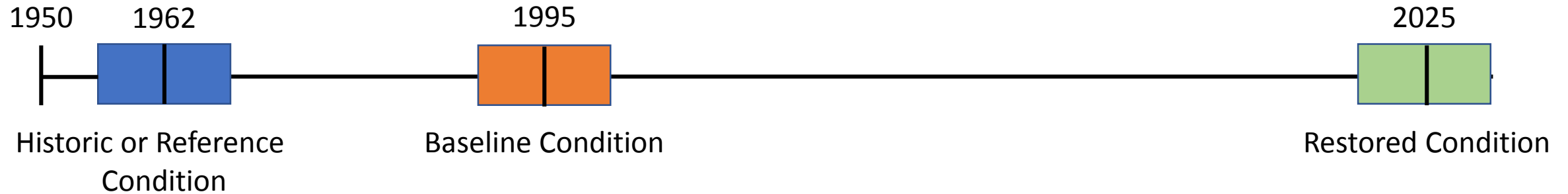




Caloosahatchee River MFL West Coast Technical Meeting May 7, 2018

RESTORATION

Restoration –renewing degraded, damaged, or destroyed ecosystems and habitats in the environment by active human intervention and action



Historic or Reference Condition – Pre-impact or pre-disturbance condition

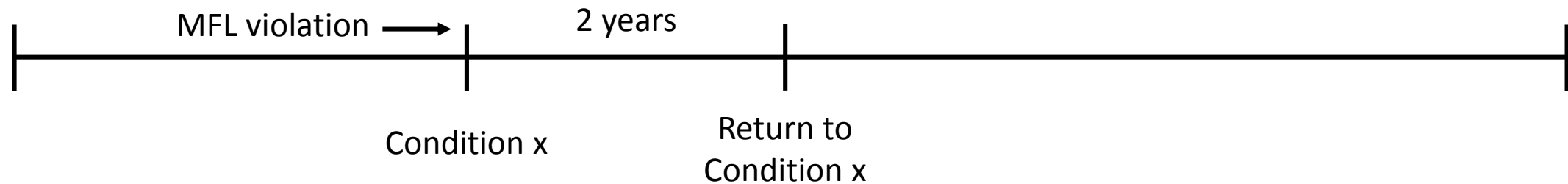
Baseline Condition – Pre-restoration condition used as a benchmark from which to measure restoration-related change

Restored Condition – Condition that achieves a pre-determined condition target; often the historic condition or a percentage thereof

RECOVER/RECOVERY

Significant harm – Temporary loss of water resource functions which result from a change in surface or groundwater hydrology, that takes more than two years to **recover**.....

1. **Recover** in context to the definition of significant harm is a return to the condition of the water resource function at the time of an MFL violation



Recovery Strategy – Development of additional water supplies and other actions, consistent with the authority granted by this chapter to:

1. Achieve **recovery** to the established minimum flow or minimum water level as soon as practicable

RECOVERY ≠ RESTORATION

CRE MFL Technical Questions

➤ Flow

- Change in flow if May was included
- Most sensitive species

➤ Duration

- Consequences to Vallisneria

➤ High Salinity Events

- Effects on other indicator species

➤ Position of Low Salinity Zone

➤ Return Frequency

EFFECTS OF MAY ON DRY SEASON

Effects of May on S-79 inflow (cfs) and salinity at Ft. Myers (S_{FtM}) from 1/1993 to 12/2016

	Dry (Nov-Apr)	DryMay (Nov-May)	ANOVA p-value
<u>Flow at S-79</u>			
Mean±SD	1393.0±2116.5	1347.4±2055.9	p = 0.274
Median	579.0	543.0	
N	4631	5406	
<u>Surface Salinity</u>			
Mean±SD	8.4±6.7	8.6±6.9	p = 0.076
Median	7.8	8.2	
N	4144	4858	
<u>Average Salinity</u>			
Mean±SD	8.9±6.7	9.1±6.8	p = 0.105
Median	8.9	9.2	
N	4185	4899	

“Dry” represents the standard SFWMD dry season from November to April.

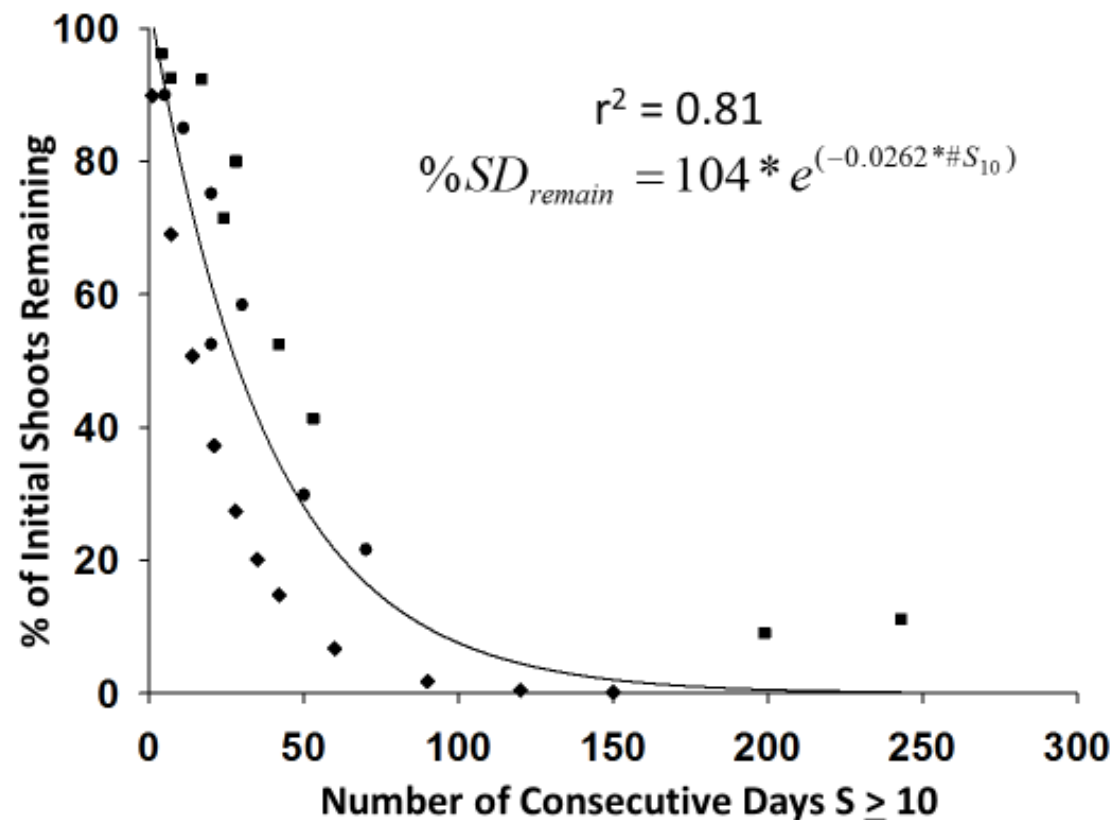
“DryMay” is the standard dry season with the addition of all May data during the POR.

