Development of Water Quality Standards for Willard Spur

Hydrology & Nutrient Loads

2011 – 2013

January 29, 2014

Willard Spur Science Panel

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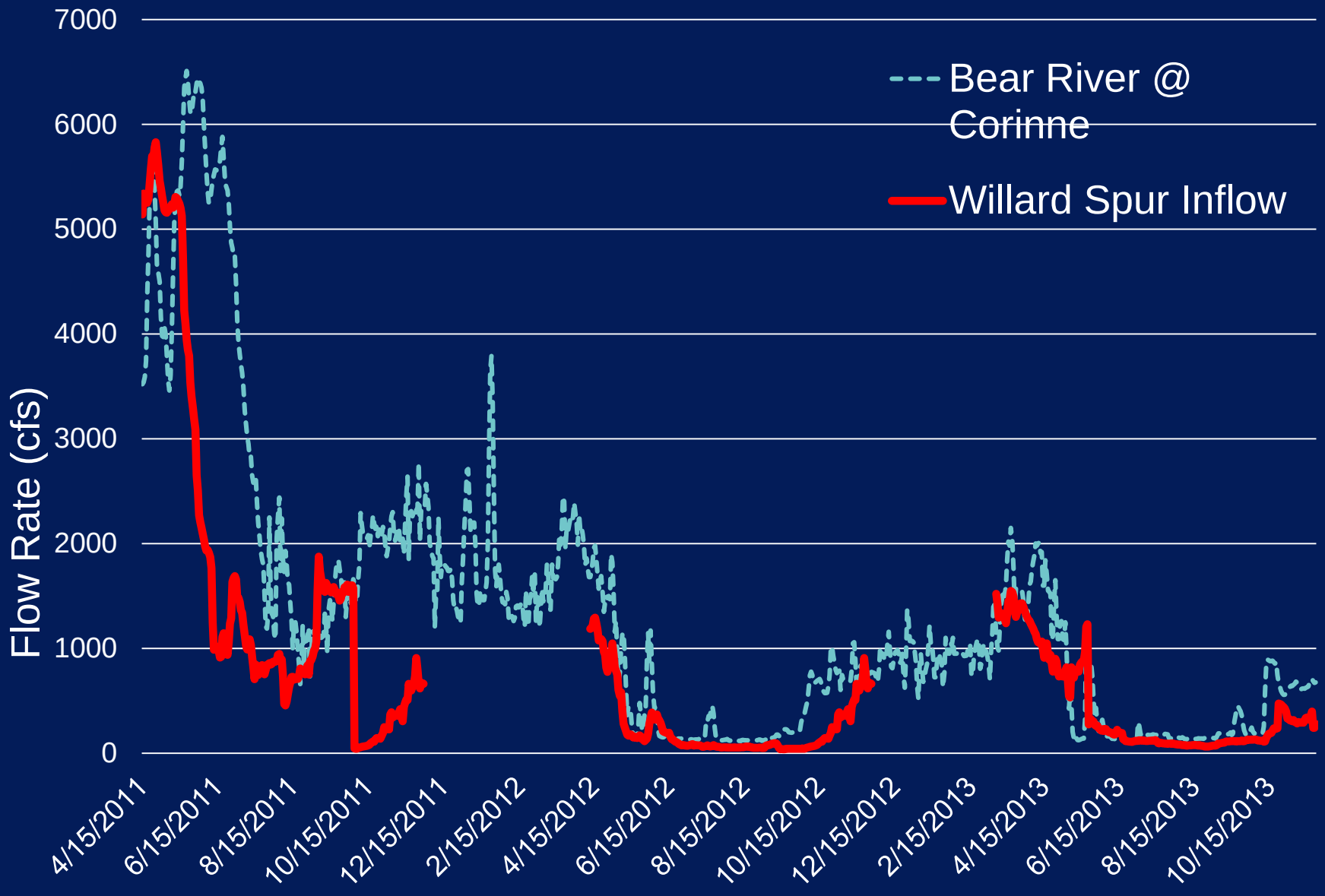
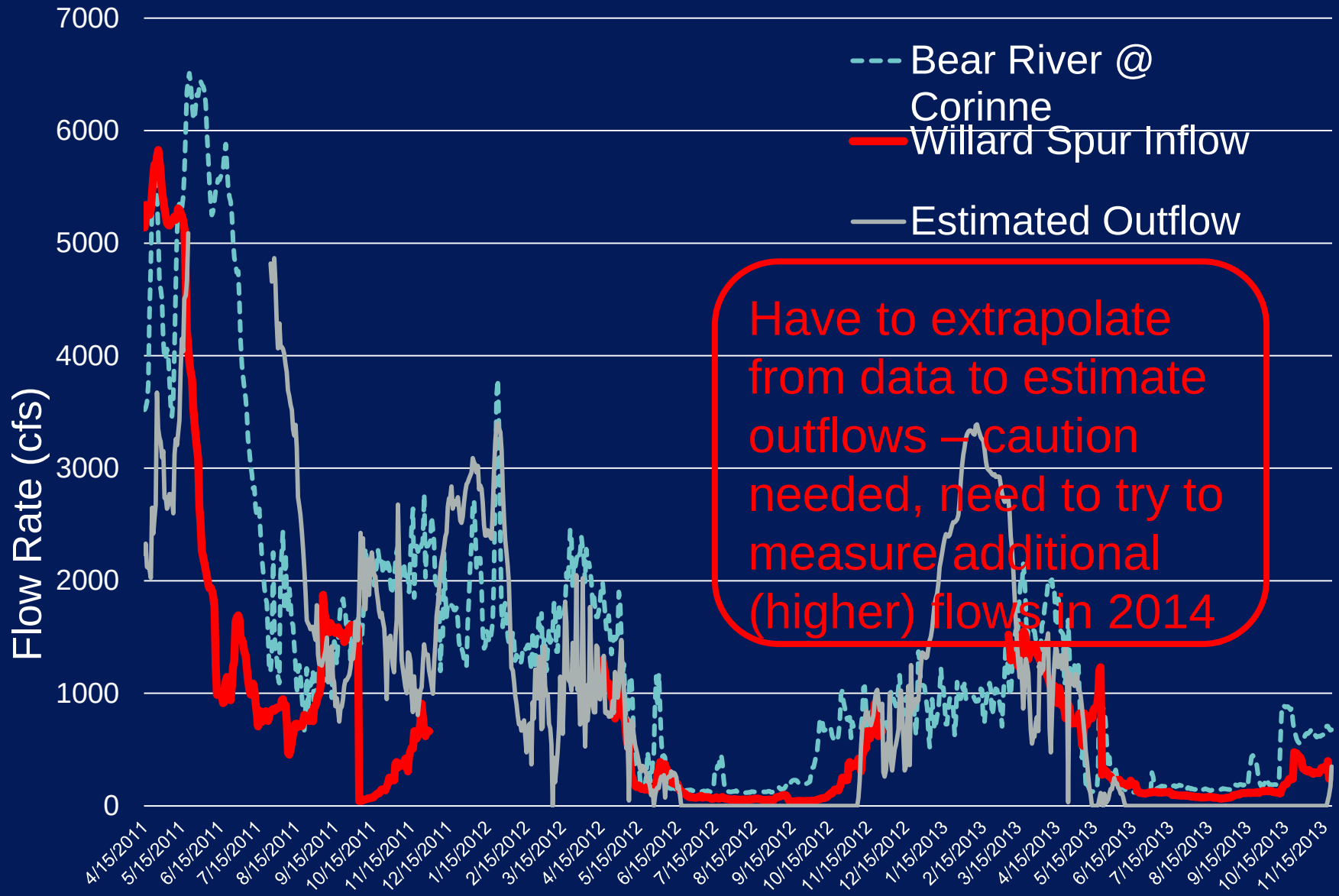
Willard Spur Water Level Fluctuations (2011-2013)

