

GOERT 2017

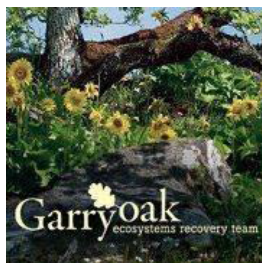
13th Research Colloquium New Ways of Understanding Garry Oak Ecosystems

Proceedings



Photo by Chris Junck

November 17th 2017



**University
of Victoria**

GOERT 2017

13th Research Colloquium

New Ways of Understanding: Citizen Science, Unmanned
Aerial Vehicles and Layered Landscapes

Proceedings

Edited by
Valentin Schaefer and Siobhan Darlington

November 2017

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Speakers for the Colloquium were primarily recommended by the Garry Oak Ecosystem Recovery Team (GOERT). Descriptions of the presentations provided in the Proceedings were based on notes taken by Siobhan Darlington of Environmental Studies at the University of Victoria. PowerPoint slides in the Proceedings were taken from the presenters' talks.

Amanda Schensema of the GOERT Society Board handled the registration desk on the day of the Colloquium with help from Anny Schaefer. Early registration was done by Jeanne Murphy of GOERT.

Val Schaefer, GOERT Society Chair and Academic Administrator for the RNS Program, was the Coordinator of the Colloquium and was responsible for developing the program, corresponding with presenters, working with the event volunteers and overseeing the production of the Proceedings.

All of the presenters volunteered their own time and paid their own transportation costs to participate in the Colloquium, a major contribution for which we are thankful and without which the Colloquium would not have been possible.

The cover photo was taken by Chris Junck.

Acknowledgement of the Territories

We acknowledge with respect that the University of Victoria is situated on the traditional territories of the Coast Salish and Straits Salish Peoples, specifically the Lekwungen (Songhees), Wyomilth (Esquimalt) and WS'ANEC' (Saanich) Peoples.

Background Information

New Ways of Understanding Garry Oak Ecosystems

The Garry Oak Ecosystem is a layered landscape that has been shaped by its historical context and contemporary social priorities are shaping its future. Citizen science is being used to help understand and restore Garry Oak ecosystems. The latest research includes the importance of new technology, project updates (recovery planning, bluebirds and Somenos), the use of native vegetation in restoration projects and a look at other endangered ecosystems (sand dunes) for common challenges and solutions. Resilience theory, novel ecosystems and ecological thresholds are hot topics. As in the past, the purpose of the GOERT Colloquium is to bring together people who are planning or conducting research and restoration projects relevant to Garry Oak Ecosystems and have them present brief descriptions of their studies and results to prompt discussion and encourage coordination and collaboration among groups.

This year's GOERT Colloquium explores the uncertainty inherent in the restoration of Garry Oak Ecosystems and offers an opportunity for dialogue about options as we move forward.

About the Garry Oak Ecosystem Recovery Team (GOERT)

Based in Victoria, BC, we coordinate efforts to protect and restore Garry Oak and associated ecosystems and the species at risk that inhabit them.

In the rainshadow of the Vancouver Island Ranges, one of Canada's richest ecosystems is also one of its most endangered. Less than 5% of Garry Oak ecosystems remain in a near-natural condition. More than 100 species of plants, mammals, reptiles, birds, butterflies and other insects are currently officially listed as "at risk of extinction" in Garry Oak and associated ecosystems. Several species have already been eliminated.

The Garry Oak Ecosystems Recovery Team (GOERT) is working to save these endangered species and the habitats they need for survival. Your help is needed. You can play a valuable part in a comprehensive recovery program to protect this rare habitat and save the plant and animal species at risk of local or global extinction.

A National Treasure

Garry Oak ecosystems are a unique national treasure. Thousands of plant and animal species inhabit Garry Oak ecosystems. They are the richest land-based ecosystems in coastal BC, they are a defining landscape characteristic of this region, and they are an integral part of the culture of this area. First Nations have harvested foods and medicines from Garry Oak ecosystems for hundreds of years, and in some areas, Garry Oak meadows were tended and deliberately burned to enhance the production of camas and other food sources.

Garry Oak Distribution

In Canada, Garry Oak ecosystems are found on southeast Vancouver Island, the Gulf Islands, and in two locations in the Fraser Valley. They are also found in Washington, Oregon, and California (where the trees are often known as Oregon White Oaks). They exist nowhere else in the world.

Our Story - What We Do

GOERT was formed in 1999 to coordinate efforts to protect and restore endangered Garry Oak and associated ecosystems and the species at risk that inhabit them.

Our Recovery Implementation Groups (RIGs) are working to complete the science-based information necessary for ecosystem and species recovery, minimize ongoing site and species losses, and motivate public and private protection and stewardship activities.

Only a concerted, long-term effort to conserve what is left of Garry Oak and associated ecosystems in Canada can halt the ever-increasing threat to their species at risk.

GOERT's recovery planning approach considers ecosystems as well as individual species at risk. Recovery planning in Canada has historically taken a species-by-species approach, but national initiatives now recognize the importance of incorporating a wider

scope in some circumstances. The ecosystem-based approach makes sense in this case, as so many species at risk occur in the same geographical area in Garry Oak and associated ecosystems.

Our Programs How We Do It

Bring Back the Bluebirds — the Western Bluebird Re-introduction Project. We were the project lead of an ambitious 5-year project to re-introduce extirpated (locally extinct) bluebirds to Vancouver Island and the Gulf Islands. In 2017 the Cowichan Valley Natutralists' Society assumed the project lead.

Species at Risk Outreach — Through the Back to Our Roots we contact private and public landholders who have species at risk on their land and helping them protect and restore the species at risk populations.

Local Government and First Nations Outreach — We work with local governments and First Nations to provide resources needed for protection and recovery of species at risk in Garry Oak habitat.

Resources for protection and restoration of Garry Oak ecosystems — These include our popular *Garry Oak Gardener's Handbook*, comprehensive restoration manual, species at risk and invasive species field manuals, and much more.

What You Can Do

Through grants and donations, the Garry Oak Ecosystems Recovery Team can continue to reach out to local governments and others who manage the remaining fragments of Garry Oak habitat in this region, the only place they exist in the world. Protection and restoration of habitat is needed to halt the decline of more than 100 species at risk. We are truly humbled by the dedication and hard work of so many partners working to save rare plants and animals and their habitat. With your support, we can continue this momentum.

Restoration Programs at the University of Victoria

Descriptions

Restoration of Natural Systems Diploma and Certificate

The Restoration of Natural Systems (RNS) program is an accredited program created to disseminate information about the emerging field of ecological restoration and to provide practical background knowledge, training, and skill development for those working in areas related to the restoration of natural systems. The program is offered jointly by the School of Environmental Studies and the Division of Continuing Studies, and is guided by an advisory committee. This interdisciplinary program provides the theory and practice needed to conduct restoration activities. It takes a holistic approach that recognizes the importance of both the social and biophysical dimensions of environmental restoration. The courses have been designed to meet the needs of professionals and to suit the busy schedules of people who work full time. Courses are offered in either an on-campus five-day immersion format or semester-long distance format. The program is offered at the 3rd and 4th year undergraduate level and often attracts students who are concurrently working on an undergraduate degree. It is also taken by professionals with degrees for professional development to acquire or improve skills in ecological restoration.

The courses in the program are expected to contribute in varying degrees to the student's knowledge and skill areas in:

- Designing restoration projects that consider a broad range of subject areas and include consideration of human factors;
- Evaluating projects on an on-going basis and making adjustments;
- Using scientifically rigorous approaches to restoration projects;
- Reading and analyzing technical reports and scientific publications;
- Introducing students to the decision makers and policies governing restoration work;
- Dispute resolution, conducting consultative processes, and consensus building;
- Presenting ideas clearly electronically, orally and in writing;
- Recognizing personal values that affect individual's decisions;
- Use of current mapping and sampling technologies;
- Solving problems encountered in implementing restoration projects;
- Working in partnership with other professionals and stakeholders;
- Developing competency in the types of equipment and procedures used to sample the natural environment;
- Developing awareness of national and international restoration issues;
- Understanding human impacts;
- Including traditional ecological knowledge in restoration planning;
- Incorporating social and scientific knowledge in restoration planning.

Diploma students must be admitted into the program and accepted to the University of Victoria for credit study. Students must complete 12 courses (6 required courses and 6

electives) to obtain their diploma. A one- or two-term co-op placement option is available for diploma students.

Certificate students must also meet the admission requirements of the program but do not have to be accepted for credit study at UVic. Students must complete 8 courses (6 required courses and 2 electives) to obtain their certificate. We also offer a non-credit Post Baccalaureate Certificate in Ecological Restoration that consists of 4 semester-long distance courses.

The RNS Program has received both the Award of Excellence from the Canadian Association for University Continuing Education (2001) and the Ecostar Award for Environmental Education from the Capital Regional District (2005).

Ecological Restoration Professional Specialization Certificate

This non-credit certificate has been designed for professionals working in the field of ecological restoration, environmental practice, biology, landscape architecture, landscape design and management, forestry and agrology. The certificate builds on the success of the Restoration of Natural Systems program to offer more advanced training for working professionals. Courses in the certificate are offered in a distance format, appealing to professionals from across North America as a means to meet their annual professional development requirements or to update their skills and understanding.

This program is intended for people who already hold a degree or diploma. The certificate is designed for practitioners working in restoration and related fields who see “problems” with current practices and want to investigate alternative and innovative solutions. This program develops critical thinking skills and asks challenging questions that require students to deal with the uncertainty that is present with problems in ecological restoration.

Upon completion of this program, students will be able to conduct detailed site assessments and restoration projects that pay special attention to the unique conditions and challenges presented by built and otherwise highly altered environments. The program focuses on the following areas:

- re-establishing natural processes;
- balancing social and economic constraints with ecosystem functioning;
- exploring new approaches to creating functional landscapes; and
- challenging our current understanding of ecological restoration as it is applied to a wide range of conditions.

The program features four courses, which are only available online:

- ER501: Design Principles for Natural Processes
- ER502: Ecosystem Design through Propagation of Native Plants
- ER503: Natural Processes: Restoration Ecology
- ER504: Invasive Species and Novel Ecosystems.

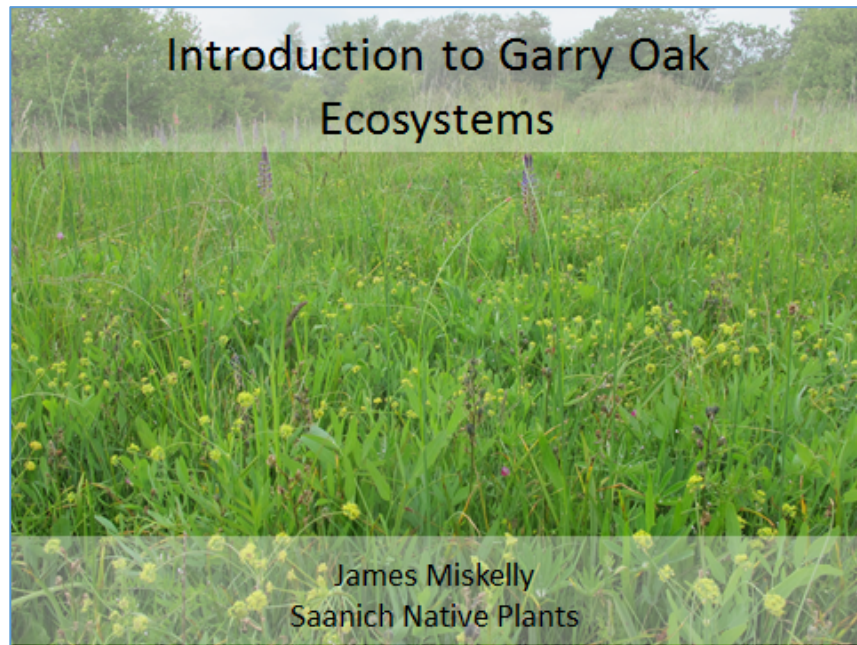
Two courses are offered each year, one in the spring (January to April) and one in the fall (September to December). Students can complete the program in as little as two years.

The program has five foundational areas of emphasis:

1. Using a systems approach to restoration that focuses on ecosystem function as well as structure. For example, the program focuses on the use of symbiotic relations such as mutualism, competition and predation as they can shape plant and animal communities, or using ecosystem engineers such as beavers to create wetlands, or taking advantage of natural succession to restore disturbed areas.
2. Restoration as a means to re-establishing natural processes. Whereas the re-establishment of species associations requires knowledge of species habitat, re-establishing processes requires all of this knowledge as well as in-depth knowledge of systems, of interdependencies and of ecological processes. For example, it involves understanding the mycorrhizae and invertebrates which form the basis of soil ecosystems.
3. Site analysis on the micro and macro level that examines ecosystems at all scales, from ions in soil and water through unicellular organisms to the larger plants and animals that dominate nature's ecosystems. The site analysis also identifies social, political, legal and other non-biological factors that need to be considered and incorporated into a restoration project.
4. Using the latest theoretical constructs in formulating restoration plans. These include concepts such as adaptive cycles, panarchy, novel ecosystems and assembly rules.
5. Restoration in severely disturbed environments that provide their own unique challenges. Frequently, all natural processes have been altered and systems have been removed. Restoration, therefore, involves re-establishing a natural system from scratch. Furthermore, a restoration biologist often only has a small patch of land to work with. And there are many on-going disturbances to the site such as noise and impervious surfaces.

