APPENDIX G -- RESULTS FROM A PRELIMINARY SOIL SALINITY SAMPLING EVENT ALONG THE NORTHWEST FORK OF THE LOXAHATCHEE RIVER

CONTENTS

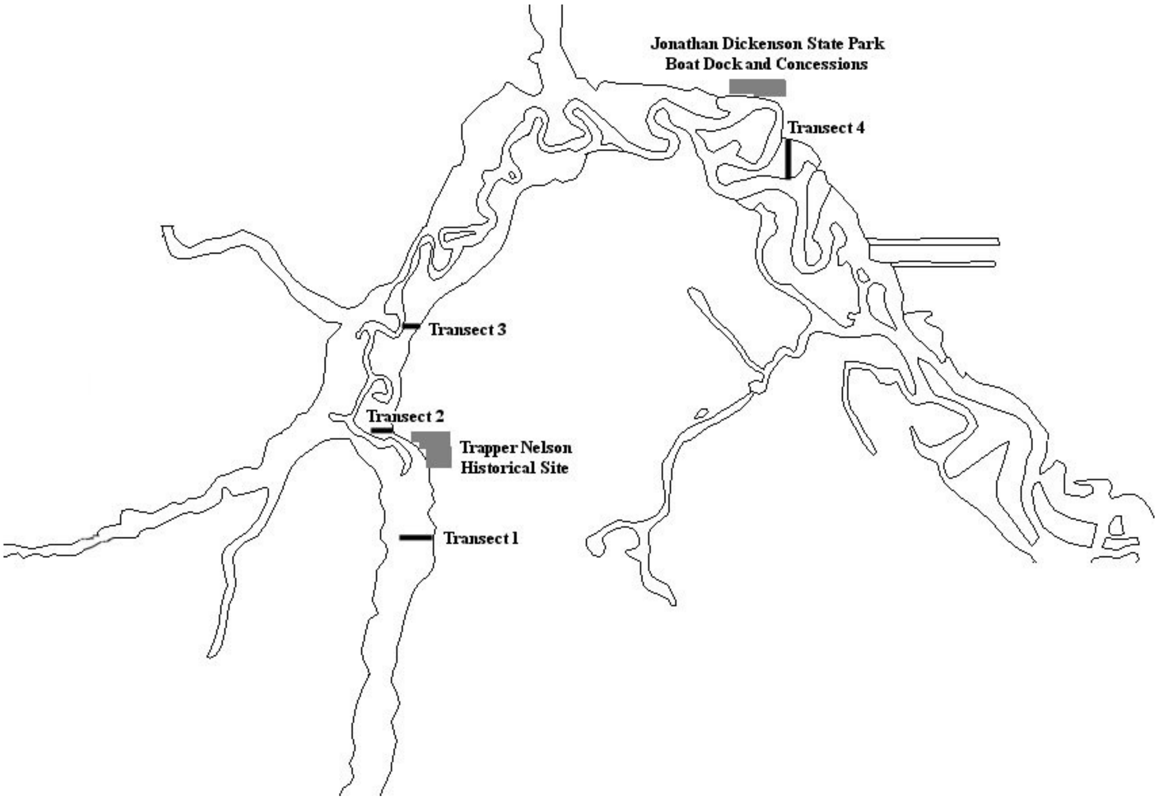
INTRODUCTION

A preliminary study of soil salinity was conducted along the Northwest Fork of the Loxahatchee River in January 2002 at four sites that represent different surface water (river) salinity conditions. This sampling effort was initiated to better understand the correlation between plant community composition and soil salinity levels, and to serve as a reconnaissance effort to gain information useful for the design of future sampling projects. The results of this study will be used to document a soil salinity gradient along the River corridor and determine if, and how, soil salinity levels vary with increasing distance from the Jupiter Inlet and soil depth.

Soil Salinity Sampling

Four soil sampling transects were established along the NW Fork of the Loxahatchee River at locations that represent varying degrees of exposure to elevated salinity from tidal influx (**Figure G-1**). All transects crossed the river floodplain, extending from the shoreline to the floodplain/upland ecotone. Transect 1 lies in an area of the NW Fork that has not been influenced by tidal salinity and crosses a freshwater floodplain swamp community dominated by swamp hardwoods (e.g. laurel oak, red bay, red maple, swamp hickory) and bald cypress. Transect 4 is located south of the Jonathan Dickinson State Park's concessions/parking area (near river mile 7.0) along a segment of the River that has been highly impacted by tidal inflows. Freshwater seeps originating from upland groundwater sources support remnant swamp hardwoods (e.g. pop ash, pond apple) and bald cypress at the floodplain/upland ecotone. Elsewhere within the floodplain, white and red mangrove dominate. Transects 2 is located just north of the Trapper Nelson homestead (near river mile 10.5) and crosses a freshwater floodplain swamp community that has been only occasionally impacted by elevated salinity. Transect 3 was located near river mile 9.9, where much of the local freshwater floodplain swamp is intact but some red mangrove (a saltwater species) is found (see **Appendix C**, Vegetation Survey Data). The selection of these sites was intended to 1) coincide with earlier vegetation transect surveys conducted by staff at Jonathan Dickinson State Park; 2) represent a gradient of sites that span from wholly freshwater to mostly saltwater conditions; and 3) represent a gradient of vegetation communities spanning from pristine freshwater swamp forest to mangrove-dominated swamp.

Figure G-1. Location of Soil Sampling Transects along the NW Fork of the Loxahatchee River, as Indicated by Black Lines



Soil sampling plot information is shown in **Table G-1**. Our original sampling design included the installation of temporary PVC wells to collect pore water samples from three depths (10 cm, 20 cm and 50 cm below the soil surface) within each plot and to analyze the samples for conductivity, chloride and sodium. In the field, we discovered that the soil conditions would not allow collection of enough pore water for the laboratory analyses. Instead, grab samples from the upper one-foot of soil were collected from all of the plots in Transects 1, 2, and 3. At transect 1, an additional sample from the flowing channel of the river was collected. At transect 3, only three plots were able to be collected due to the large amount of non-native Old World Climbing Fern (*Ligodium microphyllum*) that covered the more upland side of the transect. At transect 4, which is the most saltwater impacted site, additional samples were collected with a soil corer to include depths of 1-2' and 2-3' increments. Sufficient amounts of soil were collected from all of the plots to provide enough water for conductivity and chloride analysis.

Table G-1. Location of Soil Sampling Plots within Transects along the NW Fork of the Loxahatchee River

Collection Date	Transect	Plot (distance from River channel)
01-22-02	1	River bed
01-23-02	1	River bottom
01-23-02	2	0-3 meters
01-23-02	2	3-13 meters
01-23-02	2	33-43 meters
01-23-02	2	63-73 meters
01-23-02	2	93-103 meters
01-24-02	3	0-10 meters
01-24-02	3	30-40 meters
01-24-02	3	64-74 meters
01-24-02	4	0-10 meters
01-24-02	4	45-55 meters
01-24-02	4	95-105 meters
01-24-02	4	155-165 meters

Soil samples were transported to the Loxahatchee River Environmental Control District's laboratory. Pore water was vacuum-filtered from the soil samples using Whatman 541 filter paper in a Buchner funnel. The extracted water samples were analyzed for conductivity according to the Standard Methods section 2510B (Franson 1998) using a YSI Model 33 conductivity meter. Salinity was determined from conductivity through a conversion table. Pore water samples were also analyzed for chlorides by argentometric titration method, as described in Standard Methods section 4500B (Franson 1998). Results were entered into a spreadsheet and analyzed for trends associated with vegetation and estimated long-term (30-year) salinity conditions at each site.

Soil Samping Results and Discussion

Results from the soil salinity analysis are shown in **Table G-2**. Two methods of determining salinity were used in the laboratory, one by measuring conductivity and the other by chloride analysis. Both analyses yielded similar results and trends from these soils (**Table G-2**). Chloride proved to be a more sensitive measure of differences between sites and salinity determined by chloride analysis were slightly lower than salinity determined by conductivity.

The lowest surface soil (0-1 ft. depth) chloride concentrations were found at transect 1 (20–29 mg/L), the site least impacted by tidal salinity intrusion (**Figure G–2**). Progressively higher chloride concentrations were detected in surface soils from transect 2 (49–95 mg/L), transect 3 (67–130 mg/L), and transect 4 (2000–3000 mg/L). At transect 4, chloride concentrations also varied within the vertical soil profile near the floodplain/upland ecotone and the river bank (**Figure G–3**).

Soil salinity concentrations did not reveal a well-defined gradient along the River, as was found with the chloride data. Although the plant community at transect 3 contained both freshwater and saltwater-tolerant species, soil salinity concentrations were comparable to those at unimpacted sites (transects 1 and 2). However, chloride concentrations at transect 3 (67-130 ml/L), where some red mangrove were present, were higher than in areas inhabited by strictly freshwater vegetation.

These data indicate that soil chloride concentration, rather than salinity, may be a better parameter to use to characterize the salinity gradient along upstream portions of the NW Fork. A distinct chloride gradient was detected, associated with proximity to the Jupiter Inlet. However, elevated salinity levels were found only at transect 4 sampling sites, an area that has been strongly impacted by elevated salinity for many decades.

Results from this study indicate that “background” salinity levels are very low (0.1-0.2 ppt) in unimpacted areas. This study also suggests that salinity is not retained in the soils for long periods of time. At transect 3, an area that is affected by elevated salinity conditions during droughts (e.g. 1999-2001), salinity was comparable to the pristine transects 1 and 2.

It is important to understand that the scope of this sampling effort was narrow and interpretation or application the results are limited. This preliminary study does not address potential changes in soil salinity attributed to seasonal hydrological patterns (dry season vs. wet season), droughts, duration of exposure to a salinity concentration, soil salinity memory (ability to retain sodium or chloride), spatial distribution along the River corridor, and vertical distribution within the soil profile (which affects shallow or deeply rooted plants differently). The findings from this study can be also be useful in designing a long-term soil salinity sampling effort.

Table G-2. Soil Salinity from Transects, Calculated from Conductivity (Cond., ppt*) and Chloride (Cl, ppt) Analysis

Collection Date	**Transect**	**Plot**	**Conductivity** (Mho/cm)	**Temp.** (°C)	**Salinity** (Cond., ppt)	**Chloride** (mg/L)	**Salinity** (Cl, ppt)
1/22/02	1	River bed (grab)				29	0.05
1/23/02	1	River bottom				20	0.03
1/23/02	2	0-3 m	730	24	0.2	95	0.2
1/23/02	2	3-13 m	630	23	0.2	49	0.1
1/23/02	2	33-43 m	680	23	0.2	69	0.1
1/24/02	3	0-10 m	710	24	0.2	110	0.2
1/24/02	3	30-40 m	870	23	0.5	130	0.2
1/24/02	3	64-74 m				67	0.1
1/24/02	3	floodplain/upland ecotone	680	23	0.2	81	0.1
1/24/02	4	0-10 m (0'-1')	9900	24	5.5	3000	4.9
1/24/02	4	0-10 m (1'-2')	7900	25	4	2500	4.2
1/24/02	4	0-10 m (2'-3')	6000	23	4.5	2000	3.3
1/24/02	4	45-55 m (0'-1')	6600	23	4.5	2000	3.4
1/24/02	4	45-55 m (1'-2')	6600	23	4.5	2100	3.5
1/24/02	4	45-55 m (2'-3')	5500	23	3.0	1900	3.2
1/24/02	4	95-105 m (0'-1')	8100	23	6.5	3000	4.9
1/24/02	4	95-105 m (1'-2')	7700	23	4.2	2400	4.0
1/24/02	4	95-105 m (2'-3')	9300	23	5.2	2700	4.5
1/24/02	4	155-165 m (0'-1')	10400	23	5.9	2800	4.7
1/24/02	4	155-165 m (1'-2')	8200	23	6.5	3000	4.9
1/24/02	4	155-165 m (2'-3')	9900	23	7.7	3500	5.7

*ppt = parts per thousand

Figure G–2. Range of Chloride Concentrations measured in Soils along the NW Fork of the Loxahatchee River

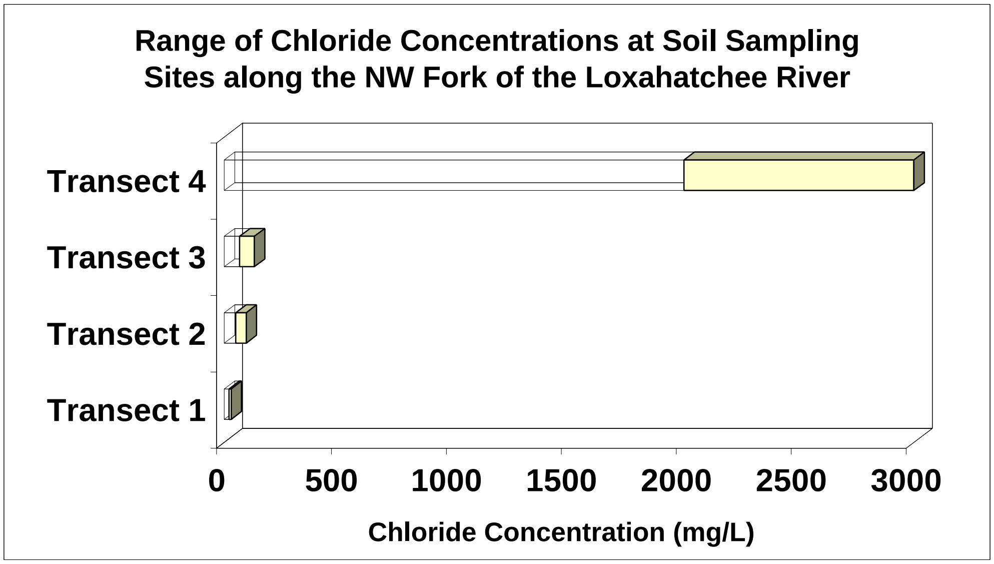
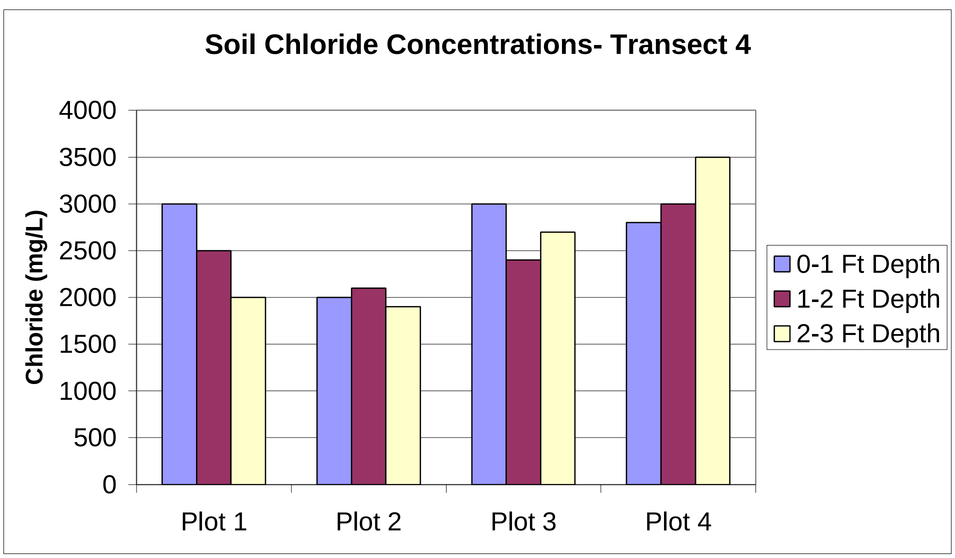


Figure G–3. Chloride Concentrations in the Vertical Soil Profile at Transect 4.



CONCLUSIONS

The results from our soil survey, which are of limited scope, suggest soil salinity is not a good predictor of long-term salinity conditions and was not useful in defining salinity conditions that lead to a decline in freshwater vegetation associated with salinity exposure. Chloride concentration, however, was more closely associated with distance from the Jupiter Inlet. More frequent and more extensive long-term soil salinity monitoring may provide data needed to determine spatial and temporal changes, and the extent of salinity concentrations that may affect the ecological community at a site.

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APPENDIX H -- ANALYSIS OF SIMULATED LONG-TERM MEAN DAILY SALINITY FROM SITES ALONG THE NORTHWEST FORK OF THE LOXAHATCHEE RIVER

CONTENTS

INTRODUCTION

Floodplain vegetation along downstream segments of the Northwest Fork of the Loxahatchee River has changed over the past century from freshwater swamp dominated by bald cypress and wetland hardwoods to salt-tolerant red mangrove swamp. In order to identify salinity conditions that may lead to changes in freshwater floodplain vegetation, District staff compiled historical flow and measured salinity data from the River, and conducted vegetation surveys in order to relate salinity to vegetation community characteristics. Since long-term salinity sampling data were not available from all sites where vegetation survey data is available, a hydrodynamic/salinity model was used to simulate salinity conditions at several upstream river sites for a 30-year period of record. The details of the hydrodynamic/salinity model, including its development and verification, can be found in **Appendix E** of this report.

The simulated long-term mean daily salinity for each of seven sites along the NW Fork were statistically analyzed to examine trends relative to proximity to the Jupiter Inlet, the primary source of salinity to the River. In addition to descriptive statistics, the simulated salinity was categorized into salinity events to make it more appropriately relatable to vegetation response. The following report presents the simulated salinity time series, describes the methods used to analyze the time series, and the results of the analysis.

METHODS

Analysis of Historical Daily Average Salinity

Long-term, continuous salinity records (e.g., multi-decade) do not exist for the Loxahatchee River or estuary. Because changes in floodplain community structure have occurred gradually over the past 50 years (see **Appendix B**), a method to generate an estimated time series of historical salinity was developed as a means to compare long-term salinity conditions at a site with vegetation community changes through time. A long-term (30 year) daily salinity data set was estimated using current (1994-2000) flow/salinity relationships developed for the NW Fork (see **Appendix D**) and long-term (30 year) historical flows from Lainhart Dam using the RMA-2/RMA-4 hydrodyamic salinity model (USACE 1996). The model was developed specifically for the Loxahatchee River using methods described in **Appendix E**. A 30-year period of record (POR) of mean daily salinity, which extended from April 1971 through January 2001, was simulated for each of eight sites (**Table H–1, also see Figure C-1 for a map of the location of these sites along the NW Fork**). From these data SFWMD staff plotted individual time series, and calculated descriptive statistics (mean, standard deviation, median, mode and maximum daily salinity concentrations) for each site. Other analysis included calculation of the percent of time that salinity was equal to or above a particular threshold value (e.g., 1 ppt, 2 ppt, 3 ppt, etc.), and the determination of the mean salinity event duration and the mean time between salinity events (i.e. salinity event analysis).

The salinity event analysis grouped the simulated salinity data from a site into salinity events that equaled or exceeded a particular salinity threshold. For example, at a threshold of 2 ppt or greater, a salinity event was defined as the number of continuous days that the simulated salinity time series was at or above this value. The mean number of days (duration) of each salinity event (*Ds*) and the mean number of days between events (*Db*) at each site (**Table H-1**) were derived for the POR. Salinity conditions at a site were expressed in terms of *Ds* and *Db* for a minimum threshold value in order to relate it to vegetation community characteristics. In terms of potential effects of salinity exposure (or any toxic substance) on freshwater vegetation, the magnitude (concentration) and duration of exposure to elevated salinity levels is related to the extent of damage to the freshwater community caused by that exposure (see Pezeshki et al. 1986, 1987, 1990, 1995; Conner & Askew 1992; Allen 1994; Allen et al. 1994, 1997). The time between salinity events is also important to allow sufficient recovery from the last damaging salinity event.

A ratio of the salinity event duration and time between events (*Ds/Db*) was calculated to provide a single numeric value to express the salinity characteristics at a specific site and to reduce the number of factors in the analysis. Event duration and time between events can be expressed in any time scale (days, weeks, months), however in our application we have used days as the standard unit of measure for this ratio. A *Ds/Db* ratio of 1 indicates that half of the time average daily salinity at a site is at or above the selected threshold. *Ds/Db* ratio values that are increasingly larger than 1 indicate more predominantly saltwater conditions at a site. This ratio decreases consistently as one travels upstream from the Jupiter Inlet and becomes zero as constant freshwater conditions are observed. For this reason, the *Ds/Db* ratio was useful as a general index of salinity at a given location along the River.

Table H-1. Sites along the Northwest Fork of the Loxahatchee River where Long-Term Mean Daily Salinity Time Series were Simulated

Site Name	**Site Location**
Vegetation Site 7-C, Water Quality Monitoring Site #64	River Mile 7.8
Vegetation Site 8-B	River Mile 8.4
Vegetation Site V-6, Water Quality Monitoring Site #65	River Mile 8.6
Vegetation Site 8-D (8-st)	River Mile 8.9
Vegetation Site 9-B	River Mile 9.2
Water Quality Monitoring Site #66	River Mile 9.4
Vegetation Site 9-C	River Mile 9.7
Vegetation Site 10-B	River Mile 10.2

RESULTS AND DISCUSSION

Estimation of a Historical Mean Daily Salinity Time Series

Using the hydrodynamic salinity model developed for the Loxahatchee River and Estuary (see **Appendix E**) and historical flow data for Lainhart Dam and other tributaries which drain into the NW Fork, we estimated the mean daily salinity concentrations at seven sites (**Table H-1**) along the NW Fork. The summary statistics from the result of this model run are shown in **Table H-2**.

Table H-2. Summary Statistics of the Estimated Mean Daily Salinity Concentrations for the 30 Year Period of Record

Site Name	River Mile	Daily Salinity			
		Mean ± St. Deviation	Median	Mode	Maximum
7-C (WQ Sta. #64)	7.8	6 ± 5	5	0	21
8-B	8.4	4 ± 4	2	0	18
WQ Sta. #65	8.6	3 ± 3	1	0	16
8-D	8.9	2 ± 3	1	0	14
9-B	9.2	1 ± 2	0	0	9
9-C	9.7	0 ± 1	0	0	6
10-B	10.2	0 ± 0	0	0	3

In order to express long-term salinity conditions at a site in terms of effects on the vegetation community, we organized the data into “salinity events”. In this analysis, it was assumed that a “threshold” of salinity exists above which an impact occurs to a plant species. Along upstream segments of the NW Fork, a salinity event at or above a specific threshold occurs for a number of days at a site, which is followed by a period of time where freshwater conditions return and recovery from the salinity impact occurs. To capture this salinity impact-recovery cycle and the net effect it may have on the freshwater plant community, the long-term salinity data was examined in terms of salinity event duration (*Ds*) and elapsed time between events (*Db*) for a particular threshold. **Table H-3** shows the duration of salinity concentrations at or above several selected threshold values for the modeled period of record. **Table H-4** shows the mean duration of salinity events and the mean time between salinity events at or above the selected threshold values for the modeled period of record. Salinity event ratios *Ds/Db* along the NW Fork show a negative correlation with distance from the Jupiter Inlet. As one moves upstream, the *Ds/Db* ratio approaches zero as fewer salinity events occur. In contrast, the *Ds/Db* ratio exceeds one and rapidly increases downstream as the magnitude and duration of each salinity event increases, and the time between salinity events decreases. An example of the *Ds/Db* relationship is shown in **Figure H-1** for a salinity threshold of ≥ 2 ppt.

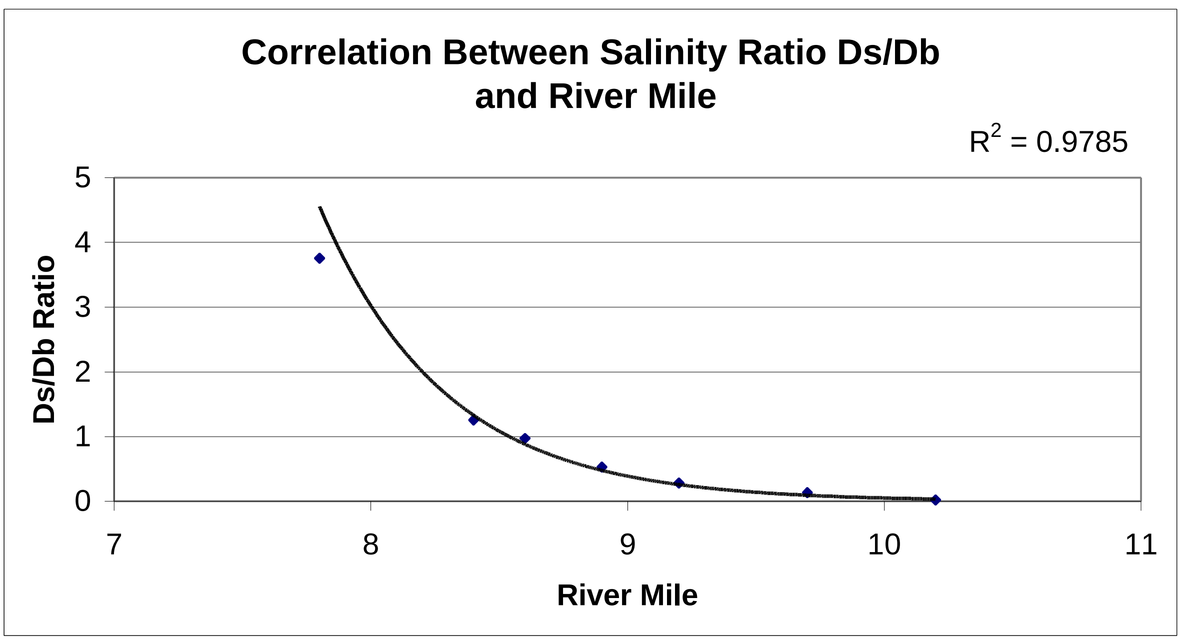
Table H-3. Duration of Estimated Mean Daily Salinity Concentrations from the 30 Year Period of Record for Several Selected Threshold Values at Sites along the NW Fork

Site	River Mile	Number of Days (Percent of Time) at or above Threshold			
		≥ 1 ppt	≥ 2 ppt	≥ 3 ppt	≥ 4 ppt
7C (#64)	7.8	9252 (84.9%)	7913 (72.6%)	6689 (61.4%)	5831 (53.5%)
8B	8.4	7038 (64.6%)	5496 (50.4%)	4613 (42.3%)	3873 (35.5%)
WQ #65	8.6	5870 (53.9%)	4562 (41.9%)	3666 (33.6%)	3013 (27.6%)
8D	8.9	4525 (41.5%)	3297 (30.3%)	2497 (22.9%)	1959 (18.0%)
9B	9.2	3071 (28.2%)	1953 (17.9%)	1297 (11.9%)	834 (7.7%)
9C	9.7	1870 (17.2%)	906 (8.3%)	418 (3.8%)	161 (1.5%)
10B	10.2	568 (5.2%)	113 (1.0%)	14 (0.1%)	0 (0.0%)

Table H-4. Mean Salinity Event Duration (days) and Time between Events (days) from Estimated Mean Daily Salinity along the NW Fork of the Loxahatchee River

Site	River Mile	Mean Duration (*Ds*) and Time Between (*Db*) Salinity Events									
		≥ 1 ppt		≥ 2 ppt		≥ 3 ppt		≥ 4 ppt		≥ 5 ppt	
		Ds	***Db***	***Ds***	***Db***	***Ds***	***Db***	***Ds***	***Db***	***Ds***	***Db***
7C (#64)	7.8	157	14	76	20	50	26	44	33	44	43
8B	8.4	83	23	49	39	52	62	48	77	45	94
WQ #65	8.6	67	30	68	70	58	85	56	111	40	124
8D	8.9	54	52	47	90	46	130	37	144	35	191
9B	9.2	55	143	46	207	45	344	41	504	29	612
9C	9.7	38	189	40	455	34	874	20	1800	22	5422
10B	10.2	31	576	22	2157	13	10899	0	-	0	-

Figure H-1. Correlation between Salinity Event Ratio *Ds/Db* (>2 ppt) and River Mile



CONCLUSIONS

Salinity characteristics at sites along the NW Fork are highly correlated to distance from the Jupiter Inlet. Generally the magnitude and duration of salinity conditions decrease as one moves upstream along the River, with predominantly freshwater conditions occurring above river mile 10 for the simulated long-term salinity time series. A categorization of the salinity time series into salinity events proved useful for combining three separate factors (salinity magnitude, duration of a salinity event, and time between salinity events) into a single numeric value.

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APPENDIX I -- SIMULATION OF CONSUMPTIVE USES WITHIN THE LOXAHATCHEE BASIN

CONTENTS

Introduction

Consumptive uses of water sources include those from public water supply, irrigation and self-supplied residential wells. The overall effect of consumptive uses on flows to the Northwest Fork of the Loxahatchee River was considered as part of the MFL process. Use of the Surficial Aquifer and the Loxahatchee River to meet local demands is a resource function. Several approaches were used to estimate the magnitude and proportion that consumptive uses may comprise of the watershed's hydrologic budget.

To address this issue, District staff analyzed available hydrogeologic data and conducted a number of groundwater model simulations. Data were obtained from SFWMD and USGS databases. Model scenarios were simulated with a modified USGS, three-dimensional, finite difference, groundwater flow model code (MODFLOW-96) that was developed by the SFWMD for northern Palm Beach County (SFWMD 2002). This model is known as the Northern Palm Beach Groundwater Model, or NPB Model. This model provided a means to estimate the relative effects of consumptive uses within the basin on water levels in Loxahatchee Slough and deliveries to the Northwest Fork of Loxahatchee River during selected wet, normal and dry periods.

MODFLOW is primarily a computer software code for evaluating groundwater flow conditions. The code utilized in this report does not incorporate a surface/groundwater module. Therefore, overland flow and associated surface water routing through canal networks is not directly simulated and the effects of consumptive use withdrawals on overland and riverine flows should only be considered as gross estimates.

Model Description

The NPB MODFLOW Model includes that portion of northern Palm Beach County that is bounded to the west by the canals, L-10 and L-12 and to the east by the Atlantic Ocean. The southern and northern boundaries include the C-51 canal and the Palm Beach-Martin County line, respectively. Boundaries and major features in the model domain are shown in **Figure I-1.**

The MODFLOW Computer code is used by the District as a tool to assist in decision making for various purposes, including water supply planning, facility design evaluations, rule-making, and consumptive use permitting. The modified, SFWMD version, of MODFLOW-96 includes three new modules: the Wetland and Diversion Packages, the Operations Package and a Multiple Well Package, each of which are briefly described below.

- Wetland and Diversion Package: This module within MODFLOW enables the top layer of the model's grid system to include overland flow through dense vegetation (including surface storage) and channel flow through slough networks, thus more accurately simulating wetland hydroperiods and canal stages encountered within South Florida.
- Operations Package: This module allows water to be moved within the MODFLOW model to simulate the operational transfer of water (e.g. opening a structure or a pump) from one location to another. The Operations Package is capable of managing flows into and out of reservoirs, such as Storm Water Treatment Areas and Aquifer Storage and Recovery wells, and can be used to provide boundary information (e.g. available runoff for potential capture by a reservoir).
- Well Package: This module allows the user to keep different well data sets (e.g., public water supply wells, agricultural wells etc.) independent of each other, thereby evaluating the effects of each type of water use separately.

Model Limitations

MODFLOW is primarily a computer software code for evaluating groundwater flow conditions. The code utilized in this report does not incorporate a surface/groundwater module. Therefore, overland flow and associated surface water routing through canal networks is not directly simulated and the effects of consumptive use withdrawals on overland flows should only be considered as gross estimates. It is recommended that future model updates incorporate a surface water routing module to provide a greater understanding of the canal systems within northern Palm Beach County.

The NPB Model was utilized for this investigation because it was readily available and covered the area of concern. In addition, it was assumed that groundwater consumptive use in the vicinity of the Loxahatchee Slough and River was of concern and a model, which addressed groundwater systems, was required.

Model Coverage and Components

The model domain for the NPB Model is uniformly organized into 0.25 mile by 0.25 mile grid cells, each covering 0.0625 sq. miles or 40 acres, resulting in a full grid of 9,280 cells per

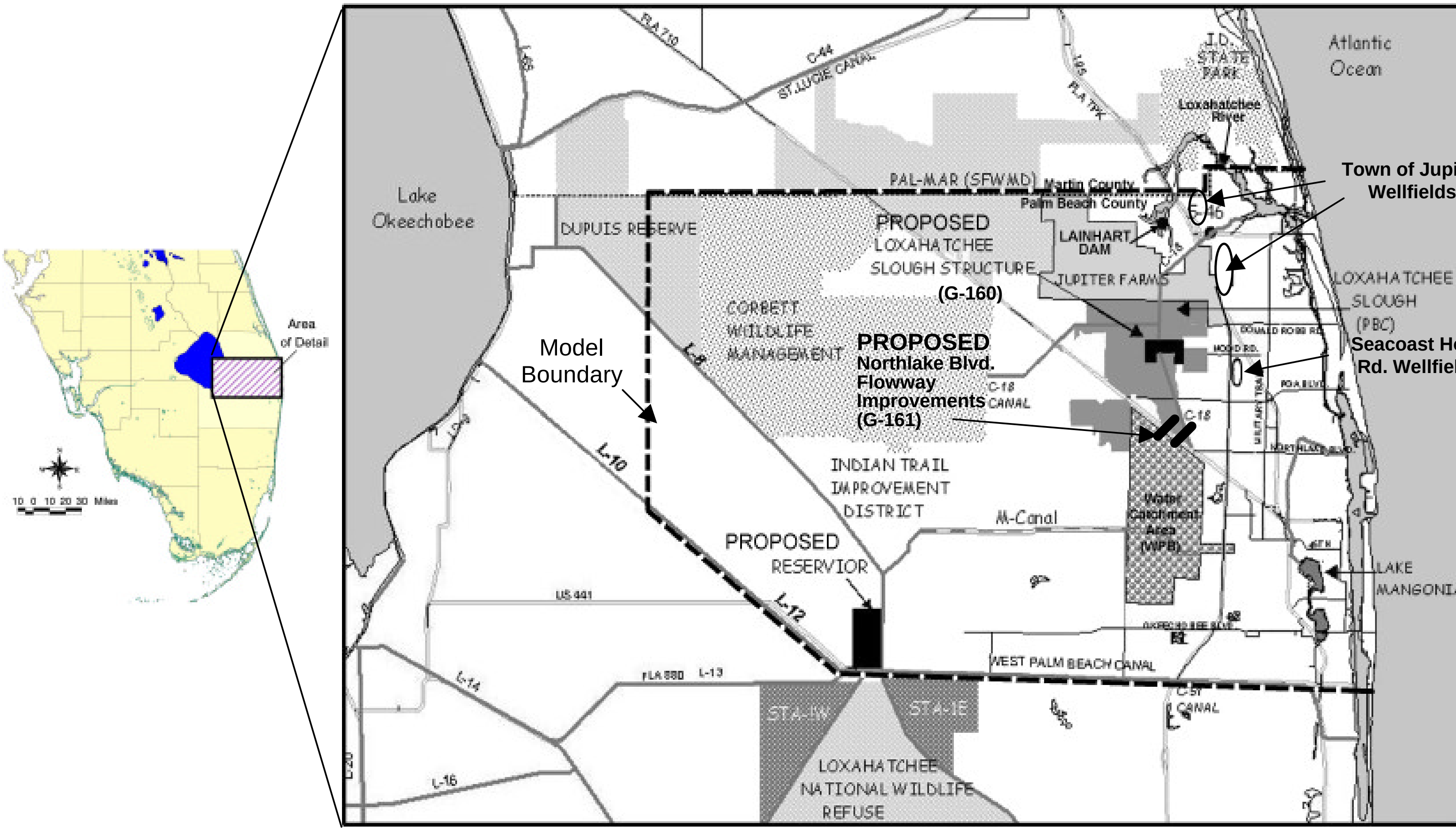

Figure I-1. Location and major features of northern Palm Beach groundwater model study area (proposed G-160 and G-161 structures were not included in the modeling scenario).

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layer with 80 rows and 116 columns. This horizontal grid allows for a degree of regional accuracy with manageable run-times and post-processing times. The grid limits (corner nodes) in U.S. State Plane Florida East NAD 27 coordinates are listed below:

x_{min} = 658,906 Easting;

x_{max} = 812,026 Easting;

y_{min} = 851,308 Northing ;

y_{max} = 956,908 Northing.

The majority of the Loxahatchee Watershed is underlain by the Surficial Aquifer System (SAS). Portions of the Biscayne Aquifer exist in this area, as well. The model divides the SAS (including the Biscayne Aquifer portions, if present) into seven layers. The model provides a representation of the hydrogeologic zones within the aquifer, as well as the partial penetration of canals and wells. The layering scheme incorporates the two principal permeable zones targeted by production wells (i.e., a highly transmissive zone representing the prolific Biscayne Aquifer and a more laterally extensive, moderately transmissive, production zone). **Figure I-2** shows the conceptual cross section of hydrogeologic zones within the SAS.

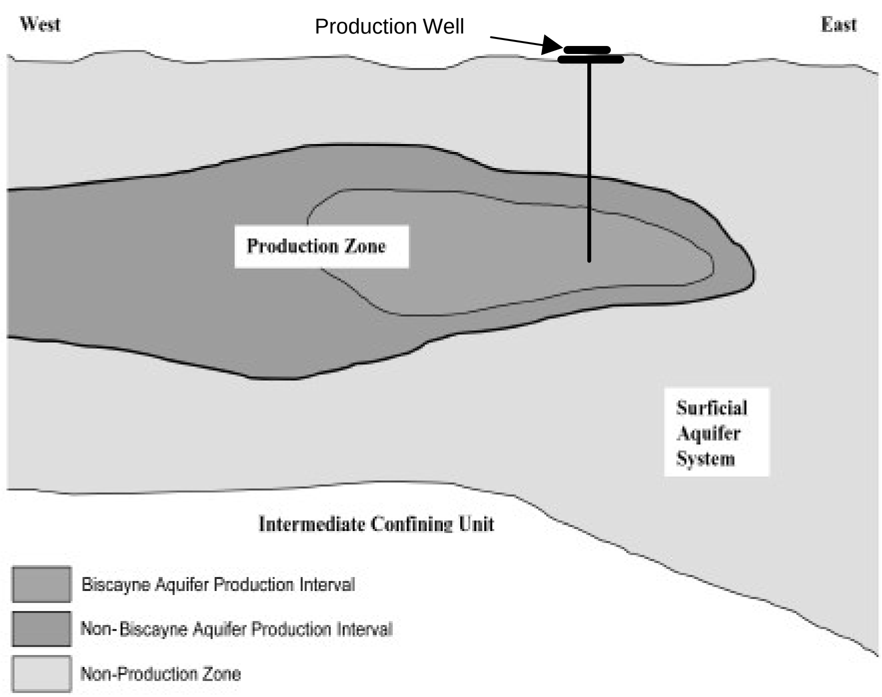

Figure I-2. Representative aquifer cross-section in Palm Beach County.

Model Calibration

Calibration of a model is achieved when the model is capable of simulating a set of field measurements within specified tolerances. The model was calibrated to transient conditions that included groundwater stages, or head, from wells within the study area, and flows at the Lainhart Dam. For calibration of heads, the total number of observation wells used in the calibration was 19 - one observation well located in Layer 3, five wells in Layer 4 and 13 wells in Layer 2. For calibration of surface water flows, data for Lainhart Dam were extracted from the SFWMD's DBHydro database and modified based upon the weir equation. Calibration targets included those average daily flows from Lainhart Dam that were less than 50 cfs. MODFLOW is a groundwater model that does not have the capability of simulating storm driven events. In addition, the primary purpose of this analysis was to document effects that occur under low flow conditions. Therefore, flows from Lainhart Dam that exceeded 50 cfs were excluded from the calibration targets. This limitation results in a reduction of the reliability of the estimates produced for average and wet periods.

The model calibration period extended from January 1987 through December 1995. This eight-year period of record incorporated "normal," "wet," and "drought" conditions, which allowed assessment of water management scenarios under conditions ranging from excess rainfall conditions (1994-95) to extreme drought conditions (1988-89). A daily time step was used, due to the large daily variations in time series data such as canal stages, rainfall, evapotranspiration, and pumpage.

The "trial and error" method was used to calibrate the NPB Model. To apply this method, parameter values are adjusted manually in sequential model runs. The results of calibration were evaluated both qualitatively and quantitatively. Results of the calibration of the model indicated that in all cases, average absolute errors were less than 1.0 foot for head calibration, and the trend match between hydrographs showing simulated versus historical groundwater levels was judged to be satisfactory for modeling purposes (SFWMD 2002). For calibration of flow, the absolute errors were less than 10 cfs during 55 percent of the simulation period. The average mean of the field data for Lainhart Dam was 24.1 cfs and the average mean of the model results for the Lainhart Dam was 24.7 cfs, for calibration targets of flow from Lainhart Dam less than 50 cfs. For flows from Lainhart Dam less than 65 cfs, the average for the field data was 30.8 cfs and the average for modeled data was 25.4 cfs. The results of the surface water calibration clearly indicate that under dry conditions, when the C-18 canal is receiving primarily inflow from the groundwater system, MODFLOW can provide a reasonable estimate. However, once significant rainfall events occur, the model cannot adequately address these surface water flows. It is recommended that, in the future, a surface water flow component should be added to the NPB Model to help achieve better calibration of surface water flow. In addition, the model boundaries should be expanded northward to include the entire estuary basin where surface and groundwater flows are contributing.

Model Application

The Northern Palm Beach County (MODFLOW) model was applied to three different scenarios to simulate the effects of consumptive uses within the Loxahatchee watershed. Specific emphasis was placed on hydrologic conditions in the C-18 Canal Basin, which provides water for a variety of consumptive uses, including public water supply, irrigation and self-supplied residential use. The three model scenarios presented below differ with respect to the way groundwater withdrawals and proposed surface water systems are represented in the model. These simulations are summarized as follows:

- "1988-1995 Actual Pumpage" model run: This scenario represents hydrologic conditions in the basin prior to recent land use and consumptive use permitting changes that have occurred in the watershed since 1995. Data for the Well Package were extracted from individual water use permits issued by the South Florida Water Management District's Regulation Department for irrigation users. For the PWS systems, actual data for each month and year of the simulation period were used. That is, what they actually reported using in March, 1992 is actually simulated. An important point in evaluating this model run, since it does include actual PWS pumpage data, was that in 1988-1990, this area of the District was under a Phase 1 and Phase 2 water restriction which required mandatory water reductions that were simulated in the model
- "No Pumping" model run: This model scenario was the same as the "1988-1995 Actual Pumpage" model run, except no groundwater withdrawals were simulated within the basin (i.e., "pumps off" scenario).
- "Permitted" model run: This scenario best represents present (2001) hydrologic conditions within the watershed. Data for the Well Package were extracted from individual water use permits issued by the South Florida Water Management District. It is important to note that the withdrawals used in the model were permitted amounts rather than actual pumpages. Therefore, in this run, model results are considered conservative (i.e. they may over-estimate adverse impacts) with respect to quantifying the effects of consumptive uses as compared to conditions today. In addition, variations in withdrawal rates due to seasonal changes were not taken into account in this model run. The 1989-1990 water restrictions were not simulated in this model run.

Model Results

The data from the model were adjusted, based on field data, to represent an average rainfall year (1991-1992) and drought conditions (1988-1989), for the Historical and Permitted model run scenarios. Historical flow data obtained from USGS and SFWMD records for the Lainhart Dam, Hobe Grove Ditch, Kitching Creek and Cypress Creek were averaged for a nearly-average rainfall year (1991-1992) and a drought year (1988-1989). **Table I-1** and **Figure I-3** are organized to show the relative contributions of G-92 and Jupiter Farms to the total flow across Lainhart Dam, which is the primary source of freshwater flow to the Northwest Fork, and to compare this input with the inflows from the other major tributaries. Once again, it should be noted that MODFLOW is primarily a computer software code for evaluating groundwater flow conditions. The code utilized in this report does not incorporate a surface/groundwater module. Therefore, overland flow and associated surface water routing through canal networks is not directly simulated and the estimates of consumptive use withdrawals on overland flows should only be considered as gross estimates.

Table I-1. Water Budget Flows (cfs) for Average and Dry years for “1988-1995 Actual Pumpage”, “Permitted”, and “No Pumping” Model Runs (see text for explanation).

Sub-Basin	**Ave. daily flow**		**Basin**	**Ave. daily flow**		**Watershed**	**Ave. daily flow**	
	Dry✠	**Ave.****		**Dry✠**	**Ave.****		**Dry✠**	**Ave.****
“1988-1995 Actual Pumpage” **Model Run**								
G-92*	27	154	Lainhart Dam*	56	164	Loxahatchee Estuary	102	235
Jupiter Farms*	29	10						
			Hobe Grove Ditch	6	11			
			Kitching Creek	4	12			
			Cypress Creek	36	48			
“Permitted” Model Run								
G-92*	21	147	Lainhart Dam*	49	156	Loxahatchee Estuary*	95	227
Jupiter Farms*	28	9						
			Hobe Grove Ditch	6	11			
			Kitching Creek	4	12			
			Cypress Creek	36	48			
“No Pumping” Model Run								
G-92*	30	155	Lainhart Dam*	59	165	Loxahatchee Estuary*	105	236
Jupiter Farms*	29	10						
			Hobe Grove Ditch	6	11			
			Kitching Creek	4	12			
			Cypress Creek	36	48			

✠Dry =Average Daily CFS from 1988-1989; **Average = Average Daily CFS from 1991-1992; *Calculated from Model

Table I-1 considers the actual field data collected for the analysis of the “1988-1995 Actual Pumpage” condition. The flows delivered from G-92 and Jupiter Farms to the Lainhart Dam, were estimated from the model and adjusted to equal actual flows

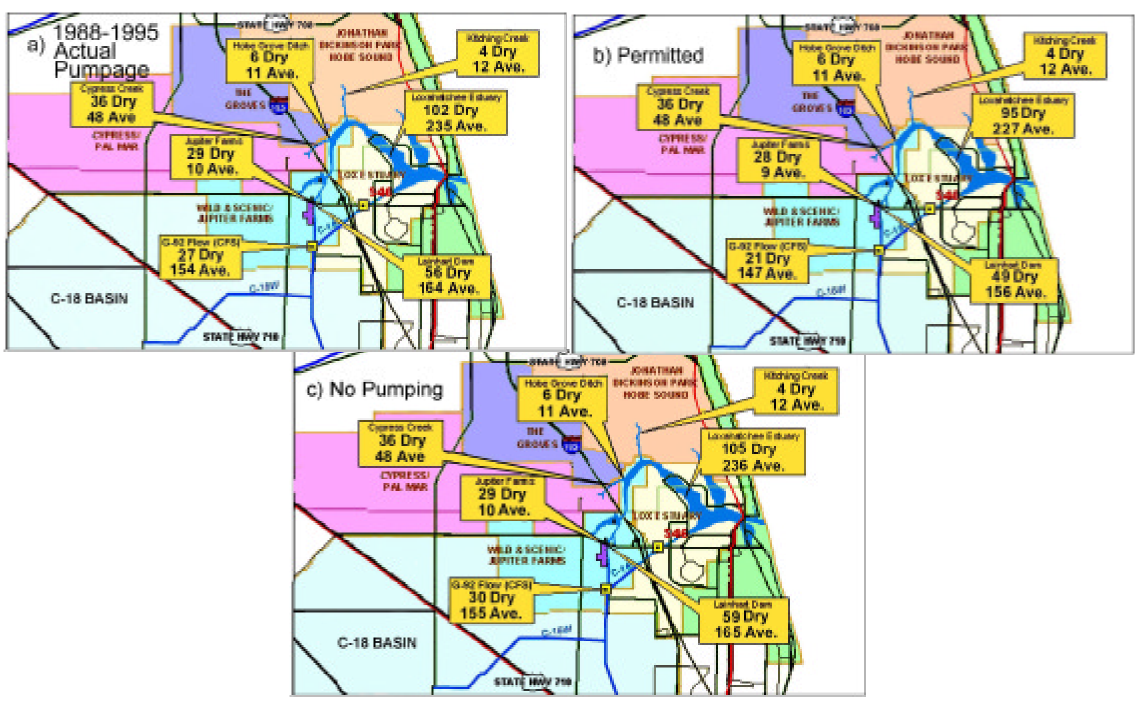

Figure 1-3. Flows to the Loxahatchee River from tributary basins and structures during dry and average rainfall conditions, based on the a) “1988-1995 Actual Pumpage,” b) “Permitted” and c) “No-Pumping” model runs.

across Lainhart Dam for the "1988-1995 Actual Pumpage" condition. The "Permitted" and "No Pumping" scenarios are simulated conditions and did not actually occur during those years. For those two runs, flows were estimated at Lainhart Dam based upon the net change in observed seepage compared to the actual, unmodified, seepage values as determined by the model and shown in **Figure I-4.**

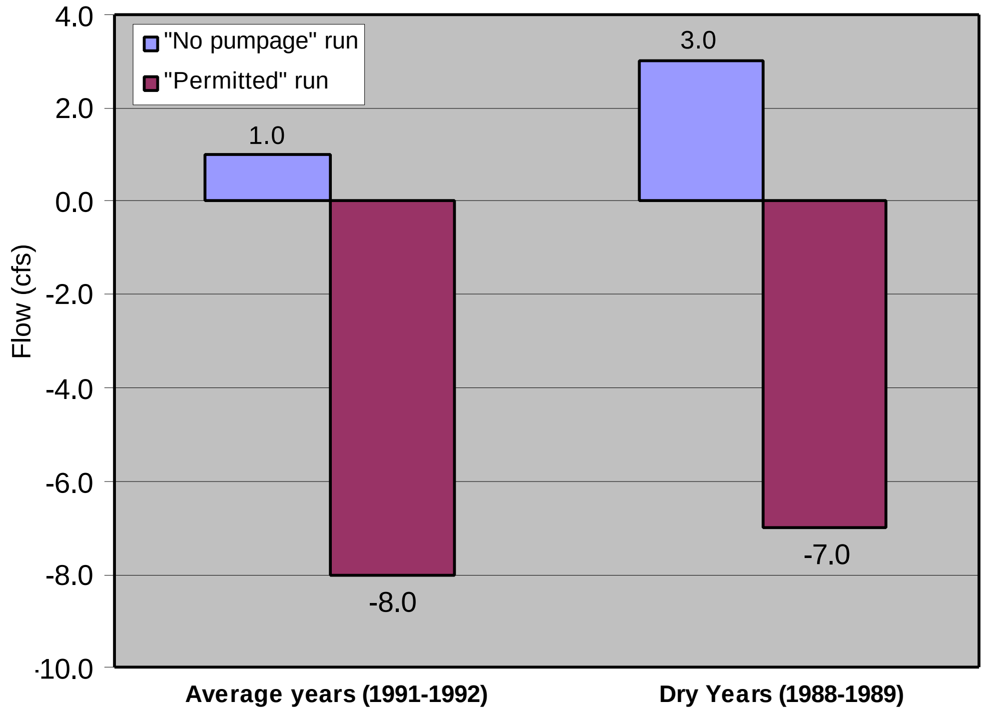

Figure 1-4. Net change in groundwater seepage from the C-18/Jupiter Farms Basin as compared to the "1988-1995 Actual Pumpage" run. Dry year (1988-89) estimates do not include the effects of mandatory water restrictions

Flows received from Cypress Creek, Hobe Groves Ditch and Kitching Creek were based on actual flow records. Figure I-3. Flows to the Loxahatchee River from Tributary Basins and Structures during Dry and Average Rainfall Conditions were based on the a) "1988-1995 Actual Pumpage," b) "Permitted," and c) "No-Pumping" model runs.

Table I-1 shows that the projected average daily flow to the Loxahatchee Estuary during an average rainfall year under the "No Pumping" scenario is 236 cfs and during a drought year is 105 cfs. For the "Permitted" scenario, 227 cfs was provided to the estuary under average rainfall conditions and 95 cfs during drought conditions. This indicates that all permitted and exempt consumptive uses account for a potential net reduction of less than 10 cfs, under drought conditions, from the C-18/Jupiter Farms Basin to the Northwest Fork. Mandatory water restrictions under drought conditions were not simulated in the model scenario. Therefore the actual net reduction may be significantly less than 10 cfs. Under average rainfall conditions, the effect of pumping was estimated to be a 9 cfs reduction, which represents a 4 percent reduction in total freshwater river flow to the estuary.

A separate model run was made to estimate the effects of different classes of Consumptive Use Permits that have been issued in the area. Pumpages were classified as utility, irrigation, and domestic self supplied. The results suggest that of the total 9 cfs (under average rainfall conditions), public water supply wells may account for approximately 75 percent (6.8 cfs), whereas irrigation and residential self-supplied demands account for the remaining 25 percent (2.2 cfs) of total flow reduction. As many of the permitted withdrawals have not been realized, these estimates should be considered to be conservative.

It should be noted that the Town of Jupiter and the Village of Tequesta have begun or are in the process of utilizing the Floridan Aquifer to help meet existing and future demands. In addition, extensive use of reclaimed water has also been implemented by Loxahatchee River Environmental Control District and Seacoast Utilities for irrigation demands to help reduce stress on the aquifer.

Potential Effects on Wetlands

As part of these analyses, District staff evaluated the effects of consumptive use withdrawals on local wetland areas, using a suite of indicator regions to estimate the degree of stress to these wetlands. The indicator regions, which were chosen to represent areas where effects were likely to occur, are listed in **Table I-2.**

Table I-2. Indicator regions selected to represent water level conditions in the Loxahatchee River Watershed.

Indicator Region No.	Location
44	Just west of C-18-E Canal
40	Near the north end of the sloughs, west of C-18 canal
35	Near the south end of the sloughs, west of C-18 E Canal
46	East of the slough near the juncture of C-18 E and C-18 W
950	Just east of the C-18 W Canal

Figure I-5 shows the locations of model grid cells and indicator regions in the major wetland areas (West Palm Beach Water Catchment Area, Loxahatchee Slough and the Corbett Area) of the NPB Model domain. Stage duration curves were generated by the model for each of the indicator regions. These curves show the period of inundation for the particular indicator region, and can be used to assess wetland effects. **Figure I-6** shows the stage duration curves for indicator regions 44, 40, 35, 46, and 950. The stage duration curve have been normalized with respect to the land surface elevation.

Comparisons of stage duration curves for the “pumps off’ vs. “permitted” scenarios show that consumptive uses may affect the indicator regions to the east of the Loxahatchee Slough (950 and 46) more than they affect the indicator regions to the west of the slough (35, 40, and 44). However, drawdowns appear to be less than 1 foot in these indicator regions suggesting that these regions have met the consumptive use resource protection criteria and have not been affected significantly by groundwater withdrawals (**Figure I-6**).

In summary, modeling studies of the northern Palm Beach County portion of the Loxahatchee River watershed indicate that consumptive uses within the Loxahatchee Basin have observable effects on flow to the Northwest Fork during drought events. The effects of these withdrawals are probably insignificant during wet and average years, but may result in minor reductions of flows across Lainhart Dam during dry periods.

During dry periods, the overall effect of permitted consumptive uses and exempt withdrawals on total flow of freshwater to the Northwest Fork and the estuary represents a decrease of less than 10 cfs, or less than a 10 percent reduction in total flow of freshwater to the estuary. During normal rainfall periods, the reduction in flow to the estuary may be on the order of 4 percent.

These estimates are considered to be conservative, because permitted withdrawals have not yet been realized, some permitted withdrawals have shifted to alternative sources, and the flow estimation capabilities of the model are limited.

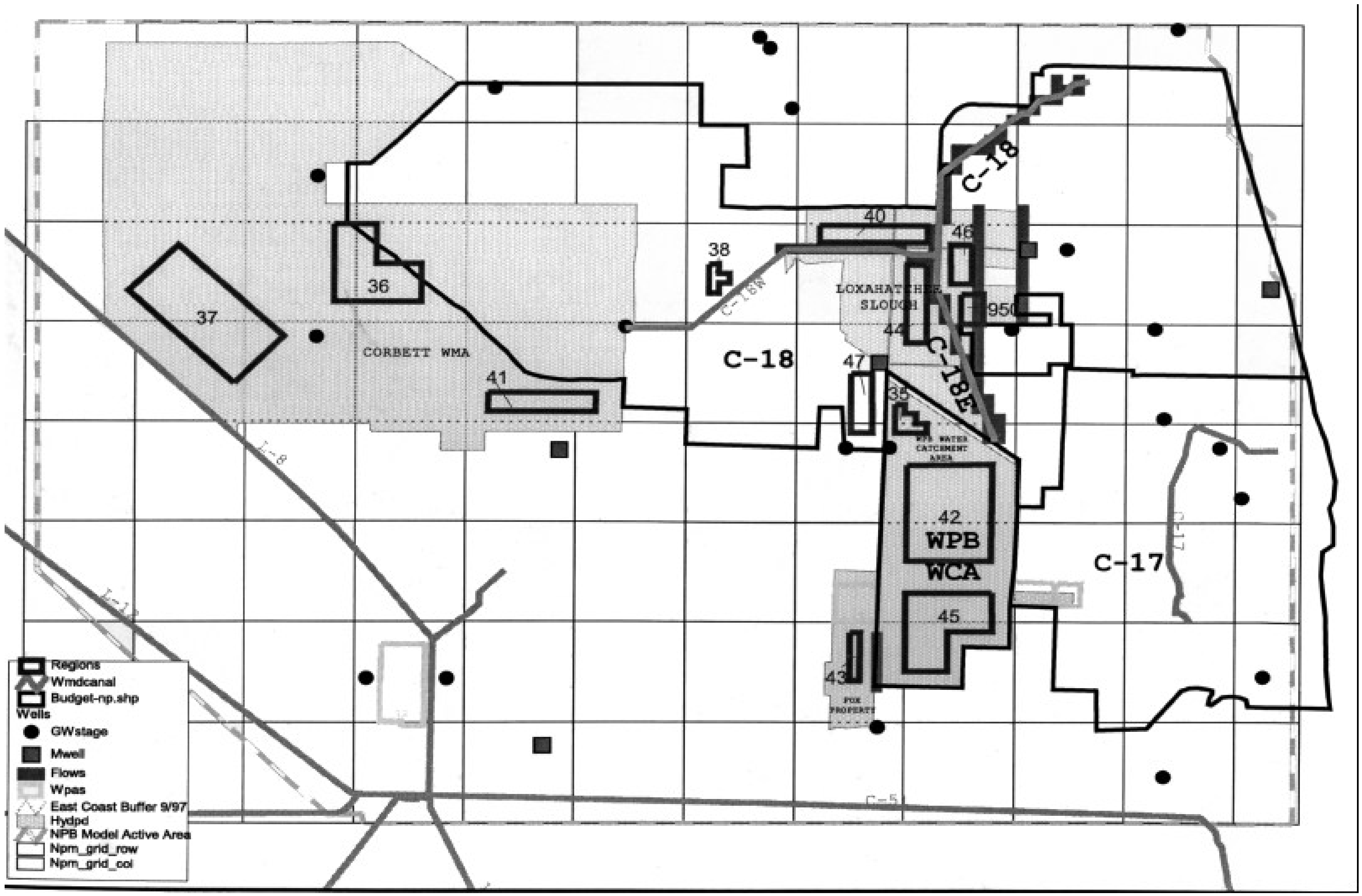

Figure I-5. Locations of Indicator Regions in the Northern Palm Beach Groundwater Model

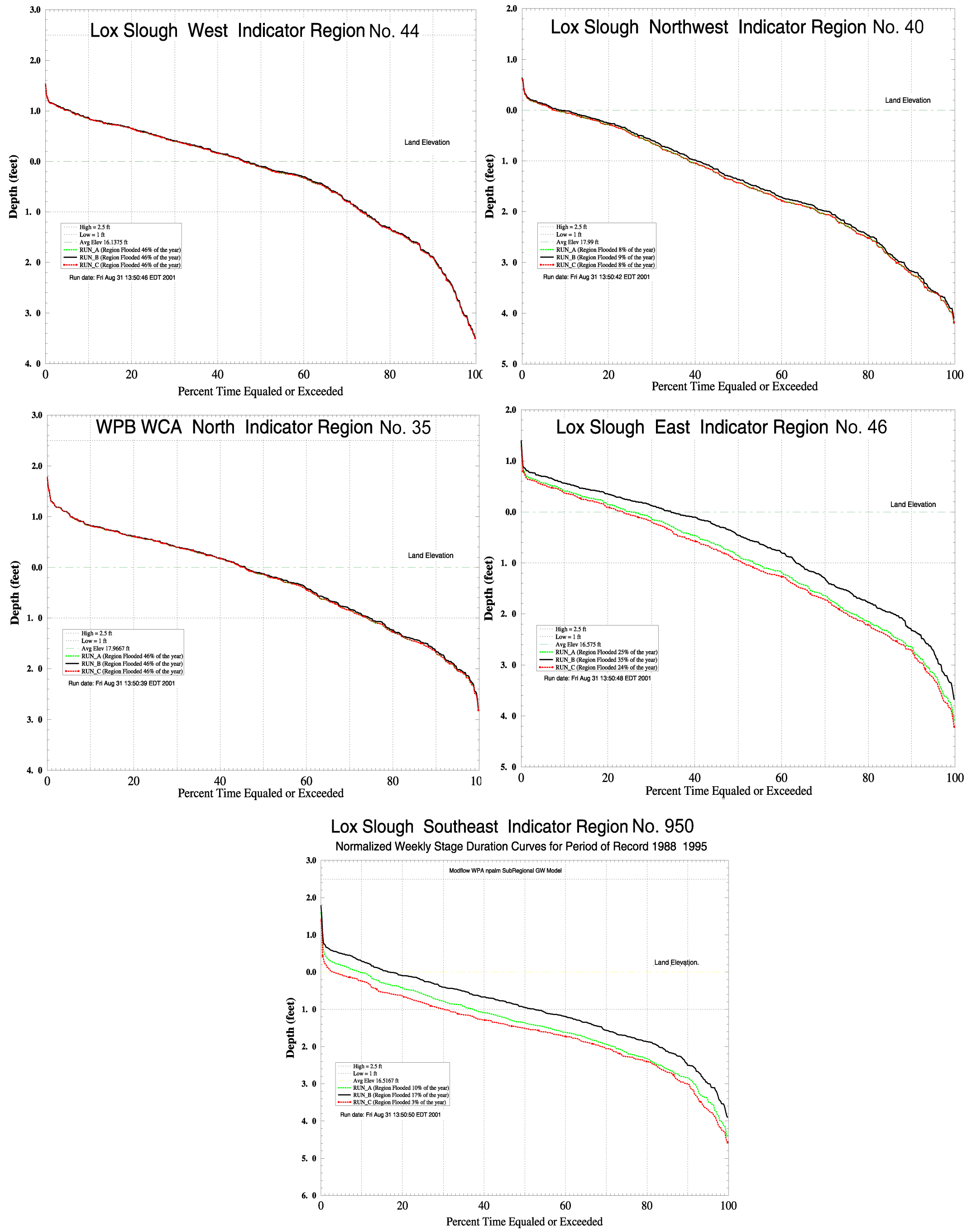

Figure I-6. Stage Duration Curves for Loxahatchee Slough Indicator Regions for the permitted (red), "1988-1995 Actual Pumpage" (green), and "pumps off" (black) model runs.

APPENDIX J -- PEER REVIEW PANEL COMMENTS ON THE JULY 15, 2002 DRAFT DOCUMENT

CONTENTS

PLANNING & DEVELOPMENT DIVISION
REQUEST FOR EXPERT ASSISTANCE

Tracking Information

Requesting Professionals:	John Zahina, Staff Environmental Scientist
Requesting Department:	Water Supply Department
Project Name:	**Peer Review Panel**: Proposed Minimum Flow Criteria for the Loxahatchee River and Estuary within the South Florida Water Management District
Date:	July 26, 2002

Introduction/Background

It is the intent of the South Florida Water Management District (District) to ensure that all planning documents produced by staff are based on sound scientific principles and best available information. This draft document represents the District's on going contributions towards developing a technical definition of *Minimum Flows and Levels (MFLs)* for the Loxahatchee River and Estuary. Towards these ends, the District seeks to obtain an objective and expert peer review of the revised draft document entitled: *"Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary" (MFL document)*, dated July 15th 2002.

Pursuant to Section 373.042, F.S., Water Management Districts must establish Minimum Flows and Levels for aquifers and surface water courses. The minimum flow for a given watercourse shall be the limit at which further withdrawals would be *significantly harmful* to the water resource or ecology of the area. Specific MFL technical criteria will be established through a state rule development and rule making process, and will be implemented through a multifaceted program of water resource development projects, operations, research and regulation. This peer review is limited to issues regarding establishment of the technical criteria and not to the related implementation process. The District seeks objective review of the technical basis for MFL criteria only (based on best available information); legal interpretations, policy decisions and assumptions are not subject to peer review.

In this effort to develop minimum flows and levels for the Loxahatchee River system, the District identified a narrative definition of "significant harm" as it relates to the MFL statute.

> 'Significant harm' means the temporary loss of water resource functions which result from a change in surface or ground water hydrology that takes more than 2 years to recover, but which is considered less severe than serious harm (Rule 40E-8.021 (24), FAC). 'Serious harm' means the long-term loss of water resource functions, as addressed in Chapters 40E-21 and 40E-22, F.A.C., resulting from a change in surface or groundwater hydrology (Rule 40E-8.021 (23), FAC).

This Statement of Work for panelists is designed to organize an independent scientific peer review pursuant to Section 373.042, FS. (attached). In 2001, an expert peer review panel was assembled to critique the technical aspects of an initial draft of the document, followed by a pubic workshop, Internet feedback, and a final report consolidating the panel's view. As a result of the suggestions and comments by panelists, additional research and technical development were suggested and completed. This second panel review process is intended to provide an objective assessment of the latest draft MFL document and on the MFL criteria proposed therein.

The peer review will be conducted in a manner allowing public participation through Internet access with the panelists. As part of this public process, as required by law, all substantive communications between the panelists regarding this peer review must be conducted through the designated website. Florida Sunshine Law prohibits phone conversations and/or meetings between two or more of the panelists outside of the public's access. Reviewers will be provided specific instructions regarding this process. Cecile Ross, Senior Attorney for Office of Council, will be available to answer any specific question you may have regarding legal issues. Ms. Ross may be contacted at (561) 682-6343, or cross@sfwmd.gov.

The scope of the peer review, under the statute, is very broad with regard to technical or scientific issues. Any scientific assumption, data, and/or modeling results, including assumptions in models, used in the development of the technical criteria are subject to review. However, District Governing Board policy decisions and assumptions are not subject to peer review. The following section is provided to clarify the role of the peer review panel. Staff will also provide further guidance or information on this issue to individual panel members upon their request.

Scope of Work: Policy versus Technical Issues

The responsibility of the peer review panel is to review technical or scientific data, methodologies, and conclusions used in the development of the MFL criteria. The term "technical" is key in understanding the scope of this process. Inherent in developing the proposed criteria is the application of "policies" and interpretations of the MFL statute. These policy considerations are only within the authority of the District's Governing

Board to decide, and should be viewed as assumptions or conditions for the technical review. As a result, it is important to clearly delineate which issues are policy-based and which are within the scope of the technical peer review.

Generally, four types of policy decisions or assumptions were applied in developing the MFL criteria, as described below.

A. Protection of Water Resource Functions

In establishing MFLs, the District must identify and consider the relevant water resource functions of the water body. These functions are set forth in state law and listed in Chapter 1 of the MFL Document. Specific water resource functions for defining significant harm to the Loxahatchee River and Estuary were identified based on their relevance to the level of protection assigned to the significant harm standard, their applicability to the regional nature of the MFL, and the broad scope of District responsibilities under the authorizing statutes. A description of these relevant resource functions for the Loxahatchee River and Estuary is set forth in Chapter 4 of the MFL document.

B. Identification of Baseline Resource Conditions: Statutory "Considerations"

Another type of policy assumption or decision made in the development of the proposed MFL is the definition of the reference point or baseline condition of the subject water resources for which significant harm is to be determined. In establishing MFLs the Governing Board must consider changes and structural alterations to watersheds, surface waters, and aquifers and the effects such changes or alterations have had, on the hydrology of an affected watershed, surface water, or aquifer…" Section 373.0421(1)(a), F.S. (see attached). For example, large drainage systems have been constructed throughout South Florida and development of residential areas has occurred in these drained areas. As a result, in setting a MFL for any remaining natural areas, the Governing Board must also consider the impacts of such drainage and the hydrological limitations that now exist in the system in order to continue to provide flood protection. In that situation, the Governing Board may establish the MFL based on the needs of the impacted natural system, instead of the pre-development conditions. Significant harm is then determined based on how the MFL may impact the water resource function of the water body. Although the peer review panel may not necessarily agree with the policy assumptions made under this statute, it is essential that the peer review be conducted in light of any of these assumptions. The considerations under this statute and how they were applied in developing the proposed Loxahatchee River and Estuary MFL are discussed in Chapter 4 of the MFL document.

C. Level of Protection Provided by the "Significant Harm" Standard

The definition of "significant harm" is also based on previous Governing Board policy decisions and assumptions that are beyond the scope of this peer review. To provide an understanding of this definition, a description of the relevant legal and policy assumptions is provided in Chapter 1 of the MFL document. The applicable narrative definition of “significant harm” is as follows:

‘Significant harm’ means the temporary loss of water resource functions which result from a change in surface water or ground water hydrology that take more than 2 years to recover, but which is considered less severe than serious harm (Rule 40E-8.021 (24), FAC).

The purpose of the MFL document is to identify the technical or scientific MFL criteria based on this definition of “significant harm.” The role of the peer review panel is to review the technical or scientific data, methodologies, and assumptions used in developing the specific MFL for the Loxahatchee River and Estuary.

D. Minimum Flow and Level Versus Restoration

The Minimum Flow and Level developed for the Loxahatchee River is intended to prevent significant harm to the resource. This differs from the concept of “restoration”, which seeks to return a portion of the river to some pre-existing historical condition. When reviewing the MFL document, the Peer Review Panel should be aware that the scope of this project is limited to development of the Minimum Flow and Level to protect the resource baseline conditions as described in the Document in Chapter 4 and is not restoration. It should be noted that as restoration plans are developed for the Loxahatchee River, the minimum flow and level may be revised through time to protect those enhanced or restored resource functions.

Some Specifics on Review of Policy and Technical Issues

A list of technical issues considered relevant to the proposed MFL establishment is provided under Task 1 in the Statement of Work. The panel members may also propose additional technical issues, which they identify. The following narrative outlines areas of the MFL document that pertain to the policy or technical aspects of establishing the MFL.

Chapter I summarizes the legal background of the MFL statute and framework of the related laws that apply to the District in Chapter 373, F.S. The panel members are requested to read this chapter and comment on any needed clarification or additional information that would help the reader better understand the logic and basis for the three types of policy decisions or assumptions discussed above.

Chapter II provides a detailed description of the Loxahatchee River, estuary and upstream watershed. Physical and hydrological attributes of the system are set forth, as well as a discussion of the water resource issues affecting the area. The panel members are requested to read this chapter and comment on any needed clarification or additional information that would help the reader better understand the logic and basis for the three types of policy decisions or assumptions discussed above.

Chapter III provides a discussion of (a) key water resource functions of the system that were considered in the development of the MFL, (b) resource protection issues, (c) considerations and exclusions. This chapter is to be reviewed by the panel and comments provided.

Chapter IV identifies the technical or scientific “methods” used in developing the proposed MFL criteria. These "methods” are reviewable technical material and should be critiqued thoroughly by the panel.

Chapter V provides a summary of the scientific approach and technical relationships that were evaluated in defining significant harm for the water body and a detailed presentation of the proposed MFL criteria with supporting documentation. Panel members should review this chapter using the same guidelines for policy versus technical issues consistent with those set for the previous chapters.

Chapter VI outlines the MFL recovery and prevention plan, including implementation policies and process, an evaluation of additional options to obtain water from other basins, and an outline of research needs for the Loxahatchee River and Estuary.

Technical Appendices A-S provide supporting data and information for the technical criteria. These need to be reviewed for accuracy, relevance, and completeness.

Scope of Work (Duties and Tasks of the Peer Review Panelist)

During this project the panelist will:

Task 1: Acknowledge receipt of review materials within 48 hours of delivery

Task 2:

a) Review background materials provided by the District to become familiar with the technical aspects of the proposed MFL criteria and the context of the criteria in existing District policy (not the subject of review)
b) Review comments and suggestions given by the peer review panel for the 2001 Draft MFL Document

Task 3: Read the MFL document and prepare a written review of this document, including a summary, conclusions, and recommendations. The review will include answers to general questions provided by District staff (see below), will comment on how successfully the current MFL document addressed the Panel’s comments/suggestions from the 2001 Peer Review, and how well the technical criteria support the proposed MFL. This review will be submitted in both hard copy and a pre-designated electronic format.

It is requested that all electronic correspondence provided to the District be compatible with Microsoft Word 97.

For services rendered, expert panelists will each receive an honorarium.

Description of Expert Assistance Task (Work Breakdown)

Task 1. Acknowledgement of receipt of Review Materials and Statement of Work

Within two days of receiving the materials, the expert will acknowledge receipt by contacting John Zahina at 561-682-2824 or< jzahina@sfwmd.gov>

Task 2. Review Background Materials and 2001 Peer Review Panel Final Report

Prior to reading the MFL document, experts will review background materials as needed to familiarize themselves with technical aspects of the MFL. The background materials have been provided as reference materials only. Recommendations from the Final Report from the 2001 Peer Review Panel are also to be reviewed.

Task 3. Review Current MFL Document and Write Review Comments

The expert's primary responsibility will be to read and comment on the MFL document with review of the background materials on an as-needed basis. The reviewer will then prepare a review of the document, provide answers to questions provided by District staff, comment on how successfully District Staff has addressed issues from the 2001 Peer Review Panel Final Report, and how well the technical document supports the development of MFL criteria. This includes comments regarding the overall structure and layout of the document, the readability of both text and graphics, and the appropriateness of the document for its intended purpose.

Review comments should address but not be limited to, the **following general questions and technical issues:**

General Questions

1. Does the MFL document present a defensible scientific basis for setting minimum flow criteria for the water body? Are the approaches or concepts described in the document scientifically sound based on 'best available information'?
2. Are the proposed criteria logically supported by 'best available information' presented in the main body of the document? What additions, deletions, or changes are recommended by the Expert to enhance the validity of the document?

3. Are there other technical approaches to setting the criteria that should be considered? Is there available information that has not been considered by the authors? If so, please identify specific technical alternatives to setting the MFLs and the data available to validate the alternative approach.
4. Does the current draft MFL document adequately address the comments provided by the 2001 Peer Review Panel Final Report?

Specific **technical issues** to be evaluated by the Panel include:

The appropriateness of:

- Use and application of the "Valued Ecosystem Component" approach for establishing the MFL
- The proposed minimum freshwater flow regime proposed for the river system during drought conditions
- Completeness of the literature review for the intended purpose
- Statistical analysis and interpretation of historical flow, salinity, and vegetation data
- Methods used to estimate the movement and location of the freshwater-saltwater interface under different flow conditions
- Methods used to characterize the vegetation community composition and distribution
- Linkage or correlation of flow and/or salinity data to impacts to biological communities (has a scientific linkage been clearly established?)
- Use and interpretation of the results of a two-dimensional hydrodynamic-salinity model to describe the effect of various freshwater flow regimes for the river and estuary
- The use of historical hydrological and /or ecological data and findings to determine minimum flow criteria for the River
- Methods or approaches used to define specific "duration" values that are components of the minimum flow criteria for the River

The expert is requested to provide specific recommendations to address any drawbacks or deficiencies in the evidence described in the MFL document for the water resource. It is anticipated that the expert will place emphasis on technical issues and the water resource functions most closely allied with his/her area of expertise. However, comments on any technical aspect of the document are welcome.

Deliverable 1: Acknowledgement of receipt of materials

The July 15, 2002 Draft MFL document has been mailed to Peer Review panelists. *Within two days of receiving this statement of work, the expert will acknowledge receipt by contacting John Zahina at 561-682-2824 or* < jzahina@sfwmd.gov>

Date Due: Within 48 hours of receipt of materials

Deliverable 2:	Review background materials and 2001 Peer Review Panel Final Report
Due Date:	August 21, 2002, within 21 days after acknowledgement of receipt of materials.
Deliverable 3:	Written review of the MFL document, including a summary, conclusions, and recommendations.
Date Due:	August 21, 2002, within 21 days after acknowledgement of receipt of materials.

Responsibilities of Requesting Division

The Project Manager is John Zahina, Staff Environmental Scientist, Planning and Development Division, SFWMD. He will provide the necessary background materials and draft MFL document to each panelist.

Evaluation Criteria for Acceptance of Deliverables

Task 1. Successful completion of Task 1 will be evidenced by judgement of District staff that the Expert was adequately prepared to discuss information in the background materials. The Expert's questions, concerns, and information needs should reflect a thorough review of background materials.

Summary of Time Line and Responsibilities

Task	**Responsible Party**	**Date Due**
Task 1: Acknowledge Receipt of Materials from SFWMD	Peer Panel	August 1, 2002 or Two days after receipt
Task 2A: Review Background Materials/Written Review	Peer Panel	August 21, 2002
Task 2B: Review 2001 Peer Review Panel Final Report	Peer Panel	August 21, 2002
Task 3: Provide Written Report of Current MFL Document	Peer Panel	August 21, 2002
Acknowledge Receipt of Written Reports from Peer Panel Experts	John Zahina	August 27, 2002
Issue Payment for Services	John Zahina	August 30, 2002

Payment for Services: Following satisfactory completion of all services required, the panelists will be paid an honorarium or fixed lump sum of $2000.00 for all labor and expenses.

APPENDIX I
Background & Review Materials

Legal Information

- Requirements of MFLs from Florida Statutes, Chapter 373.042 (Appendix L, pg. L-9)
- Final MFL Rule as published in F.A.W. March 30, 2001

Loxahatchee River & Estuary

1. Draft Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary. SFWMD.
2. Draft Appendix A-S, Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary. SFWMD.

Task 3 Reporting

Review of
Draft – Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary

South Florida Water Management District
Water Supply Division
July 15, 2002
Draft

Task 3 Planning & Development Division Request for Expert Assistance requests comment on the current MFL document, addressing General Questions and Specific Technical Issues in the RFA as a basis for that review. This review follows a set of comments made in June 2001. That review included a response to general questions and specific technical issues, similar to this review, and the submission of an overall panel review report.

My review of the revised report will be completed in two parts. The first part provides a general review, directed to the overall document "package" with an emphasis on technical issues and water resource functions. The second part will use the June 2001 comments as a starting point to address how those reviews have been incorporated into the 2002 technical documentation.

Part #1 - General Review

My general review of the 2002 documentation is that this report makes a sound scientific case for the establishment of minimum flows and levels, and presents strong justification for establishing a Loxahatchee River MFL. I find that the report adequately addresses legal and policy factors, relevant water resources functions, considerations and exclusions, and a level of protection based on the MFL standard of significant harm. The report also provides a recovery and prevention strategy, which incorporates adaptive management elements to address uncertainty.

A general comment made about he 2001 draft report was that the organization and presentation could be improved with different placement of text, improvement of illustrations, and careful editing. For the most part, I find that the 2002 Draft has addressed these issues. The present report organization is understandable, although still redundant, and the use of illustrations and data tables is much improved.

I do have a major criticism addressing discussions in multiple sections. This criticism finds that after typically lengthy discussion, where efforts have been made to fully support an argument, that after the conclusions an additional concluding statement is made that qualifies the conclusions. The qualification is often based on data limitations, a lack of full scientific understanding, or other uncertainty, which is common in this type of analysis. There is no doubt that limitations to findings should be clearly identified, but the present approach tends to diminish support for a finding, rather than qualify a finding in relation to expected, and acceptable uncertainty. I would suggest additional editing in Chapter 4 and 5 to address this issue. I found that the detailed technical support in the appendices adequately addresses uncertainty in the various analyses. In the first volume of the technical documentation I would suggest that issues of uncertainty be addressed early in the summary discussion so that the conclusions reached can stand alone. I would also suggest that the editor choose some method of highlighting critical conclusions, such as italics, so that the reader will be better able to connect specific technical findings in each section with the final arguments supporting MFL establishment.

In summary, I found the 2002 draft documentation to be highly responsive to reviewers concerns. In addition to editing and organization, it is clear that the District staff have completed additional supporting assessment and analysis, significantly strengthening the justification for, and the establishment of, minimum flows and levels for the Loxahatchee River and Estuary.

Part #2 - General Questions and Specific Technical Issues

The Request for Expert Assistance identified four general questions, three questions similar to those asked of the 2001 Draft, and a fourth question related to responsiveness to reviews. Because the comments made in 2002 can provide a basis for evaluation of the 2002 draft, and addressing question #4, I have chosen to include my comments from last year, and use those comments as a basis for the review of the 2002 draft.

1. Does the MFL Document present a defensible scientific basis for setting initial minimum flows criteria for the water body?

> *The document presents a good argument, but it fails to provide a fully "scientific" basis for the argument in some circumstances. The major criticism from this reviewer is that a number of unproven assumptions, based on observations or common sense have been introduced as accepted fact with little support, other than the ideas are repeated in the document. For example, the 2 ppt salinity threshold is identified early in the document with little support for its selection (although arguments supporting 2 ppt are made late in the document the general scientific support for this number is weak). Further, the entire document hinges on a proposed relationship between salinity and the selected VEC. Based on the assumption that salinity is the controlling factor of the Cyprus community, the entire document constructs an argument. Unfortunately this argument is often challenged by specific statements in the document. The "scientific" sense of this reviewer is that the foundation for the arguments is sound, but the report in its present organization fails to scientifically substantiate statements based on specific citation of reference documents or more general reference resources from*

> *engineering, ecology, or limnology/oceanography. I do not see this as a fatal flaw of the report, but a problem that must be addressed to provide the most defensible recommendations on MFLs.*

2002 Review

I find that the 2002 draft presents a defensible scientific basis for setting the initial minimum flows criteria. Where the 2002 document often relied on unproven assumptions, the 2002 draft more adequately develops technical arguments, adds critical data on vegetation and soils, and makes better use of model capabilities.

In summary, the revised organization of the report, the addition of additional assessment and analysis data, and the reformulation of how arguments for MFL establishment are integrated finds good technical support for the proposed MFL. In addition, the report specifically identifies the need for adaptive management, and provides a sound assessment and research plan to support future improvement of an established MFL.

The appropriate use of technical support, and the inclusion of adaptive management now takes advantage of the most effective water resources management tools.

1b. Are the approaches or concepts described in the document scientifically sound based on ‘best available information’?

> *In terms of the internal definition of ‘best available information’ generally used in this document, the approaches and concepts are generally sound. This said, the literature support for this report is somewhat limited, and could be expanded to include reference to fundamental physical principles associated with flow and mixing, and basic ecological theory. The report could benefit from a better description of flow input to the watershed (particularly things like groundwater/base flow enhancements associated with wetland restoration), and salt wedge dynamics, particularly as those dynamics are associated with freshwater inflow volumes. Similarly, the concept of VEC could benefit from a better sense of how communities are organized and the requirements for long term stability of ecosystem characteristics in a naturally changing environment. To provide an approach, the authors should consider selected use of sidebars, which will both provide better scientific support, and improve general readability for audiences with variable technical backgrounds.*

2002 Review

Although the range of topics covered in this report could result in a bibliography that is as long as the report text, I find that this report strikes a reasonable balance between full literature documentation and the criticisms made last year. I find that the first volume cites important literature, demonstrating a good sense of background materials. The methods of integration of critical literature resources have been improved, leading to strengthening the technical arguments made in the report. This report has also improved the VEC concept, replacing the dependence on bald Cyprus with the selection of community indicators, again, improving technical support for the arguments made.

2a. Are the proposed technical criteria logically supported by 'best available information' presented in the main body of the document?

> *Although the response to this question parallels the response to question 1a and b, the document may be over dependent on appendices, failing to present sufficient detail in the main body of the document.*

2002 Review

This draft has found a good balance between the technical detail of the appendices and an adequate support for arguments in a summary technical document. I find that the inclusion of detail in the 2002 draft is sufficient to support the arguments made.

2b. What additions, deletions or changes are recommended by the Expert to enhance the validity of the document?

> *Response to this question is, in part, covered in comments to technical issues. In addition, it is expected that many of this expert's detailed comments will be addressed during meetings with staff. It will be at that time that comments from all reviewers will be discussed and integrated into a follow-on plan for document completion.*

2002 Review

The present document is technically sound as presented. My only recommendation for change would be to consider preparation of an executive summary that would be accessible to a wider audience. This summary could briefly establish legal and policy factors and then summarize critical findings in support of the MFL. I can say that I had to wade through lengthly discussions, often with some foreknowledge of where the arguments were headed before a conclusion was reached. For a general audience, the technical analysis process can be simplified, still identifying critical steps, to reach the conclusions made. I think that a more accessible document will improve the support the District seeks from the range of stakeholders who have an interest in this MFL.

3a. Are their other approaches to setting the criteria that should be considered?

> *There are numerous other approaches to setting MFL criteria. Each of these approaches will have a different VEC base and require additional, and even alternate, justifications. That said, there is a critical issue in setting the MFL that has been ignored. In this water resources framework, we might expect the ecological components of the system to respond to concentration, duration, and frequency. In the MFL discussions the issues of concentration and duration have been addressed, but frequency is not included in MFL criteria. Let me suggest*

that a 20 day flow subceedence, followed by a one day exceedence of the criterion flow, followed by another 20 day subceedence will meet MFL criteria, yet create a high potential for ecological damage because of the frequency of reoccurrence.

As soon as the MFL analysis moves into frequency, then the entire "package" must be improved to address seasonal, and other issues. The District might consider this issue very carefully, because it is in the time-scale arena that critical flows can be expected to make a difference. For example, there may be a critical period when Cyprus seedlings must have fresh water. Simply setting a MFL and a duration does little to meet that specific need, and the degradation of the community identified in this report may continue. Adding frequency will significantly alter the report, but consideration of this issue should be a major point of our upcoming discussions.

2002 Review

I was particularly pleased with the recognition of concentration, duration, and frequency as factors affecting the Loxahatchee ecosystem. I feel that District staff have done an excellent job developing the technical documentation that addresses these combined issues of salinity control. I feel that staff has effectively used the modeling tools at their disposal, and collected important additional data that assists in duration and frequency analysis. It is in the application of adaptive strategies based on additional data on duration and frequency that will improve the potential for MFL success. I think the staff has effectively captured issues of variability in this draft.

3b. Is their available information that has not been considered by the authors? If so, please identify specific alternatives to setting the MFLs and the data available to validate the alternative approach.

As mentioned previously, the literature support for this report is generally limited to local studies supporting focused arguments. There are a number of alternate methods for setting MFLs, found in the extensive literature associated with Instream Flow Needs (IFN). The U. S. Fish and Wildlife Service, and now National Biological Survey lead in addressing IFN issues. Alternative approaches, as noted above, will start with the definition of the VEC/target or indicator organism. There are alternatives that consider broader community response models. Rather than respond to this question with specific identification of alternatives, This reviewer suggests that the focus of discussion at our upcoming meeting should be on watershed integration with a systems view to set a MFL that is protective of a range of resources in keeping with the spirit of the Florida regulations. This comment is not intended to suggest an alternative approach, rather it is intended to strengthen the arguments in this report and adequately address a community "vision" appropriate to this watershed.

2002 Review

I find that the District staff has followed up on IFN approaches, and they have developed a community indicator model for analysis that further strengthens a community "vision" appropriate to this watershed.

4. Does the current draft MFL document adequately address the comments provided by the 2001 Peer Review Panel Final Report.

I believe the report has adequately addressed both the details, and the spirit of the 2001 peer review.

Technical Issues

The Statement of Work asked the reviewer to address the appropriateness of ten items (nine items nine common to the 2001 review, item #6 new this year. There is some overlap between these questions and my response to general questions, and there is overlap between technical issues.

1. Use of "Valued Ecosystem Component" approach for establishing the MFL.

    The VEC is a reasonable approach for establishing a MFL but the support for selection of the specific VEC in this report is weak. For example, the arguments could be strengthened by relating Bald Cyprus to specific ecological community components that could be understood by a wider audience. Comments have already been made about the selection of a single parameter, such as salinity, as the primary control of community characteristics. The VEC discussions should be strengthened. Specific comments will be made in the detailed review.

2002 Review

The 2002 Draft has made significant alterations to the support of the VEC. The report recognizes the limitations of the use of Bald Cyprus as an indicator, and has developed a new indicator based on 6 VEC species. The change to a community indicator, supported by new analysis of vegetation now provides a good foundation for VEC determination. The VEC indicators have also been used appropriately, in conjunction with hydrologic analyses, to provide a sound argument for MFL determination. I feel that the VEC discussions have been sufficiently strengthened to support the MFL.

2. The proposed minimum freshwater flow regime proposed during drought.

    Although there is good technical support for the proposed MFL, and the arguments focusing on mile 8 are persuasive to this reviewer, the number still seems to be drawn from a random lot, then supported by modeling that is *admittedly inadequate and a historical analysis that is very short term (only 6 years) that does not include a drought period. This reviewer also found the inclusion of multiple flow requirements at different locations in the estuary were confusing. Further, the estimates of tributary influence are particularly weak, and should be improved.*

This reviewer is fairly critical of the proposed MFL. I can criticize the specificity of the number and the sense that this flow will actually meet multiple ecosystem needs. I believe the support to address both of these criticisms is present in the document, but this support must be sharpened.

2002 Review

I find that the hydrologic analyses are much improved over the 2001 Draft. The 2002 Draft adequately defines the hydrologic setting, and then makes a good argument for a focus on hydrologic conditions that can be controlled. Although the hydrologic models are not 3-dimensional, the models are used well, calibrated effectively, and shown to provide reasonable estimates with sensitivity analyses. I feel that District staff has effectively addressed major hydrologic modeling issues identified in the 2001 Draft.

In addition to improved hydrologic modeling, the 2002 Draft provides a much improved analysis of historical hydrology, using that historical analysis to support duration and frequency assessments, which improve ecosystem analyses and more fully support the proposed MFL.

3. Completeness of the literature review

This reviewer has already made several statements about the literature support.

2002 Review

As noted above, I find a good balance between detail in appendices, and literature cited in the appendices, and the selection of literature used to support the summary document.

4. Statistical analysis and interpretation of historical flow and salinity data.

This reviewer is not sure that a statistical analysis was performed on the flow and salinity data. The document noted that half hourly data on salinity was modified to a daily average and flow was only really addressed in relation to a single input. Further, the major "statistical" analysis was the development of a regression model, which produced results that were verified by comparison to a simulation model that was viewed as limited in the report. Again, I will not criticize the approach because I understand that this approach is about the best that could be done as this report was assembled. That is not to say that the most effective use of available data was made. This reviewer will be very interested in a better description of the data resources represented in Appendix D, in *particular the methods of estimating flow and the actual utilization of salinity data. What is very important is the better support of the duration criterion from this data.*

2002 Review

Another member of the review panel specifically addressed statistical analysis and interpretation issues. I find that the Ds/Db index significantly improves the analysis process. My sense is that the District staff have abandoned the approach criticized last year, substituting improved modeling, improved hydrologic analyses, and an improved method for identifying salinity relationships that include a duration factor in the index.

5. Methods used to estimate the movement and location of the freshwater-saltwater interface under different flow conditions.

The document itself provides a review of this approach, focusing on the hydrodynamic model and listing limits to the model and the potentials for model improvement. Freshwater/saltwater interactions have been extensively studied. The report establishes 2 ppt as a critical threshold, yet acknowledges a limited understanding of the dynamics of lateral movement of saline waters. The three dimensionality of this problem is critical. The report could be strengthened by development of a simple conceptual model of the freshwater-saltwater interface.

2002 Review

Although I did not find an explicit description of a simple conceptual model, the 2002 Draft has more effectively addressed long term issues, and with the SAVELOX model, provided a method of effectively connecting hydrodynamics and ecosystem value. The report has done a much better job of use of a 2 ppt threshold, and provided useful alternatives that support comparison of alternatives. It is in this area that I think the District staff has made the biggest step in integrating assessment and analyses to support the MFL. Although I could suggest additional data collection or analyses to better support models, the inclusion of an adaptive management element, which accepts uncertainty in data, models, and decisions suggests that District staff fully recognize limitations, and through research planning, will improve modeling, analysis, and assessment tools as monitoring results are obtained.

6. Methods used to characterize the vegetation community composition and distribution.

2002 Review

A major weakness of the 2001 Draft was the over dependence on Bald Cypress analysis in the vegetation assessment. The 2002 Draft has addressed that weakness, and strengthened the vegetation analysis with better analysis of historical aerial photography, additional assessments at critical locations, and an improved VEC analysis approach.

As in any ecological study, data may not be sufficient to fully support all management or decision requirements. I feel the 2002 Draft has sufficiently strengthened the vegetation community analysis to fully support the MFL recommendation.

7. Linkage or correlation of flow and/or salinity data to impact to biological communities (has a scientific linkage been clearly established?).

   Comments related to this technical question could be extensive, and will likely be the focus of considerable discussion during the site visit. I have already made comments concerning single parameter emphasis, and the expansion of discussions that might occur as VEC concepts are extended to better portray community/ecosystem relationships. I do not believe that sufficient technical support has been provided in this argument.

2002 Review

The approach used to link flow, salinity, and VEC effect is much more sophisticated in the 2002 Draft report. With re-characterization of river miles, and better correlation of past studies, and improved VEC analysis the 2002 Draft does a good job of relating salinity and vegetation impact. The addition of soil sampling, although raising questions about suitability of salinity or Cl measurements, does add a further dimension to this analysis – improving our general understanding of processes and mechanisms operational in the Loxahatchee River. In summary, I feel the correlation of flow and salinity, particularly the incorporation of duration and frequency elements does a much better job of creating the scientific linkage needed for MFL establishment. Again, where scientific linkages are weak, the adaptive management/future monitoring efforts should add needed information to improve MFLs in the future.

8. Use and interpretation of the results of a two-dimensional hydrodynamic-salinity model.

   I have responded in #5 above, noting that the document provides a review of model limitations and application. It is noted that there are anticipated modifications that should improve model predictions. Further use of the model should be a focus of upcoming discussions.

2002 Review

I find that comments made above address the use and interpretation of models. I find that the 2002 Draft makes much better use of modeling, particularly the integration of modeling and additional assessments to strengthen confidence in the overall process.

9. Use of historical hydrological and/or ecological data and findings to determine a minimum flow criteria for the river.

The document has made excellent use of historical vegetation analysis. A possible improvement would be a listing and brief analysis of the historical trends in other ecological data such as fisheries, bird counts, etc.

With an emphasis on in-channel hydrology, the report is particularly weak in defining freshwater inputs, other than from the Lainhart Dam. A particular point of discussion should be the possible addition of runoff modeling for critical watershed components to better predict tributary inflow.

2002 Review

I find that the 2002 Draft makes much better use of historical hydrological and ecological data. The improved approach to long term salinity simulations, the community approach to VEC is a sufficiently strong argument that fisheries and macroinvertebrate data are sufficient to support vegetation analyses.

10. Methods or approaches used to define specific "duration" criteria.

As noted above, in addition to duration, it will be critical to define frequency.

The arguments supporting a duration are admittedly weak. This reviewer wonders if better support for duration could be found in existing data. For example the continuous monitoring study produced salinity data at 30 minute time intervals for approximately 30 days at a deployment. This data may be useful in better defining salinity parameters that would be useful in duration criteria development. It should be recognized that duration issues are fundamentally biological and the arguments associated with Cyprus effects were particularly weak/unsupported by research. The primary method of improvement of the duration criteria will be the development of better biological response data.

2002 Review

I have already commented on the improvements in duration and frequency analysis in the 2002 Draft. I feel that the analyses do now support the inclusion of a duration in the technical criteria.

Peer Review Comments

By

Donald M. Kent, Ph.D.
Community Watershed Fund

On

Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary

South Florida Water Management District
15 July 2002 Draft

The South Florida Water Management District (District) must establish Minimum Flows and Levels (MFL) for the Loxahatchee River and Estuary pursuant to 373.042 F.S. A minimum flow is defined as the "… limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area." The minimum level is defined as the "limit at which further withdrawals would be significantly harmful to the water resources of the area." Significant harm is defined as the "…temporary loss of water resource functions which result from a change in surface water or ground water hydrology that take more than 2 years to recover …" (Rule 40E-8.021[24], FAC). For the Northwest Fork of the Loxahatchee River, significant harm is defined as:

- two or more of the six VEC species are not longer present
- the total number of species present is reduced by about one-third
- the floodplain swamp high canopy is no longer present
- seedlings of the six VEC species are no longer present
- daily mean salinity levels range from 0 to 9 ppt with a mean of 0.97 ppt and a 90th percentile limit of 2.9 ppt.

In support of the Loxahatchee River and Estuary MFL effort, the District seeks an objective peer review of any scientific assumption, data and/or modeling results used in the development of technical criteria. Said review will consist of a written review of the *Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary* (15 July 2002 Draft), including:

- answers to general questions provided by District staff
- comments on how successfully the current MFL document addressed the Panel's 2001 Peer Review Final Report
- how well the technical criteria support the proposed MFL.

In addition, the peer review will evaluate specific technical issues as listed in the *Planning & Development Division Request for Expert Assistance* dated 26 July 2002. These issues include:

- use and application of the "Valued Ecosystem Component" approach for establishing the MFL
- the proposed minimum freshwater flow regime proposed for the river system during drought conditions
- completeness of the literature review for the intended purpose
- statistical analysis and interpretation of historical flow, salinity and vegetation data
- methods used to estimate the movement and location of the freshwater-saltwater interface under different flow conditions
- methods used to characterize the vegetation community composition and distribution
- linkage or correlation of flow and /or salinity data to impacts to biological communities
- use and interpretation of the results of a two-dimensional hydrodynamic-salinity model to describe the effect of various freshwater flow regimes for the river and estuary
- the use of historical hydrological and /or ecological data and findings to determine minimum flow criteria for the River
- methods or approaches used to define specific "duration" values that are components of the minimum flow criteria for the River.

District legal and policy decisions further define the scope of the peer review. The review is to consider only the development of the MFL (and not MFL implementation). The review is to accept the water resource functions identified by the District. The review is to accept the District's opinion that the most critical need is to provide a minimum flow criteria that would protect the Northwest Fork River from significant harm, and that providing said criteria will protect other parts of the Loxahatchee River.

The 15 July 2002 Draft MFL document substantially improves upon the 22 May 2001 Draft. However, my interpretation of the findings suggests a different minimum flow at the Lainhart Dam. The final minimum flow criteria, regardless of its value, should be related to other flows to the Northwest Fork and to other parts of the Loxahatchee River and Estuary.

General Questions

1. Does the MFL document present a defensible scientific basis for setting minimum flow criteria for the water body? Are the approaches or concepts described in the document scientifically sound based on 'best available information'?

The District has done a good job presenting a defensible scientific basis for setting minimum flow criteria for the Wild and Scenic River part of the Northwest Fork of the Loxahatchee River and Estuary. The MFL document describes the River and Estuary in sufficient detail, including climate, physical features, hydrology, biological and water resources, and nearby land uses. In addition, the MFL document and appendices describe in adequate detail the methods and information used to develop the MFL criteria. For the most part, the approaches and concepts described in the MFL document are scientifically sound and based upon best available information. Nevertheless, finalization of the MFL criteria may benefit from additional consideration of:

- flows from other tributaries
- other factors that might affect vegetation community location and condition
- potential impacts to other parts of the Loxahatchee River and Estuary
- the relationship between 2 ppt salinity and vegetation community location and condition
- soil salinity transects
- the SAVELOX model.

The MFL document describes and discusses in sufficient detail historic, current and anticipated flows over the Lainhart Dam. Also, the document describes the relationship of Lainhart Dam flow to Northwest Fork salinity both empirically and as modeled by the hydrodynamic/salinity model. Collectively, this information supports a reasoned assessment of the Lainhart Dam flow necessary to sustain desired vegetation communities downstream to Cypress Creek. However, beginning with Cypress Creek, nearly 50 percent of the flow to the Northwest Fork comes from tributaries. Therefore, an assessment based upon flow over Lainhart Dam must ensure that absolute and relative flow from other sources is maintained. Alternatively, the assessment must incorporate anticipated changes in flow from these other sources.

Salinity is convincingly the primary factor determining the location and condition of the floodplain swamp and mangrove communities. However, water quantity may be an important factor in determining the location and condition of stream swamp and cypress within the upper reaches of the Northwest Fork and its tributaries. For example, parts of the middle and upper Northwest Fork and Kitching Creek (Segments 2, 3 and 5 of Figure B-3) have consistently been characterized by freshwater, but the vegetation community has changed from cypress to stream swamp. The MFL document should be explicit about whether the goal is cypress, stream swamp or either. If the goal is cypress, then the effect of changes in flow on freshwater vegetation community location and condition should be evaluated.

Legal and policy decisions have limited MFL criteria development to the Northwest Fork of the Loxahatchee River and Estuary. Nevertheless, potential impacts (positive and negative) to other parts of the system should be evaluated and the results described. For example, the Estuary provides numerous resource functions including habitat to protected species (e.g., Johnson's seagrass, *Halophila johnsonii*; West Indian manatee, *Trichechus manatus latirostris*). The District recognizes that a "… viable estuarine ecosystem requires a proper balance of freshwater inflow…"(Chapter 3), but the document fails to discuss if this balance will be achieved and by what means the balance will be evaluated.

The MFL document may give undue weight to 2 ppt salinity. Both the hydrodynamic/salinity model and the SAVELOX model appear to directly equate 2 ppt salinity to salt water, and to indirectly suggest that 2 ppt is threshold for the stream swamp. The former is a useful mechanism for estimating the relative position of fresh water and salt water. However, there is no basis presented for a relationship between 2 ppt and vegetation type. In fact, model results suggest that a mean salinity of 0.15 ppt is related to the occurrence of a healthy stream swamp community. Table 25 (p. 101) also suggests that a healthy stream swamp community requires a mean salinity of < 1 ppt.

Results of soil salinity transects are a welcome addition to the MFL document. Soil salinity may be as important, if not more important, than water salinity in determining the location and condition of the stream swamp community. However, a comparison of the transect locations with plots of historic and existing vegetation (e.g., Figure B-3) suggest that samples were collected in areas that have not experienced changes in vegetation. Presumably, soils in these areas have not experienced significant variation in salinity. An evaluation of soil salinity affects on vegetation community may be enhanced by samples collected at locations subject to changes in vegetation community and exposure to salt water, and locations with stressed stream swamp communities. Said samples would help us understand the cumulative effects of salt exposure, and allow the construct of a relationship between soil salinity and stream swamp condition.

The vegetation survey results and the hydrodynamic/salinity model afforded a tremendous opportunity to evaluate the relationship between vegetation community and river salinity. As the District recognizes, vegetation could be responding to certain salinity levels or salinity ranges, the duration of a particular salinity event, the frequency of a particular salinity event, or other factors. SAVELOX manages these potentially confounding variables by creating a new variable D_s/D_b (duration of exposure/time between exposures) as a surrogate for long-term salinity conditions. This is an admirable attempt to integrate the various salinity factors. Our understanding of the relationship between vegetation community and salinity may also benefit from an examination the relationship between vegetation community and individual salinity factors, and combinations of salinity factors. If this has not already been accomplished, the District might consider the use of step-wise regression analysis.

2. *Are the proposed criteria logically supported by 'best available information' presented in the main body of the document? What additions, deletions or changes are recommended by the Expert to enhance the validity of the document?*

The District has demonstrated that a healthy stream swamp community exists at River Mile (RM) 10.2. RM 10.2 has a mean salinity of 0.15 ppt. Salinity intrusion events above 1 ppt and 30 days duration occur once every 1.6 years, events above 2 ppt and 22 days duration occur once every 5.9 years, and events above 3 ppt occur once every 30 years. The District intends to reproduce the RM 10.2 salinity regime at RM 9.2.

The proposed MFL criteria is based on a desire to prevent the salinity at RM 9.2 from exceeding 2 ppt for any longer than has occurred within the healthy swamp community (i.e., no more than 20 days duration more often than once every six years). The document then concludes that Table 40 can be used to select a flow over Lainhart

Dam of 35 cfs to maintain mean daily salinity below 2 ppt at RM 9.2. However, a flow of 35 ppt in Table 40 corresponds to ≤ 2 ppt for 30 days once every four years, and not a mean salinity of 0.15 ppt and the duration and frequency parameters for RM 10.2 (see above) intended to be mimicked for RM 9.2.

The MFL criteria is also predicated on the belief that vegetation at RM 10.2 is healthy, vegetation at RM 9.2 has suffered significant harm, and that vegetation between these two stations has been harmed (but not significantly). However, the significant harm criteria applied to the vegetation between RM 9.2 and RM 10.2 suggests that much of this area has also suffered significant harm. Three VEC species are missing at RM 9.3 and two VEC species are missing at RM 9.7 (one species is missing at RM 9.9). Also, seedlings for four of the six VEC species are missing from the community between RM 9.2 and RM 10.2. Perhaps the definition of significant harm should be clarified to indicate whether all conditions must be satisfied, or whether failure to satisfy one of the criteria is sufficient to designate significant harm.

Significant harm for the vegetation community between RM 9.2 and RM 10.2 can be avoided by reproducing salinity conditions at RM 10.2. According to Table 37, a flow of 50 cfs at the Lainhart Dam will produce a mean salinity of 0.14 ppt at RM 10.2. A flow of 100 cfs at the Lainhart Dam will produce a comparable salinity condition at RM 9.2, and by extension at intervening locations. Flows less than 100 cfs will likely eliminate mature individuals or seedlings of the six VEC species, and thus impart significant harm.

3. Are there other technical approaches to setting the criteria that should be considered? Is there available information that has not been considered by the authors? (If so, please identify specific technical alternatives to setting the MFLs and the data available to validate the alternative approach).

The District has expended considerable effort in investigating and evaluating technical approaches for setting the criteria. No other technical approaches are recommended, other than those previously noted.

4. Does the current draft MFL document adequately address the comments provided by the 2001 Peer Review Panel Final Report?

The Panel's task is not to judge the adequacy of the District's response to our 2001 Report, but to provide advice and allow the District to judge the value of said advice. That being said, the current draft MFL document responds to some, but not all, of the comments in the 2001 Peer Review Panel Final Report. The readability of the text and figures has been improved, although careful proofreading of both is still required. Regarding organizational recommendations, the document has been reorganized to emphasize the technical analysis and modeling of salinity conditions. The document has not been reorganized to provide a section on the expected impact of flow modification on the Loxahatchee River and Estuary. Nor does the document provide MFL recommendations for the North Fork, Southwest Fork or the Estuary.

So too, the current document responds to only some of the Panel's technical comments. For example, the current document addresses the question of whether mangroves continue to encroach on the stream swamp community, inflow data for the entire Estuary, and the inadequacy of information relating cypress condition to salinity. Conversely, the current document fails to address the Panel's comments about anticipated regional growth and development, feasibility of proposed actions, the inadequacy of a linear approach to flow and discharge relationships, and a lag between Lainhart Dam flow data and downstream salinity.

Specific Technical Issues

The appropriateness of:

use and application of the "Valued Ecosystem Component" approach for establishing the MFL

The VEC approach has merit, and can be a valuable tool for management decision-making when the value of the selected ecosystem component is clearly established, and the relationship between the selected ecosystem component and other ecosystem components is clearly defined. The VEC approach for the Loxahatchee River and Estuary MFL was improved in this draft by replacing cypress with six stream swamp tree species. In this manner, the relationship between the VEC and the stream swamp community is more clearly defined. However, the use of six stream swamp tree species has not clarified the relationship between the VEC and other Loxahatchee River and Estuary ecosystem components. Of particular concern is the absence of an identifiable relationship with estuary resource functions.

the proposed minimum freshwater flow regime proposed for the river system during drought conditions

As discussed above, the proposed minimum freshwater flow regime does not demonstrably protect the river system during drought. The proposed flow would seem to maintain stress and/or deteriorating conditions in the stream swamp community, and the effects on the remainder of the Loxahatchee River and Estuary are indeterminate.

completeness of the literature review for the intended purpose

The literature review is reasonably complete for the intended purpose, if the purpose is solely the protection of the stream swamp community in the upper reaches of the Northwest Fork. The literature review should be expanded if it is also the purpose of the MFL criteria to protect the Loxahatchee River Estuary.

statistical analysis and interpretation of historical flow, salinity and vegetation data

For the most part, the statistical analyses of historical flow, salinity and vegetation data are appropriate. The District's efforts indicate due diligence, and a willingness to be innovative. As noted above, the hydrodynamic/salinity and SAVELOX models include an assumption that 2ppt salinity is a critical threshold for the stream swamp community. This assumption should be verified or removed.

Also as noted above, my interpretation of the data have led to different conclusions. Specifically, I note the potential influence of water quantity in determining the nature of the stream swamp community, and a need for a minimum average flow of about 100 cfs over the Lainhart Dam to maintain a stream swamp community at RM 9.2.

methods used to estimate the movement and location of the freshwater-saltwater interface under different flow conditions

The methods used to estimate the movement and location of the freshwater-saltwater interface under different flow conditions are appropriate and reasonable for estimating salinity conditions along the Northwest Fork of the Loxahatchee River.

methods used to characterize the vegetation community composition and distribution

The methods used to characterize the vegetation community composition and distribution are appropriate and reasonable.

linkage or correlation of flow and /or salinity data to impacts to biological communities

The methods used to correlate flow and/or salinity data to impacts are appropriate except where noted. Soil salinity samples should be collected at intervening stations along the Northwest Fork, and the data used to examine the relationship between soil salinity and vegetation type. The 2 ppt salinity threshold implicit in the models should be verified or eliminated.

use and interpretation of the results of a two-dimensional hydrodynamic-salinity model to describe the effect of various freshwater flow regimes for the river and estuary

The two-dimensional hydrodynamic-salinity model is a useful device to describe the effect of various freshwater flow regimes for the river and estuary. The model was put to good use, except when a 2 ppt salinity value was assumed to have significance for the vegetation community.

the use of historical hydrological and /or ecological data and findings to determine minimum flow criteria for the River

The use of historical hydrological and/or ecological data and findings were used appropriately to determine minimum flow criteria for the Northwest Fork, although the findings are subject to interpretation (see above). Historical hydrological and/or ecological data should be applied to a minimum flow criteria for other parts of the Loxahatchee River and Estuary, especially the latter.

methods or approaches used to define specific "duration" values that are components of the minimum flow criteria for the River

Defining specific duration values for the minimum flow criteria is a difficult task. The approach taken by the District is innovative and illustrates a determination to make the best decision possible. Undoubtedly, the duration estimates derived from the analyses are educated guesses. Nevertheless, the criteria is better served with their inclusion than without.

Conclusions

The District has demonstrated considerable diligence in obtaining and analyzing hydrological, salinity and vegetation data for the Northwest Fork of the Loxahatchee River. The hydrodynamic/salinity model and the SAVELOX model are appropriate and reasonable approaches to defining ecosystem component relationships and deriving a minimum flow criteria. As noted above, we differ in our final interpretation of an appropriate minimum flow criteria. The minimum flows and levels process for the Loxahatchee River and Estuary may benefit from review of data interpretation. Also, the minimum flow over the Lainhart Dam must be linked with flows from other tributaries of the Northwest Fork.

Focus on the upper reaches of the Northwest Fork was a policy decision, and therefore beyond the purview of the expert review. Nevertheless, I urge the District to more fully evaluate the consequences of any final minimum flow over the Lainhart Dam on other parts of the Loxahatchee River and Estuary.

Recommendations

- Establish with minimum flow criteria for other tributaries of the Northwest Fork, and connect these criteria with the minimum flow criteria for the Lainhart Dam.
- Determine the effect of water quantity on type of freshwater vegetation community in the upper reaches of the Northwest Fork.
- Evaluate potential impacts to other parts of the Loxahatchee River and Estuary from the minimum flow criteria for the Lainhart Dam.
- Verify the relationship between 2 ppt salinity and vegetation community or eliminate the assumption from the models.
- Conduct soil salinity sampling at intervening locations and re-evaluate the relationship between soil salinity and vegetation community.
- Evaluate the relationship between individual and combined salinity variables and vegetation community.
- Establish a monitoring program to determine the effectiveness of the final minimum flow criteria.

SFWMD Draft Response to Peer Review Comments of Donald M. Kent, Ph.D. for the July 2002 Draft Loxahatchee River MFL Technical Documents

Dr. Kent made the following comments concerning the methods, approach, and documentation of the proposed MFL:

Page 2, 3rd Paragraph: *The 15 July 2002 Draft MFL document substantially improves upon the 22 May 2001 Draft. However, my interpretation of the findings suggests a different minimum flow at the Lainhart Dam. The final minimum flow criteria, regardless of its value, should be related to other flows to the Northwest Fork and to other parts of the Loxahatchee River and Estuary.*

Page 3, 1st Paragraph: *The District has done a good job presenting a defensible scientific basis for setting minimum flow criteria for the Wild and Scenic River part of the Northwest Fork of the Loxahatchee River and Estuary. The MFL document describes the River and Estuary in sufficient detail, including climate, physical features, hydrology, biological and water resources, and nearby land uses. In addition, the MFL document and appendices describe in adequate detail the methods and information used to develop the MFL criteria. For the most part, the approaches and concepts described in the MFL document are scientifically sound and based upon best available information…The MFL document describes and discusses in sufficient detail historic, current and anticipated flows over the Lainhart Dam. Also, the document describes the relationship of Lainhart Dam flow to Northwest Fork salinity both empirically and as modeled by the hydrodynamic/salinity model. Collectively, this information supports a reasoned assessment of the Lainhart Dam flow necessary to sustain desired vegetation communities downstream to Cypress Creek. However, beginning with Cypress Creek, nearly 50 percent of the flow to the Northwest Fork comes from tributaries. Therefore, an assessment based upon flow over Lainhart Dam must ensure that absolute and relative flow from other sources is maintained. Alternatively, the assessment must incorporate anticipated changes in flow from these other sources…Salinity is convincingly the primary factor determining the location and condition of the floodplain swamp and mangrove communities.*

Page 4, 3rd Paragraph: *Results of soil salinity transects are a welcome addition to the MFL document. Soil salinity may be as important, if not more important, than water salinity in determining the location and condition of the stream swamp community.*

Page 4, 4th Paragraph: *The vegetation survey results and the hydrodynamic/salinity model afforded a tremendous opportunity to evaluate the relationship between vegetation community and river salinity. As the District recognizes, vegetation could be responding to certain salinity levels or salinity ranges, the duration of a particular salinity event, the frequency of a particular salinity event, or other factors. SAVELOX manages these potentially confounding variables by creating a new variable D_s/D_b (duration of exposure/time between exposures) as a surrogate for long-term salinity conditions. This is an admirable attempt to integrate the various salinity factors. Our understanding of the relationship between vegetation community and salinity may also benefit from an examination the relationship between vegetation community and individual salinity factors, and combinations of salinity factors. If this has not already been accomplished, the District might consider the use of step-wise regression analysis.*

Page 5, 5th Paragraph: *The District has expended considerable effort in investigating and evaluating technical approaches for setting the criteria. No other technical approaches are recommended, other than those previously noted.*

Page 6, 3rd Paragraph: *The VEC approach has merit, and can be a valuable tool for management decision-making when the value of the selected ecosystem component is clearly established, and the relationship between the selected ecosystem component and other ecosystem components is clearly defined.*

The VEC approach for the Loxahatchee River and Estuary MFL was improved in this draft by replacing cypress with six stream swamp tree species. In this manner, the relationship between the VEC and the stream swamp community is more clearly defined.

Page 7, 2nd Paragraph: *The literature review is reasonably complete for the intended purpose, if the purpose is solely the protection of the stream swamp community in the upper reaches of the Northwest Fork.*

Page 7, 3rd Paragraph: *For the most part, the statistical analyses of historical flow, salinity and vegetation data are appropriate. The District's efforts indicate due diligence, and a willingness to be innovative.*

Page 7, 5th Paragraph: *The methods used to estimate the movement and location of the freshwater-saltwater interface under different flow conditions are appropriate and reasonable for estimating salinity conditions along the Northwest Fork of the Loxahatchee River.*

Page 7, 6th Paragraph: *The methods used to characterize the vegetation community composition and distribution are appropriate and reasonable.*

Page 8, 1st Paragraph: *The two-dimensional hydrodynamic-salinity model is a useful device to describe the effect of various freshwater flow regimes for the river and estuary.*

Page 8, 3rd Paragraph: *Defining specific duration values for the minimum flow criteria is a difficult task. The approach taken by the District is innovative and illustrates a determination to make the best decision possible. Undoubtedly, the duration estimates derived from the analyses are educated guesses. Nevertheless, the criteria are better served with their inclusion than without.*

Page 8, 4th Paragraph: *The District has demonstrated considerable diligence in obtaining and analyzing hydrological, salinity and vegetation data for the Northwest Fork of the Loxahatchee River. The hydrodynamic/salinity model and the SAVELOX model are appropriate and reasonable approaches to defining ecosystem component relationships and deriving minimum flow criteria.*

Dr. Kent expressed the following concerns regarding the Draft document:

Page 3, 2nd Paragraph: *The MFL document describes and discusses in sufficient detail historic, current and anticipated flows over the Lainhart Dam. Also, the document describes the relationship of Lainhart Dam flow to Northwest Fork salinity both empirically and as modeled by the hydrodynamic/salinity model. Collectively, this information supports a reasoned assessment of the Lainhart Dam flow necessary to sustain desired vegetation communities downstream to Cypress Creek.* ***However, beginning with Cypress Creek, nearly 50 percent of the flow to the Northwest Fork comes from tributaries. Therefore, an assessment based upon flow over Lainhart Dam must ensure that absolute and relative flow from other sources is maintained. Alternatively, the assessment must incorporate anticipated changes in flow from these other sources.***

- **District Staff's Response**: The flow analysis used to develop the MFL criteria were based upon best available information. Flows from the other tributaries were included in the analysis, however measured flows were not available from Cypress Creek or Hobe Grove Ditch after 1991. The percent of flow contributed by the Lainhart Dam to the NW Fork in the model is 44%. This compares with field measurements that show the Lainhart Dam to provide 45% of the flow for the 1980-81 drought dry season, 46% from the 1980-81 drought wet season, 40% from the 1989-90 drought dry season, and 56% from the 1989-90 drought wet season. Based on these data, the flow ratio of 44% provided in the model appears to be a reasonable ratio for estimating the flow contribution provided by the Lainhart Dam and other tributaries during dry periods, the period of time when a minimum flow would be of interest.

The District has recently completed a contract with the USGS to update and improve the current flow/salinity monitoring program within the watershed. Additional flow gages and salinity monitoring instruments are being installed in Cypress Creek and Hobe Grove Ditch. These additional gages will provide the data needed to more fully understanding the role that these tributary basins play in shaping the river's salinity profile.

Page 3, 3rd Paragraph: *Salinity is convincingly the primary factor determining the location and condition of the floodplain swamp and mangrove communities. However, water quantity may be an important factor in determining the location and condition of stream swamp and cypress within the upper reaches of the Northwest Fork and its tributaries. For example, parts of the middle and upper Northwest Fork and Kitching Creek (Segments 2, 3 and 5 of Figure B-3) have consistently been characterized by freshwater, but the vegetation community has changed from cypress to stream swamp.* ***The MFL document should be explicit about whether the goal is cypress, stream swamp or either. If the goal is cypress, then the effect of changes in flow on freshwater vegetation community location and condition should be evaluated.***

- **District Staff's Response**: The reviewer correctly points out an inconsistency in the information contained in the Figures contained in Appendix B and Table 33 in the main text of the report. This will be corrected. District staff were unable to distinguish between the categories of stream swamp and cypress in the 1940 aerial, so we cannot say there has been change from one freshwater swamp type to another (i.e. stream swamp & cypress swamp). The legends of the above mentioned figures must be changed and the text must be modified to reflect this problem in interpretation.

Page 4, 1st Paragraph: *Legal and policy decisions have limited MFL criteria development to the Northwest Fork of the Loxahatchee River and Estuary.* ***Nevertheless, potential impacts (positive and negative) to other parts of the system should be evaluated and the results described.*** *For example, the Estuary provides numerous resource functions including habitat to protected species (e.g., Johnson's seagrass, Halophila johnsonii; West Indian manatee, Trichechus manatus latirostris). The District recognizes that a "… viable estuarine ecosystem requires a proper balance of freshwater inflow…"(Chapter 3), but the document fails to discuss if this balance will be achieved and by what means the balance will be evaluated.*

- **District Staff's Response**: A section needs to be added to the Chapter 5 (results) that explains the effects of the proposed MFL on conditions and resources in the estuary.

  An effort was made to characterize significant resources that exist in the estuarine portion of the Loxahatchee system (Chapter 2 pages 22-31). These included primarily mangrove swamp communities, other saltwater marsh vegetation, seagrasses and marine algae, fishes, macroinvertebrates and manatees. Our present (very limited) understanding of the relationships between these system components and freshwater inflows was also described. The Loxahatchee estuary covers the entire range from a primarily marine environment near the inlet and into the central embayment to a completely freshwater environment in the upper reaches of he Northwest Fork.

  Physical features of the estuary are summarized on pages 17-21. The North Fork portion of the estuary is very small in extent and has very limited resources due to several factors. The lower reaches have been extensively bulkheaded and filled, effectively eliminating important shoreline habitat. In addition, large areas of the bottom consist of soft mud or ooze that is not conducive to supporting estuarine benthic communities. The upper reaches within Jonathon Dickinson State Park in this section of the North Fork Loxahatchee River have steep shorelines that do not support significant amounts of marsh or swamp shoreline vegetation.

  The Southwest Fork is very small in size and has limited resources, probably due to the relatively frequent large discharges of freshwater from S-46 that result in scouring of the substrate and rapid and extreme salinity changes.

  None of the resources or issues in the North Fork or Southwest Fork of the estuary was considered to have a significant function that would be impacted by low flow conditions. In contrast, the resources of the Northwest Fork, Central Embayment and adjacent coastal waters are primarily sensitive to high flow events. When large discharges of several thousand cfs occur through the S-46 structure into the Southwest Fork, the entire system can become freshwater, which has significant adverse effects on marine life, especially seagrasses and benthic macroinvertebrates, and results in displacement and loss of habitat for fishes that prefer the more saline conditions.

It appears to us that low flow conditions in the Northwest Fork do not have any significant adverse effects on the estuary and may in fact be beneficial rather than harmful to these resources. Under very low flow conditions (see Appendix F, Figure F-4), most of the estuary becomes a marine system (30-35 ppt salinities). If these low flow/high salinity conditions persist for several weeks or months, seagrass communities may tend to expand upstream, providing more habitat and food for marine and estuarine fishes and invertebrates, additional stabilization of soft mud bottom communities and provide additional food for manatees. There may be some mortality occurring in oyster communities at the upper end of the Northwest Fork and some associated recruitment occurring further upstream.

The upper reaches of the Northwest Fork still contain extensive areas of habitat suitable for oysters, as well as oligohaline and freshwater habitat. Extreme fluctuations in salinity, associated with periodic low flow events, are not conducive to the development of extensive oyster communities. Oysters are very beneficial to coastal estuaries such as the Loxahatchee River because they tend to stabilize bottom sediments, provide filtration of suspended materials from the water column and provide an extensive surface area and substrate for colonization of other organisms.

The importance of a stable and extensive oligohaline zone to the health of the estuary has been well studied and documented in a nearby coastal system, the St. Lucie Estuary, located just a few miles north of the Loxahatchee River. Unfortunately, we do not have the same type of extensive data for the Loxahatchee River, although the limited studies we have suggest that the species composition of fishes and macroinvetebrates in these two systems are similar. The Loxahatchee River has more extensive and healthier seagrass and oyster communities, as a total proportion of the area of the estuary, than are found in the St. Lucie Estuary.

In the St. Lucie Estuary we were able to identify the oligohaline zone as the resource that was of primary concern in this system, that this resource would be significantly impacted by reduction of freshwater flow, and therefore needed to be protected by establishment of a MFL. We therefore proceeded to quantify the amount of oligohaline habitat that was lost to the estuary during periods of low flow and identify a critical point in the flow regime when the amount of freshwater entering the estuary from tributary flow was less than the amount of water that was being lost to the system due to evaporation.

By contrast, in the Loxahatchee River system, we have identified the freshwater swamp community in the river floodplain as the primary resource that needs to be protected by establishment of a MFL and (have largely assumed) that the estuary portion of the system will benefit from this improved flow regime by receiving a more stable flow regime that will provide more stable habitat conditions.

The effect of implementing the proposed MFL on this system is anticipated to help further improve conditions in the estuary by providing for a more extensive and stable oligohaline zone (less than 5 ppt salinity) upstream in the river between mile marker 9.2 and 8.5 or so, than occurs at present. Conditions that are more conducive to the growth of oysters on mangrove roots and the formation of oyster reefs or bars (15-25 ppt salinity) are expected to occur in the vicinity of mile marker 6 along the river. At the same time, these flows are not expected to adversely affect the marine communities that live in the central embayment, especially the Johnson's' seagrass community that exists near the railroad bridge.

Page 4, 2nd Paragraph: ***The MFL document may give undue weight to 2-ppt salinity. Both the hydrodynamic/salinity model and the SAVELOX model appear to directly equate 2 ppt salinity to salt water, and to indirectly suggest that 2 ppt is threshold for the stream swamp***. *The former is a useful mechanism for estimating the relative position of fresh water and salt water. However, there is no basis* *presented for a relationship between 2 ppt and vegetation type. In fact, model results suggest that a mean salinity of 0.15 ppt is related to the occurrence of a healthy stream swamp community. Table 25 (p. 101) also suggests that a healthy stream swamp community requires a mean salinity of < 1 ppt.*

- **District Staff's Response**: The 2-ppt salinity value comes from a review of historical salinity trends (as simulated by the model) experienced at river mile 10.2. The point we were trying to convey is that within this remaining "healthy" freshwater community, 2 ppt was near the maximum salinity value recorded over the 30-year period. Given this salinity history, this portion of the river still appears to support a healthy freshwater vegetation community even though salinity events of this magnitude (up to 2 ppt) occur approximately once ever 6 years for an average of 20 days duration. We used this data to characterize the upper limit at which these communities appear to tolerate using best available information. We did not intend to imply that the 2 ppt is any kind of scientifically derived threshold value that characterizes saltwater conditions, other than that is what appears to have happened at these sites over time based on the modeled salinity history.

  It should also be noted that the 2-ppt salinity concentration represented in the model is the daily mean. In other words, salinity could range from 0 to 4 ppt throughout the daily tidal cycle, but the mean salinity would be 2 ppt. A mean daily concentration of 1 ppt would indicate that daily salinity concentrations would vary from 0 to 2 ppt, and is found at the location on the NW Fork where salinity is 0 ppt during low tide and can reach 2 ppt only during high tide. At this site, predominantly freshwater conditions (less than 1-ppt) would occur during the period between high tides. Under these conditions, river channel salinity above 1 ppt would be transient, lasting only a few hours before the next tidal cycle would change the river channel water back to predominantly freshwater conditions. It is felt that with the flushing of salinity between high tides and the predominance of freshwater conditions, significant harm would most likely not occur when mean daily concentrations occasionally were at 1 ppt. For this reason, 2 ppt (the next integer higher) was chosen as a better number to use to define the threshold salinity concentration at which significant harm could occur. Furthermore, the model used to derive these salinities is not sufficiently sensitive to reliably resolve salinity values to 0.1, or even 0.5, whole numbers should be used.

  It is recognized that a healthy stream swamp community requires a mean salinity of < 1ppt (as Dr. Kent described above) and an associated flow to maintain that freshwater state. However, the MFL is concerned with the lowest allowable flow rate, duration and return frequency that would cause significant harm, not the average flow condition at a particular site. At river mile 10.2, salinity did increase above 2 ppt for short durations during extremely dry years. For that reason, it was calculated that a daily mean concentration of 2 ppt (as defined by the model) should not occur for longer than 20 days once every 6 years. This also assumes that freshwater conditions are dominating that site the rest of the time by District's operational policy of delivering 50 cfs to the NW Fork of the river (via G-92 and the Lainhart Dam) when upstream water is available.