Including May has an small effect on flows at S-79 in the dry season

How Duration was Derived

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

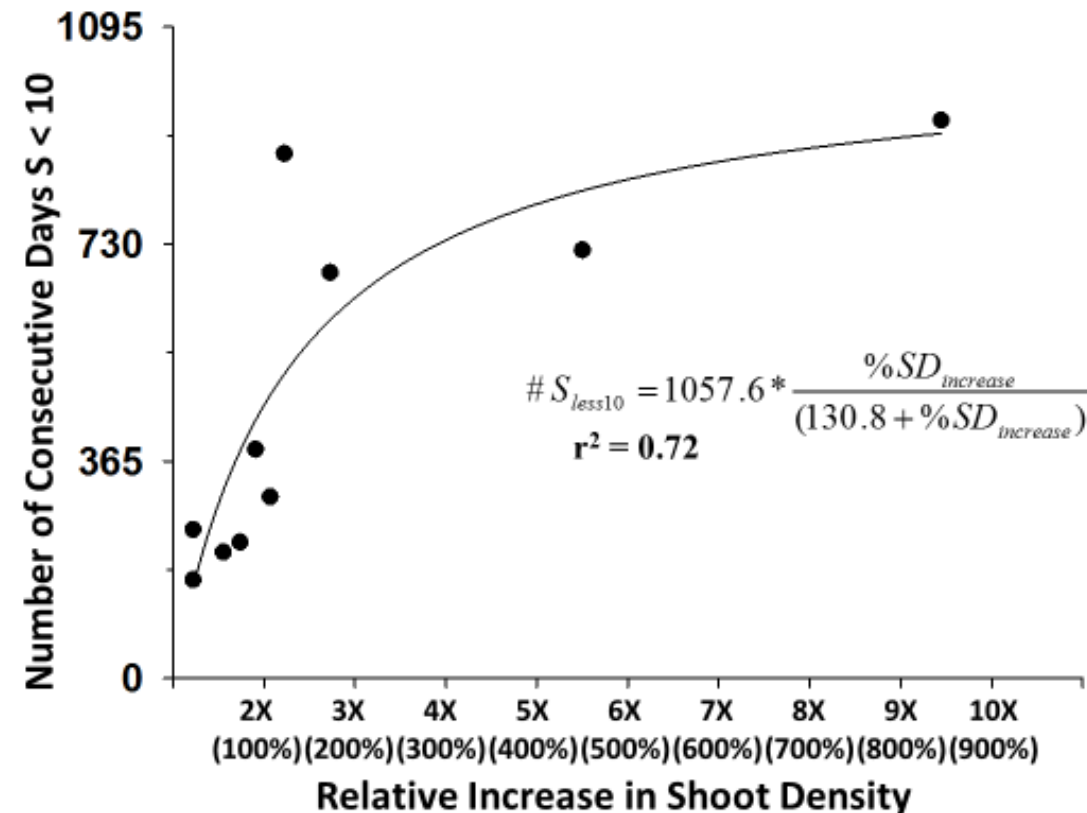
CRE MFL DURATION – TAPE GRASS EXPOSURE



14

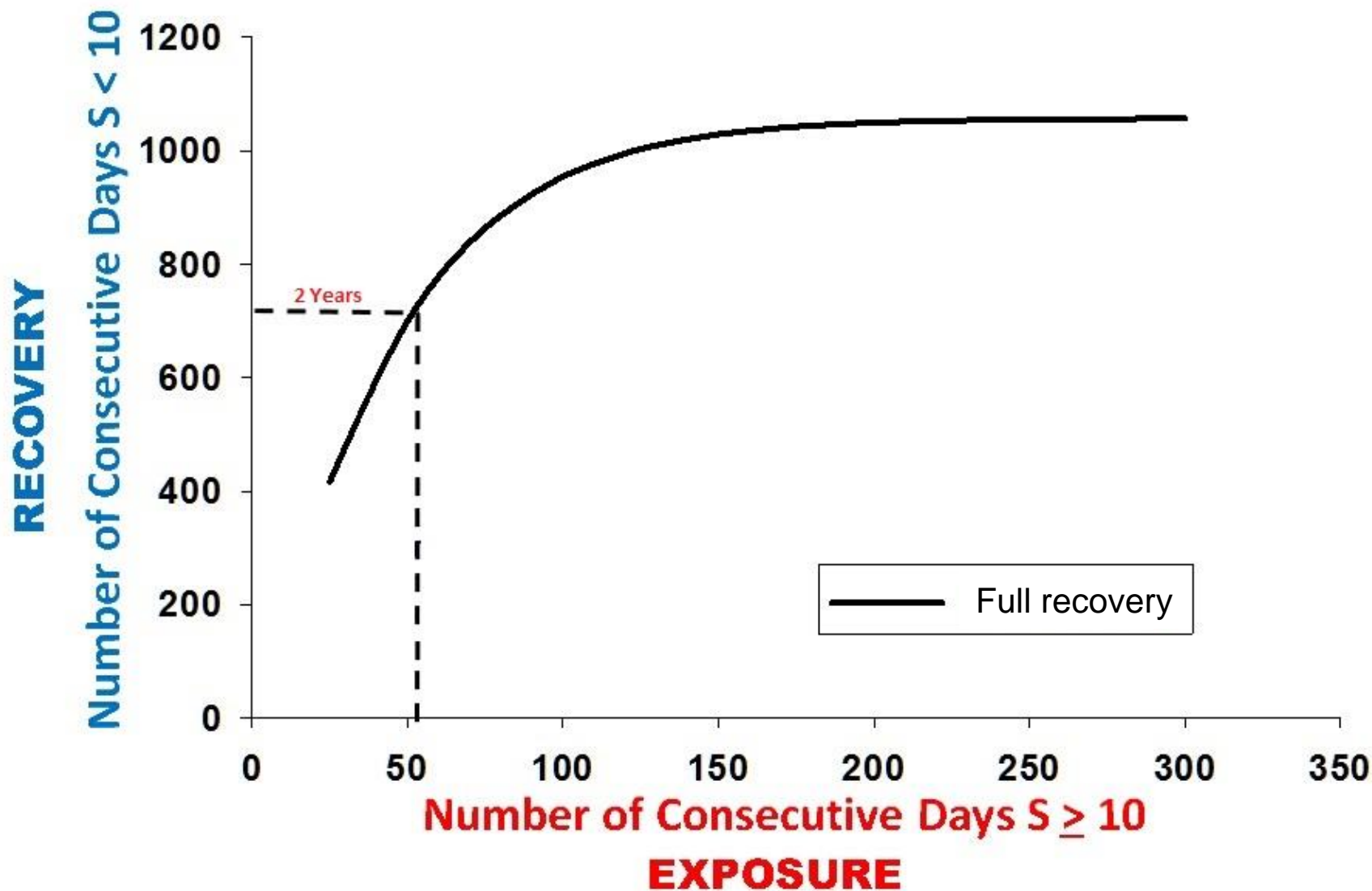
SOUTH FLORIDA WATER MANAGEMENT DISTRICT

CRE MFL DURATION – TAPE GRASS RECOVERY

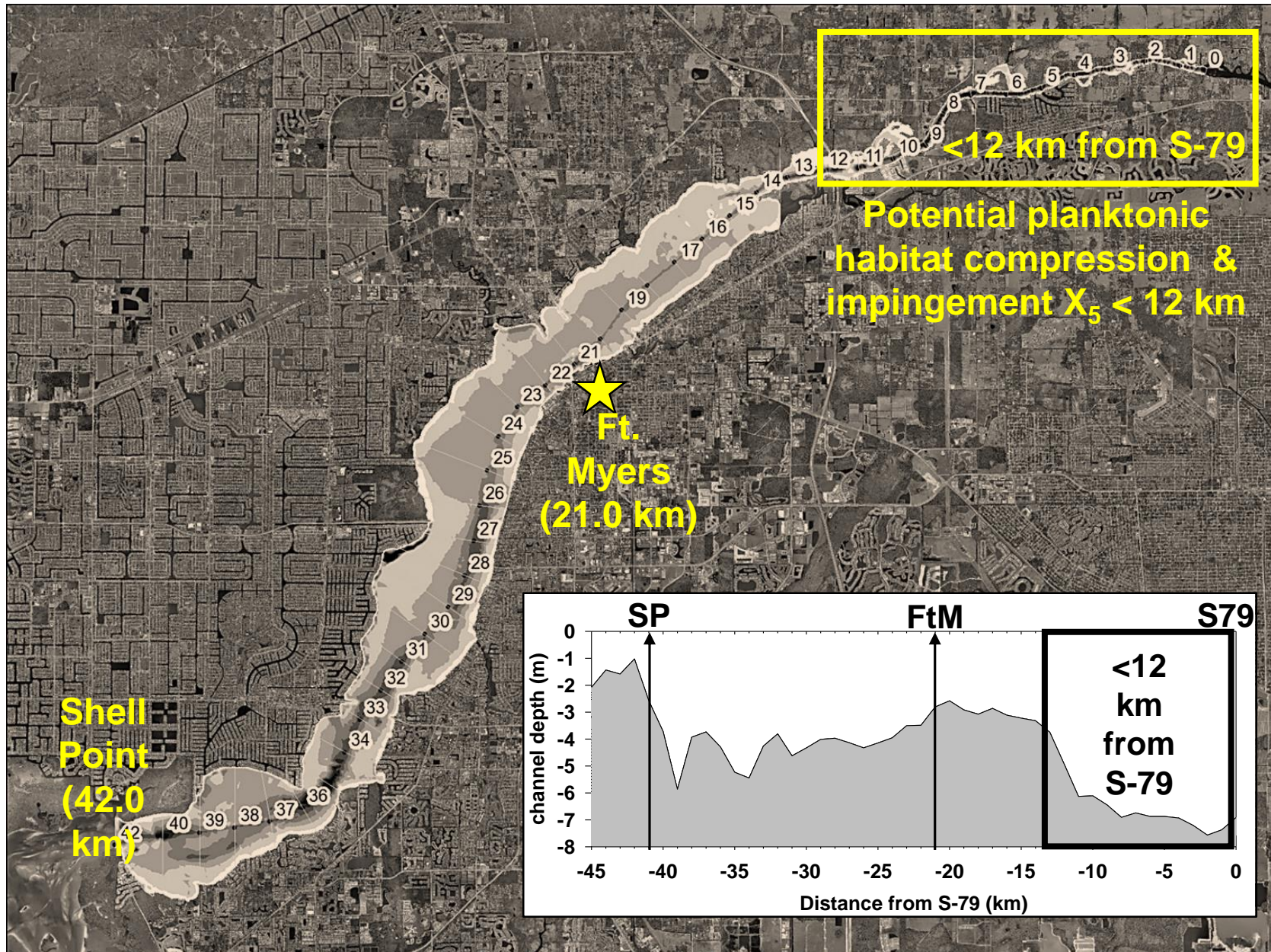


14

How Duration was Derived



CRE BATHYMETRY, DISTANCE, & ISOHALINES



Summary of potential habitat compression for eight planktonic taxa in the CRE

(Event = Center Of Abundance < 12 km)

	<u>FCB</u>	<u>FCB400</u>
<i>Lironeca</i> spp. (isopod)		
Total # days <12 km	1688	218
Total # of COA compression events	29	4
Average location/event (km)	0.0 (-0.8)	8.6
Average duration/event (days)	58	54
<i>Edotia triloba</i> (isopod)		
Total # days <12 km	2136	327
Total # of COA compression events	29	5
Average location/event (km)	1.2	7.8
Average duration/event (days)	74	65
<i>Americamysis almyra</i> Adults (Mysid)		
Total # days <12 km	3973	1839
Total # of COA compression events	50	31
Average location/event (km)	4.4	10.0
Average duration/event (days)	80	59