Willard Spur Inflows (2011-2013)

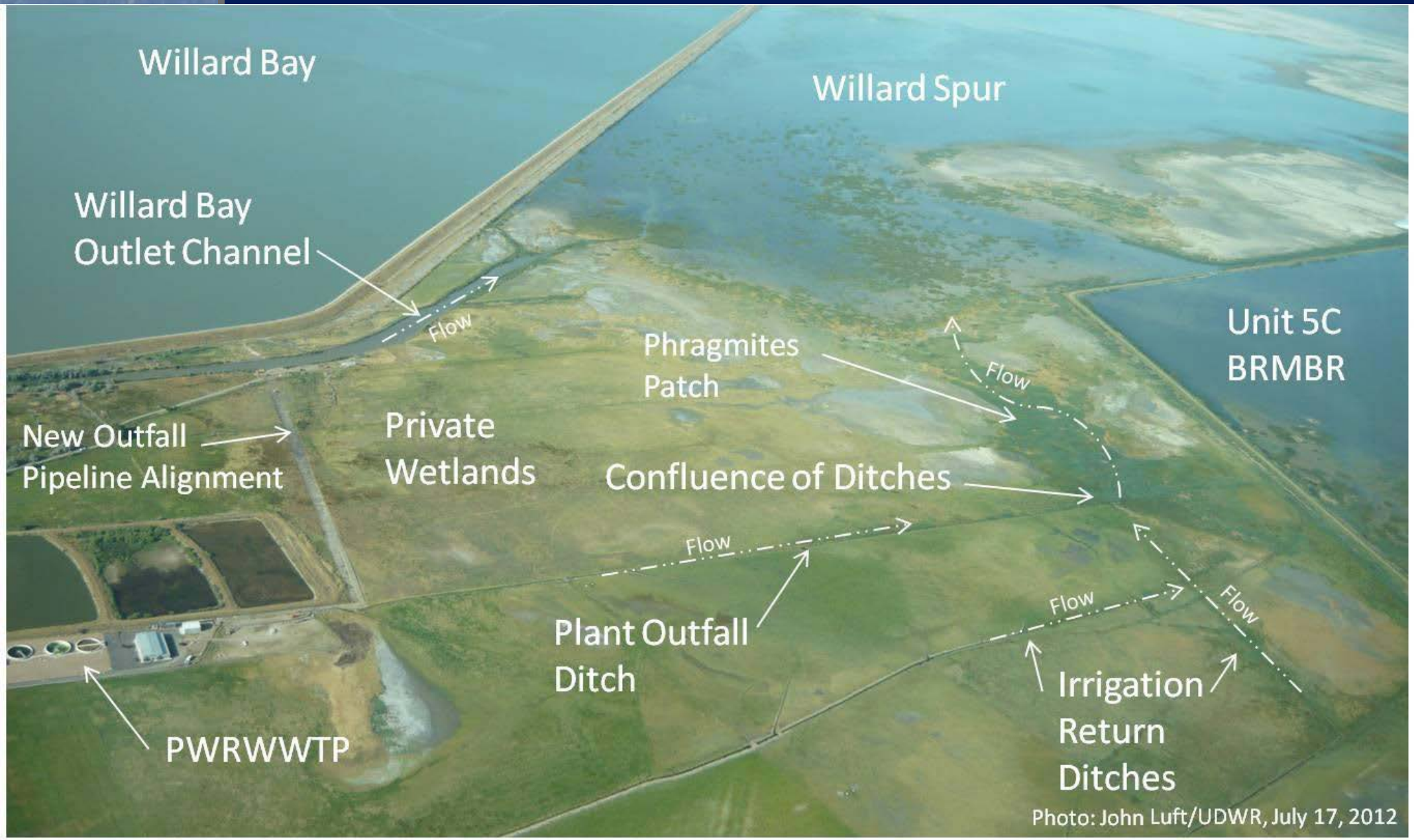


Willard Spur Outflows? (2011-2013)



Have to extrapolate from data to estimate outflows – caution needed, need to try to measure additional (higher) flows in 2014

When does the Plant's flow reach Willard Spur?



