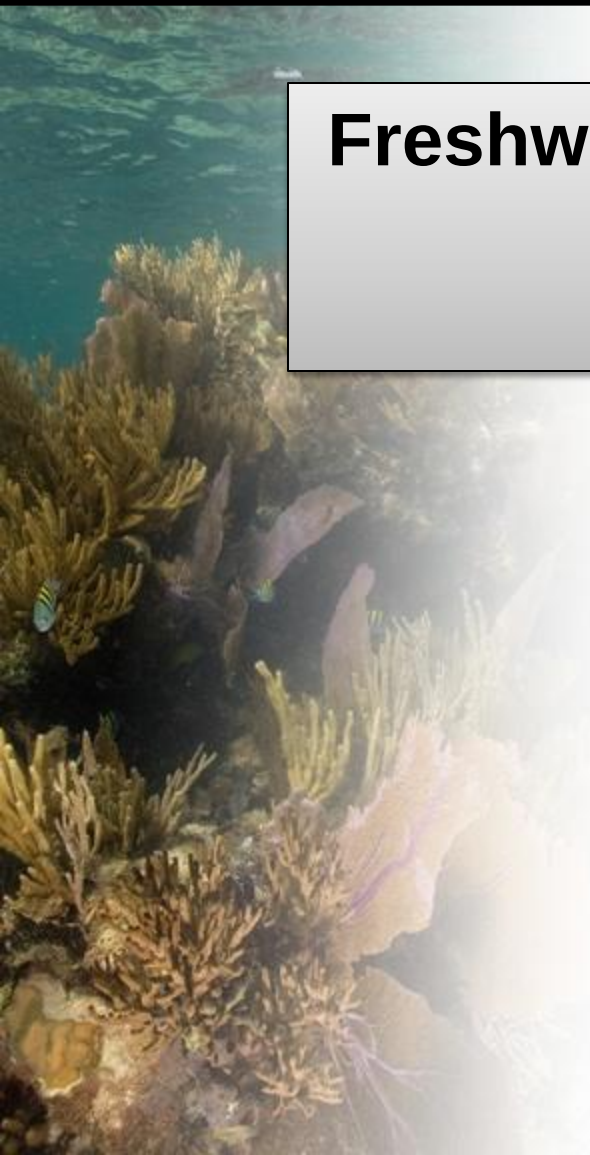

Freshwater Discharge and Protecting the Coastal Ecosystem in Biscayne National Park

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Overview

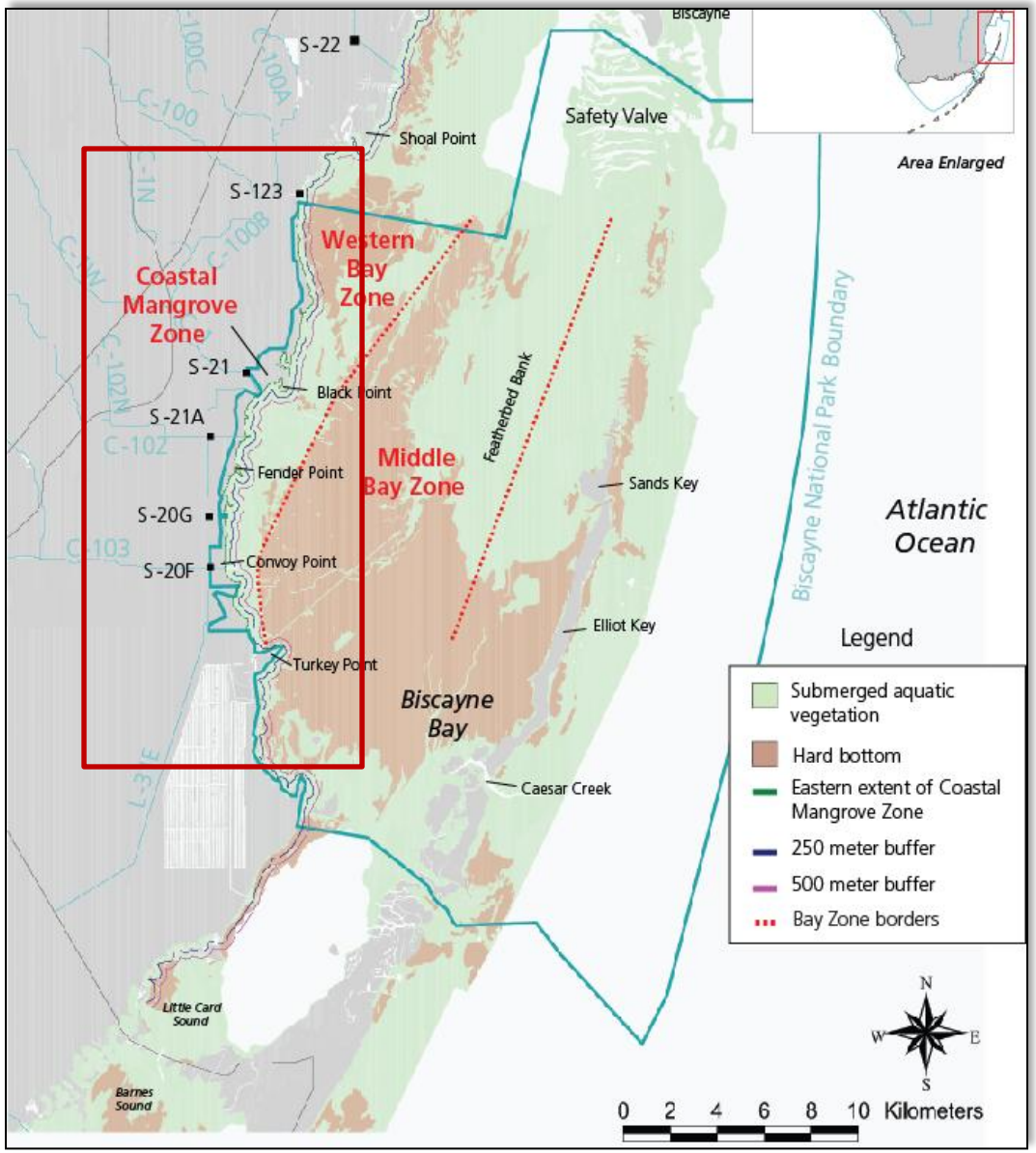
Ecological & Hydrologic Targets for Western Biscayne National Park

