



Development of Water Quality Standards for Willard Spur

Path Toward Completion (2013 – 2014)

June 6, 2013

Willard Spur Steering Committee

Agenda

- 1. Current & Anticipated Site Conditions for 2013**
- 2. Budget Status**
- 3. Research Plan for 2013**
- 4. Path Toward Completion**





Current Conditions

- **Water level is dropping**
- **Conditions are very dynamic**
- **Water was “milky” two weeks ago, this week it is clear**
- **Flow out of Willard Spur is essentially over**





Site WS2



Site WS3

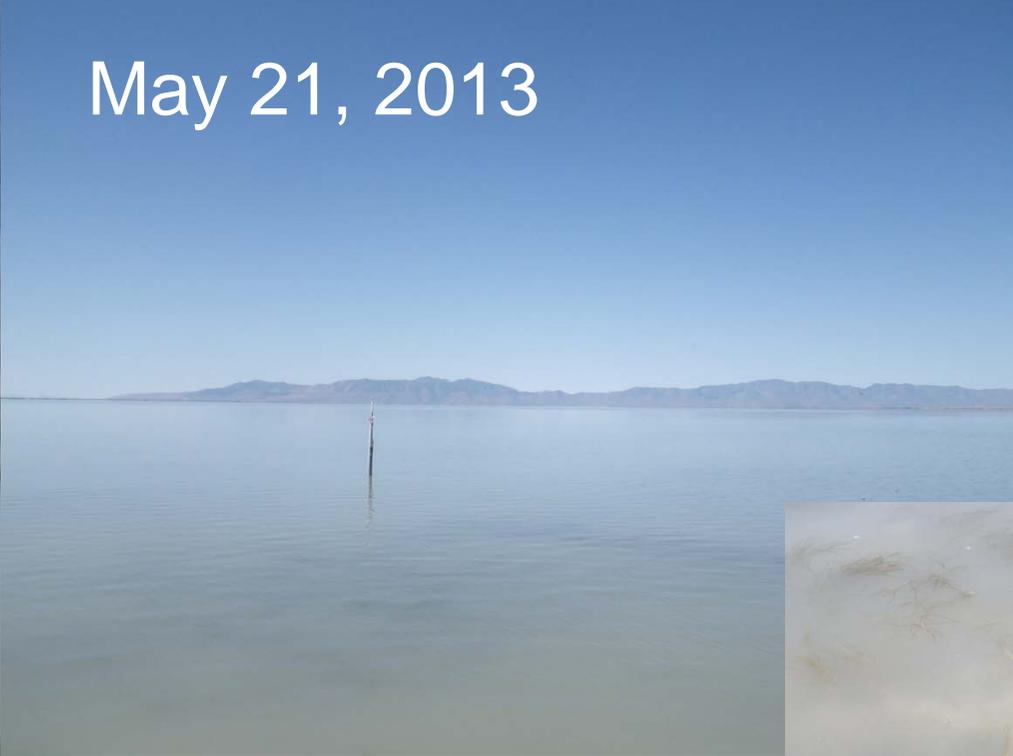




June 5, 2013



May 21, 2013



**A big change
at Site WS6**



All photos by DWQ

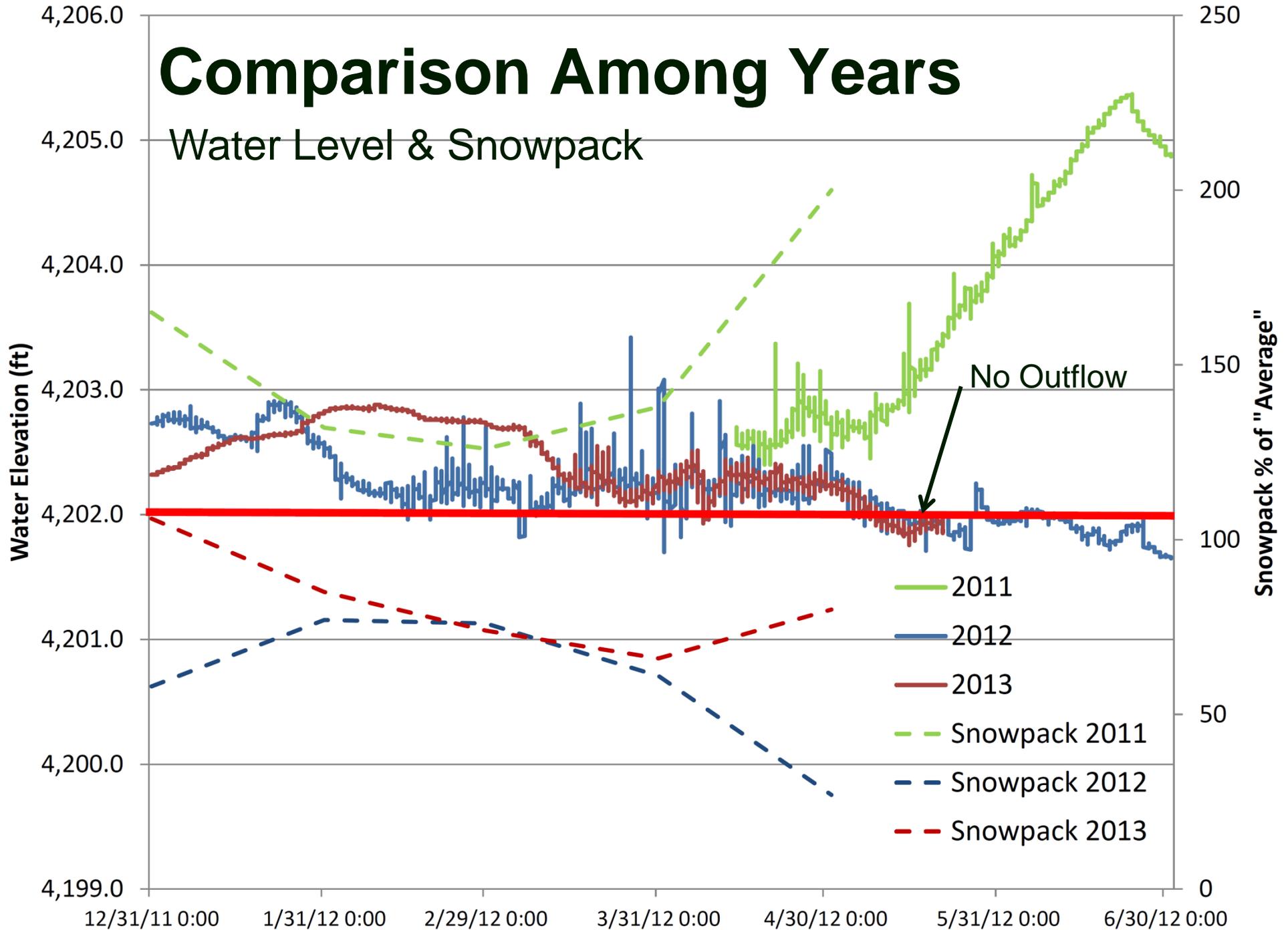
Site WS12 – May 21, 2013



All photos by DWQ

Comparison Among Years

Water Level & Snowpack





Anticipated Conditions for 2013

- **Anticipate similar conditions as observed in 2012**
- **Water level will likely:**
 - Hold fairly steady through June
 - Drop through September
 - Increase again in October
- **Much will depend upon summer weather → evaporation**





Opportunity for 2013

- 1. The “dry” condition is likely the “critical” condition we are most worried about**
 - No outflow, salinity/temp increasing, internal cycling
- 2. Confirm and refine our understanding of this condition, nutrient responses, and potential impacts**