1. Introduction to Garry Oak Ecosystems

James Miskelly, Saanich Native Plant Nursery

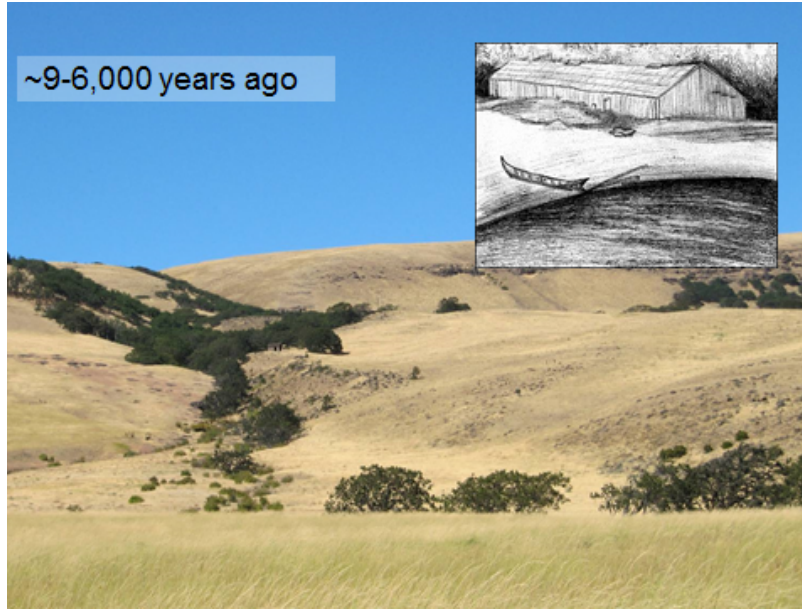


Introduction

James Miskelly introduced us to the vegetation and cultural history of Garry Oak Ecosystems from the close of the last ice age. His talk incorporated the charcoal and pollen research by Richard Hebda, Marlow Palla and Kendrick Brown and others.

Since the last ice age

Dating back to the last ice age around 13,000 years ago when the ice was retreating from our area there was a tundra-like ecosystem. That was quickly replaced 11-12,000 years ago by a scrubby shore pine community and lots of grass. The oldest archaeological evidence of human presence is a bison skeleton that came out of a bog dating back 11,500 years ago that had hunting marks on it. This ecosystem persisted for a few thousand years and went through the dryer Hypsithermal period. The pollen record shows species with southern affinities spread north like such as Garry Oak and camas. There began to be a lot of fire on the landscape with extensive open grassland and prairie land punctuated with oakwood and savannah 9-6,000 years ago. This may be the time period where Coast Salish civilisations began.

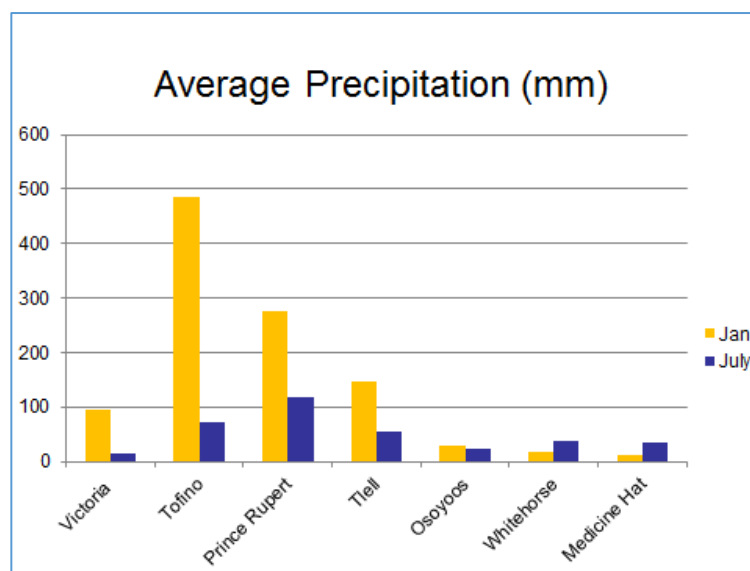


From a dry climate to a wet one

From 5,000-4,000 years ago the climate became cooler and wetter, with lots of conifer expanding their range. Moisture loving species like western redcedar occurred for the first time giving rise to the modern balance of conifer and open meadowlands we have today.

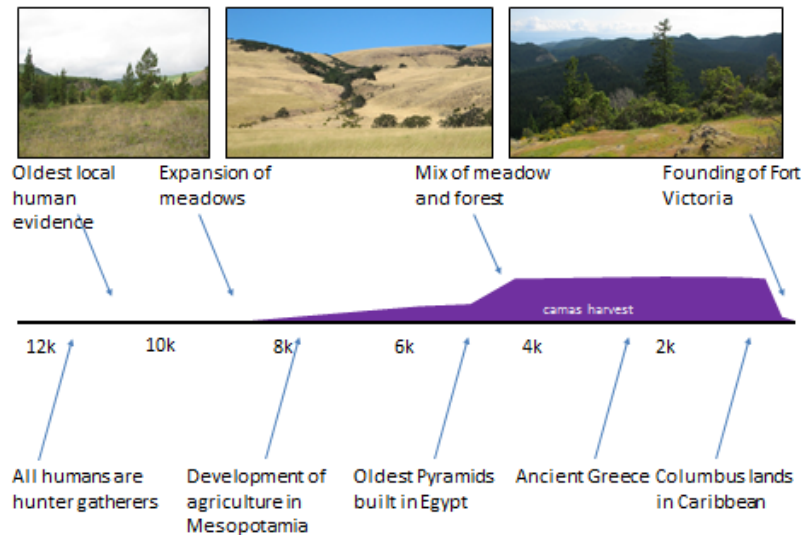
Don't we live in a rainforest? How can meadows persist?

We can explain the presence of hot, dry places and open meadowlands with the historical context of our climate. Many consider the Victoria area to be part of the Pacific Northwest rainforest. However, Victoria has much less precipitation than a rainforest with the lowest July precipitation in the country. Summer moisture deficit is part of the reason our meadows can persist. A wide range of moisture regimes and soil depths support forest development.



Fire on the landscape

The charcoal record shows that 4,000-5,000 years ago the climate became cooler and wetter. Simultaneously, the amount of fire on the landscape increased instead of decreasing. Conclusions are that fire was largely anthropogenic for maintaining hunting grounds and food resources. Fire was also used to maintain camas fields. Meadows were expanding on the landscape at the same time that agriculture was developing in Mesopotamia, and fire use was growing when the oldest pyramids were being built. Camas harvesting has significantly reduced since the arrival of European settlers.



What makes up a Garry Oak Ecosystem?

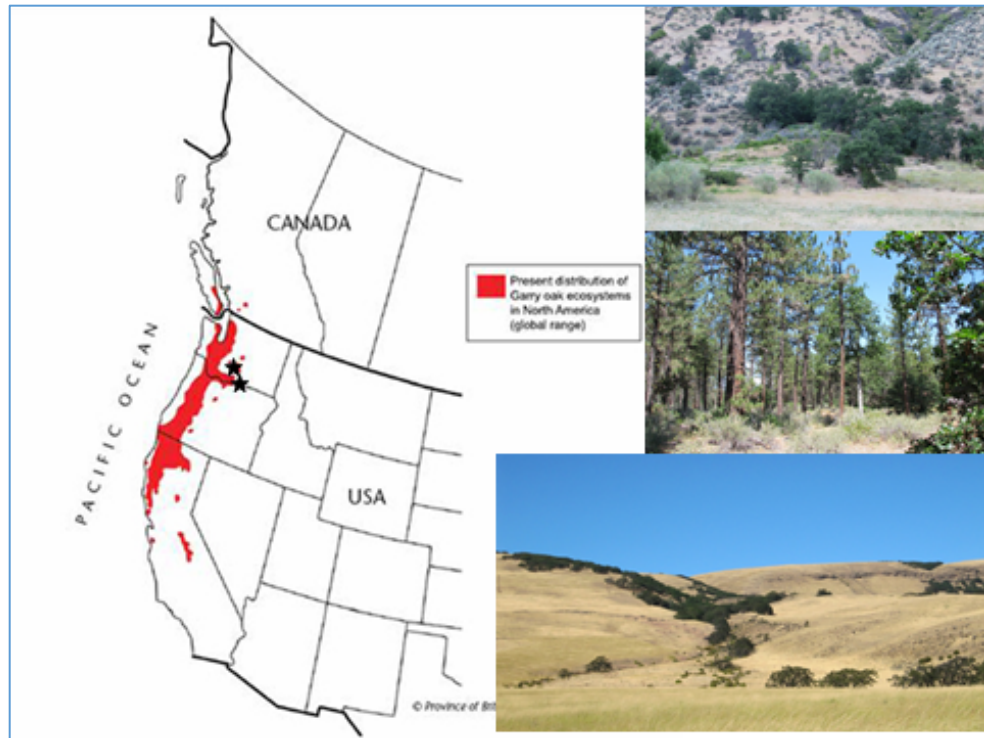
Garry Oak ecosystems (GOE) include woodland, prairies, bald or hot rocky hillsides with little soil that can't support much tree growth, wetlands, and vernal pools. Interestingly, Garry Oak doesn't always have to be present in a GOE. A few hundred years ago open savannahs of Douglas-fir were probably more common than Garry Oak.

Where do GOEs occur?

GOE occurs in southern Oregon and Northern California, though the understorey is unlike what we have here. Garry Oak occurs east of the cascades and is growing in Osoyoos, BC. Vancouver Island has a similar suite of species to other parts of BC but the GOE itself has a more restrictive range than the tree's range. How much was there in our area? We see them on islands on hilltops and in parks. In 1860 Pemberton estimated there was 100,000 acres in the Victoria area and 30,000 acres in Nanaimo. Other estimates of historical distributions are less than half of Pemberton's original estimate, and today there is only a small fraction left intact.

An ecosystem at risk

There is very little left of the GOE and what we do have left is in poor condition. Woody invasive species, pasture grasses, and lots of young conifer stands are threats to GOEs. Often, the understorey is in poor condition. Of the 10 butterfly species mostly found in GOEs, all of them are provincial species at risk. Western Meadowlark, Horned Lark, and other birds are extirpated from GOEs and in total there are 20 species on the federal Species At Risk Act that are Garry Oak species.



2. Native seed in Meadow Restoration

Kristen Miskelly, Saanich Native Plants

Native Seed in Meadow Restoration



Kristen Miskelly



Introduction

Kristen Miskelly is a biologist with a long-standing interest in the conservation, appreciation, and propagation of the unique flora of southern Vancouver Island. She discusses the use of native seed in meadow restoration and shares the successes and obstacles overcome at Saanich Native Plants.

Project start-up

The Miskelly's were thinking about ways to improve the conservation of GOEs and other flora in the Victoria area. They discovered that a limitation for many local conservation projects was having enough plant material and some of the closest local growers were up island or on the Gulf Islands. They wanted to focus specifically in the Victoria area and started out with lots of potted plants and lots of outreach and communication.

Access to seed

Access to seed was a really important element for their start-up project. Potted plants and plugs were good for small scale projects but impractical for large scale projects and are too expensive in the long term. Using seed for restoration has been done successfully for larger projects in Oregon and Washington. In the US there is a whole economy based around restoration and native seed farms. For example, Oregon Heritage Native Seed distributes seed to various conservation projects. Seed is also better for planting habitat corridors to promote pollinator species.

Seed Collection for Saanich Native Plants

The project started in the front lawn of Haliburton Farm, Saanich, with raised beds and metre square plots of native plants from which to collect seed. A lot of seed was produced but more space was needed. Seed was collected from Saanich Peninsula down to Metchosin to maintain local provenance. Some collections are on public lands, permitted areas, friends backyards, and public parks.

Progress

In 2015, the Miskelly's had access to another half-acre at Haliburton Farm where Saanich Native Plants has developed native species beds. Species such as woolly sunflower were planted by plugs. Some of the types of species planted in the rows include great and common camas, nodding onion, woolly sunflower, large-leaved lupine, California brome, annual species like small-flowered blue-eyed Mary, wet meadow/wetland species, springbank clover, and straight-beaked buttercup.

Seed sowing

In terms of timing, fall is the best for sowing many native species by seed. Some species can be sown in the spring, but if you're thinking about meadow restoration then you need to be ready in September with the land prepped to plant seed. To trigger germination for some species, cool, moist weather is required (cold stratification). Some fall-sown perennials include great camas, California oat grass, nodding onion, red columbine, and broad-leaved shootingstar. Some spring/fall sown perennials and annuals can be sown in the fall or early spring at the latest.

Spring/Fall sown perennials and annuals

Spring sown PERENNIALS	Spring sown ANNUALS
Entire-leaved Gumweed	Sea Blush
Yarrow	Small-flowered Blue-eyed Mary
Pearly Everlasting	Farewell-to-Spring
Woolly Sunflower	Small-flowered forget-me-not
Field Chickweed	Miner's Lettuce
Spring Gold	Large-flowered Collomia
Coastal Mugwort	



Site preparation

Site preparation is really important and seeds in general require good seed-soil contact. If you're working in an area where there aren't existing native plants, aggressive "blank slate" restoration techniques can be used (e.g. tilling, sheet mulching). In the United States, a lot of the site prep is done with chemicals because they're done on large parcels of agricultural lands where herbicide

use is already in progress. You can use smothering with cardboard and mulch to prepare sites as an alternative to herbicides, though in many cases you can be left with a weedy seed bank in the soil that can compromise the success of seeding afterwards. Topping the soil with something that is weed-free for seeds to germinate on is really important to prevent this. Solarization with clear plastic can be used rather than black plastic for solar energy to kill the seeds in the upper layer of the soil. Once the plastic is removed you're left with a blank slate for seeding. Sea blush germinates in the fall and can be used as a cover crop. This inhibits non-native annuals like geranium from colonizing.

