

Appendix 4-2: Supplemental Information for the Non-Everglades Construction Project Basins in the Southern Everglades

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INTRODUCTION

During Water Year 2015 (WY2015) (May 1, 2014–April 30, 2015), various structures served as direct or indirect discharge points from the five Non-Everglades Construction Project (Non-ECP) basins into the Everglades Protection Area (EPA) (see Figure 4-7 of this volume for the location of each Non-ECP basin and its associated structures). The Non-ECP structures are within the control of the South Florida Water Management District (District or SFWMD) and are referred to as “into” structures under the Non-ECP permit, with the exception of structure NSID1, which is owned and operated by the North Springs Improvement District (NSID). This appendix incorporates flow and total phosphorus (TP) data for all “into” structures.

For the five Non-ECP basins, the Florida Department of Environmental Protection Permit Number 06, 502590709 requires the District to evaluate and report on the progress toward achieving established water quality standards and the effectiveness of source control strategies based on required water quality monitoring. The data collection requirements for structures associated with the Non-ECP basins are outlined in the Non-ECP permit. Chapter 3A of this volume and Volume III, Appendix 3-2, provide the WY2015 update on the District’s data collection efforts for Non-ECP structures. This appendix summarizes the flows, TP loads, and TP flow-weighted mean concentrations (FWMC) at each basin discharge structure for WY1998 through WY2015.

The Acme Basin, which was previously considered to be a sixth Non-ECP basin, has been designated as an Everglades Construction Project (ECP) basin since December 2006. At that time, runoff from the two Acme Improvement District (Acme) Basin structures was diverted from the EPA into the C-51 West Canal and then generally directed to Stormwater Treatment Area (STA) 1 East (STA-1E). However, this appendix includes historical discharge information from the Acme Basin to the EPA. The ACME1 structure was removed in 2007 and the ACME2 structure has only been allowed to directly discharge untreated flows into Water Conservation Area (WCA) 1 under emergency conditions, such as the August 2012 Tropical Storm Isaac.

Maps showing the most recent land use data (2008–2009) for the NSID and C-11 West, C-111, Acme Improvement District, and Feeder Canal and L-28 basins are presented in **Figures 1 through 4**, respectively.

NON-ECP BASIN SUPPLEMENTAL EVALUATION

BASIN-LEVEL MONITORING DATA

The District monitors flow at structures S-190, S-140, S-18C, S-332D, S-9, and S-9A, as well as water quality by way of surface water manual grab samples and deployed automatic surface water samplers (auto-sampler). In addition, the NSID1 and ACME1 and ACME2 structures were monitored by the District until 2010 and 2006, respectively. After those dates, monitoring for these structures was continued by NSID and ACME Improvement District, respectively. **Table 1** summarizes the annual total flow, total TP load, and TP FWMC for each of the structures. The individual aggregated structure summaries represent the collective discharge into a given receiving water body. The receiving water bodies include WCA-1, WCA-2A, WCA-3A, and Everglades National Park (ENP). The individual and aggregated structure summaries for Non-ECP basins are presented for WY2006–WY2015. Volume III, Appendix 3-2, presents WY2015 water quality sampling statistics for these Non-ECP basin discharge structures, including C-111 Basin upstream structures.

BASIN-LEVEL WATER QUALITY SUMMARY

This section summarizes the water quality results for the Non-ECP and Acme basins. **Figures 5 through 8** summarize annual TP load, TP FWMC, and five-year rolling averages for the Feeder Canal, L-28, C-111, and C-11 West basins for WY1998–WY2015. **Figures 9 and 10** summarize annual TP load and TP FWMC for the NSID and Acme basins for WY1998–WY2015. It should be noted that **Figures 7 through 10** represent the TP loads from the C-111, C-11 West, NSID, and Acme basins to the EPA and not their discharges to tide. The water quality summary for each Non-ECP basin is also discussed in Chapter 4 of this volume.

UPSTREAM (SUBBASIN) LEVEL WATER QUALITY SUMMARY

Water quality, particularly TP concentrations, in Everglades Non-ECP basins and the Acme Basin is monitored at the upstream sampling sites during flow events within each basin. This section summarizes the upstream water quality data for grab and auto-sampler sites for most Non-ECP basins.

Figures 11 through 13 present WY2015 water quality data for upstream grab sampling sites within the C-11 West (consisting of South Broward Drainage District, Central Broward Water Control District, and Indian Trace Development District), NSID, and Acme basins, respectively. The grab data for these upstream sites is collected by drainage districts designated by Chapter 298, Florida Statutes.

Figure 14 shows the location of upstream structures monitored by the District via grab samples and auto-samplers within the Feeder Canal Basin (PC-17A, G-108, and WWEIR) and the L-28 basin (USSO). Flow was also monitored at these structures. **Figure 15** summarizes combined annual TP load, TP FWMC, and five-year rolling averages for the PC-17A and G-108 structures for WY1999–WY2015. Removal of G-108 in April 2010 resulted in the diversion of flow from direct discharge to the North Feeder Canal through PC-17A. **Figures 16 and 17** summarize annual TP load, TP FWMC, and five-year rolling averages for the WWEIR and USSO structures, respectively, for WY1998–WY2015.

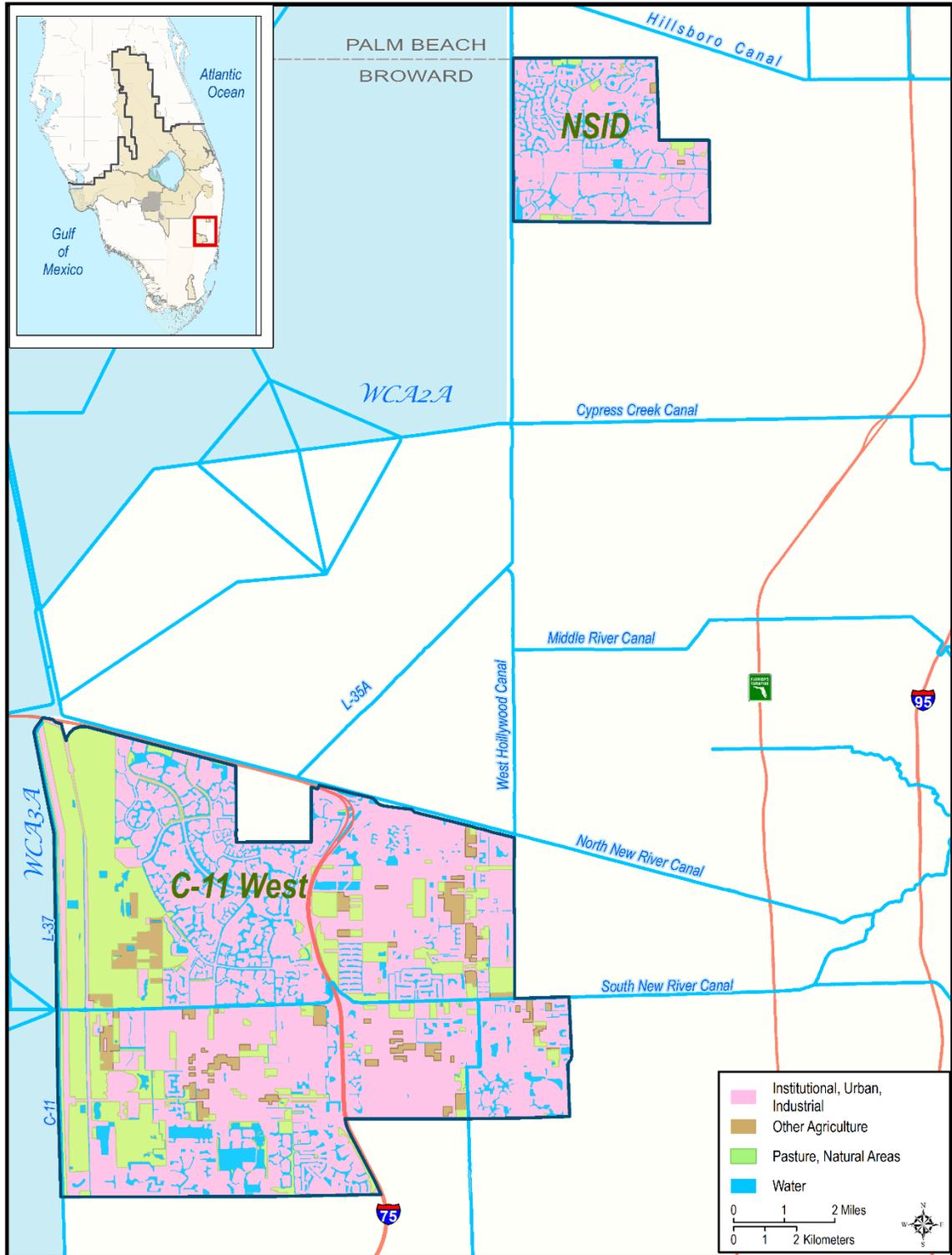


Figure 1. NSID and C-11 West land use map. Land use from the most recent available data set (2008–2009).