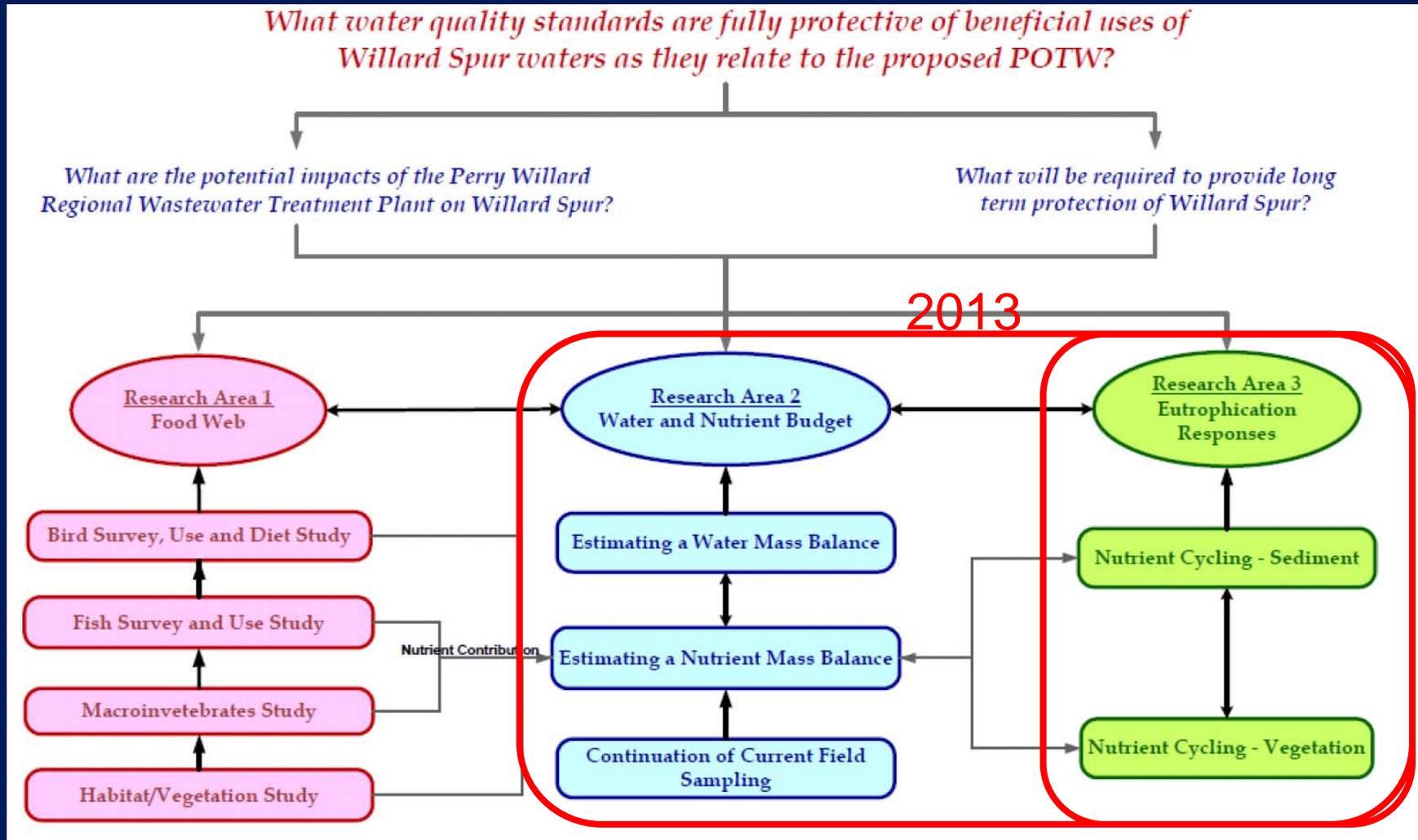
Budget Status

ORIGINAL ALLOCATED MONIES FOR RESEARCH PROGRAM		\$ 1,415,000
Project Costs to Date	Budget	Actual Costs
2011 - Baseline Monitoring & Research Plan Development	\$ 333,658	\$ 299,584
2012 - Year One Research Plan Implementation	\$ 817,056	\$ 812,066
SUBTOTAL PROJECT COSTS TO DATE	\$ 1,150,714	\$ 1,111,650
Costs for Proposed Work to Finish Project	Budget	
2013 - Year Two Research Plan Implementation	\$ 306,350	
2014 - Analysis, Recommendation Formulation, and Final Report	\$ 102,000	
SUBTOTAL COSTS FOR PROPOSED WORK	\$ 408,350	
TOTAL PROJECTED COSTS FOR RECOMMENDED RESEARCH	\$ 1,520,000	
TOTAL ALLOCATED MONIES FOR RESEARCH PROGRAM	\$ 1,415,000	
PROJECTED BUDGET SHORTFALL	\$ (105,000)	

WQB approved an additional \$105,000 on May 1, 2013



Research Plan for 2012-2013



Looking at historic and current changes due to nutrients

Looking at potential future changes due to nutrients

Challenge for 2013

- **Balance Final Needs & Budget**
- **Final Research for 2013**
 1. Characterize impacts from Plant
 2. Finish Nutrient Cycling Study
 3. Special Open Water Studies
 4. Hydrology/Nutrient Budget

