WEBER STATE UNIVERSITY

# Rainbow Trout (*Oncorhynchus mykiss*) Population Structure in Strongs Creek, Ogden, Utah

James Abbott, Jenacee Booth, Tyler Anderson, Dr. Christopher Hoagstrom (Mentor)

## Introduction

Strongs Creek is a small creek that flows past Weber State University in Ogden, UT. It has been historically stocked with nonnative rainbow trout (*Oncorhynchus mykiss*) and a population of trout persists in the creek today (Fig. 1). Previous studies have shown that abiotic and biotic factors, such as water depth and trout population density, can affect the population structure of trout (Jenkins et al., 1999; Person-Le Ruyet et al., 2008; Meyer et al., 2010). Thus, to determine if we could find similar results, we visited several locations along the length of Strongs Creek to investigate what factors affect trout population structure to benefit future management of trout populations in similar creeks.

## Methods

Four sampling sites were selected along the length of the creek. Each approximately 100 m higher in elevation than the previous site (Fig. 2). Backpack electrofishing was conducted at each location (Fig. 3). Sites were numbered from downstream to upstream, the farthest downstream site being site 1 and the farthest upstream site being site 4. One-hundred-meter sections of creek were fished twice consecutively and trout were netted, measured, and immediately released. Standard length (mm) of trout was measured from nose to end of vertebrae. Maximum water depth and wetted width were measured along 20 evenly spaced transects at each site. Habitat volume was calculated using the average width, average depth, and length at each site.

Length-frequency histograms were created, illustrating the number of individuals by length and the mean length was calculated for each site. Population density was calculated based on the number of fish caught at each site per habitat volume. Correlation analyses of mean trout length versus water depth, wetted width, and trout population density were conducted.

Figure 1. Rainbow trout (*Oncorhynchus mykiss*) in Strongs Creek, Ogden, UT. This individual was the largest caught (211 mm SL, 203 g).

Figure 2. Sampling sites in Strongs Creek, Ogden, UT. Site 1 is located near the bottom of the canyon (left).

Figure 3. Backpack electrofishing in Strongs Creek.

## Results

Trout were present at three of the study sites, no fish were found upstream of a waterfall near the end of site 3. Consequently trout were not found at site 4. Site 2 was the deepest site, whereas sites 1 and 3 had similar depth (Table 1). Trout population structure varied among sites (Fig. 4). Trout were largest on average at site 2, but the largest individuals were present in sites 1 and 3 (Fig. 4). The largest individual was caught at site 3, and the smallest individual caught at site 1 (Fig. 1). Site 2 also had the lowest trout density and site 3 had the highest (Fig. 4). There was a positive correlation between mean water depth and mean trout length (Fig. 5) and a negative correlation between mean trout density and mean trout length (Fig. 6). There was no correlation between mean wetted width and mean trout length ($r^2$=0.069).

Table 1. Mean depth and trout density of each sampling site.

| Site Number | Elevation | Mean Depth | Mean Width | Number of Trout Caught | Trout Density (Per $m^3$) |
|---|---|---|---|---|---|
| 1 (Downstream) | 1539 m | 0.13 m | 2.01 m | 54 | 1.66 |
| 2 (Downstream) | 1630 m | 0.21 m | 2.39 m | 55 | 1.15 |
| 3 (Upstream) | 1737 m | 0.15 m | 2.50 m | 56 | 1.91 |
| 4 (Upstream) | 1831 m | 0.19 m | 2.37 m | 0 | 0 |

