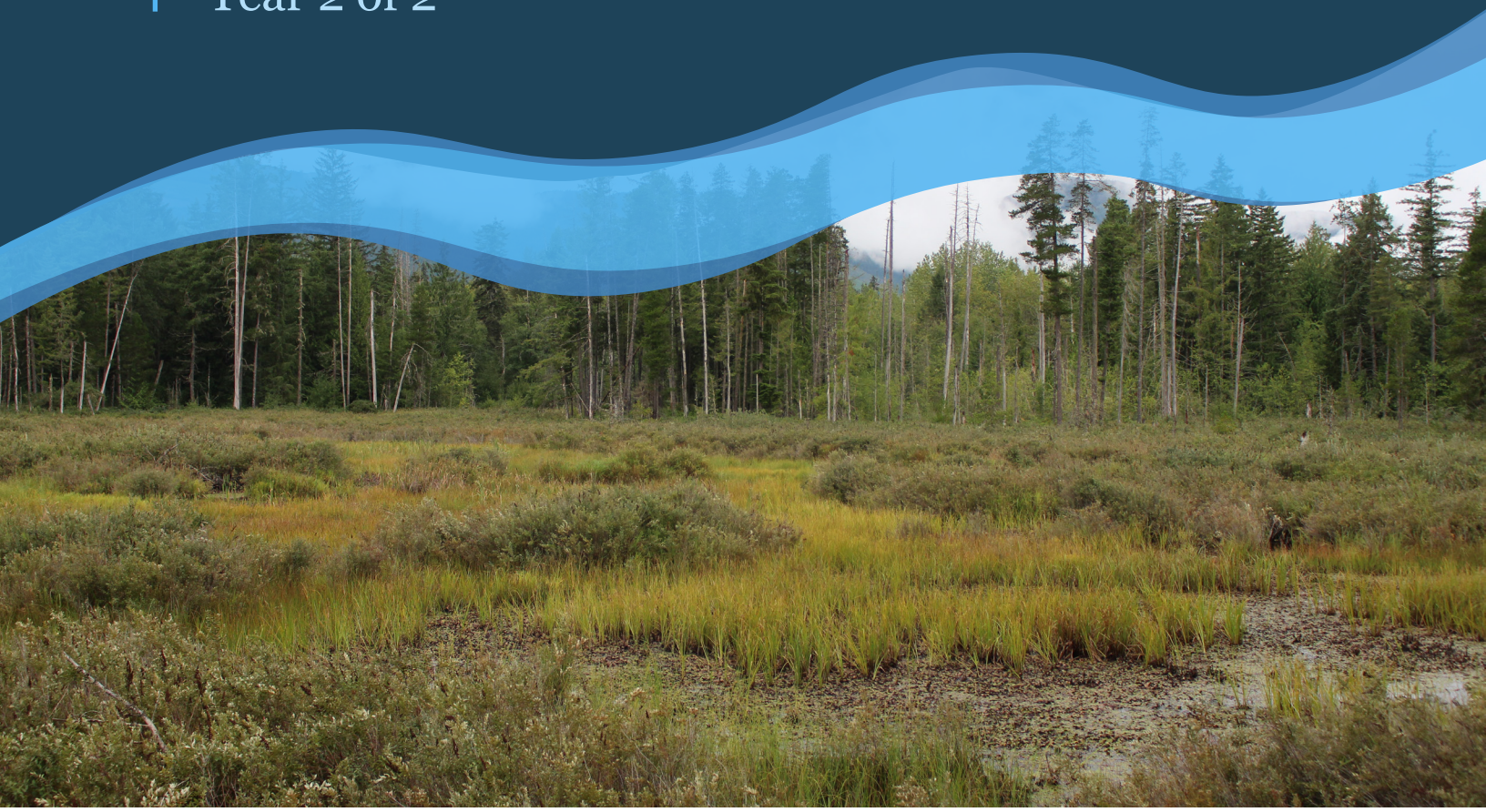
Ecological Accounting Process
French Creek Summary Report

Year 2 of 2



Produced by Vancouver Island University's Mount Arrowsmith Biosphere Region Research Institute (MABRRI), in collaboration with the Partnership for Water Sustainability in British Columbia, the City of Nanaimo, and Regional District of Nanaimo, and the Municipality of North Cowichan

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the partnership for water sustainability in bc

Regional District of Nanaimo

City of Nanaimo The Harbour City

Mount Arrowsmith Biosphere Region Research Institute

Municipality of North Cowichan

Vancouver Island University

Foreword

We respectfully acknowledge that French Creek lies within the traditional territories of Qualicum and Snaw-Naw-As First Nations who have traditionally and continue to steward these lands and waters.