2013 Objective: Reduce our Gap in Understanding of Potential Impacts  Reduce Risk of Potential Impacts





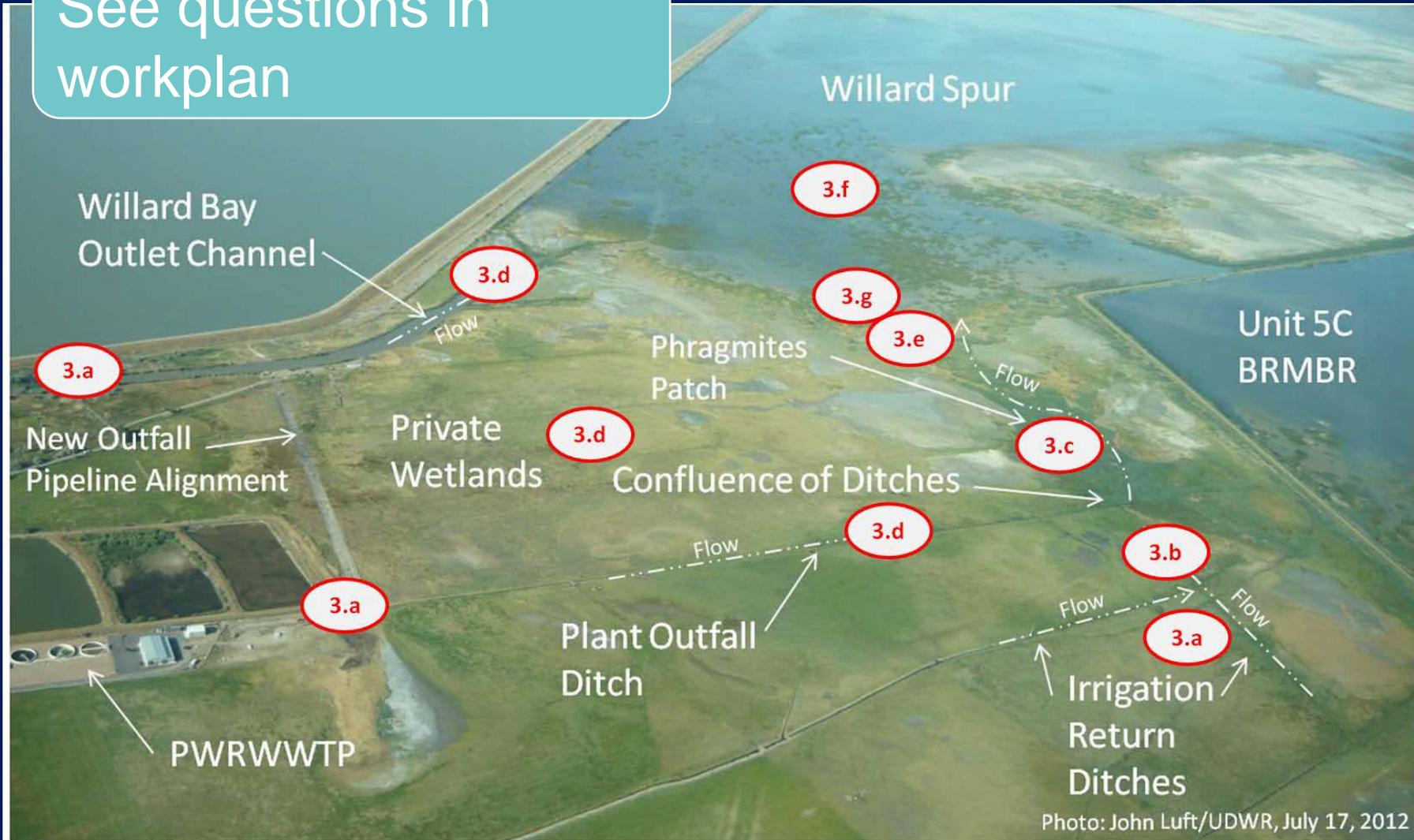
1. Characterize Impacts from Plant

- **Highest Priority**
- **Three areas**
 - Confirm historical, current, and future use of discharges on the east side
 - Sampling, monitoring, and experiments
 - Evaluation
- **See proposed workplan for Element 1**



1. Characterize Impacts from Plant

See questions in workplan





2. Complete Nutrient Cycling Study

- **Study Objectives:**
 - Provide understanding of natural variability of the biological processes related to nutrient cycling
 - Identify thresholds for nutrient response via biological indicators



2. Complete Nutrient Cycling Study

- 2013 Objectives
 1. Establish four new test plots



2. Complete Nutrient Cycling Study

- **2013 Objectives**

1. Establish four new test plots

2. Water column nutrient addition

- *Suspending bags of fertilizer in the water column*
- *Goal is to observe response to various levels of nutrients in water column*

Table 1: Summary of fertilizer amendments

Water Column Amendments	Total Mass of Fertilizer in Plot (kg)	PO ₄ -P Target Concentrations (mg/L)	Dissolved N Target Concentrations (mg/L)
High	152	0.4	2.5
Medium	36	0.1	1.1
Low	18	0.05	0.5

New for
2013





2. Complete Nutrient Cycling Study

- **2013 Objectives**

1. Establish four new test plots
2. Water column nutrient addition
3. Intensive sampling through June
 - *% cover of SAV, branch density*
 - *% cover of epiphytes, BDS, and algal mat*
 - *Light penetration*
 - *CNP in leaf tissue, isotopes in leaves & epiphytes*





2. Complete Nutrient Cycling Study

- **2013 Objectives**

1. Establish four new test plots
2. Water column nutrient addition
3. Intensive sampling through June
4. Possibly end study in July, or October
5. Evaluate 2012 sediment diatoms
 - *Identify characteristics of September bloom of phytoplankton*



2. Complete Nutrient Cycling Study

- 2013 Objectives

- 6. Microcosm experiment to look at fate of nutrients in water/sediment

Table 1: Matrix of experiments with low concentrations of nutrients

Type of chamber	Amendment	Target Concentration	Comment
Sed+WC	None	Background	In duplicate
WC only	None	Background	In duplicate
Sed+WC	(N+P)- low	0.1 mg P/1+0.5 mg-N/L	In duplicate
WC only	(N+P)- low	0.1 mg P/1+0.5 mg-N/L	In duplicate

Table 2: Matrix of experiments with high concentrations of nutrients

Type of chamber	Amendment	Target Concentration	Comment
Sed+WC	None	Background	In duplicate
WC only	None	Background	In duplicate
Sed+WC	(N+P)- high	0.5 mg P/1+2.5 mg-N/L	In duplicate
WC only	(N+P)- high	0.5 mg P/1+2.5 mg-N/L	In duplicate



3. Special Open Water Studies

- **Objective:**
 - Improve interpretation and understanding
- 1. Deploy sondes to monitor**
 - pH, temperature, DO, and specific conductance
- 2. Pelagic nutrient limitation studies**
 - Utilize similar methods with bags as 2012



