Meeting Summary

WILLARD SPUR SCIENCE PANEL MEETING

This Science Panel meeting was held on July 9, 2014 at the UDEQ building at 195 North 1950 West, Salt Lake City, Utah. The following represents a summary of discussion. It is not intended to represent meeting minutes. An audio recording of the meetings may be found at http://www.willardspur.utah.gov/panel/meetings.htm.

JULY 9, 2014

NAME/AFFILIATION

Jim Hagy**	U.S. EPA, Office of Research & Development
Theron Miller*	Farmington Bay/Jordan River Water Quality Council
Jeff Ostermiller*	Utah Division of Water Quality
Chris Cline*	U.S. Fish & Wildlife Service
David Tarboton*	Utah State University
Erica Gaddis	Utah Division of Water Quality
Chris Bittner	Utah Division of Water Quality
David Richards	EcoAnalysts ,Inc.
Jeff DenBleyker	CH2M HILL

* Indicates Science Panel member

** Attended by telephone

INTRODUCTION

See presentation slides at: http://www.willardspur.utah.gov/panel/docs/2014/07Jul/Introduction.pdf

Meeting attendees were introduced and Jeff DenBleyker reviewed the meeting's agenda. The objectives for the meeting were to confirm key understandings and observations from the study and refine the Science Panel ideas from their January 2014 meeting into an outline of recommendations for the Steering Committee.

KEY OBSERVATIONS

See presentation slides at: http://www.willardspur.utah.gov/panel/docs/2014/07Jul/PlantImpacts.pdf

BENEFICIAL USES

The Science Panel reviewed the list of beneficial uses that are currently protected in Willard Spur and agreed that the following list is updated and complete: Primary and secondary recreation, waterfowl and shorebirds, warm water fishery, other water-oriented wildlife, necessary food chain for fish and wildlife including fresh water invertebrates, algae, and emergent and submerged vegetation.

HYDROLOGY

The Science Panel agreed that Willard Spur is very dependent upon dynamic inflows that are dominated by spring flows from the Bear River. Water levels as well as all other aspects of the ecosystem depend upon these inflows. Willard Spur typically experiences two flow regimes per year. The first is the "flowing regime" where there is adequate water to flow in and out of Willard Spur. This typically occurs during October – May of each year. The "impounded regime" typically occurs from May – October of each year and is a result of a decrease in inflow rates and a natural "weir" that allows water to be held within Willard Spur. Available satellite imagery tells us that the "flowing regime" was likely the only flow regime observed during the period of 1972 to 1983 except for the year 1979. Subsequent to the floods of the 1980s and again in the late 1990's, Willard Spur has consistently experienced both the "flowing regime" and "impounded regime" almost every year.

The Science Panel discussed the unique importance of the "flushing flows" (ie, flowing regime) that Willard Spur experiences each winter and spring. It appears from this study that inflows of less than 200 cfs are a factor in creating the

impounded regime. Willard Spur moves back to the flowing regime when inflows exceed 400 cfs. What may be important to the ecosystem's condition during the summer is the timing of when the impoundment initiates and the length of time this condition lasts. The flowing regime typically observed during winter and spring seasons appears to "flush" any sediments, organics, and nutrients that build up during the summer impounded condition out of the system. This allows Willard Spur to "reset" each spring. Willard Spur's vegetation responds to the water and nutrient load it receives. Although we don't have detailed data about the flow rates, velocities, and volumes that "flush" through the system during the winter months due to the difficulties of measuring flow during ice conditions, these data could be important in understanding the flushing phenomena.

An important indicator of changes in the system could be the accumulation of organics and nutrients in the sediment. Other indicators could be the starting data and length of impounded condition.

The Science Panel discussed the natural weir that is a factor in creating the impoundment. It could be a geomorphic feature that resulted from the high inflows and Great Salt Lake levels of the floods of the 1980s and 1990s. It could also possibly be a historical feature that was not observed until inflow patterns changed after the floods mentioned above. If inflow patterns changed, they could have been a result of new water management infrastructure at BRMBR built after the floods or changes in the watershed upstream.

