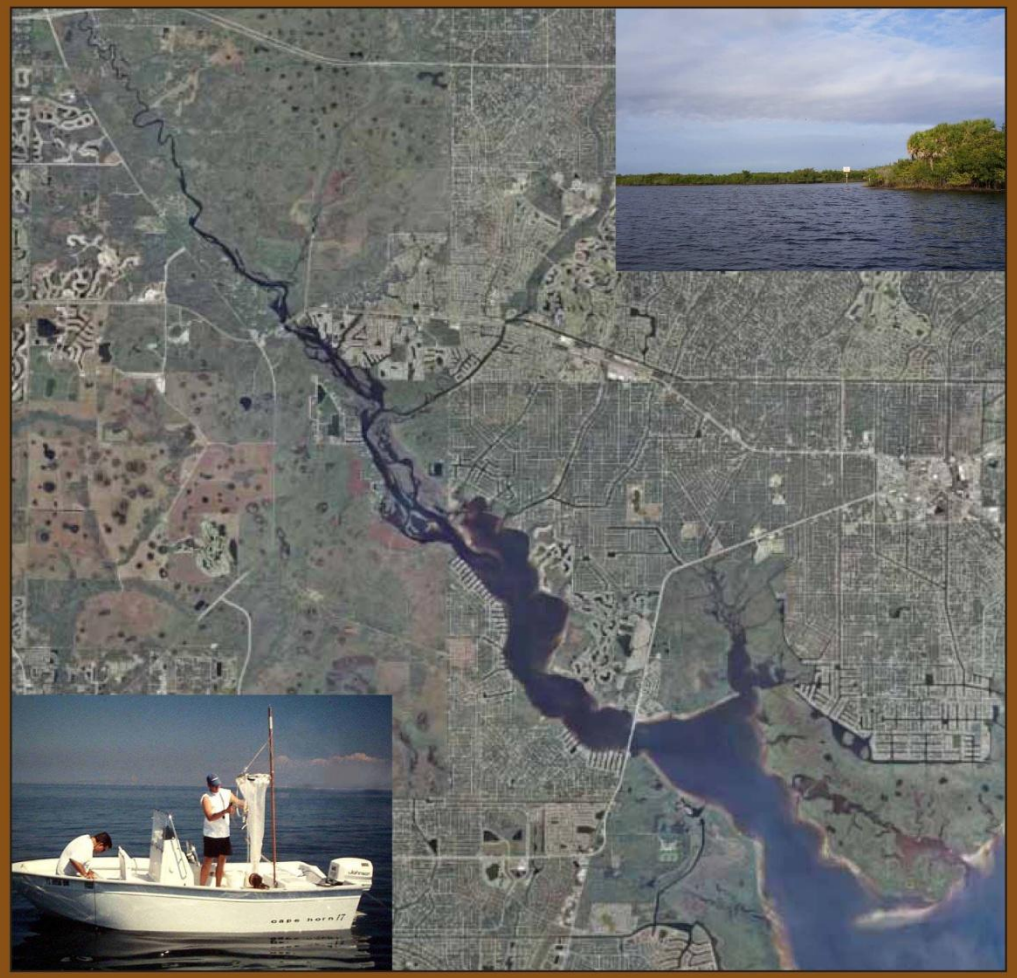
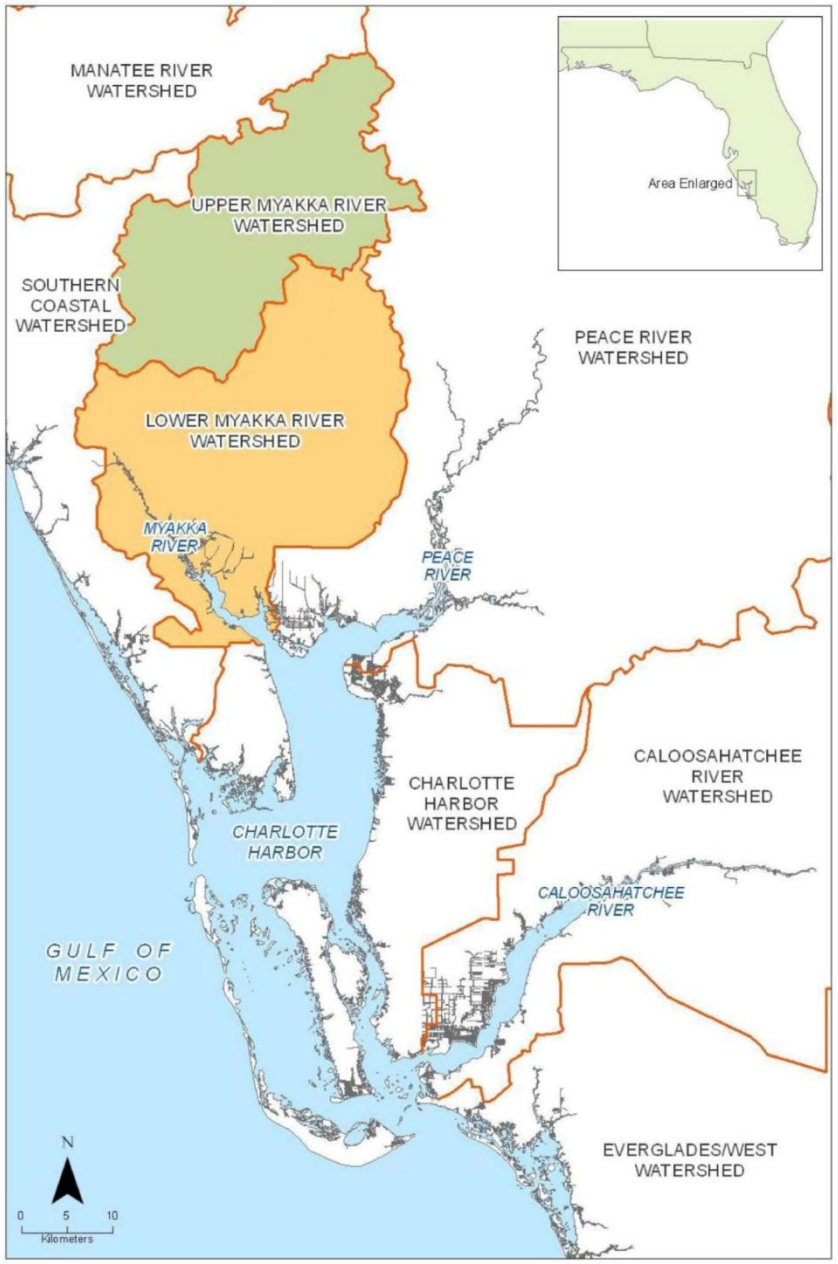
The Determination of Minimum Flows for the Lower Myakka River