Page 4, 3rd Paragraph: *Results of soil salinity transects are a welcome addition to the MFL document. Soil salinity may be as important, if not more important, than water salinity in determining the location and condition of the stream swamp community. However, a comparison of the transect locations with plots of historic and existing vegetation (e.g., Figure B-3) suggest that samples were collected in areas that have not experienced changes in vegetation. Presumably, soils in these areas have not experienced significant variation in salinity.* ***An evaluation of soil salinity affects on vegetation community may be enhanced by samples collected at locations subject to changes in vegetation community and exposure to salt water, and locations with stressed stream swamp communities****. Said samples would help us understand the cumulative effects of salt exposure, and allow the construct of a relationship between soil salinity and stream swamp condition.*

- **District Staff's Response**: Soil transect site #3 was in a location of the river where some changes in the local plant community (stress), due to salinity, were observed. These included the presence of some red mangrove, abundance of pond apple, and the lack of Virginia willow. The semiquantiative survey also showed a reduction in the number of species observed. The field study data from this site can be found in Appendix C. Unfortunately, the results of the quantitative vegetation survey from this site was not included in the analysis presented in the technical document, since only one bank was surveyed and not both (as with the other sites). It is believed that these changes have occurred since the 1970's (based on aerial photo-interpretation presented in Appendix B). The four soil sampling transects represented a salinity non-impacted site (transect 1), rarely impacted site (transect 2), regularly impacted site (transect 3), and highly impacted site (transect 4) along the NW Fork. This was explained on page G-2 on Appendix G. We can further emphasize this by rewriting and clarifying this description of the sites.

Page 5, 2nd Paragraph: *The proposed MFL criteria is based on a desire to prevent the salinity at RM 9.2 from exceeding 2 ppt for any longer than has occurred within the healthy swamp community (i.e., no more than 20 days duration more often than once every six years). The document then concludes that Table 40 can be used to select a flow over Lainhart Dam of 35 cfs to maintain mean daily salinity below 2 ppt at RM 9.2. However, a flow of 35 ppt in Table 40 corresponds to ≤ 2 ppt for 30 days once every four years, and not a mean salinity of 0.15 ppt and the duration and frequency parameters for RM 10.2 (see above) intended to be mimicked for RM 9.2.*

- **District Staff's Response:** There were some errors in the table and associated text and the table was not formatted or explained adequately. The following is a revised Table 40 and explanation.

Table 40 Various Salinity parameters that can be used to protect the resource

River Mile	Approximate Flows (cfs)* needed to maintain salinity concentrations:				
	Mean = 0.15 ppt	Mean = 0.3 ppt	Salinity ≥ 1ppt Not to exceed 31 days/1.6 yr**	Salinity ≥ 2ppt Not to exceed 22 days/5.9yr	Salinity ≥ 3 ppt Not to exceed 14 days/10yr
10.2	50	**35**	20	10	5
9.7	80	50	**32**	25	15
9.2	100	70	47	**35**	**22**
8.9	140	85	60	42	**27**
8.6	150	120	75	55	42
8.35	200	130	80	65	52

* Flows obtained from Table 37 for a given salinity value at a given station location

** Occurrence frequency and duration were obtained from Table 36: for example for 1ppt salinity at station 10.2 *Ds* = 31 days and *Db* = 576 days or 1.6 years; Likewise at 2-ppt salinity, *Ds* =22 days and *Db*=2157 days or 5.9 years

The intent was to display an array of management criteria that could be used as the basis for "transferring" the hydrologic regime from Mile Marker 10.2 down to various downstream mile markers to RM 8.35. The basis of this table is the Ds and Db values listed in Table 36 and the flow required to maintain a given salinity value as listed in Table 37. Thus if the desired intent is to use a mean salinity concentration of less than 0.15 ppt as the management criterion, it can be seen from the first column in Table 37 that a mean flow of 50 cfs is needed to provide this salinity regime at station 10.2 and a mean flow of 100 cfs is needed to provide this mean salinity at station 9.2. Similarly, if the intent is to use a salinity exposure of 2 ppt as the management criterion then, according to Table 36, such an event occurs only 22 days every six years at station 10.2 and (from Table 37 column 2, bottom row) is associated with a flow of 10 cfs. To transfer a comparable salinity exposure of 2 ppt downstream to river mile 9.2, a flow of 35 cfs (Table 37 column 5, 4th row from the bottom) should be allowed to occur no more often than 22 days every 5.9 years.

Page 5, 3rd Paragraph: *The MFL criteria is also predicated on the belief that vegetation at RM 10.2 is healthy, vegetation at RM 9.2 has suffered significant harm, and that vegetation between these two stations has been harmed (but not significantly). However, the significant harm criteria applied to the vegetation between RM 9.2 and RM 10.2 suggests that much of this area has also suffered significant harm. Three VEC species are missing at RM 9.3 and two VEC species are missing at RM 9.7 (one species is missing at RM 9.9). Also, seedlings for four of the six VEC species are missing from the community between RM 9.2 and RM 10.2. Perhaps the definition of significant harm should be clarified to indicate whether all conditions must be satisfied, or whether failure to satisfy one of the criteria is sufficient to designate significant harm.*

- **District Staff's Response**: Many of these concerns could be addressed by implementing a more comprehensive data collection and sampling program to eliminate some of the sources of variation noted above, such as whether the absence of a particular species at a particular point in the rive was due to sampling limitations or natural variability in distributions rather than the effect of salinity. Loss of any one of the VEC species from the canopy structure, to the extent that it could be reasonably be inferred to be due to salinity stress or toxicity, would arguably be considered a significant impact, in that several years (at least) of stable freshwater conditions would be required in order for it to regrow to the extent that its role in the canopy structure would be restored.

Page 5, 4th Paragraph: *Significant harm for the vegetation community between RM 9.2 and RM 10.2 can be avoided by reproducing salinity conditions at RM 10.2. According to Table 37, a flow of 50 cfs at the Lainhart Dam will produce a mean salinity of 0.14 ppt at RM 10.2. A flow of 100 cfs at the Lainhart Dam will produce a comparable salinity condition at RM 9.2, and by extension at intervening locations. Flows less than 100 cfs will likely eliminate mature individuals or seedlings of the six VEC species, and thus impart significant harm.*

- **District Staff's Response**: Please see our previous response to *Page 4, 2nd Paragraph.*

Page 6, 1st Paragraph: "…***The document has not been reorganized to provide a section on the expected impact of flow modification on the Loxahatchee River and Estuary. Nor does the document provide MFL recommendations for the North Fork, Southwest Fork or the Estuary….*** *the current document addresses the question of whether mangroves continue to encroach on the stream swamp community, inflow data for the entire Estuary, and the inadequacy of information relating cypress condition to salinity. Conversely, the current document fails to address the Panel's comments about anticipated regional growth and development, feasibility of proposed actions, the inadequacy of a linear approach to flow and discharge relationships, and a lag between Lainhart Dam flow data and downstream salinity.*

- **District Staff's Response**: The effects of anticipated regional growth and development on water resources in the region are being addressed through the development of a "MFL Recovery Plan" as required by state law (Ch. 373.042(1) for those water bodies which do not presently meet the proposed MFL. The Northern Palm Beach County Comprehensive Water Management Plan (NPBCCWMP) addressed this issue in considerable detail to define water sources and anticipated uses over the next 20 years and determine projects that are needed to ensure that additional water is provided to the Loxahatchee River to meet and exceed the proposed MFL. Approximately $40 million will be spent over the next 15 years to implement this plan. In addition, the Northern Palm Beach County Component of CERP is presently being modified to consider growth, development, water supply, regional storage and flow restoration needs for the Loxahatchee River and its entire watershed. This program anticipates expenditures about $400 million to build long-term storage facilities and provide connections between the Loxahatchee River and regional water management facilities.

  The regression method used initially to develop relationships between flow and salinity was a non-linear technique (see Appendix D, pages D-1 to D-10), but the Excel spreadsheet application for this purpose was shown to be inadequate. SAS was used to develop an improved non-linear relationship, but this approach also was felt by District staff to have some significant predictive limitations. Lag times of 3, 6 9 and 12 days were incorporated into the SAS analysis in an attempt to improve the results, but did not result in a significant improvement in correlation values (Pages D-11 to D-22). It was felt that neither of these regression approaches was especially useful and provided very limited capability to extrapolate beyond known data sets or incorporate alternative modeling scenarios that might involve modification of flows from the different sources.

  For this reason it was decided to move forward with development and use of the hydrodynamic model as recommended in the initial peer review as a means to quantify flow and salinity relationships for the river.

Page 6, 3rd Paragraph: *The VEC approach has merit, and can be a valuable tool for management decision-making when the value of the selected ecosystem component is clearly established, and the relationship between the selected ecosystem component and other ecosystem components is clearly defined. The VEC approach for the Loxahatchee River and Estuary MFL was improved in this draft by replacing cypress with six stream swamp tree species. In this manner, the relationship between the VEC and the stream swamp community is more clearly defined.* ***However, the use of six stream swamp tree species has not clarified the relationship between the VEC and other Loxahatchee River and Estuary ecosystem components. Of particular concern is the absence of an identifiable relationship with estuary resource functions.***

- **District Staff Response**: The District's approach was to successively establish and build a sequence of inferred relationships 1) between flow and salinity, 2) between flow, salinity, tree distribution and the amount of flow needed to sustain the tree community, 3) between the amount of flow needed to sustain the tree community and the resulting salinity distribution in the estuary (Appendix F), and 4) between known presence and distribution of major species in the estuary and information from field observations and literature concerning likely effects of the resulting salinity conditions on these species.

Page 7, 2nd Paragraph: *The literature review is reasonably complete for the intended purpose, if the purpose is solely the protection of the stream swamp community in the upper reaches of the Northwest Fork.* ***The literature review should be expanded if it is also the purpose of the MFL criteria to protect the Loxahatchee River Estuary.***

- **District Staff's Response**: Comment noted.

Page 8, 2nd Paragraph: *The use of historical hydrological and/or ecological data and findings were used appropriately to determine minimum flow criteria for the Northwest Fork, although the findings are subject to interpretation (see above). Historical hydrological and/or ecological data should be applied to a minimum flow criterion for other parts of the Loxahatchee River and Estuary, especially the latter.*

- **District Staff's Response**: We have some potential capability to expand our look at historical conditions in the estuary. Certainly it would be interesting to examine historical aerial photography of mangroves and saltmarsh communities throughout the estuary (from the inlet up through all three forks) in 1940 and compare it with the distribution of these communities today. We have some historical information (largely anecdotal) on fishing conditions in the river and we have some information on the distribution of oysters, based on associated dredging/removal activities that have occurred during the past fifty years. We also have information concerning seagrass distribution, since this has largely occurred since the inlet was stabilized. The extent of submerged freshwater vegetation in the river or estuary prior to opening of the inlet is unknown.

Summary of Recommendations from Dr. Kent:

1. Establish with minimum flow criteria for other tributaries of the Northwest Fork, and connect these criteria with the minimum flow criteria for the Lainhart Dam.
2. Determine the effect of water quantity on type of freshwater vegetation community in the upper reaches of the Northwest Fork.
3. Evaluate potential impacts to other parts of the Loxahatchee River and Estuary from the minimum flow criteria for the Lainhart Dam.
4. Verify the relationship between 2-ppt salinity and vegetation community or eliminate the assumption from the models.
5. Conduct soil salinity sampling at intervening locations and re-evaluate the relationship between soil salinity and vegetation community.

6. Evaluate the relationship between individual and combined salinity variables and vegetation community.
7. Establish a monitoring program to determine the effectiveness of the final minimum flow criteria.

District Response to each bullet:

1. Data collection efforts are being initiated to address this issue
2. The SaveLox model is being further refined as a possible means to address this issue during the restoration effort.
3. VEC study underway -- salinity relationships have been fairly well established. Need a more comprehensive resource inventory of the estuary.
5. Additional soil salinity monitoring should be considered as part of any additional field research that is being conducted in the floodplain
6. The relationship between individual and combined salinity variables and vegetation communities should be investigated further as part of the restoration effort. Infrequent high flows have not been defined for this effort, but we have defined some threshold impact criteria, mean flows and salinity conditions, and 90% confidence limits for salinity and (by inference) for flows.

Conclusion

Thank you for your helpful comments in this process and pointing out a number of discrepancies in the text, tables and figures contained in the draft document. We agree with your recommendation that we need to add a stand alone section identifying potential impacts to the downstream estuary. Comments on the need to reevaluate our soil salinity sampling methods and locations was also welcome. You have also made us aware of a number of assumptions contained in the report that need to clarified and that, if left unresolved, could ultimately reduce our ability to adequately protect this unique and valuable river. As you may be aware, we are in the process of upgrading hydrodynamic/salinity model to a 3-dimensional version and are collecting extensive synoptic flow and salinity data throughout this basin that we feel will provide the necessary information to address these issues in greater detail.

The MFL proposed in the draft document is intended to be an interim management target based on best available data. We envision the establishment of MFLs for the Loxahatchee River as an iterative process. Projects are already underway to meet the proposed flow of 35 cfs 94% of the time by 2006 and continue beyond that value to provide flows of 65 cfs 99% of the time by 2018. Studies are also underway to examine opportunities to enhance flows from other tributaries – Cypress Creek, Hobe Groves Ditch and Kitching Creek. The SFWMD is initiating studies with FDEP and other agencies to define overall restoration goals for the river that will not only include minimum flow criteria for the river but will also address needs for sustained average flows and periodic high flow periods that are needed to maintain a healthy river and floodplain and downstream estuary. It is anticipated that once the restoration goals for the river have been established in terms of desired flow and ecological conditions, that the MFL criteria will also have to be revised in order to be consistent with protection of the restored ecosystem from significant harm.

Review of "Technical documentation to support development of minimum flows and levels for the Loxahatchee River and Estuary"
SFWMD Water Supply Division, July 15 2002 Draft
Submitted by: Merryl Alber, Dept. of Marine Sciences, University of Georgia

Summary

The MFL proposed for the Loxahatchee River and Estuary is designed to provide adequate flow to the Northwest Fork of the River to protect the floodplain swamp community. Flow recommendations were obtained as follows: 1) a 2-d hydrodynamic model was developed that relates current flow conditions to salinity, 2) historic flows over the Lainhart Dam (1971-2000) were used in the model to hindcast daily average salinities at various places in the estuary, and the predicted salinity records were evaluated to determine both the frequency and duration of events when the water at each location was greater than various thresholds (e.g. 2 ppt), 3) a survey of the floodplain swamp community was conducted along the river, a subset of six trees were chosen as valued ecosystem components, and both the presence/absence of these trees along the river as well as their characteristics were used to identify healthy, stressed, and significantly harmed locations (at RM 10.2, 9.7, and 9.2, respectively), and finally 4) an MFL of 35 cfs at the Lainhart Dam was chosen (not to be exceeded for more than 20 d more frequently than once every 6 y), based on the model predictions of flow and salinity at the identified locations, with the goal of preventing damage or stress from occurring to the floodplain swamp community at RM 10.2 as well as preventing significant harm from occurring at RM 9.2. Additional information on soil salinity along the river, changes in vegetation over time, the relationship between flow and observed salinity, and estimates of consumptive use are also included in the document, but this information was not used directly in selecting the proposed MFL.

It is clear that the staff of the SFWMD has put a large amount of effort into the proposed MFL, and this is in many ways an improvement over the previous draft document. The report does an excellent job of addressing the comments provided in 2001, the literature review is improved, and the document is better organized. I think the shift away from cypress as an indicator is warranted, and the selected freshwater tree species provide a reasonable basis for discerning differences in the health of the floodplain community along the salinity gradient. However, there are some fundamental problems associated with the application and interpretation of the hydrodynamic model, and I do not think the document as it now stands adequately supports the proposed MFL. Below I review the major components of the proposed MFL as organized in Chapter 5.

Conclusions

Literature Review.

This is much improved over the previous version, in particular because there has been a clear effort to locate information on the salinity tolerances of cypress. However, the document would benefit from more information on the life history characteristics, functional roles, and salinity tolerances of the 6 chosen indicator species.

VEC Approach.

I'm not sure this is actually an application of the VEC approach. There is a complete list of resource functions and services provided in the document, but they are not tied very well to the floodplain swamp community. Instead, the trees that were identified are useful as indicators, rather than particularly "valued." The document indicates that these species were chosen because they occupy different ecological niches and have different functional roles, but this is not well documented. The species chosen are all relatively long-lived, and it seems like including some herbaceous species with shorter life spans is perhaps worth considering as they might provide faster response times and a better cross-section of the community.

Historical flow and salinity data

The historical flow data is presented as a very long table in Appendix D, without comment. One concern I have is whether these data were all corrected, based on the recalibration that occurred recently (this goes for Tables 23 and 24 and Figure 20 in the text as well). Although I understand that flows at G-92 are correlated with those over the Dam, they're not the same, are they? If they are, this should be stated. If not, the document would benefit from a presentation similar to that in Figure 19 of flow over the Dam since that is what is being regulated. Table 24 and Figure 20 are useful, but it would be instructive to see some summary data (e.g. different percentile flows) for the period from the reference year (1985, if that is selected) to the present.

The salinity data presented in the document are interesting. One suggestion is to recalculate the information in the Wild and Scenic segment of the river without station 63 to determine if average salinities have in fact increased over the past decade (as referred to on p. 102). This is an important point: elsewhere in the document the data suggest that flow has increased over the past decade and it would be very useful to know whether this change in flow has resulted in a measurable change in salinity or whether increased flow over the Dam has been offset by other changes in the watershed.

The salinity data presented in Appendix D were used to calibrate the hydrodynamic model, but the empirical relationships between salinity and flow were not used in any way in this document. I think these relationships are extremely useful (particularly those derived for current conditions, after the gaps had been closed) and might be appropriate as either a check on modeled salinity/flow relationships or as the basis for setting an MFL (see below). The original relationships, which were computed using Excel, are presented in figures D3-D6. These are very poor fits, and, in response to my comments on last year's document, they have been redone in SAS using variable flow-averaging periods (pages D11 – D22). The SAS fits are much improved over the ones done in Excel and could be very useful. Curiously, the SAS analysis is not referred to anywhere in the text, and SAS analyses were not performed for stations 66 and 67.

Aerial photography/GIS

This was a straightforward, complete analysis of vegetation types in the estuary over time. However, I find it worrisome that no major changes in vegetation cover were observed between 1985 and 1995. The footnote in table B-4 indicates that vegetation in a segment of the river below Trapper Nelson's was estimated from 1995 photographs. Could this substitution have perhaps led to the erroneous conclusion that things did not change in this area? Given the improvements in G-92 and the resultant increase in flow that occurred in 1989, was there a concurrent decrease in salinity (as mentioned above)? If there was an increase in salinity, wouldn't we expect to see a downstream shift in the indicator community? Perhaps this is the explanation for the field observations reported on p. 132 that suggests the location of the stressed area has moved downstream between 1985 and 1995? This needs to be explored. If there has been increased flow and decreased salinity, which in turn has led to a shift in tree distribution, that would be good evidence that the indicators are in fact appropriate. It might also mean, however, that the choice of 1985 as a reference year would result in managing towards a situation with less freshwater inflow than occurs now.

Finally, when evaluating shifts in vegetation it is worth keeping in mind that there are other factors that could account for changes in vegetation besides changes in hydrology.

River vegetation survey

The results of the vegetation survey show a clear gradient in the distribution of the 6 chosen indicator species in the floodplain community, and, although there is not technical information in place on the salinity tolerances of the various trees over the course of their life cycles, it serves as a useful starting point for the identification of healthy, stressed, and significantly harmed locations along the Northwest Fork of the River. Although these are judgment calls, the selected locations are supported by the data in terms of observed changes in the presence of the various species and by their measured characteristics (e.g. as we move downstream, fewer VEC species are represented and those that are there are smaller, with fewer seedlings and saplings). Given the fact that these trees used to occur further downstream, it is probable that salinity is an important factor that controls their distribution. One point to note is that the trends do not level off (e.g. as we move up to RM 10.6, trees are more abundant, larger, and have more seedlings and saplings). One wonders if another station further up-river would yield even more, in which case the selection of a representative healthy site might need to be re-visited.

Soil salinity samples

The observation that chloride shows a better gradient along the river than soil salinity is most likely due the fact that salinity has a much smaller dynamic range (it is constrained between 0 and 36). This makes it a less sensitive measurement, but I do not agree with the interpretation that this suggests salinity is not retained in the soil.

Hydrodynamic/salinity model

Although the 2-d model does an adequate job of matching long-term field salinity trends, the figures in Appendix E suggest some real discrepancies between observed and modeled salinity. This is acknowledged in Appendix P (p. P-4), where it states that salinity in the upper estuary is extremely sensitive to freshwater input and points out that the majority of the freshwater input was estimated from ratios (which are quite variable in reality but are fixed in the model). I understand new surface flow stations are addressing this, but without this information, and with another large estimate of inflow from groundwater (estimated as 40 cfs in a system where 35 cfs from the Dam is being proposed as the MFL), predicted salinities in the upper estuary are extremely suspect. The model may be a useful tool for exploring different management scenarios, but I am concerned about the over-reliance on model predictions of salinity as the basis of the proposed MFL.

It is instructive to compare the flows/salinities predicted by the model with those derived from the analysis presented in Appendix D: according to the model, the flow required to maintain a high tide salinity of 2 at RM 8.6 is 54 cfs (obtained from Table 7 on p. E-18), whereas an average bottom salinity of 2 ppt is correlated with a flow of 64 cfs (p. D21). At RM 7.7, the model flow is 89 cfs (again to maintain a salinity of 2). This matches the Excel fit quite well, but the prediction from the SAS relationship is approximately 140 cfs (p. D18). This suggests that **the model may underestimate the flow required to maintain salinities at their target levels and/or underestimate salinities at any point in the river, which would result in an inaccurate MFL**. If the intent is to link flow and salinity it would be more defensible (and simpler) to stick with the empirical relationships derived in Appendix D.

Even if the model were judged as the most appropriate tool for predicting salinity at different locations in the river under different flow conditions, it makes no sense to use a flow/salinity model calibrated with current data to predict 30 years worth of salinity. First, the document makes clear that there have been extensive changes in both the watershed and the estuary over that time period, such as dredging in the estuary, changes in land use resulting in changes in the amount of overland runoff and groundwater infiltration, and closing the “gaps” (which added 0.7 miles to the river). All of these changes could affect flow/salinity relationships, making historic salinity predictions based on current relationships less accurate. At the very least, some of the model predictions could be compared to historic salinity data (e.g. Appendix A describes studies by Chiu (1975), Hill (1977), Russell and McPherson (1974), and Law Environmental (1991), all of which collected salinity information).

Second, even if it could be demonstrated that the model can in fact be used to predict historic salinities, flow conditions have changed over the 30-year time period: The G-92 structure was not constructed until 1974, its capacity was increased in 1986 and additional culverts and operational criteria were added in 1987. In fact, the document states that flow over the Lainhart Dam averaged 52 cfs from 1977-1989 and increased to 86 cfs from 1990-2001, and that the occurrence of flows below 35 cfs decreased from 34% of the time to 25% of the time between the two time periods. This means that salinities at given locations in the river were very possibly greater before 1987 than they are today (this could be verified by comparing some of the field observations). Moreover, the reference point chosen by the SFWMD as the basis for establishing an MFL is 1985. It therefore does not make sense to look back to 1970.

All of the problems stated above mean that using a 30-year record to determine salinities (and deriving statistics about the average amount of time salinities at different sites are greater than a particular threshold) is not useful for understanding current conditions or setting MFLs. That said, the Ds/Db ratio is extremely interesting and looks like a useful approach for summarizing salinity data. Perhaps it could be used to characterize field salinity observations (e.g. between 1997 and 2000).

Vegetation/Salinity model

The MFL was chosen based on the model-predicted salinities at the locations identified in the vegetation surveys as healthy, stressed, and significantly harmed. To begin with, the goal of the MFL is not clear: if RM 9.2 has already been identified as an area that is experiencing significant harm (over what time frame?), then it makes no sense that the flow target has been chosen to prevent significant harm from occurring there (as stated on p. v and p. 149). The time frame is also not clear. On p. C-16 it suggests that long-term average salinity conditions since

1970 have led to the decline in freshwater vegetation, yet the analysis in Chapter 5 suggests that using those long-term averages is an appropriate basis for protecting the resource from further harm. Once the baseline condition gets sorted out (is it 1985? and has flow, salinity, or floodplain changed since that time?), this needs to be revisited.

If current vegetation at RM 10.2 is deemed healthy and the MFL goal is to protect it from harm, then what is required is to provide as much flow to RM 10.2 as it currently gets (i.e. the status quo). If this is the case, it would be much more straightforward to analyze the flow record over an appropriate period (e.g. since 1985, or perhaps since G-92 was improved or since the gaps were closed) and determine average flow (or a particular percentile flow, or the proportion of time that flow falls below a particular percentile). Interestingly, the report states that average flow over the Dam was 70 cfs from 1971-2001 (p. 160). In comparison, the model results presented in Table 40 suggest that 50 cfs is required to maintain average historic salinities of <0.15 at RM 10.2 This again suggests that the model is underestimating flow.

If the MFL goal is to provide enough freshwater so that the salinity regime currently experienced at RM 10.2 can be reproduced at a downstream location (e.g. RM 9.7 or 9.2), then it becomes necessary to understand the relationship between flow and salinity, and this is where the model comes in. However, even if the model were appropriate and could be used to predict salinities at these river locations, I find the logic here extremely convoluted. What is essentially happening is that a) the model begins with a relationship between salinity and flow, b) historic flow data are used to predict historic salinity, c) historic salinity data are used to determine Ds and Db, d) Ds and Db are related back to flow, when all that is really needed is the relationship between salinity and flow.

Moreover, when I followed the data in order to do a "reality check" on the model, things did not add up: Table 24 reports that flows of less than 35 cfs at the occurred 25% of the time at the Lainhart Dam between 1990 and 2001, and 35% of the time between 1971 and 1989 (for an average event duration of 15 or 24 d with a return frequency of approximately 2 mo). In Table 37 the model predicts that a flow of 35 cfs will result in a salinity of 2 ppt at RM 9.2 (the basis of the proposed MFL standard), and in Tables 35 and 36 we see that model-predicted salinities of 2 ppt occurred on average for 46 d every 6.8 mo, or 18% of the time at RM 9.2. I recognize that there is a response time built into the model and that we cannot expect a 1:1 correlation between flow and salinity, but these estimates of Ds (46 d), Db (6.8 mo), and % time over the threshold (18%) are very different than the flow observations (15-24 d, 2 mo, and 25-35%, respectively). Likewise, flows of 10 cfs occurred 7% of the time in the data presented for the dam (an average of 19 d every 9 mo). However, at 10 cfs the model predicts a salinity of 2 ppt at RM 10.2, which is estimated to have occurred only 1% of the time (an average of 22 d every 6 y, which is also used in the proposed MFL). Either I've misinterpreted these results or the model does a very poor job of estimating these parameters and should not be used to select an MFL.

I would suggest either working with the empirical relationships derived in Appendix D that relate flow to salinity or improving the model so that it does a better job of reproducing observed salinities. In either case, it seems like the historic salinity information is not relevant and the MFL can be set based on the current salinity regimes (e.g. it would be possible to determine what flows would be necessary to change salinity conditions at RM 9.2 such that they mimic what is currently observed at RM 10.2).

Finally, I'm not sure I understand why the emphasis is on 2 ppt. If these salinities are thought to occur very rarely (e.g. the 99th percentile), then flows could theoretically be maintained at the 98th percentile without violating the MFL. However, maintaining a salinity of 1.9 at RM 9.2 would surely cause damage to the vegetation even further upstream in the River. Is the target actually to maintain average flows such that average salinity at RM 9.2 will be what is currently experienced at RM 10.2?

Consumptive Use Permit Analysis

I do not have Appendix I, but it looks as if this is a complete review of consumptive use. If dry season impacts are 5 cfs, this could be important when flows get low.

Recommendations

I do not think the MFL should be adopted until the following points are addressed:

1. 1985 as the base year for this analysis should be carefully considered. Part of this decision should be based on a determination of whether a) flow conditions, b) salinity observations, or c) vegetation has actually changed in the river since 1985. (Another possibility would be to use 1997 as a base year (after the gaps were closed), as this would make the flow/salinity relationships more straightforward.) Whatever the base year, all analyses of average flow, salinity, and vegetation should date consistently to that year.
2. The MFL goal should be clearly stated. Is it designed to maintain current conditions at RM 10.2 (the status quo) or improve conditions at 9.2 such that the floodplain community at that site is similar to what now occurs at 10.2? It cannot be to protect RM 9.2 from significant harm, as stated in the document, since this is already occurring. If there is a difference between management goals and MFL targets, this should also be stated. However, selecting an MFL at the 99th percentile flow is not likely to meet the goal of protecting RM 10.2. Managing for the 90th percentile might be more appropriate.
3. The hydrodynamic model as it stands now is inadequate for providing accurate flow/salinity relationships. The model needs to be improved, or the relationships developed in Appendix D (using SAS) should be used for this purpose. Only relationships based on current salinity conditions (after the gaps were closed) should be used, and there should be no attempt to use historic salinities for this purpose.
4. If it makes more sense to determine the MFL in terms of salinity than flow, the analysis of Ds and Db should be done based on empirical observations of salinity at each site.

Other Comments:

1. I assume it was a policy decision to limit this MFL to the Northwest Fork of the Loxahatchee. The document is uneven in this regard, since so much information is presented on the other tributaries. However, it is informative and serves as an important reference for the whole Estuary.

2. Since there's no control over the flows in the other creeks in the Northwest Fork (and since they occur downstream of RM 9.2), maintaining the floodplain community at RM 9.2 may not

help the entire estuary. This means that it might be appropriate to add additional indicators in locations further downstream.

3. I applaud the District's efforts to incorporate an adaptive management component in this effort. The proposed work on monitoring tributary/creek flows, the groundwater investigations, continued salinity monitoring and vegetation sampling should all provide useful information that can work to improve the MFL criteria.

4. The document could benefit from some careful editing to reduce redundancies.

Specific comments:

p. 44 - Please clarify whether the information in Figure 10 (and the discussion of the figure) is a presentation of allocation or actual water use.

p. 64 – What are the units for the contour lines?

p. 80 – I think the reference to Tables 15 and 16 is supposed to be Tables 16 and 17.

p. 87 – The statement that the model fits the estimates presented in Appendix D needs to be reevaluated in light of the SAS-derived estimates.

p. 93 – Please add a sentence to #2 to give an indication that there's considerable variability in these proportions.

p. 115 – What is the reference point for the statement that major changes have occurred in vegetation downstream of RM 9.2?

p. 135 – All 6 plants chosen are freshwater species, so the last bullet before the summary needs to be modified.

The statement that a healthy floodplain community exists to RM 9.8 is not substantiated by the observations, since there is no data and RM 9.7 shows fewer, smaller trees as compared to RM 10.2

p. 142 – It would aid in the interpretation of Table 38 if somewhere in the document or Appendix the locations where each of the parameters for each species is considered to be in decline were identified.

p. 145 - Why don't the criteria used in the top of Table 40 match the observations reported for RM 10.2 in Tables 35 and 36. The observations indicate that salinity at 10.2 was greater than 1 for 30 d every 1.6 y (or 5% of the time), greater than 2 for 22 d every 5.9 y (or 1% of the time), and greater than 3 ppt for 13 d every 30 y (or 0.1% of the time), and the text states that the MFL was set not to exceed 2 for more than 20 d every 6 y, in keeping with these observations. However, the criteria developed in Table 40 are for salinities greater than 1 ppt for 40 d/y, 2 ppt for 30 d/4 y and 3 ppt for 20 d/10y, which represent 10%, 2%, and 0.5% of the time, respectively.

Presumably, this means that the flows reported in the table are greater than they should be if the goal is to match the observed flow regime at RM 10.2.

p. 148 - Does the statement about providing flows comparable to historic rates represent a management target as opposed to an MFL? Which historic flows are meant here (given that flows in 1971-1989 are considerably lower than subsequent flow).

p. 153 - Is the second management target meant to describe the situation at RM 9.2 or 9.7? This should be stated.

p. 155 - How might repairs to the Dam affect the calibration of flow? If there are major leaks now, this could also affect flow/salinity relationships.

p. 160 - The information discussed here cannot be found in Table 5.

Appendix A had figures missing.

Appendix B: Isn't this supposed to be a comparison of 2 interpretations of vegetation from 1940? This is not clear.

Appendix C. It is difficult to follow the analysis of Ds/Db presented in Table C-4 without the information presented in Tables 30-32, 36, and 39. The document would benefit if the information presented for red maple in Table 39 was presented for all species in the Appendix.

Appendix D

Appendix D describes the use of data from 1997 through 2000, yet some of the graphs begin in 1994 and others begin in 1996. It would probably be best to use the data from after the gaps were closed, as this added 0.7 miles to the channel.

SAS analyses need to be performed for stations 66 and 67.

All the Excel graphs should be deleted, since we know there are errors in the way Excel computes curve fits.

Table D-1 needs to be redone to reflect the appropriate dry season discharges derived from the SAS fits. The flow-averaging period that produces the best fit is probably the one to use (this varies from 3-d for all data to 9-d for after the closure of the gaps, which is more evidence that these relationships changed at that time). Station 65 produced the best fit on the day of observation, perhaps because it is closer to the Dam.

Once the graphs and Table D-1 have been updated, the text in this Appendix needs to be changed accordingly.

Appendix E.

I only had black and white copies of the figures and so had a lot of difficulty interpreting them.

I do not understand the paragraph on p. E-18 that describes Figures 12-15.

Appendix H states that the salinity data set was estimated based on flow relationships developed in Appendix D, but as far as I can tell these empirical relationships were not used.

Appendix N had figures missing.

SFWMD Draft Response to Peer Review Comments of Dr. Merryl Alber, Ph.D. for the July 2002 Draft Loxahatchee River MFL Technical Documents

The following are initial *draft* peer review comments prepared by SFWMD staff. District staff are reviewing these comments and are in the process of supplying additional information requested by some panel members. As a result, some of these peer comments and District responses may change after consideration of supplemental information. Final peer review comments will be posted once they are received.

The following comments were submitted in support of the methods, approach, and documentation of the proposed MFL:

- *"…It is clear that the staff of the SFWMD has put a large amount of effort into the proposed MFL, and this is in many ways an improvement over the previous draft document. The report does an excellent job of addressing the comments provided in 2001, the literature review is improved, and the document is better organized. I think the shift away from cypress as an indicator is warranted, and the selected freshwater tree species provide a reasonable basis for discerning differences in the health of the floodplain community along the salinity gradient…"*

- *"…This [the literature review] is much improved over the previous version, in particular because there has been a clear effort to locate information on the salinity tolerances of cypress…"*

- *"… The results of the vegetation survey show a clear gradient in the distribution of the 6 chosen indicator species in the floodplain community, and, although there is not technical information in place on the salinity tolerances of the various trees over the course of their life cycles, it serves as a useful starting point for the identification of healthy, stressed, and significantly harmed locations along the Northwest Fork of the River. Although these are judgment calls, the selected locations are supported by the data in terms of observed changes in the presence of the various species and by their measured characteristics (e.g. as we move downstream, fewer VEC species are represented and those that are there are smaller, with fewer seedlings and saplings)…."*

- "…Th*e Ds/Db ratio is extremely interesting and looks like a useful approach for summarizing salinity data. Perhaps it could be used to characterize field salinity observations (e.g. between 1997 and 2000)…."*

- "…I applaud the District's efforts to incorporate an adaptive management component in this effort. The proposed work on monitoring tributary/creek flows, the groundwater investigations, continued salinity monitoring and vegetation sampling should all provide useful information that can work to improve the MFL criteria…"

The following comments summarize Dr. Alber's concerns with the draft document

Page 1, 2nd paragraph: "…*There are some fundamental problems associated with the application and interpretation of the hydrodynamic model, and I do not think the document as it now stands adequately supports the proposed MFL….*"

Page 2, 4th Paragraph: *The salinity data presented in Appendix D were used to calibrate the hydrodynamic model, but the empirical relationships between salinity and flow were not used in any way in this document. I think these relationships are extremely useful (particularly those derived for current conditions, after the gaps had been closed) and might be appropriate as either a check on modeled salinity/flow relationships or as the basis for setting an MFL (see below). The original relationships, which were computed using Excel, are presented in figures D3-D6. These are very poor fits, and, in response to my comments on last year's document, they have been redone in SAS using variable flow-averaging periods (pages D11 – D22). The SAS fits are much improved over the ones done in Excel and could be very useful. Curiously, the SAS analysis is not referred to anywhere in the text, and SAS analyses were not performed for stations 66 and 67.*

- **District Response**: We agree with the reviewer's comment that the document needs to include a section in the Appendix that discusses the empirical relationships generated by Excel and SAS as presented in the report and how these relationships compare with the hydrodynamic model output (also see the following responses below).

Page 3, 5th Paragraph: *Although the 2-d model does an adequate job of matching long-term field salinity trends, the figures in Appendix E suggest some real discrepancies between observed and modeled salinity. This is acknowledged in Appendix P (p. P-4), where it states that salinity in the upper estuary is extremely sensitive to freshwater input and points out that the majority of the freshwater input was estimated from ratios (which are quite variable in reality but are fixed in the model). I understand new surface flow stations are addressing this, but without this information, and with another large estimate of inflow from groundwater (estimated as 40 cfs in a system where 35 cfs from the Dam is being proposed as the MFL), predicted salinities in the upper estuary are extremely suspect. The model may be a useful tool for exploring different management scenarios, but I am concerned about the over-reliance on model predictions of salinity as the basis of the proposed MFL*

- **District Response**: The reviewer was not supplied with color copies of the graphics presented in Appendix P and therefore it was not clear that (a) the model tended to follow the same pattern of daily salinity change as shown by the field data and (b) the model also tends to more closely predict field data at the more upstream sites where the vegetation communities of concern are located. Color copies of Appendix P have since been provided to Dr. Alber for review.

  District staff also looked at flow ratios calculated from measured data obtained from the Lainhart Dam and the other three tributaries under various average and low flow rainfall periods and compared these values to those used in the model. In general, the flow ratios used in the model were comparable to field measurements recorded during low rainfall periods, the period of time of most concern. For example, in the model the Lainhart Dam represents 44% of the total flow delivered to the NW Fork during the dry season as compared to inflows from the three other tributaries. Field measurements show this ratio to be 45% for data collected from the 1980-81 drought dry season, 46% from the 1980-81 drought wet season, 40% from the 1989-90 drought dry season, and 56% from the 1989-

90 drought wet season. Flow data is not available from Hobe Grove Ditch and Cypress Creek after 1994 as these gages were damaged after a major storm and were not replaced.

The estimate of groundwater flow was derived from a comparison of field data derived from a 1983 USGS report and measured flow/salinity data collected from a dry period in May 1999. The District recognizes that more groundwater data flow data would be desirable to confirm the estimate used in the model, but the 40 cfs value currently represents "best available data". We have no evidence to suggest that overall regional groundwater levels have changed within the basin since 1985, the period of time when the river was first designated as a Wild & Scenic River, to affect this rate.

The hydrodynamic/salinity model currently represents the District's best available tool for determining the complex interactions between daily tributary inflows and daily tidal fluctuations within the river, including variations resulting from the effects of lunar and solar cycles (e.g. spring or neap tides) and "lags" in the movement of salinity up/down the channel between tidal maxima.

Page 4, 1st Paragraph: *It is instructive to compare the flows/salinities predicted by the model with those derived from the analysis presented in Appendix D: according to the model, the flow required to maintain a high tide salinity of 2 at RM 8.6 is 54 cfs (obtained from Table 7 on p. E-18), whereas an average bottom salinity of 2 ppt is correlated with a flow of 64 cfs (p. D21). At RM 7.7, the model flow is 89 cfs (again to maintain a salinity of 2). This matches the Excel fit quite well, but the prediction from the SAS relationship is approximately 140 cfs (p. D18). This suggests that the model may underestimate the flow required to maintain salinities at their target levels and/or underestimate salinities at any point in the river, which would result in an inaccurate MFL. If the intent is to link flow and salinity it would be more defensible (and simpler) to stick with the empirical relationships derived in Appendix D.*

- **District Staff's Response**: The review has identified the need for District staff to conduct additional analysis that compare model results with available field data. These additional analysis are needed to give the reader greater assurance that the model results compare favorably with observed data, and that use of the hydrodynamic/salinity model represents the best tool available to establish flow/salinity relationships within the NW Fork of the river. To that end, District staff will conduct additional analysis and provide language in Appendix D and in the results section of the report that compare modeled data versus existing field information. This section of the document will also discuss the technical reasons and rationale as to why the District selected the hydrodynamic/salinity model as the best tool available for determining long-term flow salinity relationships.

  A review of the data presented in Appendix D noted a number of discrepancies between results provide by the SAS analysis and the results provided by the Excel analysis. For the reasons noted during the first peer review, we did not favor use of the Excel data. However, when we examined the data produced by SAS, we also noted some significant discrepancies. For example in the upper figure on page D-18, approximately 7 data points in the range from 100 to 150 cfs are above the SAS-predicted curve and more than 30 data points lie below this curve. This suggests (to us) that the SAS relationship may be over-predicting the amount of flow required for given level of salinity in this flow range. This was one of several reasons, we decided not to use either of the statistical relationships and use the model instead. That is why the new version of the document did not include reference to either statistical approaches. Again, we agree the document needs to provide a discussion comparing the empirical relationships presented in Appendix D as compared to the model output and why the model was chosen as the tool of choice for this analysis.

Page 4, 2nd Paragraph: *Even if the model were judged as the most appropriate tool for predicting salinity at different locations in the river under different flow conditions, it makes no sense to use a flow/salinity model calibrated with current data to predict 30 years worth of salinity. First, the document makes clear that there have been extensive changes in both the watershed and the estuary over that time period, such as dredging in the estuary, changes in land use resulting in changes in the amount of overland runoff and groundwater infiltration, and closing the "gaps" (which added 0.7 miles to the river). All of these changes could affect flow/salinity relationships, making historic salinity predictions based on current relationships less accurate. At the very least, some of the model predictions could be compared to historic salinity data (e.g. Appendix A describes studies by Chiu (1975), Hill (1977), Russell and McPherson (1974), and Law Environmental (1991), all of which collected salinity information).*

Page 4, 3rd Paragraph: *Second, even if it could be demonstrated that the model can in fact be used to predict historic salinities, flow conditions have changed over the 30-year time period: The G-92 structure was not constructed until 1974, its capacity was increased in 1986 and additional culverts and operational criteria were added in 1987. In fact, the document states that flow over the Lainhart Dam averaged 52 cfs from 1977-1989 and increased to 86 cfs from 1990-2001, and that the occurrence of flows below 35 cfs decreased from 34% of the time to 25% of the time between the two time periods. This means that salinities at given locations in the river were very possibly greater before 1987 than they are today (this could be verified by comparing some of the field observations). Moreover, the reference point chosen by the SFWMD as the basis for establishing an MFL is 1985. It therefore does not make sense to look back to 1970.*

All of the problems stated above mean that using a 30-year record to determine salinities (and deriving statistics about the average amount of time salinities at different sites are greater than a particular threshold) is not useful for understanding current conditions or setting MFLs. That said, the Ds/Db ratio is extremely interesting and looks like a useful approach for summarizing salinity data. Perhaps it could be used to characterize field salinity observations (e.g. between 1997 and 2000).

- **District Staff's Response**: Some of the information provided in the document suggests that watershed storage and drainage patterns have changed significantly within the basin over the past 30 years. It is true that over the past 10 years significantly more flow has been directed to the NW Fork via G-92 and the Lainhart Dam during normal and above normal rainfall conditions. This is due to increased rainfall experienced over the past 10 years as well as improvements made to G-92 which can now direct more water from the Loxahatchee Slough to the river (when it is available). However, our understanding of the watershed indicates that overall storage within the basin has remained unchanged since construction of C-18 in 1957-58. This means that during dry periods only a certain amount of water can be stored in the basin due to its limited water storage capacity. As a result, the amount of water directed towards the NW Fork during dry periods in the 1990s, is comparable to dry season flows that were recorded during the 1970s and 1980s which is precisely the problem that the MFL is trying to address. Because the basin has a limited water storage capacity, dry season flows delivered to the river have not changed significantly over time. Therefore, we believe it was reasonable to use current flow/salinity data relationships to predict past salinity events. **Table 1** provides a summary of these relationships based on flow/duration curves developed for Lainhart Dam data from different time periods. As shown in **Table 1** the amount of flow directed towards the river during high and normal rainfall periods (10th, 25th and 50th percentiles) has increased between 1985-1989 and 1990-2001, however the amount of water available for delivery to the river during low rainfall or drought periods (75th & 90th percentiles) has not increased much between 1985-1989 and the 1990-2001.

Table 1. Percent of time flows were equaled or exceeded at the Lainhart Dam

	Percent time of Lainhart Dam flows were equal to or exceeded (values reported in cfs)				
Period of record	10%	25%	50%	75%	90%
1971-2001 all data	173	105	60	29	14
1971-1984	120	90	51	25	14
1985 - 1989	116	90	59	31	16
1990-2001	226	152	82	35	14

* Data obtained from Flow duration curves

The primary purpose for developing a 30 year salinity history for the river was two fold. First it was necessary to provide a means for representing historical salinity conditions that have impacted the river over time. Secondly we needed a 30 year salinity record to capture the interannual variability of rainfall patterns that have occurred within the basin to help determine a return frequency for the occurrence of natural low flow periods that could be incorporated into the MFL criteria.

As you point out, we are implementing an adaptive assessment approach to our future research and monitoring efforts. Our ongoing flow/salinity monitoring program with the USGS has been enhanced through the placement of additional continuous flow and salinity monitoring stations. These additional data will help to address a number of the technical uncertainties associated with the model predictions. These new data should indicate the degree to which our proposed MFL will achieve the desired salinity conditions. If monitoring results show that the proposed flows are not sufficient, they will be subsequently modified as needed to protect the resource from significant harm. As stated in the our MFL Recovery Plan, a number of major projects are underway to provide more flow to the river – to achieve a sustained flow of 35 cfs or greater by 2006 and a flow of 65 cfs or greater by 2018.

Page 2, 2nd Paragraph: *The historical flow data is presented as a very long table in Appendix D, without comment. One concern I have is whether these data were all corrected, based on the recalibration that occurred recently (this goes for Tables 23 and 24 and Figure 20 in the text as well). Although I understand that flows at G-92 are correlated with those over the Dam, they're not the same, are they? If they are, this should be stated. If not, the document would benefit from a presentation similar to that in Figure 19 of flow over the Dam since that is what is being regulated. Table 24 and Figure 20 are useful, but it would be instructive to see some summary data (e.g. different percentile flows) for the period from the reference year (1985, if that is selected) to the present.*

- **District Staff's Response**: We have presented an analysis of the flow data from Lainhart Dam in Appendix H, but as you have pointed out, we have not included a discussion of source, re-calibration history, etc. In addition, we agree with the reviewer that a historical analysis and re-calibration history should be clearly presented in the main body of the report. We will also include a clear explanation of how G-92 and Lainhart Dam flows are linked together, but are not the same. This oversight will be corrected in the final draft of the technical document. The suggestion that a figure for Lainhart Dam flows, similar to Figure 19 for the G-92 structure, is well taken.

Page 1, 3rd Paragraph: *This [literature review section] is much improved over the previous version, in particular because there has been a clear effort to locate information on the salinity tolerances of cypress. However, the document would benefit from more information on the life history characteristics, functional roles, and salinity tolerances of the 6 chosen indicator species.*

- **District Staff's Response**: Comments noted.

Page 2, 1st Paragraph: *I'm not sure this is actually an application of the VEC approach. There is a complete list of resource functions and services provided in the document, but they are not tied very well to the floodplain swamp community. Instead, the trees that were identified are useful as indicators, rather than particularly "valued." The document indicates that these species were chosen because they occupy different ecological niches and have different functional roles, but this is not well documented. The species chosen are all relatively long-lived, and it seems like including some herbaceous species with shorter life spans is perhaps worth considering as they might provide faster response times and a better cross-section of the community.*

- **District Staff's Response**: The group of species identified as indicators collectively form part of a "valued ecosystem component", namely the freshwater forest canopy. These species are part of a multi-level high forest canopy that provides a specialized habitat upon which many species depend. A description of the function of this forest component can be found in Appendix C, page C-20. It is this group of six floodplain forest species that is the target VEC, rather than a single indicator species as is often the case. We can try to clarify that concept in the final draft of the document, as it may not be sufficiently clear as written in this section.

  Because we were trying to relate long-term salinity conditions to impacts to the freshwater community, long-lived species were selected. This reflects our commitment to determining the potential deleterious effects of chronic exposure that may not show up until long after the effects of acute exposure have passed. Available studies of shorter-lived species and short-term response times (acute exposure effects) are presented in the literature review section. However, the suggestion that there is value in also considering the response of shorter-lived species with faster response times is well taken and we are moving towards identifying those candidates through a contract with a consultant. We realize that understanding both the short term and long-term impacts of salinity exposure to the freshwater community are important. A discussion of short-term versus long-term exposure (i.e. chronic versus acute) can be found in Appendix C, page C-18. We can further address this issue in the final draft of the technical document.

Page 2, 3rd Paragraph: *The salinity data presented in the document are interesting. One suggestion is to recalculate the information in the Wild and Scenic segment of the river without station 63 to determine if average salinities have in fact increased over the past decade (as referred to on p. 102). This is an important point: elsewhere in the document the data suggest that flow has increased over the past decade and it would be very useful to know whether this change in flow has resulted in a measurable change in salinity or whether increased flow over the Dam has been offset by other changes in the watershed.*

- **District Staff's Response**: Comments noted; we will provide a description of the SAS analysis and show how these results compare to the modeled output.

Page 2, 5th Paragraph: *This was a straightforward, complete analysis of vegetation types in the estuary over time. However, I find it worrisome that no major changes in vegetation cover were observed between 1985 and 1995. The footnote in table B-4 indicates that vegetation in a segment of the river below Trapper Nelson's was estimated from 1995 photographs. Could this substitution have perhaps led to the erroneous conclusion that things did not change in this area? Given the improvements in G-92 and the resultant increase in flow that occurred in 1989, was there a concurrent decrease in salinity (as mentioned above)? If there were an increase in salinity, wouldn't we expect to see a downstream shift in the indicator community? Perhaps this is the explanation for the field observations reported on p. 132 that suggests the location of the stressed area has moved downstream between 1985 and 1995? This needs to be explored. If there has been increased flow and decreased salinity, which in turn has led to a shift in tree distribution, that would be good evidence that the indicators are in fact appropriate. It might also mean, however, that the choice of 1985 as a reference year would result in managing towards a situation with less freshwater inflow than occurs now. Finally, when evaluating shifts in vegetation it is worth keeping in mind that there are other factors that could account for changes in vegetation besides changes in hydrology.*

- **District Staff's Response**: The referenced footnote in Table B-4 should have read "…a segment of the river ***upstream of*** Trapper Nelson's were estimated…". As written, it could be confused with indicating an area downstream of Trapper Nelson's, which is not the case. Because the areas upstream of Trapper Nelson's have remained essentially unchanged from historical conditions (e.g. 1940 reference aerial photo), this estimate is not particularly relevant to documenting change on the NW Fork relative to salinity exposure. Hence, our comparison of 1985 and 1995 aerial photos remains complete for the areas of interest (i.e. the NW Fork downstream of Trapper Nelson's).

  It was noted although perhaps not clearly in this section of the document, that even though flows to the NW Fork have increased with the improvements to G-92, the duration of low flow events has not significantly changed (see Table 24). It is during these periods that potential damage to the freshwater community can result from salinity intrusion. So, even though flows have improved, the benefit is mostly during average and high flow times.

  The discrepancy between the location of the "stressed" area mentioned in the 1984 EIS and the District's vegetation survey in 2002 may be attributed to the fact that the location of the transition zone in the EIS was based upon qualitative, subjective, visual accounts. The location of the transition zone from "healthy" to "stressed" communities in the 2002 vegetation survey was founded on measured field data. Because the location of the beginning of the stressed zone in the EIS was not founded on measured field data, it is not possible to re-survey field sites for comparison of 1985 and 2002 time frames. Hence, comparison between the two remains more of a presentation of what is known to have been recorded in past documents with what has been found in current studies.

  In order to address the possibility that other factors may be involved in the observed changes in vegetation along the NW Fork, a discussion was included in Appendix C, page C-17.

Page 3, 3rd Paragraph: *The results of the vegetation survey show a clear gradient in the distribution of the 6 chosen indicator species in the floodplain community, and, although there is not technical information in place on the salinity tolerances of the various trees over the course of their life cycles, it serves as a useful starting point for the identification of healthy, stressed, and significantly harmed locations along the Northwest Fork of the River. Although these are judgment calls, the selected locations are supported by the data in terms of observed changes in the presence of the various species and by their measured characteristics (e.g. as we move downstream, fewer VEC species are represented and those that are there are smaller, with fewer seedlings and saplings). Given the fact that these trees used to occur further downstream, it is probable that salinity is an important factor that controls their distribution. One point to note is that the trends do not level off (e.g. as we move up to RM 10.6, trees are more abundant, larger, and have more seedlings and saplings). One wonders if another station further up-river would yield even more, in which case the selection of a representative healthy site might need to be re-visited.*

- **District Staff's Response**: The observation that some of the vegetation trends did not "level off" is noted. Above the Trapper Nelson site (approximately river mile 10.6), the river's character changes significantly. The river narrows substantially, becoming more stream-like, and is entirely covered by the forest canopy. Downstream of Trapper Nelson's, the channel widens and the river distinctly splits the forest canopy, resulting in a shoreline vegetation ecotone that is not found upstream. All vegetation surveys were conducted in this area. For this reason, a comparison of vegetation data from sites upstream of Trapper Nelson's with sites downstream of there would not be consistent or recommended.

Page 3, 4th Paragraph: *The observation that chloride shows a better gradient along the river than soil salinity is most likely due the fact that salinity has a much smaller dynamic range (it is constrained between 0 and 36). This makes it a less sensitive measurement, but I do not agree with the interpretation that this suggests salinity is not retained in the soil.*

- **District Staff's Response**: Comment noted.

Page 4, 5th Paragraph: *The MFL was chosen based on the model-predicted salinities at the locations identified in the vegetation surveys as healthy, stressed, and significantly harmed. To begin with, the goal of the MFL is not clear: if RM 9.2 has already been identified as an area that is experiencing significant harm (over what time frame?), then it makes no sense that the flow target has been chosen to prevent significant harm from occurring there (as stated on p. v and p. 149). The time frame is also not clear. On p. C-16 it suggests that long-term average salinity conditions since 1970 have led to the decline in freshwater vegetation, yet the analysis in Chapter 5 suggests that using those long-term averages is an appropriate basis for protecting the resource from further harm. Once the baseline condition gets sorted out (is it 1985? and has flow, salinity, or floodplain changed since that time?), this needs to be revisited.*

- **District Staff's Response.** Examination of historic aerial photography data indicated that hydrologic conditions from 1940 to 1985 has led to a decline in condition of the freshwater community, The condition of the resource in 1985 (when the river was designated as a Wild & Scenic River) was a reflection of this past salinity history. Changes that have occurred since that time have increased flow to the river during normal and high rainfall periods, but have not significantly improved these vegetation communities. We contend that improvements in these communities has not occurred because the river continues to experience periods of low or zero flow (see Table 1 above and Table 24 in the document) that are allowing salt water to penetrate upstream with about the same frequency as occurred historically, and that these events are preventing recovery. We are proposing, through the MFL, to greatly reduce the number of events that result in zero or low flow periods.

In addition, the goal of the MFL is to protect the identified resource from significant harm. The salinity regime identified at river mile 10.2 appears to support a healthy freshwater floodplain swamp, so that regime was applied as the maximum allowable salinity at river mile 9.2 where there still exists a remnant freshwater swamp. Hence, the proposed MFL not only protects the remaining intact community found at river mile 10.2, but also allows some recovery of remnant freshwater communities upstream of river mile 9.2.

Page 5, 2nd Paragraph: *If current vegetation at RM 10.2 is deemed healthy and the MFL goal is to protect it from harm, then what is required is to provide as much flow to RM 10.2 as it currently gets (i.e. the status quo). If this is the case, it would be much more straightforward to analyze the flow record over an appropriate period (e.g. since 1985, or perhaps since G-92 was improved or since the gaps were closed) and determine average flow (or a particular percentile flow, or the proportion of time that flow falls below a particular percentile). Interestingly, the report states that average flow over the Dam was 70 cfs from 1971-2001 (p. 160). In comparison, the model results presented in Table 40 suggest that 50 cfs is required to maintain average historic salinities of <0.15 at RM 10.2 This again suggests that the model is underestimating flow.*

- **District Staff's Response**: Average flows recorded for the river shown in Table 23 includes periods of high flow (> 1,000 cfs) as well as long periods of low or zero flow. The latter are of special concern. Under current conditions, an average flow of 70 cfs may include periods of zero flow and may not protect the resource, whereas a lower average flow of 50 cfs, with a minimum flow of not less than 35 cfs, for 20 days duration, occurring no more often than once every 6 years would better protect the resource against salt water intrusion (significant harm).
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Page 5, 3rd Paragraph: *If the MFL goal is to provide enough freshwater so that the salinity regime currently experienced at RM 10.2 can be reproduced at a downstream location (e.g. RM 9.7 or 9.2), then it becomes necessary to understand the relationship between flow and salinity, and this is where the model comes in. However, even if the model was appropriate and could be used to predict salinities at these river locations, I find the logic here extremely convoluted. What is essentially happening is that a) the model begins with a relationship between salinity and flow, b) historic flow data are used to predict historic salinity, c) historic salinity data are used to determine Ds and Db, d) Ds and Db are related back to flow, when all that is really needed is the relationship between salinity and flow.*

- **District Staff's Response**: The goal of the MFL is to protect the resource from significant harm and providing sufficient freshwater flow is one means of doing so. In addition to understanding the relationship between flow and salinity, it is also important to understand the relationship between salinity and harm to the resource. Because of a lack of suitable long-term salinity data for multiple sites along the NW Fork, a model was used to generate a long-term salinity daily time series that would provide reasonable estimates of the long-term salinity history at upstream locations. Ds and Db, a summary of this generated salinity time series, was used to relate changes to freshwater vegetation (the identified resource to be protected) with salinity. This analysis was carried out by request of the 2001 Peer Review Panel's recommendations.

<u>Page 5, 4th Paragraph</u>: *Moreover, when I followed the data in order to do a "reality check" on the model, things did not add up: Table 24 reports that flows of less than 35 cfs at the occurred 25% of the time at the Lainhart Dam between 1990 and 2001, and 35% of the time between 1971 and 1989 (for an average event duration of 15 or 24 d with a return frequency of approximately 2 mo). In Table 37 the model predicts that a flow of 35 cfs will result in a salinity of 2 ppt at RM 9.2 (the basis of the proposed MFL standard), and in Tables 35 and 36 we see that model-predicted salinities of 2 ppt occurred on average for 46 d every 6.8 mo., or 18% of the time at RM 9.2. I recognize that there is a response time built into the model and that we cannot expect a 1:1 correlation between flow and salinity, but these estimates of Ds (46 d), Db (6.8 mo), and % time over the threshold (18%) are very different than the flow observations (15-24 d, 2 mo, and 25-35%, respectively). Likewise, flows of 10 cfs occurred 7% of the time in the data presented for the dam (an average of 19 d every 9 mo). However, at 10 cfs the model predicts a salinity of 2 ppt at RM 10.2, which is estimated to have occurred only 1% of the time (an average of 22 d every 6 y, which is also used in the proposed MFL). Either I've misinterpreted these results or the model does a very poor job of estimating these parameters and should not be used to select an MFL.*

- **<u>District Staff's Response</u>**: Your questions and concerns have required the District to take a much closer look at the details of how modeled data (daily and long-term modeling results) compare with actual measured salinity data during the calibration and verification periods. We were aware of potential discrepancies between the measured data and modeled data but felt, on the whole, that the model was providing a reasonable picture of long-term flow/salinity conditions in the river. Furthermore, because the actual record of measured data was so sporadic in time and location, use of the model was preferred, since it could be used to generate a continuous picture of conditions in the river at any desired location over a 30 years period.

  Our first step in this analysis was to look at salinity conditions for water quality station #66 as represented in Figure 21 on page E-42 in the appendices. This graphic provides a comparison between modeled versus actual measured salinity conditions in the river from May to June 1999 (at the end of the dry season) at water quality station #66, which is located at river mile 9.4, within the area that has experienced "significant harm" based on our vegetation analysis.

  Actual flow data from Lainhart Dam for May to June 1999 are provided in the table on page D-52, column 3. Flow across Lainhart Dam during this period was at or below 10 cfs during most of the month of May and the first four days of June. Flow then increased rapidly to 135 cfs by June 13 and remained high for the rest of the month. Actual salinity data (red line on Figure 21 in Appendix E) were measured sporadically during this period. Salinities were in the range from 5-7 ppt during the early part of the month but then declined from May 10 (about 240 hrs) to May 25 (600 hrs), at which point there is a break in the record. The period from 840 to 930 hours represents the period from June 4 to June 12. During this time, measured bottom salinities decline from 5 ppt to zero within one day while the modeled salinity data show a steady decline to zero over a four day period. Figure 21 also shows the long-term salinity record (solid dark line) indicating a lag time of about four days and then a decline to zero over about a period of about 5 days.

Daily salinity values produced by the model showed variations in that generally reflect freshwater flow from Lainhart Dam along with solar/lunar tidal cycles etc. Predicted salinities at station # 66 during the low-flow period in May and early June ranged from a minimum low tide low salinity of about 1 ppt (near 600 hours) to a maximum high tide high salinity of about 13 ppt (at about 48 hours).

By contrast, results of the long-term model, agrees with the almost constant discharge from the Lainhart Dam, showing a 33 day period from about 75 hours to about 900 hours when salinities were above 5 ppt. The long term model shows a 4-5 day lag when salinity conditions change in the system, which is a function of how this aspect of the model works (see the note on page E-16)

Another comparison between modeled and measured data is provided by examining the salinity vs. discharge relationship graph in Figure D-6 on page D-7 for station #66 and looking at the extreme left hand side of this graph at the distribution of salinity values for flows of zero to 5 cfs. Under these low flow conditions, salinities ranged from 0.5 to about 9.8 ppt. Without doing a formal calculation, we counted approximately 11 data points above 5 ppt and 23 or so in the range from 2 to 5 ppt. It appears as though the median salinity for zero discharge is somewhere between 4 and 5 ppt.

Overall, results of these comparisons indicate that, in the short-term, the salinity model provides estimates of salinity that are within the same range as field measurements. Differences appear to occur when some undocumented input of freshwater (such as local rainfall) is occurring that results in a lower than estimated salinity value. Such an event may have occurred between 300 and 600 hours (Figure 21, page E-42). The long-term model, which estimates a daily average and does not specifically account for lunar and solar cycles (see page E-16 and graphic example in Figure 19), but does include their values implicitly in determining an overall long-term average salinity regime. The long-term model has a smoothing effect on the data. In the example shown in Figure 21, at very low flows, the result was "constant" estimated salinity of about 5-6 ppt that is very close to the median of observed data, which was on the order of 4-5 ppt.

A more variable data record, at station 65 (river mile 8.6) is shown in Figure 20 on page E-4. This graph indicates that there are periods when the long term model appears to overestimate the salinity (e.g. 2800 to 4000 hours) and periods when it underestimates (1200 to 2400 hours). It should be noted that the "actual" salinity record during the period from 1600 to 1700 hours, ranging from 10 to 16 ppt, may be in error due equipment malfunction or transcription errors. Examination of actual flow data from the month of March (page D-52, second column) indicates that flows throughout that month were generally in the range from 30 to 50 cfs, with the exception of a four day period from March 5-8 when flows declined to 25 cfs.

If we look at the SAS relationship on page D-21 (upper graph) a flow of 25 cfs could be expected to produce a bottom salinity of about 7.5 ppt , with a range, from 0 to 13 ppt. By looking at Figure 19, we can see that this time period corresponds to a neap tide, and so the short-term model predicts a relatively lower salinity value (due to weaker tides), on the order of 1-2 ppt (on Figure 20) and the long-term model predicts a salinity in the range of 3 ppt.

The consensus based on this type of analysis was that the calibration and verification in 1999 were relatively good. However, it was apparent that each of the approaches has distinct limitations and potential sources of error or bias. The decision to use the model, as opposed to using either of the statistical relationships was based on a) the model could be used to provide a continuous set of daily, weekly, monthly values over a designated time period, that provided some consideration of known forces, such as tides, that influence salinity conditions; b) The model provided us with a better ability to interpolate and extrapolate to locations throughout the river, beyond the model boundaries and existing data sets, and in areas where available data were very limited (e.g. station 67) or non-existent; and c) the model provided a better basis for comparison of current conditions with hypothetical future conditions.

Based on consideration of how the model analyzes and interprets flow data, and the apparent discrepancies between field-measured salinities and flow across Lainhart Dam (as evidenced for example in the amount of "scatter" that exists in the graphs on pages D-6 and D-7 and pages D-15 to D-22), it is not surprising that the frequency distribution of low-flow events over Lainhart Dam presented in Table 24 on Page 98 does not match well with the frequency distribution of salinity events derived from the long-term model, as shown in Tables 34- 36 on pages 138 and 139. The fact that under current (1990 to 2001) conditions, flows drop below 35 cfs for 15 days every two months (table 24) may not be comparable to the prediction that salinities will exceed 2ppt for 46 days every 6. 8 months at station 9.2, since it simply represents a three-times longer time span over which the data were aggregated (6 months vs 2 months).

Differences also occur due to the built-in response time of the model to changes in flow, which are gradual and may not reflect actual conditions that occur in the field. Finally, the model may predict that lower salinities will occur in the upper reaches of the river because relatively small amounts of tributary and groundwater inflow at the upstream end have a greater effect in the narrow channel of the river at those locations than they have in areas further downstream where the rivers widens.

Regarding the apparent differences among values based on the long-term salinity modeling effort in Tables 35, 36 and 37 with statistics based on measured flow records in Table 24. Because we have relatively good daily flow data, we can probably more accurately characterize the duration and magnitude of flow conditions much more precisely than we can characterize salinity. Not only do we have limited, incomplete and perhaps suspect salinity data to provide a basis for calibration and verification , the available data show wide ranges of variation for given flow values. The model was chosen because it provides a more or less consistent estimate of salinity and can account for some of the known sources of variability in the data (tidal cycles). However, we recognize that it may not provide a very accurate representation of conditions in the river at any particular point in time. We are assuming that these are largely randomized errors that will average out over a long period of record. We also recognize that the use of a long period of record increases the chances that we may be incorporating systematic errors that you noted in your comments, due to structural or management changes in the system that have affected the basic flow relationships, and may bias our long-term flow and salinity estimates at particular stations. We felt that this type of error was less important than being able to estimate how the system would perform under a wider range of hydrologic conditions that better represent the inter-annual patterns and cycles of flood and drought that occur in South Florida.

Page 5, 5th Paragraph: *I would suggest either working with the empirical relationships derived in Appendix D that relate flow to salinity or improving the model so that it does a better job of reproducing observed salinities. In either case, it seems like the historic salinity information is not relevant and the MFL can be set based on the current salinity regimes (e.g. it would be possible to determine what flows would be necessary to change salinity conditions at RM 9.2 such that they mimic what is currently observed at RM 10.2).*

- **<u>District Staff's Response</u>**: We have addressed this issue earlier in our response.

<u>Page 5, 6th Paragraph</u>: *Finally, I'm not sure I understand why the emphasis is on 2 ppt. If these salinities are thought to occur very rarely (e.g. the 99th percentile), then flows could theoretically be maintained at the 98th percentile without violating the MFL. However, maintaining a salinity of 1.9 at RM 9.2 would surely cause damage to the vegetation even further upstream in the River. Is the target actually to maintain average flows such that average salinity at RM 9.2 will be what is currently experienced at RM 10.2?*

<u>District Staff's Response</u>: **Page 5, 6th paragraph.**

- As shown in Figure 20 on page 99 for discharges from 1970 – 2001, the 2 ppt represents one point on a flow-frequency plot of overall river discharge. The actual flows from the dam will cover a range such as shown in the plot, wherein 2 ppt (35 cfs was exceeded about 70% of the time, the median flow was 65 cfs, flows of 200 cfs were exceeded 7% of the time etc. More recent data (see table 1 above) indicate that overall median (82 cfs) and high flows to the river have improved substantially, but the frequency of low flow events remains high (flows less than 35 cfs still occur 25% of the time). The intent is to shift this flow curve to a higher level, by reducing the frequency of flow events below 35 cfs to less than 1% but keeping the higher end flow events comparable to historic conditions.

Conclusion

Thank you for your insightful comments on this process. You have made us aware of many implicit assumptions that we have taken for granted by choosing to use the modeling approach and that, if left unresolved could ultimately reduce our ability to adequately protect this unique and valuable river. As you may be aware, we are in the process of upgrading this model to a 3-dimensional version and are collecting extensive synoptic flow and salinity data throughout this basin that we feel will provide the necessary information to address these issues in greater detail.

The MFL proposed in the draft document is intended to be an interim management target based on best available data. We envision the establishment of MFLs for the Loxahatchee River as an iterative process. Projects are already underway to meet the proposed flow of 35 cfs 94% of the time by 2006 and continue beyond that value to provide flows of 65 cfs 99% of the time by 2018. Studies are also underway to examine opportunities to enhance flows from other tributaries – Cypress Creek, Hobe Groves Ditch and Kitching Creek. The SFWMD is initiating studies with FDEP and other agencies to define overall restoration goals for the river that will not only include minimum flow criteria for the river but will also address needs for sustained average flows and periodic high flow periods that are needed to maintain a healthy river and floodplain and downstream estuary. It is anticipated that once the restoration goals for the river have been established in terms of desired flow and ecological conditions, that the MFL criteria will also have to be revised in order to be consistent with protection of the restored ecosystem from significant harm.

Additional Comments on Proposed MFL Criteria
for the Loxahatchee River and Estuary
Submitted by: Merryl Alber Dept. of Marine Sciences, Univ. of Georgia
December 20, 2002

This is a response to the two documents that were sent to be by the district as a result of my comments on the July 2002 draft of the Loxahatchee River MFL. The first is the draft response to my peer review comments, and the second is a Technical Memo prepared by Dr. Gordon Hu regarding the hydrodyamic model and regression analysis.

District Response to review

The District has done a thorough job responding to the points raised in my draft review of the proposed MFL criteria for the Loxahatchee River and Estuary. I am pleased with this effort: many of the points I raised have either been taken into consideration or have been explained to my satisfaction. In a few cases, however, I feel there is a need for further discussion (page numbers below refer to the District's response document)

p. 2 Model calibration – the district has now provided color copies of the graphics presented in Appendix P. It is a little curious that the Figure for station 65 is the only one that provides output for both the calibration and verification stages of the model (only calibration is shown for station 64 and only verification for 66). Given this limited amount of information it is unfortunate that the model misses one large spike in the field data, and that field data are missing during much of the verification stage. I agree that as far as it goes the model does largely capture the range of the salinity observations, but it would be useful to see additional verification when the data become available. The model also seems to have a much larger dynamic range than field observations at station 64.

p. 3 Despite the model's problems, the District has decided that it is preferable to the regression analysis for predicting salinity under different flow regimes. I am willing to agree with this, but I have several points that I would still like to see addressed. These points are taken up below in my response to the Technical Memorandum by G. Hu.

p. 4, 1st paragraph My review suggested that historic salinity data, where available, could be used to spot-check model predictions of salinity at various places and times in the past. Appendix A describes several studies that might be appropriate for this purpose. This point does not seem to have been addressed.

p. 4-p. 5 The District suggests that the basin's storage capacity has not changed, and provides information to show that the flow duration curve derived for 1971-1984 is similar to that for 1990-2001 during low flow periods. However, the analysis in Table 24 of the original document (p. 98) suggests that even if the same percentage of time is spent at low flows, there are fewer events (35 periods during 1990-2001 where flow was less than 20 cfs versus 59 during 1971-1989) so it is not completely clear that the low flow conditions have not changed. The District might want to revisit this analysis.

Even if low flow hasn't changed, however, that does not justify using current flow/salinity relationships because the point is that closing the gaps has changed the river and thus the salinity could have changed even during the same flow. The analysis presented by Dr. Hu suggests these changes occurred downstream of RM 8, which is fortunate in terms of setting the MFL criteria. However, this point should not be ignored when evaluating predicted salinities further downstream.

On a minor point, I'm confused over why there is limited water storage capacity during dry periods. Wouldn't that be a more important consideration during wet periods?

p. 6. Whether or not there has been a measurable increase in salinity over the past decade is an important question that needs to be addressed. In my review I suggested that the District recalculate the information obtained from the Wild and Scenic Segment of the river without station 63 to determine if average salinities have in fact increased over the past decade (see p. 102). Either this or some other way to determine whether salinity has increased in response to the general increase in flow would be really useful.
This point is made at the bottom of p. 6 in the District's response, but the line on the top of p. 7 is not a response to this comment.

p. 9 and p. 13 I understand that the goal of the MFL is to try to apply the flow regime that now occurs at 10.2 to that at 9.2, and that in essence the proposed MFL was an attempt to shift the low end of the flow duration curve up by reducing the frequency of low flow events. I am concerned (as was Dr. Kent) that the District's choice of 35 cfs may not meet this goal. As we have both noted, an average flow of 100 cfs would be a better way of ensuring that salinities at RM 9.2 average 0.15, which is what they are at 10.2 Although the response explains that this was an attempt to define average conditions, it might be worth considering a statement that relates to the flow duration curve at more than one point (e.g. whenever flows are less than 35 cfs for more than 20 d (not more than once every 6 y) OR less than 47 cfs for more than 30 d (not more than once every 1.6 y) OR less than (use other percentiles…), etc. This would avoid the possibility that flows could be kept at slightly more than 35 cfs without consequence and might be more in keeping with the District's stated goal for the MFL.

p. 12 I'm still not convinced that the differences between the long-term salinity modeling effort and the flow statistics are due to "largely randomized errors" or that the potential bias in the long-term flow and salinity estimates is "less important than being able to estimate how the system would perform under a wider range of hydrologic conditions." The wide range of variation in observed salinities at a given flow suggests that the model does not account for all of the variables (besides the tidal cycle) that can potentially affect salinity. A smoothed model is perhaps more tractable, but if it is not accurate it does not make sense to use the model to predict the system performance. Although I am willing to accept that it is inappropriate to compare the flow data to the salinity observations (as I tried to do), this again comes down to the need for additional model verification (both with current data and with historic information) to reassure users that the model is appropriate.

Technical Memo

This memo is largely focused on the work that the District has done to evaluate the flow-salinity relationships derived from regression analysis and compare these results with those of the hydrodynamic model. I am pleased to see that the District has been so responsive to my comments in this regard. My comments below are both reactions to what has been done to-date and suggestions for further refinement of these comparisons.

1. I am glad to see the District is pursuing the SAS analysis. When this analysis is complete, it would be nice to see the regressions and the statistics associated with them to know if they are indeed fitting the data well. If they are not, the next layer of analysis (e.g. as done in figure 3) is not warranted.

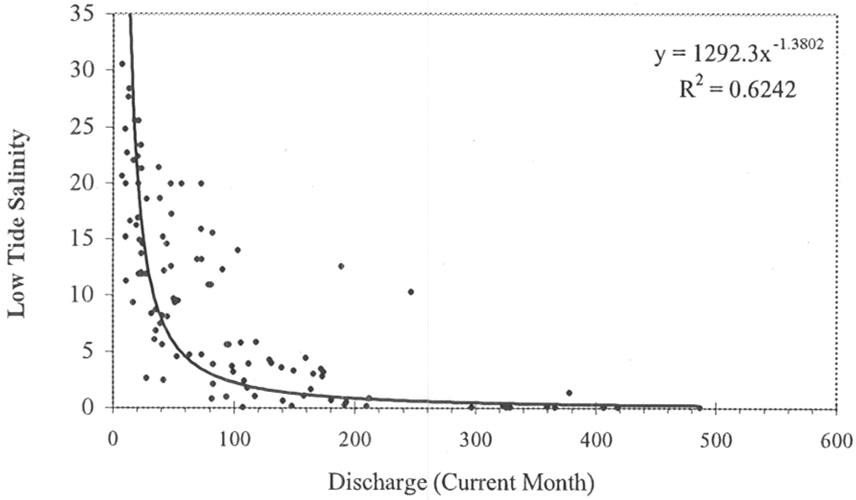
2. I agree that the SAS analysis presented for Station 64 does not provide a good fit for the high flow/low salinity data (although I might argue that it is the fit for Station 65, which is much better, that is more important in terms of the MFL). These fits could be improved by using a better time lag for data averaging.

In our experience matching each observation with the appropriate discharge can substantially improve the "tightness" of the relationship between flow and salinity. I am enclosing graphs of 2 different sites in Georgia to illustrate this point. (These are large estuaries where monthly discharge seemed appropriate as a first cut.) In both cases the salinity observations are matched with a) the discharge during the month when the observation was made, b) the discharge averaged over the month previous to the observation, and c) discharge averaged over a variable period that depended on flow. Although it is necessary to IGNORE the equations on this graph (they were fit with EXCEL before we learned to do things better), it is clear that much of the variability in these observations was due to the changes in the discharge and could be reduced by taking that into account.

Another way to improve the fits is to use only a segment of the data (as has been done here). However, if the low flow/high salinity periods are most important I'm not sure it makes sense to focus on the 0-10 ppt range of the points. What happens to the SAS fits when one confines flows to less than 100 cfs and ignores the high end of the data?

3. If I understand this properly, the "Linton" model is the one that was presented in the May 2001 draft MFL document. If so, this relationship is based on the EXCEL regressions, which we **know** are faulty (look at the curve fit for station 65 on page D-7 compared with p. D-21!). It is therefore not reassuring to see a close fit between the Linton and the hydrodynamic model.

Ogeechee River, Off Harvey's Island
LMER 14.3 km



Ogeechee River, Off Harvey's Island
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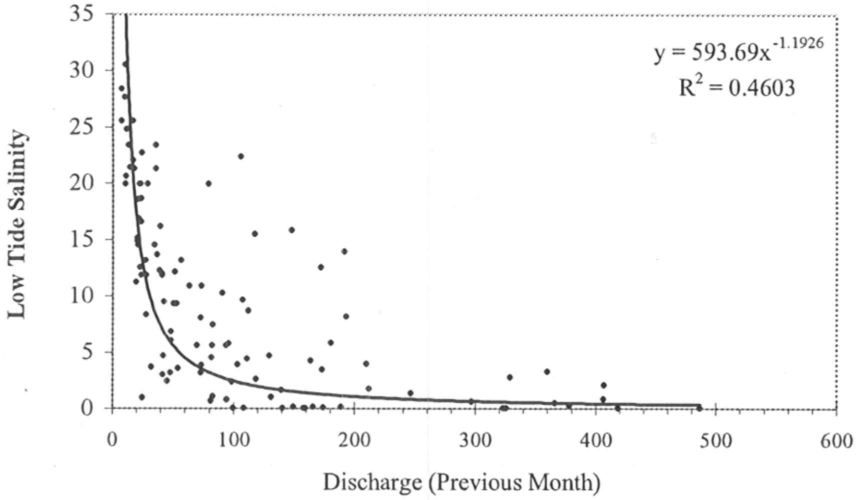

Ogeechee River, Off Harvey's Island
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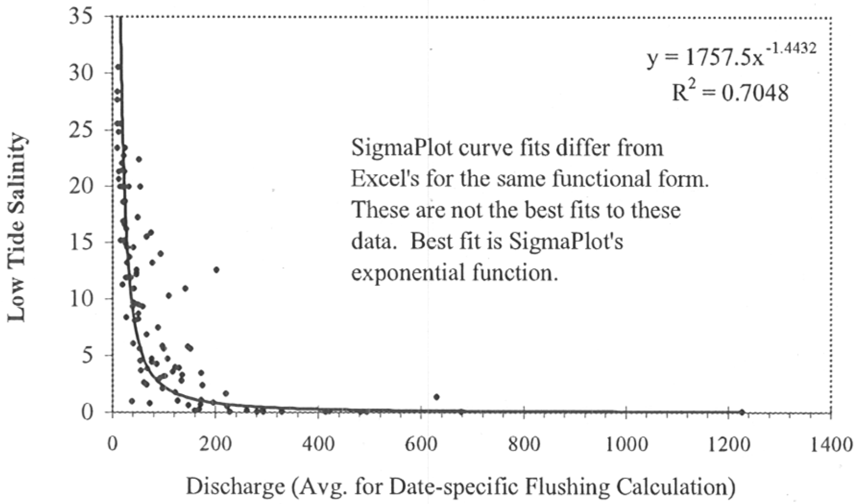
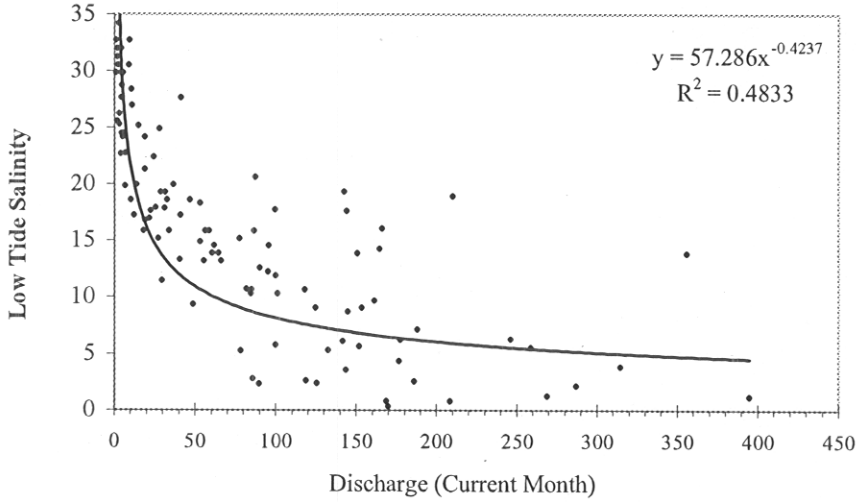


Satilla River, Buoy A15 on the Intracoastal Waterway
LMER 9.5 km



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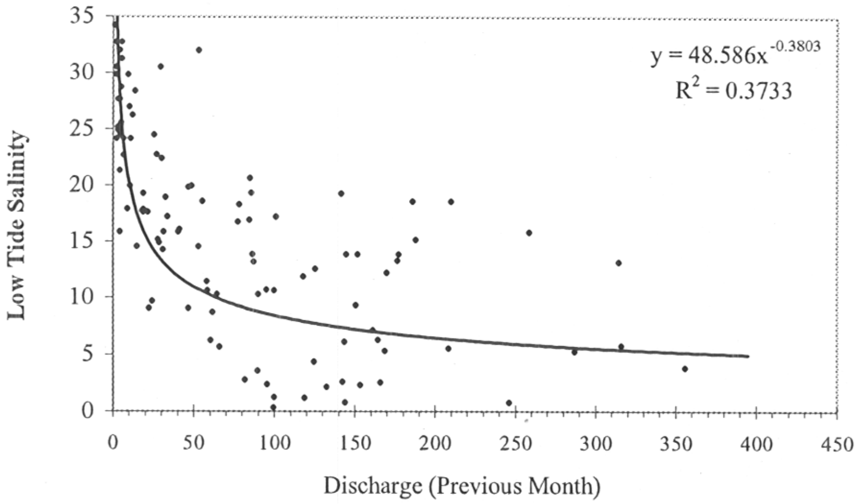

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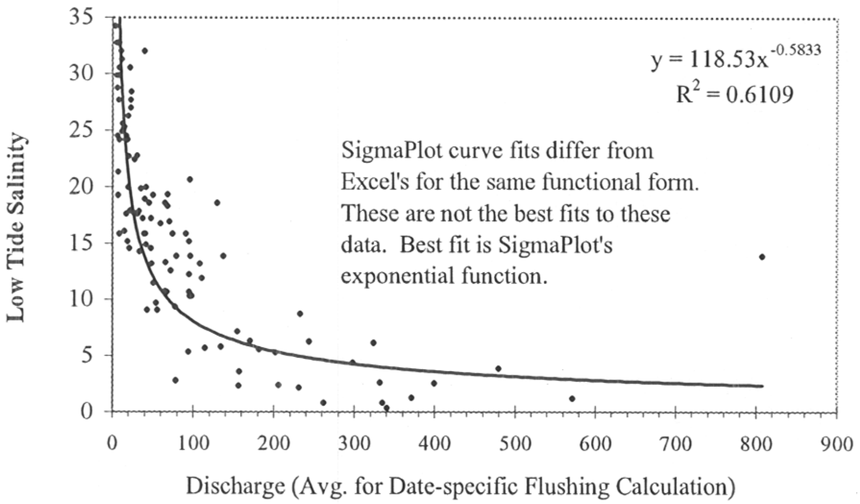

Summary and Recommendations:

I find that the District has adequately addressed most of my considerations with regard to the proposed MFL for the Loxahatchee River and Estuary. My final recommendations are summarized below:

1. Additional ground-truthing of the hydrodynamic model would be appropriate. This should involve both additional verification runs under current conditions as well as comparisons of historic salinity predictions with historic data, if available

2. It is critical to evaluate the data to see if salinity has in fact changed in the upstream portion of the river.

3. I suggest continuing the SAS analysis:
-relationships might be improved by re-evaluating which discharge to couple to with each observation
-consider using only the low flow portion of the data
-it would be useful to see graphs with the SAS fits and statistical analysis of the relationships

4. Consider rewording MFL to reflect the entire flow-discharge curve rather than focusing on one salinity/duration.

APPENDIX K – AGENCY AND PUBLIC COMMENTS RECEIVED ON THE JULY 15, 2002 DRAFT MINIMUM FLOWS & LEVELS DOCUMENT

CONTENTS

Received from Rim Bishop on July 23, 2002
Would you see that the following comments are forwarded to the appropriate SFWMD staff member please?

1. Page 1, third line from bottom - The probably should be something between "River and" and "occur."
2. Page 12, paragraph one under Pre-Development Hydrology - The word "conditions" is misspelled.
3. Page 13, paragraph 2, second to last line - "if" should be "of."
4. Page 32, second to last paragraph - To which wellfields was water diverted? How much, and how often was it taken? Why report Lox River District flow at gallons per hour, why not gallons per day?
5. Page 34, last paragraph - The opening sentence makes it sound like the C-14 feeds the Lox Slough. To the best of our knowledge, it does not.
6. Page 44, second to last paragraph - More detail, e.g. specific user allocations, should be provided.
7. Page 56 - "Wellfield Pumping" section - Shouldn't there be something after the last word of this section?
8. Page 61, table 13 - Use periods consistently within the table.
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11. Page 66, first paragraph - The word "available" is misspelled.
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13. Page 104 - There is no appendix "O" or "I", and we would very much like to review these before the report is finalized.
14. Page 107, first paragraph - My recollection is that the Northern Palm Beach County Water Resource Plan had done a more complete job of quantifying these impacts than this section implies.
15. Page 162 - Seacoast renews its concern, expressed in comments offered earlier to SFWMD, that the concept of "indirect withdrawal" is not technologically defensible and allows SFWMD far too much discretion.

We hope that you find these comments useful, and we look forward to reviewing a subsequent draft prior to adoption.

Thank you.

Rim Bishop
Seacoast Utility Authority
4200 Hood Road
Palm Beach Gardens, FL 33410

Received from Rim Bishop on July 25, 2002

We are pleased to help with the editorial aspects of the report, but we respectfully note that in the past, our spelling and punctuation comments were the only ones that appear to have been incorporated in subsequent drafts. We believe that there is a very important and clearly unintended factual misrepresentation in this draft that must be addressed.

I am sending the same comments again to draw your attention to comment no. 9 below, and to strongly suggest that the Loxahatchee River watershed boundaries established in this draft are simply wrong. Unless a reasonable scientific case can be made for including areas south of Indiantown Road and east of Military Trail, those areas, at minimum, should be excluded.

Rainfall in this area does not, can not, and, under the plans of which we are aware, will not find its way to a point upstream of the Loxahatchee River salt water interface. It all goes to tide well downstream of that point, and I'm reasonably certain that at least as much flows south (away from the estuary) as flows north. Accordingly, the area simply can not contribute any storm water to the restoration program, and it therefore is not part of the watershed.

Further, one can not scientifically link ground water withdrawals originating south of Indiantown Road and east of Military Trail to the Loxahatchee River watershed. It seems that doing so would require evidence that ground water withdrawn from this area would otherwise make its way to a point in the river upstream of the salt water interface, and that simply is not the case. Accordingly, since the area has no identifiable hydraulic connection to the Loxahatchee River, it should not be part of the watershed.

Please either provide scientific support for including this area in the watershed or revise the report to exclude it. This is a relatively small item, and correcting the report as noted takes nothing away from the central message.

We look forward to your response. Thank you again for the opportunity to comment.

Would you see that the following comments are forwarded to the appropriate SFWMD staff member please?

1. Page 1, third line from bottom - The probably should be something between "River and" and "occur."
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We hope that you find these comments useful, and we look forward to reviewing a subsequent draft prior to adoption.

Thank you.

Rim Bishop
Seacoast Utility Authority
4200 Hood Road
Palm Beach Gardens, FL 33410

To: John G. Zahina, Cathy McCarty, Patricia Walker, Marion Hedgepeth
From: Alfred Mueller, Jr.
Subject: July 15, 2002 Draft MFL for Loxahatchee River & Estuary
Date: July 26, 2002

Protection of the healthy floodplain swamp community that currently exists in the Cypress Creek tributary is necessary at this time. Cypress Creek enters the Northwest Fork upstream of river mile 10.2, the area that SFWMD staff concluded as currently representing an unharmed, healthy, sustainable floodplain swamp community. Protection of the Cypress Creek healthy floodplain swamp community should be established through the concurrent development of a MFL for Cypress Creek where Cypress Creek joins the Northwest Fork.

Table 23 on page 97 notes that Cypress Creek contributed 26-32 percent of the average daily flow delivered to the Northwest Fork. During the 1980-81 drought Cypress Creek contributed 39-40 percent of the average flow to the Northwest Fork; and during the 1989-90 drought, 34-47 percent of the average flow was contributed by Cypress Creek. Please also note that the listed average flows for Cypress Creek never fell below 30cfs! Cypress Creek is the second largest contributor to the Northwest Fork.

The subject July 15th document clearly indicates that the MFL for Cypress Creek should be no less than 30cfs. The first bulleted item of the Chapter 5, Chapter Summary on page 140 reads as follows: "Long-term flow records for the Loxahatchee River indicate that average flows during the dry season (October 16-May 14) are 70cfs. During extremely dry conditions, such as existed during the 1980-81 and 1989-90 droughts, dry season flows from Lainhart Dam averaged between 26-35cfs (Table 23)." Please note in Table 23 that dry season flows from Cypress Creek averaged consistently 30cfs during the 1980-81 and 1989-90 droughts almost matching and at times exceeding the flow from Lainhart Dam!

Section 373.0421(2), F.S., provides that if it is determined that water flows or levels will fall below an established MFL within the next 20 years or that water flows or levels are presently below the MFL, the water management district must develop and implement a recovery or prevention strategy. Without the establishment of the MFL, the foregoing protection is more limited. That is why establishing a MFL for Cypress Creek concurrently with a MFL for the Northwest Fork is necessary now!

Let's maintain Cypress Creek's current and very significant contributory flow through the establishment of a Cypress Creek MFL of 30cfs concurrently with a Lainhart Dam MFL of 35cfs. A Cypress Creek MFL of 30cfs is needed now before the issuance of new consumptive use permits in the area have an impact on current documented Cypress Creek flows! The healthy floodplain swamp community that currently exists in the Cypress Creek tributary deserves to be protected as well as downstream Northwest Fork benefits that this contributory flow provides.

Attached are my preliminary comments on the new MFL document's "Executive Summary" and a note on the new "reservation" paper. I have not yet sent this to the Board and I am looking for feedback. Many thanks. Patrick HAYESPATJ@AOL..COM 747-6397

Date: July 19, 2002
From: Patrick Hayes :HAYESPATJ@AOL..COM 747-6397
To: SFMWD Governing Board & Staff
Re: July 15, 2002 Document for MFL's on the Loxahatchee River

General Comments Regarding the Executive Summary

Although the District has done and excellent and extensive job on preparing the " flow " perspective for the Northwest Fork of the Loxahatchee River, I feel extremely misled calling this the "MFL for the Loxahatchee River and Estuary."

The Executive Summary makes it clear on several occasions that this is a "flow" document, for the Northwest Fork only. No discussion at all is evident of "levels", and many critical components of the River (The Slough, The Overall Natural Watershed, and Cypress Creek, to mention a few) are excluded or need significantly more attention.

Many people I know are quite disappointed that the "Watershed", as artificially constructed by the District, excludes much of the southern portion of the River's "Historic Slough". To minimize the special extent of this River's Watershed in the face of many Federal (CERP) and Local Projects which will reconnect the entire southern area of the River's Historic Watershed, seems inappropriate and contrary to the District's committed effort to "get the water right" (to borrow a phrase from the South Florida Ecosystem Taskforce). To exclude a "level" and "flow" regimen for the major southern slough of the river seems quite shortsighted and different from the other MFL's I've studied for comparison.

Staff and District Directors have officially stated that the River has not declined since 1985. It would appear, however, that the current document "declares" another two miles of River "significantly harmed". This seems to be the justification for reducing the MFL recommendation of 70cfs in the previous May 2001 MFL Document, to 35cfs in the current Document.

It think it is unconscionable that Staff recommend less water for the River and, thereby more water for consumptive use as a reward for 20 years of mismanaging the River's natural system causing another two miles of destruction.

The Summary also indicates that even at this level, the District cannot meet fresh water demands during the dry season and must, therefore, construct a "Recovery and Prevention Strategy". Since the River's "Wild & Scenic" designation in 1985, and the Federal & State Mandates to Restore, Protect and Preserve this national treasure, the "loophole"..." to provide sufficient flow whenever possible" continues to allow the River's demise. Yet during the last 25 years sufficient water has been found to increase consumptive use permits in the River's watershed by over 100-million gallons a day. When is this blatant contradiction going to end, and the River receive its "fair share" of vitally nourishing water?

Further comments to follow. pjh

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R/E :

the "RESERVATION" Document ---- the only parties with " legal" standing with respect to " the WORDA 2000 Base line," and the " savings clause" ---are "permit holders" (which excludes all natural systems, i.e.,: rivers, sloughs estuaries, etc.). Also the "legal" status excludes all "Storm water runoff" . When I questioned Mr. Ammon r/e the Natural system --- and specifically the Loxahatchee River --- he said that the River is "entitled to only the water that we have been giving it " --- when I reminded him that during the "wry season" that the District doesn't give us any water, and that this would imply, we have on standing, In "WORDA 2000 Base line" , and that under the "savings clause" the River would be entitled to " no water " during the critical dry season . He stated that was correct. And repeated that the Natural system was only entitled to the water that the District had been giving it, as reflected in the historical levels over the last 30 or so years.

The implications of this for the Natural system, and especially the River's are unfair, inappropriate and disastrous. It is simply not good "policy," after 30 years of refusing to set aside water, set MFL's, or develop Reservations, that our "base line" should now be "zero."

Further comments to follow --- PJH

Loxahatchee River District

2500 Jupiter Park Drive, Jupiter, Florida 33458-8964
Telephone (561) 747-5700 Fax (561) 747-9929
e-mail: osprey@loxahatcheeriver.org
website: www.loxahatcheeriver.org

Richard C. Dent, Executive Director

LOXAHATCHEE RIVER ENVIRONMENTAL CONTROL DISTRICT 1971

Award Winning
Regional Wastewater Facility
Best in Nation, E.P.A.
Best in State, D.E.P.

July 29, 2002

Mr. John G. Zahina
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33416

Re: Loxahatchee River and Estuary MFL

Dear John,

Don't Panic!! I think you'll appreciate most of these comments.

Thank you for the opportunity to review the referenced document. Given the 'just hold the line' directive, I believe the Water Management District staff has done a good job of describing the methodology employed and developing reasonable technical criteria.

Enclosed is my initial list of comments and questions relative to the draft technical document. While I have included certain opinions concerning the policy nature of decisions under which the draft was developed, my major intent is to assist in clarifying and enhancing the technical efficacy of your effort. I have also enclosed several other technical references that may be useful.

John, please give me a call to arrange a meeting at your convenience to go over the issues presented. Thanks again for a job well done.

Sincerely,

Rick

Richard C. Dent
Executive Director

Encls.

/dh

1. ***Maximum flows, River*** -- the reference to maximum flows is incomplete with information omitted on the third line up from the bottom of page 1.
2. ***Maximum flows, C-18*** -- given that the title speaks to the estuary, the need to set a flow limit through the s-46 structure should be further discussed and scheduled for future consideration.
3. ***Seasonal flows*** -- the exploration of seasonal flow minimums and consideration for future MFL inclusion is encouraged and further mention, beyond that contained in the MFL document, is requested.
4. ***MFL definition*** -- references in the executive summary, on page 3 and elsewhere in the document tend to imply that the 'significant harm' criteria is the only definition provided by law. Perhaps a clarification that this definition is the one that staff has been tasked with using would be helpful.
5. ***Recovery and prevention strategy*** -- since the river is the resource sought to be protected by the MFL and the subject of the technical document, perhaps priority and emphasis on page 7, paragraph 3, and elsewhere (Chapter 6) should be modified. State that the goal is 'to take actions to achieve the MFL criteria, while providing sufficient…'.
6. ***Rainfall A*** -- reference to a Jupiter rainfall record of 90 or 95 years, as given in the narrative and Figure 3 on page 11, may be misleading. My understanding is that the record prior to 1960 is incomplete.
7. ***Rainfall B*** -- the enclosed report on rainfall contains much of the same information developed by the SFWMD. However, two observations in the 1997 document may be helpful. First, the spatial distribution of rainfall in the watershed is very important and not considered in the MFL document. Pages 7 and 8 of the enclosed report documents significant wet season variances in rainfall amounts between eastern and western locations. Since future modeling will be rainfall driven, this factor should be incorporated. The second observation relates to rainfall frequency and intensity. Light rainfall events do not greatly add to storage as much is lost to evapotranspiration and, extreme events are difficult to effectively capture for storage.
8. ***Tributary flows*** -- Table 1 on page 17 indicates that flow data from Cypress Creek and Hobe Groves Ditch are available for a continuous POR through 1991. Please help me find the full 1981-1991 record (perhaps it is in one of the appendices).
9. ***Tidal prism*** -- the USGS data referenced on page 18 is valid but differs somewhat from the referenced work by Chiu found on page 22.
10. ***Groundwater inflow A*** -- Although the contribution of groundwater flow is addressed later in the MFL document, perhaps references to total freshwater flow on pages 19, 20 and 21 should clarify surface water contributions only. Discussions on page 97 could also benefit from this clarification.
11. ***Loxahatchee estuary*** -- the narrative on the estuary presented on pages 22 through 30 contains several references to upstream areas, JD Park, floodplain swamp community, etc.
12. ***Submerged aquatic vegetation*** -- the discussion on Johnson's seagrass on page 26 is important and further research has been published. The enclosed report by Ridler, et al is a follow up to the 1999 research and documents the continued presence of this threatened species within the estuary. Further consideration of this plant, possible as an indicator for future MFL rules, is encouraged.

13. ***Benthic macrofauna*** -- in addition to the estuarine data referenced, the LRD has also presented information in the wild and scenic reach of the river. Although not yet published, the results of the freshwater research were presented at the 2001 Loxahatchee River Symposium and the abstract and salient graphics are enclosed. In general terms, the two stations (at Trapper's and at Lainhart) show healthy freshwater communities and compare favorably with earlier work conducted by Rudolph. As relates to future research, perhaps the use of select members of the macrofauna could be used as a 'miner's canary' at certain locations in the river.
14. ***G-92 structure and C-14 canal*** -- several references on pages 32, 33 and 34 are inconsistent with my recollection. The initial installation of the culvert in the mid 1970's was of a structure designed for 50 cfs sustained and 100 cfs maximum. I know of no enlargement that occurred until 1987. Further, references to the C-14 canals construction time and enhancement might be checked with Gale English for accuracy.
15. ***Treated wastewater*** -- this reference on page 32 would be more accurate if changed to reflect 'AWT' treated wastewater, gallons per day, the presence of a recharge lake employed to discharge the water and a discontinued date of 1986.
16. ***Groundwater inflowB*** -- very preliminary research on groundwater inflows to the estuary was conducted by the LRD in the 1980's by use of seepage meters. Recognizing the recent criticisms of this methodology, the data may not be useful when considering references such as page 38 or page 68, but it is available if needed.
17. ***Reclaimed water*** -- the comment on page 44 stating that unused water is disposed might better read ' is stored for later use or disposed of by deep injection well.
18. ***Water quality A*** -- the comprehensive monitoring program discussed on pages 45 and 46 is conducted every other month, not twice each month. The addition of a phrase 'and is updated every six months' at the end of the first paragraph on page 46 would be appreciated. As relates to the Florida Water Quality Index, reports updating the index through 2001 are available. A second index employed for estuaries in Florida is the Trophic State Index (TSI). One of the enclosed documents speaks to this index as it applies to the Loxahatchee. Of special note is an observation that the estuary may be phosphorus limited (as relates to trophic state and productivity) and that new discharges to the system should be evaluated for excessive phosphorus. As relates to future research, the continued monitoring of trophic levels and phosphorus is suggested.
19. ***Water quality B*** -- the enclosed document of dissolved oxygen describes a problem in the upper reaches of the wild and scenic river and targets cause. Given the need to show that MFL induced changes will favorably impact the water quality, the topic of this report may be helpful. Essentially, it shows that C-18 water discharged to the river through the G-92 structure provides an improvement as relates to D.O. Perhaps inclusion of this observation, either on page 68 or in the research section could be beneficial.
20. ***Cypress / Salt*** -- the sentence occasional inundation by slightly saline surface water probably does not result in serious long-term impacts' is too subjective for a technical document of this caliber.
21. ***Plants and Animals*** -- the reference to diversity on page 51 should qualify the type of organisms identified. For instance, adult insects are not, nor should be, included. This comment also applies to page 61.
22. ***Recreation*** -- the discussion of facilities on page 55 should mention the present role of the Canoe Outfitters in Riverbend Park.

23. ***Other Plans*** -- on page 58 and prior pages, a summary of the Loxahatchee river watershed management plan is provided. Perhaps a similar reference to the Wild and Scenic river management plan would be useful.
24. ***Water supply*** -- this section beginning on page 62 could be improved by a more detailed discussion of agricultural water use.
25. ***Water classification*** -- there continues to be inconsistency on the extent of the Class II waters in the watershed. Table 14 on page 67 indicates that the whole of the northwest fork is Class II whereas the reference on page 71 is for Class III. This inconsistency should be resolved in favor of the freshwater reach of the northwest fork designated as Class III.
26. ***Consumptive uses A*** -- the comment on page 68 that the effects of these uses are 'not very large' should be better quantified given the analytical work on the existing data. If the reference to 5cfs on page 107 speaks to the same issue, a rationale for reaching the conclusion is lacking.
27. ***River miles*** -- Table 15 on page 77 and the graphic on page ?? clarify what has been an undesired variable. Thanks!
28. ***Modeling assumptions*** -- on page 79, the selection to use a constant when relating discharge fractions from tributaries to the Lainhart dam fails to make use of available data. Specifically, the seasonal fluctuations in the relative contributions as described by McPhearson in his early 1980's work. Additionally, the basis for the constant assumption of 40 cfs from groundwater is not explained.
29. ***Mean daily salinity*** -- references to this value is made on pages 80, 92, 145 and elsewhere. Given that the raw data on salinity was developed using maximum bottom salinities, an explanation of why and how the conversion was made is needed.
30. ***Soil salinity*** -- the concentration changes referenced on page 86 appear to be spatial, not temporal, and should be so specified.
31. ***Statistical analyses*** -- perhaps a review of Appendix D would help resolve my ignorance. As it is, however, I don't know what the paragraph on page 87 means.
32. ***Model progression*** -- the discussion of models included in the MFL document is not simple to understand. However, the reliance of one model on the results of the prior model appears weak to one not formally trained in modeling. Model 1 converts actual salinity data to simulated salinity data, the new salinity data is extrapolated over time by a second model, then subjected to the Ds/Db model. This ration is then incorporated into a fourth model relating to vegetation (and, I may have missed a model). Perhaps a better explanation of the relationships will provide clarity and confidence.
33. ***Literature review A*** - A report entitled 'Loxahatchee River Salinity Monitoring Program' (unpublished) was presented to the Loxahatchee River Management Coordinating Council in 1994. This document, certain graphics of which are enclosed, offered the opinion and supporting data that 50 cfs was insufficient to meet stated goals. To the extent that the new flow goals were accepted, the comment on page 96 that 'as late as 1998, the original USGS flow target of 50 cfs ….' Can be questioned.
34. ***Literature review B*** -- The reference at the top of page 96 slightly misstates the conclusion of the 1997 report. A minimum flow rate of 75 cfs was 'recommended' and seasonal minimum flows and maximum flow range were 'suggested'.
35. ***G-92 flow*** -- Figure 19 on page 98 is very descriptive of the improved flow capabilities. The major reason for this is less clear however, A more complete explanation of the

culvert enlargement from 100 cfs to 400 cfs is warranted. As an aside, how can the 721 cfs measurement be accurate given the max design?

36. ***Consumptive uses B*** -- the identification of uses with the potential impact to the river is incomplete. Given that the Loxahatchee slough, in either its current or proposed configuration, is integrally connected with the C-18 canal, then considering impact of groundwater withdraws under the C-18 only is insufficient. Withdraws beneath the slough also have a definite impact on the river.
37. ***G-92 Culvert B*** -- the reference to additional culverts (plural) on page 128 is questioned and the sentence following on 'operational criteria' needs clarification.'
38. ***Vegetation*** -- this section looks good but I need additional time to evaluate it and review the appendices. One observed inconsistency is noted between statements on the presence of saplings and seedlings near river mile 9.2 (see pages 116 and 135).
39. ***65cfs*** -- the summary of the NPBCCWMP on pages 152 and 153 includes the statement 'provide supplemental water to maintain up to 65 cfs…' I thought the up to phrase was corrected before the plan was issued. As related elsewhere in the MFL document, the goal of the WMD remains on of 'continue to provide flows of 65 cfs or greater….whenever water is available'.
40. ***Water delivery*** -- the narrative on page 157 relates to 35 cfs and 65 cfs. For consistency, the title of Table 42 should also list both flow goals.
41. ***Figure 34*** -- this graphic on page 158 is very descriptive. Good job.
42. ***Salinity barrier*** -- the paragraph on page 165 should include the effect of the biological community as well as salinity and other water quality issues.
43. ***Extreme dry conditions*** -- several references in the report, including table 23 on page 97 and the summary on page 140, speak to the droughts of 1980-81 and 1989-90 in terms of full dry season averages. Other references, page 98 and table 24 evaluate shorter time frames within these droughts. The difference in average flow over an extreme two or three month spell and the average flow over the full six month dry season can be significant. Given that sixty days or less of very low flow can likely cause significant harm, placement of a greater emphasis on flows during dry periods of shorter duration is suggested.
44. ***Stormwater management*** -- the enclosed Stormwater Management Plan was prepared for and accepted by the Management Coordinating Council about three years ago. The document inventories existing drainage systems, identifies problems and develops recommendations including the means to increase the duration of freshwater flows delivered to the river and reducing pollutant loadings. The evaluation of other basins on page 158 may benefit from this document.
45. ***SIRWCD improvements*** -- The efficiency of delivering supplemental flows to the river will be enhanced with the implementation of new structures within the drainage canals. Perhaps this program could be discussed more completely.
46. ***Minimum flow criteria*** -- the statement presented in the executive summary and on page 149 needs clarity &/or is incomplete in at least three respects. First, the use of 'mean monthly flows' is debated. How was this time frame established and, given flow variances, how can it be defended. Second, my question of last month is still unanswered. Is the 20-day period cumulative or consecutive? If it is intended to be consecutive, additional criteria will be needed to protect the river. The third matter relates to the

establishment of an absolute floor. Given that the salinity moves upstream within a matter of days, flows of less than 20cfs?? (pick a number) should be disallowed.

47. ***Exclusions*** -- the staff suggestion that it is not appropriate to apply the exclusion regarding historic functions is extremely subjective and has no basis in fact or support from technical information. To see this statement in the middle (page 72) of a scientific document is concerning.
48. ***Water reservations*** -- on page 164, the sentence 'the first reservation of existing water for the Loxahatchee River should be made within on year after Governing Board approval' would be more meaningful with two clarifications. What is meant by existing water, is it part of or in addition to the 35 cfs? And, Governing Board approval of what (the MFL) will trigger the reservation process?
49. ***Research needs and monitoring*** -- as relates to the currently proposed MFL and future MFL work in the freshwater and estuarine portions of the system, research and/or continued monitoring in the following areas is suggested. Submerged aquatic vegetation, macroinvertebrates, nutrients and trophic state and dissolved oxygen in the upper reach of the northwest fork.

RESOLUTION NO. 02-02

A RESOLUTION OF THE LOXAHATCHEE RIVER MANAGEMENT COORDINATING COUNCIL URGING DEVELOPMENT OF A RESTORATIVE MFL FOR THE PROTECTION AND ENHANCEMENT OF THE LOXAHATCHEE RIVER SYSTEM

WHEREAS, in 1983 Chapter 83-358 Section 4, Florida Statute (FS) designated portions of the Northwest Fork of the Loxahatchee River (the "River") as a State Wild and Scenic River specifically between River mile 6 and River mile 13.5 (Section 3) and includes the Legislative finding that it "...possesses outstandingly remarkable ecological, fish and wildlife, and recreational values..." "...which should be permanently preserved and enhanced..." (Section 2); and

WHEREAS, Chapter 83-358 Section 3 (8) FS defines the "River area" as "...that portion of the River from River mile 6 to River mile 13.5 together with such abutting uplands as determined in the permanent management plan," ...."which may be necessary to maintain the natural and scenic appeal of the River."; and

WHEREAS, the South Florida Water Management District (the "SFWMD") and the Department of Environmental Protection ("DEP") were mandated by Chapter 83-358 Section 5(1) FS to develop a Plan consistent with the National Wild and Scenic Rivers System, and in accordance with Public Law 90-542, Section 10(a) of the Wild and Scenic Rivers Act which states a non-degradation and enhancement policy for all designated River areas; and

WHEREAS, the Loxahatchee Management Coordinating Council (the "Council") was established pursuant to said FS Chapter 83-358 for the purpose of participating in the development of a Loxahatchee River Management Plan (the "Plan") for, and in accordance with the Loxahatchee River Wild and Scenic Designation and Preservation Act; and

WHEREAS, the Council has reviewed the draft Minimum Flow and Level ("MFL") proposal and finds that it does not accomplish the intent of Chapter 83-358 Section 2 stating that, "It is the intention of Legislature to provide for the permanent preservation of the designated segment of the Loxahatchee River"; and

WHEREAS, in accordance with the Plan, the SFWMD adopted December 2002 as the date for establishing a MFL for the Loxahatchee River system, and the members of this Council have concluded that this would not allow time for determination of the minimum flow needed to achieve the objective in the Plan for River enhancement, or the objective stated in the Comprehensive Everglades Restoration Plan for ecosystem restoration; and

WHEREAS, the proposed minimum flow to the River addresses "the remaining floodplain swamp community" up to River mile 9.2, but it is the Council's determination that this is inadequate, and will not protect, maintain, nor restore conditions below River mile 9.2 which existed at the time Chapter 83-358 was adopted, as it has been widely recognized for several decades that the current dry season flows to the Loxahatchee River are insufficient and damaging to the ecology of the River, and

WHEREAS, since the passage of Chapter 83-358 in 1983 more than nineteen years have lapsed without minimum flows being adopted for the River in accordance with the Plan, and in the absence of the development of MFL criteria the River continues to decline, it shall be a priority of both the SFWMD and DEP to develop minimum flow criteria; and

WHEREAS, recognition of this damage has resulted in development of preliminary plans for a series of projects proposed under the US Army Corps of Engineers' ("COE") Critical Project List, the Comprehensive Everglades Restoration Plan, the Northern Palm Beach County Comprehensive Water Management Plan ("NPBCWMP"), and the Lower East Coast Regional Water Supply Plan for increasing dry season deliveries for the River and other parts of the natural system and water supply;

NOW, THEREFORE, BE IT RESOLVED by the Loxahatchee River Management Coordinating Council as follows:

1. The SFWMD should work closely with, and offer all possible assistance to the DEP in their effort to develop a plan for enhancement of the River.

2. If the SFWMD adopts a MFL of 35 cfs for the River in December 2002 as currently proposed, as noted above, such plan only protects the remaining and existing healthy cypress swamp community, and such proposal will not completely recover, nor significantly enhance already stressed areas of the River, and will have a substantial adverse impact upon the resource values in the River area, and that any proposal if adopted shall clearly acknowledge that the adopted MFL is an interim MFL.

3. The SFWMD and the COE should include the enhancement of the River as an objective in the Northern Palm Beach Comprehensive Everglades Restoration Plan ("NPB-CERP") and include as a temporary value in that planning process a MFL of at least 65 cfs (NPBCWMP, p. 5), until a specific number is developed through joint research with the DEP River enhancement planning effort.

4. During the development of the Project Implementation Report (PIR) for the NPB-CERP, the SFWMD and the COE shall ensure the entire River watershed is considered in the planning process including those sub-basins located in Martin County as well as Palm Beach County, as was mandated in Chapter 83-358.

5. The SFWMD and the COE shall ensure that during the development of the PIR for the NPB-CERP, project components are considered for construction in all areas of the watershed that will provide additional water and are sized to be able to meet the River's needs in consideration of, and in coordination with the DEP River enhancement planning effort.

6. The SFWMD, COE and DEP should ensure that as River enhancement objectives are identified, a modified MFL will be adopted that, in conjunction with the environmental water reservation that the Water Resources Development Act of 2000 requires to be developed and included in the NPB-CERP PIR, shall:

A. reflect seasonal variations, protects non-consumptive uses such as recreation, and fish and wildlife utilization of the Loxahatchee River ecosystem including both freshwater and estuarine portions; and

B. maintain conditions that provide for the propagation of cypress trees and a complete natural forested floodplain understory and animal community, and protects and enhances a healthy estuarine natural community.

7. In consideration of the above six items, this Council recommends that a coordinated effort shall be undertaken by both the SFWMD and the DEP to adopt a restorative MFL. Both agencies shall agree to and determine the location of a mile marker within the River to which design of allowable dry season salinity intrusion will be acceptable. Such location shall be between mile marker 6 and Kitching Creek, after which a restoration plan shall be prepared in conjunction with other agencies and completed not later than twelve months from adoption of this resolution.

RESOLVED AND ADOPTED this 29th day of July 2002.

LOXAHATCHEE RIVER MANAGEMENT COORDINATING COUNCIL

Richard Dent, Chairman

Herbert H. Zebuth, Secretary

Attest: Kathy LaMartina
Kathy LaMartina, SFWMD Staff

Received from Rim Bishop on August 5, 2002

John,

Here are some preliminary comments on Exhibit O. I have handwritten markups as well that I will mail you this week.

For emphasis, I note that the demand figures noted for Seacoast are simply wrong, consistently higher by far than the actual records on file with SFWMD indicate. We have attempted to correct them where we can, and we are anxious to assist SFWMD staff in finding ways to incorporate our input.

Thank you so much for the opportunity to participate in this most important process. We deeply appreciate your responsiveness to date, and we look forward to reviewing a subsequent draft. Please do not hesitate to call if any of the comments are unclear.

Received from Rim Bishop on August 5, 2002

Seacoast Utility Authority comments to draft Exhibit "O" to the draft ***Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary***

OVERVIEW

Appendix O gives no indication of having accounted for some 15 million gallons per day of reclaimed water that is currently applied within the watershed during the driest of weather, nor the fact that this volume is likely to double within the next 15 years. The point about how dramatically water consumption will increase is clearly made however. Our recommendation would be to adjust both the editorial and numerical content of the report accordingly. SFWMD has all the data, but in case it has been misplaced, Seacoast will resubmit its figures if necessary. To do this, one might start with figures currently being compiled for the SFWMD Northern Palm Beach County Reclaimed Water Master Plan.

The author should make certain that all references and figures in this appendix are confined to the Loxahatchee River watershed and to surface water or surficial aquifer supplies. Including demands that will be met from the Floridan aquifer or overstating surficial aquifer demands, if that is what has been done, is misleading. For example, the Hood Road wellfield is the only Seacoast water supply source located within the area identified as the watershed, but some of the reported flow figures appear to include water from other Seacoast wellfields. Conversely, the report appears to identify the West Palm Beach Water Catchment area as lying within the watershed; are the City's water supply demands included as well? If not, this inconsistency should be remedied.

SFWMD taxpayers can take heart in the agency's very conservative approach to water resource planning. This draft continues the tradition of inadvertently (but consistently) overstating Seacoast's consumptive use demands. Be assured that when the day comes that SFWMD errs on the low side, we will offer corrections with equal enthusiasm and vigor. We hope that you will review and incorporate the figures that we have revised, and we are prepared to offer supporting documentation should you require it.

Finally, we renew our objection to including any lands east of Military Trail and south of Indiantown Road within the Loxahatchee River watershed. Except as confined by the law of conservation of matter and the fact that water molecules found in both areas contain both hydrogen and oxygen (which characteristics similarly apply to the polar ice caps), there is no connection. We have explained this perspective earlier and are anxious to meet with SFWMD staff if after further consideration, they disagree.

PAGE O-1

First Paragraph – Is the West Palm Beach Water Catchment area in the defined watershed? If so, the City's water demands should be included.

There should be a comma after the word "Watershed" in line three.

Second Paragraph – The 1995 demands outlined may have been LEC planning figures, but they are wrong. In 1995, the Hood Road wellfield withdrawal was 3,536 MG, not the 5,274 MG you show (see SFWMD pumpage reports). We fail to see the relevance of converting these figures to acre-feet.

It is the Village of Tequesta, not the Town of Tequesta.

Page O-2

Summary of Data …

First paragraph – Based on actual experience through multiple droughts, there is little evidence to support the statement that this area is any more susceptible to salt water intrusion than any other coastal area, including those with a connection to the regional conveyance system.

Second paragraph – One might get the impression that public water supply demand supplied from the watershed was 82.2 MGD in 1995 and will be 128.6 MGD in 2020. Is that annual average day? All from the surficial aquifer system? More definition and support for these figures is needed – we can't tie back to them based on what we know about Seacoast's needs and the needs of its neighbors.

Page O-3

Figure O-1 – Because Seacoast's flow has been incorrectly identified, this table will need to be recalculated. We do not see the need for this analysis at all.

Last paragraph – Again, the only Seacoast wellfield located within your definition of the watershed is the Hood Road wellfield. In 1999, that wellfield pumped 12,683 acre-feet (if you must use that unit of measure), not 21,631 as you suggest.

While I know that 1995 planning figures played a significant role in the Lower East Coast process, more current actual figures should be used. Otherwise, the reader might assume that measures implemented within the past ten years (reclaimed water proliferation, water conservation measures, etc.) will have no impact.

Page O-4

Table O-4 – Of what value is the column entitled “1998 Annual Water Use”. If this is just a typo and should be 1999 figures, then please correct them as noted above.

First paragraph – Should the word “Basin” be capitalized?

Figure O-2 – The value of this table is questionable at best, as far as we can tell.

Second paragraph – There should be a comma after the word “Summary”.
Also, we really do not understand the relevance of this analysis, particularly this paragraph.

Page O-5 – There is an extra “s” at the end of the word “changes”.

The regional reclaimed water system to which you refer is not, as far as we know, being developed – it is being studied. Its feasibility is seriously in question, and the report should more accurately reflect that status. The report should likewise note the successes of both Loxahatchee River District’s and Seacoast’s reclaimed water systems, including tables showing how much water these programs return to the resource each year (in MGY for sure, and in acre-feet if you must).
Table O-5 – The hydraulic connection of many, many of the listed properties to the Loxahatchee watershed simply does not exist.

Table O-1 – It is virtually impossible for the casual reader (e.g., Seacoast’s Executive Director) to determine the relevance of this table. Respectfully, it seems to add extraneous data and thereby promote confusion.

APPENDIX O -- PUBLIC AND AGRICULTURAL WATER SUPPLY

CONTENTS

Include West Palm Beach's uses?

Public Water Supply ~~Demands~~ Uses

Revisit Ag figures, estimates seem VERY low; e.g.) Mecca Farms pumpage threw North County model out of calibration

Water for urban and agricultural uses in the Loxahatchee watershed is supplied from both groundwater and surface water systems. Non-environmental surface water demands within the basin are primarily public water supply, commercial and industrial with some agricultural uses. The commercial and industrial demands vary greatly by type of business. In the Loxahatchee Watershed, commercial and industrial demands are less than one percent (1%) of the overall water demands. Because the demand is relatively small and difficult to generalize, an average demand was not calculated for this use category and emphasis was placed on estimation of agricultural and urban uses.

Total public water supply demands for the major utilities within this area for 1995 were estimated for the Lower East Coast Regional Water Supply Plan (LECRWSP -- SFWMD, 2000e) and are summarized in **Table O-1**. Total 1995 demands were estimated as 28,384 acre feet/year. Largest users within the watershed consisted of Seacoast Utilities (16,185 ac-ft/year), Town of Jupiter (10,629 ac-ft/year) and the ~~Town~~ Village of Tequesta. Together these three utilities represent more than 99% of the total urban water supply demand within the watershed.

Because public water supply withdrawals were an issue of concern in this watershed, additional analyses were undertaken by the SFWMD to update the analysis used in the LECRWSP. Recent monitoring and reporting data were analyzed as well as information provided in applications for permit renewals. This analysis and the results are described in detail in **Chapters 4 and 5**.

Why not use test year after new 6-92 & Lox Slough protocols in place, e.g. 1999

Table O-1. Urban water supply demands in the Loxahatchee Basin

Permittee	Permit Number	1995 Demands	
		Million Gallons/Year	Acre-feet/year
Seacoast (Hood Rd)	50-00365-W	3,536 ~~5,274~~	~~16,185~~
Town of Jupiter	50-00010-W	3,464	10,629
Tequesta	50-00046-W	515	1,579
PB Park Commerce	50-01528-W	4	11
Total		~~9,253~~	~~28,384~~

Source: SFWMD Unpublished Consumptive Use Permit Data

Only Seacoast use within the defined Lox River watershed

Uses

Agricultural Water Supply ~~Demands~~

A different procedure was adopted for estimating agricultural use in the Loxahatchee watershed because measured withdrawal data were not available. The procedure used was to estimate current water use based on Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) water demand modeling (Smajstrla 1990, Moraga et al. 1995), and current agricultural acreage (FDEP 1998). Agricultural water use depends on the crops that are grown in the watershed and on how those crops are managed and irrigated. An important factor in accurately estimating agricultural water use is determining the location and acreage of crops. Citrus and small vegetables are crops found in the basin. The supplemental irrigation requirements for 1995 are found in **Table O-2.**

Year

Table O-2. Agricultural Demands for the Sub-Basins in the Loxahatchee River Basin.

Subbasin No.	Subbasin Name	1-in-2 Agriculture Demands (ac-ft/yr)	1-in-10 Agriculture Demands (ac-ft/yr)
1	Jonathan Dickinson/ Hobe Sound	3,032	5,123
2	Coastal	558	816
3	The Estuary	643	939
4	C-18/Corbett	6,201	10,478
5	Cypress/PalMar	4,335	7,324
6	The Groves	7,712	13,030
7	Wild & Scenic/Jupiter Farms	792	1,158
	Total	23,273	38,868

Sources: Smajstrla 1990, Moraga et al. 1995, FDEP 1998

Summary of Data from the SFWMD Water Use Permit Database

Water for urban supply, golf courses, landscape irrigation, and agricultural uses is supplied from three sources within the Loxahatchee watershed: surface water systems, the Surficial Aquifer System (SAS) and the Floridan aquifer. Use of the SAS, the traditional source for public water supply, is limited within most of the watershed due to increased potential for impacts on local wetland systems, the Loxahatchee River, and saltwater intrusion. In addition, the Jupiter/Tequesta area is not currently connected to the Central and Southern Florida Project, which provides a backup source of water for the majority of other Lower East Coast communities. For this reason, this watershed is more susceptible to the effects of drought and salt water intrusion during dry periods than other South Florida coastal areas. As a result, several municipalities (Jupiter and Tequesta) have gone to reverse osmosis (RO), utilizing the Floridan aquifer as their primary water supply source.

Not supported by the record

Northern Palm Beach County is expected to experience significant growth between now and 2020, primarily in coastal areas. In the Northern Palm Beach County planning area, public water supply demands are projected ~~to~~ increase by 63 percent, from 82.2 million gallons per day (MGD) in 1995 to 128.6 MGD in 2020. In contrast, agricultural demands (about 13 MGD) are projected to decrease by about 12 percent by 2020 (SFWMD 2002). No additional agricultural development is predicted to occur – in

Where did these figures come from?

fact some existing agricultural lands located near the headwaters of the Loxahatchee River (Loxahatchee Slough) may be displaced by future urban development (e.g., golf courses and residential units).

In this study, public water supply, landscape irrigation and agricultural water demands within the basin were estimated based on: (a) the annual allocation of each permit holder obtained from District records and (b) the average daily demand values used in the Northern Palm Beach County Comprehensive Water Management Plan hydrologic model (MODFLOW). Permitted withdrawals by use category for 1999 are summarized in **Figure O-1** and **Table O-3.** This is the same list of permitted users within the watershed that was used in the well package of the northern Palm Beach County model simulation.

What is the relevance of this table? If it must be included, see corrected figures below.

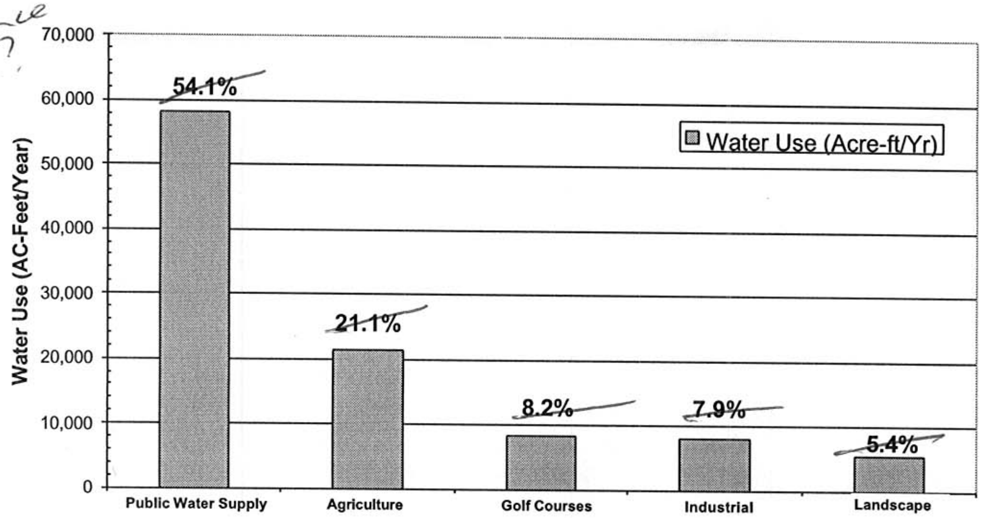

Figure O-1. Water Use in the Loxahatchee River Watershed -1999

Table O-3. Summary of Water Uses within the Loxahatchee Watershed for 1999.