<i>Clytia</i> spp. (jellyfish)		
Total # days <12 km	1767	235
Total # of COA compression events	28	4
Average location/event (km)	0.0 (-9.1)	5.9
Average duration/event (days)	63	59

Period of Record 1/1/1967 to 12/31/2005

Summary of potential habitat compression for eight planktonic taxa in the CRE

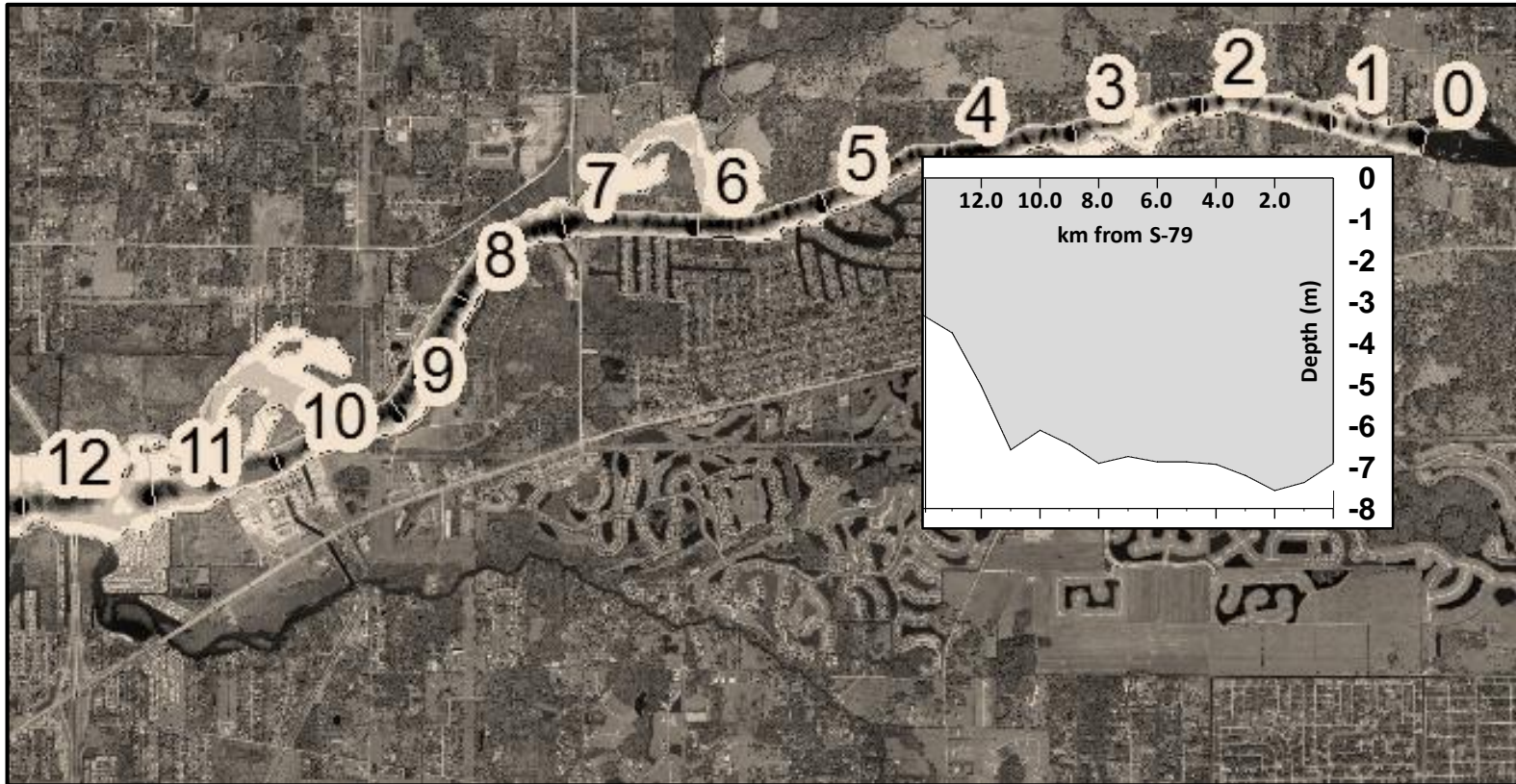
(Event = Center Of Abundance < 12 km)

	<u>FCB</u>	<u>FCB400</u>
<i>Bowmaniella brasiliensis</i> (mysid)		
Total # days <12 km	1579	195
Total # of COA compression events	26	4
Average location/event (km)	40.4	9.7
Average duration/event (days)	61	49
<i>Gobiidae</i> preflexion larvae (Goby larvae)		
Total # days <12 km	1014	18
Total # of COA compression events	24	2
Average location/event (km)	4.2	10.2
Average duration/event (days)	42	9
<i>Anchoa mitchili</i> (Common Anchovy)		
Total # days <12 km	2745	348
Total # of COA compression events	54	7
Average location/event (km)	7.8	9.8
Average duration/event (days)	51	50
<i>Mnemiopsis leidyi</i> (comb jelly)		
Total # days <12 km	2209	133
Total # of COA compression events	54	7
Average location/event (km)	11.0	11.2
Average duration/event (days)	21	4

