

## **WILLARD SPUR SCIENCE PANEL MEETING**

### **JANUARY 12, 2012**

#### **NAME/AFFILIATION**

Jim Hagy*	U.S. EPA, Office of Research & Development
John Luft*	Utah Division of Wildlife Resources
Theron Miller*	Farmington Bay/Jordan River Water Quality Council
Jeff Ostermiller*	Utah Division of Water Quality
David Tarboton*	Utah State University
Jeff DenBleyker	CH2M HILL
Emilie Flemer	Utah Division of Water Quality
Suzan Tahir	Utah Division of Water Quality
Pam Kramer	Utah Division of Wildlife Resources
Dave Naftz	USGS
Bob Barrett	USFWS

\* Indicates Science Panel member

The following represents a summary of discussion. It is not intended to represent meeting minutes. An audio recording of the meeting may be found at <http://www.willardspur.utah.gov/panel/meetings.htm>.

#### **INTRODUCTION**

The objective of the Science Panel meeting was to assess whether the project is still on track to meeting program objectives. The goals of the meeting were to 1) review progress to date, 2) review changes in conditions observed in 2011 vs 2012, 3) update on progress from the Nutrient Cycling Study team, and 4) begin to consider how we might turn the results of the ongoing work into solutions.

#### **PROGRESS TO DATE**

See presentation slides at: [http://www.willardspur.utah.gov/documents/SPSC071912/Agenda\\_Intro.pdf](http://www.willardspur.utah.gov/documents/SPSC071912/Agenda_Intro.pdf)

Jeff DenBleyker provided a brief update on the ongoing special studies and literature reviews. All special studies are progressing well with the exception of the nutrient uptake capacity study. This study was postponed to 2013 due to the lack of flow in the Willard Bay outlet channel this year. Literature reviews are all under contract and progressing. Draft reports have been requested for the October Science Panel meeting.

#### **CHANGES IN CONDITION – 2011 vs 2012**

##### **FIELD OBSERVATIONS**

See presentation slides at: [http://www.willardspur.utah.gov/documents/SPSC071912/FieldObservations\\_Tahir.pdf](http://www.willardspur.utah.gov/documents/SPSC071912/FieldObservations_Tahir.pdf)

Suzan Tahir/UDWQ provided an overview of conditions observed in 2012 vs what was observed in 2011. There has been a significant decrease in inflows to and water levels in Willard Spur as compared to 2012; resulting in problems launching the airboat in the Willard Bay outlet channel and cattle congregating around sampling locations. Dry conditions have resulted in Willard Spur ceasing its discharge to Bear River Bay and much shallower conditions. This, along with almost no inflow, has resulted in higher salinities (specific conductance has generally been 3-4 times higher than in 2011), higher water temperatures (generally 7°C warmer than same period in 2011, observed an ~18° C increase from April – June 2012 at site WS-1), and changed habitat in Willard Spur. There has been more algae observed so far this year, the expanse of mudflats continues to grow as water levels drop, and submerged aquatic vegetation (SAV) cover and condition has been significant less than in 2011.

Discussion focused upon how higher salinities and temperatures as well as increased UV due to shallower depths may be affecting the SAV condition observed in 2012. Theron Miller commented that sego pondweed is considered more sensitive to temperature and salinity than Ruppia.

## COMPARISON OF AVAILABLE DATA

See presentation slides at: [http://www.willardspur.utah.gov/documents/SPSC071912/DataEvaluation\\_Ostermiller.pdf](http://www.willardspur.utah.gov/documents/SPSC071912/DataEvaluation_Ostermiller.pdf)

Jeff Ostermiller/UDWQ provided an overview of available data and progress with some of the experiments that are underway. Below are highlights of some of the observations made and discussion:

