

Sydney Inlet Research Cabin 2017-2018 Summary Report



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Introduction: The Construction of Sydney Inlet Cabin:

In 1995, the *Clayoquot Biosphere Project* (CBP), founded by Dr. Jim Darling, was granted permission by the Ahousaht Chief and Council to build the Sydney Inlet Research cabin in the traditional territory of the Ahousaht First Nation. The cabin was built as a remote research station for local and visiting researchers to develop a greater understanding of the surrounding ecosystems and to support field studies within the Sydney estuary.

The opening ceremony, held in April 1998, was attended by 45 people including Manhousaht hereditary chief Francis (James) Swan, his mother Rosie Swan, Hereditary Chief Louie Frank Sr., Cosmo Frank, and Roman Frank. Chief Louie Frank Sr. spoke at the opening ceremony, emphasizing the need to take more stewardship responsibility. He said, “We don’t dominate anything. Nature can only take care of us as well as we take care of it.” (*Westerly News*, May 6, 1998).

Chief Louie Frank also thanked the CBP for the “courtesy and respect” they showed Ahousaht by coming and sitting with Ahousaht government before starting the project. In the official letter of permission from the Ahousaht Band Council, it states the following,

“The Ahousaht Band is pleased to grant permission to the Clayoquot Biosphere Project to go ahead in its study of the Sydney River Valley. Our tribe would like to be informed of your findings and report as is our practice for any study within our territory. Also permission from the Ahousaht First Nations will have to be granted to the Clayoquot Biosphere Project before the reports can be released to the general public” (1995).

In 2001, the responsibility for the research cabin was transferred to the Clayoquot Biosphere Trust, under the direction of Executive Director, Tom Easkin. Since that time, there has been little to no research conducted at the cabin until the more recent development of the Sydney Inlet Remote Listening Station. This report outlines the purpose, applications, and preliminary results from this project.



(Photo: Sydney Inlet Research Cabin: photo of cabin before sign was vandalized in August, 2016).

Research and Education Programs at the Sydney Inlet Cabin:

Date	Project	Project Lead
1997	<ul style="list-style-type: none"> Basking Shark Surveys Marbled Murrelet Inventory Owl Inventory Bryophyte Inventory Fungi inventory Geomorphological Survey Baseline Natural History Inventory 	Dr. John Rupp, Point Defiance Zoo & Aquarium BC Ministry of Environment Wilcon Wildlife Consulting & BC Ministry of Environment Steve Newmaster, U of Alberta Dr. Bryce Kendrick U Vic Doug Whitfield & Sam Carson Consultants Clayoquot Biosphere Project Staff & Volunteers
1998	<ul style="list-style-type: none"> Basking Shark Surveys Marbled Murrelet Inventory Rocky Intertidal Habitat in the Sydney Inlet Fungi inventory Ground and Canopy Arthropod Inventory Clayoquot Sound Stream Inventory Longitudinal Distribution of Fish Communities in the Sydney River 	Dr. John Rupp, Point Defiance Zoo & Aquarium BC Ministry of Environment Dorothy Kusmirek, University of Calgary Dr. Bryce Kendrick U Vic Doug Whitfield & Sam Carson Consultants Dr. Neville Winchester, UVic Clayoquot Biosphere Project Staff & Volunteers Scott Murdoch, NTC Fisheries Wendy Kotilla, Consultant
2015	<ul style="list-style-type: none"> Sydney Inlet Remote Listening Station 	Dr. Laura Loucks, Clayoquot Biosphere Trust & Dr. Jim Darling, Pacific Wildlife Foundation

Sydney Inlet Remote Listening Station:

In July 2015, Clayoquot Biosphere Trust's Research Director Dr. Laura Loucks and a team of local volunteers (including Dr. Jim Darling), initiated the *Sydney Inlet Remote listening Station* project at the Sydney Inlet Research Cabin. Sydney Inlet is a unique coastal fjord ecosystem with steep slopes, bedrock bluffs and ridges of old growth western cedar/ hemlock forests located on both the western and eastern sides of the Inlet. The Sydney river flows into the inlet from the north-eastern direction of this pristine unlogged watershed, comprising the Sydney Inlet estuary ecosystem.