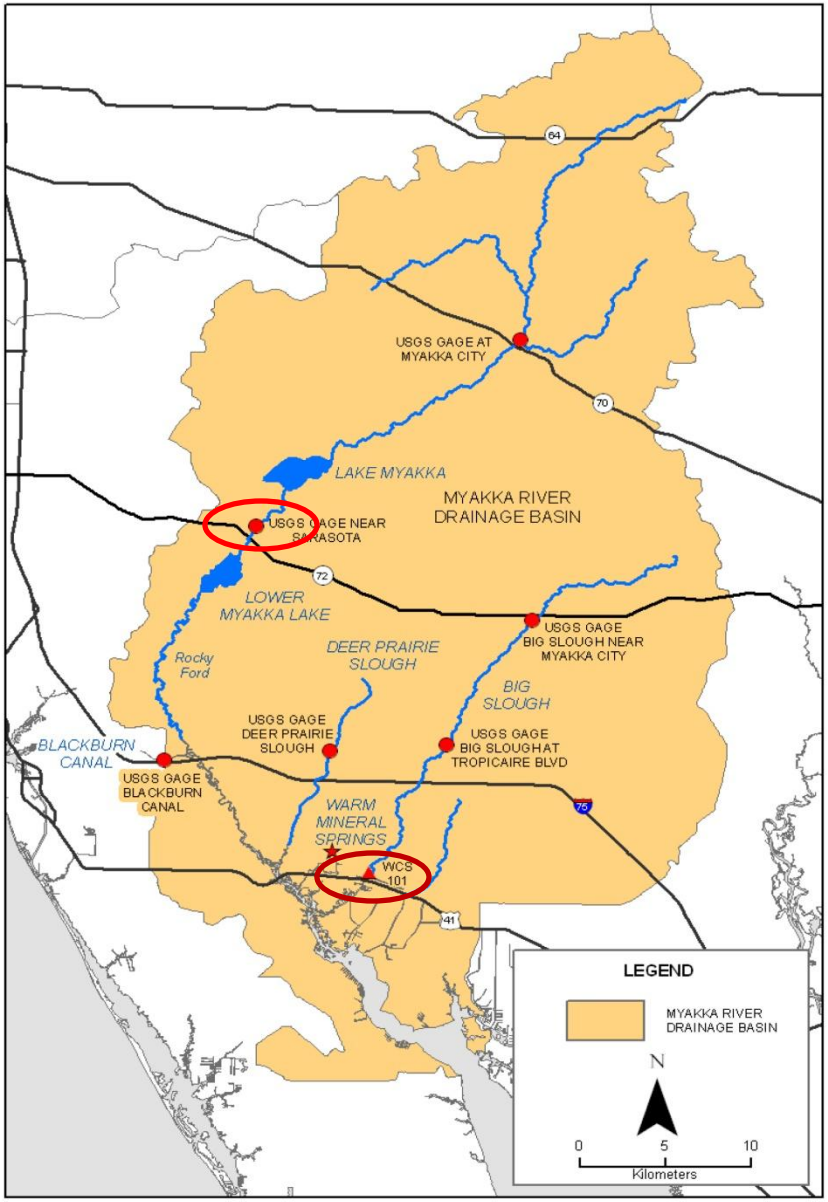
Report of the
Southwest Florida Water Management District

Peer Review Draft - August 24, 2010





Myakka River – Upper and Lower River Sub-basins



Major Streamflow Gages – Myakka River Watershed

Circled - Myakka River near Sarasota

- Myakkahatchee Creek

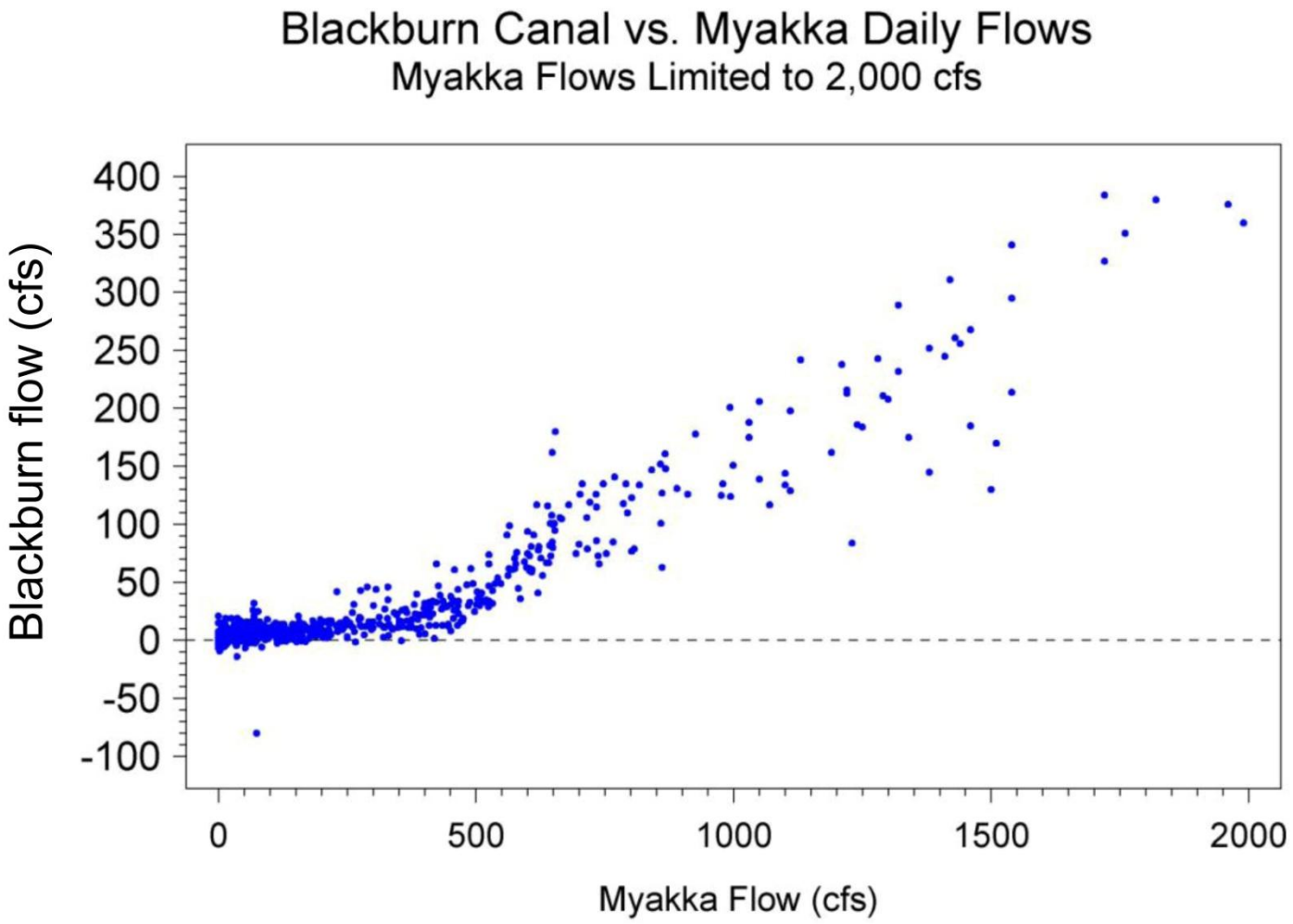


Figure 2-14. Relationship of same-day flows for the USGS streamflow gages at the Blackburn Canal at Venice FL and the Myakka River near Sarasota FL. Data limited to days when flows at the Myakka River gage were less than 2,000 cfs.