Summary of Plant Discharge Operations 2011 - 2012

Period of Operation	Discharge Location
April 2011 – July 26, 2012	Outfall ditch
July 27 – 29, 2012	Willard Bay outlet channel
July 30 – October 15, 2012	Outfall ditch
October 16, 2012	Private wetlands
Oct 18 – December 24, 2012	Willard Bay outlet channel
December 24, 2012 – March 27, 2013	Private wetlands
Marcy 27 – July 10, 2013	Willard Bay outlet channel
July 10 – August 22, 2013	Private wetlands
August 22 – October 6, 2013	Willard Bay outlet channel
October 6, 2013 - present	Private wetlands

Goal for private wetlands is to increase crop yield, reduce soil salinity

Source: personal communication Jeff Hollingsworth

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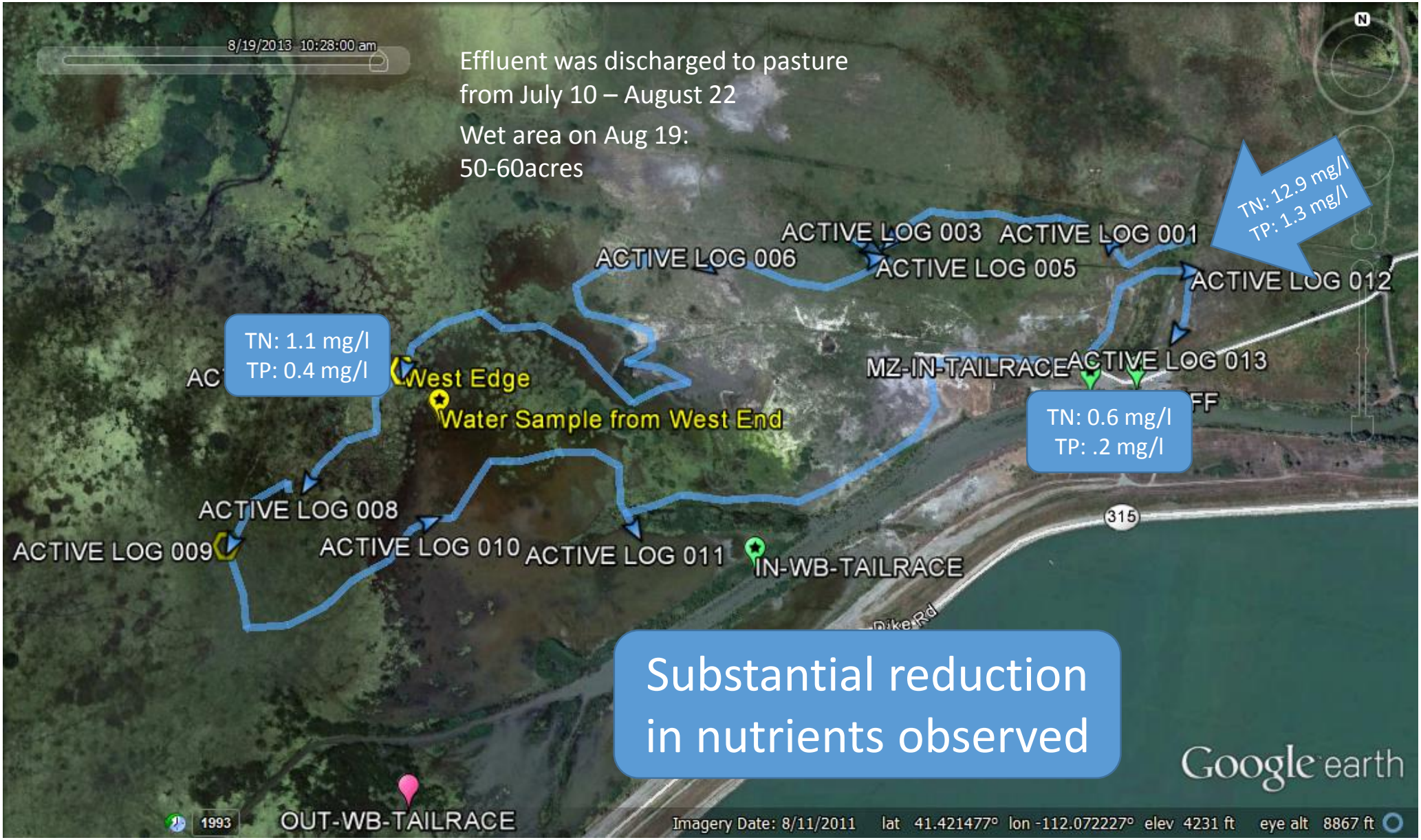
8/19/2013 10:28:00 am
Effluent was discharged to pasture from July 10 – August 22
Wet area on Aug 19: 50-60acres
TN: 12.9 mg/l
TP: 1.3 mg/l
ACTIVE LOG 003
ACTIVE LOG 001
ACTIVE LOG 006
ACTIVE LOG 005
ACTIVE LOG 012
TN: 1.1 mg/l
TP: 0.4 mg/l
West Edge
Water Sample from West End
MZ-IN-TAILRACE
ACTIVE LOG 013
TN: 0.6 mg/l
TP: .2 mg/l
ACTIVE LOG 008
ACTIVE LOG 009
ACTIVE LOG 010
ACTIVE LOG 011
IN-WB-TAILRACE
315
Substantial reduction in nutrients observed
OUT-WB-TAILRACE
Google earth
Imagery Date: 8/11/2011 lat 41.421477° lon -112.072227° elev 4231 ft eye alt 8867 ft

Nutrient Loading

- **What are the sources of nutrients entering Willard Spur and what is the relative significance of these sources?**
- Note: these pie and bar charts all assume that the full nutrient load from the Plant reaches the open water of Willard Spur. There is indication that there is uptake upstream of the open water as well as the effluent possibly evaporating prior to reaching Willard Spur. Thus, these comparisons of load contribution should be considered to be conservative and likely over-estimate the contribution of the Plant at this point. Loads will be updated to address nutrient uptake and evaporation questions.