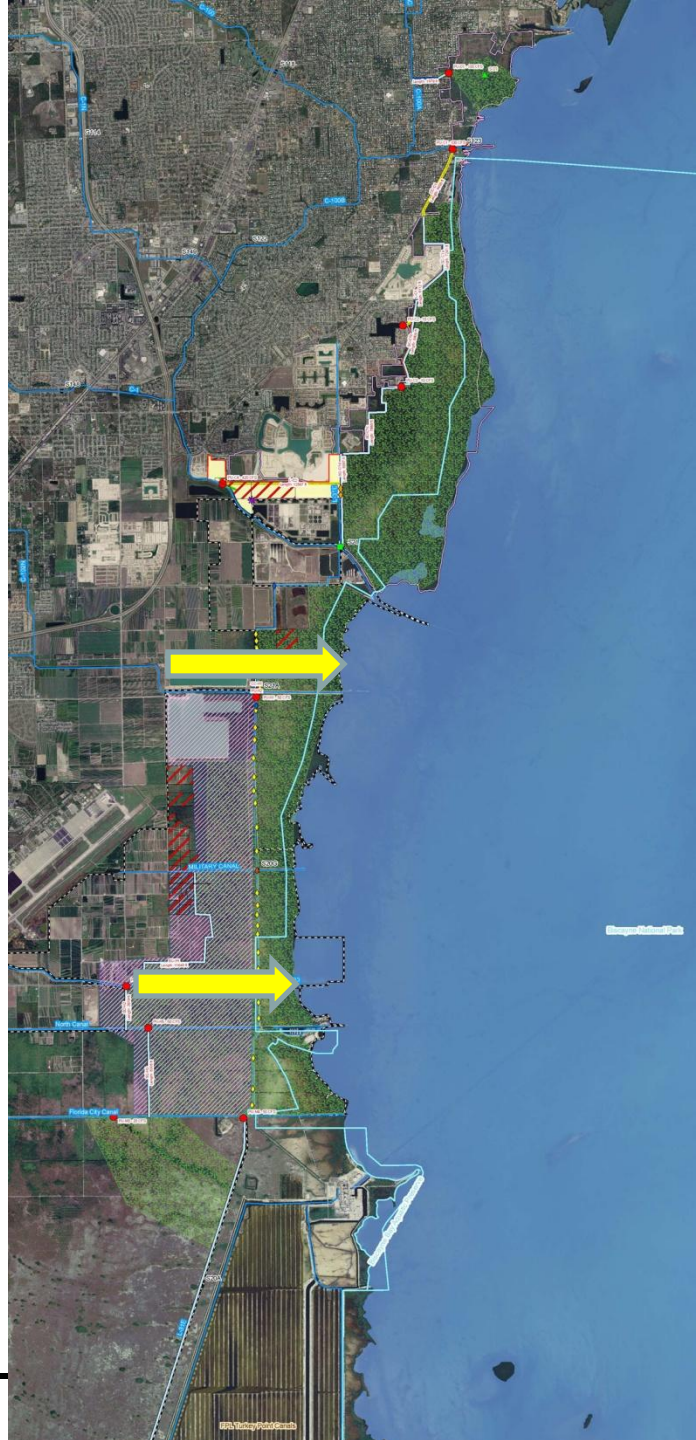
Consideration for downstream ecosystem in water management

