

# Southern Boundary Restoration and Enhancement Fund

## Annual report 2020

**Project Title:** Cowichan River – Stoltz Bluff Sediment Remediation Maintenance

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### 1. Overview

Stoltz Bluff is a deposit of glacial sediment that extends for approximately 600 m at the outside of a natural meander bend on the Cowichan River, 27 km upstream of Cowichan Bay (Figure 1-2). Stoltz Bluff was previously identified as the largest point source of fine sediment on the river, representing on average 35-45% of the river's annual total suspended sediment (TSS) load (KWL Assoc. Ltd. 2005). This is significant in that effective sediment management was identified as the second highest fish habitat restoration priority in the *Cowichan Recovery Plan*, prepared for Cowichan Tribes' Treaty Office (LGL Ltd. 2005).

The primary objective of a potential Stoltz Bluff remediation project evolved over 25 years to become "the effective control of massive sediment transport from the bluff (i.e., 10,000-28,000 m<sup>3</sup>/year since 1993) (KWL Associates Ltd. 2005)), that had been negatively affecting Cowichan River fish habitats and stocks for many kilometres downstream (Burt and Ellis 2006)." The recent Cowichan River Watershed Health and Chinook Initiative (Ayers 2017) reemphasized the value of improved year-round water quality and salmonid spawning habitat as an ongoing strategic management objective.

Beginning in July 2006, the BC Conservation Foundation (BCCF) coordinated a major sediment remediation project at Stoltz Bluff. Work included construction of an engineered 600 m rip-rap berm and terrace, complete with a series of weirs, channel gradient controls and bioengineering treatments designed to move river flows away from the base of the bluff and prevent further bank erosion and major slope failures.

The initial phase of the project took 10 weeks to build, and was supported by a group of seven partners who contributed \$830K in funds and in-kind construction materials (including \$250K from PSC). For 10 years following the project's inception, there was a significant improvement in the river's water quality (i.e., TSS and turbidity) and downstream fish habitats (Gaboury et al. 2012), which is thought to have contributed to incremental gains in annual returns of the river's fall Chinook and chum salmon stocks, as well as winter steelhead.

However, since 2014, there has been a notable (and even dramatic) change in slope stability at Stoltz Bluff, apparently prompted by the cyclical return of wetter winter weather conditions (McQuarrie 2017). Mass wasting events in the Bluff's gullies and numerous smaller slope failures, including one in the Clearwater Creek Basin in 2017 (Figure 2) that have collectively overwhelmed existing sediment retention infrastructure, resulting in higher sediment loads entering the Cowichan River.

## 2. Implementation

Stoltz Bluff underwent a slope hazard assessment following severe winter storms in 2016 and 2017. As indicated by McQuarrie (2017), the bluff will continue to fail, largely due to the instability of Clearwater Creek's gully, which is "severely over-steepened, highly unstable, and cannot be stabilized" (see Figure 2). Ongoing Stoltz Bluff sediment management is needed to meet water quality goals in the Cowichan watershed and to mitigate for the effects of fine sediments on downstream salmonid spawning and rearing habitats.

Project goals for 2019 were to:

1. Maintain vehicle access along the full length of the BC Parks Stoltz Bluff access road, which, in past years, has become blocked by slides and fallen trees during the winter months.
2. Excavate sediment accumulated in containment ponds and overflow channels and maintain drainage paths to the Cowichan River.
3. Implement bioengineering to enhance slope stability.



Figure 1. Location of Stoltz Bluff on the Cowichan River, in relation to Lake Cowichan and City of Duncan.



Figure 2. Aerial view of Stoltz Bluff following the Clearwater Creek slope failure in 2017. The sediment flowing from the creek into the Cowichan River can be seen on the center-right of the photo, as can damage to the access road.