Period of Record 1/1/1967 to 12/31/2005

Isohaline (X_5) Position Analysis

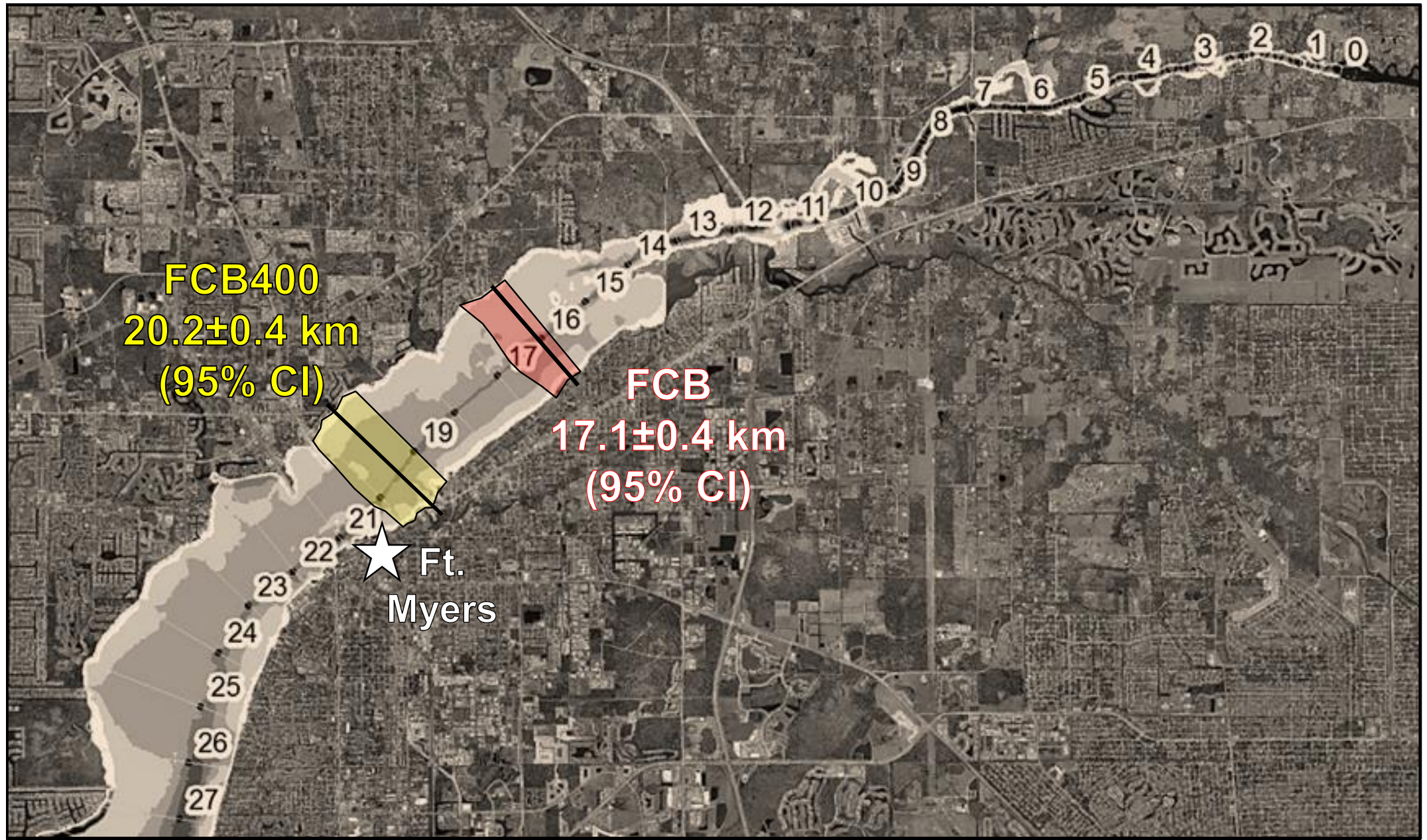
CRE MFL FCB vs. FCB400 – X_5 (km from S-79)



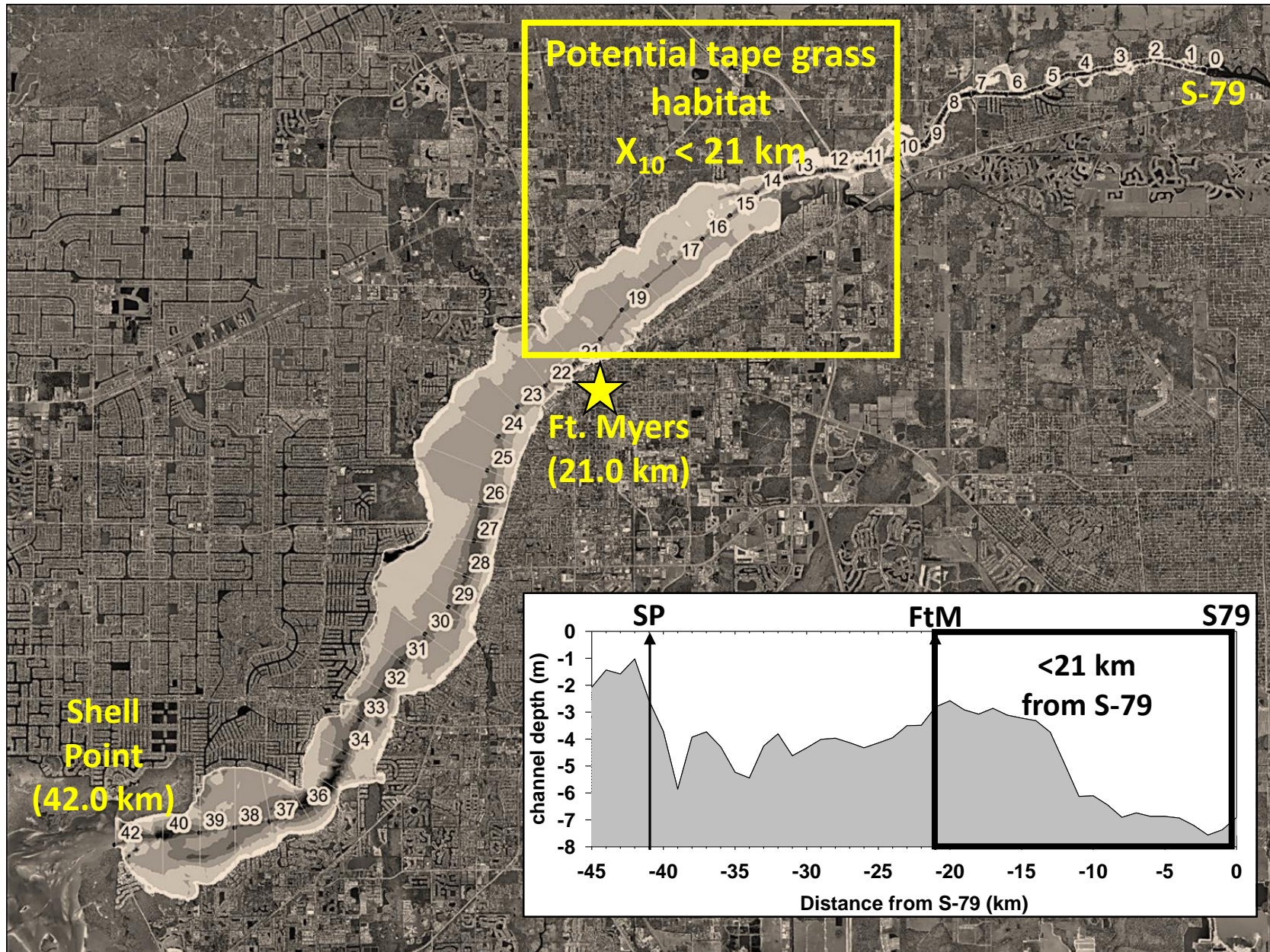
$X_5 < 12$ km from S-79 (number of days of 14,243 total)

	FCB	FCB400	Difference
Less than 12 km	3709	2025	45.4% Reduction

CRE MFL FCB vs. FCB400 – X₅ (Dry Season)