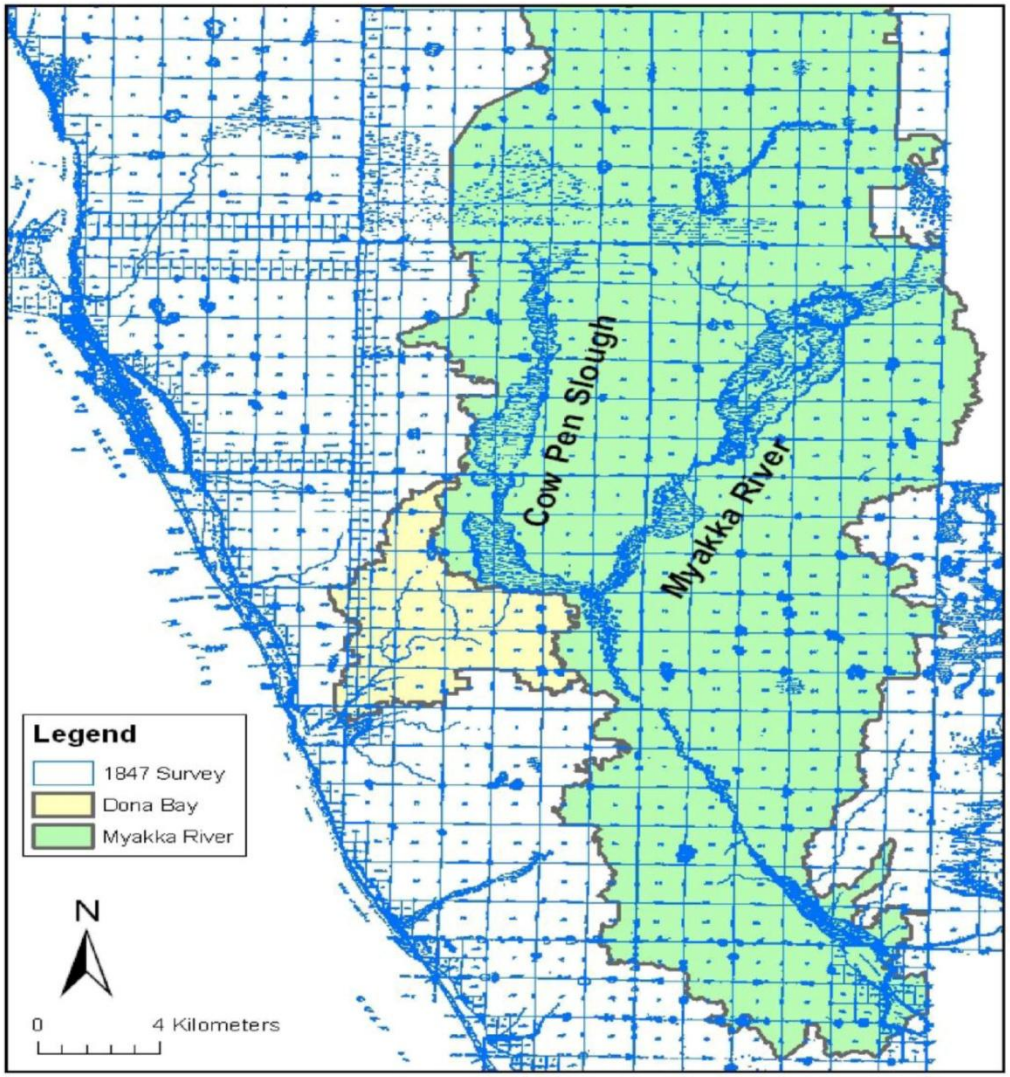


Figure 2-5. Historical watershed boundaries of Dona Bay (yellow) and the Myakka River (green) in the area of Sarasota County taken from the 1847 survey of the region.

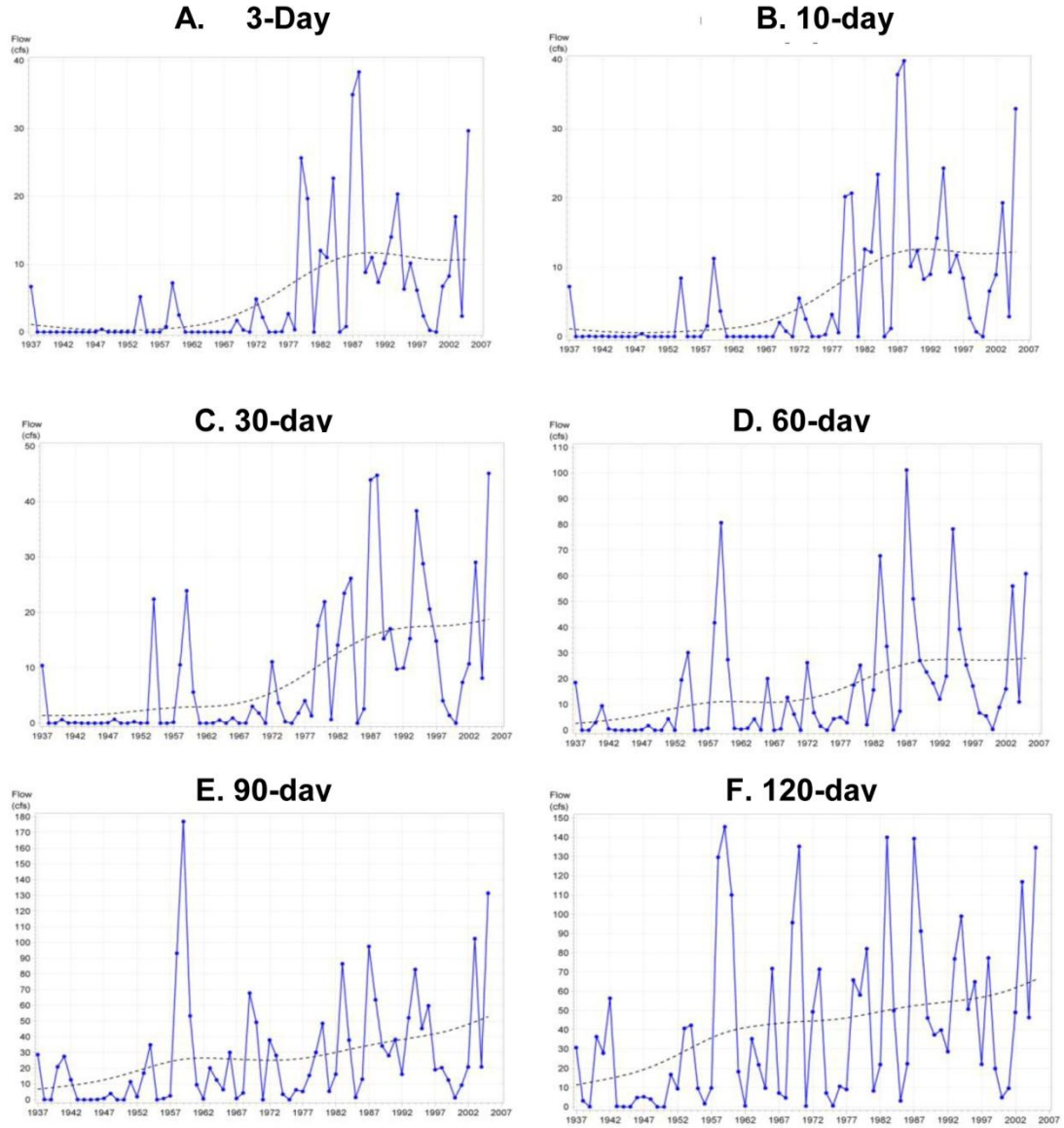
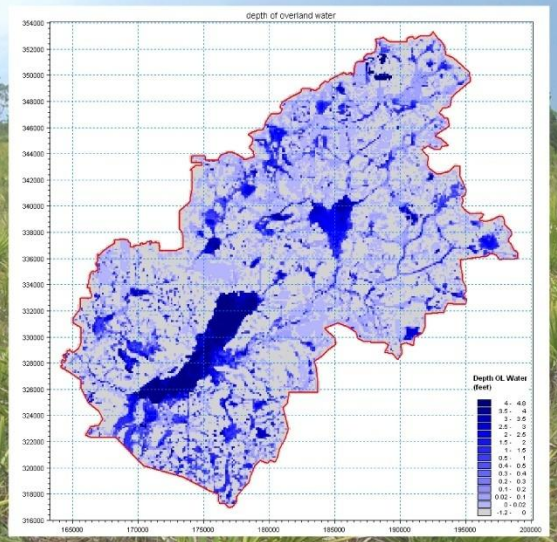


Figure 2-24. Hydrographs of yearly minimum values of the 3, 10, 30, 60, 90 and 120-day moving average flows.

Myakka River Watershed Initiative

Water Budget Model Development and Calibration – Final Report



Prepared by: Interflow Engineering, LLC, in Association with Singhofen and Associates, Inc.