3. Special Open Water Studies

3. Collect bedload samples for Willard Spur outflow

- Assist with exported nutrient estimates



3. Special Open Water Studies

4. Willard Spur Mesocosm Study

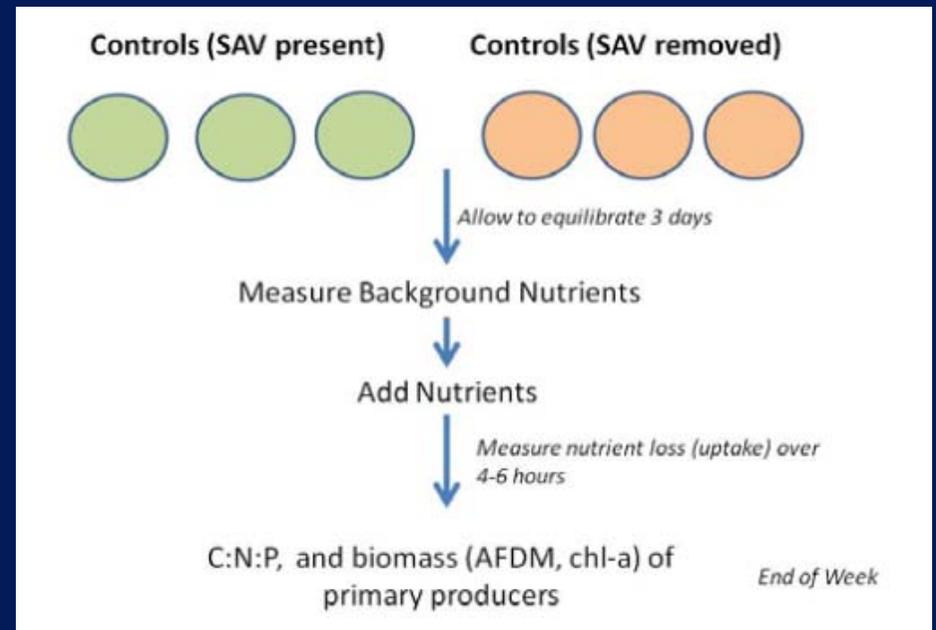
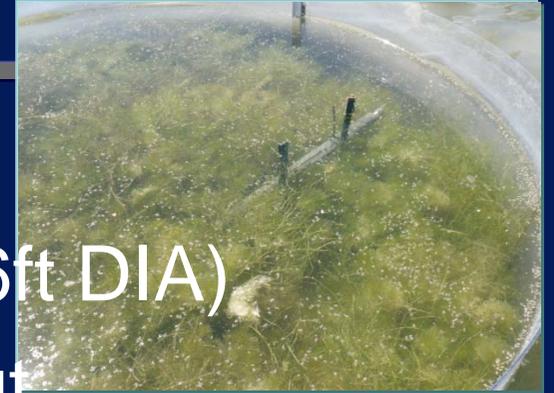
- Key questions
 - *What are the uptake rates within Willard Spur? Are they different over time?*
 - *How do plants/algae influence uptake rates and ecosystem processes?*
 - *Where do the nutrients go in a closed system?*



Willard Spur Mesocosm Study

- **Study Design**

- Will use 6 closed chambers (6ft DIA)
- Three with SAV, Three without
- Will spike nutrients into all
- Will monitor for 1 week period
- Complete experiment in June & August





What is the difference between the different experiments?

- UofU study test plots are open to the system, objective is to document responses and identify indicators
- DWQ bags are closed chambers, measuring rate of nutrient assimilation for water column only
- UofU microcosms are closed chambers, measuring rate of nutrient assimilation for water & sediment
- DWQ mesocosms are closed chambers, measuring rate of nutrient assimilation for water/sediment/SAV/algae and determining importance of SAV

All complement each other



Key questions for all GSL wetlands

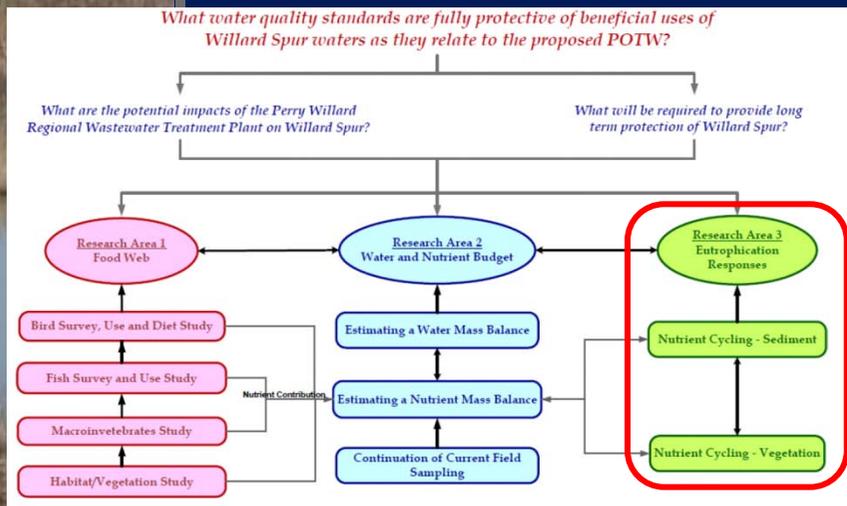
UofU Test Plots

UofU Microcosms

DWQ Bag Experiment

DWQ Mesocosms

- How does Willard Spur respond to nutrients?
- What are the assimilation rates for nutrients?
- Where do the nutrients go?