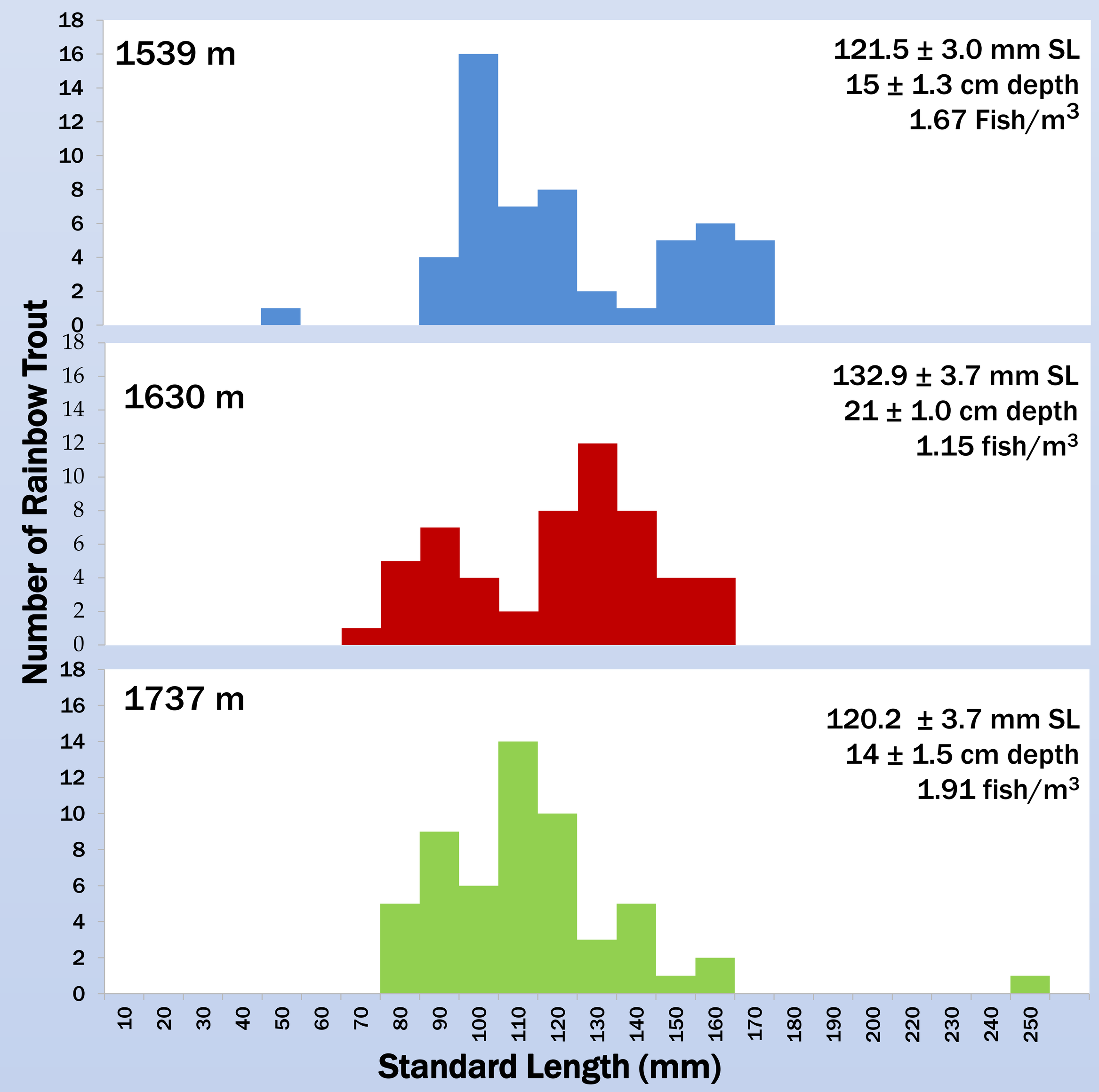


Fig.ure 4. Number of individuals per length at sites 1 (elevation 1539 m), 2 (elevation 1630 m), and 3 (elevation 1737 m). Average standard lengths and standard error (mm), average depth and standard error (cm), and fish density are included for each site.