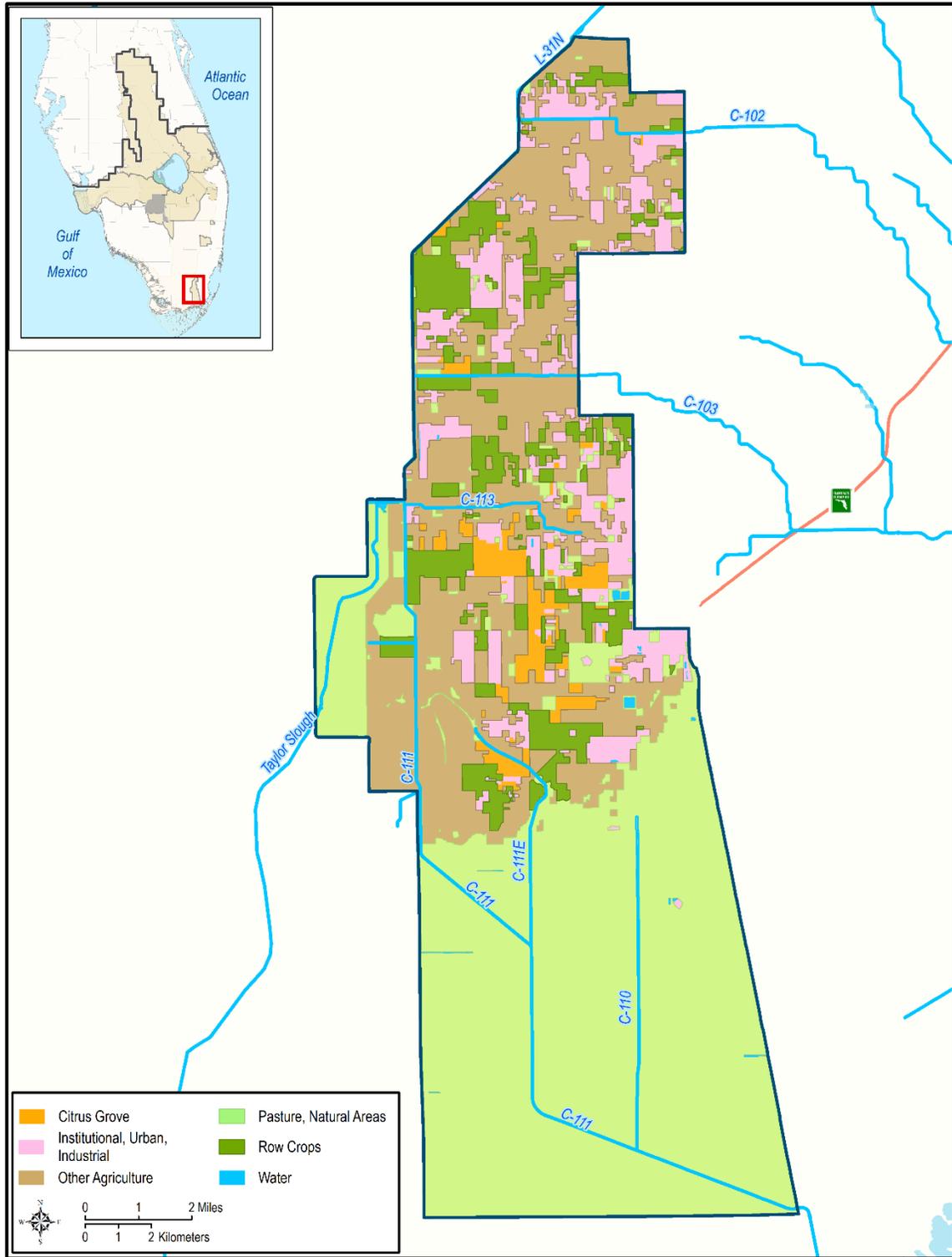


Figure 2. C-111 land use map. Land use from the most recent available data set (2008–2009).

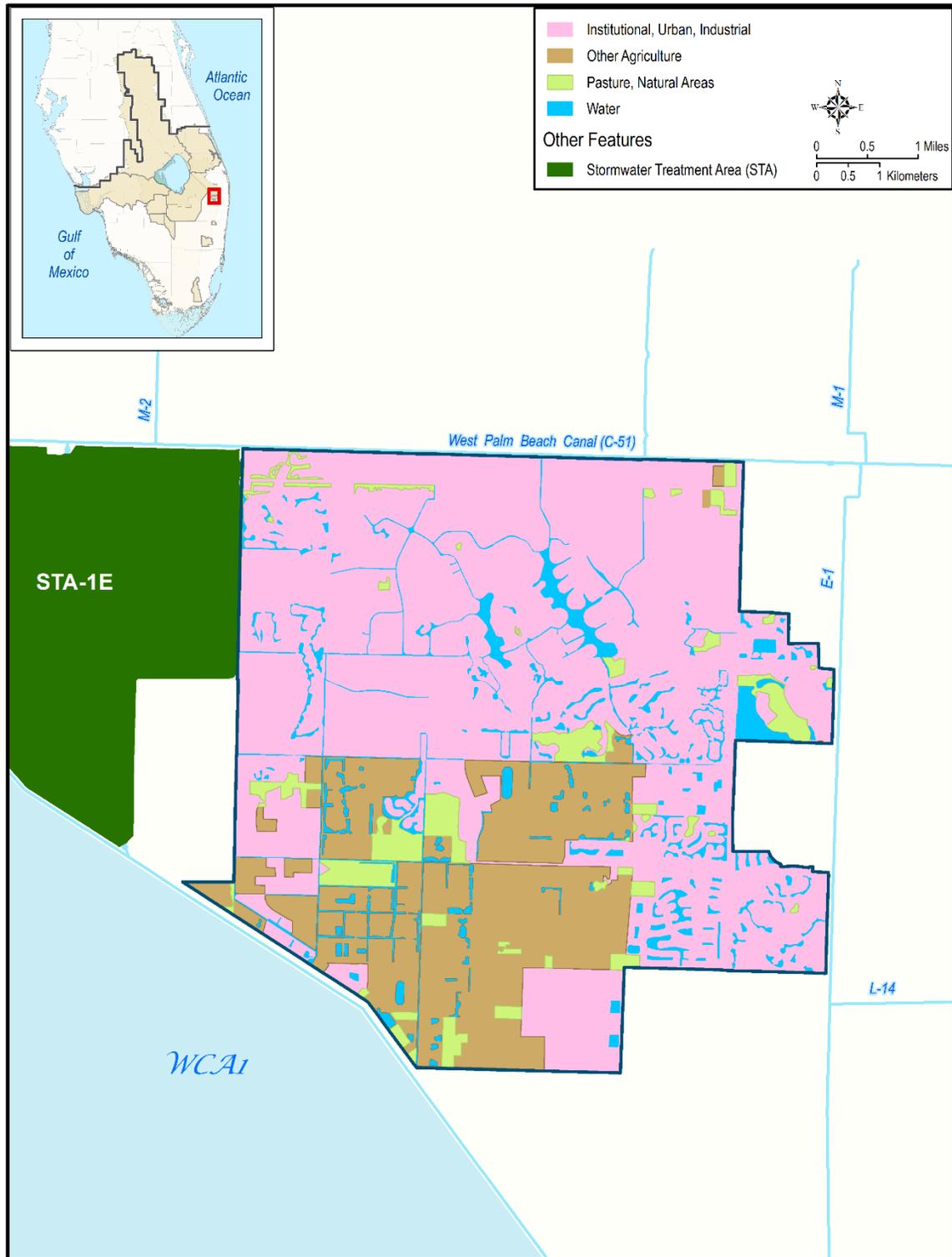


Figure 3. Acme Improvement District land use map. Land use from the most recent available data set (2008–2009).

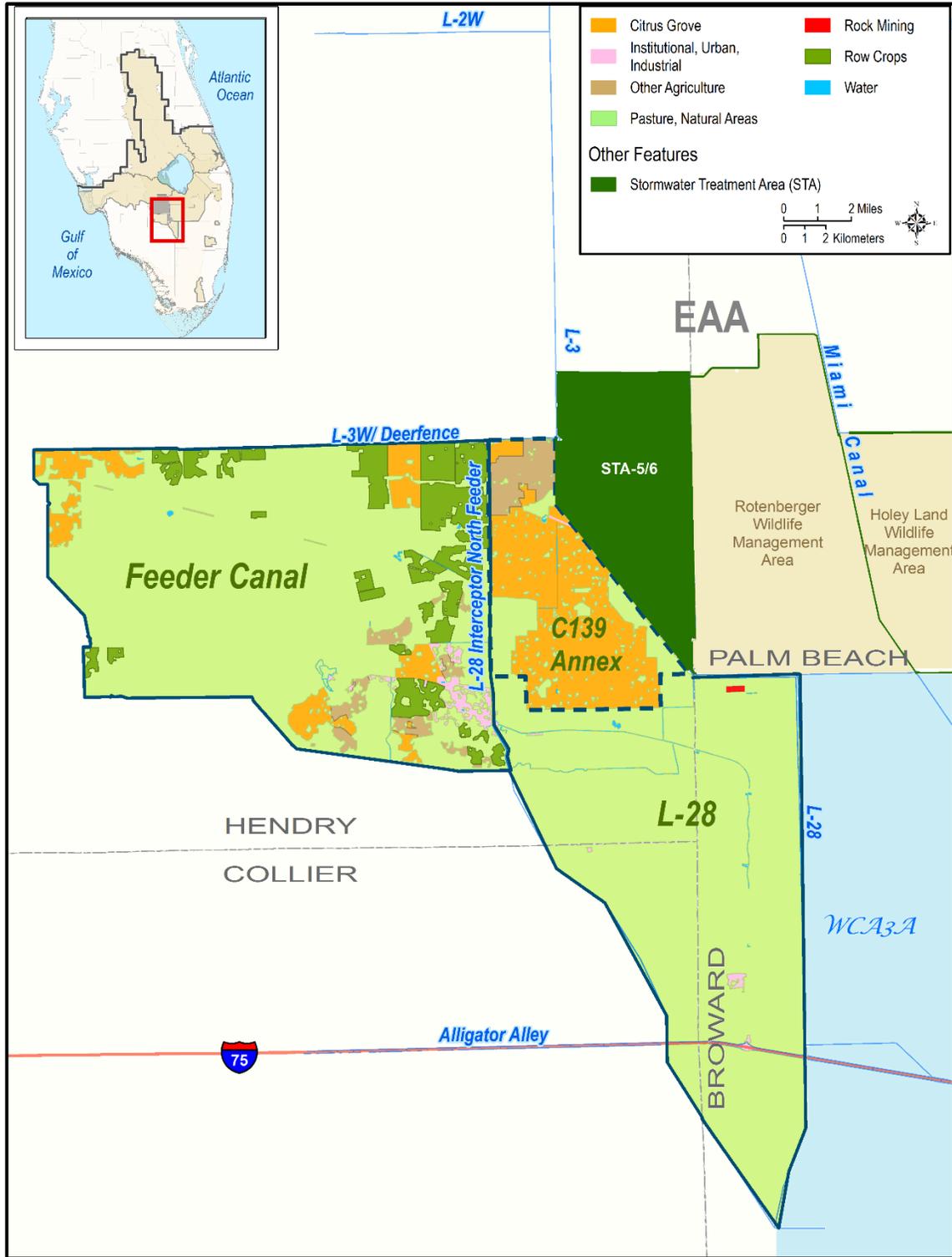


Figure 4. Feeder Canal and L-28 basins land use map. Land use from the most recent available data set (2008–2009).