The possibility that infiltration could be a significant factor was discussed. Jeff DenBleyker presented observations made in 2013 where inflows measured at BRMBR's D-line dike did not reach the open water. He also presented results from a more detailed evaluation of inflows from the east side. It appears that infiltration may be significant when open water elevations in Willard Spur drop below 4201.5 feet. The Science Panel agreed that groundwater conditions were not a part of the study but do appear to be a significant factor in how much of the inflow reaches the open water of Willard Spur, particularly during the critical impounded condition. Specifically, infiltration may explain why much of the Plant's effluent never reached the open water during these months. David Tarboton suggested looking at what the available pore volume is to confirm the observed infiltration. It was noted that some of the nutrients in the effluent that infiltrates into the groundwater may still reach Willard Spur; this cannot be quantified with available data.

The available inflow and outflow data were not adequate to "close" a water balance for Willard Spur. The rating curve developed for outflows from Willard Spur appears to only be sufficiently accurate for flows of less than 1,500cfs. Infiltration losses additionally present a challenge in accounting for outflows from Willard Spur.

Nutrient Loads

The Bear River Migratory Bird Refuge (BRMBR) was the primary source of nutrient inputs to Willard Spur followed by inputs from Harold Crane Waterfowl Management Area (HCWMA). The Perry Willard Regional Wastewater Treatment Plant (Plant) typically represented less than 3% of the surface water nutrient input to Willard Spur. Evaporation and infiltration of the Plant's effluent as well as natural assimilation of nutrients in open channels and fringe wetlands were factors in reducing the Plant's surface water nutrient input to Willard Spur.

Nutrient Responses

The Science Panel agreed with the narrative provided by Jeff DenBleyker in the presentation slides with the exception that algae and biofilm observed growing on the submerged aquatic vegetation (SAV) does not necessarily outcompete the SAV for nutrients but likely stresses or interferes with the SAV. The Science Panel agreed that changes in water chemistry that appear to coincide with when the impounded condition begins may interfere with the SAV's ability to photosynthesize. The Science Panel discussed whether Willard Spur's beneficial uses were summer centric or if there might be concerns during the winter to. They agreed that we should be looking at summer as the most sensitive period, i.e., index period.

Are Nutrients a Primary Factor in the Summer Conditions Observed?

While some effects from higher concentrations of nutrients were observed in the study's experiments, the effects from nutrient dosing were largely localized. Rapid assimilation of nutrients likely limits the extent of effects from added nutrients. While nutrients are a factor, the Science Panel agreed that they were not the primary factor in the conditions observed. The hydrology that establishes and maintains the impounded condition appears to be the primary factor.

Is Willard Spur supporting its Beneficial Uses?

The Science Panel agreed that Willard Spur appears to be in a good condition and supporting its beneficial uses from year to year. Willard Spur appears to be supporting both migrating and staging bird populations. Changes in aquatic invertebrates as a result of the impounded condition are observed that could become a problem if the hydrology does not support their return. The Science Panel is concerned with the impounded condition but we do not have the data to definitively say to what extent. The fact that Willard Spur is able to reset each year is important to its ability to adapt to the impounded condition and the resilience required for it to support its beneficial uses from year to year. The Science Panel discussed what biological integrity means. Given the existing hydrologic regime, Willard Spur appears to be healthy but could improve via hydrologic changes. The Science Panel agreed that we do not have the data to determine what the critical period of impoundment is or what flow rates or volumes are needed to flush accumulated organics and nutrients out of Willard Spur. The Science Panel agreed that the conditions observed in the impoundment during the study period were independent of the Plant as the Plant's effluent did not reach the impoundment during this time.

What are the Impacts from the Plant?