Water Use Type	Million Gallon/Year	Acre-Feet/Year
Urban Water Supply	~~18,862~~	~~58,081~~
Agriculture	6,943	21,306
Golf Courses	2,705	8,303
Industrial	2,684	8,038
Landscape	1,767	5,422
Total	~~32,961~~	~~101,150~~

See Table C=1, Appendix C for summary of water use by individual permit

See corrected Seacoast figure, recalc total.

Overall, total urban water supply demands compiled for 1999 were ~~58,081~~ acre feet/year **(Table O-3)**. The largest users within the watershed consisted of the Seacoast Utilities-Hood Road wellfield (~~21,631~~ acre-feet/year), Town of Jupiter (30,825 acre-feet/year), and the Village of Tequesta (5,427 acre-feet/year). Together these utilities represent 53.8% of the total water supply demand within the watershed **(Table O-4).**

12,683

Why 1998?

Table O-4. Summary of Urban Water Supply Demands within the Loxahatchee Watershed (MGY = Million Gallons/Year)

Permittee	Permit Number	1998 Annual Water Use (MGY)	2000 Annual Water Use (MGY)	1999 Allocations	
				MGY	Acre-feet/yr
Town of Jupiter (PWS)	50-00010-W	3442	3214	10,045	30,825*
Village of Tequesta (PWS)	50-00046-W	589	446	1,768	5,427*
Seacoast Utility- Hood Rd. (PWS)	50-00365-W	4604	4729	~~7,049~~	~~21,631~~
Palm Beach Park of Commerce	50-01528-W	N/A	N/A	65	198
Total				~~18,927~~	~~58,081~~

* Both the Town of Jupiter and the Village of Tequesta obtain a majority of their water supply from the Floridan Aquifer

Pratt? Whitney

5,037 Hood Rd - This 7049 figure includes SUA well-fields outside the defined Lox River Basin

Permitted allocation values were also compared to actual pumpage values submitted to the District by the permit holder to get a comparison of the amount of water actually used during normal operations and what is used during peak demand periods. **Figure O-2** provides a monthly summary of the three identified Public Water Supply permittees within the Loxahatchee basin comparing actual data as a percentage of permit allocations during the period from 1988 to 1999.

B

Again of what value and relevance is this table?

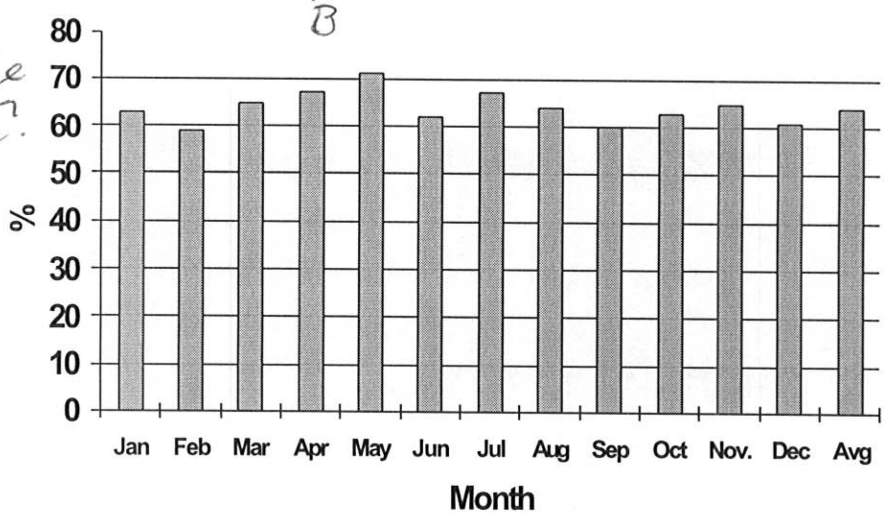

Figure O-2. Total Monthly Water Use by Jupiter, Seacoast (Hood Road Wellfield) and Tequesta expressed as a percentage of the total monthly allocation (996 million gallons per month) for these three Utilities.

Relevance?

In summary, the daily averages from the permit were compiled for each month and compared to values submitted from each utility, indicating that the actual pumpage values were, on average, between 60 and 70% of the allocation amount.

Use of traditional sources (surface water and the Surficial Aquifer System) for public water supply and landscape irrigation can be expanded for the Loxahatchee watershed with completion of the proposed water resource development projects outlined within the Lower East Coast Regional Water Supply Plan (SFWMD, 2000) and the Northern Palm Beach County Comprehensive Water Supply Plan (SFWMD, 2002) and more efficient use of regional and local water supplies. However, many of the projects will not be completed within the next five years. Therefore the SFWMD is placing more emphasis on implementation of a comprehensive water conservation program and the use of alternative sources such as the Floridan Aquifer System and reclaimed water, to help meet water needs during this period. Some public water utilities and golf courses have supplemented their water demand with the use of the Floridan Aquifer System. Development of a regional irrigation water distribution system using reclaimed water is also underway with the users listed in **Table O-5** already on line. Continued development of such alternative sources, increased emphasis on water conservation, along with some changes to wellfield configurations and operations will help meet the 1-in-10 year level of certainty and reduce impacts to the Loxahatchee River and estuary within the next five years.

This is HIGHLY misleading.
(1) A "regional" system is not being "developed," it is being studied.
(2) The users listed, those that currently receive reclaimed water, are connected to Lox River District's or Seacoast's system, not a "regional system."
(3) The failure to recognize existing successful reclaimed operations, both editorially and in evaluating regional resource impacts, is entirely inappropriate.

Table O-5 WATER SUPPLY DEMANDS WITHIN THE LOXAHATCHEE WATERSHED

Martin County			1996 Annual Water Use	1998 Annual Water Use	2000 Annual Water Use	1999 Allocations	
Land Use	Permittee	Permit Number	MGY	MGY	MGY	MGY	Ac-ft/Yr
AGR	SOUTH FLORIDA GRASSING	43-00021-W	N/A	N/A	N/A	289	887
	JENKINS LANDSCAPING	43-00045-W	N/A	N/A	N/A	67	206
	HOBE-ST LUCIE CONSERVANCY DISTRICT	43-00057-W	N/A	3072	5138	4460	13687
	SUNRISE-GULFSTREAM CITRUS GROVES	43-00120-W	N/A	N/A	N/A	545	1673
	SUNSHINE STATE CARNATION	43-00628-W	N/A	N/A	N/A	12	37
	SUN LAND CO	43-00839-W	0	0	0	974	2988
	SOUTH FLORIDA GRASSING INC	43-00893-W	N/A	N/A	N/A	410	1257
Sub Total						6757	20736
GOL	JUPITER HILLS CLUB	43-00054-W [wr]	N/A	66	234	58	177
*	MARINER SANDS COUNTRY CLUB	43-00064-W [wr]	201	586	618	298	914
	CYPRESS LINKS GOLF COURSE	43-00138-W	N/A	N/A	N/A	149	457
	TURTLE CREEK CLUB	43-00140-W [wr]	N/A	N/A	?	20	61
	EAGLEWOOD	43-00220-W [wr]	56	N/A	N/A	32	98
	JONATHANS LANDING GOLF CLUB,INC.	43-00221-W [wr]	104	91	N/A	237	728
*	JUPITER ISLAND GOLF COURSE	43-00273-W [fl]	92	138	309	16	50
*	THE MEDALIST	43-00800-W [wr]	?	?	N/A	46	141
Sub Total						855	2625
LAN	LITTLE CLUB CONDOMINIUM ASSOCIATION, INC. THE	43-00202-W	N/A	N/A	N/A	24	75
*	LOBLOLLY PINES DEVELOPMENT COMPANY	43-00382-W [wr]	N/A	194	184	106	325
	PRESERVE THE	43-00435-W	N/A	N/A	N/A	61	188
*	MARINERS SANDS LANDSCAPING	43-00441-W	N/A	3.7	4.9	69	213
	DOUBLE TREE COUNTRY CLUB	43-00632-W	N/A	N/A	N/A	154	473
	JUPITER HILLS HOMEOWNERS ASSOCIATION	43-00722-W	N/A	N/A	64	86	265
	RIVERSIDE MEMORIAL PARK	43-00885-W	N/A	0	N/A	23	70
Sub Total						524	1609

Why are these in the watershed? If these are included, why not Jupiter ~~Island~~ Island and Mariner Sands?

Table O-1. WATER SUPPLY DEMANDS WITHIN THE LOXAHATCHEE WATERSHED

Palm Beach County			1996 Annual Water Use	1998 Annual Water Use	2000 Annual Water Use	1999 Allocations	
Land Use	Permittee	Permit Number	MGY	MGY	MGY	MGY	Ac-ft/Yr
AGR	PARCEL 19.01	50-00547-W	N/A	N/A	N/A	167	511
	C-18 BASIN PROPERTY/MECCA FARMS	50-01626-W	N/A	N/A	N/A	19	59
Sub Total						186	570
GOL	TEQUESTA COUNTRY CLUB	50-00223-W wr	N/A	N/A	N/A	9	27
	SEMINOLE GOLF CLUB	50-00349-W	80	72	76	80	245
	PGA NATIONAL	50-00617-W	491	281	857	549	1685
	BALLENISLES CC OF JDM	50-00852-W wr	413	732	1344	171	524
	EASTPOINTE COUNTRY CLUB INC	50-00941-W wr	N/A	180	162	60	183
	STONEWAL ESTATES GOLF COURSE	50-01110-W	N/A	N/A	133	114	349
	OLD MARSH GOLF CLUB (UNIT 21)	50-01443-W	130	138	171	128	392
	IRONHORSE LAKE WELLS	50-01906-W	?	?	?	160	492
	INDIAN CREEK GOLF CLUB	50-02053-W wr	N/A	80	N/A	15	46
	IBIS GOLF & COUNTRY CLUB	50-02120-W	N/A	N/A	N/A	397	1219
	PUBLIC GOLF CORP. CITY OF PALM BEACH GARDENS	50-02319-W	N/A	N/A	N/A	40	123
	GOLF AND RACQUET CLUB AT EASTPOINTE	50-02831-W	N/A	180	162	44	135
	JUPITER DUNES	50-03079-W	N/A	46	N/A	39	119
	THE BEAR'S CLUB	50-04391-W wr	N/A	N/A	N/A	45	139
Sub Total						1850	5678
IND	WASTEWATER TREATMENT PLANT	50-00126-W	0	1.5	1.3	11	33
	TOWN OF JUPITER RECHARGE SYSTEM	50-01584-W	61	2.1	11	0	0
	PRATT & WHITNEY PUMP ADDITION	50-01663-W	N/A	N/A	2250	2466	7568
	NORTH COUNTY AQUATIC COMPLEX	50-02869-W	N/A	N/A	N/A	38	116
	MOBIL OIL STATION 02-F2W	50-02995-W	N/A	11	9.5	12	36
	TRI GAS INC AIR SEPARATION PLANT	50-03722-W	N/A	37	34	93	285
Sub Total						2619	8038

Table O-1. WATER SUPPLY DEMANDS WITHIN THE LOXAHATCHEE WATERSHED

Palm Beach County			1996 Annual Water Use	1998 Annual Water Use	2000 Annual Water Use	1999 Allocations	
Land Use	Permittee	Permit Number	MGY	MGY	MGY	MGY	Ac-ft/Yr
LAN	FRENCHMAN'S CREEK GOLF COURSE	50-00091-W	N/A	N/A	N/A	87	267
	JONATHAN'S LANDING	50-00237-W	208	211	285	319	979
	FPL JUNO BEACH OFFICE BUILDING	50-00742-W	N/A	N/A	N/A	15	46
	SEA OATS OF JUNO BEACH	50-01131-W	N/A	N/A	N/A	16	48
	OCEANSIDE TERRACE	50-01204-W	N/A	N/A	N/A	2	6
	RIDGE AT THE BLUFFS, H.O.A.	50-01282-W	88	104	73	52	158
	RIVER THE	50-01373-W	N/A	N/A	N/A	22	66
	JUPITER BAY	50-01391-W	N/A	4.24	N/A	8	26
	VILLAS OF OCEAN DUNES HOA	50-01392-W	N/A	N/A	N/A	18	56
	CRYSTAL POINTE	50-01442-W	N/A	N/A	N/A	14	44
	CROSSWINDS JUPITER SOUTH	50-01484-W	N/A	N/A	N/A	1	4
	SHORES THE	50-01485-W	N/A	N/A	N/A	0	0
	NORTHPOINT CORPORATE PARK	50-01490-W	N/A	N/A	N/A	34	104
	PALM BEACH PARK OF COMMERCE	50-01529-W	N/A	N/A	N/A	110	339
	ADMIRAL'S COVE AND ADMIRAL'S COVE WEST	50-01552-W	N/A	101	N/A	132	405
	INDIAN CREEK	50-01557-W	18	N/A	24	63	193
	PRATT & WHITNEY - IRRIGATION WATER SUPPLY	50-01664-W	N/A	N/A	N/A	38	116
	HAMPTON'S AT MAPLEWOOD THE	50-01702-W	N/A	N/A	N/A	50	152
	MARQUETTE ELECTRONICS	50-01842-W	N/A	N/A	N/A	5	16
	HIGH SCHOOL "GGG"	50-01955-W	N/A	N/A	N/A	30	93
	PALM BEACH MIDDLE SCHOOL A-A	50-02267-W	N/A	N/A	N/A	21	66
	BALLENISLES DEVELOPMENT	50-02370-W	N/A	N/A	118	70	215
	JUPITER PLANTATION	50-02871-W	N/A	N/A	N/A	15	47
	EASTLAKES PROPERTY OWNERS ASSOCIATION	50-03281-W	47	29	N/A	40	124
	EASTPOINTE PROPERTY OWNERS ASSOCIATION	50-03282-W WF	72	74	90	70	215
	THE SANCTUARY & FLAMINGO ROAD	50-03401-W	N/A	N/A	N/A	9	28
Sub Total						1243	3813

RESOLUTION NO. 67-01/02

A RESOLUTION OF THE VILLAGE COUNCIL OF THE VILLAGE OF TEQUESTA, PALM BEACH COUNTY, FLORIDA, OPPOSING A PROPOSED RULE BY THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT IMPLEMENTING A MINIMUM FLOW LEVEL OF 35 CFS FOR THE LOXAHATCHEE RIVER IN THE ABSENCE OF INCLUSION OF SEASONAL FLOW VARIATIONS, AND REQUESTING ADDITIONAL STEPS BE TAKEN TO ASSURE THAT RULES AFFECTING FLOWS TO THE LOXAHATCHEE RIVER INCLUDE SEASONAL FLOWS IN EXCESS OF 35 CFS PRIOR TO THE ADOPTION OF MINIMUM FLOW.

Whereas, South Florida Water Management District (SFWMD, the "District") is proposing to establish a Rule to establish Minimum Flow Level of 35 cfs (cubic feet per second) for the Loxahatchee River (the "River"); and

Whereas, a minimum flow of 35 cfs will only address minimum flows, in the event of drought conditions and does not address, nor assure season high level flows in excess of said amount continuing to flow to the River; and

Whereas, the River has historically received flows in excess of 35 cfs, and is dependent upon seasonal flows in excess of such amount to remain viable, healthy, and productive; and

Whereas, the River is one of the most valuable resources to the Village, enhancing our recreational lifestyle, our property values, and our sense of environmental awareness; and

Whereas, the SFWMD is failing to address Florida Statutes (FS) 373.042, which mandates the District to use best available information, inclusive of a seasonal variation, if appropriate, to the detriment of the River,

Now, Therefore it is hereby Resolved, that the Village of Tequesta opposes the implementation of said proposed Rule implementing a minimum flow level of 35 cfs, in the absence of inclusion of seasonal flow variations, and

Be it Further Resolved, that the Village hereby requests that additional steps be taken to assure that the Rules affecting flows to the River include seasonal flows in excess of 35 cfs prior to the adoption of minimum flow levels.

THE FOREGOING RESOLUTION WAS OFFERED by Councilmember von Frank, who moved its adoption. The motion was seconded by Councilmember Resnik, and upon being put to vote, the vote was as follows:

FOR ADOPTION **AGAINST ADOPTION**

Joseph N. Capretta
Russell J. von Frank
Edward D. Resnik

The Vice Mayor thereupon declared the Resolution duly passed and adopted this 8th day of August, 2002.

Joseph N. Capretta

Vice Mayor Joseph N. Capretta

ATTEST

Betty Laur

Acting Village Clerk
Betty Laur

Loxahatchee River Management Coordinating Council
July 29, 2002 Meeting
Council Member Attendance and Voting in Support of Resolution 02-02

Member	Affiliation
Linda McCarthy	Florida DACS
David Clark	City of Palm Bch. Gardens
David Brown	Town of Jupiter
Rick Dent	Lox. River Env. Control Dist.
Gale English	So. Indian River WCD
Geraldine Genco	Village of Tequesta
Janet Gettig	Martin County Conservation Rep.
Anthony Gravett	Landowner Representative
Tom Howard	Jupiter Inlet District
Marge Ketter	Florida DEP at-large
Richard Brust	Florida Fish & Wildlife Con. Comm.
Peter Merritt	Treasure Coast Reg. Planning Counc.
Jim Ostrander	River User Group
Commissioner Karen Marcus	Palm Beach County
Herb Zebuth	Florida DEP

Subject: Minimum Flows and Levels for the Loxahatchee River & Estuary
Date: Thu, 22 Aug 2002 06:05:41 -0700 (PDT)
From: Lloyd Brumfield <lloydb4@yahoo.com>
To: cmccart@sfwmd.gov

TO: Cathy McCarthy---South Florida Water Management District--SFWMD--Reply by 8-23-02

For many months, I have attended many meetings at the SFWMD, and other places, regarding the Loxahatchee River, especially the North Fork in Martin County, and the rapid degradation of the River. Also, it is very easily to come to the conclusion that all agencies, including the SFWMD, have intentionally neglected the Loxahatchee.

Dozens of conversations have been held with technical experts, which I am not, in all of the agencies and those who are not connected with the agencies.

The plan issued July 15, 2002 MINIMUM FLOWS AND LEVELS FOR THE LOXAHATCHEE RIVER & ESTUARY seems to be again lacking of care for the Loxahatchee River.

There are many points in the plan that could be mentioned, however, the number one is the inadequate 35 cfs MFL planned for the Loxahatchee River.

I have reviewed severals documents regarding CERP (Comprehensive Everglades Review Program) and the Loxahatchee scarcely is mentioned in some, and not at all in some.

It is my sincere hope that the SFWMD, the Corps, and the Florida DEP get serious about attending to what was the first WILD AND SCENIC RIVER designation in Florida.

There is an item that I find difficult to reconcile. When the Loxahatchee was designated the Wild and Scenic River, a coordinating council was established and has met continuously since 1985. Yet, the River has drastically degraded since that date.

===

A recent point really disturbs me. I am told that the item on the MFL of the Loxahatchee is on the agenda on September 11 in which the SFWMD Governing Board is meeting in Ft. Myers.

TELL ME IT AIN'T SO.

Sincerely,

Lloyd Brumfield, 11225 SW Meadowlark Circle, Stuart, FL 34997-2730--Phone 772-286-4326---Fax 772-286-3244

TOWN OF JUPITER

UTILITIES
PO BOX 8900
JUPITER FL 33468-8900

August 14, 2002

Matthew Morrison, Director
Water Supply Department Director
South Florida Water Management District
3301 Gun Club Road, B-1 Building
West Palm Beach, Florida 33406-3089

Re: July 15, 2002 Draft to Loxahatchee River MFL Document

Dear Matt:

We have reviewed the July 15, 2002 Draft to the Loxahatchee River Minimum Flow and Levels (MFL) Document and offer the following comments for your review and action:

1. General: We are supportive of the establishment of the 35 cfs minimum flow to the Northwest Fork of the Loxahatchee as a positive first step in protecting the NW Fork from further impacts due to upstream propagation of saline water.

2. Effects of Consumptive Uses: The document fails to effectively provide evidence of the effects of consumptive uses on the surface and ground water flows to the Loxahatchee Slough and the Northwest Fork of the river. Appendix I to the document has yet to be included which apparently was to serve as supporting documentation. Generally speaking, the conclusions drawn within the text related to the effects of consumptive uses are presently unsubstantiated.

3. Consumptive Use Provisions/MFL: Given the vast financial and technical investment made by Jupiter residents in the use of alternative water supplies in order to protect fresh water flows to the river, strong objection would be offered in response to any action leading to the reduction in existing or proposed consumptive uses within the Town. Regulatory strategies to be adopted by rule, should be crafted to promote the advancement of alternative water supply production, not hamper it. Regulatory strategies such as a prohibition on groundwater drawdowns greater than 0.1 ft beneath the C-18 Canal may

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www.jupiter.fl.us

significantly jeopardize the economical feasibility of Jupiter's Alternative Water Supply Program if left to broad interpretation.

4. Salinity Barrier Feasibility Analysis: We strongly urge the investigation of the feasibility of a structural control to facilitate enhanced restoration of the river's freshwater ecosystem in lieu of wasting fresh water to tide. It is believed that an environmentally sound solution to this option is readily available which would result in far less cost over time plus minimize downstream ecosystem disruption as the southern reaches of the Northwest Fork become less saline.

5. SW Fork MFL: We are greatly disappointed that the District has opted to eliminate the proposed MFL to the SW Fork of the river without properly addressing the need to facilitate the benefits that such a flow would create. It is hoped that the District will come to realize the vast "big picture" environmental benefits of Jupiter's Alternative Water Supply Program and offer support. Failure to secure a cost effective means of RO concentrate disposal will lead to a greater reliance on fresh water supplies which is contrary to our common water management goal.

6. Operational Protocols: The issue of establishing operational protocols for the Northern Palm Beach County Water Supply Projects remains unanswered. Significant concerns exist whether shared adversity is to be the standard of operation in times of drought and whether the SFWMD will be formalizing these arrangements as the operator of the regional system. Without a firm commitment on this matter, it is impossible to judge the appropriateness of any recovery/restoration plan or strategy.

I apologize for the delay of presenting these comments in writing; however, I believe they are reflective of our previous conversations since the publishing of the July 15, 2002 draft document. Should you have any questions, please call.

Sincerely,

David L. Brown
Director of Utilities

cc: Robert Barolotta, Town Manager
Jim Anderson, Stemle, Anderson and Associates
Shannon LaRocque, Assistant Utilities Director

K:\Water\Mngmt\DAVID\LETTERS\SFWMD\MorrisonLoxMFLLTR.wpd

PALM BEACH COUNTY FLORIDA

Department of Environmental Resources Management

3323 Belvedere Road, Building 502

West Palm Beach, FL 33406-1548

(561) 233-2400

Fax: (561) 233-2414

www.pbcgov.com

August 22, 2002

Mr. John Zahina, Project Manager
South Florida Water Management District
Post Office Box 24680
West Palm Beach, Florida 33416-4680

SUBJECT: LOXAHATCHEE RIVER MFL DOCUMENT

Dear Mr. Zahina:

The following are our department's comments on the July 12, 2002 draft Minimum Flows and Levels for the Loxahatchee River and Estuary, Technical Document. The document was provided to us for our review, and our staff downloaded several of the appendixes from the web site. We will start with general comments first and follow with specific comments.

General Comments

In general, we are disappointed that many of our comments that we made in a July 19, 2001 letter concerning the previous draft were either not addressed or only partially addressed. In particular, errors in historical information have not been corrected in the current draft. Because many of our previous comments are still valid, we are enclosing a copy of our previous letter.

We are also disappointed that the document does not look beyond the proposed Comprehensive Everglades Restoration Project (CERP) and Northern Palm Beach County Comprehensive Water Management Plan (NPBCCWMP) projects for Minimum Flows and Levels (MFL) recovery strategies in Chapter 6. As we detailed in our February 28, 2002 comment letter on the NPBCCWMP plan (enclosed), several of these projects have major environmental impacts, appear to have poor cost-to-benefit ratios, and may otherwise not be implementable. We believe that the MFL recovery plan chapter should have taken a fresh look at all projects, eliminated those of questionable benefit, and considered additional projects that might have merit.

A serious deficiency in the MFL recovery plan is a failure to investigate the potential benefits of a stormwater retention reservoir on land along the west leg of the C-18 Canal. This promising option has been given only vague mention under issues to be studied later. As we have noted in previous correspondence, there is 4,600 acres of agricultural land along the west leg of the C-18 Canal that could potentially be used to capture the runoff from 47 square miles of the Loxahatchee River watershed. A 600-acre reservoir with a depth of 8 feet (4,800 acre/feet) could provide 50 cfs of baseflow to the river for a 90-day period. This reservoir alone could provide almost all the additional baseflow needed to meet the 65 cfs 2018 target, and would help attenuate peak stormwater flows to the river. The reservoir could be funded by eliminating projects with major environmental impacts, like the C-17 and C-51 backpumping projects, and transferring the $51 million estimated for these two projects to the reservoir. Given the obvious benefits of a C-18 reservoir, we are mystified by the District's lack of interest in this project. We request that the MFL recovery plan chapter be re-written to evaluate the potential of this project.

Specific Comments

Page 10, 2nd paragraph - The Loxahatchee Slough Natural Area has been left off the list of publicly-owned natural areas and the name of the Beeline Natural Area has been changed to the Hungryland Slough Natural Area.

Page 15, last paragraph - Cypress Creek does not drain the Hungryland Slough and only drains a small portion of Jupiter Farms.

Page 32 - The document states that construction of the C-18 Canal reduced the size of the Loxahatchee Basin from 270 to 210 square miles without saying how. To our knowledge, the construction of the C-18 Canal merely drained the watershed and did not cut any portion of the basin off from the rest. The reduction of the basin appears to be caused by the berming off of the southern portions of the Loxahatchee Slough by the construction of the CSX railroad, which forms the West Palm Beach Water Catchment Area (WCA), and the draining of the portions of the slough south of the WCA by Lake Worth Drainage District. This section needs to be rewritten to explain how the watershed basin was reduced.

Page 43, Table 9 - The Hungryland Slough Natural Area next to the Corbett WMA that the County manages is only around 3,000 acres, not 10,000. If you count the portion of the Hungryland Slough within the Loxahatchee Slough Natural Area, that gives an additional 1,900 acres. However, if you count this acreage, you must reduce the Loxahatchee Slough acreage by the same amount to avoid double-counting the same acreage.

Page 113, Table 3 - The District should be careful about putting much reliance on pond apple as a key species for the valued ecosystem component (VEC). Environmental Resources Management (ERM) staff has frequently observed pond apple growing in more saline conditions than the other five key species. The data in Table 23 supports these observations. Staff reports that in many locations, it is not brackish water that kills pond apple, but destruction of the trunk and aboveground roots by marine boring organisms.

Page 153, 2nd paragraph - The management target statement "Provide supplemental water to the Loxahatchee Slough sufficient to maintain water levels that do not fall below the identified hydroperiod targets by more than six inches during normal years" does not make sense. The target hydroperiod was developed to replicate the natural Slough fluctuation under normal rainfall conditions, and should be easily met during normal years. In fact, in the western portions of the Slough where the outfall culverts are boarded up, the Slough already achieves the target hydroperiod 90-95% percent of the time in normal rainfall years without any supplemental water. When the Loxahatchee Slough Structure is built, the entire Slough will achieve similar results without any supplemental water. In a normal year, the only way the Slough would fall six inches below the target hydroperiod would be if water was being withdrawn from the Slough after water levels dropped below the target. For the first part of the target statement to be meaningful, it should be changed to read "do not fall below the identified hydroperiod targets by more than two inches during normal years" or this portion of the statement should be deleted. ERM concurs with the second part of the statement about maintaining water levels that do not drop six inches below the target hydroperiod for more than 30 days during drought periods with a return frequency of once every 10 years.

Page 156 - Phase 3 Projects - A project to install a pump station to collect runoff from the Corbett Wildlife Management Area into the C-18 Canal and store it into the Loxahatchee Slough is listed as planned despite our previous objections to this project (see both enclosed letters). ERM manages the Slough, but this project has never been discussed with us or approved by us. There will be very few situations when excess water is available in the C-18 Canal and the Slough is also below its target hydroperiod. Pumping water into the Slough when it is at or above its target hydroperiod is incompatible with the purposes for which it was purchased and the County's proposed management of the Slough. We believe that this project is not cost-effective, as any benefit from C-18 backpumping will be minimal.

As previously stated, any funding for the C-18 backpumping project would be better applied to development of a far more useful C-18 Reservoir project. We request that the C-18 backpumping project be removed from the recovery plan projects and either deleted entirely, or placed on a list of projects requiring further study. If this project remains as a recovery plan component , it should be noted that permission and cooperation from our department is not assured.

Should you have any questions about these comments, please do not hesitate to contact me at (561) 233-2400.

Sincerely,

Richard E. Walesky

Richard E. Walesky, Director
Environmental Resources Management

REW:SF
cc:(with enclosures)(2)
Ken Todd , Water Resources Manager, Palm Beach County
Patricia Walker, Plan Manager, SFWMD
Loxahatchee River Coordinating Council

Department of Environmental Resources Management
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July 19, 2001

Ms. Kathy LaMartina, Program Manager
District-wide MFL Program
South Florida Water Management District
P.O. Box 24680
3301 Gun Club Road
West Palm Beach, FL 33416-4680

Dear Ms. LaMartina:

SUBJECT: COMMENTS ON DRAFT REPORT ENTITLED " MINIMUM FLOWS AND LEVELS FOR THE LOXAHATCHEE RIVER AND ESTUARY"

The Department of Environmental Resources Management (ERM) appreciates the opportunity to comment on the draft technical document describing the methods and technical criteria for developing minimum flows and levels (MFLs) for the Loxahatchee River and estuary. We support the District's efforts to reduce or prevent harm and restore the Loxahatchee River and estuary. Our comments are as follows:

Introduction and Background (page 1) - It would be helpful if the introduction and background explained the relationship between the establishment of MFLs and the requirements and goals of the Loxahatchee River National Wild and Scenic River Management Plan, the Loxahatchee River Watershed Action Plan, and the various state and federal laws affecting management of the Loxahatchee River.

Water Reservation Rules (page 9) - Water reservations rules to achieve the MFLs are to be drafted at some undetermined date in the future. The majority of the flows needed to satisfy the MFLs appear to be coming from the Loxahatchee Slough. We request that no water reservation rules be adopted until minimum (and maximum) flows and levels have been established for the Loxahatchee Slough. Some of the proposed strategies to provide MFL flows to the Loxahatchee River have the potential to cause significant harm to the Loxahatchee Slough. Although we strongly support efforts to provide minimum flows to the Loxahatchee River, it should not be accomplished at the expense of another valuable natural resource area.

Rainfall Data (page 12) - The rainfall data used are from 1982, and do not include more recent studies (for example, Dent 1997 - "Rainfall Variations in the Loxahatchee River Watershed"). The use of the most recent studies will become more critical when future versions of the salinity model that will include precipitation are run.

Tributary Information (page 15) - Cypress Creek does not drain Jupiter Farms or the Hungryland Slough.

History Information (pages 19 - 20) - The private Florida Coast Line Canal and Transportation Company dredged the 50-foot-wide Florida East Coast Canal between Jacksonville and Miami from 1890 to 1912. It was turned over to the federal government in the late 1920s, and was widened, deepened, straightened, and renamed the Atlantic Intracoastal Waterway in the early 1930s. The first Fort Jupiter was present on Pennock Point from 1838 to 1844, and the second Fort Jupiter was present north of Center Street from 1855 to 1860 (DuBois 1981- "The History of the Loxahatchee River"). Fort Jupiter was not present on Jupiter Island in the 1870s, and Henry Flagler was not active in Palm Beach County until the 1890s. The Florida East Coast Railroad bridge was constructed across the Loxahatchee River in1894. Railroad service to West Palm Beach began in the fall of that year. The first bridge for present-day Alternate A1A was constructed in 1911 (Dubois 1981).

Land Use (pages 33 -34) - The table on page 33 does not include any conservation lands outside of Jonathan Dickinson State Park. The Jupiter Ridge Natural Area and the Juno Dunes Natural Area are in the Coastal subbasin; the Pal-Mar Natural Area and the Loxahatchee River Natural Area are in the Cypress/Pal-Mar subbasin; the Loxahatchee Slough Natural Area, the Hungryland Slough Natural Area, and the J. W. Corbett Wildlife Management Area are in the C-18/Corbett subbasin. These lands should be moved from the undeveloped land use category to the conservation category. The map on page 34 should not show an urban land use designation for unbuilt Unit 11 in the Acreage.

Water Catchment Area - The report is inconsistent in the treatment of the West Palm Beach Water Catchment Area (WCA). This area is not considered part of the Loxahatchee River watershed (pages 13 and 14), but the City of West Palm Beach is considered a major water user in the watershed (page 35). We recommend the following changes: 1) add the portion of the WCA north of Northlake Boulevard to the watershed, since this area currently drains into the Loxahatchee Slough; 2) do not add the WCA portions south of Northlake Boulevard to the watershed until sufficient improvements are made to provide a significant hydrological connection between the WCA and the Slough; and 3) do not include the City of West Palm Beach as a water user until a significant hydrological connection is established.

Water Supply (pages 35 - 36) - The urban water supply demands are significantly overstated by including permitted users outside the watershed. Besides the City of West Palm Beach, the City of Riviera Beach, the Town of Mangonia Park, Good Samaritan Hospital, PBC/Century Utilities, and Palm Beach County (2W, 8W) are all located outside the Loxahatchee River watershed in the C-17 Canal and Intracoastal drainage basins. The only urban users in the watershed are the Town of Jupiter, the Town of Tequesta, United Technologies, the Palm Beach Park of Commerce, and part of Seacoast Utilities. The report includes the total permit amount for Seacoast Utilities, which includes the Hood Road wellfield and the North Palm Beach, Burma Road, and Palm Beach Gardens wellfields. Only the numbers for the Hood Road wellfield, which is in the watershed, should be used. The three other wellfields are in the C-17 or Intracoastal watershed. If a significant hydrological connection to the WCA is established, then the City of West Palm Beach and other water suppliers dependent on recharge from the WCA could be added in the future.

Review of Aerial Photographs - The report contains several incorrect conclusions based on an analysis of the 1940 and 1995 aerial photographs. First, cypress trees are said to have disappeared because of less frequent inundation of the floodplain (page 80, page B-10). The report does not include the most obvious reason that cypress trees disappear - they are cut down. According to Dubois (1981, page 8), the entire Loxahatchee River was logged in 1941. This logging is referred to on pages 20 and 72 of the report. The statement in the report that the cypress trees remain where the floodplain was wider (and the trees were harder to log since they had to be dragged farther to the river channel) indirectly supports this. The replacement of cypress by swamp hardwoods after logging has been well-documented elsewhere (such as in the Fakahatchee Strand). Mature canopy bald cypress trees will not disappear because of inundation changes, and are quite capable of surviving on dry land. The seedling recruitment phase is when cypress trees are sensitive to water levels. If the trees had died, the dead snags should still be present as the snags are down-river. The logging explanation can be verified by looking for stumps in the areas that cypress disappeared from, or by reviewing other aerial photographs such as the 1953 series available at the local Soil and Water Conservation District office. Second, the statement that slash pine and saw palmetto have invaded the floodplain (pages 79 and B-8) also does not consider the effects of logging. Virtually all of the pine flatwoods in Palm Beach County were logged in the 1920s and 1930s. Without trees, these areas would look like wet prairies in aerial photographs. The pine forest regrew and saw palmetto expanded when wildfires were suppressed. If the soil type is checked in these areas, it will be found to be typical of pine flatwoods and not wet prairie. The incorrect conclusions about vegetation changes are important because they are cited as reasons to support the MFL, when in fact all they demonstrate are the effects of logging. Finally, there were no citrus groves on the river prior to 1940 (pages 78 and B-6). The orange groves in Riverbend County Park, the Reese tract, and the Shunk tract were established around 1900 (Jackson 1978 - "Early History of Jupiter, Florida") and are visible in the 1940 photograph. Their presence is alluded to on page 35 of the report. The Bee Line Highway was present in 1940 (pages 78 and B-5). What was actually present was the Seaboard Airline Railroad (the present-day CSX Railroad). The Bee Line Highway was not constructed until the late 1950s.

Salinity/MFL Analysis - The conclusion of the analysis is that 50 cubic feet per second (cfs) across the Lainhart Dam is all that is needed to maintain the status quo. This amount of water holds the salinity wedge at river mile 8.6, which is in the dead cypress zone and below the zone of stressed and dying cypress (page 87). The proposed MFL is 70 cfs, which would hold the salinity wedge at river mile 8.1, which is below the junction with Kitching Creek, and a significant improvement over current conditions. The Department of Environmental Protection has indicated that a much greater flow will be needed to move the saltwater wedge downstream of Jonathan Dickinson State Park and restore the Loxahatchee River (T. Swihart letter to K. LaMartina, June 18, 2001). There are some indications that this improvement can only be achieved by taking actions that would damage the Loxahatchee Slough (taking too much water out, pumping too much water in). This relates to our first recommendation - that MFLs for the river should not be established until MFLs for the Loxahatchee Slough have been established. Damaging the slough in order to improve the river is not an acceptable tradeoff. Strategies need to be identified that will protect both resources and provide for the future restoration of the River.

Selection of Cypress as Indicator Species - The technical discussion in the report leads one to the conclusion that cypress trees are the key indicator of minimum flow levels and saltwater intrusion into the floodplain. However, other plant and animal species are more sensitive to very small changes in salt concentration for extended periods of time. We recommend that further review be conducted to ensure that a sufficient scientific basis exists for using cypress as the indicator species.

Modeling - General Comments (page 58) - There is some question as to whether the two-dimensional hydrological model used in the plan is suitable for use in predicting freshwater and saltwater inflows to the estuary and the response of the river to these flows. A three-dimensional model, such as that used by the U.S.

Army Corps of Engineers, may provide a more accurate prediction of the effects of saltwater intrusion on both the Northwest Fork and the North Fork of the Loxahatchee River.

Data from a 1982 U.S. Geological Survey study was used in the determination of surface freshwater inflows. We believe that these data are out of date and inaccurate. The watershed has undergone major changes in the last 20 years, including the development of new wellfields, the expansion of row crop agriculture, and construction of many residential housing developments, all of which have the potential to affect freshwater inflows. If more recent data is available it should used in the inflow determinations. If it is not available, it may be appropriate to implement temporary measures to prevent further harm to the Loxahatchee River and delay the final adoption of MFLs until accurate flow data is available.

It is our understanding that the freshwater inflows from the North Fork of the Loxahatchee River were not included in the modeling runs. We believe that the North Fork should be included in all models and in the final rule because it plays a key role in providing freshwater inputs to the estuary.

Minimum Duration Requirement - The report recommends that the flows delivered to the Northwest Fork of the Loxahatchee River, as measured at the Lainhart Dam, not fall below 70 cfs for more than 20 consecutive days to protect the upstream cypress community against significant harm. The report, however, acknowledges that there is a lack of information concerning the ability of the saltwater wedge to penetrate the floodplain water table and the salinity level that will cause damage or mortality to cypress trees. The 20 day figure is recommended as a "placeholder" until better information becomes available. Since there is data that shows that under a reduced flow regime (e.g. from 65 to 35 cfs) for a 5 - 8 day time period, the saltwater wedge can move upstream a distance of approximately 1.0 - 1.5 river miles (report, p. 101), it would seem more prudent to establish a "placeholder" of 10 days or less.

Proposed Recovery Plan - Backpumping Into the Slough - It appears that pumps are proposed to be placed in the west leg of the C-18 Canal to backpump runoff water from the J. W. Corbett Wildlife Management Area into the Loxahatchee Slough. This action appears to be the mechanism to be used to achieve the 2020 projection that shows the slough permanently flooded, which will be very damaging to the slough. We request that this approach not be taken, and that an alternative approach be used - establishment of a stormwater impoundment along the west leg of the C-18 Canal on agricultural lands.

Proposed Recovery Plan - Groundwater Pumping Review - The report contains numerous references as to how lowered groundwater levels have affected freshwater flows to the river. However, there is no clearly stated objective to study the effects of pumping of groundwater for irrigation for the large-scale agricultural operations that border the river, or any commitment to reevaluate and possibly reduce the withdrawals when the consumption permits come up for renewal. As this process proceeds, the consumptive use permits for all currently supplied utilities should be reexamined. The review should include the sufficiency or feasibility of permit conditions restricting pumping during various levels of water restrictions. These actions should be added to the strategies to meet MFL needs.

Proposed Recovery Plan - Culvert Work - There are numerous existing culverts within the watershed that are in need of repair or replacement. Phase 1 of the Recovery Plan should include an evaluation of all existing culverts and repair/replacement as needed.

Again, we thank you for the opportunity to comment on the report. If you have any questions regarding our comments, please contact me or Jon Van Arnam, Deputy Director at (561) 233-2400.

Sincerely,

Richard E. Walesky, Director
Environmental Resources Management

REW:si
cc: Ken Todd, Water Resources Manager, Palm Beach County

Department of Environmental Resources Management
3323 Belvedere Road, Building 502
West Palm Beach, FL 33406-1548
(561) 233-2400
Fax: (561) 233-2414
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February 28, 2002

Ms. Patricia Walker, Plan Manager
South Florida Water Management District
Post Office Box 24680
West Palm Beach, Florida 33416-4680

SUBJECT: NORTHERN PALM BEACH COUNTY COMPREHENSIVE WATER MANAGEMENT PLAN

Dear Ms. Walker,

The following are our department's comments on the final draft of the Northern Palm Beach County Comprehensive Water Management Plan, both the Planning Document (PD) and the Technical Support Document (TSD). These documents were provided to us for our review.

Page 13, PD - The statement in the second paragraph about much of the slough is covered by exotics is not accurate. Vegetation mapping performed by Erwin in 1992 indicated that 645 acres or approximately 12.4% of the central wetland portion of the Loxahatchee Slough was predominantly exotic vegetation. The acreage may have expanded somewhat since then, but still is estimated as below 20 percent. While the Slough does have a significant amount of exotics, they do not cover much of the Slough. In the same paragraph, there is another erroneous statement that "the slough is serving as a seed source for infestation" of exotics into the Water Catchment Area (WCA). This statement is neither accurate nor supported by any scientific evidence. The Loxahatchee Slough is located north of the WCA and the prevailing wind direction is from the southeast, which would blow nearly all seeds released in the Slough away from the WCA. The seed source for infestation in the WCA is from land along its eastern border and remaining exotics within the WCA. We request that these two statements either be corrected or eliminated.

Page 29, PD - The C-17 Backpumping and Treatment project described on this page has a stormwater treatment area (STA) that is located on land that is predominantly native vegetation with large amounts of wetlands. Usage of this land as an STA will result in the destruction of large acreages of native uplands and wetlands, and require high amounts of mitigation with the resulting increased costs. The project could also compete for C-17 basin water with the County's 550-acre SWA Buffer wetland restoration and creation project, which also envisions diverting water from North Palm Beach County Improvement District Canals and the Turnpike Canal, and which is currently in the permitting process. Since the PD says that areas of existing or potential conflict should be identified in the plan (Page v), the discussion of the C-17 project should include this information.

Pages 29 and 30, PD - The C-51 Backpumping and Treatment project described on these pages has a STA that is located on a 600-acre parcel known as the Section 1 tract. This tract has been identified as environmentally-sensitive land and has been on the priority list for the County's environmentally-sensitive lands acquisition program since 1991. This land is entirely native vegetation with large amounts of wetlands. Usage of this land as an STA will result in the destruction of large acreages of native uplands and wetlands, and require very large amounts of mitigation with enormous costs. The new supply canal for this STA will have to run through or adjacent to the County-owned Pond Cypress Natural Area for 2.75 miles and could have major impacts to this nature preserve. Our department expects that the land targeted for the STA will be acquired by the County for environmental preservation and/or mitigation for road construction impacts, and will not be available for use for an STA by the time project construction is expected to start in 2008. Since the PD says that areas of existing or potential conflict should be identified in the plan (Page v), the discussion of the C-51 project should include this information.

Pages 36 and 37, PD - The discussion of the C-18 Reservoir is flawed by unfounded assumptions and unevenly applied criteria. There is not a limited availability of land in the west C-18 basin, as is frequently stated. There is 2,700 acres of agricultural land in the Vavrus ranch and 1,900 acres in the Mecca Farms tract. Representatives of both of these owners have expressed to us a willingness to consider a sale. We note that there is far more land available in the C-18 basin than is available in the C-51 or C-17 basins, yet neither of the two STA projects in those basins are described as having limited land availability. The discussion also limits the reservoir's depth to 6 feet without explaining why it could not be deeper. Finally, it states that a C-18 reservoir was insufficient to meet needs in a 1-in-10 year drought. Many components in the PD do not meet 1-in-10 criteria, including the regional conveyance system (Pages 23, 31, and 38, TSD). We request that either the 1-in-10 year criteria be eliminated from the discussion, or that the performance of all components of the PD be discussed for this criteria.

We note that the best performance for the Loxahatchee Slough and the northwest fork of the Loxahatchee River in avoiding exceeding high and low water target levels was for modeling runs 3 and 6, which included a limited 300-acre C-18 reservoir (Tables 15 and 16, PD) We believe that the performance would even be better if an adequately-sized reservoir was modeled, as it would attenuate stormwater flows and provide additional baseflow to the river. A 600-acre reservoir with a depth of 8 feet (4,800 acre/feet) could provide 50 cfs of baseflow for a 90-day period. This would be nearly all the 5,000 acre/feet annual deficit identified for the river (Page 24, PD). We note that stormwater from approximately 47 square miles could be directed to this reservoir, which is far more than the 33 square miles in the C-17 basin, where a stormwater retention area is proposed..

It seems obvious to us that both a C-18 reservoir and the regional conveyance system will be necessary to meet the needs of the Loxahatchee River. The reservoir could help to relieve some of the demand on the regional system, and might make components with major environmental impacts, like the C-17 and C-51 backpumping, unnecessary. The $51 million estimated for these two projects (Page 26, PD) could then be utilized for the reservoir. We request that the section on the C-18 Reservoir in both the PD and the TSD be re-written to eliminate unfounded assumptions and selectively-applied criteria. These sections should present the information on this component in a fair-handed manner and indicate how the potential of this component will be examined. We advise that land acquisition for this component needs to undertaken as soon as possible as the land may not be available several years into the future.

Page 39, PD - At the bottom of the third paragraph, there is a statement that a high rate of inflow from the C-18 Canal at the Mirasol site was to refill wetlands in the eastern Loxahatchee Slough drained by the opening of the S-46 structure. This statement is incorrect. The C-18 Canal is maintained at 14.8 feet (page 39, PD) and the Slough is completely dry at 15 feet (page 36, PD). The C-18 water does not flow uphill to refill these wetlands. The inflows at the Mirasol site are caused by a direct connection from the C-18 Canal, via the Mirasol site drainage canals, to the Turnpike canal. The Turnpike canal is drawn down to levels of 11 to 12 feet by the Hood Road wellfield pumping. This statement should either be corrected or eliminated.

Page 48, PD - We request that the County's SWA Buffer wetland restoration and recreation project be added to Table 6. The project was initiated in 2001, Palm Beach County is the lead agency, and the estimated projected cost is $10 million. The phrase "six new culverts" after the C-18 Culvert Connections to the Hungryland Slough project name should be deleted and replaced with "removal/replacement of existing culverts"

Pages 55 and 56, PD - We request that the recommendations on these pages to install a pump station to collect runoff from the Corbett Wildlife Management Area into the C-18 Canal and store it into the Loxahatchee Slough be deleted. We are not sure whether this is the same component as the back-pumping from South Indian River Water Control District (SIRWCD), but are opposed to both. Development of this pump station presupposes that the C-18 Reservoir will not be built. We believe that the reservoir will be found necessary and the pump station will be redundant. We also believe that additional storage for SIRWCD water should be found within SIRWCD's system. In any case, we believe that any benefit from C-18 backpumping will be minimal. There will be very few situations when excess water is available in the C-18 Canal and the Loxahatchee Slough is also below its target hydroperiod. Pumping water into the Slough when it is at or above its target hydroperiod is incompatible with the purposes for which it was purchased and the County's proposed management of the Slough. We are unable to tell if there is any significant benefit from the SIRWCD backpumping since it was modeled in five of the six modeling scenarios (page 7, TSD), but the benefits seem to be minimal. The regional conveyance system improvements are supposed to meet the minimal additional water requirements of the Slough and deliveries to the Slough are used as part of the justification for these improvements. We request that no action be taken on any C-18 backpumping until a final decision has been made on the C-18 reservoir, and that any benefits from the backpumping be clearly defined separate from other components and determined consistent with the constraints under which the Slough will be managed.

If you have any questions, please do not hesitate to contact me at (561) 233-2400.

Sincerely,

Richard E. Walesky

Richard E. Walesky, Director
Environmental Resources Management

REW:SF:dkg
cc: Robert Weisman, County Administrator
Gary Dernlan, Director, Water Utilities
Michael Voich, Project Manager, SFWMD
Loxahatchee River Coordinating Council

MARGE KETTER
7088 SE Rivers Edge
Jupiter FL 33458
561-747-9487

September 3, 2002

Mr. Thomas F. McCracken, Dept. Director
Land & Management Operations
South Florida Water Management District
P. O. Box 24680
West Palm Beach FL 33416-4680 FAX 561-681=6233

RE: OBJECTION TO DRAFT PROPOSED CONDITIONS OF PUD APPROVAL OF JUPITER ISLES RELATING TO 95.1 ACRES OF PINE FLATWOOD FOREST OWNED BY SFWMD LYING WEST OF AND ADJACENT TO JUPITER ISLES.
JUPITER TOWN COUNCIL FINAL HEARING RE JUPITER ISLES 9/3/02 7PM

Dear Mr. McCracken:

As a user, friend, and neighbor of Jonathan Dickinson State Park, I object to your approval of the above mentioned document proposed by John Fenniman on behalf of Schickedanz Capital Group LLC.

Any effort by the developer to mitigate the lack of adequate buffer on the western boundary of the Jupiter Isles project is unacceptable.

The 660-foot buffer in the 2000 Loxahatchee River Wild & Scenic Management Plan must be enforced. Complying with the Management Plan is required; it is not discretionary. The Plan requires increased buffering. It is not appropriate for you to support a 25-foot buffer when the Management Plan calls for 660.

SFWMD, DEP, local governments, and other agencies, all signed on to this Plan.

Members of the public are incensed the Plan is not being enforced!

Sincerely,

Marge Ketter

Marge Ketter

cc Albert Gregory, Div. Rec. & Parks
Mark Nelson, Park Manager
Dick Roberts, Park Biologist
Roger Bursey, Pres. Friends of JDSP

Catherine Dwore
13105 Silver Fox Trail
Palm Beach Gardens, FL 33418
561.624.9032

September 3, 2002

Mr. Thomas F. McCracken
Director, Land Management Operations
South Florida Water Management District
PO Box 24680
West Palm Beach, FL 33416-4680

RE: OBJECTION TO DRAFT PROPOSED CONDITIONS OF PUD APPROVAL OF JUPITER ISLES RELATING TO 95.1 ACRES OF PINE FLATWOOD FOREST OWNED BY SFWMD LYING WEST OF AND ADJACENT TO JUPITER ISLES

Dear Mr. McCracken:

As a user and friend of the Jonathan Dickinson State Park I am writing to object to approval by SFWMD of the above mentioned document proposed by John Fenniman on behalf of Schickedanz Capital Group, LLC.

This document provides no real protection to the park and is virtually unenforceable by the Town of Jupiter. Further, it places Jonathan Dickinson State Park/DEP and SFWMD in the position of taking action against a Homeowners Association and incurring the cost of potentially perpetual conflict in order to seek enforcement. Such conflict is best avoided by insisting that the Town of Jupiter protect the Park and the river from degradation of resources by exercising its land use and zoning authority to increase the buffer. Finally, it is entirely inappropriate for SFWMD to approve this document and the twenty-five foot (25' buffer) when the Loxahatchee River Management Plan, which the district has adopted, calls for buffer more in keeping with six hundred and sixty feet (660') buffer enacted by Palm Beach County.

The matter of Jupiter Isles will come before the Town of Jupiter Town Council this evening and it is my understanding that the applicant, Schickedanz Capital Group LLC, through legal counsel John Fenniman, will portray to the Town Council that the SFWMD supports this document. For the reasons I have outlined above the district should NOT support this document. I urge you to reject this agreement and authorize staff representation at the Town Council meeting this evening to enter the District's objections into the record.

Sincerely,

Catherine Dwore

Catherine Dwore

Cc: Mr. Henry Dean
Mr. Fred Davis
Mr. Chip Merriam
Ms. Pat Walker

Subject: **presentation of mf & levels for LR & estuary at EAC mtg 9/3/02 & the draft documents**
Date: Wed, 04 Sep 2002 19:45:16 -0700
From: Thomas & Elizabeth Poulson <tomandliz@adelphia.net>
To: jzahina@sfwmd.gov
CC: jaminfo@aol.com, mmorrison@sfwmd.gov, dswift@sfwmd.gov, cmccart@sfwmd.gov, twaterhouse@sfwmd.gov, vanarman@sfwmd.gov, mjmorris@sfwmd.gov

Dear colleagues:

I give the following critique as an ecologist that does long-term (decades) field work to use natural experiments to distinguish among multiple hypotheses. My primary expertise is with cave ecology and management (40 years of research and consultation, including 3 summers as an Ecological Consultant at GS-14, at Mammoth Cave National Park) but I have also worked with succession at Indiana Dunes National Lakeshore and with old-growth forests (especially beech - sugar maple) where I have evaluated multiple hypotheses about forest dynamics over decades to centuries. I have also been on the scientific advisory committee for TNC - Illinois.

I was impressed & largely convinced by your responses to the peer review of you initial document:

1. improvement of the salinity prediction model & verification thereof (John)
2. explanation of how continued change in structures and protocols will further improve the MFLs delivered to the LR (Matthew)
3. multiple criteria for picking a group of plant species that will be surrogates for the "health" of the freshwater parts of the LR (draft document)

I was less impressed by the lack of good criteria for the short-term + or - responses of the freshwater ecosystem to management and natural events like hurricanes and drought. You need to fill in these gaps.

1. Your data on "seedlings" (< breast high) and "saplings" (> breast high & < adult size -- criteria for adult never indicated) are inadequate. You need to go back to what I hope are permanent transects and get detailed data that will give real size-frequency distributions. As you point out in your prose, the smallest size classes are the indicators of whether the species are replacing themselves. In this context you need to look at the literature about your indicator species, especially cypress, to see whether they require rare events for regeneration (alternatives include at least periodic drought, periodic floods that create new channels or isolating new oxbows, and/or large windfall gaps)
2. Your prose in several places talks about criteria for stress of living trees but you never either lay out these criteria or provide data. These criteria are at least partially species specific. For example the abundance of epiphytes on cypress & galls may be indicators and the narrowing of trunk growth in cabbage palm may be an indicator. For all species partial defoliation and dieback are criteria.

I was completely unimpressed with your response that you need not push for 50 or 60 cfs mfls NOW because of supposed tradeoffs of the + side of enlarged estuarine areas and - sides of slower restoration. Neither your discussion nor the data from Dent and Ridler

support your suggestion
that the LR estuary has become a prime estuarine habitat. Compared to the Indian River lagoon:

1. red mangrove are less extensive with almost no forests
2. there are no fish or shrimp or oyster data to show that game or food species are doing well or even present in the LR estuary
3. the sea grass diversity is much less and not abundant enough for manatee or green turtle
4. manatees like more fresh and less fully saline water

So, I hope you take my comments as the constructive criticism that I intend and further improve the great job that you have started. I will, of course, be happy to discuss any of the above with any or all of you.

Take care, Tom

Thomas L. Poulson
Emeritus Ecologist U. Illinois - Chicago
Adjunct Professor in the Honors College FAU - Jupiter
Ecological Consultant to ARM
Short courses in ecology & natural history for kids - adults at Abacoa, HC-FAU, TNC, LLS-FAU

The Loxahatchee River Coalition's
Public Response to the recommended Minimum Flow & Levels for the Loxahatchee River & Estuary

DRAFT – September 12, 2002

Introduction

The Loxahatchee River Coalition is comprised of various environmental and community-based organizations and individuals committed to preserving, and restoring, and protecting, the Loxahatchee River. While we appreciate the consideration that the South Florida Water Management District (District) staff and the District Governing Board have given to the comments of various sectors of the public, we have serious concerns as to the July, 2002 Draft of the Technical Document on Minimum Flow Levels (MFL) for the Loxahatchee River and offer the following comments in the spirit of constructive participation in the development of a restoration plan for the River.

Concerns Regarding Preservation of the River

I. Current data is incomplete

The District's Staff has indicated that the current data sets they are using are incomplete and therefore they should take into consideration a seasonally fluctuating minimum flow based on prior comprehensive research.

In a meeting with the Loxahatchee River Environmental Control District [LRED] on August 7th, SFWMD staff indicated that District data on salinity and flows for the Loxahatchee River is incomplete. LRED offered to share the bi-monthly data that they have collected for over ten years. SFWMD staff asserted that they need to install salinity, flow and temperature probes at various points in the river and that after one year they will have enough data to extrapolate a more complete model. Based on District staff comment we conclude that the SFWMD's current dataset is insufficient to construct an MFL regime that will adequately protect the River. While the District develops a more complete model, we suggest the District investigate use of the LRED's research, especially as interpreted in "Freshwater Flow Requirements and Management Goals for the Northwest Fork of the Loxahatchee River" (Dent & Ridler, 1997). This study recommends a minimum flow of 75 cfs for the height of the dry season (April-May) and suggests a seasonally fluctuating minimum flow up to 130 cfs throughout the wet season (July-November).

II Florida law requires the establishment not just of minimum flows, but also minimum levels.

Specifically, Florida Statutes §373.042 requires that water management districts develop minimum flows <u>*and levels*</u> for surface waters and aquifers[1]. The District's documentation and recommendations would only address part 1a of this statute by recommending a minimum <u>flow</u>

[1] *Florida Statutes*, Section 373.042(1a-b)

of 35cfs over Lainhart Dam[2]. It does not, however, recommend an explicit minimum level as required by part 1b.

III Minimum levels are required to prevent further harm and degradation to the River

Although the Lainhart and Masten dams could arguably enforce their own specific minimum levels upstream (the height of the dams), a minimum level needs to be set for that segment of the River that lies downstream of the Masten dam. If the District is determined to prevent further saltwater incursion, it cannot do so without setting a minimum level or otherwise ensuring that minimum flows over Lainhart are increased in proportion to unexpected changes in flows from groundwater and tributaries.

Since District staff has conceded that knowledge of the hydrodynamics and ecology of the Loxahatchee River and Estuary is incomplete,[3] it is therefore conceivable that supplying a minimum flow of 35cfs over Lainhart Dam may not be sufficient to keep the salinity at river mile 9.2 from exceeding 2ppt[4]. To safeguard against potential flaws in the District's minimum flow modeling, an explicit minimum level needs to be set for river mile 9.2 in conjunction with the 35cfs minimum flow over Lainhart Dam.

IV. Recommended minimum flow requires more controls

For the current recommendation of 35cfs over the Lainhart Dam to work effectively, more controls are needed.

Due to the lack of data for groundwater and stream flow from tributaries, the model calibration was based on the historic flow recorded at Lainhart Dam to estimate the total freshwater input to the river system. In the model, discharges from tributaries were calculated as a constant fraction of the discharge at Lainhart Dam (i.e. total surface freshwater input in the model was linked to Lainhart Dam flow via flow ratios [5]. Flow factors of 0.65 for Cypress Creek, 0.14 for Hobe Grove, 0.08 for Kitching Creek, 1.4 for Trappers and 1.16 for LOXTnpk were established. For example, if the flow at Lainhart Dam was in fact 100cfs, the model would recognize the flow for Cypress Creek at 65cfs, 14cfs for Hobe Grove, 8cfs for Kitching Creek, 140cfs for Trappers, and 116cfs for LOXTnpk.

Another assumption used in the model was a constant input from ground water of 40cfs. Cypress Creek, Hobe Grove, Kitching Creek and the NW fork at Trappers each received 10cfs of groundwater input for a total ground water input of 40cfs.

These model assumptions have important ramifications:

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[2] *Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary*, South Florida Water Management District Water Supply Division, July 15, 2002 draft, p. 149

[3] *Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary*, South Florida Water Management District Water Supply Division, July 15, 2002 draft, p. vi

[4] *Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary*, South Florida Water Management District Water Supply Division, July 15, 2002 draft, p. 148

[5] *Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary*, South Florida Water Management District Water Supply Division, July 15, 2002 draft, p. 79

1. The total inflow to the NW fork associated with a flow of 35cfs at Lainhart Dam is considerably larger and includes discharges from groundwater and tributaries. Under the 35cfs at Lainhart Dam Scenario, tributary flows would be modeled as follows: Cypress Creek 33cfs, Hobe Grove 15cfs, Kitching Creek 13cfs, Trappers 59cfs, & LOXTnpk 40cfs (flows include groundwater contributions of 10cfs).

2. The flows for the tributaries were assumed to be proportional to the flows from Lainhart Dam and hence may not accurately represent actual flows, especially with depressed water tables.

3. Groundwater levels that produce the assumed groundwater input may not be present when needed most.

The following controls would mitigate potential problems under the current proposal:

1. The establishment of a minimum level for groundwater so that the groundwater level that produces 40cfs in the model is adequately protected.

2. The establishment of minimum flows for the tributaries in order that their modeled flows corresponding to the Lainhart Dam minimum flow of 35cfs are protected.

3. When tributary surface water flows fall below their corresponding modeled flows for 35cfs at the Lainhart Dam, then the Lainhart Dam flows are to be increased by the difference.

4. When groundwater levels fall below the level needed to produce the modeled 40cfs contribution, then Lainhart Dam flows are to be increased to be commensurate with the groundwater loss.

V. Florida law requires MFLs for the entire River.

Florida Statutes §373.042 provides explicitly that the water management districts shall establish minimum flows "for all surface watercourses." [1] It was not the intent of the statute to require that the districts establish minimum flows only for federally recognized wilderness preserves. In fact, the law states that the districts shall establish minimum levels for groundwater, as well as, surface waters. Given the rate of development in the adjacent areas, we are concerned about the impact of further groundwater withdrawals not only on the river, but also on the surrounding protected areas (Jonathan Dickinson State Park, Riverbend Park, Cypress Creek Tract, and Pal Mar, etc.).

Although the Wild and Scenic portion of the NW Fork is an exceptional natural resource, the entire river is of significant ecologic, economic and aesthetic value to Palm Beach County and the State. The estuary is home to a thriving fishing and boating economy that contributes important revenue to the local economy. Riverfront property is among the most valuable in the area and homeowners have a vested interest in the health of the entire River. We do not agree with the District's reasons for setting only a minimum flow for a small segment of the NW Fork based on the lack of "infrastructure and facilities."[6] The statute in question does not ask the District to "provide and manage"[6] flows. It requires the District to determine minimum flows and levels beyond which further withdrawals would be "significantly harmful to the water resources or ecology"[1] thus providing the districts with a limit at which to prevent further withdrawals.

VI. Sampling conducted to date is insufficient

In the June 10th draft of their FAQ about MFLs for the Loxahatchee River, the District staff cites that peer review observed that cypress trees were "not particularly good indicators of salinity stress."[7] In response staff selected a number of Valued Ecosystem Component [VEC] species. Although the District staff appears to have done a good job at assessing the health of the selected species, the selection of only large, woody plants[8] provides only a very narrow cross-section of the River's diverse population and is not a true indicator of overall river vegetation.

In our opinion the VECs of the river must necessarily include aquatic life such as herbaceous aquatic plants, fish, amphibians, and other species that are more sensitive to saltwater intrusion than just the few selected species.

VII. The report is overly reliant on aerial photography and contemporary data regarding the health of the River

In our opinion the District has relied too heavily on aerial photography in the assessment of the River's health and failed to obtain enough detailed hydrological & biological information (or "ground truth") necessary to properly support the broad assumptions based on the extant photographic record. Furthermore, the District has not satisfactorily addressed the possibility of harm that might have occurred between 1995 and 2002.

On page 123, the Draft states, "…19 additional acres [of freshwater vegetation] were lost from this community between 1985 and 1995." It does not indicate how many acres have been lost between 1995 and 2002. Throughout the Draft, the District presents 1995 (mainly photography) data as if it is up-to-date. If no aerial photography is available for 2000 or later then a thorough ground survey may be required in order to accurately determine the state of the River and watershed today.

In our opinion the District staff have not been provided with the resources required to accurately measure the River's current condition and how that condition has changed over time. While staff has surveyed the encroachment of mangroves into the cypress forest up until 1995 but we remain unconvinced that substantial damage has not occurred to the River since 1985. Furthermore, the justification for using the date of the River's Federal Wild and Scenic River (1985) as a

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[6] *Loxahatchee River Minimum Flows and levels: SFWMD staff responses to comments and frequently asked questions*, June 10, 2002 draft, Question no. 18

[7] *Loxahatchee River Minimum Flows and levels: SFWMD staff responses to comments and frequently asked questions*, June 10, 2002—draft, Question no. 13

[8] *Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary*, South Florida Water Management District Water Supply Division, July 15, 2002 draft, Table 31, p.116

benchmark (or base) for setting the MFLs, has not been substantiated. The state requirement for MFLs was created through the enactment of §373.042, *Florida Statutes* in 1972 and the designation of Jonathan Dickinson State Park occurred in late 1940's. If a date is needed for determining what stage of freshwater flow the MFLs should aspire to, then the District should use the designation of the State Park.

VIII. Seasonal variability is an important consideration.
A static minimum flow does not take into account seasonal variability, which is essential for the preservation of the River's natural systems.

The District touches on seasonal variability in pp. 11,12 and 97, and on the erratic nature of that variability from year to year (often as the result of hurricanes, storms, El Niño, etc.) in Figure 4 on p. 12. It does not, however, significantly address how native biota are dependent on such variability as did the SJRWMD in setting MFLs for the Wekiva River System.[9]

The SJRWMD, under the direction of Henry Dean in 1994, felt very strongly that setting one static minimum flow or level cannot sufficiently preserve either a lotic or lentic system as, over time, such a minimum often becomes the *de facto* average.[10] The SJRWMD felt that lotic systems were best protected by a regime of multiple MFLs. It is for this reason that the MFL regime worked out for the Wekiva River, by SJRWMD is so exemplary. We can find no justification for setting an MFL that affords less protection to the Loxahatchee River.

IX. As currently written the MFL Criteria would harm the Loxahatchee River
As currently written, the MFL Criteria would allow the minimum flow to be evaded substantially over-time and throughout the year, which would harm the River.

The wording of the minimum flow criteria needs to be corrected.[11] As it could be misinterpreted to suggest that, during dry periods, the minimum flow over Lainhart Dam could be allowed to fall below the minimum for 20 days at a time, repeatedly, so long that it is brought back up to 35cfs every 21st day. Under such an interpretation, the policy would allow the minimum to be met as few as 17 isolated days throughout a year (4.72% of the time). We doubt that, under the current modeling, this would be sufficient to prevent further harm.

We suggest that the criteria include a policy wherein low flows trigger water restrictions, as per Henry Dean's outstanding work on the Wekiva River MFL regime[12], or a limit on how many days the flow may fall below the minimum throughout a single year.

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[9] *Establishment of Minimum Flows and Levels for the Wekiva River System*, St. Johns River Water Management District, 1994, p. 16

[10] *Establishment of Minimum Flows and Levels for the Wekiva River System*, St. Johns River Water Management District, 1994, p. 15

[11] *Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary*, South Florida Water Management District Water Supply Division, July 15, 2002 draft, p.149

[12] Establishment of Minimum Flows and Levels for the Wekiva River System, St. Johns River Water Management District, 1994, p. 68

X. There is no evidence to support the 50% reduction of the Minimum Flow from 70cfs to 35cfs

There has not been shown significant credible scientific evidence in the July 2002 draft to support the reduction of the staff's recommended minimum flow over Lainhart Dam from 70cfs, in its May 2001 draft, to 35cfs. The modeling has not significantly changed between the two drafts to support such a drastic reduction.

In 2001, District staff recommended a minimum flow of 70cfs over Lainhart Dam in order to preserve the remaining freshwater habitat up to river mile 8.1 on the basis that as recently as 1970 a healthy bald cypress ecosystem resided in this area[13]. It was the staff's intention, at that time, to keep the saltwater wedge near river mile 8.1. This year, staff has decided to reduce that recommended minimum by half, nearly to a level of flow that staff previously believed would be disastrous to the freshwater cypress forest:

"A continuous discharge from Lainhart Dam within the 30 cfs range would allow saltwater to penetrate as far as 9.0 miles upstream which is within the remaining "healthy" cypress zone. Allowing saltwater to penetrate this far upstream would set up the opportunity for saltwater contamination of the floodplain groundwater system that could potentially result in the stress or mortality to the remaining bald cypress community. Such an event would be considered significant harm to the water resources or ecology of the area."[14]

30cfs is not much less than 35. Under the flow criteria proposed in the 2002 draft, wherein flows over Lainhart may be allowed to fall below 35cfs for up to 20 days at a time, it is reasonable to assume that the saltwater wedge will continue its encroachment upon the freshwater habitat. We have not found convincing hydrological support in the current document to justify such a marked change in recommended minimum flow.

The District acknowledges that a significant part of the National Wild & Scenic portion of the NW Fork was already seriously harmed by 1985 [15]. In our opinion, it was the responsibility of the District, as custodians of the River, to initiate restoration of the River at the time of its Wild & Scenic designation. All of the parties adopting the Loxahatchee Wild and Scenic River Management Plan are charge with preserving and enhancing the River to the fullest extent of its authority. To the extent that the District maintains the River in a damaged condition, neither preserved nor enhanced, it has failed to fulfill its agreement with the other agencies and the People of the State of Florida.

Our Recommendations

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[13] *Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary*, South Florida Water Management District Water Supply Division, May 22nd, 2001, p. 100

[14] *Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary*, South Florida Water Management District Water Supply Division, May 22nd, 2001, p. 101

[15] *Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary*, South Florida Water Management District Water Supply Division, July 15th, 2002, p. 131

The Loxahatchee River Coalition recommends that the District, in cooperation with the DEP and the public, develop a MFL regime that:

1. Sets explicit minimum flows and levels for the river and its major forks and tributaries;

2. Sets seasonal minimum flows and levels for wet and dry periods in order to preserve the natural seasonal variability of the river's hydrology, or in the alternative, sets explicit minimum low flows and levels, minimum average flows and levels and minimum high flows and levels;

3. Sets trigger points at which compulsory water restrictions come into effect;

4. Sets trigger points at which moratoria on further consumptive use permits are enacted; and

5. Dovetails with the restoration plan being developed by the District in cooperation with the Florida Department of Environmental Protection, the Florida Park Service, and the public. We hope this will also include a more aggressive land acquisition effort and the creation of more reservoir sites.

If the District is compelled, for whatever reason, to adopt a minimum flow for the Northwest Fork of the River, we encourage the District set a temporary minimum flow matching the District staff's recommendation in 2001, of not less than 70cfs over the Lainhart Dam. This recommendation is made with the expectation that the District address the additional scientific and policy issues outlined in the many public response documents, and move forward with a restoration MFL. Setting the temporary MFL at 70 cfs provides a more realistic assurance of both preventing further harm to the River and anticipating the eventual restoration of the wild and scenic segment.

The staff's recommended MFL criteria is inconsistent with the district's charge under the Wild & Scenic designation to "preserve & enhance" the River. Maintaining the Wild & Scenic river in a seriously harmed condition constitutes neither preservation nor enhancement. As far as the Wild & Scenic portion of the River is concerned, we ultimately expect to see an MFL criteria based on restoration of the entire Wild & Scenic corridor. Such an MFL criteria must necessarily protect flows from the River's tributaries, ensure seasonal variability and protect freshwater contributions from groundwater by setting a minimum level for surface waters both down and upstream of the Lainhart & Masten dams. An MFL that does not preserve and enhance the River to the Park Boundary, fails to meet the goals set in 1985 under the Wild & Scenic designation.

We look forward to working with the District to restore and protect the Loxahatchee River.

The Loxahatchee River Coalition

Received from Rim Bishop on September 17, 2002
John,

I may have misplaced it, but would you send me a copy of the Exhibit discussed in the following August 2 e-mail please?

Also, is there a more current draft of the MFL documents, one dated later than July 25 edition? We pulled the current draft down from the SFWMD web site and found that none of our August 2 or August 6 comments have been incorporated.

Essentially, I need to know whether SFWMD will be incorporating our comments or not. As you can see, we have put considerable effort into this, and I must evaluate whether further participation in the public process will be useful.

Finally, here are a few additional comments on the Loxahatchee River and Estuary MFL document July 12 draft that I hope you will find helpful.

1. Page 156, first bullet under "Phase 2 ..." - with culverts connecting the Loxahatchee Slough to the C-18 having already been boarded by PB County Dept. of Environmental Resources Management, please identify how construction of the G-160 structure will generate 5,000 acre feet of ADDITIONAL storage. We are having difficulty identifying any storage made available by the structure other than that which is within the C-18 canal section itself, and that doesn't seem to amount to 5,000 acre feet.

2. We renew our request for Exhibit I. We would very much appreciate the opportunity to have our hydrologist review and comment.

3. We would again draw your attention to our August 6, 2002 transmittal and respectfully request that our comments be fully incorporated into the next draft.

Thank you so much for your assistance. If you require further information, I hope that you will not hesitate to contact me.

Received from Rim Bishop on October 2, 2002
John, here are a few Seacoast comments on the draft Appendix I to the Lox River MFL, Exhibit I document. Please forward them to the appropriate parties.

1. Page I-3 - I know that the scale of this map is small, but the distinction that I am about to make is VERY important. Looking at the map, one might get the impression that Seacoast operates wells located west of the turnpike, near the Slough. First, the word wellfield(s) should be singular - only the Hood Road wellfield is located in the general vicinity shown. Second, the Hood Road wellfield is EAST of the turnpike, not west. It is also SOUTH of Hood Road.

2. Page I-6 - Beginning in 1997, Palm Beach County DERM boarded up old water control structures, thus causing the Slough to retain the storm water that, during the 1988 -1995 Actual Pumpage period, was runoff to the C-18. In addition, in 2001, the Mirasol (Golf Digest) surface water management system was implemented, also changing the hydrology from conditions that existed in the 1988 - 1995 period. These are substantial and material changes, and the report does not appear to consider them.

Finally, to repeat a comment submitted to you earlier, we question whether Lox Slough leakance factors applied to the model correspond to field observations (e.g., water level readings) taken in the Slough after PB County DERM boarded it up in 1997. Seacoast's observations indicate that once water levels in the Slough were raised, they remained high longer than originally anticipated. Thus, where the Slough was a C-18 contributor via runoff before 1997, it is much less so now via percolation, and we are not certain that the model accurately reflects that low percolation rate.

Thank you again for the opportunity to comment. If you wish to discuss these comments, I hope that you will not hesitate to call.

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Thank you again for the opportunity to comment. If you wish to discuss these comments, I hope that you will not hesitate to call.

Received from Rim Bishop on October 2, 2002

John, we'd like to offer the following technical review comments to supplement the e-mail submittal I sent earlier today.

We generally ask our technical consultants to review document drafts, ours or those of others, as though the consultant were serving as an expert witness for a party pursuing a legal challenge. That type of intense review usually uncovers assailable flaws and allows us the opportunity to address them before the document is released.

Of course, that is by no means Seacoast's perspective, but we find that properly framing our requests for professional assistance adds context, and consequently substance, to our consultants' review. We hope that you accept our comments in the highly constructive spirit in which they are intended.

Thanks again for your serious consideration.

TECHNICAL COMMENTS ON DRAFT APPENDIX I, LOX RIVER MINIMUM FLOWS AND LEVELS DOCUMENT

The author heavily qualifies the capability of the model to estimate with any accuracy surface-water flows when he states.

"The code does not incorporate a surface/groundwater module" and "overland flow and associated surface water routing through canal networks is not directly simulated and the effects of consumptive use withdrawals on overland and riverine flows should only be considered as gross estimates." (p. I-1).

Although the SFWMD version of MODFLOW-96 appears to have a Wetland and Diversion Package and an Operations Package, it appears that "the code utilized in this report does not incorporate a surface/groundwater module" and "overland flow and associated surface water routing through canal networks is not directly simulated and the effects of consumptive use withdrawals on overland flows should only be considered as gross estimates". (p. I-2).

"MODFLOW is a groundwater model that does not have the capability of simulating storm-driven events". (p. I-5).

"For calibration of flow, absolute errors were less than 10 cfs during 55 percent of the simulation period." This is another way of saying that absolute errors were equal to or greater than 10 cfs during 45 percent of the simulation period." Ten (10) cfs represents 40 percent of the recorded mean flow of 24.1 cfs, a considerable error. (p. I-5)

These statements do not provide any encouragement that the model has any value in establishing or defending MFLs for the Loxahatchee. In addition, the following points must be noted.

The method of converting stages observed or predicted at Lainhart Dam to flows by means of the "weir equation" is not documented here. (p. I-5).
The 10 cfs absolute error is significant (p. I-5)

Under "Model Application", what "proposed" surface water systems are referenced at the bottom of page I-5?

The title of the third simulation (p. I-6) should be "Currently Permitted" model run as it is based on recent permits rather than those in the earlier data periods.

If "variations in withdrawal rates due to seasonal changes were not taken into account" in the "Permitted" model run, does that mean the rates used were annual allocation rates rather than maximum-day or maximum-month rates? This is probably true but needs clarification. It may be explained in an earlier report.

There is no explanation for how the data from the model were "adjusted" to represent an average rainfall year and drought conditions. (p. I-6) Were these input or output data? This may have been explained in an earlier report but is not clear here.

It is unclear from Table I-1, which flows are actual and which ones are predicted. What does it mean that the flows delivered to Lainhart Dam were estimated from the model and "adjusted" to equal actual flows? (p. I-8)

The percent reduction in flows for each of 3 classifications was discussed. What were the withdrawal rates for the 3 classifications?

October 16, 2002

Ken Ammon, Director
Water Supply Department
South Florida Water Management District
P.O. Box 24680
West Palm Beach, FL 33416-4680

Dear Ken:

I have attached for your review the technical and specific comments provided by DEP staff on the District's July 15, 2002 Draft *Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary.* I have separated the comments into two categories: those concerns related specifically to the methodologies used to develop the MFL criteria, and those comments that are more editorial in nature. Please understand that there is probably some overlap between the two categories.

As you know we have other concerns related to the Loxahatchee River, which are not reflected in the attached comments. We appreciate the opportunity to continue our discussions regarding:

- the use of multiple levels when establishing MFLs,
- the role of MFLs to help achieve restoration,
- the role of reservations in restoring the river,
- establishing restoration targets for the river,
- the role of CERP in providing restoration to the river, and
- the relationship between consumptive uses in the basin and the MFL.

If you have any questions or would like to discuss the attached comments further, please contact me at 850-245-8681.

Sincerely,

Kathleen P. Greenwood
Government Analyst II
Office of Water Policy

Attachment

Technical Comments on Methodology Used to Develop Loxahatchee MFL Criteria (July 15, 2002 Draft)

1. Page 79, Modeling Assumptions. To use all of the contributions of the tributaries (Kitching Creek, Hobe Grove Ditch, etc) as a constant fraction of the freshwater discharge at Lainhart Dam and a constant ground water input of 40 cfs under all conditions is an unreliable assumption for the modeling effort. The amount of water contributed by groundwater should vary according to the hydrological conditions.

2. Page 84 and 86. River Vegetation Surveys. More explanation is needed regarding the non-random criteria used to select survey sites. Additionally, the District should explain why the transects were not conducted along a line perpendicular to the river which would appear to characterize the floodplain community more fully than a transect that was 25' wide and ran parallel to the river.

3. Page 86, Soil Salinity Surveys. Soil sample transects should have corresponded with vegetative transects or a vegetative survey should have been conducted along the soil sample transects.

4. Page 98. Table 24 and Figure 19 provide a comparison of both "historical" and more "current" flow conditions over the Lainhart dam. Without any explanation, historical conditions are defined as time period from 1977 through 1989, and current conditions are defined as 1990 through 2001. The proposed MFL criteria goes on to identifying "historical" operations as those average 1977 through 1989 flows provided by Table 24. It is not clear how the historical and current time periods were selected, or justified for the comparison. Nor is it clear why the G-92 installation date (1987) was not selected for the comparison purposes when comparing the "historical" data to that of the more recent data.

5. Page 98. Table 24 shows that historic flow over Lainhart was less than 35 cfs 73 times during 1990-2001. How often was the flow less than 35 cfs for more than 20 days (the proposed MFL harm criterion)? How often did this happen more than once in a six-year period (the proposed MFL significant harm criterion)? From the information found in the document, it is not really clear how the proposed MFL criteria relates to existing flow conditions.

6. Page 98, Table 24. When comparing "historical" data with "current" data for the purpose of showing that current and historical conditions are similar for low flow conditions, one need to compare periods of similar rainfall conditions. The comparison provided in Table 24 shows that the percentage of time that the flows fall below the 20 cfs and 15 cfs is approximately the same for the historical and current conditions, with the current time period having above average rainfall and the historical time period being dry. From this one should not automatically conclude that the current conditions are not degrading at the low flow rates, and that no harm has occurred.

7. Page 101, Table 25. The average historical salinity for the river and its tributaries range from 0.3 to 2.5 during times that the river experienced declines in freshwater floodplain community. Isn't it reasonable to conclude that even salinities as low as these caused harm? The aerial photograph analysis doesn't support conclusion on

page 102, paragraph 2, that the upstream portions have been more impacted by salt water during the past decade. Additionally, the statement on page 102, contradicts other statements in the document that the impacts to the floodplain community have remained relatively stable since 1985.

8. Page 102, Soil Salinity Survey. The soil salinity in this survey was determined by analysis for conductivity and chlorides of soluble salts in the soil water. Soluble salts in the soil water resulting from salinity intrusion may not necessarily stay in the soil for long periods of time. The soluble salt levels are highly transitory with river flow, particularly if the soils are sandy soils. Therefore, salinity of soil pore water is not a good indicator of past long-term salinity effects. Additionally, the narrow scope of the survey should preclude the District from making any conclusions about the results.

9. Page 107, first paragraph. This section does not provide a reasonable estimate of the consumptive use. Appendix I presents a table (page I-7) that shows that under drought conditions (1988-1989) average flows are 41 cfs at the Lainhart dam, and estimates an increase to 55 cfs under a no pumping (no consumptive use) model run. The "5 cfs" professional estimate needs should be explained in more detail and should be linked with the modeling observations of Appendix I. Also there should be an explanation of why the proposed MFL is lower than the existing 41 cfs predicted by this model, including a discussion of the accuracy of the modeled predictions.

10. Page 113, Table 29. The reference "Tobe, et al. 1998" is not an appropriate reference for salinity tolerance of the species listed in the table. This reference is a plant identification manual and gives generalized habitat descriptions. It does not describe the salinity tolerance of the species listed in the table. Other more specific references should be found and used or the text should clearly explain that this reference provides generalized information regarding species habitat.

11. Page 134, Species Selected. While the District makes a reasonable argument for excluding herbaceous and canopy species from the Valued Ecosystem Community analysis, it appears to be too limiting. The canopy species could be included as an indicator of the very long-term conditions, while the herbaceous species could be included as an indicator of short-term conditions. All strata should have been analyzed during the vegetation surveys to give a more complete picture of health of the river's plant communities. A more detailed study that includes a larger assortment of species is needed. Additionally, as the District refines the MFL analysis of the other segments of the ecosystem need to be done including the benthic invertebrateand vertebrate populations.

12. Pages 136-141. Application of Modeling Tools. Throughout this section it is not clear why an average salinity of 2 ppt was chosen. The analysis shown in Figure 32 appears not to be average salinities but discrete salinity values. Table 34 shows the average salinities derived from Figure 32. The entire section seems misleading and implies that river mile 10.2 experienced an average salinity of 2 ppt, when the analysis shows average salinities were estimated at 0.154 ppt. From Table 34 it

appears that the section of the river experiencing an average salinity of 2 ppt, was somewhere between River Mile 8.9 and 8.6. It appears that many different statistics were combined to form the MFL without an adequate explanation. The flows were derived from the one model, while the duration and frequency were derived from an entirely different analysis.

13. Pages 136-141. Salinity Threshold. The document mentions that "a numbers of previous authors have identified the 2 ppt threshold as being an effective indicator of saltwater contamination because this concentration is significantly higher than background concentrations of salts ...". The authors also presented evidence that salinities of 2 ppt may not kill established cypress tress. We believe the salinity threshold should instead be based on protecting the six valued ecosystem component species (pond apple, dahoon holly, red maple, red bay, pop ash, and Virginia willow) since they are more sensitive to salinity than bald cypress (Page 113). Evidence presented in the report showed that these six taxa were classified as strictly freshwater taxa, suggesting that adverse effects to these taxa would occur at even 1 ppt. Therefore, we believe that the MFL model should use 1 ppt instead of 2 ppt when considering significant harm.

14. Page 140, Table 37. From table 34, the model results indicate that the average salinity at river mile 10.2 was 0.154 ppt. Yet to determine a flow regime to mimic the salinity depicted in Figure 32, the District uses an average salinity of 2 ppt. When determining the appropriate flow from table 37 to maintain mean salinity levels, why was a mean salinity of 2 ppt used instead of 0.154 ppt?

15. Page 138, Table 35 and page 145, Table 40. There was some confusion regarding which duration and frequency data were used in the model. The results produced by the 30-year model simulation show that at RM 10.2, salinities above 2 ppt occurred for 22 days every 2157 days (5.9 years) in the last 30 years. Solely based on this result, the document defines the salinity threshold (2 ppt), duration (20 days), and frequency (once every six years) to set the minimum flow for RM 9.2. However, we feel the technical support for the duration and frequency defined is not adequate. The document refers to Table 40 to set the minimum flow of 35 cfs. In Table 40, however, a category for 2 ppt and 30 days/4 years is defined, but a duration and frequency category of 20 days/6 years is not found. Which is the correct model input?

16. Pages 146-149. What will be the effect of the proposed MFL on the frequency, duration, and flooding of the swamp floodplain community? Most of the analysis focuses on moving the salinity wedge within the river's channel, but does not appear to take into account the certain hydrological requirements of the VEC community within the floodplain. Can the District provide an analysis of the effect of the proposed MFL on the frequency, duration, and depth of inundation to the floodplain?

17. Page 148, Proposed Minimum Flow Criteria. It appears that the proposed criteria could allow multiple instances where the flow could go very low, even to zero, during a single year and the MFL would not be considered violated. For instance, you could

have 20 consecutive days of flow under 35 cfs (as low as 0) followed by a day (it could be less) of flow of at least 35 cfs. If this cycle is repeated throughout the year it implies that the river could get no more than 35 cfs for 18 days a year (4.9% of the time) and still meet the criteria. We understand that this is not the intent of the criteria, and suggest that it be rewritten to avoid this misinterpretation.

18. Page 148, Proposed Minimum Flow Criteria. While the approach to recreate salinity conditions found at an apparently healthy section of the river further downstream appears to be reasonable, the criteria used to describe this condition does not appear to adequately describe the conditions. For instance, the salinity results indicate that salinities above 3 ppt. did not occur at river mile 10.2, yet the proposed MFL criteria could allow salinities to exceed 3 ppt for 20 consecutive days, which would seem to cause significant harm.

19. Appendix E, pages E-22 and E-23. When comparing the real time salinity data with the model run predictions it appears that the model is much more influenced by tidal fluctuations (influence of the inlet), than what was observed in the real time data. During low flow conditions, the model continuously shows salinity variations of the order of 10 ppt whereas the real time data shows variations of the order of 2 to 3 ppt (Figures 2 and 3). There needs to be a discussion on the reasons for these observed salinity range variations, why the predicted fluctuations are so much greater in the model run, than what was observed in the field data, and how these variations are accounted for when selecting the MFL. How much of these variations are due to the fact that the hydrodynamic salinity model does not consider the groundwater influence and fluctuations?

20. Appendix O. Based on a review of Tables O-1 and O-3, it appears there was approximately a 30,000 acre-feet/year increase in urban water supply demands between 1995 and 1999. Is this correct? Table O-4 indicates a total **allocation** of 58,081 acre-feet/year for 1999, whereas Table O-3 indicates a total **demand** of 58,081 acre-feet/year.

Specific/Editorial Comments (July 15, 2002 Draft)

1. Page iii, fourth paragraph. While lack of data may be an appropriate reason for not establishing a MFL for the North Fork of the Loxahatchee River, the inability to regulate flow from the North Fork is not an adequate reason to not establish a MFL for the North Fork. Additionally, the highly altered nature of the Southwest Fork is not an appropriate reason for not establishing an MFL. If either of these two water bodies is expected to be harmed from withdrawals, then a MFL should be established.

2. Page 1, third line from bottom. Replace “and” with “can.”

3. Page 1, last paragraph. This is the only place in the document that refers to "periodic large volume fresh water flows" that impact the resource. Does the District know the impacts of the large volume flows? If not, does the District plan to evaluate the impacts of these flows and take appropriate management actions?

4. Page 5, Figure 1. This figure indicates that reservations are only in effect for hydrologic conditions less severe than a 1-in10 drought event. Please revise this drawing to show that reservations will be implemented during all hydrologic conditions.

5. Page 10, third paragraph. This paragraph should also include a reference to the *Proposed Restoration Vision for the Northwest Fork of the Loxahatchee River* as developed jointly by DEP and SFWMD.

6. Page 12, Figure 4. The figure should include rainfall for year 2001 (also noted that x axis labeling is off for the 2000 mark).

7. Page 16, second paragraph. The Loxahatchee River has never been designated a State Wild and Scenic River.

8. Page 17, Table 1, and Page 97, Table 23. Please provide summary of average wet season and dry season flows that occurred during the 1971 and 1999-2001 drought periods. While the tables reflect that an average of 70 cfs flows to the Loxahatchee Estuary during the dry season for the period of record, the statistical medians and modes of the flow events discharging through the Northwest Fork of the Loxahatchee River should also be provided (i.e. how many days of 0 cfs events).

9. Page 17, Table 1. This table indicates an average daily dry season flow of 70 cfs over the Lainhart Dam. Coupled with other tributary flows a total of 125 cfs is provided to the river during the dry season. These are average conditions and flows may fall to 10 cfs or lower. Similarly, wet season average flows are 185 cfs but frequently exceed this during the wet season. Nevertheless, the dry season/drought conditions are the primary concern, which points out the need for better water management and storage facilities to reduce excess high flows so the average actually occurs during droughts.

10. Page 22, Drainage Alterations. This section indicates that the Loxahatchee basin has declined from 270 to 210 square miles, yet page 13 of the document indicates that the

size of the basin has declined from 250 to 200 square miles. Please correct the discrepancy.

11. Page 26 - 27. The document notes that the largest oysters occur between river mile 4.0 and 6.0. Historically, where were the most productive oyster areas?

12. Page 32, third paragraph. The Hobe Grove Ditch was dug to the Loxahatchee River in the late 1960s. Sod farming has been a more recent agricultural change. The Chinese vegetable farm was operating years before sod farming was undertaken.

13. Page 34, second paragraph, and page 79. The 1973 USGS document by Harry Rodis concluded that a continuous flow of 50 cfs would only to protect the middle reaches of the river within the park, which only extends downstream to the Trapper Nelson Interpretive Site. The MFL technical document should more clearly describe the USGS report conclusions.

14. Page 43, Overview of Consumptive Uses Within the Watershed. What is meant by the term "combined average annual allocation?" Is this number the sum of all allocations divided by the number of permits? Instead, please provide the total annual allocation in the basin.

15. Page 44, Figure 10-A. Should "groundwater" be labeled as "surficial aquifer?" It is confusing to have "groundwater" labeled separately from "Floridan aquifer" unless a different aquifer is being used.

16. Page 44, first paragraph. This section notes that reclaimed water is disposed of in the wet season. Assuming water quality concerns could be met, what is the feasibility of storing this water for supplementing flows to the river during the dry season?

17. Page 59, Water Resource Functions Protected by MFL. This section indicates that water supply and flood protection are functions that should be protected by an MFL. The MFL is established to protect the water resource from significant harm, so the District can know what amount of water can be used for water supply or what effects the MFL will have on flood protection. The "water supply" and "drainage and flood protection" bullets should be removed from the list of items cited as being protected by an MFL. These are appropriate resource functions of the river and can be identified as functions, but the MFL should be established independent of these functions.

18. Page 66, Recreation. This section could benefit from including information about Jonathon Dickinson State Park's (JDSP) contribution to the local economy. JDSP encompasses 11,480 acres and attracts 169,768 visitors annually (1999-00), largely because of the Loxahatchee River and recreation that depends on it. According to research conducted by FSP, the total direct economic impact of JDSP on the local community is $5,101,443 annually. Deterioration of the ecology and aesthetics of the river are serious concerns that affect tourists and the local community.

Specific/Editorial Comments (July 15, 2002 Draft)

19. Page 66, Recreation. This section should also include a description of the statutory responsibility of Florida State Parks when managing the JDSP. The DEP is compelled by Florida Statute 258.037 to establish a policy "to promote the state park system for the use, enjoyment, and benefit of the people of Florida and visitors; to acquire typical portions of the original domain of the state which will be accessible to all of the people, and of such character as to emblemize the state's natural values; conserve these natural values for all time; administer the development, use and maintenance of these lands and render such public service in so doing, in such a manner as to enable the people of Florida and visitors to enjoy these values without depleting them..."

20. Page 68, last paragraphs. One paragraph indicates that there is no detailed information on the role of groundwater providing base flows to the Loxahatchee, yet the next paragraph indicates that the effects of consumptive use permits are not very large. Additionally, on page 81, the document indicates that many of the data records reporting actual pumpage values from permit holders were missing or incomplete. It is difficult to understand how the report concludes that consumptive uses have little or no impact on the groundwater flows to the river, when little is known about the influence of groundwater on base flows to the river. The possibility remains that alternative sources may need to be developed for users to eliminate withdrawals that are indeed affecting river flow.

21. Pages 69-71, Consideration and Exclusions. The various references to water supply throughout this section implies that the effects of consumptive uses can be taken into consideration by the Governing Board when considering the effects of alterations pursuant to Section 373.042 (1)(a). While it is appropriate to identify these as functions of the waterbody, the water supply functions are not to be taken into account when establishing the MFL. Once the MFL is established, maintaining current water supply should not be included when determining the MFL. The statute explicitly prohibits allowing significant harm caused by withdrawals and the discussion in this section should include that statement. Water supply considerations can be factored into the recovery and prevention strategy, not the MFL establishment.

22. Page 69, first sentence and Page 107. The sentence on page 69 regarding monitoring of consumptive uses indicates that monitoring is conducted to prevent any decline in groundwater available to the river. This contradicts the statement on Page 107, which states that dry season impacts on flows are less that 5 cfs. Please clarify whether flows are impacted by groundwater withdrawals.

23. Pages 72-73, Exclusions. This section is confusing and could use some clarification. This section should clearly describe that the district is going to consider the effects of structural alterations to the water resource, except those associated with consumptive uses, as allowed pursuant to Section 373.042(1)(a). The District should provide more explanation about the provisions of 373.042(1)(b), which allows the District in certain situations not to establish MFL for certain waterbodies. This section would benefit from a summary statement that indicates that the District is going to consider the structural effects to the river but is still going to establish a MFL for the river.

24. Page 77, Table 15. The comparison table of river miles from different reports is helpful, but a better map with some specific locations would assist the reader.

25. Page 79. Why wasn't the data on sub-basin freshwater inflows reported in the Kitching Creek Study (conducted by Martin County and Florida State Parks) included in the development of the MFL criteria?

26. Page 80, first paragraph. This section indicated that long term salinity records were not available for the river at the vegetation survey sites. The document should describe the salinity records that were available.

27. Page 81, Documentation of Historic Water Use Within the Loxahatchee Basin. Is it possible for the District to provide the total amount of water permitted for withdrawal and the amount that is actually withdrawn within the Loxahatchee Watershed?

28. Page 83. According to the "Vascular Plants of Jonathan Dickinson State Park", sweet gum (*Liquidambar styraciflua*) is not found along the Northwest Fork.

29. Page 87, second paragraph. We think that estimating the amount of water that flowed from the watershed prior to development is relevant to developing a MFL and restoration targets. It is important to better understand how much water originally drove the system; a predevelopment water budget should be estimated.

30. Page 96, last sentence. MFLs are not simply to be maintained during conditions associated with regional drought. Low flow conditions may also be caused by overuse of the resource that could be occurring during average or wet conditions. This sentence implies that MFLs will only be in effect during droughts and should be deleted.

31. Page 97, Table 23. The data presented in the table does not correspond to the data collected by USGS and used in the Russell and McPherson report as referenced.

32. Page 98. Table 24 shows the historical record extends back to 1971. Has the District's research uncovered any earlier data on flows or levels in the Northwest Fork? Can this data be used?

33. Page 105, bullets 3 and 4, and Figure 22. The bullets indicate that only 2 permits authorize withdrawals showing greater than 0.1' drawdown, and only 4 permits authorize drawdowns greater than 0.1' drawdown in C-18 canal. Yet, Figure 22 shows more than 6 points of groundwater allocations with greater than 0.1' drawdown. This discrepancy should be explained in the document.

34. Page 106, Effects of Water Use. This section describes the singular effect of the various uses in the basin, but does not describe the cumulative effect of all these withdrawal points. This section should include a summary of a cumulative analysis of the withdrawals.

Specific/Editorial Comments (July 15, 2002 Draft)

35. Page 106, Effects of Water Use. It would be helpful if the District provided information about the timing of withdrawals. Can the district show the amount of withdrawals that occurred during wet, average, dry, and extremely dry conditions? While the District notes that average flows at Lainhart Dam has increased (p. 140), it is also curious to note that during the same period, extreme low flows (< 10 cfs) increased by approximately 10%.

36. Page 112, Table 27. Many scientific names were misspelled in this table, please correct. Additionally, no mangrove species are listed in this table. Weren't these species counted and measured as part of the vegetative transects? They should have been present in the transects located downstream of river mile 9.

37. Page 115. The district should describe the difference between seedlings and saplings or provide definitions in the glossary.

38. Page 119, second paragraph. The coastal hammock community does not occur along the river, however there are hydric hammocks and one tropical hammock (see Jonathon Dickinson State Park's Unit Management Plan).

39. Page 121, second paragraph. Cabbage palms commonly occur in both upland and wetland habitats and are usually a dominant component of hydric hammocks. Please revise the statement that indicates cabbage palms are "normally" associated with upland communities.

40. Page 122, last paragraph, and page 132. The information used to reach the conclusion that vegetation has stabilized since 1985 seems to be based upon very limited information. It is quite possible that the decline is slight, but continued especially since there is no information on the health of the VEC community or the impacts to seedling germination and survival. The information presented seems to only support the conclusion that changes in the extent of cypress trees seem to have stabilized. As was noted earlier in the report, the canopy species may take longer to respond to stress than the rest of the floodplain community particularly the VEC community.

41. Page 125, Figure 29. From this analysis it appears that the construction of the C-18 canal had a much greater impact on the riverine community than the opening of the inlet.

42. Page 139, Table 36. The Ds and Db in Table 36 for sites 9B, 9C and 10B are much different from those in Table H-4 in Appendix H.

43. Page 139, third paragraph: The verbs should be in the past tense.

44. Page 140, 2nd Bullet. The dry season flows should also be provided here.

45. Page 148. Please explain how the proposed MFL criteria relates to the Stipulation for Consent Decree (Case No. 79-1910 CA (L) 01 C) between the Florida Wildlife

Federation and the South Florida Water Management District and the Florida Department of Environmental Regulation (now DEP).

46. Page 148. Harm Criteria. If flows at Lainhart falls below 35 cfs for more than 20 days, the MFL criteria will be exceeded and "harm" will occur to the floodplain. What resulting actions will the WMD take? If this happens more than once every six years, significant harm and an MFL violation occur. What resulting actions will the WMD take?

47. Page 153, paragraph preceding bulleted list. This paragraph indicates that 1984 was the year the NW Fork was designated a Wild and Scenic River, yet the rest of the document indicates 1985 was the year the river was designated as a Wild and Scenic River. Please clarify this contradiction.

48. Page 153, Management Targets. This section refers to a flow of 65 cfs, but does not provide a duration or frequency component, which results in a meaningless value. What exactly is meant by "providing 65 cfs flow whenever possible" and how will this affect the salinity along various sections of the river? To which point along the river will this flow target push the freshwater/saltwater interface? How long and how often is this expected to occur? It is premature to cite 65 cfs as a management target when the DEP and the District are in the process of determining appropriate restoration flows. Furthermore, care should be used within the document to indicate that this management target is not proposed as a reservation or the ultimate restoration goal for the river.

49. Page 153, Management Targets. The selection of 1985 as a baseline to determine management targets for the river, seems to have been arbitrarily selected. More explanation is needed to distinguish Management Targets from the MFL and restoration goals, if they are different. Since the vast majority of the damage to this river occurred prior to this date, and the mangrove encroachment has not substantially changed since 1985, setting 1985 as a baseline condition does not provide for meaningful restoration of the flow to the river.

50. Page 153, paragraph preceding the bottom bullets. The three management targets proposed are too limiting and does not include the scenario that allows for recovery of historical cypress community that has experienced significant harm. It is unclear how these targets relate to restoration goals and the MFL.

51. Pages 154 – 156, Phased Recovery Plan. The MFL phased recovery plan is based on implementation of projects identified in the NPBCCWMP and the Comprehensive Everglades Restoration Plan. The Loxahatchee River, an Outstanding Florida Water body, is afforded the highest protection pursuant to 62-302.700, Florida Administrative Code. As such, no degradation of water quality is permitted and all discharges to the Loxahatchee River shall meet state water quality standards. In addition, project components of CERP, pursuant to 373.1502(3)(B)(2), F.S., (Comprehensive Everglades Restoration Plan Recovery Act) shall not contribute to violations of the state water quality standards.

Specific/Editorial Comments (July 15, 2002 Draft)

52. Page 154, Recovery Plan. The plan needs more detailed explanation of how the proposed projects tie in with the recovery goals, so that we can better evaluate the plan. Many of the projects provide flood protection and water supply benefits and it is not clear how much these projects contribute to improving flows to the river. Is it possible to expedite critical projects that provide critical storage needs (such as installation of the G160 structure)?

53. Page 160, Operational Protocols. In the second paragraph it states that the District will continue to provide a flow of 50 cfs or greater over the Lainhart Dam while in the management target is stated as 65 cfs or greater. Please clarify this discrepancy.

54. Page 165, River Restoration. Please provide more details, including the action steps that specifically describe how this will occur. Additionally, details are needed that ensure appropriate restoration targets will be included as CERP projects are designed and developed.

55. Page 165, Estuarine Research. This section correctly notes the need to determine the effects of the proposed MFL on various components of the Estuary. Additionally, the section should note that the MFL will be revised as these studies are completed.

56. Page 165, Salinity Barrier Feasibility Analysis. For your information, several meetings were held, in 1975, and drawings were completed regarding this proposed structure. Except for the final design, this information is available at the District 5 Administration Office Florida State Parks.

57. Pages 166-168. The District should provide more details regarding this research effort including time lines for accomplishing each task, estimated costs, and funding sources.

58. Table of Contents. This needs to be correlated/updated with correct references to page numbers.

59. Appendices. The references to main document figures need to correlated/updated (example B-14 make reference to Figures 2 of main report, which probably should have referenced Figure 4).

60. Appendix A, Page A-7. Duever's referenced Figures A-1 and A-2 were not included.

61. Appendix I. Due to the "gross estimates" that this model generates, the calibration error of less than 10 CFS during 55 percent of the simulation period, the constant contributions assumed from each tributary, and the use of averages instead of extreme conditions, the value of 9 CFS proposed does not seem to be representative of what the actual effects could be.

62. Appendix O, Table O-3.This table shows that 32,961 MGD/year of water usage in the Loxahatchee watershed. This equates (32,961 x 1.55 divided by 365 = 139.9) to 140 cfs of daily watershed flow. The majority of this water usage is for urban water

supply of which most (63 percent) comes from groundwater. Although this flow may not be important in the wet season, it probably is a significant contributor to base flows during the dry season. As the dry season flows are the primary issue, it seems that existing and future water allocations could continue to reduce groundwater flows to the river unless water conservation practices, desalinization, or reuse reduce demand. Again, it also points out the need for improved water management and storage facilities to extend the hydroperiod during the dry season.

63. The document may be improved by some reorganization and elimination of redundancy.

   a. Chapter 2 and Chapter 3 should be combined. After the description of an aspect of the water body, immediately discuss the resource functions and considerations related to that aspect. In this way, some descriptions in Chapter 2 that are not important related to the MFL and recovery issues could be eliminated. Some repeated information and statements in Chapter 3 could also be deleted.

   b. Chapter 4 and Chapter 5 would also be better combined, following the same logic in the above comment. Combining chapters would allow repeated information and statements to be eliminated, and readers could more easily find the connection between the results and the methods.

   c. Chapter 4 and Chapter 5 would be improved if they were rewritten according to the criteria for establishing the MFL. In the current document, readers cannot easily find the information about where and how each element (criterion) of the MFL is determined. It would be better to have a specific, clear and logical description about how each element (criterion) of MFL is determined, in the following sequence:

   - baseline time (year) to establish MFL
   - indicators (Valued Ecosystem Components)
   - location (river miles) of significant harm
   - location of the flow measuring point
   - salinity threshold
   - maximum duration and frequency
   - threshold flow rate.

64. The following (underlined) may be errors:

   - Page 57, first paragraph: "…in all <u>the</u> of the other subbasins."
   - Page 86, second paragraph: "…in Table <u>29</u> were measured…"
   - Page 91, second paragraph: " Once the water resource… <u>and</u> specific technical…water body."
   - Page 93, third paragraph: "See also Table <u>22</u> of this report."
   - Page 115, third paragraph: "…the majority the six VEC species…"
   - Page 116, third paragraph: "…significant harm (Table <u>31</u>)."
   - Page 138, third paragraph: "…during 12% <u>of</u> of the simulation…"

Specific/Editorial Comments (July 15, 2002 Draft)

- Page 142, the footnote of Table 38: "…vegetation parameter (Ds/Db) was observed…"
- Page 144, second paragraph: "…up to 2 ppt (Figure 30)."
- Page 146, second paragraph: "(river mile 9.2)(Table 35)."
- Page 153, second paragraph: "…in 1984, at the time…"

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RES 10-12

November 4, 2002

The Honorable Geraldine Genco
Mayor, Village of Tequesta
P.O. Box 3273
Tequesta, FL 33469-0273

Subject: Resolution No. 67-01/02 – Opposing the Loxahatchee River MFL

Mayor and Council Members:

District staff has reviewed Village Resolution No. 67-01/02 opposing the 35-cfs minimum flow and level (MFL) proposed for the Loxahatchee River and the need to also include seasonal flow criteria for the river. We are not clear what specific information was provided to the Council prior to the vote, but the District would like to provide each councilperson with the following background information:

Basis of the Proposed MFL Criteria

1. The Loxahatchee watershed represents a highly altered ecosystem. Permanent opening of the Jupiter Inlet in 1947 now exposes the lower portion of the river to the daily tidal regime. Construction of the C-18 canal to provide flood protection for the Jupiter/Tequesta area has drained the Loxahatchee Slough (the headwaters of the river) resulting in a loss of over 8,000 acre feet of storage within the watershed.
2. Resource problems occur within the NW Fork of the Loxahatchee River primarily during the dry season when Lainhart Dam flows drop below 35 cfs and allows saltwater to penetrate upstream of river mile 9 impacting remaining freshwater vegetation communities. During extreme drought conditions, these flows may reach zero and allow saltwater to move as far upstream as Trapper Nelson's (river mile 10.7).
3. The proposed minimum flow criteria were developed to prevent significant harm to water resources of ecology of the area as provided in *Chapter 373.042(1) F.S.* To prevent further damage to these freshwater communities, the District has proposed a minimum flow of 35 cfs (as measured at the Lainhart Dam) which can not be exceeded more than 20 days duration, more often than once every 6 years. Under current conditions (1990-2001) the river fell below 35 cfs 11 out of 12 years for total of 1,081 days (about 3 years in total). The proposed MFL would greatly improve this condition.
4. It should also be understood that during the dry season a minimum flow of 35 cfs provided by the Lainhart Dam equates to about 30 cfs discharged from Cypress Creek, 7 cfs from Hobe Grove Ditch, and 5 cfs from Kitching Creek, for a total flow of 77 cfs delivered to the river during the dry season.

5. The District has an existing agreement (1982 Consent Agreement) to provide at least 50 cfs of flow to the river as measured at the Lainhart Dam when available. These water deliveries will continue, even after the MFL is adopted.
6. SFWMD staff have been working with the Florida Department of Environmental Protection (FDEP), Jonathan Dickinson State Park (JDSP), the Loxahatchee River Management Coordinating Council, and members of the public over the past two years to develop a MFL for the NW Fork of the Loxahatchee River. Due to concerns about new development proposed within the Loxahatchee watershed, there is general agreement that an initial MFL needs to be established for the river as soon as possible for consideration in the District's consumptive use permitting process.

MFL Recovery Plan

1. To meet the proposed MFL, the District has developed a MFL Recovery Plan designed to immediately increase water storage within the basin to meet the proposed MFL criteria by 2006. Key projects currently underway include: construction of the Loxahatchee Slough Structure ($2.7 million) to capture and store water in the slough for later delivery to the river during the dry season; widening the M-canal and constructing the C-2 pump station ($3.0 million) to provide flows from the L-8 canal when available; and construction of a flowway under Northlake Boulevard ($1.2 million) to provide flows from the West Palm Beach Water Catchment Area to the headwaters of the Loxahatchee River.
2. As part of the Northern Palm Beach County Comprehensive Water Management Plan (NPBCCWMP), the District has committed over $39 million for water conveyance and water storage projects over the next 14 years to reconnect the regional system with the headwaters of the Loxahatchee River. Construction of these projects will provide a target flow of 65 cfs to the NW Fork of the river by 2018.
3. The District recognizes that the proposed MFL represents only a partial solution to the problems that exist within the Loxahatchee watershed. As defined in state statues, MFL criteria are only intended to protect the resource from significant harm. Restoration of the river will be accomplished as outlined on page 3 of this letter.

Seasonal Flow Criteria

District staff examined seasonal variations in flow to the river as part of the MFL analysis. A seasonal variation component to the MFL for the Loxahatchee River was not considered to be appropriate because of the following considerations:

1. Average flows (about 100 cfs) and typical peak flows (as much as 700 cfs) to the river, tend to follow normal seasonal rainfall patterns and seem to be appropriate to protect existing resources in the watershed.
2. As discussed previously, the primary problem that impacts the river are low flow events experienced during the dry season and during extended droughts. Extended dry periods allow saltwater to encroach up river and cause harm to water resources.
3. There is little evidence indicating that wet season flows, or flows that occur at any other time of year (other than the dry season) are currently impacting the resource due to an existing facility, water withdrawal or water management practice.
4. Establishing a seasonally based MFL, although suggested as an option by Chapter 373.042(1) F.S. is inconsistent with established District policy for other water bodies, including the greater Everglades, Lake Okeechobee, Caloosahatchee River and Estuary and the St. Lucie

River and Estuary. Seasonally based flow targets for these areas are being addressed through restoration plans.

River Restoration Efforts

1. SFWMD staff is also actively engaged with the FDEP, other agencies, local government and the public, to develop an achievable restoration goal for the river and estuary. The District has committed substantial technical staff and resources to develop seasonally managed flow criteria for the river as part of the restoration process. This work is already underway and is viewed by the District as the appropriate vehicle to develop seasonal flow criteria for the river.
2. The District is also working with the USACE to address the environmental restoration needs of the Loxahatchee watershed as part of the regional Comprehensive Everglades Restoration planning (CERP) process. As part of CERP, the District and USACE are developing the Northern Palm Beach County Project Implementation Report (PIR). The PIR identifies a number of key projects that will provide increased storage within the basin that will provide more water for the NW Fork of the Loxahatchee River. These projects include: construction of the L-8 reservoir which will add 48,000 ac-ft of storage to the basin, C-18 basin storage, C-51/C-17 back pumping and treatment, and Pal Mar/Corbett land acquisition and hydroperiod enhancement.
3. A major outcome of this planning effort will be a more complete set of seasonally managed flow criteria for the river that are driven by natural rainfall patterns. As part of that process, the District will expand the watershed modeling effort to include the entire Loxahatchee watershed (including Martin County).
4. MFL criteria for the river will be revisited after restoration goals and seasonal flow criteria have been defined and a water reservation for the river has been established. The CERP restoration process is viewed by the District as the appropriate process to address restoration needs of the system and seasonal flow characteristics of the river. Once identified, the restoration flow targets will be used in the CERP project design and the water reserved for the river on a project by project basis.

Based on the information provided above, we urge the Village Council to reconsider resolution No. 67-01/02, which opposes implementation of the MFL rule for the Loxahatchee River. Additionally we would look forward to meeting with you personally, to discuss any outstanding issues you may have associated with the Loxahatchee River. Thank you for your continued interest in the water resources of South Florida.

Sincerely,

Kenneth G. Ammon, P.E.
Director
Water Supply Department

Bc: H. Dean, 1110
C. Merriam, 4110
P. Gleason
L. Lindahl
J. Mulliken, 4310
M. Pearcy, 4350
D. Swift, 4350
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P. Sime, 4420
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A tax exempt Florida not-for-profit corporation pursuant to Section 501(c)(3) of the Internal Revenue Code.
Dedicated to representing the public interest in environmental and land use matters.

PLEASE REPLY TO: Treasure Coast Office

November 13, 2002

Mr. John Zahina
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33408

RE: Loxahatchee MFL comments

Dear John,

Let me first apologize for the delay in providing you with these written comments on the draft technical criteria for the establishment of a minimum flow and level for the Loxahatchee River, submitted on behalf of the Florida Wildlife Federation, the Sierra Club Loxahatchee Group, and the Martin County Conservation Alliance. I am confident, however, that the issues raised in these comments will not be new to you, as we have voiced the majority of these concerns at numerous public meetings on the subject. While these comments are directed to the July 2002 draft technical criteria, I believe many of the issues here raised will also apply to the soon to be released November draft technical criteria. I understand that release of the November draft is imminent, and so as not to delay your process, I would ask that you keep these comments in mind when considering revisions to that document. Likewise, we will supplement or revise these comments in response to our review of the November draft technical criteria.

Our primary concerns at this point relate to the extremely short timeframe (less than 1 month) proposed for the rule development process. Given the highly complex nature of an MFL rule and the significant public interest in protecting and enhancing the Loxahatchee River, it would appear that additional time for stakeholder analysis of the revised technical criteria would be warranted.

We are additionally concerned that the proposed MFL exceedence and violation criteria and return frequency are not sufficient to protect the river from significant harm. As currently worded, the proposed MFL criteria would allow repetitive or long term low flow or zero flow events, the effects of which have not been analyzed in the technical criteria. We recommend revising the exceedence and violation criteria to prevent such an outcome.

We are unconvinced that 1985 represents an appropriate baseline condition for establishment of the MFL. The state's interest in protecting and restoring the Loxahatchee was evident well before 1985, and numerous scientific studies from that time document the damage that had already been caused by reduction of flows to the river. We urge the District to select an earlier baseline which more accurately reflects the longstanding state and federal interest in protecting and enhancing the historical conditions of the river and watershed.

It is also disappointing to see that MFL's have not been established for the Loxahatchee Slough, or for any of the tributaries to the Northwest Fork. Failure to establish tributary MFL's will allow significant harm to continue to occur on the River, particularly to the currently healthy cypress swamp existing at Kitching Creek.

Finally, we believe it is critical that the MFL, once established, be reviewed earlier than in 5 years. We recommend that the District commit to reviewing the MFL by no later than 2004, concurrent with the proposed schedule for establishment of an initial reservation to protect existing water for the protection of fish and wildlife and with the scheduled completion of the Northern Palm Beach County Project Implementation Report.

Thank you for consideration of our comments. As always, we are available to meet with District staff to address these concerns in greater detail.

Sincerely,

Lisa Interlandi

cc: Henry Dean, SFWMD
Dave Swift, SFWMD
Joel VanArnum, SFWMD
Ken Ammon, SFWMD
Scott Burns, SFWMD
Cecile Ross, SFWMD
Melissa Meeker, FDEP
David Struhs, FDEP
Manley Fuller, FWF
Kay Gates, Lox Sierra
Donna Melzer, MCCA
Nathaniel P. Reed

The Environmental & Land Use Law Center submits the following comments on behalf of the Florida Wildlife Federation, the Sierra Club Loxahatchee Group, and the Martin County Conservation Alliance regarding the July Draft Loxahatchee River MFL Technical document and proposed rule. These comments are preliminary in nature, and will be revised and / or supplemented as rule development proceeds.

TIMING FOR RULE DEVELOPMENT PROCESS

Our initial concern is that the proposed rule development schedule is extremely aggressive, and does not provide sufficient opportunity for public input, does not allow sufficient time for stakeholder review between mail out of the final draft MFL technical document (November 15th) and rule development workshops (November 19th and 25th) and final Governing Board approval (December).

Recommendation: Revise rule development schedule to allow sufficient time for stakeholder review of final draft rule prior to rule development workshops. Increase opportunities for public participation in rule development by scheduling an at least one additional full day public workshop on the proposed rule.

MFL CRITERIA AND RETURN FREQUENCY

Under the proposed rule, an MFL violation occurs within the Northwest Fork of the Loxahatchee River when an exceedance occurs more than once every six years. An "exceedance" is defined as when flows to the Northwest Fork of the river as measured over Lainhart Dam decline below 35 cfs for more than 20 consecutive days within any given calendar year.

The proposed definition of "exceedance" is loosely worded and as drafted is insufficient to prevent significant harm. While not suggesting that the District would employ such an operational strategy, as an example, the proposed rule would allow unlimited cycling of 19 days of less than 35 cfs (or even zero flow), followed by 1 day of 35 cfs, without ever triggering an exceedance, which would result in a substantial reduction in overall flows to the River.

While such an example appears somewhat extreme and unlikely, less extreme examples would be more likely to occur, but were not analyzed by the technical criteria and could be equally damaging to the river.

Also, due to the 1 in 6 years return frequency, once an exceedance (< 35 cfs for >20 days) has occurred, lower than 35 cfs flows could continue consecutively for up to 1 year without triggering an MFL violation.

The technical criteria fails to analyze the impact that numerous, repetitive, or long term low flow or zero flow events, as would be allowed under the proposed technical criteria, could have on the river.

Additionally, by establishing a single numerical minimum flow, the proposed MFL fails to account for natural seasonal fluctuations in water flows or levels, as required by Rule 62-40.473 F.A.C. which states:

> *"(1) In establishing minimum flows and levels pursuant to Section 373.042, consideration shall be given to the protection of water resources, natural seasonal fluctuations in water flows or levels, and environmental values associated with coastal, estuarine, aquatic, and wetlands ecology. . ."*

Page 68 of the technical criteria acknowledges that "Protection of this resource requires reducing or reversing the current trend of saltwater intrusion and mangrove invasion within the upstream freshwater portion of the river by maintaining minimum baseline freshwater flows to the Northwest Fork." This statement appears to be contradicted by the proposed MFL of 35 cfs. The MFL as proposed does not reduce or reverse the damage that has been caused by decades of neglect and oversight.

The proposed MFL appears to adopt the strategy of maintaining the status quo, although due to the problems with the return frequency, definition of exceedance, etc. detailed above, it is unlikely that the proposed MFL would in fact maintain the status quo, as it would appear to allow a significant reduction in current flows.

As has been suggested by FDEP staff, if the status quo is to be maintained, current flow conditions cannot be allowed to deteriorate --an MFL to protect the status quo should include a range of flow requirements similar to those in Table 40 on page 145 and include flows from page 139. Flows at Lainhart Dam should average 50 cfs annually, not fall below 35 cfs for more than 40 days once a year, fall to 20 cfs once every 1.67 years and for no more than 30 days, fall to 10 cfs every 6 years and for no more than 20 days, and fall to 5 cfs for no more than 13 days once every 30 years, and never fall below 5 cfs. Such an MFL could best be administered by developing a rainfall formula to meet its requirements.

We, however, disagree that a strategy of maintaining the status quo is appropriate for establishment of an MFL for the Loxahatchee River, as we believe such an approach would conflict with the non-degradation and enhancement policy expressed by the Federal Wild and Scenic River's act, which requires that Wild and Scenic Rivers be managed to protect and enhance the values for which the River was designated, and accordingly we recommend establishment of an MFL that promotes some level (even if limited) of river restoration.

Furthermore, the consent decree between Florida Wildlife Federation and the District requires the District to provide a minimum flow of 50 cfs "when available". There would appear to be some conflict between an MFL of 35 cfs and an accompanying recovery strategy and fulfillment of the District's obligations under this consent decree. More explanation is needed on how the District will define the phrase "when available", and how this requirement will be implemented in the future. For instance, would the District grant a consumptive use permit if the permit was consistent with the 35 cfs recovery strategy, but

would reduce the frequency that 50 cfs is "available" under the terms of the consent decree?

Recommendation: Analyze impact that repetitive or long term low flow or zero flow events could have and revise MFL exceedence / violation definition or return frequency accordingly; or revise MFL exceedence / violation definition and return frequency to prevent repetitive or long term low or zero flow events.

Recommendation: Revise MFL to encompass a flow regime with natural seasonal fluctuations in water flows or levels, as required by Rule 62-40.473 F.A.C.

Recommendation: Provide further explanation about the District's obligations under the Florida Wildlife Federation consent decree and about how these obligations will be fulfilled in application of the recovery strategy and in future permitting decisions.

USE OF 1985 BASE CONDITION

Throughout the document, and particularly on P. 130, the draft technical criteria states that SFWMD staff selected the condition of the river in 1985 as the baseline or reference point for establishing the MFL. The document states that 1985 was chosen as the base condition because the Wild and Scenic River Management Plan (SFWMD, 2002) recognized the values of the river at that time and identified the need to protect and enhance these resources.

Choosing 1985 as the MFL base condition appears somewhat arbitrary, as in 1985 it had long been recognized that the Loxahatchee River was seriously threatened by reduced flows, and the need to increase flows to enhance the river condition was well documented. The Federal Wild and Scenic River's act, itself states a non-degradation and enhancement policy, which requires that each wild and scenic river be managed to protect and <u>enhance</u> the values for which the river was designated. Additionally, in 1983 the District was given the rulemaking authority and direction by the legislature to establish a Loxahatchee River rule to regulate activities in the watershed which could have an adverse effect on river resources. Such a rule was never adopted, while the River's condition has continued to deteriorate.

Concerned citizens, environmental advocates, and governmental agencies have called for the restoration of flows to the Northwest Fork of the Loxahatchee River for at least the last three decades. Similarly, it was decades ago that the SFWMD was given the responsibility to establish a MFL for the river. While over the last 30 years no MFL has been established, damaging low flows have persisted while over-drainage and development have continued unabated, further degrading the river and its cypress swamp community.

Numerous large scale studies were conducted on the river in the early 1970's, including the 1973 United States Geologic Survey hydrologic study, which concluded that the primary cause of environmental problems facing the river was the upstream movement of salt water which had caused changes in the flora and fauna of Jonathon Dickinson State Park. The report found that land

development, canal construction, and water control practices allowed salt water to encroach upstream, and determined that a <u>minimum of 50 c.f.s. would be required to retard further upstream movement of salt water under the drainage and development conditions that existed at the time of the study.</u> See 1985 Management Plan, p. 21.

The state recognized the river's importance and need for protection as early at 1970 by designation of the Loxahatchee River–Lake Worth Creek Aquatic Preserve by the Governor and Cabinet, sitting as the Board of Trustees of the Internal Improvement Trust Fund. In 1975, the Legislature passed the "Florida Aquatic Preserve Act" (Chapter 258, Fla. Stat.) which directs that " submerged lands in areas which have exceptional biological, aesthetic, and scientific value, as hereinafter described, be set aside forever as aquatic preserves or sanctuaries for the benefit of future generations." The intent of the State, through the Trustees and the Legislature, to protect, preserve, and enhance the condition of the Loxahatchee River has been evident since at least the early 1970's.
Even the 1985 Management Plan, which the technical criteria relies upon in setting the 1985 baseline, recognized that the river was in jeopardy due to low flows, and therefore increasing minimum flows was a principle goal of the plan. "Clean fresh water of sufficient quantity and periodicity is essential in maintaining the area's scenic qualities and diverse native plant communities and wildlife populations. Man-made alterations to the river's natural drainage patterns have reduced the quantity and quality of water in river, and these changes have contributed to the corresponding declines in the river's natural and scenic qualities." 1985 Management Plan, p. 14.

A principle goal of the plan, insofar as the management of the river's water resources is concerned, is to, "increase minimum flows to the river <u>as much as possible in order to effect the greatest possible downstream movement of the saltwater wedge during dry conditions</u>". 1985 Management Plan, p. 100.

Additionally, Section 373.042(1) Fla. Stat. requires the District to consider, and at its discretion provide for, the protection of non-consumptive uses in the establishment of minimum flows and levels. This provision should be utilized to ensure sufficient flows for the protection and enhancement of Jonathon Dickinson State Park, the Loxahatchee River – Lake Worth Creek Aquatic Preserve, and for the protection and enhancement of the wild and scenic river values.

Recommendation: Revise baseline condition for the protected resource functions of the Loxahatchee River and estuary to an earlier date which more accurately represents the longstanding state and federal interest in protecting and enhancing the historical conditions of the river and watershed.

Recommendation: Revise MFL to provide for the protection of non-consumptive uses pursuant to Section 373.042(1) Fla. Stat., including amounts of water necessary for the protection and enhancement of the wild and scenic values of the Loxahatchee River, and protection and enhancement of Jonathon Dickinson State Park, and the Loxahatchee River–Lake Worth Creek Aquatic Preserve. These non-consumptive uses are critical for the protection of public lands and for

Florida State Parks and should be protected by the MFL due to the immense public benefit these resources provide.

CONSUMPTIVE USES

The technical criteria asserts throughout that , "...water use within the watershed does not hydrologically influence the flows in the Loxahatchee River...". Conversely, the document also acknowledges the inability to calculate the impact of consumptive use and states that "professional judgment" indicates dry season impacts to the river could be in the range of 5 cfs.

From a lay perspective, 5 cfs does not appear to be a reasonable estimate of consumptive use impacts on the river, particularly given the extensive development and numerous wellfields in and adjacent to the Loxahatchee River basin and the acknowledged uncertainties in the model and the inability of the model to link surface water and ground water flows. It was also troubling to see on page 81 that consumptive use permitting records which are necessary to determine actual dry season pumpage were examined and "many of the data records were missing or incomplete."

Assuming 5 cfs is an accurate estimate, the technical criteria inappropriately minimizes the significance of such an impact. 5 cfs is 15% of a 35 cfs MFL, which could, in fact, be significant.

The document acknowledges on p. 63 that "...very little allocable water remains from the surficial aquifer within the watershed." It is concerning that the district considers <u>any</u> water available for allocation in the watershed, when there is no clear answer as to how consumptive uses have impacted dry season flows to the river. The lack of allocable surficial aquifer water in the watershed calls for the district to refrain from issuing or renewing consumptive use permits from the surficial aquifer within the Loxahatchee watershed until alternative water resources are available.

Recommendation: Conduct a more thorough analysis of the impacts of consumptive use on flows to the river. Expedite development of integrated surface and groundwater model and to better understand impacts to the river.

Recommendation: Refrain from issuing or renewing consumptive use permits which draw from the surficial aquifer within the Loxahatchee watershed.