This report was produced by Vancouver Island University (VIU)'s Mount Arrowsmith Biosphere Region Research Institute (MABRRI), under the mentorship of the Partnership for Water Sustainability in British Columbia (PWSBC), and in collaboration with the Regional District of Nanaimo, the City of Nanaimo, and the Municipality of North Cowichan. This report reflects findings from Year 2 of a three-year transition strategy partnership to embed the knowledge of the EAP into MABRRI's VIU. MABRRI would like to express gratitude to these partners, as well as the dedicated collaborating community stewards for their ongoing support and contributions towards this study.

List of Abbreviations

BC	British Columbia
EAP	Ecological Accounting Process
FSA	Full Study Area
GIS	Geographic Information Systems
ISA	Inner Study Area
MABRRI	Mount Arrowsmith Biosphere Region Research Institute
M&M	Maintenance and Management
NCA	Natural Capital Asset
OSA	Outer Study Area
PWSBC	Partnership for Water Sustainability in BC
RDN	Regional District of Nanaimo
VIU	Vancouver Island University

Introduction

Natural assets provide a range of benefits to society, such as stormwater management, fish habitat, increased biodiversity, and public enjoyment. In the presence of development and other land use pressures, natural assets require maintenance and management for their continued function and health. The Ecological Accounting Process (EAP) is a methodology and set of metrics used to determine the baseline financial value of the natural asset and suggest a percentage of that value to be allocated towards its maintenance and management, similar to how built infrastructure receives operations and management budgeting. The EAP emphasizes the investment needed to maintain and restore stream systems in urban settings. Additionally, the EAP provides an overview of ecosystem conditions to identify areas that could be prioritized for conservation or restoration. This report is a summary of the second-year EAP study of French Creek in the Regional District of Nanaimo (RDN).

French Creek was chosen for an EAP analysis because it is considered an at-risk catchment and is experiencing increasing development pressures. This report is the second in a two-year EAP project for French Creek. The year-one study focused on the financial value (Natural Capital Asset value) and suggested maintenance and management (M&M) budget for the entire stream system based on land uses. The year-one study determined that the total Natural Capital Asset (NCA) value of French Creek ranges from $22.8 million to $33.5 million. With that, between $228,500 and $335,400 was the suggested baseline annual investment towards maintenance and management of the creek for the local government. Private landowners and stewardship groups contribute to and increase this investment because responsibility for protection of the natural commons is shared by all.

The year-two study further examined five focus areas along French Creek. To determine focus areas for the study, a community advisory committee was assembled and consulted. The community advisory committee was comprised of representatives from various government and non-government organizations and private property owners with experience in stewardship and conservation efforts within the watershed. The committee recommended five locations of focus: Bell Lake, Dudley Marsh, Hamilton Marsh, French Creek Bridge Trails and Invasive Hogweed area, and French Creek Estuary. The first four listed were selected by the committee as focus areas that would benefit from conservation and restoration efforts, whereas the committee identified the French Creek Estuary as a priority focus area in need of more significant restoration. The Natural Capital Asset (NCA) value and M&M budget were calculated for each focus area, along with an analysis of the ecosystem conditions.