Most of the Plant's nutrient load reaches the open water of Willard Spur during high water levels in Willard Spur. High water levels in Willard Spur are correlated to high inflows, high nutrient input from other sources, and significant stands of SAV. Thus, we observe high levels of dilution, export of nutrients from Willard Spur, nutrient assimilation within Willard Spur, and little impacts from nutrients when the Plant's nutrient loads are most likely to reach Willard Spur. Very little of the Plant's nutrient load reaches the open water of Willard Spur during low water levels in Willard Spur. Low water levels in Willard Spur are correlated to low inflows and an impounded condition. While the impounded condition appears to be the most sensitive condition when the Plant could have an impact, the Plant's effluent does not currently reach the open water during this time.

The Science Panel discussed whether the effluent could have an impact if the Plant's flow rates were high enough for it to reach the impoundment. If the impoundment has the assimilative capacity, then the risk is likely low. The team should look into this further using assimilation rates from the study's experiments. Inflows from BRMBR and HCWMA were observed to reach the impoundment during the study period but their impacts cannot be determined from the data. The effluent may only have a localized effect if its nutrients are rapidly assimilated. The Science Panel discussed but was not able to conclude what the impact of higher concentrations of nutrients within the impoundment might be.

A possible indicator to monitor might be the timing of when the "green water" phase initiates. Does cyanobacteria replace green algae?

The Science Panel agreed that the risk of the Plant's effluent impacting the open waters of Willard Spur is low at this time. Any impacts are likely localized to the point of discharge. The presence of water on the mudflats could possibly allow for *phragmites* to propagate. There was some discussion about possible impacts to an impounded Willard Bay tailrace channel. UDWQ will need to determine if the tailrace is part of Willard Spur. There was also a question as to whether endocrine disruptors in the effluent could be a problem. These were not a focus of this study but could be considered as part of a long term monitoring program.

The Science Panel agreed that the focus should remain on the critical impounded condition, maintain low carbon and nutrients in the sediments, and monitor any local impacts from the Plant's effluent to confirm whether they remain local or extend into Willard Spur. Increased flows from the Plant in the future could possibly reach the impoundment; data is not available to be able to definitively determine what those impacts could be.

Recommendations for Actions

See presentation slides at: http://www.willardspur.utah.gov/panel/docs/2014/07Jul/RecommendedActions.pdf

The Science Panel discussed means of further reducing the Plant's potential risk to Willard Spur. The Science Panel agreed that it is good to further reduce risk but it is difficult to weigh the cost of this benefit when the risks are already low. The Science Panel discussed the relative risk of the Plant to other nutrient sources in light of the nutrient loads observed during this study. While the Plant is a minimal risk, the Science Panel agreed that part of its objective was to provide recommendations to protect Willard Spur in general. Given Willard Spur appears to be in a good condition, the goal is to prevent its condition from worsening. The actions the Science Panel have identified to date work toward that goal.

Monitoring Plan

A long term monitoring strategy should be developed to allow UDWQ to assess the condition of Willard Spur but also to monitor for detrimental changes in its ecosystem. Key indicators will be developed from key attributes the Science Panel will identify.

BRMBR Water Management

Water management should be investigated to optimize water quality within the BRMBR and Willard Spur in addition to optimizing habitat quality. Minimization of the impounded condition should be investigated but care should be taken in prescribing fixed conditions as they may impact the system's dynamics and resilience. The USFWS should incorporate Willard Spur into its water management planning as well as incorporate bird use and water depth into its habitat model.

Reducing Risks from the Plant

The Science Panel agreed that reducing nutrient loads to Willard Spur is a good thing and important to sustaining the ecosystem. However, the Plant's current discharge to the pasture does not appear to reach Willard Spur. There is some question as to if the effluent discharged to the tailrace would impact the tailrace and whether it might reach the impounded condition if Willard Bay releases occur. Additionally, future expansion of the Plant may increase likelihood that effluent could reach the impoundment. Seasonal nutrient removal or management of the effluent could be implemented in these cases.

The Plants UPDES permit could be modified to add an additional discharge location to the pasture if the pasture is delineated as jurisdictional wetlands and the same waters of the United States as the tailrace and Willard Spur. The pasture could be used to assimilate nutrients and enhance evapotranspiration/infiltration of the water and reduce any risks from the effluent. Some BMPs may need to be included in the UPDES if this method is implemented to enhance any benefits from the practice.