Recommendation: Internally audit or otherwise ensure that consumptive use pumpage records are timely submitted, complete, and available for public review.

LOXAHATCHEE SLOUGH AND ESTUARY

The MFL technical criteria does not address minimum flows or levels for the Loxahatchee Slough or the Loxahatchee Estuary. Will MFL's be established for these waterbodies, and if so, when? The document is entitled Minimum Flows and Levels for the Loxahatchee River and Estuary, however no description of the desired estuarine conditions is included. More analysis and explanation is

needed on considerations such as the desired extent and location of sea grasses and the associated freshwater flow regime, the conditions needed to support a healthy reproducing oyster population, and flows needed for the maintenance of a healthy estuarine fish population.

It would seem most appropriate to address the water needs of the Loxahatchee Slough, River, and Estuary comprehensively or at least concurrently to ensure that all components of the natural system maintain necessary levels and flows so that they can begin to function properly together.

Recommendation: Set timeframe to establish MFL for Loxahatchee Slough.

Recommendation: Revise MFL document to more thoroughly address desired conditions for Loxahatchee Estuary and flow necessary to achieve those conditions.

TRIBUTARIES

Tributary inflows to the northwest fork account for nearly 50% of the River's inflow, yet the proposed MFL only measures inflow from one point (Lainhart) -- no MFLs are proposed for any of the River's additionally tributaries: Cypress Creek (26-32%), Kitching Creek (11-13%) or Hobe Grove Ditch (5%).

Due to a lack of data, the MFL model assumes tributary inflows to be a constant fraction of the discharge at Lainhart dam. This does not appear to be a safe assumption. Because the tributaries were excluded from MFL development, it may not be reasonable to assume that these flows will remain constant, particularly because the tributaries are virtually ignored in the proposed recovery strategy. The proposed MFL in no way ensures that these flows will not reduced or diverted by development or otherwise.

Failure to properly address tributary inflows is particularly concerning for Kitching Creek, which still contains large areas of healthy cypress forest. An MFL which only protects areas upstream of River mile 9.2 and does not require any minimum tributary inflow from Kitching Creek will allow significant harm to occur to the healthy floodplain swamp community at Kitching Creek.

Additionally, with the District currently in the process of acquiring vast portions of Cypress Creek, it would appear feasible and prudent to include restoration of flows from Cypress Creek, and other tributaries, as part of the overall MFL Recovery Strategy.

Recommendation: Revise MFL to establish minimum flows for each of the river's tributaries.

Recommendation: Include restoration of tributary inflows as part of the MFL Recovery Strategy.

Recommendation: Revise MFL to ensure protection of healthy cypress floodplain swamp community at Kitching Creek.

VEGETATION SURVEY

On P. 132, the document states that based on comparisons of vegetation community descriptions from 1985 and 2002, it can be inferred that there has been little change in the distribution of freshwater and salt tolerant vegetation since the mid- 1980's. Existing canopy vegetative communities have been analyzed from aerial photographs from 1940, 1985, and 1995. However, the aerial coverage comparison was not brought up to date, which should be done to support the inference that there have been no significant vegetation change between 1984 and 2002 .

Recommendation: Update vegetation survey from 2002 aerial photograph.

REVIEW OF MFL

Due to a current lack of data, uncertainties in the model, and ongoing studies and efforts to identify a restoration target, the proposed MFL, once established should be reviewed sooner than 5 years.

Recommendation: Review MFL in 2 years or after completion of joint DEP / SFWMD restoration target studies, to ensure MFL is appropriate in light of revised restoration target.

SFWMD Responses to FDEP Comments on July 15, 2002 Draft of the Loxahatchee MFL Technical Criteria Document

SFWMD Staff Responses to Technical Comments

1. This issue is addressed in the revised document. The flow analysis used to develop the MFL criteria were based upon best available information. There is a good amount of data available from the 1980-81, 1985 and 1989-90 drought periods where we have concurrent flow data from all of the tributaries. Comparison of actual data collected from the river during these low flow periods with those values used in the hydrodynamic model show good agreement. For example, the percent of flow contributed by the Lainhart Dam to the NW Fork used in the model was 44%. This compares with field measurements that show the Lainhart Dam to provide 45% of the flow for the 1980-81 drought dry season, 46% from the 1980-81 drought wet season, 40% from the 1989-90 drought dry season, and 56% from the 1989-90 drought wet season. Based on these data, the flow ratio of 44% provided in the model appears as a reasonable ratio for estimating the flow contribution provided by the Lainhart Dam and other tributaries during dry periods, the period of time that would be of most interest in setting the MFL.

   The District has recently completed a contract with the USGS to update and improve the current flow/salinity monitoring program within the watershed. Additional flow gages and salinity monitoring instruments are being installed in Cypress Creek and Hobe Grove Ditch. These additional gages will provide the data needed to more fully understanding the role that these tributary basins play in shaping the river's salinity profile.

2. There are a number of acceptable methods to conduct field surveys of floodplain vegetation. A floodplain cross-section transect is one approach if the intent is to document the range of communities that exist at a particular point. The belt quadrat approach used in this study was designed to allow comparison of areas within the floodplain that had approximately equal exposure to flooding and drying caused by river water level. A more random sampling approach to locating sites within the floodplain is appropriate from a population that can be assumed to have a normal distribution. In this case, sites were located selectively, rather than randomly, to represent areas that were not obviously influenced by structural features of the floodplain. This protocol is clearly explained in the Methods section of the report. Again, these data represent best available information. We are not aware of more recent data conducted along the river corridor other than the Ward & Roberts (unpublished) vegetation surveys conducted in 1993.

3. As explained in the report, this was a preliminary effort to obtain background information that could be used to develop a more comprehensive soil/salinity monitoring program. In response to FDEP's comment, in an ideal world, every vegetation survey point would have had associated detailed topographic survey data as well as soil salinity data, descriptive soil profiles, and soil chemistry analyses. Our ability to collect and analyze soil samples was limited by both staff time and budget. As a result, only a few samples could be collected and analyzed for the most basic indicators of saltwater influence. The soil salinity sites were selected to corresponded to plant survey sites at selected points in the river that we hoped would best represent the range of salt influence from frequent exposure to infrequent exposure. A much more comprehensive look at soil salinity is warranted, including intensive

sampling at a range of depths at frequent intervals, especially during dry periods, to account for the fact that salt may only be detectable in the soil when salinity is high in the river and may be rapidly removed from surface soils when freshwater flows in the river increase. In Chapter 6 we discuss future monitoring and research efforts designed to obtain better soil salinity information along the river corridor.

Questions 4, 5 & 6

Figure 19 has been modified illustrate average annual flows from Lainhart Dam rather than from G-92. This figure was placed in the report at the request of Tom Swihart. The purpose of Figure 19 is to represent decadal differences in freshwater flow patters, i.e. to compare flow conditions in the 1970's with the 1980' and 1990's. It seems reasonable therefore to compare data from the 70's and 1980's as "historical" and data from the 1990's as "current." Another approach that could have been used, of course, was to use 1987 as the divide point, as you suggest. Still another approach may have been to use 1983 or a 1985 as the divide point (before and after wild and scenic river designation), or 1979 (before and after the consent decree). As noted, there were significant differences in rainfall patterns between the 1970s, 1980s, and 1990s and the increases in rainfall during the latter decades may have been responsible for the observed overall increase in average flows to river during this period. This issue is discussed in Chapter 2, Figure 4 and in Chapter 5. The more critical issue from our perspective, as noted in FDEP's comment, is that the incidence of very low flow events has not improved substantially during this period. As shown in Table 24, the occurrences of flows less than 20 cfs and less than 10 cfs have remained approximately the same. Table 24 shows that during the 1990s flows less than 35 cfs occurred 25% of the time, as reflected in 73 events, with an average duration of 15 days and a return frequency of two months. Although we did not do the math to determine exactly how many violations of the proposed MFL criteria this represents, we felt it was safe to assume that, on average, we could expect that the proposed MFL criteria were probably exceeded <u>4-6 times</u> <u>per year</u>. Under the proposed criteria, flow rates below 35 cfs for 20 days duration, would only be allowed to occur <u>once ever six years</u>.

The conclusions presented in the report was not that the resource had not been harmed by current flow conditions, but rather that recent flow conditions have not caused noticeable further degradation of the resource, relative to conditions that existed in 1985, the point in time when the river was designated as Florida's first Wild and Scenic river. A section of the river has been identified in the report that is presently experiencing significant harm, due to the effects of historical and current flow conditions. Again, these conclusions are based on best available data.

7. Table 25 is based on analysis of routine water quality sampling data that is collected periodically by LRED. As they mention in their report, the 'Wild and Scenic" segment of the river contains one downstream station that is often estuarine in character and frequently has elevated salinities. Nevertheless, comparison of the 1998-2001 drought years, with historical average conditions, indicates significantly higher salinities. Unfortunately a comparison was not provided with historical drought periods, such as may have occurred in 1971, 1981 and 1989. The District's contention that impacts to the river have remained relatively stable since 1985 was based on assessment of floodplain the vegetation communities recorded in this study, vegetation maps provided in the FDNR 1985 Wild and Scenic River EIS, and a FDNR

1993 survey of the river. Comparison of these vegetation maps are provided in the revised final draft.

8. We agree with all of these points and have tried to insert the appropriate qualifying text in the document.

9. The estimates of consumptive use are based on several sources of information. This includes the amount of water allocated in consumptive use permits, the amount of water that is reported to be used by utilities, estimates of water use based on land use type and weather conditions, and estimates of water use provided by the USGS. If there are other more appropriate sources of information available that should included within the document, we are not aware of this information. In response to a number of consumptive use questions posed by FDEP staff, the District agreed to conduct additional modeling to provide a more definitive answers to these questions. The MODFLOW modeling effort was designed to provide a general indication of relationships between surface and ground water as a means to develop an integrated approach to assessing cumulative impacts of water withdrawals in the basin. At this point in time, this model represents the best tool we have to address this type of question. The information contained in Appendix I was revised after copies were provided to FDEP. The new revised version includes a discussion of the accuracy of the model and indicates a difference of up to approximately 10 cfs, of which about 50% is attributed to consumptive use withdrawals by major utilities.

10. We agree with FDEP comments that this reference provides only a generalized description of vegetation habitats. Appropriate qualifying information will be placed in the document.

11. We agree that a range of species and characteristics needs to be considered in terms of monitoring the overall health of the community and determining both long-term and short-term impacts and restoration needs of the system. A more comprehensive study and monitoring program is warranted within the watershed. A summary of proposed future research projects is provided in Chapter6, in the section entitled *Research Needs.* This particular suite of vegetation monitoring parameters was chosen because it was felt that they were best suited to determination of significant harm that takes more than two years for recovery to occur.

12. Results from a number of different tools and types of analyses were combined to address these issues and develop management criteria. Figure 32 shows that, under current operating conditions, salinities of 2 ppt occur infrequently (for 20 days once every six years) at river mile 10.2 and often (several times a year) at river mile 9.2. Results of this model run were analyzed to determine how much flow was needed to prevent salinity at river mile 9.2 from exceeding 2 ppt. This flow was determined as 35 cfs. We proposed therefore, in order to protect the resources at river mile 9.2 from exposure to 2 ppt salinity, that river flows should not be allowed to drop below 35 cfs for more than 20 days, more often than once every six years

    Another analysis was made to determine the long-term average salinity that occurred at river mile 10.2. As shown in Table 34, that long-term average salinity was 0.15 ppt. Therefore we used the model to determine how much flow was needed to provide a similar salinity (0.14 ppt) at river mile 10.2. That flow value, as shown in Table 37 was about 100 cfs. Analysis of flow data from the river (see Figure 19 in the November 2002 report) indicate that during the past decade (1991-2001) the District has provided and average flow of 106 cfs to the river.

However, we did not choose to use the average annual flow as the MFL criterion because a) even though we are already providing 100 cfs annual flow on a continuing basis, the river is still experiencing long periods of low or no flow when salt water can penetrate far upstream into areas that have healthy floodplain swamp communities; and b) use of the annual average as a management criterion allows the potential for too much variability to occur (long periods of no flow can be "balanced" by short periods of high flow) to provide adequate protection for the resource. Therefore we chose to focus on the management of extreme events as the best means to prevent significant harm

13. Evidence presented in this report indicated that these six trees, although they are primarily freshwater species, can tolerate occasional exposure to salt concentrations of 1 ppt and even fewer exposures to salinities of 2 ppt as evidenced by the "exposure history" of the healthy floodplain swamp community that exists at river mile 10.2.

14. This is a significant misinterpretation of the intent of the analysis presented in this section. We attempted to analyze the conditions that exist at river mile 10.2 in terms of a number of different criteria related to salinity exposure, including the duration of exposure to various salinity levels and the elapsed time between exposure events, and the average salinity conditions

15. As also noted by the peer review panel, information in these tables was in error and has been modified in the revised document.

16. An analysis of this issue has been included in the revised document.

17. This concern has been raised by a number of reviewers. Review of past management practices indicates that this scenario is unlikely to occur except under extreme events. Adequate language to minimize occurrence of these kinds of events needs to be incorporated into the rule during the rule development process,

18. The recovery plan addresses this issue by providing adequate sustained flow through time (by 2006) to prevent increases above 2 ppt salinity, as required by state law.

19. Appendix E is being modified to address these types of concerns.

20. Appendix O has been rewritten to address apparent inconsistencies in the data.

SFWMD Staff Responses to Specific Editorial Comments

1. The analysis of resources did not show significant resources that could potentially be impacted by reduction of flow from the North Fork River or from southwest Fork Tributaries. Additional analysis of these resources may be conducted in conjunction with the restoration effort.

2. This problem was fixed in the text.

3. Impacts of excessive flows are beyond the scope of the MFL effort but should be addressed in the development of a practical restoration plan for the river and estuary

4. This is a standard District graphic that serves a number of purposes. There is management consensus that the relationships shown here are appropriate.

5. Reference added to document. Please note that this restoration vision has not been endorsed by our Governing Board, nor has it been fully endorsed by the current restoration effort.

6. We would like to add the 2001 data. We have submitted a request for our modeling section to develop this information when the data set for the SFWMM is next updated.

7. We have included a copy of the state legislation designating this river in the appendices and cited the relevant state law in the document (Ch 83-358, Laws of Florida).

8-9. Details of flow events are provided in Appendix D and are discussed throughout the text. Text in this section was modified to address these comments.

10. Corrections were made in the text

11. We have no data to determine where oysters may have been present in the system historically. The fact that large amounts of material have been removed from the central embayment and the mouth of the river during the past century, suggesting that extensive oyster bars may historically have been present in this area.

12. This text was added to the document.

13. The text was modified in the document to address this issue.

14. The text was modified to address this issue.

15. Text was exchanged on the figure,

16. The text was modified in the report to address this comment.

17. We agree with the ideas expressed in this comment. The text in the document was modified to better explain these relationships. The purpose of the MFL is protect the resource. Water supply and flood control are functions of the resource that need to be considered when the MFL is developed. The effects of the proposed MFL on these functions needs to be assessed as part of the subsequent analysis.

18-19. This information was added to the document.

20. We agree with almost all of the statements in this comment. We are in the process of developing an interactive, groundwater and surface water, watershed modeling tool that can be used to assess the impacts of water withdrawals on river flows. This model will also provide a means to assess cumulative impacts of permits. Results of this work in progress are provided in Appendix I. An effort was made to use the model to predict interactions and then calibrate and verify the output against actual flow and water level data from the basin.

21. Text in the document was modified to address this comment and incorporate parts of the text provided.

22. Text in the document was modified to address this inconsistency. Our best estimates indicate that flows to the river are minimally impacted by groundwater withdrawals. Monitoring is one tool that is used to help estimate the magnitude of these impacts.

23. This section was modified in the document to clarify the intent including some of the text provided in your comment.

24. Comment noted.

25. We have recently obtained a copy of this report and are in the process of analyzing the data for application to the MFL.

26. Text in the document was modified to summarize the types of data available.

27. The total amount of water withdrawal in the basin, based on permit allocations, use data, and estimates derived from models is provided in Chapter 2 and also in Appendix O.

28. Change made to document.

29. An initial estimate of predrainage water conditions was provided in Appendix N. However, it was felt that this analysis was not detailed enough to provide useful information. An initial attempt was made to use the District's Natural Systems model to estimate historical flows from this basin, but the mode l grid (2miles x 2 miles) was considered to be too coarse to provide useful information.

30. Comment noted. Our approach to MFLs is that they are in effect under all conditions, but the levels are maintained or exceeded under most conditions. MFLs become especially relevant during extremely dry periods when there is potential conflict between consumptive uses and the natural system for limited resources. The MFL recovery and prevention strategy is designed to ensure that adequate water is available to meet the MFL criteria and also meet regional water supply needs so that there is no need to compete for water for all rainfall conditions that are less severe than a 1-in-10 year drought.

31. The only data from Russell and McPherson that was used in this table was flow data for the North Fork.

32. We are not aware of any data prior to 1971. If data are available we would like to consider use of this information in the document.

33. Comment noted. The dots represent individual wells. Permits typically are issued to landowners or utilities that operate a number of wells on their property. Thus a single permit may be represented by a cluster of dots in close proximity on the map. Impacts are evaluated for each permit and thus consider the combined effects of withdrawals that occur from all of the wells covered by the permit.

34. The attempt to develop a cumulative analysis of the effects of consumptive uses in the basin is presented in Appendix I. Another analysis of cumulative impacts, using more conventional techniques is presented in Chapter 2. Both methods resulted in an estimate that consumptive water use by the major utilities results in about a 5 cfs reduction in river flow.

35. Information on the timing of withdrawals was provided in Appendix O, indicating that utilities have peak withdrawals during the dry season, that rarely reach or exceed the amount allocated.

36. Spellings of names in this table were corrected. Mangroves are not a typical component of the freshwater VEC community, but their presence in transects should have been noted.

37. Seedlings were described as shorter than breast height (approximately 4 feet) whereas saplings were taller than breast height.

38. The text was changed in response to this comment

39. The text was changed in response to this comment

40. FDEP comments on this issue were incorporated into the document.

41. Comment noted. This figure was removed from the main document but is stil provided in Appendix B.

42. The table in Appendix H was changed in response to this comment

43. Comment noted

44. An additional bullet was added to address dry season flows

45. The relationship of the MFL criteria to the *Stipulation of Consent Decree* is mentioned in Chapter 6 in conjunction with the recovery and prevention strategy

46. Actions that will be taken by the SFWMD in response to MFL exceedances are discussed in Chapter 6 and include both operational and regulatory activities.

47. The text was changed to address this comment.

48. The text was changed to address this comment.

49. The text was changed in response to this comment.

50. The text was modified in response to this comment to clarify relationships among management goals.

51. Text from this comment was added to the document.

52. Text from this comment was added to the document

53. Document text was modified to clarify this apparent discrepancy.

54. Text about relationship with CERP was added to the document. Action steps that describe how restoration will occur are expected to be developed during the coming year for input to next year's budget cycle.

55. Text added to document to address this comment

56. Information from this comment was added to the document

57. Details of this effort will be developed during the next budget cycle after the MFL has been adopted

58-59. Hopefully we have caught all oft the discrepancies in the Table of Contents and cross-references to the appendices.

60. These figures were added to Appendix A.

61. Appropriate disqualifiers have been added to this Appendix to explain the limitations of the modeling approach.

62. This appendix has been rewritten to address a number of discrepancies and inconsistencies

63. These are good suggestions for a completely revised approach to this document. Unfortunately, we do not have time or resources to make these changes now, but will certainly consider this approach in future documents.

64. These errors will be fixed in the document.

To: Loxahatchee River Coalition/Jupiter Farms Environmental Council
info@loxrivercoalition.org

From: Planning and Development Division, Water Supply Department, South Florida Water Management District (SFWMD)

Date January 7, 2003

Subject: SFWMD Staff responses to the draft comments, dated September 12, 2002, that were received from the Loxahatchee River Coalition concerning public response to the recommended Minimum Flow & Levels for the Loxahatchee River & Estuary.

Thank you for your extensive and detailed comments on the SFWMD July 2002 publication entitled, "*DRAFT Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary*". We appreciate the time and effort taken by the Loxahatchee River Coalition to carefully review this document and provide thoughtful and constructive comments.

We were especially pleased to see that many of the issues you mention were similar to concerns raised by other agencies, concerned citizens and the peer review panel. In many cases, the changes that you have suggested in your comments have been addressed in the revised and updated November 2002 version of the document and appendices. We have included new or additional information, analyzed additional data, and provided new or updated interpretation and discussion, based on your suggestions. The final product has been greatly improved by the valuable insights, suggestions and information provided by the Loxahatchee River Coalition.

We have identified a few of the questions or concerns raised by The Loxahatchee River Coalition that we feel warrant further discussion and clarification, as noted on the attached pages. Please also take the time to examine the updated documentation we have placed on the SFWMD website at *www.sfwmd.gov./org/wsd/mf/loxmfl/docs.html* or contact Cathy McCarthy at 561-682-6325 if you would like to receive hard copies of these reports. If you have additional technical comments or concerns, please contact the project manager, John Zahina at 561-682-6824.

LOX RIVER COALITION COMMENT:

I. Current data is incomplete (part A)

The District's Staff has indicated that the current data sets they are using are incomplete and therefore they should take into consideration a seasonally fluctuating minimum flow based on prior comprehensive research.

In a meeting with the Loxahatchee River Environmental Control District [LRED] on August 7th, SFWMD staff indicated that District data on salinity and flows for the Loxahatchee River is incomplete. LRED offered to share the bi-monthly data that they have collected for over ten years. SFWMD staff asserted that they need to install salinity, flow and temperature probes at various points in the river and that after one year they will have enough data to extrapolate a more complete model. Based on District staff comment we conclude that the SFWMD's current dataset is insufficient to construct an MFL regime that will adequately protect the River.

DISTRICT STAFF'S RESPONSE:

The Minimum Flow and Level Statute (Ch 373.042(1)(b) F.S.) instructs water management districts ". . . using the best information available." All available salinity data from the Loxahatchee River were compiled and considered in developing the proposed MFL. This included the list of studies presented in Appendix A, the technical analyses presented in Appendices D, E, F and P of this report, as well as water quality data available from various agencies. Salinity data from the Loxahatchee River Environmental Control District (LRECD) were used to calibrate and verify the hydrodynamic salinity model for the Loxahatchee River (Appendix E).

Salinity data from the LRECD for upstream areas of the NW Fork can be divided into two types. The bi-monthly data (1991 to present) was collected for two water depths. Unfortunately this salinity data does not capture the daily changes that can occur over short time intervals (minutes to hours) due to tidal influences. In reality, salinity concentrations vary considerably from hour to hour at different sites each day as the tidal surge moves upstream and recedes from the river channel. A single sampling event is only able to determine salinity at a specific location at that moment, but cannot tell us what the minimum, maximum, and daily average salinity is for that site. Only a continuous sampling event, such as one where water samples are collected at multiple depths at regular intervals (such as once an hour) can provide that kind of information. Because of the expense and manpower requirements of this type of sampling, it is typically only conducted sporadically during low flow conditions. The second type of data collected by LRECD is this kind of continuous sampling event. Since the hydrodynamic salinity model calculates salinity along the Loxahatchee River for each half-hour time step, it was the continuous salinity data that were used to compare how well the model predicts measured salinity. The results from that analysis are in presented in Appendix E. Based upon a comparison of what the model predicts and what was actually measured at various sites along the NW Fork, we concluded that the model is the best available tool that can provide reasonable predictions of salinity conditions on the river.

When we indicated that current salinity data sets are incomplete, we mean that there was no continuously-sampled salinity data set for the NW Fork that covered the desired long period of time (e.g. 30 years) at specific locations where plant communities have been studied along the river. This information is necessary in order to associate a salinity exposure with damage to freshwater plant communities. However, shorter-term, continuously-sampled data were available from LRECD for the period from 1995 to 2001 and were used to calibrate the hydrodynamic salinity model. Comparison of these data with results of model simulations, indicated that the model produces a reasonable estimate of long-term salinity conditions on the river. The model was then used to estimate a long-term (30 year) salinity time series at each of the eight vegetation sampling sites.

This method of using a model to estimate past conditions has been used elsewhere. For example, the St. Johns River Water Management District used a model to estimate a historical lake level time series using long-term rainfall and aquifer level data. Using the output from this model, "historical" levels in Lake Washington were estimated and used as a basis for developing an MFL. Models have also been used to estimate past or future conditions in the development of all regional water supply plans completed by the SFWMD and to develop simulations for the Comprehensive Everglades Restoration Plan (CERP) and are widely accepted as valuable tools in investigating water resource needs. This approach is also discussed in the USGS report entitled, "Instream Flow Incremental Methodology," which relies heavily on the use of models to "backcast" historical hydrologic conditions when no data are available. More information can be obtained from the USGS web site (www.mesc.usgs.gov/products/softare/ifim/)

Additionally, as part of the MFL recovery plan, flow, salinity, and temperature sampling is planned for the Northwest Fork and its three major tributary streams. This information is needed to develop and verify a 3-dimentional hydrodynamic model for the Loxahatchee River now in development. That study will be able to directly relate different flows from tributary sources with varying salinity concentrations both vertically in the water column and spatially along the river. This "next generation" of salinity model for the river will greatly improve our ability to simulate different management scenarios and will be the basis for future revisions to the MFL.

LOX RIVER COALITION COMMENT:

I. Current data is incomplete (part B)

While the District develops a more complete model, we suggest the District investigate use of the LRED's research, especially as interpreted in "Freshwater Flow Requirements and Management Goals for the Northwest Fork of the Loxahatchee River" (Dent & Ridler, 1997). This study recommends a minimum flow of 75 cfs for the height of the dry season (April-May) and suggests a seasonally fluctuating minimum flow up to 130 cfs throughout the wet season (July-November).

DISTRICT STAFF'S RESPONSE:

A review of all flow-salinity studies that have been conducted on the NW Fork of the Loxahatchee River (see Appendix A) reveals that the numerous authors have taken the position of determining a Lainhart (or Lainhart plus other tributaries) flow in order to manage the river for control of salinity concentrations. It is important to note that these studies (1) consider only salinity management in protection of the freshwater floodplain swamp; (2) vary widely in their recommendations for a minimum flow; and (3) vary widely in their opinions of where the transition between saltwater and freshwater conditions should occur. Although these studies have produced valuable information concerning the relationship between river flow and salinity, and presumably recommended a minimum flow to prevent *harm*, none were developed based on the specific statutory MFL requirements of Chapter 373.042 (1) F.S. that require assessment of the effects of withdrawals and protection from *significant harm*.

LOX RIVER COALITION COMMENT:

II. Florida law requires the establishment not just of minimum flows, but also minimum levels.

Specifically, Florida Statutes §373.042 requires that water management districts develop minimum flows and levels for surface waters and aquifers. The District's documentation and recommendations would only address part 1a of this statute by recommending a minimum flow of 35cfs over Lainhart Dam. It does not, however, recommend an explicit minimum level as required by part 1b.

DISTRICT STAFF'S RESPONSE:

You are partly correct. Florida law (Chapter 373.042(1) F.S. requires each water management district to establish minimum flows and levels (MFLs) for surface waters and aquifers within their jurisdiction. The statute however goes on to state that "minimum flows" will be established for all surface watercourses in the area, and that a minimum flow for a given watercourse shall be the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. The statute also defines the term "minimum water level" as the level of groundwater in an aquifer and the level of surface water at which withdrawals would be significantly harmful to the water resources of the area.

Nowhere in the statute does it specifically state that both definitions (minimum flow and minimum level) must be determined concurrently for each water body. The SFWMD has determined that the Northwest Fork of the Loxahatchee River is a natural surface watercourse, that the primary problem affecting the watercourse is the migration of saltwater upstream that has impacted the resource during dry periods, and that the most appropriate way to protect this resource is to provide a *minimum flow* that will reduce further upstream migration of salt water.

This is consistent with the approach used by the District to established minimum flow criteria for the Caloosahatchee and St. Lucie estuaries. In contrast, the District has established *minimum levels* for the Biscayne aquifer, Lower West Coast aquifers, Lake Okeechobee, and Everglades surface waters.

LOX RIVER COALITION COMMENT:

III Minimum levels are required to prevent further harm and degradation to the River

Although the Lainhart and Masten dams could arguably enforce their own specific minimum levels upstream (the height of the dams), a minimum level needs to be set for that segment of the River that lies downstream of the Masten dam. If the District is determined to prevent further saltwater incursion, it cannot do so without setting a minimum level or otherwise ensuring that *minimum flows over Lainhart are increased in proportion to unexpected changes in flows from groundwater and tributaries.*

Since District staff has conceded that knowledge of the hydrodynamics and ecology of the Loxahatchee River and Estuary is incomplete, it is therefore conceivable that supplying a minimum flow of 35cfs over Lainhart Dam may not be sufficient to keep the salinity at river mile 9.2 from exceeding 2 ppt. To safeguard against potential flaws in the District's minimum flow modeling, an explicit minimum level needs to be set for river mile 9.2 in conjunction with the 35cfs minimum flow over Lainhart Dam.

DISTRICT STAFF'S RESPONSE:

At the request of reviewers, a study of the water levels in the floodplain swamp along the NW Fork was conducted. Surveyed transects across the floodplain of the NW Fork were used to determine the elevation (NGVD) of the floodplain between the opposing upland embankments at 10 ft increments. These surveys were conducted in December 1983, before the designation of the NW Fork as "Wild & Scenic" and before the surrounding lands were purchased by the District for preservation. Stage recorders were installed at four transect locations to measure water levels from September 1984 through June 1990. Continuous stage data are available at Lainhart Dam from April 1971 to present. The locations of these transects, which lie between Lainhart Dam and Trapper Nelson's site, represent the most pristine river floodplain swamp.

The results of this floodplain water level study provided more insight into the hydrological needs of the remaining floodplain swamp. Correlations were established between flow over Lainhart Dam and water levels at these transects. These estimates of water levels at each transect were then used to calculate the percentage of flooding in the floodplain. These results indicate that more than 50% of the floodplain swamp is inundated at a flow of 35 cfs. At flows of 65 cfs, 65% to 75% of the floodplain is inundated. These results are compiled in Appendix N of the November 2002 version of the Final Draft Technical Document. Studies that have been conducted in floodplain forests throughout the world have shown that the soils in such forests must be allowed to dry out occasionally, for sufficiently long periods to allow seed germination and growth. Failure to provide such conditions will eventually lead to damage and loss of the floodplain swamp. Clearly, setting a minimum flow or level where the floodplain is rarely allowed to dry out will destroy the floodplain forest. The current Consent Agreement, which requires the District to provide 50 cfs when upstream water is available, and the proposed minimum flow criteria, which allow a very short (20 day duration) period below 35 cfs every six years, represent a balance among competing management objectives. These flow regimes are designed to limit saltwater intrusion, provide sufficient inundation for the floodplain swamp to protect aquatic organisms and still permit occasional drying of floodplain soils.

LOX RIVER COALITION COMMENT:

IV. Recommended minimum flow requires more controls

For the current recommendation of 35cfs over the Lainhart Dam to work effectively, more controls are needed.

Due to the lack of data for groundwater and stream flow from tributaries, the model calibration was based on the historic flow recorded at Lainhart Dam to estimate the total freshwater input to the river system. In the model, discharges from tributaries were calculated as a constant fraction of the discharge at Lainhart Dam (i.e. total surface freshwater input in the model was linked to Lainhart Dam flow via flow ratios. Flow factors of 0.65 for Cypress Creek, 0.14 for Hobe Grove, 0.08 for Kitching Creek, 1.4 for Trappers and 1.16 for LOXTnpk were established. For example, if the flow at Lainhart Dam was in fact 100 cfs, the model would recognize the flow for Cypress Creek at 65 cfs, 14 cfs for Hobe Grove, 8 cfs for Kitching Creek, 140 cfs for Trappers, and 116 cfs for LOXTnpk.

Another assumption used in the model was a constant input from ground water of 40 cfs. Cypress Creek, Hobe Grove, Kitching Creek and the NW fork at Trappers each received 10 cfs of groundwater input for a total ground water input of 40 cfs.

These model assumptions have important ramifications:

1. *The total inflow to the NW fork associated with a flow of 35 cfs at Lainhart Dam is considerably larger and includes discharges from groundwater and tributaries. Under the 35 cfs at Lainhart Dam Scenario, tributary flows would be modeled as follows: Cypress Creek 33 cfs, Hobe Grove 15 cfs, Kitching Creek 13 cfs, Trappers 59 cfs, & LOXTnpk 40 cfs (flows include groundwater contributions of 10 cfs).*

2. *The flows for the tributaries were assumed to be proportional to the flows from Lainhart Dam and hence may not accurately represent actual flows, especially with depressed water tables.*

3. *Groundwater levels that produce the assumed groundwater input may not be present when needed most.*

The following controls would mitigate potential problems under the current proposal:

1. *The establishment of a minimum level for groundwater so that the groundwater level that produces 40cfs in the model is adequately protected.*

2. *The establishment of minimum flows for the tributaries in order that their modeled flows corresponding to the Lainhart Dam minimum flow of 35 cfs are protected.*

3. *When tributary surface water flows fall below their corresponding modeled flows for 35cfs at the Lainhart Dam, then the Lainhart Dam flows are to be increased by the difference.*

4. *When groundwater levels fall below the level needed to produce the modeled 40cfs contribution, then Lainhart Dam flows are to be increased to be commensurate with the groundwater loss.*

DISTRICT STAFF'S RESPONSE:

Your observations about the assumptions used in the modeling and their operational and management implications are valid concerns that will ultimately determine how effectively this system can be managed and protected. Your suggestions for how to manage this system generally reflect the kind of approach and operational protocols that may be used once facilities are in place to deliver supplemental water to the basin. Under current conditions, however, the SFWMD has very limited capability to effectively manage flows to the river during dry periods.

There is evidence to substantiate the assumptions that the flow ratios used in this report are representative of tributary flows during dry periods. Actual tributary flow data collected during drought periods were analyzed and the ratios were very close to those used in the model. A further discussion of this issue is provided in the revised report and all of the data used for this analysis are provided in Appendix D of the November 2002 version of the Final Draft Technical Document.

Nevertheless, even though the numbers seem to reflect long-term or average relationships among the various sources of freshwater inflow, the various figures provided in Appendix D indicate that a great deal of variation occurred among salinities predicted by the model based on Lainhart Dam flows alone. This suggests that variability in other tributary flows, groundwater and perhaps effects of wind, storm surges or other factors also influence salinity along the river.

The District is presently installing additional tributary flow and monitoring facilities within the river and watershed. Continuous salinity monitoring will also occur at the points where the major tributaries join the Northwest Fork. A complementary groundwater monitoring network should also be considered, perhaps as part of the restoration effort. Data from these sources could be used to verify and refine our assumptions concerning how much freshwater is actually entering the system.

A more direct means to determine the success of the proposed MFL criteria would be to monitor salinity conditions at or near river mile 9.2 and determine the ability of the freshwater flow regime to actually prevent saltwater intrusion. This approach has now been added to the MFL Rule and will provide a means to integrate flow from all sources and, most importantly, indicate whether the amount of flow provided was actually protecting the resource. An approach of this type was used in the Caloosahatchee River and Estuary MFL, which provides criteria for river flow at the Franklin Lock and Dam and criteria for salinity exceedance at the point in the river where the resource (a bed of submerged freshwater plants) needs to be protected.

Most importantly, a comprehensive ecosystem monitoring effort is needed that examines not only the six key VEC species, which show long-term trends in the forest community, but also the 35-40 other herbaceous species and other appropriate features that can indicate stress or damage on shorter time scales.

The other critical component is to determine what actions can be taken if (when) a MFL exceedance occurs or is likely to occur. Until facilities are in place to provide more water to the river, such exceedances are likely to happen and the District is very limited in the actions that can be taken in response to such exceedances. Once new facilities have been constructed and additional water is available, the operational protocols associated with these facilities must be developed that will describe what actions taken to address MFL exceedances.

The South Florida Water Management District submitted a letter to the Florida Department of Environmental Protection on October 31, 2002, adding Cypress Creek, Hobe Grove Ditch, and Kitching Creek, the primary tributaries to the Northwest Fork, to the Minimum Flows and Levels 2003 Priority List and Schedule. The recent efforts to develop MFLs for the NW Fork of the Loxahatchee River indicated the need to better define, and establish MFL criteria for other tributary inflows to this river that had very little available flow data. The District has committed to developing MFLs for these water bodies by 2007, which will allow the staff sufficient time to collect and analyze flow data from the gauges that will be installed within the tributaries this year. The proposed MFL rule reiterates the intent to develop MFLs for these tributaries and also for the Loxahatchee Slough.

In addition, portions of Cypress Creek, Kitching Creek and Hobe Grove Ditch, which extend westward from river mile 10.6 to the intersection of Gulf Stream Citrus Road (latitude 26.96484, longitude 80.1855), from river mile 8.1 northward through JDSP to the north of Bridge Road (latitude 27.05513, longitude 80.17580) and from river mile 9.1 westward to the Hobe-St. Lucie Conservancy District pump station outfall (latitude 26.5908, longitude 80.1031) respectively, were included in the description of the Northwest Fork MFL water body.

Under our current management practices, flows to the river are largely driven by local rainfall events. When rain falls in the watershed, the excess runoff flows to the canals and rivers and is discharged to tide. This results in flow rates that vary widely from as little as 50 cfs up to 1,200 cfs or more during extreme storm events. When there is no local rainfall, seepage of groundwater out of the sloughs and into the canals and tributaries, provides a base flow of surface water that feeds into the river. As the dry season progresses and groundwater levels decline further, water levels in the rivers and canals also decline until they may reach a point that water no longer flows across the structures. During such periods, river flow is probably controlled by groundwater seepage -- around the control structures and into the river channel.

The SFWMD controls discharge into the Northwest Fork of the River through the G-92 structure. Operational guidelines for these facilities are described in Appendix L of the November 2002 version of the Final Draft Technical Document. When there is little or no rainfall occurring in the Loxahatchee River basin, but water levels upstream of the structure are high enough (12.5 feet or above) to allow water to pass, a flow of 50 cfs is provided through this structure to the river. As water levels approach 12.5 feet, discharge rates are reduced so as to be able to prolong the period of discharge. If water levels are not high enough upstream to provide a flow of 50 cfs, then whatever amount of water is available, is allowed to pass through the structure. Once upstream water levels are below 12.0 feet, the G-92 structure is closed no water can pass. All flow in the Northwest Fork is then provided by local rainfall, runoff and seepage occurring further downstream.

Water flows from G-92 downstream through the C-14 Canal, past the drainage outlet from Jupiter Farms to the Lainhart Dam. This means that flow across Lainhart Dam is the total amount of flow from G-92 plus the amount of water discharged from Jupiter Farms plus a small amount of groundwater seepage that occurs in that portion of the canal.

By the time that flow at Lainhart Dam drops below 35 cfs, there is only a very small amount of water available in Loxahatchee Slough. Even if it were possible to force more water through the G-92 structure (for example with a pump), the result would be that the slough would empty faster. A short-term gain in flow rate would thus result in a longer period with reduced or no flow occurring to the river. The only way to correct this deficiency is to provide more storage.

LOX RIVER COALITION COMMENT:

V. Florida law requires MFLs for the entire River.

Florida Statutes §373.042 provides explicitly that the water management districts shall establish minimum flows "for all surface watercourses." It was not the intent of the statute to require that the districts establish minimum flows only for federally recognized wilderness preserves. In fact, the law states that the districts shall establish minimum levels for groundwater*, as well as, surface waters. Given the rate of development in the adjacent areas, we are concerned about the impact of further groundwater withdrawals not only on the river, but also on the surrounding protected areas (Jonathan Dickinson State Park, Riverbend Park, Cypress Creek Tract, and Pal Mar, etc.).*

Although the Wild and Scenic portion of the NW Fork is an exceptional natural resource, the entire river is of significant ecologic, economic and aesthetic value to Palm Beach County and the State. The estuary is home to a thriving fishing and boating economy that contributes important revenue to the local economy. Riverfront property is among the most valuable in the area and homeowners have a vested interest in the health of the entire River. We do not agree with the District's reasons for setting only a minimum flow for a small segment of the NW Fork based on the lack of "infrastructure and facilities." The statute in question does not ask the District to "provide and manage" flows. It requires the District to determine minimum flows and levels beyond which further withdrawals would be "significantly harmful to the water resources or ecology" thus providing the districts with a limit at which to prevent further withdrawals.

DISTRICT STAFF RESPONSE:

The SFWMD has limited resources and staff to use for development of MFLs and there are many areas within the District that are severely threatened. That is the reason for the MFL Priority Waterbody List. The District has chosen to divide up areas in order to establish MFLs, based on available information, coordination with other activities, and the principle that protection of the most sensitive indicator of resource impacts will also provide protection for less-sensitive resources. Also, as identified in the MFL legislation Section 373.042(2) F.S., priorities are established based on ". . . existence of potential for significant harm . . ." and ". . . those waters that are experiencing or may be reasonably expected to experience adverse impacts."

Examples of this approach are seen in the MFL criteria that have been developed for other areas within the District as follows:

- For the Biscayne Aquifer, MFL water levels were established for the northern part of the aquifer in 2001 and water levels for the southern part will be identified in 2004 in conjunction the Biscayne Bay MFL.

- In the St. Lucie Estuary, MFL criteria were based on protection of the oligohaline zone in the estuary. There were no perceived threats to freshwater systems in the rivers themselves that would not be adequately protected by providing the amount of water needed to protect the estuary.

- In the Caloosahatchee River and Estuary, providing the flow needed to protect the freshwater plant community located downstream of the locks and dam would also protect resources in the river itself and downstream estuarine communities.

District staff recognize that the proposed criteria for the Northwest Fork of the Loxahatchee River do not provide adequate protection for the tributary basins and therefore have added these tributaries to the 2003 MFL priority list.

Ultimate resource protection of the Loxahatchee River and estuary lies not just with establishment of the MFL and recovery plan, but also with the establishment of a water reservation in conjunction with the definition of practical restoration goals and an associated restoration plan. The MFL criteria will then need to be revised to be consistent with the restoration plan and reservation.

LOX RIVER COALITION COMMENT:

VI. Sampling conducted to date is insufficient

In the June 10th draft of their FAQ about MFLs for the Loxahatchee River, the District staff cites that peer review observed that cypress trees were "not particularly good indicators of salinity stress." In response staff selected a number of Valued Ecosystem Component [VEC] species. Although the District staff appears to have done a good job at assessing the health of the selected species, the selection of only large, woody plants provides only a very narrow cross-section of the River's diverse population and is not a true indicator of overall river vegetation.

In our opinion the VECs of the river must necessarily include aquatic life such as herbaceous aquatic plants, fish, amphibians, and other species that are more sensitive to saltwater intrusion than just the few selected species.

DISTRICT STAFF'S RESPONSE:

District staff recognizes that the selected VEC "key" species represents the selection of only large, woody plants and that these are only a very narrow cross-section of the River's diverse population. District staff feels that the VEC "key" species considered (9 in all, see Table C-2), as well as other aspects of the community (e.g. total number of species, measurement of growth parameters, and canopy structure) are true and reliable indicators of overall freshwater floodplain vegetation health.

An important consideration of this analysis is that the primary VEC in the Loxahatchee River MFL is not a **species**, but the entire **vegetation community structure**. A discussion of the ecological importance of maintaining the freshwater floodplain swamp can be found on pages C-19 to C-20 (also see pages 107-110). This VEC is holistic in scope, as outlined in the definitions of "No Harm," "Stressed," and "Significant Harm" provided on pp. 146-147. This VEC was developed based on consideration of the following:

(1) Identification of the dominant species in the freshwater floodplain swamp (both in terms of physical size and biomass), which are listed in Table C-2 on page C-9. Five of these species are strictly freshwater in distribution;

(2) The total number of other plant species present (see Figures C-3a and C-3b, page C-11);

(3) Growth measurements of the dominant species (see Table 31, page 116);

(4) A decline in floodplain forest canopy structure (see Figures C-4a, C-4b and C-4c, page C-14); and

(5) The presence of seedlings/saplings (Table 32, page 116), which indicate the ability of the community to reproduce itself.

District staff considered other potential VECs, including herbaceous aquatic plants, fish, amphibians and other species that are potentially more sensitive to saltwater intrusion. Many of these species, although they may be rapidly affected by saltwater intrusion, will also recover very rapidly once salt water is removed, and hence cannot be used effectively as a basis to define significant harm that takes two or more years for recovery to occur.

Also, herbaceous plants tend to have shallower root systems and hence may not respond to the effects of saltwater intrusion to the same extent as the larger trees. Because seawater is denser than fresh water, saltwater intrusion generally occurs first at the base of the aquifer, resulting in contamination of deeper waters before the shallow zones of the aquifer and surface waters are affected. In addition, herbaceous species may also respond rapidly to a number of other environmental variables such as the effects of drought, fire, frost or disease and therefore may not be the indicator of long-term salinity effects.

Because of the lack of scientific data that documents salinity tolerance in many plant species found along the Loxahatchee River, the semi-quantitative vegetation study was conducted in 2000-2001 to indicate the best potential indicator species. The result of this study was the selection of those species that were included in the VEC. Unfortunately there were no native and widespread herbaceous aquatic plants that occurred in the freshwater floodplain of the Northwest Fork, hence no particular species were proposed as indicators of salinity intrusion to that area. Fish, amphibians and birds are mobile and can move in response to changes in salinity conditions. Hence the location of these species today may not reflect what has occurred at the site during the last dry season (which may have damaged the plant community). To compound this problem further, standing freshwater may be found in backwater areas during periods when the river channel may have elevated salinity. Measurement of such mobile organisms (fish, amphibians, and birds) at particular river segments may thus confound direct correlation of community change to salinity. In addition, there were no long-term or comprehensive monitoring data for the distribution of these organisms within the Loxahatchee River system that that could be used a basis to determine the extent to which these organisms have been impacted by flow rates, water levels or salinity.

To address these issues, District staff will continue to investigate potential VECs that will be used to monitor brackish and saltwater portions of the Loxahatchee River system, including species suggested above and others (including algae and invertebrates). The MFL proposed in this document focuses on protection of the remaining freshwater floodplain swamp community, which is the resource that the "Wild & Scenic River" was designated to protect. In order to continue to protect the "health" of the freshwater floodplain swamp, District staff feel that studies conducted to date confirm that the current VEC is appropriate to the resource, was developed based on the best information available.

LOX RIVER COALITION COMMENT:

VII. The report is overly reliant on aerial photography and contemporary data regarding the health of the River

In our opinion the District has relied too heavily on aerial photography in the assessment of the River's health and failed to obtain enough detailed hydrological & biological information (or "ground truth") necessary to properly support the broad assumptions based on the extant photographic record. Furthermore, the District has not satisfactorily addressed the possibility of harm that might have occurred between 1995 and 2002.

On page 123, the Draft states, "…19 additional acres [of freshwater vegetation] were lost from this community between 1985 and 1995." It does not indicate how many acres have been lost between 1995 and 2002. Throughout the Draft, the District presents 1995 (mainly photography) data as if it is up-to-date. If no aerial photography is available for 2000 or later then a thorough ground survey may be required in order to accurately determine the state of the River and watershed today.

In our opinion the District staff have not been provided with the resources required to accurately measure the River's current condition and how that condition has changed over time. While staff has surveyed the encroachment of mangroves into the cypress forest up until 1995 but we remain unconvinced that substantial damage has not occurred to the River since 1985. Furthermore, the justification for using the date of the River's Federal Wild and Scenic River (1985) as a benchmark (or base) for setting the MFLs, has not been substantiated. The state requirement for MFLs was created through the enactment of §373.042, Florida Statutes in 1972 and the designation of Jonathan Dickinson State Park occurred in late 1940's. If a date is needed for determining what stage of freshwater flow the MFLs should aspire to, then the District should use the designation of the State Park.

DISTRICT STAFF'S RESPONSE:

Aerial photographic surveys from 2000 are only now becoming available and, as such, were not used in the July 15th, 2002 draft document. Analysis is ongoing. However, extensive field surveys of the vegetation community along the NW Fork were conducted between 2000 and 2002. This information is the most current and detailed vegetation information available for the River. This included the recording of all species and their abundance found at each of 33 sites (23 on the NW Fork, 10 on Kitching Creek), measurement of the height, canopy diameter, trunk diameter, and seedling/saplings of dominant tree species. The results of these studies are found in Appendix C and summarized in Chapter 4 (pages 84-86) and Chapter 5 (pages 111-118). The data from these surveys were used to develop the vegetation map presented in Figure 31-C, page 131. This map shows the present location of "healthy," "damaged," and "mangrove-dominated" segments of the NW Fork, and was based solely on the results of the in-depth vegetation surveys conducted from 2000-2002 (not from aerial photography). When comparing this map (2002 conditions) with that developed by the Florida Department of Natural Resources (now FDEP) for the Environmental Impact Statement for the Wild & Scenic River in 1984 (Figure 31-A, page 131) the extent of freshwater and mangrove communities seems to have changed little, if any. In fact, the transition zone between mangrove and freshwater communities may be further downstream today than is shown on the FDEP's 1984 map. Additionally, the aerial photo study presented in Appendix B, which compared photography from 1985 and 1995, was unable to document any significant change between the mangrove-freshwater swamp boundary between these years. Since these two independent studies (field study map from 2000-2002 compared with 1984 FDEP vegetation map, and 1985 aerial photography compared with 1995 aerial photography) give similar results, the conclusion was reached that no significant change in extent of mangrove-freshwater communities has occurred in the NW Fork since the mid 1980's.

LOX RIVER COALITION COMMENT:

VIII. Seasonal variability is an important consideration.

A static minimum flow does not take into account seasonal variability, which is essential for the preservation of the River's natural systems.

The District touches on seasonal variability in pp. 11,12 and 97, and on the erratic nature of that variability from year to year (often as the result of hurricanes, storms, El Niño, etc.) in Figure 4 on p. 12. It does not, however, significantly address how native biota are dependent on such variability as did the SJRWMD in setting MFLs for the Wekiva River System.

The SJRWMD, under the direction of Henry Dean in 1994, felt very strongly that setting one static minimum flow or level cannot sufficiently preserve either a lotic or lentic system as, over time, such a minimum often becomes the de facto average. The SJRWMD felt that lotic systems were best protected by a regime of multiple MFLs. It is for this reason that the MFL regime worked out for the Wekiva River, by SJRWMD is so exemplary. We can find no justification for setting an MFL that affords less protection to the Loxahatchee River.

DISTRICT STAFF'S RESPONSE:

The intent of the MFL is to define the "limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area" (Section 373.042(1)(a), F.S.). Section 373.042(1)(b) indicates that "When appropriate, minimum flows and levels may be calculated to reflect seasonal variations." It does not direct the water management districts to define seasonal variability criteria or restoration targets. Seasonal variation in flow patterns and the amount of water needed for restoration are important components for overall river management. However, there are better tools available to accomplish these tasks.

A review of the MFL methods used by other water management districts, as well as the method that was applied to the Wekiva River, clearly shows that these approaches would not be appropriately applied to the Loxahatchee River. The Wekiva River is not connected to the ocean (is not threatened by salt water intrusion or sea level rise), is a highly altered system, and has floodplain communities that differ significantly from communities in the Loxahatchee River.

The Wekiva River system also has the advantage that 50 years of flow records were available for the spring. The primary issue addressed in the Loxahatchee River is the significant harm caused by intrusion of salt water within the upper reaches of the river during the dry season. No basis for significant harm due to withdrawals was determined to exist due to seasonal hydropattern conditions within the floodplain swamp. Analyses based floodplain transects indicate that these different management goals can be in conflict at higher flows, but at the proposed MFL flow of 35 cfs, both floodplain management and saltwater intrusion goals can be reasonably balanced. Furthermore, peer reviewers of the Wekiva River document indicated concern that the multiple MFL regime was not based on biological (resource) criteria, but rather upon historical water level (hydrologic) data. Development of comprehensive restoration and management targets for the Loxahatchee, which encompass low, average, and high flow conditions, are currently being carried out by a multi-agency team that includes the FDEP and SFWMD. These rainfall-based, seasonally varying delivery patterns, which reflect natural flow conditions in the system, will be the basis for water reservations -- the primary tool of the SFWMD associated with restoration.

LOX RIVER COALITION COMMENT:

IX. As currently written the MFL Criteria would harm the Loxahatchee River

As currently written, the MFL Criteria would allow the minimum flow to be evaded substantially over-time and throughout the year, which would harm the River.

The wording of the minimum flow criteria needs to be corrected. As it could be misinterpreted to suggest that, during dry periods, the minimum flow over Lainhart Dam could be allowed to fall below the minimum for 20 days at a time, repeatedly, so long that it is brought back up to 35cfs every 21st day. Under such an interpretation, the policy would allow the minimum to be met as few as 17 isolated days throughout a year (4.72% of the time). We doubt that, under the current modeling, this would be sufficient to prevent further harm.

We suggest that the criteria include a policy wherein low flows trigger water restrictions, as per Henry Dean's outstanding work on the Wekiva River MFL regime, or a limit on how many days the flow may fall below the minimum throughout a single year.

DISTRICT STAFF'S RESPONSE:

District staff have revised the proposed MFL rule language to address this concern. A MFL exceedance occurs within the Northwest Fork of the Loxahatchee River when flows over Lainhart Dam decline below 35 cfs for more than 20 consecutive days more than once in a six year period, or when the average daily salinity concentration expressed as a 20-day rolling average exceeds two parts per thousand more than once in a six year period. The average daily salinity will be representative of mid-depth in the water column (average of salinities measured at 0.5 meters below the surface and 0.5 meters above the bottom) at river mile 9.2 (latitude 26.9839, longitude 80.1609). If the drought event is greater than 1-in-10, Phase 3 restrictions will be imposed.

LOX RIVER COALITION COMMENT:

X. There is no evidence to support the 50% reduction of the Minimum Flow from 70 cfs to 35 cfs.

There has not been shown significant credible scientific evidence in the July 2002 draft to support the reduction of the staff's recommended minimum flow over Lainhart Dam from 70cfs, in its May 2001 draft, to 35cfs. The modeling has not significantly changed between the two drafts to support such a drastic reduction.

In 2001, District staff recommended a minimum flow of 70cfs over Lainhart Dam in order to preserve the remaining freshwater habitat up to river mile 8.1 on the basis that as recently as 1970 a healthy bald cypress ecosystem resided in this area. It was the staff's intention, at that time, to keep the saltwater wedge near river mile 8.1. This year, staff has decided to reduce that recommended minimum by half, nearly to a level of flow that staff previously believed would be disastrous to the freshwater cypress forest:

"A continuous discharge from Lainhart Dam within the 30 cfs range would allow saltwater to penetrate as far as 9.0 miles upstream which is within the remaining "healthy" cypress zone. Allowing saltwater to penetrate this far upstream would set up the opportunity for saltwater contamination of the floodplain groundwater system that could potentially result in the stress or mortality to the remaining bald cypress community. Such an event would be considered significant harm to the water resources or ecology of the area."

30cfs is not much less than 35. Under the flow criteria proposed in the 2002 draft, wherein flows over Lainhart may be allowed to fall below 35cfs for up to 20 days at a time, it is reasonable to assume that the saltwater wedge will continue its encroachment upon the freshwater habitat. We have not found convincing hydrological support in the current document to justify such a marked change in recommended minimum flow.

The District acknowledges that a significant part of the National Wild & Scenic portion of the NW Fork was already seriously harmed by 1985. In our opinion, it was the responsibility of the District, as custodians of the River, to initiate restoration of the River at the time of its Wild & Scenic designation. All of the parties adopting the Loxahatchee Wild and Scenic River Management Plan are charge with preserving and enhancing the River to the fullest extent of its authority. To the extent that the District maintains the River in a damaged condition, neither preserved nor enhanced, it has failed to fulfill its agreement with the other agencies and the People of the State of Florida.

DISTRICT STAFF'S RESPONSE:

It is the intent of the South Florida Water Management District to ensure that all planning documents produced by staff are based on sound scientific principles and information. As part of the process of developing MFL technical criteria for the Loxahatchee River, the District assembled an independent panel of experts to conduct a scientific peer review of the 2001 draft document, which proposed 70 cfs as a MFL for the NW Fork. Response from the peer review panel clearly indicated that this flow target was developed as a result of a policy decision of where significant harm occurred, rather than from a scientific determination. The panel felt that establishing a specific salinity value for protection of the bald cypress community could not be supported by the technical information presented in the document (see page 5 from the final peer review panel report). Hence, additional field studies were conducted on the resource of concern (the freshwater floodplain swamp) and the locations of “healthy,” “stressed,” and “significantly harmed” freshwater swamp were defined and the flow required to protect the resource from significant harm was calculated.

In the first draft document, much emphasis was placed on bald cypress as the key indicator species. Our more recent field studies, as well as those of authors working in cypress forests in Louisiana and elsewhere, indicate that bald cypress can be somewhat salt tolerant. In fact, bald cypress is still found along portions of the River where other species (e.g. pop ash, dahoon holly, water hickory, and Virginia willow) have been lost due to salinity exposure. Because of this, bald cypress is not an appropriate indicator of floodplain “health” or the location of the remaining freshwater floodplain swamp.

The basis for establishing the MFL at a location in the floodplain swamp along the NW Fork, as it was described in 1985, was discussed previously in the response concerning comparison of 1984, 1985 and current aerial photos and FDEP vegetation maps.

In addition to this MFL, which is intended to achieve partial enhancement of the Northwest Fork of the Loxahatchee River to prevent significant harm, restoration of the Loxahatchee River beyond the MFL will be addressed pursuant to Rule 40E-8.421(6), F.A.C. and other applicable provisions of state law. The South Florida Water Management District commits to restore freshwater flows to the Northwest Fork of the River above the MFL through Chapter 373, F.S. and the Comprehensive Everglades Restoration Plan, Northern Palm Beach Project Implementation Report (NPB-PIR), and its associated authorities. The District will continue to partner with the FDEP to establish an achievable restoration goal and plan for the Loxahatchee River watershed that will be implemented through the NPB-PIR process. This MFL will be reviewed within two years of adoption and revised, if necessary, to ensure consistency with the restoration goal and plan identified pursuant to Rule 40E-8.421,F.A.C. or other applicable provisions of state law.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
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ADM 02-06

January 16, 2003

Environmental & Land Use Law Center, Inc.
Ms. Lisa Interlandi
224 Datura Street, Suite 201
West Palm Beach, FL 33401

**Subject: Review Comments
Minimum Flows and Levels- NW Fork of the Loxahatchee River**

Dear Ms. Interlandi,

On behalf of the South Florida Water Management District, I want to thank you for your participation in the development of the Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River. We received and carefully considered your reviews and comments on the July 2002 Draft Document entitled "Technical Documentation to Support Development of Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River." Where specific editorial errors were pointed out, these corrections were made to the draft document. Other comments were addressed either by providing clarification within the document text, in the rule making process, or by responses to similar comments that have been posted on the District website at:
www.sfwmd.gov/org/wsd/mfl/loxmfl/peer.html

The District's Governing Board voted unanimously in December 2002 to publish the final draft rule. We intend to begin implementation of this rule in March 2003. We appreciate your effort to provide us with comments and extend our thanks for your assistance in this process. Public participation was very valuable and the changes we made at the public's suggestion greatly enhanced the quality of the final product. The direct participation also allowed the District staff to better understand and address the concerns of the community. We look forward to continued partnership in future efforts within the Loxahatchee watershed, including the development of a long-term restoration program for the river.

Sincerely,
Michelle J. Pearcy
Michelle J. Pearcy
Director
Planning and Development Division
Water Supply Department

MJP/nk

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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ADM 02-06

January 16, 2003

Loxahatchee River District
Mr. Rick Dent
2500 Jupiter Park Drive
Jupiter, FL 33458

Subject: Review Comments
Minimum Flows and Levels- NW Fork of the Loxahatchee River

Dear Mr. Dent,

On behalf of the South Florida Water Management District, I want to thank you for your participation in the development of the Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River. We received and carefully considered your reviews and comments on the July 2002 Draft Document entitled "Technical Documentation to Support Development of Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River." Where specific editorial errors were pointed out, these corrections were made to the draft document. Other comments were addressed either by providing clarification within the document text, in the rule making process, or by responses to similar comments that have been posted on the District website at:
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Sincerely,

Michelle J. Pearcy

Michelle J. Pearcy
Director
Planning and Development Division
Water Supply Department

MJP/nk

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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ADM 02-06

January 16, 2003

Department of Environmental Resources Management
Mr. Richard Walesky
3323 Belvedere Road, Building 502
West Palm Beach, FL 33406

Subject: **Review Comments**
Minimum Flows and Levels- NW Fork of the Loxahatchee River

Dear Mr. Walesky,

On behalf of the South Florida Water Management District, I want to thank you for your participation in the development of the Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River. We received and carefully considered your reviews and comments on the July 2002 Draft Document entitled "Technical Documentation to Support Development of Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River." Where specific editorial errors were pointed out, these corrections were made to the draft document. Other comments were addressed either by providing clarification within the document text, in the rule making process, or by responses to similar comments that have been posted on the District website at:
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Sincerely,

Michelle J. Pearcy

Michelle J. Pearcy
Director
Planning and Development Division
Water Supply Department

MJP/nk

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
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ADM 02-06

January 16, 2003

Seacoast Utility Authority
Mr. Rim Bishop, Executive Director
4200 Hood Road
Palm Beach Gardens, FL 33410

Subject: **Review Comments**
Minimum Flows and Levels- NW Fork of the Loxahatchee River

Dear Mr. Bishop,

On behalf of the South Florida Water Management District, I want to thank you for your participation in the development of the Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River. We received and carefully considered your reviews and comments on the July 2002 Draft Document entitled "Technical Documentation to Support Development of Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River." Where specific editorial errors were pointed out, these corrections were made to the draft document. Other comments were addressed either by providing clarification within the document text, in the rule making process, or by responses to similar comments that have been posted on the District website at:
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Michelle J. Pearcy

Michelle J. Pearcy
Director
Planning and Development Division
Water Supply Department

MJP/nk

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ADM 02-06

January 16, 2003

Town of Jupiter Utilities
Mr. David Brown
P.O. Box 8900
Jupiter, FL 33468

Subject: **Review Comments**
Minimum Flows and Levels- NW Fork of the Loxahatchee River

Dear Mr. Brown,

On behalf of the South Florida Water Management District, I want to thank you for your participation in the development of the Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River. We received and carefully considered your reviews and comments on the July 2002 Draft Document entitled "Technical Documentation to Support Development of Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River." Where specific editorial errors were pointed out, these corrections were made to the draft document. Other comments were addressed either by providing clarification within the document text, in the rule making process, or by responses to similar comments that have been posted on the District website at:

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Sincerely,

Michelle J. Pearcy

Michelle J. Pearcy
Director
Planning and Development Division
Water Supply Department

MJP/nk

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ADM 02-06

January 16, 2003

Mr. Lloyd Brumfield
11225 SW Meadowlake Circle
Stuart, FL 34997

**Subject: Review Comments
Minimum Flows and Levels- NW Fork of the Loxahatchee River**

Dear Mr. Brumfield,

On behalf of the South Florida Water Management District, I want to thank you for your participation in the development of the Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River. We received and carefully considered your reviews and comments on the July 2002 Draft Document entitled "Technical Documentation to Support Development of Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River." Where specific editorial errors were pointed out, these corrections were made to the draft document. Other comments were addressed either by providing clarification within the document text, in the rule making process, or by responses to similar comments that have been posted on the District website at:
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Sincerely,

Michelle J. Pearcy
Michelle J. Pearcy
Director
Planning and Development Division
Water Supply Department

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ADM 02-06

January 16, 2003

Ms. Catherine Dwore
13105 Silver Fox Trail
Palm Beach Gardens, FL 33418

Subject: **Review Comments**
Minimum Flows and Levels- NW Fork of the Loxahatchee River

Dear Ms. Dwore,

On behalf of the South Florida Water Management District, I want to thank you for your participation in the development of the Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River. We received and carefully considered your reviews and comments on the July 2002 Draft Document entitled "Technical Documentation to Support Development of Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River." Where specific editorial errors were pointed out, these corrections were made to the draft document. Other comments were addressed either by providing clarification within the document text, in the rule making process, or by responses to similar comments that have been posted on the District website at:
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Director
Planning and Development Division
Water Supply Department

MJP/nk

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ADM 02-06

January 16, 2003

Mr. Patrick Hayes
Ideas & Things
18809 S.E. Federal Highway
Tequesta, FL 33467

Subject: Review Comments
Minimum Flows and Levels- NW Fork of the Loxahatchee River

Dear Mr. Hayes,

On behalf of the South Florida Water Management District, I want to thank you for your participation in the development of the Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River. We received and carefully considered your reviews and comments on the July 2002 Draft Document entitled "Technical Documentation to Support Development of Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River." Where specific editorial errors were pointed out, these corrections were made to the draft document. Other comments were addressed either by providing clarification within the document text, in the rule making process, or by responses to similar comments that have been posted on the District website at:
www.sfwmd.gov/org/wsd/mfl/loxmfl/peer.html

The District's Governing Board voted unanimously in December 2002 to publish the final draft rule. We intend to begin implementation of this rule in March 2003. We appreciate your effort to provide us with comments and extend our thanks for your assistance in this process. Public participation was very valuable and the changes we made at the public's suggestion greatly enhanced the quality of the final product. The direct participation also allowed the District staff to better understand and address the concerns of the community. We look forward to continued partnership in future efforts within the Loxahatchee watershed, including the development of a long-term restoration program for the river.

Sincerely,
Michelle J. Pearcy
Michelle J. Pearcy
Director
Planning and Development Division
Water Supply Department

MJP/nk

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
3301 Gun Club Road, West Palm Beach, Florida 33406 • (561) 686-8800 • FL WATS 1-800-432-2045 • TDD (561) 697-2574
Mailing Address: P.O. Box 24680, West Palm Beach, FL 33416-4680 • www.sfwmd.gov

ADM 02-06

January 16, 2003

Mrs. Marge Ketter
7088 SE Rivers Edge
Jupiter, FL 33458

Subject: Review Comments
Minimum Flows and Levels- NW Fork of the Loxahatchee River

Dear Mrs. Ketter,

On behalf of the South Florida Water Management District, I want to thank you for your participation in the development of the Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River. We received and carefully considered your reviews and comments on the July 2002 Draft Document entitled "Technical Documentation to Support Development of Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River." Where specific editorial errors were pointed out, these corrections were made to the draft document. Other comments were addressed either by providing clarification within the document text, in the rule making process, or by responses to similar comments that have been posted on the District website at:
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ADM 02-06

January 16, 2003

Mr. Alfred Mueller, Jr.
5505 Center Street
Jupiter, FL 33458

Subject: **Review Comments**
Minimum Flows and Levels- NW Fork of the Loxahatchee River

Dear Mr. Mueller, Jr.,

On behalf of the South Florida Water Management District, I want to thank you for your participation in the development of the Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River. We received and carefully considered your reviews and comments on the July 2002 Draft Document entitled "Technical Documentation to Support Development of Minimum Flows and Levels for the Northwest Fork of the Loxahatchee River." Where specific editorial errors were pointed out, these corrections were made to the draft document. Other comments were addressed either by providing clarification within the document text, in the rule making process, or by responses to similar comments that have been posted on the District website at:
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Sincerely,

Michelle J. Pearcy
Michelle J. Pearcy
Director
Planning and Development Division
Water Supply Department

MJP/nk

APPENDIX L -- SELECTED PASSAGES FROM THE FLORIDA STATUTES AND FLORIDA ADMINISTRATIVE CODE

CONTENTS

SELECTED PASSAGES FROM CHAPTER 373, FLORIDA STATUTES

Source: http://www.leg.state.fl.us/statutes on October 16, 2001

373.016 Declaration of policy.--

(1) The waters in the state are among its basic resources. Such waters have not heretofore been conserved or fully controlled so as to realize their full beneficial use.

(2) The department and the governing board shall take into account cumulative impacts on water resources and manage those resources in a manner to ensure their sustainability.

(3) It is further declared to be the policy of the Legislature:

(a) To provide for the management of water and related land resources;

(b) To promote the conservation, replenishment, recapture, enhancement, development, and proper utilization of surface and ground water;

(c) To develop and regulate dams, impoundments, reservoirs, and other works and to provide water storage for beneficial purposes;

(d) To promote the availability of sufficient water for all existing and future reasonable-beneficial uses and natural systems;

(e) To prevent damage from floods, soil erosion, and excessive drainage;

(f) To minimize degradation of water resources caused by the discharge of stormwater;

(g) To preserve natural resources, fish, and wildlife;

(h) To promote the public policy set forth in s. 403.021;

(i) To promote recreational development, protect public lands, and assist in maintaining the navigability of rivers and harbors; and

(j) Otherwise to promote the health, safety, and general welfare of the people of this state.

In implementing this chapter, the department and the governing board shall construe and apply the policies in this subsection as a whole, and no specific policy is to be construed or applied in isolation from the other policies in this subsection.

(4)(a) Because water constitutes a public resource benefiting the entire state, it is the policy of the Legislature that the waters in the state be managed on a state and regional basis. Consistent with this directive, the Legislature recognizes the need to allocate water throughout the state so as to meet all reasonable-beneficial uses. However, the Legislature acknowledges that such allocations have in the past adversely affected the water resources of certain areas in this state. To protect such water resources and to meet the current and future needs of those areas with abundant water, the Legislature directs the department and the water management districts to encourage the use of water from sources nearest the area of use or application whenever practicable. Such sources shall include all naturally occurring water sources and all alternative water sources, including, but not limited to, desalination, conservation, reuse of nonpotable reclaimed water and stormwater, and aquifer storage and recovery. Reuse of potable reclaimed water and stormwater shall not be subject to the evaluation described in s. 373.223(3)(a)-(g). However, this directive to encourage the use of water, whenever practicable, from sources nearest the area of use or application shall not apply to the transport and direct and indirect use of water within the area encompassed by the Central and Southern Florida Flood Control Project, nor shall it apply anywhere in the state to the transport and use of water supplied exclusively for bottled water as defined in s. 500.03(1)(d), nor shall it apply to the transport and use of reclaimed water for electrical power production by an electric utility as defined in section 366.02(2).

(b) In establishing the policy outlined in paragraph (a), the Legislature realizes that under certain circumstances the need to transport water from distant sources may be necessary for environmental, technical, or economic reasons.

(5) The Legislature recognizes that the water resource problems of the state vary from region to region, both in magnitude and complexity. It is therefore the intent of the Legislature to vest in the Department of Environmental Protection or its successor agency the power and responsibility to accomplish the conservation, protection, management, and control of the waters of the state and with sufficient flexibility and discretion to accomplish these ends through delegation of appropriate powers to the various water management districts. The department may exercise any power herein authorized to be exercised by a water management district; however, to the greatest extent practicable, such power should be delegated to the governing board of a water management district.

(6) It is further declared the policy of the Legislature that each water management district, to the extent consistent with effective management practices, shall approximate its fiscal and budget policies and procedures to those of the state.

History.--s. 2, part I, ch. 72-299; s. 36, ch. 79-65; s. 70, ch. 83-310; s. 5, ch. 89-279; s. 20, ch. 93-213; s. 250, ch. 94-356; s. 1, ch. 97-160; s. 1, ch. 98-88.

373.036 Florida water plan; district water management plans.--

(1) FLORIDA WATER PLAN.--In cooperation with the water management districts, regional water supply authorities, and others, the department shall develop the Florida water plan. The Florida water plan shall include, but not be limited to:

(a) The programs and activities of the department related to water supply, water quality, flood protection and floodplain management, and natural systems.

(b) The water quality standards of the department.

(c) The district water management plans.

(d) Goals, objectives, and guidance for the development and review of programs, rules, and plans relating to water resources, based on statutory policies and directives. The state water policy rule, renamed the water resource implementation rule pursuant to s. 373.019(20), shall serve as this part of the plan. Amendments or additions to this part of the Florida water plan shall be adopted by the department as part of the water resource implementation rule. In accordance with s. 373.114, the department shall review rules of the water management districts for consistency with this rule. Amendments to the water resource implementation rule must be adopted by the secretary of the department and be submitted to the President of the Senate and the Speaker of the House of Representatives within 7 days after publication in the Florida Administrative Weekly. Amendments shall not become effective until the conclusion of the next regular session of the Legislature following their adoption.

(2) DISTRICT WATER MANAGEMENT PLANS.--

(a) Each governing board shall develop a district water management plan for water resources within its region, which plan addresses water supply, water quality, flood protection and floodplain management, and natural systems. The district water management plan shall be based on at least a 20-year planning period, shall be developed and revised in cooperation with other agencies, regional water supply authorities, units of government, and interested parties, and shall be updated at least once every 5 years. The governing board shall hold a public hearing at least 30 days in advance of completing the development or revision of the district water management plan.

(b) The district water management plan shall include, but not be limited to:

1. The scientific methodologies for establishing minimum flows and levels under s. 373.042, and all established minimum flows and levels.

2. Identification of one or more water supply planning regions that singly or together encompass the entire district.

3. Technical data and information prepared under ss. 373.0391 and 373.0395.

4. A districtwide water supply assessment, to be completed no later than July 1, 1998, which determines for each water supply planning region:

a. Existing legal uses, reasonably anticipated future needs, and existing and reasonably anticipated sources of water and conservation efforts; and

b. Whether existing and reasonably anticipated sources of water and conservation efforts are adequate to supply water for all existing legal uses and reasonably anticipated future needs and to sustain the water resources and related natural systems.

5. Any completed regional water supply plans.

(c) If necessary for implementation, the governing board shall adopt by rule or order relevant portions of the district water management plan, to the extent of its statutory authority.

(d) In the formulation of the district water management plan, the governing board shall give due consideration to:

1. The attainment of maximum reasonable-beneficial use of water resources.

2. The maximum economic development of the water resources consistent with other uses.

3. The management of water resources for such purposes as environmental protection, drainage, flood control, and water storage.

4. The quantity of water available for application to a reasonable-beneficial use.

5. The prevention of wasteful, uneconomical, impractical, or unreasonable uses of water resources.

6. Presently exercised domestic use and permit rights.

7. The preservation and enhancement of the water quality of the state.

8. The state water resources policy as expressed by this chapter.

(3) The department and governing board shall give careful consideration to the requirements of public recreation and to the protection and procreation of fish and wildlife. The department or governing board may prohibit or restrict other future uses on certain designated bodies of water which may be inconsistent with these objectives.

(4) The governing board may designate certain uses in connection with a particular source of supply which, because of the nature of the activity or the amount of water required, would constitute an undesirable use for which the governing board may deny a permit.

(5) The governing board may designate certain uses in connection with a particular source of supply which, because of the nature of the activity or the amount of water required, would result in an enhancement or improvement of the water resources of the area. Such uses shall be preferred over other uses in the event of competing applications under the permitting systems authorized by this chapter.

(6) The department, in cooperation with the Executive Office of the Governor, or its successor agency, may add to the Florida water plan any other information, directions, or objectives it deems necessary or desirable for the guidance of the governing boards or other agencies in the administration and enforcement of this chapter.

History.--s. 6, part I, ch. 72-299; ss. 2, 3, ch. 73-190; s. 122, ch. 79-190; s. 3, ch. 97-160; s. 7, ch. 98-88; s. 164, ch. 99-13.

373.0361 Regional water supply planning.--

(1) By October 1, 1998, the governing board shall initiate water supply planning for each water supply planning region identified in the district water management plan under s. 373.036, where it determines that sources of water are not adequate for the planning period to supply water for all existing and projected reasonable-beneficial uses and to sustain the water resources and related natural systems. The planning must be conducted in an open public process, in coordination and cooperation with local governments, regional water supply authorities, government-owned and privately owned water utilities, self-suppliers, and other affected and interested parties. A determination by the governing board that initiation of a regional water supply plan for a specific planning region is not needed pursuant to this section shall be subject to s. 120.569. The governing board shall reevaluate such a determination at least once every 5 years and shall initiate a regional water supply plan, if needed, pursuant to this subsection.

(2) Each regional water supply plan shall be based on at least a 20-year planning period and shall include, but not be limited to:

(a) A water supply development component that includes:

1. A quantification of the water supply needs for all existing and reasonably projected future uses within the planning horizon. The level-of-certainty planning goal associated with identifying the water supply needs of existing and future reasonable-beneficial uses shall be based upon meeting those needs for a 1-in-10-year drought event.

2. A list of water source options for water supply development, including traditional and alternative sources, from which local government, government-owned and privately owned utilities, self-suppliers, and others may choose, which will exceed the needs identified in subparagraph 1.

3. For each option listed in subparagraph 2., the estimated amount of water available for use and the estimated costs of and potential sources of funding for water supply development.

4. A list of water supply development projects that meet the criteria in s. 373.0831(4).

(b) A water resource development component that includes:

1. A listing of those water resource development projects that support water supply development.

2. For each water resource development project listed:

a. An estimate of the amount of water to become available through the project.

b. The timetable for implementing or constructing the project and the estimated costs for implementing, operating, and maintaining the project.

c. Sources of funding and funding needs.

d. Who will implement the project and how it will be implemented.

(c) The recovery and prevention strategy described in s. 373.0421(2).

(d) A funding strategy for water resource development projects, which shall be reasonable and sufficient to pay the cost of constructing or implementing all of the listed projects.

(e) Consideration of how the options addressed in paragraphs (a) and (b) serve the public interest or save costs overall by preventing the loss of natural resources or avoiding greater future expenditures for water resource development or water supply development. However, unless adopted by rule, these considerations do not constitute final agency action.

(f) The technical data and information applicable to the planning region which are contained in the district water management plan and are necessary to support the regional water supply plan.

(g) The minimum flows and levels established for water resources within the planning region.

(3) Regional water supply plans initiated or completed by July 1, 1997, shall be revised, if necessary, to include a water supply development component and a water resource development component as described in paragraphs (2)(a) and (b).

(4) Governing board approval of a regional water supply plan shall not be subject to the rulemaking requirements of chapter 120. However, any portion of an approved regional water supply plan which affects the substantial interests of a party shall be subject to s. 120.569.

(5) By November 15, 1997, and annually thereafter, the department shall submit to the Governor and the Legislature a report on the status of regional water supply planning in each district. The report shall include:

(a) A compilation of the estimated costs of and potential sources of funding for water resource development and water supply development projects, as identified in the water management district regional water supply plans.

(b) A description of each district's progress toward achieving its water resource development objectives, as directed by s. 373.0831(3), including the district's implementation of its 5-year water resource development work program.

(6) Nothing contained in the water supply development component of the district water management plan shall be construed to require local governments, government-owned or privately owned water utilities, self-suppliers, or other water suppliers to select a water supply development option identified in the component merely because it is identified in the plan. However, this subsection shall not be construed to limit the authority of the department or governing board under part II.

History.--s. 4, ch. 97-160.

373.042 Minimum flows and levels.--

(1) Within each section, or the water management district as a whole, the department or the governing board shall establish the following:

(a) Minimum flow for all surface watercourses in the area. The minimum flow for a given watercourse shall be the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area.

(b) Minimum water level. The minimum water level shall be the level of groundwater in an aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area.

The minimum flow and minimum water level shall be calculated by the department and the governing board using the best information available. When appropriate, minimum flows and levels may be calculated to reflect seasonal variations. The department and the governing board shall also consider, and at their discretion may provide for, the protection of nonconsumptive uses in the establishment of minimum flows and levels.

(2) By July 1, 1996, the Southwest Florida Water Management District shall amend and submit to the department for review and approval its priority list for the establishment of minimum flows and levels and delineating the order in which the governing board shall establish the minimum flows and levels for surface watercourses, aquifers, and surface water in the counties of Hillsborough, Pasco, and Pinellas. By November 15, 1997, and annually thereafter, each water management district shall submit to the department for review and approval a priority list and schedule for the establishment of minimum flows and levels for surface watercourses, aquifers, and surface waters within the district. The priority list shall also identify those water bodies for which the district will voluntarily undertake independent scientific peer review. By January 1, 1998, and annually thereafter, each water management district shall publish its approved priority list and schedule in the Florida Administrative Weekly. The priority list shall be based upon the importance of the waters to the state or region and the existence of or potential for significant harm to the water resources or ecology of the state or region, and shall include those waters which are experiencing or may reasonably be expected to experience adverse impacts. The priority list and schedule shall not be subject to any proceeding pursuant to chapter 120. Except as provided in subsection (3), the development of a priority list and compliance with the schedule for the establishment of minimum flows and levels pursuant to this subsection shall satisfy the requirements of subsection (1).

(3) Minimum flows or levels for priority waters in the counties of Hillsborough, Pasco, and Pinellas shall be established by October 1, 1997. Where a minimum flow or level for the priority waters within those counties has not been established by the applicable deadline, the secretary of the department shall, if requested by the governing body of any local government within whose jurisdiction the affected waters are located, establish the minimum flow or level in accordance with the procedures established by this section. The department's reasonable costs in establishing a minimum flow or level shall, upon request of the secretary, be reimbursed by the district.

(4)(a) Upon written request to the department or governing board by a substantially affected person, or by decision of the department or governing board, prior to the establishment of a minimum flow or level and prior to the filing of any petition for administrative hearing related to the minimum flow or level, all scientific or technical data, methodologies, and models, including all scientific and technical assumptions employed in each model, used to establish a minimum flow or level shall be subject to independent scientific peer review. Independent scientific peer review means review by a panel of independent, recognized experts in the fields of hydrology, hydrogeology, limnology, biology, and other scientific disciplines, to the extent relevant to the establishment of the minimum flow or level.

(b) If independent scientific peer review is requested, it shall be initiated at an appropriate point agreed upon by the department or governing board and the person or persons requesting the peer review. If no agreement is reached, the department or governing board shall determine the appropriate point at which to initiate peer review. The members of the peer review panel shall be selected within 60 days of the point of initiation by agreement of the department or governing board and the person or persons requesting the peer review. If the panel is not selected within the 60-day period, the time limitation may be waived upon the agreement of all parties. If no waiver occurs, the department or governing board may proceed to select the peer review panel. The cost of the peer review shall be borne equally by the district and each party requesting the peer review, to the extent economically feasible. The panel shall submit a final report to the governing board within 120 days after its selection unless the deadline is waived by agreement of all parties. Initiation of peer review pursuant to this paragraph shall toll any applicable deadline under chapter 120 or other law or district rule regarding permitting, rulemaking, or administrative hearings, until 60 days following submittal of the final report. Any such deadlines shall also be tolled for 60 days following withdrawal of the request or following agreement of the parties that peer review will no longer be pursued. The department or the governing board shall give significant weight to the final report of the peer review panel when establishing the minimum flow or level.

(c) If the final data, methodologies, and models, including all scientific and technical assumptions employed in each model upon which a minimum flow or level is based, have undergone peer review pursuant to this subsection, by request or by decision of the department or governing board, no further peer review shall be required with respect to that minimum flow or level.

(d) No minimum flow or level adopted by rule or formally noticed for adoption on or before May 2, 1997, shall be subject to the peer review provided for in this subsection.

(5) If a petition for administrative hearing is filed under chapter 120 challenging the establishment of a minimum flow or level, the report of an independent scientific peer review conducted under subsection (4) is admissible as evidence in the final hearing, and the administrative law judge must render the order within 120 days after the filing of the petition. The time limit for rendering the order shall not be extended except by agreement of all the parties. To the extent that the parties agree to the findings of the peer review, they may stipulate that those findings be incorporated as findings of fact in the final order.

History.--s. 6, part I, ch. 72-299; s. 2, ch. 73-190; s. 2, ch. 96-339; s. 5, ch. 97-160.

373.0421 Establishment and implementation of minimum flows and levels.--

(1) ESTABLISHMENT.--

(a) *Considerations*.--When establishing minimum flows and levels pursuant to s. 373.042, the department or governing board shall consider changes and structural alterations to watersheds, surface waters, and aquifers and the effects such changes or alterations have had, and the constraints such changes or alterations have placed, on the hydrology of an affected watershed, surface water, or aquifer, provided that nothing in this paragraph shall allow significant harm as provided by s. 373.042(1) caused by withdrawals.

(b) *Exclusions*.--

1. The Legislature recognizes that certain water bodies no longer serve their historical hydrologic functions. The Legislature also recognizes that recovery of these water bodies to historical hydrologic conditions may not be economically or technically feasible, and that such recovery effort could cause adverse environmental or hydrologic impacts. Accordingly, the department or governing board may determine that setting a minimum flow or level for such a water body based on its historical condition is not appropriate.

2. The department or the governing board is not required to establish minimum flows or levels pursuant to s. 373.042 for surface water bodies less than 25 acres in area, unless the water body or bodies, individually or cumulatively, have significant economic, environmental, or hydrologic value.

3. The department or the governing board shall not set minimum flows or levels pursuant to s. 373.042 for surface water bodies constructed prior to the requirement for a permit, or pursuant to an exemption, a permit, or a reclamation plan which regulates the size, depth, or function of the surface water body under the provisions of this chapter, chapter 378, or chapter 403, unless the constructed surface water body is of significant hydrologic value or is an essential element of the water resources of the area.

The exclusions of this paragraph shall not apply to the Everglades Protection Area, as defined in s. 373.4592(2)(h).

(2) If the existing flow or level in a water body is below, or is projected to fall within 20 years below, the applicable minimum flow or level established pursuant to s. 373.042, the department or governing board, as part of the regional water supply plan described in s. 373.0361, shall expeditiously implement a recovery or prevention strategy, which includes the development of additional water supplies and other actions, consistent with the authority granted by this chapter, to:

(a) Achieve recovery to the established minimum flow or level as soon as practicable; or

(b) Prevent the existing flow or level from falling below the established minimum flow or level.

The recovery or prevention strategy shall include phasing or a timetable which will allow for the provision of sufficient water supplies for all existing and projected reasonable-beneficial uses, including development of additional water supplies and implementation of conservation and other efficiency measures concurrent with, to the extent practical, and to offset, reductions in permitted withdrawals, consistent with the provisions of this chapter.

(3) The provisions of this section are supplemental to any other specific requirements or authority provided by law. Minimum flows and levels shall be reevaluated periodically and revised as needed.

History.--s. 6, ch. 97-160.

373.223 Conditions for a permit.--

(1) To obtain a permit pursuant to the provisions of this chapter, the applicant must establish that the proposed use of water:

(a) Is a reasonable-beneficial use as defined in s. 373.019;

(b) Will not interfere with any presently existing legal use of water; and

(c) Is consistent with the public interest.

(2) The governing board or the department may authorize the holder of a use permit to transport and use ground or surface water beyond overlying land, across county boundaries, or outside the watershed from which it is taken if the governing board or department determines that such transport and use is consistent with the public interest, and no local government shall adopt or enforce any law, ordinance, rule, regulation, or order to the contrary.

(3) Except for the transport and use of water supplied by the Central and Southern Florida Flood Control Project, and anywhere in the state when the transport and use of water is supplied exclusively for bottled water as defined in s. 500.03(1)(d), any water use permit applications pending as of April 1, 1998, with the Northwest Florida Water Management District and self-suppliers of water for which the proposed water source and area of use or application are located on contiguous private properties, when evaluating whether a potential transport and use of ground or surface water across county boundaries is consistent with the public interest, pursuant to paragraph (1)(c), the governing board or department shall consider:

(a) The proximity of the proposed water source to the area of use or application.

(b) All impoundments, streams, groundwater sources, or watercourses that are geographically closer to the area of use or application than the proposed source, and that are technically and economically feasible for the proposed transport and use.

(c) All economically and technically feasible alternatives to the proposed source, including, but not limited to, desalination, conservation, reuse of nonpotable reclaimed water and stormwater, and aquifer storage and recovery.

(d) The potential environmental impacts that may result from the transport and use of water from the proposed source, and the potential environmental impacts that may result from use of the other water sources identified in paragraphs (b) and (c).

(e) Whether existing and reasonably anticipated sources of water and conservation efforts are adequate to supply water for existing legal uses and reasonably anticipated future needs of the water supply planning region in which the proposed water source is located.

(f) Consultations with local governments affected by the proposed transport and use.

(g) The value of the existing capital investment in water-related infrastructure made by the applicant.

Where districtwide water supply assessments and regional water supply plans have been prepared pursuant to ss. 373.036 and 373.0361, the governing board or the department shall use the applicable plans and assessments as the basis for its consideration of the applicable factors in this subsection.

(4) The governing board or the department, by regulation, may reserve from use by permit applicants, water in such locations and quantities, and for such seasons of the year, as in its judgment may be required for the protection of fish and wildlife or the public health and safety. Such reservations shall be subject to periodic review and revision in the light of changed conditions. However, all presently existing legal uses of water shall be protected so long as such use is not contrary to the public interest.

History.--s. 3, part II, ch. 72-299; s. 10, ch. 73-190; s. 10, ch. 76-243; s. 35, ch. 85-81; s. 4, ch. 98-88.

373.246 Declaration of water shortage or emergency.--

(1) The governing board or the department by regulation shall formulate a plan for implementation during periods of water shortage. As a part of this plan the governing board or the department shall adopt a reasonable system of water-use classification according to source of water supply; method of extraction, withdrawal, or diversion; or use of water or a combination thereof. The plan may include provisions for variances and alternative measures to prevent undue hardship and ensure equitable distribution of water resources.

(2) The governing board or the department by order may declare that a water shortage exists for a source or sources within all or part of the district when insufficient water is or will be available to meet the present and anticipated requirements of the users or when conditions are such as to require temporary reduction in total use within the area to protect water resources from serious harm. Such orders will be final agency action.

(3) In accordance with the plan adopted under subsection (1), the governing board or the department may impose such restrictions on one or more classes of water uses as may be necessary to protect the water resources of the area from serious harm and to restore them to their previous condition.

(4) A declaration of water shortage and any measures adopted pursuant thereto may be rescinded by the governing board or the department.

(5) When a water shortage is declared, the governing board or the department shall cause notice thereof to be published in a prominent place within a newspaper of general circulation throughout the area. Publication of such notice will serve as notice to all users in the area of the condition of water shortage.

(6) The governing board or the department shall notify each permittee in the district by regular mail of any change in the condition of his or her permit or any suspension of his or her permit or of any other restriction on the permittee's use of water for the duration of the water shortage.

(7) If an emergency condition exists due to a water shortage within any area of the district, and if the department, or the executive director of the district with the concurrence of the governing board, finds that the exercise of powers under subsection (1) is not sufficient to protect the public health, safety, or welfare; the health of animals, fish, or aquatic life; a public water supply; or recreational, commercial, industrial, agricultural, or other reasonable uses, it or he or she may, pursuant to the provisions of s. 373.119, issue emergency orders reciting the existence of such an emergency and requiring that such action, including, but not limited to, apportioning, rotating, limiting, or prohibiting the use of the water resources of the district, be taken as the department or the executive director deems necessary to meet the emergency.

(8) An affected party to whom an emergency order is directed under subsection (7) shall comply immediately, but may challenge such an order in the manner set forth in s. 373.119.

History.--s. 10, part II, ch. 72-299; s. 14, ch. 78-95; s. 11, ch. 82-101; s. 10, ch. 84-341; s. 601, ch. 95-148; s. 168, ch. 99-13.

SELECTED PASSAGES FROM CHAPTER 258, FLORIDA STATUTES

Source: http://www.leg.state.fl.us/statutes on May 10, 2002

258.037 Policy of division.--It shall be the policy of the Division of Recreation and Parks: To promote the state park system for the use, enjoyment, and benefit of the people of Florida and visitors; to acquire typical portions of the original domain of the state which will be accessible to all of the people, and of such character as to emblemize the state's natural values; conserve these natural values for all time; administer the development, use and maintenance of these lands and render such public service in so doing, in such a manner as to enable the people of Florida and visitors to enjoy these values without depleting them; to contribute materially to the development of a strong mental, moral, and physical fiber in the people; to provide for perpetual preservation of historic sites and memorials of statewide significance and interpretation of their history to the people; to contribute to the tourist appeal of Florida.

History.--s. 12, ch. 25353, 1949; ss. 25, 35, ch. 69-106.

Note.--Former s. 592.12.

SELECTED PASSAGES FROM CHAPTER 40E-2, FLORIDA ADMINISTRATIVE CODE

Source: http://fac.dos.state.fl.us/fac/ on November 13, 2000

CHAPTER 40E-2 CONSUMPTIVE USE

40E-2.010 Review of Consumptive Use Permit Applications.

Consumptive use permit applications are processed pursuant to Section 120.60, F.S., Part VI of Chapter 40E-1, F.A.C., and Chapter 28-107, F.A.C.

Specific Authority 120.54(5), 120.60 FS. Law Implemented 120.54(5), 120.60 FS. History–New 7-2-98.

40E-2.011 Policy and Purpose.

(1) It is the policy of the District to control all water uses within its boundaries, pursuant to the provisions of Chapter 373, Florida Statutes, and Chapter 17-40 and Title 40E, F.A.C.

(2) The rules in this chapter implement the comprehensive water use permit system contemplated in Part II of Chapter 373, Florida Statutes.

(3) Additional rules relating to water use are found in Chapter 40E-20 (General Water Use Permits), Chapter 40E-21 (The Water Shortage Plan), Chapter 40E-22 (Regional Water Shortage Plans) and Chapter 40E-23 (Critical Water Supply Problem Areas).

(4) Standards for the construction, repair and abandonment of water wells are found in Chapter 40E-3 (Water Wells) and Chapter 40E-30 (General Permits for Water Wells).

Specific Authority 373.044, 373.113, 373.171 FS. Law Implemented 373.103(1), 373.203, 373.216 – .249 FS. History–New 9-3-81, Formerly 16K-2.01, Amended 7-4-82, 2-24-85, 11-18-91.

40E-2.031 Implementation.

(1) The effective dates for the water use permitting program established in this chapter are:

(a) If the use or withdrawal of water exceeds 100,000 gallons per day, the effective dates are:

1. January 12, 1977, for the portion of the District formerly within the Ridge and Lower Gulf Coast Water Management District;

2. March 2, 1974, for the remainder of the District;

(b) If the use or withdrawal of water does not exceed 100,000 gallons per day, the effective date is January 14, 1979.

(2) The effective dates specified in subsection (1) are used to determine the two year period provided in Section 373.266, Florida Statutes, for existing water users to file initial applications.

Specific Authority 373.044, 373.113 FS. Law Implemented 373.103(1), 373.216, 373.226 FS. History–New 9-3-81, Formerly 16K-2.011.

40E-2.041 Permits Required.

(1) Unless expressly exempt by law or District rule, a water use permit must be obtained from the District prior to any use or withdrawal of water.

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(2) The District issues water use permits in two forms, individual water use permits and general water use permits. An individual water use permit may be obtained by meeting the requirements of this chapter. Chapter 40E-20 provides the requirements for qualifying for a general water use permit.

(3) Under certain circumstances the Board or the Executive Director may issue a temporary water use permit pursuant to Rule 40E-2.441 and Section 373.244, Florida Statutes.

Specific Authority 373.044, 373.113 FS. Law Implemented 373.103(1), 373.219, 373.244 FS. History–New 9-3-81, Formerly 16K-2.03(1), (2).

40E-2.051 Exemptions.

No permit is required under Rule 40E-2.041 for the following water uses:

(1) Water used strictly for domestic use at a single family dwelling or duplex provided that the water is obtained from one withdrawal facility for each single family dwelling or duplex.

(2) Water used strictly for fire fighting purposes, and

(3) Water used at a single family dwelling or duplex including but not limited to home lawn and ornamental irrigation, car washing, and other incidental uses provided that the water is obtained from one withdrawal facility for each single family dwelling or duplex.

Specific Authority 373.044, 373.113, 373.171 FS. Law Implemented 373.219 FS. History–New 9-3-81, Formerly 16K-2.025, Amended 2-24-85, 4-20-94.

40E-2.091 Publications Incorporated by Reference.

(1) The "Basis of Review for Water Use Permit Applications within the South Florida Water Management District – October 1997", is hereby published by reference and incorporated into this chapter.

(2) The document listed in subsection (1) is published by the District and is available from the District upon request.

Specific Authority 373.044, 373.113, 373.171 FS. Law Implemented 373.219, 373.223, 373.224, 373.229, 373.232, 373.233, 373.236, 373.239 FS. History–New 9-3-81, Formerly 16K-2.035(1), Amended 2-24-85, 11-21-89, 1-4-93, 4-20-94, 11-26-95, 7-11-96, 4-9-97, 12-10-97.

40E-2.101 Content of Application.

(1) Applications for permits required by this chapter shall be filed with the District. The application shall contain:

(a) The following parts of Form 0645 Surface Water Management Permit Applications and/or Water Use Permit Applications, as incorporated by reference in Rule 40E-1.659;

1. Part RC-1A Administrative Information for Surface Water Management Permit Applications and/or Water Use Permit Applications;

2. Part RC-1W Application for a Water Use Permit;

(b) The appropriate permit application processing fee required by Rule 40E-1.607;

(c) The information required in subsection 373.229(1), Florida Statutes; and

(d) Information sufficient to show that the use meets the criteria and conditions established in Rule 40E-2.301.

(2) The application must be signed by the applicant or the authorized agent of the applicant.

Specific Authority 373.044, 373.113, 373.171 FS. Law Implemented 373.103(1), 373.219, 373.223, 373.229 FS. History–New 9-3-81, Amended 12-1-82, 2-24-85, 11-21-89, Repromulgated 1-4-93, Amended 4-20-94.

40E-2.301 Conditions for Issuance of Permits.

(1) In order to obtain a permit, permit renewal, or permit modification under this chapter, an applicant must give reasonable assurances that the proposed water use at the time the permit application is deemed complete:

(a) will not cause significant saline water intrusion;

(b) will not adversely impact offsite land uses;

(c) will not cause adverse environmental impacts;

(d) will not cause pollution of the water resources;

(e) is otherwise a reasonable-beneficial use as defined in subsection 373.019(4), Florida Statutes, with consideration given to the factors set forth in Rule 17-40.401(2);

(f) will not interfere with presently existing legal uses;

(g) is in accordance with the State Water Policy on water transport pursuant to Rule 17-40.402;

(h) makes use of a reclaimed water source unless the applicant, in any geographic location, demonstrates that its use is either not economically, environmentally or technically feasible; or in areas not designated as Critical Water Supply Problem Areas pursuant to Chapter 40E-23, F.A.C., the applicant demonstrates reclaimed water is not readily available; and

(i) is consistent with Sections 373.016, 373.036, Florida Statutes, and otherwise is consistent with the public interest as prescribed by Chapter 373 and this Chapter.

(2) In order to satisfy the conditions for permit issuance in subsection (1), the permit applicant must provide reasonable assurances that the criteria in the "Basis of Review for Water Use Permit Applications within the South Florida Water Management District – October 1997", incorporated by reference in Rule 40E-2.091(1), are met.

Specific Authority 373.044, 373.113, 373.171 FS. Law Implemented 373.023, 373.185, 373.219, 373.223, 373.226, 373.236 FS. History–New 9-3-81, Formerly 16K-2.035(2), Amended 2-24-85, 1-4-93, 4-20-94, 7-11-96, 4-9-97, 12-10-97.

40E-2.321 Duration of Permit.

(1) Unless revoked or otherwise modified, the duration of a water use permit issued pursuant to this chapter is the lesser of:

(a) The time period for which the permit applicant demonstrates that water will be available to meet the projected demands and during which the conditions for issuance of a permit in Rule 40E-2.301 will be met.

(b) The time period for which the permit applicant demonstrates legal control.

(2) In addition to the duration limitation in subsection (1) above, the permit durations for specific uses shall not exceed the following time periods:

(a) For public water supply and industrial water uses, the period shall not exceed 10 years.

(b) For dewatering water uses, the period shall not exceed 3 years.

(c) For irrigation uses, the period shall not exceed the basin expiration date as specified in the document described in Rule 40E-2.091 as applicable to the location of the project.

(d) For aquifer remediations, the period shall not exceed that required to complete the operation as specified in the Remedial Action Plan approved by the state or local agency having legal jurisdiction over such activities or 20 years, whichever is less.

(e) For all other uses, the period shall not exceed 10 years.

Specific Authority 373.044, 373.113, 373.171 FS. Law Implemented 373.236 FS. History–New 9-3-81, Amended 2-24-85, 4-20-94, 7-11-96.

40E-2.331 Modification of Permits.

(1) A permittee shall apply to the Board for approval of any modification of an unexpired permit pursuant to Section 373.239, Florida Statutes. The Executive Director shall initiate proceedings to modify a permit pursuant to Rule 40E-1.609, F.A.C.

(2) Applications for modification, except letter modifications issued pursuant to subsection (4), shall contain the information required in Rule 40E-2.101, will be evaluated using the criteria specified in Rule 40E-2.301 and will be subject to the limiting conditions specified in Rule 40E-2.381. Modifications shall be approved if criteria in Rule 40E-2.301 are met.

(3) Proposed increases in allocation will be treated as new uses to the extent the proposed allocation exceeds the existing allocation.

(4)(a) Modification of an existing water use permit shall be approved by letter, provided the permit is in compliance with all applicable limiting conditions and the modification request:

1. does not result in an increase in the amount of the permit allocation;

2. does not modify the existing permit expiration date, except that when the permit duration is based upon the current lease expiration date, the permit duration shall be extended by letter modification to the new lease date, but shall not exceed the applicable permit duration pursuant to Rule 40E-2.321;

3. does not potentially interfere with any presently existing legal use of water, cause adverse environmental impacts, saltwater intrusion, pollution of the water resources, adverse impacts to offsite land uses, or does not otherwise raise issues requiring a Staff determination of whether such impacts would occur pursuant to the "Basis of Review for Water Use Permit Applications within the South Florida Water Management District – October 1997", incorporated by reference in Rule 40E-2.091(1); and,

4. does not change the permitted withdrawal source(s) or use classification.

5. does not result in a modification of the permit which must be approved by the Governing Board pursuant to Section 373.239(2), F.S.

(b) The timeframes set forth in Rule 40E-1.606 shall apply to the processing of letter modifications.

Specific Authority 373.044, 373.113 FS. Law Implemented 373.223, 373.229, 373.239 FS. History–New 9-3-81, Formerly 16K-2.09(1), Amended 4-20-94, 7-11-96, 4-9-97, 12-10-97.

40E-2.341 Revocation of Permits.

Violations of this chapter may result in the revocation or suspension of the authorization in whole or in part in accordance with the provisions of Chapter 373, including Sections 373.119 and 373.243, F.S., Chapter 120, F.S., and Rules 40E-1.609, and 28-107.004, F.A.C.

Specific Authority 373.044, 373.113 FS. Law Implemented 120.60(6), 373.103(4), 373.219, 373.229 FS. History–New 4-20-94, Amended 7-2-98.

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40E-2.351 Transfer of Permits.

A permittee must comply with the requirements of Rule 40E-1.6107 in order to obtain a permit transfer to a new permittee. If the permit transfer is in conjunction with an application for permit modification, the permit shall be transferred at the time of permit modification if all applicable permit transfer criteria are met. Upon approval, all terms and conditions of the permit shall be binding on the transferee.

Specific Authority 373.044, 373.113 FS. Law Implemented 373.223, 373.229, 373.239 FS. History–New 9-3-81, Formerly 16K-2.09(2), Amended 4-20-94.

40E-2.381 Limiting Conditions.

The Board shall impose on any permit granted under this chapter such reasonable standard and special permit conditions as are necessary to assure that the permitted use or withdrawal will be consistent with the overall objectives of the District, will not be harmful to the water resources of the District, is reasonable-beneficial, will not interfere with any presently existing legal uses, and is consistent with the public interest. Standard permit conditions in Section 5.1 of the "Basis of Review for Water Use Permit Applications within the South Florida Water Management District – October 1997", incorporated by reference in Rule 40E-2.091(1) shall be set forth in the permit. Special permit conditions, including those specified in Section 5.2 of the "Basis of Review for Water Use Permit Applications within the South Florida Water Management District – October 1997", shall be set forth in the permit.

Specific Authority 373.044, 373.113, 373.171 FS. Law Implemented 373.219(1) FS. History–New 9-3-81, Amended 2-24-85, 7-26-87, 4-20-94, 7-11-96, 4-9-97, 12-10-97.

40E-2.441 Temporary Permits.

The Board or the Executive Director may issue temporary water use permits under the provisions of Section 373.244, Florida Statutes.

Specific Authority 373.044, 373.113 FS. Law Implemented 373.244 FS. History–New 9-3-81, Amended 4-20-94.

40E-2.451 Emergency Authorization.

(1) Permission to begin use, withdrawal, or diversion of water prior to the issuance of a permit may be applied for in writing, when emergency conditions exist which would justify such permission. However, no such permission shall be granted unless the use, withdrawal, or diversion is already being considered for a permit under Rule 40E-2.041. A serious set of unforeseen or unforeseeable circumstances must exist to create an emergency. Mere carelessness or lack of planning on the part of the applicant shall not be sufficient grounds to warrant the granting of emergency authorization.

(2) Emergency authorizations shall be administered pursuant to Rule 40E-1.6115, F.A.C.

Specific Authority 373.044, 373.113 FS. Law Implemented 120.60(5), 373.219 FS. History–New 9-3-81, Formerly 16K-2.11, Amended 4-20-94, 7-2-98.

40E-2.501 Permit Classification.

Each water use permit shall be classified according to source, use and method of withdrawal. The source use and method of withdrawal classes are listed in Rules 40E-21.611 through 40E-21.691.

Specific Authority 373.044, 373.113 FS. Law Implemented 373.246 FS. History–New 9-3-81, Formerly 16K-2.12(2), Amended 7-4-82.

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Source: http://www.nps.gov/rivers/wsract.html on May 7, 2001

Wild and Scenic Rivers Act

(P.L. 90-542, as amended)
(16 U.S.C. 1271-1287)

[1]An Act
To provide for a National Wild and Scenic Rivers System, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that,

(a) this Act may be cited as the "Wild and Scenic Rivers Act."

Congressional declaration of policy.

(b) It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes.

Congressional declaration of purpose.

(c) The purpose of this Act is to implement this policy by instituting a national wild and scenic rivers system, by designating the initial components of that system, and by prescribing the methods by which and standards according to which additional components may be added to the system from time to time.

Composition of system; requirements for State-administered components.

SECTION 2. (a) The national wild and scenic rivers system shall comprise rivers (i) that are authorized for inclusion therein by Act of Congress, or (ii) that are designated as wild, scenic or recreational rivers by or pursuant to an act of the legislature of the State or States through which they flow, that are to be permanently administered as wild, scenic or recreational rivers by an agency or political subdivision of the State or States concerned, that are found by the Secretary of the Interior, upon application of the Governor of the State or the Governors of the States concerned, or a person or persons thereunto duly appointed by him or them, to meet the criteria established in this Act and such criteria supplementary thereto as he may prescribe, and that are approved by him for inclusion in the system, including, upon application of the Governor of the State concerned, the Allagash Wilderness Waterway, Maine; that segment of the Wolf River, Wisconsin, which flows through Langlade County; and that segment of the New River in North Carolina extending from its confluence with Dog Creek downstream approximately 26.5 miles to the Virginia State line. Upon receipt of an application under clause (ii) of this subsection, the Secretary shall notify the Federal Energy Regulatory Commission and publish such application in the *Federal Register*. Each river designated under clause (ii) shall be administered by the State or political subdivision thereof without expense to the United States other than for administration and management of federally owned lands. For purposes of the preceding sentence, amounts made available to any State or political subdivision under the Land and Water Conservation [Fund] Act of 1965 or any other provision of law shall not be treated as an expense to the United States. Nothing in this subsection shall be construed to provide for the transfer to, or administration by, a State or local authority of any federally owned lands which are within the boundaries of any river included within the system under clause (ii).

Classification.

(b) A wild, scenic or recreational river area eligible to be included in the system is a free-flowing stream and the related adjacent land area that possesses one or more of the values referred to in Section 1, subsection (b) of this Act. Every wild, scenic or recreational river in its free-flowing condition, or upon restoration to this condition, shall be considered eligible for inclusion in the national wild and scenic rivers system and, if included, shall be classified, designated, and administered as one of the following:

(1) *Wild river areas* -- Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

(2) *Scenic river areas* -- Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

(3) *Recreational river areas* -- Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Congressionally designated components.

SECTION 3. (a) The following rivers and the land adjacent thereto are hereby designated as components of the national wild and scenic rivers system:

(1) **CLEARWATER, MIDDLE FORK, IDAHO.** -- The Middle Fork from the town of Kooskia upstream to the town of Lowell; the Lochsa River from its junction with the Selway at Lowell forming the Middle Fork, upstream to the Powell Ranger Station; and the Selway River from Lowell upstream to its origin; to be administered by the Secretary of Agriculture.

(2) **ELEVEN POINT, MISSOURI.** -- The segment of the river extending downstream from Thomasville, to State Highway 142; to be administered by the Secretary of Agriculture.[1a]

(3) **FEATHER, CALIFORNIA.** -- The entire Middle Fork downstream from the confluence of its tributary streams one kilometer south of Beckwourth, California; to be administered by the Secretary of Agriculture.

(4) **RIO GRANDE, NEW MEXICO.** -- The segment extending from the Colorado State line downstream to the State Highway 96 crossing, and the lower four miles of the Red River; to be administered by the Secretary of the Interior.

(5) **ROGUE, OREGON.** -- The segment of the river extending from the mouth of the Applegate River downstream to the Lobster Creek Bridge; to be administered by agencies of the Departments of the Interior or Agriculture as agreed upon by the Secretaries of said Departments or as directed by the President.

(6) **SAINT CROIX, MINNESOTA AND WISCONSIN.** -- The segment between the dam near Taylors Falls, Minnesota, and the dam near Gordon, Wisconsin, and its tributary, the Namekagon, from Lake Namekagon downstream to its confluence with the Saint Croix; to be administered by the Secretary of the Interior; *Provided*, That except as may be required in connection with items (a) and (b) of this paragraph, no funds available to carry out the provisions of this Act may be expended for the acquisition or development of lands in connection with, or for administration under this Act of, that portion of the Saint Croix River between the dam near Taylors Falls, Minnesota, and the upstream end of Big Island in Wisconsin, until sixty days after the date on which the Secretary has transmitted to the President of the Senate and Speaker of the House of Representatives a proposed cooperative agreement between the Northern States Power Company and the United States (a) whereby the company agrees to convey to the United States, without charge, appropriate interests in certain of its lands between the dam near Taylors Falls, Minnesota, and the upstream end of Big Island in Wisconsin, including the company's right, title, and interest to approximately one hundred acres per mile, and (b) providing for the use and development of other lands and interests in land retained by the company between said points adjacent to the river in a manner which shall complement and not be inconsistent with the purposes for which the lands and interests

in land donated by the company are administered under this Act. Said agreement may also include provision for State or local governmental participation as authorized under subsection (e) of section 10 of this Act. A one-thousand-three-hundred-and-eighty-acre portion of the area commonly known as the Velie Estate, located adjacent to the Saint Croix River in Douglas County, Wisconsin, as depicted on the map entitled, "Boundary Map/Velie Estate--Saint Croix National Scenic Riverway," dated September 1980, and numbered 630-90,001, may be acquired by the Secretary without regard to any acreage limitation set forth in subsection (b) of this section or subsection (a) or (b) of section 6 of this Act.

(7) **SALMON, MIDDLE FORK, IDAHO.** -- From its origin to its confluence with the main Salmon River; to be administered by the Secretary of Agriculture.

(8) **WOLF, WISCONSIN.** -- From the Langlade-Menominee County line downstream to Keshena Falls; to be administered by the Secretary of the Interior.

(9) **LOWER SAINT CROIX, MINNESOTA AND WISCONSIN.** -- The segment between the dam near Taylors Falls and its confluence with the Mississippi River: *Provided*, (i) That the upper twenty-seven miles of this river segment shall be administered by the Secretary of the Interior; and (ii) That the lower twenty-five miles shall be designated by the Secretary upon his approval of an application for such designation made by the Governors of the States of Minnesota and Wisconsin.[2]

(10) **CHATTOOGA, NORTH CAROLINA, SOUTH CAROLINA, GEORGIA.** -- The segment from 0.8 mile below Cashiers Lake in North Carolina to Tugaloo Reservoir, and the West Fork Chattooga River from its junction with [the] Chattooga upstream 7.3 miles, as generally depicted on the boundary map entitled, "Proposed Wild and Scenic Chattooga River and Corridor Boundary," dated August 1973; to be administered by the Secretary of Agriculture: *Provided*, That the Secretary of Agriculture shall take such action as is provided for under subsection (b) of this section within one year from the date of enactment of this paragraph [May 10, 1974]; *Provided further*, That for the purposes of this river, there are authorized to be appropriated not more than $5,200,000 for the acquisition of lands and interests in lands and not more than $809,000 for development.

(11) **RAPID RIVER, IDAHO.**[3] -- The segment from the headwaters of the main stem to the national forest boundary and the segment of the West Fork from the wilderness boundary downstream to the confluence with the main stem, as a wild river.

(12) **SNAKE, IDAHO AND OREGON.**[3] -- The segment from Hells Canyon Dam downstream to Pittsburgh Landing, as a wild river; and the segment from Pittsburgh Landing downstream to an eastward extension of the north boundary of section 1, township 5 north, range 47 east, Willamette meridian, as a scenic river.

(13) **FLATHEAD, MONTANA.** -- The North Fork from the Canadian border downstream to its confluence with the Middle Fork; the Middle Fork from its headwaters to its confluence to the South Fork; and the South Fork from its origin to the Hungry Horse Reservoir, as generally depicted on the map entitled, "Proposed Flathead Wild and Scenic River Boundary Location" dated February 1976; to be administered by agencies of the Departments of the Interior and Agriculture as agreed upon by the Secretaries of such Departments or as directed by the President. Action required to be taken under subsection (b) of this section shall be taken within one year from the date of enactment of this paragraph [October 12, 1976]. For the purposes of this river, there are authorized to be appropriated not more than $6,719,000 for the acquisition of lands and interests in lands. No funds authorized to be appropriated pursuant to this paragraph shall be available prior to October 1, 1977.

(14) **MISSOURI, MONTANA.**[4] -- The segment from Fort Benton one hundred and forty-nine miles downstream to Robinson Bridge, as generally depicted on the boundary map entitled, "Missouri Breaks Free-flowing River Proposal," dated October 1975, to be administered by the Secretary of the Interior. For the purposes of this river, there are authorized to be appropriated not more than $1,800,000 for the acquisition of lands and interests in lands. No funds authorized to be appropriated pursuant to this paragraph shall be available prior to October 1, 1977.

(15) **OBED, TENNESSEE.** -- The segment from the western edge of the Catoosa Wildlife Management Area to the confluence with the Emory River; Clear Creek from the Morgan County line to the confluence with the Obed River, Daddys Creek from the Morgan County line to the confluence with the

Obed River; and the Emory River from the confluence with the Obed River to the Nemo Bridge as generally depicted and classified on the stream classification map dated December 1973. The Secretary of the Interior shall take such action, with the participation of the State of Tennessee as is provided for under subsection (b) within one year following the date of enactment of this paragraph [October 12, 1976]. The development plan required by such subsection (b) shall include cooperative agreements between the State of Tennessee acting through the Wildlife Resources Agency and the Secretary of the Interior. Lands within the Wild and Scenic River boundaries that are currently part of the Catoosa Wildlife Management Area shall continue to be owned and managed by the Tennessee Wildlife Resources Agency in such a way as to protect the wildlife resources and primitive character of the area, and without further development of roads, campsites, or associated recreational facilities unless deemed necessary by that agency for wildlife management practices. The Obed Wild and Scenic River shall be managed by the Secretary of the Interior. For the purposes of carrying out the provisions of this Act with respect to this river, there are authorized to be appropriated such sums as may be necessary, but not to exceed $2,000,000 for the acquisition of lands or interests in lands and not to exceed $400,000 for development. No funds authorized to be appropriated pursuant to this paragraph shall be available prior to October 1, 1977.

(16) **PERE MARQUETTE, MICHIGAN.** -- The segment downstream from the junction of the Middle and Little South Branches to its junction with United States Highway 31 as generally depicted on the boundary map entitled, "Proposed Boundary Location, Pere Marquette Wild and Scenic River,"; to be administered by the Secretary of Agriculture. After consultation with State and local governments and the interested public, the Secretary shall take such action as is provided for under subsection (b) with respect to the segment referred to in this paragraph within one year from the date of enactment of this paragraph. Any development or management plan prepared pursuant to subsection (b) shall include (a) provisions for the dissemination of information to river users and (b) such regulations relating to the recreational and other uses of the river as may be necessary in order to protect the area comprising such river (including lands contiguous or adjacent thereto) from damage or destruction by reason of overuse and to protect its scenic, historic, esthetic and scientific values. Such regulations shall further contain procedures and means which shall be utilized in the enforcement of such development and management plan. For the purposes of carrying out the provisions of this Act with respect to the river designated by this paragraph, there are authorized to be appropriated not more than $8,125,000 for the acquisition of lands or interests in lands and $402,000 for development. Notwithstanding any other provision of this Act, the installation and operation of facilities or other activities within or outside the boundaries of the Pere Marquette Wild and Scenic River for the control of the lamprey eel shall be permitted subject to such restrictions and conditions as the Secretary of Agriculture may prescribe for the protection of water quality and other values of the river, including the wild and scenic characteristics of the river.

(17) **RIO GRANDE, TEXAS.** -- The segment on the United States side of the river from river mile 842.3 above Mariscal Canyon downstream to river mile 651.1 at the Terrell-Val Verde County line; to be administered by the Secretary of the Interior. The Secretary shall, within two years after the date of enactment of this paragraph [November 10, 1978], take such action with respect to the segment referred to in this paragraph as is provided for under subsection (b). The action required by such subsection (b) shall be undertaken by the Secretary, after consultation with the United States Commissioner, International Boundary and Water Commission, United States and Mexico, and appropriate officials of the State of Texas and its political subdivisions. The development plan required by subsection (b) shall be construed to be a general management plan only for the United States side of the river and such plan shall include, but not be limited to, the establishment of a detailed boundary which shall include an average of not more than 160 acres per mile. Nothing in this Act shall be construed to be in conflict with

(A) the commitments or agreements of the United States made by or in pursuance of the treaty between the United States and Mexico regarding the utilization of the Colorado and Tijuana Rivers and of the Rio Grande, signed at Washington, February 1944 (59 Stat. 1219), or

(B) the treaty between the United States and Mexico regarding maintenance of the Rio Grande and Colorado River as the international boundary between the United States and Mexico, signed November 23, 1970.

For purposes of carrying out the provisions of this Act with respect to the river designated by this paragraph, there are authorized to be appropriated such sums as may be necessary, but not more than $1,650,000 for the acquisition of lands and interests in lands and not more than $1,800,000 for development.

(18) **SKAGIT, WASHINGTON.** -- The segment from the pipeline crossing at Sedro-Woolley upstream to and including the mouth of Bacon Creek; the Cascade River from its mouth to the junction of its North and South Forks; the South Fork to the boundary of the Glacier Peak Wilderness Area; the Suiattle River from its mouth to the boundary of the Glacier Peak Wilderness Area at Milk Creek; the Sauk River from its mouth to its junction with Elliott Creek; the North Fork of the Sauk River from its junction with the South Fork of the Sauk to the boundary of the Glacier Peak Wilderness Area; as generally depicted on the boundary map entitled, "Skagit River -- River Area Boundary;" all segments to be administered by the Secretary of Agriculture. Riprapping related to natural channels with natural rock along the shorelines of the Skagit segment to preserve and protect agricultural land shall not be considered inconsistent with the values for which such segment is designated. After consultation with affected Federal agencies, State and local government and the interested public, the Secretary shall take such action as is provided for under subsection (b) with respect to the segments referred to in this paragraph within one year from the date of enactment of this paragraph [November 10, 1978]; as part of such action, the Secretary of Agriculture shall investigate that portion of the North Fork of the Cascade River from its confluence with the South Fork to the boundary of the North Cascades National Park and if such portion is found to qualify for inclusion, it shall be treated as a component of the Wild and Scenic Rivers System designated under this section upon publication by the secretary of notification to that effect in the Federal Register. For the purposes of carrying out the provisions of this Act with respect to the river designated by this paragraph there are authorized to be appropriated not more than $11,734,000 for the acquisition of lands or interest in lands and not more than $332,000 for development.

(19) **UPPER DELAWARE RIVER, NEW YORK AND PENNSYLVANIA.**[5] -- The segment of the Upper Delaware River from the confluence of the East and West branches below Hancock, New York, to the existing railroad bridge immediately downstream of Cherry Island in the vicinity of Sparrow Bush, New York, as depicted on the boundary map entitled, "The Upper Delaware Scenic and Recreational River," dated April 1978; to be administered by the Secretary of the Interior. Subsection (b) of this section shall not apply, and the boundaries and classifications of the river shall be as specified on the map referred to in the preceding sentence, except to the extent that such boundaries or classifications are modified pursuant to section 704(c)[6] of the National Parks and Recreation Act of 1978. Such boundaries and classifications shall be published in the *Federal Register* and shall not become effective until ninety days after they have been forwarded to the Committee on Interior and Insular Affairs of the United States House of Representatives and the Committee on Energy and Natural Resources of the United States Senate. For purposes of carrying out the provisions of this Act with respect to the river designated by this paragraph there are authorized to be appropriated such sums as may be necessary.

(20) **DELAWARE, NEW YORK, PENNSYLVANIA, AND NEW JERSEY.** -- The segment from the point where the river crosses the northern boundary of the Delaware Water Gap National Recreation Area to the point where the river crosses the southern boundary of such recreation area; to be administered by the Secretary of the Interior. For purposes of carrying out this Act with respect to the river designated by this paragraph, there are authorized to be appropriated such sums as may be necessary. Action required to be taken under subsection (b) of this section with respect to such segment shall be taken within one year from the date of enactment of this paragraph [November 10, 1978], except that, with respect to such segment, in lieu of the boundaries provided for in such subsection (b), the boundaries shall be the banks of the river. Any visitors facilities established for purposes of use and enjoyment of the river under the authority of the Act establishing the Delaware Water Gap National Recreation Area shall be compatible with the purposes of this Act and shall be located at an appropriate distance from the river.

(21) **AMERICAN, CALIFORNIA.** -- The North Fork from a point 0.3 mile above Heath Springs downstream to a point approximately 1,000 feet upstream of the Colfax-Iowa Hill Bridge, including the Gold Run Addition Area, as generally depicted on the map entitled, "Proposed Boundary Maps" contained in Appendix I of the document dated January 1978 and entitled, "A Proposal: North Fork American Wild and Scenic River" published by the United States Forest Service, Department of Agriculture; to be

designated as a wild river and to be administered by agencies of the Departments of Interior and Agriculture as agreed upon by the Secretaries of such Departments or as directed by the President. Action required to be taken under subsection (b) shall be taken within one year after the date of the enactment of this paragraph [November 10, 1978]; in applying such subsection (b) in the case of the Gold Run Addition Area, the acreage limitation specified therein shall not apply and in applying section 6(g)(3), January 1 of the calendar year [1977] preceding the calendar year in which this paragraph is enacted shall be substituted for January 1, 1967. For purposes of carrying out the provisions of this Act with respect to the river designated by this paragraph, there are authorized to be appropriated not more than $850,000 for the acquisition of lands and interests in land and not more than $765,000 for development.

(22) **MISSOURI RIVER, NEBRASKA, SOUTH DAKOTA.** -- The segment from Gavins Point Dam, South Dakota, fifty-nine miles downstream to Ponca State Park, Nebraska, as generally depicted in the document entitled, "Review Report for Water Resources Development, South Dakota, Nebraska, North Dakota, Montana," prepared by the Division Engineer, Missouri River Division, Corps of Engineers, dated August 1977 (hereinafter in this paragraph referred to as the "August 1977 Report"). Such segment shall be administered as a recreational river by the Secretary. The Secretary shall enter into a written cooperative agreement with the Secretary of the Army (acting through the Chief of Engineers) for construction and maintenance of bank stabilization work and appropriate recreational development. After public notice and consultation with the State and local governments, other interested organizations and associations, and the interested public, the Secretary shall take such action as is required pursuant to subsection (b) within one year from the date of enactment of this section [November 10, 1978]. In administering such river, the Secretary shall, to the extent, and in a manner, consistent with this section --

(A) provide (i) for the construction by the United States of such recreation river features and streambank stabilization structures as the Secretary of the Army (acting through the Chief of Engineers) deems necessary and advisable in connection with the segment designated by this paragraph, and (ii) for the operation and maintenance of all streambank stabilization structures constructed in connection with such segment (including both structures constructed before the date of enactment of this paragraph and structures constructed after such date, and including both structures constructed under the authority of this section and structures constructed under the authority of any other Act); and (B) permit access for such pumping and associated pipelines as may be necessary to assure an adequate supply of water for owners of land adjacent to such segment and for fish, wildlife, and recreational uses outside the river corridor established pursuant to this paragraph. The streambank structures to be constructed and maintained under subparagraph (A) shall include, but not be limited to, structures at such sites as are specified with respect to such segment on pages 62 and 63 of the August 1977 Report, except that sites for such structures may be relocated to the extent deemed necessary by the Secretary of the Army (acting through the Chief of Engineers) by reason of physical changes in the river or river area. The Secretary of the Army (acting through the Chief of Engineers) shall condition the construction or maintenance of any streambank stabilization structure or of any recreational river feature at any site under subparagraph (A)(i) upon the availability to the United States of such land and interests in land in such ownership as he deems necessary to carry out such construction or maintenance and to protect and enhance the river in accordance with the purposes of this Act. Administration of the river segment designated by this paragraph shall be in coordination with, and pursuant to the advice of a Recreational River Advisory Group which shall be established by the Secretary. Such Group may include in its membership, representatives of the affected States and political subdivisions thereof, affected Federal agencies, and such organized private groups as the Secretary deems desirable. Notwithstanding the authority to the contrary contained in subsection 6(a) of this Act, no land or interests in land may be acquired without the consent of the owner: *Provided*, That not to exceed 5 per centum of the acreage within the designated river boundaries may be acquired in less than fee title without the consent of the owner, in such instance of the Secretary's determination that activities are occurring, or threatening to occur thereon which constitute serious damage or threat to the integrity of the river corridor, in accordance with the values for which this river was designated. For purposes of carrying out the provisions of the Act with respect to the river designated by this paragraph, there are authorized to be appropriated not to exceed $21,000,000, for acquisition of lands and interests in lands and for development.

(23) **SAINT JOE, IDAHO.** -- The segment above the confluence of the North Fork of the Saint Joe River to Spruce Tree Campground, as a recreational river; the segment above Spruce Tree Campground to Saint Joe Lake, as a wild river, as generally depicted on the map entitled, "Saint Joe River Corridor Map" on file with the Chief of the Forest Service and dated September 1978; to be administered by the Secretary of Agriculture. Notwithstanding any other provision of law, the classification of the Saint Joe River under this paragraph and the subsequent development plan for the river prepared by the Secretary of Agriculture shall at no time interfere with or restrict the maintenance, use, or access to existing or future roads within the adjacent lands nor interfere with or restrict present use of or future construction of bridges across that portion of the Saint Joe designated as a "recreational river" under this paragraph. Dredge or placer mining shall be prohibited within the banks or beds of the main stem of the Saint Joe and its tributary streams in their entirety above the confluence of the main stem with the North Fork of the river. Nothing in this Act shall be deemed to prohibit the removal of sand and gravel above high water mark of the Saint Joe River and its tributaries within the river corridor by or under the authority of any public body or its agents for the purposes of construction or maintenance of roads. The Secretary shall take such action as is required under subsection (b) of this section within one year from the date of enactment of this paragraph [November 10, 1978]. For the purposes of this river, there are authorized to be appropriated not more than $1,000,000 for the acquisition of lands or interest in lands.

(24) **SALMON, IDAHO.** --

(A) The segment of the main river from the mouth of the North Fork of the Salmon River downstream to Long Tom Bar in the following classes: (i) the forty-six-mile segment from the mouth of the North Fork of the Salmon River to Corn Creek as a recreational river; and (ii) the seventy-nine mile segment from Corn Creek to Long Tom Bar as a wild river; all as generally depicted on a map entitled, "Salmon River" dated November 1979, which is on file and available for public inspection in the Office of the Chief, Forest Service, United States Department of Agriculture.

