

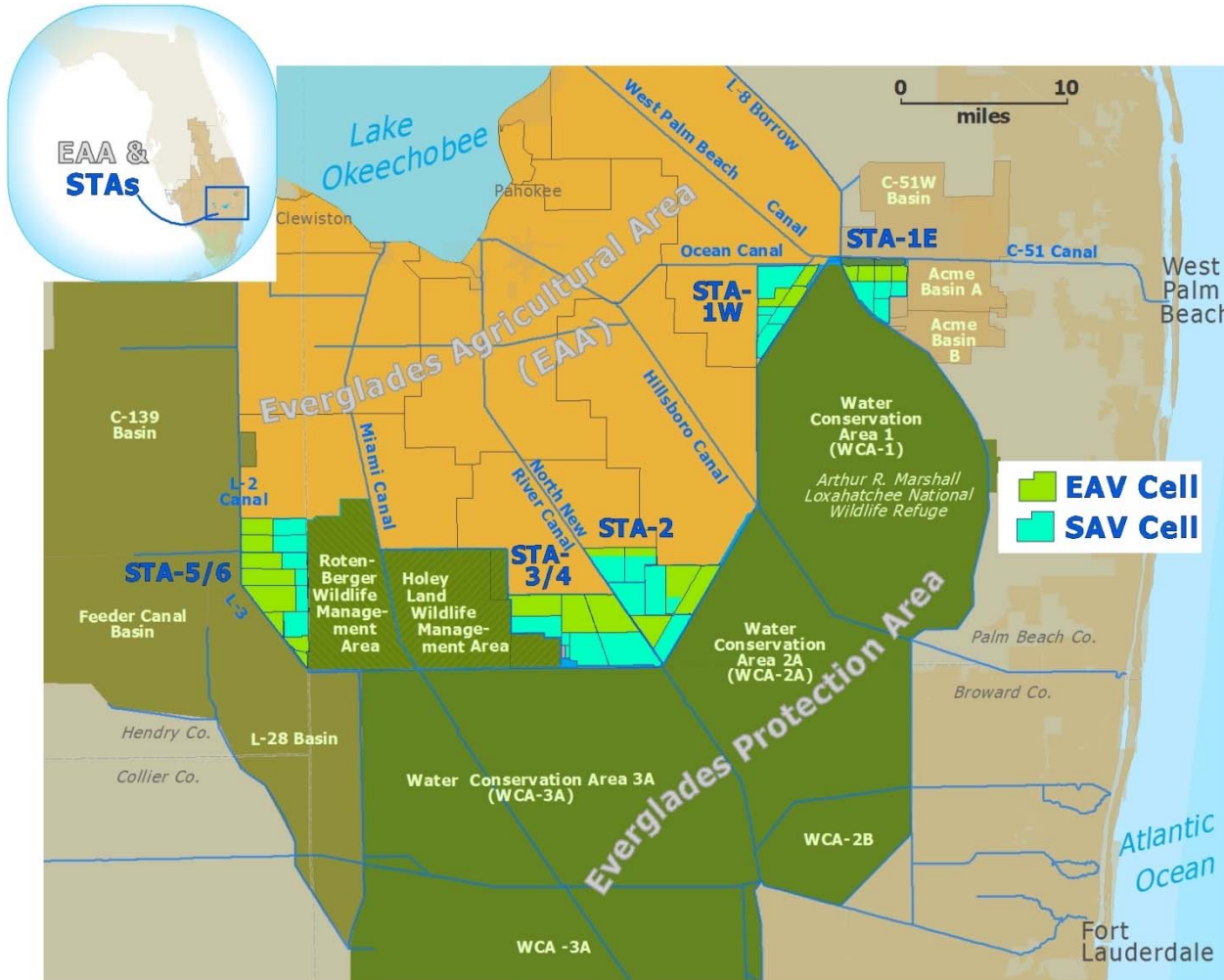
Greater Everglades Ecosystems Restoration Conference
April 21-23, 2015



