



Development of Water Quality Standards for Willard Spur

“Wish List” for 2013

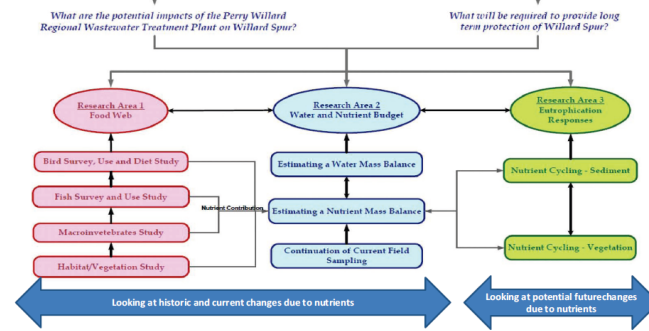
January 29, 2013

Willard Spur Science Panel



Linking Objectives & Questions to Answers & Solutions
 Development of Water Quality Standards for Willard Spur

What water quality standards are fully protective of beneficial uses of Willard Spur waters as they relate to the proposed POTW?



Study Question	Research Area that will address question	Specific Study/Task to address question	Possible Management Solutions
1. What are the potential impacts of the Plant on Willard Spur?			
1.1. What characteristics of the effluent are of concern?	2	Hydrology monitoring	
1.1.1 Is alteration of site hydrology a concern?	2	2011 and 2012 Sampling Plan	Maintain Discharge Monitoring Reporting
1.1.2 Are the chemical constituents of concern?	2	2011 and 2012 Sampling Plan, Nutrient Budget	Maintain Discharge Monitoring Reporting
1.2. What are the nutrient loads in the effluent with and without nutrient removal?	2	2011 and 2012 Sampling Plan, Nutrient Budget	
1.3. What are the sources of nutrients entering Willard Spur and what is the relative significance of these sources?	2	2011 and 2012 Sampling Plan, Nutrient Budget	
1.4. How much of that load will reach Willard Spur accounting for nutrient assimilation by the wetland channel?	2	Nutrient Uptake Capacity Analysis - Special Study	
1.5. How will the wetland channel respond to the effluent's nutrient load?	2	2011 and 2012 Sampling Plan	
1.5.1 How will it respond in the long term?	2	Sampling Study, Nutrient assimilation of Harlequin Crane WMA	Long term monitoring plan with assessment framework
1.6. Under what conditions does the effluent reach and not reach Willard Spur?	2	Hydrology study	
1.7. Of the nutrients that reach Willard Spur, how might they change the ecosystem?	2	Site-wide Intensive Sampling Study	
	3	Nutrient cycling study	
	1	Vegetation/habitat mapping & R review, Avian use R review, Fish use R review, Macroinvertebrate evaluation & R review	
1.7.1 Do these changes have a deleterious effect on Willard Spur?	3	Nutrient cycling study	Change LPDES permit conditions, permanent nutrient removal
2. What will be required to provide long term protection of Willard Spur?			
2.1. What are the beneficial uses of Willard Spur?	2	2011 and 2012 Sampling Plan	Change beneficial use designation
2.2. What is the present condition of Willard Spur?	2	2011 and 2012 Sampling Plan	
2.2.1 What are the hydraulic/hydrologic characteristics of Willard Spur?	2	2011 and 2012 Sampling Plan, Hydrologic monitoring	
2.2.2 What are the sources of contaminants entering Willard Spur and what is the relative significance of these sources?	2	2011 and 2012 Sampling Plan, Nutrient Budget	
2.2.3 What are the relative concentrations of potential contaminants in water, sediment, macroinvertebrates, and fish in Willard Spur?	2	2011 and 2012 Sampling Plan	
2.2.4 What are the current vegetation, macroinvertebrate, and phytoplankton compositions in Willard Spur?	1	Vegetation/habitat mapping & R review, Macroinvertebrate evaluation & R review	
	2	2011 and 2012 Sampling Plan	
2.2.5 What are the current bird and fish compositions in Willard Spur?	1	Avian use R review, Fish use R review	Address the petitioners request to reclassify Willard Spur as Category 3 Waters
	2	2011 and 2012 Sampling Plan	Assessment of beneficial use support
	external	DWR bird surveys	
2.3. What are "natural" responses vs. responses to the Plant?			
2.3.1 How has Willard Spur changed over time to what we see today? What factors may have caused that change? How could nutrients affect change?	2	Hydrology monitoring	
2.3.1.1 How have hydrologic conditions changed?	1	Vegetation/habitat study mapping & R review	
2.3.1.2 How have vegetation/habitat changed?	1	Avian use R review	
2.3.1.3 How has bird use changed?	1	2011 Waterfowl diet study	
2.3.1.4 How has fish use changed?	1	Fish use R review	
2.3.1.5 How has macroinvertebrate (lower food chain) use changed?	1	Macroinvertebrate evaluation & R review	
2.3.1.5.1 What is influencing lower numbers of 2011 macroinvertebrates? Pattern doesn't match other GSL wetlands.	2	Macroinvertebrate life history analysis	
2.3.1.5.2 Where do macroinvertebrates get their food? Is food source impacted by nutrients?	2	Macroinvertebrate stable isotope analysis	
2.3.2 How does the Willard Spur ecosystem respond to conditions in 2011 vs 2012 - a wet year representing optimal conditions vs dry/normal year representing critical conditions?	3	Nutrient cycling study	
	2	2011 and 2012 Sampling Plan, Sonde deployment, Site-wide intensive sampling study	
	1	Vegetation/habitat mapping & R review, Avian use R review, Fish use R review, Macroinvertebrate evaluation & R review	
	external	Dr. Kettering study of GSL invasive species	long term monitoring plan with assessment framework
	external	DWR bird surveys	
2.4. How is Willard Spur cycling nutrients? How does it respond to nutrients?	3	Nutrient cycling study	
2.5. What factors influence how Willard Spur is responding to nutrients?	3	Nutrient cycling study	
2.6. How might Willard Spur respond to increased nutrients? In short term? In long term?	2	2011 and 2012 Sampling Plan	Fingers for use in long term monitoring, Numeric indicators with narrative criteria, Site-specific numeric criteria
	3	Nutrient cycling study	