Prepared for: Southwest Florida Water Management District

December 5, 2008

INTERFLOW ENGINEERING LLC

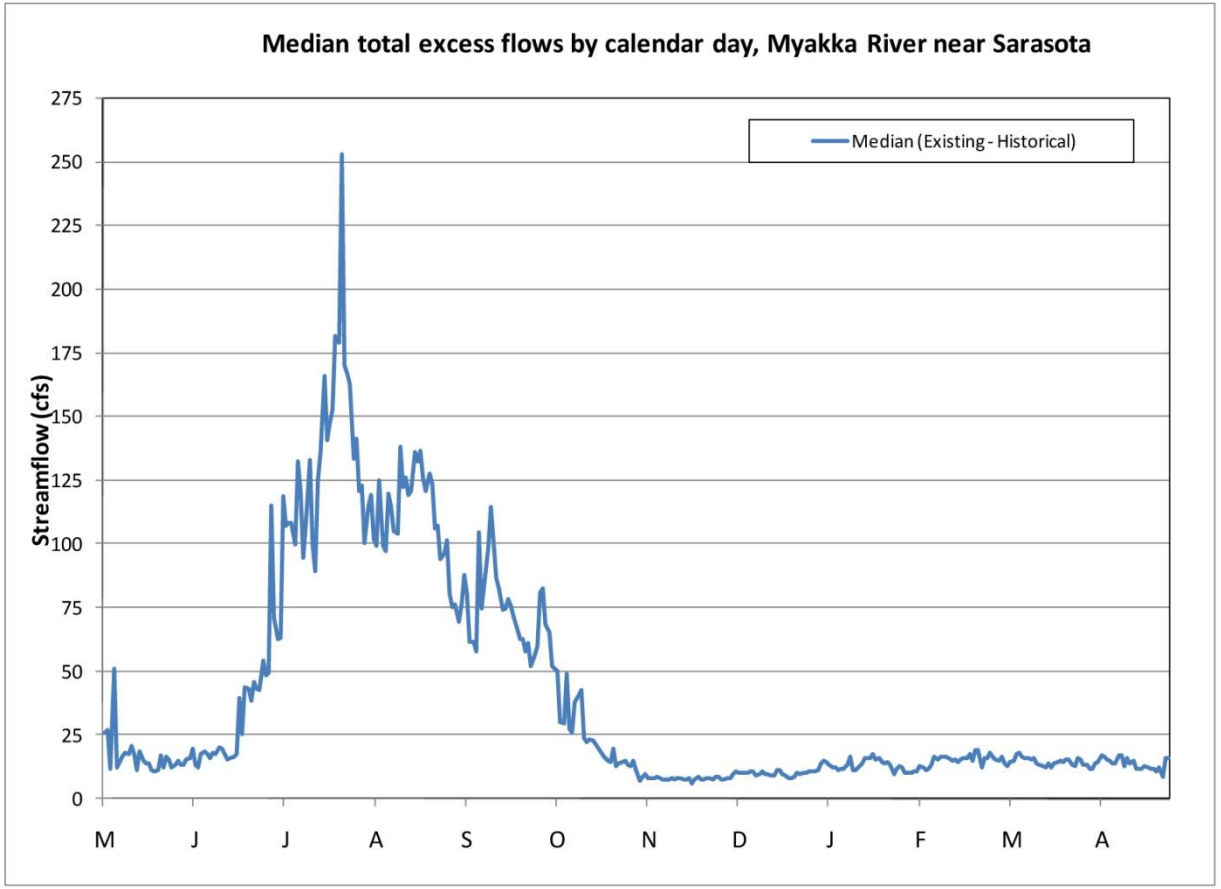


Figure 2-31. Median daily values for total excess flows at the Myakka River near Sarasota gage based a MIKE SHE simulation of the upper river sub-basin for May 1994 through April 2006

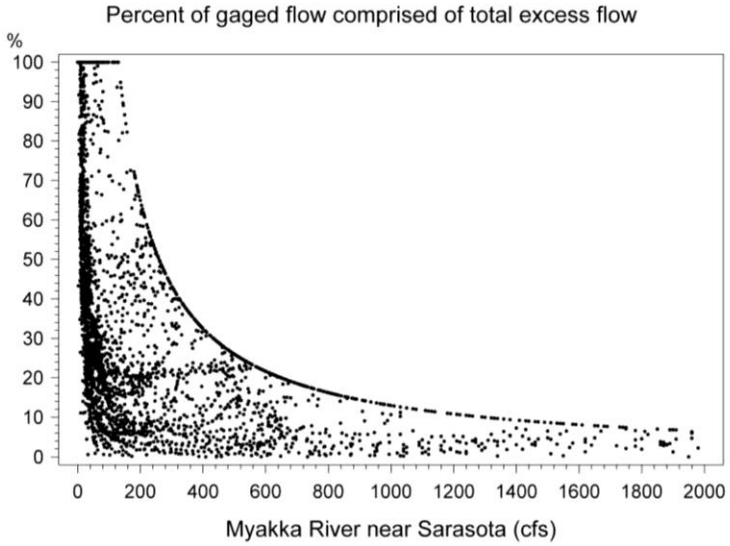


Figure 8-9. Percentages of daily flows at the Myakka River near Sarasota gage comprised by the adjusted total excess flows.

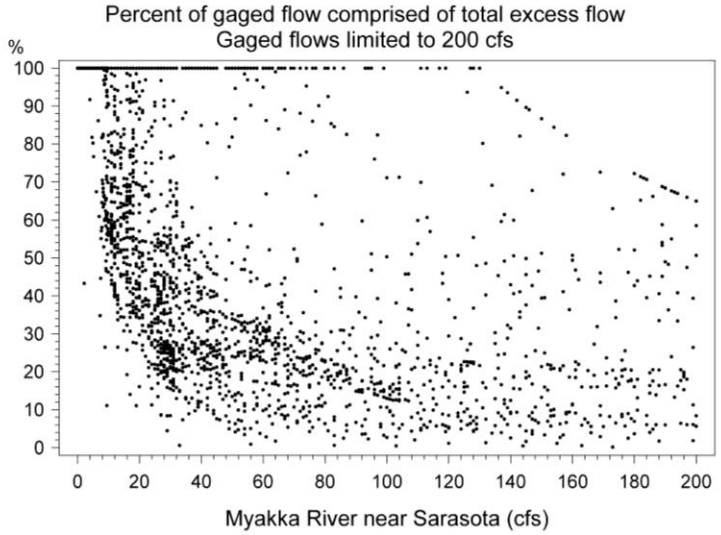
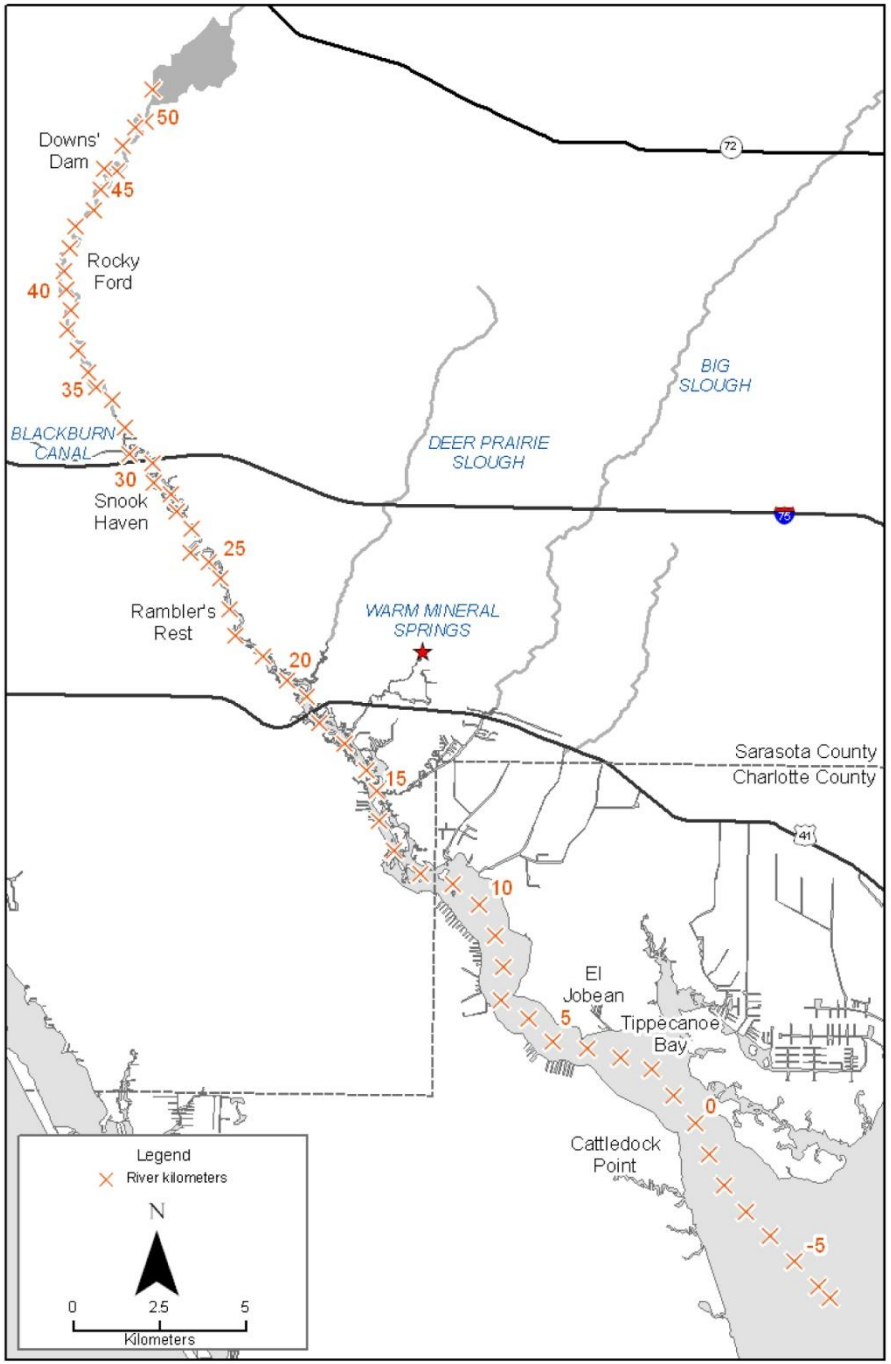


Figure 8-10. Percentages of daily flows at the Myakka River near Sarasota gage comprised by the adjusted total excess flows with the scale of the x axis limited to 200 cfs.