4. Sampling & Monitoring

- **Objective: understand dynamics of Willard Spur, inform experiments, allow comparison of annual variation**
- **Scaling back effort**
 - DWQ assumed USGS gauging efforts
 - Prioritized and reduced number of sites





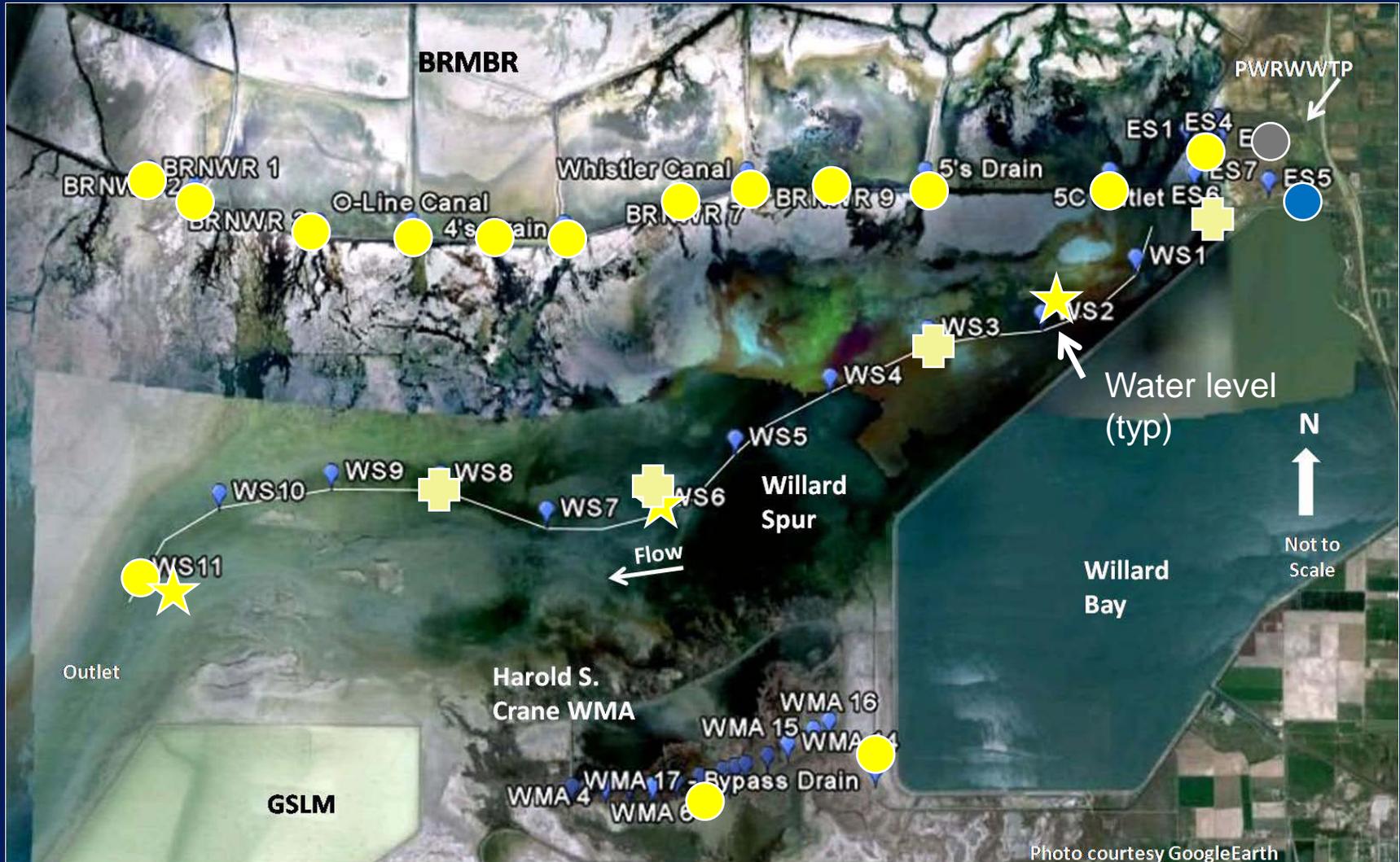
4. Sampling & Monitoring

- **Objective: understand dynamics of Willard Spur, inform experiments, allow comparison of annual variation**
 1. Monitor water level changes
 2. Measure outflow from Willard Spur
 - *Estimate nutrient export*
 3. Monitor changes at open water sites
 4. Monitor inflow rates and water quality
 - *Estimate nutrient loads*

