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ER390 Final Report
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Rippon Creek Restoration Initiative

Executive Summary

The Maxwell Creek Watershed on Salt Spring Island has experienced significant anthropogenic pressures including logging, wetland drainage for agriculture and road construction. Rippon Creek is one of the three main streams in the watershed. Restoration of ecological functions in Rippon Creek is important to improve water quality in Maxwell Lake, which is a major source of drinking water on Salt Spring Island. The goals of restoration include reducing water velocity in Rippon Creek, the associated erosion and sediment loading, increasing soil moisture and improving habitat conditions. To achieve these outcomes, it requires building relationships and getting buy-in from local organizations, landowners and government agencies. A primary focus of this process was applying for a Section 11 Permit to be granted permission from the Province of BC to do works in Rippon Creek. Unfortunately, due to permitting delays and evolving priorities of partner organizations, this project was not carried out as originally planned. Due to the complexity of coordinating with several stakeholders, a long-term, adaptive management approach is needed to achieve project goals and carry out restoration in this watershed.

Introduction

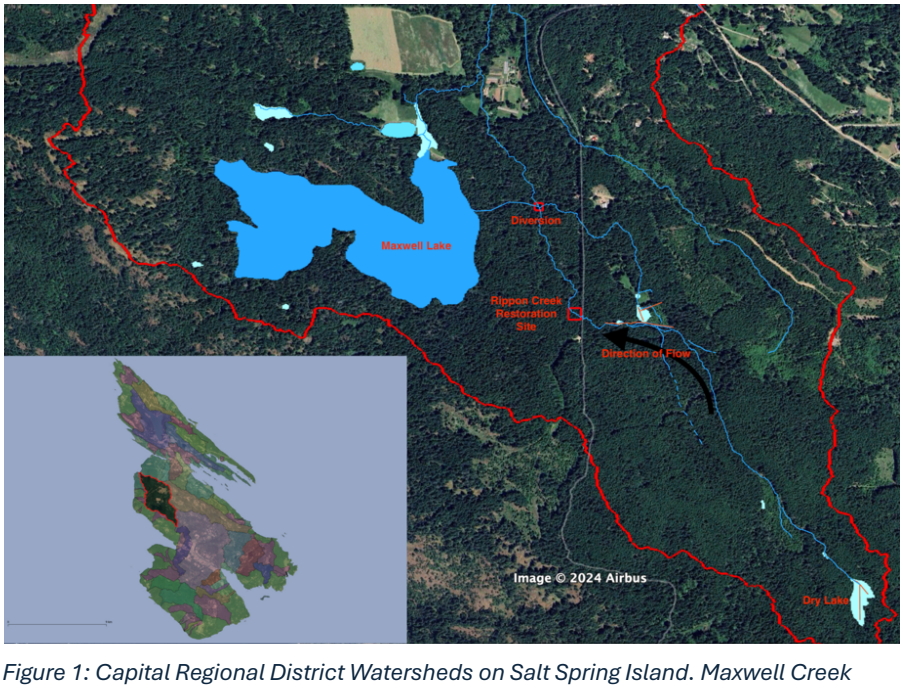

Figure 1: Capital Regional District Watersheds on Salt Spring Island. Maxwell Creek Watershed outlined in Red. Map by Nicholas Courtier.

The Maxwell Creek Watershed (Figure 1) is found on Mount Maxwell or Hwmet'utsum as it is called in Hul'q'umi'num, one of the local First Nation's languages. This watershed is found in the Coastal Western Hemlock (CWH) biogeoclimatic zone, which is an anomaly on Salt Spring Island because most of the rest of the island is in the Coastal Douglas Fir (CDF)

