

**REPORT TO REGIONAL WATER SUPPLY COMMISSION  
MEETING OF WEDNESDAY, FEBRUARY 19, 2014**

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**SUBJECT      SOOKE RIVER BIOLOGICAL MONITORING PROGRAM 2003-2012**

**ISSUE**

This report provides an overview of the recently completed 10 year Biological Monitoring Program for the Sooke River.

**BACKGROUND**

Since the raising of the Sooke Lake Reservoir Dam in 2003, the Capital Regional District (CRD) has released water from Sooke Lake Reservoir and Deception Lake Reservoir for fisheries purposes. Prior to 2003, there were no planned water releases from either reservoir for fisheries purposes. Water releases only occurred naturally, typically in the late winter and early spring months, when the reservoirs reached full storage capacity. As a result, there was often no water flowing in the Sooke River between the Sooke Lake Reservoir dam and the Leech River and reduced flows below the Leech River during the summer and fall periods when flows for fisheries purposes are most critical. The attached drawing shows the extent of the entire Sooke River Basin, including the Leech River watershed, which flows into the Sooke River and the lower Sooke River watershed below the Sooke Dam. The drawing also shows the Phase 2 study sections of the Sooke and Leech Rivers, which are discussed later in this report.

The provision for fisheries water releases from Sooke Lake Reservoir and Deception Lake Reservoir was established in 2002 with an agreement between the CRD, the T'Sou-ke Nation, Department of Fisheries and Oceans and the Ministry of Water, Land and Air Protection (currently renamed to the Ministry of Forests, Lands and Natural Resource Operations). One of the conditions of the agreement was to undertake a fish habitat monitoring program downstream of the Sooke Lake Reservoir Dam, to determine the impacts of the altered water release regime that resulted from the dam raising.

More specifically, the terms of reference for the monitoring program required the consultant to:

- Assess and monitor habitat for spawning and rearing
- Assess conditions of migration (upstream and downstream)
- Assess insect productivity of riffle habitat and drift rates of insects useful to fish
- Assess tributary access
- Assess stranding and predation
- Assess smolt production and resident trout abundance

The first year of the monitoring program was conducted by Stantec Consulting Ltd. and the following nine years of the program were completed by D. Burt & Associates Ltd. The costs for the first five years of the program were \$197,300; the costs for the final five years of the program were \$130,800 as a result of a methodology change.

The following provides an overview of the monitoring program results presented in 2013.

**Results of the Biological Monitoring Program**

In the first five years of the biological monitoring program (Phase 1: 2003-2007), aquatic insects as well as fish were sampled at three sites on the Sooke River, as well as a control site on the Leech River. Overall results provided evidence that the flow releases were beneficial to the aquatic insect population. The response of fish populations to the flow releases appeared to depend on life stage. Trout in their first year of life (fry) showed a positive response to the flow releases while older age groups (parr) showed no detectable response. The lack of response in trout parr may have been related to habitat characteristics at the monitoring sites relative to the control site and/or that flow releases were insufficient to elicit a

response in parr standing stock (parr have much higher depth and velocity preferences than fry). A recommendation of the 2007 report was to select new monitoring sites with better parr habitat that were more comparable to the control site on the Leech River.

While Phase 1 of the program provided evidence that the flow releases were beneficial to both insect and fish populations, it was also recognized that the program had several limitations:

1. Lack of multi-year pre-release data
2. Low number of sites in the monitoring and control reaches
3. Habitat at the control site (Leech River) was different than at the monitoring sites
4. Low number of sites combined with spatial and annual variations in fish abundance resulted in a situation where it is difficult to make statistical conclusions about differences in fish at each site

In 2008, the program term was extended for another five years (Phase 2: 2008-2012) but with an improved study design. Modifications included dropping the insect monitoring component while expanding the fish monitoring component. Four new performance measures were identified to gauge the response of fish to the flow releases, and the number of monitoring sites was increased to include nine sites in the Sooke River mainstem and three control sites in the Leech River.

The following are the results of Phase 2 of the program:

**Performance Measure 1** - For trout in their first year of life (fry) and in their second year of life (parr) as well, the results showed that fish abundance in the monitored sites was similar to that found in the Leech River control sites.

