

# Living Lab Program for Climate Change and Conservation - Final Report



## Climate change resilience and sensitivity of key wetland ecosystems in the Ancient Forest/Chun T'oh Whudujut Park

### Research findings

- Water level data collected from the 12 well sites in the wetland show that the wetland reaches peak water table during spring snowmelt, followed by a progressive lowering punctuated by rainfall events.
- Groundwater samples were typically more concentrated in major cations than surface water samples, suggesting the water is stored in the subsurface for extended time periods, rather than a more dynamic exchange with surficial waters.
- Airborne laser scanning has revealed the topography of the wetland is complex, with minor outflows to the Fraser River and two primary flow directions; one directly toward the Fraser River (NE) and another towards Slim Creek (ESE).
- Analysis of herbarium samples collected in long-term wetland monitoring plots indicates that wetlands in the Ancient Forest area support 488 lichen and plant species. This includes 1 macroscopic green algae, 20 liverworts, 13 lichens, 93 mosses, and 361 vascular plant species.
- Species found in the studied wetlands that have special conservation significance for being regionally or globally rare, or rare regional endemics include *Carex lacustris* (not known in British Columbia outside the Robson Valley), *Castilleja purpurascens* (a regionally endemic species previously known from only a handful of populations close to the type locality), *Erythranthe* sp. A (known only from calcareous fens in the study area), *Salix raupii* (a rarely observed species throughout its global range), *Schistidium holmenianum* (a disjunct occurrence of a higher latitude species, the only population known in BC), and *Sphagnum cuspidatum* (previously known in western North America only from a few observations near urban Vancouver deemed exotic, whereas the occurrences in the Robson Valley are undoubtedly native).

### Methods summary

- Water samples were collected from snowmelt, creeks, ponds and shallow groundwater
- Water level loggers were installed in March 2019 and have continuously logged shallow groundwater tables, and surface ponding levels to present
- Airborne laser scanning was used to generate a sub-decimeter scale digital elevation model of ~50% of the park.

- We have established long term ecological monitoring (LTEM) plots in 28 wetlands in three adjacent B.C. Provincial Parks in the Robson Valley: Ancient Forest/Chun T'oh Whudujut, Slim Creek, and Sugarbowl - Grizzly Den, and in the nearby large Sinclair Mills (Meteor Lake) wetland. With subplots that were set up in the larger wetlands, this resulted in a total of 54 replicate plots being established, a robust sample size for a regional installation.
- All vascular plants, lichens, and bryophytes were enumerated within LTEM plots using a controlled intuitive wander method that directs allocation of field efforts to maximize species-capture. Voucher samples have been deposited with the Beatty Biodiversity Museum with data for rare species deposited with the B.C. Conservation Data Center.

## Key outcomes for BC Parks

- Water level data suggest that the wetland water table is affected by the timing and magnitude of snowmelt. This indicates that climate change is likely to alter the timing and elevation of peak water table for the wetland. However, it is yet to be determined whether it is the local snowmelt which is the primary driver, or regional (upstream) snowmelt volumes.
- Although the Ancient Forest/Chun T'oh Whudujut Provincial Park and Protected area was established in 2016 primarily with the objective of protecting ancient western redcedar stands, the current Living Labs work suggests that another key focus for the management plan of this park (currently under development) will be the conservation of these provincially significant wetlands and their associated taxa in the park.
- Project surveys in the Meteor Lake wetland, an extensive wetland complex (> 2000 ha) immediately west of Sugarbowl - Grizzly Den Provincial Park, point to the high conservation value of this area and suggest that relevant ministries should consider more formal protection measures for this area. Disruptions of hydrology from resource road construction or quarry activity are particularly relevant threats.
- Project biodiversity data are planned to be available in the online data repository for *Botany*, a National Research Council of Canada Journal, with a 2020 manuscript submission outlining key project findings.

## Relevance to BC Parks management

- Continue to promote climate change outreach opportunities.
- The UNBC climate station near the Ancient Forest Trail site provides key information to understanding changes in climate in the northern Columbia Mountains, both for B.C. Parks and for management of adjacent crown lands.
- Major wetlands in the three parks studied were previously unknown to science. Our findings suggest that they have major provincial significance, both as rare ecosystems in the region, for their diverse species assemblages, and for their role in sustaining ecological processes in the upper Fraser River watershed. Identified areas should be zoned to receive full protection from any disturbances that could impact biodiversity. This input is timely as B.C. Parks is currently working on their first management plan for the combined Slim Creek and Ancient Forest/Chun T'oh Whudujut Provincial Park and Protected areas. Project findings have been included in the newly drafted Ecosystem Overview Assessment for Slim Creek, Ancient Forest / Chun T'oh Whudujut Park and Protected Area, informing the public consultation process for the park management plan.

## Project's challenges/opportunities

1. A proposed opportunity raised by the project is the possibility of using a UAV (drone) project to facilitate high resolution mapping of wetland inundation waters. This would develop an understanding of the distribution of water and wetland types.
2. A major opportunity arising from the project is the incorporation of the new information on species biodiversity and rare ecosystems in the Ancient Forest/Chun T'oh Whudujut Park into the next generation of interpretive signs for the Ancient Forest Trail. Conversations about updating the Ancient Forest interpretive signs and incorporating features such as QR codes have been initiated with Natasha Ewing, Community Liaison Officer for the Northern Region.
3. A challenge for the project investigators and for the Living Labs program will be that of obtaining resources to conduct future reassessments in long-term plots to determine how climate change impacts play out.
4. A major limitation revealed by the project is the paucity of previous scientific surveys in wetlands of northern B.C., especially in the Robson Valley and its tributaries. The current project suggests the scientific importance of this area, however, many wetland complexes remain unvisited. Of concern, our preliminary survey at one wetland complex in the McGregor River valley suggests that surface hydrology (and attendant species diversity) have been significantly altered by resource road development. We are potentially losing species before we have a chance to determine their presence.

## Conclusions

Climate change impacts in provincial parks of the Robson Valley may be particularly severe, given the reliance of these ecosystems on winter snowpacks. There is an urgent need for better inter-agency cooperation between the B.C. Ministry of Environment & Climate Change Strategy and the Ministry of Forests, Lands, Natural Resource Operations and Rural Development to ensure that knowledge creation and climate change mitigation is better integrated across regional landscapes.

## References and links

Scientists Monitoring Impacts of Climate Change on Wetlands, August 12, 2019.

<https://engage.gov.bc.ca/bcparksblog/2019/08/12/scientists-monitoring-impacts-of-climate-change-on-wetlands/>

Bezzola, A., and D. Coxson. 2019. Slim Creek, Ancient Forest / Chun T'oh Whudujut Park and Protected Area, Ecosystem Overview Assessment. Report submitted to B.C. Parks, March 14, 2019.

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