zone (Forest Service British Columbia, 2021). The Maxwell Creek watershed's geology contains sandstone, shales, gravelly sandy loam, colluvial materials and a C-horizon consisting of fractured bedrock (Doll, 2023). The forests are dominated by Douglas Fir (*Pseudotsuga menziesii*), Western red cedar (*Thuja plicata*) and Western hemlock (*Tsuga heterophylla*). Understory vegetation is sparse in some areas but where it exists it consists mostly of Salal (*Gaultheria shallon*), Oregon Grape (*Mahonia nervosa*) and Sword Fern (*Polisticum munitum*). One notable endangered species is the Northern Red-Legged Frog (*Rana aurora*) which I spotted along Rippon Creek. Restoration work in the Maxwell Creek Watershed is being led by the Climate Adaptation Research Lab (CARL) – a branch of the charitable society Transition Salt Spring (TSS) - to increase the Maxwell Creek Watershed's resilience to wildfires and restore ecological integrity in the surrounding forests. I have been a member of CARL for the past two years. This watershed's ecosystems have been simplified (as can be witnessed from historic aerial photographs) after years of human activity such as clear-cut logging, agriculture and road building (Nordin, McKean, & Boyd, 1982).

Figure 2: Close up map view of Restoration Site

Rippon Creek flows ephemerally from a spring in 'Dry Lake' (a ditched wetland) into Maxwell Lake, a source of nearly 50% of drinking water for the Salt Spring Island community. Rippon Creek flows down Mount Maxwell through several drained wetlands, forested areas, and groundwater flows and it becomes concentrated along road ditches when it reaches Maxwell Road because the road acts as a dam. Once the creek passes through the Mount Maxwell Road culvert, water flows through another forested area and is concentrated again in a flume/diversion site that is controlled by the North Salt Spring Waterworks District (NSSWD). When the creek carries excessive sediment, it is directed past Maxwell Lake, but when the water quality is sufficient, it is sent through a pipe into the lake to be added to the drinking water supply.

The reach of Rippon Creek by Mount Maxwell Road was chosen as a site of intervention because it is experiencing excessive erosion, sedimentation and harmful runoff and it has a lack of riparian plant diversity/ecological structure (Figure 3). CARL has been studying the Maxwell Creek Watershed for the past two years and identified a culvert that runs under Mount Maxwell Road as a choke point for the above problems. This region is expected to experience more frequent and severe extreme weather events (Prairie Climate Centre, 2021) such as atmospheric rivers, which increase the need for intervention to prevent current ecological issues from becoming exacerbated. Intervening at this site should be understood as one project of many in a long-term vision of restoring these ecosystems at a watershed scale. The objectives of intervening in Rippon Creek are to improve water quality (by slowing water velocity and reducing erosion/sedimentation), to increase soil moisture (to prevent the risk of catastrophic wildfires in the watershed) and enhance wildlife habitat (by creating more in-stream habitat through adding Large Woody Debris ((LWD)) and increasing the diversity and cover of native riparian plants). Approximately half of the watershed is governed by a Salt Spring Conservancy covenant which restricts most human activity including ecological restoration projects. The proposed restoration project is adjacent to the covenant land and owned by the NSSWD.

Figure 3: Rippon Creek Restoration Site, Downstream View from the Mount Maxwell Road Culvert

Building the Case for Intervention

Landowners needed to understand why this particular section of Rippon Creek needs intervention, so my colleague Grace Fields and I did a Riparian Health Assessment (see Appendix 1) using the Streamkeepers Advanced Steam Habitat Field Data Sheet. We needed to be on site while the creek was flowing so we planned our visit in October. CARL used data collected in the watershed to apply for grant funding and to share details of the watershed's health with NSSWD.

This reach of Rippon Creek suffers from a lack of instream cover other than a few sword ferns. There were no shrubs present adjacent to the creek, which means there is a lack of understory structure in this section of the ecosystem. The vegetation beside the creek consists of moss and a few sedges. The streambed material is mostly gravel that had washed into the creek bed from the road or rock

armouring on the opposite side of Mount Maxwell Road. This section of creek resembles a channelized ditch with no off-channel or pooling habitat. The bank stability grade that was given at the time of our initial assessment is higher than it would be if this reach of the creek was reassessed in 2024. Over the past year, bank stability has declined and headcuts have formed, which make the issue of erosion more apparent (Figure 4). Overall, this reach of Rippon Creek was given a grade of 36 out of a possible 135 points meaning that this reach would be considered in a 'marginal to poor condition.' This assessment is an important piece of evidence for why intervention here is necessary.