Sowing: Soil as deep as the seed is wide

Distribution: Sand, vermiculite

Good seed:soil contact

Steadily moist until germination



Density of seed planting

The recommended density for native seed planting in the Victoria area is ~300-900 seeds/m². Drier sites require a higher seeding density than wetter sites in general. If you are developing a mix, some of the things that should be considered include how many seeds you want in a unit area and how many seeds per gram that species has e.g. *Anaphalis* has 24,000 seeds in a gram vs. Great Camas has 139.

Summary

Start with an area that is manageable. Planning your planting materials ahead of time, planting densely enough, using both perennials and annuals is important, and using both evergreen and deciduous species. Time your seed sowing (early fall and or early spring), and time the inclusion of potentially aggressive species like yarrow or California brome. Be sure to plant species that make sense for your site.

This picture is of a seeding September/October, some of the annuals like sea blush have started. By first spring yarrow is popping up, spring gold and nodding onion are



First late spring

germinating. Sea blush is showing already. Quite a few things bloom early which is good to keep up your confidence and satisfaction for restoration.

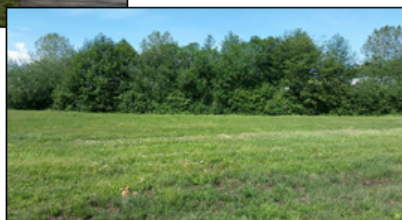
In Victoria

Saanich Native Plants is working on small projects with people getting rid of lawns and restoring meadows. Fort Rodd Hill has an ongoing Garry Oak learning meadow project and the Cowichan Garry Oak Preserve does experiments using seed, tilling, mulching, and potted plants.

Future



Lawns
Farms
Right-of-Ways
Conservation Lands



In the future

Part of the Saanich Native Plants future goals are to scale up seeding to bring the costs of seed down. Site prep has begun on Fairfield Farm in Cobble Hill with the aim to seed this year. The Habitat Acquisition Trust has done a lot of seeding for pollinator species locally. BC hydro is collaborating on an area near Lochside Trail with pollinator partnerships to restore meadows.

Resources

Cascadia Prairie Oak Partnership (CPOP), has lots of resources and a listserv for e-mail alerts. Their resources include a native seed production manual, hundreds of different species profiles, and information about their propagation. Yellow Point Propagation Ltd., PickSeed, Inside Passage, and Saanich Native Plants all have resources on their websites.

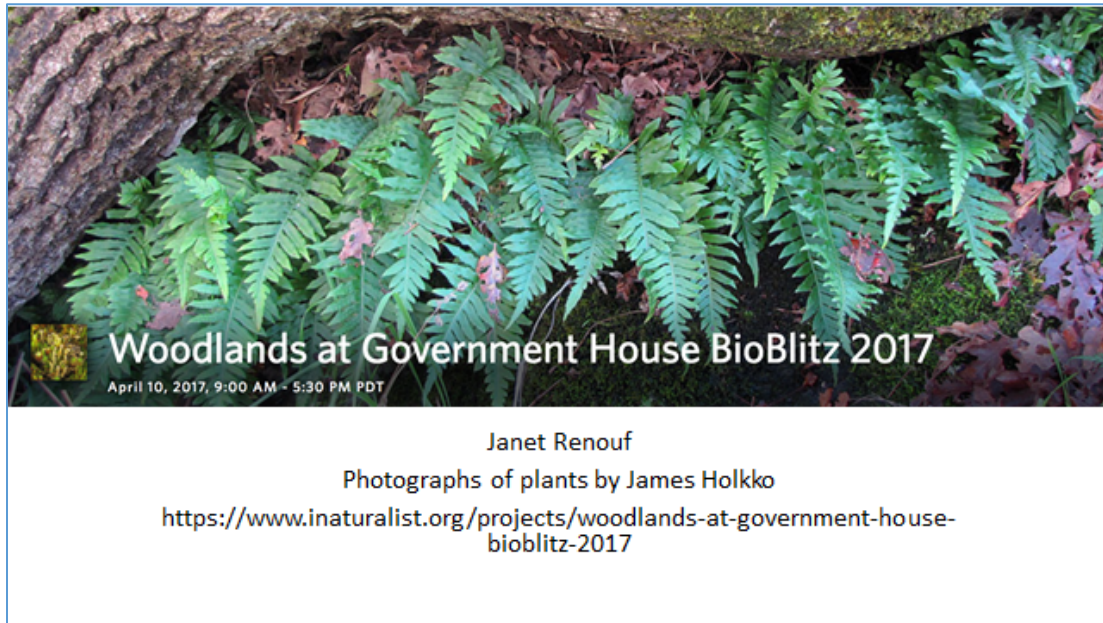


First Fall/Winter



3. Woodlands at Government House Bioblitz 2017

Val Schaefer, Chair, GOERT Society, on behalf of Janet Renouf, Friends of Government House Gardens Society. Photographs by James Holkko



Greetings from Janet Renouf

Greetings all! Part of me would like to be with you today to hear your views on the impact of Citizen Science on the health of our shared environment and your visions for our collective future. But part of me is very happy to delegate the sharing of this brief report and be across the continent, walking the beach, counting pelicans and upping my vitamin D levels. It all began in May of 2014 when I met with Dr. Hebda in his office to talk about marking the upcoming 25 years of invasives removal and restoration. He suggested conducting a BioBlitz to establish a baseline inventory against which future FGHGS volunteers could evaluate the impact of all our restoration efforts.

Friends of Government House

- Goals: ours - create baseline list of species, with GPS co-ordinates
- The scientists - see what's there
- Participants: # of scientists 30 (38 originally registered but 8 had to cancel for various reasons)
- # of volunteers 20
- Though we debated inviting some school and public participation, we opted to keep to the KISS principle for this first ever Woodlands BioBlitz.
- Handouts were developed for scientists and for volunteers. Maps showing the sectors scientists were to rotate through were enlarged and laminated.
- Base Camp Venue: Butterworth Cottage

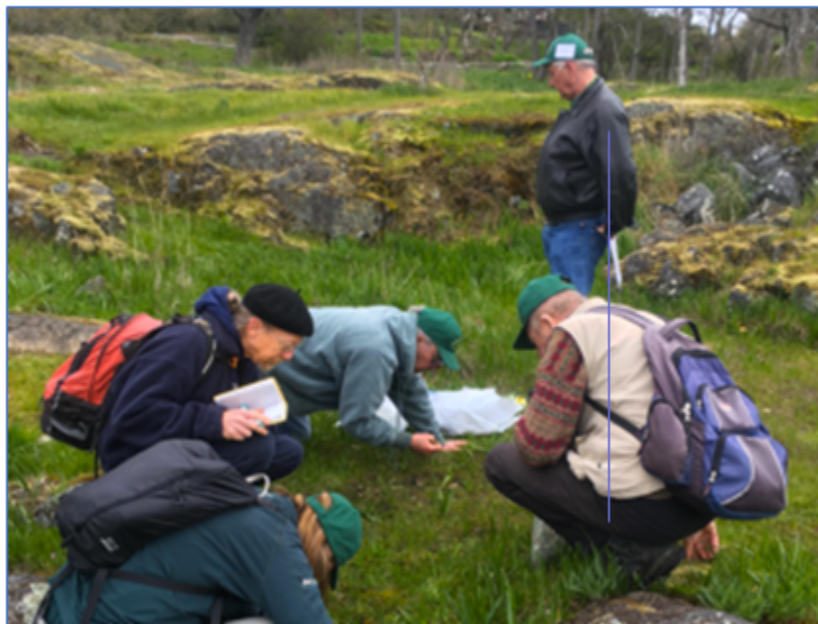


Bioblitz goals

Organized by the Friends of Government House, the bioblitz goals were to create a baseline list of species with GPS coordinates and involve scientists to participate and document what's there with the help of volunteers.

The bioblitz began in May 2014 with Richard Hebda. He and Nancy Turner began the Restoration program at UVic in the 90s.

Some specimens were collected by Richard Hebda for RBCM. Also present are Thomas Munson, Aimee Pelletier, Hans Roemer and Val Schaefer



Plants

Botany Team 1: Sean Rangel reported for the group of Richard Hebda, Hans Roemer, Aimee Pelletier, Thomas Munson, Ryan Batten, Valentin Schaefer and Rangel. Co-ordinates included

for all except red and some blue listed plants as I had requested. We do not want co-ordinates of rare plants posted on-line or printed up.

Total plants: 112, 45 native, 2 blue listed: *Nuttall's quillwort* *Isoetes nuttallii*, *slimleaf onion* *Allium amplexans*

Mosses & Liverworts

Bryophytes: Terry McIntosh reporting for the group of Kem Luther, Olivia Lee, Wynne Miles

Count = 61 species 1 red listed - *Bartramia stricta*; 1 blue listed - *Entosthodon fascicularis*; 1 exotic *Calliergonella cuspidate*.

Vascular plants

Vascular plants: Hans Roemer reported separately on the specimens he collected and identified at home. There were 64 natives, 98 introductions, and 1 unknown ash, possibly Oregon ash. He also observed, " We have avoided listing plants that have obviously been planted and are still in their original place. However, we have included some exotic plants where it was clear that they have spread into the 'native' environment (even some native trees appear to have been planted such as the lone Sitka spruce and western hemlock.)

Fungi

Fungi: collected by Oluna & Adolf Ceska

Biscogniauxia nummularia * *Dendrothele candida* * *Fomitoporia robusta* * *Hysterium angustatum* * *Lachnum virgineum* * *Mollisia benesuada* * *Mollisia cinerea* * *Peniophora cinerea* * *Peniophorella pubera* *Phellinus ferreus* * *Propolis farinosa* * *Schizopora paradoxa* * *Stereum hirsutum* *Stereum sanguinolentum* * *Stereum striatum* *Stictis radiata* *Trametes hirsuta* *

Species marked with asterisks are documented in Mushroom Observer:

http://mushroomobserver.org/species_list/show_species_list/1012



Red Bryum, *Imbricobryum miniatum* (FKA: *Bryum miniatum*)

© James Harkins

Lichens: 74 species found and reported by Ryan Batten

Birds: 34 species reported by Agnes Lynn with observations posted to iNaturalist

Insects: Reported by entomologist Robb Bennett – his data is probably in iNaturalist



4. Fort Rodd Hill, Gulf Islands National Parks Reserve Bioblitz

Aimée Pelletier, Species at Risk Communications Officer, Parks Canada



Introduction

Aimée Pelletier works for Parks Canada as a Species at Risk Communications Officer based at Fort Rodd Hill and Fisgard Lighthouse National Historic Sites. Her talk discusses the highlights of the Parks Canada 150 bioblitzes on Vancouver Island.

What is a bioblitz?

Parks Canada bioblitzes are about engaging the public with national parks and national marine conservation areas. Bioblitzes are a great tool for engaging families and youth in learning about local biodiversity, and helping inspire the next generation of biologists and naturalists.

“Bio” means life and blitz means to do something quickly and intensively. In a bioblitz experts team up with volunteers to inventory species observations. Species observations are recorded using a free app called iNaturalist. This is a bilingual app, the data is accessible to anyone, and you can track observations in real time. Species ID can also be confirmed by others.

Parks Canada events are from coast to coast, with over 30 events in 2017 to celebrate Canada 150. In delivering successful bioblitzes, experts are needed along with local collaborators, promoters, and partnerships with local museums and aquariums.

Parks Canada bioblitzes connect Canadians with nature in our protected areas, are flexible in format, have natural resource conservation and visitor experience goals, build relationships with partners and stakeholders, and engage with indigenous peoples.

Parks Canada events in coastal BC

Three events in coastal BC include the Fort Rodd Hill and Fisgard Lighthouse National Historic Site in May, Pacific Rim National Park in May long weekend and Gulf Islands National Park Reserve on Pender island. Each event included drop-in programs for the public, bioblitz festivals, the nature nerds program for older children assisting with experts on surveys, and volunteer experts. Eventbrite was used to register participants.



Fort Rodd Hill

Fort Rodd Hill hosted its 2nd Bioblitz this year with over 700 participants, 20 experts and 20 collaborators. The main focus of the event was public-programming during the Family BioBlitz Festival, but the site was open to expert surveys for 24 hours.

Event Themes

- If you build it or restore it they will come – wildlife values of the GOE learning meadow and other natural areas of Fort Rodd Hill
- International Migratory Bird Day; helping birds along the way (hosted by Rocky Point)
- Engaging families and young naturalists in learning about local biodiversity

What did they find?

~ 863 observations

307 species

83 Identifiers

24 observers

The most observed species was the wandering salamander (14), Canada Goose, leichtlin's camas 12 species at risk being propagated in our Conservation nursery. Natural populations of Deltoid balsamroot, Macoun's meadowfoam, Poverty clover, Band-tailed Pigeon, Olive-sided Flycatcher, and Marbled Murrelet.

MOST OBSERVED SPECIES



Wandering Salamander...
14 Observations



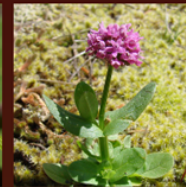
Canada Goose
10 Observations



Leichtlin's Camas...
9 Observations



Trailing blackberry
8 Observations



Shortspur seablush
8 Observations



Oregon Oak
8 Observations

MOST OBSERVED INTRODUCED SPECIES



Wandering Salama...
14 Observations



Common Broom
5 Observations



Dove's-foot crane...
5 Observations



European holly
5 Observations

MOST OBSERVED THREATENED SPECIES



Wandering Salama...
14 Observations



Wingstem Monkey...
6 Observations



Anna's Hummingbi...
5 Observations



Goldback Fern
5 Observations

Highlights

The events were attended by NatureKids BC, Junior Nature Sketch Club from Robert Bateman Centre, lots of families, and the events successfully engaged youth with the natural world. The kids loved the opportunity to hand-release birds banded by RPBO.

Indigenous community engagement was successful with Coast Salish people carving unveiling, the Songhees seafood and steam truck, and the traditional plant walk on Lekwungen food systems.

