

SPATIAL DISTRIBUTION AND SPECIES SEGREGATION OF BONNEVILLE CUTTHROAT TROUT, BROWN TROUT, AND BROOK TROUT

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1. INTRODUCTION

The Logan River in northern Utah supports one of the largest remaining metapopulations of the imperiled Bonneville cutthroat trout (BCT - *Oncorhynchus clarki Utah*). While the physical characteristics of the Logan River support the needs of these fish, BCT suffer from competition with non-native species of brown trout (*Salmo trutta*) and brook trout (*Salvelinus fontinalis*). In the tributaries of Temple Fork and Spawn Creek, Passive Integrated Transponder (PIT) tags are being used to evaluate habitat use of these three trout species. Specifically, PIT tags reveal differences in persistent microhabitat utilization (habitat hotspots) and movement for each species. Combining PIT tag data with repeat spawning surveys also helps to explain BCT spawning habitat in the absence of brown trout.

Differences in habitat hotspots for each species can provide insight into preferred environmental conditions. Different environmental needs along with biological and behavioral effects help to explain the spatial distribution of the three trout species.

2. TEMPLE FORK AND SPAWN CREEK STUDY SITE

Temple Fork and Spawn Creek are tributaries to the Logan River in northern Utah. Flows created by snowmelt and perennial springs support each species of trout throughout the year. Beaver dams are present in both creeks.



Figure 1: Temple Fork Watershed in the Logan River, Utah.

3. METHODS

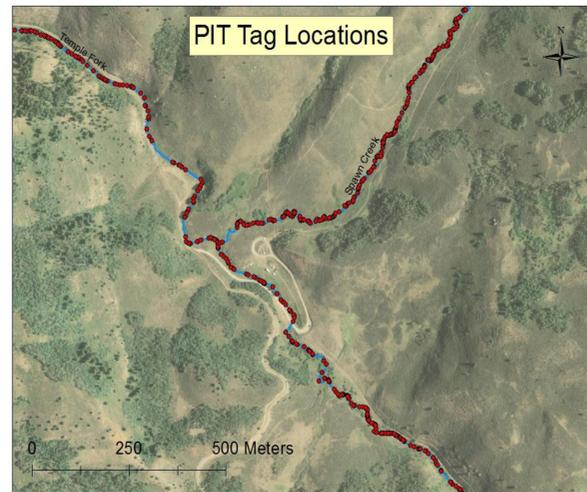


Figure 2: PIT tag spatial locations snapped to the stream layer of Temple Fork and Spawn Creek.

PIT tags have been recorded using capture/recapture, active scanning, and stationary in-stream antennae. Coordinates for each PIT tag are taken with GPS. These coordinates are used in ArcMap to display the spatial locations of fish.

Habitat hotspots were identified using the Density tool in the Spatial Analyst toolbox. The resulting raster was reclassified to display the number of fish within a 7.5 meter radius.

Beaver dam passage by fish was identified by isolating PIT tags above and below each major dam for each species. PIT tag numbers located above a dam were joined to all tags below a dam to identify fish that have crossed a beaver dam.

BCT spawning hotspots were identified using four years of spawning surveys. GPS locations of BCT spawning were displayed in ArcMap. Spawning points were again used in the Density tool and reclassified to identify persistent spawning hotspots.

4. SPECIES DISTRIBUTIONS

Habitat hotspots for each species show differences in habitat use. Brook trout primarily stay within beaver ponds. BCT and Brown trout occupy stream segments and beaver ponds. However, many habitat hotspots for BCT and brown trout occur in subtly different locations.