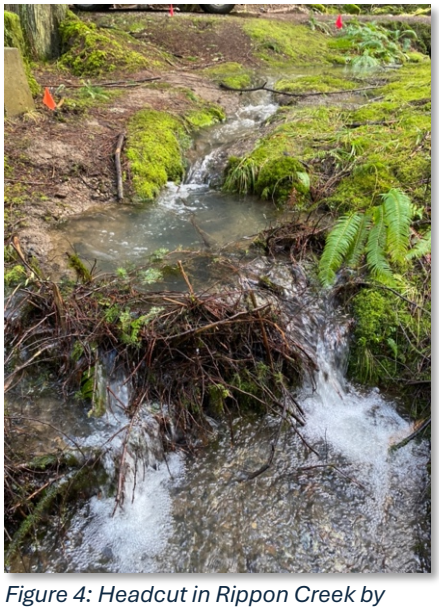

Figure 4: Headcut in Rippon Creek by Mount Maxwell Road. Photo by Keegan Thomas.

Design Proposal

The initial theoretical design was drawn up by me (Figure 6). I proposed creating a side pool with the goal of slowing water velocity, increasing soil moisture and creating wetland habitat. I proposed revegetating areas along the creek with native riparian plants. In order to reduce water flows

Figure 6: Theoretical Design by Karlis Hawkins

from over top of Mount Maxwell Road which occur during heavy rains, I proposed building a woodchip barrier to filter water before it reaches the creek bed. Lastly, I wanted to regrade the slopes on either side of the culvert and vegetate it to increase filtration and reduce sediment in the creek. The theoretical design was shown to experts and used to inspire a technical design.

The technical design was created by the consulting firm Rewilding Water and Earth (RWE). Instead of a side pool, this design features two small wetlands in the middle of the creek that are armoured with rock to protect against erosion from heavy flows which often occur over the winter months. The first wetland (closest to the culvert) is designed as a sediment trap which could be dredged with an excavator yearly or bi-annually depending on how quickly sediment builds up. The second wetland is designed as a habitat area with LWD. This wetland has a greater area, is deeper and would be surrounded by riparian plants. Water is pooled behind a rock vertical grade control (or a small dam) which is meant to slow water velocity and create wetland habitat. Although this design proposes relatively small wetlands, it is meant to create habitat that could benefit various species. Again, this design is meant as a primary phase of restoration which would be followed up by several other interventions in the watershed with similar goals and strategies in mind.

Figure 7: Red-legged Frog in Rippon Creek. Photo by Karlis Hawkins

Partnerships

Relationship building was essential to move ahead with restoration plans in the watershed. It was important to build support for intervention in Rippon Creek and to get permission from the various entities responsible for the land in the watershed including NSSWD, neigbouring landowners, and MOTI. The CARL team also needed to collaborate with RWE and report project progress/changes to our funders and the TSS Board of Directors.

Since NSSWD owns the land where the intervention was set to take place, it was important for CARL to have consistent communication with the NSSWD's board of directors. They were supportive of our suggestions of using nature-based solutions to improve water quality and provided funding to collect data in the Maxwell Creek Watershed. They granted access to their fenced property and supported other restoration experiments outside the scope of this report. This is the most important relationship for CARL to maintain going forward.

Several private landowners in the watershed were contacted to open opportunities for collaboration. This outreach led by Ruth Waldick was largely successful as at various points, these landowners offered to propagate native plants for the project, supply soil for planting along the creek and show up to restoration events. Having community support for intervention in Rippon Creek meant

that CARL was able to operate in the area smoothly without concern for neighbours reporting team members as trespassers.