Family bioblitz festival

- 16 community groups with educational booths/programs
- Bat quest with HAT
- VNHS early morning bird walk
- Passerine and hummingbird banding demonstrations with RPBO
- Live birds-of-prey demos
- Native plants for sale
- Seed bombs
- Mason bee workshop





Pacific Rim National Park

The first bioblitz for PRNP was from May 20-21 2017 with over 300 participants, 27 experts, and 6 collaborators. The themes were introducing locals to bioblitz, and species snapshot of terrestrial and marine species. The iNaturalist findings included 958 observations, 307 species, 77 identifiers, and 19 observers. The most observed species were evergreen huckleberry and salal.



Gulf islands National Park Reserve

The 3rd bioblitz for the Gulf Islands occurred from June 9-10 2017 and included sea, lake, forest and night stations, guided species surveys, and family bioblitz festivals. There were 225 participants, 20 experts, and 9 collaborators. The themes for this event were to engage young naturalists, and increase public awareness of how parks Canada is protected.

The iNaturalist findings included 281 species, with 5 species of bats! Some of the highlights were the inclusion of 22 students from a local outdoor school and indigenous youth.

National/Regional BioBlitz Partners

- Support BioBlitz events in various capacities:
 - Send experts
 - Serve as repositories for collected specimens
 - Provide public programming
 - Help cross-promote events

















Collaborators

- Victoria Natural History Society
- Rocky Point Bird Observatory
- Royal BC Museum
- Songhees Nation
- Esquimalt Nation
- Capital Regional District (CRD) Parks
- Ancient Forest Alliance
- Habitat Acquisition Trust
- Saanich Native Plants
- Garden Works (Oak Bay)
- The Raptors
- Esquimalt Lagoon Stewardship Initiative (ELSI)
- Friends of Uplands Park (FOUP)
- World Fisheries Trust/Gorge Waterway Initiative/Gorge Waterway Action Society
- The Gardens at HCP
- Rithe's Bog Conservation Society

- BC Purple Martin Stewardship Project
- Friends of EcoReserves BC
- Swan Lake Christmas Hill Nature Sanctuary
- Robert Bateman Centre



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5. Garry Oak Ecosystem Conservation Efforts at Fort Rodd Hill, Gulf Islands National Park Reserve

Nathan Fisk, Parks Canada



Introduction

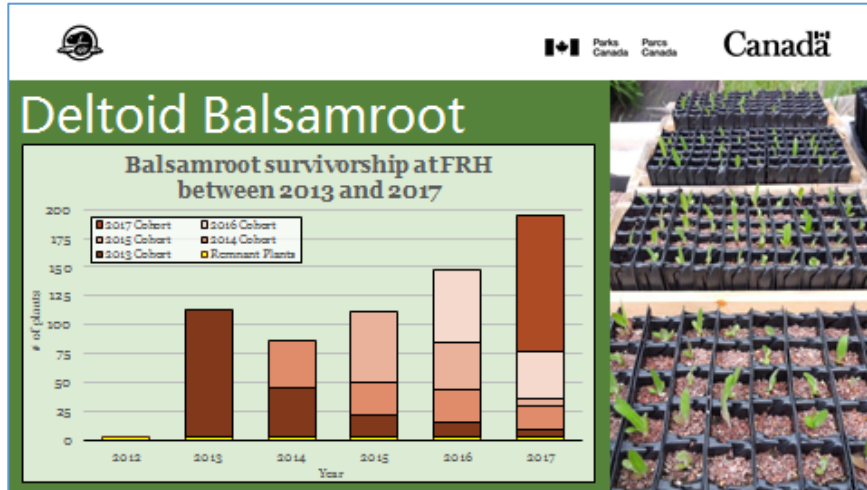
Parks Canada staff member Nathan Fisk from the Coastal BC unit presented an update on the species at risk restoration and maintenance projects initiated by Fort Rodd Hill and Fisgard Lighthouse National Historic Site.

Fort Rodd Hill Nursery

Fort Rodd hill is situated the head of the Esquimalt lagoon with prevailing winds passing overhead, creating a very sheltered spot for the nursery.

Species in the nursery include contorted-pod evening primrose, a winter annual forb associated with taprooted sand ecosystems. There are 4 islands hosting 5 populations in BC. They grow in deeper production beds and are killed off by heavy frosts associated with arctic outflow events on winter sands. Approximately 1.5 million seeds from the plant were produced this year.

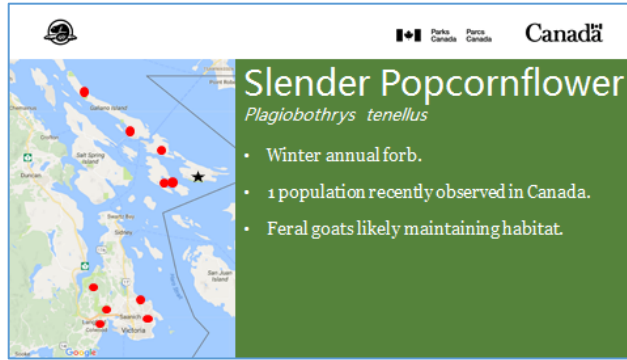
Deltoid balsamroot are long lived, tap-rooted, perennial forbs with 7 populations remaining in Canada with 75 plants or less. The 8th and largest population remains at Mount Tzouhalem. A remnant Fort Rodd Hill population consists of 2 or 3 individuals.



Flowering beds were increased at the nursery, and each has a deltoide balsamroot in it. Collars are used for younger plants because there are not enough resources underground and they require protection from slug predation. About 100 deltoide flowered this year, and another 3000 were seeded. Blossom bags are used to protect the seeds once petals have withered from finches and other bird predation.



Golden paintbrush production has been scaled up recently. The highest production is ¼ million seeds. This species experiences lots of seedling mortality. The stock comes from Trial Island off Victoria's south coast. The species uses multiple nursery beds and *Eriophyllum lanatum* is used as a host. Lupines and aster family plants produce alkaloid compounds as a predator response, therefore by using high alkaloid hosts you may be able sour the milk of the golden paintbrush and reduce herbivory.



Slender popcornflower is a winter annual forb with 1 population recently observed in Canada on Saturna Island. Feral goats are likely maintaining the habitat. Plants are the size of a quarter right now, persisting in hairy stage. Seed was collected from Brown Ridge and the nursery produced 35 grams of seed (15,000 seed).

White-top aster is a perennial rhizomatous forb with 22 remnant populations in Canada. Translocations have been going well. Plants were mostly in a vegetative state in the last few years, with a little bit of flowering in 2017. They germinate quite well from seed which has been collected from nursery grown plants. Trial Island, Uplands Park, and Bear Mountain genetics are all represented in the nursery.

Building Capacity

Fort Rodd Hill is working on building capacity and increased production in the nursery with 27 species and 13 either endangered or threatened at present. Some of the challenges to date include limited genetics and mechanisms for collaboration.

6. Taylor's checkerspot Recovery Implementation Group Update

Erica McClaren, Jennifer Heron, Chris Junck

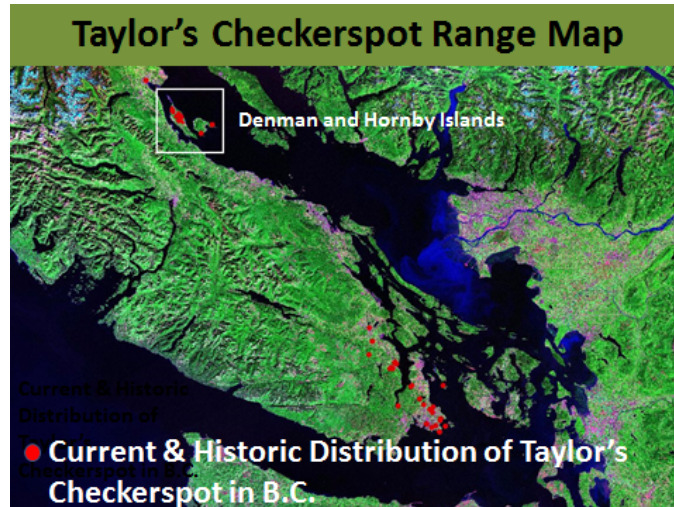


Project Team

The coastal bluff ecosystem restoration project is located within Helliwell Provincial Park on Hornby Island. This project is lead by Erica McClaren, Jennifer Heron and Derek Moore, in collaboration with GOERT's – Invertebrate at Risk RIG members, local advisory groups (Hornby Island Provincial Parks Committee, Hornby Island Natural History Centre, Hornby Island Conservancy, and High Salal Ranch), and the K'omoks First Nation. Saanich Native Plants (Kristen and James Miskelly) have been assisting to develop and implement meadow restoration prescriptions.

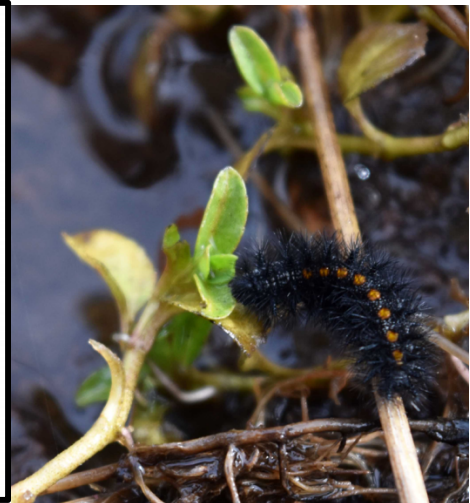
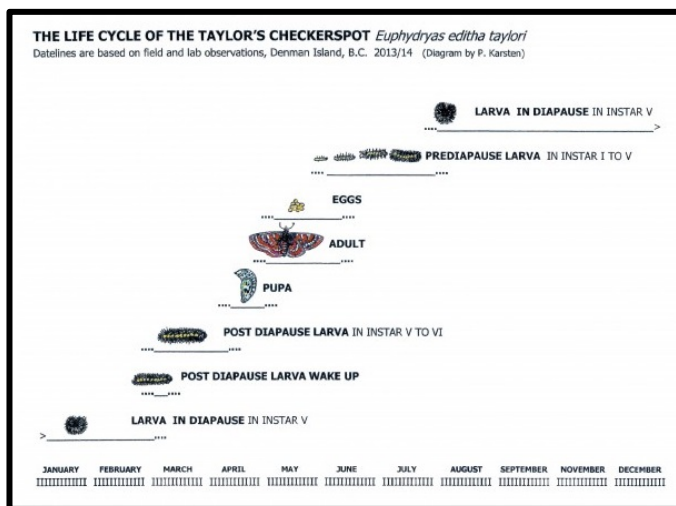
Historical Range

Historic range of the Taylor's Checkerspot butterfly includes southeast portion of Vancouver Island, Denman and Hornby Islands and Comox. Denman Island is the only place left that have the butterfly today.



Denman Island Protected Area

Under the carbon credit agreement, a 10-hectare area has been kept free of trees and set aside for Taylor's Checkerspot butterfly management. Restoration activities on Denman include invasive plant removal (Scotch broom, some thistles), removal of regenerating trees, and enhancing larval and host plant diversity and abundance. These plants include marsh speedwell, thyme-leaved speedwell, and coastal strawberry. Much of the habitat enhancement, invasive species removal and monitoring work has been conducted by local volunteers.



Captive rearing and release of Taylor's Checkerspot

From 2014-16, Peter Karsten started a breeding facility on Denman Island where 284 larvae were released in 2015 and ~1300 in 2016. In 2016 the Greater Vancouver Zoo breeding facility took over for Peter and released ~255 larvae in 2017. About 155 are planned to be released in 2018. Future actions include habitat restoration planning and how to prevent trees from re-growing, as well as promoting community engagement and volunteer recruitment.

Denman Conservancy Associated Settlement Lands Covenant Area

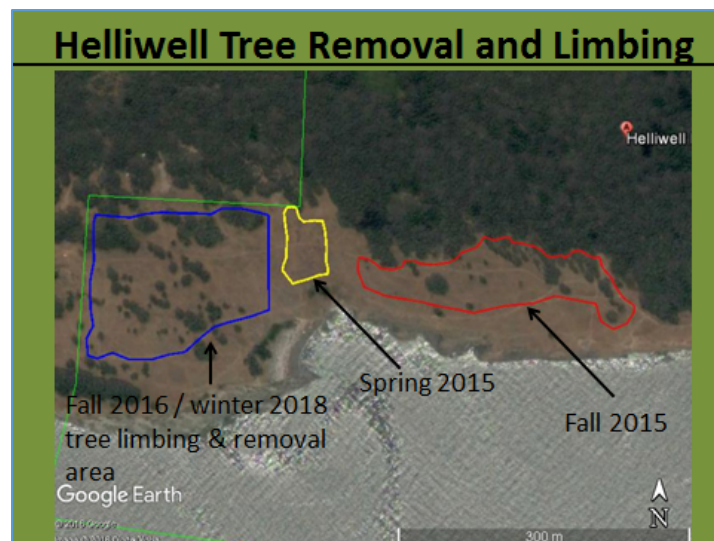
This project has made progress protecting habitat for bTaylor's Checkerspot butterflies by marking boundaries of a Taylor's Checkerspot reserve area, conducting invasive plant removal, maintaining open meadows through tree/shrub removal, planning for the creation of demonstration nectar garden in 2018, and monitoring butterflies.

Middle Farm

Middle Farm is a private land co-op that was granted permission for collecting eggs for the creation of the original breeding program. Some restoration activities have included invasive plant removal, particularly of reed canary grass and conifers around wet meadow areas.

Helliwell Provincial Park

Tree limbing and removal are planned in Helliwell between fall 2017 and winter 2018. Primarily ingrowing Douglas-fir are being removed from the coastal bluff ecosystem meadow areas, however there are some challenges with thistle growing in cleared areas and maintaining support from the local community.