Downs' Dam
50
45
Rocky Ford
40
35
BLACKBURN CANAL
30
Snook Haven
25
Rambler's Rest
20
WARM MINERAL SPRINGS
DEER PRAIRIE SLOUGH
BIG SLOUGH
15
Sarasota County
Charlotte County
10
El Jobean
5
Tippecanoe Bay
0
Cattledock Point
-5
72
75
41
Legend
River kilometers
N
0
2.5
5
Kilometers

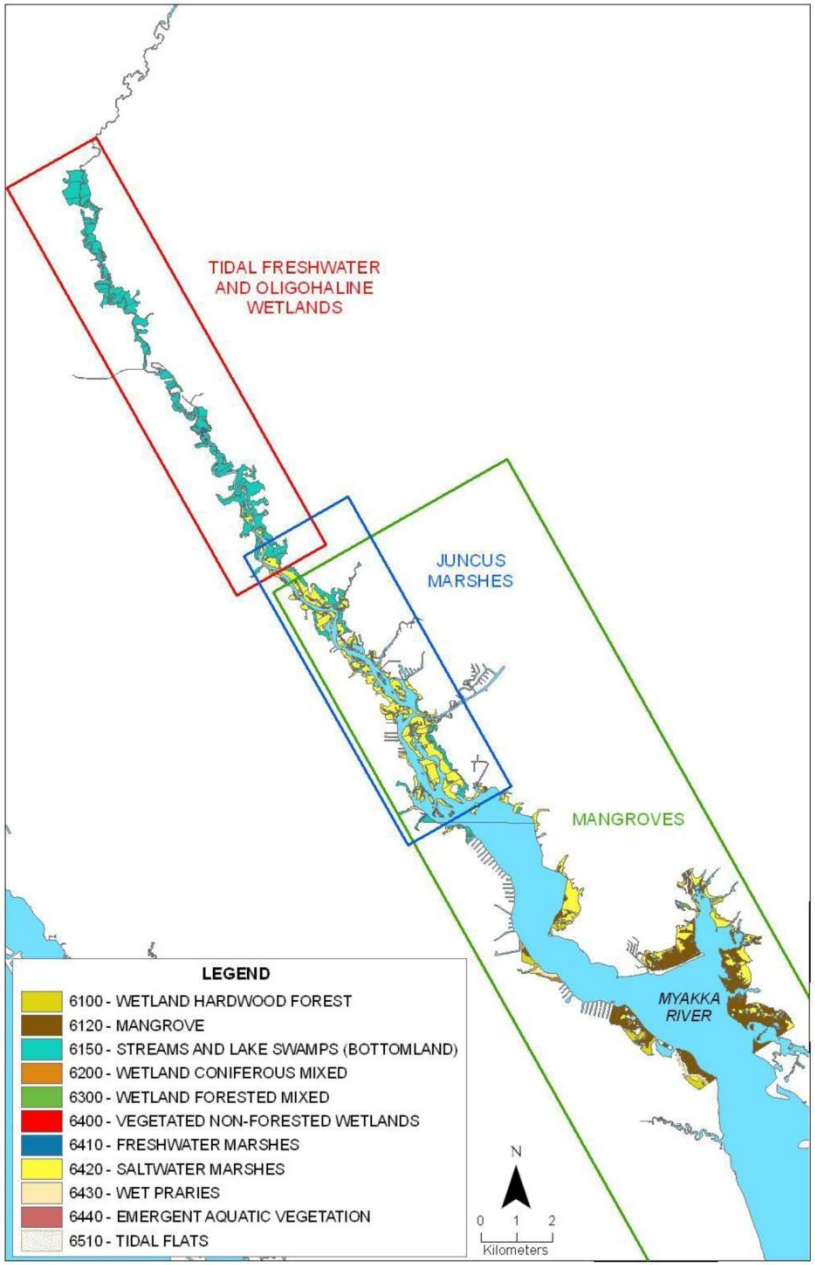


Figure 6-2. Ten wetland forms identified from FLUCCS aggregated into three principal zones characterized by dominant vegetation communities on the Lower Myakka River. A fourth zone, freshwater floodplain forests, lies upstream.

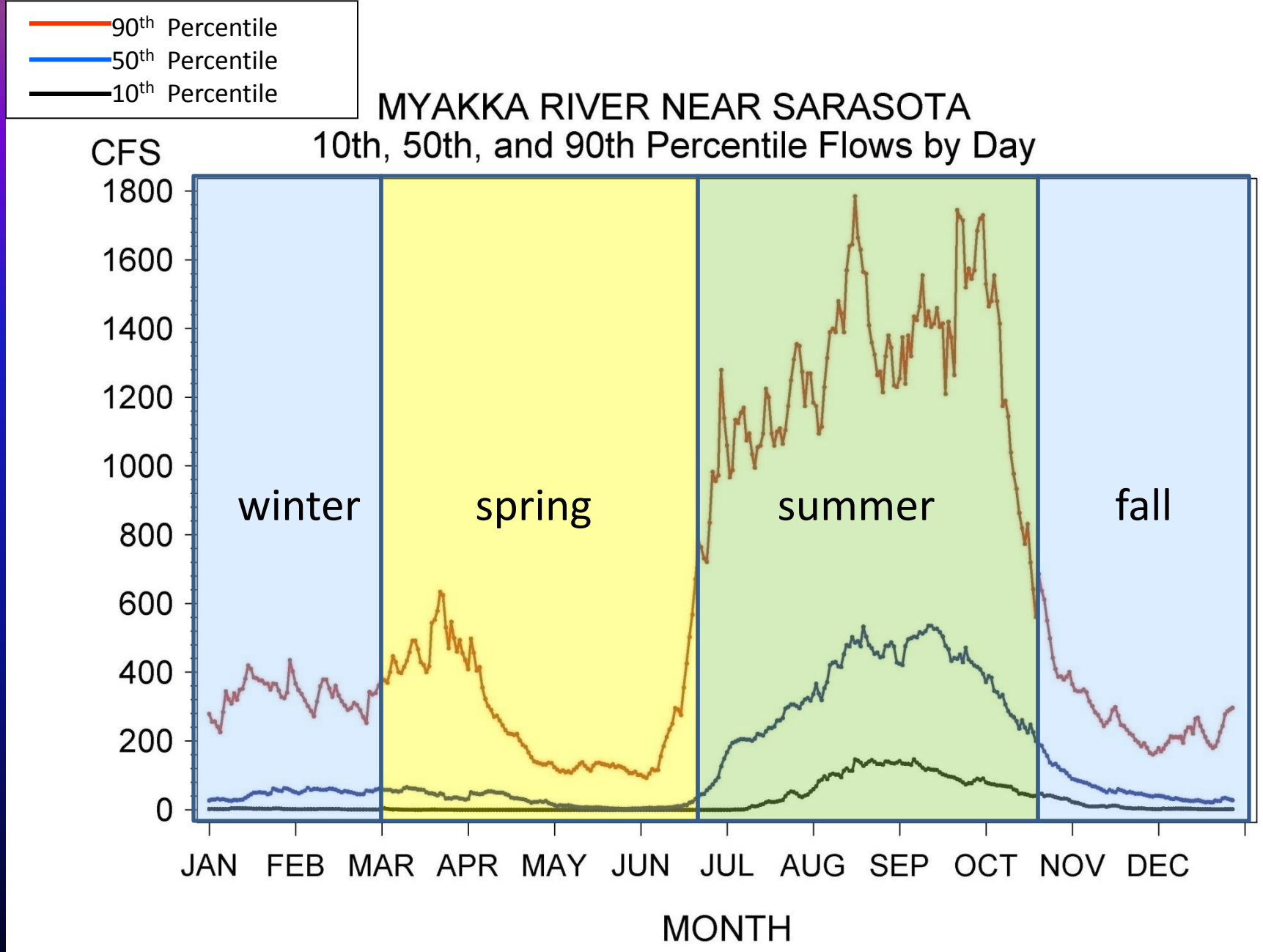

90th Percentile
50th Percentile
10th Percentile
MYAKKA RIVER NEAR SARASOTA
10th, 50th, and 90th Percentile Flows by Day
CFS
1800
1600
1400
1200
1000
800
600
400
200
0
winter
spring
summer
fall
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH

Table 8-17. Shoreline lengths and areas of oligohaline / tidal freshwater wetlands upstream of the median location of the 2 psu surface isohaline in Block 1 (March 1 - June 20) for 1995-2004 and 1999-2002. Values also expressed as percent reductions from baseline. Percent reductions greater than 15% are highlighrted in yellow, reductions greater than 25% are highlighted in gray

	Shoreline lengths of Oligohaline Tidal Freshwater Wetlands upstream of the median position of the 2 psu surface isohaline in Block 1			
	1995-2004		**1999-2002**	
Block 1 (March 1 - June 20)	***Kilometers of OTF Shoreline***	***Percent reduction from baseline***	***Kilometers of OTF Shoreline***	***Percent reduction from baseline***
Baseline	3.102	NA	0.952	NA
Agricutural adjustment	2.153	31%	0.796	16%
Total adjustment	2.048	34%	0.739	22%
Total adjustment + North Port - 10%	1.853	40%	0.681	28%
Total adjustment + North Port - 20%	1.562	50%	0.624	34%
Total adjustment + North Port - 30%	1.367	56%	0.624	34%

	Hectares of Oligohaline Tidal Freshwater Wetlands upstream of the median position of the 2 psu surface isohaline in Block 1			
	1995-2004		**1999-2002**	
Block 1 (March 1 - June 20)	***Hectares of OTF Wetlands***	***Percent reduction from baseline***	***Hectares of OTF Wetlands***	***Percent reduction from baseline***
Baseline	24.316	NA	7.075	NA
Agricutural adjustment	16.585	32%	6.546	7%
Total adjustment	15.725	35%	6.374	10%
Total adjustment + North Port - 10%	14.107	42%	6.203	12%
Total adjustment + North Port - 20%	11.680	52%	6.004	15%
Total adjustment + North Port - 30%	10.062	59%	5.950	16%

Table 8-11. Percent reductions in the bottom area and water volume of selected salinity zones in the Lower Myakka River for flow reduction scenarios relative to baseline flows for the years 1999-2002. Percent reductions greater than or equal to 15% are highlighted in yellow. All values rounded to nearest integer. NA is listed for zones that moved past the downstream end of the study area for substantial amounts of time.

Bottom Area	**Salinity Zone**					
	<2 psu	***< 5 psu***	***<12 psu***	***<17 psu***	***2 to 12 psu***	***11 to 17 psu***
North Port Permitted	1%	1%	NA	NA	NA	NA
Agricutural adjustment	6%	5%	NA	NA	NA	NA
Total adjustment	6%	5%	NA	NA	NA	NA
Total adjustment - North Port	7%	6%	NA	NA	NA	NA
Total adjustment - North Port - 10%	10%	8%	NA	NA	NA	NA
Total adjustment - North Port - 20%	12%	11%	NA	NA	NA	NA
Total adjustment - North Port - 30%	15%	13%	NA	NA	NA	NA

Water Volume	**Salinty Zone**				
	<2 psu	***< 5 psu***	***< 14 psu***	***3 to 14 psu***	
North Port Permitted	1%	1%	NA	NA	
Agricutural adjustment	6%	5%	NA	NA	
Total adjustment	6%	6%	NA	NA	
Total adjustment - North Port	7%	7%	NA	NA	
Total adjustment - North Port - 10%	10%	9%	NA	NA	
Total adjustment - North Port - 20%	13%	11%	NA	NA	
Total adjustment - North Port - 30%	16%	13%	NA	NA	

Table 8-12. Percent reductions in the bottom area and water volume of selected salinity zones in the Lower Myakka River for flow reduction scenarios relative to baseline flows for BLOCK 1 during the years 1999-2002. Percent reductions greater than or equal to 15% are highlighted in yellow; reductions greater than or equla to 25% are highlighted in gray. All values rounded to nearest integer.

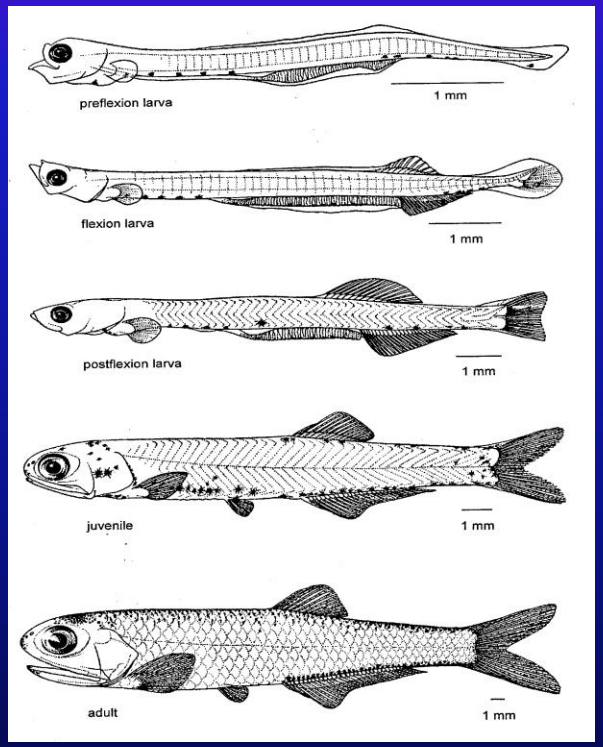
Bottom Area Block 1 (March 1 - June 20)	Salinity Zone					
	<2 psu	*< 5 psu*	*<12 psu*	*<17 psu*	*2 to 12 psu*	*11 to 17 psu*
North Port Permitted	2%	2%	4%	3%	5%	2%
Agricutural adjustment	16%	16%	15%	10%	14%	8%
Total adjustment	21%	21%	20%	13%	19%	11%
Total adjustment - North Port	23%	23%	25%	17%	25%	15%
Total adjustment - North Port - 10%	27%	27%	28%	20%	28%	17%
Total adjustment - North Port - 20%	31%	31%	32%	23%	32%	20%
Total adjustment - North Port - 30%	35%	35%	37%	26%	37%	23%

Water Volume Block 1 (March 1 - June 20)				
	<2 psu	*< 5 psu*	*< 14 psu*	*3 to 14 psu*
North Port Permitted	2%	2%	4%	5%
Agricutural adjustment	16%	13%	15%	14%
Total adjustment	21%	17%	19%	19%
Total adjustment - North Port	22%	19%	24%	24%
Total adjustment - North Port - 10%	26%	22%	28%	28%
Total adjustment - North Port - 20%	30%	26%	33%	34%
Total adjustment - North Port - 30%	34%	31%	37%	38%

Table 8-13. Percent reductions in the bottom area and water volume of selected salinity zones in the Lower Myakka River for flow reduction scenarios relative to baseline flows for BLOCK 2 during the years 1999-2002. Percent reductions greater than or equal to 15% are highlighted in yellow. NA is listed for zones that moved past the downstream end of the study area for substantial amounts of time during Block 2.