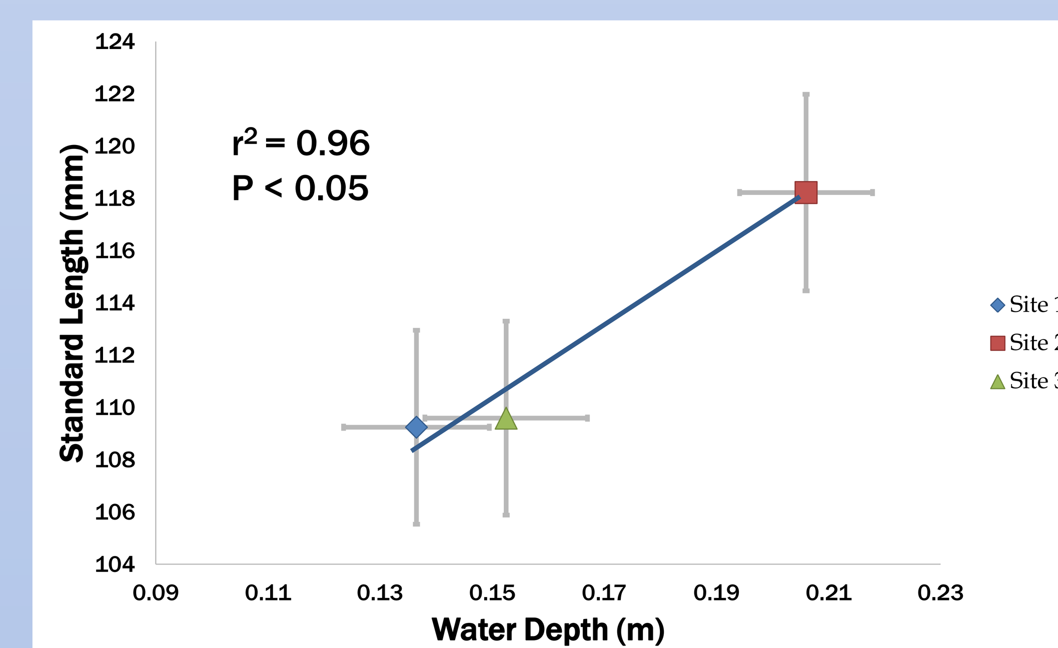


Figure 5. Trout standard length (mm, with standard error) compared to the average water depth (m) at each site.

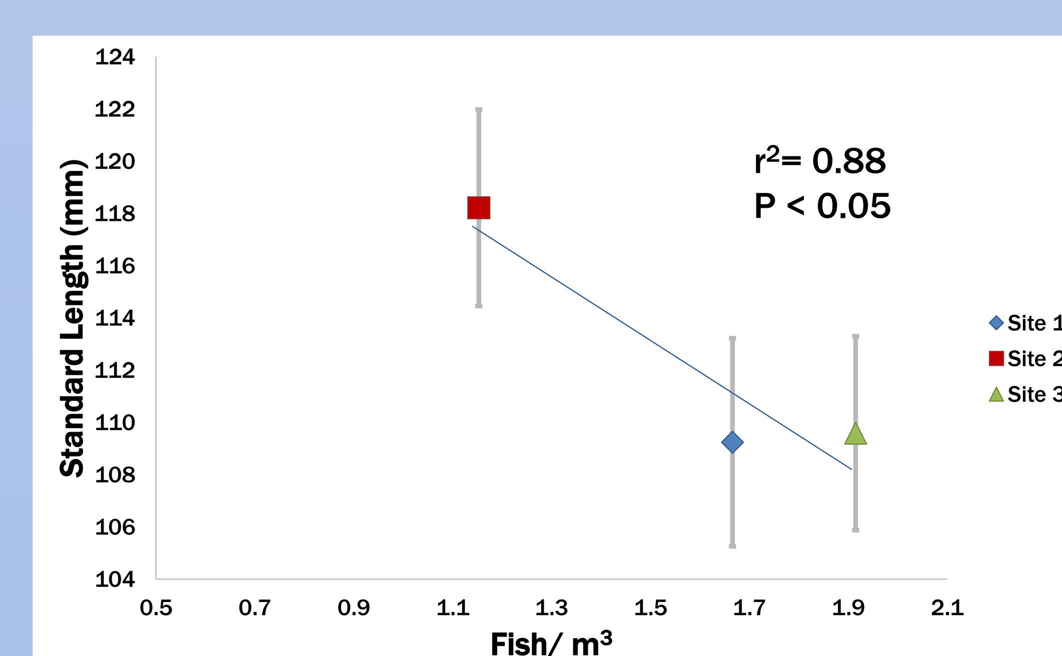


Figure 6. Average trout standard length (mm, with standard error) versus trout density (fish/$m^3$) by study site.

Figure 7. Site 2 (elevation 1630 m), which was on average the deepest of the sites we sampled.

## Conclusion

We found that water depth and population density influenced the length of individual rainbow trout. In deeper creek stretches, trout were longer on average, possibly because of reduced spatial limitation. This correlation has also been noted in other studies (Harvey et al., 2005). Trout were also longer on average where population density was lowest, consistent with other studies (Jenkins et al., 1999). Thus, higher water depth and lower trout density appear to go hand in hand, both contributing to longer average trout length.

Wildlife management implications of these findings include an ability to estimate potential average trout size based on creek depth and population density. If management officials wish to maximize average trout length, it would be beneficial to maintain habitats with greater depth and avoid stocking to many trout in a small stream to keep a relatively low population density.

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