• A key measure of what we should complete is linking the work back to our objectives





What are Plant's Impacts?

- **Investigate Irr & Outfall Ditch Hydrology**
 - When do flows reach open water?
- **Confirm Probable Nutrient Loads & Discharge Location & Permit Conditions**
- **Nutrient Uptake Studies**
 - Outfall Ditch, WB Tailrace, Private Wetlands
- **Field of Influence – Look for Plant “Signal”**
 - Isotope analysis – transects
- **BMPs for Plant Discharge**





Long Term Protection – Food Web

- **Historical Bird Use**
 - Finish analysis of DWR data, seasonal use vs diet items
- **Fish Use**
 - Could sample again
 - Fish diet



Long Term Protection – Food Web

- **Macroinvertebrate Use**
 - Life cycle studies early in season
 - Confirm success of overwintering generation
 - Isotope analysis?
 - Metrics vs increase in filamentous algae
- **Vegetation**
 - Comparison of 1992 vs 2011
 - Invasives impact on habitat quality
 - Nutrients vs invasives



Long Term Protection – Water/Nutrients

- **Hydrology**
 - Capture “normal” year
- **Nutrient Budget**
 - Nutrient loads for “normal” year
 - Look at evaporation/outflow loads
 - Incorporate denitrification rates
 - Measure outflow and sample detritus



Long Term Protection - Responses

- **N/P limitation experiments**
 - Look at seasonal variation
- **Refine metabolism analysis – microbial activity**
- **Sediment Cores – historical deposition**
 - Where does P go?
 - Was system driven to N limitation?
 - Confirm USUAL's methods for P in sediment





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Nutrient Cycling Study for 2013

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Willard Spur Science Panel



Nutrient Cycling Questions

1. What are the natural, temporal changes that occur in WS submergent wetlands?
2. What factors drive the changes?
3. How do differences in nutrient conditions in the water column drive changes?
4. How do natural variability in biological processes and productivity relate to nutrient cycling in WS?



Nutrient Cycling Study - 2013

- **Will focus on water column amendments only – no sediment amendments**
- **We will look at one test plot with three amendments and one control**
- **We will add a control for the control – essentially an independent ambient site**



Nutrient Cycling Study - 2013

- **We will replace bags of fertilizer hanging on ropes with a “bag on a stick concept”**
 - Minimize ropes that catch drifting debris
 - Minimize places for birds to roost
- **We will focus upon April – June to capture the key factors that indicate decline in SAV**





Nutrient Cycling Study - 2013

- Will use plexiglass chambers to evaluate the chemical processes that are controlling the flux of nutrients in the sediment/water column
- Will spike the chambers to look at potential nutrient increases
- Possibly look at different months and locations



Next Steps

- **Have provided the investigators with direction so they can develop workplans and budgets**
- **DWQ will develop workplans and budgets for remaining studies**
- **DWQ will review vs the remaining budget**
- **Discuss with Science Panel**





Schedule

- **February**

- Investigators/DWQ to develop workplans/budgets

- **March**

- Science Panel to review workplans and finalize recommendation via conference call
- Steering Committee at end of March to review/approve recommendations





Schedule

- **April**
 - Contracting
 - Investigators mobilizing for spring runoff
- **July**
 - Science Panel and Steering Committee meetings

