SFI CONSERVATION GRANT

EXPLAINER

Fraser Basin Council

SUSTAINABLE FORESTRY INITIATIVE
SFI-00001

MONITORING WATER TEMPERATURES AND FLOWS FOR STEELHEAD IN RELATION TO FOREST MANAGEMENT PRACTICES

Project Lead	Fraser Basin Council Society
Awarded	2018-2021
Location	British Columbia, Canada
Partners	West Fraser (SFI-certified organization) British Columbia Timber Sales (SFI-certified organization) Secwepemc Fisheries Commission Simon Fraser University of Northern British Columbia Stuwix Resources

In 2018, SFI awarded Fraser Basin Council Society a Conservation Grant to support the conservation of the Thompson River steelhead a culturally and ecologically significant, but highly endangered fish species in British Columbia.

KEY POINTS

- The project monitored temperature of the Bonaparte River to determine how wildfire severity and timber harvesting influenced water temperature—key factors in steelhead habitat health. This created baseline data for the watershed that did not previously exist.
- This collaborative conservation project involved Indigenous groups, academia, SFI-certified organizations, and government entities. The project supported workforce participation and recognized the cultural values tied to the steelhead.
- While no significant short-term temperature differences were found across forest disturbance types, some years showed elevated stream temperatures, potentially tied to post-wildfire conditions. Importantly, new cold-water tributaries were identified (e.g., Maiden Creek), leading to immediate restoration work and conservation planning.

WHY IT MATTERS

Steelhead trout (aka steelhead salmon) are an iconic symbol and important species of both the Thompson River Watershed, and the Fraser Basin located in British Columbia. Steelhead are highly regarded for their cultural importance and as a crucial food source to regional indigenous communities like the Nlaka'pamux and Secwepemc people, and the Fraser Basin is one of the world's most productive salmon river systems. The Fraser Basin is also central to the region's world-class recreational fishery. Unfortunately, Steelhead are in decline, and the provincial government currently recognize Thompson steelhead as a species of extreme conservation concern.

Thompson steelhead are among the longest migrating trout in Canada. Steelhead begin their early life in the Thompson River, migrate to the ocean, eventually returning to the freshwater Fraser River after two years to spawn. The Thompson River steelhead population encompasses fish spawning in the Nicola, the Bonaparte, and the Deadman watershed. Dramatic population declines over the last three generations are largely a consequence of declining habitat quality and reduced survival rates while at sea (COSEWIC 2020).

The Thompson watershed has experienced physical habitat decline due to natural resource extraction, agriculture, and urban development. The forested landscape in the area has also been altered due to infestations of endemic Mountain Pine Beetle. Forest canopy cover is important in maintaining shade to control stream temperature, which needs to stay within an ideal range for many aquatic species, including steelhead. Additionally, in 2017, intense wildfires in the region resulted in changes to the riparian areas and steelhead spawning beds. The dual threats of climate change and increased wildfire activity can significantly impact water temperatures through various mechanisms. The intense heat from fires can directly raise the temperature of nearby water bodies and the destruction of riparian vegetation reduces shading, allowing more sunlight to heat the water. Hydrological changes such as altered water flow and reduced infiltration can exacerbate these effects by decreasing water volume and increasing temperature susceptibility. These elevated temperatures can stress aquatic species adapted to cooler conditions, like steelhead, and cause decline.

In 2018, SFI awarded a Conservation Grant to Fraser Basin Society Council to monitor temperatures in the Thompson watershed, where steelhead spawn and rear, to determine impacts from forestry and wildfire on habitat conditions. Additionally, this project supported The Thompson Steelhead Working Group, a multi-governmental collaborative initiative formed in 2014 to bring together representatives of the Nlaka'pamux and Secwepemc First Nations, the Province of British Columbia, and the Government of Canada (Fisheries and Oceans Canada) to develop a recovery and management plan for Thompson steelhead. This conservation grant was designed to bring together multiple partners from across a diverse group of communities to raise awareness and foster collaboration between Indigenous peoples, the commercial sport fishery, and forest managers in the Thompson River watershed.