Table 1. WY2006–WY2015 Non-ECP basin discharges to the EPA by tributary basin: total flow volumes and TP loads and FWMCs. [Note: kac-ft – 1,000 acre-feet; mt – metric tons; and µg/L – micrograms per liter.]

Non-ECP Basin Structures into WCA-1											
	Water Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
ACME1 ^a (Acme Basin ^b)	Flow Volume (kac-ft)	14.16	13.61	0	0	0	0	0	0	0	0
	TP Load (mt)	1.40	1.97	0	0	0	0	0	0	0	0
	TP FWMC (µg/L)	80	117	N/A ^a	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ACME2 ^{a,c} (Acme Basin ^b)	Flow Vol. (kac-ft)	12.77	12.71	0	0	0	0	0	1.23 ²	0	0
	TP Load (mt)	1.83	2.22	0	0	0	0	0	0.21 ²	0	0
	TP FWMC (µg/L)	116	141	NF ^d	NF	NF	NF	NF	139 ²	NF	NF
Total (WCA-1)	Flow Vol. (kac-ft)	26.93	26.32	0.00	0.00	0.00	0.00	0.00	1.23	0.00	0.00
	TP Load (mt)	3.24	4.18	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.00
	TP FWMC (µg/L)	97	129	NF	NF	NF	NF	NF	139	NF	NF

Non-ECP Basin Structures into WCA-2A											
	Water Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
NSID1 Total (NSID Basin) (WCA-2A)	Flow Vol. (kac-ft)	0	0	0	0	0	0	0	2.03	0	0
	TP Load (mt)	0	0	0	0	0	0	0	0.07	0	0
	TP FWMC (µg/L)	NF	26	NF	NF						

a. Pump stations ACME1 and ACME2 stopped operation in December 2006. ACME1 structure was removed shortly after. ACME2 structure might flow under emergency conditions. N/A – not applicable.

b. Acme Basin has been designated as an Everglades Construction Project (ECP) basin since December 2006.

c. ACME2 structure flowed during Tropical Storm Isaac (August 28–31, 2012).

d. NF – no flow for period.

Table 1. Continued.

Non-ECP Basin Structures into WCA-3A											
	Water Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
S-190 (Feeder Canal Basin)	Flow Vol. (kac-ft)	142.47	67.03	24.02	83.09	86.35	40.24	49.99	25.15	70.37	39.68
	TP Load (mt)	27.20	17.77	2.99	14.06	7.79	2.24	2.53	3.02	6.61	5.29
	TP FWMC (µg/L)	155	215	101	137	73	45	41	97	76	108
S-140 (L-28 Basin)	Flow Vol. (kac-ft)	203.58	88.52	90.34	136.31	136.94	77.69	85.59	73.31	108.40	108.30
	TP Load (mt)	12.51	5.12	4.05	6.65	9.21	3.77	5.06	4.48	6.24	9.88
	TP FWMC (µg/L)	50	47	36	40	55	39	48	50	47	74
S-9 (C11 West Basin)	Flow Vol. (kac-ft)	128.47	42.46	52.63	54.68	119.30	58.17	113.69	166.72	90.05	67.80
	TP Load (mt)	3.06	1.00	1.28	1.30	2.95	0.97	2.18	3.25	1.62	1.29
	TP FWMC (µg/L)	19	19	20	19	20	13	16	16	15	15
S-9A (C11 West Basin)	Flow Vol. (kac-ft)	61.35	81.35	87.80	88.50	56.05	90.05	77.41	80.76	86.14	51.30
	TP Load (mt)	1.21	1.31	1.52	1.26	0.91	1.36	1.30	1.06	1.15	0.64
	TP FWMC (µg/L)	16	13	14	12	13	12	14	11	11	10
Total (WCA-3A)	Flow Vol. (kac-ft)	543.75	279.36	254.79	362.57	398.63	266.14	326.68	345.95	354.97	267.08
	TP Load (mt)	45.49	25.19	9.84	23.27	20.86	8.35	11.06	11.81	15.62	17.09
	TP FWMC (µg/L)	68	73	31	52	42	25	27	28	36	52

Table 1. Continued.

Non-ECP Basin Structures into Everglades National Park (ENP)											
	Water Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
S-174 ^{a,b} (C111 Basin)	Flow Vol. (kac-ft)	9.20	0.00	0	0	0	0	0	0	0	0
	TP Load (mt)	0.16	0.00	0	0	0	0	0	0	0	0
	TP FWMC (µg/L)	14	5	NF ^c	NF						
S-18C (C111 Basin)	Flow Vol. (kac-ft)	188.51	80.36	124.38	173.10	249.36	130.13	104.72	149.23	119.02	84.85
	TP Load (mt)	3.30	0.69	1.16	1.55	1.95	1.21	1.21	1.79	0.66	0.50
	TP FWMC (µg/L)	14	7	8	7	6	8	9	10	5	5
S-332D ^b (C111 Basin)	Flow Vol. (kac-ft)	153.80	45.05	32.69	144.49	181.20	105.08	65.55	133.14	127.60	99.79
	TP Load (mt)	2.06	0.30	0.26	1.28	1.82	1.89	0.56	1.04	1.05	0.74
	TP FWMC (µg/L)	11	5	6	7	8	15	7	6	7	6
Total (ENP)	Flow Vol. (kac-ft)	351.51	125.41	157.07	317.59	430.55	235.21	170.27	282.36	246.62	184.64
	TP Load (mt)	5.51	0.99	1.42	2.83	3.77	3.10	1.77	2.83	1.71	1.24
	TP FWMC (µg/L)	13	6	7	7	7	11	8	8	6	5

a. Structure S-174 was plugged in September 2007.

b. Flow and load calculation at S-175 and S-332 was replaced in WY2001 with S-174 and S-332D.

c. NF – no flow for the period.

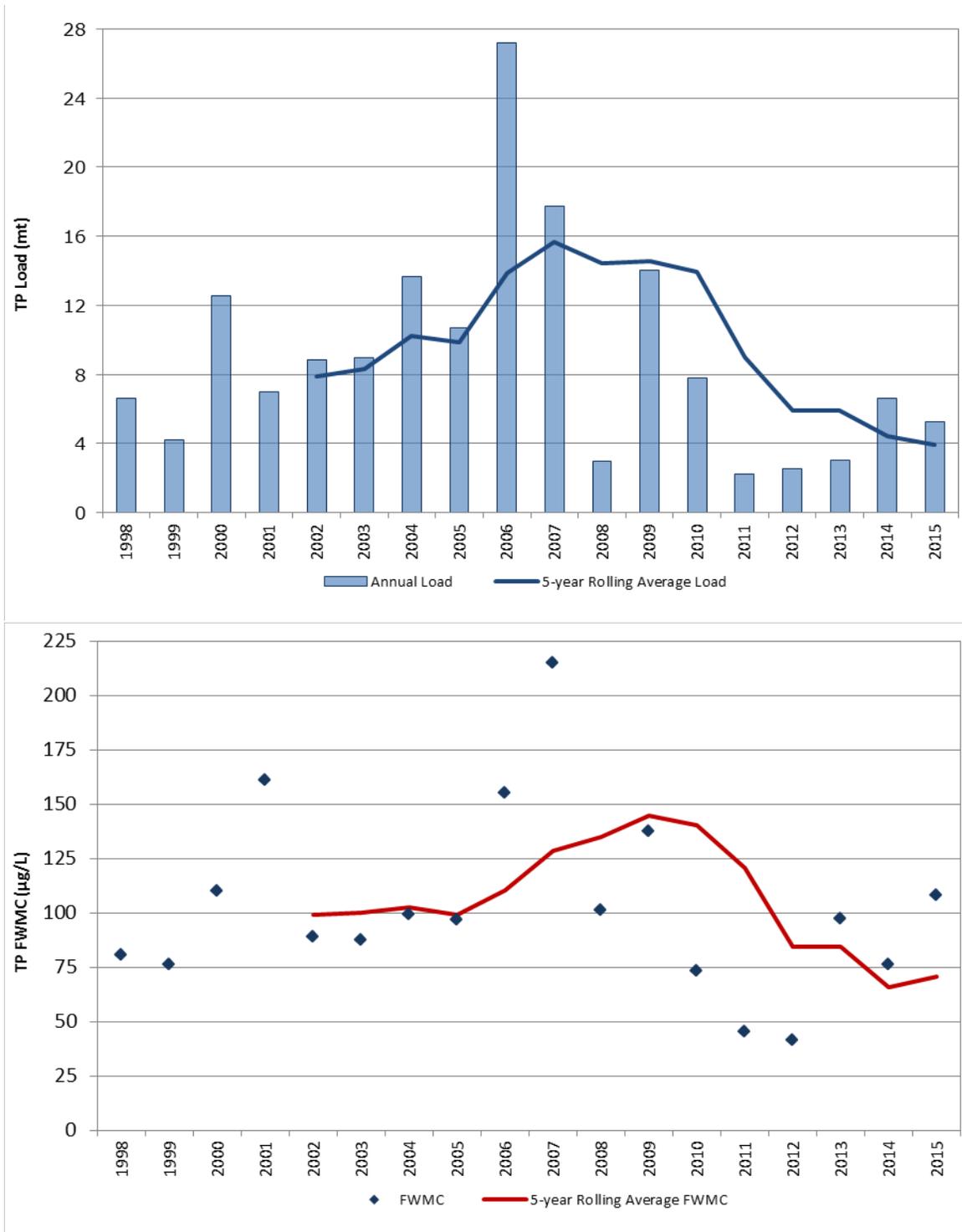


Figure 5. WY2006–WY2015 Feeder Canal Basin (S-190) discharges to the EPA):
 Upper Plot - Annual total phosphorus (TP) loads and five-year rolling averages;
 Lower Plot - Annual TP flow-weighted mean concentrations (FWMC)
 and five-year rolling averages.