The Ministry of Transportation (MOTI) was an important supporting organization for this project because they manage Mount Maxwell Road and maintain the culverts. I reached out to Sean Wong, Manager of Biological Programs to discuss how our proposal would affect Mount Maxwell Road and see if his team was willing to participate. Much of the proposed project's area was within the MOTI right-of-way. After several phone calls and emails, Sean came to do a site visit at the watershed with the Roads Area Manager Owen Page and Andrew Anderson, a water resources Engineer. CARL members and the team of MOTI staff walked along the Rippon Creek and sections of Mount Maxwell Road to show them particular problematic spots of erosion. We discussed getting a permit from MOTI to create side cuts along the road ditch to help divert the water into the forest so that it could be filtered naturally rather than simply flowing down the ditch. They agreed that this approach would help improve water quality. We also showed them the culvert under Mount Maxwell Road and after viewing it in person, MOTI staff considered the idea of helping fund the replacement of it because it was showing signs of being compromised. However, given the complications and added budget of replacing the culvert, this was not pursued when we eventually prepared for construction. In the end, the MOTI staff were satisfied with our approach and made some suggested tweaks to our design, like for example, arguing against creating a woodchip barrier (originally part of my theoretical design) to filter sediment along the road because it could cause nutrient loading in the creek.

RWE staff Sara Yeomans and Robin Annschild were important partners for this project because they authored a technical design after a site visit to Rippon Creek. They also acted as advocates for the project with various organizations that were involved. It was vital to have professionals who gave the project all of the legitimacy and detail that was lacking before their involvement. Robin Annschild was able to connect me with an excavator operator Ken Tara, who she had worked with on other wetland restoration projects. He was an important person to consult during a site visit to understand what could be done in the space, the time needed with an excavator and the budget for construction.

Section 11 Permit

To get permission to do this intervention, we needed to apply for the Water Sustainability Act, Section 11 Permit through the Province of BC. This permit grants permission to work in an officially recognized stream such as Rippon Creek. It was clear from the permit application form that the

province is not used to assessing restoration projects as most standard applications tend to be for off-site watering for livestock. There was lengthy discussion between project advocates about which entity would appear most suitable as the primary applicant for this permit. The options were TSS, MOTI or NSSWD. The advantage with MOTI is that they are a government entity and would have a better institutional reputation than a small non-profit organization like TSS. However, the province happened to be in the middle of a change in the application process and Sean Wong suggested that applying with MOTI could lengthen the approval process. In the end, NSSWD was chosen as the most suitable applicant. However, since they understood the overview of the project as opposed to the intricate details, it took plenty of email exchanges for NSSWD staff to feel confident to apply. I made sure that the applicants from NSSWD had all of the details necessary about our initiative in Rippon Creek including the project description, GPS coordinates, maps, contacts, etc. Understandably, it was important for NSSWD that this project was being led by professionals from RWE rather than just a student initiative. The importance of reputation and legitimacy was of primary concern in this phase of the project. The permit application is supposed to be assessed within 45 days of submission. With that timeline, it would have been approved by August 15th, 2024, however, the approval is still pending as of the writing of this report, meaning that construction is delayed until 2025.

Outcomes

Despite applying for the Section 11 Permit with 45-days advance notice of construction, the permitting office did not approve the permit in time for construction in 2024. Furthermore, NSSWD changed their organizational priorities around restoration due to their planned installation of a Dissolved Air Flotation (DAF) treatment plant in 2025. Therefore, even if the permit was approved in time, CARL with the support of RWE needed to change the restoration plan. This change happened only a few weeks before planned construction. Regardless, the outcome of the last year of work has positioned CARL to undertake restoration work in the Maxwell Creek Watershed with support from various community partners. The restoration professionals at RWE explained that last minute changes are a regular part of restoration planning and projects. All of this underlines the importance of approaching this work with the lens of adaptive management.

The current plan for 2025 is to intervene along Rippon Creek by hiring an arborist to fall a select few trees to create pooling habitat with LWD and introduce riparian plants in the under-vegetated areas. This is an intervention that fits with the goals of NSSWD and doesn't require a permit,

so it is a more adaptable approach. It should be able to achieve some of the same goals as the original technical design, such as locally increasing soil moisture and improving habitat values with LWD and riparian plants, but perhaps at a slightly smaller scale than the original plan. One unique feature of this plan is that it will open up more light in the canopy which could assist the recovery of specific plants.