**Performance Measure 2** – For this performance measure, the 95th percentile of one year or greater aged trout biomass was compared with the theoretical maximum predicted by the Provincial Alkalinity Model, which is a model based on the relationship between biomass and alkalinity. The greater the measure of alkalinity, the greater the productivity of the river.

This measure suggests that production of trout in the Sooke River is performing reasonably well compared to theoretical capacity (76% over 9 years), but not to the same degree as the Leech River (112% over 9 years).

**Performance Measure 3** - For the comparison of fish in the Sooke River with external watersheds, the only concurrent data available were from the Jordan River (2008 – 2010, flows regulated) and the Chemainus River (2008 and 2009, natural flows). The parameter used for fish comparisons was biomass as a percentage of the Alkalinity Model's theoretical maximum biomass. Section B of the Sooke River (from the Leech River southward to the falls - see attached drawing) was used for the Jordan River comparisons, and Section A (between the falls and De Mamiel Creek) for the Chemainus River comparisons. These comparisons indicated that biomass of resident trout (fry and parr) in Section B of the Sooke River was performing better than biomass of trout in the Jordan River in all three concurrent years. However, steelhead parr biomass in Section A of the Sooke River performed more poorly than steelhead parr biomass in the Chemainus River in the two concurrent years.

**Performance Measure 4** - A hydrology analysis of flow releases from Sooke Lake and Deception Reservoirs has shown that summer base flows increased beyond what would have occurred under a natural flow regime (by an average of 1.0% MAD, or Mean Annual Discharge in July and by 2.8% MAD in August). A regression analysis comparing fish production with flow suggests that current biomass levels of rainbow and steelhead fry are greater than what would have occurred without the fish flow releases.

#### Summary of the 10-year Monitoring Program

After 10 years of studying numerous sites in the Sooke and Leech Rivers for fish health and habitat, the overall conclusion from the four performance measures is that trout stocks in the Sooke River are healthy, and that production levels are similar or close to those in the Leech River control sites when habitat differences are factored in. The water releases have had the intended effect.

Coho fry from hatchery releases were sometimes encountered at sites in Section B of the Sooke River (see attached plan). The consultant has recommended that the Coho would likely have better survival rates and have less interaction with rainbow trout if they were released in Section C of the Sooke River.

The consultant also found that there was some evidence that the biomass of trout in the Sooke River mainstem were at or near habitat capacity. A concern here is that hatchery released steelhead fry or parr could compete with wild steelhead. This requires further investigation.

It was also noted that the high trout biomass found at some sites in the Leech River was in part due to the complexity of habitat found at these locations. Enhancement activities that increase habitat complexity (by adding root wads or large boulders) would be one way to increase rearing capacity of existing habitat (and hence production) in the Sooke River. However, any work involving increasing complexity would require hydrology and engineering assessments to ensure stability and minimize risks. This also would introduce an artificial enhancement in the Sooke River, and we have only committed to improving the habitat as it would have existed naturally (water releases are based on the natural hydrological cycle). As a result of the above noted and the high cost of this artificial enhancement work, it is not being considered at this time.

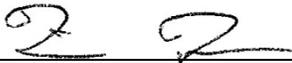
The biological consultant has recommended that the Phase 2 sites be reviewed every three years to confirm that juvenile fish stocks and their habitat remain healthy, and that the current fisheries water release regime continue to provide benefits to fish stocks and habitat.

**CONCLUSION**

Since the CRD started planned releases of water from Sooke Lake Reservoir in 2003 for fisheries purposes, a healthy fish population and habitat is being maintained downstream of the Sooke Lake Reservoir Dam, which would not exist today without CRD water releases.

**RECOMMENDATION**

That the Regional Water Supply Commission receive the staff report for information.

  
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Concurrence

Attachment: 1



UTM Zone 10N NAD 1983



## Sooke River Biological Monitoring Program Study Sections

### DISCLAIMER

This map is for general information only and may contain inaccuracies.

July 2013 | SookeRiverWatershedReachBreaks.mxd | gis@crd.bc.ca



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