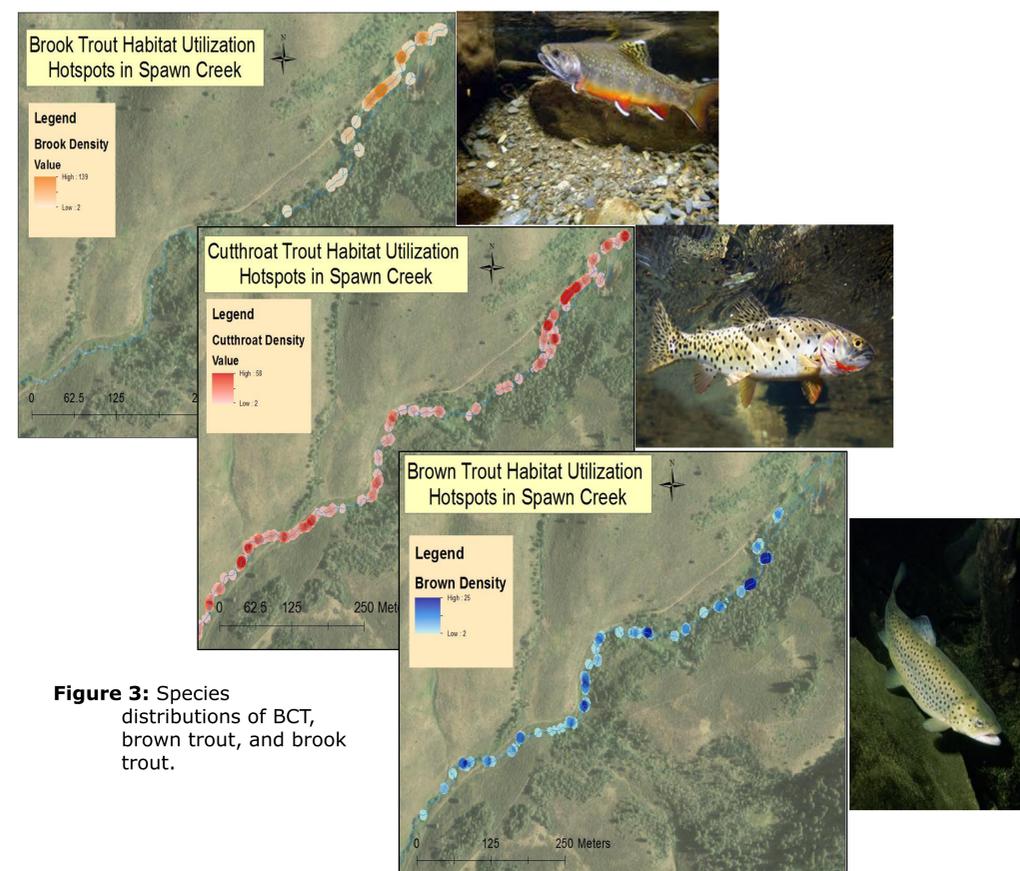


Figure 3: Species distributions of BCT, brown trout, and brook trout.

5. BCT SPAWNING HOTSPOTS

BCT spawning hotspots were identified from four years of spawning surveys. Spawning hotspots often occur in the absence of brown trout.