Native plants are being planted in the tree limbing and removal areas and these areas are being monitored to see how well things are growing. Most of the planted species are resistant to deer browsing for now due to the fact that locals are not supportive of fencing off restoration areas.

First Nations Involvement

Currently the project team is working on integrating culturally important plants into planting prescription and including First Nations on site visits to Denman Island and Helliwell Parks before and after restoration efforts.

For project updates and articles on Taylor's Checkerspot visit the GOERT website.

Garry Oak Invertebrates At Risk Recovery Implementation Group

- Jennifer Heron (Chair), BC Ministry of Environment, Vancouver, BC
- Erica McClaren, BC Parks, Black Creek, BC
- Chris Junck, Private Consultant, Victoria, BC
- Cris Guppy, Entomologist, Whitehorse, YT
- Nick Page, Raincoast Applied Ecology, Vancouver, BC
- Suzie Lavallee, UBC, Vancouver, BC
- Andrew Fyson, Denman Island Conservancy Association, Denman Island, BC
- Patrick Lilley, Private Consultant, North Vancouver, BC
- Erika Bland, Denman Island Conservancy Association, Denman Island, BC
- Kristen Miskelly, Saanich Native Plants Nursery and Consulting
- Nicole Kroeker, Parks Canada Agency, Victoria, BC
- Deborah Bishop, Denman Island, BC
- Andrea Gielens & Menita Prasad, Greater Vancouver Zoo Breeding Facility
- Tony Law, Hornby Island, BC
- Trudy Chatwin, Retired Species at Risk Biologist with BC Ministry of Forests, Lands and Natural Resource Operations
- Jessica Steiner, Wildlife Preservation Canada

Funding & Project Support



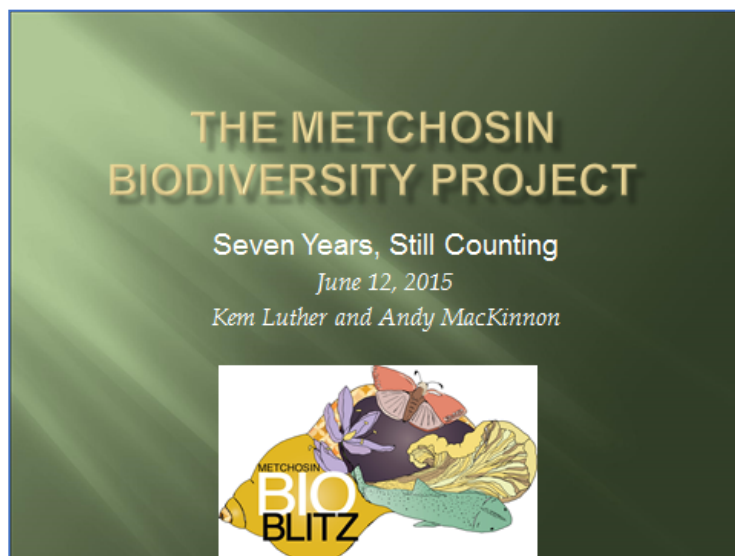
Garry Oak
Ecosystems
Recovery Team

DENMAN
CONSERVANCY
ASSOCIATION



7. The Metchosin Biodiversity Project – seven years, still counting

Andy Mackinnon, Kem Luther, Metchosin Biodiversity Project



Introduction

Kem Luther and Andy Mackinnon have been involved in a bioblitz project that started 7 years ago to increase our understanding of Metchosin's species and ecosystems and to promote awareness to protect and restore important areas.

Talks and Walks

One of the purposes of the biodiversity project is to share natural history information with interested people in Metchosin and adjacent jurisdictions. We have done this in part through cooperation with Metchosin's long running (now 10-year) talk and walk series that was started by Moralea Milne. In this series, are invited from all over BC to come and to share their expertise. The talk and walk events occur ten months out of the year, on Fridays, and are free.

How did it begin?

With lots of dithering! In 2011, Andy MacKinnon, Moralea Milne, and Kem Luther formed the Metchosin Biodiversity Project and started planning in earnest. They were later joined by Joel Ussery. The project began by researching other bioblitzes and laying out ground rules in the months before the first bioblitz. The event, the group decided, would begin with a Friday night talk followed by Saturday morning species counting within the boundaries of Metchosin. The organizers needed to work with a small budget and recruit volunteers and experts to participate. A database and web site (<http://metchosinbiodiversity.com>) was set up to tally and report the bioblitz outcomes.

Bioblitz #1 2011

The first bioblitz occurred on April 30th on a sunny day. The headquarters were at the Metchosin Community House and the event was conducted in partnership with Capital Regional District Parks. About 60 volunteers attended the event. Hans Roemer took a bioblitz crew to Sugarloaf Mountain to count and other groups went to Devonian, Matheson Lake, Pearson, Race Rocks, and Witty's Lagoon. Bird species inventories were conducted by Jeremy Gatten and Jamie Fenneman. They spotted a nesting pair of bluebirds. A fungal crew found a blue-grey tailed dropper at Matheson Lake. A total of 850 species were inventoried of which 40% were vascular plants. Over 50 species of spider were documented.

Bioblitz #2 2012

The second bioblitz occurred on May 5th with sunny weather. The headquarters were at the Mel Cooper Cabin of the Metchosin-based Boys and Girls Club. Anne Nightingale gave the Friday night talk about owls and 55 volunteers attended the Saturday blitz, with groups going to Camp Thunderbird, Blinkhorn, Witty's, Tower Point, the Boys and Girls Club property, and Weir's Beach. A total of 940 + species, including the blue-listed common bladder moss, were inventoried. Experts from Sanford Fleming University found 20 species of bees. Interesting finds were the red-legged frog and purple sanicle.

Bioblitz #3 2013

The third bioblitz occurred on April 27 and was a rainy day. James Miskelly and Libby Avis gave the Friday night talks on butterflies. The headquarters were at the Mel Cooper Cabin of the Boys and Girls Club. About 55 volunteers attended and this year there were strong teams of bryophyte and algal experts. Almost 100 species of algae were identified and 125 bryophytes. The lichen count more than doubled, thanks largely the increasing expertise of Ryan Batten and Daryl Thompson. Over 400 species of vascular plants were identified. A team traveling with Hans Roemer zipped around Metchosin, recording a different species every 40 seconds! A total of 1200 species in one day were inventoried, the highest total yet. Some interesting finds were the Townsend's solitaire, the lungless salamander, and *Crumia latifolia*.



Mycoblitz #1 2013

The annual bioblitz was underachieving in fungi so in 2013 a separate mycoblitz began targeting fungi on Nov 8-9. Britt Bunyard, editor of *Fungi* magazine, gave the Friday night talk.

Bioblitz #4 2014

The fourth bioblitz occurred on May 24 with the headquarters in the Mel Cooper Cabin at the Boys and Girls Club. On the Friday before the outing, Ted Leischer gave a talk on native bees and Kathryn Martell gave a talk on bluebirds. About 70 volunteers attended the event. Rick Nordin found 20 freshwater plankton species. Some interesting finds were *Pachyella babingtonii*, a small ascomycete, and Howell's *Triteleia* at Tower Point. A total of 850 species were inventoried.

Mycoblitz #2 2014

This year the fungi event was held on Nov 8 and Britt Bunyard gave a new talk on fungi. A display was laid out of various species in the District of Metchosin council room. During the event 115 new species of mushrooms were inventoried.

Bioblitz #5 2015

The fifth bioblitz occurred on June 12 with sunny weather. The headquarters were the Metchosin Boys and Girls Club and Kem Luther and Andy Mackinnon gave the Friday night talks. Volunteers surveyed Witty's lagoon and went to Metchosin crown lands. A total of 540 species and 120 new species were inventoried, including the goldenrod crab spider and the topiary grass-veneer moth.



Mycoblitz #3 2015

The third mycoblitz occurred on Nov 7 and the day was overcast. Headquarters were at Municipal Hall and 20 experts participated in the event. About 165 species were inventoried with 32 new ones. Interesting finds were *Tubaria punicea*, the Christmas Naucoria.

Bioblitz #6 2016

The sixth bioblitz occurred on May 9, with sunny weather. This year a new format was used. The regular bioblitz inventorying was limited to experts and the general public was invited to events at a biodiversity day, which was on April 30. The main reason for the change was that experts were having difficulties teaching volunteers and making lists at the same time. Surveys for the

bioblitz occurred at DND William Head and Albert Head where 667 species were inventoried, 130 of which were new to the bioblitz database.

Mycoblitz #5 2017

The most recent mycoblitz occurred on November 4 on a rainy, snowy day. Surveys were made at Camp Thunderbird, the Camosun College Van der Meer property, and Pearson College lands. A total of 155 species were found, 45 of which were new to the bioblitz database, including the readhead (*Chrysomphalina aurantiaca*) and deer (*Pluteus exilis*) mushrooms.

Since the first Metchosin bioblitz there have been 2392 species recorded!

Lesson learned

In our seven years of bioblitzes and mycoblitzes, the organizers have discovered (1) that it is difficult to address survey and public participation goals in a single day, (2) that species surveys must be multiyear projects in order to get a fair picture of species diversity, and (3) that species inventories only paint a part of the ecosystem picture—an emphasis on species diversity, for example, overlooks species frequency.

8. Update on development of federal Species Recovery Plans for species at risk in Garry Oak Ecosystems.

Kim Borg, Environment and Climate Change Canada



Environment and
Climate Change Canada

Environnement et
Changement climatique Canada







Update on development of federal recovery documents for species at risk in Garry Oak Ecosystems

GOERT Colloquium 2017

Kim Borg

Conservation Planning Unit - Species at Risk
Canadian Wildlife Service – Pacific Region
Environment and Climate Change Canada (ECCC)

Nov. 17, 2017

Introduction

Kim Borg is with the Conservation Planning Unit – Species at Risk, Canadian Wildlife Service – Pacific Region, Environment & Climate Change Canada presents an overview of federal recovery documents for species at risk in Garry Oak Ecosystems.

Overview of the Species at Risk Act (SARA) and recovery planning

SARA develops national strategies, plans, or programmes for the conservation and sustainable use of biological diversity. SARA arose from Canada's signing on to the Convention on Biological Diversity in 2003. Its purpose is to prevent wildlife species in Canada from disappearing, becoming extirpated, or going extinct. SARA must provide for the recovery of wildlife species that are listed and to manage species of special concern to prevent them from becoming endangered or threatened.

Three agencies manage species at risk, including Parks Canada agency (within parks), the Department of Fisheries and Oceans (DFO) and Environment and Climate Change Canada (ECCC) which manages most species and administrative duties.

SARA process

The Committee on the Status of Endangered Wildlife In Canada (COSEWIC) conducts species assessments separate from government using science and indigenous knowledge and provides their assessment to SARA agencies. Currently, there are 548 species on Schedule 1 of SARA, 200 of which occur within BC and the Canadian Pacific and of those, 155 are terrestrial for which ECCC is the lead agency.

Recovery Planning

Extirpated, Endangered or Threatened species need a recovery strategy (2-5 years depending on listing). The designated SARA agency must identify threats to species, set population and distribution objectives, set targets for population levels, and identify critical habitat. An action plan follows from a recovery strategy and lists specific actions that need to be taken to help the species meet recovery goals. When a species is listed as special concern a management plan is needed – no critical habitat needs to be identified but must identify prevention of species slipping into other listings. Each document has opportunity for public comment for 60 days.

Critical Habitat (CH) is.....

The habitat that is necessary for the survival or recovery of a listed wildlife species

- CH identification is:
 - A mapped boundary (yellow polygon, red bounding-box), AND:
 - list of biophysical attributes
- Examples of activities likely to destroy critical habitat

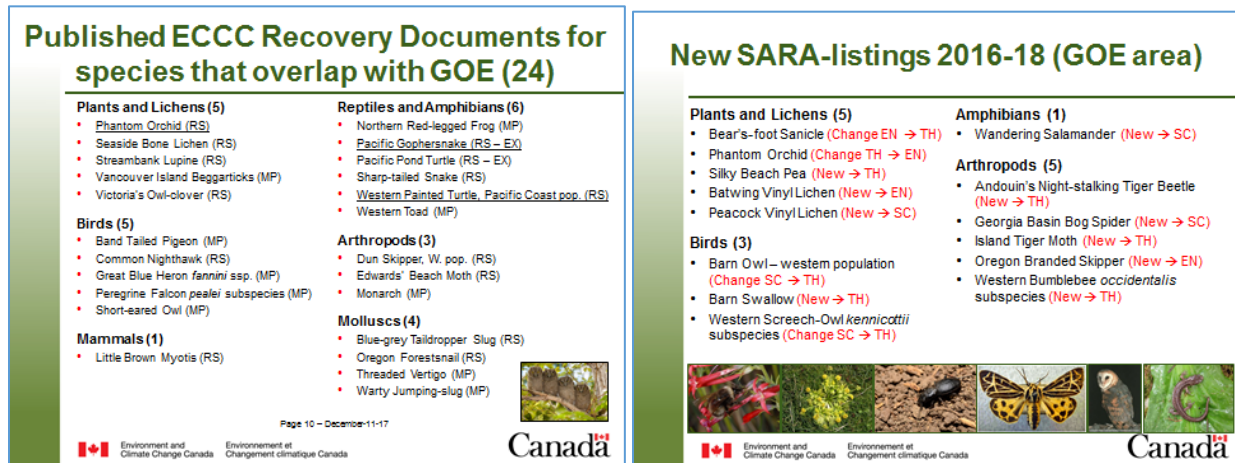
Environment and Climate Change Canada Environnement et Changement climatique Canada **Canada**

Critical Habitat

Critical habitat is the habitat that is necessary for the species to survive or recover and is tightly linked to population distribution targets. In defining critical habitat, a mapped boundary and list of biophysical attributes (moisture levels, % leaf cover etc.) must be provided in recovery plans along with examples of activities that are likely to destroy critical habitat (heavy trampling). These attributes are determined based on the best available information to the extent possible. Socio-economic factors are not considered during CH identification. Publicly available CH maps for BC are available on the Open Data Portal.