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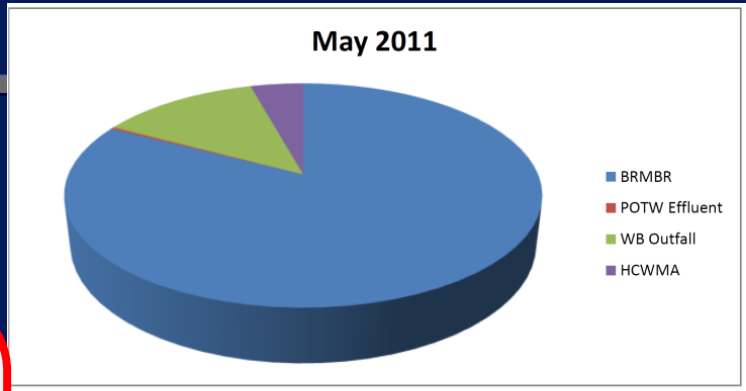
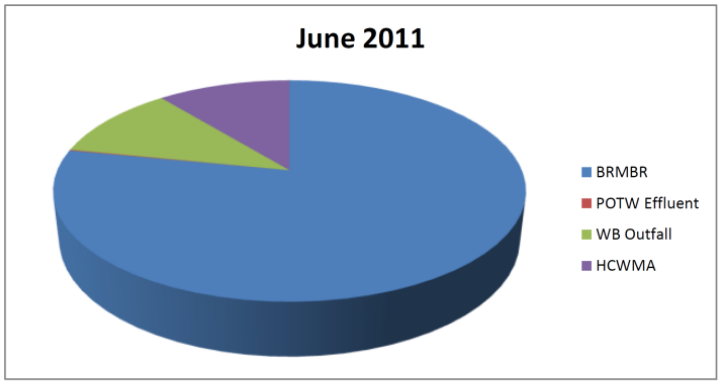
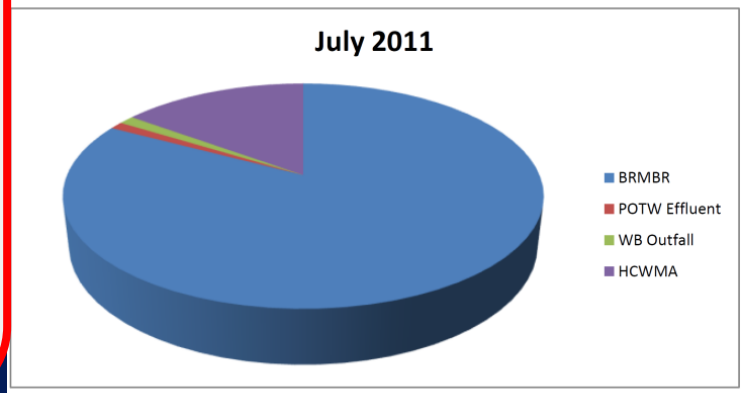
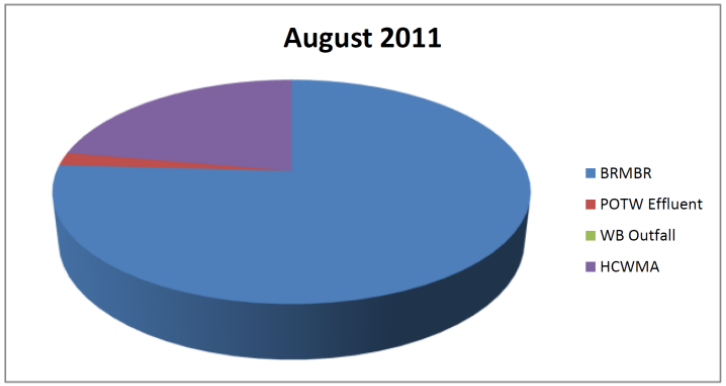
Total Nitrogen Loading - 2011

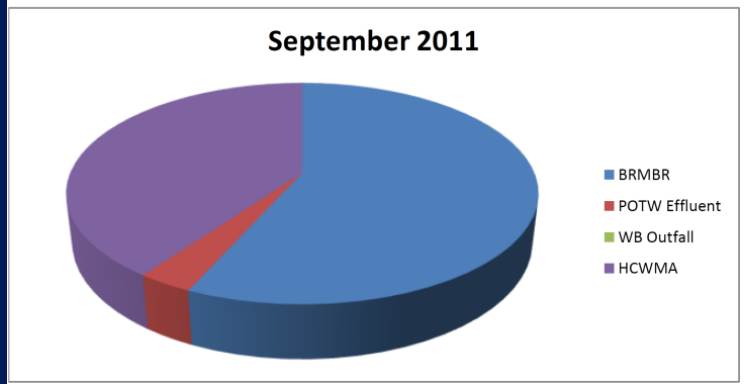
Note that charts have not been adjusted to account for load reductions due to evaporation/uptake, these charts represent loads at sampling site