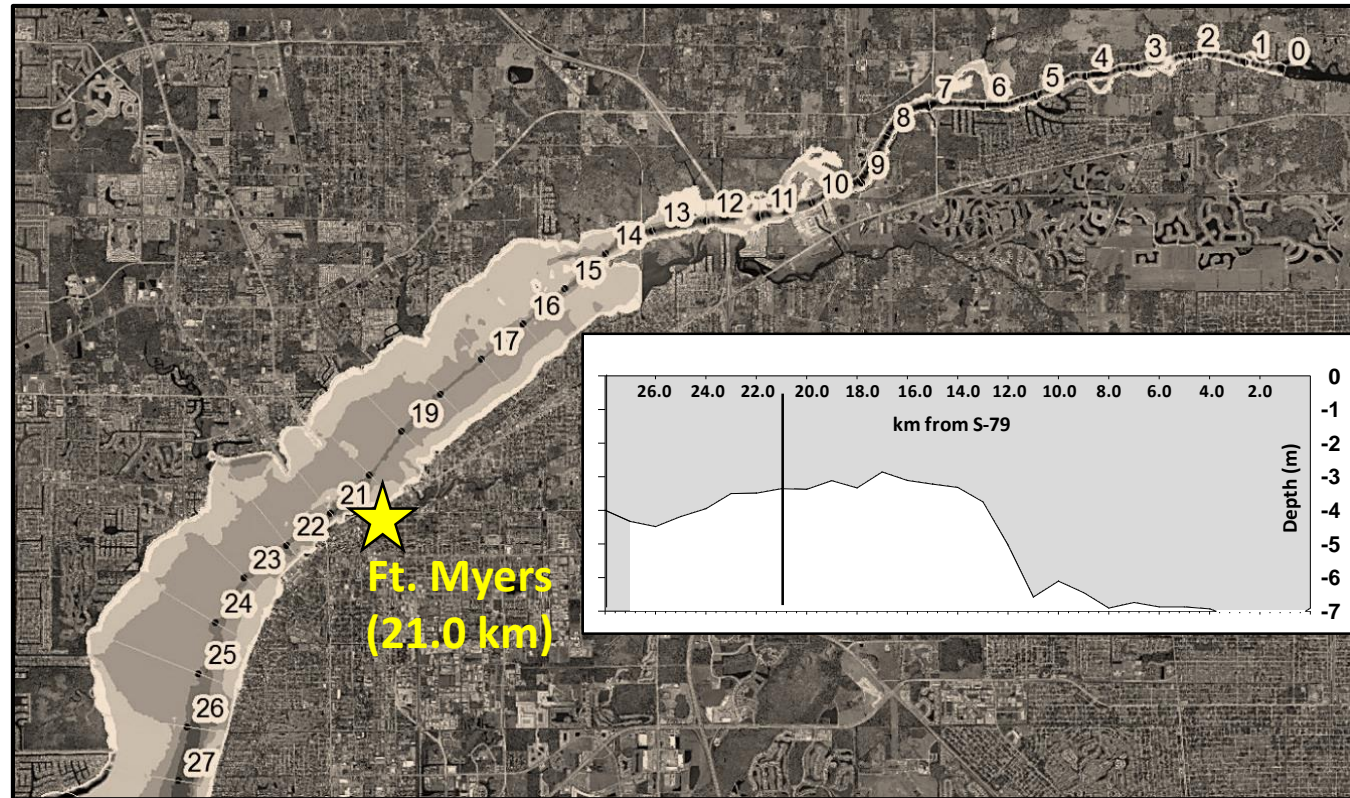


CRE BATHYMETRY, DISTANCE, & ISOHALINES



Isohaline (X_{10}) Position Analysis

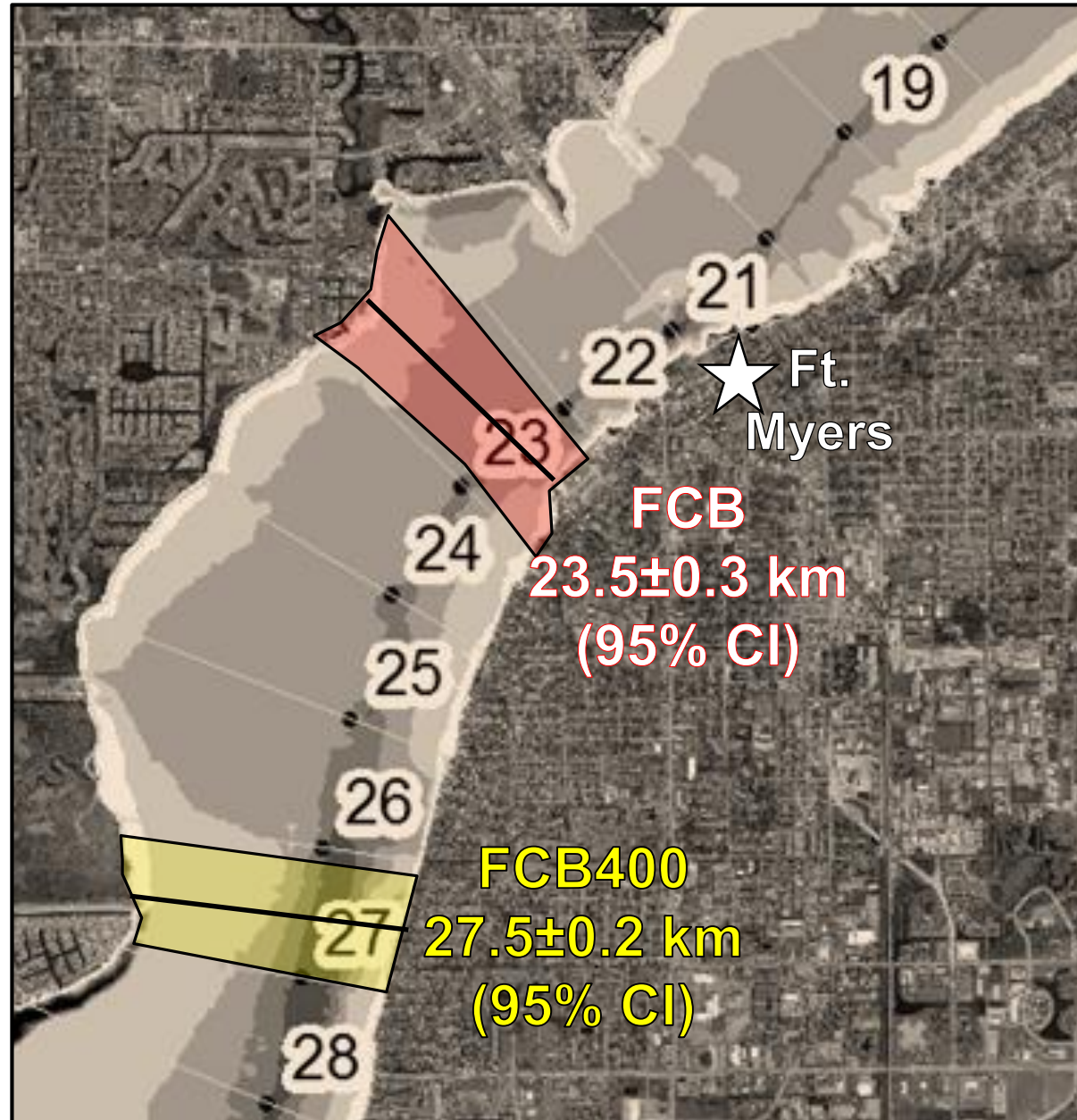
CRE MFL FCB vs. FCB400 – X_{10} (km from S-79)