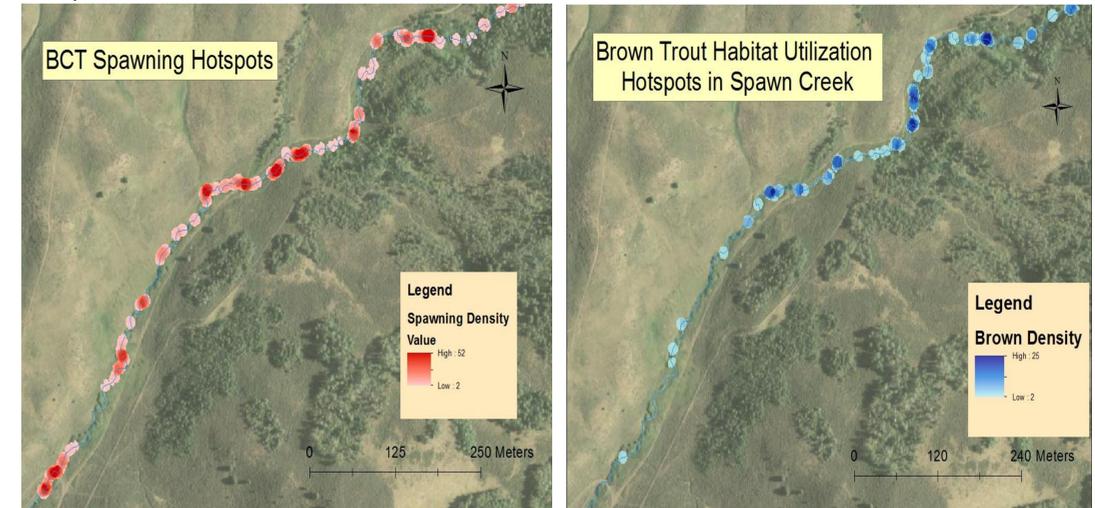


Figure 4: BCT spawning hotspots and brown trout habitat use hotspots in Spawn Creek.

6. BCT AND BROWN TROUT BEAVER DAM PASSAGE

Comparisons of habitat use by BCT and brown trout in Temple Fork show strikingly different species distributions. Brown trout are found in the lower reaches of Temple Fork primarily in an open valley reach. BCT are primarily found above beaver dams in an upper reach of temple fork. Data of beaver dam passage shows that brown trout have not crossed the upper and lower beaver dams of Temple Fork. Travel direction during dam passage (upstream or downstream) was also identified. It is likely that brown trout are limited to the lower reaches of Temple Fork by an environmental limitation caused by the valley constriction in the middle reach. More research is needed to understand why small numbers of brown trout pass the dams. Future research will also look at seasonal patterns of beaver dam passage.

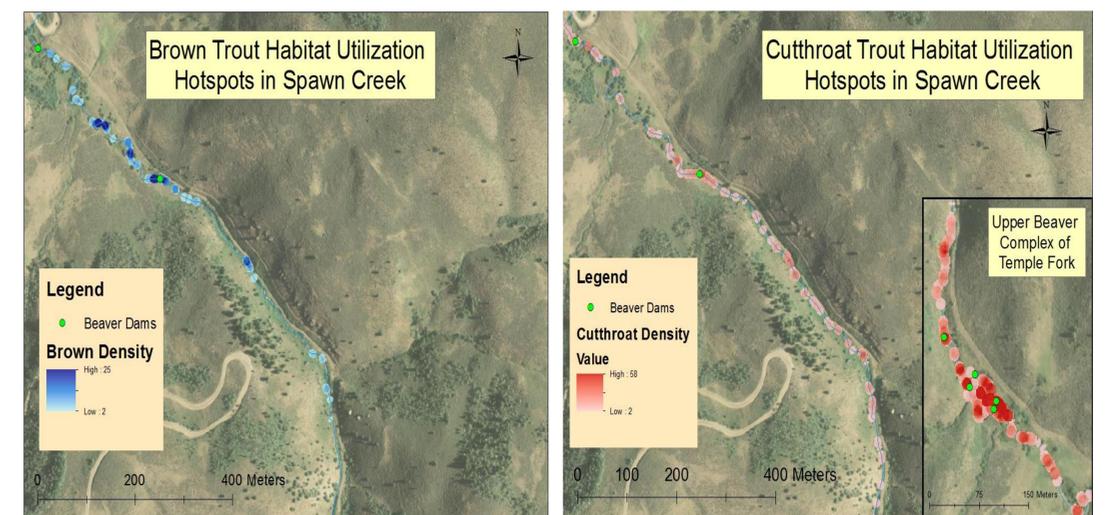


Figure 5: BCT and brown trout habitat utilization in Temple Fork. Species distributions are noticeably different due to valley width changes and beaver dams.

7. CONCLUSIONS & FUTURE WORK

Habitat hotspots derived from PIT tag data in the Temple Fork watershed indicate locations consistently used by fish over three years of data. Understanding of the physical environment at these microhabitat locations has the potential to provide insight into how each species of fish mechanistically uses fine scale stream habitats.

8. REFERENCES

Schrank, A. J. and F. J. Rahel (2004). "Movement patterns in inland cutthroat trout (*Oncorhynchus clarki Utah*): management and conservation implications." *Can. J. Fish. Aquat. Sci.* **61**: 1528-1537.