

# P4-Mapping Inflows, Diversions, and Vegetation along the Lower Bear River Basin

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## Abstract

The Department of Civil and Environmental Engineering at Utah State University (USU), through a National Science Foundation project, has partnered with the Outdoor Recreation Program, at USU to offer the Bear River Fellows Program - a unique river-based experiential learning opportunity for freshmen Fellows to receive first-hand experience in collecting, synthesizing and analyzing environmental and ecological data. Part of these objectives included observing plant composition over time as well as measuring inflows to and diversions from the river.

We examined environmental and ecological variables from three different sites along the Lower Bear River between the Idaho-Utah state line and Cutler dam on August 13<sup>th</sup> – 16<sup>th</sup>, 2013. In order to organize, analyze, and graphically communicate data, maps were created by plotting locations of diverse species of riparian vegetation, locations of beaver activity, and observed versus actual human-caused inflows and diversions. Through our collection of vegetation samples and locations, we concluded the trends and specific locations of plant species, such as *Phragmites*, that grow in areas along the Bear River.

## Objectives

1. How will our observations change over time? (bank vegetation)
2. How do changes in flow, water level, and beaver activity contribute to change in vegetation?
3. How do human inputs/withdrawals affect flow?
4. Can we demonstrate conservation of mass along the river?

## Methods

- Traveled from site to site, observing riparian vegetation, beaver activity, and human-caused inflows and diversions
- Used Excel spreadsheets to organize and input data into ArcGIS
- Used ArcGIS to create maps (Figures 1-3)
- Identified different species of vegetation as well as location and size of inflows and diversions



## Vegetation Maps

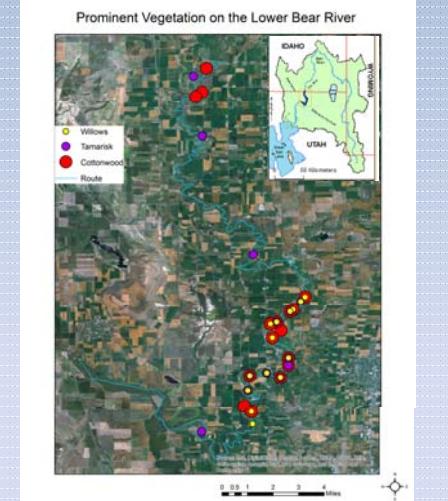


Figure 1: Location of willows, tamarisk, and cottonwood vegetation along the Bear River. These three plants were more prominent at the beginning and end of our river trip.

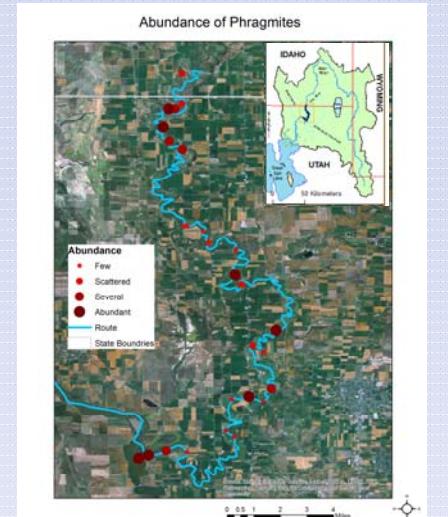


Figure 3: Abundance of *Phragmites* along the Bear River. *Phragmites* unlike other vegetation, was consistently present along the river.

## Inflows & Diversions Maps

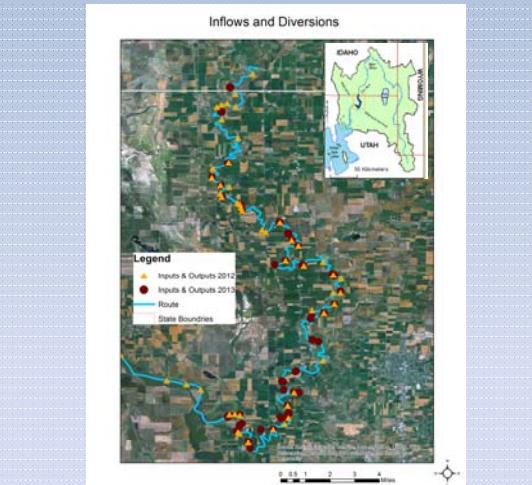


Figure 2: Map comparing the inflows and diversions along the river from observations taken during a canoeing trip in August of 2012 and in August of 2013. Most inflows and diversions were observed in same locations on both trips but did variate slightly from year to year.

## Next Steps

- Complete the mass balance to answer questions concerning effects of human inflows and diversions on vegetation presence
- Investigate location and causes of vegetation removal
- Leave data for future fellows to utilize



## Conclusions

- Willows, tamarisk, and cottonwood are more prominent along the beginning and end of the trip. It is unclear what is causing this separation.
- *Phragmites* can be traced from the state line to Cutler Reservoir, making it the most prevalent vegetation species we found.
- There is an area of eradication where many species of vegetation have become minimal or obsolete. Although the reason for the eradication is unclear, it was observed that many trees had been burned.
- The location of inflows and diversions seemed to have changed slightly from year to year. We believe that the reason for this change is different observations of each individual and the accuracy of the GPS.