- Specific conditions and goals
- Triggers for dry season flow

Multiple lines of evidence

- Sensitivity to system during dry season
- Quantity and timing





Biscayne National Park

South Florida Natural Resources Center

Changes in the Nearshore Areas

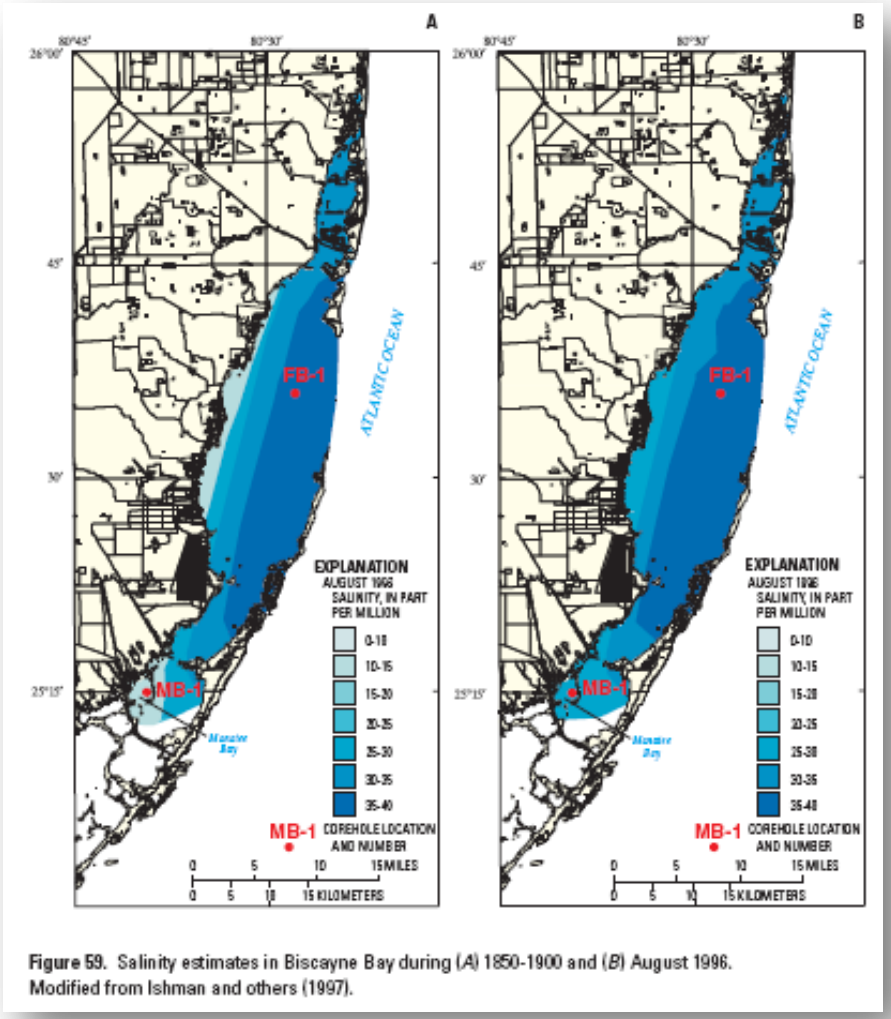


Figure 59. Salinity estimates in Biscayne Bay during (*A*) 1850-1900 and (*B*) August 1996. Modified from Ishman and others (1997).

Historic trend of increasing salinity in the nearshore zone

1900
Mesohaline conditions (5 to 18 PSU)

1996
Polyhaline conditions (18-30 PSU)

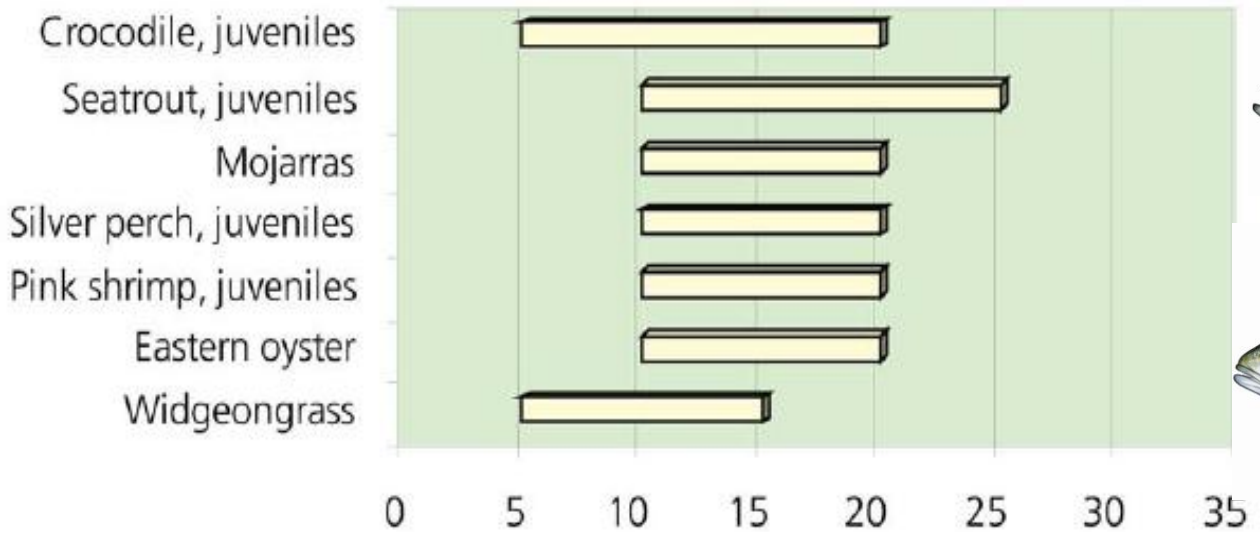
USGS Circular 1275, Impact of anthropogenic development on coastal groundwater hydrology in Southeastern Florida, 1900 – 2000.

Impacts

Changing habitat and reduced diversity

Ecology and Salinity

Late dry season target: **Average monthly salinity from 15 to 25 PSU. Never exceed 30 PSU**



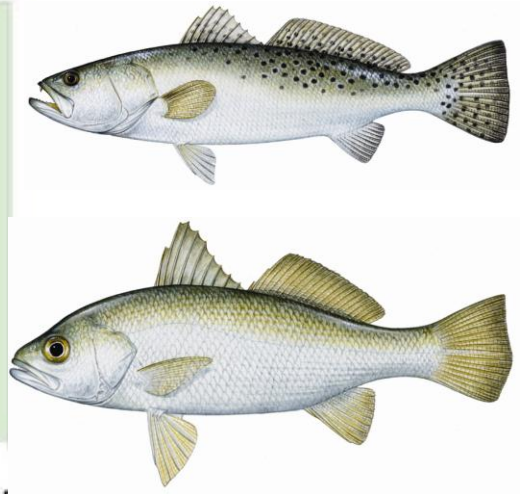


Figure 5 from "*Ecological Targets…"* report summarizes the optimal salinity range for a variety of species in the coastal zone.

Quantity and Timing

How much water?