The purpose of the Sydney Inlet Remote Listening Station was to explore whether sound recordings can be used to develop base-line information on changes in biodiversity in the Sydney Inlet terrestrial and marine ecosystems. In our first year, we gathered recordings of local species such as marbled murrelet, bald eagle, great blue heron, black oyster catcher, mew gull, pacific wren, swainson's thrush, western raven and large wildlife such as black bear, wolves, and cougars.

Project Goals and Objectives:

Over the next 2-3 years, the project goal is to identify a consistent recording schedule and methodology to document the seasonal patterns of change in species. Once this has been established, our two main objectives are:

- (1) to determine whether we can use sound recordings to identify ecosystem level impacts from climate change in the Sydney Inlet; and
- (2) to engage Ahousaht youth in the process of recording sounds, identifying species through listening to sound recordings and observing sound spectrographs.

Project Applications:

The biodiversity on west coast Vancouver Island is strongly correlated with the ecosystems associated with the coastal temperate old growth rainforest. However, changing climate trends over the next 50 years are predicted to result in warmer winter temperatures (between 1.1 and 3.4°C), annual precipitation increases mostly in the fall through to the spring (between 6% and 24%), less rainfall in the summer months (between 5% and 15%) and summer drought frequency could increase considerably (between 15 and 46%) (Lerner, J. 2011). As changes occur in temperature and precipitation, it's reasonable to expect that these changes could also impact the seasonal timing of shorebird migrations, salmon spawning and the annual migrations of songbirds. The purpose of the Sydney Inlet soundscape project is to develop a base-line reference for the seasonal shifts in species diversity and their changing sound patterns. Recording these sound patterns on an annual basis and inventorying these sound files

will provide a base-line with which we can compare annual changes in the species and timing of the dawn and dusk bird song chorus, changes in the movement of wildlife and marine mammals and correlate these changes with monthly temperature and rainfall data.

Previous biodiversity inventories have documented the presence or absence of specific species in this region. However, these scientific observations have not recorded monthly changes in species or species sound patterns. In particular, no previous research has looked both at marine and terrestrial sound pattern changes.

Time line:

The first phase of the project, creating the audio baseline, will be completed by Dec. 2018. One of the primary project goals is to track changes in the diversity of species sound patterns over time. Hence, the seasonal shifts are significant markers of what changes we expect will be audible by some shift in species and timing of the dawn and dusk chorus. In the fall, we expect to hear more raptors such as bald eagles, red tailed hawks, and osprey to correspond with the timing of the Chinook and Coho salmon spawning season and later run-times for steelhead. From March until May, we are listening for the sounds of migratory shore birds, and in June we expect to hear more song birds. However, these are our initial assumptions and will be corroborated with the audio recording data.

Project Time-Line Phase I: Developing an Audio Base-line 2015-2018

Species Patterns	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.
Salmon Spawning												
Unknown												
Shorebirds												
Songbirds												

Preliminary Results:

Our first soundscape ecology project continues to expand with exciting new discoveries and possibilities for the future. In 2016 and 2017, we gathered nearly 1000 hours of recorded sounds from the Sydney Inlet remote listening station. Local wildlife enthusiasts (see Appendix A) including Adrian Dorst, Jim Darling, Katherine Carey and Rachel Myers have contributed roughly 25 hours of listening time, resulting in 32 identified bird species (see Appendix B), 10 documented midnight mammal spouts, several seasonal shifts in the dawn songbird chorus and numerous mystery sounds. In 2018, we've gathered approximately 500 hours of sound recordings.