Methodology

EAP steps 1 through 6 were completed for the year-two French Creek EAP study. Step one involved calculating the baseline financial value of the stream system, referred to as the NCA value. The NCA value was calculated based on land parcel data for the parcel area within 34 metres of the centre of the stream on both sides. Step 2 calculated a suggested annual maintenance and management (M&M) budget as 1% of the NCA value calculated in step 1. The NCA value is expected to reflect the risk or magnitude of stream degradation because land uses that have a greater impact on riparian areas are typically associated with higher land assessment values. In the EAP, this concept is referred to as the riparian deficit, and step 3 provided a statement of this riparian deficit. Steps 4 and 5 quantified aspects of the riparian condition through a desktop analysis using Geographic Information Systems (GIS) for the Inner Study Area (ISA; 34m from the centre of the stream on both sides) and the Outer Study Area (OSA; 200m from the ISA on both sides). The riparian conditions analyzed included impervious surfaces, or areas that water cannot flow through, and vegetation canopy heights. The final step completed for this report, step 6, concerned rainwater drainage, which was determined based on elevation mapping in the absence of more specific drainage infrastructure data.

Findings

The most prevalent zoning type in all but one study area was agriculture. Agricultural land accounted for 80% of the parcels in the Hamilton Marsh focus area, 100% of parcels in the Bell Lake focus area, 76% of parcels in the French Creek Bridge Trail and Invasive Hogweed focus area, and 0% in the French Creek Estuary focus area. The French Creek Estuary focus area was predominantly (98%) zoned for residential suburban use, reflecting its denser residential development compared to the other focus areas.

The total NCA values for the study areas range from $5.3 million to $6.7 million with M&M budgets ranging from $53,400 to $67,000 (Tables 1 and 2). Although these overall values are somewhat consistent, the size of the study area is an important factor to consider. The French Creek Estuary focus area includes only 2,350 m of stream length. This is less than one quarter of the size of the next smallest area, but it maintains a comparably high NCA value ($5.6 million). In fact, when the NCA values and M&M budgets of the study areas are standardized by the ISA they encompass, the French Creek Estuary focus area has the highest value by a wide margin. The NCA value of the French Creek Estuary focus area is $55.90/$m^2$ (with an M&M budget of $0.56/$m^2$) while the other areas range from $6.43-7.00/$m^2$ ($0.06-0.07/$m^2$ M&M budget).

The focus area with the highest percentage of impervious surfaces and the least amount of tall vegetation was also the French Creek Estuary (Tables 3 and 4). This area consisted of 7% impervious surface area and 13% tall vegetation cover in the ISA and 13% impervious surface area and 15% tall vegetation cover in the OSA. These findings support the concept that with an increase in development and more impervious surface area, there will be more strain on the stream system, and more investment may be required for the maintenance and management of the stream. The urban, constructed drainage system that slopes down to the stream from residential developments in the French Creek Estuary focus area suggests potential for additional strain. Relative to the French Creek Estuary Area, the other four focus areas have less impervious surfaces, ranging from 0-2% in the ISA and 3-4% in the OSA. The other areas also have more tall vegetation coverage, ranging from 35-59% in the ISA and 25-62% in the OSA. However, potential impacts may still arise from land uses associated with agriculture and forestry, such as vegetation clearing and ditching.

To provide some context to the M&M budget suggested through EAP, the researchers contacted local stewardship groups and the RDN to gain insight into the previous investments spent on French Creek. On average, over the past ten years, stewardship groups have spent approximately $580,000 annually and the RDN has spent about $35,000 annually on maintenance and management initiatives. While this was not an exhaustive list, it highlighted the efforts made by the RDN and local stewardship groups, which exceeded the suggested budget calculated through the EAP.

Table 1: NCA Summary Table (Including Managed Forest Lands)

NCA Summary Table					
Group	**Stream Length (m)**		**Natural Commons Asset Values**		
			Total $ ($)	**$ per m ($/m)**	**$ per m2 ($/m2)**
A - Hamilton Marsh	10,837.40	50	6,588,340.96	607.93	7.04
B - Bell Lake	11,472.95	50	5,951,278.69	518.72	6.43
C - Dudley Marsh	11,246.00	50	5,342,193.91	475.03	6.43
D - French Creek Bridge Trail and Invasive Hogweed	13,297.18	50	6,727,538.83	505.94	6.58
E - French Creek Estuary and Area	2,351.81	50	5,599,359.99	2,380.88	55.90
Weighted Averages				613.93	7.63

Table 2: Maintenance and Management Budget (including Managed Forest Lands)