[Note: mt – metric tons and µg/L – micrograms per liter.]

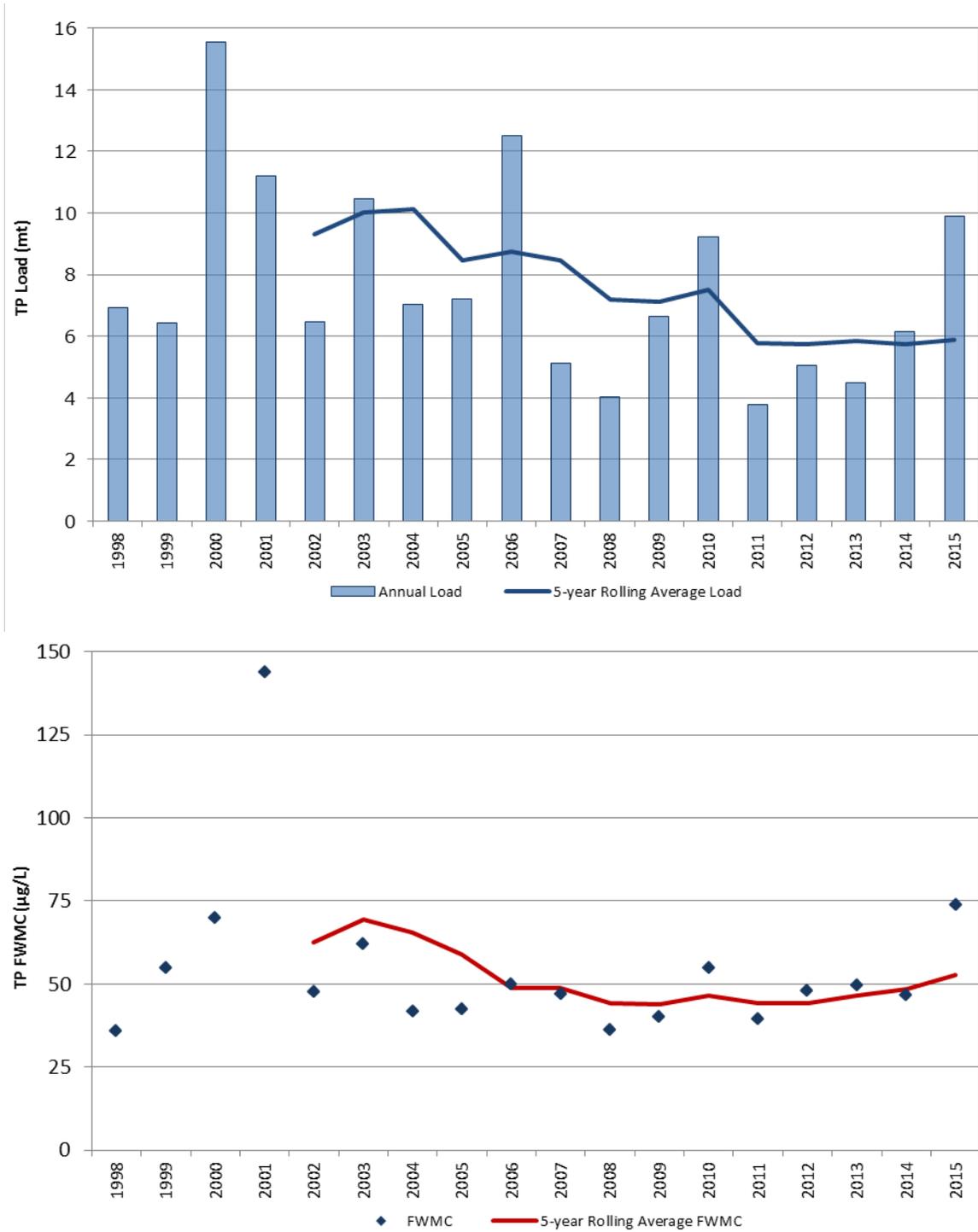


Figure 6. WY1998–WY2015 L-28 Basin (S-140) discharges to the EPA.
 Upper Plot - Annual TP load and five-year rolling averages;
 Lower Plot - Annual TP FWMC and five-year rolling averages.

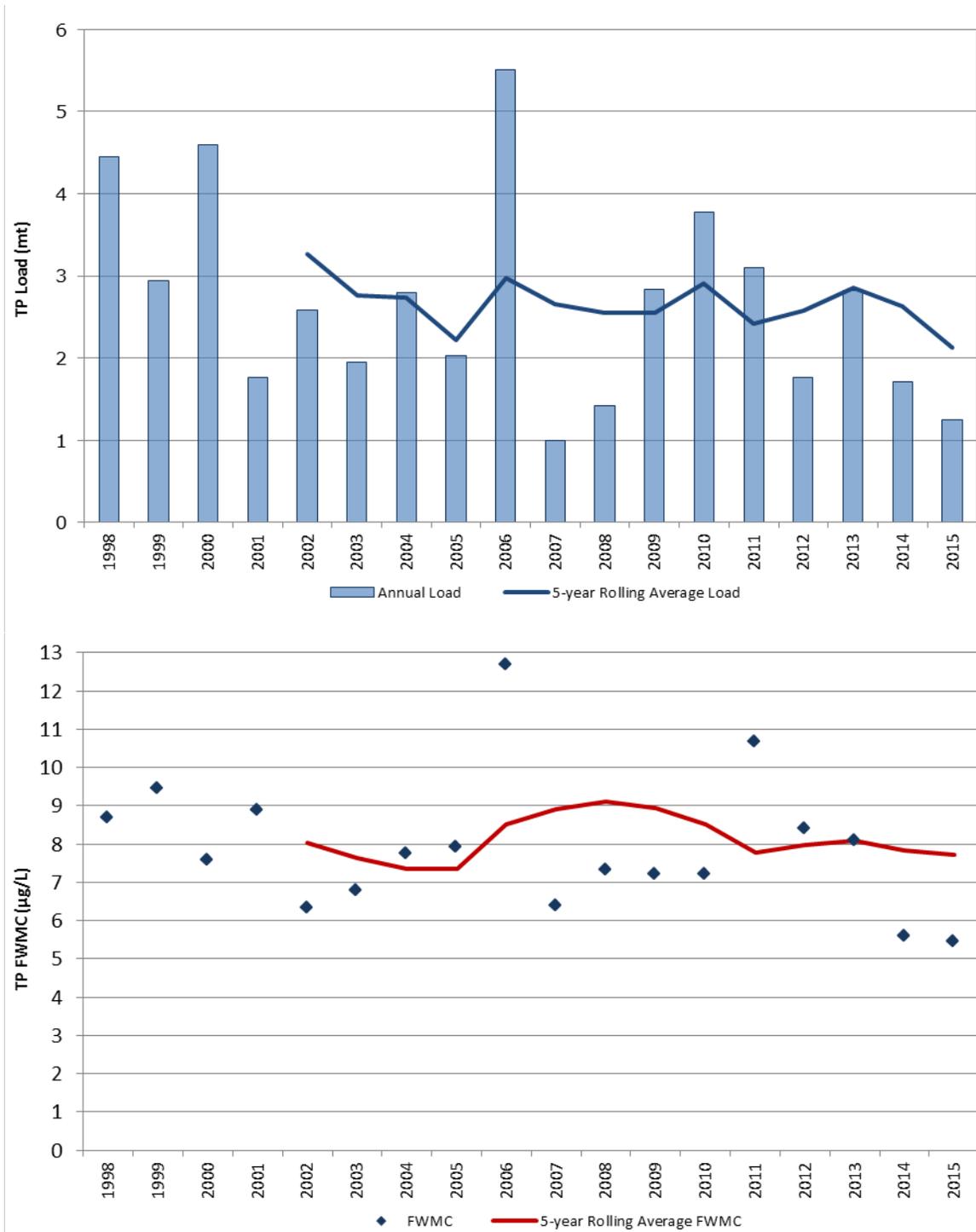


Figure 7. WY1998–WY2015 C-111 Basin (S-18C and S-332D) discharges to the EPA: Upper Plot - Annual TP load and five-year rolling averages; Lower Plot - Annual TP FWMC and five-year rolling averages. [Note: Flow and load calculations at S-175 and S-332 were replaced in WY2001 with S-174 and S-332D. Structure S-174 was plugged in September 2007.]