ECCC's three year document posting plan (2014/15 to 2016/17)

A 3-year "posting plan" was developed to expedite posting of recovery documents for 192 ECCC-CWS species. 88 of these are for species that occur in B.C. ~26 overlap with GOE.



New SARA listings 2016-18 (GOE area)

There were 11 migratory birds added to Schedule 1 November 15, 2017 (includes Barn and Bank swallow, western grebe, bobolink)

Transfer of Recovery Planning from Parks Canada Agency to ECCC

ECCC will take on all future tasks as SARA-responsible Agency for species that are not confined to PCA lands. This implicates 49 SARA listed species at risk in BC. ECCC will update any existing recovery plans and implementing action plan documents.

Funding Programs

Aboriginal Fund for Species at Risk (AFSAR)

- Supports involvement of aboriginal groups in activities related to species at risk conservation
- Includes a prevention stream for culturally important species
- Contact: Kate Shapiro kate.shapiro@canada.ca

Habitat Stewardship Program (HSP)

- Provides funds to stewards to implement activities that protect or conserve habitats/address priority threats for SARA-listed species

National Wetlands Conservation Fund (NWCF)

- Provides funds to restore or enhance wetlands
- Focuses on non-federal lands
- Not limited to waterfowl habitats
- Contact: Ivy Whitehorne ivy.whitehorne@canada.ca

Interdepartmental Recovery Fund

- Intended for federal departments (including INAC) and departmental corporations
- Supports recovery activities

For more information:

1. SARA public registry: www.sararegistry.gc.ca
2. COSEWIC assessment process:
<https://www.canada.ca/en/environment-climate-change/services/committee-status-endangered-wildlife.html>
3. List of provincial & federal species in BC, by regional district:
www.speciesatrisk.bc.ca
4. BC Species and Ecosystems Explorer:
<http://www.env.gov.bc.ca/atrisk/toolintro.html>
5. Assembly of First Nations SARA Toolkit:
<http://www.afn.ca/uploads/files/env/sara-guide.pdf>
6. Environment Canada's Funding Programs
<https://www.canada.ca/en/environment-climate-change/services/environmental-funding/programs.html>

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Environment and
Climate Change Canada

Environnement et
Changement climatique Canada

Canada

9. Update on Bluebird Project

Ryan Hetschko, Cowichan Valley Naturalists' Society



Bring Back the Bluebirds Project

Cowichan Valley Western Bluebird Reintroduction Project

Ryan Hetschko
Project Manager 2017



Introduction

Ryan Hetschko provided an update on the 6th year of the Bring Back the Bluebirds project. Western Bluebirds disappeared 20-25 years ago in the Cowichan Valley and there were no signs of bluebirds until the reintroduction project began 6 years ago. The goal of the project is to achieve a self-sustaining population in their former range of southeastern Vancouver Island.

Extirpation of the Western Bluebird

Western Bluebirds were extirpated in the mid-1990s, GOERT took on a 5-year translocation program to bring back the birds. In 2017 there are now birds returning to breed on the island each season. Some of the reasons of decline relate strongly to the decline of GOERT ecosystems. Western Bluebirds don't exclusively need Garry Oak habitat but need similar savannah habitats. Cowichan Valley has experienced extensive habitat loss from industrial activity and agriculture. Other causes of decline relate to competition with invasive species such as House Sparrows, house cats and pesticide spraying in agricultural areas.

Project Goals and Why Cowichan

The Cowichan valley is one of the last places with suitable habitat on Vancouver Island though there is potential to expand beyond the valley in the future. The goal of the project was to produce a self-sustaining population. The whole project was based on three main sites including a large host population in Washington outside of Tacoma, the San Juan islands and the project in Duncan. The hope is that all three sites will provide one larger population and birds will mix.

Nestbox stewardship program

The nestbox stewardship program addresses the urgent need to replace missing natural cavities and engages landowners and community members in Garry Oak habitat stewardship. Providing artificial cavities is key to sustaining a reintroduced population of bluebirds and benefits a

number of other native cavity nesting birds that are also in decline. Currently, Cowichan has 242 boxes over ~75 properties on private lands.

Translocation Program

Bluebirds were captured using mist nets and transported in bird cages from Washington State. The birds were placed in an aviary that resembles natural bluebird habitat for 1-3 weeks and were fed meal worms. Each translocated adult and Cowichan born juvenile is color banded to track who returns the following season and how old they are etc.

Five Years in Review (2012-2016)

2012 - Pilot

- 4 breeding pairs and 9 young were released into the Cowichan Valley
- 1 pair with young decide to stay and establish a second nest...
- Four eggs hatch – the first Island-hatched bluebirds in 17 years!

2013

- 5 Western Bluebirds arrive on their own
- 28 bluebirds are released: 9 pairs, 10 young
- 5 successful nests fledged 22 island-hatched young
- For the first time, both returned and released bluebirds are establishing successful breeding territories.

2014

- 8 Western Bluebirds arrive on their own
- 32 bluebirds are released: 9 pairs, 15 young
- 8 successful nests fledged 33 Island-hatched young
- 2 generations of returned and released bluebirds are nesting in the Cowichan Valley

2015

- 23 Western Bluebirds arrive on their own
- 20 bluebirds are released: 3 pairs, 14 young
- 11 successful nests fledged 52 Island-hatched young
- For the first time, the majority of young on the island were produced by returning birds!

2016

- 28 Adults return on their own
- 96 eggs with 67 juveniles assumed fledged
- 11 breeding territories with 20 nest attempts, of which 16 were successful
- First ever bluebird pair to establish an unassisted breeding territory (No GOERT boxes or assistance on first clutch)
- First ever unbanded female to come to the valley on her own!

2017

- 18 known adults
- 34 fledged juveniles
- 64 eggs laid
- 12 nest attempts
- 7 nesting pairs
- No translocations
- Majority of box monitoring completed by volunteers

- First adult female arrival from San Juan Island (unfortunately sterile). This shows intermixing is happening between all of the populations.

Population Support

Predator Protection
and Supplemental
Feedings



Population support

To support nesting bluebirds, predator protection with cones or PVC sleeves on a freestanding post is used to prevent squirrels and cats from entering the nestboxes. House Sparrows are deterred using two pieces of doweling with strips of Mylar. This bothers House Sparrows but not the bluebirds. When a nest has juveniles, supplemental feedings are provided by leaving out mealworms to ensure healthy fledglings.

New for 2017

A Cowichan Valley Naturalists' Society trail monitoring network pilot has been established for continuing monitoring efforts on bluebird populations. Relations with landowners and volunteers from the CVNS have improved. A box monitoring workshop and year-end appreciation event were hosted for the end of the bluebird season to thank volunteers. Currently, the project aims to pave the transition to grassroots, volunteer based programs for the future. Other activities in 2017 include local fundraising with burger and beer specials and a bluebird display at The Raptors in Duncan.

www.cowichanbluebird.ca

How can **You** help bluebirds?

1. Discourage house sparrows
2. Keep cats indoors
3. Plant native fruit-bearing shrubs and Garry oak trees
4. Get involved with the project: host a nestbox, volunteer, donate
5. 'Like' the CVNS on Facebook and report sightings to the Cowichan Valley Naturalists' Society
6. Make a donation and attend fundraisers
7. Join the Cowichan Valley Naturalists' Society



10. What does the tweet say: the role of framing in social media science communication and implications for GOERT

Alina Fisher, University of Victoria



Introduction

Alina joined GOERT in 2016 as the Bring Back the Bluebirds Project Coordinator. Alina is a researcher, ecologist, and mom to two spirited young girls. Alina comes from a population ecology and community ecology background, and recently completed her Masters of Professional Communications at Royal Roads University using GOERT as a case study. Her talk presents some of her research findings from her recent graduate work.

Social media for conservation efforts

People rally behind conservation efforts when wildlife are charismatic like this panda bear or harp seal pup. Cognitively, we know that other species are more endangered like the Mississippi gopher frog but charismatic megafauna tug at our heartstrings. The Western Bluebird falls in between the charismatic effect of pandas and scary-looking endangered peacock tarantulas. NGOs that are successful in protecting species are effective at communicating with the public and rallying for support.

Social media can be a homogeneous environment to discuss what you're interested in, creating an echo-chamber of similar worldviews.

Science communication is often assumed to be the same as science education. Rather, scientists and NGOs often repeat their messages over and over without successfully engaging others in the conversation. Persuasion puts up barriers, and the way science communication is set up is in a binary way that is confrontational. The use of invitational rhetoric is deliberate and can affect engagement in a more meaningful way.

When using social media, is there a difference in where attention lays? Is there a difference in what scientists and their target publics consider a good post?

Research questions

- Do scientists and their target audiences derive the same understanding from social media content?
- Are decisions about the quality of a social media post effected by background knowledge or experience?

In other words, do scientists make their decisions on the quality of a post based on information presented, while members of the public may make their decisions on other aspects of the post?

Methods: Focus groups

Focus groups are good for collecting qualitative data and to discuss what meaning is taken from presented social media material.

Methods: Surveys

To quantify preferences, respondents were given messaging pairs framed differently to compare and respond along a Likert scale from 1-5 on a number of measures including engagement and informativeness.

All grouped by scientists, science literate, and the public.

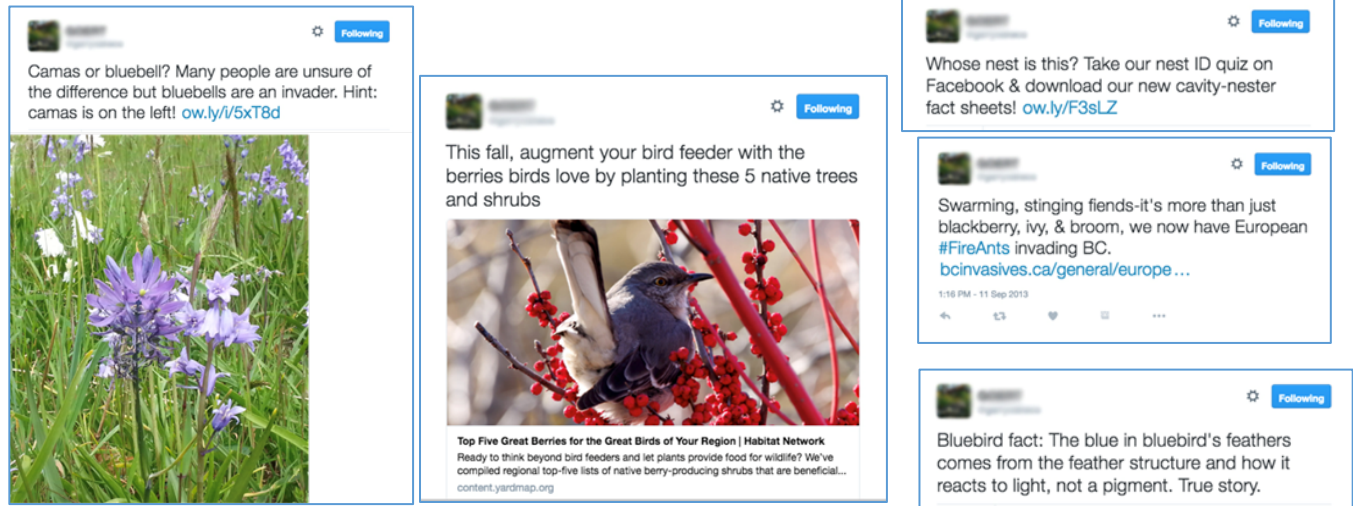
There is a lot of similarity and agreement among the groups over the definition of conservation. Public groups were more utilitarian in their views, keeping wildlife separated from areas used by humans, and natural resource use. The public group identified a need for advocacy and education and funding.

Understanding of conservation issues

Did it differ between scientists and the public? One question posed to respondents was that “statistics show a reduction in bee populations in Canada. This has an impact on native birds because...?” The public group had a good underlying knowledge of conservation issues but also acknowledged their knowledge deficit. However, there’s not necessarily a deficit in knowledge.

What is the difference between understanding an issue and acting on an issue?

The way information is presented matters. There is an assumption that a social media post can be informative or engaging but it can be both.



Which tweet had the most impact?

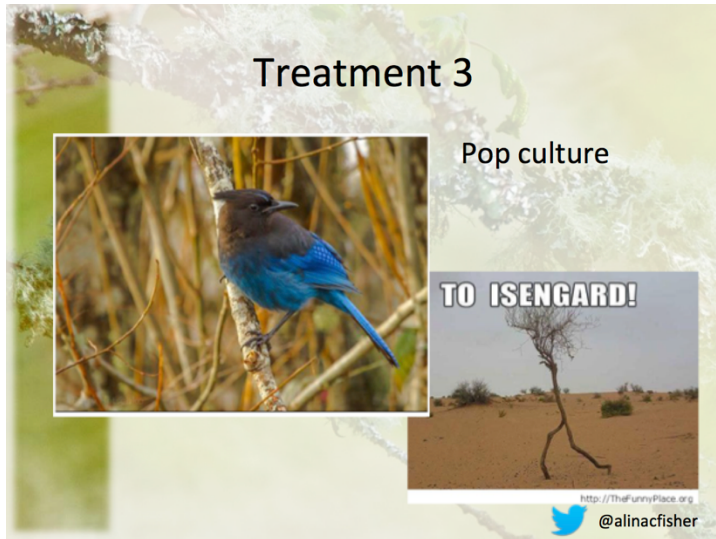
The public responded to the tweet about berries attracting birds. Scientists found that few tweets were equally impactful. The scientists found that the ants tweet was the most important where the public and science-literate groups found several were important. The tweet most likely to motivate was the berries tweet for the public. Responses differed between all of the groups in terms of their responses to the tweets.