Bottom Area Block 2 (Oct. 28 - Feb. 28)	Salinity Zone					
	<2 psu	*< 5 psu*	*<12 psu*	*<17 psu*	*2 to 12 psu*	*11 to 17 psu*
North Port Permitted	1%	1%	NA	NA	NA	NA
Agricutural adjustment	5%	5%	NA	NA	NA	NA
Total adjustment	5%	5%	NA	NA	NA	NA
Total adjustment - North Port	7%	7%	NA	NA	NA	NA
Total adjustment - North Port - 10%	11%	11%	NA	NA	NA	NA
Total adjustment - North Port - 20%	14%	14%	NA	NA	NA	NA
Total adjustment - North Port - 30%	18%	18%	NA	NA	NA	NA

Water Volume Block 2 (Oct. 28 - Feb. 28)	Salinity Zone				
	<2 psu	*< 5 psu*	*< 14 psu*	*3 to 14 psu*	
North Port Permitted	1%	2%	NA	NA	
Agricutural adjustment	6%	5%	NA	NA	
Total adjustment	6%	6%	NA	NA	
Total adjustment - North Port	7%	8%	NA	NA	
Total adjustment - North Port - 10%	11%	10%	NA	NA	
Total adjustment - North Port - 20%	15%	13%	NA	NA	
Total adjustment - North Port - 30%	19%	16%	NA	NA	



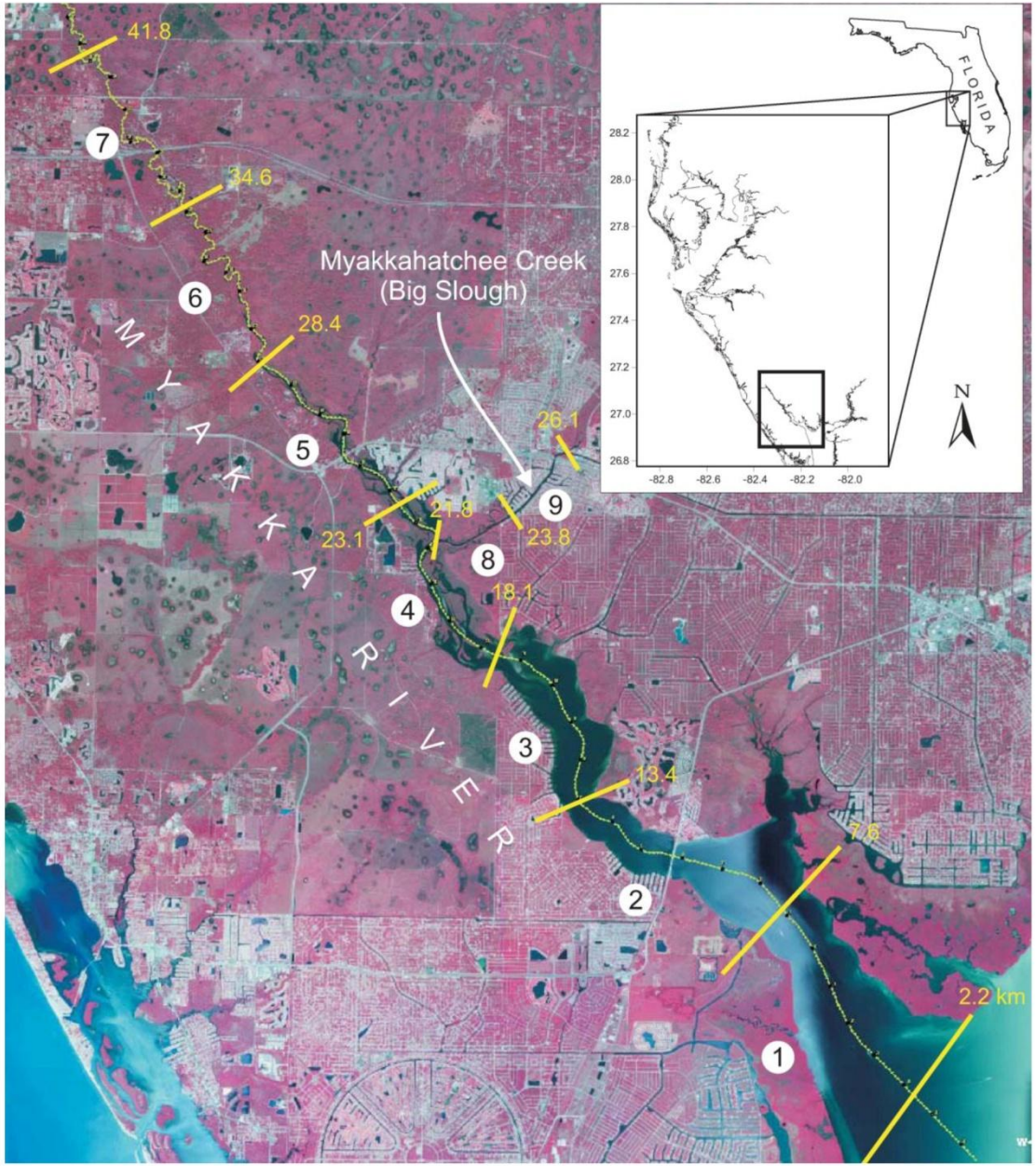


Figure 6-29. Map of USF/FFWCC sampling zones with kilometer distiches shown in yellow. A value of 6.5 km should be subtracted from the kilometer values shown on the map to correspond to the SWFWMD centerline scale for the river.

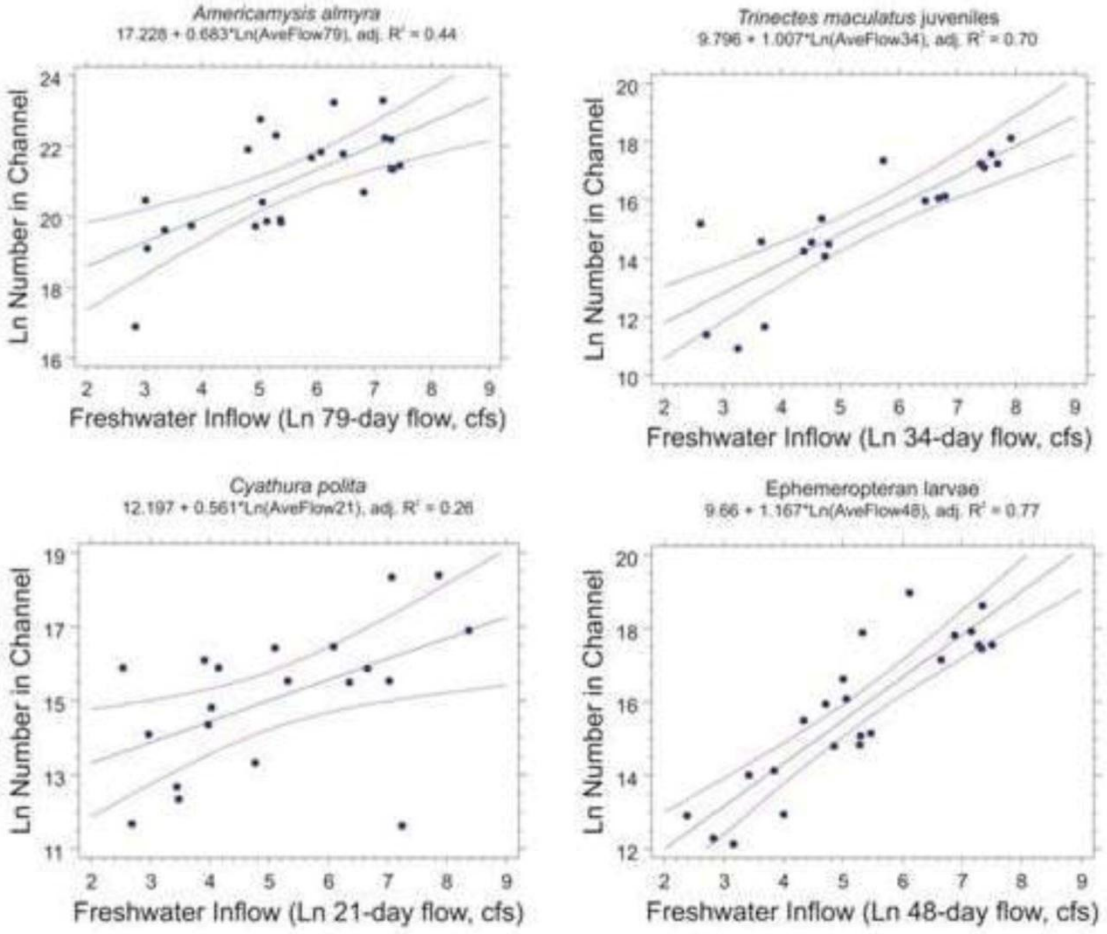


Figure 6-32. Relationships of total abundance vs. gaged freshwater inflow for four fish and invertebrate taxa captured by plankton net in the Lower Myakka River. The gage in the flow term for *Ephemeropteran* larvae is the Myakka River near Sarasota. The sum of flows at that gage and the Big Slough (Myakkahatchee Creek) at Tropicaire Blvd. is the flow term for the other taxa.