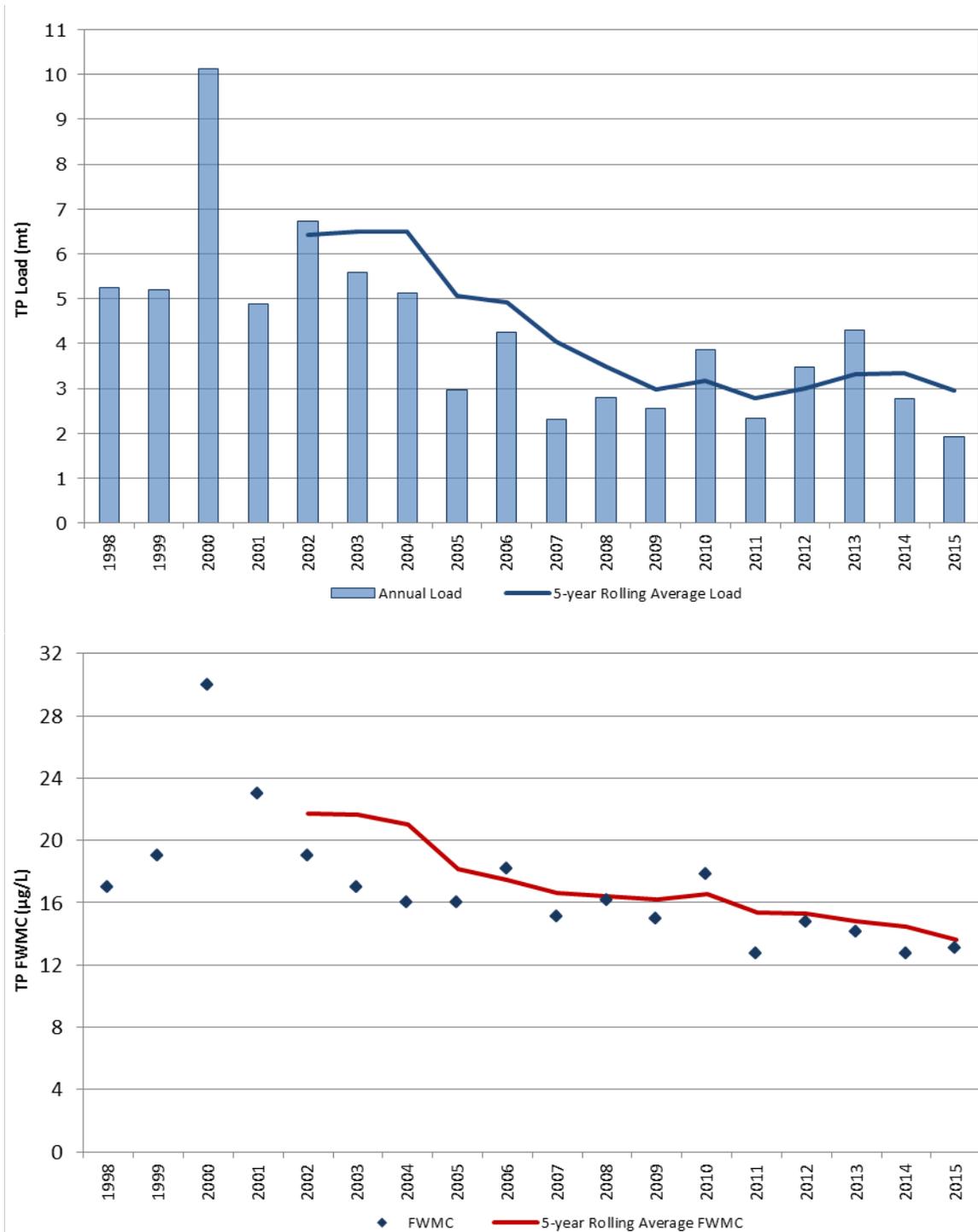


Figure 8. WY1998–WY2015 C-11 West Basin (S-9 and S-9A) discharges to the EPA: Upper Plot - Annual TP load and five-year rolling averages; Lower Plot - Annual TP FWMC and five-year rolling averages.

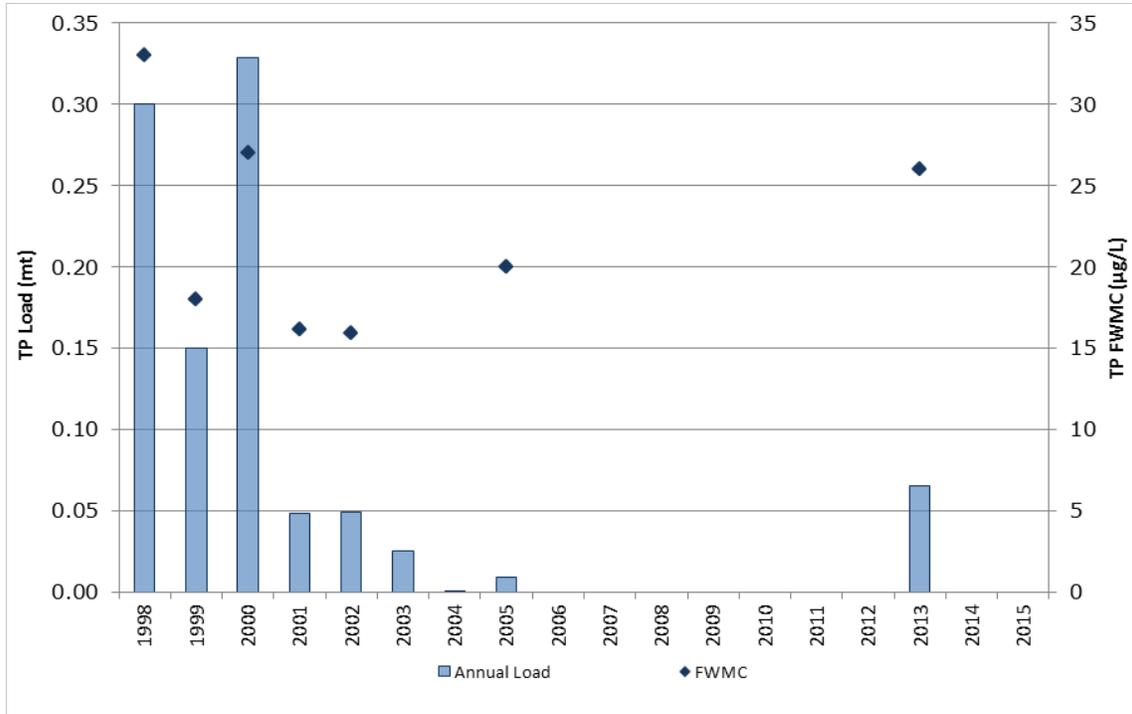


Figure 9. WY1998–WY2015 NSID Basin (NSID1) annual TP load and TP FWMC in discharges to the EPA.