Historical Performance of the Everglades Stormwater Treatment Areas

Delia Ivanoff & Kathy Pietro
Applied Sciences Bureau
divanoff@sfwmd.gov

Location Map



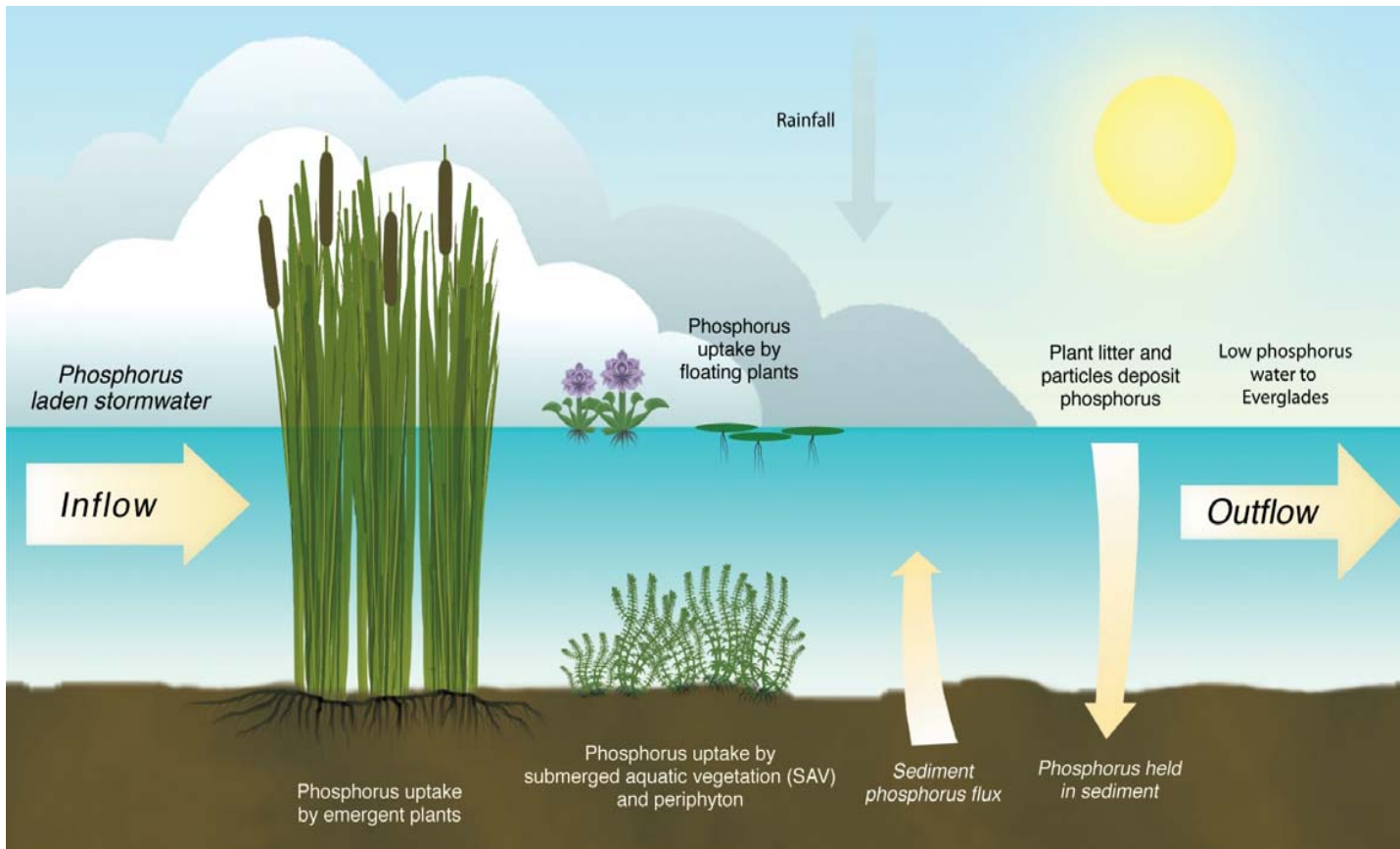
STA	Treatment Area, acres
1E	4,994
1W	6,544
2	15,495
3/4	16,327
5/6	13,685
Total	57,045



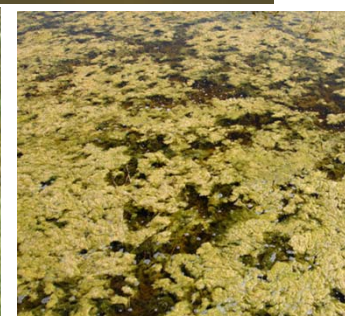
Purpose and Mandates

- Reduce phosphorus in runoff water prior to discharge to the Everglades Protection Area.
- Mandates:
 - Everglades Forever Act
 - NPDES and EFA permits
 - Consent decrees
- Current Water-quality based effluent limit (WQBEL) for TP
 - Maximum of 19 ppb Annual Flow-weighted Mean
 - Not to exceed 13 ppb long-term flow-weighted mean in more than three (3) out of five (5) years.