(B) This segment shall be administered by the Secretary of Agriculture: *Provided*, That after consultation with State and local governments and the interested public, the Secretary shall take such action as is required by subsection (b) of this section within one year from the date of enactment of this paragraph [June 23, 1980].

(C) The use of motorboats (including motorized jetboats) within this segment of the Salmon River shall be permitted to continue at a level not less than the level of use which occurred during calendar year 1978.

(D) Subject to existing rights of the State of Idaho, including the right of access, with respect to the beds of navigable streams, tributaries or rivers, dredge and placer mining in any form including any use of machinery for the removal of sand and gravel for mining purposes shall be prohibited within the segment of the Salmon River designated as a component of the Wild and Scenic Rivers System by this paragraph; within the fifty-three mile segment of the Salmon River from Hammer Creek downstream to the confluence of the Snake River; and within the Middle Fork of the Salmon River; and its tributary streams in their entirety: *Provided*, That nothing in this paragraph shall be deemed to prohibit the removal of sand and gravel, outside the boundaries of the River of No Return Wilderness or the Gospel-Hump Wilderness, above the high water mark of the Salmon River or the Middle Fork and its tributaries for the purposes of construction or maintenance of public roads: *Provided further*, That this paragraph shall not apply to any written mineral leases approved by the Board of Land Commissioners of the State of Idaho prior to January 1, 1980.

(E) The provisions of section 7(a) of this Act with respect to the licensing of dams, water conduits, reservoirs, powerhouses, transmission lines or other project works, shall apply to the fifty-three-mile segment of the Salmon River from Hammer Creek downstream to the confluence of the Snake River.

(F) For the purposes of the segment of the Salmon River designated as a component of the Wild and Scenic Rivers System by this paragraph, there is hereby authorized to be appropriated from the Land and Water Conservation Fund, after October 1, 1980, not more than $6,200,000 for the acquisition of lands and interests in lands.[7]

(25) **ALAGNAK, ALASKA.**[8] -- That segment of the main stem and the major tributary to the Alagnak, the Nonvianuk River, within Katmai National Preserve; to be administered by the Secretary of the

Interior.

(26) **ALATNA, ALASKA.** -- The main stem within the Gates of the Arctic National Park; to be administered by the Secretary of the Interior.

(27) **ANIAKCHAK, ALASKA.** -- That portion of the river, including its major tributaries, Hidden Creek, Mystery Creek, Albert Johnson Creek, and North Fork Aniakchak River, within the Aniakchak National Monument and National Preserve; to be administered by the Secretary of the Interior.

(28) **CHARLEY, ALASKA.** -- The entire river, including its major tributaries, Copper Creek, Bonanza Creek, Hosford Creek, Derwent Creek, Flat-Orthmer Creek, Crescent Creek, and Moraine Creek, within the Yukon-Charley Rivers National Preserve; to be administered by the Secretary of the Interior.

(29) **CHILIKADROTNA, ALASKA.** -- That portion of the river within the Lake Clark National Park and Preserve; to be administered by the Secretary of the Interior.

(30) **JOHN, ALASKA.** -- That portion of the river within the Gates of the Arctic National Park; to be administered by the Secretary of the Interior.

(31) **KOBUK, ALASKA.** -- That portion within the Gates of the Arctic National Park and Preserve; to be administered by the Secretary of the Interior.

(32) **MULCHATNA, ALASKA.** -- That portion within the Lake Clark National Park and Preserve; to be administered by the Secretary of the Interior.

(33) **NOATAK, ALASKA.** -- The river from its source in the Gates of the Arctic National Park to its confluence with the Kelly River in the Noatak National Preserve; to be administered by the Secretary of the Interior.

(34) **NORTH FORK OF THE KOYUKUK, ALASKA.** -- That portion within the Gates of the Arctic National Park; to be administered by the Secretary of the Interior.

(35) **SALMON, ALASKA.** -- That portion within the Kobuk Valley National Park; to be administered by the Secretary of the Interior.

(36)**TINAYGUK, ALASKA.** -- That portion within the Gates of the Arctic National Park; to be administered by the Secretary of the Interior.

(37) **TLIKAKILA, ALASKA.** -- That portion within the Lake Clark National Park; to be administered by the Secretary of the Interior.

(38) **ANDREAFSKY, ALASKA.** -- That portion from its source, including all headwaters, and the East Fork, within the boundary of the Yukon Delta National Wildlife Refuge; to be administered by the Secretary of the Interior.

(39) **IVISHAK, ALASKA.** -- That portion from its source, including all headwaters and an unnamed tributary from Porcupine Lake within the boundary of the Arctic National Wildlife Range; to be administered by the Secretary of the Interior.

(40) **NOWITNA, ALASKA.** -- That portion from the point where the river crosses the west limit of township 18 south, range 22 east, Kateel River meridian, to its confluence with the Yukon River within the boundaries of the Nowitna National Wildlife Refuge; to be administered by the Secretary of the Interior.

(41) **SELAWIK, ALASKA.** -- That portion from a fork of the headwaters in township 12 north, range 10 east, Kateel River meridian to the confluence of the Kugarak River, within the Selawik National Wildlife Refuge; to be administered by the Secretary of the Interior.

(42) **SHEENJEK, ALASKA.** -- The segment within the Arctic National Wildlife Refuge; to be administered by the Secretary of the Interior.

(43) **WIND, ALASKA.** -- That portion from its source, including all headwaters and one unnamed tributary in township 13 south, within the boundaries of the Arctic National Wildlife Refuge; to be administered by the Secretary of the Interior.

(44) **ALAGNAK, ALASKA.** -- Those segments or portions of the main stem and Nonvianuk tributary lying outside and westward of the Katmai National Park/Preserve and running to the west boundary of township 13 south, range 43 west; to be administered by the Secretary of the Interior.

(45) **BEAVER CREEK, ALASKA.** -- The segment of the main stem from the vicinity of the confluence of the Bear and Champion Creeks downstream to its exit from the northeast corner of township 12 north, range 6 east, Fairbanks meridian within the White Mountains National Recreation Area, and the

Yukon Flats National Wildlife Refuge, to be administered by the Secretary of the Interior.

(46) **BIRCH CREEK, ALASKA.** -- The segment of the main stem from the south side of Steese Highway in township 7 north, range 10 east, Fairbanks meridian, downstream to the south side of the Steese Highway in township 10 north, range 16 east; to be administered by the Secretary of the Interior.

(47) **DELTA, ALASKA.** -- The segment from and including all of the Tangle Lakes to a point one-half mile north of Black Rapids; to be administered by the Secretary of the Interior.

(48) **FORTYMILE, ALASKA.** -- The main stem within the State of Alaska; O'Brien Creek; South Fork; Napoleon Creek, Franklin Creek, Uhler Creek, Walker Fork downstream from the confluence of Liberty Creek; Wade Creek; Mosquito Fork downstream from the vicinity of Kechumstuk; West Fork Dennison Fork downstream from the confluence of Logging Cabin Creek; Dennison Fork downstream from the confluence of West Fork Dennison Fork; Logging Cabin Creek; North Fork; Hutchison Creek; Champion Creek; the Middle Fork downstream from the confluence of Joseph Creek; and Joseph Creek; to be administered by the Secretary of the Interior.

(49) **GULKANA, ALASKA.** -- The main stem from the outlet of Paxson Lake in township 12 north, range 2 west, Copper River meridian to the confluence with Sourdough Creek; the south branch of the west fork from the outlet of an unnamed lake in sections 10 and 15, township 10 north, range 7 west, Copper River meridian to the confluence with the west fork; the north branch from the outlet of two unnamed lakes, one in sections 24 and 25, the second in sections 9 and 10, township 11 north, range 8 west, Copper River meridian to the confluence with the west fork; the west fork from its confluence with the north and south branches downstream to its confluence with the main stem; the middle fork from the outlet of Dickey Lake in township 13 north, range 5 west, Copper River meridian to the confluence with the main stem; to be classified as a wild river area and to be administered by the Secretary of the Interior.

(50) **UNALAKLEET, ALASKA.** -- The segment of the main stem from the headwaters in township 12 south, range 3 west, Kateel River meridian extending downstream approximately 65 miles to the western boundary of township 18 south, range 8 west; to be administered by the Secretary of the Interior.

(51) **VERDE, ARIZONA.** -- The segment from the boundary between national forest and private land in sections 26 and 27, township 13 north, range 5 east, Gila Salt River meridian, downstream to the confluence with Red Creek, as generally depicted on a map entitled, "Verde River -- Wild and Scenic River," dated March 1984, which is on file and available for public inspection in the Office of the Chief, Forest Service, United States Department of Agriculture; to be administered by the Secretary of Agriculture. This designation shall not prevent water users receiving Central Arizona Project water allocations from diverting that water through an exchange agreement with downstream water users in accordance with Arizona water law. After consultation with State and local governments and the interested public and within two years after the date of enactment of this paragraph [August 28,1984], the Secretary shall take such action as is required under subsection (b) of this section.

(52) **AU SABLE, MICHIGAN.** -- The segment of the main stem from the project boundary of the Mio Pond project downstream to the project boundary at Alcona Pond project as generally depicted on a map entitled, "Au Sable River" which is on file and available for public inspection in the Office of the Chief, Forest Service, United States Department of Agriculture; to be administered by the Secretary of Agriculture.

(53) **TUOLUMNE, CALIFORNIA.** -- The main river from its sources on Mount Dana and Mount Lyell in Yosemite National Park to Don Pedro Reservoir consisting of approximately 83 miles as generally depicted on the proposed boundary map entitled, "Alternative A," contained in the Draft Tuolumne Wild and Scenic River Study and Environmental Impact Statement published by the United States Department of the Interior and Department of Agriculture in May 1979; to be administered by the Secretary of the Interior and the Secretary of Agriculture. After consultation with State and local governments and the interested public and within two years from the date of enactment of this paragraph [September 28, 1984], the Secretary shall take such action as is required under subsection (b) of this section. Nothing is this Act shall preclude the licensing, development, operation, or maintenance of water resources facilities on those portions of the North Fork, Middle Fork or South Fork of the Tuolumne or Clavey Rivers that are outside the boundary of the wild and scenic river area as designated in this section. Nothing in this section is intended or shall be construed to affect any rights, obligations, privileges, or benefits granted under any prior authority of law including chapter 4 of the Act of December 13, 1913, commonly referred to as the Raker Act (38 Stat.

242) and including any agreement or administrative ruling entered into or made effective before the enactment of this paragraph [September 28,1984]. For fiscal years commencing after September 30, 1985, there are authorized to be appropriated such sums as may be necessary to implement the provisions of this subsection.

(54) **ILLINOIS, OREGON.** -- The segment from the boundary of the Siskiyou National Forest downstream to its confluence with the Rogue River as generally depicted on a map entitled "Illinois River Study" and is also part of a report entitled "A Proposal: Illinois Wild and Scenic River;" to be administered by the Secretary of Agriculture. After consultation with State and local governments and the interested public, the Secretary shall take such action as is required under subsection (b) of this section within one year from the date of enactment of this paragraph [October 19, 1984]. For the purposes of this Act with respect to the river designated by this paragraph, effective October 1, 1984, there are authorized to be appropriated such sums as necessary for the acquisition of lands or interests in lands, and such sums as necessary for development.

(55) **OWYHEE, OREGON.** -- The South Fork from the Idaho-Oregon State line downstream to Three Forks; the Owyhee River from Three Forks downstream to China Gulch; and the Owyhee River downstream from Crooked Creek to the Owyhee Reservoir as generally depicted on a map entitled "Owyhee, Oregon" dated April 1984; all three segments to be administered as a wild river by the Secretary of the Interior. After consultation with State and local governments and the interested public, the Secretary shall take such appropriate action as is required under subsection (b) of this section within one year from the date of enactment of this paragraph [October 19, 1984]. For the purposes of this Act with respect to the river designated by this paragraph, effective October 1, 1984, there are authorized to be appropriated such sums as necessary for the acquisition of lands or interests and such sums as necessary for development.

(56) **HORSEPASTURE, NORTH CAROLINA.** -- The segment from Bohaynee Road (N.C. 281) downstream approximately 4.25 miles to where the segment ends at Lake Jocassee, to be administered by the Secretary of Agriculture. Notwithstanding any limitation of section 6 of this Act, the Secretary is authorized to utilize the authority of this Act and those pertaining to the National Forests to acquire by purchase with donated or appropriated funds, donation, or exchange or otherwise, such non-Federal lands or interests in lands within, near, or adjacent to the designated segments of the river which the Secretary determines will protect or enhance the scenic and natural values of the river.

(57) **CACHE LA POUDRE, COLORADO.**[9] -- The following segments as generally depicted on the proposed boundary map numbered FS-56 and dated March 1986, published by the United States Department of Agriculture, each to be administered by the Secretary of Agriculture; except that those portions of the segments so designated which are within the boundary of Rocky Mountain National Park shall continue to be administered by the Secretary of the Interior:

(A) Beginning at Poudre Lake downstream to the confluence of Joe Wright Creek, as a wild river. This segment to be designated the "Peter H. Dominick Wild River Area."

(B) Downstream from the confluence of Joe Wright Creek to a point where the river intersects the easterly north-south line of the west half southwest quarter of section 1, township 8 north, range 71 west of the sixth principal meridian, as a recreational river.

(C) South Fork of the Cache la Poudre River from its source to the Comanche Peak Wilderness Boundary, approximately four miles, as a wild river.

(D) Beginning at the Comanche Peak Wilderness Boundary to a point on the South Fork of the Cache la Poudre River in section 1, township 7 north, range 73 west of the sixth principle meridian, at elevation 8050 mean sea level, as a recreational river.

(E) South Fork of the Cache la Poudre River from its intersection with the easterly section line of section 30, township 8 north, range 72 west of the sixth principle meridian, to confluence of the main stem of the Cache la Poudre River, as a wild river.

With respect to the portions of the river segments designated by this paragraph which are within the boundaries of Rocky Mountain National Park, the requirements of subsection (b) of this section shall be fulfilled by the Secretary of the Interior through appropriate revisions to the general management plan for the park, and the boundaries, classification, and development plans for such portions need not be published in the *Federal Register*. Such revisions to the general management plan for the park shall assure that no development or use of parklands shall be undertaken that is inconsistent with the designation of such river segments as a wild river. For the purposes of the segments designated by this paragraph, there are authorized to be appropriated $500,000 for development and $2,500,000 for land acquisition.

(58) **SALINE BAYOU, LOUISIANA.**[10] -- The segment from Saline Lake upstream to the Kisatchie National Forest, as generally depicted on the Proposed Boundary Map, numbered FS-57, and dated March 1986; to be administered by the Secretary of Agriculture. For the purposes of the segment designated by this paragraph, there are authorized to be appropriated for fiscal years commencing after September 30, 1986, not to exceed $1,000,000 for the acquisition of lands and interests in lands and for development."

(59) **BLACK CREEK, MISSISSIPPI.**[11] -- The segment from Fairley Bridge Landing upstream to Moody's Landing as generally depicted on a map entitled "Black Creek Wild and Scenic River," numbered FS-58 and dated March 1986, to be administered by the Secretary of Agriculture as a scenic river area under section 2(b)(2). For the purposes of the segment designated by this paragraph, there are authorized to be appropriated up to $300,000 for the acquisition of lands and interests in lands and for development.

(60) **KLICKITAT, WASHINGTON.** -- The segment from its confluence with Wheeler Creek, Washington, near the town of Pitt, Washington, to its confluence with the Columbia River; to be classified as a recreation river and to be administered by the Secretary of Agriculture.

(61) **WHITE SALMON, WASHINGTON.** -- The segment from its confluence with Gilmer Creek, Washington, near the town of B Z Corner, Washington to its confluence with Buck Creek, Washington; to be classified as a scenic river and to be administered by the Secretary of Agriculture.[12]

(62) **MERCED, CALIFORNIA.** --

(A) The main stem from its sources (including Red Peak Fork, Merced Peak Fork, Triple Peak Fork, and Lyle Fork) on the south side Mount Lyell in Yosemite National Park to a point 300 feet upstream of the confluence with Bear Creek, consisting of approximately 71 miles, and the South Fork of the river from its source near Triple Divide Peak in Yosemite National Park to the confluence with the main stem, consisting of approximately 43 miles, both as generally depicted on the map entitled "Merced River Wild and Scenic Rivers -- Proposed," dated June 1987, to be administered by the Secretary of Agriculture and the Secretary of the Interior. With respect to the portions of the river designated by this subparagraph which are within the boundaries of Yosemite National Park, and the El Portal Administrative unit, the requirements of subsection (b) of this section shall be fulfilled by the Secretary of the Interior through appropriate revisions to the general management plan for the park, and the boundaries, classification, and development plans for such portions need not be published in the *Federal Register*. Such revisions to the general management plan for the park shall assure that no development or use of park lands shall be undertaken that is inconsistent with the designation of such river segments. There are authorized to be appropriated such sums as may be appropriated to the Secretary of Agriculture for the acquisition of lands and interests in lands and for development.

(B)(i) The main stem from a point 300 feet upstream of the confluence with Bear Creek downstream to the normal maximum operating pool water surface level of Lake McClure (elevation 867 feet mean sea level) consisting of approximately 8 miles, as generally depicted on the map entitled "Merced Wild and Scenic River," dated April, 1990. The Secretary of the Interior shall administer the segment as recreational, from a point 300 feet upstream of the confluence with Bear Creek downstream to a point 300 feet west of the boundary of the Mountain King Mine, and as wild, from a point 300 feet west of the boundary of the Mountain King Mine to the normal maximum operating pool water surface level of Lake McClure. The requirements of subsection (b) of this section shall be fulfilled by the Secretary of the Interior through appropriate revisions to the Sierra Management Framework Plan for the Sierra Planning Area of the Folsom Resource Area, Bakersfield District, Bureau of Land Management. There are authorized to be appropriated such sums as may be necessary to carry out the purposes of this subparagraph. (ii) To the extent permitted by, and in a manner consistent with section 7 of this Act (16 U.S.C. 1278), and in accordance with other applicable law, the Secretary of the Interior shall permit the construction and operation of such pumping facilities and associated pipelines as identified in the Bureau of Land Management right-of-way application CACA 26084, filed by the Mariposa County Water Agency on November 7, 1989, and known as the "Saxon Creek Project," to assure an adequate supply of water from the Merced River to Mariposa County.

(C) With respect to the segments of the main stem of the Merced River and the South Fork Merced River designated as recreational or scenic pursuant to this paragraph or by the appropriate agency pursuant to subsection (b), the minerals to Federal lands which constitute the bed or bank or are situated within one-quarter mile of the bank are hereby withdrawn, subject to valid existing rights, from all forms of appropriation under the mining laws and from operation of the mineral leasing laws including, in both cases, amendments thereto.[13]

(63) **KINGS, CALIFORNIA.** -- The Middle Fork of the Kings River from its headwaters at Lake Helen between Muir Pass and Black Giant Mountain to its confluence with the main stem; the South Fork, Kings River from its headwaters at Lake 11599 to its confluence with the main stem; and the main stem of the Kings River from the confluence of the Middle Fork and the South Fork to the point at elevation 1,595 feet above mean sea level. The segments within the Kings Canyon National Park shall be administered by the Secretary of the Interior. The remaining segments shall be administered by the Secretary of Agriculture. After consultation with State and local governments and the interested public and within one year after the enactment of this paragraph [November 3, 1987], the respective Secretaries shall take such action as is required under subsection (b) of this section. In the case of the segments of the river administered by the Secretary of the Interior, the requirements of subsection (b) shall be fulfilled through appropriate revisions to the general management plan for Kings Canyon National Park, and the boundaries, classification, and development plans for such segments need not be published in the *Federal Register*. Such revisions to the general management plan for the park shall assure that no development or use of park lands shall be undertaken that is inconsistent with the designation of the river under this paragraph. For the purposes of the segments designated by this paragraph, there are authorized to be appropriated such sums as may be necessary, but not to exceed $250,000, to the Secretary of Agriculture for development and land acquisition to carry out the purposes of this paragraph.

(64) **NORTH FORK KERN RIVER, CALIFORNIA.** --

(A) The segment of the main stem from the Tulare-Kern County line to its headwaters in Sequoia National Park, as generally depicted on a map entitled "Kern River Wild and Scenic River -- Proposed" and dated June, 1987; to be administered by the Secretary of Agriculture; except that portion of the river within the boundaries of the Sequoia National Park shall be administered by the Secretary of the Interior. With respect to the portion of the river segment designated by this paragraph which is within the boundaries of Sequoia National Park, the requirements of subsection (b) of this section shall be fulfilled by the Secretary of the Interior through appropriate revisions to the general management plan for the park, and the boundaries, classification, and development plans for such portion need not be published in the Federal Register. Such revision to the general management plan for the park shall assure that no developments or use of park lands shall be undertaken that is inconsistent with the designation of such river segment.

(B) **SOUTH FORK KERN RIVER, CALIFORNIA.** -- The segment from its headwaters in the Inyo National Forest to the southern boundary of the Domelands Wilderness in the Sequoia National Forest, as generally depicted on a map entitled "Kern River Wild and Scenic River -- Proposed" and dated June 1987; to be administered by the Secretary of Agriculture.

(C) Nothing in this Act shall affect the continued operation and maintenance of the existing diversion project, owned by Southern California Edison on the North Fork of the Kern River, including reconstruction or replacement of facilities to the same extent as existed on the date of enactment of this paragraph [November 24, 1987].

(D) For the purposes of the segments designated by this paragraph, there are authorized to be appropriated such sums as may be necessary, but not to exceed $100,000, to the Secretary of Agriculture for development and land acquisition.

(65) **BLUESTONE, WEST VIRGINIA.** -- The segment in Mercer and Summers Counties, West Virginia, from a point approximately two miles upstream of the Summers and Mercer County line down to the maximum summer pool elevation (one thousand four hundred and ten feet above mean sea level) of Bluestone Lake as depicted on the boundary map entitled "Bluestone Wild and Scenic River," numbered WSR-BLU/20,000, and dated January 1987; to be administered by the Secretary of the Interior as a scenic river. In carrying out the requirements of subsection (b) of this section, the Secretary shall consult with State and local governments and the interested public. The Secretary shall not be required to establish detailed

boundaries of the river as provided under subsection (b) of this section. Nothing in this Act shall preclude the improvement of any existing road or right-of-way within the boundaries of the segment designated under this paragraph. Jurisdiction over all lands and improvements on such lands owned by the United States within the boundaries of the segment designated under this paragraph is hereby transferred without reimbursement to the administrative jurisdiction of the Secretary of the Interior, subject to leases in effect on the date of enactment of this paragraph [October 26, 1988] (or renewed thereafter) between the United States and the State of West Virginia with respect to the Bluestone State Park and the Bluestone Public Hunting and Fishing Area. Nothing in this Act shall affect the management by the State of hunting and fishing within the segment designated under this paragraph. Nothing in this Act shall affect or impair the management by the State of West Virginia of other wildlife activities in the Bluestone Public Hunting and Fishing Area to the extent permitted in the lease agreement as in effect on the enactment of this paragraph [October 26, 1988], and such management may be continued pursuant to renewal of such lease agreement. If requested to do so by the State of West Virginia, the Secretary may terminate such leases and assume administrative authority over the areas concerned. Nothing in the designation of the segment referred to in this paragraph shall affect or impair the management of the Bluestone project or the authority of any department, agency, or instrumentality of the United States to carry out the project purposes of that project as of the date of enactment of this paragraph [October 26, 1988]. Nothing in this Act shall be construed to affect the continuation of studies relating to such projects which were commenced before the enactment of this paragraph.

(66) **SIPSEY FORK OF THE WEST FORK, ALABAMA.** --

(A) Segments of the Sipsey Fork and several tributaries; to be administered by the Secretary of Agriculture in the classifications indicated, as follows: (1) Sipsey Fork from the confluence of Sandy Creek upstream to Forest Highway 26, as a scenic river; and (2) Sipsey Fork from Forest Highway 26 upstream to its origin at the confluence of Thompson Creek and Hubbard Creek, as a wild river; and (3) Hubbard Creek from its confluence with Thompson Creek upstream to Forest Road 210, as a wild river; and (4) Thompson Creek from its confluence with Hubbard Creek upstream to its origin in section 4, township 8 south, range 9 west, as a wild river; and (5) Tedford Creek from its confluence with Thompson Creek upstream to section 17, township 8 south, range 9 west, as a wild river; and (6) Mattox Creek from its confluence with Thompson Creek upstream to section 36 of township 7 south, range 9 west, as a wild river; and (7) Borden Creek from its confluence with the Sipsey Fork upstream to Forest Road 208, as a wild river; and (8) Borden Creek from Forest Road 208 upstream to its confluence with Montgomery Creek, as a scenic river; and (9) Montgomery Creek from its confluence with Borden Creek upstream to the southwest quarter of the southwest quarter of section 36, township 7 south, range 8 west, as a scenic river; and (10) Flannigan Creek from its confluence with Borden Creek upstream to Forest Road 208, as a wild river; and (11) Flannigan Creek from Forest Road 208 upstream to section 4, township 8 south, range 8 west, as a scenic river; and (12) Braziel Creek from its confluence with Borden Creek upstream to section 12, township 8 south, range 9 west, as a wild river, and (13) Hogood Creek from its confluence with Braziel Creek upstream to the confluence with an unnamed tributary in section 7, township 8 south, range 8 west, as a wild river.

(B) A map entitled "Sipsey Fork of the West Fork Wild and Scenic River" generally depicting the Sipsey Fork and the tributaries, shall be on file and remain available for public inspections in the office of the Chief of the Forest Service, Department of Agriculture.

(67) **WILDCAT RIVER, NEW HAMPSHIRE.** --

(A) A 14.51 mile segment including the following tributaries: Wildcat Brook, Bog Brook, and Great Brook (all as generally depicted on a map entitled "Wildcat River," dated October 1987) to be administered as follows: those segments of the Wildcat River and its tributaries located within the boundary of the White Mountain National Forest (hereinafter in this paragraph referred to as "the forest") shall be administered by the Secretary of Agriculture (hereinafter in this paragraph referred to as the "Secretary"); those segments located outside the boundary of the forest shall be administered by the Secretary through a cooperative agreement with the Board of Selectmen of the town of Jackson and the State of New Hampshire pursuant to section 10(e) of this Act. Such agreement shall provide for the long-term protection, preservation, and enhancement of the river segments located outside the boundary of the forest and shall be consistent with the comprehensive management plan to be prepared by the Secretary pursuant to section 3(d) of this Act and with the July 1987 River Conservation Plan prepared by the Wildcat Brook Advisory Committee in conjunction with the National Park Service.

(B)(i) To assist in the implementation of this paragraph, the Secretary shall establish, within 3 months after the date of enactment of this subparagraph [October 28, 1988], a Wildcat River Advisory Commission (hereinafter in this paragraph referred to as the "Commission"). (ii) The Commission shall be composed of 7 members appointed by the Secretary as follows: one member from recommendations submitted by the Governor of the State of New Hampshire; 4 members from recommendations submitted by the Jackson Board of Selectmen, of which at least 2 members shall be riparian property owners, and at least one member shall be on the Board of Selectmen; one member from recommendations submitted by the Jackson Conservation Commission; and one member selected by the Secretary. Members of the Commission shall be appointed for terms of 3 years. A vacancy in the Commission shall be filled in the manner in which the original appointment was made. Any member appointed to fill a vacancy occurring before the expiration of the term for which his predecessor was appointed shall be appointed only for the remainder of such term. Any member of the Commission appointed for a definite term may serve after the expiration of his term until his successor is appointed. The Commission shall designate one of its members as Chairman. (iii) The Commission shall meet on a regular basis. Notice of meetings and agenda shall be published in local newspapers which have a distribution which generally covers the area affected by the designation of the segments described in this paragraph. Commission meetings shall be held at locations and in such a manner as to ensure adequate public involvement. (iv) Members of the Commission shall serve without compensation as such, but the Secretary may pay expenses reasonably incurred in carrying out their responsibilities under this paragraph on vouchers signed by the Chairman. (v) Four members of the Commission shall constitute a quorum but a lesser number may hold hearings. (vi) The Commission shall cease to exist on the date 10 years after the enactment of this paragraph [October 28, 1988]. (vii) The provisions of section 14(b) of the Federal Advisory Committee Act (Act of October 6, 1972; 86 Stat. 776), are hereby waived with respect to the Commission.

(C) The authority of the Secretary to acquire lands outside the boundary of the White Mountain National Forest for purposes of this paragraph shall be limited to acquisition by donation or acquisition with the consent of the owner thereof. The Secretary may also acquire scenic easements for purposes of this paragraph as provided in section 6 of this Act.

(D) There are hereby authorized to be appropriated such sums as may be necessary to carry out the purposes of this paragraph.

(68) **BIG MARSH CREEK, OREGON.**[14] -- The 15-mile segment from the northeast quarter of section 15, township 26 south, range 6 east, to its confluence with Crescent Creek in the northeast quarter of section 20, township 24 south, range 7 east, as a recreational river; to be administered by the Secretary of Agriculture: *Provided*, That nothing in this Act shall prohibit the Secretary from undertaking construction activities to enhance and restore wetland resources associated with Big Marsh Creek.

(69) **CHETCO, OREGON.** -- The 44.5-mile segment from its headwaters to the Siskiyou National Forest boundary; to be administered by the Secretary of Agriculture in the following classes: (A) The 25.5-mile segment from its headwaters to Boulder Creek at the Kalmiopsis Wilderness boundary as a wild river; (B) the 8-mile segment from Boulder Creek to Steel Bridge as a scenic river; and (C) the 11-mile segment from Steel Bridge to the Siskiyou National Forest boundary, one mile below Wilson Creek, as a recreational river.

(70) **CLACKAMAS, OREGON.**--The 47-mile segment from Big Springs to Big Cliff; to be administered by the Secretary of Agriculture in the following classes: (A) The 4-mile segment from Big Springs to the Forest Service Road 4690 bridge as a scenic river; (B) the 3.5-mile segment from the Forest Service Road 4690 bridge to the junction with Oregon State Highway 224 as a recreational river; (C) the 10.5-mile segment from Oregon State Highway 224 to the June Creek Bridge as a scenic river; (D) the 9-mile segment from June Creek Bridge to Tar Creek as a recreational river; (E) the 5.5-mile segment from Tar Creek to just south of Indian Henry Campground as a scenic river; and (F) the 14.5-mile segment just south of Indian Henry Campground to Big Cliff as a recreational river.

(71) **CRESCENT CREEK, OREGON.** -- The 10-mile segment from the southwest quarter of section 11, township 24 south, range 6 east, to the west section line of section 13, township 24 south, range 7 east, as a recreational river, to be administered by the Secretary of Agriculture.

(72) **CROOKED, OREGON.** -- The 15-mile segment from the National Grassland boundary to Dry Creek; to be administered by the Secretary of the Interior in the following classes: (A) The 7-mile segment from the National Grassland boundary to River Mile 8 south of Opal Spring as a recreational river; and (B) the 8-mile segment from Bowman Dam to Dry Creek as a recreational river.

(73) **DESCHUTES, OREGON.** -- Those portions as follows: (A) The 40.4-mile segment from Wickiup Dam to northern boundary of Sunriver at the southwest quarter of section 20, township 19 south, range 11 east as a recreational river; to be administered by the Secretary of Agriculture; (B) the 11-mile segment from the northern boundary of Sunriver at the southwest quarter of section 20, township 19 south, range 11 east, to Lava Island Camp as a scenic river, to be administered by the Secretary of Agriculture; (C) the 3-mile segment from Lava Island Camp to the Bend Urban Growth Boundary at the southwest corner of section 13, township 18 south, range 11 east, as a recreational river; to be administered by the Secretary of Agriculture; (D) the 19-mile segment from Oden Falls to the Upper End of Lake Billy Chinook as a scenic river; to be administered by the Secretary of the Interior; (E) the 100-mile segment from the Pelton Reregulating Dam to its confluence with the Columbia River as a recreational river; to be administered by the Secretary of the Interior through a cooperative management agreement between the Confederated Tribes of the Warm Springs Reservation, and the State of Oregon as provided in section 10(e) of this Act and section 105 of the Omnibus Oregon Wild and Scenic Rivers Act of 1988.

(74) **DONNER UND BLITZEN, OREGON.** -- Those segments, including its major tributaries, as a wild river; to be administered by the Secretary of the Interior as follows: (A) The 16.75-mile segment of the Donner und Blitzen from its confluence with the South Fork Blitzen and Little Blitzen; (B) the 12.5-mile segment of the Little Blitzen from its headwaters to its confluence with the South Fork Blitzen; (C) the 16.5-mile segment of the South Fork Blitzen from its headwaters to its confluence with the South Fork Blitzen; (D) the 10-mile segment of Big Indian Creek from its headwaters to its confluence with the South Fork Blitzen; (E) the 3.7-mile segment of Little Indian Creek from its headwaters to its confluence with Big Indian Creek; and (F) the 13.25-mile segment of Fish Creek from its headwaters to its confluence with the Donner und Blitzen.

(75) **EAGLE CREEK, OREGON.** -- The 27-mile segment from its headwaters below Eagle Lake to the Wallowa-Whitman National Forest boundary at Skull Creek; to be administered by the Secretary of Agriculture in the following classes: (A) The 4-mile segment from its headwaters below Eagle Lake to the Eagle Cap Wilderness boundary at Hummingbird Mountain as a wild river; (B) the 15.5-mile segment from the Eagle Cap Wilderness boundary at Hummingbird Mountain to Paddy Creek as a recreational river; (C) the 6-mile segment from Paddy Creek to Little Eagle Creek as a scenic river; and (D) the 1.5-mile segment from Little Eagle Creek to the Wallowa-Whitman National Forest boundary as a recreational river.

(76) **ELK, OREGON.** -- The 19-mile segment to be administered by the Secretary of Agriculture in the following classes: (A) The 17-mile segment from the confluence of the North and South Forks of the Elk to Anvil Creek as a recreational river, and (B) the 2-mile segment of the North Fork Elk from the falls to its confluence with the South Fork as a wild river.

(77) **GRANDE RONDE, OREGON.** -- The 43.8-mile segment from its confluence with the Wallowa River to the Oregon-Washington State line in the following classes: (A) The 1.5-mile segment from its confluence with the Wallowa River to the Umatilla National Forest boundary in section 11, township 3 north, range 40 east, as a recreational river; to be administered by the Secretary of Agriculture; (B) the 17.4-mile segment from the Umatilla National Forest boundary in section 11, township 3 north, range 40 east, to the Wallowa-Whitman National Forest boundary approximately one-half mile east of Grossman Creek as a wild river; to be administered by the Secretary of Agriculture; (C) the 9-mile segment from the Wallowa-Whitman National Forest boundary approximately one-half mile east of Grossman Creek to Wildcat Creek as a wild river; to be administered by the Secretary of the Interior; and (D) the 15.9-mile segment from Wildcat Creek to the Oregon-Washington State line as a recreational river; to be administered by the Secretary of the Interior.

(78) **IMNAHA, OREGON.** -- Those segments, including the South Fork Imnaha; to be

administered by the Secretary of Agriculture in the following classes: (A) The 6-mile segment from its confluence with the North and South Forks of the Imnaha River to Indian Crossing as a wild river; (B) the 58-mile segment from Indian Crossing to Cow Creek as a recreational river; (C) the 4-mile segment from Cow Creek to its mouth as a scenic river; and (D) the 9-mile segment of the South Fork Imnaha from its headwaters to its confluence with the Imnaha River as a wild river.

(79) **JOHN DAY, OREGON.** -- The 147.5-mile segment from Service Creek to Tumwater Falls as a recreational river; to be administered through a cooperative management agreement between the State of Oregon and the Secretary of the Interior as provided in section 10(e) of this Act.

(80) **JOSEPH CREEK, OREGON.** -- The 8.6-mile segment from Joseph Creek Ranch, one mile downstream from Cougar Creek, to the Wallowa-Whitman National Forest boundary as a wild river; to be administered by the Secretary of Agriculture.

(81) **LITTLE DESCHUTES, OREGON.** -- The 12-mile segment from its source in the northwest quarter of section 15, township 26 south, range 6 1/2 east to the north section line of section 12, township 26 south, range 7 east, as a recreational river; to be administered by the Secretary of Agriculture.

(82) **LOSTINE, OREGON.** -- The 16-mile segment from its headwaters to the Wallowa-Whitman National Forest boundary; to be administered by the Secretary of Agriculture in the following classes: (A) The 5-mile segment from its headwaters to the Eagle Cap Wilderness boundary as a wild river; and (B) the 11-mile segment from the Eagle Cap Wilderness boundary to the Wallowa-Whitman National Forest boundary at Silver Creek as a recreational river.

(83) **MALHEUR, OREGON.** -- The 13.7-mile segment from Bosonberg Creek to the Malheur National Forest boundary; to be administered by the Secretary of Agriculture in the following classes: (A) The 7-mile segment from Bosonberg Creek to Malheur Ford as a scenic river; and (B) the 6.7-mile segment from Malheur Ford to the Malheur National Forest boundary as a wild river.

(84) **MCKENZIE, OREGON.** -- The 12.7-mile segment from Clear Lake to Scott Creek; to be administered by the Secretary of Agriculture in the following classes: (A) The 1.8-mile segment from Clear Lake to the head of maximum pool at Carmen Reservoir as a recreational river; (B) the 4.3-mile segment from a point 100 feet downstream from Carmen Dam to the maximum pool at Trail Bridge Reservoir as a recreational river; and (C) the 6.6-mile segment from the developments at the base of the Trail Bridge Reservoir Dam to Scott Creek as a recreational river.

(85) **METOLIUS, OREGON.** -- The 28.6-mile segment from the south Deschutes National Forest boundary to Lake Billy Chinook in the following classes: (A) The 11.5-mile segment from the south Deschutes National Forest boundary (approximately 2,055.5 feet from Metolius Springs) to Bridge 99 as a recreational river; to be administered by the Secretary of Agriculture; (B) the 17.1-mile segment from Bridge 99 to Lake Billy Chinook as a scenic river; by the Secretary of Agriculture, through a cooperative management agreement between the Secretary of the Interior and the Confederated Tribes of the Warm Springs Reservation, as provided in section 10(e) of this Act and section 105 of the Omnibus Oregon Wild and Scenic Rivers Act of 1988: *Provided*, That the river and its adjacent land area will be managed to provide a primitive recreational experience as defined in the ROS User's Guide.

(86) **MINAM, OREGON.** -- The 39-mile segment from its headwaters at the south end of Minam Lake to the Eagle Cap Wilderness boundary, one-half mile downstream from Cougar Creek, as a wild river; to be administered by the Secretary of Agriculture.

(87) **NORTH FORK CROOKED, OREGON.** -- The 32.3-mile segment from its source at Williams Prairie to one mile from its confluence with the Crooked River in the following classes: (A) The 3-mile segment from its source at Williams Prairie to the Upper End of Big Summit Prairie as a recreational river; to be administered by the Secretary of Agriculture; (B) the 3.7-mile segment from the Lower End of Big Summit Prairie to the bridge across from the Deep Creek Campground as a recreational river; to be administered by the Secretary of Agriculture; (C) the 8-mile segment from the bridge across from the Deep Creek Campground to the Ochoco National Forest boundary, one-half mile from Lame Dog Creek as a scenic river; to be administered by the Secretary of Agriculture; (D) the 1.5-mile segment from the Ochoco National Forest boundary to Upper Falls as a scenic river; to be administered by the Secretary of the Interior; (E) the 11.1-mile segment from Upper Falls to Committee Creek as a wild river; to be administered by the Secretary of the Interior; and (F) the 5-mile segment from Committee Creek to one mile from its

confluence with the Crooked River as a recreational river; to be administered by the Secretary of the interior.

(88) **NORTH FORK JOHN DAY, OREGON.** -- The 54.1-mile segment from its headwaters in the North Fork of the John Day Wilderness Area at section 13, township 8 south, range 36 east, to its confluence with Camas Creek in the following classes: (A) The 3.5-mile segment from its headwaters in the North Fork of the John Day Wilderness at section 13, township 8 south, range 36 east, to the North Fork of the John Day Wilderness boundary as a wild river; to be administered by the Secretary of Agriculture; (B) the 7.5-mile segment from the North Fork of the John Day Wilderness boundary to Trail Creek as a recreational river; to be administered by the Secretary of Agriculture; (C) the 24.3-mile segment from Trail Creek to Big Creek as a wild river; to be administered by the Secretary of Agriculture; (D) the 10.5-mile segment from Big Creek to Texas Bar Creek as a scenic river; to be administered by the Secretary of Agriculture; and (E) the 8.3-mile segment from Texas Bar Creek to its confluence with Camas Creek as a recreational river; to be administered by the Secretary of Agriculture.

(89) **NORTH FORK MALHEUR, OREGON.** -- The 25.5-mile segment from its headwaters to the Malheur National Forest boundary as a scenic river; to be administered by the Secretary of Agriculture.

(90) **NORTH FORK OF THE MIDDLE FORK OF THE WILLAMETTE, OREGON. --** The 42.3-mile segment from Waldo Lake to the Willamette National Forest boundary, to be administered by the Secretary of Agriculture in the following classes: (A) The 8.8-mile segment from Waldo Lake to the south section line of section 36, township 19 south, range 5 1/2 east as a wild river; (B) the 6.5-mile segment from the south section line of section 36, township 19 south, range 5 1/2 east to Fisher Creek as a scenic river; and (C) the 27-mile segment from Fisher Creek to the Willamette National Forest boundary as a recreational river.

(91) **NORTH FORK OWYHEE, OREGON.** -- The 8-mile segment from the Oregon-Idaho State line to its confluence with the Owyhee River as a wild river; to be administered by the Secretary of the Interior.

(92) **NORTH FORK SMITH, OREGON.** -- The 13-mile segment from its headwaters to the Oregon-California State line; to be administered by the Secretary of Agriculture in the following classes: (A) The 6.5-mile segment from its headwaters to Horse Creek as a wild river; (B) the 4.5-mile segment from Horse Creek to Baldface Creek as a scenic river; and (C) the 2-mile segment from Baldface Creek to the Oregon-California State line as a wild river.

(93) **NORTH FORK SPRAGUE, OREGON.** -- The 15-mile segment from the head of River Spring in the southwest quarter of section 15, township 35 south, range 16 east, to the northwest quarter of the southwest quarter of section 11, township 35 south, range 15 east, as a scenic river; to be administered by the Secretary of Agriculture.

(94) **NORTH POWDER, OREGON.** -- The 6-mile segment from its headwaters to the Wallowa-Whitman National Forest boundary at River Mile 20 as a scenic river; to be administered by the Secretary of Agriculture.

(95) **NORTH UMPQUA, OREGON.** -- The 33.8-mile segment from the Soda Springs Powerhouse to Rock Creek in the following classes: (A) The 25.4-mile segment from the Soda Springs Powerhouse to the Umpqua National Forest boundary as a recreational river; to be administered by the Secretary of Agriculture; and (B) the 8.4-mile segment from the Umpqua National Forest boundary to its confluence with Rock Creek as a recreational river; to be administered by the Secretary of the Interior.

(96) **POWDER, OREGON.** -- The 11.7-mile segment from Thief Valley Dam to the Highway 203 bridge as a scenic river; to be administered by the Secretary of the Interior.

(97) **QUARTZVILLE CREEK, OREGON.** -- The 12-mile segment from the Willamette National Forest boundary to slack water in Green Peter Reservoir as a recreational river; to be administered by the Secretary of the Interior.

(98) **ROARING, OREGON.** -- The 13.7-mile segment from its headwaters to its confluence with the Clackamas River; to be administered by the Secretary of Agriculture in the following classes: (A) The 13.5-mile segment from its headwaters to one-quarter mile upstream of the mouth as a wild river; and (B) the 0.2-mile segment from one-quarter mile upstream of the mouth to its confluence with the Clackamas River as a recreational river.

(99) **SALMON, OREGON.** -- The 33.5-mile segment from its headwaters to its confluence with the Sandy River in the following classes: (A) The 7-mile segment from its headwaters to the south boundary line of section 6, township 4 south, range 9 east as a recreational river; to be administered by the Secretary of Agriculture: *Provided*, That designation and classification shall not preclude the Secretary from exercising discretion to approve the construction, operation, and maintenance of ski lifts, ski runs, and associated facilities for the land comprising the Timberline Lodge Winter Sports Area insofar as such construction does not involve water resources projects; (B) the 15-mile segment from the south boundary line at section 6, township 4 south, range 9 east to the junction with the South Fork of the Salmon River as a wild river; be administered by the Secretary of Agriculture; (C) the 3.5-mile segment from the junction with the south fork of the Salmon River to the Mt. Hood National Forest boundary as a recreational river; to be administered Lymp Creek as a recreational river; to be administered by the Secretary of the Interior; and (E) the 4.8-mile segment from Lymp Creek to its confluence with the Sandy River as a scenic river; to be administered by the Secretary of the Interior.

(100) **SANDY, OREGON.** -- Those portions as follows: (A) The 4.5-mile segment from its headwaters to the section line between sections 15 and 22, township 2 south, range 8 east as a wild river; to be administered by the Secretary of Agriculture; (B) the 7.9-mile segment from the section line between sections 15 and 22, township 2 south, range 8 east to the Mt. Hood National Forest boundary at the west section line of section 26, township 2 south, range 7 east as a recreational river; to be administered by the Secretary of Agriculture; and (C) the 12.5-mile segment from the east boundary of sections 25 and 36, township 1 south, range 4 east in Clackamas County near Dodge Park, downstream to the west line of the east half of the northeast quarter of section 6, township 1 south, range 4 east, in Multnomah County at Dabney State Park, the upper 3.8 miles as a scenic river and the lower 8.7 miles as a recreational river; both to be administered through a cooperative management agreement between the State of Oregon, the Secretary of the Interior and the Counties of Multnomah and Clackamas in accordance with section 10(e) of this Act.

(101) **SOUTH FORK JOHN DAY, OREGON.** -- The 47-mile segment from the Malheur National Forest to Smokey Creek as a recreational river; to be administered by the Secretary of the Interior.

(102) **SQUAW CREEK, OREGON.** -- The 15.4-mile segment from its source to the hydrologic Gaging Station 800 feet upstream from the intake of the McAllister Ditch, including the Soap Fork Squaw Creek, the North Fork, the South Fork, the East and West Forks of Park Creek, and Park Creek Fork; to be administered by the Secretary of Agriculture as follows: (A) The 6.6-mile segment and its tributaries from the source to the Three Sisters Wilderness boundary as a wild river; and (B) the 8.8-mile segment from the boundary of the Three Sisters Wilderness Area to the hydrologic Gaging Station 800 feet upstream from the intake of the McAllister Ditch as a scenic river: *Provided*, That nothing in this Act shall prohibit the construction of facilities necessary for emergency protection for the town of Sisters relative to a rapid discharge of Carver Lake if no other reasonable flood warning or control alternative exists.

(103) **SYCAN, OREGON.** -- The 59-mile segment from the northeast quarter of section 5, township 34 south, range 17 east to Coyote Bucket at the Fremont National Forest boundary; to be administered by the Secretary of Agriculture in the following classes: (A) The 26.4-mile segment from the northeast quarter of section 5, township 34 south, range 17 east to the west section line of section 22, township 32 south, range 14 1/2 east, as a scenic river; (B) the 8.6-mile segment from the west section line of section 22, township 32 south, range 14 east, to the Fremont National Forest boundary in the southeast quarter of section 10, township 33 south, range 13 east, as a recreational river; and (C) the 24-mile segment from the Fremont National Forest boundary in the southwest quarter of section 10, township 33 south, range 13 east, to Coyote Bucket at the Fremont National Forest boundary, as a scenic river.

(104) **UPPER ROGUE, OREGON.** -- The 40.3-mile segment from the Crater Lake National Park boundary to the Rogue River National Forest boundary; to be administered by the Secretary of Agriculture in the following classes: (A) The 0.5-mile segment from the Crater Lake National Park boundary to approximately 0.1-mile downstream from the forest road 6530760 (West Lake Road) crossing as a scenic river; (B) the 6.1-mile segment from approximately 0.1-mile downstream from the forest road 6530760 (West Lake Road) crossing to Minehaha Creek as a wild river; and (C) the 33.7-mile segment from

Minehaha Creek to the Rogue River National Forest boundary as a scenic river.

(105) **WENAHA, OREGON.** -- The 21.55-mile segment from the confluence of the North Fork and the South Fork to its confluence with the Grande Ronde River; to be administered by the Secretary of Agriculture in the following classes: (A) The 18.7-mile segment from the confluence of the North Fork and South Fork to the Umatilla National Forest as a wild river; (B) the 2.7-mile segment from the Umatilla National Forest boundary to the eastern most boundary of the Wenaha State Wildlife Area as a scenic area; and (C) the 0.15-mile segment from the eastern most boundary of the Wenaha State Wildlife Area to the confluence with the Grande Ronde River as a recreational river.

(106) **WEST LITTLE OWYHEE, OREGON.** -- The 51-mile segment from its headwaters to its confluence with Owyhee River as a wild river; to be administered by the Secretary of the Interior.

(107) **WHITE, OREGON.** -- The 46.5-mile segment from its headwaters to its confluence with the Deschutes River in the following classes: (A) The 2-mile segment from its headwaters to the section line between sections 9 and 16, township 3 south, range 9 east, as a recreational river; to be administered by the Secretary of Agriculture; *Provided*, That designation and classification shall not preclude the Secretary from exercising discretion to approve construction, operation, and maintenance of ski lifts, ski runs, and associated facilities for the land comprising the Mt. Hood Winter Sports Area insofar as such construction does not involve water resource projects and is consistent with protecting the values for which the river was designated; (B) the 13.6-mile segment from the section line between sections 9 and 16, township 3 south, range 9 east, to Deep Creek as a recreational river; to be administered by the Secretary of Agriculture; (C) the 6.5-mile segment from Deep Creek to the Mt. Hood National Forest boundary as a scenic river, to be administered by the Secretary of Agriculture; (D) the 17.5-mile segment from the Mt. Hood National Forest boundary to Three Mile Creek as a scenic river; to be administered by the Secretary of the Interior; (E) the 5.3-mile segment from Three Mile Creek to River Mile 2.2 as a recreational river; to be administered by the Secretary of the Interior; and (F) the 1.6-mile segment from River Mile 1.6 to its confluence with the Deschutes River as a recreational river; to be administered by the Secretary of the Interior.

(108) **RIO CHAMA, NEW MEXICO.** -- The segment extending from El Vado Ranch launch site (immediately south of El Vado Dam) downstream approximately 24.6 miles to elevation 6,353 feet above mean sea level; to be administered by the Secretary of Agriculture and the Secretary of the Interior. For purposes of compliance with the planning requirements of subsection (d), the Cooperative Management Plan for the river prepared by the Secretary of Agriculture and the Secretary of the Interior may be revised and amended to the extent necessary to conform to the provisions of this Act. The segment of the Rio Chama beginning at the El Vado Ranch launch site downstream to the beginning of Forest Service Road 151 shall be administered as a wild river and the segment downstream from the beginning of Forest Service Road 151 to elevation 6,353 feet shall be administered as a scenic river.[15]

(109) **EAST FORK OF JEMEZ, NEW MEXICO.** -- The 11-mile segment from the Santa Fe National Forest boundary to its confluence with the Rio San Antonio; to be administered by the Secretary of Agriculture in the following classifications: (A) The 2-mile segment from the Santa Fe National Forest boundary to the second crossing of State Highway 4, near Las Conchas Trailhead, as a recreational river; and (B) the 4-mile segment from the second crossing of State Highway 4, near Las Conchas Trailhead, to the third crossing of the State Highway 4, approximately one and one-quarter miles upstream from Jemez Falls, as a wild river; and (C) the 5-mile segment from the third crossing of State Highway 4, approximately one and one-quarter miles upstream from Jemez Falls, to its confluence with the Rio San Antonio, as a scenic river. After the enactment of this paragraph, Federal lands within the boundaries of the segments designated under this paragraph or which constitute the bed or bank or are situated within one-quarter mile of the ordinary highwater mark on each side of such segments are withdrawn, subject to valid existing rights, from all forms of appropriation under the mining laws and from operation of the mineral leasing laws of the United States, and no patent may be issued for the surface estate with respect to any mining claim located on such lands. Nothing in this paragraph shall be construed as precluding mining operations on any valid existing claim, subject to applicable regulations under section 9.

(110) **PECOS RIVER, NEW MEXICO.** -- The 20.5 mile segment from its headwaters to the townsite of Tererro; to be administered by the Secretary of Agriculture in the following classifications: (A) The 13.5 mile segment from its headwaters to the Pecos Wilderness boundary, as a wild river; and (B) the

7-mile segment from the Pecos Wilderness boundary to the townsite of Tererro, as a recreational river. After the enactment of this paragraph, Federal lands within the boundaries of the segments designated under this paragraph or which constitute the bed or bank or are situated within one-quarter mile of the ordinary highwater mark on each side of such segments are withdrawn, subject to valid existing rights, from all forms of appropriation under the mining laws and from operation of the mineral leasing laws of the United States, and no patent may be issued for the surface estate with respect to any mining claim located on such lands. Nothing in this paragraph shall be construed as precluding mining operations on any valid existing claim, subject to applicable regulations under section 9.

(111) **SMITH RIVER, CALIFORNIA.** -- The segment from the confluence of the Middle Fork Smith River and the North Fork Smith River to the Six Rivers National Forest boundary, including the following segments of the mainstem and certain tributaries, to be administered by the Secretary of Agriculture in the following classes: (A) The segment from the confluence of the Middle Fork Smith River and the South Fork Smith River to the National Forest boundary, as a recreational river; (B) Rowdy Creek from the California-Oregon State line to the National Forest boundary, as a recreational river.

(112) **MIDDLE FORK SMITH RIVER, CALIFORNIA.** -- The segment from the headwaters to its confluence with the North Fork Smith River, including the following segments of the mainstem and certain tributaries, to be administered by the Secretary of Agriculture in the following classes: (A) The segment from its headwaters about 3 miles south of Sanger Lake, as depicted on the 1956 USGS 15| Preston Peak topographic map, to the center of section 7, T.17 N., R. 5 E., as a wild river; (B) the segment from the center of section 7, T. 17 N., R. 5 E., to the center of section 6, T. 17 N., R. 5 E., as a scenic river; (C) the segment from the center of section 6, T. 17 N., R. 5 E., to one-half mile upstream from its confluence with Knopki Creek, as a wild river; (D) the segment from one-half mile upstream of its confluence with Knopki Creek to its confluence with the South Fork Smith River, as a recreational river; (E) Myrtle Creek from its headwaters in section 9, T. 17 N., R. 1 E., as depicted on the 1952 USGS 15| Crescent City topographic map, to the middle of section 28, T.17 N., R. 1 E., as a scenic river; (F) Myrtle Creek from the middle of section 28, T. 17 N., R. 1 E., to its confluence with the Middle Fork Smith River, as a wild river; (G) Shelly Creek from its headwaters in section 1, T. 18 N., R. 3 E., as depicted on the 1951 USGS 15| Gasquet topographic map, to its confluence with Patrick Creek, as a recreational river; (H) Kelly Creek from its headwaters in section 32, T. 17 N., R. 3 E., as depicted on the 1951 USGS 15| Gasquest topographic map, to its confluence with the Middle Fork Smith River, as a scenic river; (I) Packsaddle Creek from its headwaters about 0.8 miles southwest of Broken Rib Mountain, as depicted on the 1956 USGS 15| Preston Peak topographic map, to its confluence with the Middle Fork Smith River, as a scenic river; (J) East Fork Patrick Creek from its headwaters in section 10, T. 18 N., R. 3 E., as depicted as a recreational river; (K) West Fork Patrick Creek from its headwaters in section 18, T., 18 N., R. 3 E., as depicted on the 1951 15| Gasquet topographic map to its confluence with the East Fork Patrick Creek, as a recreational river; (L) Little Jones Creek from its headwaters in section 34, T. 17 N., R. 3 E., as depicted on the 1951 USGS 15| Gasquet topographic map to its confluence with the Middle Fork Smith River, as a recreational river; (M) Griffin Creek from its headwaters about 0.2 miles southwest of Hazel View Summit, as depicted on the 1956 USGS 15| Preston Peak topographic map, to its confluence with the Middle Fork Smith River, as a recreational river; (N) Knopki Creek from its headwaters about 0.4 miles west of Sanger Peak, as depicted on the 1956 USGS 15| Preston Peak topographic map, to its confluence with the Middle Fork Smith River, as a recreational river; (O) Monkey Creek from its headwaters in the northeast quadrant of section 12, T. 18 N., R. 3 E., as depicted on the 1951 USGS 15| Gasquet topographic map, to its confluence with the Middle Fork Smith River, as a recreational river; (P) Patrick Creek from the junction of East and West Forks of Patrick Creek to its confluence with Middle Fork Smith River, as a recreational river; (Q) Hardscrabble Creek from its headwaters in the northeast quarter of section 2, T. 17 N., R. 1 E., as depicted on the 1952 USGS 15| Crescent City topographic map, to its confluence with the Middle Fork Smith River, as a recreational river.

(113) **NORTH FORK SMITH RIVER, CALIFORNIA.** -- The segment from the California-Oregon State line to its confluence with the Middle Fork Smith River, including the following segments of the mainstem and certain tributaries, to be administered by the Secretary of Agriculture in the following classes: (A) The segment from the California-Oregon State line to its confluence with an unnamed

tributary in the northeast quarter of section 5, T. 18 N., R. 2 E., as depicted on the 1951 USGS 15| Gasquet topographic map, as a wild river; (B) the segment from its confluence with an unnamed tributary in the northeast quarter of section 5, T. 18 N., R. 2 E., as depicted on the 1951 15| Gasquet topographic map, as a scenic river; (C) the segment from its southern-most intersection with the eastern section line of section 5, T. 18 N., R. 2 E., as depicted on the 1951 USGS 15| Gasquet topographic map, to its confluence with Stony Creek, as a wild river; (D) the segment from its confluence with Stony Creek to its confluence with the Middle Fork Smith River, as a recreational river; (E) Diamond Creek from California-Oregon State line to its confluence with Bear Creek, as a recreational river; (F) Diamond Creek from its confluence with Bear Creek to its confluence with the North Fork Smith River, as a scenic river; (G) Bear Creek from its headwaters in section 24, T. 18 N., R. 2 E., as depicted on the 1951 USGS 15| Gasquet topographic map, to its confluence with Diamond Creek, as a scenic river; (H) Still Creek from its headwaters in section 11, T. 18 N., R. 1 E., as depicted on the 1952 USGS 15| Crescent City topographic map, to its confluence with the North Fork Smith River, as a scenic river; (I) North Fork Diamond Creek from the California-Oregon State line to its confluence with Diamond Creek, as a recreational river; (J) High Plateau Creek from its headwaters in section 26, T. 18 N., R. 2 E., as depicted on the 1951 USGS 15| Gasquet topographic map, to its confluence with Diamond Creek, as a scenic river; (K) Stony Creek from its headwaters in section 25, T. 18 N., R. 2 E., as depicted on the 1951 USGS 15| Gasquet topographic map, to its confluence with the North Fork Smith River, as a scenic river; (L) Peridotite Creek from its headwaters in section 34, T. 18 N., R. 2 E., as depicted on the 1951 USGS 15| Gasquet topographic map, to its confluence with the North Fork Smith River, as a wild river.

(114) **SISKIYOU FORK SMITH RIVER, CALIFORNIA.** -- The segment from its headwaters to its confluence with the Middle Fork Smith River, and the following tributaries, to be administered by the Secretary of Agriculture in the following classes: (A) The segment from its headwaters about 0.7 miles southeast of Broken Rib Mountain, as depicted on the 1956 USGS 15| Preston Peak topographic map, to its confluence with the South Siskiyou Fork Smith River, as a wild river; (B) the segment from its confluence with the South Siskiyou Fork Smith River to its confluence with the Middle Fork Smith River, as a recreational river; (C) South Siskiyou Fork Smith River from its headwaters about 0.6 miles southwest of Buck Lake, as depicted on the 1956 USGS 15| Preston Peak topographic map, to its confluence with the Siskiyou Fork Smith River, as a wild river.

(115) **SOUTH FORK SMITH RIVER, CALIFORNIA.** -- The segment from its headwaters to its confluence with the main stem of the Smith River, and the following tributaries, to be administered by the Secretary of Agriculture in the following classes: (A) The segment from its headwaters about 0.5 miles southwest of Bear Mountain, as depicted on 1956 USGS 15| Preston Peak topographic map, to Blackhawk Bar, as a wild river; (B) the segment from Blackhawk Bar to its confluence with the main stem of the Smith River, as a recreational river; (C) Williams Creek from its headwaters in section 31, T. 14 N., R. 4 E., as depicted on the 1952 USGS 15| Ship Mountain topographic map, to its confluence with Eight Mile Creek, as a wild river; (D) Eightmile Creek from its headwaters in section 29, T. 14 N., R, 4 E., as depicted on the 1955 USGS 15| Dillon Mountain topographic map, to its confluence with the South Fork Smith River, as a wild river; (E) Harrington Creek from its source to its confluence with the South Fork Smith River, as a wild river; (F) Prescott Fork of the Smith River from its headwaters about 0.5 miles southeast of Island Lake, as depicted on the 1955 USGS 15| Dillon Mountain topographic map, to its confluence with the South Fork Smith River, as a wild river; (G) Quartz Creek from its headwaters in section 31, T. 16 N., R. 4 E., as depicted on the 1952 15| USGS Ship Mountain topographic map, to its confluence with the South Fork Smith River, as a recreational river; (H) Jones Creek from its headwaters in section 36, T. 16 N., R. 3 E., as depicted on the 1952 USGS 15| Ship Mountain topographic map, to its confluence with the South Fork Smith River, as a recreational river; (H) Jones Creek from its headwaters in section 36, T. 16 N., R. 3 E., as depicted on the 1952 USGS 15| Ship Mountain topographic map, to its confluence with the South Fork Smith River, as a recreational river; (I) Hurdygurdy Creek from its headwaters about 0.4 miles southwest of Bear Basin Butte, as depicted on the 1956 USGS 15| Preston Peak topographic map, to its confluence with the South Fork Smith River, as a recreational river; (J) Gordon Creek from its headwaters in section 18, T. 16 N., R. 3 E., as depicted on the 1951 USGS 15| Gasquet topographic map, to its confluence with the South Fork Smith River, as a recreational river; (K)

Coon Creek from the junction of its two headwaters tributaries in the southeast quadrant of section 31, T. 17 N., R. 3 E., as depicted on the 1951 USGS 15| Gasquet topographic map, to its confluence with the South Fork Smith River, as a recreational river; (L) Craigs Creek from its headwaters in section 36, T. 17 N., R. 2 E., as depicted on the 1951 USGS 15| Gasquet topographic map, to its confluence with the South Fork Smith River, as a recreational river; (M) Goose Creek from its headwaters in section 13, T. 13 N., R. 2 E., as depicted on the 1952 USGS 15| Ship Mountain topographic map, to its confluence with the South Fork Smith River, as a recreational river; (N) East Fork Goose Creek from its headwaters in section 18, T. 13 N., R. 3 E., as depicted on the 1952 USGS 15| Ship Mountain topographic map, to its confluence with Goose Creek, as a recreational river; (O) Buck Creek from its headwaters at Cedar Camp Spring, as depicted on the 1952 USGS 15| Ship Mountain topographic map, to the northeast corner of section 8, T.14 N., R. 3 E., as a scenic river; (P) Buck Creek from the northeast corner of section 8, T. 14 N., R. 3 E., to its confluence with the South Fork Smith River, as a wild river; (Q) Muzzleloader Creek from its headwaters in section 2, T. 15 N., R. 3 E., as depicted on the 1952 USGS 15| Ship Mountain topographic map, to its confluence with Jones Creek, as a recreational river; (R) Canthook Creek from its headwaters in section 2, T. 15 N., R. 3 E., as depicted on the 1952 USGS 15| Ship Mountain topographic map, to its confluence with the South Fork Smith River, as a recreational river; (S) Rock Creek from the national forest boundary in section 6, T. 15 N., R. 2 E., as depicted on the 1952 USGS 15| Ship Mountain topographic map, to its confluence with the South Fork Smith River, as a recreational river; (T) Blackhawk Creek from its headwaters in section 21, T. 15 N., R. 2 E., as depicted on the 1952 USGS 15| Ship Mountain topographic map, to its confluence with the South Fork Smith River, as a recreational river.

(116) **CLARKS FORK, WYOMING.--**

(A) The twenty and five-tenths-mile segment from the west boundary of section 3, township 56 north, range 106 west at the Crandall Creek Bridge downstream to the north boundary of section 13, township 56 north, range 104 west at Clarks Fork Canyon; to be administered by the Secretary of Agriculture as a wild river. Notwithstanding subsection (b), the boundary of the segment shall include all land within four hundred and forty yards from the ordinary high water mark on both sides of the river. No land or interest in land may be acquired with respect to the segment without the consent of the owner thereof. For the purposes of carrying out this paragraph, there is authorized to be appropriated $500,000 for development and $750,000 for the acquisition of land and interests therein.

(B) Designation of a segment of the Clarks Fork by this paragraph as a component of the Wild and Scenic Rivers System shall not be utilized in any Federal proceeding, whether concerning a license, permit, right-of-way, or any other Federal action, as a reason or basis to prohibit the development or operation of any water impoundment, diversion facility, or hydroelectric power and transmission facility located entirely downstream from the segment of the river designated by this paragraph: *Provided*, That water from any development shall not intrude upon such segment. Congress finds that development of water impoundments, diversion facilities, and hydroelectric power and transmission facilities located entirely downstream from the segment of the river is not incompatible with its designation as a component of the Wild and Scenic Rivers System.

(C) The Secretary of Agriculture is directed to apply for the quantification of the water right reserved by the inclusion of a portion of the Clarks Fork in the Wild and Scenic Rivers System in accordance with the procedural requirements of the laws of the State of Wyoming: *Provided*, That, notwithstanding any provision of the laws of the State of Wyoming otherwise applicable to the granting and exercise of water rights, the purposes for which the Clarks Fork is designated, as set forth in this Act and this paragraph, are declared to be beneficial uses and the priority date of such right shall be the date of enactment of this paragraph [November 28, 1990].

(D) The comprehensive management plan developed under subsection (d) for the segment designated by this paragraph shall provide for all such measures as may be necessary in the control of fire, insects, and diseases to fully protect the values for which the segment is designated as a wild river.

(117) **NIOBRARA, NEBRASKA.** --

(A) The 40-mile segment from Borman Bridge southeast of Valentine downstream to its confluence with Chimney Creek and the 30-mile segment from the river's confluence with Rock Creek downstream to the State Highway 137 bridge, both segments to be classified as scenic and administered by the Secretary of the Interior. That portion of the 40-mile segment designated by this subparagraph located within the Fort Niobrara National Wildlife Refuge shall continue to be managed by the Secretary through the Director of the United States Fish and Wildlife Service.

(B) The 25-mile segment from the western boundary of Knox County to its confluence with the Missouri River, including that segment of the Verdigre Creek from the north municipal boundary of Verdigre, Nebraska, to its confluence with the Niobrara, to be administered by the Secretary of the Interior as a recreational river. After consultation with State and local governments and the interested public, the Secretary shall take such action as is required under subsection (b) of this section.[16]

(118) **MISSOURI RIVER, NEBRASKA AND SOUTH DAKOTA.** -- The 39-mile segment from the headwaters of Lewis and Clark Lake to the Ft. Randall Dam, to be administered by the Secretary of the Interior as a recreational river.[17]

(119) **BEAR CREEK, MICHIGAN.** -- The 6.5-mile segment from Coates Highway to the Manistee River, to be administered by the Secretary of Agriculture as a scenic river.[17]

(120) **BLACK, MICHIGAN.** -- The 14-mile segment from the Ottawa National Forest boundary to Lake Superior, to be administered by the Secretary of Agriculture as a scenic river.

(121) **CARP, MICHIGAN.** -- The 27.8-mile segment from the west section line of section 30, township 43 north, range 5 west, to Lake Huron, to be administered by the Secretary of Agriculture in the following classes: (A) The 2.3-mile segment from the west section line of section 30, township 43 north, range 5 west, to Forest Development Road 3458 in section 32, township 43 north, range 5 west, as a scenic river; (B) the 6.5-mile segment from the Forest Development Road 3458 in section 32, township 43 north, range 5 west, to Michigan State Highway 123, as a scenic river; (C) the 7.5-mile segment from Michigan State Highway 123 to one quarter of a mile upstream from Forest Development Road 3119, as a wild river; (D) the 0.5-mile segment from one quarter of a mile upstream of Forest Development Road 3119 to one quarter mile downstream of Forest Development Road 3119, as a scenic river; (E) the 4.9-mile segment from one quarter of a mile downstream of Forest Development Road 3119 to McDonald Rapids, as a wild river; (F) the 6.1-mile segment from McDonald Rapids to Lake Huron, as a recreational river.

(122) **INDIAN, MICHIGAN.** -- The 51-mile segment from Hovey Lake to Indian Lake to be administered by the Secretary of Agriculture in the following classes: (A) The 12-mile segment from Hovey Lake to Fish Lake, as a scenic river; (B) the 39-mile segment from Fish Lake to Indian Lake, as a recreational river.

(123) **MANISTEE, MICHIGAN.** -- The 26-mile segment from the Michigan DNR boat ramp below Tippy Dam to the Michigan State Highway 55 bridge, to be administered by the Secretary of Agriculture as a recreational river.

(124) **ONTONAGON, MICHIGAN.** -- Segments of certain tributaries, totaling 157.4 miles, to be administered by the Secretary of Agriculture as follows: (A) The 46-mile segment of the East Branch Ontonagon from its origin at Spring Lake to the Ottawa National Forest boundary in the following classes: (i) the 20.5-mile segment from its origin at Spring Lake to its confluence with an unnamed stream in section 30, township 48 norther, range 37 west, as a recreational river, (ii) the 25.5-mile segment from its confluence with an unnamed stream in section 30, township 48 north, range 37 west, to the Ottawa National Forest boundary, as a wild river; (B) the 59.4-mile segment of the Middle Branch Ontonagon, from its origin at Crooked Lake to the northern boundary of the Ottawa National Forest in the following classes: (i) the 20-mile segment from its origin at Crooked Lake to Burned Dam, as a recreational river, (ii) the 8-mile segment from Burned Dam to Bond Falls Flowage, as a scenic river, (iii) the 8-mile segment from Bond Falls to Agate Falls, as a recreational river, (iv) the 6-mile segment from Agate Falls to Trout Creek, as a scenic river, (v) the 17.4-mile segment from Trout Creek to the northern boundary of the Ottawa National Forest, as a wild river; (C) the 37-mile segment of the Cisco Branch Ontonagon from its origin at Cisco Lake Dam to its confluence with Ten-Mile Creek south of Ewen in the following classes: (i) the 10-mile segment from the origin of Cisco Branch Ontonagon at Cisco Lake Dam to the County Road 527 crossing, as a recreational river, (ii) the 27-mile segment from the Forest Development Road 527 crossing to the confluence of the Cisco Branch and Ten-Mile Creek, as a scenic river; (D) the 15-mile segment of the West Branch Ontonagon from its confluence with Cascade Falls to Victoria Reservoir, in the following classes: (i) the 10.5-mile segment from its confluence with Cascade Falls to its confluence with the South Branch

Ontonagon, as a recreational river, (ii)The 4.5-mile segment from its confluence with the South Branch Ontonagon to Victoria Reservoir, as a recreational river. Notwithstanding any limitation contained in this Act, the Secretary is authorized to acquire lands and interests in lands which, as of August 1, 1990, were owned by Upper Peninsula Energy Corporation, and notwithstanding any such limitation, such lands shall be retained and managed by the Secretary as part of the Ottawa National Forest, and those lands so acquired which are within the boundaries of any segment designated under this paragraph shall be retained and managed pursuant to this Act.

(125) **PAINT, MICHIGAN.** -- Segments of the mainstream and certain tributaries, totaling 51 miles, to be administered by the Secretary of Agriculture as follows: (A) The 6-mile segment of the main stem from the confluence of the North and South Branches Paint to the Ottawa National Forest boundary, as a recreational river; (B) the 17-mile segment of the North Branch Paint from its origin at Mallard Lake to its confluence with the South Branch Paint, as a recreational river; (C) the 28-mile segment of the South Branch Paint from its original at Paint River Springs to its confluence with the North Branch Paint, as a recreational river.

(126) **PINE, MICHIGAN.** -- The 25-mile segment from Lincoln Bridge to the east 1/16th line of section 16, township 21 north, range 13 west, to be administered by the Secretary of Agriculture as a scenic river.

(127) **PRESQUE ISLE, MICHIGAN.** -- Segments of the mainstream and certain tributaries, totaling 57 miles, to be administered by the Secretary of Agriculture as follows: (A) The 23-mile segment of the mainstream, from the confluence of the East and West Branches of Presque Isle to Minnewawa Falls, to be classified as follows: (i) the 17-mile segment from the confluence of the East and West Branches Presque Isle to Michigan State Highway 28, as a recreational river, (ii) the 6-mile segment from Michigan State Highway 28 to Minnewawa Falls, as a scenic river; (B) the 14-mile segment of the East Branch Presque Isle within the Ottawa National Forest, as a recreational river; (C) the 7-mile segment of the South Branch Presque Isle within the Ottawa National Forest, as a recreational river; (D) the 13-mile segment of the West Branch Presque Isle within the Ottawa National Forest, as a scenic river.

(128) **STURGEON, HIAWATHA NATIONAL FOREST MICHIGAN.** -- The 43.9-mile segment from the north line of section 26, township 43 north, range 19 west, to Lake Michigan, to be administered by the Secretary of Agriculture in the following classes: (A) The 21.7-mile segment from the north line of section 26, township 43 north, range 19 west, to Forest Highway 13 as a scenic river; (B) the 22.2-mile segment from Forest Highway 13 to Lake Michigan as a recreational river.

(129) **STURGEON, OTTAWA NATIONAL FOREST, MICHIGAN.** -- The 25-mile segment from its entry into the Ottawa National Forest to the northern boundary of the Ottawa National Forest, to be administered by the Secretary of Agriculture in the following classes: (A) The 16.5-mile segment from its entry into the Ottawa National Forest to Prickett Lake, as a wild river; (B) the 8.5-mile segment from the outlet of Prickett Lake Dam to the northern boundary of the Ottawa National Forest, as a scenic river.

(130) **EAST BRANCH OF THE TAHQUAMENON, MICHIGAN.** -- The 13.2-mile segment from its origin in section 8, township 45 north, range 5 west, to the Hiawatha National Forest boundary, to be administered by the Secretary of Agriculture in the following classes: (A) The 10-mile segment from its origin in section 8, township 45 north, range 5 west, to the center of section 20, township 46 north, range 6 west, as a recreational river; (B) the 3.2-mile segment from the center of section 20, township 46 north, range 6 west, to the boundary of the Hiawatha National Forest, as a wild river.

(131) **WHITEFISH, MICHIGAN.** -- Segments of the mainstream and certain tributaries, totaling 33.6 miles, to be administered by the Secretary of Agriculture as follows: (A) The 11.1-mile segment of the mainstream from its confluence with the East and West Branches of the Whitefish to Lake Michigan in the following classes: (i) the 9-mile segment from its confluence with the East and West Branches of the Whitefish to the Center of section 16, township 41 north, range 21 west, as a scenic river, (ii) the 2.1-mile segment from the center of section 16, township 41 north, range 21 west, to Lake Michigan, as a recreational river; (B) the 15-mile segment of the East Branch Whitefish from the crossing of County Road 003 in section 6, township 44 north, range 20 west, to its confluence with the West Branch Whitefish, as a scenic river; (C) the 7.5-mile segment of the West Branch Whitefish from County Road 444 to its confluence with the East Branch Whitefish, as a scenic river.

(132) **YELLOW DOG, MICHIGAN.** -- The 4-mile segment from its origin at the outlet of Bulldog Lake Dam to the boundary of the Ottawa National Forest, to be administered by the Secretary of Agriculture as a wild river.

(133) **ALLEGHENY, PENNSYLVANIA.** -- The segment from Kinzua Dam downstream approximately 7 miles to the United States Route 6 Bridge, and the segment from Buckaloons Recreation Area at Irvine, Pennsylvania, downstream approximately 47 miles to the southern end of Alcorn Island at Oil City, to be administered by the Secretary of Agriculture as a recreational river through a cooperative agreement with the Commonwealth of Pennsylvania and the counties of Warren, Forest, and Venango, as provided under section 10(e) of this Act; and the segment from the sewage treatment plant at Franklin downstream approximately 31 miles to the refinery at Emlenton, Pennsylvania, to be administered by the Secretary of Agriculture as a recreational river through a cooperative agreement with the Commonwealth of Pennsylvania and Venango County, as provided under section 10(e) of this Act.[18]

(134) **BIG PINEY CREEK, ARKANSAS.** -- The 45.2-mile segment from its origin in section 27, township 13 north, range 23 west, to the Ozark National Forest boundary, to be administered by the Secretary of Agriculture as a scenic river.[19]

(135) **BUFFALO RIVER, ARKANSAS.** -- The 15.8-mile segment from its origin in section 22, township 14 north, range 24 west, to the Ozark National Forest boundary, to be administered by the Secretary of Agriculture in the following classes: (A) The 6.4-mile segment from its origin in section 22, township 14 north, range 24 west, to the western boundary of the Upper Buffalo Wilderness, as a scenic river; (B) the 9.4-mile segment from the western boundary of the Upper Buffalo Wilderness to the Ozark National Forest boundary, as a wild river.

(136) **COSSATOT RIVER, ARKANSAS.** -- Segments of the main stem and certain tributaries, totaling 20.1 miles, to be administered as follows: (A) The 4.2-mile segment of the main stem from its confluence with Mine Creek to the Caney Creek Wilderness Boundary on the north section line of section 13, township 4 south, range 30 west, to be administered by the Secretary of Agriculture as a recreational river; (B) the 6.9-mile segment of the main stem from the Caney Creek Wilderness Boundary on the north section line of section 13, township 4 south, range 30 west, to the south section line of section 20, township 4 south, range 30 west, to be administered by the Secretary of Agriculture as a scenic river; (C) the 4.4-mile segment of the Brushy Creek tributary from the north line of the south 1/2 of the southeast 1/4 of section 7, township 4 south, range 30 west, to the south section line of section 20, township 4 south, range 30 west, to be administered by the Secretary of Agriculture as a scenic river; (D) the 4.6-mile segment of the main stem from the State Highway 4 bridge to Duchett's Ford, to be administered by the Secretary of the Army as a scenic river consistent with the operation of Gillham Dam (as authorized by section 203 of the Flood Control Act of 1958 (Public Law 85-500)). For purposes of management of such segment, the Secretary of the Army may enter into a cooperative agreement or memorandum of understanding or other appropriate arrangement with the Secretary of Agriculture or an appropriate official of the State of Arkansas.

(137) **HURRICANE CREEK, ARKANSAS.** -- The 15.5-mile segment from its origin in section 1, township 13 north, range 21 west, to its confluence with Big Piney Creek, to be administered by the Secretary of Agriculture in the following classes: (A) The 11.8-mile segment from its origin in section 1, township 13 north, range 21 west, to the western boundary of the private land bordering Hurricane Creek Wilderness, as a scenic river; (B) the 2.4-mile segment from the western boundary of the private land bordering the Hurricane Creek Wilderness to the Hurricane Creek Wilderness boundary, as a wild river; (C) the 1.3-mile segment from the Hurricane Creek Wilderness boundary to its confluence with Big Piney Creek, as a scenic river.

(138) **LITTLE MISSOURI RIVER, ARKANSAS.** -- Segments totaling 15.7 miles, to be administered by the Secretary of Agriculture in the following classes: (A) The 11.3-mile segment from its origin in the northwest 1/4 of section 32, township 3 south, range 28 west, to the west section line of section 22, township 4 south, range 27 west, as a scenic river; (B) the 4.4-mile segment from the north line of the southeast 1/4 of the southeast 1/4 of section 28, township 4 south, range 27 west, to the north line of the northwest 1/4 of the southwest 1/4 of section 5, township 5 south, range 27 west, as a wild river.

(139) **MULBERRY RIVER, ARKANSAS.** -- The 56.0-mile segment from its origin in section 32, township 13 north, range 23 west, to the Ozark National Forest boundary, to be administered by the Secretary of Agriculture in the following classes: (A) The 36.6-mile segment from its origin in section 32, township 13 north, range 23 west, to Big Eddy Hollow in section 3, township 11 north, range 27 west, as a recreational river; (B) the 19.4-mile segment from Big Eddy Hollow in section 3, township 11 north, range 27 west, to the Ozark National Forest boundary, as a scenic river.

(140) **NORTH SYLAMORE CREEK, ARKANSAS.** -- The 14.5-mile segment from the Clifty Canyon Botanical Area boundary to its confluence with the White River, to be administered by the Secretary of Agriculture as a scenic river.

(141) **RICHLAND CREEK, ARKANSAS.** -- The 16.5-mile segment from its origin in section 35, township 13 north, range 20 west, to the northern boundary of section 32, township 14 north, range 18 west, to be administered by the Secretary of Agriculture in the following classes: (A) The 7.8-mile segment from its origin in section 35, township 13 north, range 20 west, to the western boundary of the Richland Creek Wilderness, as a scenic river; (B) the 5.3-mile segment from the western boundary of the Richland Creek Wilderness to the eastern boundary of Richland Creek Wilderness, as a wild river; (C) the 3.4-mile segment from the eastern boundary of the Richland Creek Wilderness to the northern boundary of section 32, township 14 north, range 18 west, as a scenic river.

(142) **SESPE CREEK, CALIFORNIA.** -- The 4-mile segment of the main stem of the Creek from its confluence with Rock Creek and Howard Creek downstream to its confluence with Trout Creek, to be administered by the Secretary of Agriculture as a scenic river; and the 27.5-mile segment of the main stem of the creek extending from its confluence with Trout Creek downstream to where it leaves section 26, township 5 north, range 20 west, to be administered by the Secretary of Agriculture as a wild river.

(143) **SISQUOC RIVER, CALIFORNIA.** -- The 33-mile segment of the main stem of the river extending from its origin downstream to the Los Padres Forest boundary, to be administered by the Secretary of Agriculture as a wild river.

(144) **BIG SUR RIVER, CALIFORNIA.** -- The main stems of the South Fork and North Fork of the Big Sur River from their headwaters to their confluence and the main stem of the river from the confluence of the South and North Forks downstream to the boundary of the Ventana Wilderness in Los Padres National Forest, for a total distance of approximately 19.5 miles, to be administered by the Secretary of Agriculture as a wild river.

(145) **GREAT EGG HARBOR, NEW JERSEY.** -- 39.5-miles of the main stem to be administered by the Secretary of the Interior in the following classifications: (A) From the mouth of the Patcong Creek to the mouth of Perch Cove Run, approximately 10 miles, as a scenic river; (B) from Perch Cove Run to the Mill Street Bridge, approximately 5.5 miles, as a recreational river; (C) from Lake Lenape to the Atlantic City Expressway, approximately 21 miles, as a recreational river; and (D) from Williamstown-New Freedom Road to the Pennsylvania Railroad right-of-way, approximately 3 miles, as a recreational river, and 89.5 miles of the following tributaries to be administered by the Secretary of the Interior in the following classifications: (E) Squankum Branch from its confluence with Great Egg Harbor River to Malaga Road, approximately 4.5 miles, as a recreational river; (F) Big Bridge Branch, from its confluence with Great Egg Harbor River to headwaters, approximately 2.2 miles, as a recreational river; (G) Penny Pot Stream Branch, from its confluence with Great Egg Harbor River to 14th Street, approximately 4.1 miles, as a recreational river; (H) Deep Run, from its confluence with Great Egg Harbor River to Pancoast Mill Road, approximately 5.4 miles, as a recreational river; (I) Mare Run, from its confluence with Great Egg Harbor River to Weymouth Avenue, approximately 3 miles, as a recreational river; (J) Babcock Creek, from its confluence with Great Egg Harbor River to headwaters, approximately 7.5 miles, as a recreational river; (K) Gravelly Run, from its confluence with Great Egg Harbor River to Pennsylvania

Railroad Right-of-Way, approximately 2.7 miles, as a recreational river; (L) Miry Run, from its confluence with Great Egg Harbor River to Asbury Road, approximately 1.7 miles, as a recreational river; (M) South River, from its confluence with Great Egg Harbor to Main Avenue, approximately 13.5 miles, as a recreational river; (N) Stephen Creek, from its confluence with Great Egg Harbor River to New Jersey Route 50, approximately 2.3 miles, as a recreational river; (O) Gibson Creek, from its confluence with Great Egg Harbor River to First Avenue, approximately 5.6 miles, as a recreational river; (P) English Creek, from its confluence with Great Egg Harbor River to Zion Road, approximately 3.5 miles, as a recreational river; (Q) Lakes Creek, from its confluence with Great Egg Harbor River to the dam, approximately 2.2 miles, as a recreational river; (R) Middle River, from its confluence with Great Egg Harbor River to the levee, approximately 5.6 miles, as a scenic river; (S) Patcong Creek, from its confluence with Great Egg Harbor River to Garden State Parkway, approximately 2.8 miles, as a recreational river; (T) Tuckahoe River (lower segment) from its confluence with Great Egg Harbor River to the Route 50 bridge, approximately 9 miles, as a scenic river; (U) Tuckahoe River, from the Route 50 Bridge to Route 49 Bridge, approximately 7.3 miles, as a recreational river; and (V) Cedar Swamp Creek, from its confluence with Tuckahoe River to headwaters, approximately 6 miles, as a scenic river.

(146) **MAURICE RIVER, MIDDLE SEGMENT.**[20] -- From Route 670 Bridge at Mauricetown to 3.6 miles upstream (at drainage ditch just upstream of Fralinger Farm), approximately 3.8 miles to be administered by the Secretary of the Interior as a scenic river.

(147) **MAURICE RIVER, MIDDLE SEGMENT.** -- From the drainage ditch just upstream of Fralinger Farm to one-half mile upstream from the United States Geological Survey Station at Burcham Farm, approximately 3.1 miles, to be administered by the Secretary of the Interior as a recreational river.

(148) **MAURICE RIVER, UPPER SEGMENT.** -- From one-half mile upstream from the United States Geological Survey Station at Burcham Farm to the south side of the Millville sewage treatment plan, approximately 3.6 miles, to be administered by the Secretary of the Interior as a scenic river.

(149) **MENANTICO CREEK, LOWER SEGMENT.** -- From its confluence with the Maurice River to the Route 55 Bridge, approximately 1.4 miles, to be administered by the Secretary of the Interior as a recreational river.

(150) **MENANTICO CREEK, UPPER SEGMENT.** -- From the Route 55 Bridge to the base of the impoundment at Menantico Lake, approximately 6.5 miles, to be administered by the Secretary of the Interior as a scenic river.

(151) **MANUMUSKIN RIVER, LOWER SEGMENT.** -- From its confluence with the Maurice River to a point 2.0 miles upstream, to be administered by the Secretary of the Interior as a recreational river.

(152) **MANUMUSKIN RIVER, UPPER SEGMENT.** -- From a point 2.0 miles upstream from its confluence with the Maurice River to its headwaters near Route 557, approximately 12.3 miles, to be administered by the Secretary of the Interior as a scenic river.

(153) **MUSKEE CREEK, NEW JERSEY.** -- From its confluence with the Maurice River to the Pennsylvania Seashore Line Railroad Bridge, approximately 2.7 miles, to be administered by the Secretary of the Interior as a scenic river.[21]

(154) (A) **RED RIVER, KENTUCKY.** -- The 19.4-mile segment of the Red River extending from the Highway 746 Bridge to the School House Branch, to be administered by the Secretary of Agriculture in the following classes: (i) the 9.1-mile segment known as the "Upper Gorge" from the Highway 746 Bridge to Swift Camp Creek, as a wild river (this segment is identified as having the same boundary as the Kentucky Wild River), (ii) the 10.3-mile segment known as the "Lower Gorge" from Swift Camp Creek to the School House Branch, as a recreational river. (B) There are authorized to be appropriated such sums as are necessary to carry out this paragraph.[21]

(155) **RIO GRANDE, NEW MEXICO.** -- The main stem from the southern boundary of the segment of the Rio Grande designated pursuant to paragraph (4), downstream approximately 12 miles to the west section line of Section 15, Township 23 North, Range 10 East, to be administered by the Secretary of the Interior as a scenic river.[22]

(156) **FARMINGTON RIVER, CONNECTICUT.** -- The 14-mile segment of the West Branch

and mainstem extending from immediately below the Goodwin Dam and Hydroelectric Project in Hartland, Connecticut, to the downstream end of the New Hartford-Canton, Connecticut, town line (hereinafter in the paragraph referred to as the "segment"), as a recreational river, to be administered by the Secretary of the Interior through cooperative agreements between the Secretary of the Interior and the State of Connecticut and its relevant political subdivisions, namely the Towns of Colebrook, Hartland, Barkhamsted, New Hartford, and Canton and the Hartford Metropolitan District Commission, pursuant to section 10(e) of this Act. The segment shall be managed in accordance with the Upper Farmington River Management Plan, dated April 29, 1993, and such amendments thereto as the Secretary of the Interior determines are consistent with this Act. Such plan shall be deemed to satisfy the requirement for a comprehensive management plan pursuant to section 3(d) of this Act.[23]

Establishment of boundaries; classification.

(b) The agency charged with the administration of each component of the national wild and scenic rivers system designated by subsection (a) of this section shall, within one year from the date of designation of such component under subsection (a) (except where a different date if [is] provided in subsection (a)), establish detailed boundaries therefor (which boundaries shall include an average of not more than 320 acres of land per mile measured from the ordinary high water mark on both sides of the river); and determine which of the classes outlined in section 2, subsection (b), of this Act best fit the river or its various segments. Notice of the availability of the boundaries and classification, and of subsequent boundary amendments shall be published in the *Federal Register* and shall not become effective until ninety days after they have been forwarded to the President of the Senate and the Speaker of the House of Representatives.

Public availability of maps and descriptions.

(c) Maps of all boundaries and descriptions of the classifications of designated river segments, and subsequent amendments to such boundaries, shall be available for public inspection in the offices of the administering agency in the District of Columbia and in locations convenient to the designated river.

Review requirements for early designations and management plans.

(d)(1) For rivers designated on or after January 1, 1986, the Federal agency charged with the administration of each component of the National Wild and Scenic Rivers System shall prepare a comprehensive management plan for such river segment to provide for the protection of the river values. The plan shall address resource protection, development of lands and facilities, user capacities, and other management practices necessary or desirable to achieve the purposes of this Act. The plan shall be coordinated with and may be incorporated into resource management planning for affected adjacent Federal lands. The plan shall be prepared, after consultation with State and local governments and the interested public within 3 full fiscal years after the date of designation. Notice of the completion and availability of such plans shall be published in the *Federal Register*.

(2) For rivers designated before January 1, 1986, all boundaries, classifications, and plans shall be reviewed for conformity within the requirements of this subsection within 10 years through regular agency planning processes.

Requirements for study reports.

SECTION 4. (a) The Secretary of the Interior or, where national forest lands are involved, the Secretary of Agriculture or, in appropriate cases, the two Secretaries jointly shall study and submit to the President reports on the suitability or nonsuitability for addition to the national wild and scenic rivers system of rivers which are designated herein or hereafter by the Congress as potential additions to such system. The President shall report to the Congress his recommendations and proposals with respect to the designation of each such river or section thereof under this Act. Such studies shall be completed and such reports shall be made to the Congress with respect to all rivers named in subparagraphs 5(a) (1) through (27) of this Act no later than October 2, 1978. In conducting these studies the Secretary of the Interior and the Secretary of Agriculture shall give priority to those rivers (i) with respect to which there is the greatest likelihood of developments which, if undertaken, would render the rivers unsuitable for inclusion in the national wild and scenic rivers system, and (ii) which possess the greatest proportion of private lands within their areas. Every such study and plan shall be coordinated with any water resources planning involving the same river which is being conducted pursuant to the Water Resources Planning Act (79 Stat. 244; 42 U.S.C. 1962 et seq.). Each report, including maps and illustrations, shall show among other things the area included within the report; the characteristics which do or do not make the area a worthy addition to the system; the current status of land ownership and use in the area; the reasonably foreseeable potential uses of the land and water which would be enhanced, foreclosed, or curtailed if the area were included in the national wild and scenic rivers system; the Federal agency (which in the case of a river which is wholly or substantially within a national forest, shall be the Department of Agriculture) by which it is proposed the area, should it be added to the system, be administered; the extent to which it is proposed that such administration, including the costs thereof, be shared by State and local agencies; and the estimated cost to the United States of acquiring necessary lands and interests in land and of administering the area, should it be added to the system. Each such report shall be printed as a Senate or House document.

(b) Before submitting any such report to the President and the Congress, copies of the proposed report shall, unless it was prepared jointly by the Secretary of the Interior and the Secretary of Agriculture, be submitted by the Secretary of the Interior to the Secretary of Agriculture or by the Secretary of Agriculture to the Secretary of the Interior, as the case may be, and to the Secretary of the Army, the Secretary of Energy, the head of any other affected Federal department or agency and, unless the lands proposed to be included in the area are already owned by the United States or have already been authorized for acquisition by Act of Congress, the Governor of the State or States in which they are located or an officer designated by the Governor to receive the same. Any recommendations or comments on the proposal which the said officials furnish the Secretary or Secretaries who prepared the report within ninety days of the date on which the report is submitted to them, together with the Secretary's or Secretaries' comments thereon, shall be included with the transmittal to the President and the Congress.

Review requirements for State components.

(c) Before approving or disapproving for inclusion in the national wild and scenic rivers system any river designated as a wild, scenic or recreational river by or pursuant to an act of the State legislature, the Secretary of the Interior shall submit the proposal to the Secretary of Agriculture, the Secretary of the Army, the Secretary of Energy, and the head of any other affected Federal department or agency and shall evaluate and give due weight to any recommendations or comments which the said officials furnish him within ninety days of the date on which it is submitted to them. If he approves the proposed inclusion, he shall publish notice thereof in the *Federal Register*.

Study boundaries.

(d) The boundaries of any river proposed in section 5(a) of this Act for potential addition to the National Wild and Scenic Rivers System shall generally comprise that area measured within one-quarter mile from the ordinary high water mark on each side of the river. In the case of any designated river, prior to publication of boundaries pursuant to section 3(b) of this Act, the boundaries also shall comprise the same area. This subsection shall not be construed to limit the possible scope of the study report to address areas which may lie more than one-quarter mile from the ordinary high water mark on each side of the river.

Study rivers.

SECTION 5. (a) The following rivers are hereby designated for potential addition to the national wild and scenic rivers system:

(1) **Allegheny, Pennsylvania.** -- The segment from its mouth to the town of East Brady, Pennsylvania.

(2) **Bruneau, Idaho.** -- The entire main stem.

(3) **Buffalo, Tennessee.** -- The entire river.

(4) **Chattooga, North Carolina, South Carolina, and Georgia.** -- The entire river.

(5) **Clarion, Pennsylvania.** -- The segment between Ridgway and its confluence with the Allegheny River.

(6) **Delaware, Pennsylvania and New York.** -- The segment from Hancock, New York, to Matamoras, Pennsylvania.

(7) **Flathead, Montana.** -- The North Fork from the Canadian border downstream to its confluence with the Middle Fork; the Middle Fork from its headwaters to its confluence with the South Fork; and the South Fork from its origin to Hungry Horse Reservoir.

(8) **Gasconade, Missouri.** -- The entire river.

(9) **Illinois, Oregon.** -- The entire river.

(10) **Little Beaver, Ohio.** -- The segment of the North and Middle Forks of the Little Beaver River in Columbiana County from a point in the vicinity of Negly and Elkton, Ohio, downstream to a point in the vicinity of East Liverpool, Ohio.

(11) **Little Miami, Ohio.** -- That segment of the main stem of the river, exclusive of its tributaries, from a point at the Warren-Clermont County line at Loveland, Ohio, upstream to the sources of Little Miami including North Fork.

(12) **Maumee, Ohio and Indiana.** -- The main stem from Perrysburg, Ohio, to Fort Wayne, Indiana, exclusive of its tributaries in Ohio and inclusive of its tributaries in Indiana.

(13) **Missouri, Montana.** -- The segment between Fort Benton and Ryan Island.

(14) **Moyie, Idaho.** -- The segment from the Canadian border to its confluence with the Kootenai River.

(15) **Obed, Tennessee.** -- The entire river and its tributaries, Clear Creek and Daddys Creek.

(16) **Penobscot, Maine.** -- Its east and west branches.

(17) **Pere Marquette, Michigan.** -- The entire river.

(18) **Pine Creek, Pennsylvania.** -- The segment from Ansonia to Waterville.

(19) **Priest, Idaho.** -- The entire main stem.

(20) **Rio Grande, Texas.** -- The portion of the river between the west boundary of Hudspeth County and the east boundary of Terrell County on the United States side of the river: *Provided*, That before undertaking any study of this potential scenic river, the Secretary of the Interior shall determine, through the channels of appropriate executive agencies, that Mexico has no objection to its being included among the studies authorized by this Act.

(21) **Saint Croix, Minnesota and Wisconsin.** -- The segment between the dam near Taylors Falls and its confluence with the Mississippi River.

(22) **Saint Joe, Idaho.** -- The entire main stem.

(23) **Salmon, Idaho.** -- The segment from the town of North Fork to its confluence with the Snake River.

(24) **Skagit, Washington.** -- The segment from the town of Mount Vernon to and including the mouth of Bacon Creek; the Cascade River between its mouth and the junction of its North and South Forks; the South Fork to the boundary of the Glacier Peak Wilderness Area; the Suiattle River from its mouth to the Glacier Peak Wilderness Area Boundary at Milk Creek; the Sauk River from its mouth to its junction with Elliot Creek; the North Fork of the Sauk River from its junction with the South Fork of the Sauk to the Glacier Peak Wilderness Area boundary.

(25) **Suwannee, Georgia and Florida.** -- The entire river from its source in the Okefenokee Swamp in Georgia to the gulf and the outlying Ichetucknee Springs, Florida.

(26) **Upper Iowa, Iowa.** -- The entire river.

(27) **Youghiogheny, Maryland and Pennsylvania.** -- The segment from Oakland, Maryland, to the Youghiogheny Reservoir, and from the Youghiogheny Dam downstream to the town of Connellsvsille, Pennsylvania.

(28) **American, California.** -- The North Fork from the Cedars to the Auburn Reservoir.

(29) **Au Sable, Michigan.** -- The segment downstream from Foot Dam to Oscoda and upstream

from Loud Reservoir to its source, including its principal tributaries and excluding Mio and Bamfield Reservoirs.

(30) **Big Thompson, Colorado.** -- The segment from its source to the boundary of Rocky Mountain National Park.

(31) **Cache la Poudre, Colorado.** -- Both forks from their sources to their confluence, thence the Cache la Poudre to the eastern boundary of Roosevelt National Forest.

(32) **Cahaba, Alabama.** -- The segment from its junction with United States Highway 31 south of Birmingham downstream to its junction with United States Highway 80 west of Selma.

(33) **Clark's Fork, Wyoming.** -- The segment from the Clark's Fork Canyon to the Crandall Creek Bridge.

(34) **Colorado, Colorado and Utah.** -- The segment from its confluence with the Dolores River, Utah, upstream to a point 19.5 miles from the Utah-Colorado border in Colorado.

(35) **Conejos, Colorado.** -- The three forks from their sources to their confluence, thence the Conejos to its first junction with State Highway 17, excluding Platoro Reservoir.

(36) **Elk, Colorado.** -- The segment from its source to Clark.

(37) **Encampment, Colorado.** -- The Main Fork and West Fork to their confluence, thence the Encampment to the Colorado-Wyoming border, including the tributaries and headwaters.

(38) **Green, Colorado.** -- The entire segment within the State of Colorado.

(39) **Gunnison, Colorado.** -- The segment from the upstream (southern) boundary of the Black Canyon of the Gunnison National Monument to its confluence with the North Fork.

(40) **Illinois, Oklahoma.** -- The segment from Tenkiller Ferry Reservoir upstream to the Arkansas-Oklahoma border, including the Flint and Barren Fork Creeks.

(41) **John Day, Oregon.** -- The main stem from Service Creek Bridge (at river mile 157) downstream to Tumwater Falls (at river mile 10).

(42) **Kettle, Minnesota.** -- The entire segment within the State of Minnesota.

(43) **Los Pinos, Colorado.** -- The segment from its source, including the tributaries and headwaters within the San Juan Primitive Area, to the northern boundary of the Granite Peak Ranch.

(44) **Manistee, Michigan.** -- The entire river from its source to Manistee Lake, including its principal tributaries and excluding Tippy and Hodenpyl Reservoirs.

(45) **Nolichucky, Tennessee and North Carolina.** -- The entire main stem.

(46) **Owyhee, South Fork, Oregon.** -- The main stem from the Oregon-Idaho border downstream to the Owyhee Reservoir.

(47) **Piedra, Colorado.** -- The Middle Fork and East Fork from their sources to their confluence, thence the Piedra to its junction with Colorado Highway 160.

(48) **Shepaug, Connecticut.** -- The entire river.

(49) **Sipsey Fork, West Fork, Alabama.** -- The segment, including its tributaries, from the impoundment formed by the Lewis M. Smith Dam upstream to its source in the William B. Bankhead National Forest.

(50) **Snake, Wyoming.** -- The segment from the southern boundaries of Teton National Park to the entrance to Palisades Reservoir.

(51) **Sweetwater, Wyoming.** -- The segment from Wilson Bar downstream to Spring Creek.

(52) **Tuolumne, California.** -- The main river from its source on Mount Dana and Mount Lyell in Yosemite National Park to Don Pedro Reservoir.

(53) **Upper Mississippi, Minnesota.** -- The segment from its source at the outlet of Itasca Lake to its junction with the northwestern boundary of the city of Anoka.

(54) **Wisconsin, Wisconsin.** -- The segment from Prairie du Sac to its confluence with the Mississippi River at Prairie du Chien.

(55) **Yampa, Colorado.** -- The segment within the boundaries of the Dinosaur National Monument.

(56) **Dolores, Colorado.** -- The segment of the main stem from Rico upstream to its source, including its headwaters; the West Dolores from its source, including its headwaters, downstream to its confluence with the main stem; and the segment from the west boundary, section 2, township 38 north, range 16 west, NMPM, below the proposed McPhee Dam, downstream to the Colorado-Utah border,

excluding the segment from one mile above Highway 90 to the confluence of the San Miguel River.

(57) **Snake, Washington, Oregon, and Idaho.** -- The segment from an eastward extension of the north boundary of section 1, township 5 north, range 47 east, Willamette meridian, downstream to the town of Asotin, Washington.

(58) **Housatonic, Connecticut.** -- The segment from the Massachusetts-Connecticut boundary downstream to its confluence with the Shepaug River.

(59) **Kern, California.** -- The main stem of the North Fork from its source to Isabella Reservoir excluding its tributaries.

(60) **Loxahatchee, Florida.** -- The entire river including its tributary, North Fork.

(61) **Ogeechee, Georgia.** -- The entire river.

(62) **Salt, Arizona.** -- The main stem from a point on the north side of the river intersected by the Fort Apache Indian Reservation boundary (north of Buck Mountain) downstream to Arizona State Highway 288.

(63) **Verde, Arizona.** -- The main stem from the Prescott National Forest boundary near Paulden to the vicinity of Table Mountain, approximately 14 miles above Horseshoe Reservoir, except for the segment not included in the national forest between Clarkdale and Camp Verde, North segment.

(64) **San Francisco, Arizona.** -- The main stem from [its] confluence with the Gila upstream to the Arizona-New Mexico border, except for the segment between Clifton and the Apache National Forest.

(65) **Fish Creek, New York.** -- The entire East Branch.

(66) **Black Creek, Mississippi.** -- The segment from Big Creek Landing in Forest County downstream to Old Alexander Bridge Landing in Stone County.

(67) **Allegheny, Pennsylvania.** -- The main stem from Kinzua Dam downstream to East Brady.

(68) **Capacon, West Virginia.** -- The entire river.

(69) **Escatawpa, Alabama and Mississippi.** -- The segment upstream from a point approximately one mile downstream from the confluence of the Escatawpa River and Jackson Creek to a point where the Escatawpa River is joined by the Yellowhouse Branch in Washington County, Alabama, near the town of Deer Park, Alabama; and the segment of Brushy Creek upstream from its confluence with the Escatawpa to its confluence with Scarsborough Creek.

(70) **Myakka, Florida.** -- The segment south of the southern boundary of the Myakka River State Park.

(71) **Soldier Creek, Alabama.** -- The segment beginning at the point where Soldier Creek intersects the south line of section 31, township 7 south, range 6 east, downstream to a point on the south line of section 6, township 8 south, range 6 east, which point is 1,322 feet west of the south line of section 5, township 8 south, range 6 east in the county of Baldwin, State of Alabama.

(72) **Red, Kentucky.** -- The segment from Highway numbered 746 (also known as Spradlin Bridge) in Wolf County, Kentucky, downstream to the point where the river descends below seven hundred feet above sea level (in its normal flow) which point is at the Menifee and Powell County line just downstream of the iron bridge where Kentucky Highway numbered 77 passes over the river.

(73) **Bluestone, West Virginia.** -- From its headwaters to its confluence with the New.

(74) **Gauley, West Virginia.** -- Including the tributaries of the Meadow and the Cranberry, from the headwaters to its confluence with the New.

(75) **Greenbrier, West Virginia.** -- From its headwaters to its confluence with the New.

(76) **Birch, West Virginia.** -- The main stem from the Cora Brown Bridge in Nicholas County to the confluence of the river with the Elk River in Braxton County.

(77) **Colville, Alaska.**

(78) **Etivluk-Nigu, Alaska.**

(79) **Utukok, Alaska.**

(80) **Kanektok, Alaska.**

(81) **Kisaralik, Alaska.**

(82) **Melozitna, Alaska.**

(83) **Sheenjek (lower segment), Alaska.**

(84) **Situk, Alaska.**

(85) **Porcupine, Alaska.**

(86) **Yukon (Ramparts section), Alaska.**

(87) **Squirrel, Alaska.**

(88) **Koyuk, Alaska.**

(89) **Wildcat Brook, New Hampshire.** -- The segment from its headwaters including the principal tributaries to its confluence with the Ellis River. The study authorized in this paragraph shall be completed no later than six years from the date of enactment of this paragraph [June 19, 1984] and an interim report shall be prepared and submitted to the Congress no later than three years from the date of enactment of this paragraph.

(90) **Horsepasture, North Carolina.** -- The segment from Bohaynee Road (N.C. 281) downstream to Lake Jocassee.

(91) **North Umpqua, Oregon.** -- The segment from the Soda Springs Powerhouse to the confluence of Rock Creek. The provisions of section 7(a) shall apply to tributary Steamboat Creek in the same manner as such provisions apply to the rivers referred to in such section 7(a). The Secretary of Agriculture shall, in the Umpqua National Forest plan, provide that management practices for Steamboat Creek and its immediate environment conserve, protect, and enhance the anadromous fish habitat and population.

(92) **Farmington, West Branch, Connecticut and Massachusetts.**[25] -- The segment from the intersection of the New Hartford-Canton, Connecticut, town line upstream to the base of the West Branch Reservoir in Hartland, Connecticut; and the segment from the confluence with Thorp Brook in Sandisfield, Massachusetts, to Hayden Pond in Otis Massachusetts.

(93) **Great Egg Harbor River, New Jersey.** -- The entire river.

(94) **Klickitat, Washington.** -- The segment from the southern boundary of the Yakima Indian Reservation, Washington, as described in the Treaty with the Yakimas of 1855 (12 Stat. 951), and as acknowledged by the Indian Claims Commission in Yakima Tribe of Indians v. U.S., 16 Ind. Cl. Comm. 536 (1966), to its confluence with the Little Klickitat River, Washington: *Provided*, That said study shall be carried on in consultation with the Yakima Indian Nation and shall include a determination of the degree to which the Yakima Indian Nation should participate in the preservation and administration of the river segment should it be proposed for inclusion in the Wild and Scenic Rivers System.

(95) **White Salmon, Washington.** -- The segment from its confluence with Trout Lake Creek, Washington, to its confluence with Gilmer Creek, Washington, near the town of B Z Corner, Washington.

(96) **Maurice, New Jersey.** -- The segment from Shell Pile to the point three miles north of Laurel Lake.

(97) **Manumuskin, New Jersey.** -- The segment from its confluence with the Maurice River to the crossing of State Route 49.

(98) **Menantico Creek, New Jersey.** -- The segment from its confluence with the Maurice River to its source.

(99) **Merced, California.** -- The segment from a point 300 feet upstream of the confluence with Bear Creek downstream to the point of maximum flood control storage of Lake McClure (elevation 867 feet mean sea level).

(100) **Blue, Oregon.** -- The segment from its headwaters to the Blue River Reservoir; by the Secretary of Agriculture.

(101) **Chewaucan, Oregon.** -- The segment from its headwaters to the Paisley Urban Growth boundary to be studied in cooperation with, and integrated with, the Klamath River Basin Plan; by the Secretary of Agriculture.

(102) **North Fork Malheur, Oregon.** -- The segment from the Malheur National Forest boundary to Beulah Reservoir; by the Secretary of the Interior.

(103) **South Fork McKenzie, Oregon.** -- The segments from its headwaters to the upper end of Cougar Reservoir and from the lower end of Cougar Reservoir to its confluence with the McKenzie River; by the Secretary of Agriculture.

(104) **Steamboat Creek, Oregon.** -- The entire creek; by the Secretary of Agriculture.

(105) **Wallowa, Oregon.** -- The segment from its confluence with the Minam River to its confluence with the Grande Ronde River; by the Secretary of Agriculture.

(106) **Merrimack River, New Hampshire.** -- The segment from its origin at the confluence of the Pemigewasset and Winnipesaukee Rivers in Franklin, New Hampshire, to the backwater impoundment at Hooksett Dam, excluding Garvins Falls Dam and its impoundment.

(107) **Pemigewasset, New Hampshire.** -- The segments from Profile Lake downstream to the southern boundary of the Franconia Notch State Park and from the northern Thornton town-line downstream to the backwater of the Ayers Island Dam; by the Secretary of the Interior.[26]

(106) **St. Marys River, Florida and Georgia.**[27] -- The segment from its headwaters to its confluence with the Bells River.

(109) **Mills River, North Carolina.**[28] -- The North Fork from the bottom of the spillway of the Hendersonville Reservoir downstream to its confluence with the South Fork; the South Fork from its confluence with the Pigeon Branch downstream to its confluence with the North Fork; and the main stem from the confluence of the North and South Forks downstream to a point 750 feet upstream from the centerline of North Carolina Highway 191/280.

(110) **Sudbury, Assabet, and Concord, Massachusetts.**[29] -- The segment of the Sudbury from the Danforth Street Bridge in the town of Framingham, to its confluence with the Assabet, the Assabet from 1,000 feet downstream of the Damon Mill Dam in Concord, to its confluence with the Sudbury and the Concord from the confluence of the Sudbury and Assabet downstream to the Route 3 Bridge in the town of Billerica. The study of such river segments shall be completed and the report submitted thereon not later than at the end of the third fiscal year beginning after the date of enactment of this paragraph.

(111) **Niobrara, Nebraska.** -- The 6-mile segment of the river from its confluence with Chimney Creek to its confluence with Rock Creek.[30]

(112) **Lamprey, New Hampshire.** -- The segment from the southern Lee town line downstream to the confluence with Woodman's Brook at the base of Sullivan Falls in Durham.

(112) **White Clay Creek, Delaware and Pennsylvania.**[31] -- The headwaters of the river in Pennsylvania to its confluence with the Christina River in Delaware, including the East, West, and Middle Branches, Middle Run, Pike Creek, Mill Creek, and other main branches and tributaries as determined by the Secretary of the Interior (herein after [sic] referred to as the White Clay Creek).

(114) **Brule, Michigan and Wisconsin.** -- The 33-mile segment from Brule Lake in the northeast quarter of section 15, township 41 north, range 13 east, to the National Forest boundary at the southeast quarter of section 31, township 41 north, range 17 east.[32]

(115) **Carp, Michigan.** -- The 7.6-mile segment from its origin at the confluence of the outlets of Frenchman Lake and Carp Lake in section 26, township 44 north, range 6 west, to the west section line of section 30, township 43 north, range 5 west.

(116) **Little Manistee, Michigan.** -- The 42-mile segment within the Huron-Manistee National Forest.

(117) **White, Michigan.** -- The 75.4-mile segment within the Huron-Manistee National Forest as follows: (A) The 30.8-mile segment of the main stem from U.S. 31 to the Huron-Manistee National Forest boundary at the north line of section 2, township 13 north, range 15 west, 1.5 miles southwest of Hesperia; (B) the 18.9-mile segment of the South Branch White from the Huron-Manistee National Forest boundary east of Hesperia at the west line of section 22, township 14 north, range 14 west, to Echo Drive, section 6, township 13 north, range 12 west; (C) the 25.7-mile segment of the North Branch White from its confluence with the South Branch White in section 25, township 13 north, range 16 west, to McLaren Lake in section 11, township 14 north, range 15 west.

(118) **Ontonagon, Michigan.** -- The 32-mile segment of the Ontonagon as follows: (A) The 12-mile segment of the West Branch from the Michigan State Highway 28 crossing to Cascade Falls; (B) the 20-mile segment of the South Branch from the confluence of the Cisco Branch and Tenmile Creek to the confluence with the West Branch Ontonagon.

(119) **Paint, Michigan.** -- The 70-mile segment as follows: (A) 34 miles of the mainstream beginning at the eastern boundary of the Ottawa National Forest in section 1, township 44 north, range 35 west, to the city of Crystal Falls; (B) 15 miles of the mainstream of the Net River from its confluence with the east and west branches to its confluence with the mainstream of the Paint River; (C) 15 miles of the east branch of the

Net River from its source in section 8, township 47 north, range 32 west, to its confluence with the mainstream of the Net River in section 24, township 46 north, range 34 west; (D) 14 miles of the west branch of the Net River from its source in section 35, township 48 north, range 34 west, to its confluence with the mainstream of the Net River in section 24, township 46 north, range 34 west.

(120) **Presque Isle, Michigan.** -- The 13-mile segment of the mainstream from Minnewawa Falls to Lake Superior.

(121) **Sturgeon, Ottawa National Forest, Michigan.** -- The 36-mile segment of the mainstream from the source at Wagner Lake in section 13, township 49 north, range 31 west, to the eastern boundary of the Ottawa National Forest in section 12, township 48 north, range 35 west.

(122) **Sturgeon, Hiawatha National Forest, Michigan.** -- The 18.1-mile segment from Sixteen Mile Lake to the north line of section 26, township 43 north, range 19 west.

(123) **Tahquamenon, Michigan.** -- The 103.5-mile segment as follows: (A) The 90-mile segment of the mainstream beginning at the source in section 21, township 47 north, range 12 west, to the mouth at Whitefish Bay; and (B) the 13.5-mile segment of the east branch from the western boundary of the Hiawatha National Forest in section 19, township 46 north, range 6 west, to its confluence with the mainstream.

(124) **Whitefish, Michigan.** -- The 26-mile segment of the West Branch Whitefish from its source in section 26, township 46 north, range 23 west, to County Road 444.

(125) **Clarion, Pennsylvania.** -- The segment of the main stem of the river from Ridgway to its confluence with the Allegheny River. The Secretary of Agriculture shall conduct the study of such segment.

(126) **Mill Creek, Jefferson and Clarion Counties, Pennsylvania.** -- The segment of the main stem of the creek from its headwaters near Gumbert Hill in Jefferson County, downstream to the confluence with the Clarion River.

(127) **Piru Creek, California.** -- The segment of the main stem of the Creek from its source downstream to the maximum pool of Pyramid Lake and the segment of the main stem of the Creek beginning 300 feet below the dam at Pyramid Lake downstream to the maximum pool at Lake Piru, for a total distance of approximately 49 miles.[33]

(128) **Little Sur River, California.** -- The segment of the main stem of the river from its headwaters downstream to the Pacific Ocean, a distance of approximately 23 miles. The Secretary of Agriculture shall consult with the Big Sur Multiagency Advisory Council during the study of the river.

(129) **Matilija Creek, California.** -- The segment from its headwaters to its junction with Murietta Canyon, a distance of approximately 16 miles.

(130) **Lopez Creek, California.** -- The segments from its headwaters to Lopez Reservoir, a distance of approximately 11 miles.

(131) **Sespe Creek, California.** -- The segment from Chorro Grande Canyon downstream to its confluence with Rock Creek and Howard Creek, a distance of about 10.5 miles.

(132) **North Fork Merced, California.** -- The segment from its headwaters to its confluence with the Merced River, by the Secretary of Agriculture and the Secretary of the Interior.

(133) **Delaware River, Pennsylvania and New Jersey.** -- (A) The approximately 3.6-mile segment from the Erie Lackawanna Railroad Bridge to the southern tip of Dildine Island; (B) the approximately 2-mile segment from the southern tip of Mack Island to the northern border of the town of Belvidere, New Jersey; (C) the approximately 12.5-mile segment from the southern border of the town of Belvidere, New Jersey, to the northern border of the city of Easton, Pennsylvania, excluding river mile 196.0 to 193.8; (D) the approximately 9.5-mile segment from the southern border of the town of Phillipsburg, New Jersey, to a point just north of the Gilbert Generating Station; (E) the approximately 14.2-mile segment from a point just south of the Gilbert Generating Station to a point just north of the Point Pleasant Pumping Station; (F) the approximately 6.5-mile segment from a point just south of the Point Pleasant Pumping Station to the north side of the Route 202 bridge; (G) the approximately 6-mile segment from the southern boundary of the town of New Hope, Pennsylvania to the town of Washington Crossing, Pennsylvania; (H) the Cook's Creek tributary; (I) the Tinicum Creek tributary; (J) the Tohickon Creek tributary.

(134) **New River, West Virginia and Virginia.** -- The segment defined by public lands commencing at the U.S. Route 460 bridge over the New River in Virginia to the maximum summer pool elevation (one thousand four hundred and ten feet above mean sea level) of Bluestone Lake in West Virginia; by the Secretary of the Interior. Nothing in this Act shall affect or impair the management of the Bluestone project or the authority of any department, agency or instrumentality of the United States to carry out the project purposes of that project as of the date of enactment of this paragraph. The study of the river segment identified in this paragraph shall be completed and reported on within one year after the date of enactment of this paragraph [October 26, 1992].

(135) **Rio Grande, New Mexico.** -- The segment from the west section line of Section 15, Township 23 North, Range 10 East, downstream approximately 8 miles to the southern line of the northwest quarter of Section 34, Township 23 North, Range 9 East.

( ) **Wekiva River, Florida.** -- (A) The entire river.

(B) The Seminole Creek tributary.

(C) The Rock Springs Run tributary.

Study periods.

(b)(1) The studies of rivers named in subparagraphs (28) through (55) of subsection (a) of this section shall be completed and reports thereon submitted by not later than October 2, 1979: *Provided*, That with respect to the rivers named in subparagraphs (33), (50), and (51), the Secretaries shall not commence any studies until -- (i) the State legislature has acted with respect to such rivers, or (ii) one year from the date of enactment of this Act [January 3, 1975], whichever is earlier. Studies of the river[s] named in paragraphs (38), (55), (83), and (87) shall be completed and the reports transmitted to the Congress not later than January 1, 1987.

(2) The study of the river named in subparagraph (56) of subsection (a) of this section shall be completed and the report thereon submitted by not later than January 3, 1976.

(3) The studies of the rivers named in paragraphs (59) through (76) of subsection (a) shall be completed and reports submitted thereon not later than five full fiscal years after the date of the enactment of this paragraph [November 10, 1978]. The study of rivers named in paragraphs (62) through (64) of subsection (a) shall be completed and the report thereon submitted by not later than April 1981. The study of the river named in paragraph (90) of subsection (a) shall be completed not later than three years after the date of enactment of this sentence [October 17, 1984]. The study of the river named in paragraph (93) of subsection (a) shall be completed not later than three years after the date of the enactment of this sentence [October 30, 1986].

(4) For the purposes of conducting the studies of rivers named in subsection (a), there are authorized to be appropriated such sums as necessary. Effective October 1, 1986, there are authorized to be appropriated for the purpose of conducting the study of the river named in paragraph (93) not to exceed $150,000.

(5) The studies of the rivers in paragraphs (77) through (88) shall be completed and reports transmitted thereon not later than three full fiscal years from date of enactment of this paragraph [December 2, 1980]. For the rivers listed in paragraphs (77), (78), and (79) the studies prepared and transmitted to the Congress pursuant to section 105(c) of the Naval Petroleum Reserves Production Act of 1976 (Public Law 94-258) shall satisfy the requirements of this section.

(6) Studies of rivers listed in paragraphs (80) and (81) shall be completed, and reports submitted within and not later than the time when the Bristol Bay Cooperative Region Plan is submitted to Congress in accordance with section 120434 of the Alaska National Interest Lands Conservation Act.

(7) The study of the West Branch of the Farmington River identified in paragraph (92) of subsection (a) shall be completed and the report submitted thereon not later than the end of the third fiscal year beginning after the enactment of this paragraph [October 30, 1986]. Such report shall include a discussion of management alternatives for the river if it were to be included in the national wild and scenic river system.

(8) The study of the Merrimack River, New Hampshire, shall be completed and the report thereon submitted not later than three years after the date of enactment of this paragraph [August 10, 1990].

(9) The study of the Pemigewasset River, New Hampshire, shall be completed and the report thereon submitted not later than three years after the date of enactment of this paragraph [August 10, 1990].

(8)[35] The study of the river named in paragraph (106)27 of subsection (a) shall be completed no later than three years after the date of enactment of this paragraph [August 15,1990]. In carrying out the study, the Secretary of the Interior shall consult with the Governors of the States of Florida and Georgia or their representatives, representatives of affected local governments, and owners of land adjacent to the river. Such consultation shall include participation in the assessment of resources values, and the development of alternatives for the protection of these resource values, and shall be carried out through public meetings and media notification. The study shall also include a recommendation on the part of the Secretary as to the role the States, local governments and landowners should play in the management of the river if it were designated as a component of the national wild and scenic rivers system.

(11) The study of the Lamprey River, New Hampshire shall be completed by the Secretary of the Interior and the report thereon submitted not later than 3 years after the date of enactment of this paragraph [December 11, 1991].

(11)(A)[36] The study of the White Clay Creek in Delaware and Pennsylvania shall be completed and the report submitted not later than 3 years after the date of enactment of this paragraph [December 11, 1991].

(B) In carrying out the study, the Secretary of the Interior shall prepare a map of the White Clay Creek watershed in Delaware and Pennsylvania, and shall develop a recommended management plan for the White Clay Creek. The plan shall provide recommendations as to the protection and management of the White Clay Creek, including the role the State and local governments, and affected landowners, should play in the management of the White Clay Creek if it designated as a component of the national wild and scenic rivers system.

(C) The Secretary shall prepare the study, including the recommended management plan, in cooperation and consultation with appropriate State and local governments, and affected landowners.

(11)[37] The study of segments of the Brule, Carp, Little Manistee, White, Paint, Presque Isle, Ontonagon, Sturgeon (Hiawatha), Sturgeon (Ottawa), Whitefish, and Tahquamenon Rivers in Michigan under subsection (a) shall be completed by the Secretary of Agriculture and the report submitted thereon not later than at the end of the third fiscal year beginning after the date of enactment of this paragraph [March 3, 1992]. For purposes of such river studies, the Secretary shall consult with each River Study Committee authorized under section 5 of the Michigan Scenic Rivers Act of 1990, and shall encourage public participation and involvement through hearings, workshops, and such other means as are necessary to be effective.

(11)(A)[38] The study of the Delaware River segments and tributaries designated for potential addition to the national wild and scenic rivers system pursuant to section 5(a)(133) of this Act shall be completed and the report submitted to Congress not later than one year after the date of enactment of this paragraph [October 23, 1992].

(B) The Secretary shall -- (i) prepare the study in cooperation and consultation with appropriate Federal, State, regional, and local agencies, including but not limited to, the Pennsylvania Department of Environmental Resources, the New Jersey Department of Environmental Protection and Energy, the Delaware and Lehigh Navigation Canal National Heritage Corridor Commission and the Delaware and Raritan Canal Commission; and (ii) consider previous plans for the protection of affected cultural, recreational, and natural resources (including water supply and water quality) and existing State and local regulations, so as to avoid unnecessary duplication.

(C) Pursuant to section 11(b)(1) of this Act, the Secretary shall undertake a river conservation plan for the segment of the Delaware River from the northern city limits of Trenton, New Jersey, to the Southern boundary of Bucks County, Pennsylvania.

(12) The study of the Rio Grande in New Mexico shall be completed and the report submitted not later that 3 years after the date of enactment of the paragraph.

Additional study requirements.

(c) The study of any of said rivers shall be pursued in as close cooperation with appropriate agencies of the affected State and its political subdivisions as possible, shall be carried on jointly with such agencies if request for such joint study is made by the State, and shall include a determination of the degree to which the State or its political subdivisions might participate in the preservation and administration of the river should it be proposed for inclusion in the national wild and scenic rivers system.

Federal agency consideration of wild and scenic values.

(d)(1) In all planning for the use and development of water and related land resources, consideration shall be given by all Federal agencies involved to potential national wild, scenic and recreational river areas, and all river basin and project plan reports submitted to the Congress shall consider and discuss any such potentials. The Secretary of the Interior and the Secretary of Agriculture shall make specific studies and investigations to determine which additional wild, scenic and recreational river areas within the United States shall be evaluated in planning reports by all Federal agencies as potential alternative uses of the water and related land resources involved.

(2) The Congress finds that the Secretary of the Interior, in preparing the Nationwide Rivers Inventory as a specific study for possible additions to the national wild and scenic rivers system, identified the Upper Klamath River from below the John Boyle Dam to the Oregon-California State line. The Secretary, acting through the Bureau of Land Management, is authorized under this subsection to complete a study of the eligibility and suitability of such segment for potential addition to the national wild and scenic rivers system. Such study shall be completed, and a report containing the results of the study shall be submitted to Congress by April 1, 1990. Nothing in this paragraph shall affect the authority or responsibilities of any other Federal agency with respect to activities or action on this segment and its immediate environment.

Acquisition procedures and limitations.

SECTION 6. (a)(1) The Secretary of the Interior and the Secretary of Agriculture are each authorized to acquire lands and interests in land within the authorized boundaries of any component of the national wild and scenic rivers system designated in section 3 of this Act, or hereafter designated for inclusion in the system by Act of Congress, which is administered by him, but he shall not acquire fee title to an average of more than 100 acres per mile on both sides of the river. Lands owned by a State may be acquired only by donation or by exchange in accordance with the subsection (d) of this section. Lands owned by an Indian tribe or a political subdivision of a State may not be acquired without the consent of the appropriate governing body thereof as long as the Indian tribe or political subdivision is following a plan for management and protection of the lands which the Secretary finds protects the land and assures its use for purposes consistent with this Act. Money appropriated for Federal purposes from the land and water conservation fund shall, without prejudice to the use of appropriations from other sources, be available to Federal departments and agencies for the acquisition of property for the purposes of this Act.

Federal agency consideration of wild and scenic values.

(2) When a tract of land lies partially within and partially outside the boundaries of a component of the national wild and scenic rivers system, the appropriate Secretary may, with the consent of the landowners for the portion outside the boundaries, acquire the entire tract. The land or interest therein so acquired outside the boundaries shall not be counted against the average one-hundred-acre-per-mile fee title limitation of subsection (a)(1). The lands or interests therein outside such boundaries, shall be disposed of, consistent with existing authorities of law, by sale, lease, or exchange.