Framing is used to appeal to different audiences

1. Fearful, sensational appeal to conservative minded individuals
2. Polarizing topics
3. Pop culture (humourous)
4. Concise, personal

Example: An original post with a Stellar's Jay told you about Stellar's Jays role in Garry Oak dispersal through caching acorns

Treatment of humour – reference to Ents from Lord of the Rings



Summary Results

Survey results tell us that the response to contentious or fearful topics will be based on gender. Scientists, science-literate, and the public have similar ways of defining conservation and were well aligned in understanding conservation issues. Scientists and NGOs need to bridge the gaps with their audience in communicating. We need to reach hearts to change minds. We need to use social media consistently, and show that we value our audience's opinions and engage with them. We need to be social and use them differently than other media types. We can use humour to connect and we need to be succinct with our messages.

11. Uplands Park Bioblitz

Margaret Lidkea, Friends of Uplands Park



Introduction

Margaret Lidkea is one of the founders of the Friends of Uplands Park which was established in 2009. Margaret is well known for her work, as far back as 1993, in organizing Broom Bashes at Uplands Park with the Girl Guides, and, for her ongoing work with local schools where she shares her knowledge of the rare Garry Oak ecosystem found in Uplands Park. Her talk summarizes the Victoria Bioblitz 150 findings for this area.

Canadian Wildlife Federation

Bioblitz Canada partners aim to help Canadians learn about and connect with nature. During Canada 150 there were 35 bioblitzes across the country, and Victoria's bioblitz was the first.

Victoria Bioblitz 150

The Victoria bioblitz was organized by GOERT members Britton Jacob-Schram, the University of Victoria Restoration of Natural Systems Program, Sierra Club and Catherine Koegan. The event was held at the University of Victoria and led by Jake Mentz, Beaconhill Park led by Britton and Catherine, and at Uplands Park led by Margaret Lidkea, FOUP.

Bioblitz Prep for Upland's Park

Posters were sent out around Victoria in the Oak Bay newspaper and other places to spread awareness of the event. Part of the mandate of the event was to encourage connectivity.

Friends of Uplands Park (FOUP) was created to provide opportunities for protection and education with 13 members. FOUP led the event at Uplands Park which is 75 acres and



includes GOE and rare maritime meadow, rocky marine foreshore of cattle point. Uplands park also has 24 rare plants. RNS student Wiley Thomas provided his expertise and used flagging tape to mark sensitive habitats for the event.

Public Data Sheet

Biodiversity Survey		
MS	Coniferous Trees Marine invertebrates - Mollusks - chum salmon - silver salmon - alewife - herring - blue crabs - bay anchovy - bay anchovy - bay anchovy	Grasses - Alfalfa - alfalfa - alfalfa - alfalfa - alfalfa - alfalfa - alfalfa - alfalfa - alfalfa
MS	Birds common - harbor seal - harbor seal - harbor seal - harbor seal - harbor seal - harbor seal - harbor seal - harbor seal	Mammals - harbor seal - harbor seal - harbor seal - harbor seal - harbor seal - harbor seal - harbor seal - harbor seal
	Worms and slugs	Reptiles (example: snake)

Time to count

The bioblitz day was cold, wet, windy and cloudy. Tents were erected by volunteers. Approximately ~ 50 participants attended, most did not use cell phones or make lists because of the rain. Public data sheets were available for inventorying species.

Kem Luther identified mosses for the day. Geoffrey and David Newell recorded birds. A Killdeer was spotted at Cattle Point along with Japanese wireweed (algae) and hermit crabs. Octavio Cruz identified rocky foreshore species and involved the public. Octavio Cruz identified rocky foreshore species and involved the public. Sean McCann and Catherine Scott identified spiders and insects, recording a Western black widow spider.

Use your citizens wisely



iNaturalist – Uplands Park

• Experts	Observations	Species
• Geoffrey +David Newell – birds	61	59
• Kem Luther – mosses, lichens	47	44
• Sean McCann + C Scott – spiders, insects	15	9
• Octavio Cruz – marine foreshore	9	9
• Total	132	122
• Bioblitz Total - +UVic, Beacon Hill	481	275

Challenges

Some of the challenges of organizing the event were the short lead-up time, lack of volunteers, media, exposure, limited time to invite committed groups (only 4-5 experts could come). Hosting the event on Earth day and it being the first bioblitz presented some organizational challenges and the paperwork required was extensive and should be simplified in the future. Having a rain-day option might be worthwhile in the future since the weather likely reduced the volunteer turnout.

Citizen science value

Bioblitz events are valuable because they allow locals to contribute to research and active projects in their community. These events maximize the data that can be collected and volunteers assist scientists in physical work while connecting to nature and gaining hands-on skills and scientific education. Getting locals outdoors and contributing to local conservation creates a sense of place, belonging, and love, and promotes stewardship within the community.

Naturehood

Nature Canada created a program called Naturehood to try to bring people and wildlife together. Naturehood inspires people to look after the natural areas in their neighbourhood, and helps humans and wildlife live together. The Victoria Harbour Bird Sanctuary is the oldest migratory bird sanctuary on Canada's Pacific coast and recently recognized as a Naturehood! There have been 15 selected in Canada.

Get Involved at Uplands Park

In the future, bioblitz's may be hosted for specific categories like fungi, insects and spiders etc. Other citizen science needs include science education, habitat restoration, invasive plant removal, planting of native plants and volunteers at future events.

12. Ecosystems on the Edge - Restoring Coastal Sand Ecosystem on Sidney Island

Pippi Lawn, Gulf Islands National Park



Introduction

Pippi Lawn works as Coastal Sands Ecosystem Project Manager for Parks Canada and presented her work on the Ecosystems on the Edge project restoring coastal sand ecosystems on Sidney Island.

Coastal Sand Ecosystems (CSE) are at risk

Key ecological attributes of CSEs include sparsely vegetated ecological communities, sand movement, low profile herbaceous vegetation, shorebirds, and maintenance of species at risk populations. CSEs tend to be in poor condition with extensive of human impact and invasive species affecting habitat quality. There are many associated species at risk including threatened common nighthawk that nest directly on the sand. Other species include Edward's beach moth, endangered contorted pod evening primrose, threatened silky beach pea, and red listed yellow sand verberna.

Threats to coastal sand ecosystem

Healthy sand ecosystems need open patches of sand with vegetation, not too many trees or shrubs, and sand movement. Some of the threats facing CSEs are encroachment and stabilization, loss of sand movement and bare sand. Invasive plants such as Scotch broom and European beach grass change the structure of the beach and the terrestrial ecosystem. These plants stabilize the sand by binding sand too tightly together and consequently lose sand spaces that species need to survive. Woody debris from the logging industry also has an impact on CSEs as well as deer browsing, trampling by visitors, and mosses that are squeezing out important species like evening primrose.

Key Project activities

The Ecosystems on the edge project is a 2-year long project that involves invasive species management and habitat augmentation on Sidney Island. Some of the objectives include removing Scotch broom and European beach grass, improving habitat for species at risk, augmenting habitat with additional seed, installing signage, removing barriers, keeping people from the site, and engaging with partners and volunteers.

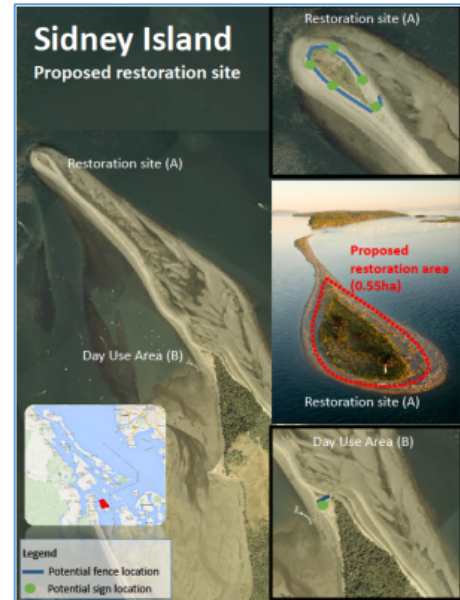
Invasive plant removals

All Scotch broom has been removed from the sites using hand saws and brush saws. An area of 3000m² was treated and biomass removed was burned in the spring with minimal re-sprouting. The broom had to be cut very high, and the loppers weren't strong enough for thicker trunks.

An area approximately 500m² has been treated for the removal of European beach grass. Regular treatments are needed because they keep re-sprouting from the rhizomes; however, there has been an immediate response from species at risk. The treatment is considered a partial success for now. Spading forks and shovels are currently used to get at the rhizomes as much as possible where the use of machinery disturbs species at risk.

Volunteer program

The Sidney Island project has been working with over 13 organizations including UBC and UVic parks clubs, the Greater Victoria Green Team, UVic Field School, Shawnigan School, Glenlyon School, Parkland Secondary, Camosun and UVic classes, Volunteer Victoria, Fort Rodd Hill volunteer list, and the Canadian Society of Ecology and Evolution. Approximately 241 individuals and 29 events have contributed 1480 volunteer hours to the project over the past year. Most events are in the fall and spring and many of the volunteers are returning. In the summer, Common Nighthawks are trying to nest so events are scheduled to avoid this important time.



Augmentation of SAR populations

Augmentation of rare plants populations has been done by sowing additional, nursery-grown seed onto prepared habitat. Augmentation is in partnership with the Species at Risk Nursery at Fort Rodd Hill and some of the seed planted to date include endangered contorted-pod evening-primrose and red-listed American glehnia.

Incredible response of contorted-pod evening primrose

Project activities such as habitat improvement and augmentation resulted in 950% increase in annual population counts this year relative to previous years. A vast meadow developed with over 30,000 new plants.

Signage and Fencing

Closure signage was installed around the perimeter of the restoration site. Fencing materials were purchased and are scheduled to be installed this winter using upright 4x4 planks at infrequent intervals with rope. Interpretive signage will be developed and installed this winter as well.

Monitoring – UAV surveys

UAVs were used for scientific purposes to map 3D models of substrate and document changes. In National Parks there are drone restrictions with the exception of permits for research. It can be difficult to get permits approved because of the proximity to airspace from Sidney Island. The drone work was done in collaboration with Mike Collyer at Pacific Rim National Park Reserve. The drone took images with 3 cm resolution which were used to create 3D maps of sand showing how the shape of the profile might change with restoration efforts. This data can be used to improve vegetation mapping.



Monitoring – Vegetation, Species at Risk

Vegetation monitoring has been conducted on Sidney Island to record restoration efforts. There has been a decrease in cover of invasive shrubs/trees from 59% to <1% since the project began. Species at risk monitoring has occurred for the expansion of yellow-sand verbena and population increases for contorted-pod evening primrose and silky beach pea. There are stable counts for nesting pairs of Common Nighthawk.

Regional collaboration

There are a number of organizations doing CSE restoration including Island View Beach (CRD), James Island (Nature Conservancy Canada), TŁXEN (Tsawout First Nation), CSE recovery team, SAR nursery, and Pacific Rim National Park Reserve. They are great resources for sharing ideas for restoration, mutual site visits, resources, hosting workshops, and further collaboration.

13. Dynamics of the mycoflora in the Coastal Douglas-fir zone during wet and dry years

Oluna Ceska and Adolf Ceska

DYNAMICS OF MYCOFLORA IN THE COASTAL DOUGLAS-FIR ZONE MACROFUNGI INVENTORY PROJECT ON OBSERVATORY HILL 2004-2017

OLUNA & ADOLF CESKA
GOERT Colloquium UVIC
November 17, 2017

Observatory Hill (also known as Little Saanich Mountain) is a hill on the outskirts of Victoria, BC, Canada, elevation 224 m. In 1913, Canadian astronomer J.S. Plaskett selected this hill as a site for a large, 1.83 m telescope. The observatory and the telescope were finished in May 1918. Since 1995, Observatory Hill has been the site of the NRC Herzberg Institute of Astrophysics (HIA). The research facilities are clustered on the top of the hill, and relatively large areas have been left undeveloped in order to provide good conditions for astronomical observation.

The western slope of the hill hosts several rare species of vascular plants, bryophytes, insects, and vertebrates. Several species of vascular plants and two bryophyte species have been recorded and monitored in the Species At Risk Act (SARA) registry. When the HIA astronomer Dr. Paul Feldman realized that no federal funding agency would support a similar mycofloristics project, he initialized our survey with a small fund from the HIA budget.



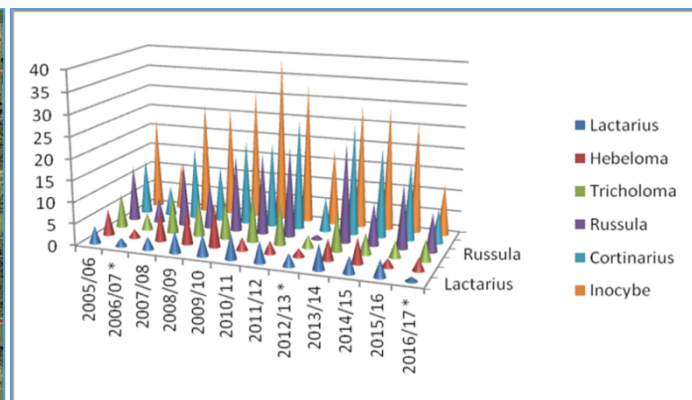
UBC HERBARIUM

9,820 ACCESSIONS TO THIS MOMENT (5,323 from Observatory Hill)



From November 27, 2004 to November 2017, we made over 440 collecting visits to Observatory Hill and recorded/collected about 1,400 species of fungi. With its duration and intensity of collecting this project is unique in North American field mycology.