Phosphorus Removal Process



- Particulate settling
- Plant uptake
- Microbial uptake
- Binding with cations, e.g. Ca
- Phosphorus cycling
- Burial

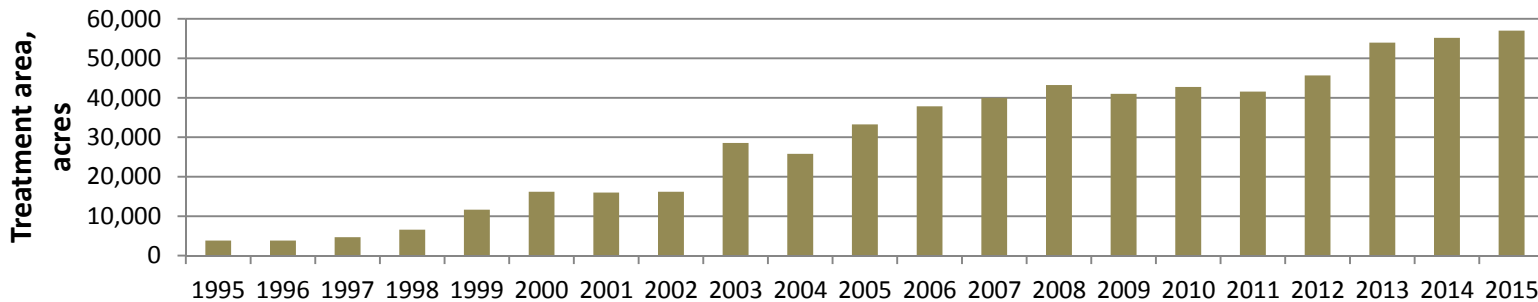
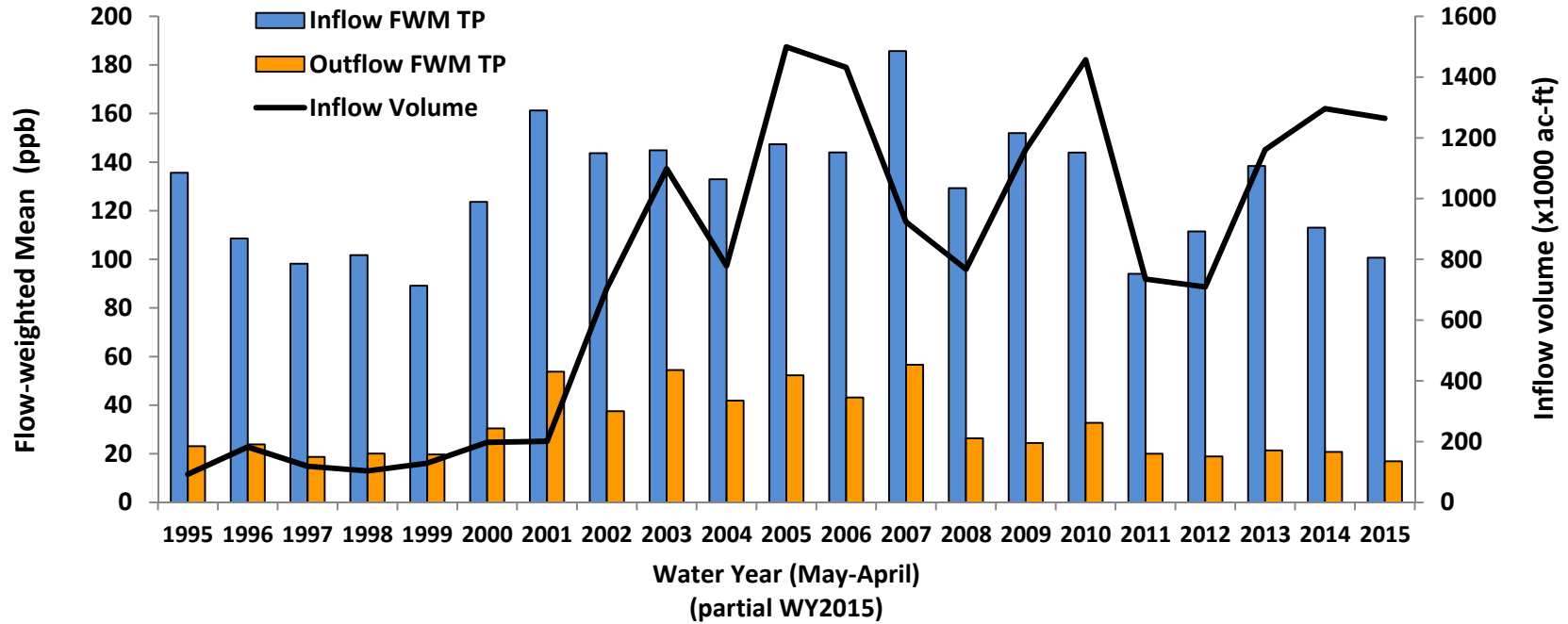