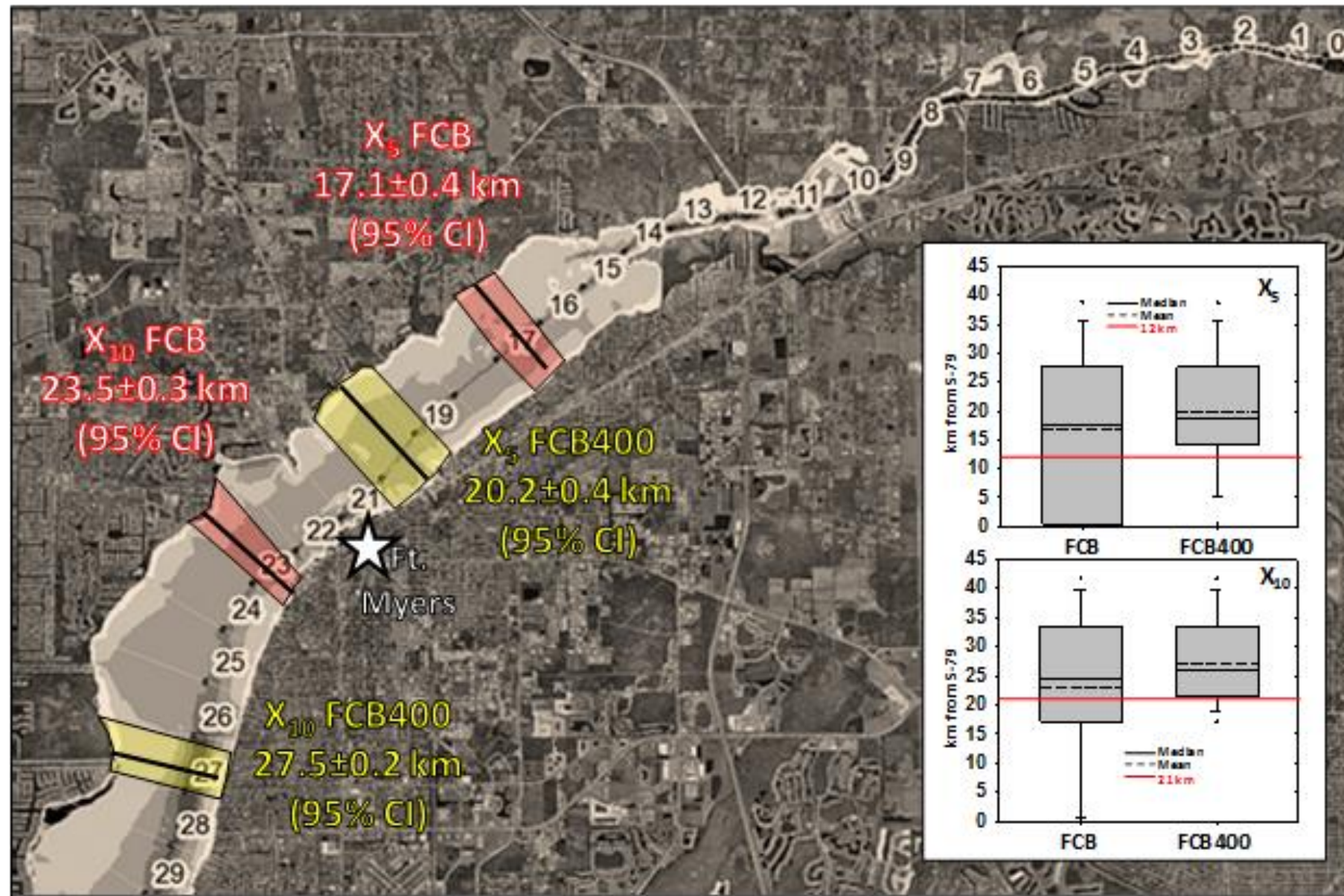
$X_{10} < 21$ km from S-79 (number of days of 14,243 total)

	FCB	FCB400	Difference
Less than 21 km	3914	2458	37.2% Reduction

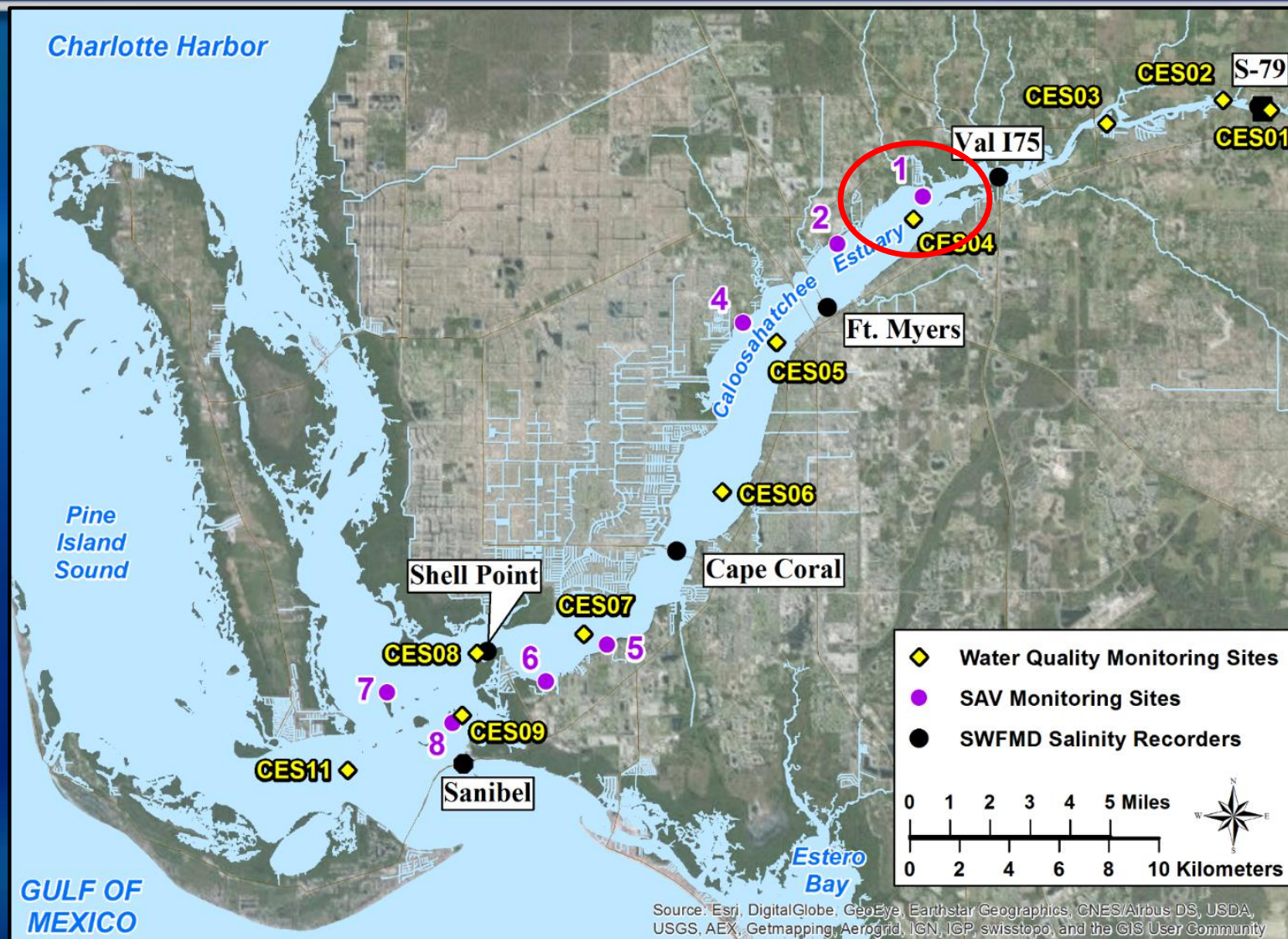
CRE MFL FCB vs. FCB400 – X_{10} (Dry Season)