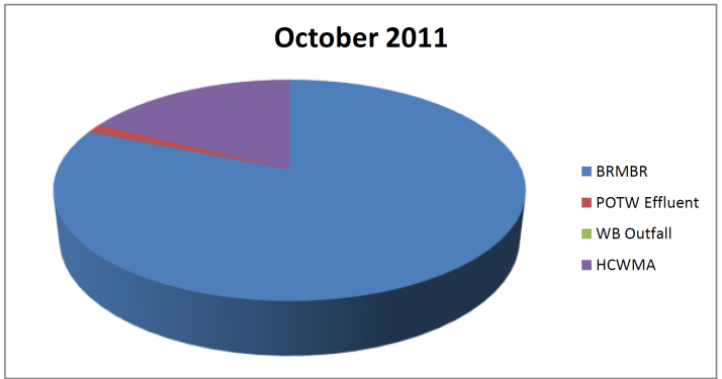












Total Nitrogen Loading - 2012

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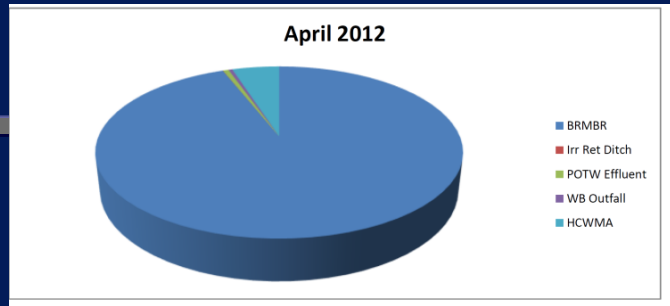
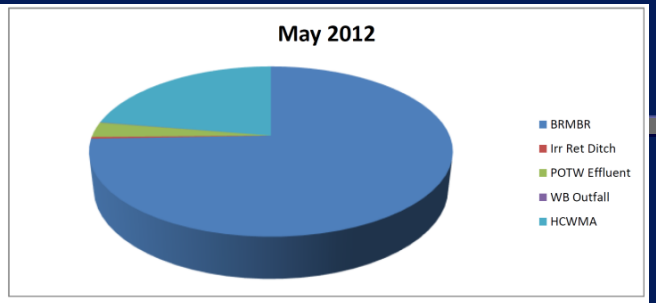
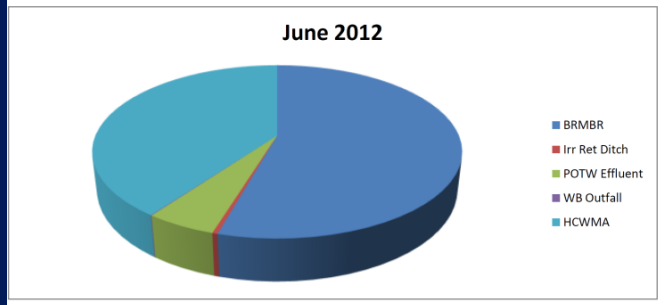
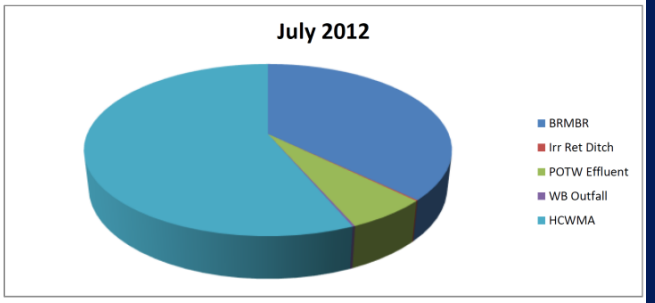
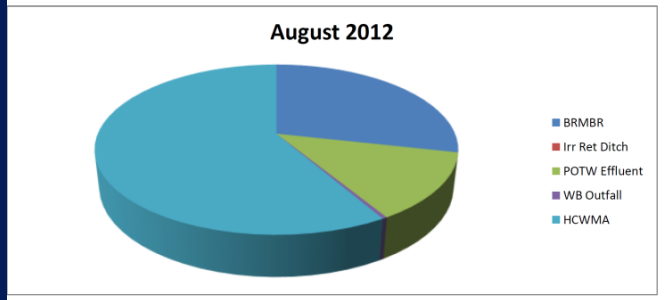
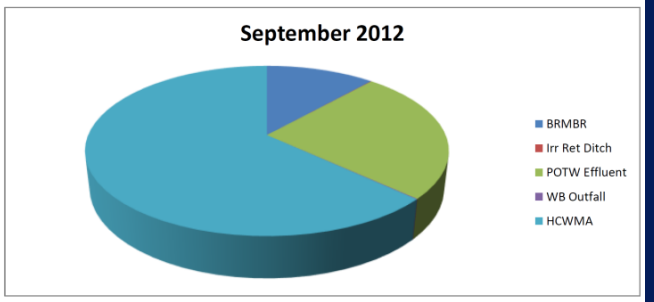