Assessing STA Performance

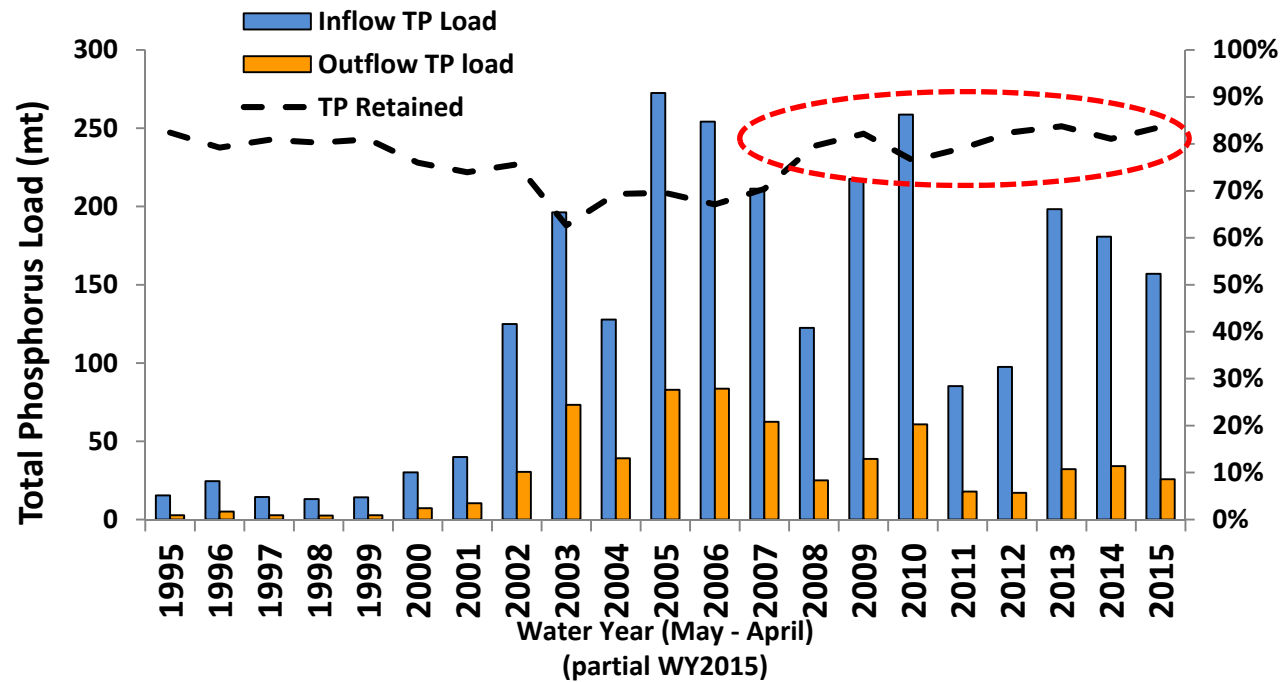
- Volume of water treated
- Phosphorus load retained
- Phosphorus load reduction (%)
- Reduction in water column P concentration
 - Outflow TP concentration - permit WQBEL
- Phosphorus species reduction
- Settling rate (k value)