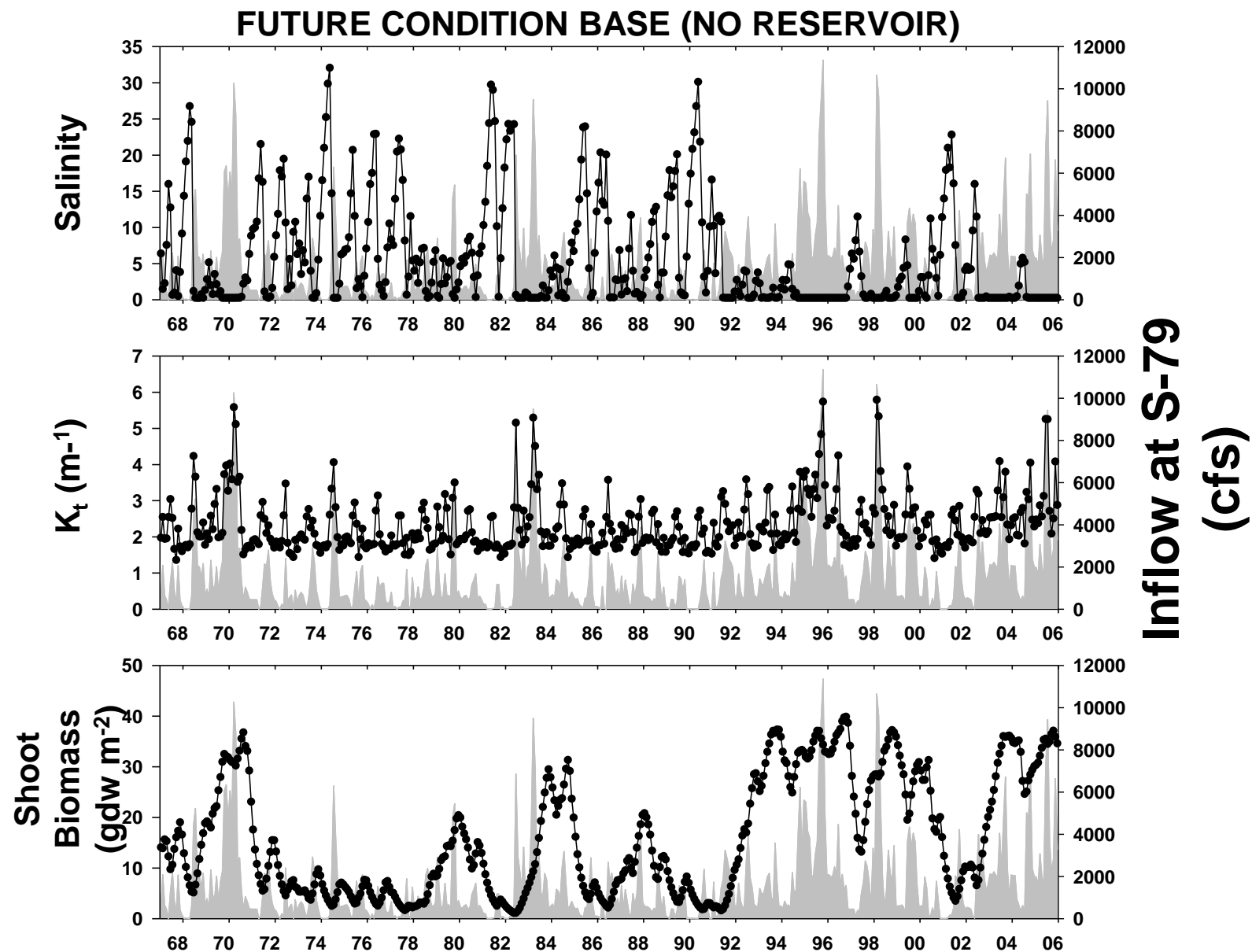
Isohaline Position– X_5 and X_{10} (Dry Season) CRE MFL FCB vs. FCB400