The potential also exists for soundscape ecological monitoring. Soundscape recordings from July-August captured the post-dusk and pre-dawn flight patterns of Marbled Murrelets returning to their nesting sites in the upper Sydney river watershed. We recently used this information to support the need for spatially designated Marbled Murrelet reserves in the BC Ministry of Forests, Lands and Natural Resources threatened species recovery plan (see Appendix C).



(Photo: CBT summer student Katherine Carey helping to set up the Sydney Inlet remote listening station in July 2015.)

Sydney Inlet Soundscape Data-Base:

In June 2018, we contracted Josie Byington to develop the Sydney Inlet Soundscape relational database. The goal of the database is to develop a multi-audio analytical tool to support queries and reports on our soundscape recordings. Below is a table outlining the various data inputs that will be used to sort and search the sound recording data.

Data Inputs	Description
Participants	Name, role, contact information of project participants
Species	Abbreviation, common name, scientific name, type of species, linked photo files, audio files, spectrographs
Recordings	Details from data logger, start date, end date, data collector
Analysis Events	Details about participants, date and recordings analyzed
Audio Analysis	List of birds identified in Pac Rim Park, common name, species name
Pacific Rim Bird List	List of terms to describe non-animal sounds

Non-Animal Sounds	
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Future Research and Education Opportunities:

We have identified several preliminary learning outcomes from this project with applications for future outdoor education programs. For example, the ability to visually identify bird species is greatly enhanced by multi-sensory learning approaches such as listening and observing sound patterns on the spectrographs in the Raven software™. The following education opportunities are also worth discussing.

1. Maaqtussis High School youth outdoor education field trips;
2. Bird identification workshops using sound recordings and site visits to the Sydney Inlet Estuary;
3. Sound editing and mixing workshops to develop nature ‘inspired’ sound compositions;
4. Sound recording workshops to develop technological skills and training to operate sound recording equipment; and
5. Ecological monitoring and stewardship skills training.

References Cited:

Frank, Louie , 1995. Letter of Permission from Ahousaht Band Council, July 23. Ahousaht, BC.

Lerner, J, Editor. 2011. Climate Change Adaptation in Clayoquot Sound: Ahousaht, Hesquiaht, and Tla-o-qui-aht Community-based Climate Change Adaptation Plan, Phase II Report. Prepared by Equilibrio and Ecotrust Canada for the Hesquiaht First Nation, Tofino, BC, 226 pages.

Moss, Carla, 1998. “Sydney Estuary Research Station Opens”, The Westerly News, May 6, P.8.

Appendix A:

Sydney Cabin Clayoquot Biosphere Trust Researchers (Remote Listening Project)

Year	Name	Contact Info
2015	Dr. Laura Loucks	laura@clayoquotbiosphere.org
	Dr. Jim Darling	jimd367@gmail.com
	Adrian Dorst	adrianusdorst@gmail.com
	Sander Jain	photography@sanderjain.com
	Katherine Carey	katherine@clayoquotbiosphere.org
2016	Dr. Laura Loucks	laura@clayoquotbiosphere.org
	Dr. Jim Darling	jimd367@gmail.com
	Adrian Dorst	adrianusdorst@gmail.com
	Sander Jain	photography@sanderjain.com
	Lisa Stozeck	lisa@clayoquotbiosphere.org
2017	Dr. Laura Loucks	laura@clayoquotbiosphere.org
	Dr. Jim Darling	jimd367@gmail.com
	Adrian Dorst	adrianusdorst@gmail.com
	Sander Jain	photography@sanderjain.com
	Mathieu Addison	Mathieu@clayoquotbiosphere.org
2018	Dr. Laura Loucks	laura@clayoquotbiosphere.org
	Dr. Jim Darling	jimd367@gmail.com
	Adrian Dorst	adrianusdorst@gmail.com
	Sander Jain	photography@sanderjain.com
	Mathieu Addison	Mathieu@clayoquotbiosphere.org

Appendix B:

Preliminary Bird Species List from Sydney Inlet Sound Project

Bald Eagle	<i>Haliaeetus leucocephalus</i>
Osprey	<i>Pandion haliaetus</i>
Bantail	
Sooty Grouse	
Mew Gull	<i>Larus canus</i>
Glaucus winged Gull	
Marbled Murrelet	<i>Brachyrampus marmoratus</i>
Belted Kingfisher	<i>Ceryle alcyon</i>
Hairy Woodpecker	<i>Picoides villosus</i>
Pacific Slope Flycatcher	<i>Empidonax difficili</i>
Common Raven	<i>Corvus corax</i>
Northwestern Crow	<i>Corvus caurinus</i>
Chestnut Backed chickadee	
Brown Creeper	<i>Certhia americana</i>
Pacific Wren	<i>Troglodytes troglodytes</i>
American Robin	<i>Turdus migratorius</i>
Varied Thrush	<i>Ixoreus naevius</i>
Hermit Thrush	<i>Catharus guttatus</i>
Swainson'S Thrush	<i>Catharus ustulatus</i>
Red crossbill	<i>Loxia curvirostra</i>
Golden Crown Kinglet	
Canada Goose	
Common Loon	
Rufus Humming Bird	
Common Murre	
Song sparrow	
Great Blue Heron	
Common merganser	
Hutton's Vireo	
Northern Flicker	

Appendix C:

Letter to Ministry of Lands and Natural Resource Operations

March 31, 2016
Forests, Lands and Natural Resource Operations
2080A Labieux Rd.
Nanaimo, BC V9T 6J9

Dear Darryn McConkey and Steve Gordon,

Thank you for the opportunity to provide our feedback on the proposed recovery strategy for Marbled Murrelet populations. Our comments are consistent with the recommendations of the Scientific Panel on Sustainable Forest Practices in Clayoquot Sound (Clayoquot Sound Scientific Panel 1995) and reflect a watershed level approach for managing Marbled Murrelet habitat quality and population recovery.

Clayoquot Sound has been identified as an area of significant habitat for approximately one-third of the west and north Vancouver Island regional population of Marbled Murrelets (Burger 2002). The high population is reflective of the large areas of in-tact old growth forest ecosystems adjacent to nearshore marine feeding areas (Chatwin et al. 2007). Hence, sustainable watershed level planning is necessarily a key component of our recommendations. We propose the following considerations:

- Marbled Murrelet nesting sites are strongly correlated with specific micro-habitat characteristics as well as macro-habitat characteristics. Therefore, we recommend all reserves for marbled murrelet nesting habitat be spatially designated and consider the principal ecosystem components required for nesting site conditions.
- The distribution of Marbled Murrelet habitats are known to be positively correlated with a number of variables associated with old growth forests such as: large trees supporting high epiphyte cover on their branches, densities of trees with four or more potential nest platforms, variability in size and structure of trees and high timber volume. Several variables were found to negatively impact Marbled Murrelet habitat such as ecosystem fragmentation and predation associated with edge effects. Therefore, we recommend that suitable reserve locations consider both the specific components that are positively correlated with Marbled Murrelet habitat and the conditions that negatively impact habitat.
- Watersheds with highly productive old growth forest ecosystems and a low proportion of fragmentation should be prioritized for Marbled Murrelet reserves. In addition, a suite of watershed level protection strategies associated with Marbled Murrelet habitat should also be considered for ecosystem-based watershed-level planning and monitoring. For example, the Scientific Panel recommendations include rate-of-cut restrictions to protect the forest interior and old growth successional stages, variable retention targets and the use of watershed reserves to protect unstable slopes, sensitive soils, rare ecosystems, important wildlife habitat and hydriparian integrity. All of these factors are integral to the principal components required for sustaining Marbled Murrelet habitat reserves.
- Finally, we recommend that watershed level monitoring should be implemented to track habitat targets and population estimates.

Sincerely,
Laura Loucks, PhD
Research Coordinator
Clayoquot Biosphere Trust