Table 8-27. Summary of results of percent changes in abundance metrics for **BLOCK 1** for four fish and invertebrate taxa from the plankton catch predicted with regressions presented by Peebles (2008) that use the sum of the Myakka River and Myakkahatchee Creek gages. Results listed as percent change from baseline for four flow reduction scenarios for two time periods (1995-2004 and 1999-2002). Results for each scenario are listed for predictions limited to the flow domains of the regression (left of -) and predictions using all flows (right of -). Cells that include percent changes of 15% and greater are highlighted in yellow and changes 25% and greater are highlighted in gray.

		1995-2004				1999-2002			
		A	B	C	D	A	B	C	D
Taxon	Scenario	median percent change	NAUC CDF curves	mean abundance	median abundance	median percent change	NAUC CDF curves	mean abundance	median abundance
Americamysis almyra	NP	3 - 3	2	2 - 2	3 - 3	4 - 4	4	4 - 4	3 - 4
	Total adjustment	14 - 17	9	10 - 11	17 - 14	20 - 21	17	18 - 20	23 - 22
	Total adjustment - NP	17 - 23	11	12 - 13	21 - 18	25 - 27	21	22 - 25	26 - 26
	Total adjustment - NP - 10%	22 - 28	17	17 - 19	26 - 23	29 - 31	26	26 - 29	27 - 31
Americamysis almyra (2) *	NP	4 - 4	2	3 - 3	4 - 4	4 - 7	5	5 - 6	3 - 6
	Total adjustment	16 - 24	12	13 - 14	16 - 25	28 - 34	24	24 - 27	26 - 33
	Total adjustment - NP	20 - 30	15	15 - 17	19 - 26	33 - 38	29	29 - 33	26 - 39
	Total adjustment - NP - 10%	26 - 36	19	20 - 22	22 - 30	39 - 45	34	35 - 40	32 - 46
Trinectes maculatus juveniles	NP	5 - 6	3	2 - 3	8 - 6	6 - 8	5	5 - 6	7 - 12
	Total adjustment	26 - 30	12	12 - 13	26 - 36	29 - 34	26	26 - 29	34 - 32
	Total adjustment - NP	32 - 36	14	14 - 15	31 - 39	34 - 42	31	31 - 33	39 - 41
	Total adjustment - NP - 10%	38 - 42	22	22 - 22	38 - 44	40 - 47	37	37 - 39	45 - 46
Cyathura polita	NP	3 - 4	2	2 - 3	4 - 4	4 - 5	3	4 - 2	3 - 4
	Total adjustment	17 - 20	12	12 - 13	16 - 25	18 - 22	17	18 - 22	19 - 24
	Total adjustment - NP	19 - 24	15	14 - 15	19 - 26	21 - 31	20	21 - 21	23 - 23
	Total adjustment - NP - 10%	24 - 28	19	22 - 22	22 - 30	25 - 34	24	25 - 25	27 - 27
Menidia spp.	NP	2 - 2	2	2 - 1	3 - 1	3 - 3	2	3 - 0	3 - 1
	Total adjustment	12 - 12	9	13 - 13	15 - 15	14 - 14	11	15 - 15	14- 14
	Total adjustment - NP	15 - 15	11	16 - 11	17 - 14	19 - 19	13	19 - 12	19 - 13
	Total adjustment - NP - 10%	18 - 18	13	18 - 13	20 - 17	21 - 21	16	21 - 14	21 - 16

Table 8-28. Summary of results of percent changes in abundance metrics for **BLOCK 2** for four fish and invertebrate taxa from the plankton catch predicted with regressions presented by Peebles (2008) that use the sum of the Myakka River and Myakkahatchee Creek gages. Results listed as percent change from baseline for four flow reduction scenarios for two time periods (1995-2004 and 1999-2002). Results for each scenario are listed for predictions limited to the flow domains of the regression (left of -) and predictions using all flows (right of -). Cells that include percent changes of 15 % and greater and are highlighted in yellow and changes of 25% and greater are highlighted in gray.

		1995-2004				1999-2002			
		A	B	C	D	A	B	C	D
Taxon	Scenario	median percent change	NAUC CDF curves	mean abundance	median abundance	median percent change	NAUC/CDF curves	mean abundance	median abundance
Americamysis almyra	NP	2 - 2	1	1 - 1	1 - 2	2 - 2	2	2 - 2	2 - 2
	Total adjustment	7 - 7	5	6 - 6	5 - 4	8 - 8	7	8 - 8	6 - 7
	Total adjustment - NP	8 - 9	7	7 - 7	6 - 6	10 - 10	9	9 - 10	8 - 9
	Total adjustment - NP - 10%	14 - 14	12	12 - 12	11 - 12	15 - 15	14	14 - 15	14 - 15
Americamysis almyra (2) *	NP	1 - 1	1	1 - 1	1 - 1	2 - 2	2	2 - 2	2 - 2
	Total adjustment	5 - 6	5	5 - 5	4 - 4	7 - 8	7	7 - 7	7 - 6
	Total adjustment - NP	7 - 7	6	6 - 7	5 - 6	8 - 9	8	8 - 9	6 - 7
	Total adjustment - NP - 10%	11 - 12	10	11 - 11	10 - 11	13 - 14	13	13 - 14	8 - 8
Trinectes maculatus juveniles	NP	4 - 4	2	2 - 2	4 - 4	6 - 6	3	4 - 4	6 - 7
	Total adjustment	12 - 12	6	5 - 5	11 - 14	15 - 16	11	11 - 12	13 - 14
	Total adjustment - NP	14 - 17	6	8 - 8	16 - 18	20 - 22	14	14 - 15	20 - 21
	Total adjustment - NP - 10%	22 - 24	8	10 - 10	24 - 26	28 - 29	22	22 - 23	25 - 27
Cyathura polita	NP	3 - 3	2	2 - 2	3 - 3	4 - 4	3	2 - 3	4 - 5
	Total adjustment	7 - 8	5	5 - 6	4 - 4	9 - 10	10	8 - 9	10 - 10
	Total adjustment - NP	10 - 11	7	7 - 8	5 - 6	13 - 15	15	11 - 13	13 - 14
	Total adjustment - NP - 10%	14 - 16	11	12 - 13	10 - 11	17 - 19	17	15 - 18	16 - 17
Menidia spp.	NP	2-2	1	2 - 2	2 -2	2 - 2	2	2 -2	3 - 3
	Total adjustment	5-5	4	5 - 5	5 - 5	7 - 7	7	7 - 7	6 - 6
	Total adjustment - NP	7-- 7	5	8 - 8	7 - 7	10 - 10	10	11- 11	10 - 10
	Total adjustment - NP - 10%	10- 10	8	10 - 10	9 - 9	12- 12	11	13 - 13	12- 12

A

* double reciprocal model

Lower Myakka River
Proposed Minimum Flow Rule

- Withdrawals limited to excess flow (up to 130 cfs) in upper river sub-basin when flows at the Myakka River near Sarasota gage are less than 400 cfs
- Withdrawals include excess flow plus 10% of remaining flow at gage when gaged flows exceed 400 cfs
- Minimum flows for Myakkahatchee Creek adopted within five years

Lower Myakka River
Adaptive management options

- The simultaneous implementation of the Upper Myakka River Basin Initiative and the Lower Myakka minimum flows will require hydrologic monitoring and adaptive management

- Evaluate strategies to replace lost flows to the Lower River resulting from removal of excess flows

Lower Myakka River
Minimum flows Current status

- Have received report of scientific peer review panel
- Panel is interested in historic flow simulation that includes effects of Cowpen Slough and Blackburn Canal modifications on reducing flow to the lower river
- Panel emphasizes the District evaluate strategies to replace lost flows to the Lower River resulting from removal of excess flows, particularly in the dry season
- District will respond to peer review report