Recommendations

Based on our Riparian Health Assessment and given the restrictions on where ecological restoration can currently proceed, Rippon Creek should be restored according to RWE's original technical design. Nature-based solutions such as these can be pursed at the same time as technical ones such as installing a DAF plant. In fact, this intervention would likely reduce the cost of operating a DAF plant since water quality would be improved before it reaches the water filtration system. The two wetlands by the culvert would help reduce water velocity and locally reduce erosion and sedimentation. The rock armouring would address the head cuts and prevent future ones from forming, which will eventually compromise the Mount Maxwell Road culvert. Pooling water will improve habitat conditions for riparian plants and increase biodiversity values. Figure 8 is a table of suggested riparian plants to be introduced. These plants were chosen for their ability to adapt to changing moisture conditions, suitability for partial-shade environments and because they are found in the CWH biogeoclimatic zone. These plants will help reduce erosion, capture sediment and provide habitat value for wetland amphibians, insects, pollinators and birds. LWD will provide habitat for the Northern Red-legged frogs and dragonfly species.

Figure 8: Riparian Plants for Introduction to Rippon Creek

Common Name	**Genus**	**Species**
Red Elderberry	*Sambucus*	*racemosa*
Stink Currant	*Ribes*	*bracteosum*
Thimbleberry	*Rubus*	*parviflorus*
Salmonberry	*Rubus*	*spectabilis*
June Plum (or Indian Plum)	*Oemleria*	*cerasiformis*
Rough Horsetail	*Equisetum*	*Hyemale*
Slough Sedge	*Carex*	*Obnuta*

Through discussions with the consultants at RWE, ideas about future interventions in Rippon Creek arose. The limitations of the one intervention by Mount Maxwell Road are obvious due to the small scale of the project and the much larger scale of the problems. Future interventions could take the form of constructing Beaver Dam Analogs (BDAs) to create impermanent wetland pools which would capture water, slow velocity during peak flows, and distribute water away from the main channel. This would have the same benefits as the intervention around the Mount Maxwell Road culvert, but it would be distributed down the watershed and could be replicated several times. Water pools will increase hyporheic flow in the watershed. It is likely that Rippon Creek is a human-made stream that would have been mostly flowing through groundwater in pre-colonial times. Wetland drainage, logging and road construction are major factors in the formation of Rippon Creek as it is today. Therefore, creating the conditions for more hyporheic flow and groundwater recharge would help restore some of the watershed's previous ecological processes. Constructing BDAs is an opportunity for community education and public participation. It would require semi-regular maintenance as seasonal rains would cause some BDAs to breach every few years. This would help mimic a natural system instead of the more concentrated, channelized creek system that exists today.

Lastly, the importance of restoring Dry Lake at the top of the watershed cannot be overstated. This is where the problems of excessive erosion begin. Thomas Biebighauser proposed a wetland restoration project there in 2014. If the ditches were to be plugged up and more water was conserved at the top of the mountain, it would reduce issues throughout the rest of the watershed. However, the covenant would need to be modified in order to begin any restoration work there. Dry Lake is uniquely valuable as a habitat for various species because historically, it was a large, functioning wetland with no ditches. In the long-term vision of watershed-scale restoration, this initiative could have the greatest effect.

Conclusion

The goal of this project was to intervene in the reach of Rippon Creek by the Mount Maxwell Road culvert. Despite a concerted effort in relationship building, planning and organizing, ultimately the permit was not approved in time. In addition, landowner priorities changed, which meant that our initial restoration proposal needed to be changed. Construction of any kind is delayed until at least early 2025. This project demonstrates the importance of submitting Section 11 Permit applications well before the 45-day deadline to allow ample time for the government bureaucracy to respond. The

project also showed how relationship building between community partners takes up significant time in the restoration process. Relationships are difficult to maintain in good standing when there are last minute changes to budgets, project details and timelines. A long-term, adaptive management approach is important so that even if initial plans do not work out, restoration work can be pursued at the next available opportunity.