Maintenance and Management Budget				
Group	**NCA Total ($)**	**M&M ($)**		**M&M ($) per m²**
A - Hamilton Marsh	6,588,340.96	65,883.41	6.09	0.07
B - Bell Lake	5,951,278.69	59,512.79	5.19	0.06
C - Dudley Marsh	5,342,193.91	53,421.94	4.75	0.06
D - French Creek Bridge Trail and Invasive Hogweed	6,727,538.83	67,275.39	5.06	0.07
E - French Creek Estuary and Area	5,599,359.99	55,993.60	23.81	0.56

Table 3: Impervious Area Summary of Abutting Parcels in the Full Study Area (FSA) and Inner Study Area (ISA)

	Abutting Parcels	FSA Total Area (m²)	FSA	Percent of FSA (%)	ISA Total Area (m²)	ISA	Percent of ISA (%)
Hamilton Marsh	50	4,555,423	133,457	3	806,437	2,945	0
Bell Lake	50	3,391,617	118,092	3	874,648	8,829	1
Dudley Marsh	50	2,990,626	105,561	4	802,264	14,760	2
French Creek Bridge Trail and Invasive Hogweed	50	5,512,115	137,856	3	971,003	5,793	1
French Creek Estuary and Area	50	271,062	35,119	13	87,024	5,665	7
Total Creekshed	250	16,720,843	530,086	1*	3,541,376	37,992	1*

*Total percent of Outer Study Area (OSA) and Inner Study Area (ISA) is representative of the percent of the entire creekshed and not additive.

Table 4: Vegetation Summary of Abutting Parcels in the Full Study Area FSA)

		Hamilton Marsh	Bell Lake	Dudley Marsh	French Creek Bridge Trail and Invasive Hogweed	French Creek Estuary and Area
Parcels	Total Abutting Parcels	50	50	50	50	50
	FSA Total Area (m^2)	**4,555,423**		**2,990,626**	**5,512,115**	**271,062**
Short Vegetation (m^2)	LiDAR	1,556,447	243,075	0	2,136,320	67,458
	VRI	108,813	53,550	65,326	52,715	0
	Total	1,665,260	296,625	65,326	2,189,035	67,458
	% of FSA	37	9	2	40	25
Medium Vegetation (m^2)	LiDAR	1,556,447	198,321	0	1,723,857	128,610
	VRI	144,663	472,468	810,204	56,289	0
	Total	1,701,111	670,789	810,204	1,780,147	128,610
	% of FSA	**37**	**20**	**27**	**32**	**47**
Tall Vegetation (m^2)	LiDAR	609,887	75,614	0	916,064	39,875
	VRI	754,269		1,829,354	482,491	0
	Total	1,364,156		1,829,354	1,398,555	39,875
	% of FSA	**30**	**62**	**61**	**25**	**15**

Note: The above percentages are not inclusive of water bodies or areas of impervious surfaces and therefore may not add to 100%

Conclusion

In conclusion, of the five focus areas selected for the French Creek Year Two EAP study, the French Creek Estuary focus area was highlighted as an area requiring significant restoration, while the other study areas were identified for conservation and restoration. The EAP analysis revealed complementary findings in that the French Creek Estuary focus area had a greater NCA value and suggested M&M budget compared to the other study areas. This aligns with the fact that the estuary area has denser development and more concentrated land uses that could potentially degrade the stream. These conditions of the Estuary area were also reflected in the increased impervious surface, reduced vegetation, and constructed drainage that typically accompanies more developed residential neighbourhoods. As such, more significant funding should be allocated for restoration in this area. It is recommended that funding in the other areas focus on conservation and restoration, as their lower NCA values highlight the importance of proactive maintenance and management to avoid potential increases in investment resulting from increased development and land use changes.

Overall, the suggested M&M budget, calculated through EAP, can serve as a tool to guide budgeting for initiatives, such as those outlined in the French Creek Estuary Nature Preserve Management Plan and Regional Strategy for Rainwater Management. This EAP analysis report on the state of the creek in this moment in time can also be used as a baseline for future study. Having a well-defined process allows for comparable analyses in the future, which will help evaluate the progress of conservation and management strategies.