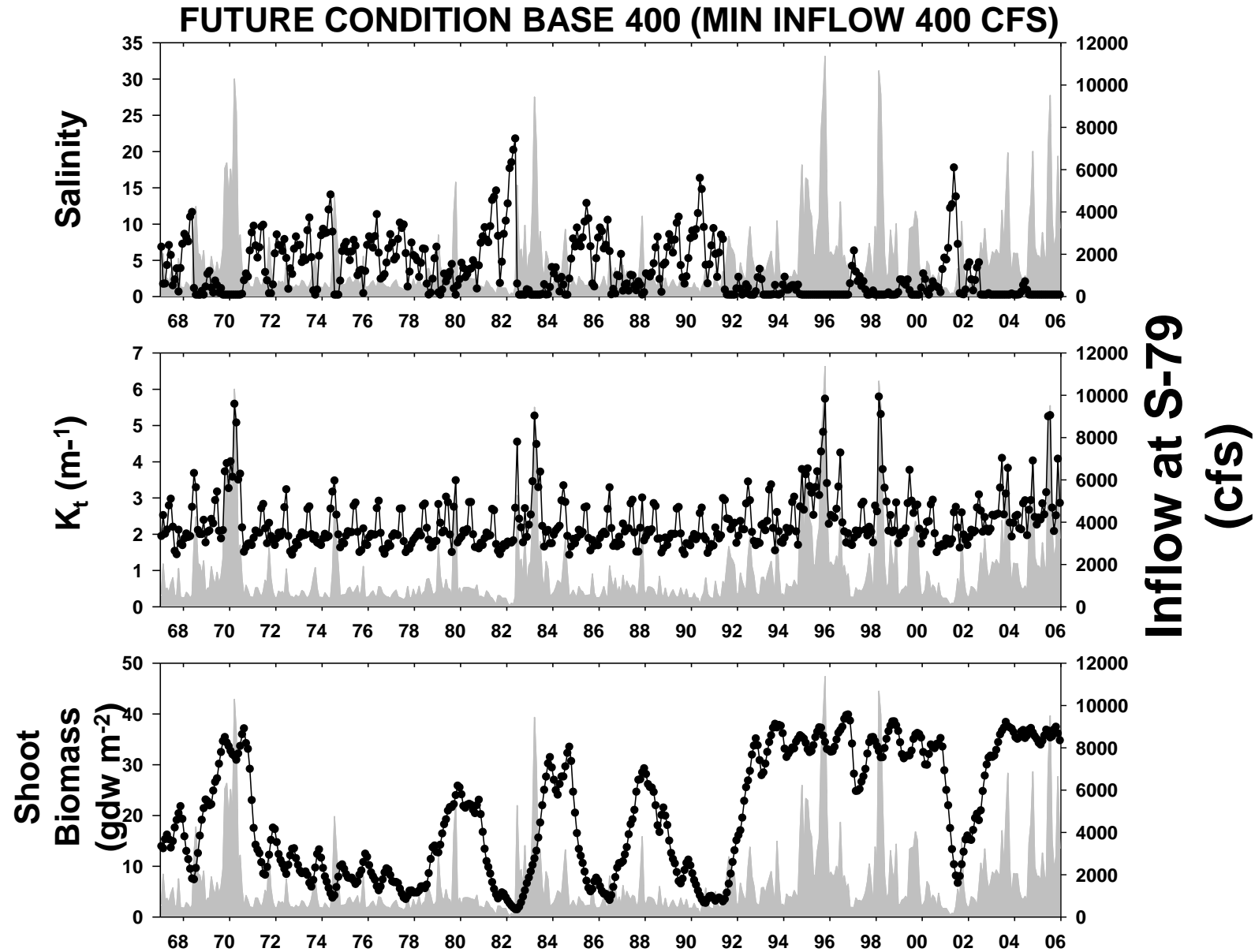
Tape Grass Model



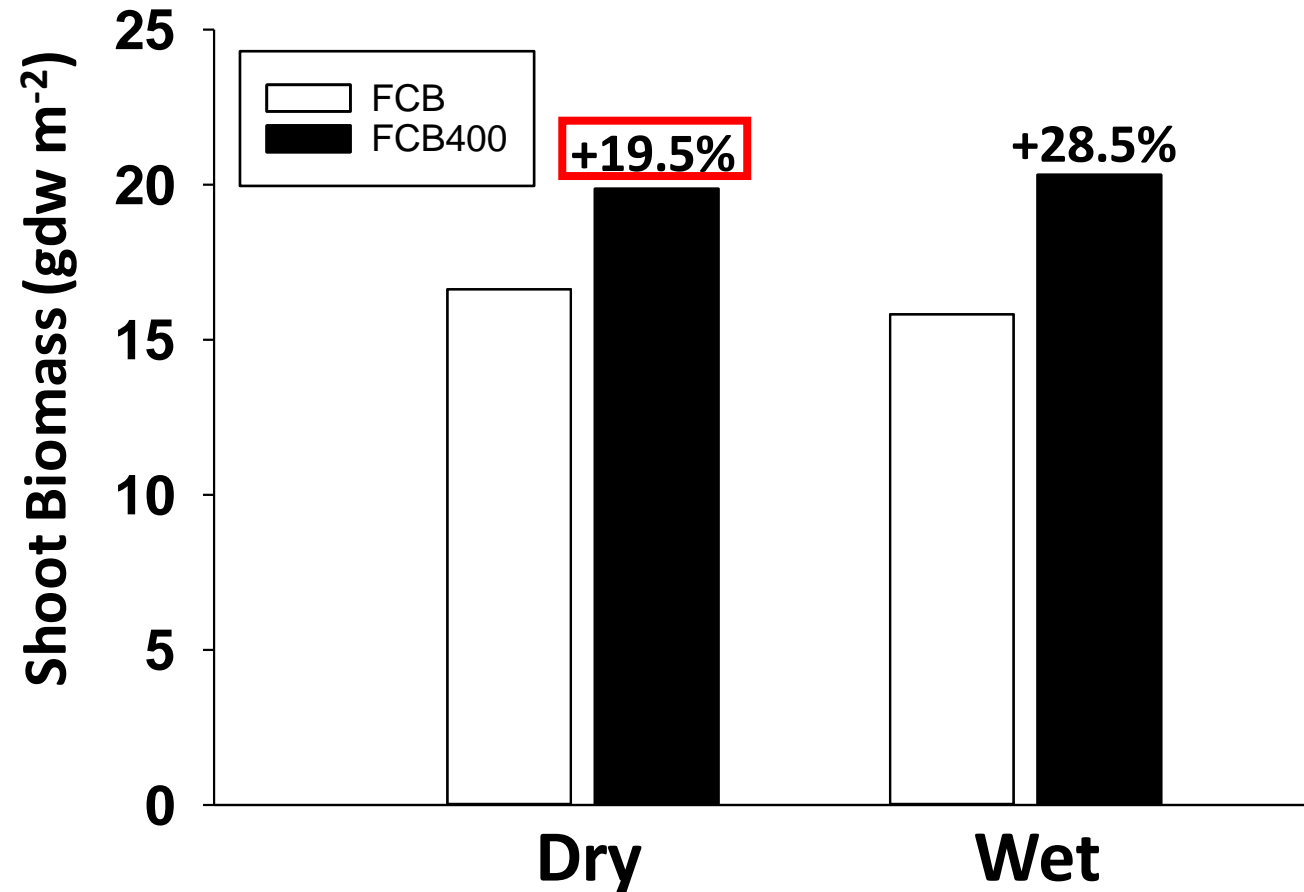
CRE MFL TAPE GRASS MODEL - FCB



CRE MFL TAPE GRASS MODEL – FCB400

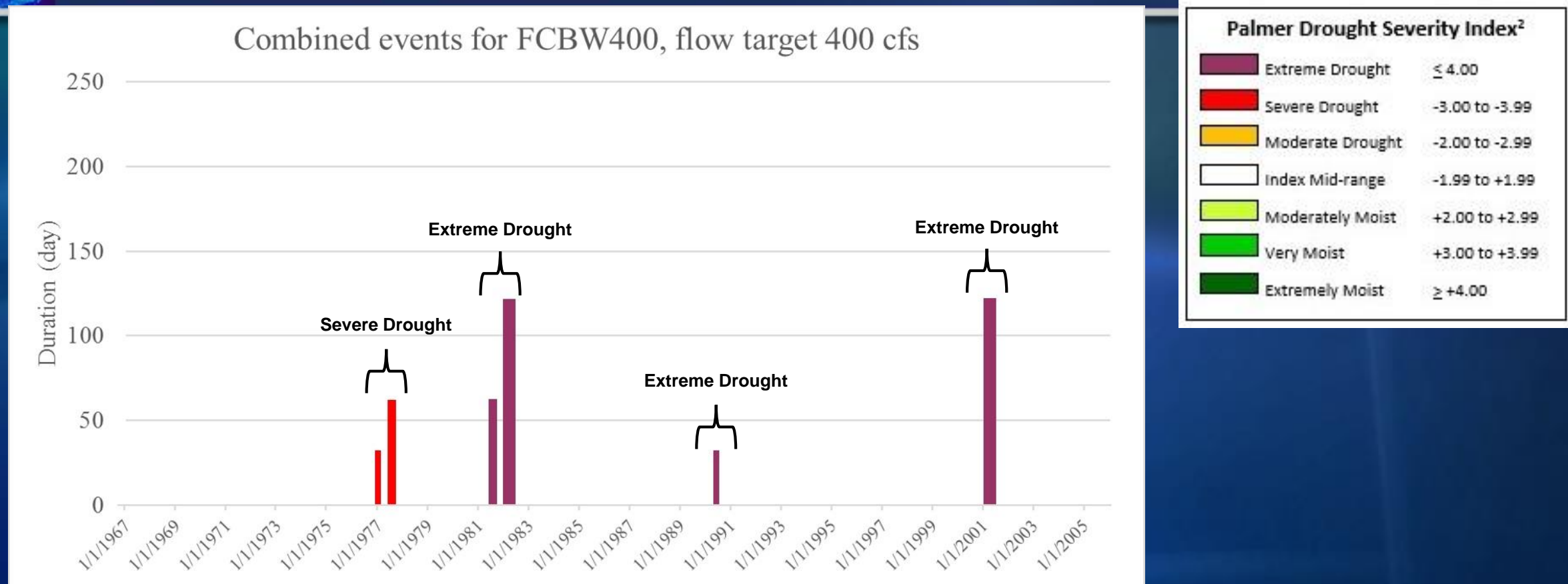


CRE MFL FCB vs. FCB400 – S_{val1} & V_{shoot} (gdw m⁻²)



Effects of season (dry vs. wet) and inflow scenario (FCB vs. FCB400) on the average simulated tape grass shoot biomass (gdw m⁻²) at SAV Monitoring Site 1 from 1/1/1967 to 12/31/2005

Regional Drought Conditions during Combined Salinity and Flow Exceedance Events in the CRE¹



¹ From National Oceanic and Atmospheric Administration/National Centers for Environmental Information at <https://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/psi/200201-200312>.

² Palmer, W.C. 1965. Meteorological Drought. *Research Paper No. 45*. U.S. Weather Bureau. National Oceanic and Atmospheric Administration Library and Information Services Division, Washington, D.C.



Summary of Benefits from C-43 Reservoir

- Change in different flows ranges at S-79
- Salinity and combined events
- Isohaline position changes
 - X_5
 - X_{10}
- Changes in Shoot Biomass for Vallisneria
- Positive effects on planktonic species
 - Habitat Compression

Summary of Benefits from C-43 Reservoir

<u>Flows at S-79 (cfs)</u>	<u>FCB</u>	<u>FCB400</u>	<u>% Diff</u>
# months 0-400	104	14	-86.5%
# months 401-2800	292	388	+32.9%
# months 2800-4500	40	38	-5.0%
# months >4500	32	28	-12.5%

<u>Salinity and Combined Events</u>	<u>FCB</u>	<u>FCB400</u>	<u>% Diff</u>
Average # of days/event	162	137	-15.4%
Average salinity/event	19.6	13.8	-30.6%
Total # of combined events	26	6	-77%

Summary of Benefits from C-43 Reservoir

<u>Isohaline Position (X_5)</u>	<u>FCB</u>	<u>FCB400</u>	<u>Change</u>
X_5 Dry Season Mean + SD	17.1 \pm 13	20.2 \pm 10.2	3.1 km
X_5 Number of Days < 12 km	3709	2025	-45.4%
X_5 Average # of days/event < 12 km	127	70	-44.9%
<u>Isohaline Position (X_{10})</u>			
X_{10} Dry Season Mean + SD	23.5 \pm 13.1	27.5 \pm 8.3	4 km
X_{10} Number of Days < 21 km	3914	2458	-37.2%

Summary of Benefits from C-43 Reservoir

<u>Vallisneria (Site 1)</u>	<u>FCB</u>	<u>FCB400</u>	<u>%Change</u>
Total # events $S \geq 10$ for 55 days	20	6	-70.0%
Average # of days/event	137	115	-16.4%
Dry Season Change in shoot biomass		+19.5%	
Wet Season Change in shoot biomass		+28.5%	

Period of Record for Tape Grass Simulation 1/1/1967-12/31/2005

Summary of Benefits from C-43 Reservoir

<u>Total # of Compression Events</u>	<u>FCB</u>	<u>FCB400</u>	<u>%Change</u>
Lironeca spp. (isopod)	29	4	-86.2
Edotia tribola (isopod)	29	5	-82.8
Americamysis almyra (mysid)	50	31	-38.0
Clytia spp. (jellyfish)	28	4	-85.7
Bowmaniella brasiliensis (mysid)	26	4	-84.6
Gobiidae preflexion (Goby larvae)	24	2	-91.7
Anchoa mitchili (Common Anchovy)	54	7	-87.0
Mnemiopsis leidyi (comb jelly)	54	7	-87.0



Additional Discussion