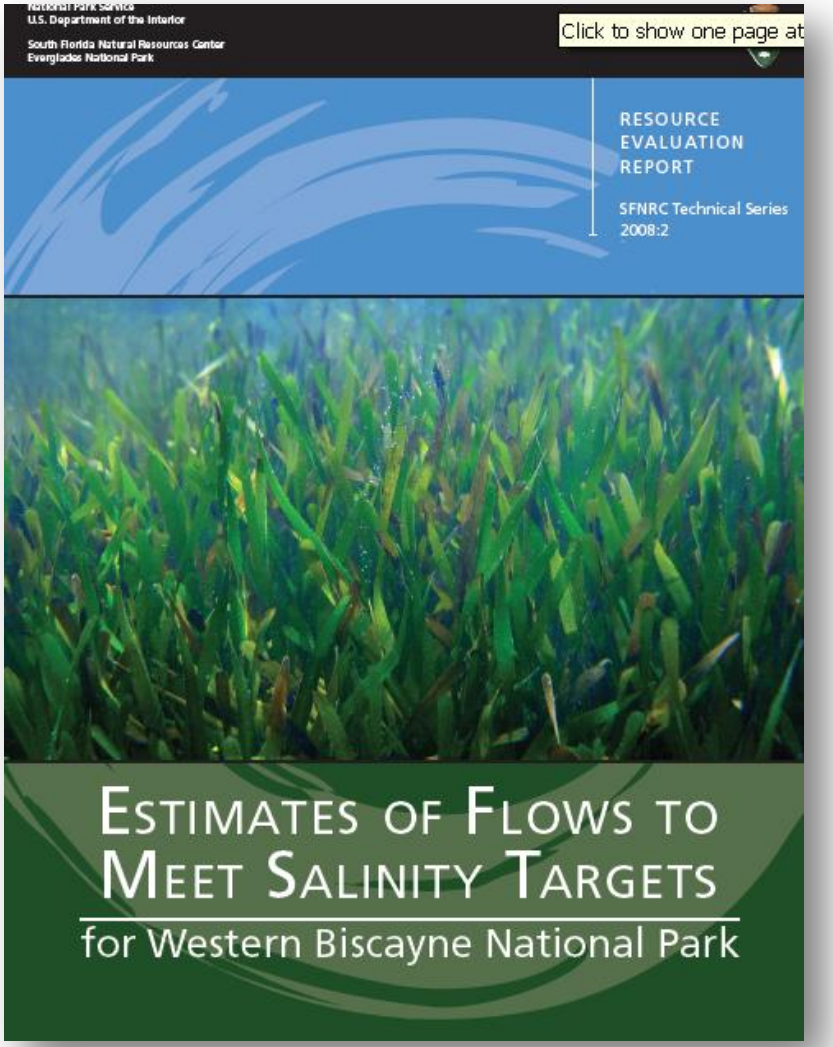
Justification based on 3 different measures:

Hypersalinity prevention estimate

86 cfs at both C-103 & C-102 (172 cfs total)

Hydrodynamic Model results

Observation based estimate



Quantity and Timing

How much water?

Justification based on 3 different measures:

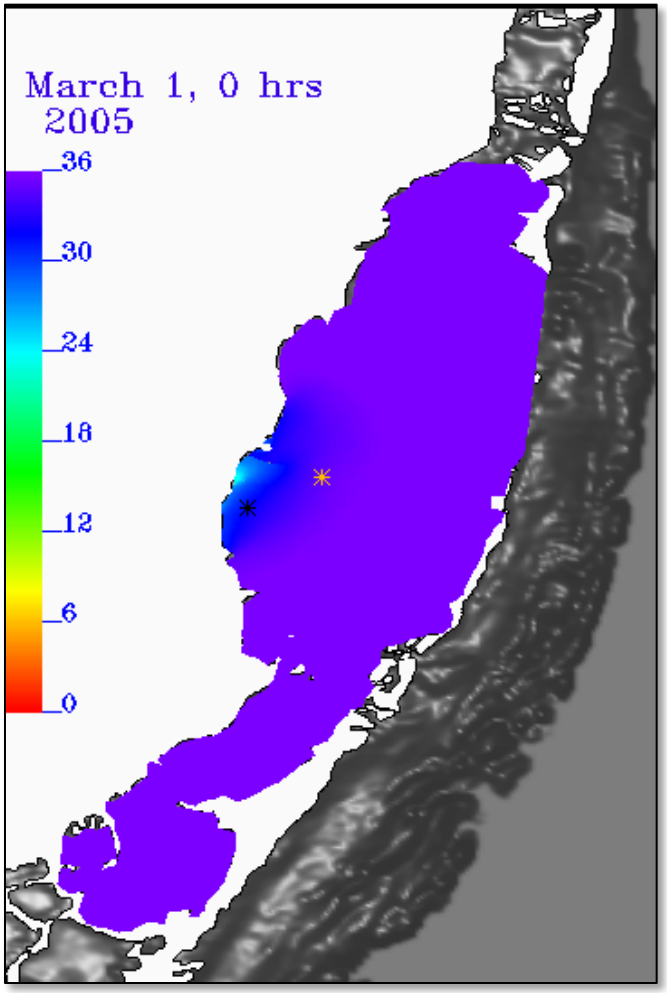
Hypersalinity prevention estimate

86 cfs at both C-103 & C-102 (176 cfs total)

Hydrodynamic Model results

52 cfs at both C-103 & C-102 (104 cfs total)