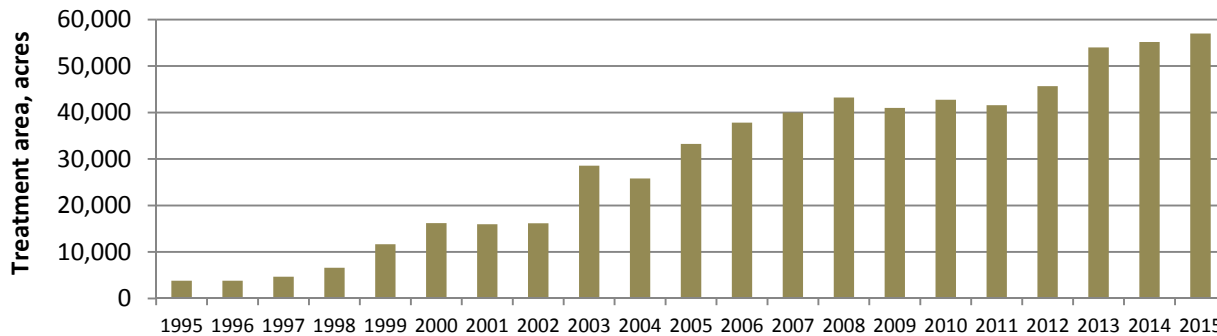
Annual Flows and TP Concentrations



Phosphorus Load Retention

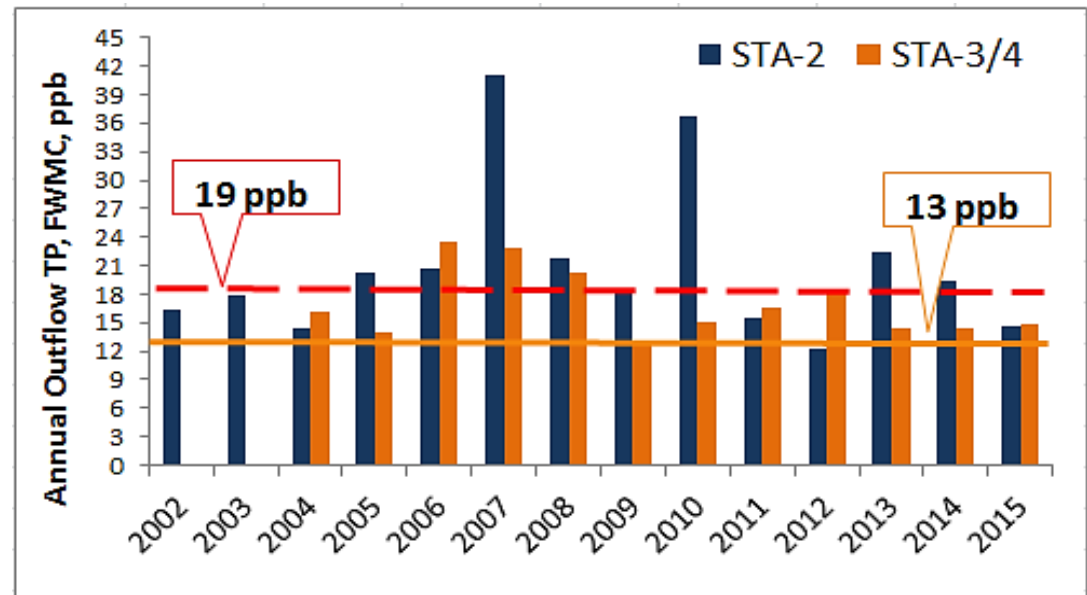
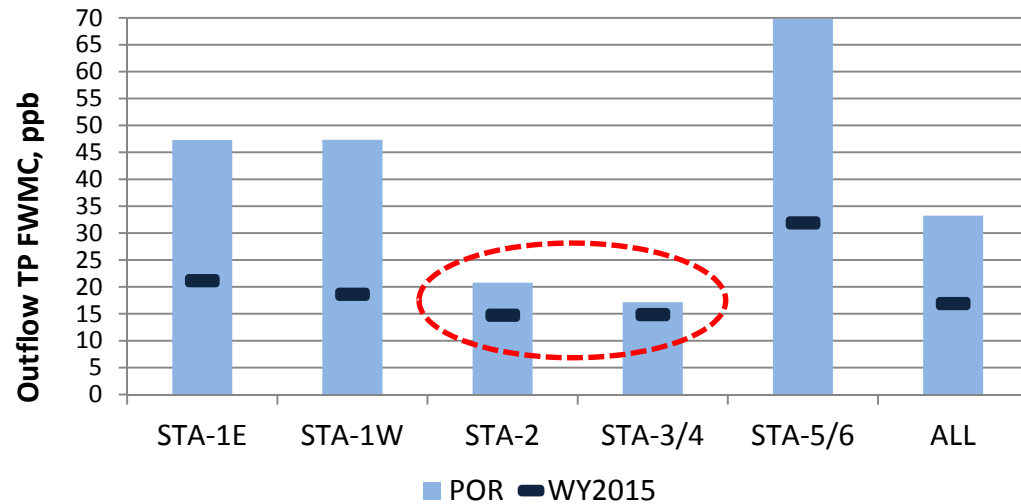