Acknowledgments

Special thanks to Ruth Waldick who was the primary coordinator between the many partner organizations and individuals. TSS assisted with administrative support and promotion of this work in the community. NSSWD allowed regular access to study the watershed and provided funding. Grace Fields and Keegan Thomas supported this project with data collection, project coordination and by applying for grants. Mapping was done by Nicholas Courtier. Robin Annschild and Sara Yeomans from RWE wrote the technical design of the Rippon Creek wetlands, wrote a detailed budget and supported CARL as consultants. Ken Tara supported the technical design by providing advice about excavation and construction budgeting. Sean Wong and Owen Pages from MOTI assisted with design recommendations and provided institutional support to our project. Nancy Shackleford supported this project with her expertise and advice as I navigated all of the changing circumstances. The Lorraine Kennedy Foundation, the Community Engaged Learning Office, the Capital Regional District and Environment Climate Change Canada provided funding.

Appendix 1

Enter the data: Streamkeepers Database,
www.streamkeepers.info

Advanced Stream Habitat Survey Field Data Sheet

(use a new data sheet for each reference site surveyed) **Module 2 (con't)**

Stream Name Rippon Creek	Date Oct 28 2023
Stream segment and section #'s Downstream of Mt. Maxwell Rd. Culvert	

STEP 5 HABITAT ASSESSMENT ***(the score in bold, estimate a value within the range listed)***

Characteristic	Results	Good	Acceptable	Marginal	Poor	Score
1: Streambed material: % boulder and cobble		**15 - 20** 50%	**10 - 15** 30-50%	**5 - 10** 10-30%	**0 - 5** <10%	1
2: Embeddedness:		**15 - 20** 25–0%	**10 - 15** 50-25%	**5 - 10** 75-50%	**0 - 5** >75%	10
3: Instream cover:		**15 - 20** >3	**10 - 15** 2 to 3	**5 - 10** 1 to 2	**0 - 5** <1	0
4: % Pool Habitat <2% stream slope 2-5% stream slope >5% stream slope		**11 - 15** >60% pool >50% pool >40% pool	**7 - 11** 50-60% 40-50% 30-40%	**3 - 7** 40-50% 30-40% 20-30%	**0 - 3** <40% <30% <20%	3
5: Off-channel habitat: ponds, side channels with protection from flood flows		**11 - 15** year round, good protection	**7 - 11** seasonal, good protection	**3 - 7** seasonal, minimal protection	**0 - 3** little or none, no protection	0
6: Bank stability / **evidence of erosion or bank failure** *(see note 1)*		**11 - 15** stable / none	**7 - 11** moderately stable / some	**3 - 7** moderately unstable / some	**0 - 3** unstable / lots	5
7. Bank vegetation: % stream bank covered by vegetation		**8 - 10** >90%	**5 - 8** 70-90%	**2 - 5** 50-70%	**0 - 2** and <50%	7
8. Overhead canopy: % bankfull channel overhung by trees and shrubs		**8 - 10** >30%	**5 - 8** 20-30%	**2 - 5** 10-20%	**0 - 2** 0-10%	8
9. Riparian zone: # bankfull channels wide / **trees and shrubs**		**8 - 10** 2 or more / abundant on whole floodplain	**5 - 8** 1 to 2 / good species mix	**2 - 5** <1 / common, few species	**0 - 2** 0 / sparse or absent	2
TOTAL SCORE		**102 - 135**	**66 - 102**	**30 - 66**	**0 - 30**	36

6 instances of overhanging ferns

No shrubs

Note 1: The evidence of erosion or bank failure changes from **Good** (intact banks) to **Acceptable** (healed or banks stabilized) to **Marginal** (active erosion or extensive bank stabilization) to Poor (many actively eroding areas or upslope slides reaching channel).

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