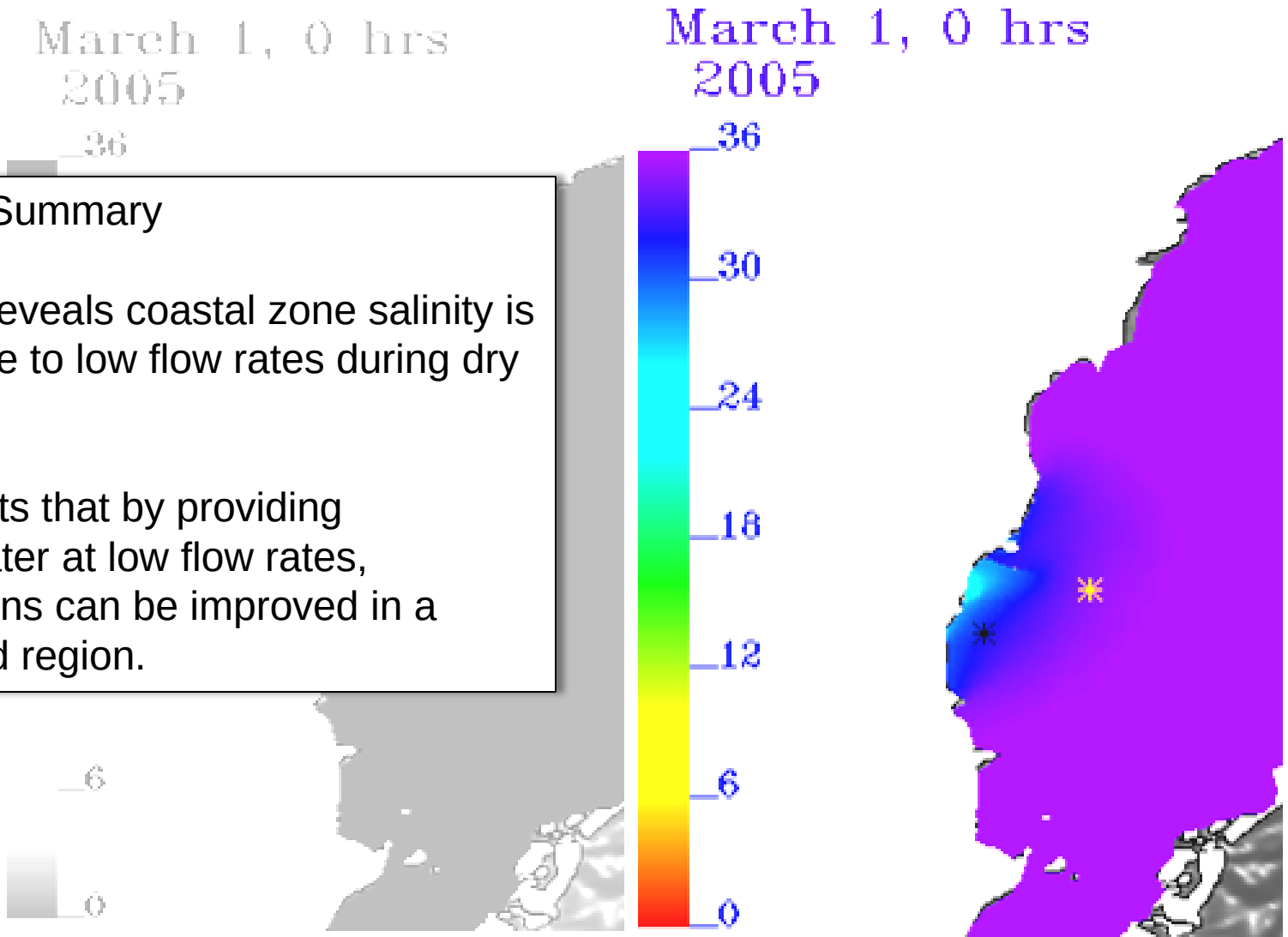
Observation based estimate



Comparing Model Salinity Data

Base conditions

Slow flow scenario



BBSM Summary

Model reveals coastal zone salinity is sensitive to low flow rates during dry season.

Suggests that by providing freshwater at low flow rates, conditions can be improved in a targeted region.

Quantity and Timing

How much water?

Justification based on 3 different measures:

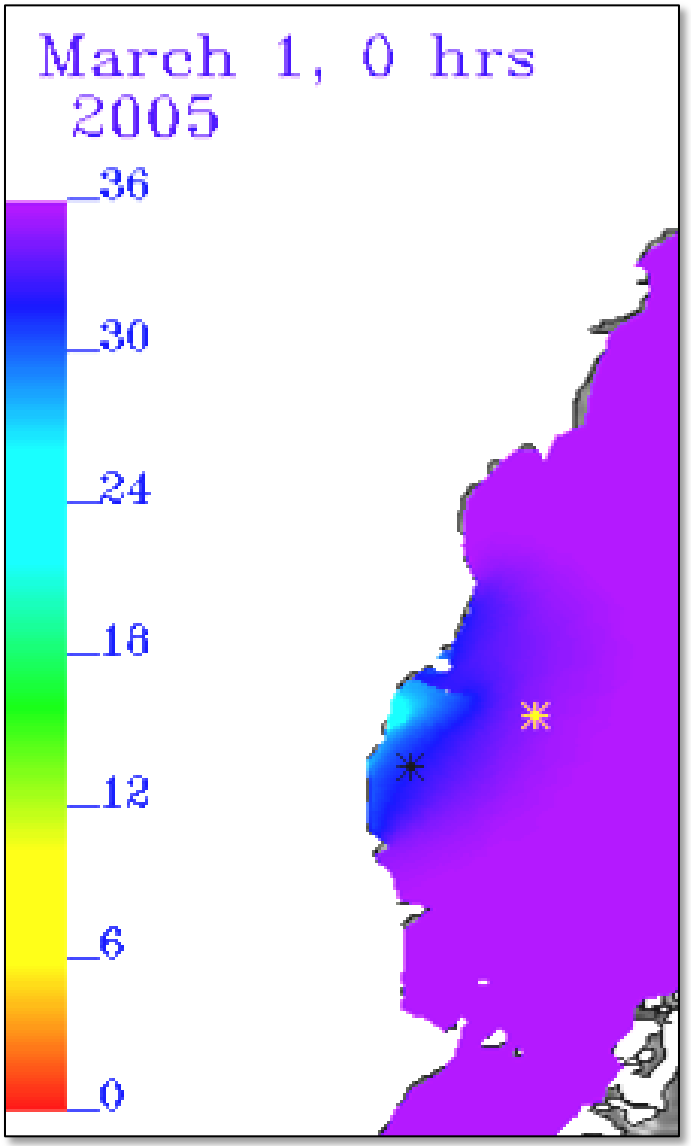
Hypersalinity prevention estimate

86 cfs at both C-103 & C-102 (176 cfs total)

