Continuous Water Quality Monitoring:

Assessing the Current Sediment and Nutrient Trapping Capabilities of Mud Lake

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Outlet

Inlet

Introduction

Mud Lake is a 16,000 acre wetland located at the Northern end of Bear Lake, Utah. In 1907 the Bear River was rerouted, by way of a canal system, through Mud Lake in order to use Bear Lake as a water storage reservoir. The Bear River, characterized by its high nutrient and sediment loads, has always posed a risk to the oligotrophic waters of Bear Lake. Historically Mud Lake has acted as a natural filter for nutrients and sediments bound for Bear Lake, but its current capabilities were unknown.

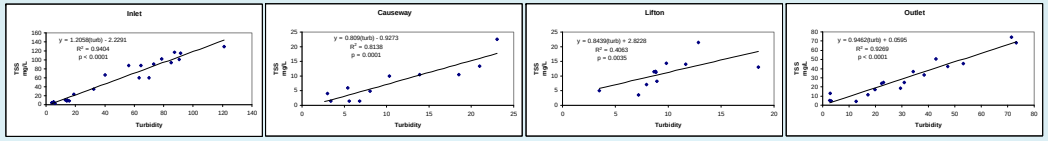

Figure 3. All major inflow and outflow sites are shown with the corresponding TSS vs Turbidity relationship. These relationships allowed turbidity to be a surrogate measurement for TSS.

Figure 1. The major inflow and outflow structures of the system. Water begins at the Inlet where the Bear River is diverted. From there water travels through to the Causeway where it is stored in Bear Lake. When water is needed downstream it is pumped from Bear Lake at Lifton and travels down to the Outlet site.

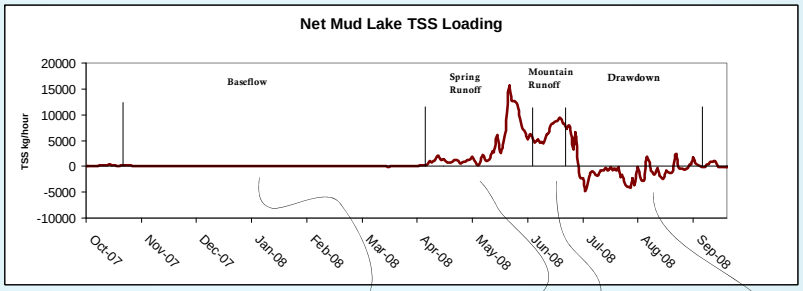

Figure 4. Net TSS Loading of Mud Lake for the 2008 water year.

Conclusions

During the 2008 water year 13,632 Metric tons (MT) of sediment came through the Inlet via the Bear River. Mud Lake trapped 7,673 MT of sediment and passed 7,777 MT of sediment downstream back into the Bear River. Over this time period there was actually a net export of sediment from Bear Lake through the Lifton site of 1,818 MT. If the Mud Lake system did not exist it would be expected that Bear Lake would receive the entire sediment load of 13,632 MT from the Bear River, and if exports remained the same only be able to remove approximately 10% of that load.

Although these results only represent data from one water year, the obvious advantages of Mud Lake to Bear Lake can be clearly seen. The benefits of using these methods and technology is the ease of collecting data throughout multiple years and seasons. Once the instrumentation is in place and surrogate relationships have been created these methods provide real solutions to long term high frequency monitoring of water systems.

Materials and methods

In order to determine the current nutrient and sediment trapping capabilities of Mud Lake, high frequency turbidity monitors were installed at the major inlets and outlets of Mud Lake. Grab samples were taken periodically and analyzed for Total Suspended Solids (TSS) and Total Phosphorus (TP). Relationships were created between the turbidity measurements and the TSS and TP results (Figure 3). With these relationships being significant it allows for the high frequency turbidity measurements to be used as a surrogate for the TSS and TP parameters.

Figure 2. The image on the left is of the solar panel which was used to produce power for the turbidity sensor. The image on the right is of a DTS-12 SDI-12 Turbidity Sensor.

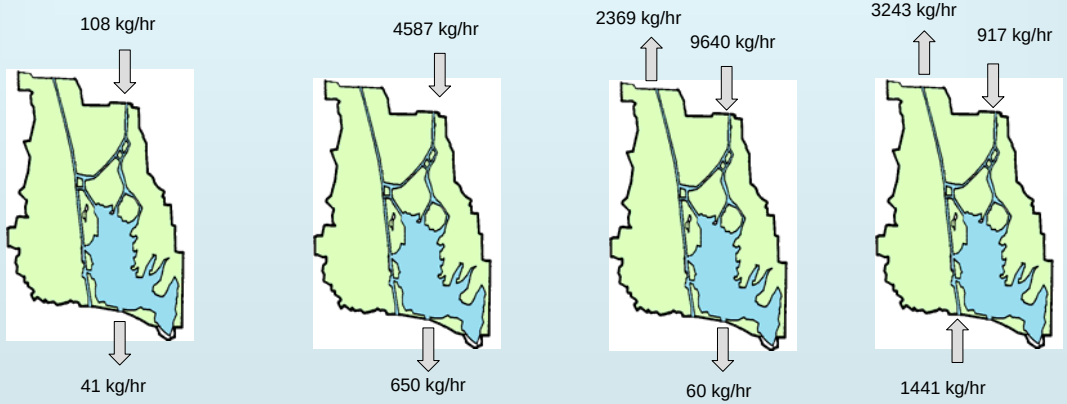

Figure 5. Site specific average TSS loading rates across 4 seasonal time periods. The net TSS trapped during each time period is shown in metric tons (MT).

Lifton

Causeway

Acknowledgements

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