In the summer of 2019, CIDA Contracting Ltd. was contracted by BCCF to implement heavy equipment-based sediment remediation work at Stoltz Bluff. In July 2020, one machine was mobilized to the site and worked for two days in order to expedite the drying of soils within the main sediment catchment pond. This task was recommended by Chris Cole, R.P.F., P.Eng in order to make fall work easier. During the two days in July (3rd and 4th) soils within the sediment were stacked into ‘wind rows’ to help with drainage to allow for easier removal during in the fall 2019 construction works.

Between September 30th and October 3rd BCCF contracted CIDA holding and Chris Cole, R.P.F. to complete sediment removal from the main catchment area, in addition to some minor stabilization works were completed in the lower part of the Clearwater creek gully. During four days two excavators (Volvo 324 and a Cat 315) and one 30T rock truck removed ~900 m<sup>3</sup> of clay/silt soils to a spoil site just downstream but within the Stoltz bluff region, in addition another ~500 m<sup>3</sup> of sediment was removed from the ponds and added to the main containment berm.

A French drain was constructed at the downstream outlet of Clearwater creek to facilitate drainage across the access road, as the old 300 mm culvert was entirely plugged with silt and debris. ~8m<sup>3</sup> of rock (300-900 mm angular riprap) was obtained and placed in the Clearwater

Creek gully at the toe of the slope, adjacent to the lower check dams to provide some erosion protection in the area for higher flows.

Mr. Cole produced an “As-built” report to document the annual work plan and mitigation work implemented at Stoltz Bluff; this report has been attached as Appendix A for your reference.

Bioengineering was undertaken at Stoltz Bluff by BCCF staff and Cowichan Tribes planting crews. In November 2019, BCCF staff met with Dave Polster on site to discuss an overall restoration prescription for Stoltz Bluff. Following recommendations from this site visit, a small crew of Cowichan Tribes members and BCCF staff harvested and planted ~1500 live stakes over a total area of 1564 meters squared at the Stoltz bluff site. ~700 stakes were planted in the spoil piles left over from sediment extracted from the containment pond in 2019 and ~800 stakes were planted on the perimeter of the containment pond and the outer edge of the containment berm. Planting and harvesting occurred from December 2019 through January 2020. The species composition of the stakes planted were as follows: 5% - Red Osier Dogwood, 20% - Willow Sp. and 75% Balsam poplar. While all three of these species have been successfully staked on site in previous years, it was decided to primarily plant balsam poplar based on their observed natural recruitment and success in the area.



Figure 3. Bioengineering work completed at Stoltz Bluff during the winter of 2019/20.



Figure 4. Site shown in figure 5 after one summer's growth (July 2020)

Using partnership funding (Coastal Restoration fund), in-situ turbidity loggers were purchased and installed above and below the Clearwater creek outlet to monitor the sediment load from the site. Preliminary data from the winter of 2019/20 are showing minimal differences between the two locations suggesting restoration activities are working to limit sediment loading from this site.

### 3. Recommendations

One of the biggest issues on site needing to be addressed is that there is now little to no room for material excavated out of the sediment ponds to be spoiled on site. Berms are getting very high, in 2019 spoil areas became overwhelmed, some of the more competent material was added to lift the access road. In future years spoils may need to be hauled off site to effectively manage the amount of material.

Annually, the gully will need to be re-assessed in the spring and mitigation measures applied and repeated during late summer, likely for several years (McQuarrie 2017). During 2020, we anticipate that the sediment containment ponds, containment pond outlets, and overflow channels will require full excavation due to the recent slope instability at Clearwater Creek and that the access road will require maintenance due to debris build-up. We will also continue bioengineering work; live-staking with black cottonwood, willow spp., and red-osier dogwood along the base of the Clearwater Creek gully and around the sediment containment ponds.

Priority areas for bioengineering will be determined from sediment accumulation patterns over the winter/spring.

The uncertainty around precipitation and storm events has led to the development of an adaptive management approach for Stoltz Bluff maintenance. BCCF staff will conduct environmental monitoring (weather/precipitation, flows, turbidity, sediment accumulation) over the fall-winter-spring to assess maintenance needs for the following summer-fall and proactively adjust sediment mitigation plans in collaboration with BCCF contractors.

## References

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