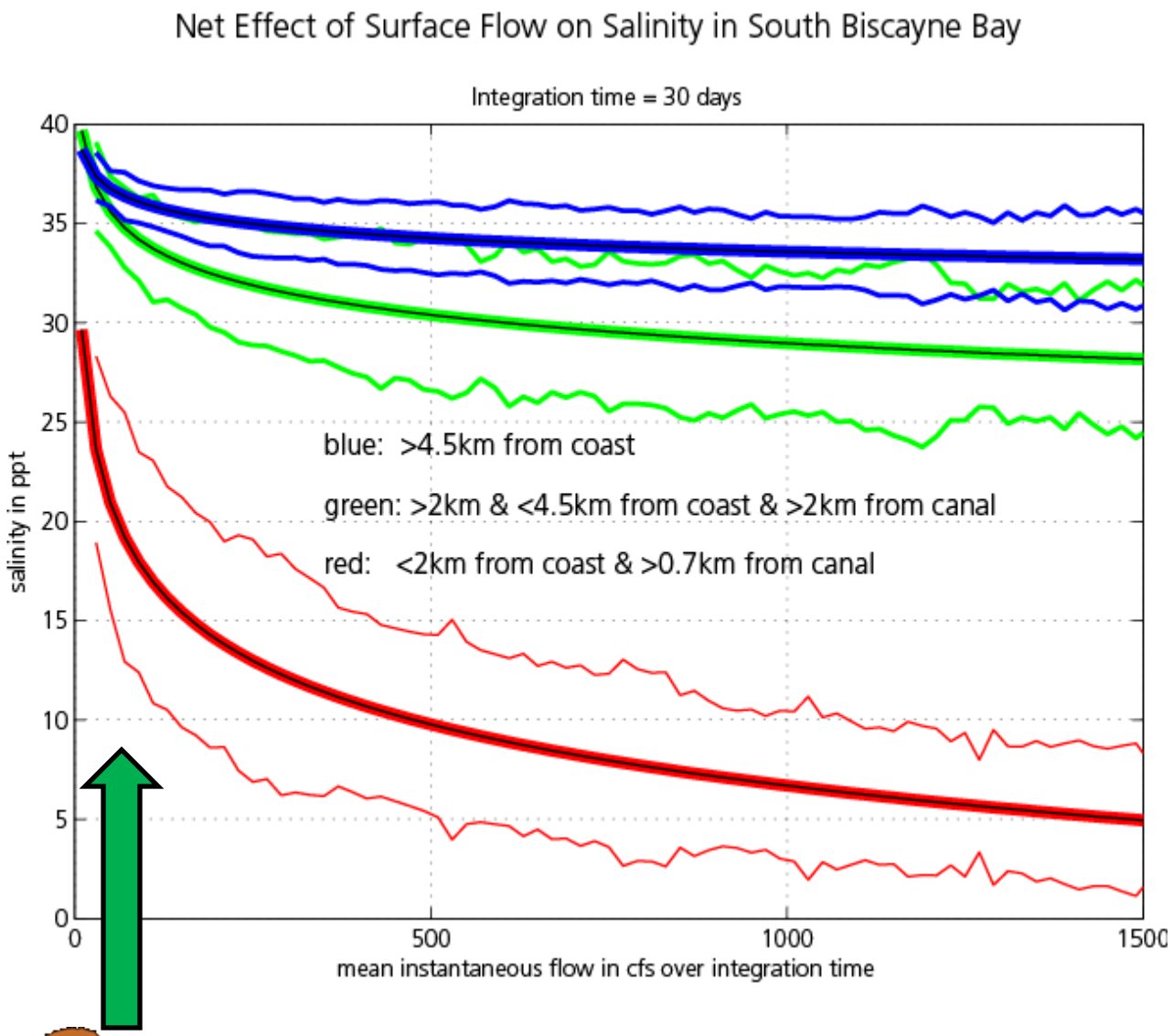
Hydrodynamic Model results

52 cfs at both C-103 & C-102 (104 cfs total)

Observation based estimate



Quantity



Most sensitive at low flow rates near coast (red)

100 cfs = 10 ppt reduction in salinity

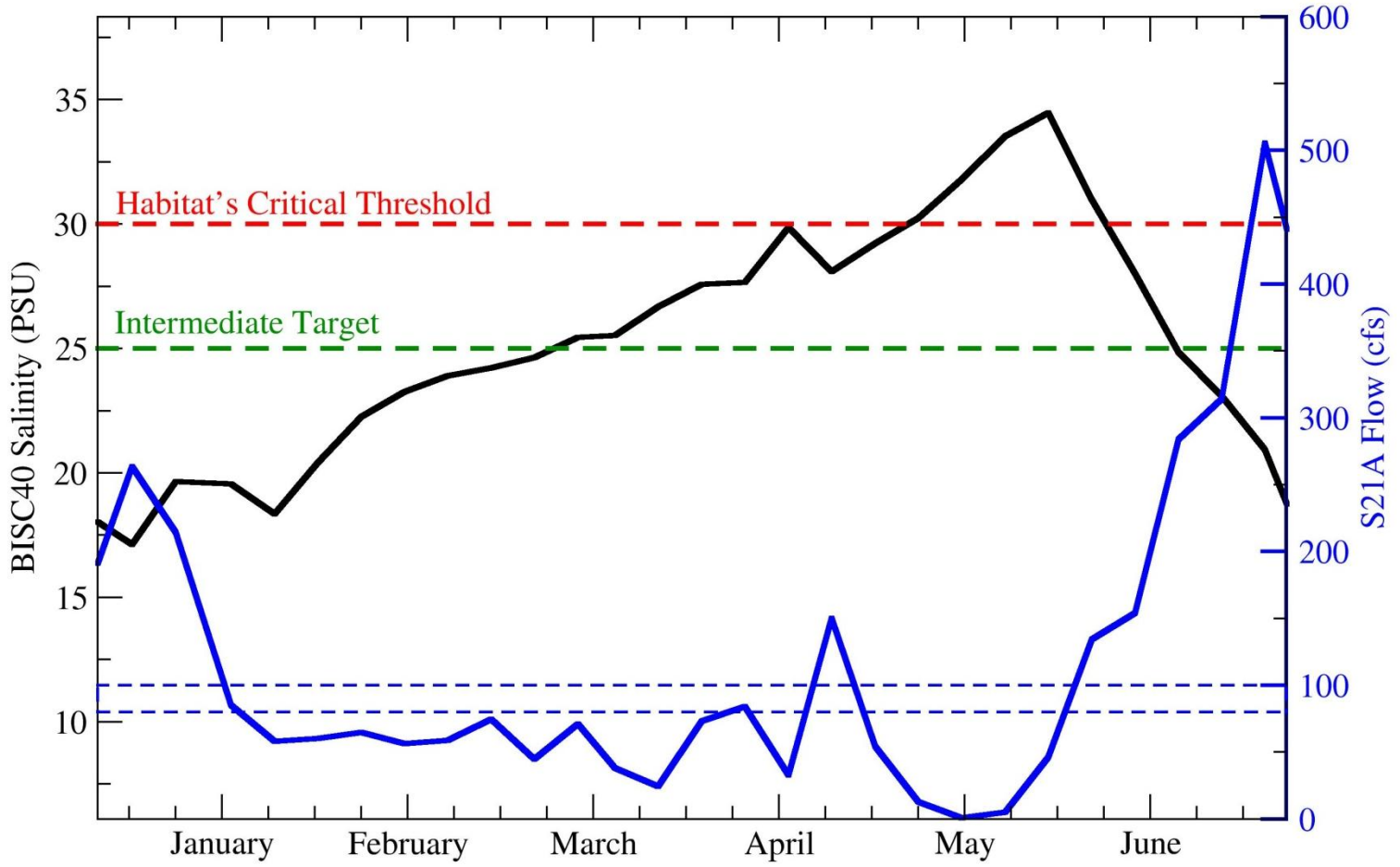
Diminishing returns with increasing flow rate