1. Inflow and water level data for 2011 and 2012 illustrate the significant difference in hydrologic condition between years. This year is significantly drier than 2011.
2. 2012 water temperatures are higher and more variable than in 2011. Water temperatures increased earlier and more quickly in 2012 than in 2011.
3. Daily water temperature fluctuations also appear greater in 2012 than in 2011. The volume of water, i.e., water depth, could be a factor in moderating these temperatures. For example, water depths were greater and water temperature swings were less in 2011 vs water depths were shallower and water temperature swings are greater in 2012.
4. The observed percentage of SAV cover is noticeably lower in 2012 than in 2011.
5. Similar pattern for dissolved oxygen (DO). The observed DO minimum appears to be the same in both years but the DO maximum is much greater in 2012. No long periods of anoxic conditions have been observed to date in 2012.
6. Jeff described an initial evaluation of sonde data completed by UDWQ for 2012 data. Gross primary productivity appears to be almost three times greater in 2012 than in 2011 even though the observed SAV biomass is very different. There appeared to be significantly more SAV in 2011. Similarly, ecosystem respiration is significantly higher in 2012 than in 2011.
  - a. These observations could potentially be because of higher temperatures and shallower depths.
  - b. One hypothesis is that there is not much organic matter in sediments, thus the higher production and respiration observed in 2012 may be primarily a function of active SAV growth. Respiration may increase relative to production during SAV senescence due to increased organic matter and associated microbial decay.
  - c. Conditions in 2012 may be dominated by internal flux of nutrients vs. in 2011 conditions may have been more dominated by organics coming into the system.
  - d. There was a discussion of how aeration can be affected by moving water and wind. Shallow water may have more aeration than deeper water. Will need to look at the effects of wind in the calculations and sensitivity to re-aeration rates.
  - e. Data appears to be consistent with available data from Florida Everglades.
  - f. Sondes are still deployed at sites WS-8, WS-4 and in the Willard Bay outlet channel.
7. Jeff described the nutrient diffusing substrate (NDS) experiment UDWQ ran in July 2012 to determine what nutrients are limiting.
  - a. The experiment failed in the Willard Bay outlet channel due to sediment deposition. This could perhaps be because sediment is stirred up by boats or construction work at the boat ramp and new pipeline outfall.
  - b. Nutrients did not seem to influence algal growth at site WS-8 at all. Phosphorus seems to impede algal growth but perhaps microbes are attracted to P and graze any algal growth. Jeff described various approaches to limit this effect in future experiments. We might be at the breakpoint of heterotrophic condition at WS-8.
  - c. Site WS-4 appeared to be more nitrogen limited than phosphorus limited.
  - d. There was discussion and the following action items were identified:
    - i. Redeploy the NDS experiment as soon as possible for both phytoplankton and periphyton.
    - ii. Maintain the sondes as long as possible.
    - iii. Look at the effects of wind and sensitivity of productivity/respiration calculations to re-aeration rates. Look at how pH may affect them as well.

## NUTRIENT CYCLING STUDY

Heidi Hoven with The Institute for Watershed Sciences (IWS) began the discussion by providing an overview of project goals and progress to date (see presentation slides at [ADD LINK](#)). The time was then turned over to Bill Johnson and Joel Pierson (both with the University of Utah) to discuss installation and the water and sediment chemistry attributes of the experiment.

### EXPERIMENTAL SETUP & CHEMISTRY

See presentation slides at: [http://www.willardspur.utah.gov/documents/SPSC071912/Chemistry\\_Johnson.pdf](http://www.willardspur.utah.gov/documents/SPSC071912/Chemistry_Johnson.pdf)

Joel Pierson began by providing a description of where the experimental plots are located within Willard Spur and a summary of the experimental design. He then provided an in depth description of how the experimental plots were established noting that costs for installation were significantly greater than planned due to the quantity of fertilizer required. Joel also provided a summary of the challenges they had faced to date including declining water levels, floating debris, and use of the site by birds.

- Floating debris had been a significant challenge in that the debris, floating in from offsite locations, was accumulating on the site's posts, ropes and floats and covering a significant percentage of the area. The debris was largely composed of SAV that had apparently been torn up from other locations in Willard Spur and carried to the site by wind and/or water currents. Not only was the debris potentially shading growth below it but it was beginning to sink and impacting SAV below it. While the sediment control plot and high water treated plot had the most debris, the water treatment plots had a greater percentage of coverage and thickness of debris mats. The project team undertook a significant effort to manually remove all of the debris from the site and install an orange construction fence around the experimental plots, offset from the actual plots, to exclude any offsite debris from the test plots. The fence appears to be successfully addressing the issue.
- Birds have also been a challenge at the site. Birds appear to be taking advantage of every post, float, and/or fence for use in roosting and nesting at the site. The birds are a concern in that they present a source of nutrients, however, the birds have always been observed to use all six sites equally. Jim Hagy suggested the use of springs placed vertically on the posts to preclude their use for roosting.

Bill Johnson provided a summary of the water column samples being collected and the laboratory analyses being completed (see presentation slides). Bill asked for input and confirmation of the analyses being completed (items with red text on slides). The Science Panel agreed with the field parameters being measured in the water column. The Science Panel also agreed that because results to date were consistent across each plot that measurements at only one location per plot would be adequate. The Science Panel agreed that only three water samples per test plot were needed and only one analysis of CBOD per test plot is needed. The Science Panel agreed that non filtered samples should be analyzed for ammonia, Total Phosphorus, and TKN. Filtered samples should be analyzed for nitrate/nitrite and Total Nitrogen. Turbidity analysis is not needed, should keep carbonate solids, TVS, TSS. The Science Panel agreed that only one sample per test plot was needed for total and methyl mercury and trace elements. The UofU will continue to analyze four samples from each test plot for major anions.

Bill also provided a summary of the sediment samples being collected and the laboratory analyses being completed (see presentation slides). Bill asked for input and confirmation of the analyses being completed (items with red text on slides). The Science Panel agreed that only one sediment sample per test plot needed to be sent to Utah State University Analytical Laboratories (USUAL) and agreed with the panel of analyses to be completed.