- Variable annual inflow load
- POR total retained P: 2,000 mt
- P load Retention 75% (POR)/80% or better recent years

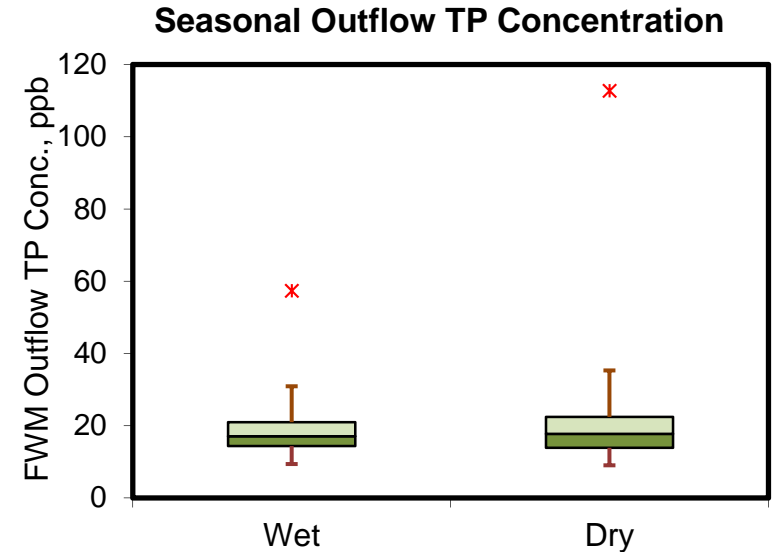
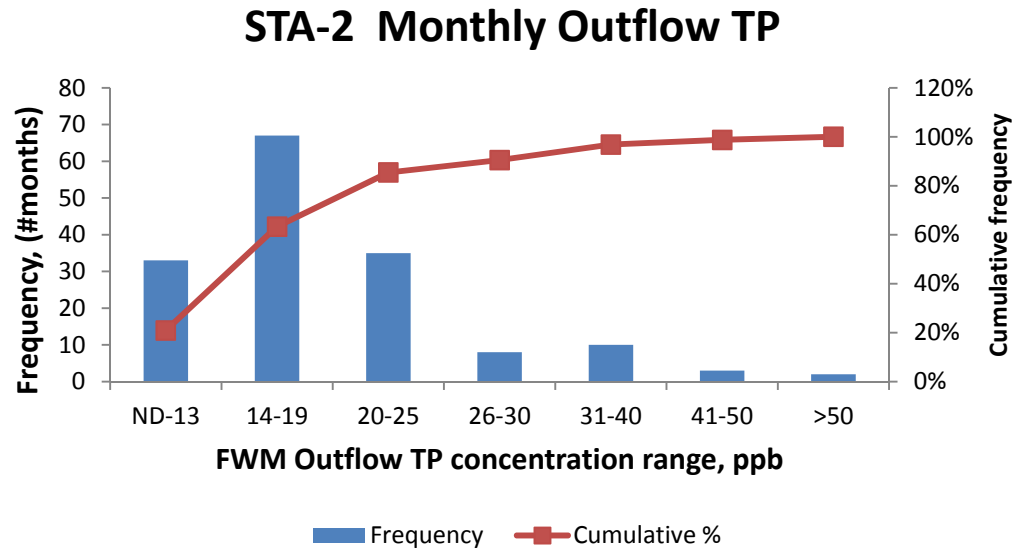


Annual Outflow TP Concentration

- **POR outflow FWMC:**
 17 (STA-3/4) to 70 ppb (STA-5/6)
- **WY 2015 outflows:**
 15 (STA-2 & STA-3/4) to 32 ppb (STA-5/6)
- STA-2 & 3/4 frequently achieved ≤ 19 ppb; each achieved ≤ 13 ppb once