(b) If 50 per centum or more of the entire acreage outside the ordinary high water mark on both sides of the river within a federally administered wild, scenic or recreational river area is owned in fee title by the

United States, by the State or States within which it lies, or by political subdivisions of those States, neither Secretary shall acquire fee title to any lands by condemnation under authority of this Act. Nothing contained in this section, however, shall preclude the use of condemnation when necessary to clear title or to acquire scenic easements or such other easements as are reasonably necessary to give the public access to the river and to permit its members to traverse the length of the area or of selected segments thereof.

(c) Neither the Secretary of the Interior nor the Secretary of Agriculture may acquire lands by condemnation, for the purpose of including such lands in any national wild, scenic or recreational river area, if such lands are located within any incorporated city, village or borough which has in force and applicable to such lands a duly adopted, valid zoning ordinance that conforms with the purposes of this Act. In order to carry out the provisions of this subsection the appropriate Secretary shall issue guidelines, specifying standards for local zoning ordinances, which are consistent with the purposes of this Act. The standards specified in such guidelines shall have the object of (A) prohibiting new commercial or industrial uses other than commercial or industrial uses which are consistent with the purposes of this Act, and (B) the protection of the bank lands by means of acreage, frontage, and setback requirements on development.

(d) The appropriate Secretary is authorized to accept title to non-Federal property within the authorized boundaries of any federally administered component of the national wild and scenic rivers system designated in section 3 of this Act or hereafter designated for inclusion in the system by Act of Congress and, in exchange therefor, convey to the grantor any federally owned property which is under his jurisdiction within the State in which the component lies and which he classifies as suitable for exchange or other disposal. The values of the properties so exchanged either shall be approximately equal or, if they are not approximately equal, shall be equalized by the payment of cash to the grantor or to the Secretary as the circumstances require.

(e) The head of any Federal department or agency having administrative jurisdiction over any lands or interests in land within the authorized boundaries of any federally administered component of the national wild and scenic rivers system designated in section 3 of this Act or hereafter designated for inclusion in the system by Act of Congress is authorized to transfer to the appropriate Secretary jurisdiction over such lands for administration in accordance with the provisions of this Act. Lands acquired by or transferred to the Secretary of Agriculture for the purposes of this Act within or adjacent to a national forest shall upon such acquisition or transfer become national forest lands.

(f) The appropriate Secretary is authorized to accept donations of lands and interests in land, funds, and other property for use in connection with his administration of the national wild and scenic rivers system.

(g)(1) Any owner or owners (hereinafter in this subsection referred to as "owner") of improved property on the date of its acquisition, may retain for themselves and their successors or assigns a right of use and occupancy of the improved property for noncommercial residential purposes for a definite term not to exceed twenty-five years, or in lieu thereof, for a term ending at the death of the owner, or the death of his spouse, or the death of either or both of them. The owner shall elect the term to be reserved. The appropriate Secretary shall pay to the owner the fair market value of the property on the date of such acquisition less the fair market value on such a date of the right retained by the owner.

whenever the appropriate Secretary is given reasonable cause to find that such use and occupancy is being exercised in a manner which conflicts with the purposes of this Act. In the event of such a finding, the Secretary shall tender to the holder of that right an amount equal to the fair market value of that portion of the right which remains unexpired on the date of termination. Such right of use or occupancy shall terminate by operation of law upon tender of the fair market price.

(3) The term "improved property", as used in this Act, means a detached, one-family dwelling (hereinafter referred to as "dwelling"), the construction of which was begun before January 1, 1967, (except where a different date is specifically provided by law with respect to any particular river), together with so much of the land on which the dwelling is situated, the said land being in the same ownership as the dwelling, as the appropriate Secretary shall designate to be reasonably necessary for the enjoyment of the dwelling for the sole purpose of noncommercial residential use, together with any structures accessory to the dwelling which are situated on the land so designated.

Restrictions on hydro and water resource development projects on designated rivers.

SECTION 7. (a) The Federal Power Commission [FERC] shall not license the construction of any dam, water conduit, reservoir, powerhouse, transmission line, or other project works under the Federal Power Act (41 Stat. 1063), as amended (16 U.S.C. 791a et seq.), on or directly affecting any river which is designated in section 3 of this Act as a component of the national wild and scenic rivers system or which is hereafter designated for inclusion in that system, and no department or agency of the United States shall assist by loan, grant, license, or otherwise in the construction of any water resources project that would have a direct and adverse effect on the values for which such river was established, as determined by the Secretary charged with its administration. Nothing contained in the foregoing sentence, however, shall preclude licensing of, or assistance to, developments below or above a wild, scenic or recreational river area or on any stream tributary thereto which will not invade the area or unreasonably diminish the scenic, recreational, and fish and wildlife values present in the area on the date of designation of a river as a component of the national wild and scenic rivers system. No department or agency of the United States shall recommend authorization of any water resources project that would have a direct and adverse effect on the values for which such river was established, as determined by the Secretary charged with its administration, or request appropriations to begin construction of any such project, whether heretofore or hereafter authorized, without advising the Secretary of the Interior or the Secretary of Agriculture, as the case may be, in writing of its intention so to do at least sixty days in advance, and without specifically reporting to the Congress in writing at the time it makes its recommendation or request in what respect construction of such project would be in conflict with the purposes of this Act and would affect the component and the values to be protected by it under this Act. Any license heretofore or hereafter issued by the Federal Power Commission [FERC] affecting the New River of North Carolina shall continue to be effective only for that portion of the river which is not included in the national wild and scenic rivers system pursuant to section 2 of this Act and no project or undertaking so licensed shall be permitted to invade, inundate or otherwise adversely affect such river segment.

Restrictions on hydro and water resource development projects on study rivers.

(b)The Federal Power Commission [FERC] shall not license the construction of any dam, water conduit, reservoir, powerhouse, transmission line, or other project works under the Federal Power Act, as amended, on or directly affecting any river which is listed in section 5, subsection (a), of this Act, and no department or agency of the United States shall assist by loan, grant, license, or otherwise in the construction of any water resources project that would have a direct and adverse effect on the values for which such river might be designated, as determined by the Secretary responsible for its study or approval -- (i) during the ten-year period following enactment of this Act [October 2, 1968] or for a three complete fiscal year period following any Act of Congress designating any river for potential addition to the national wild and scenic rivers system, whichever is later, unless, prior to the expiration of the relevant period, the Secretary of the Interior and where national forest lands are involved, the Secretary of Agriculture, on the basis of study, determine that such river should not be included in the national wild and scenic rivers system and notify the Committees on Interior and Insular Affairs of the United States Congress, in writing, including a copy of the study upon which the determination was made, at least one hundred and eighty days while Congress is in session prior to publishing notice to that effect in the *Federal Register*: *Provided*, That if any Act designating any river or rivers for potential addition to the national wild and scenic rivers system provides a period for the study or studies which exceeds such three complete fiscal year period the period provided for in such Act shall be substituted for the three complete fiscal year period in the provisions of this clause (i); and (ii) during such interim period from the date a report is due and the time a report is actually submitted to the Congress; and (iii) during such additional period thereafter as, in the case of any river the report for which is submitted to the President and the Congress for inclusion in the national wild and scenic rivers system, is necessary for congressional consideration thereof or, in the case of any river recommended to the Secretary of the Interior for inclusion in the national wild and scenic rivers system under section 2(a)(ii) of this Act, is necessary for the Secretary's consideration thereof, which additional period, however, shall not exceed three years in the first case and one year in the second.

Nothing contained in the foregoing sentence, however, shall preclude licensing of, or assistance to, developments below or above a potential wild, scenic or recreational river area or on any stream tributary thereto which will not invade the area or diminish the scenic, recreational, and fish and wildlife values present in the potential wild, scenic or recreational river area on the date of designation of a river for study as provided in section 5 of this Act. No department or agency of the United States shall, during the periods hereinbefore specified, recommend authorization of any water resources project on any such river or request appropriations to begin construction of any such project, whether heretofore or hereafter authorized, without advising the Secretary of the Interior and, where national forest lands are involved, the Secretary of Agriculture in writing of its intention so to do at least sixty days in advance of doing so and without specifically reporting to the Congress in writing at the time it makes its recommendation or request in what respect construction of such project would be in conflict with the purposes of this Act and would affect the component and the values to be protected by it under this Act.

(c) The Federal Power Commission [FERC] and all other Federal agencies shall, promptly upon enactment of this Act, inform the Secretary of the Interior and, where national forest lands are involved, the Secretary of Agriculture, of any proceedings, studies, or other activities within their jurisdiction which are now in progress and which affect or may affect any of the rivers specified in section 5, subsection (a), of this Act. They shall likewise inform him of any such proceedings, studies, or other activities which are hereafter commenced or resumed before they are commenced or resumed.

Grants under Land and Water Conservation Fund Act of 1965.

(d) Nothing in this section with respect to the making of a loan or grant shall apply to grants made under the Land and Water Conservation Fund Act of 1965 (78 Stat. 897; 16 U.S.C. 4601-5 et seq.).

Limitations to entry on public lands.
(a) Designated rivers.

SECTION 8. (a) All public lands within the authorized boundaries of any component of the national wild and scenic rivers system which is designated in section 3 of this Act or which is hereafter designated for inclusion in that system are hereby withdrawn from entry, sale, or other disposition under the public land laws of the United States. This subsection shall not be construed to limit the authorities granted in section 6(d) or section 14A of this Act.

(b) Study rivers.

(b) All public lands which constitute the bed or bank, or are within one-quarter mile of the bank, of any river which is listed in section 5, subsection (a), of this Act are hereby withdrawn from entry, sale, or other disposition under the public land laws of the United States for the periods specified in section 7, subsection (b), of this Act. Notwithstanding the foregoing provisions of this subsection or any other provision of this Act, subject only to valid existing rights, including valid Native selection rights under the Alaska Native Claims Settlement Act, all public lands which constitute the bed or bank, or are within an area extending two miles from the bank of the river channel on both sides of the river segments referred to in paragraphs (77) through (88) of section 5(a) are hereby withdrawn from entry, sale, State selection or other disposition under the public land laws of the Unites States for the periods specified in section 7(b) of this Act.

Limitations on mineral entry and development on Public Lands; designated rivers.

SECTION 9. (a) Nothing in this Act shall affect the applicability of the United States mining and mineral leasing laws within components of the national wild and scenic rivers system except that -- (i) all prospecting, mining operations, and other activities on mining claims which, in the case of a component of the system designated in section 3 of this Act, have not heretofore been perfected or which, in the case of a component hereafter designated pursuant to this Act or any other Act of Congress, are not perfected before its inclusion in the system and all mining operations and other activities under a mineral lease, license, or permit issued or renewed after inclusion of a component in the system shall be subject to such regulations as the Secretary of the Interior or, in the case of national forest lands, the Secretary of Agriculture may prescribe to effectuate the purposes of this Act; (ii) subject to valid existing rights, the perfection of, or issuance of a patent to, any mining claim affecting lands within the system shall confer or convey a right or title only to the mineral deposits and such rights only to the use of the surface and the surface resources as are reasonably required to carrying on prospecting or mining operations and are consistent with such regulations as may be prescribed by the Secretary of the Interior, or in the case of national forest lands, by the Secretary of Agriculture; and (iii) subject to valid existing rights, the minerals in Federal lands which are part of the system and constitute the bed or bank or are situated within one-quarter mile of the bank of any river designated a wild river under this Act or any subsequent Act are hereby withdrawn from all forms of appropriation under the mining laws and from operation of the mineral leasing laws including, in both cases, amendments thereto. Regulations issued pursuant to paragraphs (i) and (ii) of this subsection shall, among other things, provide safeguards against pollution of the river involved and unnecessary impairment of the scenery within the component in question.

Study rivers.

(b) The minerals in any Federal lands which constitute the bed or bank or are situated within one-quarter mile of the bank of any river which is listed in section 5, subsection (a) of this Act are hereby withdrawn from all forms of appropriation under the mining laws during the periods specified in section 7, subsection (b) of this Act. Nothing contained in this subsection shall be construed to forbid prospecting or the issuance of leases, licenses, and permits under the mineral leasing laws subject to such conditions as the Secretary of the Interior and, in the case of national forest lands, the Secretary of Agriculture find appropriate to safeguard the area in the event it is subsequently included in the system. Notwithstanding the foregoing provisions of this subsection or any other provision of this Act, all public lands which constitute the bed or bank, or are within an area extending two miles from the bank of the river channel on both sides of the river segments referred to in paragraphs (77) through (88) of section 5(a), are hereby withdrawn, subject to valid existing rights, from all forms of appropriation under the mining laws and from operation of the mineral leasing laws including, in both cases, amendments thereto, during the periods specified in section 7(b) of this Act.

Management direction.

SECTION 10. (a) Each component of the national wild and scenic rivers system shall be administered in such manner as to protect and enhance the values which caused it to be included in said system without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration primary emphasis shall be given to protecting its aesthetic, scenic, historic, archaeologic, and scientific features. Management plans for any such component may establish varying degrees of intensity for its protection and development, based on the special attributes of the area.

(b) Any portion of a component of the national wild and scenic rivers system that is within the national wilderness preservation system, as established by or pursuant to the Act of September 3, 1964 (78 Stat. 890; 16 U.S.C., ch. 23),[39] shall be subject to the provisions of both the Wilderness Act and this Act with respect to preservation of such river and its immediate environment, and in case of conflict between the provisions of these Acts the more restrictive provisions shall apply.

(c) Any component of the national wild and scenic rivers system that is administered by the Secretary of the Interior through the National Park Service shall become a part of the national park system, and any such component that is administered by the Secretary through the Fish and Wildlife Service shall become a part of the national wildlife refuge system. The lands involved shall be subject to the provisions of this Act and the Acts under which the national park system or national wildlife refuge system, as the case may be, is administered, and in case of conflict between the provisions of these Acts, the more restrictive provisions shall apply. The Secretary of the Interior, in his administration of any component of the national wild and scenic rivers system, may utilize such general statutory authorities relating to areas of the national park system and such general statutory authorities otherwise available to him for recreation and preservation purposes and for the conservation and management of natural resources as he deems appropriate to carry out the purposes of this Act.

(d) The Secretary of Agriculture, in his administration of any component of the national wild and scenic rivers system area, may utilize the general statutory authorities relating to the national forests in such manner as he deems appropriate to carry out the purposes of this Act.

(e) The Federal agency charged with the administration of any component of the national wild and scenic rivers system may enter into written cooperative agreements with the Governor of a State, the head of any State agency, or the appropriate official of a political subdivision of a State for State or local governmental participation in the administration of the component. The States and their political subdivisions shall be encouraged to cooperate in the planning and administration of components of the system which include or adjoin State-or county-owned lands.

Federal assistance to others; cooperation; use of volunteers.

SECTION 11. (a) The Secretary of the Interior shall encourage and assist the States to consider, in formulating and carrying out their comprehensive statewide outdoor recreation plans and proposals for financing assistance for State and local projects submitted pursuant to the Land and Water Conservation Fund Act of 1965 (78 Stat. 897), needs and opportunities for establishing State and local wild, scenic and recreational river areas.

(b)(1) The Secretary of the Interior, the Secretary of Agriculture, or the head of any other Federal agency, shall assist, advise, and cooperate with States or their political subdivisions, landowners, private organizations, or individuals to plan, protect, and manage river resources. Such assistance, advice and cooperation may be through written agreements or otherwise. This authority applies within or outside a federally administered area and applies to rivers which are components of the national wild and scenic rivers system and to other rivers. Any agreement under this subsection may include provisions for limited financial or other assistance to encourage participation in the acquisition, protection, and management of river resources.

(2) Wherever appropriate in furtherance of this Act, the Secretary of Agriculture and the Secretary of the Interior are authorized and encouraged to utilize the following:

(A) For activities on federally owned land, the Volunteers in the Parks Act of 1969 (16 U.S.C. 18g-j) and the Volunteers in the Forest Act of 1972 (16 U.S.C. 558a-558d).

(B) For activities on all other lands, section 6 of the Land and Water Conservation Fund Act of 1965 (relating to the development of statewide comprehensive outdoor recreation plans).

(3) For purposes of this subsection, the appropriate Secretary or the head of any Federal agency may utilize and make available Federal facilities, equipment, tools and technical assistance to volunteers and volunteer organizations, subject to such limitations and restrictions as the appropriate Secretary or the head of any Federal agency deems necessary or desirable.

(4) No permit or other authorization provided for under provision of any other Federal law shall be conditioned on the existence of any agreement provided for in this section.

Management policies

SECTION 12. (a) The Secretary of the Interior, the Secretary of Agriculture, and the head of any other Federal department or agency having jurisdiction over any lands which include, border upon, or are adjacent to, any river included within the National Wild and Scenic Rivers System or under consideration for such inclusion, in accordance with section 2(a)(ii), 3(a), or 5(a), shall take such action respecting management policies, regulations, contracts, plans, affecting such lands, following November 10, 1978, as may be necessary to protect such rivers in accordance with the purposes of this Act. Such Secretary or other department or agency head shall, where appropriate, enter into written cooperative agreements with the appropriate State or local official for the planning, administration, and management of Federal lands which are within the boundaries of any rivers for which approval has been granted under section 2(a)(ii). Particular attention shall be given to scheduled timber harvesting, road construction, and similar activities which might be contrary to the purposes of this Act.

(b) Nothing in this section shall be construed to abrogate any existing rights, privileges, or contracts affecting Federal lands held by any private party without the consent of said party.

(c) The head of any agency administering a component of the national wild and scenic rivers system shall cooperate with the Administrator, Environmental Protection Agency and with the appropriate State water pollution control agencies for the purpose of eliminating or diminishing the pollution of waters of the river.

Reservation of State and Federal jurisdiction and responsibilities; access to and across wild and scenic rivers.

SECTION 13. (a) Nothing in this Act shall affect the jurisdiction or responsibilities of the States with respect to fish and wildlife. Hunting and fishing shall be permitted on lands and waters administered as parts of the system under applicable State and Federal laws and regulations unless, in the case of hunting, those lands or waters are within a national park or monument. The administering Secretary may, however, designate zones where, and establish periods when, no hunting is permitted for reasons of public safety, administration, or public use and enjoyment and shall issue appropriate regulations after consultation with the wildlife agency of the State or States affected.

(b) The jurisdiction of the States and the United States over waters of any stream included in the national wild, scenic or recreational river area shall be determined by established principles of law. Under the provisions of this Act, any taking by the United States of a water right which is vested under either State or Federal law at the time such river is included in the national wild and scenic rivers system shall entitle the owner thereof to just compensation. Nothing in this Act shall constitute an express or implied claim or denial on the part of the Federal Government as to exemption from State water laws.

(c) Designation of any stream or portion thereof as a national wild, scenic or recreational river area shall not be construed as a reservation of the waters of such streams for purposes other than those specified in this Act, or in quantities greater than necessary to accomplish these purposes.

(d) The jurisdiction of the States over waters of any stream included in a national wild, scenic or recreational river area shall be unaffected by this Act to the extent that such jurisdiction may be exercised without impairing the purposes of this Act or its administration.

(e) Nothing contained in this Act shall be construed to alter, amend, repeal, interpret, modify, or be in conflict with any interstate compact made by any States which contain any portion of the national wild and scenic rivers system.

(f) Nothing in this Act shall affect existing rights of any State, including the right of access, with respect to the beds of navigable streams, tributaries, or rivers (or segments thereof) located in a national wild, scenic

(g) The Secretary of the Interior or the Secretary of Agriculture, as the case may be, may grant easements and rights-of-way upon, over, under, across, or through any component of the national wild and scenic rivers system in accordance with the laws applicable to the national park system and the national forest system, respectively: *Provided*, That any conditions precedent to granting such easements and rights-of-way shall be related to the policy and purpose of this Act.

Land donations.

SECTION 14. The claim and allowance of the value of an easement as a charitable contribution under section 170 of title 26, United States Code, or as a gift under section 2522 of said title shall constitute an agreement by the donor on behalf of himself, his heirs, and assigns that, if the terms of the instrument creating the easement are violated, the donee or the United States may acquire the servient estate at its fair market value as of the time the easement was donated minus the value of the easement claimed and allowed as a charitable contribution or gift.

Lease of Federal lands.

SECTION 14A. (a) Where appropriate in the discretion of the Secretary, he may lease federally owned land (or any interest therein) which is within the boundaries of any component of the national wild and scenic rivers system and which has been acquired by the Secretary under this Act. Such lease shall be subject to such restrictive covenants as may be necessary to carry out the purposes of this Act.

(b) Any land to be leased by the Secretary under this section shall be offered first for such lease to the person who owned such land immediately before its acquisition by the United States.

Exceptions for Alaska.

SECTION 15. Notwithstanding any other provision to the contrary in sections 3 and 9 of this Act, with respect to components of the national wild and scenic rivers system in Alaska designated by paragraphs (38) through (50) of section 3(a) of this Act -- (1) the boundary of each such river shall include an average of not more than six hundred and forty acres per mile on both sides of the river. Such boundary shall not include any lands owned by the State or a political subdivision of the State nor shall such boundary extend around any private lands adjoining the river in such manner as to surround or effectively surround such private lands; and (2) the withdrawal made by paragraph (iii) of section 9(a) shall apply to the minerals in Federal lands which constitute the bed or bank or are situated within one-half mile of the bank of any river designated a wild river by the Alaska National Interest Lands Conservation Act.

Definitions.

SECTION 16. As used in this Act, the term --

(a) "River" means a flowing body of water or estuary or a section, portion, or tributary thereof, including rivers, streams, creeks, runs, kills, rills, and small lakes.

(b) "Free-flowing", as applied to any river or section of a river, means existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway. The existence, however, of low dams, diversion works, and other minor structures at the time any river is proposed for inclusion in the national wild and scenic rivers system shall not automatically bar its consideration for such inclusion: *Provided*, That this shall not be construed to authorize, intend, or encourage future construction of such structures within components of the national wild and scenic rivers system.

(c) "Scenic easement" means the right to control the use of land (including the air space above such land) within the authorized boundaries of a component of the wild and scenic rivers system, for the purpose of protecting the natural qualities of a designated wild, scenic or recreational river area, but such control shall not affect, without the owner's consent, any regular use exercised prior to the acquisition of the easement. For any designated wild and scenic river, the appropriate Secretary shall treat the acquisition of fee title with the reservation of regular existing uses to the owner as a scenic easement for purposes of this Act. Such an acquisition shall not constitute fee title ownership for purposes of section 6(b).

Authorization of appropriations for land acquisition.

SECTION 17. There are hereby authorized to be appropriated, including such sums as have heretofore been appropriated, the following amounts for land acquisition for each of the rivers described in section 3(a) of this Act:

- Clearwater, Middle Fork, Idaho, $2,909,800;
- Eleven Point, Missouri, $10,407,000;
- Feather, Middle Fork, California, $3,935,700;
- Rio Grande, New Mexico, $253,000;

- Rogue, Oregon, $15,147,000
- St. Croix, Minnesota and Wisconsin, $21,769,000;
- Salmon, Middle Fork Idaho, $1,837,000; and
- Wolf Wisconsin, $142,150.

FOOTNOTES

[1] The Wild and Scenic Rivers Act (16 U.S.C. 1271-1287) as set forth herein consists of Public Law 90-542 (October 2, 1968) and amendments thereto.

[1a] Public Law 102-220 contains additional provisions.

[2] Public Law 92-560, which inserted this paragraph, contains additional provisions.

[3] Public Law 94-199 added paragraphs 11 and 12. Public Law 94-199 also contains several related provisions.

[4] For additional provisions of law concerning the Missouri River segment, see Public Law 94-486 (Sec. 202 and Sec. 203).

[5] The National Parks and Recreation Act of 1978, Public Law 95-625, section 704(b)-(j).

[6] Section 401(p) of the Act of October 12, 1979 amended section 704(a) of the Act of November 10, 1978 which added this section. That amendment changed the reference here to "section 704(c)."

[7] Section 9(b) of the Central Idaho Wilderness Act of 1980 (PL 96-312) contains the following provision: (b) That segment of the main Salmon River designated as a component of the Wild and Scenic Rivers System by this Act, which lies within the River of No Return Wilderness or the Gospel-Hump Wilderness designated by Public Law 95-237, shall be managed under the provisions of the Wild and Scenic Rivers Act, as amended, and the regulations promulgated pursuant thereto, notwithstanding section 10(b) of the Wild and Scenic Rivers Act or any provisions of the Wilderness Act to the contrary.

[8] Public Law 96-487 which designated rivers in Alaska contains many provisions applying only to rivers in that State.

[9] Title I of Public Law 99-590 contains additional provisions concerning the Cache la Poudre.

[10] Designated as paragraph (57) in original law.

[11] Designated as paragraph (58) in original law.

[12] Section 13 of Public Law 99-663, contains additional provisions affecting tributaries.

[13] Section 3 of Public Law 102-432 which added (62)(B)(i) contains additional provisions.

[14] Title I of Public Law 100-557 which designated rivers (68) through (107) contains additional provisions.

[15] Public Law 100-633, which inserted this paragraph, contains additional provisions.

[16] River #108, Rio Chama, is the last river which has been numbered in section 3(a). The remaining numbers in this section have been assigned in chronological order according to designation and probably will be confirmed by a technical amendment to the Act.

[17] Public Law 102-50 which designated this river contains additional provisions.

[18] Public Law 102-249 which designated rivers 119 through 132 contains additional provisions.

[19] Public Law 102-271 which designated this river contains additional provisions.

[20] Public Law 102-275 which designated rivers 134 through 141 contains an additional provision regarding a State-administered component.

[21] Public Law 103-162 which designated this river contains additional provisions.

[22] Public Law 103-170 which designated this river contains an additional provision.

[23] Public Law 103-242 which designated this river contains additional provisions.

[24] Public Law 103-313 which designated this river contains additional provisions.

[25] Title II, Section 202 of Public Law 99-590 contains additional provisions concerning the Farmington River.

[26] Public Law 101-357 which authorized this study contains an additional provision regarding funding.

[27] Should be (108). Congress will probably pass a technical amendment to correct the numbering sequence.

[28] From this point on, except for White Clay Creek, the authorizing legislation did not provide numbers. Numbers 109-135 have been assigned chronologically to assist the user. Congress probably will pass a technical amendment providing numbers.

[29] Public Law 101-628 which authorized this study contains additional provisions.

[30] Public Law 102-50 which authorized this study contains additional provisions.

[31] Should be 113.

[32] Section 5 of Public Law 102-249 which authorized studies 114 through 124 contains special study provisions.

[33] Section 7(b) of Public Law 102-301 which authorized studies 127 through 131 contains additional study instructions.

[34] Probably should refer to Section 1203.

[35] This should be (10). Future technical amendments probably will be made to establish correct numbering sequence.

[36] Should be (12)(A).

[37] Should be (13).

[38] Should be (14).

[39] So in original law. Refers to "the Wilderness Act."

Laws Amending or Related to the Wild and Scenic Rivers Act.

- 92-560
- 93-621
- 94-199
- 94-486
- 95-87
- 95-625
- 96-87
- 96-312
- 96-487
- 99-590
- 99-663
- 100-33
- 100-150
- 100-412
- 100-552
- 100-534
- 100-557
- 100-605
- 100-633
- 100-677
- 101-175
- 101-357
- 101-612
- 101-628
- 102-50
- 102-220
- 102-249
- 102-271
- 102-275
- 102-301
- 102-432
- 102-460
- 102-536
- 103-162
- 103-170
- 103-242
- 103-313

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Wild and Scenic Rivers Guidelines

Federal Register / Vol. 47, No. 173 / Tuesday, September 7, 1982

DEPARTMENT OF THE INTERIOR

Office of the Secretary

National Park Service

DEPARTMENT OF AGRICULTURE

Office of the Secretary

Forest Service

National Wild and Scenic Rivers System; Final Revised Guidelines for Eligibility, Classification and Management of River Areas

AGENCY: National Park Service and Office of the Secretary, Interior; Forest Service and Office of the Secretary, USDA.

ACTION: Publication of final revised guidelines.

FOR FURTHER INFORMATION CONTACT: Bob Brockwehl (NPS), 202/272-3566. William R. Snyder (USFS), 202/382-8014.

SUPPLEMENTARY INFORMATION: Guidelines for the study of potential national wild and scenic rivers and management of designated rivers were first issued jointly by the Department of Agriculture and the Department of the Interior in 1970. On January 28, 1981, draft revised guidelines were published in the *Federal Register* for public comment (Vol. 46, No. 18, pp. 9148-9158). The document which follows was prepared after consideration of 50 letters of comment received from other Federal agencies, State governments, private industry, citizens' groups and individuals. Major comments and responses are summarized below. Many of the comments received were not addressed because they related to aspects of the wild and scenic rivers program beyond the scope of these guidelines. (See Preface of the revised guidelines.)

Comments and Responses

Comment: The definition of the term outstandingly remarkable value is too vague and too liberal. Too many rivers will be eligible for designation, unreasonably constraining economic development of natural resources.

Response: Balancing of the need for protection versus development of each river area will be considered by the Congress in deciding whether or not to designate the river area. A determination that a particular river is eligible for designation does not necessarily imply that designation is the best use of the river in terms of the national interest.

Comment: The guidelines give inadequate emphasis to public involvement in the study process.

Response: Public involvement is sufficiently addressed in the context of environmental statements or assessments prepared in the study process.

Comment: The guidelines do not make sufficiently clear which of the management principles apply to private lands.

Response: The guidelines may be unclear to the general reader in this respect. The management principles are to be implemented throughout each river area to the fullest extent possible under the managing agency's general statutory authorities and other existing Federal, State and local laws, including zoning ordinances where available. Some management principles obviously apply only to Federal lands within the river area. For instance, the Wild and Scenic Rivers Act does not open private lands to public recreation. Management principles may apply to private lands only to the extent required by other laws such as local zoning and air and water pollution regulations.

Comment: Restriction of timber harvest to selective harvest techniques is unnecessarily limiting from both the timber production and the natural resource preservation standpoints.

Response: The guidelines have been amended in accordance with this comment.

Comment: Specific guidance contained in the 1970 guideline with respect to the granting of rights-of-way for transmission lines is omitted from the revised draft guidelines.

Response: The subsection on rights-of-way has been amended in accordance with this comment.

Comment: A protected study area extending one half mile from each bank of the river is excessive when the final boundaries of a river area must average no more than one quarter mile from each bank (320 acres per mile).

Response: The half-mile figure was intended to ensure that all areas likely to be included within the boundaries of a designated river area would be considered in the study process. Setting a study boundary based on the "visual corridor" concept was considered but rejected. The one-quarter-mile figure was finally selected to avoid unnecessary limitations on resource developments. Some developments which may be initiated beyond the one-quarter-mile boundary during the study period might be affected in the future if the area under development is included in the boundaries of the river area designated by Congress.

Comment: Evaluation of the study area in its existing condition for classification purposes does not allow for the fact that a forest area growing in relatively natural condition at the time of the study may be scheduled for clearcutting at some future date. The classification process should allow for authorized and scheduled future uses which could change the condition and, thus, the classification of the river area.

Response: The guidelines have been amended to permit consideration of alternative classifications for the river area where authorized future uses could alter classification. The following additional changes were made in response to suggestions from the reviewing public or from reviewers within the responsible agencies.

- Unnecessary definitions were deleted.
- Quotations and paraphrases of the Wild and Scenic River Act (including the whole of Section II -- Policy) were eliminated as much as possible. Instead, the guidelines will reference the appropriate sections of the Act where necessary.
- The entire subsection titled "Findings and Recommendations" and portions of the subsection titled

"General Management Principles" were deleted and their content was placed in other appropriate sections.

Additional copies of the guidelines, the Wild and Scenic Rivers Act, as amended, and further information on the National Wild and Scenic Rivers System may be obtained from: National Park Service, Rivers and Trails Division (780), 440 G Street, N.W., Washington, D.C. 20243.

Dated: July 12, 1982.

G. Ray Arnett, Assistant Secretary for Fish and Wildlife and Parks (Interior).

Dated: August 26,1982.

Douglas W. MacCleery, Deputy Assistant Secretary for Natural Resources and Environment (Agriculture).

Department of Agriculture

Department of the Interior

National Wild and Scenic Rivers System

Guidelines for Eligibility, Classification and Management of River Areas.

Contents

Table 2 -- Classification Criteria for Wild, Scenic and Recreational River Areas

Appendix

The Wild and Scenic Rivers Act (Pub. L. 90-542 as amended through Pub. L. 96-487) (omitted)

Preface

The National Wild and Scenic Rivers System

The Wild and Scenic Rivers Act, (Pub. L. 90-542 as amended; 16 U.S.C. 1271-1287) established a method for providing Federal protection for certain of our country's remaining free-flowing rivers, preserving them and their immediate environments for the use and enjoyment of present and future generations. Rivers are included in the system so that they may benefit from the protective management and control of development for which the Act provides.

The preamble of the Act states:

> *It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in freeflowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes.*

Addition of Rivers to the System

The Wild and Scenic Rivers Act provides two methods for adding a river to the National Wild and Scenic Rivers System. The first method is by an act of Congress. Congress can designate a river directly, or it can authorize a river for study as a potential wild, scenic or recreational river. Upon completion of a study conducted by the Department of the Interior or the Department of Agriculture, a study report is prepared and transmitted to the President who, in turn, forwards it with his recommendations to Congress for action.

The second method for inclusion of a river in the national system is through the authority granted to the Secretary of the Interior in section 2(a)(ii) of the Act. Upon application by the Governor or Governors of the State or States involved, the Secretary can designate a river as a component of the national system provided that the river has been designated as a wild, scenic or recreational river by or pursuant to an act of the legislature of the State or States through which it flows to be permanently administered as a wild, scenic, or recreational river by an agency or political subdivision of the State or States concerned.

To be eligible for inclusion in the system through either method, rivers must meet certain criteria set forth in section 2(b) of the Act. Procedures for proposing State-administered rivers for designation have been issued by the Department of the Interior.

The Guidelines

Subsequent to enactment of the Wild and Scenic Rivers Act in October 1968, the Departments of Agriculture and the Interior initiated studies of twenty-seven rivers which the Act authorized for study as potential additions to the National Wild and Scenic Rivers System. As these studies progressed, it became evident that specific requirements of the Act concerning the evaluation, classification and management of these rivers were subject to differing interpretations within and between the two departments.

It was therefore agreed that a uniform evaluation and management approach should be formulated for use by the two departments, and through a cooperative effort, Guidelines for Evaluating Wild, Scenic and Recreational River Areas Proposed for Inclusion in the National Wild and Scenic Rivers System Under Section 2, Public Law 90-542 was prepared and promulgated in February 1970.

The guidelines not only provide guidance for the congressionally mandated studies under section 5(a) of the Act, but are also useful for evaluations conducted by water resource development agencies under section 5(d) and for States applying for inclusion of State-designated rivers in the national system.

Revision of the Guidelines

While these guidelines were effective throughout a decade, it became clear that revision was necessary to incorporate changes identified through use and to reflect requirements of new laws and regulations. Therefore, on August 2, 1979, the President directed in his Environmental Message that "the Secretary of Agriculture and the Secretary of the Interior shall jointly revise their guidelines for evaluating wild, scenic and recreational rivers to ensure consideration of river ecosystems and to shorten the time currently used to study rivers for designation."

This revision of the guidelines has been prepared in response to the President's 1979 directive and includes:

- Clarification of the fact that free-flowing rivers which contain outstandingly remarkable ecological values are eligible for addition to the national system.
- Clarification of the fact that free-flowing river segments in or near urban areas that possess outstandingly remarkable values are eligible for addition to the national system.
- Elimination of the 25-mile minimum length guideline.
- Revision of the definition of sufficient river flow or volume of water in the river. Sufficient flow was not defined in the Act, and the definition in the existing guidelines was unnecessarily limiting.
- Revised water quality guidelines to allow inclusion in the system of rivers where restoration to high water quality is planned.
- A revised section on management of designated river areas.
- A study schedule to accelerate completion of the river studies authorized by Congress.

Section I -- Definitions

The following definitions are provided for the purpose of these guidelines only.

Act: The Wild and Scenic Rivers Act.

Carrying capacity: The quantity of recreation use which an area can sustain without adverse impact on the outstandingly remarkable values and free-flowing character of the river area, the quality of recreation experience, and public health and safety.

Classification criteria: Criteria specified in Section 2(b) of the Act for determining the classification (wild, scenic or recreational) of eligible river segments.

Classification: The process of determining which of the classes outlined in section 2(b) of the Act (wild, scenic, or recreational) best fit the river or its various segments.

Component: A river area designated as a unit of the National Wild and Scenic Rivers System.

Designation: Inclusion of a river area in the national system either by act of Congress or by authority of the Secretary of the Interior.

Development: Any manmade structure or modification of the natural or existing river environment.

Eligibility: Qualification of a river for inclusion in the national system through determination that it is free-flowing and with its adjacent land area possesses at least one outstandingly remarkable value.

Flow: The volume of water in a river passing a given point in a given period of time, usually expressed in terms of cubic feet per second or cubic meters per second.

Impoundment: A body of water formed by any manmade structure.

Management plan: The detailed development plan required under section 3(b) of the Act which states the boundaries and classification of the river area and presents a plan for its public use, development and administration.

Primary contact recreation: Activities in which there is prolonged and intimate contact with the water, (e.g., swimming, water skiing, surfing, kayaking, "tubing," and wading or dabbling by children).

River area: For a river study, that portion of a river authorized by Congress for study and its immediate environment comprising an area extending at least one-quarter mile from each bank. For designated rivers, the river and adjacent land within the authorized boundaries.

Secondary contact recreation: Activities in which contact with the water is either incidental or accidental, e.g., boating, fishing and limiting contact with water incident to shoreline activities.

Study agency: The agency within the Department of Agriculture or the Department of the Interior delegated the responsibility for a wild and scenic river study.

Study report: The report on the suitability or nonsuitability of a study river for inclusion in the national system, which section 4(a) requires the Secretary of Agriculture, or the Secretary of the Interior, or both jointly to prepare and submit to the President. The President transmits the report with his recommendation to the Congress.

Study team: A team of professionals from interested local, State and Federal agencies invited by the study agency and participating in the study.

Section II -- The River Study

The Study Process

Section 4(a) mandates that all rivers designated as potential additions to the system in section 5(a) be studied as to their suitability for inclusion in the system:

> *The Secretary of the Interior or, where national forest lands are involved, the Secretary of Agriculture or, in appropriate cases, the two Secretaries jointly shall study and submit to the President reports on the suitability or nonsuitability for addition to the national wild and scenic rivers system of rivers which are designated herein or hereafter by the Congress as potential additions to such system. The President shall report to the Congress his recommendations and proposals with respect to the designation of each such river or section thereof under this Act.*

The purpose of a wild and scenic river study is to provide information upon which the President can base his recommendation and Congress can make a decision. Procedures for developing the necessary information and preparing the study report may vary depending on the agency which conducts the study, but generally will include the steps shown on Table 1, Accelerated Study Schedule.

Wild and scenic river studies will comply with all applicable statutes and executive orders, which may include the following: the National Environmental Policy Act (Pub. L. 91-190), the National Historic Preservation Act (Pub. L. 89-665), the Endangered Species Act (Pub. L. 93-205), the Fish and Wildlife Coordination Act (Pub. L. 85-264), the Water Resources Planning Act (Pub. L. 89-80), the Floodplain and Wetlands Executive Orders (E.O. 11988 and E.O. 11990), the National Forest Management Act of 1976 (Pub. L. 94-588), the Federal Land Policy and Management Act of 1976 (Pub. L. 94-579), the Wild and Scenic Rivers Act, (Pub. L. 90-542, as amended), and any rules and regulations issued pursuant thereto.

The Study Report

Each river study report will be a concise presentation of the information required in sections 4(a) and 5(c) of the Act as augmented by the Council on Environmental Quality regulations implementing the procedural provisions of the National Environmental Policy Act (40 CFR Parts 1500-1508).

Section 4(a):

> *Each report, including maps and illustrations, shall show among other things the area included within the report; the characteristics which do or do not make the area a worthy addition to the system; the current status of land ownership and use in the area; the reasonably foreseeable potential uses of the land and water which would be enhanced, foreclosed or curtailed if the area were included in the national wild and scenic rivers system; the Federal agency (which in the case of a river which is wholly or substantially within a national forest, shall be the Department of Agriculture) by which it is proposed the area, should it be added to the system, be administered; the extent to which it is proposed that such administration, including the costs thereof, be shared by State and local agencies; and the estimated cost to the United States of acquiring necessary lands and interests in land and of administering the area, should it be added to the system.*

In addition, section 5(c) requires that:

> *The study of any of said rivers . . . shall include a determination of the degree to which the State or its political subdivisions might participate in the preservation and administration of the river should it be proposed for inclusion in the national wild and scenic rivers system.*

Study reports may be combined with draft and final environmental impact statements (EIS) as permitted by Section 1506.4 of the Council on Environmental Quality regulations. Study reports will be reviewed by other Federal agencies, states and the public as required by section 4(b) of the Wild and Scenic Rivers Act. Each of the following subsections describes the way in which the information is generated, analyzed and presented in the report.

Description of the River Area

Each report will contain a description of the area included in the study. The study area will cover, as a minimum, an area extending the length of the river segment authorized for study and extending in width one-quarter mile from each bank of the river.

Adjacent river areas beyond one quarter mile form each river bank may be studied if their inclusion could facilitate management of the resources of the river area. For example, there may be important historic, archeological or ecological resource areas which may extend beyond the boundaries of the mandated study area, but could be better managed by inclusion in the river area. Also, management of the river area may be facilitated by extension to include established or available access points not included in the study.

For the purposes of study and determining eligibility and classification, the river area may be divided into segments.

The description of the river area will identify the outstandingly remarkable values and the extent of man's activity in the river environment to provide a clear basis for findings of eligibility and classification. While only one outstandingly remarkable value is necessary for eligibility, the study report should carefully document all values of the river area.

In addition to the information required by Sections 4(a) and 5(c) of the Act, this section of the report will describe any existing zoning ordinances or other provisions of law governing land use in the study area.

If the study report and the environmental impact statement are combined, the same chapter may describe both the river area and the affected environment. For EIS purposes and for general information, a brief description of the regional setting will also be included.

Determination of Eligibility

Each report will contain a determination as to the eligibility of all portions of the authorized study area. Section 2(b) of the Act states that "a . . . river area eligible to be included in the system is a free-flowing stream and the related adjacent land area that possesses one or more of the values referred to in section 1, subsection (b) of this Act." The terms "river" and "free-flowing" are defined in section 16 of the act.

In reading and applying the criteria for eligibility, the following points are relevant:

- The fact that a river segment may flow between large impoundments will not necessarily preclude its designation. Such segments may qualify if conditions within the segment meet the criteria.
- Rivers or river segments in or near urban areas that possess outstandingly remarkable values may qualify. Only one outstandingly remarkable value is needed for eligibility.
- In addition to the specific values listed in Section 1(b) of the Act, other similar values, such as ecological, if outstandingly remarkable, can justify inclusion of a river in the national system.
- The determination of whether a river area contains "outstandingly remarkable" values is a professional judgment on the part of the study team. The basis for the judgment will be documented in the study report.
- There are no specific requirements concerning the length or the flow of an eligible river segment. A river segment is of sufficient length if, when managed as a wild, scenic or recreational river area, the outstandingly remarkable values are protected. Flows are sufficient if they sustain or complement the outstandingly remarkable values for which the river would be designated.

Classification

Study reports will indicate the potential classification which best fits each eligible river segment as viewed in its existing condition. Section 2(b) of the Act states that rivers which are found eligible and included in the National Wild and Scenic Rivers Systems shall be classified as one of the following:

> *(1) Wild river areas -- Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shoreline essentially primitive and waters unpolluted. These represent vestiges of primitive America.*

These criteria are interpreted as follows:

a. "Free of impoundments." Wild river areas shall be free of impoundments.

b. "Generally inaccessible except by trail." Wild river areas will not contain roads, railroads, or other provisions for vehicular travel within the river area. The existence of a few inconspicuous roads leading to the boundary of the river area at the time of study will not necessarily bar wild river classification.

c. "Watersheds or shorelines essentially primitive." Wild river areas will show little or no evidence of human activity. Shorelines and watersheds within the river area should be essentially free of structures including such things as buildings, pipelines, powerlines, dams, pumps, generators, diversion works, rip-rap and other modifications of the waterway or adjacent land within the river corridor. The existence of a few inconspicuous structures, particularly those of historic or cultural value, at the time of study need not bar wild classification.

A limited amount of domestic livestock grazing or hay production may be considered "essentially primitive." There should be no row crops or ongoing timber harvest and the river area should show little or no evidence of past logging activities.

d. "Waters unpolluted." The water quality of a wild river will meet or exceed Federal criteria or federally approved State standards for aesthetics, for propagation of fish and wildlife normally adapted to the habitat of the stream, and for primary contact recreation except where exceeded by natural conditions.

(2) Scenic river areas -- Those rivers or sections or rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

These criteria are interpreted as follows:

a. "Free of impoundments." Scenic river areas will be free of impoundments.

b. "Shorelines or watersheds still largely primitive." To qualify for scenic classification, the rivers segment's shorelines and immediate environment should not show substantial evidence of human activity. The portion of the watershed within the boundary of the scenic river may have some discernible existing development. "Largely primitive" means that the shorelines and the immediate river environment still present an overall natural character, but that in places land may be developed for agricultural purposes. Row crops would be considered as meeting the test of "largely primitive," as would timber harvest and other resource use, providing such activity is accomplished without a substantial adverse effect on the natural appearance of the river or its immediate environment.

c. "Shorelines largely undeveloped" means that any structures or concentration of structures must be limited to relatively short reaches of the total area under consideration for designation as a scenic river area.

d. "Accessible in places by road" means that roads may reach the river area and occasionally bridge the river. The presence of short stretches of conspicuous or longer stretches of inconspicuous and well-screened roads or railroads will not necessarily preclude scenic river designation. In addition to the physical and scenic relationship of the free-flowing river area to roads or railroads, consideration should be given to the type of use for which such roads or railroads were constructed and the type of use which would occur within the proposed scenic river area.

(3) Recreational river areas -- Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

These criteria are interpreted as follows:

a. "Readily accessible by road or railroad." River areas classified as recreational may contain existing parallel roads or railroads in close proximity to one or both banks of the river as well as bridge crossings and roads fording or ending at the river.

b. "Some development along their shorelines." Lands may have been developed for the full range of agricultural and forestry uses, may show evidence of past and ongoing timber harvest, and may include some residential, commercial or similar development.

c. "Some impoundment or diversion in the past." There may be some existing impoundments, diversions and other modifications of the waterway having an impact on the river area. Existing low dams, diversion works, rip-rap and other minor structures will not bar recreational classification, provided the waterway remains generally natural and riverine in appearance. The classification criteria are summarized in Table 2, appended to these guidelines.

There are several points which all participants and observers of the study process should bear in mind when reading and applying the classification criteria:

- It is important to understand each criterion, but it is more important to understand their collective intent. Each river segment and its immediate environment should be considered as a unit. The basis for classification is the degree of naturalness, or stated negatively, the degree of evidence of man's activity in the river area. The most natural rivers will be classified wild; those somewhat less natural, scenic, and those least natural, recreational.

- Generally, only conditions within the river area determine classification; however, occasionally conditions outside the river area, such as developments which could impact air and water quality, noise levels or scenic views within the river area, may influence classification.

- For the purpose of classification, a river area may be divided into segments. Each segment, considered as a whole, will conform to one of the classifications. In segmenting the river, the study team should take into account the management strategies necessary to administer the entire river area and should avoid excessive segmentation.

- The Wild and Scenic Rivers Act provides no specific guidance on water quality for scenic and recreational rivers. However, the Clean Water Act has made it a national goal that all waters of the United States be made fishable and swimmable, and provides the legal means for upgrading water quality in any river which would otherwise be suitable for inclusion in the system. Therefore, rivers will not necessarily be excluded from the system because of poor water quality at the time study, provided a water quality improvement plan exists or is being developed in compliance with applicable State and Federal laws.

- Although each classification permits certain existing development, the criteria do not imply that additional inconsistent development is permitted in the future.

- The classification criteria provide uniform guidance for professional judgment, but they are not absolutes. It is not possible to formulate criteria so as to mechanically or automatically classify river areas. Therefore, there may occasionally be exceptions to some of the criteria. For example, if the study team finds that strict application of the statutory classification criteria would not provide the most appropriate classification for a specific river segment, the study report may recommend for congressional consideration an exception to the classification criteria.

Analysis of the Alternatives

To provide for decision making and to satisfy the requirements of the National Environmental Policy Act, study reports will include an analysis of alternatives. The study team will develop an array of alternative plans encompassing all reasonable proposals for use of the river area including uses which may be incompatible with designation of the river area as a component of the national system. Where appropriate, alternative plans for the river area may be based on, but not limited to:

- Alternative managing agencies for the river area;

- Alternative protective measures other than national designation;

- Alternative uses of the area incompatible with designation as a component of the national system; and

- Alternative classifications for the river area. Occasionally there may be authorized but not yet constructed projects, which if constructed would alter the classification of the river area. In such cases, alternatives may be presented to permit consideration of the river area as it would be classified both with and without the authorized project. Authorized projects may include approved land management plans prepared by a Federal land management agency under its statutory authorities.

The study report will present at least one alternative plan calling for national designation through either Congressional or Secretarial designation of all eligible segments of the congressionally authorized study area.

If the study team finds a segment ineligible for designation as a component of the National Wild and Scenic Rivers System, but still worthy of protection, alternatives for State, local or private preservation may be presented, as well as protection under other Federal programs.

If areas adjacent to the study area have been studied and found eligible, the report may present alternatives which incorporate such areas into the river area proposed for designation. Such expansion of the original study area either in length or in width may be desirable to preserve and facilitate management of river ecosystems, historic or archeological areas or other special areas.

Section III -- Management

Wild and scenic rivers shall be managed with plans prepared in accordance with the requirements of the Act, other applicable laws, and the following general management principles. Management plans will state: General principles for any land acquisition which may be necessary; the kinds and amounts of public use which the river area can sustain without impact to the values for which it was designated; and specific management measures which will be used to implement the management objectives for each of the various river segments and protect esthetic, scenic, historic, archaeologic and scientific features.

If the classification or classifications determined in the management plan differ from those stated in the study report, the management plan will describe the changes in the existing condition of the river area or other considerations which required the change in classification.

General Management Principles

Section 10(a) states,

> *Each component of the national wild and scenic rivers system shall be administered in such a manner as to protect and enhance the values which caused it to be included in said system without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration primary emphasis shall be given to protecting its esthetic, scenic, historic, archaeologic, and scientific features. Management plans for any such component may establish varying degrees of intensity for its protection and development on the special attributes of the area.*

This section is interpreted as stating a nondegradation and enhancement policy for all designated river areas, regardless of classification. Each component will be managed to protect and enhance the values for which the river was designated, while providing for public recreation and resource uses which do not adversely impact or degrade those values. Specific management strategies will vary according to classification but will always be designed to protect and enhance the values of the river area. Land uses and developments on private lands within the river area which were in existence when the river was designated may be permitted to continue. New land uses must be evaluated for their compatibility with the purposes of the Act.

The management principles which follow stem from section 10(a). Managing agencies will implement these principles to the fullest extent possible under their general statutory authorities and existing Federal, State and local laws. Because of these limitations, however, implementation of the principles may differ among and within components of the system depending on whether the land areas involved are federally, State, locally or privately owned.

Carrying Capacity. Studies will be made during preparation of the management plan and periodically thereafter to determine the quantity and mixture of recreation and other public use which can be permitted without adverse impact on the resource values of the river area. Management of the river area can then be planned accordingly.

Public Use and Access. Public use will be regulated and distributed where necessary to protect and enhance (by allowing natural recovery where resources have been damaged) the resource values of the river area. Public use may be controlled by limiting access to the river, by issuing permits, or by other means available to the managing agency through its general statutory authorities.

Basic Facilities. The managing agency may provide basic facilities to absorb user impacts on the resource. Wild river areas will contain only the basic minimum facilities in keeping with the "essentially primitive" nature of the area. If facilities such as toilets and refuse containers are necessary, they will generally be located at access points or at a sufficient distance from the river bank to minimize their intrusive impact. In scenic and recreational river areas, simple comfort and convenience facilities such as toilets, shelters, fireplaces, picnic tables and refuse containers are appropriate. These, when placed within the river area, will be judiciously located to protect the values of popular areas from the impacts of public use.

Major Facilities. Major public use facilities such as developed campgrounds, major visitor centers and administrative headquarters will, where feasible, be located outside the river area. If such facilities are necessary to provide for public use and/or to protect the river resource, and location outside the river area is infeasible, such facilities may be located within the river area provided they do not have an adverse effect on the values for which the river area was designated.

Motorized Travel. Motorized travel on land or water is generally permitted in wild, scenic and recreational river areas, but will be restricted or prohibited where necessary to protect the values for which the river area was designated.

Agricultural and Forestry Practices. Agricultural and forestry practices should be similar in nature and intensity to those present in the area at the time of designation. Generally, uses more intensive than grazing and hay production are incompatible with wild river classification. Row crop production and timber harvest may be practice in recreational and scenic river areas. Recreational river areas may contain an even larger range of agricultural and forestry uses. Timber harvest in any river area will be conducted so as to avoid adverse impacts on the river area values.

Other Resource Management Practices. Resource management practices will be limited to those which are necessary for protection, conservation, rehabilitation or enhancement of the river area resources. Such features as trail bridges, fences, water bars and drainage ditches, flow measurement devices and other minor structures or management practices are permitted when compatible with the classification of the river area and provided that the area remains natural in appearance and the practices or structures harmonize with the surrounding environment.

Water Quality. Consistent with the Clean Water Act, water quality in wild, scenic and recreational river areas will be maintained or, where necessary, improved to levels which meet Federal criteria or federally approved State standards for aesthetics and fish and wildlife propagation. River managers will work with local authorities to abate activities within the river area which are degrading or would degrade existing water quality.

Additional management principles stem from other sections of the Act as follows:

- Land Acquisition: Section 6
- Water Resource Development: Section 7
- Mining: Section 9
- Management of Adjacent Federal Lands: Section 12(a)
- Hunting and Fishing: Section 13(a)
- Water Rights: Section 13(b)-(f)
- Rights-of-Way: Section 13(g)

The following policies are consistent with and supplement the management principles stated in the Act:

Land Use Controls. Existing patterns of land use and ownership should be maintained, provided they remain consistent with the purposes of the Act. Where land use controls are necessary to protect river area values, the managing agency will utilize a full range of land-use control measures including zoning, easements and fee acquisition.

Rights-of-Way. In the absence of reasonable alternative routes, new public utility rights-of-way on Federal lands affecting a Wild and Scenic River area or study area will be permitted. Where new rights-of-way are unavoidable, locations and construction techniques will be selected to minimize adverse effects on scenic, recreational, fish and wildlife and other values of the river area.

Other legislation applicable to the various managing agencies may also apply to wild and scenic river areas. Where conflicts exist between the provisions of the Wild and Scenic Rivers Act and other acts applicable to lands within the system, the more restrictive provisions providing for protection of the river values shall apply.

Table 1 -- Accelerated Study Schedule

(omitted, no longer used)

Table 2 -- Classification Criteria for Wild, Scenic and Recreational River Areas

ATTRIBUTE	WILD	SCENIC	RECREATIONAL
Water Resources Development	Free of impoundment.	Free of impoundment.	Some existing impoundment or diversion. The existance of low dams, diversions, or other modifications of the waterway is acceptable, provided the waterway remains generally natural and riverine in appearance.
Shoreline Development	Essentially primitive. Little or no evidence of human activity. The presence of a few inconspicuous structures, particularly those of historic or cultural value, is acceptable. A limited amount of domestic livestock grazing or hay production is acceptable. Little or no evidence of past timber harvest. No ongoing timber harvest.	Largely primitve and undeveloped. No substantial evidence of human activity. The presence of small communities or dispersed dwellings or farm structures is acceptable. The presence of grazing, hay production, or row crops is acceptable. Evidence of past or ongoing timber harvest is acceptable, provided the forest appears natural from the riverbank.	Some development. Substantial evidence of human activity. The presence of extensive residential development and a few commercial structures is acceptable. Lands may have been developed for the full range of agricultural and forestry uses. May show evidence of past and ongoing timber harvest.
Accessibility	Generally inaccessible except by trail. No roads, railroads or other provision for vehicular travel within the river area. A few existing roads leading to the boundary of the river area is acceptable.	Accessible in places by road. Roads may occasionally reach or bridge the river. The existance of short stretches of conspicuous or longer stretches of inconspicuous roads or railroads is acceptable.	Readily accessible by road or railroad. The existance of parallel roads or railroads on one or both banks as well as bridge crossings and other river access points is acceptable.

Water Quality	Meets or exceeds federal criteria or federally approved state standards for aesthetics, for propagation of fish and wildlife normally adapted to the habitat of the river, and for primary contact recreation (swimming), except where exceeded by natural conditions.	No criteria prescribed by the Wild and Scenic Rivers Act. The Federal Water Polution Control Act Amendments of 1972 have made it a national goal that all waters of the United States be made fishable and swimmable. Therefore, rivers will not be precluded from scenic or recreational classification because of poor water quality at the time of their study, provided a water quality improvement plan exists or is being developed in compliance with applicable federal and state laws.

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CHAPTER 83-358

Committee Substitute for Senate Bill No. 459

An act relating to the Loxahatchee River; creating the Loxahatchee River Wild and Scenic Designation and Preservation Act; providing legislative declarations and intent; providing definitions; designating a portion of the river as a wild and scenic river; providing for development of a management plan; providing for a coordinating council; authorizing the Governor to apply for inclusion of the designated portion of the river in the National Wild and Scenic Rivers System; providing for preservation of existing governmental authority; providing for rules; specifying regulatory and permitting authority; providing for enforcement; providing for injunctions; specifying violations and penalties; providing for repeal; providing an effective date.

Be It Enacted by the Legislature of the State of Florida:

Section 1. Short title.--Sections 1 through 12 of this act may be cited as the "Loxahatchee River Wild and Scenic Designation and Preservation Act."

Section 2. Legislative declaration.--The Legislature finds and declares that a certain segment of the Loxahatchee River in Palm Beach and Martin Counties possesses outstandingly remarkable ecological, fish and wildlife, and recreational values which are unique in the United States. These values give national significance to the river as one which should be permanently preserved and enhanced, not only for the citizens of the State of Florida, but for the citizens of the United States, of present and future generations. The permanent management and administration of the river, however, involves a complex interaction of national, state, regional, and local interests which require balancing, coordination of purpose and continuing participation by and access to the public, through its elected representatives. It is the intention of the Legislature to provide for the permanent preservation of the designated segment of the Loxahatchee River by way of development of a plan for permanent administration by agencies of the state and local government which will ensure the degree of protection necessary for inclusion of that segment of the river in the National Wild and Scenic Rivers System but retaining that degree of flexibility, responsiveness, and expertise which will accommodate all of the diverse interests involved in a manner best calculated to be in the public interest.

Section 3. Definitions.--As used in this act:

(1) "Activity" means the doing of any act or the failing to do any act, whether by a natural person or a corporation.

(2) "Board" means the governing board of the South Florida Water Management District.

(3) "Coordinating Council" means the council created by s. 5(3)(o).

(4) "Department" means the Department of Natural Resources.

(5) "Division" means the Division of Recreation and Parks of the Department of Natural Resources.

(6) "Executive Board" means the Governor and Cabinet sitting as the head of the Department of Natural Resources.

(7) "Resource value" means any one or more of the specific scenic, recreational, geologic, fish and wildlife, historic, cultural, or ecological features identified by the National Park Service, Department of the Interior, in its Draft Wild and Scenic Rivers Study/Draft Environmental Impact Statement as being outstandingly remarkable or worthy of note.

(8) "River area" means that portion of the Northwest Fork of the Loxahatchee River from river mile 6 to river mile 13.5, together with such abutting uplands as determined in the permanent management plan to form the corridor having visual impact on the river user, and which may be necessary to maintain the natural and scenic appeal of the river.

Section 4. Designation of wild and scenic river.--The Northwest Fork of the Loxahatchee River between river mile 6 and river mile 13.5 is hereby designated as a wild and scenic river for the purposes of this act and subject to all of the provisions of this act. Such designated portion is more particularly described as that portion of the Northwest Fork downstream of the southern boundary of Riverbend County Park located in Palm Beach County and upstream of an east-west line passing through a point where the southern boundary of Jonathan Dickinson State Park intersects the eastern shoreline of the river.

Section 5. Development of management plan.--

(1) The department and the South Florida Water Management District shall jointly develop a proposed management plan for the designated segment of tne Loxahatchee River, which management plan, subject to and consistent with the provisions of this act, will be designed to qualify the designated segment of the river for inclusion in the National Wild and Scenic Rivers System.

(2) The development of the proposed management plan shall include participation by the National Park Service, by all appropriate state agencies, by all appropriate or interested local governments, including but not limited to Palm Beach County, Martin County, the Jupiter Inlet District, the Town of Jupiter, the Loxahatchee River Environmental Control District, the South Indian River Water Control District, and the Northern Palm Beach County Water Control District, the Palm Beach County Farm Bureau, and by any others deemed advisable by the department or board. To the extent not inconsistent with the provisions of this act, the plan shall include such conditions as the United States Secretary of the Interior may require.

(3) The proposed management plan shall include provision for:

(a) Permanent protection and enhancement of the ecological, fish and wildlife, and recreational values identified by the National Park Service in its draft study of the river and for which the river was chosen for inclusion in the system without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of those values; primary emphasis being given to protecting esthetic, scenic, historic, archaeologic, and scientific features;

(b) Continuation of land uses and developments on private lands within the river area which are in existence on the effective date of this act which are not incompatible with the purposes of designation;

(c) Periodic studies to determine the quantity and mixture of recreation and other public uses which can be permitted without adverse impact on the resource values of the river area;

(d) Regulation and distribution of public access where necessary to protect and enhance the resource values of the river area;

(e) Basic facilities to absorb user impact on the river area, including necessary toilet or refuse containers, but located in order to minimize their intrusive impact;

(f) Location of major facilities such as developed campgrounds, visitor centers, and administrative headquarters outside the river area;

(g) Restriction of motorized travel by land vehicle or boat where necessary to protect the resource values in the river area;

(h) Agricultural and forestry practices similar in nature and intensity or less intensive than those present in the river area on the effective date of this act;

(i) Limitation of resource management practices to those necessary for protection, conservation, rehabilitation, or enhancement of river area resource values;

(j) Maintenance of existing water quality;

(k) Whenever alternative routes are unavailable, location and construction of new public utility or road, rights-of-way in a way which minimizes adverse effects on scenic, recreational, fish and wildlife, and other resource values in the river area;

(l) Continuance of existing drainage and water management practices, unless such existing practices will degrade or diminish existing water quality or existing resource values in the river area, and allowance of new water resource management practices which will not have a substantial adverse impact on resource values in the river area;

(m) Review and regulation of all activities conducted or proposed to be conducted which will or may have a substantial adverse impact on any of the resource values in the river area as provided in this act;

(n) Continuation of activities or developments below or above the designated segment which will not invade the river area or substantially diminish the scenic, recreational, and fish and wildlife resource values present in the river area on the effective date of this act; and

(o) A permanent management coordinating council composed of one representative from each of the participants provided for in subsection (2). The coordinating council shall review and make recommendations, in the first instance, on all applications for permits required by this act, as well as all proposals for amendments or modifications to the permanent management plan, and render its nonbinding advisory opinion to the board and the department. Each participant shall appoint one member to the coordinating council. The coordinating council shall elect a chairman, vice chairman, and secretary to serve for a term of 1 year. The coordinating council shall adopt bylaws to provide for such other officers as it may deem necessary, election of officers, removal of officers for just cause, meetings, quorum, procedures for the conduct of its business, and such other matters as the membership may deem advisable in the conduct of its business. Such professional staff as the coordinating council may require shall be provided by the South Florida Water Management District.

(4) To the extent not inconsistent with this act, the proposed management plan may also include any other provisions deemed by the department and the board to be necessary or advisable for the permanent protection of the river as a component of the National Wild and Scenic Rivers System.

Section 6. Authority for application for inclusion in National Wild and Scenic Rivers System.--Upon completion of the development of a proposed management plan, the executive director of the department shall forward the proposed management plan to the executive board. After the executive board has received, reviewed and accepted a proposed management plan, the Governor may apply to the United States Secretary of the Interior for inclusion of the designated segment of the Loxahatchee River into the National Wild and Scenic Rivers System.

Section 7. Preservation of existing governmental authority.--

(1) Nothing contained in this act shall operate to divest any agency, water management district, municipality, county, or special district of any authority or jurisdiction in existence on the effective date of this act.

(2) Construction and maintenance of improvements at the Jupiter Inlet and in the Loxahatchee River downstream from the designated segment for purposes of navigation, waterway flushing, or upland drainage, including creation or preservation of channels, maintenance dredging, jetty improvements, riprapping, construction of groins and similar improvements, and removal of sand or dead oyster shell bars when deemed to have a potential for substantial adverse impact on the resource values of the river area shall be undertaken using techniques which minimize adverse effects on scenic, recreational, fish and wildlife and other values of the river area.

Section 8. Rulemaking authority.--After approval by the Secretary of the Interior of an application by the Governor under this act for inclusion of the Loxahatchee River in the National Wild and Scenic Rivers System, the board and the department shall each have full authority under their separate jurisdictions as provided in s. 9 to adopt rules deemed necessary for the discharge of the respective duties of each as provided herein, including the adoption of the proposed management plan as the permanent management plan, and including the power to adopt rules modifying or amending the management plan in accordance with the provisions of this act and rules providing for permanent management of the designated segment as a component of the National Wild and Scenic Rivers System.

Section 9. Separation of regulatory authority.--

(1) The department shall have full and exclusive authority to adopt rules concerning and to regulate activities within the river area having a direct and substantial adverse effect on any resource value within the river area.

(2) The board shall have full and exclusive authority to adopt rules concerning and to regulate activities outside the river area having substantial adverse impact on resource values within the river area.

(3) The department and the board shall coordinate all activities related to rule adoption and enforcement in order to avoid to the maximum extent possible any conflicts or duplication arising therefrom.

Section 10. Permitting authority.--

(1) No person or entity shall conduct any activity or do anything which will or may have an adverse impact on any resource value in the river area without first having received a permit from the board or the department, as appropriate.

(2) Any applicant for a permit shall file an application for a permit with the board or the department, whichever has regulatory authority, upon such forms and in such manner as the board or the department shall by rule require. The board and the department may require, with or in addition to such applications, the furnishing of any information deemed necessary or desirable for full and complete consideration of all factors relevant to informed decisions on the applications.

(3) A permit may be granted only after a finding by the board or the department, whichever has regulatory authority, that the activity for which a permit has been requested will not have a substantial adverse impact on resource values in the river area.

(4) The board and the department may adopt an application fee schedule providing for payment of reasonable fees to defray the cost of processing applications.

(5) The provisions of chapter 120, Florida Statutes, shall apply to the board and to the department, but not to the coordinating council, in carrying out the functions and duties prescribed for each by this act.

Section 11. Enforcement.--

(1) Officers of the division shall have full authority to enforce any rule adopted under this act with the same police powers given them by law to enforce the rules of state parks.

(2) The board shall have full power to enforce this act or any rule adopted under this act by action for injunctive relief or by any other method available for enforcement of rules adopted under chapter 373.

Section 12. Penalties.--Violation of any rule adopted under this act constitutes a misdemeanor of the second degree, punishable as provided in s. 775.082 or s. 775.083, Florida Statutes. Continuing violation after notice constitutes a separate violation for each day so continued.

Section 13. This act is repealed on a date 2 years after the effective date of this act, unless the portion of the Loxahatchee River designated by this act as a wild and scenic river is included in the National Wild and Scenic Rivers System on or before that date.

Section 14. This act shall take effect upon becoming a law.

Approved by the Governor June 24, 1983.

Filed in Office Secretary of State June 24, 1983.

RESOLUTION

WHEREAS the Governor and Cabinet sitting as Head of the Department of Natural Resources have considered a Loxahatchee River Wild and Scenic Rivers Study and draft Environmental Impact Statement prepared by the United States Department of the Interior; and

WHEREAS the Department of the Interior has concluded that a 7.5-mile segment of the Loxahatchee River in Palm Beach and Martin Counties meets the criteria for inclusion in the National Wild and Scenic Rivers System; and

WHEREAS it would be in the best interest of the State to preserve and, to the maximum degree possible, enhance this exceptional resource:

NOW, THEREFORE, BE IT RESOLVED that the Governor and Cabinet sitting as Head of the State of Florida Department of Natural Resources do hereby endorse in concept the inclusion of the identified 7.5-mile segment of the Loxahatchee River in the National Wild and Scenic Rivers System, and do direct the Department of Natural Resources staff, in concert with affected state, federal, regional, and local agencies, to develop a management plan which satisfies federal requirements for including the Loxahatchee River in the National Wild and Scenic Rivers System. The principal goals of the plan will be to preserve and enhance the river's unique natural values, restore the river's historical hydrologic regime, and reverse deleterious saltwater intrusion into the river. The staff is further directed to submit the plan to the Board for final consideration.

Adopted this 11th day of January, 1983, by the Governor and the Cabinet of the State of Florida as Head of the State of Florida Department of Natural Resources.

Bob Graham
Governor

George Firestone
Secretary of State

Jim Smith
Attorney General

Gerald Lewis
Comptroller

Bill Gunter
Treasurer

Doyle Conner
Commissioner of Agriculture

Ralph D. Turlington
Commissioner of Education

MINIMUM FLOWS AND LEVELS

Part I: General

PART I: GENERAL

40E-8.011 Purpose and General Provisions.

(1) The purpose of this Chapter is:

(a) To establish minimum flows for specific surface watercourses and minimum water levels for specific surface waters and specific aquifers within the South Florida Water Management District, pursuant to Section 373.042, F.S.; and;

(b) To establish the rule framework for implementation of recovery and prevention strategies, developed pursuant to Section 373.0421, F.S.

(2) Minimum flows are established to identify where further withdrawals would cause significant harm to the water resources, or to the ecology of the area. Minimum levels are established to identify where further withdrawals would cause significant harm to the water resources of the area. Specific minimum flows and levels (MFLs) are established in this rule for specified priority water bodies that have been designated pursuant to Section 373.042(2) F.S.

(3) The MFL's established herein are based on existing best available information, and will be periodically reviewed, at least every five years, based on new information and changing water resource conditions. Revisions to established MFLs will be peer reviewed as required by Section 373.042, F.S., prior to rule adoption. The minimum flow criteria for the Caloosahatchee River in Rule 40E-8.221(2), F.A.C., shall be reviewed within one year of the effective date of this rule (September 10, 2001) and amended, as necessary, based on best available information.

(4) The recovery and prevention strategies set forth in Rule 40E-8.421, F.A.C., the consumptive use permitting procedures described in Paragraph ~~Rules~~ 40E-2.301(1)(i), Rule 40E-8.431, F.A.C., and Section 3.9 of the "Basis of Review for Water Use Permit Applications within the South Florida Water Management District – September 2001," and the water shortage plan implementation provisions specified in Rules 40E-8.441, 40E-21.531, and 40E-

21.541, and Part III of Chapter 40E-22, F.A.C., are inseparable components of the minimum flows and levels established in Rules 40E-8.321 and 40E-8.331, F.A.C. The District would not have adopted the minimum flows and levels set forth in Rules 40E-8.321 and 40E-8.331, F.A.C. for Lake Okeechobee, the Everglades, the Biscayne Aquifer, the Lower West Coast Aquifers, and the Caloosahatchee River without simultaneously adopting their related implementation rules. If the rules cited above, as they pertain to a specified MFL water body, are found to be invalid, in whole or in part, such specified minimum flow(s) or level(s) in Rule 40E-8.321 or 40E-8.331, F.A.C., (including Lake Okeechobee, Everglades, Biscayne Aquifer, Lower West Coast Aquifers, Caloosahatchee River) shall not be adopted, or if already in effect, shall not continue to be applied, until the District amends the applicable regional water supply plan(s), as necessary, and amends the subject rules, as necessary to address the reason for invalidity consistent with the requirements of Section 373.0421, F.S. This section shall be triggered after a rule is found to be invalid pursuant to a final order issued under Section 120.56, F.S., and after appellate review remedies have been exhausted.

Specific Authority 373.044, 373.113, 373.171 FS.

Law Implemented 373.016, 373.036, 373.0361, 373.042, 373.0421 FS.

History - New 9-10-01.

40E-8.021 Definitions.

The terms set forth herein shall have the meanings ascribed to them, unless the context clearly indicates otherwise, and such meanings shall apply throughout the rules contained in this Chapter. The terms defined in Rule 40E-8.021, F.A.C., shall apply throughout the District's consumptive use permit rules. In the event of a conflict or difference between the definitions contained in Rule 40E-8.021, F.A.C., and the definitions set forth in other District rules, the definitions in this Rule 40E-8.021, F.A.C., shall control for purposes of this chapter.

(1) Biscayne Aquifer – means the highly permeable surficial strata (hydraulic conductivities generally greater than 500 ft/day) that occur within Monroe, Miami-Dade (excluding those portions of coastal Monroe and Miami-Dade counties that discharge groundwater into Florida and Biscayne Bays), eastern Broward, and portions of eastern Palm Beach counties.

(2) Caloosahatchee River – means the surface waters that flow through the S-79 structure, combined with tributary contributions below S-79 that collectively flow southwest to San Carlos Bay.

(3) C&SF Project – means the project for Central and Southern Florida authorized under the heading 'CENTRAL AND SOUTHERN FLORIDA' in section 203 of the Flood Control Act of 1948 (Chapter 771).

(4) CERP – means the Comprehensive Everglades Restoration Plan contained in the 'Final Integrated Feasibility Report and Programmatic Environmental Impact Statement', dated April 1, 1999, as modified by the Water Resources Development Act of 2000.

(5) Certification or Certify – means the formal determination by the District, through a validation process consistent with state and federal law, of the total amount of water made available by a project or project phase of a recovery or prevention strategy, as appropriate, for natural systems and other uses.

(6) Direct Withdrawal means:

(a) A ground water withdrawal that causes a water table drawdown greater than 0.1 feet, as determined using a model accepted by the District, at any location beneath the MFL surface water body or aquifer, up through a 1 in 10 year drought; or

(b) A surface water withdrawal from facilities physically located within the boundaries of a MFL surface water body.

(7) Everglades – means the lands and waters included within Water Conservation Areas, the Holeyland/Rotenberger wildlife management areas, and the freshwater portions of the Everglades National Park.

(8) Harm – means the temporary loss of water resource functions, as defined for consumptive use permitting in Chapter 40E-2, F.A.C., that results from a change in surface or ground water hydrology and takes a period of one to two years of average rainfall conditions to recover.

(9) Indirect Withdrawal – means the withdrawal of water from a water source for a consumptive use that receives surface water or ground water from a MFL water body or is tributary to a MFL water body.

(10) Lake Okeechobee – means the lands and waters contained within the perimeter of the Hoover Dike.

(11) LEC Plan – means the Lower East Coast Regional Water Supply Plan – May 2000, including all three volumes.

(12) Lower West Coast Aquifers – means the lower Tamiami aquifer, sandstone aquifer and the mid-Hawthorn aquifer that occur within Charlotte, Hendry, Glades, Lee and Collier counties.

(13) LWC Plan – means the Lower West Coast Regional Water Supply Plan – April 2000, including all three volumes.

(14) Minimum Flow – means a flow established by the District pursuant to Sections 373.042 and 373.0421, F.S., for a given water body and set forth in Parts II and III of this chapter, at which further withdrawals would be significantly harmful to the water resources or ecology of the area.

(15) Minimum Flow and Level Exceedance – means to fall below a minimum flow or level, which is established in Parts II and III of this chapter, for a duration greater than specified for the MFL water body.

(16) Minimum Flow and Level Violation – means to fall below a minimum flow or minimum level, which is established in Parts II and III of this chapter, for a duration and frequency greater than specified for the MFL water body. Unless otherwise specified herein, in determining the frequency with which water flows and levels fall below an established MFL for purposes of determining a MFL violation , a "year" means 365 days from the last day of the previous MFL exceedance.

(17) Minimum Level – means the level of groundwater in an aquifer or the level of surface water established by the District pursuant to Sections 373.042 and

373.0421, F.S., in Parts II and III of this chapter, at which further withdrawals would be significantly harmful to the water resources of the area.

(18) MFL Water Body – means any surface water, watercourse, or aquifer for which an MFL is established in Part II or III of this chapter.

(19) Operations – means activities taken by the District for the movement of surface water through works of the District pursuant to Chapter 373, F.S.

(20) Prevention Strategy(ies) – means the structural and non-structural actions approved by the District in regional water supply plans, pursuant to Section 373.0421, F.S., or by rule, for areas where MFLs are currently not violated, but are projected to be violated within twenty (20) years of the establishment of the minimum flow or level, if said prevention strategies are not implemented.

(21) Recovery Strategy(ies) – means the structural and non-structural actions approved by the District in regional water supply plans, pursuant to Section 373.0421, F.S., or by rule, for areas where MFLs are currently violated.

(22) Regional Water Supply Plan – means a plan approved by the District pursuant to Section 373.0361, F.S.

(23) Serious Harm – means the long-term loss of water resource functions, as addressed in Chapters 40E-21 and 40E-22, F.A.C., resulting from a change in surface or ground water hydrology.

(24) Significant Harm – means the temporary loss of water resource functions, which result from a change in surface or ground water hydrology, that takes more than two years to recover, but which is considered less severe than serious harm. The specific water resource functions addressed by a MFL and the

duration of the recovery period associated with significant harm are defined for each priority water body based on the MFL technical support document.

Specific Authority 373.044, 373.113, 373.171 FS.

Law Implemented 373.016, 373.036, 373.0361, 373.042, 373.0421 FS.

History – New 9-10-01.

PART II: MFL CRITERIA LOWER EAST COAST REGIONAL PLANNING AREA

40E-8.221: Minimum Flows and Levels Surface Waters.

The MFLs contained in this Part identify the point at which further withdrawals would cause significant harm to the water resources, or ecology, of the area as applicable, pursuant to Sections 373.042 and 373.0421, F.S. It is the District's intent to correct or prevent the violation of these MFLs through management of the water resources.

(1) Lake Okeechobee. An MFL violation occurs in Lake Okeechobee when an exceedance, as defined herein, occurs more than once every six years. An "exceedance" is a decline below 11 feet NGVD for more than 80, non-consecutive or consecutive, days, during an eighteen month period. The eighteen month period shall be initiated following the first day Lake Okeechobee falls below 11 feet NGVD, and shall not include more than one wet season, defined as May 31st through October 31st of any given calendar year.

(2) Caloosahatchee River. A minimum mean monthly flow of 300 CFS is necessary to maintain sufficient salinities at S-79 in order to prevent a MFL exceedance. A MFL exceedance occurs during a 365 day period, when: (a) a

30-day average salinity concentration exceeds 10 parts per thousand at the Ft. Myers salinity station (measured at 20% of the total river depth from the water surface at a location of latitude 263907.260, longitude 815209.296; or (b) a single, daily average salinity exceeds a concentration of 20 parts per thousand at the Ft. Myers salinity station. Exceedance of either subsection (a) or subsection (b), for two consecutive years is a violation of the MFL.

(3) Everglades.

(a) Criteria for Peat-Forming Wetlands. Water levels within wetlands overlying organic peat soils within the water conservation areas, Rotenberger and Holeyland wildlife management areas, and Shark River Slough (Everglades National Park) shall not fall 1.0 feet or more below ground surface, as measured at a key gage, for one or more days during a period in which the water level has remained below ground for a minimum of 30 days, at specific return frequencies as specified in Table 1, below.

(b) Criteria for Marl-Forming Wetlands. Water levels within marl-forming wetlands that are located east and west of Shark River Slough, the Rocky Glades, and Taylor Slough within Everglades National Park, shall not fall 1.5 feet below ground surface, as measured at a key gage, for one or more days during a period in which the water level has remained below ground for a minimum of 90 days, at specific return frequencies for different areas, as identified in Table 1, below.

The MFL criteria listed in Table 1 are based on existing changes and structural alterations to the pre-drainage conditions of the Everglades. It is the District's intent through implementation of the LEC Plan and the CERP to achieve minimum hydropattern return frequencies that approximate CERP compatible pre-drainage conditions in the Everglades. As a result, as the existing structural changes and alterations are corrected, the MFL criteria contained herein will be modified through a rule amendment consistent with the LEC Plan and the CERP.

Specific Authority 373.044, 373.113, 373.171 FS.

Law Implemented 373.016, 373.036, 373.0361, 373.042, 373.0421 FS.

History – New 9-10-01.

Table 1. Minimum water levels, duration and return frequencies for key water management gages located within the Everglades [1,2, 3]

Area	Key Gage	Soil Type & MFL Criteria	Return Frequency (years) [3]-[4]
WCA-1	1-7	Peat[1]	1 in 4
WCA-2A	2A-17	Peat	1 in 4
WCA-2B	2B-21	Peat	1 in 3
WCA-3A North	3A-NE	Peat	1 in 2
WCA-3A North	3A-NW	Peat	1 in 4
WCA-3A North	3A-2	Peat	1 in 4
WCA-3A North	3A-3	Peat	1 in 3
WCA-3A central	3A-4	Peat	1 in 4
WCA-3A South	3A-28	Peat	1 in 4
WCA-3B	3B-SE	Peat	1 in 7
Rotenberger WMA	Rotts	Peat	1 in 2
Holeyland WMA	HoleyG	Peat	1 in 3
NE Shark Slough	NESRS-2	Peat	1 in 10
Central Shark Slough	NP-33	Peat	1 in 10
Central Shark Slough	NP 36	Peat	1 in 7
Marl wetlands east of Shark Slough	NP-38	Marl [2]	1 in 3
Marl wetlands west of Shark Slough	NP-201 G-620	Marl	1 in 5
Rockland marl marsh	G-1502	Marl	1 in 2
Taylor Slough	NP-67	Marl	1 in 2

(1) = MFL Criteria for Peat-forming wetlands: ***Water levels within wetlands overlying organic peat soils within the water conservation areas, Rotenberger and Holeyland wildlife management areas, and Shark River Slough (Everglades National Park) shall not fall 1.0 feet or more below ground surface, as measured at a key gage, for one or more days during a period in which the water level has remained below ground for at least 30 days, at specific return frequencies shown above.***

(2) = MFL Criteria for Marl-forming wetlands: ***Water levels within marl-forming wetlands that are located east and west of Shark River Slough, the Rocky Glades, and Taylor Slough within the Everglades National Park, shall not fall 1.5 ft. below ground surface, as measured at a key gage, for one or more days during a period in which the water level has remained below ground for at least 90 days, at specific return frequencies for different areas, as shown above.***

(3) = ***Return frequencies were developed using version 3.7 of the South Florida Water Management Model (SFWMM) and are the same as those stated on page 168, Table 44 of the adopted LEC Regional Water Supply Plan (May 2000).***

(4) = MFL depth, duration and return frequencies are based on historic rainfall conditions for the 31 year period of record from 1965 to 1995.

40E-8.231 Minimum Levels: Aquifers.

Biscayne Aquifer - The minimum level for the Biscayne aquifer is the level that results in movement of the saltwater interface landward to the extent that ground water quality at an established withdrawal point is insufficient to serve as a water supply source. A MFL violation occurs when water levels within the aquifer produce this degree of saltwater movement at any point in time.

Specific Authority 373.044, 373.113, 373.171 F.S.

Law Implemented 373.016, 373.036, 373.0361, 373.042, 373.0421, F.S.

History - New 9-10-01.

PART III: MFL CRITERIA FOR LOWER WEST COAST REGIONAL PLANNING AREA

40E-8.321 Minimum Flows and Levels: Surface Waters.

The MFLs contained in this Part identify the point at which further withdrawals would cause significant harm to the water resources~~,~~ or ecology, of the area, as applicable, pursuant to Sections 373.042 and 373.0421, F.S. It is the District's intent to correct or prevent the violation of these criteria through management of the water resources.

Specific Authority 373.044, 373.113, 373.119, 373.129, 373.136, 373.171 FS.

Law Implemented 373.016, 373.036, 373.0361, 373.042, 373.0421, 373.175, 373.216, 373.219, 373.223, 373.246 FS.

History - New 9-10-01.

40E-8.331 Minimum Levels: Aquifers.

The minimum levels for the lower Tamiami aquifer, the Sandstone aquifer and the mid-Hawthorn aquifer shall equal the structural top of the aquifer. A violation of this criteria occurs when the water levels drop below the top of the uppermost geologic strata that comprises the aquifer, at any point in time. Water level measurements that are made to monitor the conditions of the aquifers for the purpose of this rule, shall be located no closer than 50 feet from any existing pumping well.

Specific Authority 373.044, 373.113, 373.171 FS.

Law Implemented 373.016, 373.036, 373.0361, 373.042, 373.0421 FS.

History - New 9-10-01.

PART IV: IMPLEMENTATION

40E-8.421 Prevention and Recovery Strategies.

(1) At the time of adoption of this rule, the existing flow or level for certain specified water bodies is below, or within 20 years is projected to fall below, the applicable MFL. For this reason, Section 373.0361, F.S., requires regional water supply plans to contain recovery and prevention strategies, including water resource development and water supply development projects that are needed to achieve compliance with MFLs during the planning period. The implementation of such projects will allow for the orderly replacement or enhancement of existing water sources with alternative supplies in order to provide sufficient water for all existing and projected reasonable-beneficial uses, consistent with Section 373.0421, F.S.

(a) MFLs and recovery and prevention strategies will be implemented in phases with consideration of the District's missions in managing water resources, including water supply, flood protection, environmental enhancement and water quality protection, as required by Section 373.016, F.S.

(b) MFLs are implemented to prevent significant harm to the water resources and, where applicable, the ecology of the area due to further withdrawals (Sections 373.042 and 373.0421, F.S.). A consumptive use permitting program is implemented to prevent harm to the water resource (Section 373.219, F.S.). A water shortage program is implemented to prevent serious harm to the water resource (Sections 373.175 and 373.246, F.S.). Additionally, the protection of water resources will, in part, be achieved through the reservation of water for fish and wildlife or public health and safety (Section 373.223(4), F.S.). The conceptual model identifying the relationships between these water resource protection requirements is set forth in Figure I in this Part.

(c) The rules implementing water resource protection tools, including Chapters 40E-2, 40E-8, 40E-20, 40E-21, and 40E-22, F.A.C., identify the specific factors and conditions that will be applied and considered in implementing the conceptual model. Due to the extreme variations in water resource conditions, climatic conditions, hydrologic conditions, and economic considerations that will be faced when implementing these rules, it is critical to apply such criteria flexibly and to reserve for the governing board the ability to implement water resource protection and allocation programs considering all of the District's missions under Chapter 373, F.S., and to balance water supply, flood protection, resource protection and water quality protection needs. Implementation of the recovery and prevention strategies will be achieved in compliance with the assurances to consumptive users and to natural systems contained in the LEC Plan and the LWC Plan.

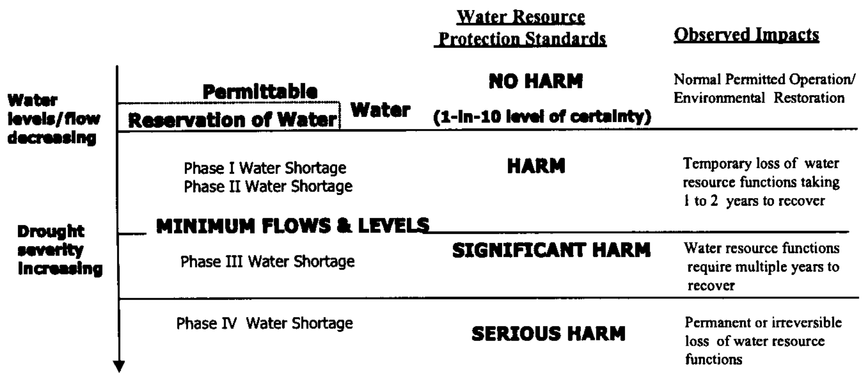
(d) The phasing and timetables for implementation of structural components in recovery and prevention strategies contained in approved regional water supply plans are found to meet the requirements in Section 373.0421(2), F.S., for the expeditious and practicable recovery of the MFLs.

(e) Upon completion of each project or project phase of a recovery or prevention plan the District will certify the availability of water, as defined in Subsection ~~Rule~~ 40E-8.021(5), F.A.C.

(f) In order to ensure that the actual and projected performance of prevention and recovery strategies approved in the regional waters supply plans is sufficient to meet water resource needs, including MFLs, and the existing and projected reasonable-beneficial uses, the District will update recovery and prevention strategies on a periodic basis, based on new information and system performance.

The performance of the recovery and prevention strategies in comparison to the performance projected in the regional water supply plans, will be assessed by the District for each recovery or prevention strategy phase. Based on the actual performance and new information obtained regarding the water resources, the District will review and revise, if necessary, recovery and prevention strategies through the regional water supply plan update process every five years, or sooner, as required by Section 373.0361, F.S. At that time, the governing board will determine if rule modifications to the MFL or recovery and prevention strategies are necessary to continue to meet the requirements of Sections 373.042 and 373.0421, F.S.

Figure 1: Conceptual Relationship Among the Harm, Serious Harm and Significant Harm Standards



(2) The Everglades and the Caloosahatchee River

(a) As the effective date of this rule, the Everglades and Caloosahatchee River have experienced MFL violations. As a result, the LEC Plan and the LWC Plan contain approved recovery strategies, pursuant to Section 373.0421, F.S. Included in these recovery and prevention strategies is the CERP.

b) MFLs for many areas within the Everglades and the Caloosahatchee River, served by the C&SF Project, will not be achieved immediately upon adoption of this rule largely because of the lack of adequate regional storage or ineffective water drainage and distribution infrastructure. Although not all locations within the Everglades are currently in violation of the proposed MFL, the Everglades, as a whole, is subject to a recovery strategy. The LEC Plan identifies the structural and non-structural remedies necessary for the recovery of MFL water bodies. These structural and non-structural remedies are also intended to restore the Everglades and the Caloosahatchee River above the MFLs, through Chapter 373, F.S. authorities of the District. The projected long-term restoration of flows and levels in the Everglades resulting from implementation of the LEC Plan and the CERP is documented in the LEC Plan, and are intended to more closely approximate "pre-drainage" conditions. The planned components include implementing consumptive use and water shortage programs, removing conveyance limitations, implementing revised C&SF Project operational programs, storing additional freshwater, reserving water for the protection of fish and wildlife, and developing alternative sources for water supply. These components will be implemented over the next 20 years, resulting in a phased restoration of the affected areas.

(c) The District, as the U.S. Army Corps of Engineers' local sponsor of the C &SF Project, is charged with implementing the CERP, in accordance with the Water Resources Development Act of 2000

(WRDA), Title VI entitled "Comprehensive Everglades Restoration," and in accordance with State law. Assurances regarding water availability for consumptive uses and protection of natural systems are set forth in WRDA, Chapter 373, F.S., CERP and the LEC Plan, which will be followed by the District in implementing this Chapter. Additional quantities of water for both consumptive uses and the natural systems made available from the CERP and other water resource development projects will be documented and protected on a project basis. For project components implemented under CERP, the additional quantity, distribution and timing of delivery of water that is made available for the natural system for consumptive use, will be identified consistent with purposes of the CERP. Under State law, water reservations and water allocations to consumptive uses will be utilized to protect water availability for the intended purposes.

(3) Lake Okeechobee. The LEC Plan contains an approved prevention strategy for Lake Okeeechobee pursuant to Section 373.0421, F.S. The prevention strategy consists of implementing the District's water shortage plan, including supply side management, as simulated in the LEC Plan, and constructing and operating water supply and resource development projects.

(4) Biscayne Aquifer. The LEC Plan contains an approved prevention strategy for the Biscayne Aquifer pursuant to Section 373.0421, F.S., which consists of the following:

(a) Maintain coastal canal stages at the minimum operation levels shown in Table J-2 of the LEC Plan;

(b) Apply conditions for permit issuance in Chapter 40E-2 or 40E-20, F.A.C., to prevent the harmful movement of saltwater intrusion up to a 1-in-10 year level of certainty;

(c) Maintain a ground water monitoring network and utilize data to initiate water shortage actions pursuant to Rule 40E-8.441, F.A.C. and Chapters 40E-21 and 40E-22, F.A.C.;

(d) Construct and operate water resource and water supply development projects; and

(e) Conduct research in high risk areas to identify where the portions of the saltwater front is adjacent to existing and future potable water sources.

(5) Lower West Coast Aquifers. The LWC Plan identifies a prevention strategy for the LWC Aquifers, pursuant to Section 373.0421, F.S., as follows:

(a) Establish "no harm" maximum permittable levels for each aquifer (regulatory levels) for a 1-in-10 year level of certainty;

(b) Implement rule criteria to prevent harm through the consumptive use permitting process, including conditions for permit issuance in Rule 40E-2.301, F.A.C.;

(c) Construct and operate water resource and supply development projects; and,

(d) Implement the water shortage plan in Chapter 40E-21, F.A.C., as needed to prevent serious harm during drought conditions in excess of a 1-in-10 year level of certainty.

Specific Authority 373.044, 373.113, 373.171 FS.

Law Implemented 373.016, 373.036, 373.0361, 373.042, 373.0421 FS.

History - New 9-10-01.

40E-8.431 Consumptive Use Permits.

(1) Consumptive use permit applications that propose to withdraw water directly or indirectly from a MFL water body, that meet the conditions for permit issuance in Part II of Chapter 373, F.S., (including implementing rules in this chapter, Chapter 40E-2, the Water Use Basis of Review, and 40E-20, F.A.C. as applicable), and are consistent with the approved recovery and prevention strategies under Section 373.0421, F.S., will be permitted. Consumptive use permit applications will be reviewed based on the recovery and prevention strategy approved at the time of permit application review.

(2) An existing permit will not be subject to revocation or modification by the District, prior to permit expiration, based on its impact on a MFL water body, unless the District has determined in the regional water supply plan that the reasonable-beneficial use served by the existing permitted allocation can otherwise be met from new or alternative water sources available (in place and operational) concurrent with such revocation or modification.

(3) A permittee must comply with the requirements of Rule 40E-2.351, F.A.C., in order to obtain a permit transfer to a new permittee.

Specific Authority 373.044, 373.113, 373.171 FS.

Law Implemented 373.016, 373.036, 373.0361, 373.042, 373.0421 FS.

History - New 9-10-01.

40E-8.441 Water Shortage Plan Implementation.

(1) Water shortage restrictions will be imposed as required by District rules~~,~~ on the direct or indirect withdrawals from a MFL water body if a MFL exceedance occurs or is projected to occur during climatic conditions more severe than a 1 in 10 year drought, to the extent consumptive uses contribute to such exceedance. Under these circumstances, the District will equitably distribute available supplies to prevent serious harm to the water resources, pursuant to Sections 373.175 and 373.246, F.S., and the District's Water Shortage Plan, Chapter 40E-21, F.A.C. The Water Shortage Plan utilizes a phased cutback approach with the severity of use restrictions increasing commensurate with increased potential for serious harm to the water resources.

(2) Water shortage restrictions will not be used in place of a component in an approved recovery plan to provide hydrologic benefits that are ultimately to be provided by such recovery strategy.

(3) MFL criteria will not be utilized to trigger water shortage restrictions during climatic conditions less severe than a 1 in 10 year level of drought.

(4) Water shortage restrictions will be implemented considering the factors in Chapter 40E-21, F.A.C., and this rule. In declaring a water shortage to protect a MFL water body, the governing board shall give consideration to:

(a) The level of drought;

(b) Whether the MFL criteria will be or is being exceeded due to direct or indirect withdrawals;

(c) The magnitude of the impact on the MFL water body, including water resource functions addressed by the MFL, from such withdrawals;

(d) The magnitude of the regional hydrologic improvements projected to be derived from the proposed cutbacks;

(e) Water management actions significantly contributing to the MFL exeedance; and

(f) The practicality of using other methods, such as deliveries of water from the regional system, to reduce MFL exceedances.

(5) The establishment and implementation of MFLs shall not limit the District's ability to impose water shortage restrictions pursuant to Sections 373.175 and 373.246, F.S., and the District's Water Shortage Plan, Chapter 40E-21, F.A.C., when water levels in a MFL water body are above an established MFL, nor shall it limit the District's ability to allow for the discharge or withdrawal of water from a MFL water body, when water levels are below an established MFL.

(6) Phase III water shortage restrictions may be imposed, consistent with the factors herein, when a MFL criteria exceedance or violation is imminent. Phase III or greater water shortage restrictions shall be implemented allowing for a shared adversity between continuing consumptive use and water resource needs.

Specific Authority 373.044, 373.113 FS.

Law Implemented 373.042, 373.0421, 373.175, 373.246 FS.

History - New 9-10-01.

G-92
C-18 CULVERT
MARTENS CULVERT

This structure is a single-barreled, concrete box culvert, located through the north bank of the C-18 Canal about two miles southwest of the turnpike crossing of C-18. Control is effected by a manually or remotely operated sluice gate mounted on a reinforced concrete headwall on the canal side. This new structure was completed in June 1987.

PURPOSE

This structure permits flow augmentation of the west branch of the Loxahatchee River and diverts water between C-18 and C-14.

OPERATION

This structure is operated to supplement flows in the west branch of the Loxahatchee River during dry periods, to divert flows from the southwest fork as long as capacity is available in C-14, or to divert extremely high flood flows from C-14 into C-18 in accordance with a proposed agreement between the South Florida Water Management District and the Loxahatchee River Environmental Control District. This agreement has two operational provisions as follows:

(1) Flow Augmentation in C-14

Releases may be made through the structure so as to maintain a flow of 50 cfs at the Lainhart Dam (about 100 yards) below the SR-706 bridge over the west branch of the Loxahatchee River, as long as the headwater stage at G-92 is 12.5 feet or greater. As the headwater stage nears 12.5 feet, the discharge will be reduced so as to prolong the period of discharge. The gate will be closed for all headwater stages of 12.0 feet or less.

(2) Flood Control Releases

Whenever S-46 is close to its automatic opening stage, G-92 will be opened so as to release up to 400 cfs as long as the tailwater does not exceed 14.5 feet. If the tailwater stage rises above 14.5 feet, with the gate closed it will remain closed until the tailwater exceeds the headwater stage by 0.5 feet, whereupon the gate will be opened full and remain open until

Revised 9/16/94

either the tailwater stage recedes to 14.5 feet or the h(adwater stage rises above the tailwater stage, whichever occurs first.

FLOOD DISCHARGE CHARACTERISTICS

There is no design flood discharge for this structure.

DESCRIPTION

Type: Reinforced concrete box culvert with u)stream control

Number of Barrels: 1

Net Length: 50.0 feet

Flowline Elevation: 5.5 feet

Service Bridge Elevation: 22.0 feet

Water level which will by-pass structure: 20.0 feet

Gates:

Number: 1

Size: 8 feet high by 10 feet wide

Type: Pedestal mounted, motor operat(d hoist

Control: On-site, manual headwater cont ol and remote computer control

Lifting Mechanism:

Normal Power Source: Commercial electricity

Emergency Power Source: LP gas engine driven generator

Type Hoist Direct drive electric motor, gear connected to gear box and gate stems.

ACCESS: From turnpike via 2 mile access road on left (NW) bank of ('-18 or from SR 710 (Beeline Highway) via 6½ mile access road on left (NW) bank of C-18.

Revised 9/16/94

HYDROLOGIC AND HYDRAULIC MEASUREMENTS

Water Level: On-site, analog and remote digital headwater and tailwater recorders

Gate Position Recorder: On-site analog recorder and remote digital recorder

Rain Gauge: None

DEWATERING FACILITIES

Upstream and downstream stop logs

Revised 9/16/94

M E M O R A N D U M

February 20 1985

TO: Fred Davis, Director, Water Chemistry Division

FROM: Dewey F. Worth, Environmental Sciences Division

SUBJECT: Dry Season Operation of G-92, C-18, and the Loxahatchee Slough

Due to current dry conditions, flows in the Loxahatchee River Northwest Fork west of Indian Town Road have recently dropped below 50 cfs. A breakdown of the inflows to the river indicates the C-18 currently contributes about 78% of this volume with the remainder supplied by drainage from the South Indian River Water Control District lateral canals. Under the 1974 "C-14 culvert operation manual", G-92 is closed when C-18 falls below a stage of 12.50 ft msl. Closure of this structure will significantly reduce flows to the river and may not be necessary if some flexibility is exercised in the operation of the system. I suggest we experimentally test the water supply capabilities of the C-18/Loxahatchee Slough system to augment flows to the Northwest Fork over the next several months. In order to accomplish this, the following modifications in the operation of the system will be necessary.

1. Maintain a target discharge through the G-92 of 30-35 cfs when the stage level in C-18 falls below 13.0 ft msl and tailwater stage at G-92 falls below 10.60 ft msl.

2. Modify operating criteria for the G-92 culvert. Lower the C-18 cut off stage to 12.0 ft msl (or lower) to allow longer operation of the G-92 structure.

3. Manipulate existing water supply in the Loxahatchee Slough - flashboards on the three culverts in C-18 are currently fixed at 17.0 ft msl. Boards should be selectively removed to drawdown the slough and allow greater discharge capacity to C-18. Removal of the boards and rate of discharge to C-18 should be governed with the goal of sustaining the 30 cfs discharge through the G-92 structure. In order to extend the water delivery capabilities of the slough, boards should be replaced when the G-92 tailwater stage indicates a rising trend above 10.50 ft msl.

Operation of the system based on the above criteria will require more frequent manipulation of culvert flashboards and gate openings than under normal procedure. To expedite these changes, I suggest the West Palm Beach Field Station assume daily operating responsibility of the G-92 culvert and C-18 flashboards. The field station currently has personnel in the field on a daily basis to check on structures and stage level conditions in C-18.

To assess the impact of these changes in operation on the river, stream gage measurements will be coordinated to determine how much and where the water goes.

Dewey F. Worth

Dewey F. Worth
Environmentalist 2
Environmental Sciences Division
Resource Planning Dept.

cc: J.W. Dineen
Dick Slyfield
Joe Schweigart
P.B. Rhoads
Jim Lane

[redacted] [redacted]

M E M O R A N D U M

TO: Director, Department of Resource Operations

FROM: Director, Division of Operations

SUBJECT: Operation of G-92

The subject structure has been operated according to an agreement, dated March 11, 1975, between this District and the Loxahatchee River Environmental Control District. By this agreement, the latter District (ENCON) will operate the culvert in accordance with the provisions of the agreement whenever the headwater stage at S-46 is 12.5 feet NGVD or above. On March 7th of this year, the headwater stage at S-46 dropped below 12.5.

The Department of Resource Planning has advised this department that the stage can drop below 12.5 feet without causing any damage. Consequently, this District will operate G-92 whenever the S-46 stage is below 12.5. The G-92 gate opening will be maintained at 0.5 feet during this operation, regardless of the stage at S-46, unless advised otherwise by the Department of Resource Planning.

ENCON has been advised by telecom this date of this method of operations. They will also be advised of any gate changes.

R. E. Sylfield, P.E.
Director of Operations

RES/rb April 9, 1985

cc: Director, Resource Planning
Loxahatchee River Environmental Control District
Attention: Mr. Richard Dent

M E M O R A N D U M

TO: Director, Department of Resource Operations

FROM: Director, Division of Operations

SUBJECT: Operation of G-92

The subject structure has been operated according to an agreement, dated March 11, 1975, with the Loxahatchee River Environmental Control District (Encon). At the suggestion of Mr. Dewey Worth of the Department of Resource Planning by memorandum dated February 20, 1985, to Mr. Fred Davis of that Department, the operation was modified to lower the minimum level of 12.5 feet NGVD in C-18 as specified in the agreement with Encon. This modification is covered in my memorandum to you, dated April 9, 1985.

It has been brought to my attention that stages in C-18 below 12.0 feet NGVD cause severe bank erosion and sloughing problems in that canal. Therefore, the additional provision will be adopted that whenever the headwater stage at S-46 drops below 12.0 feet NGVD, the gate at G-92 will be closed.

R. E. Slyfield

R. E. Slyfield, P.E.
Director of Operations
Department of Resource Operations

RES/rb May 14, 1985

cc: Director, Resource Planning
Loxahatchee Environmental Control District
Attention: Mr. Richard Dent

SJN/ep
C-18

IN THE CIRCUIT COURT OF THE FIFTEENTH JUDICIAL CIRCUIT OF FLORIDA, IN AND FOR PALM BEACH COUNTY

CASE NO. 79-1910 CA (L) 01 C

FLORIDA WILDLIFE FEDERATION,
Non-Profit Florida Corporation,

Plaintiff,

vs

THE FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION and THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT,

Defendants.

FINAL ORDER

This Court, having considered the "Stipulation for Consent Decree" signed by all of the parties to this cause, and being otherwise fully advised in the premises herein finds and it is thereupon

ORDERED AND ADJUDGED as follows:

1. The aforesaid "Stipulation for Consent Decree", attached hereto, is hereby adopted as the Order of this Court, said Stipulation constituting a final disposition of all matters at issue in this case.

2. This Court reserves jurisdiction to ensure compliance with the terms of this Order.

DONE and so ORDERED in Chambers at the Palm Beach County Courthouse, West Palm Beach, Florida, this 19 day of July, 1982.

TIMOTHY P. POULTON
Judge of Circuit Court

Copies furnished to: Thomas J. Schwartz, Esquire
Thomas E. Kingcade, Esquire
Alfred J. Malefatto, Esquire

SJN/ph
C-18

IN THE CIRCUIT COURT OF THE FIFTEENTH JUDICIAL CIRCUIT OF FLORIDA, IN AND FOR PALM BEACH COUNTY

CASE NO. 79-1910 CA (L) 01 C

FLORIDA WILDLIFE FEDERATION,
Non-Profit Florida Corporation,

Plaintiff,

vs

THE FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION and THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT,

Defendants.

STIPULATION FOR CONSENT DECREE

The parties, FLORIDA WILDLIFE FEDERATION; STATE OF FLORIDA DEPARTMENT OF ENVIRONMENAL REGULATION (hereinafter "the DER") and the SOUTH FLORIDA WATER MANAGEMENT DISTRICT (hereinafter "the District"), by and through the undersigned attorneys, hereby stipulate to the entry of a Final Order in the above-styled case in accordance with the following terms and conditions:

1. Subject to the approval of the United States Army Corps of Engineers, the District shall maintain an operating schedule for the S-46 gated spillway, so that the "dry season" operating schedule is maintained on a year round basis. This schedule provides for automatic opening of the structure when water levels in the C-18 canal reach a level of 15 feet msl. The structure becomes stationary at 14.5 feet msl and closes at 14 feet msl. In the event of an impending hurricane, tropical storm or other significant rainfall event, the District may in its discretion make releases from the S-46 gated spillway in anticipation of any such event, which may lower the water elevation in the C-18 Canal below the agreed operating level.

2. The District shall schedule the program for control of aquatic weeds within the C-18 canal right of way so as to minimize the use of herbicides, subject to cost considerations regarding alternative methods of aquatic weed control. Those herbicides as are used by the District shall be approved by the Environmental Protection Agency and permitted by the Florida Department of Natural Resources.

3. The District shall ascertain the ownership of the "Lainhart Dam" and shall, as soon as possible utilize District forces, exercise all due diligence to arrange for the restoration of the Dam to the structural condition that would control discharge conditions

as described in the District's C-18 Culvert Operation Manual of September 1974. This shall be for the purpose of maintaining higher groundwater stages in the area tributary to the Northwest Fork of the Loxahatchee River and to facilitate the transfer of water from the "diversion culvert" presently existing at the junction of the District's C-18 canal and the South Indian River Drainage District's C-14 canal to the Northwest Fork of the Loxahatchee River.

4. Subject to the presence of available water supplies, the District shall in cooperation with ENCON, make releases through the aforesaid "diversion culvert" which are adequate to maintain a mimimum flow of approximately 50 cfs in the Northwest Fork of the Loxahatchee River. The determination as to availability of water supplies shall be within the sound discretion of the District, based upon rainfall conditions.

5. The District shall use existing inflow culverts, modified as necessary, to maintain water levels within the area commonly known as the "Loxahatchee Slough" at such levels as are adequate to maintain the existing natural wetland ecosystem in the subject area. The parties recognize that the District shall have reasonable discretion to vary the period during which water levels are maintained at maximum levels, depending upon rainfall conditions, flood control considerations and environmental factors; and that in order to maintain natural conditions and vegetation in the subject area, it will be necessary for the District to lower water levels during the "dry season", with the precise time period thereof being within the reasonable discretion of the District.

6. The District's Governing Board, shall recommend to the United States Army Corps of Engineers that the existing federally authorized project be modified to return, to the maximum extent possible, to the natural regimen that existed in regard to the tributaries to the Loxahatchee River prior to the construction of the C-18 canal and the S-46 gated spillway. This involves diverting surface water flows to the "Northwest Fork" of said river to its maximum carrying capacity prior to making surface water discharges to the "Southwest Fork" of the river. The District shall recommend that the aforesaid objective be accomplished through the following modifications to the federal project:

a) Developing the capability to divert a greater flow of surface water runoff from C-18 to the Northwest Fork of the Loxahatchee River.

b) Maintenance of a water retention area for the purpose of accommodating surface water runoff from those lands within the Loxahatchee Slough area and areas tributary to the Northwest Fork of the Loxahatchee River.

7. The parties recognize that the aforesaid project modifications are contingent upon approval by the United States Army Corps of Engineers, and appropriate federal, state and local regulatory agencies. The District agrees to exercise all due diligence to acquire the property rights and obtain all necessary permits.

8. The parties also recognize that the District shall continue to make discharges through the S-46 gated spillway for flood control purposes before, during and after certain rainfall events, but that in the event the federal project is modified to permit discharges to the Northwest Fork of the Loxahatchee River, the District shall utilize the Northwest Fork as its primary discharge facility and shall operate the water control system so as to maximize the use of said Northwest Fork prior to making discharges through the Southwest Fork, with the exception that discharges may still be made at the Southwest Fork prior to exceeding the maximum carrying capacity of the Northwest Fork in anticipation of extreme rainfall events.

9. Each party shall bear its own respective costs and attorneys fees for all proceedings in this case.

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APPENDIX M -- A SUMMARY OF THE OTHER PLANNING AND IMPLEMENTATION EFFORTS IN THE BASIN

CONTENTS

United States Geological Service (USGS)

USGS is currently responsible for maintaining the flow station located in the upstream portion of Kitching Creek. Three additional flow stations have been proposed for construction at the confluences where Kitching Creek, Hobe Ditch, and Cypress Creek flow into the Northwest Fork of the Loxahatchee River. It is projected that these flow stations will be maintained cooperatively by USGS and the SFWMD for at least five years following their installation. Flow, salinity readings at 20% and 80% of the total depth, temperature, and surface water elevations will be collected. An additional four monitoring stations are proposed at the North Jetty, the Boy Scout Dock, the mouth of the North Fork, and the mouth of Kitching Creek to provide additional data for the Hydrodynamic/Salinity Model developed for the NW fork of the Loxahatchee River. These stations will record water elevation, temperature, and salinity (near the surface and near the bottom) on a continuous basis approximately every fifteen minutes. USGS will be responsible for collecting the data from monitoring sites on a quarterly basis and preparing an annual report.

Environmental Protection Agency (EPA)

In 1994, the EPA initiated the Loxahatchee River Basin Wetland Planning Project to identify wetlands in the basin and provide information about the functions and values of these wetlands. The EPA assisted Martin County in gathering data within the 28,000 acres project area and helped to coordinate the project activities of the various agencies involved.

Florida Department of Environmental Protection (FDEP)

Section 9 of Chapter 83-358, Laws of Florida outlines the role that the Florida Department of Environmental Protection plays in protecting the Loxahatchee River and states that “the department shall have full and exclusive authority to adopt rules concerning and to regulate activities within the river area having a direct and substantial adverse effect on any resource value within the river area”. They are mandated with managing the Wild and Scenic portion of the Northwest Fork of the Loxahatchee River and the land within Jonathan Dickinson State Park. In 1997, the DEP launched its ecosystem management initiative in the Loxahatchee River watershed. The first component of this initiative was the development of an action plan to identify the current gaps in environmental protection and how various projects may assist in closing them. Other components included an aggressive public education component with numerous public workshops, a full watershed brochure, a quarterly newsletter, and a speaker bureau, and the establishment of an exotic plant committee responsible for carrying out workshops and monthly exotic plan removal on public lands (FDEP Loxahatchee River Watershed page). The Florida Department of Environmental Protection and the South Florida Water Management Districts are partners with other agencies and local governments to establish an achievable Restoration Plan for the Loxahatchee River Watershed. This restoration effort commenced in September 2002.

The Loxahatchee River Environmental Control District (LRD)

The Loxahatchee River Environmental Control District (aka. LRD) was established in 1971 to meet the local needs of water supply, wastewater management, and storm drainage within the Loxahatchee River watershed. Chapter 71-882, Special Acts of Florida, authorizes the LRD to implement various planning, regulatory, and operational functions to meet those needs. The District plays an active role in wastewater management, by operating a regional wastewater treatment system that covers the majority of the Loxahatchee basin east of I-95, conducts aquatic monitoring on the Loxahatchee River, and provides information and environmental education opportunities to the public. In 1992, the LRD developed the Loxahatchee River Area Stormwater Management Plan, a basin-wide plan that was written to ensure adequate treatment of stormwater before it is discharged to receiving waters. Following the development of this plan, several municipal utilities developed local stormwater plans of their own. The LRD also developed a water quality index for the Loxahatchee River, similar to the one created by the FDEP, and generates semi-annual reports, describing the quality of surface waters throughout the basin. Other duties include maintenance of the WildPine Ecological Laboratory, which is open to the public and scientific community for the purpose of gathering further insight into the various processes of the riverine system, and involvement in a cooperative venture with the Friends of the Loxahatchee to increase understanding and encourage public participation in river issues. Additional information on the Loxahatchee River Environmental Control District can be found at www.loxahatcheeriver.org/home.html.

Loxahatchee River Management Coordinating Council (LRMCC)

This council was established in 1983 by the SFWMD and the FDEP, as directed by the Laws of Florida, Section 83-358.5, to ensure the effective management of projects on the Northwest Fork involving various government agencies. The LRMCC is composed of one representative from the following agencies; U.S. Department of the Interior, Department of Environmental Regulation (DERM), Department of Transportation (DOT), Game & Freshwater Fish Commission, Department of Community Affairs, Department of Agriculture and Consumer Services (Division of Forestry), Department of State (Division of Archives, History & Records Management), Treasure Coast Regional Planning Council, Martin County, Palm Beach County, Town of Jupiter, Jupiter Inlet District, Loxahatchee River Environmental Control District, South Indian River Water Management Control District, Northern Palm Beach County Improvement District, and Palm Beach County Farm Bureau. Additional members include representatives of local environmental groups, public entities within the basin, and private property owners. The LRMCC's primary focus is protecting the Wild and Scenic Loxahatchee River corridor, and they play an important role in ensuring that the preservation and enhancement goals of the Loxahatchee River Wild and Scenic Management Plan are realized by identifying and resolving coordination problems and enhancing communication between all interests in the river area. The LRMCC is currently conducting a stormwater study for the Northwest fork basin and developing a solid waste management plan for Jupiter Farms (FDEP 1999). Additional responsibilities include reviewing and making recommendations on proposed changes to the Plan, all permits required by Chapter 83-

358, and all rules outlined in Chapter 83-358 for the protection, management, and operation of the river.

Loxahatchee River Wild and Scenic River Management Plan

The Loxahatchee River Wild and Scenic River Management Plan identifies the current management actions necessary to maintain and enhance the Wild and Scenic Corridor. Tasks related to hydrologic restoration, vegetation management, land use regulation and visitor use management are presented, and the respective responsible entities are identified. A schedule of implementation for the next five years is also included. The next update of the plan is scheduled for 2005, and will be led by the Florida Department of Environmental Protection with assistance from the SFWMD.

The Loxahatchee River Watershed Management Planning Committee

The Loxahatchee River Watershed Management Planning Committee (LRWMCP) is a multi-agency and community-based coalition that was established to define and evaluate the status of the entire watershed and propose actions to improve and protect the natural resources within the watershed. Throughout the planning process workshops and surveys were utilized to gather public input and the LRWMPC findings were published in the second draft of the Loxahatchee River Watershed Action Plan in October 1998.

The Loxahatchee River Watershed Action Plan

The Loxahatchee River Watershed Action Plan was developed in 1998 and updated in October 2002. This action plan outlines a comprehensive assessment of the current condition and needs of the seven major subbasins of the watershed, which are Jonathan Dickinson State Park/Kitching Creek, Coastal, Estuary, C-18 Canal/Corbett, Cypress Creek/Pal Mar, Groves, and Wild and Scenic/Jupiter Farms. The Plan includes over 60 proposed environmental projects in areas of educational activities, land management activities, and "turn-dirt" improvement projects. The Table below lists the proposed projects that have been either completed or initiated as of October 2002.

Project	Organization Responsible for Completing the Project
Wild & Scenic Stormwater Study	Loxahatchee River District in 2000
The first Loxahatchee River Watershed Science Symposium (February 2001)	Loxahatchee River Watershed Environmental and Awareness Committee
Riverbend Park Restoration Day for volunteers in February 2001	Palm Beach County Parks Department
Enhance Sheetflow in Corbett	Fish and Wildlife Conservation Commission in 2001
Sandhill Crane Site Acquisition	SFWMD and Palm Beach County in 2001
Sediment and Water Quality Analyses for Pesticides and Heavy Metals	Loxahatchee River District in 2001
C-18 Triangle Tract Acquisition	SFWMD and Palm Beach County in 2001
Loxahatchee River Boater's Guide	Jupiter Inlet District in 2001
Loxahatchee Slough Outparcel Acquisition	40% completed by the SFWMD and Palm Beach County as of August 2002
Riverbend Park Hydrologic Restoration completed in 2002	Palm Beach County Parks Department
State funding secured for important water quality improvement projects in 2002	Loxahatchee River Preservation Initiative

Project	Organization Responsible for Completing the Project
Provide Sewers to Urban Areas Still on Septic Tanks (900 homes on the Tequesta Peninsula).	Loxahatchee River District completed the Tequesta Peninsula sewer project in 2002.
Mitigation Program for Wetlands Impacted by Residential Development in Jupiter Farms and Palm Beach County Estates	FDEP in 2002

*This table was adapted from the University of Florida's EXTENSION Institute of Food and Agricultural Sciences Spring 2002 publication on the Loxahatchee River Watershed, Environmental Education and Awareness and supplemented with information from the October 2002 Loxahatchee River Watershed Action Plan.

The following Table lists the projects outlined in the Loxahatchee River Watershed Action Plan that have transitioned from the conceptual stage to the implementation stage.

Project	Responsible Organization
Atlantic Ridge Acquisition	SFWMD (partially completed as of 2002)
Camp Murphy Restoration	FDEP Division of Recreation and Parks
Pinegroves Campground – Removal of Australian Pine & Natural Community Restoration	FDEP Division of Recreation and Parks
Develop Total Maximum Daily Loads for five waterbody sections in the Loxahatchee River watershed	FDEP
Jupiter Riverwalk	Town of Jupiter
Little Club Drive Stormwater Improvement Project	Martin County
Volunteer Stewardship Program	Palm Beach County ERM
Siltation/Sedimentation Study	Jupiter Inlet District
Beeline Corridor Land Acquisition	SFWMD and Palm Beach County
Loxahatchee Slough Restoration	SFWMD and Palm Beach County
Pal-Mar Acquisition Project 36%c completed as of August 2002.	SFWMD, Martin County, and Palm Beach County
Cypress Creek/Pal-Mar/Groves Hydrologic Study	SFWMD, Martin County, and FDEP
Establish Minimum Flow to National Wild and Scenic NW Fork of the Loxahatchee River	SFWMD

*This table was adapted from the University of Florida's EXTENSION Institute of Food and Agricultural Sciences Spring 2002 publication on the Loxahatchee River Watershed, Environmental Education and Awareness and supplemented with information from the October 2002 Loxahatchee River Watershed Action Plan.

Additional information on the proposed projects for each sub-basin including a description of the project, the lead agency, time frame, the source of funding, and the project's current status can be found in the October 2002 Loxahatchee River Watershed Action Plan.

The Loxahatchee River Preservation Initiative

The Loxahatchee River Preservation Initiative is an outgrowth of the FDEP's watershed management effort. The document was prepared by a sub-committee created by the Loxahatchee River Watershed Management Planning Committee to prioritize the turn-dirt projects outlined in the Loxahatchee River Watershed Action Plan and identify potential funding opportunities for the proposed projects. The committee reviewed the various projects outlined in the Action Plan and those identified after 1998, and focused on those classified as high priority based on the following criteria: potential positive impact on water quality, ability to proceed to the construction phase in a timely manner, and the availability of a local government sponsor to support the project. The projects for which 2003 funding is being requested from the State Legislature and local sponsors are listed in the Table below, which is from the Loxahatchee River Preservation Initiative 2003. Detailed descriptions of the projects and a summary of their benefits and readiness can be found in the 2003 Loxahatchee River Preservation Initiative.

Rank Order	Project Name	Local Sponsor
1	Wild & Scenic River Corridor Habitat Restoration – Phase 1 Hell's Canal, Citrus Corridor, Section 29, West of Parcel 19	Jonathan Dickinson State Park
2	Kitching Creek Restoration	Martin County
3	Riverbend Park Hydrologic Restoration	Palm Beach County
4	Loxahatchee Slough Restoration – Phase 3	Palm Beach County
5	Jones Creek Restoration – Phase 2	Jupiter Inlet District
6	Jonathan Dickinson State Park Water Quality Improvements	LRECD/Jupiter
7	Community Stormwater Retrofits	Town of Jupiter
8	Wild & Scenic River Corridor Exotic/Pest Plant Control – Phase 1	Jonathan Dickinson State Park
9	Loxahatchee River Main Embayment Sand Traps	Jupiter Inlet District
10	Cypress Creek Restoration – Phase 1	Martin County

DEP Regional Aquatic Preserve Plan

The Aquatic Preserve Act was passed in 1975 to maintain submerged lands of exceptional beauty in their natural or existing conditions. The Loxahatchee River-Lake Worth Creek Aquatic Preserve is one of the four preserves established to protect freshwater flora and fauna, and is managed in two separate sections. The larger section, designated as the urban preserve, is comprised of Lake Worth Creek, the North Fork, Southwest Fork, and Northwest Fork up to river mile 5.5 while the smaller section, designated as a wilderness preserve, includes the upstream areas of the Northwest Fork. The major objectives of this plan include restoring and enhancing the natural condition of the resources within the urban preserve, as much as possible, and maintaining and enhancing the existing condition of the wilderness preserve. Some of the on-site objectives include maintaining and enhancing the function of plant communities, protection of animal life, geologic features, archaeological and historical sites, and water resources, both quality and hydrology, and the development of a cumulative impact analyses program. Specific information on the management objectives, how this plan will interface with all levels of government, non-government agencies, and interest groups, and the various uses of the preserve (public, private, commercial, scientific research, and environmental education) can be found in the document (Department of Natural Resources, 1984).

Loxahatchee River Aquatic Plant Work Plan

This Plan which was prepared by the FDEP in 1994, serves as the management directive for control of exotic non-native aquatic plants in the Wild and Scenic Northwest Fork of the Loxahatchee River. It identifies the plant species, criteria, and standards that guide the aquatic plan managers in integrated pest management. The main goal of this plan is to enhance the native vegetation along the river corridor by keeping the non-native plants at maintenance control levels.

Integrated Water Resource Plan, Northern Palm Beach and Southern Martin Counties

This Plan addresses the future provision of water to both urban and environmental needs. This document recognized and prioritized the need to reserve sufficient quantities of freshwater for the environment.

J.W. Corbett Wildlife Management Area Conceptual Management Plan

The J.W. Corbett Wildlife Management Area (WMA) consists of 60,224 acres and is primarily managed to provide for public uses such as hunting, fishing, horseback riding, and nature appreciation. The goals listed in the plan include; 1) Maintain the area's historic composition of native plant communities to provide the natural diversity, abundance, and distribution of indigenous wildlife species, 2) Provide for appropriate, compatible multi-use recreation opportunities while assuring a quality outdoor experience and conservation of Corbett WMA's natural and cultural resources, 3) Develop WMA awareness and support through community participation, 4) Identify and protect archaeological, historical, and cultural resources. The plan also identifies resource management problems and lists strategies to address those problems.

United Technologies Corporation, Pratt & Whitney Environmentally Sensitive Lands Preserve Area Management Plan

United Technologies Corporation, Pratt & Whitney established a 1,283 acre preserve in accordance with the 25% set-aside criteria of the Palm Beach County Environmentally Sensitive Lands Ordinance (No. 90-47) in 1992. This plan specifies resource management measures necessary to rectify existing incompatible conditions and to safeguard the future quality of the preserve. Restorative measures for immediate implementation include exotic plant removal. Measures to insure the proper future management of the preserve include hydrological maintenance, a combination of prescribed burning and mechanical maintenance for vegetative management, protection of flora listed as endangered, threatened or species of special concern, minimization of human impacts, periodic removal of exotic vegetation, and protection of wildlife. Special management measures have been provided for three protected wildlife species: Everglades kite, wood stork, and Florida sandhill crane.

Jonathan Dickinson State Park

The mission of Jonathan Dickinson State Park is to "provide resource-based recreation while preserving, interpreting, and restoring natural and cultural resources" (www.dep.state.fl.us/parks/district5/jonathandickinson/index.asp). The Park consists of approximately 11,480 acres in Martin County and northern Palm Beach County. Twenty-six hundred acres within the park is a wilderness preserve and approximately 2,100 acres contains the highly endangered scrub community. The Park attracts 169,768 visitors annually (1999-2000) and according to research conducted by the Florida Parks Service the total direct economic impact of JDSP on the local community is $5,101,443 annually. The Park biologists conduct prescribed burning, exotic plant removal, wetland and upland restoration, and water quality monitoring. The Park also manages the cultural resources within its boundary, which include the preservation, restoration and research of historic buildings, archaeological sites, artifacts, and historical landscapes. Additional information on JDSP can be found at www.dep.state.fl.us/parks/district5/jonathandickinson/index.asp.

Save Our Rivers Projects (SFWMD) – Land Acquisition

The Save Our Rivers program (SOR) and Water Management Lands Trust Fund were enacted by the Florida Legislature in 1981. The SOR act enables the water management districts to acquire lands necessary for water management, water supply, and the conservation and protection of water resources. Maps denoting acquired lands, potential land acquisition areas, and SOR project areas for the Loxahatchee River and Loxahatchee Slough are available at www.sfwmd.gov/org/clm/lsd/lsdproj.html. One of the most recent Save Our Rivers Projects is the Cypress Creek land acquisition project. The District partnered up with the State, Palm Beach and Martin Counties to purchase a total area of 3,995 acres at a total price of $41 million. (Please note that at the date of this publication the contract has been approved, but closing has not occurred).

Canal 18 Restoration – Revegetation Program

The South Florida Water Management District is carrying out restoration activities within Canal 18 and Limestone Creek, which include the removal of exotic vegetation and planting of indigenous species, the creation of tidal wetlands, and reconnecting (and expanding) portions of the original Limestone Creek channel to C-18. Additional information on this program and a photograph of Limestone Creek prior to the construction of Canal 18 can be found at www.sfwmd.gov/org/clm/row/c18.html.