Regulatory Tools

See presentation slides at: http://www.willardspur.utah.gov/panel/docs/2014/07Jul/RegulatoryBackground.pdf

Jeff Ostermiller began with an overview of one of the Science Panel's objectives: to answer the question "What will be required to provide long term protection of Willard Spur?" Jeff then led an overview of available regulatory tools the Science Panel can consider. Willard Spur is currently classified as 2B, 3B, and 3D within the BRMBR's boundaries and 5C and 5E outside of the BRMBR.

The Utah Water Quality Board was petitioned to reclassify Willard Spur as a Category 1 water, thus no point discharges are allowed. If Willard Spur was reclassified as a Category 2 water, point discharges would be allowed but only up to background concentrations, i.e., does not degrade existing water quality. A significant challenge with this approach is defining background conditions when significant variances are observed within and among years. Other challenges are that only point sources are considered stressors to the system and not hydrologic modification, phragmites, and other sources of nutrients. The Science Panel agreed that these are all stressors that could impact Willard Spur.

Jeff explained the difference between 2B, 3B, and 3D and the 5C and 5E beneficial use classifications. They are very similar except that 2B, 3B, and 3D include numeric criteria for toxics and specifically protect the warm water fishery use whereas the 5C and 5E classifications do not. While making the change to 2B, 3B, and 3D for all of Willard Spur may be appropriate, conditions that exceed some of the numeric criteria have been observed in Willard Spur. Wetlands have unique characteristics that 2B, 3B, and 3D do not address, e.g., low dissolved oxygen and high temperature and pH. Any change to account for these characteristics would require a use attainability analysis. The Science Panel discussed whether reclassifying to 2B, 3B, and 3D accomplished what was required to protect Willard Spur and whether anything more complicated was needed. They agreed that such a change would most likely impact the Plant, BRMBR, HCWMA and the Bear River watershed.

Jeff discussed another approach that could be implemented that would create a site specific narrative standard. This standard would only apply to Willard Spur and would focus upon protecting key attributes that define its current condition and preventing key attributes that would indicate degradation. If this approach is followed, the Science Panel would define the key attributes that could then be used for the narrative standard. A monitoring plan could then be developed around indicators that target those attributes. Jeff and Erica Gaddis discussed some of the key attributes defined by the Great Salt

Lake Comprehensive Management Plan and Health Index. The Science Panel agreed that these attributes should be the starting point. The Science Panel agreed that maintaining the dynamic hydrologic conditions appears to protect the system's resiliency. Other attributes discussed included maintaining populations and diversity, maintaining habitat, preventing chemical constituents that harm beneficial uses, support resiliency, maintain flushing flows and low sediment carbon/nutrients.

The Science Panel agreed that Willard Spur has changed over time. Prior to the floods of the 1980's, Willard Spur appears to have had continuous flushing flows. Data is not available to describe its condition at that time. After the floods of the 1980's a new hydrologic regime was formed most likely by changes in the local geomorphology and changes in upstream hydrology. These changes in hydrology were likely due to changes in water management in the Bear River watershed and perhaps as a result of BRMBR being rebuilt. The new flow dynamics these changes created have created Willard Spur's current ecosystem and resiliency. The current ecosystem is in good condition; even the impoundment appears to be beneficial to shorebirds. Willard Spur's resiliency and the ability for it to reset on an annual basis appear to allow Willard Spur to assimilate and export the nutrients it currently receives. Changes that impact this resiliency are what will likely put Willard Spur most at risk.

Path Forward

The project team will move to complete ongoing reports and summarize key attributes to be protected and prevented. The Science Panel will review these attributes on a conference call on August 21 at 1:00pm. The final attributes will then be used to identify indicators that can be incorporated into a monitoring plan. The project team will summarize discussions in a document for the Science Panel's review. The goal is to have one final meeting the week of October 13 to make its final recommendations to the Steering Committee.