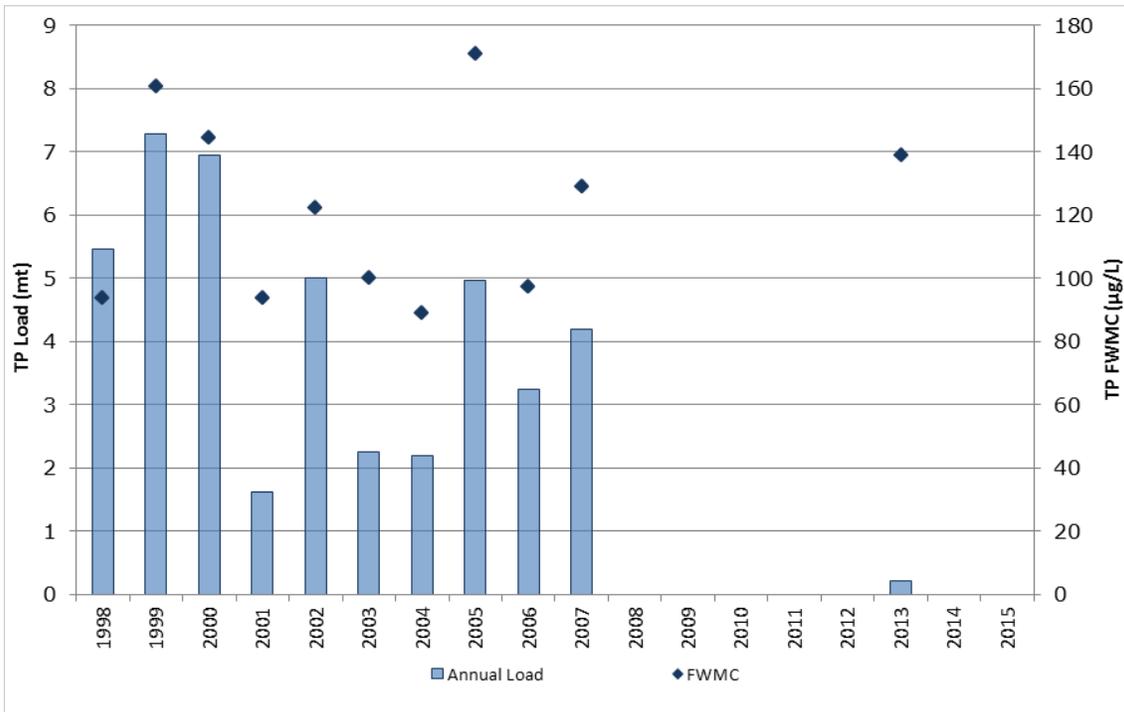
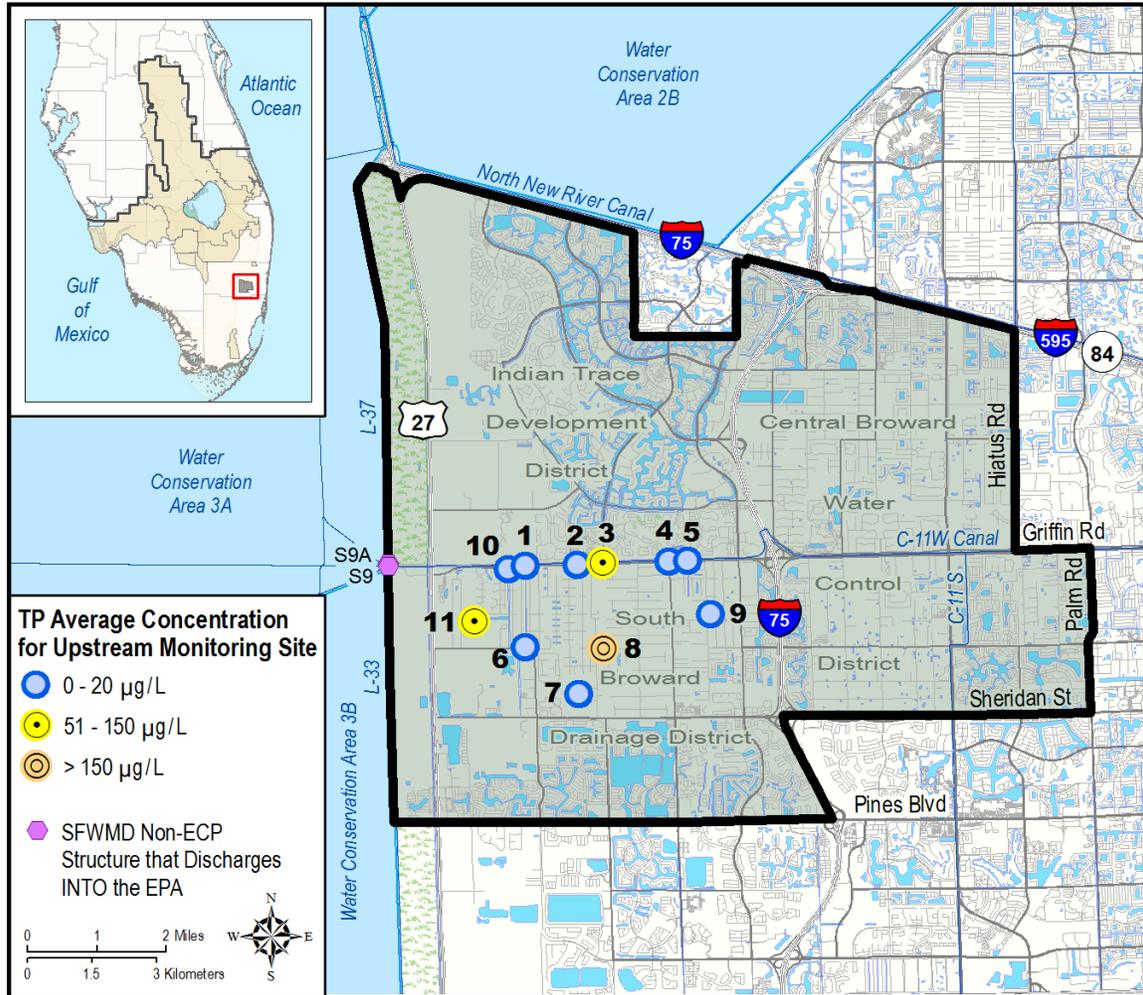


Figure 10. WY1998–WY2015 Acme Basin (ACME1 and ACME2) annual TP load and TP FWMC in discharges to the EPA. [Note: Pump stations ACME1 and ACME2 stopped operation in December 2006 and Acme Basin discharges were diverted to C-51 West Canal. ACME1 structure was removed shortly after; however 0.2 mt of TP load discharged to the EPA in WY2013 as a result of flood protection measures associated with Tropical Storm Isaac.]



Map ID	Station	# of Samples	TP Concentration (µg/L)		
			Average	Min	Max
1	C1102.0TS	2	11	10	12
2	C1102.8TS	2	20	16	23
3	C1103.3TS	3	112	36	190
4	C1104.3TS	2	11	9	12
5	C1104.6TS	2	8	7	8
6	C112.0TS2	2	10	7	12
7	C112.8TS2	2	14	8	19
8	C113.3TS1	3	178	93	230
9	C114.9TS1	2	16	11	20
10	C1101.7TS	2	17	11	23
11	C1108.TS1	2	66	31	100

Figure 11. WY2015 summary of TP data for C-11 West Basin upstream monitoring sites.