Bill provided an overview of results from the analyses completed to date. Both low and high water treatment plots are at similar 0.04 mg/L concentrations for phosphate but higher (within one standard deviation) than control. There was a similar trend for nitrate concentrations. Similarly there is not much of a difference between plots in the sediment treatment areas either. There was some discussion as to whether nutrients might be moving into the sediments or being taken up by biological activity. No answers at this point but Bill noted that the sediments have very low permeability. Bill also noted that trace element concentrations in the water column are very consistent between all plots, except for Cr and Ni. All agreed that the Cr and Ni results could be disregarded. It was suggested that UofU should look at and compare levels for these elements in water quality standards and EPA action levels. Jeff Ostermiller said that UDWQ could help with this.

## NUTRIENT FLUX EXPERIMENTS

See presentation slides at: [http://www.willardspur.utah.gov/documents/SPSC071912/Flux\\_Ramin.pdf](http://www.willardspur.utah.gov/documents/SPSC071912/Flux_Ramin.pdf)

Ramin Nasrabadi with the University of Utah provided an overview of their experiments to quantify the rate of loss of added nutrient within the water column and within the water column and sediment. The experiments will allow determination of nutrient loss rates from small areas/volumes and all determination of the influence of vegetation percent cover and other variables on nutrient uptake.

The team is utilizing small, box shaped in-situ chambers that have bottoms (to test loss within water column) and no bottoms (to test loss within water column and sediment). Tests are run for three hours with measurements taken over the span of the experiment. Samples are filtered in the field with dissolved nutrients measured back at the laboratory. Initial results show that sediment seems to have a significant role in uptake. Ramin noted that they are operating very close to the detection limit. Isotopes will be used next year to better understand what is taken up by sediment vs. other biological activity. Jim Hagy noted that an alternate method to measure ammonia and total phosphorus should be used given the subtle changes and low values. He can provide an alternate method if needed.

## MACROPHYTE & ALGAL RESPONSE

See presentation slides at: [http://www.willardspur.utah.gov/documents/SPSC071912/Vegetation\\_Hoven.pdf](http://www.willardspur.utah.gov/documents/SPSC071912/Vegetation_Hoven.pdf)

Heidi Hoven/IWS provided an overview of her team's work to assess the response of macrophytes and algae to the different treatment plots. Their work includes a visual assessment of % cover of SAV, epiphytes and surface mats, light penetration, SAV branch density, biomass cores and tissue CNP analysis, phytoplankton and macroalgal biomass and productivity, evaluating phytoplankton flora and collecting benthic diatom samples. Heidi described the apparatus being used to collect diatoms and periphyton. Starting to see green on the slides. She said she is seeing an epiphytic response in sediment treatments, i.e., more epiphytic growth in the high sediment treatment plot. The percent cover of SAV is the same across all plots. There was a big change in conditions in the period from May to July. Most of the plot areas are now heavily loaded with algae.

Heidi discussed some possible disturbances that affect SAV in Willard Spur. She again noted the floating debris challenge that they had in early June. The floating debris was 1.5 feet thick in some places and was something that had to be addressed. She has also noted the potential impact that pelicans and other disturbances may have. There are patches of Willard Spur with heavy SAV cover where there is no SAV. Are pelicans ripping SAV out in places as they pursue fish? There are also areas with SAV where the water is clear and other areas where the water is turbid. Are carp causing the turbidity or are other biological mechanisms at work?

Heidi finished by providing an overview of the new method of sampling macroinvertebrates. UDWQ's SOP for macroinvertebrate sampling was not feasible from a drifting boat. Thus, after some discussion the team opted to utilize the cores they are collecting for biomass cores. Early indications are that they will provide the information that is needed.

## TRANSLATING STUDIES TO SOLUTIONS

See presentation slides at: <http://www.willardspur.utah.gov/documents/SPSC071912/StudiesToSolutions.pdf>

Jeff DenBleyker provided a brief overview of Figure 4-1 in the 2012 Willard Spur Sampling and Analysis Plan. Jeff asked the Science Panel to review the figure to identify any other possible management solutions that should be evaluated. The goal is to identify possible solutions to ensure we complete the studies required to evaluate and either confirm or eliminate alternatives. Chris Cline suggested that perhaps some of the methodology used in natural resource damage assessments (NRDAs) could be used to evaluate habitat value and link that to potential impacts.

## SCHEDULE

The Science Panel agreed that their next meeting would be held on October 23, 2012 at UDWQ's offices in Salt Lake City. The agenda will include reports from the Nutrient Cycling Study team as well as other contractors preparing literature reviews. The goal will be to discuss results and begin to discuss studies that will need to be completed in 2013 to gather remaining information that will be required to make recommendations.