

# **Report for 2003WY13B: Conveyance Losses and Travel Times of Reservoir Releases Along the Bear River from Woodruff Narrows Reservoir to Cokeville Wyoming**

- Dissertations:
  - Kunz, W., 2005. Return Flows, Re-Diversion, and Losses Associated With the Bear River In Wyoming and Utah, M.S. Thesis, Department of Civil Engineering, University of Wyoming, Laramie WY.

Report Follows

**Abstract:**

The Bear River is the longest river in the United States without an ocean outlet. It originates in the Uinta Mountains of Utah and flows north to Wyoming, Idaho, and back to Utah and releases its water into the Great Salt Lake. With the extreme drought experienced in the late 90's and early part of the new millennium, the accuracy to which water is allocated has become increasingly important. The Bear River is a vital lifeline to farmers, ranchers, industry and municipalities in Utah, Wyoming, and Idaho; therefore, knowledge of its water losses, gains and general fluctuations are of vital importance. The Bear River between Woodruff Narrows reservoir and Pixley diversion dam is a reach with 17 irrigation diversions that cause enormous amounts of return flow in the system. This study examines many factors that may be of interest to the irrigators in the Bear River region. Not only are estimates for conveyance loss being developed, but so are approximations of gains, seasonal losses, and re-diversion proportions. Also included in the study are estimates of travel time and return flow timing to aid irrigators in approximating the time that water may become available to them. Preliminary results indicate that conveyance losses are approximately 1% per mile, while system loss averages to be 41% of inflow. The analysis also shows gains to be 62% of diverted flow with diverted flow being approximately 111% of inflow to the system. Channel travel time is approximately 5 days from Woodruff Narrows Reservoir to Pixley dam.

**Current Project Status:**

Four additional gages have been installed along the Bear River and data was collected for the 2004 irrigation season. One of these gages is shown in Figure 1 below. By installing additional gages, shorter reaches were created and estimates of conveyance losses were developed for each reach.



Figure 1 – Newly installed gaging station on the Bear River

Ongoing work is directed towards refining our calculations. Flow data will be collected for the 2005 irrigation season and analyzed for conveyance losses and compared to the preliminary results obtained for the 2004 irrigation season. Also, estimates for return flows are currently limited to the entire reach, with the new gages, better estimates about where return flows occur may be

obtained by repeating the analysis over the shorter reaches and for smaller time increments (monthly as opposed to annual values). This change in time scale may lead to better estimates of return flow timing within the shorter reaches. Finally, a GIS based model to delineate return flow paths is being developed as part of this study. This model along with the installation of real time telemetry on the newly installed gages may result in a real-time model for water usage in the study area. The Bureau of Reclamation office in Provo Utah is assisting us with telemetry installations.

The project is on track in both research objectives and training potential. Two graduate students were supported with project funding. One completed his MS degree this spring. Students on the project are receiving training related to water resources engineering through academic course work, research project activities and opportunities to interact with State agency personnel and irrigators.

### **Student Support**

William Kunz, MS Civil Engineering, University of Wyoming

Trenton Franz, MS Civil Engineering, University of Wyoming

### **Meetings/Presentations/Publications**

Kunz, W. (2005), Return Flows, Re-Diversion, and Losses Associated With the Bear River In Wyoming and Utah, M.S. Thesis, Department of Civil Engineering, University of Wyoming, Laramie WY.

“Re-diversion Proportions on the Bear River”, Bear River Advisory Group, Cokeville Wyoming, October 2004.

“Bear Lake Eco Symposium and Annual Meeting of Bear River affiliates” September 2004

“Conveyance Losses on the Bear River” Wyoming State Engineers office, Utah State Engineers Office, Cokeville Wyoming, January 2004.

“Conveyance Losses on the Bear River”, Bear River Advisory Group, Kemmer Wyoming, July 2003.