Bonaparte River Fishway

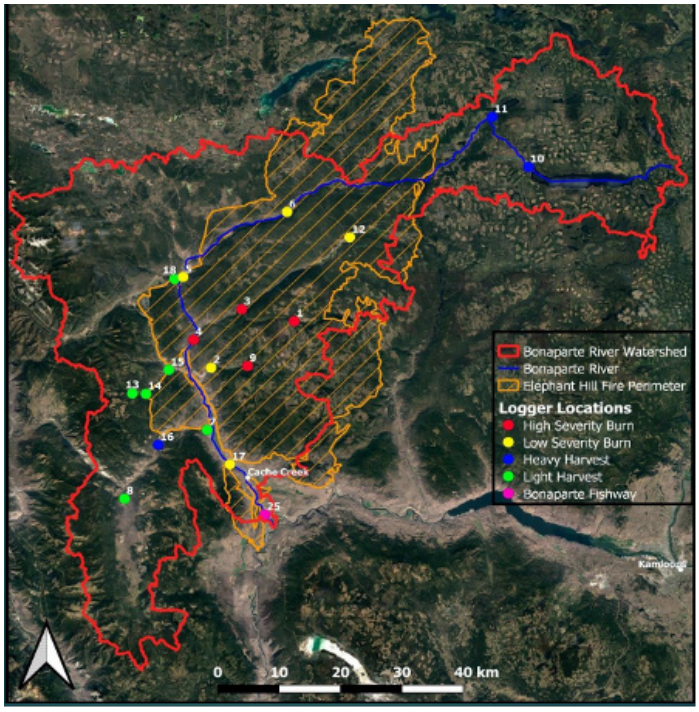
BRIEF PROJECT DESCRIPTION, OBJECTIVES, AND METHODS

Photos courtesy of the Sewepemc Fisheries Commission. Right: Bonaparte Rivere Watershed; Left: Staff installing temperature logger.

The purpose of this project was to monitor water temperature in parts of the Thompson watershed where steelhead spawn and rear. Researchers aimed to determine potential impacts of wildfire and timber harvesting on water temperature as well as to provide baseline water temperature data for the Bonaparte watershed. Complementing ongoing work in the neighboring Deadman and Nicola watersheds, the project focused on pinpointing leverage points for the forest sector to optimize retention efforts, thereby improving water flows and temperatures for the steelhead population.

To conduct this study, the Secwepemcúl'ecw Fisheries Commission deployed 25 temperature loggers throughout the Bonaparte River, which leads into the Thompson River, to monitor water temperatures during the spring and summer across three years (2018 to 2020). Monitoring was strategically done in areas impacted by the 2017 wildfires and timber harvesting, as well as near the river's outlet into the Thompson River. Logger locations were broken down into five categories: high severity burn, low severity burn, heavy harvest, light harvest, and the Bonaparte Fishway. Data was collected on different environmental elements at each location including water depth, habitat type, and surrounding vegetation.

Annual meetings from 2018 to 2021 were held to bring stakeholders together to discuss water temperatures within the Thompson watersheds. Participants were diverse, representing academic, nonprofit, governmental, and Indigenous organizations, major community partners were present, including the Bonaparte First Nation, Fraser Basin Council, and the Secwepemcúl'ecw Restoration & Stewardship Society. Meetings focused on sharing past and current water temperature monitoring findings and generating best practices for data collection in the Bonaparte Watershed. This project utilized an interdisciplinary approach with its inclusion of experts from multiple fields, enhancing collaboration and streamlining knowledge transfer regarding concurrent research conducted in the Nicola and Deadman watersheds.



Map identifying the 25 logger placements in the Bonaparte River Watershed.

RESULTS AND OUTCOMES

Overall, there was no significant difference between water temperatures over the three- year sampling period. Additionally, there was no observed difference between the different activities affecting the forests based on fire intensity or harvest intensity. Preliminary results suggested that stream temperatures in 2020 stayed higher for longer throughout the year. This trend appeared across most sites, suggesting that there may be several factors affecting water temperature in the Bonaparte watershed. Wildfires are known to cause immediate, short-term increases in stream temperatures when burning (Paige and Zygmunt 2013) while long-term changes in water temperature may be a result of channel movement post fire, loss of riparian vegetation, or severity of the burn (Beakes et al. 2014). It is more likely to see localized changes in temperature over the long term, although various time scales are not well documented. Without a long-term average, it is difficult to say if the higher temperatures seen in 2020 were a result of the 2017 wildfires or regional temperature fluctuations.

