

Final report of the Smith River fish movement and survival study – 2019

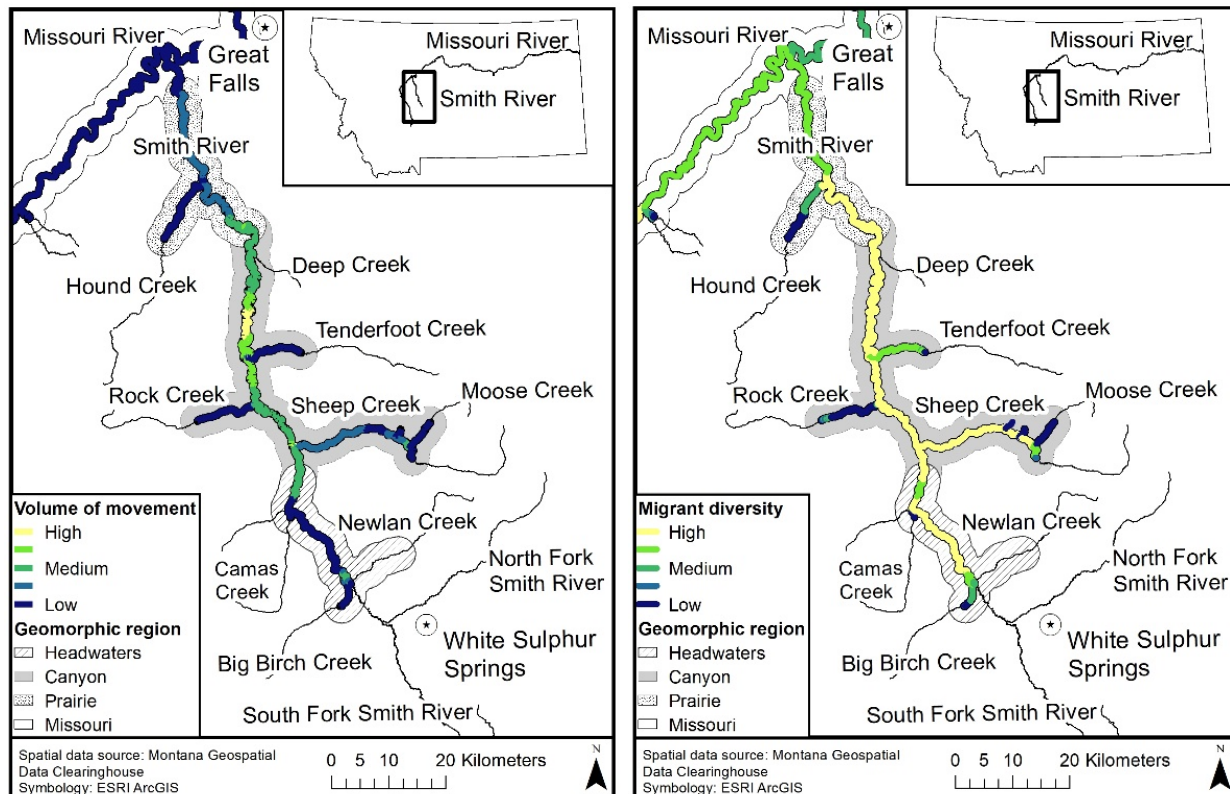
Since 2014, we have monitored the movements of fish in the Smith River watershed to understand patterns of fish movement and survival. In total, we marked 7,621 fish with unique PIT tags and then relocated marked fish as they passed a network of stationary PIT tag arrays. We also used mobile PIT tag readers mounted in boats or backpacks to relocate fish between and upstream of stationary PIT tag arrays. Over the course of the study, we observed 35,283 movements by 5,763 fish. Tagged fish moved throughout the entire Smith River watershed, and some tagged fish left the Smith River watershed travelling into the adjacent Missouri, Dearborn, and Sun River watersheds. Many fish travelled more than 10 miles, and some fish moved more than 100 miles. The ability of fish to move long distances throughout the Smith River watershed almost certainly helps improve species diversity and population resilience.

Among salmonids, Mountain Whitefish and Rainbow Trout were the most mobile especially during spawning seasons. Generally, Brown Trout and Brook Trout moved less often and shorter distances compared to Mountain Whitefish and Rainbow Trout. However, some Brown Trout migrated over 50 miles to access spawning tributaries. In the Smith River, Ling (Burbot) and Longnose Suckers were also migratory, and some individuals moved more than 20 miles during spawning seasons. Movement by fish was most