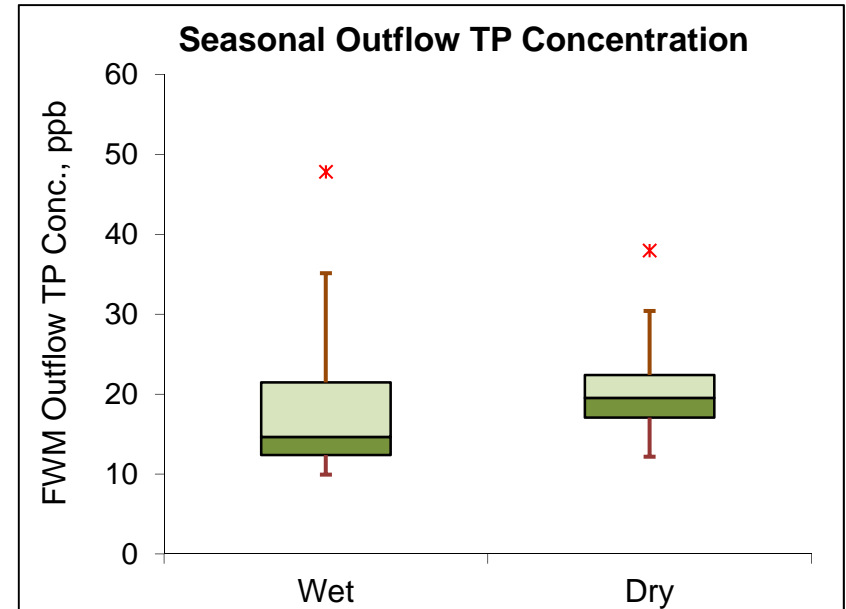
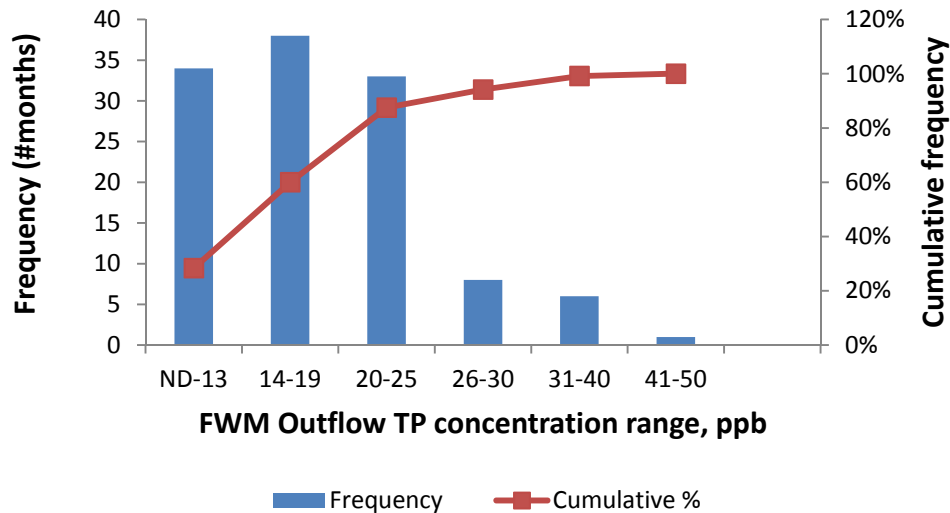
STA-2 Monthly & Seasonal Outflow TP Distribution



- 13 ppb or less – 21% of the time
- 19 ppb or less - 63% of the time
- Median TP FWM concentrations are comparable between wet and dry seasons.