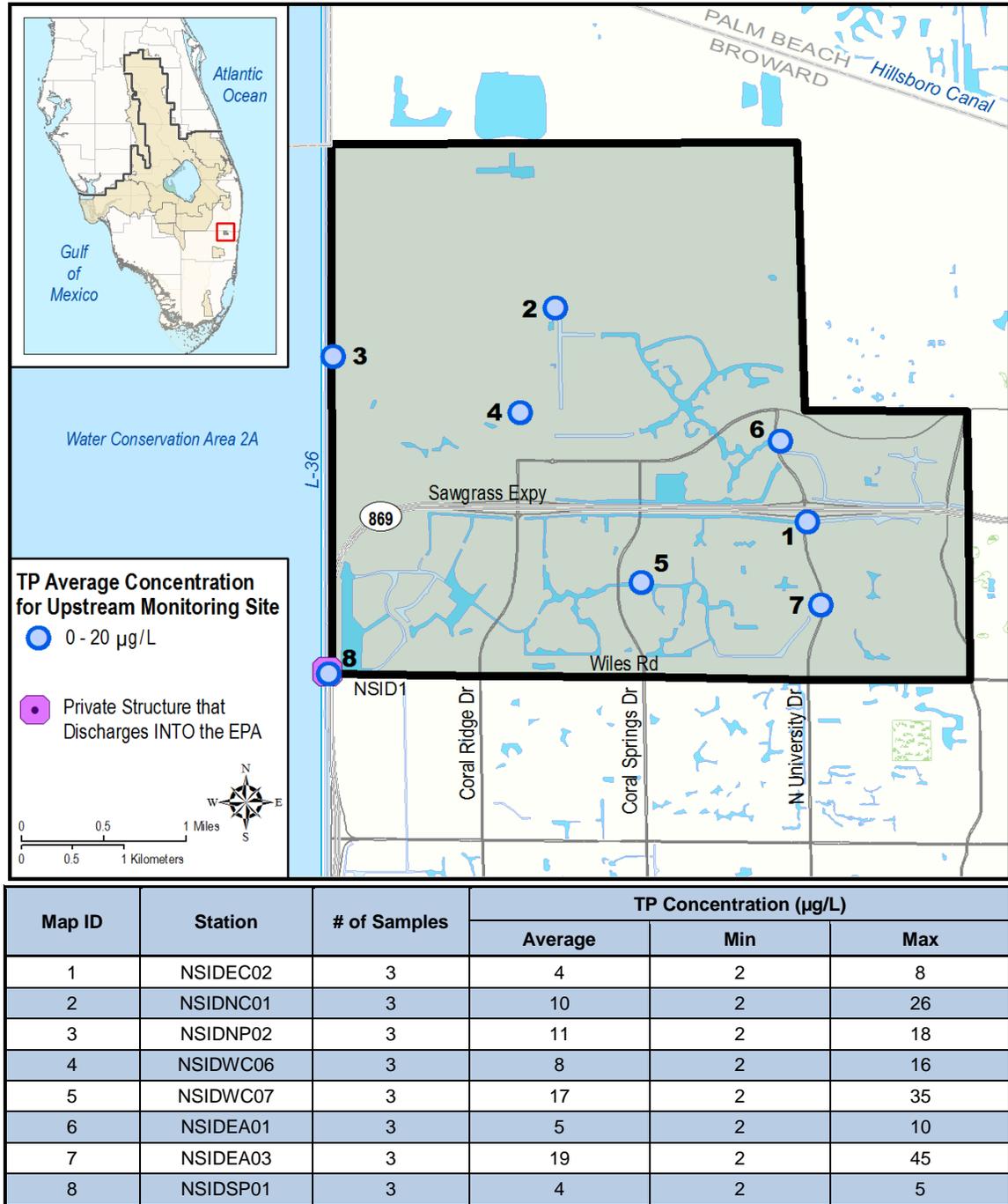
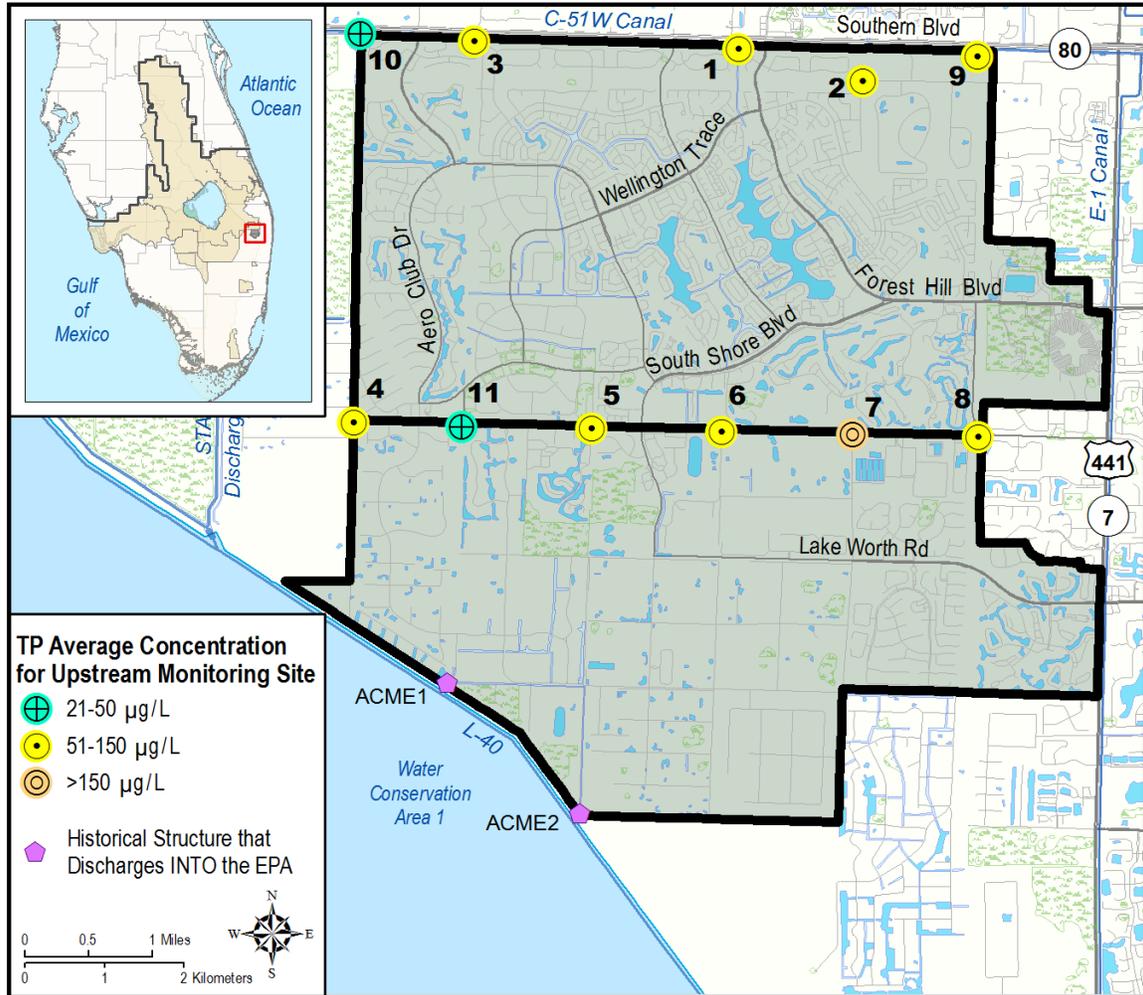
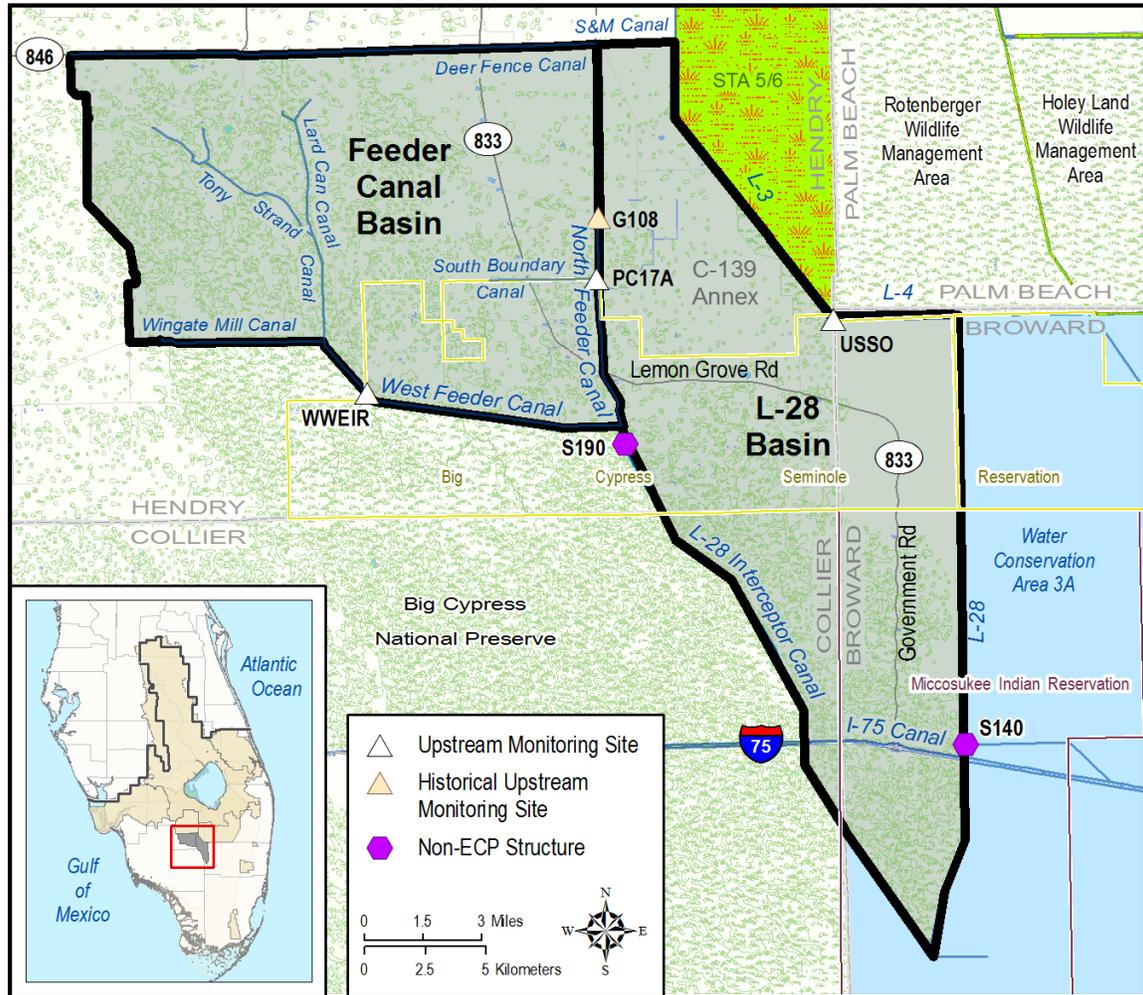


Figure 12. WY2015 summary of TP data for the NSID Basin upstream monitoring sites.



Map ID	Station	# of Samples	TP Concentration (µg/L)		
			Average	Min	Max
1	VOW3	10	56	17	75
2	VOW35	10	53	18	81
3	VOW4	10	69	44	180
4	VOW40	4	53	48	57
5	VOW42	3	89	85	94
6	VOW43	3	132	98	200
7	VOW44	3	163	150	190
8	VOW45	3	69	65	72
9	VOW6	10	60	30	190
10	VOW7	9	42	34	48
11	VOW72	3	49	42	57

Figure 13. WY2015 summary of TP data for the Acme Basin upstream monitoring sites. [Note: Pump stations ACME1 and ACME2 stopped operation in December 2006. ACME1 structure was removed shortly thereafter. ACME2 structure might flow under emergency conditions.]



User Name: cmiessau Remedy ID Ticket: 9011 REGIEREG Map Date: 17-JUL-2015 CMESSAU \\lad.sfwmd.gov\dfsroot\data\lerr_gis\projects\EV\GIS\A2016\mxd\SPER2016_VolI_Ch4_App4-2_FeederL28_UpstreamTP_WY2015_cm1.mxd

Figure 14. Feeder Canal Basin and L-28 Basin upstream monitoring sites.
[Note: Structure G-108 was removed in April 2010.]

