

**Assessing The Potential For Eelgrass Restoration  
In The Squamish Estuary, British Columbia**

by

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## ABSTRACT

The primary goal of this thesis project was to assess the potential for conducting eelgrass (*Zostera marina*) restoration in the Squamish Estuary, British Columbia. Eelgrass restoration was considered from a community-based approach as a means to restore critical fisheries habitat and other key ecosystem services in the estuary. These processes have been negatively affected by the loss of estuarine habitat caused by past and present industrial, commercial and residential development in the Squamish Estuary and its surrounding watersheds. An assessment of the restoration of eelgrass in this area must take into account the dynamic environmental characteristics of this region, in order to determine if they meet the habitat requirements for eelgrass survival and growth, which has not been previously studied in fjordal estuaries. Test plots of eelgrass were planted at two sites in the estuary, Cattermole Slough (CAT) and Stawamus Estuary (STA), in order to assess the survivorship of eelgrass, as well as the physical/chemical variables in these two locations. The sites were monitored for six months post-transplant for water column variables, including Secchi depth, temperature, salinity, conductivity and dissolved oxygen, as well as the particle size class distribution and organic content of the surface substrate at both sites. Within the monitoring timeline of this project, eelgrass survivorship was within the wide range reported for other transplant projects (CAT: 20.80% and STA: 5.33%). No significant difference was found between the two sites, in terms of transplant survivorship, blade length or the majority of physical and chemical variables measured. Furthermore, the range for all of the variables measured was within that known to support eelgrass in other regions of the Pacific Northwest. Therefore, it

was concluded that transplant survival is possible in these two regions of the Squamish Estuary. However, based on the data collected, a relationship between eelgrass survivorship and the environmental parameters could not be established. The establishment of a transplant and monitoring methodology and the baseline physical/chemical information collected through monitoring provide the necessary information to conduct future eelgrass restoration projects in the Squamish Estuary. This protocol, along with the results and recommendations from this project, have assessed the feasibility of conducting eelgrass restoration by community groups in the Squamish Estuary, with relevance to similar coastal communities in British Columbia and the contiguous Pacific Northwest.

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The summer of 2004 found me in Squamish, B.C., eager to start by Master's research, but not quite knowing how it would proceed or where it would lead. Fortunately, guidance and help came with the job, and I am forever thankful for the principal people who encouraged and helped me with this project: Edith Tobe, with all her energy, initiative and know-how, my primary contact in Squamish and the person who suggested I do this project in the first place. Cynthia Durance, the role model "eelgrass" woman of British Columbia, for her technical, scientific expertise, generous use of equipment, and persistent support at all levels. Colin Levings at DFO, for hooking me up with Edith, and providing equipment and laboratory support for the project (also much thanks to Beth Piercey in this regard), as well as personal encouragement of the project. At Queen's University, I am indebted to my supervisors, Dr. Paul Treitz and Dr. Shelley Arnott for helping with my thesis objectives and providing tremendous support along the way. They have embraced a subject matter quite apart from their own, and have encouraged me throughout the process.

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Squamish Valley looking north from the Malamute, Margot Hessing-Lewis, 2004



## DEDICATION



To all the eelgrass in fjordal British Columbia – let there be light!

## INTRODUCING THE SQUAMISH ESTUARY

### A Scientist's Narrative of Place and Space

*You first glimpse the Squamish Valley as your vehicle careens around the corner on the Sea to Sky Highway. From its source at the head of the Sound, a plume of aqua-blue glacial water swirls its way into the darkness of Howe Sound. Snow-clad mountain peaks and craggy glaciers originating in the Coast Range dominate the landscape. The town of Squamish nestles between the river channels and green flanks of a large estuary to the west side of town.*

*But that is your last view of the estuary – there are more important things to watch for on this road. Skiers from Whistler slalom at breakneck speed on their drive home to Vancouver. Landslides are common, and the occasional bridge has been known to wipe-out completely, sending vehicles into the ocean. Monolithic Stawamus Chief rises at the edge of the highway, and drivers crane their heads to view climbers clambering to the top.*

*On every trip through town you count the new housing developments, golf courses and shopping centres lining the highway, spurred by the impending Olympics boom. A new private liberal arts university is even setting up shop on what used to be a clear-cut. The sign at the city limits welcomes you to the “Outdoor Recreation Capital of Canada” – echoed by roof racks of kayaks, windsurfers, mountain bikes, skis and snowboards, all dependent on the natural capital that the region has to offer.*

*But, if you turn off the highway and head downtown, the legacy of a timber town is still evident: cheap hotels, sorting yards, and the constant drone of heavy machinery. You've entered the Squamish transition zone: from resource to service economy, from freshwater watersheds to marine tides, from natural systems to built environments. In this economic and demographic transition, the health of the natural ecosystems of the Estuary has been ignored at the expense of human enterprise. Yet, this estuary is pivotal to the viability of regional marine resources and tourism, and emblematic of an emerging Sea to Sky ethic, a sense of place fundamental to the viability of the evolving community.*

*At the edges of the downtown core you park the car and follow signs to the Estuary Trail. A committed group of locals are responsible for the creation and marking of the trail system that curves throughout the marsh and woods abutting the large estuary. They are the stewards of this region, preserving the ecological treasure of the estuary from future development and helping to restore it from an industrial past. You make your way to the water's edge and search for signs of life.*

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## LIST OF ACRONYMS

- ANOVA – analysis of variance
- B.C. – British Columbia
- DFO – Department of Fisheries and Oceans Canada
- DO – dissolved oxygen
- DW – dry weight
- FREMP – Fraser River Estuary Management Plan
- GPS – global positioning system
- LAI – leaf area index
- MANOVA – multiple analysis of variance
- MLLW – mean low lower water
- NTDB – National Topographic Database
- PAR – photosynthetically active radiation
- RM – repeated measures
- SAV – submerged aquatic vegetation
- SCUBA – self-contained underwater breathing apparatus
- SECC – Squamish Estuary Coordinating Committee
- SECS – Squamish Estuary Conservation Society
- SEMC – Squamish Estuary Management Committee
- SEMP – Squamish Estuary Management Plan
- SER – Society for Ecological Restoration
- SERC – Squamish Estuary Review Committee
- SRWS – Squamish River Watershed Society