Northern Palm Beach County Comprehensive Water Management Plan

The Northern Palm Beach County Comprehensive Water Plan was developed by the City of West Palm Beach and the SFWMD to outline mutual goals for the management of water resources in the Southern L-8, Western C-51, and C-18 basins. The plan outlines a program of structural improvements to increase the storage and conveyance of surface water within and between the former basins, and the development of alternative water supply sources to meet the urban and environmental demands over the next 20 years. The project components are designed to reconnect the Loxahatchee Slough and the Northwest Fork of the Loxahatchee River to the regional water management system. Detailed information pertaining to the proposed projects can be found in Volumes 1 & 2 of the Plan (SFWMD, 2001). Volume I details the schedules, costs, and funding of the proposed projects over the next two to five years, and includes a list of related water management projects and agencies involved in cooperative efforts that support or supplement this plan. Volume II is a technical report summarizing the planning, modeling, and analyses that led to the recommended structural improvements.

Northern Palm Beach County CERP Project Management Plan

The Northern Palm Beach County CERP Project Management Plan was developed by the U.S Army Corp of Engineers (USACE) and the SFWMD to outline the steps needed to increase water supply and improve water quality while maintaining flood protection. The Plan contains a number of elements that will be implemented in two parts. Part I includes the following six separable elements: Pal-Mar and J.W. Corbett Wildlife Management Area Hydropattern Restoration, L-8 Basin Modifications, C-51 and L-8 Reservoir, Lake Worth Lagoon Restoration, C-17 Backpumping and Treatment, and C-51 Back-pumping and Treatment. These elements were combined into a single project to address the interdependencies and tradeoffs between the different elements and provide a more efficient and effective design of the overall project. These projects will commence in 2001 and should be largely completed within twelve years. Part II includes the construction of the C-51 Regional Groundwater Aquifer Storage and Recovery (ASR) system and the L-8 Basin ASR system, and is scheduled to begin in 2009 and continue through 2020. These projects will provide additional long-term storage within the North Palm Beach County region. Detailed information pertaining to these projects can be found in the Northern Palm Beach County CERP Project Management Plan (SFMWD, 2002).

Florida Fish & Wildlife Conservation Commission – Florida Marine Research Institute (FMRI)

The Florida Marine Research Institute (FMRI) conducted an electrofishing study, which commenced in 1990 and continued through 1992 to collect life history information such as age, growth rates, and reproductive status of snook inhabiting the downstream reaches of the Loxahatchee River. During this study, some baseline salinity information was also collected. As a follow up of this study, FMRI scientists conducted monthly, randomized pilot sampling utilizing a 180-meter long seine in the downstream portions of the Loxahatchee River and estuary. Unfortunately, due to the large size of the net the sampling was not very effective and only a few trials were completed. The data from these two studies is available upon request from FMRI.

In May 2002, FMRI scientists initiated a two-year project to ascertain the sizes and ages of snook that are being caught-and-released by saltwater anglers in Charlotte Harbor and Tequesta (http://www.floridamarine.org). There are a total of twelve sampling locations, three of which are located in the Loxahatchee River and estuary, that will be randomly selected for monthly sampling. In 1999, the former rule on snook harvest size was modified to prohibit the harvest of snook thirty-four inches or longer. Since that rule change very little data has been collected on the lengths, ages, and abundance of undersized and oversized snook in Florida waters. In this study, FMRI biologists will simulate the angling community and its fishing habits during the open and closed snook seasons, and will collect data on the species captured, size, release status of the fish, and the mortality of snook above and below the legal catch size. In addition to this sampling, FMRI will seek additional help from volunteer anglers. These anglers will be randomly selected from the saltwater fishing license database and will be asked to fill out a log book during one of their fishing trips. The data collected by the biologists and anglers will be presented to the Florida Fish and Wildlife Conservation Commissioners for review to decide if the current management practices are effective at sustaining the snook population.

FMRI also conducts statewide manatee counts and is currently in the process of compiling and organizing all of their meta-data so that it may be posted on their website for public use. The annual manatee counts are conducted across the state with the assistance of twelve other agencies, research labs and universities (http://www.floridamarine.org). The counts are normally conducted on a sunny, windless day immediately following a prolonged cold front. The cooler temperatures cause the manatees to seek out warmer sites, which concentrates them into smaller areas, and the windless, sunny day encourages them to float making them more readily visible to those conducting the surveys. Results of the surveys conducted from 1991 through 1999 are available on the FMRI website. Once the meta-data site is completed, the public will be able search for specific data sets and will be given important information pertaining to those sets such as what was collected, when was it collected, and the type of methodology used.

Palm Beach County ERM

In 1991, Palm Beach County ERM developed the North Palm Beach County General Aviation Airport Habitat Management Plan for Preserve Areas. The airport consists of an 1,832-acre, triangular shaped parcel of land northwest of the intersection of Beeline Highway and PGA Blvd. The airport's development order required that two preserves be established and maintained in perpetuity and that this habitat management plan be drafted. The two preserve areas total 925 acres of upland and wetland mosaic. The wetlands are primarily wet prairies and the uplands are dominated by low pine flatwood or oak and cabbage palm hammocks. The plan addresses removal of exotic vegetation, controlled burning, fencing, passive recreation and scientific uses, and continued wetland viability.

PBCERM has acquired more than 13,000 acres of the Loxahatchee slough through their Environmentally Sensitive Lands program for conservation and recreational purposes. An additional 1,125 acres of land located adjacent to the county lands were purchased by the SFWMD in 1999, and these lands are proposed to be managed by PBCERM. PCBERM and the District are also proposing to jointly conduct baseline (current) and post-construction/operation (G-160 Structure) vegetation and hydrological monitoring within the Loxahatchee Slough to assess the effectiveness of the first tier of improvements outlined in the North Palm Beach County Comprehensive Water Management Plan. The county will be responsible for conducting the field vegetation surveys while the District is responsible for installing the staff gauges and conducting landscape-level monitoring using aerial photography from Digital Orthographic Quad (DOQ) photos. The field based surveying is scheduled to commence in August or September 2002 and continue on a semi-annual basis (wet and dry season) through 2007. These surveys will be conducted at five sites within the Loxahatchee Slough, and at each location three permanent 3x3 meter plots containing representative plant communities will be established. The vegetation surveys will include water depth measurements, characterization of the macrophyte species present in each plot and their relative abundance, using either actual counts or a standard comparative index (whichever is appropriate to the species). Annual reports summarizing the data and discussing the findings will be written by PBCERM.

Martin County

A portion of this was prepared by Kim Love, Martin County on March 11, 2002 and November 20, 2002

Kitching Creek

In 1994, the EPA initiated the Loxahatchee River Basin Wetland Planning Project to identify wetlands in the basin and provide information about the functions and values of these wetlands. The Martin County government was chosen to conduct the portion of the project located in Martin County, which covered approximately 77,000 acres. In 1998, Martin County, St. Johns River Water Management District (SJRWMD), and FDEP jointly funded a two-year watershed restoration study of the Kitching Creek watershed. Earth Tech was hired to conduct field measurements of hydrologic and water quality conditions, model surface water and ground water flows, and provide conceptual designs of potential alternatives that could improve water quality, restore the ecosystem, and reduce flooding.

The objectives of the study included headwater revitalization, rehydration of disturbed wetlands in the Kitching Creek watershed, determining the feasibility of linking the wetlands, which were divided by the construction of Bridge Road (C.R. 708), tracking E-coli contamination entering Jonathan Dickinson State Park from Kitching Creek, and the assessment of surface and groundwater flow and quality. Utilizing the information gathered from the field collections and model development, Earth Tech created the Kitching Creek Water Quality Improvement Project.

This Project, at build-out, could enhance surface water flows to the Loxahatchee River by raising average groundwater elevation by as much as 2 feet over an area exceeding 1,000 acres located north of the River, thereby increasing the groundwater contribution to the Loxahatchee River. The Project is comprised of several alternative plans, and three of these are summarized in the following sections. Detailed information pertaining to all of the plans and their recommended implementation schedule can be found in the Final Hydraulic Report of the Kitching Creek Water Quality Improvement Project.

One part of the overall project redirects flow, which currently moves south through the Kitching Creek Road Ditch causing erosion and flooding, southwest through wetlands into Kitching Creek's predevelopment flowway and a wetland system located south of 138th Street. This redirection will reduce flooding along 138th Street, Powerline Avenue and Kitching Creek Road. These water management measures can be accomplished by blocking existing culverts under Bridge Road and installing new ones in different locations, possibly re-engineering a portion of Bridge Road, regrading existing drainage ditches to provide shallow, wide flowways, and installing stormwater treatment ponds, berms and other water control structures.

The East Creek Tributary Diversion Berm is a water management improvement structure located in the vicinity of the intersection of 138th Street and Powerline Avenue. This project will create a diversion that redirects flow away from the populated areas along Powerline Avenue and Kitching Creek Road into the predevelopment flow way of Wilson Creek. This diversion will be accomplished by blocking existing culverts at the intersection of Powerline Avenue and Bridge Road. Installation of a new culvert under Bridge Road east of the intersection and construction of a 2-ft. high berm will allow flow to be directed to the southeast toward Wilson Creek that is located within Jonathan Dickinson State Park.

The Flora Avenue water management improvements extend approximately 8,000 feet southward from the intersection of Flora Avenue and Bridge Road. Benefits of this project component are improvements in the water quality flowing into Jonathan Dickinson State Park property south and east of Flora Avenue and reductions in the level of flooding of Flora Avenue residences and businesses. Decreased flooding along Flora Avenue will be accomplished by raising a 2000-ft section of the roadway and providing new water quality structures adjacent to Flora Avenue. Stormwater from developed areas along the road will be routed to detention ponds for attenuation and sediment removal prior to discharge to Jonathan Dickinson State Park.

Martin County has secured FDEP 319 funding for the Flora Avenue portion of the Kitching Creek Water Quality Project in the amount of $464,000.00 and an additional $50,000.00 from Jonathan Dickinson State Park for design and engineering work for this project. Martin County is currently partnering with the U.S. Army Corps of Engineers (the Corps) to fund a restoration project for Kitching Creek. The Corps operates a “Continuing Authority” program that funds several smaller projects outside of its large capital projects such as the Central and Southern Florida Flood Control Project. One of those Continuing Authority categories, the “206 Aquatic Ecosystem Restoration,” provides for a Preliminary Restoration Plan (PRP), and if approved, a restoration feasibility study and construction funding up to a cap of Five Million Dollars. The Corps has assembled a project team and has begun work on a Preliminary Restoration Plan for Kitching Creek.

Cypress Creek

Palm Beach County, Martin County and the District are partnering to purchase approximately 4000 acres in the Cypress Creek basin. It is anticipated that the sale will close by January 2003. Martin County and the District are partnering to match “water project” dollars from the State Legislature to design, engineer and construct facilities within the Cypress Creek Project that will contribute to the restoration of the Wild and Scenic Loxahatchee River.

Pal-Mar and Atlantic Ridge

Martin County has submitted the eastern reach of the Pal-Mar and the remainder of the Atlantic Ridge Florida Forever Projects to the Audubon Society for consideration for acquisition funding. These parcels are necessary for additional water management alternatives for the Cypress Creek and Kitching Creek sub-basins.

Jupiter Inlet District

The Jupiter Inlet District (JID) was established by the Florida legislature in 1921 to maintain and preserve the navigability of the Jupiter Inlet and the Loxahatchee River downstream of Jonathan Dickinson State Park, and operate and maintain the northernmost portion of Jupiter Inlet Park. At four locations within Jonathan Dickinson State Park, boat traffic caused destruction of mangrove shorelines and the breaching of narrow divisions between adjacent canals. Those breaches “short cut” the historical meanders and allowed for more direct tidal influence upon the upstream reaches. In 1996-1997 the JID implemented an oxbow restoration project in the NW fork to restore more natural flow to the historic meandering sections of the River, improve water quality in the stagnant areas, reduce organic deposition in isolated oxbows, and increase the retention time of freshwater runoff and decrease saltwater intrusion. The four gaps were closed with rock and earthen dams to provide a hydraulic barrier, which was biologically and aesthetically compatible with JDSP. Pre-construction and post-construction studies determined that the closures resulted in lower salinity levels and longer response times for the upstream stations to experience increases in salinity.

Other projects associated with the Loxahatchee River and Estuary that are overseen by the Jupiter Inlet District include the implementation of the Loxahatchee River Management Plan, the Sim’s Creek enhancement project, seagrass bed monitoring, and preparation of the Loxahatchee River Boater’s Guide. In cooperation with Palm Beach County ERM, the JID completed a tidal creek enhancement program for one of the enhancement sites identified in the Sims Creek Enhancement Study (1993). The program consisted of exotic vegetation removal and the creation of a 2.05 acre mangrove-spartina wetland. The enhancement and restoration to the wetland portions of the site will provide additional habitat resources for fisheries and wildlife species and eliminate an exotic seed source that could spread to other portions of the watershed. In addition, a portion of Sims creek was dredged to clean out accumulated sediments. This dredging restored the creek to historic depths and provided more stable benthos, littoral zones, and maintainable traps for reducing sediment loads to the Loxahatchee River. The Loxahatchee River Boater’s Guide was completed in 2001, and the siltation/sedimentation study slated for the Loxahatchee estuary has progressed from the conceptual phase to the implementation phase.

Treasure Coast Regional Planning Council (TCRPC)

The Treasure Coast Regional Planning Council was established in 1975 to promote cooperative efforts and communication between local units of government, representatives of major economic interests, and the public to promote health, safety, and general welfare of the citizenry and plan for future development of the Treasure Coast region. The Council is comprised of local elected and appointed officials, and is responsible for planning in Indian River, St. Lucie, Martin, and Palm Beach counties. To accomplish their mission, the TCRPC operates a variety of programs and planning functions related to growth management and development within the Treasure Coast Region. In 1994, the TCRPC conducted the portion of the Loxahatchee River Basin Wetland Planning Project that fell within Palm Beach County boundaries. The Palm Beach County portion of the project area included approximately 65,000 acres and included land that extended north to the Martin County border, east to the Florida Turnpike, south to Northlake Boulevard, and west to a north-south line located approximately one mile west of CR 711. A two-fold wetland assessment was utilized in the project, which involved remote analysis based on the interpretation of infrared aerial photography and field analysis. The wetlands were classified as high, medium, or low quality and the percentages were 73%, 13%, and 8%, respectively. The largest area of high quality wetlands was the Loxahatchee Slough. Further information on the Loxahatchee River Basin Wetland Planning Project can be found in the Technical Summary Document prepared by the TCRPC in July 1999, and additional information on the TCRPC can be found at www.tcrpc.org.

City of West Palm Beach Water Catchment Area Advisory Committee

The City of West Palm Beach Water Catchment Area Advisory Committee was established in 1976 by the City Commission of West Palm Beach as outlined in Chapter 67-2169 passed by the Florida Legislature. The Committee is comprised of eight members, seven of which are appointed by the Mayor of West Palm Beach and the other is West Palm Beach's Director of Utilities, who is an ex-officio member. They are responsible for providing the City Commission "with advice and recommendations on all matter arising within the City of West Palm Beach and related areas which may, in any manner, impact or otherwise affect the preservation and environmental quality of the Water Catchment Area as a public water supply and significant wetland/environmental asset" (Selfridge, G.P., 2002 personal communication). More specifically, they advise the Committee on matters related to preserving an adequate water supply for the current and future residents of West Palm Beach, especially in regards to avoiding water supply shortages during times of prolonged drought, while ensuring that it is kept in its natural state for public use and enjoyment. It is the express intent of the City Commission that all issues, which could potentially impact the Water Catchment Area either directly or indirectly be submitted to the Committee for its review and recommendation before that issue is presented to the City Commission.

South Indian River Water Control District

The South Indian River Water Control District (SIRWCD) was created in 1923 by an Act of the Florida Legislature. It encompasses 12,500 acres in Jupiter Farms, Egret Landing, Palm Beach County Estates, and the Jupiter Commerce Park. One of their primary responsibilities is the management of storm water runoff to prevent damage to private property. District canals are utilized to transport excess rainwater via gravitational flow into natural holding areas such as the Loxahatchee slough, wetlands, and water conservation areas. Additional information on the SIRWCD can be found at www.sirwcd.org/index.html.

Florida Inland Navigation District

The mission of the Florida Inland Navigation District is to perform the functions of the "local sponsor" of the Atlantic Intracoastal Waterway project. To meet this objective the District provides all lands required for the navigation project including rights of way and lands for the management of dredged materials removed from the waterway channel during dredging activities.

Regional and Local Utilities

Utilities in the northern Palm Beach County area are diversifying supply sources to reduce reliance on regional water sources, including tapping the Floridan aquifer and developing water reuse systems. The three major water suppliers are the Town of Jupiter, Village of Tequesta, and Seacoast Utilities. The Town of Jupiter's water utility presently has a treatment capacity to produce over 27 MGD. Up to 12 MGD of this could be produced with water from the Floridan aquifer via reverse osmosis treatment. Jupiter has also developed a wellfield recharge system that involves skimming water from the C-18 Canal, when it is available, and routing it to storm water management systems in the vicinity of their wellfield to maintain water levels in these systems and increase recharge of the aquifer. The Village of Tequesta has also tapped the Floridan aquifer for public water supply using a 1.5 MGD reverse osmosis treatment facility. Seacoast Utility's relies on the surficial aquifer system for their source water public water supply. Water reuse has been implemented extensively in the northern Palm Beach County area. The two major providers, the Loxahatchee River Environmental Control District and Seacoast Utility, have waiting lists for reclaimed water. The Loxahatchee River Environmental Control District reuses over 5 MGD of reclaimed water for irrigation of 11 golf courses in the Jupiter/Tequesta area and the Abacoa Development. Seacoast Utility reuses almost 6 MGD for irrigation of 7 golf courses and other green space, and for ground water recharge.

Indian River Lagoon National Estuary Preserve

The Indian River Lagoon National Estuary Preserve was established in 1990 under the EPA's National Estuary Program (NEP). Although the EPA administers the NEP, the Indian River Lagoon program decisions and activities are carried out by committees comprised of representatives from local government, federal agencies, academic institutions, industry and estuary user-groups, and private citizens. The priority management issues identified by the committee include human population growth, habitat loss and alteration, fisheries and other species decline/loss, freshwater inflow, increased concentrations of nutrients, toxic substances, and other conventional pollutants, sedimentation, and introduced/pest species (United States EPA, 2002). The excessive amounts of stormwater runoff transport large amounts of nutrients and sediments into the IRL, which in turn negatively impact benthic organisms, promote algae overgrowth, and smother seagrass beds. In 1992, the Indian River NEP built a concrete sediment trap in a drainage system located adjacent to a developed portion of the shoreline to decrease the amount of sand, leaves, and litter from entering the lagoon, which has successfully captured about four tons of sediment in the last ten years. Due to the success of that sediment trap, others are being expanded to additional sections of the lagoon.

Indian River Lagoon – South Feasibility Study

The Indian River Lagoon South Feasibility Study was a joint Federal and State effort led by the United States Army Corps of Engineers (USACE) - Jacksonville District and the SFWMD to prepare a plan for restoration, protection and preservation of the water resources in Martin and St. Lucie counties. The Plan recommends the creation of approximately 13,000 acres of new reservoirs, 9,900 acres of wetland based treatment areas, 92,900 acres of natural storage and water quality treatment areas, and muck remediation and artificial habitat. These features will significantly reduce damaging watershed discharges into the St. Lucie estuary and Indian River Lagoon from C&SF canal structures, provide water quality treatment and storage in the natural system, and increase water supply, while maintaining flood control and the other objectives of the

Central and Southern Florida Project. This Plan also defines the most appropriate placement for the reservoirs approved in the Comprehensive Everglades Restoration Plan (CERP). The proposed Pal-mar Complex and Cypress Creek Complex Natural Storage and Treatment Areas will both provide additional flow to the Loxahatchee Slough and River. The Pal-mar complex consists of approximately 17,143 acres of improved pasture with degraded wetlands located on the south side of C-44. It will serve as a reservoir for some of the excess flow that is currently discharged from Lake Okeechobee through the C-44 canal to the South Fork of the St. Lucie River and out to tide water when lake levels exceed USACE regulation schedules. Water stored in Pal-Mar or adjacent areas could potentially be used to supplement flow to the South Fork of the St. Lucie River and the Loxahatchee River during dry periods. Water stored in those areas will also supplement regional groundwater levels that may provide additional flow to the rivers. The Cypress Creek Complex consists of 32,639 acres of primarily improved pasture land and will provide additional flow to the South Fork of the St. Lucie River and Cypress Creek, a tributary which empties in the Northwest Fork of the Loxahatchee during periods of low rainfall. A copy of this document can be found at www.evergladesplan.org/pm/studies/irl/index.shtml.

Manatee Recovery Plan

The goal of this plan is to assure the long-term viability of the Florida manatee in the wild, allowing initially for reclassification to threatened status and, ultimately, removal from the List of Endangered and Threatened Wildlife. The plan sets forth criteria, which when met, will ensure a healthy, self-sustaining population of manatees in Florida by reducing or removing threats to the species' existence. A comprehensive discussion on the current threats to manatees, the actions and strategies needed to achieve a healthy and sustainable manatee population, and the prioritization, delegation of responsibility, and implementation of the recovery tasks are discussed in great detail in the plan.

The Loxahatchee Greenways Project

The Loxahatchee Greenways Project was carried out by The Conservation Fund, 1000 Friends of Florida, and the MacArthur Foundation. The project used GIS technology to identify regional greenway corridors that could connect the remaining pristine lands, and established a green infrastructure network that protects the resource base while still supporting the surrounding communities and sustaining the economy. Benefits of the Loxahatchee Greenways Project include protection of the River and its flora and fauna, protection of the wetland systems, water supply, recreational and educational opportunities, a reduction in the cost of future public services, and increases in property values. Planning agencies, businesses and communities agreed to incorporate the Loxahatchee Greenways Network into their conservation and development efforts.

Loxahatchee River Coalition

The Loxahatchee River Coalition is an environmental activist group with the mission to restore and preserve the Loxahatchee River and its ecosystem for present and future generations. The Coalition promotes stewardship and advocates for policies and programs that will benefit the inherent natural resources of the Loxahatchee River through education and activism.

Friends of the Loxahatchee River

Friends of the Loxahatchee River was founded in 1995 to offer local citizens the opportunity to learn more about the River and its ecosystems. The mission of this organization is to provide environmental education opportunities, conduct aquatic research programs, and promote public involvement in river conservation efforts.

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Appendix N

ANALYSIS OF FLOODPLAIN WATER LEVELS IN RELATIONSHIP TO PROPOSED MFL CRITERIA FOR THE NORTHWEST FORK THE LOXAHATCHEE RIVER

Contents

INTRODUCTION

The primary focus of the proposed MFL was to address the problem of saltwater intrusion within the Northwest Fork of the Loxahatchee River. During the course of this investigation, another major ecological question was identified, specifically: What are hydrologic requirements of the floodplain swamp, particularly that portion of the river designated as Wild and Scenic, and how will the implementation of the proposed MFL criteria impact or benefit that section of the river?

Two primary approaches were used to answer this question: (1) a review of the literature was conducted to identify appropriate water depths and hydroperiods that will sustain a healthy floodplain swamp community, and (2) floodplain transect data were analyzed to determine the relationship between river flow (calculated from stage data obtained from the Lainhart Dam) and the inundation characteristics of the floodplain swamp. The study area was limited to the area of the upper NW Fork of the Loxahatchee River located between Indiantown Rd. (State Rd. 706) and the Trapper Nelson's interpretive site (river mile 10.7). Areas downstream of Trapper Nelson's site were not included in this study, since the Lainhart Dam flow-floodplain stage relationships are different due to the effects of tributary inflows. The information presented below is a preliminary examination of hydroperiod requirements and inundation characteristics of major biological communities in the floodplain of the upper NW Fork of the Loxahatchee. District staff also used these relationships to assess the effects of implementing the proposed minimum flow criteria that were presented in the main body of this report.

METHODS

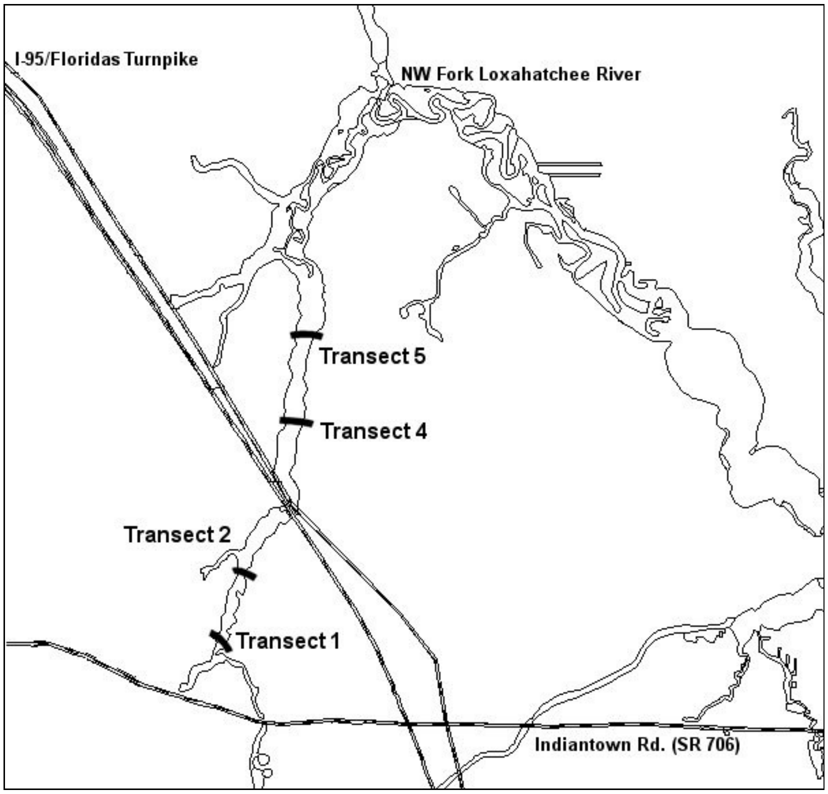
Literature Review

A literature review was conducted to identify the water depth and hydroperiod requirements of selected floodplain swamp species. This review was also used to obtain information on the germination requirements and flooding tolerances of cypress and other common floodplain swamp species. A summary of the major studies and relevant findings are provided (also see **Appendix A**).

Floodplain Transect Analysis

During the mid-1980's District staff conducted a series of floodplain surface water and soil elevation measurements at four selected transects located along the Wild and Scenic portion of the Loxahatchee River (D. Worth personal communication). Transects 1 and 2 were located between Indiantown Rd. and the Florida Turnpike/I-95 bridges (**Figure 1).** Transects 4 and 5 were located between the Florida Turnpike/I-95 bridges and the Trapper Nelson's interpretive site, located in Jonathan Dickinson State Park. Transect 3 was also surveyed, but was not included in this analysis because it lies along Cypress Creek near the confluence with the NW Fork and was outside the area of interest. Elevation measurements (feet NGVD) were made at 10-ft. intervals along each transect and were entered into a MS Excel spreadsheet (1 cell = 10 ft.). The number of cells that were at or below a specific water level were used to calculate the percent of the transect cross-sectional area that was inundated at a given stage.

Figure 1. Location of the transect sites along the upper NW Fork of the Loxahatchee River



Wells and stage recorders were installed at each of the four transect locations to measure daily average water levels (in feet NGVD). Data collected from each of the transect stage recorders were related to USGS and SFWMD stage measurements obtained from the Lainhart Dam. The four well stage recorders were in operation from 1984 through 1990 and the archived data was extracted from the SFWMD's DBHYDRO database. Additional information concerning the well sites are provided in **Table 1.**

Table 1. Floodplain Transect Well monitoring information

Transect	Survey Date*	Heading*	Gauging Station**	Lat/Long**	X-Y Coordinates (NAD 27)**	Location**
T1	12/20/83	N 22° 30' W	LOX.R1_G	26 5625.202 80 1024.15	925479.393 948362.741	Approx. 0.5 km down-stream of State Rd. 706
T2	12/22/83	S 75° E S 36° E S 11° E	LOX.R2_G	26 5656.201 80 1012.15	926544.921 951500.123	Downstream side of Masten Dam
T4	4/9/84	N 61° W	LOX.R3_G	26 5729.2 80 0958.149	927789.931 954840.688	Approx. 1.5 km down-stream of Masten Dam
T5	3/13/84	N 46° E S 85° E	LOX.R4_G	26 5806.199 80 0952.149	928308.185 958580.409	Approx. 2.5 km down-stream of Masten Dam

*Source: SFWMD survey staff field notes
**Source: SFWMD DBHYDRO database

Stage hydrographs (1984-1990) were developed from the transect well data. Summary statistics (mean, standard deviation, and range of variation) were developed from these hydrographs to calculate mean differences in elevation between each transect site as compared to the Lainhart Dam. Data used in these analyses were only from periods when concurrent and continuous stage data were available

Estimates of Floodplain Hydroperiod Length

Calculations were made to determine the average percent of time each transect site was flooded, during the period since major improvement were made to the G-92 structure in 1987. Using soil elevation data from the transect studies, the average elevation of each floodplain transect was estimated, in feet NGVD. Lainhart Dam daily stage measurements were obtained from USGS and SFWMD data obtained from the District's DBHYDRO database. The relative differences in surface water elevations were calculated between the Lainhart Dam and each transect site shown in **Table 5. A**ctual Lainhart Dam stage records from 1987-2001were then used to develop stage hydrographs and stage duration curves for each transect and determine the average percent of time each transect has been inundated (hydroperiod) since 1987.

Effects of Proposed MFL on Floodplain Inundation Characteristics

In an effort to assess the effects of the proposed MFL criteria on floodplain inundation characteristics, the following analyses were conducted. Lainhart Dam stage data (ft. NGVD) was converted into average daily flow data (cubic feet per second) using a weir equation developed by SFWMD staff (see **Appendix D**). These daily flow records were then related to measured floodplain stage data recorded at each transect. This information was used to determine the range of flows needed to inundate each floodplain transect in terms of percent of area flooded, i.e., for a given flow regime, a certain percentage of the floodplain cross sectional area is inundated. These data were used to establish the relationship between the amount of water that passes over the Lainhart Dam and the percent of each transect that is inundated at a given Lainhart Dam flow rate.

RESULTS

LITERATURE REVIEW

The primary focus of this review was to identify relevant studies that indicate hydrological conditions required for germination and seedling survival of bald cypress and other floodplain swamp species and the ranges of natural and extreme (flood and drought) water level fluctuations (hydroperiod) required to sustain a healthy floodplain swamp community dominated by bald cypress and mixed hardwood swamp communities similar to those communities found along the upper NW Fork of the Loxahatchee River. The major findings of the literature review are discussed below.

Wetland Hydroperiod Requirements

The aspects of wetland flooding can be separated into components of hydroperiod, depth, seasonality, and frequency. When considered together, these components define a wetland's hydrologic regime. Simplifying the hydrologic regime in terms of "average" annual values for depth, duration, and frequency of flooding is helpful in characterizing general conditions. In reality, however, a wetland is unlikely to experience an average year. Instead, the hydrologic regime will exhibit variation from year to year (CH2M HILL 1996a).

Ewel (1990) found that hydroperiod (i.e. the duration of saturated soils or standing water) is the dominant environmental factor that controls the ecological characteristics of a swamp. Hydroperiod affects soil aeration and the ability of plants to survive and reproduce. When flooding persists, oxygen in the soil is gradually depleted, causing increasingly stressful conditions on roots. Only a few species can tolerate the lack of oxygen and high concentrations of soluble iron and manganese, and even hydrogen sulfide that develop in the root zone under these conditions. Short hydroperiods, flowing water, and high dissolved oxygen levels characterize river swamps, making organic matter removal rates rapid and fire uncommon. Generalized hydroperiods for a variety of swamp types are presented in **Table 2.**

Bald Cypress Seed Germination and Seedling Survival

Bald cypress is the most common wetland tree in Florida and is often recorded as the dominant species in swamps with fluctuating water levels. Bald cypress seeds cannot germinate when soils are flooded, although seedlings grow best in saturated but unflooded soils (Dickson & Broyer 1972), Bald cypress however grows too slowly to survive competition with faster growing hardwoods. Bald cypress does not survive extended submerged conditions (Demaree 1932), making successful regeneration of a cypress swamp highly dependent on regular water level fluctuations. When mature, however, cypress is the most flood-tolerant of all tree species in Florida (e.g. Harms et al. 1980).

Young et al. 1994 reported that bald cypress typically occurs in areas subjected to frequent or prolonged flooding. Mature trees are reported to tolerate flood depths of 3 m or more (Wilhite & Toliver 1990), but are also found in well-drained areas (Mattoon 1915). The ability of bald cypress to grow in different hydrologic regimes has been the subject of numerous studies on germination requirements (Demaree 1932, Penfound 1952, Dubarry 1963), growth of seedlings and mature trees (Mattoon 1915, 1916; Demaree 1932, Eggler 1955, Dickson & Broyer 1972, Mitsch et al. 1979), and distribution of the species (Bedinger 1971, McKnight et al. 1981, Theriot 1988). Other studies have documented the growth response of bald cypress to alterations of natural hydrologic regimes, specifically permanent inundation of an area. Results of these studies, however, have been inconsistent: Conner & Day (1976) found that growth of bald cypress in permanently flooded areas of Lac des Allemands Swamp, Louisiana, was greater than in areas with other hydrologic regimes. In contrast, Duever & McCollom (1987) found a decrease in growth of bald cypress trees in areas that had been permanently flooded in Florida. Keeland (1994) reported less growth in bald cypress trees in South Carolina that were subjected to increased flood levels relative to trees from

Table 2. Proposed hydroperiod ranges of major types of Florida swamps (based on Table 9.1 from Ewel 1990).

Type of Swamp	Average Hydroperiod*	Main Water Source
River Swamps		
Whitewater floodplain forest	Short	River
Blackwater floodplain forest	Short	River
Spring run swamp	Short	Deep groundwater
Stillwater Swamps		
Bay swamp	Long	Shallow groundwater
Cypress pond	Moderate	Shallow groundwater
Cypress savanna	Moderate	Rain
Cypress strand	Moderate	Shallow groundwater
Gum pond	Long	Shallow groundwater
Hydric hammock	Short	Deep groundwater
Lake fringe swamp	Moderate	Lake
Melaleuca swamp	Moderate	Shallow groundwater
Mixed hardwood swamp	Moderate	Shallow groundwater
Shrub bog	Long	Shallow groundwater

*Short = less than 6 months; Moderate = 6-9 months; Long = greater than 9 months

a nearby undisturbed area. A decrease in growth following deep flooding has also been reported from Illinois (Mitsch et al. 1979). A growth surge of short duration followed by a long-term depression in growth was observed by Stahle et al. (1992) in bald cypress tree that were permanently flooded following formation of Reelfoot Lake by the New Madrid earthquakes of 1811-1812.

Conner and Toliver (1990) report that in general, bald cypress regenerates well in swamps where the seedbed is moist and competitors are unable to cope with flooding, but extended dry periods are necessary for the seedlings to grow tall enough to survive future flooding. As a result, bald cypress stands are usually made up of several even-aged classes (Mattoon 1915). Naturally seeded trees often reach heights of 20-36 cm during the first growing season and 40 – 60 cm during the second season (Mattoon 1915).

Keeland and Conner (1999) reported that bald cypress seedlings die if completely submerged for a very long period during the growing season (Demaree 1932, Eggler & Moore 1961). Penfound (1949) observed that those bald cypress seedlings that barely extended above the water surface when Lake Chicot (Louisiana) was first formed were capable of surviving, while submerged seedlings were killed. Bald cypress regenerated well under low-water conditions that allowed seedlings to grow tall enough to maintain some of their foliage above the water during the growing season. Proper conditions for germination and survival include a good seed crop during the previous fall, abundant light, little competition from other species (especially mature trees), and a very moist but not flooded seedbed. Permanent flooding after establishment may slow growth rates, but seedlings taller than the maximum water-surface elevation during the growing season should have good survival. The cohort nature of bald cypress stands throughout the United States suggests that extensive regeneration of this species has historically occurred during extended periods of low water (Matoon 1915, Putnam et al. 1960).

Duever's (1980) study of the Corkscrew Swamp Sanctuary in South Florida reviewed water level data collected from four transects located along the major flowway of the Sanctuary. Results showed sites which had the largest and fastest growing bald cypress tress exhibited hydroperiods ranging from 286-296 days. Tree-ring analysis indicated that longer hydroperiods of 306-325 days at four cypress sites along the dike retarded cypress growth. Growth rates were also slower at sites with shorter hydroperiods of 133 to 270 days. Poor growth was particularly obvious on the 133-day hydroperiod site, where there was a vigorous shrub stratum of wax myrtle (*Myrica cerifera*), a species characteristic of sites with hydroperiods between 45 and 155 days.

Effects of Hydroperiod on Wetland Plant Communities

CH2M Hill (1996a) conducted a literature review on the relationship between hydroperiod and wetland type. They reported that wetlands in Florida follow natural and usually predictable fluctuations in depth and duration of inundation in response to seasonal patterns of rainfall and evapotranspiration. These fluctuations significantly influence the composition of plant and animal communities and associated wetland functions. Climatic and cultural changes in the quantity and timing of hydrologic inflows and outflows can affect the pattern and range in water level fluctuations, leading to changes in wetland structure and function.

Schomer & Drew (1982) estimated the flooding duration requirements of different Florida wetland communities by using data from a characterization of vegetation in the Florida Everglades. They found that bald cypress communities are inundated from 3 months (25% inundation) to 9 months (75% inundation) per year. Brown & Starnes (1983) defined a narrower range in average water depths and hydroperiods for the major types of wetlands in Seminole County (**Table 3**). In their assessment, bald cypress hydroperiods averaged from 250 days (68% inundation) to 300 days (82% inundation).

Table 3. Hydroperiod ranges for several wetland types (source: Brown & Starnes 1983).

Community Type	Average Low Water (ft above soil surface)	Average High Water (ft above soil surface)	Hydroperiod (days/year)
Hydric Hammock	Below ground surface	0.33	100-150
Wet Prairie	Below ground surface	1.64	150-200
Bayhead	Below ground surface	0.98	200-250
Mixed Hardwood Swamp	Below ground surface	1.97	200-250
Cypress Dome	Below ground surface	1.64	250-300
Deep Marsh	0.66	3.28	Approx. 365
Shallow Marsh	Below ground surface	2.3	Approx. 365

Table 4 provides a summary of data compiled from a number of studies conducted in central and southwest Florida. Wetland types are ranked in order of increasing hydroperiod. Average low and high water depths are provided where available. These data support the observation that wetland types are associated with a wide hydroperiod range, which generally defines the flooding tolerance of the community. The summary data also show that the hydroperiod range of a given wetland community may overlap with one to several other community types. Each of the major types can be arrayed along the hydrological gradient.

Table 4. Observed flooding depth and duration of Florida plant communities

Community Type*	Average Low Water (ft above soil surface)	Average High Water (ft above soil surface)	Hydroperiod (days/year)
Mesic Hammock			28
Low Pine Flatwoods			42-225
Wet Prairie			57
Shrub Swamp (transitional)			50-60
Cypress Dome			Approx. 105
Marsh			135-255
Oak-Palm Hammock	-1.37	1.45	75-200
Open Pine-Prairie	-1.88	1.93	150-200
Transitional Pine-Prairie	-1.98	2.03	150-200
Altered Wetlands (average)			Approx. 173
Evergreen Swamp (*Melaleuca*)			175
Scrub Cypress			194
Bay Swamp			210
Hypericum Marsh	-2.63	1.39	213
Deep Freshwater Marsh		2.63	215
Spartina bakeri Marsh	-3.21	1.26	218
Hydric Pine Flatwoods		0.56	225
Cypress/Pine Swamp			225-238
Shallow Cypress Swamp			238
Shrub Swamp (shallow)			239
Shallow Evergreen Swamp		0.47	243
Deep Cypress Swamp			250
Deeper Freshwater Marsh		0.88	254
Polygonum Marsh	-2.99	2.07	262
Fraxinus-Salix Swamp	-2.30	2.06	308
Shrub Swamp (deep)			310-350
Unaltered Wetlands (average)			Approx. 313
Cladium Marsh	-1.80	1.68	319
Cephalanthus Scrub/Shrub	-2.36	1.84	320
Panicum-Rhynchospora Marsh	-1.83	1.87	327
Pond (aquatic bed)			327-355
Mixed Emergent Marsh	-1.43	2.1	338

* Documented observed values may not reflect typical hydroperiods for some wetlands

Sources: Bays & Winchester 1986; Brown 1991; Brown & Starnes 1983; CH2M HILL 1987; CH2M HILL & Winchester 1988a, 1988b, 1988c; ESE 1991a, 1991b, 1991c, 1992a, 1992b

Floodplain Transect Survey Results

Floodplain Transect Surface Water Hydrology

Figure 2 provides a hydrograph of surface water levels recorded along each transect from 1984-1990 as well as Lainhart Dam flows for the same time period. Summary statistics (mean, standard deviation, and range of variation) were developed from these hydrographs to calculate mean differences in elevation between each transect site as compared to the Lainhart Dam. These differences in elevation are presented in **Table 5**.

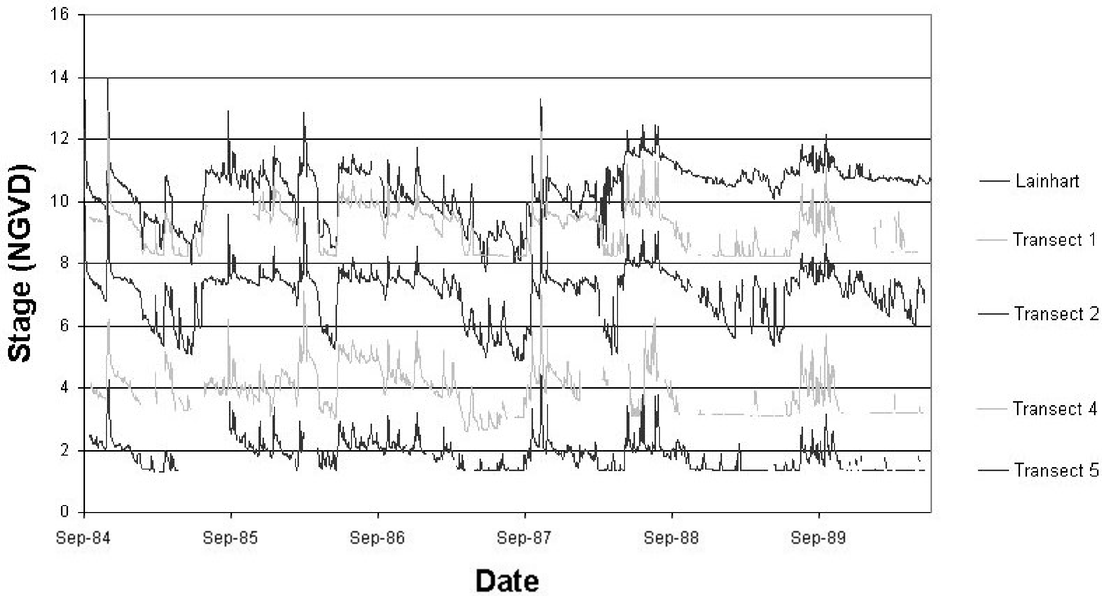


Figure 2 Daily Stage hydrographs for the four transects and Lainhart Dam (1984-1990**)**

Table 5. Mean (standard deviation) difference between the Lainhart Dam water levels and those recorded downstream at each transect location (in feet NGVD).

Transect Name	Transect 1	Transect 2	Transect 4	Transect 5
Station Id.	LOX.R1_G	LOX.R2_G	LOX.R3_G	LOX.R4_G
Mean (STD)	0.78 (0.28)	3.04 (0.37)	6.12 (0.42)	8.33 (0.38)

Floodplain Transect Soil Elevation Profiles

District staff measured soil elevations (feet NGVD) across the floodplain of the upper NW Fork of the Loxahatchee River in December 1983-April 1984 (SFWMD survey staff field notes). Elevation profiles of each transect are presented in **Figures 3a to 3d**. Results showed that average elevations of the transects decreased 6 to 7 feet in the river channel and floodplain, respectively, from Transect 1 to Transect 5 (**Table 6**). These data show that floodplain is not flat, but undulates along an elevation that varies 1.0 to 1.5 ft. from the edge of the river channel to the edge of the floodplain. Elevations of the upland – floodplain swamp ecotone between opposing sides of the river at three transects were inconsistent and highly variable. Presumably, this may be related to the magnitude of freshwater seepage available from upland areas flanking the floodplain.

Caution must be used when examining the length of transect segments as the survey did not always cross the floodplain directly perpendicular to the river channel.

Table 6. Transect Lengths and Approximate Floodplain Elevations (NGVD) at each Transect

	Transect 1	Transect 2	Transect 4	Transect 5
Total Transect Length (ft)	470	560	520	670
– Upland (ft)	30	90	90	20
– Floodplain Swamp (ft)	360	430	400	580
– River Channel (ft)	80	40	30	70
Floodplain-Upland Ecotone (NGVD)	12.4 – 14.6	8.0 – 11.9	4.8	2.1 – 5.6
Floodplain-Channel Ecotone (NGVD)	8.2	6.9	2.7	2.0
Channel Bottom (NGVD)	1.4	3.2	-3.2	-2.2
Mean Floodplain Elevation (NGVD)	9.9	8.2	4.0	2.3

Floodplain Hydroperiod Estimates

Table 7 shows the estimated percent of time each transect was flooded from 1987 to 2001. These hydroperiod calculations were derived from the average floodplain transect elevation measurements (ft. NGVD) shown in **Table 6,** the relationships presented in **Table 5.,** and the recorded Lainhart Dam stage data from 1987 to 2001. Results showed that hydroperiods at the four transect sites to range from 44%- 88.9% with an overall average of 72.3% (flooded an average of 264 days/year) as shown in **Table 7**. The shortest hydroperiod (driest) occurred at Transect 2 located just downstream from the Masten Dam. We believe this is caused by the proximity of the structure, which generally causes this area to be much drier than the other transect locations. In contrast, Transects 1, 3 and 4 were much wetter with average hydroperiods ranging from 76.7 to 88.9 % (flooded from 280–324 days/year). These values generally fall within ranges reported for cypress domes (250-300 days/year) but are wetter than the mixed hardwood swamp (200-250 days/year) values shown in **Tables 3** and **4**. Results of these analyses show that over the past 14 years the upstream portion of the Wild and Scenic portion of the Northwest Fork of the Loxahatchee River has experienced adequate periods of inundation to support both cypress and mixed hardwood swamp communities.

Table 7. Estimates of the Average Percent of Time each Transect was Inundated from 1987-2001

Transect	Percent of Time Flooded (Hydroperiod)	Average No. of Days/year Inundated
T1	76.7 %	280 days
T2	44 %	160 days
T4	88.9%	324 days
T5	79.8%	291 days
Avg T1,T4, T5	81.8 %	298 days
All	***72.3 %***	***264 days***

Effects of Lainhart Dam Flow Rates on Floodplain Inundation

A key question of this study was how will implementation of the proposed MFL criteria impact the portion of the river that is designated as Wild and Scenic? To answer this question, Lainhart stage and flow rate data were correlated with surface water levels and soil elevation profiles recorded at each transect, using the relationships shown in **Tables 5 and 6**. Relationships between Lainhart lows and their corresponding water depths at each transect are graphically shown in **Figures 3a to 3d** along the right-hand axis. Calculations of the percent of floodplain (excluding the river channel and upland areas) that would be flooded under a given Lainhart dam flow rate are also shown. These results are also presented in **Table 8**.

Table 8. Percent of the floodplain (area) inundated in relationship to Lainhart Dam flow rates (cfs) (excluding uplands and river channel).

	Lainhart Dam Flow Rates (cubic feet/second)								
Name	**10 cfs**	**25 cfs**	**35 cfs**	**48 cfs**	**65 cfs**	**75 cfs**	**100cfs**	**200cfs**	**300cfs**
Transect 1	14%*	44%	61%	61%	64%	64%	69%	78%	86%
Transect 2**	0%	7%	16%	40%	49%	53%	74%	86%	91%
Transect 4	25%	58%	75%	93%	95%	95%	100%	100%	100%
Transect 5	5%	43%	57%	71%	81%	83%	93%	98%	100%
Avg.(Transects 1, 4, and 5)	15%	48%	64%	75%	80%	81%	87%	92%	95%
Average (all transects)	11%	38%	52%	66%	72%	74%	84%	91%	94%

* Percent of the floodplain (area) inundated
** This transect is located just downstream of the Masten Dam and is influenced by this structure

From examination of the general trends shown in **Figures 3a to 3d** and **Table 8**, some general points can be made concerning the hydrology of the floodplain between SR 706 (Indiantown Rd.) and Trapper Nelson's site. Nearly all of the floodplain is inundated at flows greater than 300 cfs. Conversely, flows less than 10 cfs are required to allow surface water to fully recede from the floodplain. At flows of 35 cfs, the area of inundated floodplain ranges from 16% at Transect 2 up to 75% at Transect 4, however the average for all transects is still greater than 50% (**Table 8**).

Plots of percent floodplain inundation versus Lainhart dam flow rates at Transects 1, 4, and 5 were comparable. However, Transect 2 demonstrated a lower percent of floodplain inundated at flows under 75 cfs. Again this was attributed to the effects of the Masten Dam, which is located just upstream of this transect. It is important to note that the effects of the Masten Dam were not observed further downstream at Transect 4. Based on these data, a minimum flow of 35 cfs recorded at the Lainhart Dam would inundate more than 50% of the floodplain on average (**Table 8)**. In contrast, nearly 95% of the floodplain is inundated at a flow of 300 cfs, while flows of less than 10 cfs are needed for surface water to fully recede from the floodplain (**Table 8).**

Providing a dry season minimum flow regime that inundates more than 50% of the floodplain would provide protection from the effects of drought and over-drainage. In addition, water levels maintained within this range would also (a) provide aquatic refugia for aquatic invertebrates, amphibians and fish species to survive during dry periods, (b) reduce the possibility for invasion by melaleuca, Brazilian pepper and Old World climbing fern, and (c) reduce the frequency of severe fires that could impact the remaining floodplain swamp forest. Overall, these results indicate that the water levels resulting from a minimum flow of 35 cfs would not adversely impact the upstream floodplain swamp.

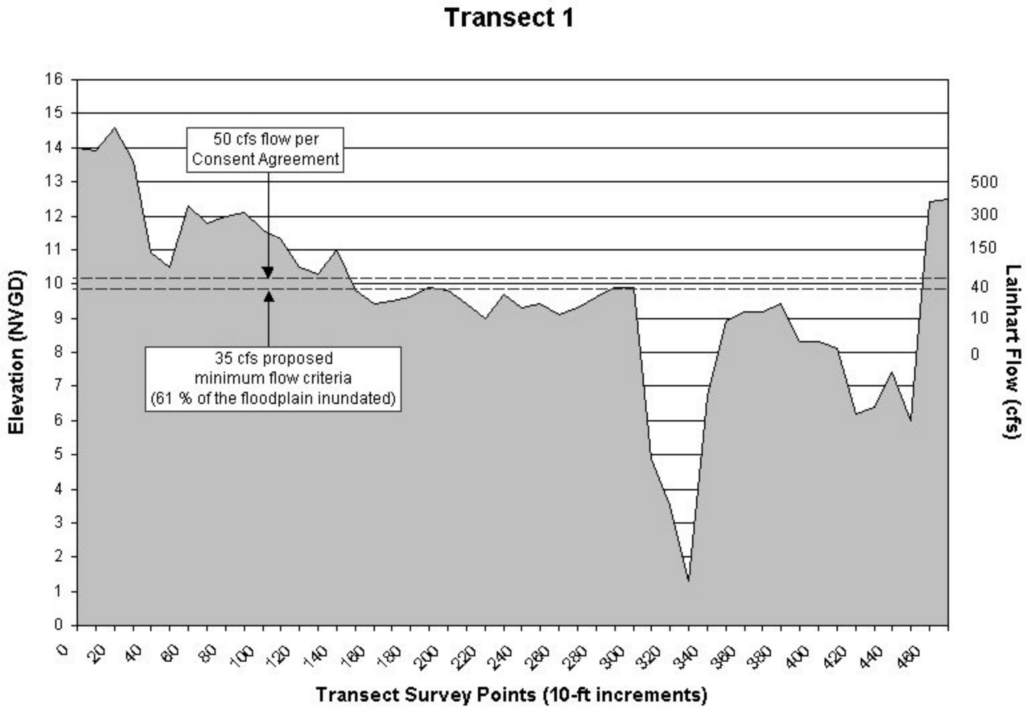


Figure 3a. Transect 1 profile across the floodplain along the upper NW Fork of the Loxahatchee River.

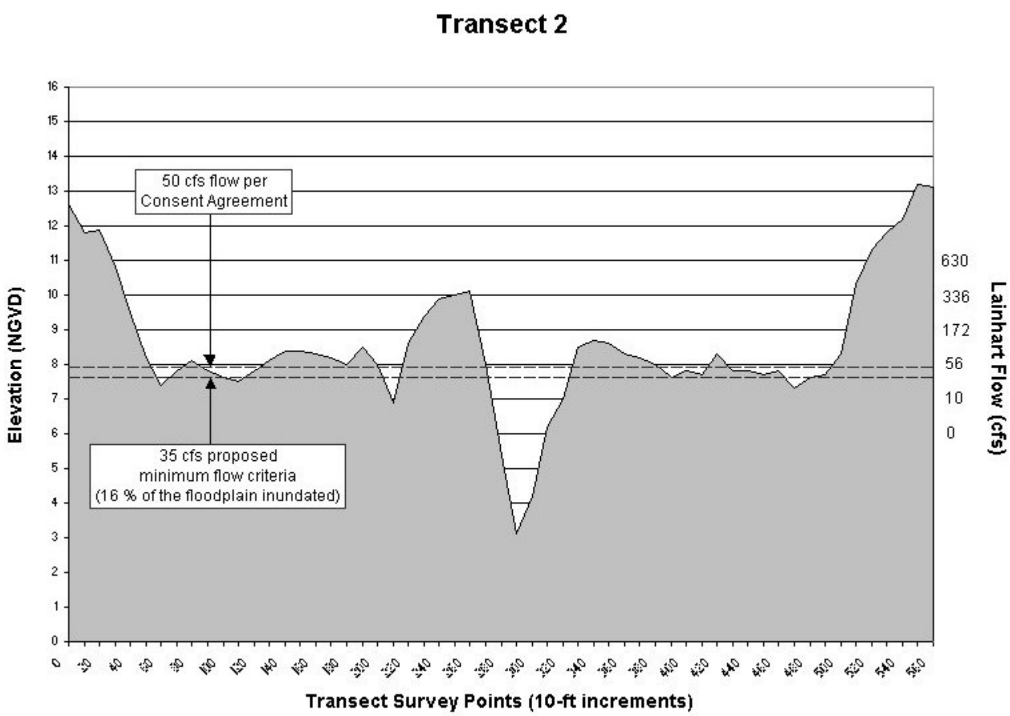


Figure 3b. Transect 2 profile across the floodplain along the upper NW Fork of the Loxahatchee River.

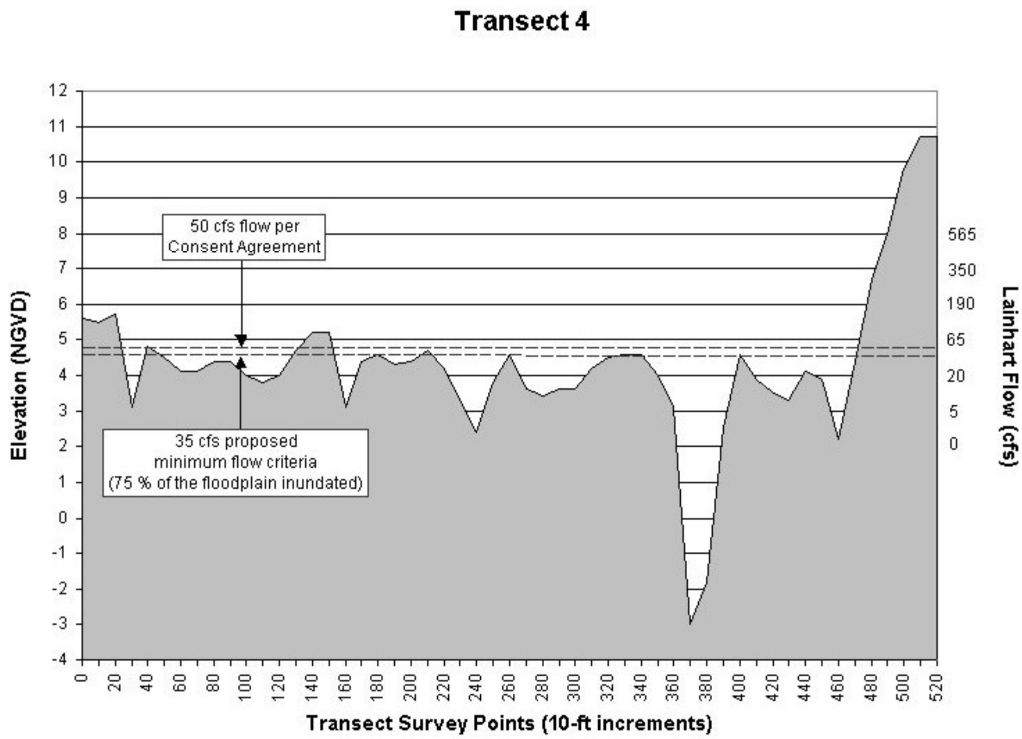


Figure 3c. Transect 4 profile across the floodplain along the upper NW Fork of the Loxahatchee River.

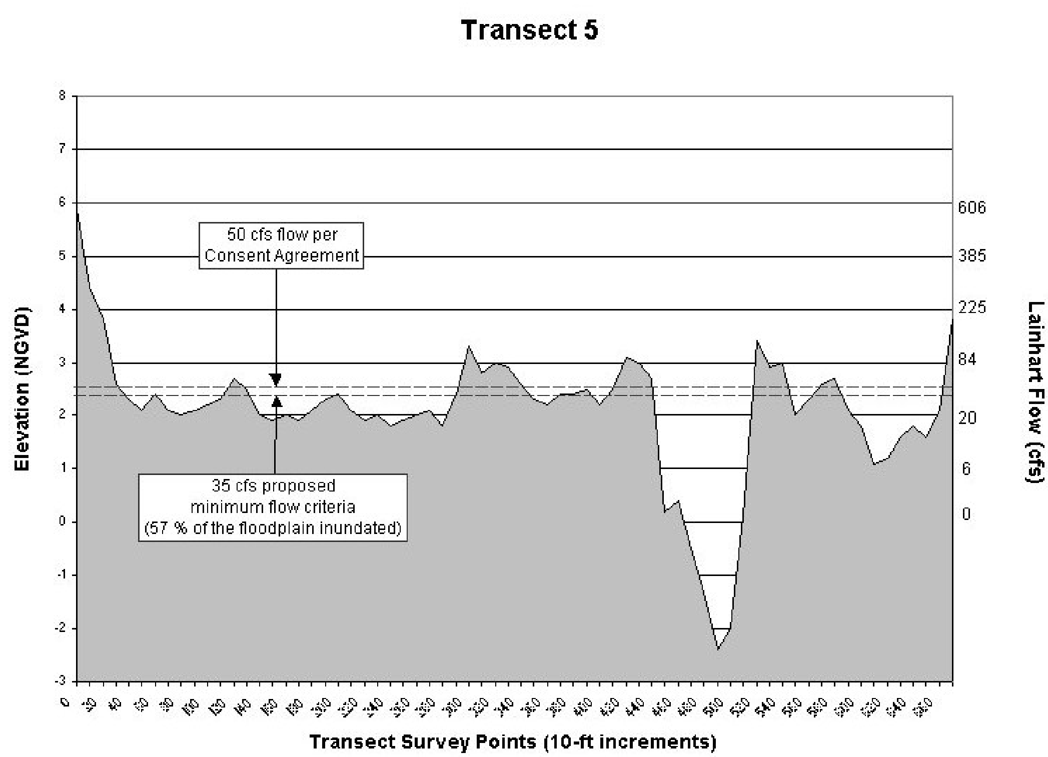


Figure 3d. Transect 5 profile across the floodplain along the upper NW Fork of the Loxahatchee River.

DISCUSSION

Hydrologic Requirements of Floodplain Communities

The analysis of stage and flow relationships at transects in the Loxahatchee River floodplain upstream of Trapper Nelson's site demonstrates how closely these two hydrological factors are linked. Since the stage at each transect is so closely correlated to stage (flow) at Lainhart Dam (see **Table 5** and **Figure 2**), flows through the river channel are a dominant factor that controls surface water levels in the floodplain (i.e., rather than groundwater or surface flows from other sources).

Establishment of a minimum flow and level for the Loxahatchee River entails determination of the lower limit that would cause significant harm to the identified resource. Elsewhere in this document, the determination of a minimum flow for the river was based on the need to protect the remaining freshwater swamp community from significant harm that occurs due to salinity intrusion. Other potential criteria (water levels) are provided in this section that should be considered when developing future floodplain management goals and objectives. Water level requirements of floodplain swamp communities have not been analyzed in sufficient detail to provide a basis to define "significant harm" to the resource.

Some possible impacts of maintaining insufficient water levels in the floodplain include: (1) increased fire frequency; (2) reduced reproduction of floodplain vegetation; (3) invasion of floodplain communities by upland or exotic species; and (4) impacts to wildlife that rely on aquatic habitats for reproduction. On the other hand, setting a minimum flow for the river that is too high, such as could occur by trying to avoid saltwater intrusion or compensate for rising sea levels, could cause (1) prolonged floodplain inundation; (2) increased scouring of the river channel and erosion of river embankments; (3) increased transport of unconsolidated material to the estuary, burying seagrass and oyster beds; and (4) drown existing floodplain swamp communities and (5) eliminate periodic dry downs required for successful reproduction. Several authors have defined an average annual duration of flooding for floodplain and bald cypress communities, realizing that "average" conditions may not occur very often. During most years, rainfall patterns are either above average or below average rainfall patterns. It is assumed that if an appropriate annual flooding duration is achieved, occasional periods of too little and too much flooding will occur due to natural variation and that extreme conditions are also a part of the natural system.

Future efforts to establish restoration targets for the river will include consideration of the whole range of variability required to sustain a healthy floodplain swamp community. The focus of the MFL, however, is to examine water flows and levels that are required to prevent significant harm. In order to address the latter issue, we first determined the amount of flow needed to protect the river floodplain community from significant harm due to saltwater intrusion. During the course of this analysis, the peer review panel asked the question: What are the effects of the proposed MFL criteria on the upstream wild and scenic portion of the river? This appendix provides one approach to analyzing these effects. We have not studied this issue in sufficient detail, however, to develop a quantitative relationship between water levels and significant harm to the resource. Such an analysis would be needed to establish "minimum level" criteria for the Loxahatchee River floodplain. To describe the effects of water levels on the floodplain, we first examined the water level requirements of soils and different plant communities that occur along the NW Fork of the river. Each of these requirements was determined individually with no expectation that one would necessarily be consistent with one another.

Water Level Requirements of Floodplain Soils

Water levels should rarely fall to the point where the floodplain soils dry out and are subject to desiccation. A review of transect elevations (see **Figures 3a to 3d**, **Table 7**) indicates that flows of approximately 5 cfs and lower (except at Transect 2, which is influenced by Masten Dam) are required to lower surface water levels in the river channel to more than 1 ft. below the soil surface. Altough a 1 ft criteria was used as a performance measure for protection of peat soils in the Everglades (SFWMD 2000), such a criterion would be very conservative for the Loxahatchee River floodplain, since the soils in this area are predominantly mineral alluvial deposits (sand) as opposed to organic (peat) in composition. It is recommended, therefore, that protecting soils from the effects of excessive drying is not a critical resource protection issue in the Loxahatchee River floodplain.

Summary of Hydroperiod Requirements for Floodplain Swamps

Based on the studies cited above, District staff have summarized the findings of the literature review to provide appropriate ranges of flooding and drying (hydroperiod) that will support and sustain both bald cypress and mixed hardwood swamp species. These data are summarized in **Table 9** below which reports average annual hydroperiods for floodplain swamp, bald cypress, and mixed hardwood communities from a variety of habitats.

Key findings of this review indicate that the floodplain swamp, community is inundated on average, 120 days/year, with a range from 30 to 183 days reported from the literature **(Table 9).** These hydroperiod values are considerably shorter than those reported for bald cypress and mixed hardwood swamps, but there is some overlap in the ranges. The hydroperiod range for a typical bald cypress swamp varied from 133 to 330 days/year, with an average of approximately 240 days/year (see Duever 1980, CH2M HILL 1996a). At the lower end of this range, poor growth was reported and a vigorous shrub stratum of drier habitat species was found. At the upper end of this range, growth rates were reduced, as open water habitats tended to occupy sites with hydroperiods longer than 330 days. Average hydroperiods reported for typical mixed hardwood swamp range from 150-240 days/year (**Table 9**).

Results of this study showed that the upstream floodplain of the wild and scenic portion of the river is inundated from 160 days/year (Transect 2) to 324 days/year (Transect 4). Overall, the four transects were flooded 264 days/year (flooded 72.3% of the time), on average (**Table 7).**

Table 9. Average annual hydroperiod of floodplain, bald cypress, and mixed hardwood swamp communities. Results represent study sites from Florida.

Community Type	**Hydroperiod(days/year)**	**Author(s)**
Floodplain Swamps		
Typical	30-150 (120 average)	CH2M HILL 1996a
	60-135	ESE 1994
Whitewater	less than 183	Ewel 1990
Blackwater	less than 183	Ewel 1990
Bald Cypress		
“Slow-growing”	133-270	Duever 1980
“Fast-growing”	286-296	Duever 1980
“Slow-growing”	306-325	Duever 1980
Cypress Communities		
Deep	250	CH2M HILL 1996a*
	270-330 (300 average)	CH2M HILL 1996a
Dome	250-300	Brown & Starnes 1983
	Approx. 105	CH2M HILL 1996a*
Pond	183-274	Ewel 1990
Savanna	183-274	Ewel 1990
Strand	183-274	Ewel 1990
Shallow	90-180 (150 average)	CH2M HILL 1996a
	238	CH2M HILL 1996a*
Typical	180-270 (240 average)	CH2M HILL 1996a
	80-260	Shomer & Drew 1982
Mixed Hardwood		
Typical	183-274	Ewel 1990
	200-250	Brown & Starnes 1983
	90-180 (150 average)	CH2M HILL 1996a
	90-180	ESE 1994
Deep	180-270 (240 average)	CH2M HILL 1996a

*Results represent a summarization of findings from multiple authors

Some general conclusions can be drawn from this review. First, fluctuating water levels with an occasional draw down are essential components of the life cycle of floodplain, bald cypress, and mixed hardwood swamp communities. Forested wetland communities that do not periodically dry out and thus are inundated most of the year do not support seedling reproduction or sustainable growth of swamp vegetation. Swamps that have been altered by dams, levees or roads, which caused unnaturally prolonged hydroperiods, have experienced stress and eventual death of forest vegetation (see Keeland & Conner 1999, Young et al. 1994). The literature review indicates that no natural, healthy, or reproductive floodplain swamps are found on sites with hydroperiods in excess of an average of 330 days/year (inundated 90% of the time). Furthermore, excessively long hydroperiods will suppress seed germination and seedling growth (Keeland & Conner 1999, Mattoon 1915, Keeland et al. 1996, Conner & Toliver 1990, Ewel 1990). In contrast, hydroperiods that are too short (less than 130 days/years or 35% inundation) result in a shift to vegetation typically found in short-hydroperiod, drier wetland communities.

Examination of the survey transects from the upper NW Fork shows that surface water is essentially confined to the river channel when flows are less than 10 cfs, indicating that very low flows are required to fully draw down surface water from the floodplain swamp. On the other hand, flows greater than 300 cfs are required to fully inundate the floodplain swamp (i.e. surface water covers more than 90% of the floodplain). Water depths can exceed 2.5 ft under these conditions. Therefore, in order to provide the required draw down for the floodplain swamp, surface water levels should occasionally fall to a level that dries out most of the floodplain. These low water conditions correspond to flows of less than 25 cfs (see **Table 8**) and are essential to avoid flooding stress, promote seed germination, and allow sufficient time to establish swamp tree seedlings and regenerate the forest. Based on the long-term rainfall trends reported in **Figure 4** of the Technical Document, it is estimated that such extreme drought conditions occur within the basin approximately once every 9 years on average.

Water Level Requirements of Fish & Invertebrates

The Southwest Florida Water Management District (SWFWMD) initiated an analysis of the minimum flows and levels for the Upper Peace River (SWFWMD 2002). As part of their studies and criteria, they examined the effects of low water levels on fish habitat and passage. The SWFWMD reasoned that maintaining depths of 0.6 ft or greater would provide adequate water levels for fish passage and would also ensure continuous flow, allow for recreational navigation (e.g. canoeing), improve aesthetics, and avoid or lessen other potential problems related to no flow conditions, such as low dissolved oxygen concentrations, localized phytoplankton blooms, and increased predatory pressure resulting from loss of habitat/cover. Extreme conditions, such as drying of the river channel, have not been reported from the upper NW Fork of the Loxahatchee River. However some of the concerns of fish passage, recreational navigation, and water quality may merit consideration during development of futures restoration plans for the Loxahatchee River. A review of the historic water levels for the upstream segment of the NW Fork (**Figures 4a to 4d**) indicates that water levels in the channel have not declined to less than one foot during the period of record (1971 to 2002), even when no flow over Laonhart Dam was recorded. The minimum flow of 35 cfs, which is proposed to prevent saltwater intrusion in the upstream segment of the NW Fork, provides sufficient water depths and flows to meet these needs.

The "wetted perimeter inflection point" technique used by the Southwest Florida Water Management District on the Upper Peace River minimum flow and level project (SWFWMD 2002) was reviewed for application to the Loxahatchee River. Wetted perimeter methods assume that a direct relationship exists between wetter perimeter and fish habitats in streams (Annear & Conder 1984). Studies on streams in the Southeast (Benke et al. 1995) have demonstrated that the greatest amount of macroinvertebrate biomass per unit reach of stream occurs on the stream bottom. This aquatic habitat type is primarily that of bedrock or unconsolidated sand bottom, which is different from that normally found within the floodplain itself. **Table 10** shows water elevation and flow at which the entire river channel is inundated. A review of this information shows that a flow of more than 25 cfs would provide maximized wetted perimeter of the stream bed, except at Transect 2 where the downstream effects of Masten Dam have changed the floodplain hydrology.

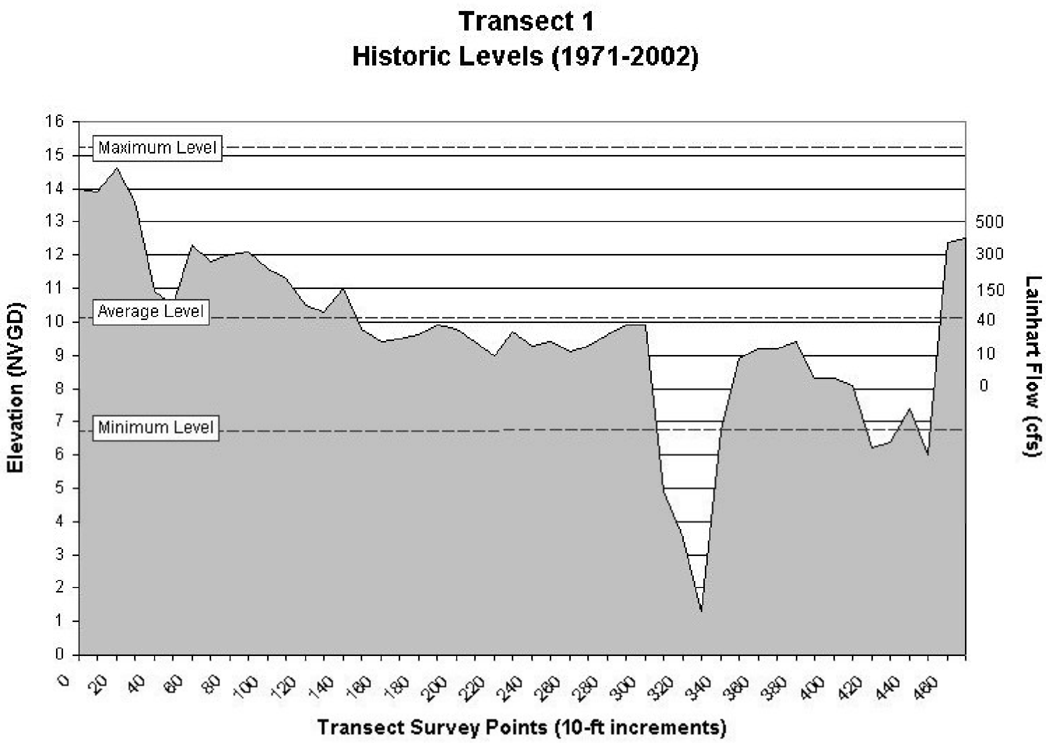


Figure 4a. Historic water levels at Transect 1.

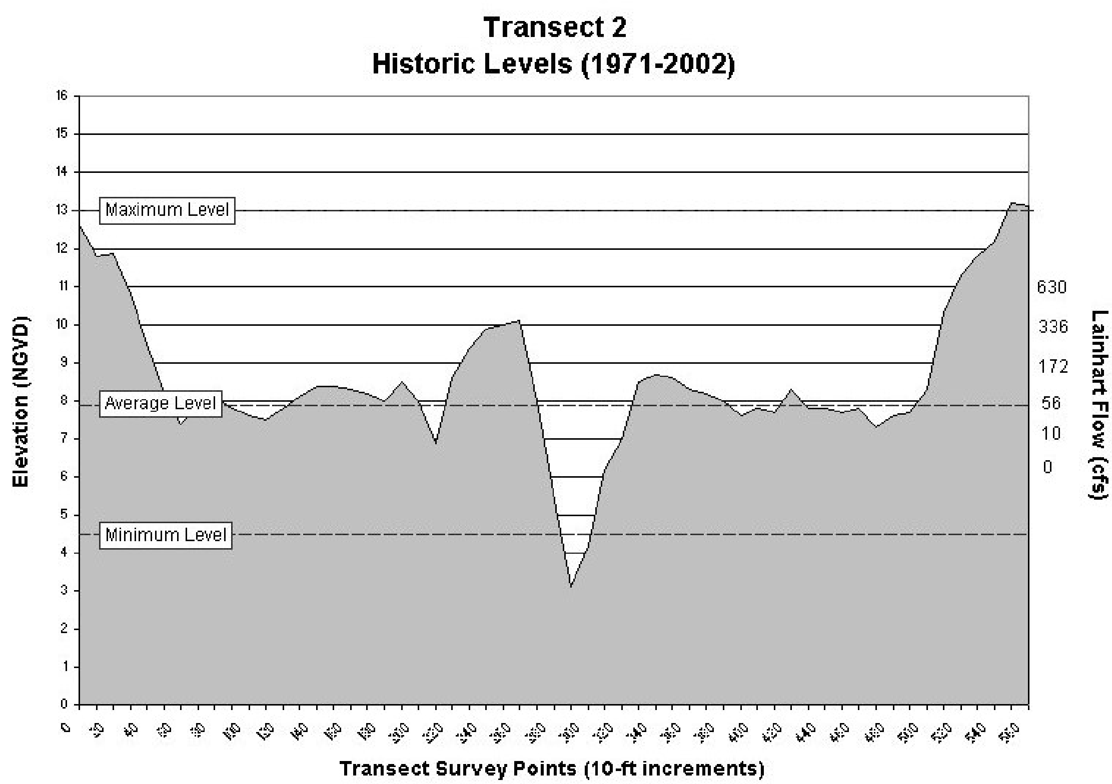


Figure 4b. Historic water levels at Transect 2.

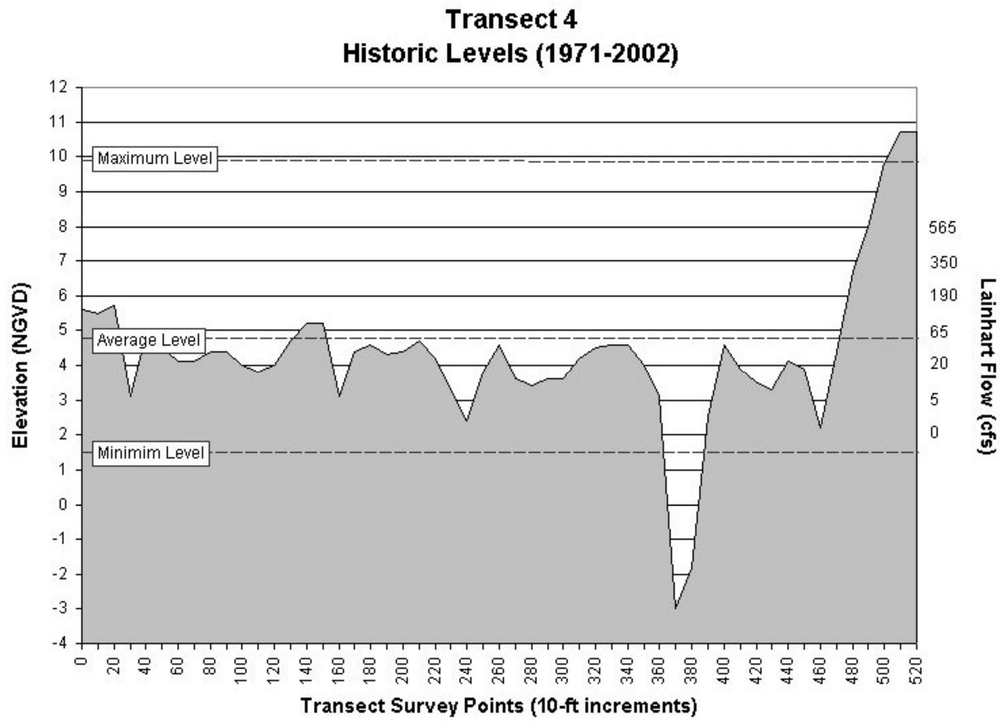


Figure 4c. Historic water levels at Transect 4.

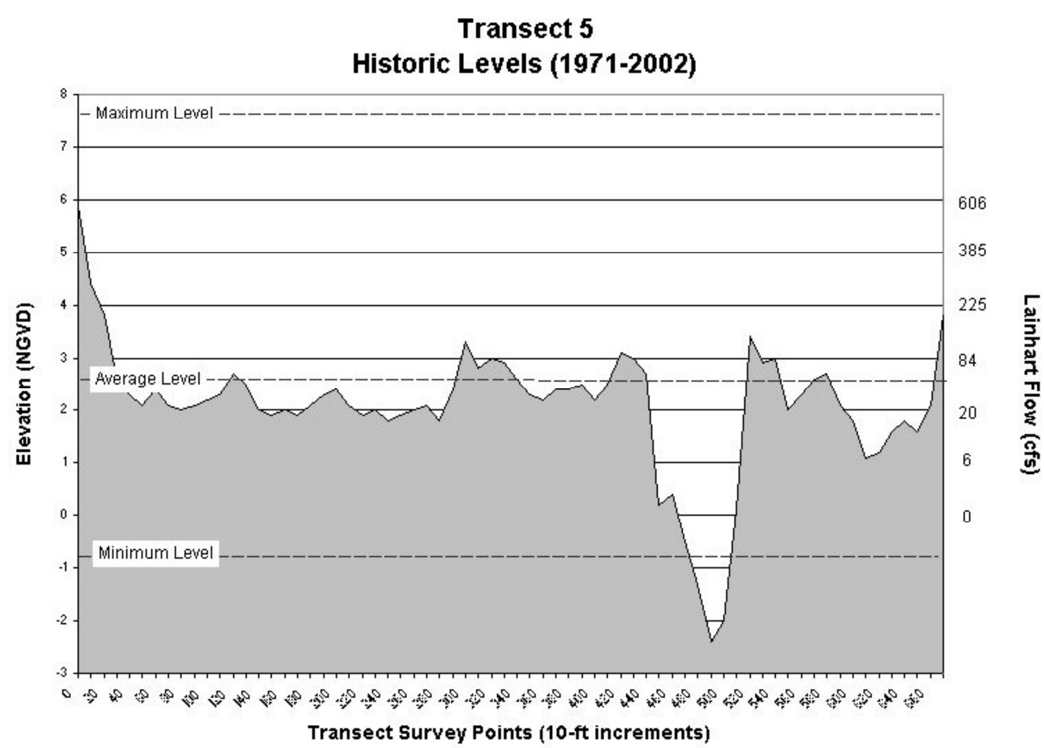


Figure 4d. Historic water levels at Transect 5**.**

Table 10. Surface water levels and respective flows required to fully inundate the stream channel and bottom of the upper NW Fork of the Loxahatchee.

Transect	Approximate Elevation (NGVD)	Approximate Flow at Lainhart Dam (cfs)
T1	9.0	10
T2	7.9	48
T4	4.0	15
T5	2.2	28
Avg (T1, T4, and T5)*		18
Avg (All Transects)		25

* Transect 2 is Located just south of the Masten Dam and heavily influenced by it, an average of the transects not affected by this factor is included.

Summary of Water Level Criteria for Floodplain Communities

Table 11 presents a summary of water level criteria for floodplain communities (outlined above). Results from analysis of floodplain elevation, flooding characteristics, and historical water level data indicate that the proposed MFL criterion for the NW Fork is within recommended ecological targets for soils and floodplain vegetation. Caution must be exercised when setting a minimum flow and level for the NW Fork that will remove the potential for periodic natural draw down of surface water levels in the floodplain swamp. Artificially high minimum flows, intended to stave off salinity intrusion resulting from dredging and opening of the Jupiter Inlet, may prolong hydroperiods and drown upstream portions of the floodplain swamp in the upper reaches of the river, and inhibit germination and growth of seedlings that regenerate the forest.

Table 11. A Summary of Water Level Requirements for the Upper NW Fork of the Loxahatchee River

Parameter	Purpose	Flow*	Level	Minimum Duration
Floodplain soils	Prevent desiccation of soil and degradation of organic soils	Greater than 5 cfs	Groundwater not to fall more than 1 ft below soil surface	
Floodplain Vegetation	Prevent damage to floodplain vegetation from excessive flooding and allow sufficient time for seedling establishment	Less than 25 cfs	Surface water covers less than approximately 1/3 of floodplain	60-240 days/year
Water Quality	Prevent stagnation of stream water and reduce saltwater intrusion	35 cfs or more		
Wetted Perimeter	Maximize the extent of stream habitat	Greater than 25 cfs	Stream bed and banks inundated	

*expressed as cubic feet per second flow over Lainhart Dam

It is important to note that this analysis focuses on the upper NW Fork of the Loxahatchee River, defined as that segment between Trapper Nelson’s site and Indiantown Rd. (SR 706). Historically, this portion of the river seems to have periodically experienced very low flows and water levelsthat were necessary for seed germination and seedling survival of cypress and other freshwater swamp species.. Flows from other downstream tributary sources (e.g., Cypress Creek, Hobe Grove Ditch, or Kitching Creek) may need to be increased as a means to control saltwater intrusion within the river while periodically reducing flows along the upper NW Fork of the river to allow drying of the floodplain for seed germination and regrowth.

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APPENDIX O -- PUBLIC AND AGRICULTURAL WATER SUPPLY

CONTENTS

List of Tables

Overall Water Use in the Loxahatchee Basin

Water for urban and agricultural uses in the Loxahatchee watershed is supplied from both groundwater and surface water systems. Non-environmental surface water demands within the basin are primarily public water supply, commercial and industrial with some agricultural uses. The commercial and industrial demands vary greatly by type of business. The majority of water used in the basin is for urban and agricultural uses.

Current water resource demands from public water supply, landscape irrigation and agricultural within the basin were estimated based on: (a) the average daily demand values used in the Northern Palm Beach County Comprehensive Water Management Plan for 1995 (SFWMD, 2002) and (b) the annual allocation of each permit holder obtained from the District Water Use permit database from 1998 through 2000. These data are summarized in **Table O-1**. A listing of all Water Supply Permits within the Loxahatchee watershed is provided at the end of this appendix in **Table O-5**. Overall, total allocated urban water demands compiled for 1999 were 32,896 million gallons a year (MGY), which is equivalent to 100,957 acre-feet/year or 90.1 MGD. The largest allocated uses within the watershed were public water supply (18,862 MGY or 51.7 MGD) at 57.3% and agriculture at (6,943 MGY or 19.0 MGD) at 21.1%.

Table O-1. Summary of 1999 Allocated Water Uses within the Loxahatchee Watershed.

Water Use Type	Million Gallon/Year	Acre-Feet/Year	Million Gallon/Day	% of Total
Urban Water Supply	18,862	57,887	51.7	57.3
Agriculture	6,943	21,308	19.0	21.1
Golf Courses	2,705	8,302	7.4	8.2
Industrial	2,619	8,038	7.2	8.0
Landscape	1,767	5,423	4.8	5.3
Total	**32,896**	**100,957**	**90.1**	**99.9**

Source: SFWMD Water Supply Permit Database, see **Table O-5.**

Public Water Supply Demands

Because public water supply withdrawals are an issue of concern in this watershed, additional analyses were undertaken by the SFWMD to update the information provided in the LECRWSP. Recent monitoring and reporting data were analyzed as well as information provided in applications for permit renewals. Results of this analysis were incorporated into **Chapters 4 and 5** of the Technical Criteria Document. Total public water supply demands for the major utilities within this area were compiled based on actual water use data in SFWMD water use permit records from 1990 through 1999. These data are summarized in **Table O-2**.

Table O-2. Urban water supply demands (actual water use*) in the Loxahatchee Basin.

Year	Seacoast (Hood Road)	Town of Jupiter**	Tequesta**	TOTAL	TOTAL (MGD)
1990	3,412	3,448	351	7,211	19.8
1991	3,198	3,191	397	6,786	18.6
1992	3,238	3,150	536	6,924	19.0
1993	3,536	3,345	665	7,546	20.7
1994	3,480	3,422	497	7,399	20.3
1995	**3,536**	**3,464**	**513**	**7,513**	**20.6**
1996	3,673	3,699	549	7,921	21.7
1997	3,995	3,399	428	7,822	21.4
1998	4,604	3,442	589	8,635	23.7
1999	4,129	3,846	581	8,556	23.4
10 year avg.	**3,673**	**3,471**	**511**	**7,655**	**21.0**

* Water use in million gallons per year and total water use in million gallons per day (MGD)
** Both the Town of Jupiter and the Village of Tequesta obtain a majority of their water supply from the Floridan Aquifer
Source: SFWMD Unpublished Consumptive Use Permit Data

A ten-year average was computed for this period of record. The 1995-year is comparable with the average for the ten years of record and was used for modeling demands in the Lower East Coast Regional Water Supply Plan (LECRWSP) – (SFWMD 2000). Total 1995 demands were estimated as 7,513 MGY (20.6 MGD) and the ten-year average as 7,655 MGY (21 MGD). The largest users within the watershed consisted of Seacoast Utilities (Hood Rd. Wellfield), Town of Jupiter and the Town of Tequesta. Together these three utilities represent more than 99% of the total urban water supply demand within the watershed.

Table O-3 illustrates the amounts of water that were actually used by the major utilities from 1998 through 2000.

Table O-3. Summary of Actual vs. Allocated Urban Water Use* in the Loxahatchee Watershed

PWS Permittees	Permit Number	1998 Annual Water Use (MGY)	1999 Annual Water Use (MGY)	2000 Annual Water Use (MGY)	1999 Allocations		
					MGY	MGD	Acre-feet/yr
Town of Jupiter	50-00010-W *	3,442	3,846	3,214	10,045	27.5	30,825*
Village of Tequesta	50-00046-W *	589	581	446	1,768	4.8	5,427*
Seacoast Utility- Hood Rd.	50-00365-W	4,604	4,129	4,729	7,049	19.3	21,631
Total		**8,635 (23.7 MGD)**	**8,556 (23.4 MGD)**	**8,389 (22.9 MGD)**	**18,862**	**51.6**	**57,881**

*MGY = Million Gallons/Year; MGD= Million Gallons/Day
*Both the Town of Jupiter and the Village of Tequesta obtain a majority of their water supply from the Floridan Aquifer

The average usage during this period was 23.3 MGD, which represents about 45% of the 51.6 MGD that was allocated for public water supply use. This comparison illustrates the fact that public water supply permittees rarely use the full-allocated amounts and allocated amounts may only be reached during the extreme droughts.

Agricultural Water Supply Demands

Because measured withdrawal data for agricultural uses were not available, these demandswere estimated from Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) water demand modeling (Smajstrla 1990, Moraga et al. 1995) and current agricultural acreage (FDEP 1998). Agricultural water use depends on the crops that are grown in the watershed and on how those crops are managed and irrigated. An important factor in accurately estimating agricultural water use is determining the location and acreage of crops. Citrus and small vegetables are the primary agricultural crops found in the basin. The supplemental irrigation requirements for 1995 are found in **Table O-4.**

Table O-4. Estimated 1995 Agricultural Water Demands in the Loxahatchee River Basin.

Subbasin No.	Subbasin Name	1-in-2 Agriculture Demands (ac-ft/yr)	1-in-10 Agriculture Demands (ac-ft/yr)
1	Jonathan Dickinson/ Hobe Sound	3,032	5,123
2	Coastal	558	816
3	The Estuary	643	939
4	C-18/Corbett	6,201	10,478
5	Cypress/PalMar	4,335	7,324
6	The Groves	7,712	13,030
7	Wild & Scenic/Jupiter Farms	792	1,158
	Total	**23,273 (20.7 MGD)**	**38,868 (34.7 MGD)**

Sources: Smajstrla 1990, Moraga et al. 1995, FDEP 1998

As shown in **Table O-4**, estimated actual agricultural water use (20.7 MGD) may be slightly higher than the amount allocated in permits (19.0 MGD) shown in **Table O-1**.

Water Supply Sources

Water for urban supply, golf courses, landscape irrigation, and agricultural uses is supplied from three sources within the Loxahatchee watershed: surface water systems, the Surficial Aquifer System (SAS) and the Floridan Aquifer System (FAS). Use of the SAS, the traditional source for public water supply, is limited in most of the watershed due to increased potential for impacts on local wetland systems, the Loxahatchee River, and saltwater intrusion.

In addition, Jupiter/Tequesta is a unique area where the geology does not have a prolific aquifer such as the Biscayne Aquifer. In this area the fine materials, sand and shell within the SAS will not allow large withdrawals. For this reason, this watershed is more concerned with the effects of drought and salt water intrusion during dry periods than other South Florida coastal areas. As a result, several municipalities have chosen (Jupiter and Tequesta) to go to reverse osmosis (RO), utilizing the Floridan aquifer as their primary water supply source.

Use of traditional sources (surface water and the Surficial Aquifer System) for public water supply and landscape irrigation can be expanded for the Loxahatchee watershed with completion of proposed water resource development projects (SFWMD 2000, SFWMD 2002) and more efficient use of regional and local water supplies. However, many of these projects will not be completed within the next five years. Therefore the SFWMD is placing more emphasis on implementation of a comprehensive water conservation program and the use of alternative sources such as the Floridan Aquifer System and reclaimed water to help meet water needs during this period. Some public water utilities and golf courses have supplemented their water demand with the use of the Floridan Aquifer System**.**

Two of the utilities within the Loxahatchee River Watershed presently use reclaimed water as a supplemental source, minimizing the need to withdraw from the surficial aquifer. Seacoast produces approximately 8 MGD of reclaimed water and returns approximately 6 MGD to the basin and the Loxahatchee River Environmental Control District produces approximately 5 MGD and returns approximately 4.5 MGD to the basin. The use is for landscape and/or golf course irrigation and groundwater recharge. Continued development of such alternative sources, increased emphasis on water conservation, along with some changes to wellfield configurations and operations will help meet future water needs in this area and reduce impacts to the Loxahatchee River and estuary within the next five years.

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Table O-5 Water Supply Demands within the Loxahatchee Watershed

Martin County			1996 Annual Water Use	1998 Annual Water Use	2000 Annual Water Use	1999 Allocations	
Land Use	**Permittee**	**Permit Number**	**MGY**	**MGY**	**MGY**	**MGY**	**Ac-ft/Yr**
AGR	SOUTH FLORIDA GRASSING	43-00021-W	N/A	N/A	N/A	289	887
	JENKINS LANDSCAPING	43-00045-W	N/A	N/A	N/A	67	206
	HOBE-ST LUCIE CONSERVANCY DISTRICT	43-00057-W	N/A	3072	5138	4460	13687
	SUNRISE-GULFSTREAM CITRUS GROVES	43-00120-W	N/A	N/A	N/A	545	1673
	SUNSHINE STATE CARNATION	43-00628-W	N/A	N/A	N/A	12	37
	SUN LAND CO	43-00839-W	0	0	0	974	2988
	SOUTH FLORIDA GRASSING INC	43-00893-W	N/A	N/A	N/A	410	1257
Sub Total						**6757**	**20736**
GOL	JUPITER HILLS CLUB	43-00054-W [wr]	N/A	66	234	58	177
	MARINER SANDS COUNTRY CLUB	43-00064-W [wr]	201	586	618	298	914
	CYPRESS LINKS GOLF COURSE	43-00138-W	N/A	N/A	N/A	149	457
	TURTLE CREEK CLUB	43-00140-W [wr]	N/A	N/A	?	20	61
	EAGLEWOOD	43-00220-W [wr]	56	N/A	N/A	32	98
	JONATHANS LANDING GOLF CLUB,INC.	43-00221-W [wr]	104	91	N/A	237	728
	JUPITER ISLAND GOLF COURSE	43-00273-W [fl]	92	138	309	16	50
	THE MEDALIST	43-00800-W [wr]	?	?	N/A	46	141
Sub Total						**855**	**2625**
LAN	LITTLE CLUB CONDOMINIUM ASSOCIATION, INC. THE	43-00202-W	N/A	N/A	N/A	24	75
	LOBLOLLY PINES DEVELOPMENT COMPANY	43-00382-W [wr]	N/A	194	184	106	325
	PRESERVE THE	43-00435-W	N/A	N/A	N/A	61	188
	MARINERS SANDS LANDSCAPING	43-00441-W	N/A	3.7	4.9	69	213
	DOUBLE TREE COUNTRY CLUB	43-00632-W	N/A	N/A	N/A	154	473
	JUPITER HILLS HOMEOWNERS ASSOCIATION	43-00722-W	N/A	N/A	64	86	265
	RIVERSIDE MEMORIAL PARK	43-00885-W	N/A	0	N/A	23	70
Sub Total						**524**	**1609**

Table O-5. Water Supply Demands within the Loxahatchee Watershed (Cont.)

Palm Beach County			1996 Annual Water Use	1998 Annual Water Use	2000 Annual Water Use	1999 Allocations	
Land Use	**Permittee**	**Permit Number**	**MGY**	**MGY**	**MGY**	**MGY**	**Ac-ft/Yr**
AGR	PARCEL 19.01	50-00547-W	N/A	N/A	N/A	167	511
	C-18 BASIN PROPERTY/MECCA FARMS	50-01626-W	N/A	N/A	N/A	19	59
Sub Total						186	570
GOL	TEQUESTA COUNTRY CLUB	50-00223-W wr	N/A	N/A	N/A	9	27
	SEMINOLE GOLF CLUB	50-00349-W	80	72	76	80	245
	PGA NATIONAL	50-00617-W	491	281	857	549	1685
	BALLENISLES CC OF JDM	50-00852-W wr	413	732	1344	171	524
	EASTPOINTE COUNTRY CLUB INC	50-00941-W wr	N/A	180	162	60	183
	STONEWAL ESTATES GOLF COURSE	50-01110-W	N/A	N/A	133	114	349
	OLD MARSH GOLF CLUB (UNIT 21)	50-01443-W	130	138	171	128	392
	IRONHORSE LAKE WELLS	50-01906-W	?	?	?	160	492
	INDIAN CREEK GOLF CLUB	50-02053-W wr	N/A	80	N/A	15	46
	IBIS GOLF & COUNTRY CLUB	50-02120-W	N/A	N/A	N/A	397	1219
	PUBLIC GOLF CORP. CITY OF PALM BEACH GARDENS	50-02319-W	N/A	N/A	N/A	40	123
	GOLF AND RACQUET CLUB AT EASTPOINTE	50-02831-W	N/A	180	162	44	135
	JUPITER DUNES	50-03079-W	N/A	46	N/A	39	119
	THE BEAR'S CLUB	50-04391-W wr	N/A	N/A	N/A	45	139
Sub Total						**1850**	**5678**
IND	WASTEWATER TREATMENT PLANT	50-00126-W	0	1.5	1.3	11	33
	TOWN OF JUPITER RECHARGE SYSTEM	50-01584-W	61	2.1	11	0	0
	PRATT & WHITNEY PUMP ADDITION	50-01663-W	N/A	N/A	2250	2466	7568
	NORTH COUNTY AQUATIC COMPLEX	50-02869-W	N/A	N/A	N/A	38	116
	MOBIL OIL STATION 02-F2W	50-02995-W	N/A	11	9.5	12	36
	TRI GAS INC AIR SEPARATION PLANT	50-03722-W	N/A	37	34	93	285
Sub Total						**2619**	**8038**

Table O-5. Water Supply Demands within the Loxahatchee Watershed (Cont.)

Palm Beach County			1996 Annual Water Use	1998 Annual Water Use	2000 Annual Water Use	1999 Allocations	
Land Use	**Permittee**	**Permit Number**	**MGY**	**MGY**	**MGY**	**MGY**	**Ac-ft/Yr**
LAN	FRENCHMAN'S CREEK GOLF COURSE	50-00091-W	N/A	N/A	N/A	87	267
	JONATHAN'S LANDING	50-00237-W	208	211	285	319	979
	FPL JUNO BEACH OFFICE BUILDING	50-00742-W	N/A	N/A	N/A	15	46
	SEA OATS OF JUNO BEACH	50-01131-W	N/A	N/A	N/A	16	48
	OCEANSIDE TERRACE	50-01204-W	N/A	N/A	N/A	2	6
	RIDGE AT THE BLUFFS, H.O.A.	50-01282-W	88	104	73	52	158
	RIVER THE	50-01373-W	N/A	N/A	N/A	22	66
	JUPITER BAY	50-01391-W	N/A	4.24	N/A	8	26
	VILLAS OF OCEAN DUNES HOA	50-01392-W	N/A	N/A	N/A	18	56
	CRYSTAL POINTE	50-01442-W	N/A	N/A	N/A	14	44
	CROSSWINDS JUPITER SOUTH	50-01484-W	N/A	N/A	N/A	1	4
	SHORES THE	50-01485-W	N/A	N/A	N/A	0	0
	NORTHPOINT CORPORATE PARK	50-01490-W	N/A	N/A	N/A	34	104
	PALM BEACH PARK OF COMMERCE	50-01529-W	N/A	N/A	N/A	110	339
	ADMIRAL'S COVE AND ADMIRAL'S COVE WEST	50-01552-W	N/A	101	N/A	132	405
	INDIAN CREEK	50-01557-W	18	N/A	24	63	193
	PRATT & WHITNEY - IRRIGATION WATER SUPPLY	50-01664-W	N/A	N/A	N/A	38	116
	HAMPTON'S AT MAPLEWOOD THE	50-01702-W	N/A	N/A	N/A	50	152
	MARQUETTE ELECTRONICS	50-01842-W	N/A	N/A	N/A	5	16
	HIGH SCHOOL "GGG"	50-01955-W	N/A	N/A	N/A	30	93
	PALM BEACH MIDDLE SCHOOL A-A	50-02267-W	N/A	N/A	N/A	21	66
	BALLENISLES DEVELOPMENT	50-02370-W	N/A	N/A	118	70	215
	JUPITER PLANTATION	50-02871-W	N/A	N/A	N/A	15	47
	EASTLAKES PROPERTY OWNERS ASSOCIATION	50-03281-W	47	29	N/A	40	124
	EASTPOINTE PROPERTY OWNERS ASSOCIATION	50-03282-W [wr]	72	74	90	70	215
	THE SANCTUARY & FLAMINGO ROAD	50-03401-W	N/A	N/A	N/A	9	28
Sub Total						**1243**	**3813**

Table O-5. Water Supply Demands within the Loxahatchee Watershed (Cont.)

Palm Beach County		**Permit Number**	**1996 Annual Water Use**	**1998 Annual Water Use**	**2000 Annual Water Use**	**1999 Allocations**	
Land Use	**Permittee**	**Permit Number**	**MGY**	**MGY**	**MGY**	**MGY**	**Ac-ft/Yr**
PWS	TOWN OF JUPITER	50-00010-W [fl]	3699	3442	3214	10045	30825
	VILLAGE OF TEQUESTA	50-00046-W [fl]	549	589	446	1768	5427
	SEACOAST UTILITY AUTHORITY (Hood Rd.)	50-00365-W	3673	4604	4729	7049	21631
	PALM BEACH PARK OF COMMERCE	50-01528-W	N/A	N/A	N/A	65	198
		Sub Total				**18927**	**58081**
		Martin Co Total				**8137**	**24970**
		Palm Beach Co Total				**24825**	**76180**
		TOTAL	N/A	N/A	N/A	**32962**	**101150**

[wr] Waste Water Reuse
[fl] Floridan Aquifer

APPENDIX P -- THE EFFECTS OF FRESHWATER INFLOW, INLET CONVEYANCE AND SEA LEVEL RISE ON THE SALINITY REGIME IN THE LOXAHATCHEE ESTUARY

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CONTENTS

Abstract

The upstream migration of salt water into the historic freshwater reaches of the Loxahatchee River is the likely cause of the altered floodplain cypress forest community along the Northwest Fork and some of its tributaries. Mangroves are replacing cypress forest and areas of mixed swamp hardwoods have reacted to different degrees to the saltwater stress. A hydrodynamic/salinity model was developed to study the influence of freshwater input, tidal inlet deepening and sea level rise on the salinity regime in the estuary.

Field data analysis and model simulations indicate that the salinity condition in the estuary is sensitive to the amount of freshwater input from the watershed. During dry seasons the salt front advances into areas that were historically freshwater habitats.

Historic evidence indicates that the Loxahatchee estuary was periodically closed and opened to the sea. Due to the active long shore sediment transport, the tidal inlet was probably characterized by shifting sandbars through which ran a narrow and unstable channel. Inlet dredging in the past several decades has increased the hydraulic conveyance of the inlet and the tidal influence into the estuary.

The sea level record from a site in south Florida indicates that the sea level has been rising at a rate of approximately 2.3-mm per year. The rise of sea level in the past century has probably raised the mean tide level by about 23 centimeters. If the sea level rise continues as predicted, it is foreseeable that the salt front will move further upstream along with the sea level rise.

Field data analysis and the preliminary model output led us to believe that the advance of seawater up the estuary is the combined effect of watershed hydrological changes, inlet deepening and sea level rise.

Keywords: estuary; freshwater inflow; sea level rise; salinity; saltwater intrusion

INTRODUCTION

The Loxahatchee River estuary empties into the Atlantic Ocean at Jupiter Inlet in southeastern Florida. The estuarine system is comprised of three forks: the Southwest Fork, North Fork, and Northwest Fork (Figure 1). Estuarine conditions extend from Jupiter Inlet to about 5 river miles up the Southwest Fork, 6 river miles up the North Fork, and 10 river miles up the Northwest Fork. Four tributaries; Loxahatchee River, Cypress Creek, Hobe Grove Ditch, and Kitching Creek discharge to the Northwest Fork. Canal 18 (C-18), built in 1957 – 1958, is the major tributary to the Southwest Fork. The North Fork has several small unnamed tributaries. Rainfall in the area is seasonal, 5 inches per month is common during the wet season from

May through October. Amounts near 2.5 inches per month generally occur during the dry season from November to April (Russell and Goodwin, 1987).

The upstream migration of salt water into the historic freshwater reaches of the Loxahatchee River is the likely cause of the altered floodplain cypress forest community along the Northwest Fork and some of its tributaries. A hydrodynamic/salinity model was developed to study the influence of freshwater input on the salinity conditions in the river and estuary. The hydrodynamic model was calibrated against National Ocean Service (NOS) data for a three-month period from December 1996 to February 1997. The tidal output was then verified against NOS data for a four-month period from January 1999 to April 1999. The salinity model was calibrated and verified against field data that were collected from January to June of 1999. The model was applied to scenarios with varying amounts of freshwater inflow. Both the field data and model simulation indicated that there is a strong correlation between freshwater inflow and the salinity regime in the estuary. Based on model output and field data analysis, a relationship was developed to predict salinity at various points in the estuary with respect to freshwater inflow rates and tidal fluctuations. The model was also used to provide a preliminary assessment of the impacts that inlet deepening and sea level rise have had on the salinity regime in the estuary.

METHODS

The software used in the development of the Loxahatchee River Hydrodynamics/Salinity Model were computer programs RMA-2 and RMA-4, which were developed by Resource Management Associates (RMA) and the Army Corps of Engineers (USACE, 1996). The model mesh was formed from a total of 4736 topographic data points derived from survey data. The XY coordinates and elevation of the 4736 points provide the geometry of the model. Figure 1 shows the finite element model mesh that was developed for this modeling study. The available bathymetric data does not cover the upstream portion of the Northwest Fork. The model mesh in Figure 1 used average depths, which were reported by a previous study, for that portion of the river (Russell and Goodwin, 1987). The model mesh will be updated when the bathymetric data for the upper Northwest Fork are collected.

Freshwater inflow data were available from three flow gages. The gage on the upper Northwest Fork at Lainhart Dam controls about forty to fifty percent of total freshwater input to the Northwest Fork. The other two gages are located on the North Fork, and on the Southwest Fork at flow control structure S-46 (Figure 1). The freshwater input from Cypress Creek, Hobe Grove and Kitching Creek was estimated based on a previous study by USGS (Russell and McPherson, 1983). Based on flow data from these tributaries and Lainhart Dam, the report established ratios between discharge from each tributary and the discharge at Lainhart Dam. These ratios were used to estimate the discharge from these tributaries.

The hydrodynamic model was calibrated against NOS data for a three-month period from December 1996 to February 1997. The tidal output was verified against NOS data for a four-month period from January 1999 to April 1999. Figure 2 is the comparison of model output and NOS predicted tide at the station Boy Scout Dock on the Northwest Fork (Figure 1). This station is the most upstream (inland) station that is listed in the NOS Tide Table. Model output was also verified against data from other NOS sites at the Middle and Lower Estuary and at the Jupiter Inlet.

Calibration of the salinity model was based on flow and salinity records from January 1 to April 30, 1999. The period includes a typical transition from wet season to dry season. While the flow record at Lainhart Dam shows a decreasing freshwater inflow to the estuary, the salinity records indicate that the salinity increased significantly, even at the upstream portion of the estuary. Figure 3 and 4 are comparisons between model output and the field records at Station 64 (River Mile 7.7) and Station 65 (River Mile 8.6).

Model verification was based on the field records of the subsequent two months - May and June 1999. Starting in May, the freshwater inflow increased and salinity level dropped accordingly. Model output was depicted with two different colors in Figure 4. The first portion shows the results of the model calibration. The second portion shows results of the model verification. Figure 5 is the verification results at Station 66 (River Mile 9.4).

While the model output followed the overall trend of salinity changes, it did not track all the short term variations that were observed in the field. Field data indicates that salinity in the upper estuary is extremely sensitive to the amount of freshwater input. Since approximately fifty to sixty percent of the freshwater input was estimated based on a set of fixed ratios, the amount of total freshwater input apparently did not accurately reflect the short term variations of flow discharge from tributaries. Such inaccuracy would in turn cause error in salinity prediction. On the other hand, over longer periods these ratios seem to have produced a relatively accurate estimate of the overall amount of freshwater input to the estuary. As a result, the model was able to follow the overall trend of salinity changes indicated by the field data. New flow stations are currently being deployed on major tributaries. The model will be re-calibrated when a more complete data set becomes available.

The model applications included eleven simulations at various levels of freshwater input to develop flow versus salinity relationship. The estuarine salinity regime is the result of a dynamic process that involves mainly tides and freshwater inflow. Salinity fluctuates constantly in response to changes in tides and freshwater inflow. Even if the freshwater inflow is constant, there is a significant variation in salinity within each tidal cycle. The variation in range between spring and neap tides is another major factor that affects the salinity. A 28-day tidal cycle with two spring tides and two neap tides was chosen for all the flow scenario simulations. The model predicts salinity for each of the over 3000 nodes at 30-minute intervals. The model output was filtered to select high tide and low tide salinity. The 56 high tide salinity values and 56 low tide salinity values were averaged to find the mean high tide salinity and the mean low tide salinity for the 28-day period.

RESULTS

The Influence of Freshwater Input on the Salinity Regime in the Estuary

The results of eleven model simulations at various levels of freshwater input are condensed into two color plates (Figure 6 and 7). The curves in Figure 6 and 7 represent the flow versus salinity relationship at 7 sites in the Northwest Fork. On the horizontal axis of these charts, the amount of freshwater input was represented by the flow rate at the Lainhart Dam. The corresponding salinity for the given flow can be read from the vertical axis. Salinity given by Figure 6 is mean high tide salinity. Figure 7 gives mean low tide salinity. Combined, these two charts can be used to predict high tide and low tide salinity values in the Northwest Fork for a given freshwater discharge.

The model output is consistent with the results of field measurements and indicates a correlation between salinity in the estuary and freshwater inflow rate. The correlation appears to be the strongest in the upper Northwest Fork. When freshwater discharge at the Lainhart Dam decreases to approximately 35 cubic feet per second (cfs), salinity in a large portion of the Northwest Fork will exceed two parts per thousand (ppt). Both the field data and model results indicate that a change of freshwater input as small as 10 cfs can cause detectable salinity changes in this area.

To facilitate management decisions, maps of 2-ppt salinity lines were prepared based on model output (Figure 8 and 9). Figure 8 shows the spatial positions of 2-ppt salinity lines with various freshwater inflow rates at high tide. Figure 9 shows the locations of 2-ppt lines at low tide.

The difference between spring and neap tides is also a significant factor. To present the 2-ppt lines under an average tide condition, the results in Figure 8 and 9 were created based on a tide range of 2.48 ft at Jupiter Inlet. The mean tidal range at the inlet is 2.46 ft, according to NOS data. Therefore the results presented on the maps represent an “average tidal condition.” The 2-ppt lines shown in these maps will be at about the middle point between the position of the salt front at spring tides and at the neap tides.

The Influence of Inlet Conveyance and Sea Level Rise on the Salinity Regime

Inlet Configuration

Historic evidence indicates that the Loxahatchee estuary was periodically closed and opened to the sea (McPherson, Sabanskas and Long, 1982). Due to active, long-shore sediment transport, the Jupiter Inlet was probably characterized by shifting sandbars through which ran a narrow and unstable channel. When James Henshall visited the area in the early 1880s, he observed the "Jupiter River flowing eastward, and over Jupiter Bar into the sea." He also described the difficulty of sailing through the inlet, which was "quite narrow" and had "an angle in its channel at the worst possible place" (Henshall, 1884). An aerial photo of the inlet from 1940s shows extensive flood shoals (sandbars that were formed by sands pushed into the inlet by tides), which would have limited the hydraulic conveyance of the inlet and the tidal range in the estuary. Under natural conditions with active sedimentation, the hydraulic conveyance of the inlet would be smaller than the conveyance under dredged conditions.

Sea Level Rise

Extensive analyses of tidal records indicates that global sea level has risen at a rate of approximately 2 mm per year for at least the last century or so (Douglas, 1991; 1992). Based on this estimate, the sea level around 1900 was about eight inches lower than the present level. A lower sea level means that a smaller range of tidal influence existed in the estuary.

Sea level rise was even more rapid prior to 1900. Approximately 15,000 years ago, the shore of the Atlantic Ocean was several miles east and more than 300 feet lower than its present location and altitude at Jupiter Inlet. From about 15,000 to 6,000 years ago, sea level rose at a rate of more than 3 feet per century. Tidal waters began to flood the estuary embayment. Prior to this time, the embayment was probably a flood plain or freshwater marsh (McPherson, Sabanskas and Long, 1982).

The rise of sea level has likely increased the range of tidal influence in the Loxahatchee River. If the sea level rise continues as predicted, it is foreseeable that the tide influence will move further upstream along with the sea level rise.

The Effects of Inlet Deepening and Sea Level Rise

The hydrodynamic/salinity model was applied as part of a preliminary investigation, to estimate the impacts of inlet dredging and sea level rise. This section outlines the preliminary results of six model simulations that have been completed. Freshwater input was kept constant through all six model simulations. Sea level and inlet depth were changed so that their effects on the position of saltwater wedge could be examined. Table 1 lists boundary conditions of the model simulations. Inlet depth was reduced from the current condition to average depths of 6, 4, and 2 feet subsequently. The current average depth of the inlet is approximately 8 - 10 feet. While the first four simulations were all at current sea level, simulation 5 was at the1900 sea level, which was 8 inches lower. Simulation 6 used the boundary condition of Simulation 1, except that sea level was one foot higher. The purpose of this simulation was to estimate the possible effects of future sea level rise.

Table 1. Boundary conditions of model simulations

Boundary Condition	Simulation 1	Simulation 2	Simulation 3	Simulation 4	Simulation 5	Simulation 6
Sea level	Present MSL	Present MSL	Present MSL	Present MSL	1900 MSL	Present MSL + 1 ft
Discharge at Lainhart Dam	65 cfs	65 cfs	65 cfs	65 cfs	65 cfs	65 cfs
Total freshwater input to Northwest Fork	188 cfs	188 cfs	188 cfs	188 cfs	188 cfs	188 cfs
Freshwater input to North Fork	4 cfs	4 cfs	4 cfs	4 cfs	4 cfs	4 cfs
Freshwater input to South Fork	5 cfs	5 cfs	5 cfs	5 cfs	5 cfs	5 cfs
Inlet condition	1999 condition*	Average depth 6 feet	Average depth 4 feet	Average depth 2 feet	Average depth 2 feet	1999 condition*

To compare the range of tidal influence at various inlet depths, the location of 2 ppt salinity lines of model simulations 1 through 4 were plotted in Figure 10. The model output indicates that a shallower inlet would reduce the tidal influence on the river. For example, when the inlet depth is reduced to 4 feet by sedimentation, the 2 ppt line would move approximately 1 mile downstream from its present location under existing inlet condition. Therefore, dredging of the inlet in the past several decades has probably helped move the salt wedge upstream.

The two green lines in Figure 11 show the predicted locations of 2 ppt salinity lines at the estimated 1900 sea level (8 inches lower than current sea level) and a predicted future sea level (12 inches higher than current sea level). Comparing the results of Simulations 4 (current sea level with 2' inlet depth, Line D) and 5 (1900 sea level, Line E), the sea level rise itself in the past century would have moved the salt wedge upstream nearly 0.5 miles. The green line at the upstream end (Line F) is the predicted position of 2 ppt salinity line with an one foot sea level rise. If the inlet depth and freshwater inflow remain unchanged, the effect of sea level rise will therefore push saltwater further upstream from its present location (Line A).

DISCUSSION

Both field data analysis and the model output indicate a strong correlation between the amount of freshwater input and the estuarine salinity regime. The upstream portion of the Northwest Fork is especially sensitive to changes in freshwater input. Table 2 is based on the flow ~ salinity relationship presented in Figure 6. The table shows the flow rate of freshwater input that is required to maintain salinity below 2-ppt at various locations in the Northwest Fork.

Table 2. Freshwater inflow required to maintain high tide salinity below 2ppt at seven locations in the Northwest Fork

River Mile	Station #	Freshwater discharge into Northwest Fork above Kitching Creek (cfs)	Estimated discharge at Lainhart Dam(cfs)
6.5	#63	424	187
7.7	#64	202	89
8.6	#65	123	54
9.4	#66	64	28

The position of the salt wedge is the balance point between ocean tides and freshwater flow from the watershed. While a reduction in freshwater flow could cause saltwater intrusion, the modeling results illustrated that deepening of the inlet and rising sea level would also push the salt wedge further upstream. The preliminary modeling results indicate sea level rise and inlet dredging have significant impacts on the salinity regime in the Loxahatchee Estuary.

Based on the model simulations that had a shallower inlet and lower sea level, Table 3 lists the amount of freshwater that would be required under present conditions to maintain the 2 ppt line at locations that correspond to the 2ppt locations that occurred under the three historic scenarios.

The analysis outlined above indicates that sea level rise and inlet dredging have significant impacts on the salinity regime in the Loxahatchee Estuary. Due to the changes in sea level and inlet configuration, the amount of freshwater required to prevent salt water intrusion has increased if the management goal is to provide historic salinity condition in the river and estuary.

Table 3. Increased freshwater demand to prevent saltwater intrusion

Present and historic conditions	2 ppt line river mile	Required freshwater under historic condition (cfs)		Required freshwater under present condition (cfs)	
		Freshwater discharge at Lainhart Dam	Freshwater input to NWF	Freshwater discharge at Lainhart Dam	Freshwater input to NWF
A-Present condition	8.25			65	188
B-Inlet average depth 6 ft	7.7	65	188	85	246
C-Inlet average depth 4 ft	7.4	65	188	100	289
D-Inlet depth 4 ft, 1900 MSL	7.0	65	188	120	347

Inlet sedimentation is a very dynamic process. The modeling effort outlined in this document is just the first step of a preliminary investigation. More efforts are necessary to acquire historic bathymetry and sea level data and improve the accuracy of freshwater inflow data.

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McPherson, B.F., Sabanskas, M., & Long, W., 1982. Physical, Hydrological, and Biological Characteristics of the Loxahatchee River Estuary, Florida. USGS Water-Resources Investigations, Open file report, 82-350.

Russell, G.M., McPherson, B.F., 1983. Freshwater Runoff and Salinity Distribution in the Loxahatchee River Estuary, Southeastern Florida. USGS Water-Resources Investigations Report, 83-4244.

Russell, G.M., Goodwin, C.R., 1987. Simulation of Tidal Flow and Circulation Patterns in the Loxahatchee River Estuary, Southeastern Florida. USGS, Water-Resources Investigations Report 87-4201. Tallahassee, Florida, 1987.

USACE, 1996. Users' Guide to RMA2 Version 4.3. US Army Corps of Engineers, Waterways Experiment Station, Hydraulic Laboratory.