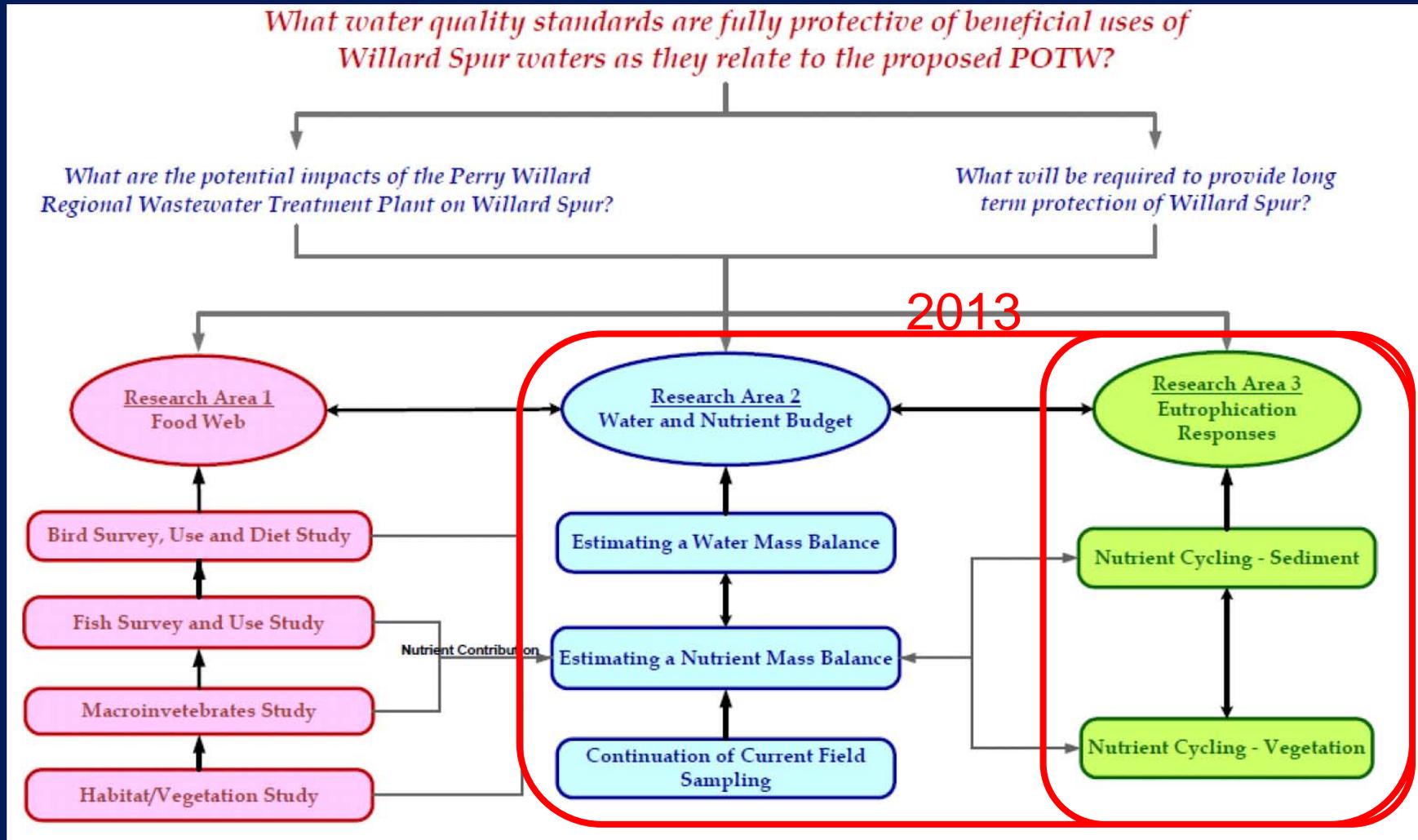


Sampling and Monitoring Sites

- Flow & Samples
- ★ Water Level
- ⊕ Monitoring



Research Plan for 2013

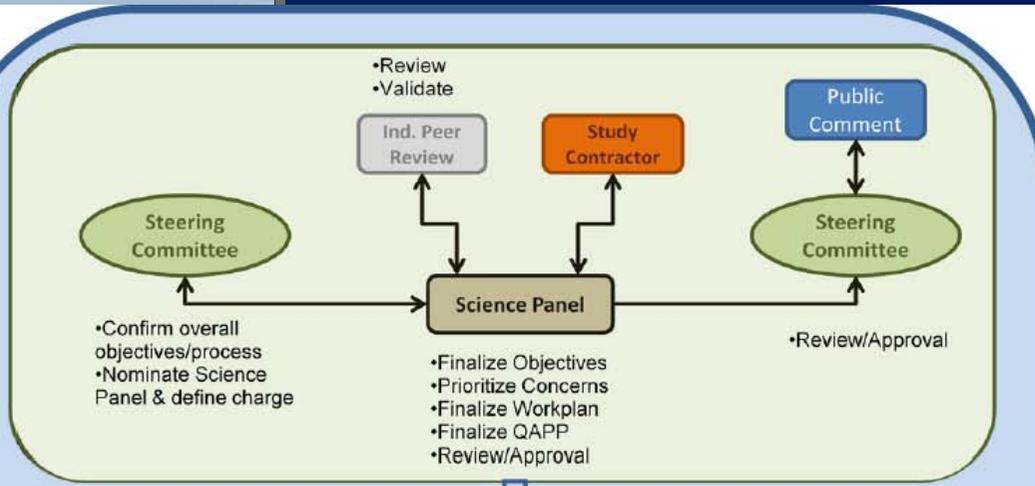


Looking at historic and current changes due to nutrients

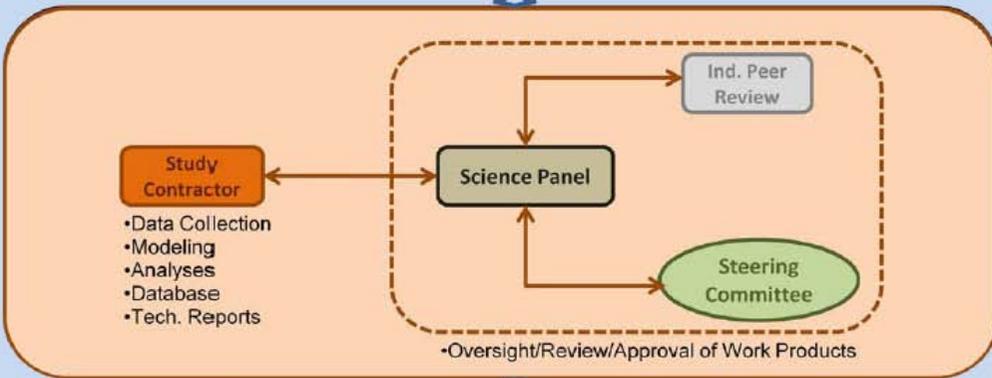
Looking at potential future changes due to nutrients