The project provided baseline temperature data for the Bonaparte River that had not existed before SFI funding. Both sub-watersheds have periods of late summer where maximum daily temperatures approach 25°C, a potentially lethal temperature and oxygen level for all fish. Additionally, data in this project was used to help identify key areas for conservation efforts and discovered tributaries of cold water that were previously unknown. For example, Maiden Creek was identified as a high priority creek to seek habitat restoration funding. At the completion of the first year of this project, funding was sought out and attained. In 2020, approximately 1.5 kilometers of significant restoration work was completed on the creek. Additional tributaries of cold water, previously unknown, were identified through the project and have already had restoration projects completed to protect the sources of this cold water.

This project provided SFI-certified organizations operating in the region with baseline data on water temperatures that can be used for continual monitoring or comparative research in the future. This work addressed climate change adaptation by identifying opportunities for habitat enhancement or restoration in small, lower-order, upper-elevation streams, aiming to improve conditions for fish and other aquatic life affected by changing water temperatures. These ecosystems now receive less snow and more rain, increasing the need for sustained water flows during prolonged summer droughts.

Maiden Creek Restoration Site, British Colombia

HOW THE PROJECT CONNECTS TO COMMUNITY

This project brought together key stakeholders and community members to evaluate the status of the Thompson Watershed. It focused on creating an atmosphere of collaboration and engagement between academic, non-profit, and Indigenous-related groups, and key SFI-certified organizations from BC Timber Sales, Stuwix Resources and West Fraser Mills to address values that support steelhead habitat restoration.

It quantified the impact of SFI-certified organization activities relative to improving stream habitat and water quality by comparing water temperatures between areas of variable forest disturbance related to harvest and fire activity. Since steelheads are an indicator of the biodiversity values within a watershed, analysis of these metrics help build understanding regarding the contribution of sustainable forest management to conserving species at risk. Additionally, regard for Indigenous values was at the forefront of this effort, acknowledging the cultural importance of the Nlaka'pamux and Secwepemc peoples.

HOW IT RELATES TO THE SFI STANDARDS

Temperature monitoring and collaboration efforts for the Thompson watershed directly supported numerous objectives in the SFI 2022 Forest Management Standard:

- Objective 3: Protection of Water Resources
- Objective 4: Conservation of Biological Diversity
- Objective 8: Recognize and Respect Indigenous Peoples' Rights
- Objective 12: Forestry Research, Science and Technology
- Objective 14: Community Involvement and Landowner Outreach
- Objective 17: Management Review and Continual Improvement

The project showcased a holistic approach to conservation and demonstrated a commitment to protecting water resources, conserving biological diversity, respecting Indigenous Peoples' rights, advancing forestry research, and embracing continuous management improvement.

A driving factor was the importance of Steelhead to the Nlaka'pamux and Secwepemc people coinciding with recognizing and respecting Indigenous rights. Acknowledging the intertwined relationship between people and the land was imperative to grounding the work in a purpose greater than just environmental conservation. This project also funded the Secwepemc Fisheries Commission to undertake the field work, data collection, and reporting for the Bonaparte watershed, supporting the Indigenous workforce and their key involvement in the project completion.

The project outputs can inform forest professionals in achieving these objectives. West Fraser operates in all three watersheds of this project, and data outputs such as which streams currently have higher temperatures than others may complement the development of site specific, or even landscape level, management strategies that are especially important for threatened Steelhead in the region. This is consistent with the SFI Conservation Impact goal of helping to inform forest management based on science-based findings.

Participating organizations came together to uphold a key SFI objective of conserving biologic diversity through the endangered Steelhead population. Its native relationship with the BC region and surrounding watersheds highlighted the project's alignment and support of the SFI 2022 Forest Management Standard. The commitment to annual meetings with diverse professionals to discuss water monitoring findings and best management practices exhibited coherence with SFI's performance measures for continual improvement. This holistic approach not only advanced forestry research and management practices but also fostered community well-being and sustainable forest ecosystems, setting a precedent for future conservation initiatives.

RESOURCES

- COSEWIC. 2020. COSEWIC assessment and status report on the Steelhead Trout Oncorhynchus mykiss (Thompson River and Chilcotin River populations) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xvi + 104 pp. (https://www.canada.ca/en/environment-climatechange/services/species-risk-public-registry.html)
- Secwepemc Fisheries Commission. Bonaparte Watershed water temperature monitoring – 2020 presentation. 2020. Presented to Sustainable Forestry Initiative.
- Sterling, J., Guerin, J., Ducharme, S., & Chestnut, J. (2020, December). Bonaparte Watershed water temperature monitoring – 2020. Prepared for Mike Simpson, Fraser Basin Council by Secwepemc Fisheries Commission. Received by Sustainable Forestry Initiative.
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