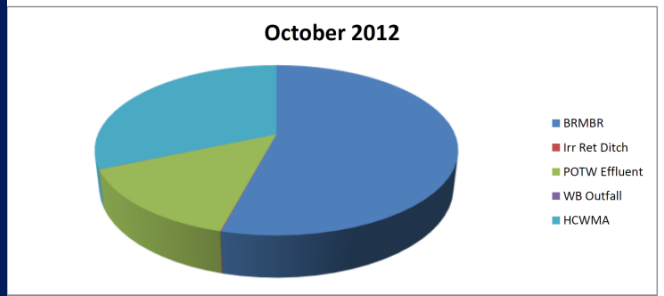


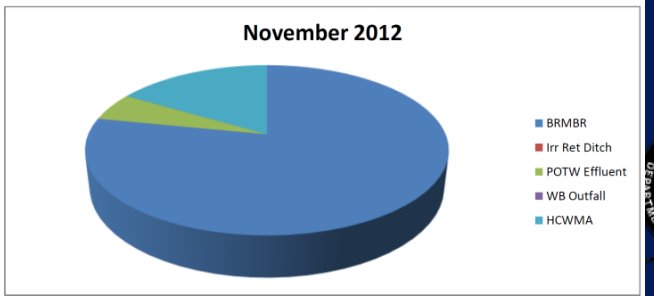




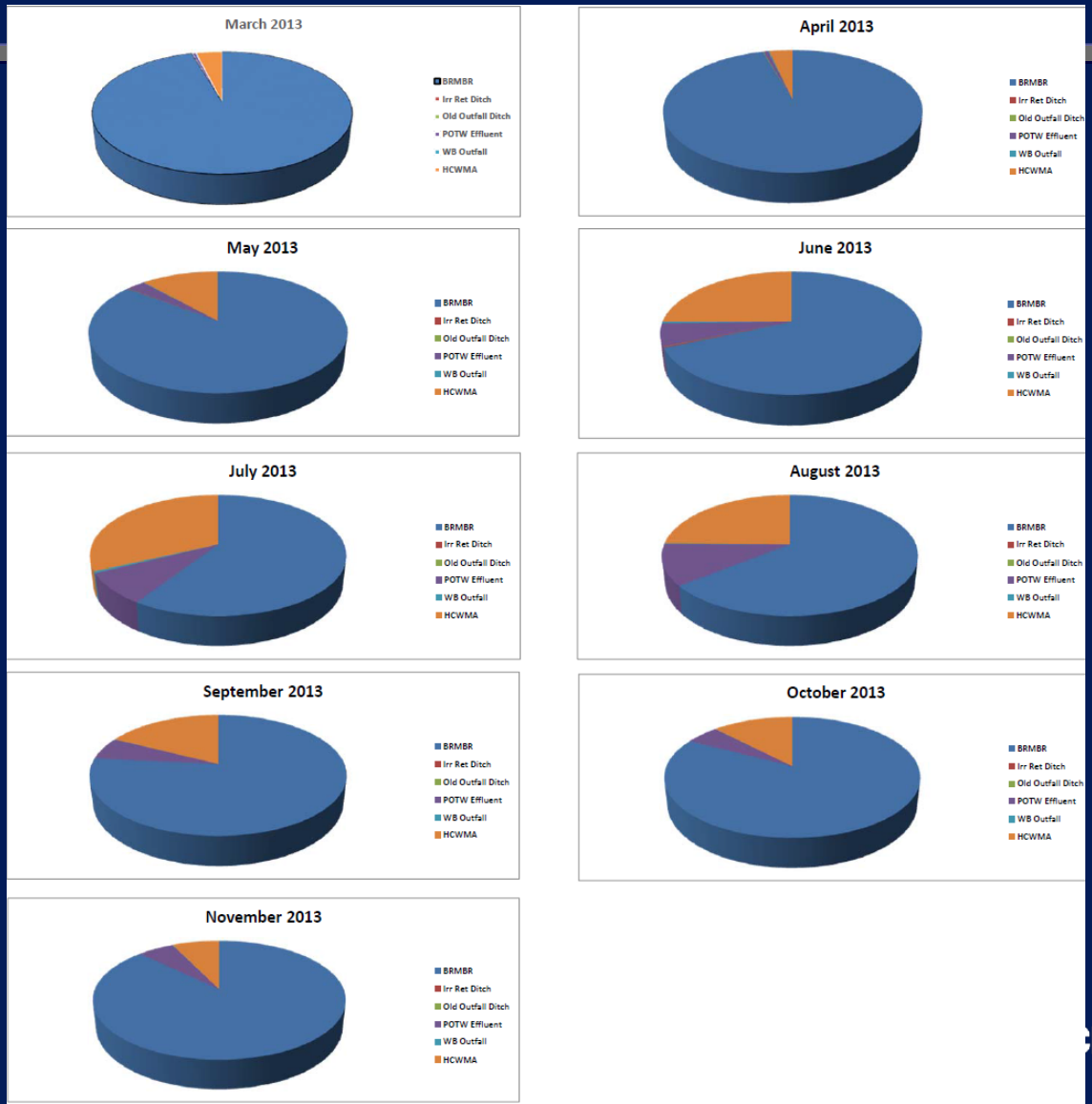








Total Nitrogen Loading - 2013



Note that charts have not been adjusted to account for load reductions due to evaporation/uptake, these charts represent loads at sampling site

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Total Phosphorus Loading - 2011

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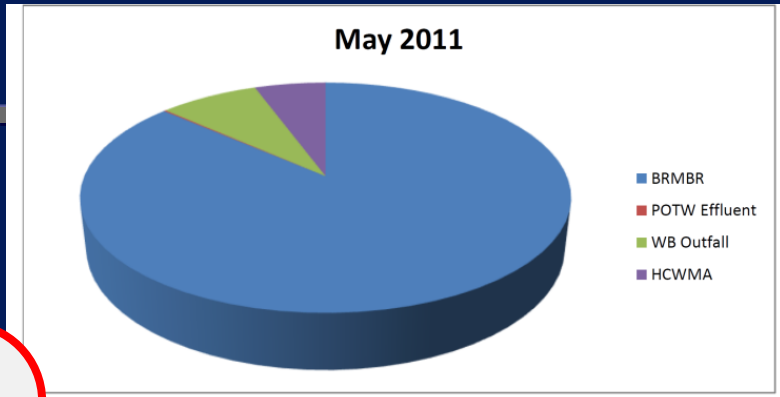