Path to Completion 2011

Plan Formulation



2012-2013 Research & Evaluation



2014 Reporting & Recommendations



DWQ Input & Oversight
Throughout Process

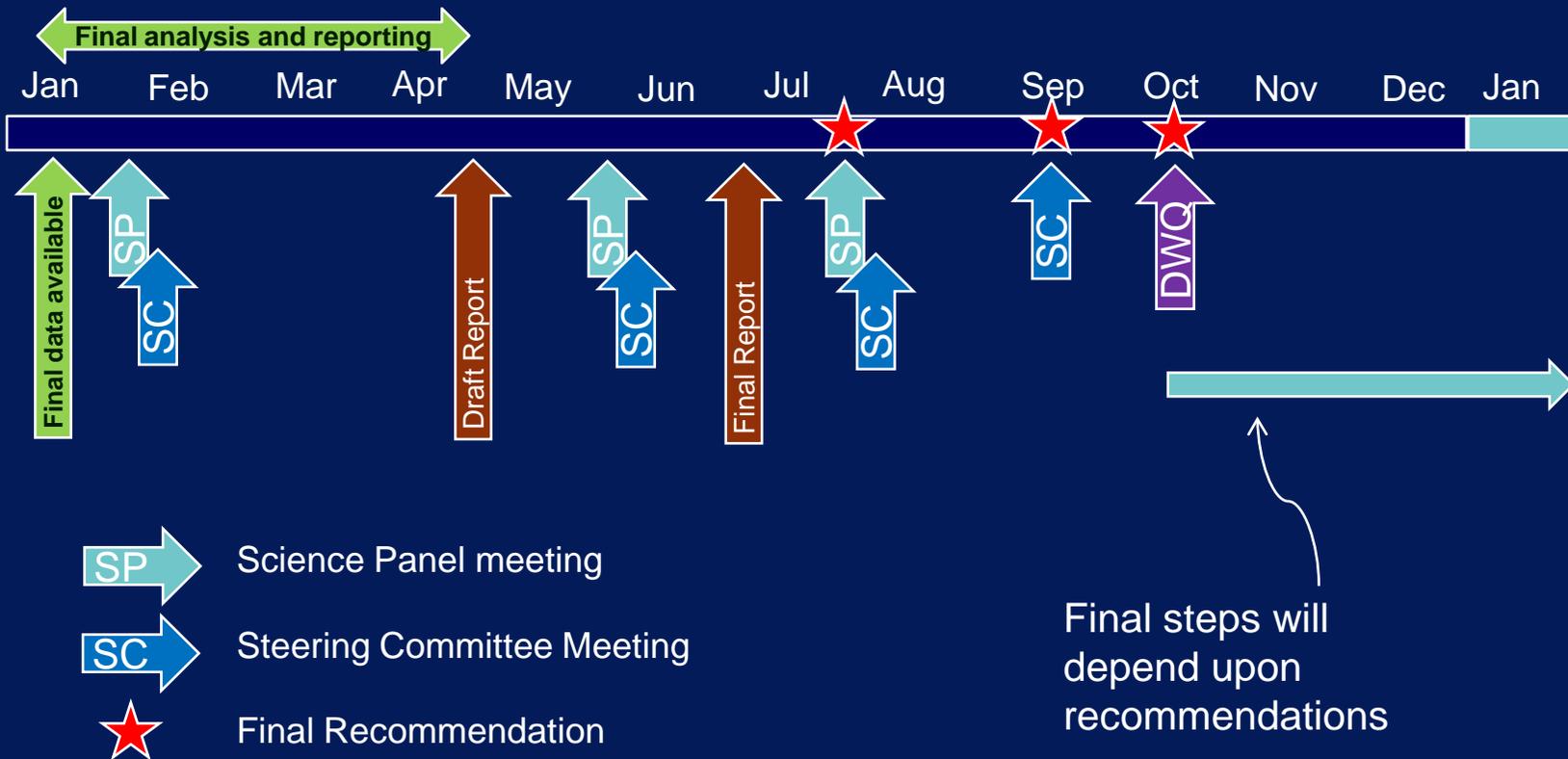


Schedule of Deliverables

	Description	Data	Draft	Final
	2012 Research Studies			
→	Final reports		30-Dec-12	30-Jul-13
	Database			
→	2011-2012 Database			30-Jun-13
	2011-2013 Database		28-Feb-14	30-Jun-14
	2013 Research Plan			
	Plant Impacts	31-Jan-14	30-Mar-14	30-Jun-14
	Nutrient Cycling Study	30-Sep-13	30-Nov-13	28-Jan-14
	Open Water Studies	30-Oct-13	3-Jan-14	28-Feb-14
	Final Reporting			
	2011-2013 Hydrology	31-Jan-14	30-Mar-14	
	2011-2013 Nutrient Loads	31-Jan-14	30-Mar-14	
	Nutrient Cycling Study		30-Apr-14	30-Jun-14
	Final Reporting		30-Apr-14	30-Jun-14



Path Toward Completion - 2014



Questions?