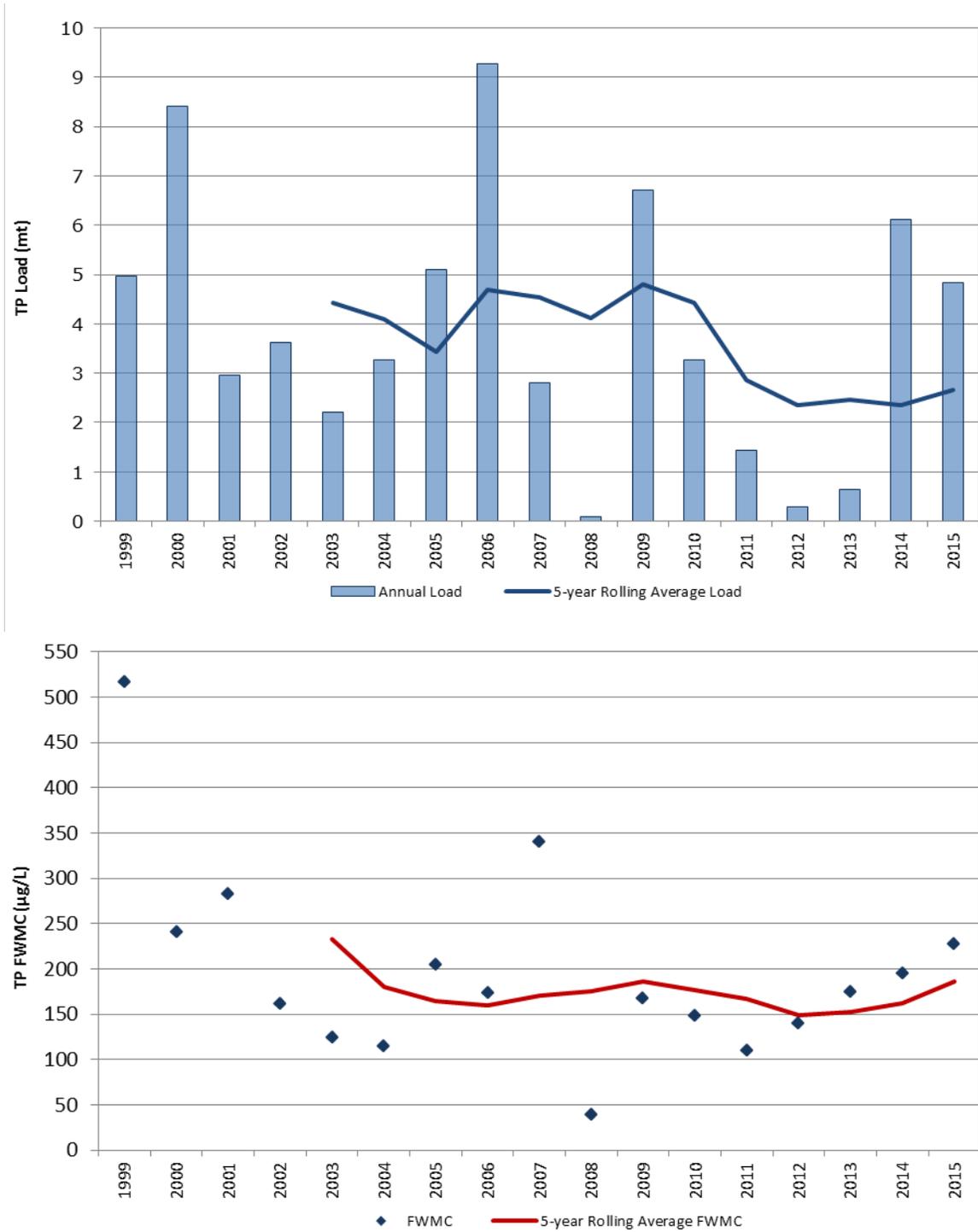


Figure 15. WY1999–WY2015 combined PC-17A and G-108 discharges: Upper Plot - Annual TP load and five-year rolling averages; Lower Plot - Annual TP FWMC and five-year rolling averages. [Note: Structure G-108 was removed in April 2010.]

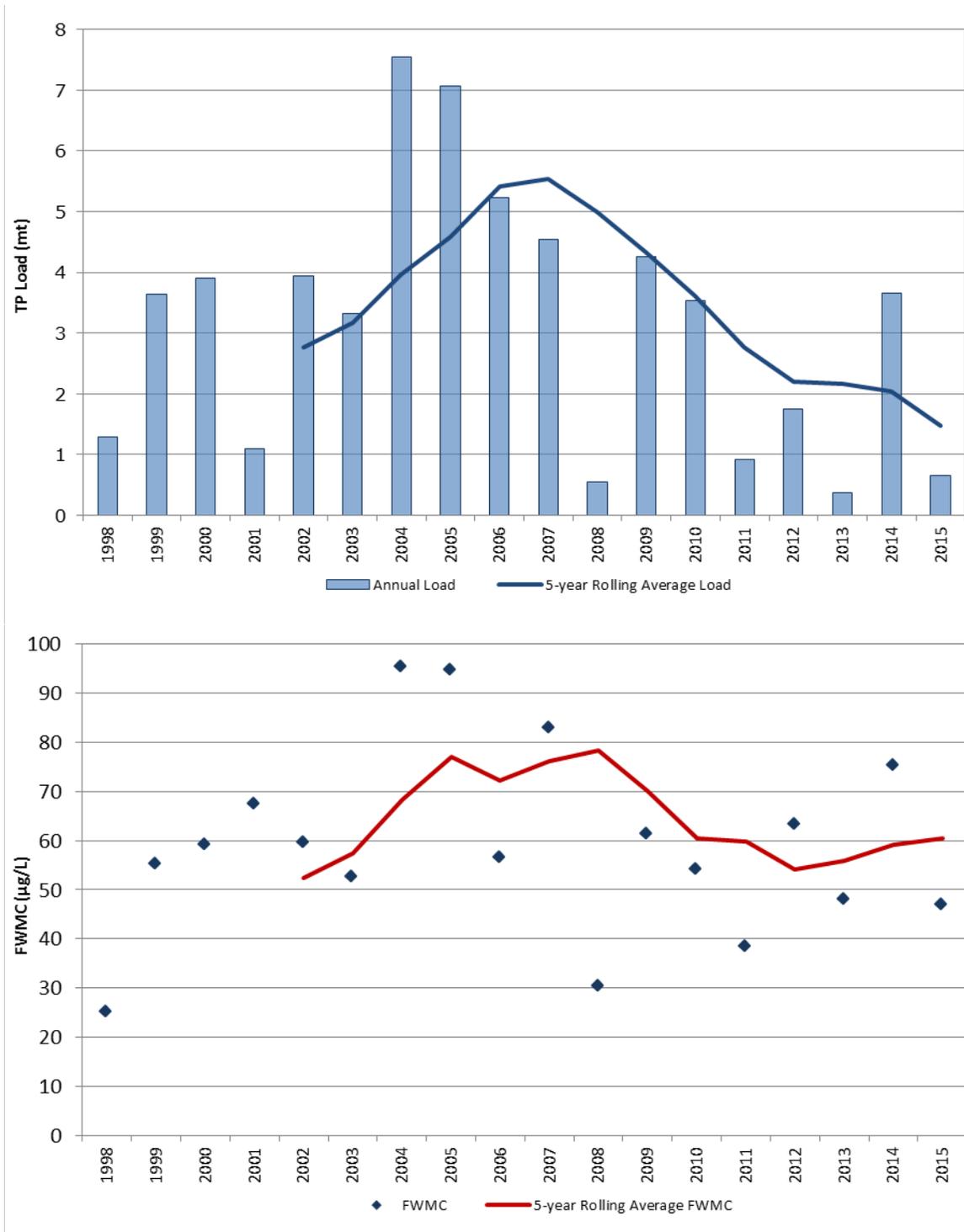


Figure 16. WY1998–WY2015 WWEIR discharges:
 Upper Plot - Annual TP load and five-year rolling averages;
 Lower Plot - Annual TP FWMC and five-year rolling averages.

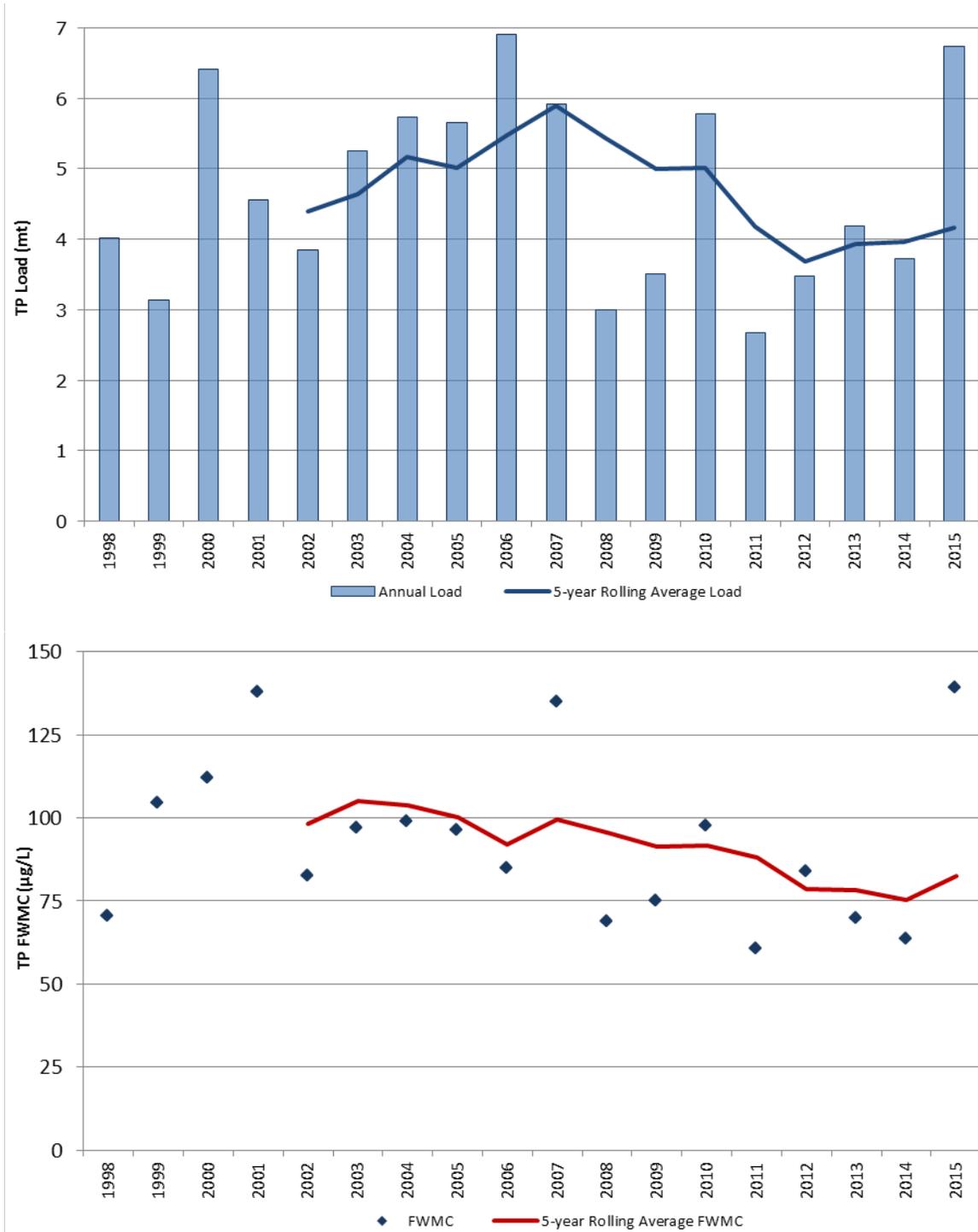


Figure 17. WY1998–WY2015 USSO discharges:
 Upper Plot - Annual TP load and five-year rolling averages;
 Lower Plot - Annual TP FWMC and five-year rolling averages.