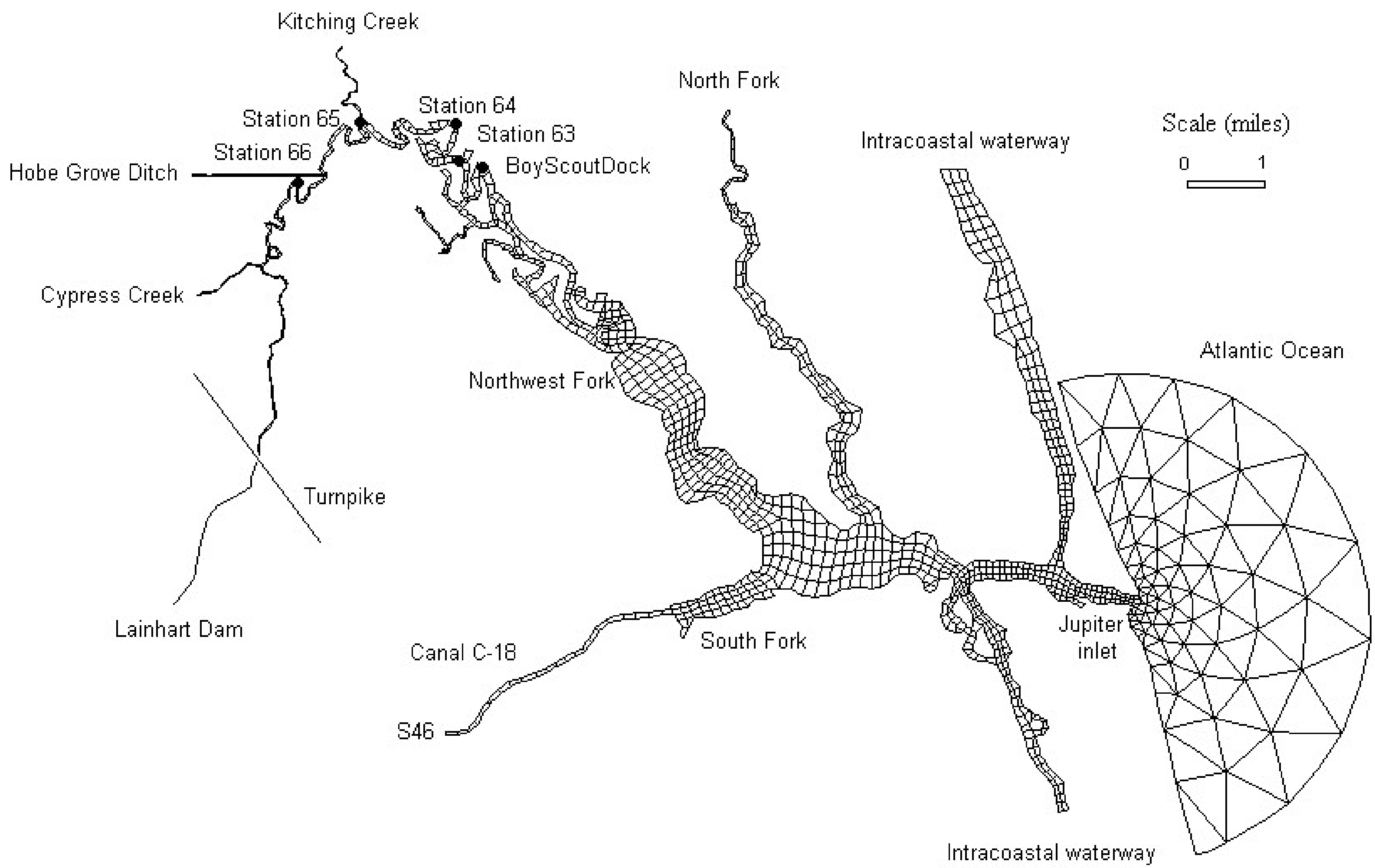

Figure 1. Finite element mesh of Loxahatchee Estuary Salinity Model

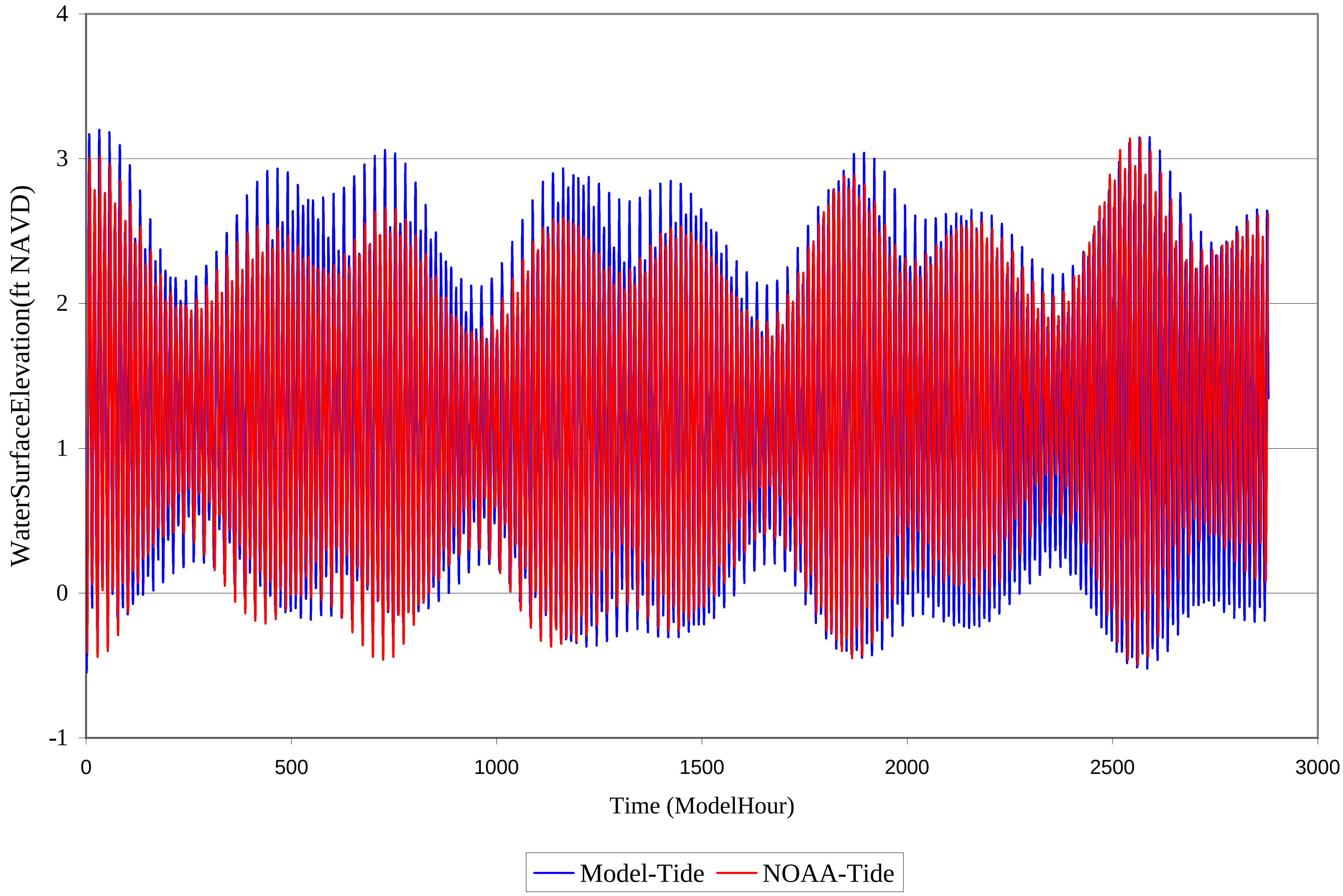

Figure 2. Model output vs. NOS data: Tides at BoyScoutDock, January 1 - April 30, 1999

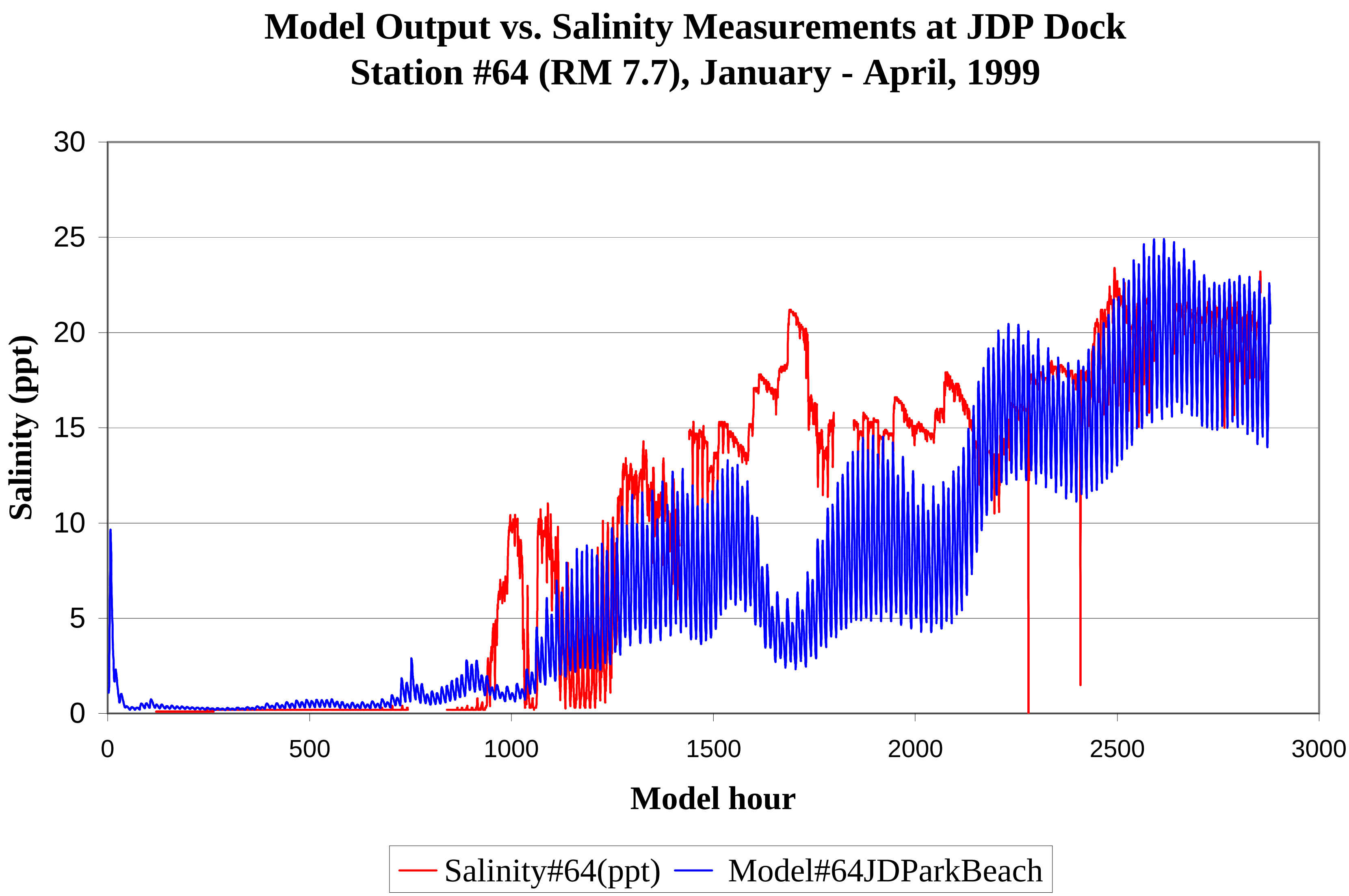

Figure 3. Comparison of model output and field record at Station 64 (RM 7.7)

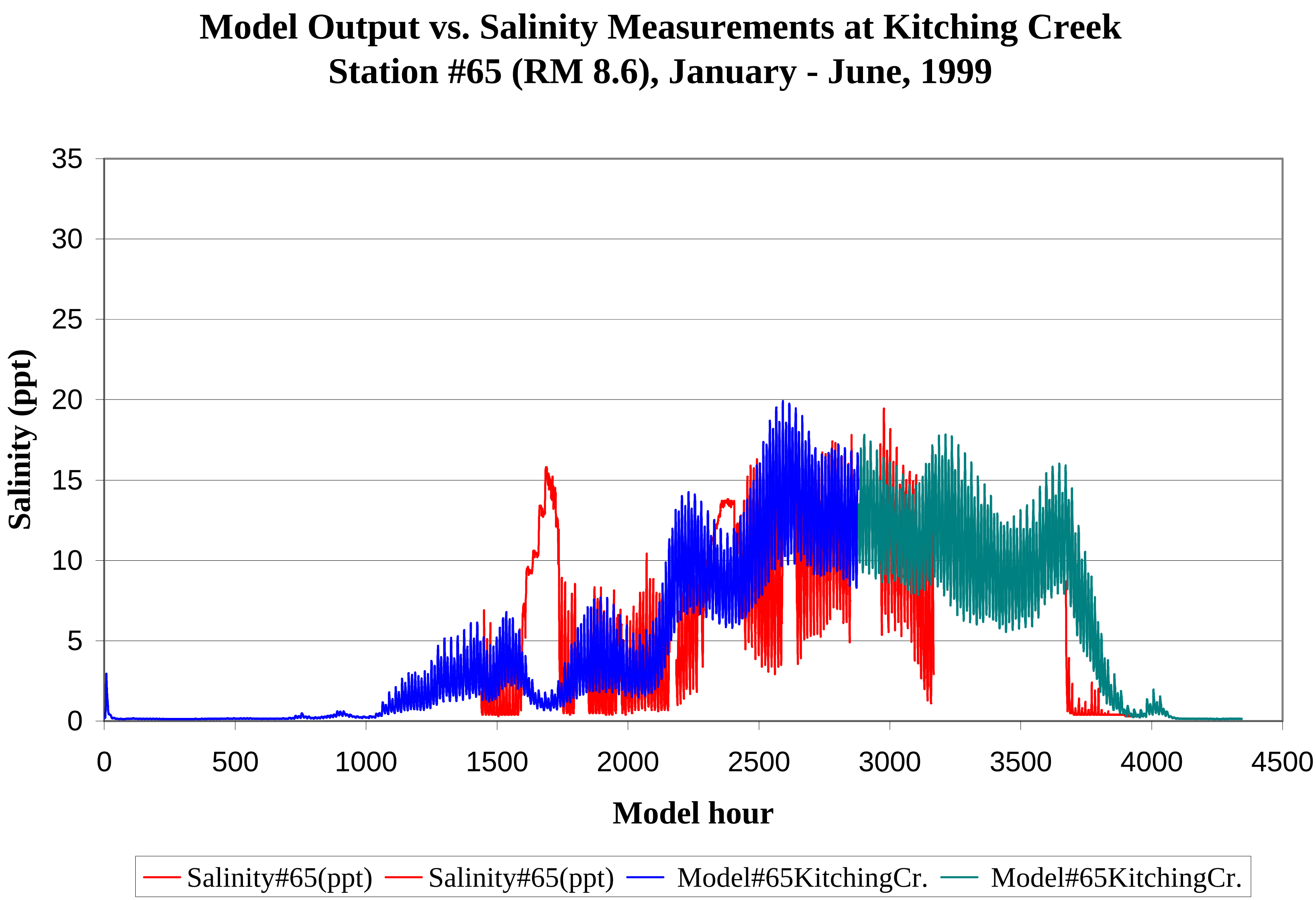

Figure 4. Comparison of model output and field record at Station 65 (RM 8.6)

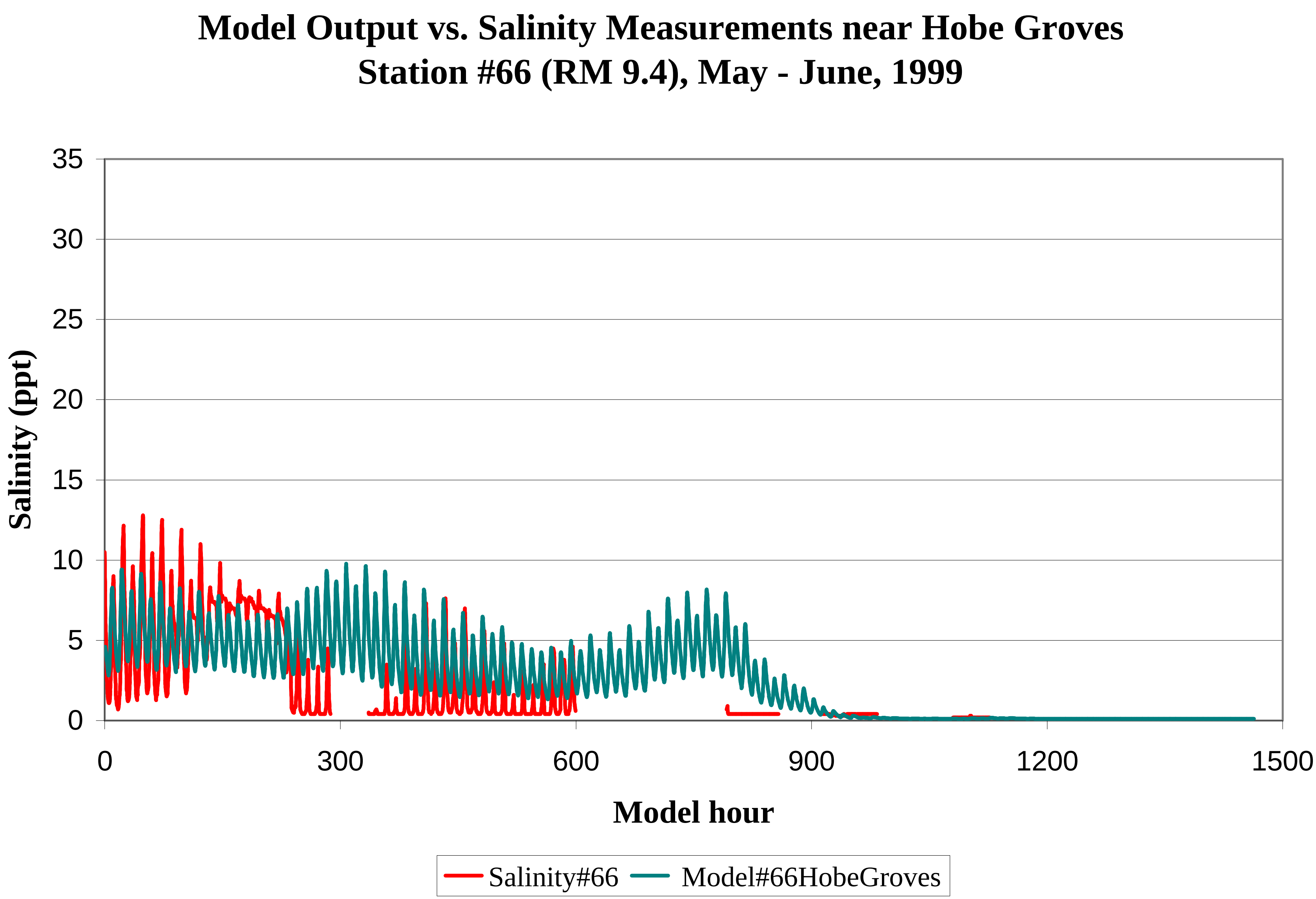

Figure 5. Comparison of model output and field record at Station 66 (RM 9.4)

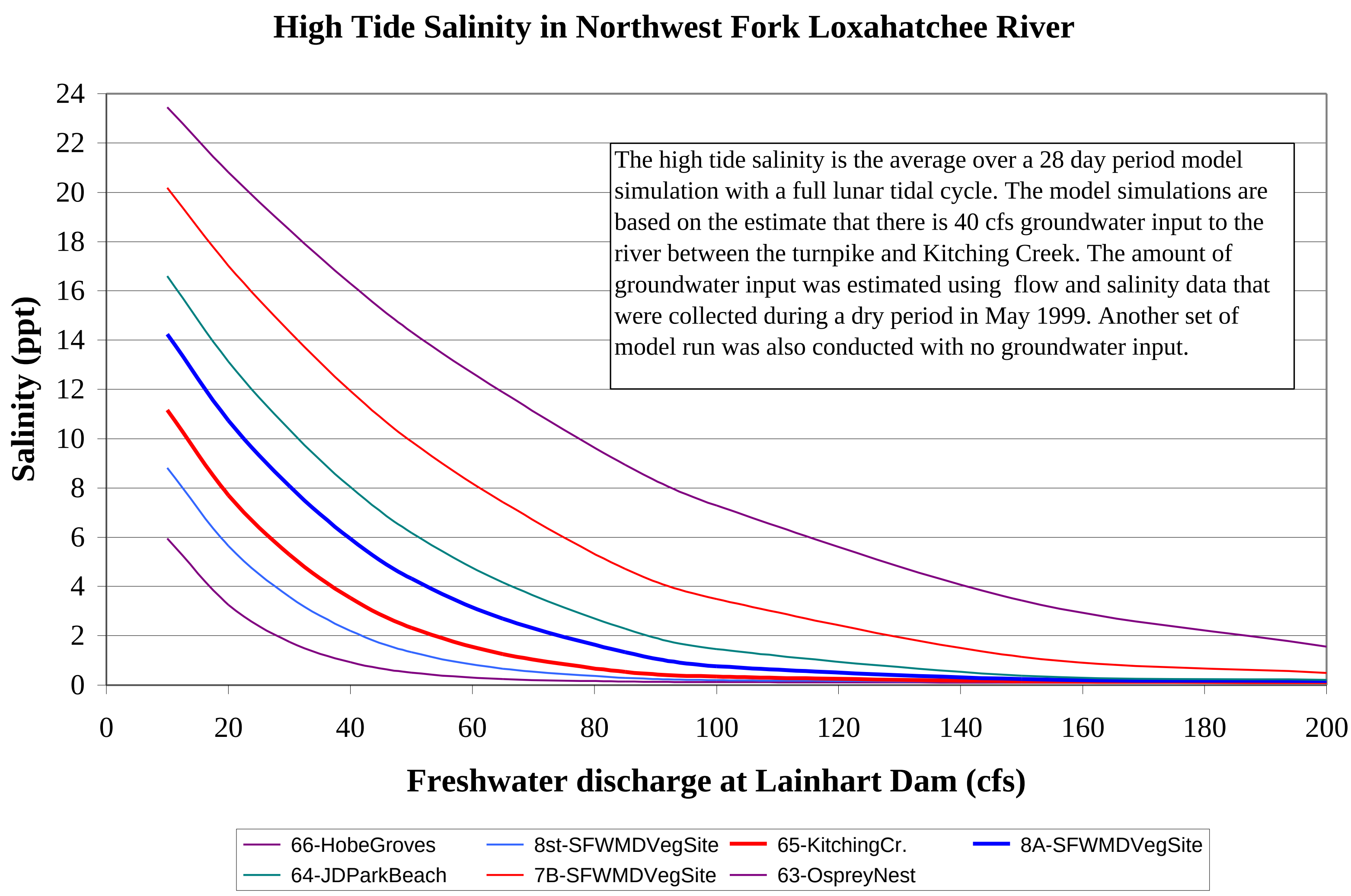

Figure 6. The relationship between high tide salinity and the amount of freshwater inflow

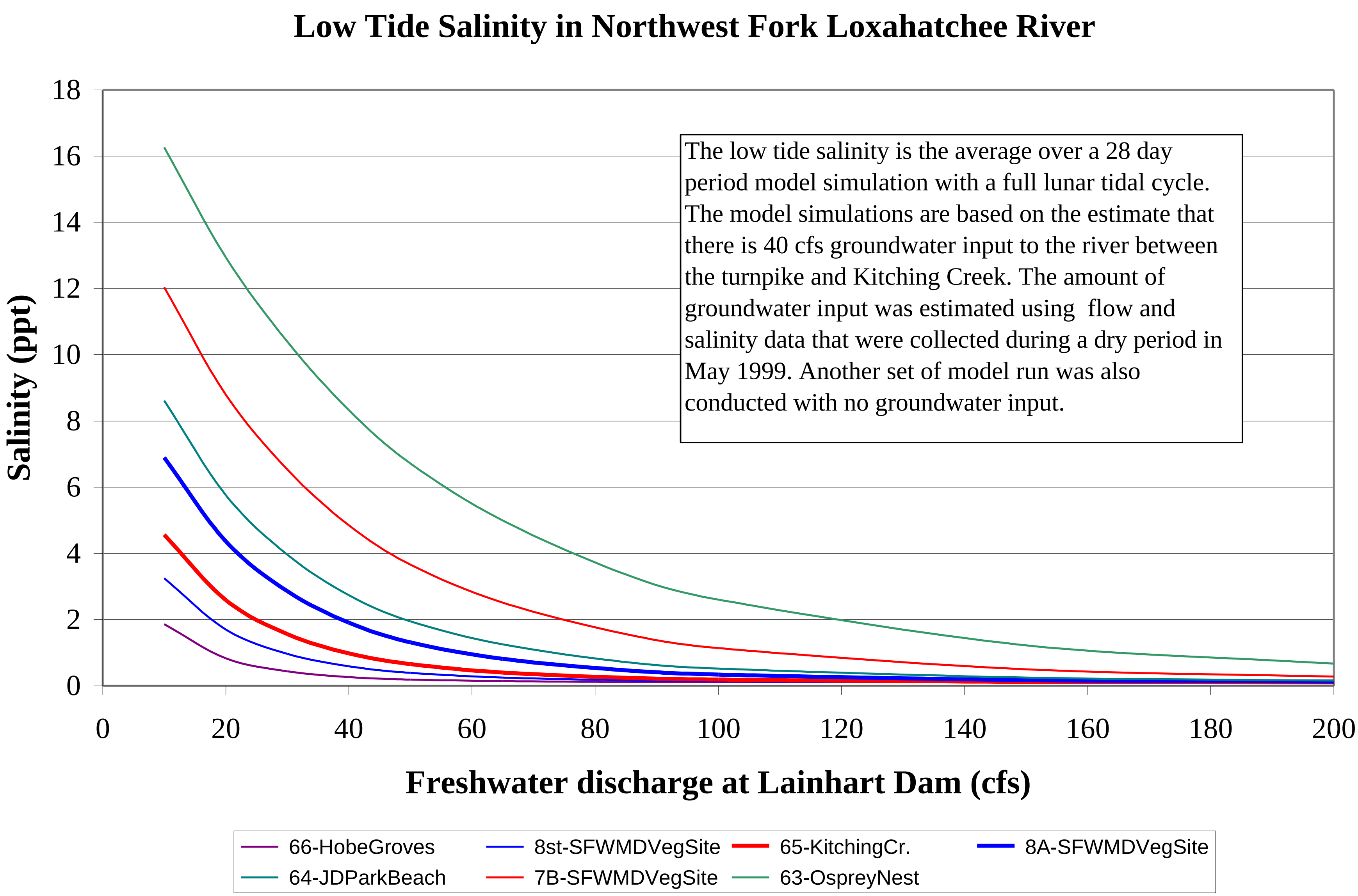

Figure 7. The relationship between low tide salinity and the amount of freshwater inflow

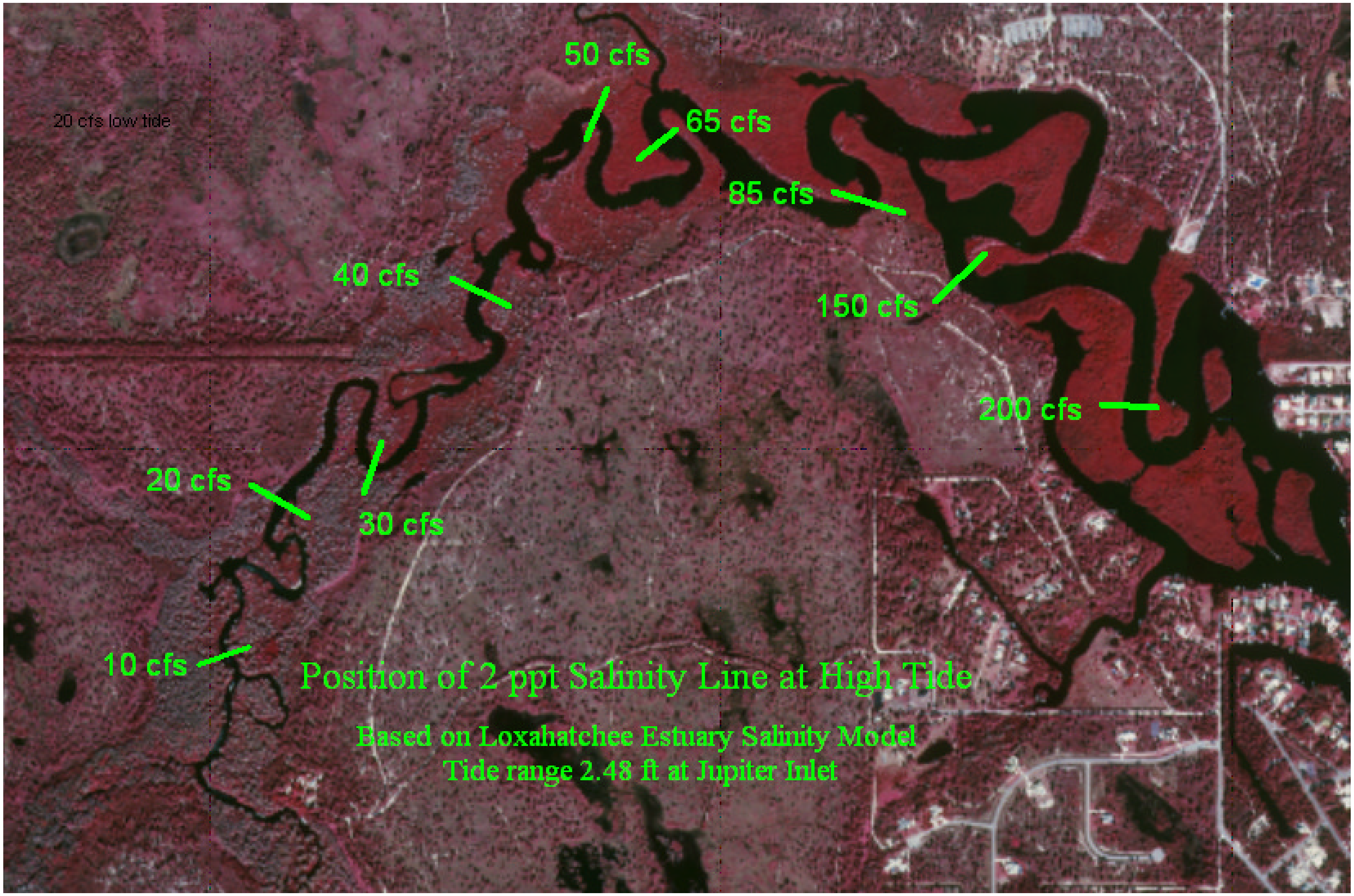

Figure 8. 2-ppt salinity line position at high tide
2-ppt lines are labeled with discharge at Lainhart Dam

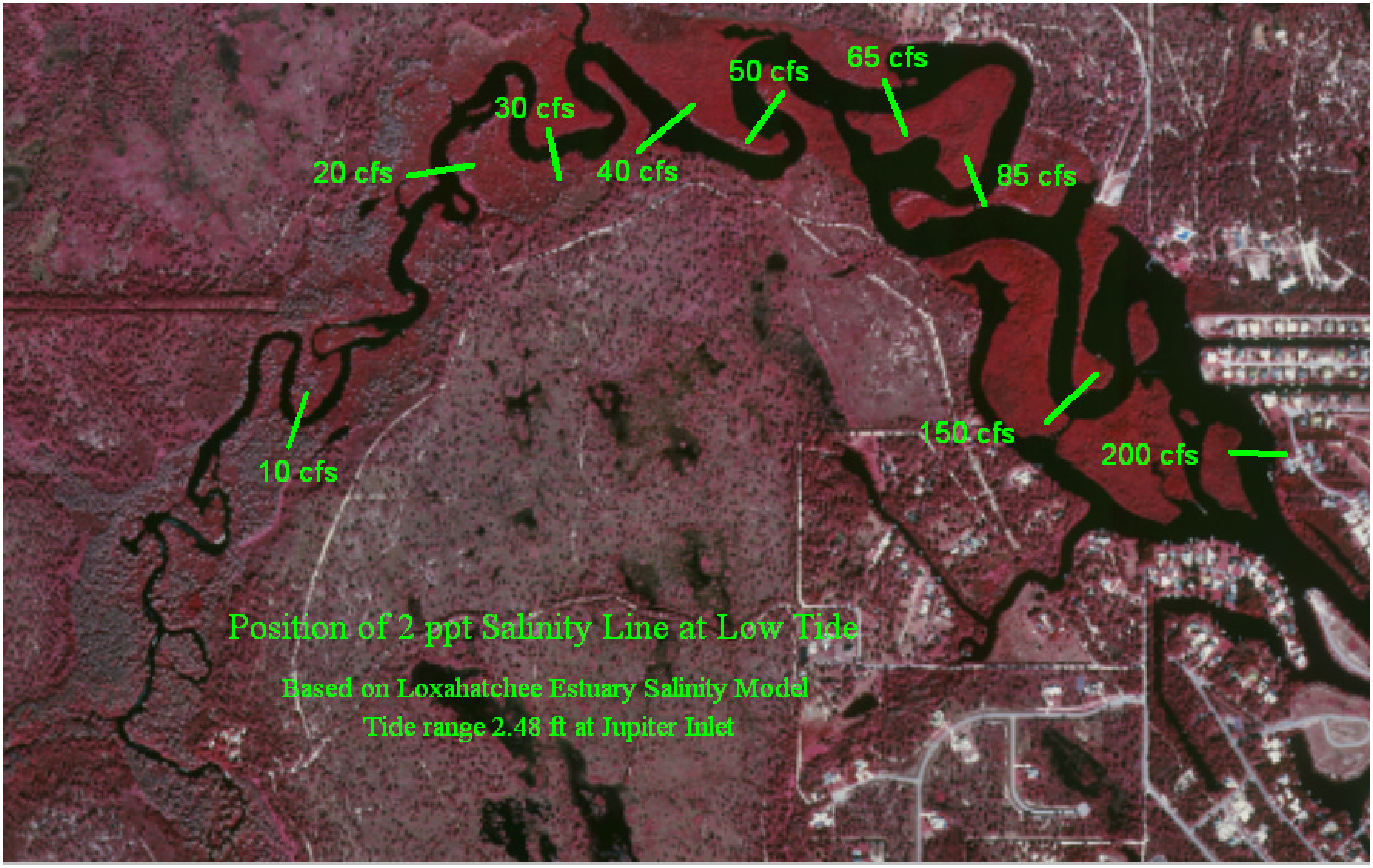

Figure 9. 2-ppt salinity line position at low tide.
2-ppt lines are labeled with discharge at Lainhart Dam

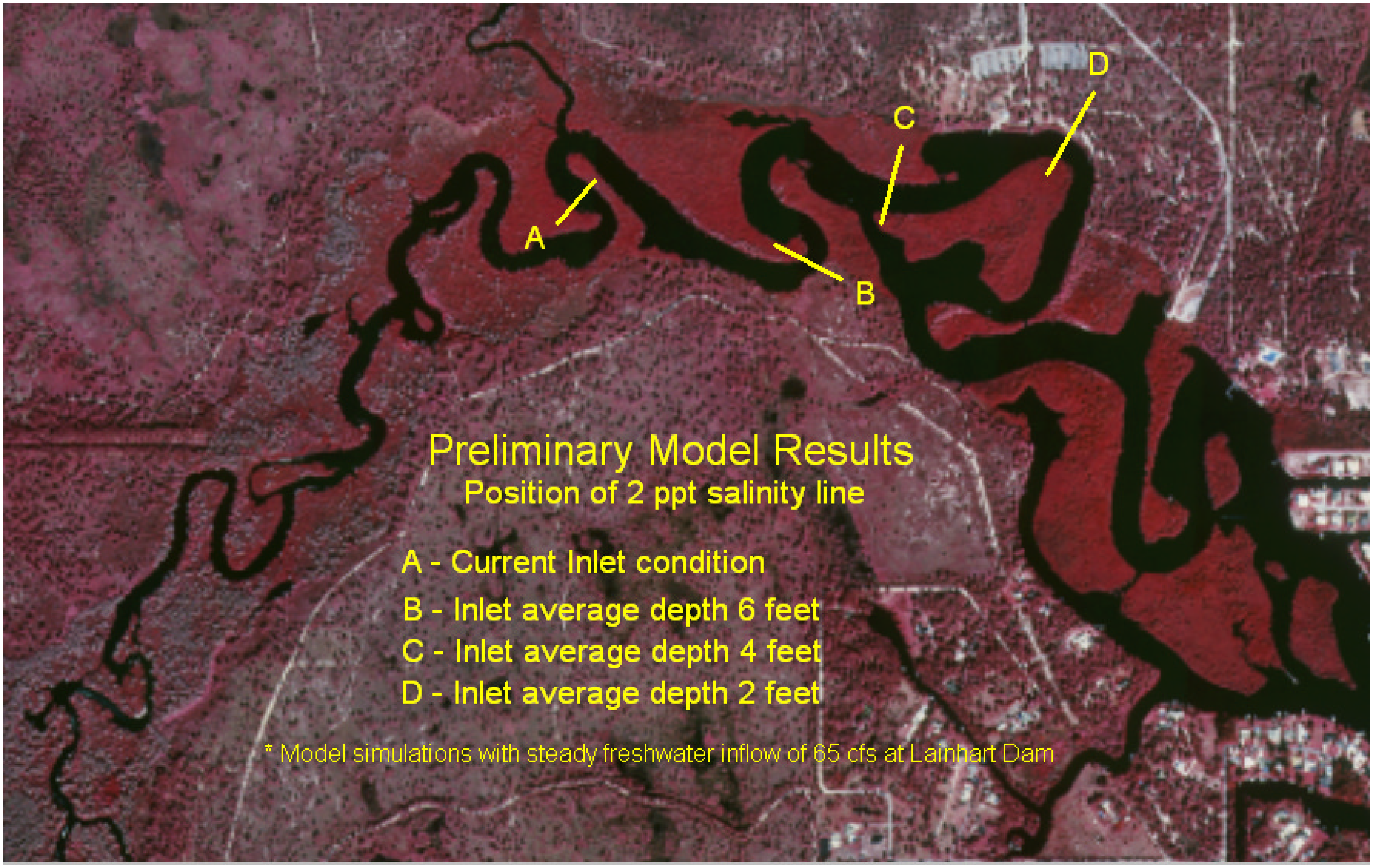

Figure 10. 2-ppt salinity line position at various inlet depths.
2-ppt lines are labeled with depth at Jupiter Inlet

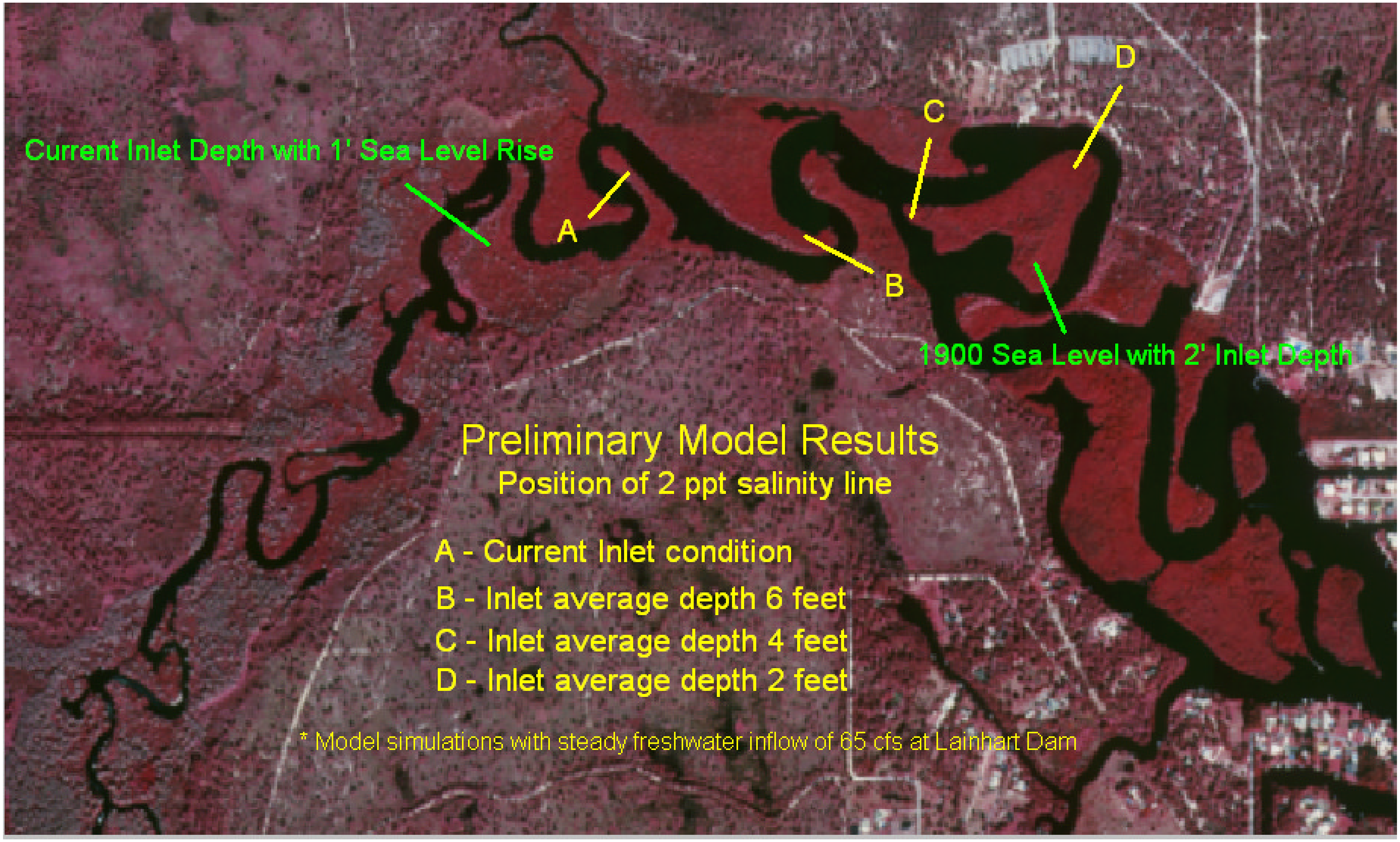

Figure 11. 2-ppt salinity line position at various inlet depths and sea level.
2-ppt lines are labeled with depth at Jupiter Inlet and sea level

APPENDIX Q -- CORRESPONDENCES REGARDING THE 2002 & 2003 MINIMUM FLOWS AND LEVELS PRIORITY LIST

CONTENTS

d' Vanplaman

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
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RES 16

October 16, 2002

Mr. David Struhs
Secretary, Department of Environmental Protection
Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Dear Mr. ~~Struhs~~: DAVID

In response to Section 373.042(2), Florida Statutes, the South Florida Water Management District (District) is submitting the "2002 Minimum Flows and Levels Priority List" and schedule. The District's Governing Board approved the attached list and schedule on October 11, 2001.

We look forward to the Department's approval so that it may be published in the Florida Administrative Weekly by January 1, 2002.

Sincerely,

Henry

Henry Dean
Executive Director

TB/kl
Attachments

2002 Minimum Flows and Levels Priority List:
1996-2002 (updated 10/12/01)

#	WMD	Waterbody	WB Type	County	1996 List	1997 List	1998 List	1999 List	2000 List	2001 List	Date Estab.	Peer Rev.	Reason for Schedule Change	Existence of or Potential for Significant Harm	Location (latitude & longitude)
12	SF	Lake Butler Chain	L	Orange						2008		Y		Projecting future increases in withdrawals	
13	SF	Alligator Lake	L	Osceola	2006	2006	2006	2006	2006	2006		Y		Projecting future increases in withdrawals.	
14	SF	E. Lake Tohopekaliga	L	Osceola	2006	2006	2006	2006	2006	2006		Y		Projecting future increases in withdrawals.	
15	SF	Lake Hatchineha	L	Osceola	2006	2006	2006	2006	2006	2006		Y		Projecting future increases in withdrawals.	
16	SF	Lake Tohopekaliga	L	Osceola	2006	2006	2006	2006	2006	2006		Y		Projecting future increases in withdrawals.	
17	SF	Cypress Lake	L	Polk	2006	2006	2006	2006	2006	2006		Y		Projecting future increases in withdrawals.	
18	SF	Fish Lake	L	Polk	2006	2006	2006	2006	2006	2006		Y		Projecting future increases in withdrawals.	
19	SF	Lake Jackson	L	Polk	2006	2006	2006	2006	2006	2006		Y		Projecting future increases in withdrawals.	
20	SF	Lake Marian	L	Polk	2006	2006	2006	2006	2006	2006		Y		Projecting future increases in withdrawals.	
21	SF	Lake Pierce	L	Polk	2006	2006	2006	2006	2006	2006		Y		Projecting future increases in withdrawals.	
22	SF	Lake Rosalie	L	Polk	2006	2006	2006	2006	2006	2006		Y		Projecting future increases in withdrawals.	
23	SF	Kissimmee	L	Polk, Osceola	2004	2004	2004	2004	2004	2006		Y	no immediate adverse WS impacts; consistency with other Kissimmee chain lakes	Projecting future increases in withdrawals.	
24	SF	Loxahatchee	R	Palm Beach, Martin	2000	2001	2001	2001	2001	2002		Y		Existing alterations to watershed have altered discharges to estuary. Existing and projected increases in withdrawals are also a factor.	
25	SF	Kissimmee	R	Polk, Highlands, Okeechobee, Glades	2004	2004	2004	2004	2004	2006		Y	no immediate adverse WS impacts; consistency with other Kissimmee chain lakes	Projecting future increases in withdrawals.	
26	SF	Caloosahatchee	R, E	Lee, Hendry	1999	2000	2000	2000	2001	complete	2001	Y		Alterations to the watershed have changed discharges to the estuary. Existing and projected increases in withdrawals are also a factor.	
	SF	Estero	R,E	Lee,						2006		Y		Projecting future increases in withdrawals	
27	SF	St. Lucie	R, E	St. Lucie	2000	2001	2001	2001	2001		2001*	Y		Alterations to the watershed have changed discharges to the estuary. Existing and projected increases in withdrawals are also a factor.	
28	SF	Everglades National Park and WCAs	W	Palm Beach, Broward, Dade	1996	1999	1999	2000	2001	complete	2001	Y	Need to wait for completion of Lower East Coast Water Supply Plan which is scheduled for 4/00	Projecting future increases in withdrawals	

WB Type: A=Aquifer, Fl=Floridan, E=Estuary, L=Lake, R=River, W=Wetland; 2001 List=anticipated MFL establishment date proposed in 2001; Peer Rev.=voluntary peer review of MFL; * MFL in rule making; ** MFL rule challenged.

Jeb Bush
Governor

Department of
Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

December 12, 2001

Mr. Henry Dean, Executive Director
South Florida Water Management District
Post Office Box 24680
West Palm Beach, Florida 33416-4680

RE: 2001 Minimum Flows and Levels Priority List and Schedule

Dear Mr. Dean:

Thank you for your October 16, 2001 letter providing SFWMD's 2001 minimum flows and levels (MFL) priority list and schedule. We commend the District on establishing MFLs this year for Lake Okeechobee, the Biscayne aquifer, Everglades National Park, the Lower West Coast aquifer system, and the Caloosahatchee River. This is a milestone for the District in the protection and restoration of South Florida's water resources. We are also pleased that the District added the Lower West Coast Water Table Aquifer, Estero Bay, and the Lake Butler Chain of Lakes for establishment in 2004, 2006 and 2008, respectively. Additionally, the postponement of the Loxahatchee River MFL in response to peer review concerns should result in a better MFL. Pursuant to Section 373.042(2), F.S., this letter constitutes approval of your 2001 MFL priority list and schedule. However, the Department asks you to consider the following comments as you establish MFLs and prepare next year's priority list.

As you know, the Floridan Aquifer resources in the Northern Kissimmee Basin are reaching their limits of development. It is important for SFWMD and SJRWMD to work together to protect and sustain the water resources and natural systems of Central Florida. The establishment of a MFL for the Floridan Aquifer by 2005 will be an important step in protecting these resources and will provide critical information as you update the regional water supply plan for the Northern Kissimmee Basin in 2005. During the development of MFLs, it is important that the District evaluates the impact of additional groundwater withdrawals on the area's sensitive surface waters and wetlands. Specifically, we hope the District will consider expediting the MFL establishment for the Lake Butler Chain of Lakes to 2005, so that this information can be used to update the water supply plan.

Establishment of a MFL for the Northwest Fork of the Loxahatchee River has been delayed one year so that additional technical work can be done. This MFL is especially important to the Department because of the impacts experienced by Jonathon Dickinson State Park. It is our understanding that concurrent with establishment of the MFL, the District will commit to a process and schedule to determine a feasible restoration goal for flows in the river. This goal will be the basis for future revisions to the MFL. We anticipate a recovery and prevention strategy will be needed for this system, both for the initial MFL and the subsequent revisions, and look forward to continued close cooperation with the District on ensuring appropriate flows in the Loxahatchee River.

The Department's Bureau of Watershed Management has also reviewed the 2001 MFL priority lists (see attached memo). The Bureau is responsible for developing Total Maximum Daily Loads (TMDLs) for the state's impaired water bodies. Understanding the range and timing of available levels and flows in Florida's major lakes, rivers, and other water bodies is essential to development of Total Maximum Daily Loads (TMDLs).

As the goals of the MFL and TMDL programs are similar, we should try to coordinate their schedules, thereby using the state's resources more efficiently. It would help if the District established MFLs on a schedule slightly in advance of the need to develop TMDLs. The attached memo contains the Department's TMDL water body list and schedule for the next two years. Before preparing next year's MFL priority list, please have your staff contact Jan Mandrup-Poulsen at s.c. 291-9488 to discuss possible coordination of MFL and TMDL schedules.

The Department supports your continuing efforts toward establishing MFLs and requests that the District carefully considers these comments in the development of next year's priority list and schedule. To allow adequate time for review, we request that next year's list be submitted by October 15, 2002. If you have any questions, please contact Janet Llewellyn or Tom Swihart at (850) 488-0784.

Sincerely,

David B. Struhs
Secretary

DBS/kk

Attachment

cc: Janet Llewellyn, DEP, DWRM
Melissa Meeker, DEP, SED
Herb Zebuth, DEP, SED
Rick Cantrell, DEP, SFD
Richard Orth, DEP, SFD
Vivian Garfein, DEP, CFD
Chris Ferraro, DEP, CFD
Dana Bryan, DEP, DRP
Pam McVety DEP, DRP
Eric Livingston, DEP, BWM
Jan Mandrup-Poulsen, DEP, BWM
Terrie Bates, SFWMD
Matthew Morrison, SFWMD
Joel VanArman, SFWMD
Chris Sweazy, SFWMD

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RES 10-12

January 29, 2002

Secretary David B. Struhs
Florida Department of Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear Secretary ~~Struhs~~: DAVID

Subject: 2001 Minimum Flows and Levels Priority List and Schedule

The South Florida Water Management District (District) appreciates the time taken by you and your staff to review our Minimum Flows and Levels (MFLs) Priority List and provide thoughtful comments. The District will give full consideration to the Florida Department of Environmental Protection (FDEP) suggestions for modifying this list in the future to more effectively incorporate MFL criteria into Water Supply Plans. In addition, the District will work with the Department to identify impaired waters and develop coordinated schedules for TMDL and MFL development.

The District further agrees that we need to assist the FDEP and Jonathon Dickinson State Park staff in their efforts to develop successful restoration goals and objectives for the Loxahatchee River. The District will include a request to allow staff to assist FDEP with restoration of the Loxahatchee River, along with other District priority efforts, as items for discussion as part of the Governing Board's strategic planning retreat on February 22 of this year. Over the next several months, District staff will continue efforts to develop an MFL for the Northwest Fork of the Loxahatchee River and estuary, based on best available data, to protect this system against significant harm.

Thank you again for your thoughtful comments and advice concerning Minimum Flows and Levels within our District. We look forward to further discussions with you and your staff concerning the future of the Loxahatchee River system and other MFL priority areas.

Sincerely,

Henry

Henry Dean
Executive Director

c: Dana Bryan, DEP, DRP
Rick Cantrell, DEP, SFD
Chris Ferraro, DEP, CFD
Vivian Garfein, DEP, CFD
Eric Livingston, DEP, BWM
Janet Llewellyn, DEP, DWRM
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ADM 06-02

October 31, 2002

Janet Llewellyn
Deputy Director
Florida Department of Environmental Protection
2600 Blair Stone Road, MS 46
Tallahassee, FL 32399-3000

Subject: **Minimum Flows and Levels (MFL) 2003 Priority List and Schedule**

Dear Ms. Llewellyn,

The Water Resources Act (s. 373.042 F.S.) requires that the Water Management District's provide an updated MFL priority list to the Department of Environmental Protection for review and approval by October 15 of each year. Final publication of the list in the FAW is required by January 1. Certain water resources may be excluded from the list, but in general:

> "The priority list shall be based upon the importance of the waters to the state or region and the existence of, or potential for, significant harm to the water resources or ecology of the state or region and shall include those waters which are experiencing or may reasonably be expected to experience adverse impacts." (Section 373.042(2), F.S.)

Attached to this memo is a copy of the currently proposed 2003 Priority List. This list was generated from previous year lists and recommendations in the Regional Water Supply Plans.

Changes for this year's list include the following:

- **Florida Bay (modified from 2003 to 2005)**: Establishment of the Florida Bay MFL was rescheduled from 2003 to 2005 due the need to coordinate this effort with the Florida Bay Feasibility Study that is scheduled to be completed in 2005. Experience with development of MFLs has shown that development of the MFL technical criteria and supporting rule is more efficient if restoration goals for the system have been clearly defined. The Florida Bay Feasibility Study will define restoration conditions from which the MFL will be developed to protect from significant harm.

- **Primary Tributaries to the Northwest Fork of the Loxahatchee River (new priority) to be completed by 2007.** The recent effort to develop MFLs for the Northwest Fork of the Loxahatchee River indicated the need to better define, and establish MFL criteria for other tributary inflows to this river that had very little available flow data. The primary tributaries are Cypress Creek, Hobe Grove and Kitching Creek. The date of 2007 is proposed, in order to provide sufficient time for FDEP and SFWMD, in cooperation with other agencies and local interests, to develop a restoration plan for the river. In addition, the SFWMD and USACE will be able to complete the Project Implementation Report for the northern Palm Beach County Comprehensive Everglades Restoration Plan (CERP) components. By 2007, the District will also have sufficient time to collect and analyze flow data from these tributaries, from gauges that are being installed this year. The proposed date will thus allow sufficient time to determine restoration needs for this system; identify structural, operational and regulatory actions that need to be implemented; and to collect and analyze four years of data on tributary flows that will provide a sound basis for establishment of the MFL.

The remaining water bodies and schedules remain the same as were provided on last year's list.

If you have any questions regarding the contents of this transmittal or the attached list, please feel free to contact me at (561) 682-6502.

Sincerely,

Kenneth G. Ammon, P.E.
Director
Water Supply Department

KGA/nk

Attachment

Cc: Henry Dean, 1110
Pat Gleason, GB Member
Len Lindahl, GB Member
Karl Kurka, FDEP
Chip Merriam, 4110
Michelle Pearcy, 4350

South Florida Water Management District
2002 Minimum Flows and Levels Priority List
and Schedule for Establishment
10/31/02

Region	Priority Water Bodies	Year Established
Lower East Coast	Surface Water:	
	Biscayne Bay	2004
	Florida Bay	**2005**
	Loxahatchee River Tributaries	**2007**
	Ground Waters:	
	Southern Coastal Biscayne Aquifer	2004
Lower West Coast	Surface Waters:	
	Estero Bay	2006
	Ground Waters:	
	Water Table Aquifer	2004
Kissimmee Basin	Surface Waters:	
	Kissimmee River	2006
	Lake Kissimmee	2006
	Lake Tohopekaliga	2006
	East Lake Tohopekaliga	2006
	Alligator Lake	2006
	Lake Jackson	2006
	Lake Rosalie	2006
	Cypress Lake	2006
	Lake Hatchineha	2006
	Lake Pierce	2006
	Lake Marian	2006
	Fish Lak	2006
	Lake Istokpoga	2004
	Lake Butler Chain of Lakes	2008
	Ground Water:	
	Floridan Aquifer	2004

This list is published pursuant to Section 373.042(2), Florida Statutes.

"Establishment" of a minimum flow or level, as provided in this list, is the publication of the notice of intended rule adoption in the Florida Administrative Weekly pursuant to Section 120.54(3)(a), Florida Statutes.

SFWMD will voluntarily conduct independent scientific peer review of minimum flows and levels criteria for all water bodies on the above list, pursuant to Section 373.042(4), Florida Statutes.

Bold = change in schedule from previous list

Note: Those water bodies that are scheduled to be completed by the endof 2002 have been removed from the list, including the St. Lucie and Loxahatchee Rivers.

Bc: Albert Basulto, 4910
Vicki Lehr, 4910
John Mulliken, 4310
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APPENDIX R -- REVIEW OF METHODS THAT COULD POTENTIALLY BE USED TO DEVELOP MFL CRITERIA

CONTENTS

METHODS CONSIDERED FOR USE

Conceptual Basis for Minimum Flows

River management is a complex process that requires consideration of a number of variables. Minimum flows are an important component of riverine flow characteristics. However, providing a minimum flow represents only one aspect of management and/or restoration of river hydrology. Focusing on a single aspect of river hydrology (minimum flows) is an overly simplistic treatment of complex ecosystem interactions. Long-term hydrological data, especially measures of variability, have been under utilized in most management decisions aimed at river ecosystem protection or restoration (National Research Council 1992).

Because of the intrinsic ecological complexity of estuaries, scientists and managers have also objected to the idea that minimum flows can be set for estuaries. Complexity in itself is not a sufficient reason to question the concept of minimum flows for estuaries. In fact, it simply supports the fact that complex biological systems, such as those in estuaries, require more study. Due to the lack of understanding and a shortage of previous attempts to establish minimum flows, estuarine scientists and managers do not have even simplistic minimum flow examples to study or criticize. Rather than waiting until all information is available before making a management decision, the best approach is adaptive: set inflows based on assumptions derived from conceptual and mathematical modeling using best available information, monitor the results for success or failure, continue research, and reevaluate flow targets.

Recent Advances in Flow Analysis

Restoring Natural Flow Regimes

Because modifications of hydrologic regimes in rivers are known to directly and indirectly alter the composition, structure, or function of riverine aquatic and wetland ecosystems, most river scientists tend to agree that it is better to approximate natural flow regimes and maintain entire ensembles of species, than to optimize water regimes for one or a few species. In reality, however, the great majority of in stream determinations have been based on one or a few species' requirements. It is now understood that native aquatic biodiversity depends on maintaining or creating some approximation of natural flow variability, and that native species and communities will perish if the environment is pushed outside the range of natural variability. Where rivers are concerned, a natural flow paradigm is gaining acceptance. It states "the full range of natural intra- and interannual variation of hydrologic regimes, and associated characteristics of timing, duration, frequency, and rate of change, are critical in sustaining the full native biodiversity and integrity of aquatic ecosystems" (Richter et al. 1997). A corollary idea is that ensembles of species and ensembles of habitats should be used to gage the effect of hydrological alteration. Sentiment for a similar paradigm for estuaries is growing. In river-dominated estuaries, it seems reasonable to evaluate both flows and salinities with respect to their multiple forms of variation.

Richter "Range of Variability" Criteria

A new and robust method was developed for determining hydrologic alterations in rivers (Richter et al. 1996). The "range of variability approach" is based on the calculation of means and coefficients of variability of 32 hydrologic variables grouped into five sets:

- Magnitude of monthly water conditions
- Magnitude and duration of annual extreme conditions
- Timing of annual extreme water conditions
- Frequency and duration of high and low pulses
- Rate and frequency of water condition changes

Comparisons are made between "before" and "after" modifications. In the absence of "before" data, models can be used to estimate water conditions. Some alterations affect only a few indicators, whereas others affect many. Patterns of alteration help managers determine the aspects of flow to modify.

This technique employs more variables and offers more promise in protecting ecosystem integrity. It is gaining in popularity and has been used extensively by the Northwest Florida Water Management District in its role in the Apalachicola-Chatahoochee-Flint Tri-State Compact (USACE 1998). In cases where restoration is sought for a system with no "natural" flow data, it is necessary to employ hydrologic simulation models to estimate historical conditions. While such models may provide good estimates of impact magnitude, they do not illuminate their causes. Nevertheless, the method captures a number of features, especially rates of change, that are not commonly used in estuarine science and management, but may have important effects on estuarine ecosystems.

The "range of variability approach" can be applied, even when flow data are scant, to set initial river management targets for rivers in which the flow regime has been greatly altered by human developments such as dams and large diversions. If adequate stream flow records exist for at least 20 years of natural conditions, the method can be used directly. In the absence of all 20 years of data, missing data can be estimated. In the absence of any data, models may be employed or normalized estimates can be generated from nearby, similar streams. Some hydrologic variables cannot be generated by these latter methods, affecting the power of the technique.

The criteria for streams pose great difficulty for estuarine managers where tributary data are sparse; where tributaries have been extensively altered for long periods of time; or where regulated flows are only part of an estuary's total freshwater budget.

Synthesis and Application

Methods Considered for Use For the Loxahatchee River

Several general methods were identified that could be used to establish minimum flows for the Loxhatchee River and Estuary. Components of five possible approaches are integrated in this study. These methods are described generally below, followed by assessment of their applicability.

1. In Stream Flow Methods. Historical flow, hydraulic, or habitat methods can be used to determine acceptable flows of individual tributaries to rivers (Stalnacker et al. 1995). This approach presumes that a river or estuary's needs for fresh water can be met by providing sufficient flow from tributary surface waters; that the majority of inflow occurs via streams, rivers, canals or other gaged surface waters; and that data are available or can be obtained.

2. Hydrological Variability Techniques. Following Richter et al. (1996) this approach extends the in stream techniques through a fuller analysis of flow characteristics. An untested but feasible application of the method would be its use with salinity data rather than flow data. Data requirements are large, but most types of salinity data could be generated through the use of models. Results of natural or historical conditions would be compared to existing or predicted conditions of salinity.

3. Habitat Approaches. Browder and Moore (1981) proposed the concept of analyzing the overlap of dynamic and stationary habitat elements for particular species. This approach could be developed more fully. If submerged aquatic vegetation was targeted, for example, the method would query the probability that appropriate depths, sediment types, salinities, and conditions of water clarity coincided under differing flow regimes.

4. Indicator Species. This approach relates a change in abundance, distribution, or condition of particular species to a flow or salinity. Criteria for selection may include a species' commercial, recreational, or aesthetic value; ecological importance; status as a species at risk (threatened, endangered, etc.), or endemism. Statistical methods attempt to match abundance values to appropriately time lagged inflow or salinity conditions.

5. Valued Ecosystems Component Approaches. An extension of the indicator species approach, valued ecosystem component (VEC) analysis also uses statistical methods, but accounts for more known or suspected intermediate variables. Recommended by the United States Environmental Protection Agency (1987) for national estuary programs to characterize constraints to living resources, VEC analysis plays an important part in a general model for the design of eutrophication monitoring programs in South Florida estuaries. VEC is a goal driven approach that has the ability to focus research and provide managers with short-term alternatives in data poor estuaries.

Assessment of Methods Relative to the Loxahatchee River

Hydrologic Methods

A major limitation is the lack of historical flow and salinity data for the Loxahatchee River and Estuary from prior to construction of the inlet, drainage by major canals, and dredging of the waterways. Some aspects of the historical (natural) flow regime can be inferred, however, from anecdotal information, historical records and analysis of remnant vegetation such as tree rings (Duever and McCollum, 1982), dead trees and stumps, but there are virtually no hydrologic, water quality or biological data from this watershed prior to about 1970.

A possible approach to overcome this lack of information is to develop a hydrological model to represent historical water levels and flow patterns. The SFWMD has a regional model that is used to simulate conditions that existed in South Florida during the 19th century. This so-called “Natural Systems Model” is used to predict water levels and distribution over the entire South Florida region, including the Loxahatchee River watershed, Unfortunately, because the model was designed for a very large area, it provides low resolution at any particular location, and is not sufficient to provide accurate estimates of water levels or flows in the Loxahatchee watershed. Additional effort is needed in the future to extend this model, at a higher resolution, to provide more detailed analyses for northern Palm Beach and southern Martin Counties.

In lieu of the NSM, an attempt was made to predict historical (pre-development) flows from the Loxahatchee River watershed based on historical land use/land cover data, climatological data, and water level information from throughout the region and general topographic features of the basin. This approach provided a general picture of flow patterns and estimated annual average volumes of runoff, but was not considered to adequate for prediction of dry season, low-flow conditions. Additional efforts will be made to refine this approach during the coming year. In addition to the above modeling approaches, the following methods were used to analyze actual data from the watershed:

1. Instream Flows. This included an assessment of existing inflows to the river from different surface water sources and estimates of groundwater inflow along different stretches of the river. The hydrodynamic model was also used, in combination with historical USGS flow records, to simulate a 30-year salinity record for the period from 1971-2000, at selected sites along the Northwest Fork . Additional efforts are underway to identify methods that can be used to enhance flows to the river in the future. Most of the emphasis so far has been placed on examination of resources in northern Palm Beach County. Plans are underway to provide additional storage and improve water conveyance capacity to provide additional flow to the River from Loxahatchee Slough and the regional water management system. Opportunities in other basins (e.g. Kitching Creek, Pal/Mar Cypress Creek and Hobe Groves) are being investigated now for inclusion in future updates of this document.

2. Hydrologic Variability. The range of inflows to the river was examined with emphasis on long-term average flows, dry season flow conditions and the magnitude, frequency and duration of low flow events. This approach needs to be expanded in the future to consider wet season flow conditions as well as maximum flow events with recognition that the full range of natural flow conditions needs to be addressed in this process. Full use of this approach has been delayed until modeling tools have been developed that provide a better picture of natural historical flow conditions that occurred in the River.

Biological Methods

Results of field vegetation studies and peer review of an earlier draft of this document indicated that the decision to use a single species, cypress, did not provide an adequate basis to protect critical resources in the Loxahatchee River, especially since cypress trees were not the most sensitive or responsive vegetation species to river flow and/or salinity changes. The panel suggested that a broader, community-based approach would be more appropriate. In response to this recommendation and the results of recent field studies, SFWMD staff considered the use of habitat, indicator species, and Valued Ecosystem Component approaches as described below.

3. Habitat Approaches. The evaluation of biological response to changes in flow was expanded to consider the freshwater floodplain swamp community as an important river habitat. In a fully functional floodplain swamp ecosystem, freshwater trees, in conjunction with cypress, comprise a multi-layer canopy that provides the aesthetic basis for the “wild and scenic” river as well as a range of living conditions for native birds, mammals, reptiles, amphibians and invertebrates. Factors that impact the distribution and health of this community were analyzed including river flow, salinity and soils. In addition, 30 or more associated herbaceous floodplain plant species that primarily comprise the understory of this community were also identified as a critical component of this habitat.

4. Indicator Species. Six species of hardwood trees were identified as indicator species for the freshwater swamp community. Distribution of these species along the river was documented and related to river flow, surface water salinity and soil salinity conditions.

5. Valued Ecosystem Component (VEC). The indicator species approach was expanded to include the VEC concept. Management goals were established based on protection of the valued ecosystem component, which in this case represents those freshwater vegetation species that are most sensitive to the environmental factor of interest (salinity). It is assumed that providing a minimum freshwater flow to the river that will protect this group of species against saltwater intrusion will also protect the entire community. Results of a river vegetation survey identified six "key" woody vegetation species characteristic of the floodplain swamp that appear to be more sensitive to the effects of long-term salinity conditions within the river as compared to bald cypress, cabbage palms or red mangroves. These six species are also important structural components of the forest canopy, and play a number of other functional roles in the forest ecology. Impacts to the VEC beyond a critical level is considered to constitute significant harm to the river floodplain swamp community.

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APPENDIX S -- SFWMD STAFF RESPONSES TO COMMENTS AND FREQUENTLY ASKED QUESTIONS

1. Who is responsible for protecting the river?

Chapter 83-358, Laws of Florida provides guidance regarding authority for protection of the Northwest Fork of the Loxahatchee River. In Section 9, it states that the Florida Department of Environmental Protection (DEP) "shall have full and exclusive authority to adopt rules concerning and to regulate activities within the river area having a direct and substantial adverse effect on any resource value within the river area." Section 9 states further that the South Florida Water Management District Governing Board (SFWMD) "shall have full and exclusive authority to adopt rules concerning and to regulate activities outside the river area having substantial adverse impact on resource values within the river area."

2. What are the resources of the River that need to be protected?

Chapter 373.042, F.S. identifies the need to protect "water resources" during the MFL process. The term "water resource" is used throughout Chapter 373, F.S. Water resource functions protected under Chapter 373, F.S. are broad, as illustrated in Section 373.016, F.S., which includes flood control, water quality protection, water supply and storage, fish and wildlife protection, navigation, and recreation.

3. How will Minimum Flows and Levels Criteria protect the resource?

The overall purpose of Chapter 373, F.S. is to ensure the sustainability of water resources of the state (section 373.016, F.S.) To carry out this responsibility, Chapter 373, F.S. provides the SFWMD with several tools with varying levels of resource protection standards. MFLs play one part in this framework. MFLs are set at the point at which further withdrawals would cause significant harm to the water resources, or ecology, would occur. The SFWMD has defined significant harm as the temporary loss of water resource functions, which result from a change in surface or ground water hydrology, that takes more than two years to recover

4. What are the "considerations and exclusions" that were applied to the Loxahatchee River?

Section 373.0421(1)(a), F.S. requires the water management districts when setting a MFL, to consider changes and structural alterations that have occurred to a water resource. Numerous alterations have occurred in the river and its watershed that have been evaluated during development of these MFL criteria. These alterations were discussed in May 2001 draft of the MFL document.

5. Should a rainfall driven schedule, like that being developed for the Everglades, be developed for the Loxahatchee River to ensure seasonally-adjusted deliveries?

The adoption of a Minimum Flow and Level Rule for the Northwest Fork of the Loxahatchee River is an important step in the development of a series of plans, projects and activities that need to be accomplished in support of this important natural resource. During the development of the Northwest Fork of the Loxahatchee River Restoration Plan the issues of timing of delivery of flows and maximum flows will be addressed.

6. Are there significant water quality issues that need to be considered in this plan?

The Loxahatchee River is an Outstanding Florida Water and therefore has some commensurate water quality requirements. The majority of the known water quality issues that need to be considered in the context of overall watershed management are primarily due to nonpoint source pollution. The SFWMD is participating with other agencies, such as the DEP and the Loxahatchee River District, to address these concerns through establishment of Total Maximum Daily Loads (TMDLs) for appropriate water body segments and through the Environmental Resource Permitting (ERP) process

7. Should development of Minimum Flows and Levels criteria also address the effects of maximum flows?

The adoption of a Minimum Flow and Level Rule for the Northwest Fork of the Loxahatchee River is an important step in the development of a series of plans, projects and activities that need to be accomplished in support of this important natural resource. During the development of the Northwest Fork of the Loxahatchee River Restoration Plan the issue of maximum flows will be addressed.

8. Cypress trees are not particularly good indicators of salinity stress. Other criteria need to be developed that are based on, more sensitive species that respond, and can be monitored, over shorter time periods.

This problem was identified during the peer review process for the May 2001 version of the report. In response to the peer review recommendations, SFWMD scientists conducted additional surveys of resources along the river and identified a freshwater floodplain plant community characterized by adults, seedlings and saplings of six commonly occurring, core sensitive species, of trees and more than 30 associated herbaceous species, a subset of which includes species identical to the "Wild and Scenic" designation This community is felt to provide a sensitive and effective indicator of the healthy floodplain forest resource that needs to be protected and enhanced in this system

9. The St. Lucie River has been studied in great detail and a very comprehensive plan has been developed to protect and restore this system. Why have so much less time, attention and resources been devoted to the Loxahatchee River?

The St. Lucie River has a long history of problems that have been thoroughly documented and studied during the past forty years. In addition, it has received special attention from the USCOE and SFWMD because it is fed by three major SFWMD Project canals and is a primary outlet of water from Lake Okeechobee. New project facilities (canals and reservoirs) have been proposed for construction in this basin since the 1950's to meet water supply needs of the region. It also lies at the confluence of the Okeechobee and the Intracoastal waterways.

Although Northwest Fork of the Loxahatchee River has some similar issues, much of this system still remains in a largely natural state and its problems are not as severe as those encountered in the St. Lucie Estuary. However, to prevent impacts and protect this important resource, in 1985 significant land acquisition was started and completed in 1991to place the river corridor in public ownership. Since the 1970's structural and operational improvements have been implemented to direct more flow to the Northwest Fork of the Loxahatchee River. After seven years of data collection, public comment, modeling and analysis the Northern Palm Beach County Comprehensive Water Management Plan was accepted by the SFMWD Governing Board on May

9, 2002. This plan identifies a series of projects that will provide 65 cfs to the Northwest Fork when they are constructed and operational. Implementation of the Northern Plan has been started.

10. The SFWMD always seems to be developing models and does not seem to be doing any real work to solve the problems.

The SFWMD has made a commitment to the use of models as planning and design tools for all major undertakings. Models take time to develop and require a substantial amount of data in order to give relative benefits and impacts of proposed solutions. The advantages are that, once developed, models can be used rapidly and effectively to evaluate wide ranges of options. Although a great deal of modeling effort has been applied to develop models for the portion of the Loxahatchee watershed in northern Palm Beach County, additional work is needed to develop a similar level of modeling tools for portions of the Loxahatchee watershed in southern Martin County. This effort is expected to be completed in 2004.

11. Minimum flow criteria need to be established for wet-season as well for dry-season flows.

This is part of a broader question that is related to restoration and is based on identifying how much of the system needs to be protected and to what extent. The MFL legislation seems to imply the MFLs should be established to identify how much water is needed to protect the resources during extreme low-flow events. Thus it might be useful to define a minimum dry season flow, a minimum wet season flow and also require that some higher levels of flow may be needed to periodically provide flushing or ensure that upper limits of the floodplain are inundated often enough to protect resources that require occasional inundation. It is the intent of SFWMD staff to identify these other needs as part of the restoration plan for the Northwest Fork of the Loxahatchee River.

12. The initial draft (May 2001) of MFL document did not provide a clear separation between scientific and policy decision-making. The choice to declare a certain part of the river as "significantly harmed" is clearly a political rather than a scientific decision.

MFLs require a scientific understanding of the resource and the effects that water conditions have on the resource, but also require the application of judgement to balance among competing impacts. The final decision will inevitably involve some compromise among these impacts and will be determined by the SFWMD Governing Board.

13. Why has the SFWMD reduced its proposed MFL from 70 cfs to 35 cfs during the past year?

The original MFL was based on a number of assumptions concerning the resource that needed to be protected and the conditions that were needed to protect this resource. The peer review panel pointed out that the technical basis used in this original document was not sound. -- that cypress trees were not particularly good indicators of salinity stress, that the downstream-most point at which cypress trees exist along the shoreline may not be directly related to salinity conditions in the river, but may rather be an artifact of groundwater seepage from adjacent uplands, and that there was no sound basis for the chosen threshold (2 ppt) as a condition that might have adverse effects on cypress trees.

14. How were flows to the river managed during the drought event that occurred during the past year and what were the impacts of these flows on resources in the river?

Flows to the Northwest Fork of the Loxahatchee River are managed based on our existing operational protocols for G-92 that require delivery of at least 50 cfs to the Northwest Fork whenever possible. Annual average flows for 2000 and 2001 were below normal but, more importantly, there were significant periods when flows to the river were below 35 cfs -- in the 10cfs or less range. Flows of less than 35 cfs occurred during approximately five months of each of these two years. During such periods, salt water will generally move upstream to, or above the Trapper Nelson site. Significant harm can occur if such low flow conditions persist. These are the kinds of events that the proposed MFL is designed to prevent.

15. What is the scientific basis that is used to define "harm" and "significant harm" to the resource?

The terms "harm" and "significant harm" are qualitative terms by their nature and do not have objective scientific definitions. Practical definitions of these terms have evolved over the last several years as work has been completed in a number of different ecological systems throughout South Florida.

Serious Harm - refers to long-term, irreversible or permanent impacts that occur during drought event more severe than the 1-in-10 year level of certainty. Declaration of water shortages is the tool that is used by the SFMWD Governing Board to prevent serious harm, pursuant to Chapter 373.246, F.S.

Significant Harm - means the temporary loss of water resource functions, which result from a change in surface or ground water hydrology, that takes more than two years to recover, but which is considered less severe than serious harm (CH. 40E-8.021(24), F.S.)

Harm refers to a measurable damage or impact to a resource that can recover within one year or less.

The interpretation of these terms is specific to each MFL water body and is based on establishing quantifiable relationships between water level or flow conditions and effects on the functions provided by the water resource.

16. What is the "baseline condition" of the resource that is used to determine the extent of harm that has occurred in this system over time?

The baseline condition that was chosen for the establishment of the Northwest Fork of the Loxahatchee River MFL was the condition of the river and floodplain in 1985. At the time that the "Wild and Scenic" River designation occurred there was data available concerning river flow, salinity conditions, and estimated distribution of plant communities.

17. South Florida has only one "Wild and Scenic River." Is it appropriate to only provide a *minimum flow* needed to protect this system against *significant harm*? The more appropriate management issue is rather how to provide water to the river in sufficient abundance at all times to protect or enhance this unique resource.

The SFWMD recognizes that setting a MFL, according to state law, is not the only basis for overall management of the Northwest Fork of the Loxahatchee River. It is simply one resource protection tool that establishes limits that are expected to be reached only rarely, under severe water shortage conditions. The more important task is to identify the management and restoration needs of the Northwest Fork above the Minimum Flow and Level. The proposed MFL criterion define a flow and an associated duration and return frequencies that represent a small, but very important, component of the total flow regime for the river. The flows that need to be provided during the rest of the time are the important determinants of the overall health and species composition of the floodplain. Development and adoption of a Minimum Flow and Level Rule for the Northwest Fork of the Loxahatchee River is just one important step in a series of plans, projects and activities to be accomplished for protection and restoration of this valuable resource. A Restoration Plan, led by the DEP with assistance from the SFWMD, will address the broader issues for enhancement and protection of this resource.

18. The MFL seems to only focus on resources in the Northwest Fork of the River. How are resources in the North Fork River and the Loxahatchee Estuary factored into the MFL criteria?

The Northwest Fork of the Loxahatchee River was chosen as the primary focus for MFL development because: a) the designation of the NW Fork as a "Wild and Scenic" river and the associated importance of this river to the state and the nation; b) the presence of infrastructure and facilities to provide and manage flows to the NW Fork; c) most of the watershed of the Northwest Fork is protected through public ownership,therefore, there is no immediate concern that flows from this river are likely to be significantly altered in the future; d) there is no evidence of adverse impacts to the North Fork of the river due to reduced flows; e) there are no facilities to control water flow and distribution in this system; f) the Southwest Fork is highly modified and does not contain significant freshwater-dependent resources.

19. Why doesn't the SFWMD issue a "permit" for the river to protect its use of the resource to a comparable extent that Consumptive Use Permits protect water supplies for other users?

The appropriate method of assuring an allocation of water for protection of environmental resources in the Northwest Fork of the Loxahatchee River is through the "reservation" process. The reservation provides a higher standard of protection than would be afforded by a Consumptive Use Permit. It is a more effective means to balance the environmental protection and restoration needs of the River against the competing needs of public and agricultural water supply.

20. The Northern Palm Beach County Comprehensive Water Management Plan is primarily a water supply plan and provides very little environmental benefit.

The goals and objectives of the Northern Palm Beach County Comprehensive Water Management Plan clearly state that the proposed projects will concurrently meet the projected environmental and urban water supply needs for the year 2020. By 2006, two projects in this plan will be completed, which will achieve the proposed MFL of 35 cfs 94% of the time. When all the projects are completed in 2018, the 65 cfs base flow target will be provided 99% of the time. In addition, the supplemental water will restore the hydroperiod of the Loxahatchee Slough, restore the hydroperiod of the Grassy Waters Preserve, provide increased drainage for the Indian Trail Improvement District, improve the water quality of the Lake Worth Lagoon by reducing stormwater discharges, and meet the 2020 urban and agricultural water supply demands of the area.

21. What is the relationship between the amount of water that is released from Lainhart Dam and the amount of water that is needed to move the salinity wedge to various locations downstream?

The amount of water released from Lainhart Dam is only one component of the total freshwater flow to the Northwest Fork of the Loxahatchee River. Contributions by other tributaries are discussed in Question 34. The proportion of total river flow that occurs from this dam varies seasonally and from year to year depending primarily on local rainfall conditions and secondarily on water management practices in the adjacent watershed. Because of variations in flow from other sources, flow from Lainhart dam shows a relatively poor correlation to salinity conditions downstream. In general, a flow of approximately 35-cfs from Lainhart Dam (when combined with typical surface and groundwater flows from other basins) is needed to maintain a salinity concentration of 2 ppt at river mile 9.2. A flow of 65 cfs from Lainhart Dam is required to maintain a salinity concentration of 2 ppt at river mile 8.4.

22. How much water are you assuming is to come from groundwater and tributary inflows?

Groundwater flow is known to be an important component of total river flow in this system and more work is needed to gather data and document the relationship. Groundwater flow is generally estimated by adding up the effects of all known surface water flows, comparing this prediction with actual salinity measurements in the river and typical cycles, with the assumption that groundwater flow accounts for the difference between estimated and measured values. The estimated groundwater flow to the river is 40 cfs. The model assumes that the groundwater flow is equally distributed among the four major tributary sub-basins, C-18 Canal and other areas upstream of Lainhart Dam, Cypress Creek/Hobe Groves and Kitching Creek.

23. What are the historic levels of flow that occurred to the River prior to development in the watershed?

Two approaches were taken by the SFWMD to estimate the historic flow into the Northwest Fork of the Loxahatchee River and neither one produced very satisfactory answers. Both methods indicated that average annual flows were in the range from 60 to 100 cfs. However, neither of these approaches could provide adequate predictions of seasonal flows or flows during flood and drought conditions. Additional studies of this question will be undertaken when more detailed modeling studies have been completed.

24. The Northern Palm Beach County Comprehensive Water Management Plan does not adequately address resource management needs in, or potential availability of water from, Martin County.

The Northern Palm Beach County Comprehensive Water Management Plan did not take water resource needs or water availability in Martin County into consideration. However, the plan recognizes that it would benefit the area if that evaluation and analysis were performed and includes recommendations for additional studies. Among many other factors it provided a basis to support for the type of more detailed planning effort that is currently underway in southern Martin County.

25. How much have flows to the river changed during the last century?

Very little data are available to determine what kinds of flows were likely to have occurred in the river 100 years ago. Although the watershed was probably connected to the Everglades during very wet periods, during dry periods, the area that includes the present Loxahatchee Slough was probably the primary source of water to the River. The Loxahatchee Slough Cypress Creek, and Kitching Creek and numerous other smaller tributaries probably provided a substantial amount of flow to the River during dry periods due to flow through channels and groundwater seepage.

Available evidence suggests that freshwater plant communities extended much further downstream in the Northwest Fork of the River than they do today, probably to the upper end of the estuary. The Northwest Fork River channel was probably much narrower and shallower. The Northwest Fork Estuary was probably somewhat saline, at least enough to support the growth of large numbers of oysters. The estuary was probably shallower and had oyster bars or reefs and sandbars strategically located to restrict the flow of saltwater upstream into the River.

26. What other changes have occurred in the river, adjacent waters and the watershed that have caused salt water to move upstream in the Northwest Fork?

Besides minor changes to the flows of the Northwest Fork of the Loxahatchee River that have occurred due to water consumption in upland basins, flows to the river have been more severely altered by the construction and operation of drainage and flood control facilities. In addition, stabilization and improvement of the Jupiter Inlet, removal of oyster bars in the estuary, dredging of channels in the river and estuary to improve navigation and obtain fill, and the cutting of channels through river meanders have all eliminated barriers and provided additional means to allow movement of salt water upstream into the Northwest Fork of the Loxahatchee River.

27. What effects have these changes in flows had on plant communities in the river and the floodplain?

A number of surveys of plant communities along the river have been conducted, beginning in the 1970's. Additional information is available from aerial photographs that were taken in the 1940's, 1950's, 1960,s 1970's and 1980s, 1990s. This information indicates that there has been a progressive decline in freshwater swamp and cypress communities in the watershed and associated upstream migration of mangroves. The most extensive changes appear to have occurred during the period from 1953 to 1985. For example, during this period, in the area from river mile 6.6 to river mile 8.9, coverage of mangroves increased from nine acres in 1940 to 84 acres in 1985, whereas freshwater swamp and cypress declined from 104 acres in 1940 to 15.5.acres in 1985. Comparison of 1984 field data and 1985 aerial photographs with 1995 aerial photographs and field data collected during 2000-2001 indicate that no significant vegetation changes have occurred since 1985.

28. What are the effects of consumptive uses on the ability to provide water to the river?

The limited information available indicates that the effects of consumptive uses in the basin on flows to and through the river are relatively small, on the order of 10 cfs or less. Each application for a Consumptive Use Permit, either a modification of an existing use or a new use, is evaluated on a case-by-case basis. The impacts of additional withdrawals on environmental resources will be thoroughly evaluated during the permit review process. Interactive surface-groundwater models are under development that will allow an evaluation of the cumulative effects of water withdrawals throughout the basin.

The establishment of the Minimum Flow and Level Rule for the Northwest Fork of the Loxahatchee River will certainly be an important factor for consideration of the future withdrawals in the northern Palm Beach County area. Implementation of the Northern Palm Beach County Comprehensive Water Management Plan, which will bring supplemental water to the northern Palm Beach County area, is critical for future water supplies, both urban and environmental.

29. Why does the SFWMD not limit further withdrawals for consumptive use until the MFL criteria are met?

In support of the Minimum Flow and Level Rule for the Northwest Fork of the Loxahatchee River, a Recovery Plan will be developed. It will contain several components, one of which will be a regulatory strategy that will limit the issuance of new Consumptive Use Permits and Environmental Resource Permits in the area.

30. Are the needs of Loxahatchee Slough also being addressed in this Plan?

The needs of the Loxahatchee Slough are not addressed in the Minimum Flow and Level Rule for the Northwest Fork of the Loxahatchee River. However, the Northern Palm Beach County Comprehensive Water Management Plan which is a major component of the Recovery Plan did consider and address the hydrologic needs of the slough. Any additional planning efforts for the Northwest Fork, such as the development of a Restoration Plan, must also include analyses to determine effects on Loxahatchee Slough and other adjacent areas.

31. If MFL criteria are implemented and new facilities are constructed to meet these criteria, what effects will these changes have on actual flows to the river and resources in the river floodplain?

During wet periods, excess water will be captured and stored in reservoirs and ASR wells for subsequent release during dry periods. Damaging high flows to the Northwest Fork of the Loxahatchee River will therefore be reduced in magnitude and duration, thus improving the current seasonal flow pattern. Some preliminary modeling studies have been conducted to determine the effects of proposed water facilities on future flows to the Northwest Fork, but these results are not considered to be representative of actual future water management scenarios. Much depends on how much area is included in the effective watershed boundaries of the basin and how new and existing facilities are actually operated. One way to resolve this issue is to develop a rainfall-driven operational protocol for the river that determines how much water is provided during any period (monthly for example) based on the amount of rainfall that occurs in the watershed during that period and the amount of runoff that would naturally have occurred under those conditions.

32. Neither the IRL feasibility study nor the North Palm Beach County CERP Project adequately address restoration needs of the Loxahatchee River

The base flow target of 65 cfs that was used for the Northern Palm Beach County Comprehensive Water Management Plan was also used as a basis for the initial planning efforts of the North Palm Beach County project of CERP and the Lower East Coast Regional Water Supply Plan. The IRL Feasibility Study was also largely completed before additional needs for delivery of water to the Northwest Fork of the Loxahatchee River were quantified. The North Palm Beach CERP Project can be modified in the future to address water supply needs of the Northwest Fork once these needs have been quantified through development of the Restoration Plan. Some of the options in the IRL study for storage, treatment and conveyance of water south of C-44 Canal, which were initially considered, but rejected, based on their lack of benefits to the St. Lucie River, may be reexamined in the future to determine if they could provide significant benefits to the Northwest Fork of the Loxahatchee River.

33. How much of the overall flow to the river comes from Lainhart Dam and how much comes from other sources. Are you assuming that if you increase flow from the Dam that flow from these other sources will automatically increase proportionally?

Lainhart Dam is generally the single largest source of freshwater inflow to the Northwest Fork, especially during sustained dry periods, although significant amounts of water are provided by groundwater seepage and flow from other tributaries. The flows vary considerably by season. These flows from other sources and tributaries may be especially important during very dry periods. During an average wet season, Lainhart Dam provides 95 cfs of flow to the Northwest Fork. Under average dry season conditions, 70 cfs of flow is provided by Lainhart Dam, 32 cfs from Cypress Creek and 7 cfs from Hobe Groves and 16 cfs from Kitching Creek for a total of 125 cfs. Lainhart Dam represents about 56% of this total. During a more severe dry period, such as the 1989-90 drought, an average of 26 cfs was provided from Lainhart Dam, 30 cfs from Cypress Creek, 7 cfs from Hobe Groves and 1 cfs from Kitching Creek for a total of 64 cfs.

Lainhart Dam represents about 41% of this total. The modeling was based on historic seasonal flows from other basins rather than requiring a proportional increase in flow to match the discharge from Lainhart Dam

34. How will the proposed MFL criteria affect actual operations of District facilities to deliver water to the river? Does establishing this MFL really have an effect on the river or is it simply a "paper tiger?"

The Minimum Flow and Level Rule for the Northwest Fork of the Loxahatchee River will have a Recovery Plan associated with it that will address construction of the structures, regulatory strategies, and operational protocols. The Northern Palm Beach County Comprehensive Water Management Plan will be the major component of the Recovery Plan.

Operational protocols play an important role in the Recovery Plan for the Northwest Fork. Operation of the regional system has been adjusted through the years to deliver water to the Northwest Fork at times and in amounts, so that the present procedures are beneficial to that important resource. These procedures will remain in place until new protocols and facilities, identified in the recovery plan, have been developed. The Recovery Plan will include additional operational improvements, which leverage benefits provided by construction of additional storage facilities, to assure the future health of the Northwest Fork, especially during droughts and prolonged dry periods.

35. As restoration and water resource development projects are implemented, what assurances are provided that any "new water" will be used to enhance flows to the River rather than given away for public or agricultural water supply?

The Mission of the SFWMD is to manage and protect water resources of the region by balancing and improving water quality, flood control, natural systems and water supply. The development and implementation of plans, projects and programs that address protection of current resources and provide for future needs achieve this mission. The mission is also achieved through operation and maintenance of physical facilities and regulatory programs, which effectively distribute and manage available resources.

Regulatory strategies are important part of the recovery plan that supports the MFL for the Northwest Fork of the Loxahatchee River. Several potential regulatory strategies are under consideration to address the integration of Consumptive Use Permitting with Recovery and Restoration Plans.

A Reservation of water to the Northwest Fork is another tool that can be used by the SFWMD to protect "new water" resources from consumptive use allocation. The use of reservations was recommended in the Lower East Coast Regional Water Supply Plan. For the Northwest Fork, a rainfall-driven reservation policy may be most appropriate. An initial reservation could be made to protect of the base condition (existing beneficial flows) and additional water that is produced by water resource development projects could be reserved in a manner that is consistent with the "CERP" process.

36. How does protection of the river from significant harm differ from Restoration of the River?

The MFL defines the amount of water that is needed to prevent significant harm from occurring to the resource. It is anticipated that the MFL only becomes relevant during extreme dry conditions, when flows are well below their "normal" limits. The MFL consists of a flow amount, duration and a return frequency.

Restoration of the Northwest Fork of the Loxahatchee River is focused on long-term sustainability and defines the amount of flow needed to sustain the resource under all hydrologic conditions. If restoration efforts are successful, it is anticipated that the resource will improve over time and that the amount of water needed to protect this improved resource from significant harm will increase. MFL criteria will therefore have to be reviewed periodically to ensure that they are in concert with the state of the resource.

37. Are you going to be evaluating the feasibility of constructing a downstream salinity control/navigational structure as a means of improving freshwater conditions in the River?

This option has been explored in the past and will be given consideration in future studies of the river and watershed.

38. How will new and existing consumptive use permits be affected by the proposed MFL criteria

Possible future regulatory strategies that will be part of the Recovery and Prevention Plan need to address constraints on future permit issuance, re-issuance of existing permits and actions that need to be taken during water shortages. Some of the concepts that have been adopted as a rule for other MFL water bodies including the Everglades include: a) not allowing new or additional direct or indirect withdrawals unless new certified project water is made available for consumptive use permits (CUPs); b) ensuring that any new or additional indirect withdrawals are consistent with the approved recovery strategy. Other uses in the watershed that are shown not have a significant direct or indirect influence on flow to the river would be subject to normal CUP criteria.

39. Once the proposed MFL is being met/achieved in the river, what guarantees will be in place to ensure that CUP permits will not be issued that give away water needed for restoration of the river?

The Basis of Review for Consumptive use permits includes conditions that are designed to protect wetlands and natural river flows from harm due to consumptive use withdrawals. The MFLs provide an additional level of protection that is designed to protect the resource from significant harm caused by additional withdrawals. Water shortage declarations are used as a means to reduce water consumption and the impacts of significant harm and serious harm.

In addition to CUP strategies, the SFWMD is also developing appropriate strategies to address water shortages based on the concept that water restrictions could be imposed on direct or indirect uses when: MFL exceedance occurs or is imminent, and/or climatic conditions are more severe than a 1 in 10 drought. The level of water supply restrictions imposed under such conditions would depend on specific factors in SFWMD rule.

40. If historical drainage has been identified as a cause of reduced flow in the River, will changes be made to existing or future ERP permits in this watershed to address these issues?

As with Consumptive Use Permits, regulatory strategies that address future Environmental Resource Permit criteria may need to be developed as a component of the Recovery and Prevention Strategy for the Northwest Fork of the Loxahatchee River. No changes are anticipated for existing Environmental Resource Permits.

41. What are the elements of the recovery plan, how much water will they provide and when will this water be available?

Even though the currently proposed plan takes 20 years to be fully implemented, substantial benefits occur in a much shorter time frame. A sustained flow of 35 cfs from the G-92 structure into the Northwest Fork can be attained by 2006. Average flows will also increase at that time. Opportunities to provide supplemental flow from other tributaries and basins, including Jupiter Farms, Cypress Creek, Hobe Groves, and Kitching Creek are presently being explored. These inflows may offer additional opportunities to achieve both short-term and long-term flow benefits that contribute to achieving the MFL more quickly and meeting overall river restoration flow requirements in a shorter time frame. The long time necessary to achieve full benefits of the proposed recovery plan is due to the need to acquire additional lands and construct and operate large reservoirs at the Palm Beach Aggregates site and perhaps in the C-18 Canal Basin, and to fully implement technologies such as Aquifer Storage and Recovery that are still in the development and testing stage.

42. A recovery plan that requires 20 years to produce 65 cfs in unacceptable.

Even though the currently proposed plan takes 20 years to be fully implemented, substantial benefits occur in a much shorter time frame. A sustained flow of 35 cfs from the G-92 structure into the Northwest Fork can be attained by 2006. Average flows will also increase at that time. Opportunities to provide supplemental flow from other tributaries and basins, including Jupiter Farms, Cypress Creek, Hobe Groves, and Kitching Creek are presently being explored. These inflows may offer additional opportunities to achieve both short-term and long-term flow benefits that contribute to achieving the MFL more quickly and meeting overall river restoration flow requirements in a shorter time frame. The long time necessary to achieve full benefits of the proposed recovery plan is due to the need to acquire additional lands and construct and operate large reservoirs at the Palm Beach Aggregates site and perhaps in the C-18 Canal Basin, and to fully implement technologies such as Aquifer Storage and Recovery that are still in the development and testing stage.

43. Your analyses suggest that during the next four years, until new facilities can be constructed, that the MFL criteria may not be met on a regular basis. How much additional damage is expected to occur to the resource during this period?

For the foreseeable future, while new facilities are being constructed and after those facilities are in place, the SFWMD will continue to operate the system in the same manner that it has during the past decade. A base flow of 50 cfs will be provided to the Northwest Fork whenever possible and seasonal flows will be conveyed based on rainfall patterns and drainage needs in the basin. These operational protocols, combined with rainfall patterns during the past decades have resulted in a 96% increase in water deliveries to the Northwest Fork between the 1970's and the 1990s. During the 1990's the average daily flow to the river was 102 cfs whereas during the 1970's the average flow was 57 cfs. Available data derived from aerial photography suggest that during the period from 1985 to 1995, there was no additional damage done to the resource in terms of changes in vegetation communities. This information suggests that if current rainfall patterns and operational procedures are maintained, that no *additional* damage to the resource should occur during the next four years while new facilities are being constructed (in 2003-2004) and operations are "ramped up" and fully operational (2004-2006).

44. Does the proposed recovery and prevention strategy, as detailed in the northern Palm Beach County plan, only provide additional water for the river or have additional water supply needs for urban and agricultural use also been considered in this plan?

The Northern Palm Beach County Comprehensive Water Management Plan when implemented is designed to deliver supplemental water to the northern Palm Beach County area. The concept will provide 65 cfs for the Northwest Fork of the Loxahatchee River, hydroperiod restoration for the Loxahatchee Slough and the Grassy Waters Preserve and will also meet the agricultural and urban water supply needs projected for the year 2020.

In addition, improved drainage for the Indian Trail Improvement District and improved water quality for the Lake Worth Lagoon are also benefits of the plan. The Northern Palm Beach County Comprehensive Water Management Plan is only one element of the MFL Recovery plan. Other elements include interaction with CERP efforts in northern Palm Beach County and the Indian River Lagoon, ongoing investigations in Cypress Creek, Hobe Grove and Kitching Creek Basins, review and modification of operational procedures, regulatory changes and development of a Restoration Plan for the River.

45. Why wasn't restoration of the Loxahatchee River specifically integrated into CERP?

The Restudy and CERP address the Central and South Florida Project, which the Loxahatchee River is not connected to. Therefore, the Loxahatchee was not part of that study domain. Since 1985 the Florida Department of Environmental Protection, Southeast District office and the Park Service staff, the Loxahatchee River Management Coordinating Council and the SFWMD have identified the goal to develop a restoration plan for the Northwest Fork of the Loxahatchee River. The target base flow of 65 cfs, which was incorporated into the Northern Palm Beach County Comprehensive Water Management Plan, was developed over time with assistance of these agencies and organizations.

As the development of the MFL for the Northwest Fork progressed the need to develop a restoration plan for the river was formally identified this past year. A Restoration Plan cannot be developed without specific restoration goals and objectives; therefore, we cannot identify the amount of water that is needed in order to determine the role that CERP might play in providing that water. The SFWMD will be working with DEP in support of identifying a restoration flow target and a Restoration Plan for the Northwest Fork. The SFWMD will work within the CERP process to incorporate the results of these efforts within the North Palm Beach County CERP Project.

46. What is the difference between CERP and the NPBCCWMP? What does one do, beyond the other, which will help the Loxahatchee River?

The NPBC CWMP provides basic infrastructure needed to convey water from the Southern L-8 Basin to northern Palm Beach County. Links between the Grassy Water Preserve, Loxahatchee Slough and the Northwest Fork of the Loxahatchee River will enable the regionally oriented CERP projects to provide more localized benefits to particular resources within the region. The NPBCCWMP projects are , by and large, being implemented in a shorter time period with significant cost sharing by the SFWMD, the state, local governments and private interests

47. The SFWMD acknowledges that the Loxahatchee River has been degraded and that it needs to be restored. Therefore, why isn't the SFWMD doing the "right thing"?

We believe we are doing the right thing for the Northwest Fork of the Loxahatchee River. The role of the SFWMD is not solely an environmental regulatory agency. The SFWMD's missions are to: 1) provide flood protection; 2) provide adequate water supply; 3) protect and improve water quality and preserve and restore natural systems along with their water resource related functions ecosystem management. Specifically, to do the right thing, the SFWMD must determine and manage a balance among these sometimes conflicting four elements. SFWMD Governing Board adoption of a MFL and Recovery Plan, development of a Restoration Plan, construction of the Northern Plan projects and integration into the North Palm Beach County CERP Project are all currently being developed or initiated

48. Instead of only using science, why isn't the SFWMD using "common sense" to protect and restore the Loxahatchee River?

The SFWMD tries to balance science and common sense. Specifically, Chapter 373.042, F.S. requires water management districts to use best available information in the development of minimum flows and levels.

49. Predictions for the future of South Florida indicate a massive population increase. Specifically, development in northern Palm Beach County and southern Martin County will continue to increase, thereby significantly increasing the demand for water within the Loxahatchee watershed. Do the MFL, NPBCCWMP/CERP, water reservation, and restoration, take into account future water needs? Will there be enough water for the Loxahatchee River in the future?

The Northern Palm Beach County Comprehensive Water Management Plan includes projects that will provide supplemental water to the northern Palm Beach County area in sufficient quantities to meet all projected needs for the year 2020 concurrently, including 65 cfs over the Lainhart Dam to the Northwest Fork of the Loxahatchee River. Please refer to the response to question No. 46.

50. Issues regarding protecting and/or restoring the Loxahatchee River have been voiced to the SFWMD for over 25 years. Why is it that only recently these issues have begun to be addressed by the SFWMD?

The SFWMD has been dealing with this issue for the past 25 years through improvements in water deliveries to the Northwest Fork of the Loxahatchee River. Significant land acquisition in the river corridor and land acquisition in the watershed was completed in 1991. More recently, completion of the LECRWSP in May 2000 and the NPBCCWMP in May 2002 will serve to protect the Northwest Fork. Also, as the CERP, North Palm Beach County Project PIR progresses additional funds will be available to construct projects that will afford more protection for the Northwest Fork. The plans provide a foundation upon which permanent solutions for the Northwest Fork can be developed, such as, G-160 (Loxahatchee Slough structure) and G-161. These facilities, structures and storage areas are necessary to bring supplemental water to northern Palm Beach County.

Under the leadership of the Florida Department of Environmental Protection, with the technical assistance of the SFWMD a Restoration Plan will be developed. A Restoration Plan for the Northwest Fork is critical for the future health of the Northwest Fork.

51. What is the difference between a MFL, a water reservation and hydrologic restoration?

The Minimum Flow and Level is established through a rule and protects water resources from significant harm, especially during long dry periods or droughts. A Water Reservation is another legal process used to establish adequate flows to a water body to meet protection and/or restoration goals and objectives. Both of these tools are used to accomplish hydrologic restoration.

52. Does the SFWMD use a watershed water budget in order to determine how much water is available (a running balance), or can be reserved, for the Loxahatchee River, under different scenarios?

Yes, among other methods. Models developed for the purpose of water management analysis make it possible for different scenarios to be evaluated. The SFWMD will be providing this kind of technical support during the development of the Restoration Plan for the Northwest Fork of the Loxahatchee River.

53. How often will the MFL be updated/revised?

Established minimum flows and levels will be reviewed in conjunction with revisions or updates to the LECRWSP. They will be revised as needed to protect resources in the river based on better information concerning status of the resource or the amount of water needed to protect this resource. The LECRWSP is updated every five years. The next update is due in 2004.

54. Designation of the Northwest Fork of the Loxahatchee River as a National "Wild and Scenic" River is supposed to afford additional protection for the River. In addition, the SFWMD and DEP are the ones charged with providing the additional protection. However, based on this special designation, why isn't the District doing more to protect and restore the river above and beyond a water system that doesn't have the designation?

The additional resource protection needs of this system will be determined through the development of a restoration plan by DEP with assistance from SFWMD. Assurances that these additional needs will be met will be provided through revision of the MFL to protect the restored resources from significant harm and through establishment of water reservations for the Northwest Fork of the Loxahatchee River. Please also see responses for No. 19 and No. 52

55. The SFWMD has not been doing enough to protect South Florida's only Wild and Scenic River

Studies done in the late 1970's and early 1980's identified problems in the Northwest Fork of the Loxahatchee River and Estuary that were attributed to the progressive movement of salt water upstream, resulting in mortality to cypress trees and associated freshwater floodplain communities. These impacts were caused by the deepening, widening and stabilization of the Jupiter Inlet in 1947; dredging of oyster bars and sandbars in the Northwest Fork and the estuary to improve navigation; and construction of the C-18 Canal and subsequent draining of the watershed to allow agricultural and residential development. These changes greatly increased the ability of saltwater to move upstream in the Northwest Fork. Simultaneously, the amount of fresh water that drained from the watershed to provide flow to the Northwest Fork was reduced, especially during dry periods.

Land Acquisition. Immediately after designation of the Northwest Fork as a "Wild and Scenic River," the SFWMD began purchasing land along the river corridor and in the watershed. This land was acquired to protect the natural lands along the river corridor, protect remaining wetlands and natural areas in the watershed, and to provide flexibility to implement future water management options, such as the ability to develop additional storage within the basin. In 1985, approximately 4.8 miles of the 7.5 mile river segment were in public ownership. By 1995, all 7.5 miles of the river corridor had been purchased by the addition of 1,461 acres purchased under the Save our Rivers (SOR) program. An additional 367 acres adjacent to the river corridor was purchased by Palm Beach County. Land acquisition efforts are continuing, to purchase lands that may be used to provide regional water storage (if necessary), but also to establish an interconnected network of natural lands that act as wildlife corridors. Eventually, the goal is to preserve, and provide connections among, Jonathon Dickinson State Park, the Atlantic Ridge, Allapattah Flats, J.W. Corbett Wildlife Management Area, Loxahatchee Slough, Hungryland Slough, the DuPuis Preserve and Grassy Waters Preserve. Presently, approximately 40% of the

Loxahatchee Watershed is in public ownership, with another 5% slated for purchase through the SOR program during the next several years

Establishing Flow Criteria. Following designation of the Wild and Scenic River in 1985, a base flow target of 50 cfs at Lainhart Dam was established as the rate of discharge that was needed to provide a downstream salinity concentration of 2 ppt at the mouth of Kitching Creek. This rate of flow was considered, at the time, to provide an appropriate level of protection for resources in the Northwest Fork. The SFWMD made a commitment to provide that rate of flow or higher, whenever possible. Since that time, the SFWMD has installed new facilities, improved existing structures and changed operational procedures to enhance flows to the Northwest Fork and help meet this target.

Improved Water Deliveries. In addition, the SFWMD has been continually upgrading and improving its facilities and operations to provide more water to the Northwest Fork. The current proposal to establish minimum flow criteria represents the continuation of a process that began in the late 1980's to systematically increase and improve the timing and delivery of flows to the Northwest Fork over Lainhart Dam. Since construction of the C-14 Canal and G-92 structure in 1989, the SFWMD has had improved capabilities to deliver water to the Northwest Fork. Average annual water deliveries across Lainhart Dam increased from an estimated 57 cfs during the period from 1971 to 1979 to 104 cfs during the period from 1990 to 2001. During the period since 1985, recent results from salinity monitoring programs and aerial photographic surveys indicate that further upstream migration of saltwater mangroves has not occurred and the loss of additional freshwater floodplain communities has been curtailed.

Low flow events still occur during extreme dry periods but have been reduced in frequency and duration. The River floodplain can tolerate a certain amount of exposure to salt water if the exposure is not prolonged and if adequate time is allowed between salinity exposures for the plant communities to recover. However, since the 50 cfs flow target cannot be met on a consistent basis, additional infrastructure and operational changes are still needed to provide more flow and begin the restoration process to move the saltwater interface further downstream.

Providing More Water. The District's *Lower East Coast Regional Water Supply Plan,* as approved in May 2000, identified and resolved regional water management issues in Dade, Broward and Palm Beach Counties and the Florida Keys. As part of this planning effort, the need was identified to develop a subregional plan to address local water management issues in northern Palm Beach County. Committees of experts and stakeholders were convened and a base, dry season, restoration flow target of 65 cfs was identified for the Loxahatchee River. The *Northern Palm Beach County Comprehensive Water Management Plan* was accepted by the SFWMD Governing Board in May 2002. It describes the projects, facilities, funding needs, funding sources and cooperating entities needed to meet the 65 cfs flow target. These projects will cost an estimated $8 million over the next five years. In addition, the Northern Palm Beach County Project of the Comprehensive Everglades Restoration Plan identifies $435 million in facilities that need to be constructed during the next 20 years to increase storage and improve water distribution in this basin. When construction of these proposed facilities is complete, flows of 65 cfs or more will be provided over the Lainhart Dam to the Northwest Fork of the Loxahatchee River more than 99% of the time.

Minimum Flows and Levels. In 1999, the SFWMD began the process of developing Minimum Flow criteria for the Northwest Fork of the Loxahatchee River. The purpose of the Minimum Flow criteria, as defined in Florida Statutes, Ch. 373, is to protect water resources from *significant harm.* This is a different standard from *restoration* requirements and is intended to define the lowest level of flow that can occur in the river without causing harm that will require more than two years for recovery to occur. This proposed flow rate provides a management or operational lower limit of flow that can occasionally occur during extremely dry events. As such, it specifies the low flow rate, the amount of time that this flow condition can persist, and how often such events can be allowed to occur.

River Restoration. In conjunction with the process of establishing *minimum* flow criteria needed to protect the resource from *significant harm*, the Florida Department of Environmental Protection (FDEP) has entered into a partnership with the SFWMD to develop an *achievable restoration* plan for the Northwest Fork of the Loxahatchee River. This plan will be based on: a) documentation of historic conditions that existed in the river, floodplain and estuary; b) description of the historic and existing biological, cultural and aesthetic values of the resource; c) consideration of any constraints that have been imposed on the system by human activities; and d) development of "achievable restoration" goals and objectives that characterize how the river and floodplain should look and be managed in the future. It is anticipated that once this future condition has been defined, additional effort will be needed to characterize how much water will be needed to sustain and protect these enhanced resources, potentially resulting in a need to develop new sources of water and to modify the flow targets and MFL criteria for the Northwest Fork

Other Sources of Water. So far, recovery efforts have focused primarily on providing additional water from northern Palm Beach County, through the Loxahatchee Slough and Lainhart Dam to the Northwest Fork. Additional water may also be available from basins in southern Martin County. Investigations are underway in these other basins, especially Pal-Mar and Kitching Creek, to identify and develop other sources of historical supplemental water supply to the Northwest Fork that can be used to provide flow beyond the levels that can be delivered from Lainhart Dam. These studies will provide the basis for determining how much additional water can be provided from the watershed to help meet any future water needs that may be identified for the River in the restoration plan.

56. The proposal to establish a flow target of 35 cfs must also consider seasonal flow requirements. Specifically, water deliveries to the river should be directly related or proportional to the amount of rainfall that occurs in the watershed. Furthermore, the minimum flow should not only address the amount of water needed during dry conditions but should also establish an acceptable "minimum" flow for the wet season. These steps are necessary to preserve the natural variability and seasonality of flow patterns that support natural riverine ecosystems.

The Northwest Fork of the Loxahatchee River must have a natural range of variability of flow in order to protect its ecosystems. Many plant and animal communities depend on seasonal, annual and multi-year cycles of flood and drought for successful reproduction and survival. Flows vary seasonally in response to rainfall and runoff in the surrounding watershed. The challenge is to ensure that adequate supplies are delivered through water control facilities in a manner that simulates these cycles and at the same time avoids unnatural extremes -- excess discharge of flood waters or prolonged periods with little or no water releases. This can be achieved by providing storage facilities that serve a similar function to the natural lakes and wetlands that existed throughout the watershed prior to drainage. During the wet season, excess water is diverted water into storage and released slowly out of these facilities to provide flow during dry periods. Your suggestion to measure rainfall in the basin and use this as the basis to determine appropriate flows to the river is exactly the kind of management approach that we have envisaged. This is similar to the approach that has been proposed and implemented in the past to control deliveries of water to other natural areas, such as Everglades National Park. Such an approach provides a means to ensure that natural cycles of water delivery are maintained and needs to be addressed in the restoration effort.

The proposed MFL recovery plan provides an initial set of facilities that will be used to convey water into the Northwest Fork during dry periods by providing a link to regional storage facilities. In addition, new facilities will be constructed to capture and store water into during wet periods. Much of this water is excess flood water that would otherwise be released to tide through the S-46 structure. Such releases of flood waters create other severe problems in the river, the estuary and the Indian River Lagoon. The proposed recovery plan achieves the initial target of meeting the MFL, to provide flows that remain above 35 cfs, within four years, and continuing with additional projects to eventually provide a sustained flow of more than 65 cfs to the Northwest Fork.

57. What is the purpose for developing Minimum Flows and Levels?

In concept, to halt further degradation of the resource. By definition, the minimum flow and level is not restoration because it only considers the minimum range of flows to prevent significant impact and not the entire range of flows and variability required to sustain a healthy system.

The Minimum Flows and Levels (MFL) criteria were developed to address a particular water management concern -- to establish a “threshold” of flow rate, duration and frequency that should not be exceeded in the Northwest Fork in order to prevent significant harm. Development of the MFL is required by legislation and must meet the legislative requirements as contained in the "Florida Water Resources Act," Sections 373.042 and 373.0421, F.S. Based on experience with the development of other MFLs, the SFWMD has defined significant harm as “ . . . the temporary loss of water resource functions, which result from a change in surface or ground water hydrology, that takes more than two years to recover, but which is considered less severe than serious harm.” (CH. 40E-8.021(24), F.S.)

58. What role do Minimum Flows and Levels play in the protection of Florida’s water resources?

The MFL is just one of many tools. The proposed MFL's are not a “stand alone” resource protection tool, but should be considered in conjunction with all other resource protection responsibilities granted to the water management districts by law as part of a comprehensive water resources management approach geared towards assuring the sustainability of the water resources. This includes consumptive use permitting, water shortage management, operational protocols, and development of water reservations. In addition, the SFWMD recently completed the *Lower East Coast Regional Water Supply Plan* (May, 2000) pursuant to Chapter 373.0361 F.S., which also includes recommendations for establishment of minimum flows and recovery and prevention strategies. A more detailed *Northern Palm Beach County Comprehensive Water Management Plan* (May 2002) was developed to address specific water supply issues, including the need to provide additional water to the Northwest Fork.

59. How does establishment of a MFL relate to achieving restoration?

The MFL is not intended to achieve restoration. The flow criteria proposed in the MFL document are not intended to restore the river. In accordance with the legislative requirements, the proposed MFL criteria were only developed to protect resources that presently exist in the river from incurring significant harm. Defining the flows needed to preserve and restore the system is a separate process. In the Everglades, we had the Comprehensive Everglades Restoration Plan (CERP) that defined ultimate restoration goals and objectives for the ecosystem and the associated flows and levels that were needed within specific areas of the system to achieve this restoration. When the SFWMD established Minimum Flows and Levels for the Everglades, these levels were often substantially less than the restoration criteria, because they were recognized as conditions that were needed to protect the system from significant harm and would only occur infrequently during extreme water shortages.

60. I have heard the term "interim MFL" used repeatedly. Once an MFL is established, how and when can it be revised?

The MFL can change over time as the resource improves or additional information becomes available. In the case of the Everglades, for example, MFLs were established based on the current condition of the resource, with recognition that as new facilities are constructed and more water is provided in the future, the resource (Everglades vegetation and soils) is expected to improve. As the resource improves, the levels at which significant harm can occur will also change and the MFL must be reevaluated. Provision is therefore made to review the status of an MFL every five years, during the update of the associated regional water supply plan, to determine if the flows and levels need to be revised. The MFL can, in fact, be revised at any time that additional information becomes available that may affect the criteria. For example, when the "interim MFL" was established for the Caloosahatchee River, a condition of the rule was that additional data would be collected and studies conducted so that the the criteria could be reviewed within one year.

61. The MFL criteria seem to be much less than the amount of water needed to fully protect the resource from harm or the amount of water needed for restoration.

The MFL is not a long-term flow target for the river but only applies during infrequent and extreme droughts. The minimum flow criteria, as proposed by the SFWMD, are only allowed to occur under extreme dry events, which can last no more than 20 days, and occur no more often than once every six years. During such events, average salinity at mile marker 9.2 in the river may increase to 2 ppt. However, during the remainder of the time (five out of six years and 340 days during the sixth year). Salinities at this critical location should remain below 2 ppt and fresh water conditions (less than 0.5 ppt) need to occur during the vast majority of the time. Prolonged exposure of the freshwater-forested floodplain community is necessary to keep these plants healthy enough to tolerate the occasional, infrequent, short-duration exposures to saltwater without being killed.

62. What is the process for determining how much water is needed to fully protect or restore the River?

A process for defining restoration needs for the Northwest Fork is presently underway. This larger issue, which is currently being addressed by the Florida Department of Environmental Protection, SFWMD, other agencies and local interests, is the development of a restoration plan for the Northwest Fork. The restoration plan will identify the appropriate balance that needs to be maintained between freshwater and brackish-water environments in this system, the long-term, sustained flow requirements of the river and the seasonality of flows needed to protect the natural flow characteristics of this critical resource. Most importantly, the restoration plan will define projects and facilities that are needed throughout the Loxahatchee River watershed to achieve this flow. So far, the SFWMD has only looked at particular basins in northern Palm Beach County as potential sources. The restoration plan will evaluate the ability to obtain more water other areas in Palm Beach and Martin counties such as Pal-Mar, Cypress Creek, Hobe Groves and Kitching Creek. The water needed to meet the long term restoration flow requirements, protect the natural resource functions and values of the river would be met by establishing a reservation to ensure that the water provided by future projects and activities will, in practice, be used to restore the river.

Presently, FDEP is taking the lead, with technical support from the SFWMD, to establish a framework/pathway to reach consensus on establishing an appropriate MFL for the river. This includes:

a. The development of an "unconstrained" restoration vision for the river. This was jointly developed by SFWMD and the DEP Division of Recreation and Parks.

b. Examination of constraints on achieving restoration and development of a "practical restoration goal" that would include the desired flow and any additional work (vegetation manipulation, etc) that may be necessary. This has not been completed.

c. Deciding what role the MFL "tool" should play in achieving the practical restoration goal.

63. What options does the Governing Board have with respect to establishing a MFL. Must they only consider protection of the resource that exists today or can they seek to protect the resource as it existed in the past or will exist in the future?

The precise choices and responsibilities of the Governing Board in making this determination are not specified in Florida Statute. Bases on prior experience concerning actions taken by other water management District's the Governing Board Governing Board has at least two options as follows:

a. Establish a "restoration" MFL to protect some future condition of the resource, along with the associated recovery strategy to meet the MFL over time.

b. Establish an "interim" MFL to protect existing resources, along with a recovery strategy (as needed), with the commitment of the involved agencies to cooperatively to pursue a restoration program that will achieve the practical restoration goal. As the restoration program proceeds, the MFL would need to be revised, or reservations of water adopted to protect the enhanced flows in the river.

64. Once the Technical Criteria document is completed and has been peer reviewed, what happens next?

- Results of the peer review and preliminary public comments are presented to the Governing Board. The Governing Board may choose to make some policy statements directing staff on how to proceed with rule development.
- Staff will develop draft rule language.
- A series of workshops will be held to review the draft rule, solicit input and make revisions to the rule as appropriate. The earliest possible date for a public workshop would be in September - this is based on sending out the required notice to Florida Administrative Weekly three weeks in advance. The draft rule should be available by the workshop date.
- If there are no major re-writes to the rule required then the actual FINAL rule language could go to the November board for authorization to publish the required notice in F.A.W. Once published there can be no changes to the rule language (with a few exceptions), and the time clock for affected parties to challenge the rule starts. IF there are no challenges the rule could then go to the December board for adoption. It would then be filed with the Department of State at the end of December and become effective 20 days after filing - sometime around the end of January.
- If there are any changes to the rule after publication in F.A.W. a notice of change must be published which would set back the effective date about 1 month.

65. There seems to be discrepancy between the amount of water provided for the Northwest Fork by NPBCCWMP, and the amount of water identified in the Loxahatchee MFL report.

The NPBCCWMP focused primarily on meeting regional water supply needs over the next 20 years. These included water needs of major wetland systems (Corbett Area, Grassy Waters Preserve and Loxahatchee Slough), reducing flows to coastal estuaries and increasing flows to the Northwest Fork, as well as providing water for urban and agricultural use through the year 2020. A flow target of 65 cfs was used for the Northwest Fork because, in 1992, it was the best estimate of the amount of water that was needed for the river. The plan stated, however, that a better estimate of water needs for the Northwest Fork would be provided through the MFL process and that flow criteria for the river would be refined when the MFL process was completed. The MFL process is now proposing a minimum flow of 35 cfs as the amount needed to protect the river from significant harm, recognizing that larger flows are needed to achieve restoration.

66. Where is it stated that the SFWMD is committed to provide any more water to the Loxahatchee River than whatever is stated in the MFL criteria?

The LEC Regional Water Supply Plan needs to clearly address this issue in the next update (2005) to provide necessary assurances that the elements of the NPCCWMP will continue to be implemented after 2006 to provide as much additional water as possible towards achieving restoration of the Loxahatchee River,

67. There is also an apparent disconnect between the CERP and the Loxahatchee MFL.

Under federal law, reservations for "new water" for natural systems must be identified for the CERP projects. It is unclear how reservations for the CERP projects, which have not yet been determined, relate to the Northwest Fork, the Loxahatchee MFL or the NPBCCWMP. If an interim MFL is identified, all parties should still realize that CERP reservations should achieve the practical restoration goal, not just the interim MFL. The important first step in this process, therefore, is to develop and quantify the amount of water that is needed to meet the agreed-upon restoration goals and objectives for this system.

68. Design of the Northern Palm Beach CERP projects needs to be investigated and optimized so that they can contribute to the restoration of Northwest Fork.

Once the hydrologic needs for restoration have been quantified, then the CERP projects need to be examined to determine if design changes could be made to maximize the water that they provide to the natural system. Hopefully, this can be accomplished while CERP projects are still in their early design phases. If this opportunity is missed, however, the CERP process still provides opportunities to make further changes to the facilities through the RECOVER process.

69. During the MFL analysis, has the district estimated the amount of time that the flood plain is inundated and the areal extent of inundation?

We have looked into analyzing the extent of flood plain inundation associated with different water levels in the river channel and have found that it is possible to generally estimate this. This analysis would be founded on previous transect surveys across the NW Fork, which have already been conducted. However, there is no (known) measured historical data for surface water elevation (NGVD) from the Northwest Fork, except for the upstream side of Lainhart Dam. The complexity of this type of data arises from the fact that surface water elevations within the river channel will vary along different segments as a function of inflow from each tributary (Lainhart Dam, Cypress Creek, Hobe Grove Ditch, and Kitching Creek) and with tidal force. Without this critical piece of information, flood plain inundation cannot be reliably examined. Future efforts could include this as part of the development of restoration targets that include water level criteria at different points along the floodplain.

70. When you did the vegetation transects, did you also collect elevation data?

Elevation data were not collected when the vegetation survey work was done. In order to have reliable elevations, a survey crew would need to survey in benchmarks and determine elevation (NGVD) for each site. Relative to the vegetation survey, the elevation changes were not a major factor in the distribution of species, since the widths of all transects were within 25 feet (quantitative survey) to 50 feet (semiquantitative survey) of the river edge and were all roughly at the same elevation. Furthermore, site selection criteria restricted survey locations to the center of the flood plain and not along the edge (near uplands) where the elevation measurably increases.

71. Are the flows that are shown in the tables Mean Flows? How do these flows depicted in the table relate to the duration of 20 days, and frequency of once every six years?"

These rates represent flows which, if sustained for 5 to 9 days on average, will result in average salinity conditions of the given value at the location shown. The frequency and duration criteria were derived by a separate process that looked at conditions that historically occurred at the location in the Northwest Fork where a healthy floodplain community exists. Examination of the simulated mean daily salinity record at this location indicated that events during which salinity exceeded 2 ppt only occurred five times during the 30-year simulation period (once every six years) and that the average duration of such exposures was 20 days.

72. Why are you using a salinity concentration of 2 ppt as the cut off point?

The 2 ppt salinity concentration, as used in this analysis, is a daily mean salinity that is “vertically averaged between the top and bottom of the water column. This is not a particularly useful value from an ecological perspective, but is the kind of output that is produced by our current modeling tools. In other words, salinity could range from 0 to 4 ppt throughout the daily tidal cycle, and from the surface to the bottom of the river, but the mean salinity would be 2 ppt. A mean daily concentration of 1 ppt would indicate that daily salinity concentrations would generally vary from 0 to 2 ppt. Such a value would most likely occur at a location on the Northwest Fork where salinity is 0 ppt during low tide and can reach 2 ppt during high tide. At this site, predominantly freshwater conditions (less than 1 ppt) would occur during the period between high tides. Under these conditions, river channel salinity above 1 ppt would be transient, lasting only a few hours before the next tidal cycle would change back to predominantly freshwater conditions. It is felt that with the flushing of salinity between high tides and the predominance of freshwater conditions, significant harm would most likely not occur when mean daily concentrations occasionally were at 1 ppt. For this reason, 2 ppt (the next integer higher) was a better number to use to define the threshold salinity concentration at which harm could occur. Furthermore, the model used to derive these salinities is not sufficiently sensitive to reliably resolve salinity values to 0.1, or even 0.5; an thus we were more comfortable using whole numbers.

73. If your understory ("key") species are not tolerant of saltwater, wouldn't any salinities greater than freshwater (0.5 ppt) cause significant harm? Do you have any specific references that these species reproduce and thrive at brackish water salinities (>0.5 ppt)?

The Northwest Fork is a dynamic system that is heavily influenced by daily tidal cycles (two high and two low tides per day), occasional and short lived influxes of salinity appear to have not impacted pristine freshwater riverine swamp (as is found at river miles 10.2, 10.4, and 10.6). Most studies in the scientific literature tend to correlate a static (stable) salinity concentration (often controlled in a laboratory setting) to a type of damage to freshwater plant species. Application of this type of study results must be used cautiously, as transient short-term salinity exposure with recovery/flushing time between events (as is found on the Northwest Fork) will not be comparable to consistent salinity exposure found in controlled experiments.

References cited in the document were obtained from a review of available literature to indicate the general salt tolerance of these species. In most cases, there have been no scientific studies to demonstrate a specific type of plant damage with a specific salinity concentration or exposure time. Mostly, the references were used to indicate that these species are restricted to, or found predominantly in, certain habitat types (freshwater, brackish water, or saltwater) in the natural world. The table was not intended to indicate the degree or extent of salinity tolerance associated with a specific threshold (e.g. >0.5 ppt). In fact, our literature review and results of our field surveys have shown that freshwater species have a range of tolerances to salinity based upon inherent sensitivity of the species, the degree of intra-specific genetic variability, and local conditions.

74. The hydrograph in the technical document shows that flows to the Northwest Fork increased after modifications to G-92. We assume that these are predominantly wet season flows. The dry season flows shown don't really show a corresponding increase in flow as a result of changes to G-92. Can you explain why?

The flows shown in the hydrograph are daily mean flows for the entire period of record. Although flows seemed to have increased during wet and intermediate periods, dry season flows (particularly during drought years) are not significantly enhanced. The G-92 structure is only able to provide flows when sufficient water is available from upstream sources. The fact that dry season flows are not significantly increased underscores the primary problem. The solution is to provide more storage so that additional water can be delivered to augment flows over Lainhart Dam during the dry season.

The District currently operates the system to provide a flow of 50 cfs or more to the Northwest Fork, when available. However, during extended periods of little or no rainfall, flows are reduced, and then eventually must be stopped completely when upstream water levels reach critically low conditions. The construction of the G-160 and G-161 structures, as well as other components of the *Northern Palm Beach County Comprehensive Water Management Plan* (NPBCCWMP), are addressing this issue.

75. If the District were to adopt a MFL with a condition that the flow could not go below for more than, say, 30 days, would this mean that the flow could drop to zero for 30 days or less? If that happened, how far upstream would the salt water extend? Have you done an analysis of the effects of allowing the flow to go to zero for that many days? Have you analyzed the effects of that long a duration of zero flow on the "key" species?

The currently proposed MFL limits flows of less than 35 cfs to not exceed 20 days, once every six years. An analysis of the available historic flow records (30 years, 1971-2001) for Lainhart Dam indicate the following:

1) Flows of 5 cfs only occurred during periods when flows were also less than 35 cfs for more than 20 days;
2) Over the 30 year period, there were three events when flows fell below 10 cfs -- lasting 10, 8, and 5 days -- during which the MFL was NOT violated. These events had only a short-duration impact on the salinity at upstream sites since there is a several-day "lag" from the time when a drop in flows occurs and salinity increases at an upstream site.

This seems to a pattern that is characteristic of the flow behavior of the basin/river system. These data indicate that the hypothetical scenario you suggest (flows going to zero without a violation of the MFL) has not occurred in the past..

With the G-160 and G-161 structures operational, modeling indicates that an MFL violation would have occurred during only one of the nine years. With all of the NPBCCWMP elements in place, flows would not drop below 35 cfs. The feasibility of obtaining additional water from other sub-basins, such as Cypress Creek and Kitching Creek, is currently being investigated,

76. Has permitting exceeded the ground water resources that would provide 35 cubic feet per second (cfs) in extreme periods? Is there a water budget or is this just a guess?

1. Effects of Permits. The effects of consumptive uses in the watershed have been estimated based on three types of analyses, which indicate that these withdrawals have little effect on the Northwest Fork during normal and above normal rainfall periods. During drought periods, however, they have a measurable, but not especially large, effect on River Flow. Lack of surface water storage capability within the drainage basin, rather than groundwater withdrawal, is the key factor that affects flow to the River.

a. An inventory of existing water use permits in the watershed was conducted to quantify the amount of water allocated and, where data exist, the amount of allocated water actually pumped, by agricultural, industrial and public water supply utilities, within the watershed.

b. An interactive surface-ground water model was originally developed for use in the Northern Palm Beach County planning efforts, including the Lower East Coast Regional Water Supply Plan the Northern Palm Beach County Comprehensive Water Management Plan and the Northern Palm Beach County component of CERP. This model was extended and modified to incorporate interaction between ground water and surface water resources. The model incorporates the inflows and outflows that are components of a traditional water budget. Data from Consumptive Use Permits were incorporated in this model to estimate the effects of water use by these permitted facilities on water levels in Loxahatchee Slough and flow from the Slough to the Northwest Fork of the Loxahatchee River.

c. Data from individual water use permits issued by the SFWMD indicate that public water supply accounts for about 61% of the water allocated in the basin, agriculture accounts for about 19%, Golf course irrigation accounts for 8%, private homes account for 7% and landscape irrigation 5%.

Examination of permitted water use data indicates that about 90 million gallons per day (mgd) (140 cfs) of consumptive use occurs in the Loxahatchee Slough/C-18 Canal basin. Much of this water is pumped from Floridan Aquifer wells or wells that are located a sufficient distance from the River or the slough so that the impacts are minimal. Data from individual permits were examined to identify those facilities that could potentially have direct or indirect impacs on water levels in the Northwest Fork and C-18 Canal and to estimate the effects of each permit.

Surface Water Use. No direct withdrawals occur from the Northwest Fork of the Loxahatchee River (downstream of Lainhart Dam). Three facilities have 3 surface water withdrawals from the C-18 Canal.

Ground Water Use. Only one project causes groundwater drawdown of more than 0.1 ft beneath the Loxahatchee River and five projects result in groundwater drawdowns of more than 0.1 ft beneath the C-18 Canal.

Results of the watershed modeling studies show that those permits that are located close enough to the Loxahatchee River or the Slough to have an effect, result in an estimated reduction of flow from the river on the order of 10 cfs. Of this total, approximately 5-6 cfs is attributed to withdrawals by public water supply utilities and the remainder to self-supplied residential and agricultural water use.

Consumptive uses in the watershed thus have a small but measurable effect on our current ability to meet the proposed 35 cfs MFL criteria. Within four years, when the G-160 structure in the Loxahatchee Slough and the G-161 culverts are completed, the 35 cfs MFL criteria will be met. These new projects are designed to compensate for the effects of consumptive use as represented in the models. Furthermore, the reservations process will provide additional assurance that the system improvements will provide the required amount of flow to the Northwest Fork.

77. Do we know what effect lowering of regional groundwater levels during the dry season will have on water levels in the Loxahatchee River and on net flow to the Loxahatchee River?

The effects of groundwater levels on the Northwest Fork of the Loxahatchee River flow have not been directly studied in this watershed. The United States Geological Survey (USGS) estimated groundwater flow in their studies by measuring surface water flows, developing a water budget for the river and comparing the salinities predicted by the water budget with actual salinities in the river. The measured salinities were lower than the predicted salinities, so the extra fresh water needed to create these salinities was attributed to flow from groundwater and other sources. For the Northwest Fork, this value was approximately 40 cfs for the watershed. There as no apparent difference between wet season and dry season ground water flow, although intuitively one would expect dry season groundwater flow to be less during dry periods.

Our recent hydrodynamic modeling study was based largely on data from the USGS study, compared to more recent flow data from the Lainhart dam, and additional salinity monitoring data obtained from the Loxahatchee River District. This information, in general, indicated that groundwater inflows were of similar magnitude to those defined by the USGS. The hydrodynamic model distributed this 40 cfs flow equally among the four major tributaries --the Northwest Fork , Cypress Creek, Hobe Groves and Kitching Creek -- corresponding to 10 cfs of ground water inflow at each of these locations. It should also be noted that the 35 cfs flow target was developed by incorporating actual field measurements of flow and salinity to calibrate and verify the model, so that localized variations in stream flow and groundwater flow were considered in this process.

78. There was much discussion of the effects of water levels on flora. Is there corresponding information about effects on fauna?

Much of the attention of this effort has been focused on plant communities because these were the primary resources that were identified for protection in the Wild and Scenic River Management Plan. However, the river ecosystem cannot be managed effectively unless all plant and animal communities are considered. The revised technical report will contain additional information about fauna in the river system, especially the threats posed by exotic species, the special needs of threatened and endangered species, the importance and distribution of fishes and macroinvertebrates, as well as a discussion of seagrass and mangrove distribution in the estuary. There is no question that a change in river flow will affect the distribution and balance of estuarine and marine species and their associated food chains. An increase in flow will lead to an increase in nutrient inflows and overall productivity in the system. Choosing the appropriate balance between upstream freshwater productivity (e.g. floodplain forest and freshwater marshes) and brackish-saline resources (such as mangroves an seagrass beds) is a complex issue that needs to be addressed in the development of an overall ecosystem restoration plan.

79. How accurate is the estimate of the requirement for 35 cfs or the ability to deliver this amount through the structures? Is there a significant difference if the flow is 34 cfs? It may be necessary or desirable to set a safety factor to allow for uncertainties in these estimated values.

Our ability to measure and deliver water into this system is limited. The G-92 structure allows the SFWMD to transfer water from the C-18 Basin to the Jupiter Farms C-14 Canal (managed by the South Indian River Water Control District) and subsequently over the Lainhart Dam. Withdrawals from the C-18 Canal must cease when stages in this canal reach 12.5 ft NGVD, due to effects of lower water levels on the stability of side slopes of the canal. The SFWMD uses a rating curve to measure the flow over the Lainhart dam and into the Northwest Fork of the Loxahatchee River. The opening of the G-92 structure is then adjusted accordingly to obtain the desired flow rate. Records from other inflow points are of limited quality and duration..

The ability of our models to accurately predict flows is also limited by the accuracy of the data and the assumptions that drive the model. The 35 cfs flow is generally considered by staff to be accurate within about 20%. Specifically, the amount of water needed to hold the salinity wedge at a given point in the Northwest Fork varies from day to day, depending on tide and wind conditions as well as the amount of flow that is occurring from other sources. Our ability to deliver a particular into the river from Lainhart Dam is accurate to within about 20%. For these reasons, there is not a very high correlation between measured flow across Lainhart Dam and measured salinity levels in the Northwest Fork and this correlation decreases as one moves further downstream.

The proposed flow of 35 cfs represents a river flow that, on average, will maintain mean tidal salinity of 2ppt at the stated location. This represents an average between the bottom and top of the water column, and from high tide to low tide conditions, and thus might represent a range from 0 to 4 ppt salinity, on a given day. This value thus has a built-in margin of error and incorporates consideration of some of the uncertainties noted above, recognizing that the actual daily flow may be more or less than this amount.

The key to making this system work is to use an adaptive management approach to providing flows to the Northwest Fork. Appropriate monitoring and performance measures therefore need to be established for key parameters in the system, including salinity conditions, tributary inflows, groundwater conditions, and plant and animal communities in the floodplain, river and estuary. Implementation of long-term monitoring programs will ensure that these performance measures are achieved. If monitoring data indicate that the flow criteria are not sufficient to maintain the freshwater/saltwater interface at river mile 9.2, then the 35 cfs flow will need to be increased, or other appropriate measures taken.

Finally, SFWMD staff feels that the proposed MFL of 35 cfs represents a significant improvement above and beyond existing conditions. Currently the Northwest Fork receives no flow during the dry season whenever little or no rainfall occurs for an extended period of time. The proposed return frequency (no more often than once every six years) and the duration of exposure to such events (20 days) are deemed to be sufficient to protect existing resources and initiate recovery of the freshwater forest community in areas where this community has been damaged in the past. Equally importantly, it represents the amount of flow that can effectively be provided within the next four years by projects that are presently identified and funded as components of approved plans. Even if a higher MFL were established today, we could not provide any more water any faster with existing resources.