Any mycofloristics project of this scale requires a solid academic base (in this case it was the University of British Columbia Herbarium with Prof. Mary Berbee as Director), and a large number of mycologists who specialize in certain groups of fungi. We actively cooperate with several taxonomists. This cooperation already resulted in several newly described species of fungi and more taxonomic innovations are being prepared for publication.



We started this survey just in time to catch the onset of global warming. In Victoria, we have very dry summers and the length and intensity of the drought is a very important factor in the number of species that are fruiting in fall. In a graph with the most common mycorrhizal species, the number is dropping in the years when there is drought. In 2012-13 there was a big drought, the same in 2016, and in the autumn following such drought, we have observed a sharp decline of decline in numbers of mycorrhizal species. Non-mycorrhizal species are more resilient to the weather changes. There is almost the same number of non-mycorrhizal *Mycena* or *Galerina* in those dry years as they are in wet years.

14. Massive dying of Arbutus on Observatory Hill and elsewhere

Oluna Ceska and Adolf Ceska

MASIVE DYING OF *ARBUTUS MENZIESII* ON OBSERVATORY HILL

MACROFUNGI INVENTORY PROJECT
ON OBSERVATORY HILL 2004-2017

OLUNA & ADOLF CESKA
GOERT Colloquium UVIC
November 17, 2017

Introduction

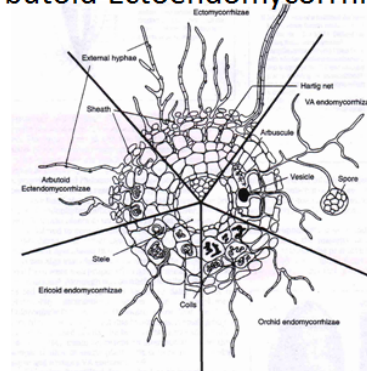
Adolf and Oluna Ceska have been inventorying and describing macrofungi on Observatory Hill for over 10 years. Adolf presents their observations of the rapid Arbutus die-off on the hill and possible causes for this phenomenon.

Recent die-off

Lately there has been a very rapid die-off of arbutus on observatory hill. Could this be happening in other areas? One suspect is global warming. Increased snowfall last year may have contributed to arbutus deadfall. Arbutus is a very interesting tree with different mycorrhizae called arbutoid. In spite of this, it shares fungi with Douglas-fir and Garry Oak. Most of Douglas-fir and Garry Oak mycorrhizae has the fungus growing as a mantle around the root. One mushroom can produce two types of mycorrhizae for both species.



Arbutoid Ectoendomycorrhizae



Tubaria sp.

Earlier there was a *Tubaria punicea* project as a result of a bioblitz. It was studied by Brandom Matheny and Joe Ammirati at the University of Washington in Seattle.



How to look for *Tubaria*

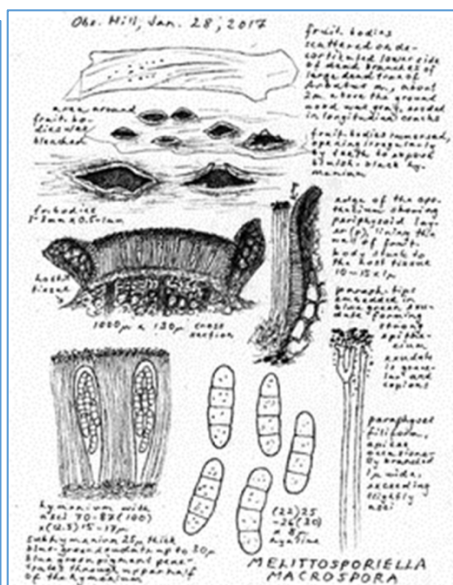
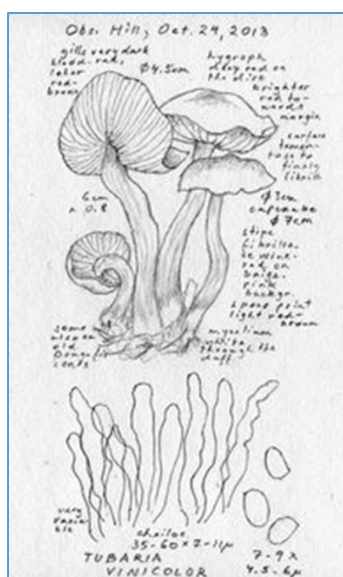
- At the base of eroded madrone (*Arbutus menziesii*) trees
- From the end of October to the beginning of March
- The optimum time is in November/December

Tubaria grows in arbutus trees and might be contributing to the decline of arbutus. Based on those specimens collected, *Tubaria punicea* was separated from *Tubaria vinicolor* growing on old leaves and cones. Oluna found it growing not far from the other *Tubaria punicea*. The difference between the two requires further investigation.

Other fungi

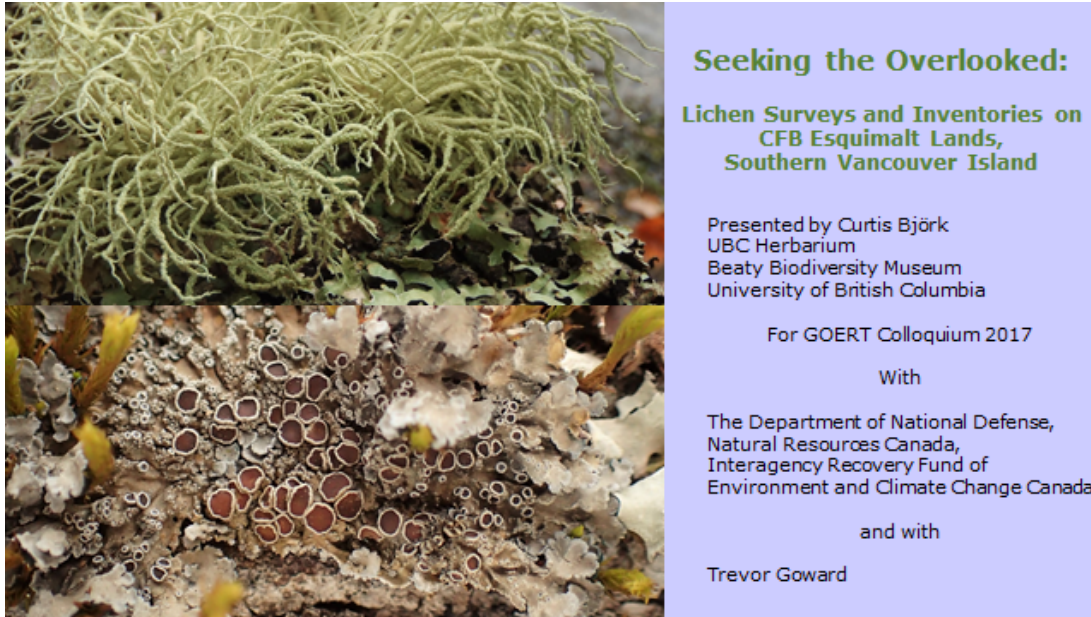
Antrodia malicola is rare and grows on dead arbutus on observatory hill. *Orbilbia vibriones* grow in desert areas and on arbutus there are several species haven't been described yet. They are very small.

There were quite a few dead Douglas-fir on observatory hill. The cause could be an accumulation of several dry years back to back.



15. A lichen inventory of the DND properties on Southern Vancouver Island

Curtis Bjork, Natural Resources Canada



Introduction

Curtis Bjork is a Research Associate with the UBC herbarium and a trained vascular botanist who took up the study of lichens in 1999. For the past 20 years, Curtis has worked as a botanical consultant over a wide area of the western U.S. and, more recently, in British Columbia. His talk provided an overview of lichen surveys on CFB Esquimalt lands.

Lichen diversity

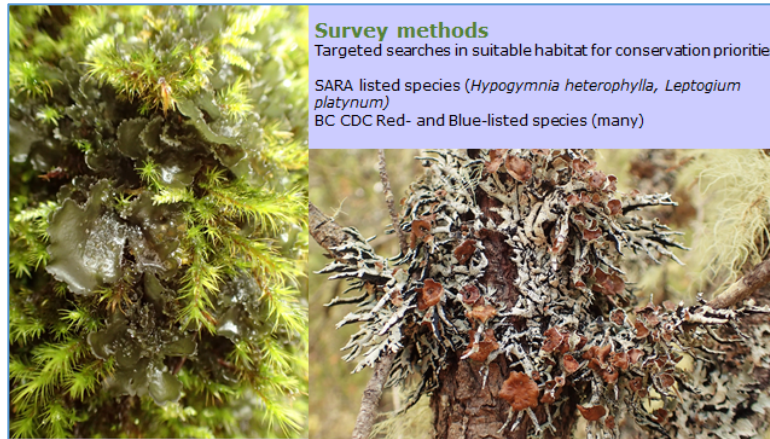
Lichens are a symbiosis of at least one fungus. Recent discoveries have found that in a major subset of lichens there is a second obligate fungus that has determinative power over the phenotype of the lichen. They are very diverse in forms and lichens as a whole are not a taxonomic group but rather a set of conditions that share commonalities. There are ~40,000 species of lichens globally and 2,800-3000 species in BC. They are fussy organisms probably because of their status as symbiotic organisms. Lichens can “see” 20-30 habitats; different rocks and trees can have totally different lichens in the same habitat.

Lichen on Vancouver Island

Rocky Point, Albert Head and Mary Hill are the CFB Esquimalt properties. The Albert Head project is complete and field work is currently done on Rocky Point and Mary Hill inventorying lichen species. Most of the coast of Vancouver Island is very damp after rainfall, especially in forest understorey. The Strait of Georgia has an air quality problem and lichens are sensitive to air pollution. It's especially bad in on the mainland where there are lichen dead zones in areas with too much sulphur dioxide and other pollutants. The three sites being studied for lichen have good air circulation.

Threats to lichen

Pollution, logging activities, and invasive species all have an impact on lichen. Trees with too much English ivy exclude lichens that would otherwise be there and Daphne affects lichen that would grow close to the ground.



Lichen Surveys

There are two purposes for conducting surveys. One is to look for SARA listed species/species of concern. Surveys are targeted in areas that would be the most likely to have high conservation status species. The second purpose is to inventory all species and to determine if there are any other species of concern there. During the two years of the project approximately 3,000 specimens were collected. Shoreline habitats are good for lichen diversity because of salt spray. Lichens are very chemically sensitive and some are demanding of high nitrogen. A forest of alders will have different lichens than a forest of Douglas-fir, but regardless of forest type the types of trees lichens choose has to do with the bark or wood chemistry. Each tree has their own suite of lichen species and different rock types, habitats, and exposures lead to enormous diversity. For example, at Rocky Point there is a small exposure of Gausson that has its own lichen growing on it.

Group	Genera	Species
Chlorolichens	34	121
Cyanolichens	17	55
Mesolichens	7	10
Macro+Meso	58	186
Crusts, chlorococcoid	59	237
Crusts, trentepohlioid	10	23
Crusts, total	68*	260
Calicioids	6	9
Lichenicoles	6	8
Basidiolichens	1	2
Microlichens total	75	279
Total lichen taxa	139	465

Albert head has huge lichen diversity for just 1km², much higher than many other larger areas like the entire state of Nevada. Many species that have been found so far are new to science or new to North America.

Attendees

Individuals (Alphabetical by First Name)

Adolf Ceska
Adrian Small
Adriane Pollard
Agnes Lynn
Aimee Pelletier
Alina Fisher
Alwyn Rutherford
Amelita Kucher
Andrew Simon
Bill Scott
Brenda Constanzo
Brittany Boyd
Caitlin Bingham
Carmel Thomson
Carol Davies
Carole Rossell
Carrina Maslovat
Cathy Savage
Chris Junck
Chris Paul
Christophe Bjork
Christopher Justice
Colleen O'Brien
D. Cam Campbell
D Godfrey
Daniela Toriola-
Lafuente
Dave Lock
Dave Poje
Dave Polster
Don Eastman
Doug Adam
Emily Cameron
Eric Gross
Genevieve Singleton
Grace Ciarniello
Hal Gibbard
Ian Browning
Jaclyn Prentiss
Jacques Sirois

James Miskelly
Janet Simpson
Jay Rastogi
Jeff Skinner
Jenifer Penny
Jennifer Heron
Jessica Cheng
Jessica Mitts
Jillian Tuson
Joan Looy
Jocelyn Wood
Judity Carden
Julia Daly
Karen Jarvis
Kathleen Matthews
Kevin Moore
Kristen Miskelly
Laura Gretzinger
Laura Matthias
Lea Gelling
Lili Munn
Lisa Wielinga
Lori James Derry
Louise Goulet
Loys Maingon
Lucien Serban
Luise Hermanutz
Lynn Husted
Margaret Ferguson
Margaret Lidkea
Margot Cooper
Mark Aitken
Michael Bocking
Michael Wilson
Mike Meagher
Morgan Bocking
Nathan Fisk
Oluna Cheska
Pamela Spalding
Patrick Lucey
Pippi Lawn
Quirin Hohendork
Raj Prasad

Ren Ferguson
Rob Walker
Ryan Hetschko
Sam Munn
Sarah Cotter
Sheila Linder
Sonia Voicescu
Spencer Quayle
Susan Bernhardt
Susan Hannon
Sylvia Samborski
Sylvia Voicescu
Terri Hunter
Thomas Munson
Thor Henrich
Tracy Cornforth
Travis Muir
Trudy Chatwin
Tyler Innes
Victoria Morgan
Vitaly Ostroumov
Wayne Erickson
Winona Pugh
Wylie Thomas
Wynne Miles