This Brown Trout was one of over 7,000 fish tagged as part of the Smith River Fish Movement Study conducted by researchers at Montana State University and Montana Fish, Wildlife and Parks. Photo: David Ritter, rittercraft.com

common in the main-stem Smith River from Deep Creek to Camas Creek as well as the lower reaches of Tenderfoot and Sheep Creeks. Migrant diversity (i.e. probability that passing fish came from different species or different locations within the watershed) was high along the main-stem Smith River as well along most the length of Sheep Creek. Access to Tenderfoot Creek and Sheep Creek appears to be important for Mountain Whitefish and Rainbow Trout, and access to Rock Creek and Big Birch Creek appears to be important for Brown Trout. Juvenile Rainbow Trout tagged in Sheep Creek moved throughout the entire Smith River watershed from Birch Creek downstream to Truly Bridge near the Missouri River. Adult Rainbow Trout from throughout the watershed moved into Sheep Creek and Tenderfoot Creek for spawning. Mountain Whitefish from the canyon and the headwaters moved into Tenderfoot Creek and Sheep Creek during the spring and summer for feeding as well as refuge from stressful summer water temperatures. Whitefish moved into these same tributaries in the fall to spawn. Brown Trout travelled up to 35 miles to move into Rock Creek to spawn, and brown trout moved up to 50 miles from upper Sheep Creek to spawn in Birch Creek.



Observed patterns of volume of movement and migrant diversity across the Smith River watershed. Volume of movement was greatest in the Smith River between Deep Creek and Tenderfoot Creek. Migrant diversity was high across much of the Smith River and Sheep Creek.

Survival varied across the watershed and among species. Among Mountain Whitefish, survival was highest in the middle Smith River watershed and the headwaters from Fort Logan upstream to Birch Creek. Rainbow Trout survival was highest in the middle Smith River watershed. Survival of both species was lower downstream of Rattlesnake Campground, and survival of Rainbow Trout upstream of Sheep Creek in the headwaters was as low as survival downstream of Rattlesnake Campground. Survival of Brown Trout differed little across the watershed. Survival in the summer was similar to survival in other seasons indicating that many fish are able to find refuge habitats where water temperatures are moderated by groundwater and tributary inputs. Rates of survival were generally low (< 25 % annual survival) except for Mountain Whitefish in the headwaters and canyon (40 – 55 % annual survival). Some mortality was natural, and survival estimates are probably 5-15% lower than true survival due to tag loss. However, a substantial portion of mortality was due to predation by American White Pelicans. Pelican predation was the cause of at least 15 % of mortality in some locations. Patterns of survival and movement suggest that the semi-wilderness canyon from Sheep Creek to about Rattlesnake Campground probably serves as a core habitat for Mountain Whitefish and Rainbow Trout. If fish such as Mountain Whitefish and Rainbow Trout were not able to move throughout the watershed, the abundance and species diversity of fish outside of the canyon would probably decrease, and populations of Mountain Whitefish and Rainbow trout throughout the watershed

would potentially be more susceptible to environmental disturbances such as drought and extreme water temperatures.

We observed movements across the Smith River watershed that linked distant regions and groups of fish. These movements connected regions of relatively high survival to regions of relatively low survival, and movement of fish across the Smith River watershed probably has helped to promote reproductive success, fish size, abundance, and species diversity. On average, dams are located every 30 miles along mid-sized rivers in the United States. In the Smith River and adjacent Missouri River watersheds, fish moved along 360 miles of un-fragmented stream network. These rivers provide an example of the complexity of fish movements in systems that



The semi-wilderness canyon between Sheep Creek and Rattlesnake Campground is an important corridor for fish movement and has the highest rates of annual survival among fish in the Smith River watershed.

are not blocked by instream barriers. Within the Smith River watershed, fisheries management should advocate for maintaining fish passage along the Smith River and into major tributaries. Connectivity to the Smith River between Sheep Creek and Rattlesnake Campground should be maintained to help support populations of fish in the prairie and headwaters. Landowners and land managers in the Smith River watershed have maintained the river in a state that has promoted the strength of the Smith River fishery, and therefore, future management of the river should continue to promote cooperation among landowners, resource management agencies, local industry leaders, and interest groups.

This project has been a fantastic opportunity to work with people who care deeply about central Montana and the Smith River and would not have been possible without the generous support of Meagher and Cascade County landowners. We appreciate the help and support of the Helena-Lewis and Clark National Forest as well as the Montana Department of Natural Resources and Conservation. We would also like to thank Montana Trout Unlimited and some of the local Trout Unlimited Chapters for their interest in and support of our research. The Smith River Advisory Council helped our project through its administrative and financial support.

Many tagged fish are still alive in the Smith River watershed, and therefore we will continue to monitor movements past stationary PIT tag arrays. Because trout, whitefish, and other stream-dwelling species can live 5 to 15 years, we hope to use this opportunity to learn about how fish move over the entire life of the fish. At four years, our study constitutes one of the longest studies of fish movement, and continued monitoring of tagged fish will be useful to understand long-term patterns of fish movement over the life of tagged fish. Jason Mullen and the region 4 FWP fisheries staff will be in charge of the existing PIT tag arrays and can answer any questions regarding future operation of these sites.

Thank you!

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