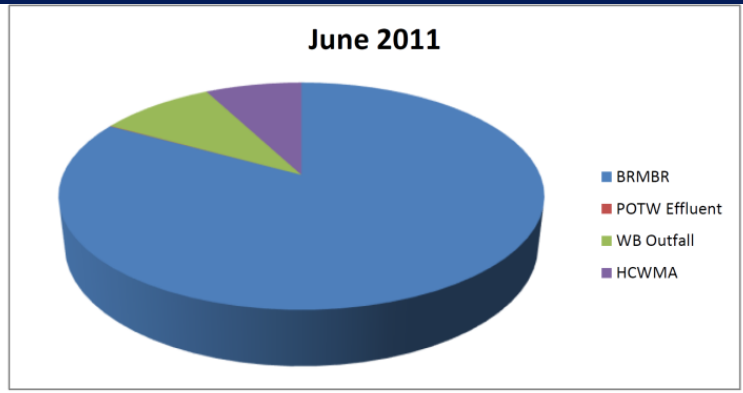

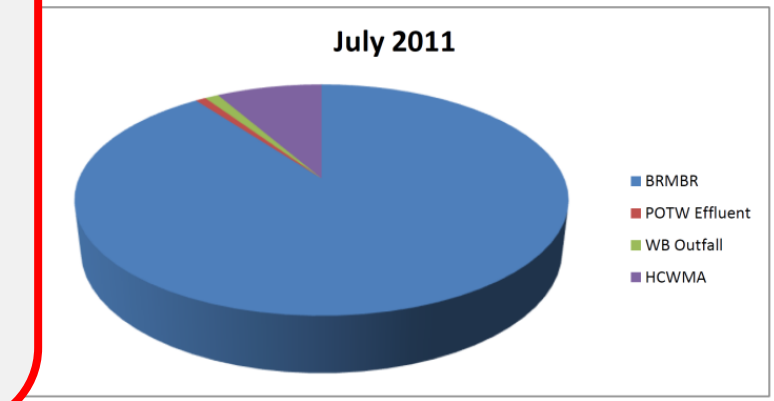

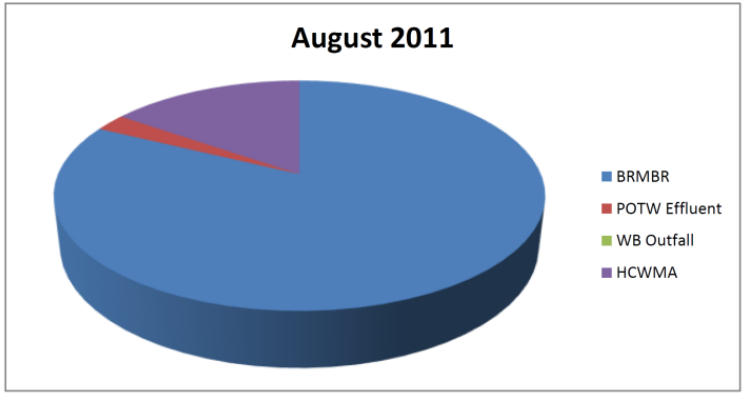

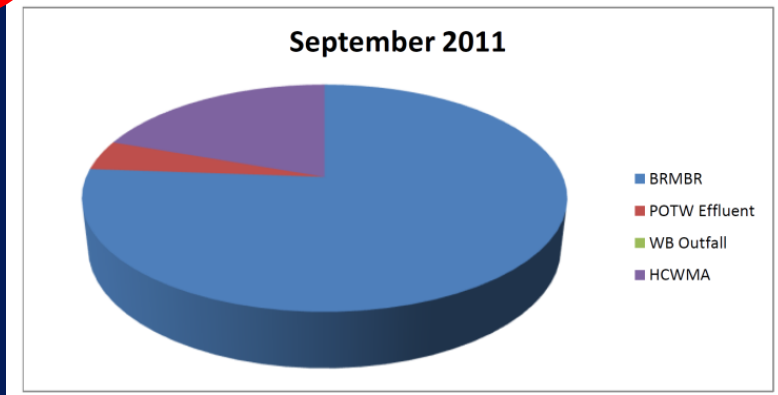

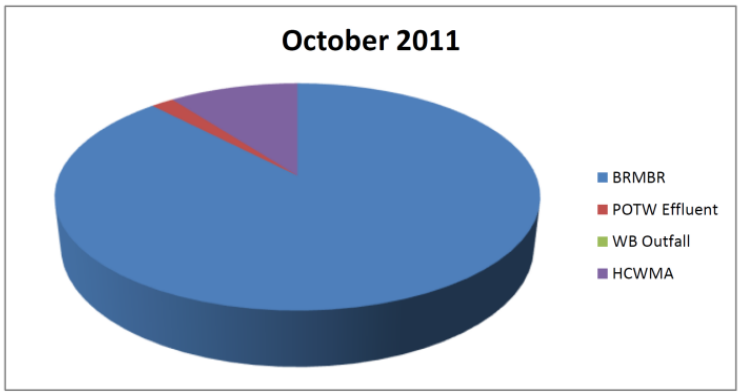

Total Phosphorus Loading - 2012

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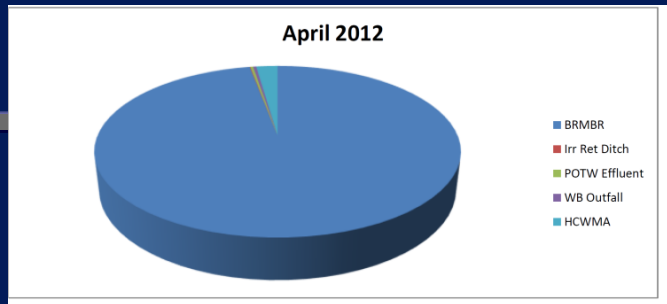