STA-3/4 Monthly & Seasonal Outflow TP Distribution

Monthly Outflow TP Frequency Distribution

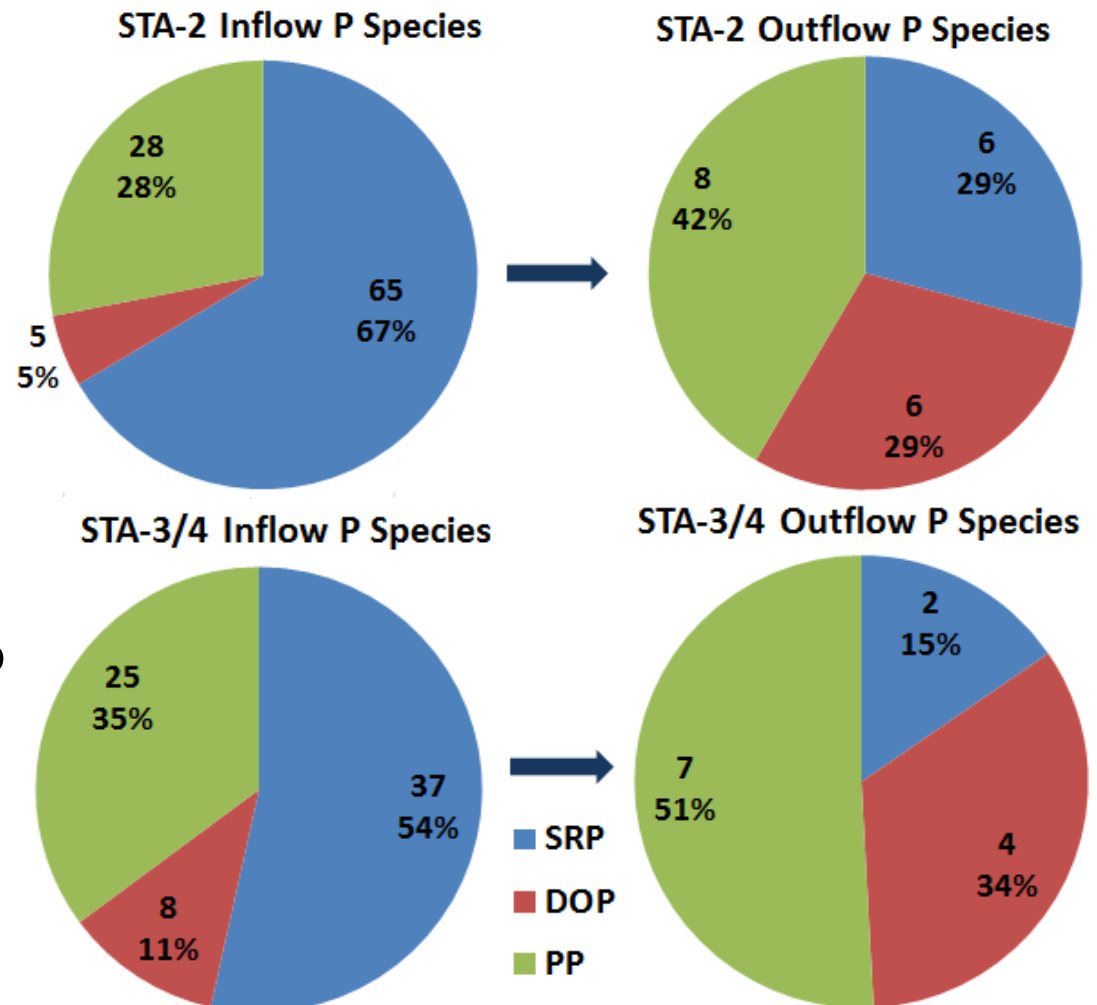


- 13 ppb or less - 28% of the time
- 19 ppb or less – 60% of the time
- Median TP FWMC slightly higher during the dry season; higher variability during the wet season

Phosphorus Species

WY2010 – partial WY2015

- SRP comprise the bulk of inflow TP
- STAs have been very effective in reducing SRP and PP
- In these well-performing STAs, PP comprise the bulk of outflow TP.



Summary

- Since WY1995, the STAs have treated over 16 million ac-ft of runoff.
- To date, STAs retained ~2000 mt of P
 - 75% reduction in P load for POR
 - 80% or better reduction in P load in the past eight years
- Reduced TP concentration from 134 ppb (inflow) to 33 ppb (outflow) (POR)
 - Best: STA-2 and ¾ with 21 and 17 ppb, respectively
 - Highest: STA-5/6 with 70 ppb
 - Outflow concentrations have improved over the years
 - WY2015 – 15 ppb in STA-2 and 3/4

Summary

- On an annual basis, STA-2 & STA-3/4 have frequently achieved ≤ 19 ppb but each STA only achieved ≤ 13 ppb once.
- On a monthly basis, ≤ 19 ppb and ≤ 13 ppb are often achieved in STA-2 and STA-3/4.
- No seasonal differences in outflow TP concentrations in STA-2; STA-3/4 shows higher variability in TP concentration during the wet season.
- Very effective at reducing SRP; remaining TP at outflow of well-performing STAs is primarily PP.

Questions?