Driven by mixing dynamics

Quantity

How much water?

***Observation based estimate* =** Between 80 to100 cfs



Quantity and Timing

How much water? 76 cfs: range 52 to 100 cfs

(152 cfs total)

Justification based on 3 different measures:

Hypersalinity prevention estimate

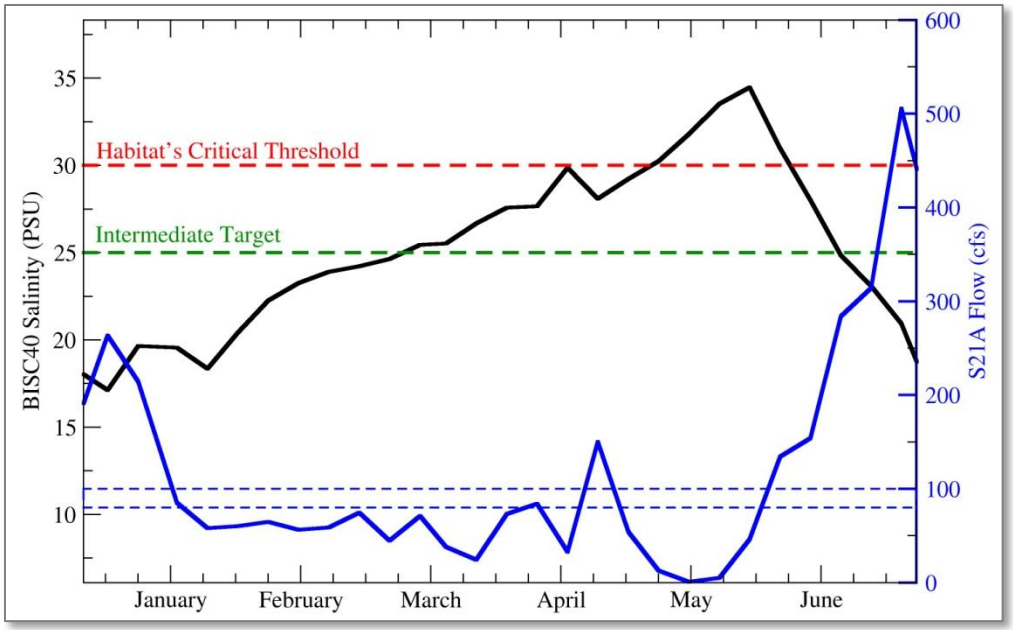
86 cfs at both C-103 & C-102

Hydrodynamic Model results

52 cfs at both C-103 & C-102

Observation based estimate

Between 80 to100 cfs



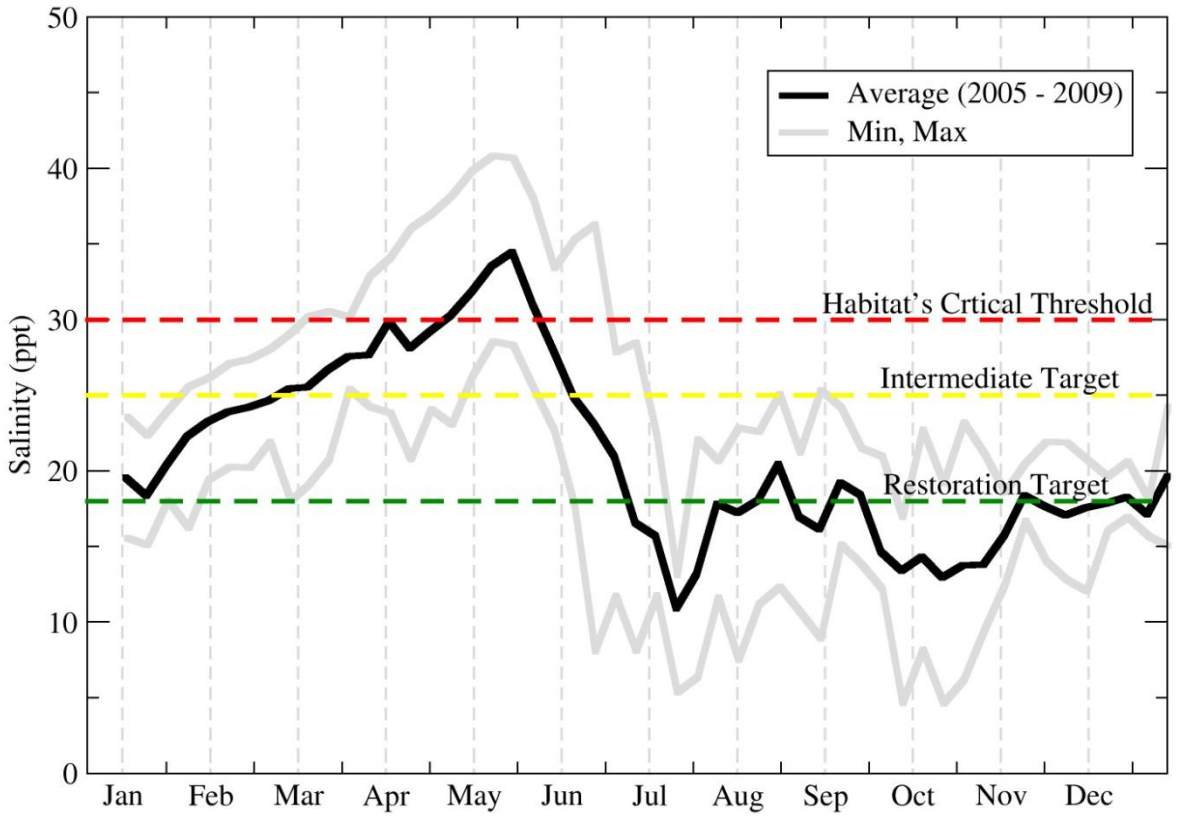
Timing

When?

February through May using salinity as trigger

Justification:

5 – year data series shows need most critical March to June



Summary

- **Request:** ~ 76 cfs per canal, Feb. through May, from C-102 & C-103 as needed based on salinity trigger.
- **Volume:** <10 kaf per month
- **Goal:** salinity never above 30 PSU
- **Target:** salinity maintained below 25 PSU

Not a replacement for the long term goals of Biscayne National Park but a step in the right direction

BBCW Phase 1 - Integration

Effectively integrates with BBCW Project.

- Request uses existing infrastructure
- Triggering flow from salinity provides mechanism to phase out this action when other restoration efforts bring salinity in line with targets
- Cost sharing for monitoring effort

References

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Pattillo, M., T. Czapla, D. Nelson, and M. Manaco, 1997, Distribution and abundance of fishes and invertebrates in Gulf of Mexico estuaries. Volume II: Species life history summaries. ELMR Rep. No. 11. NOAA/NOS Strategic Environmental Assessments Division, Silver Spring, MD, 377 pp.

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And others referenced in:

SFNRC, 2006, *Ecological & Hydrologic Targets for Western Biscayne National Park*. South Florida Natural Resources Center, Everglades National Park, Homestead, FL. SFNRC Technical Series 2006:1.25 pp.

Contact Information

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Existing Flows (kaf)

S20F

Period	2005	2006	2007	2008	2009	Minimum	Average	Maximum
JAN	4.30	3.80	5.29	3.94	2.98	2.98	4.06	5.29
FEB	1.50	5.73	4.97	4.17	0.69	0.69	3.41	5.73
MAR	4.25	3.63	0.86	4.14	4.71	0.86	3.52	4.71
APR	1.39	3.18	3.33	9.08	0.70	0.70	3.53	9.08
MAY	0.07	2.16	5.83	0.00	9.12	0.00	3.43	9.12
JUN	42.74	2.19	23.76	9.17	28.38	2.19	21.25	42.74
JUL	18.67	22.85	21.44	13.70	16.61	13.70	18.65	22.85
AUG	38.08	13.61	6.45	28.77	11.29	6.45	19.64	38.08
SEP	37.24	15.53	18.07	15.40	18.93	15.40	21.03	37.24
OCT	20.70	12.58	27.63	34.05	18.49	12.58	22.69	34.05
NOV	10.55	12.54	14.95	11.65	30.33	10.55	16.00	30.33
DEC	8.93	8.88	4.69	6.36	38.26	4.69	13.42	38.26
Total	188.42	106.69	137.26	140.43	180.49	70.78	150.66	277.48

Existing Flows (kaf)

S21A

Period	2005	2006	2007	2008	2009	Minimum	Average	Maximum
JAN	3.43	4.14	4.21	0.51	1.77	0.51	2.81	4.21
FEB	1.88	5.24	3.77	0.34	0.72	0.34	2.39	5.24
MAR	3.25	4.08	1.08	1.19	0.46	0.46	2.01	4.08
APR	1.03	2.55	2.40	4.32	0.00	0.00	2.06	4.32
MAY	1.20	2.72	2.77	0.70	3.02	0.70	2.08	3.02
JUN	21.76	2.80	11.10	6.58	11.08	2.80	10.66	21.76
JUL	8.96	11.09	10.87	6.39	7.58	6.39	8.98	11.09
AUG	26.06	7.21	4.82	13.40	5.11	4.82	11.32	26.06
SEP	24.33	11.01	8.41	7.28	10.18	7.28	12.24	24.33
OCT	15.58	6.29	12.48	13.90	5.51	5.51	10.75	15.58
NOV	9.60	6.48	8.05	5.64	6.92	5.64	7.34	9.60
DEC	3.50	5.77	1.63	2.65	10.47	1.63	4.80	10.47
Total	120.59	69.38	71.59	62.91	62.80	36.07	77.45	139.77

TOTAL

	Average
FEB	**5.80**
MAR	**5.53**
APR	**5.59**
MAY	**5.51**
TOTAL	**16.92**

On average, district provided ~ 17 of the currently requested 40 kaf