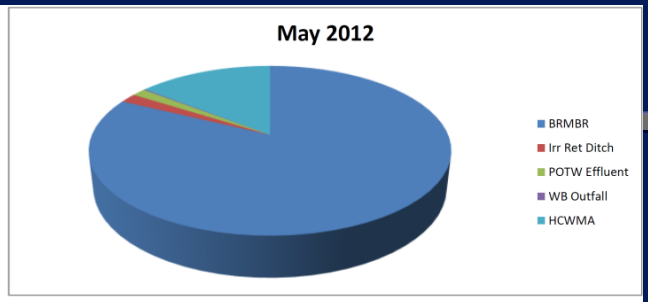

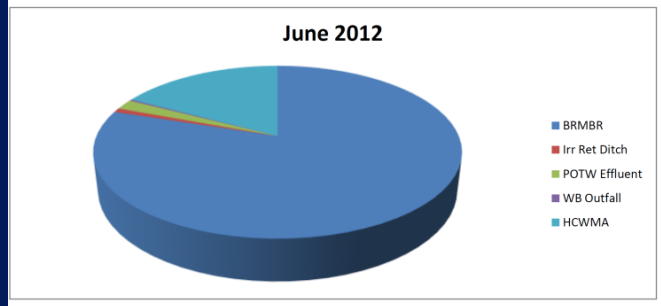

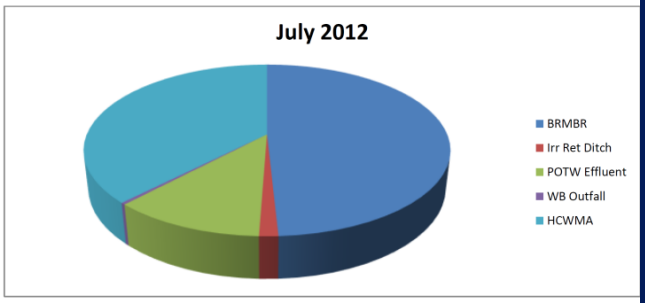

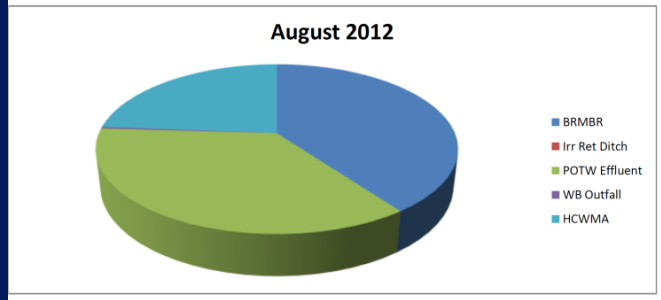

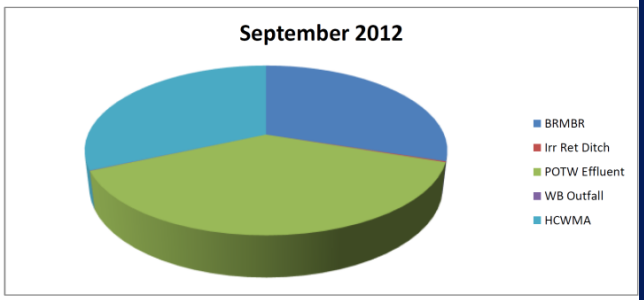

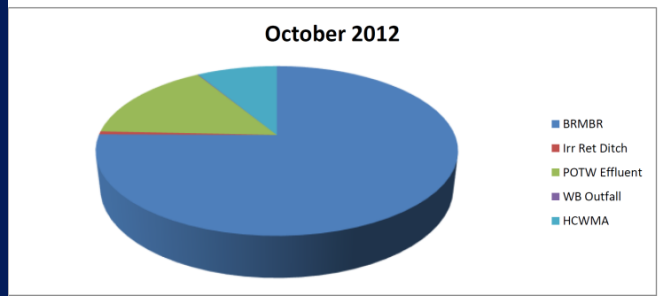

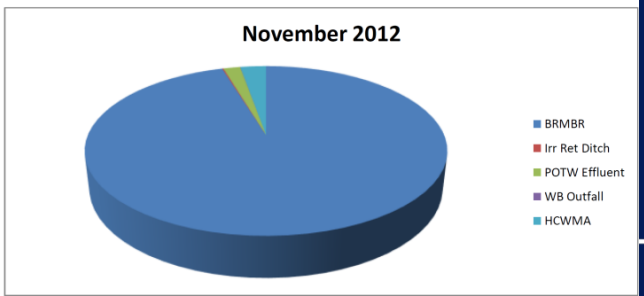

Total Phosphorus Loading - 2013

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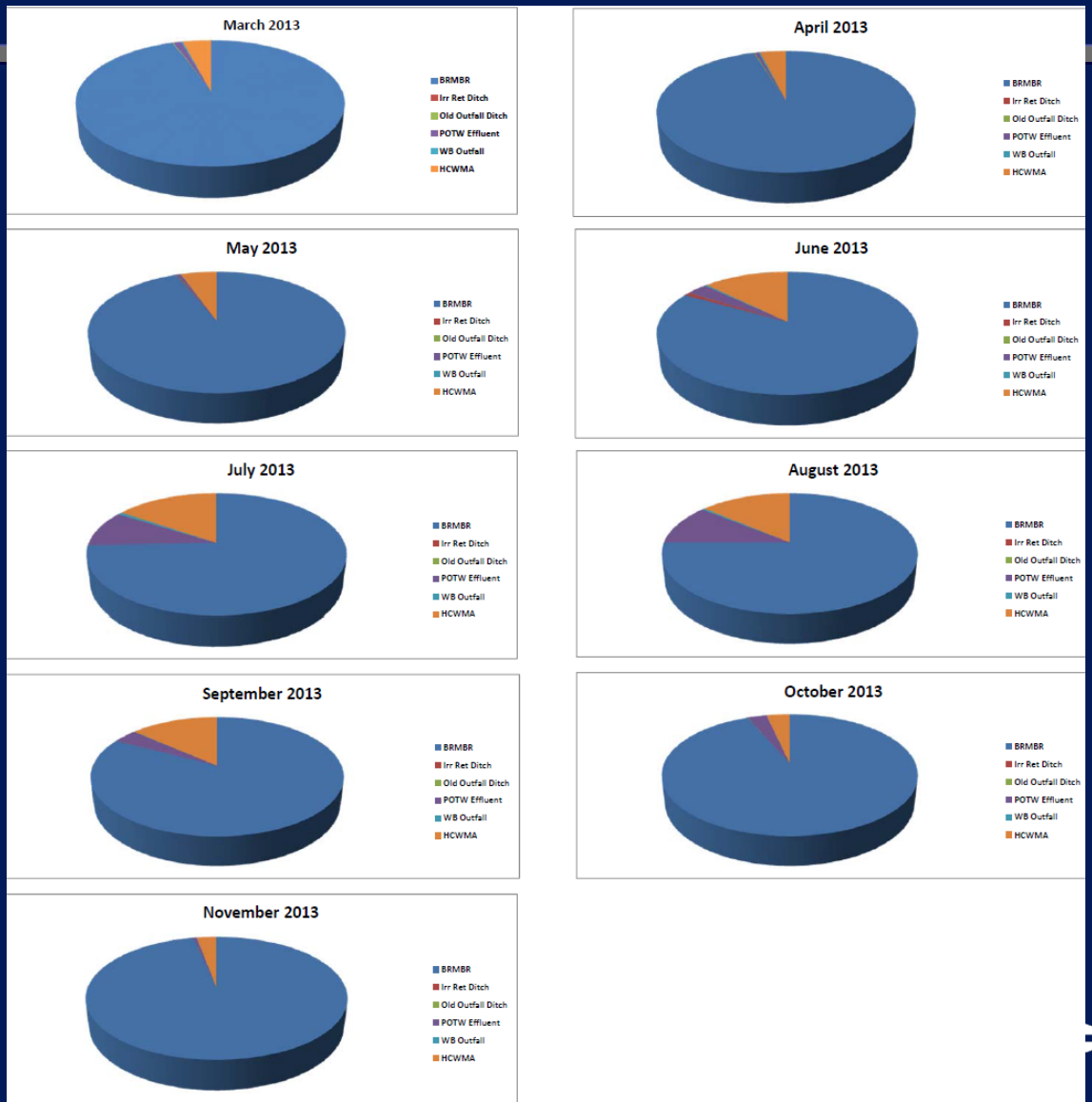

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