Garryoak ecosystems recovery team

Research Colloquium 2012 Proceedings

Photo: Hailey O'Neill/Parks Canada

Pacific Forestry Centre
Canadian Forest Service
506 West Burnside Road
Victoria, BC
Canada

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Program

9th ANNUAL RESEARCH COLLOQUIUM
February 17th, 2012
Pacific Forestry Centre, Victoria

9:00 Opening remarks, *Conan Webb, Acting Chair of GOERT*

9:10 Welcome to Pacific Forestry Centre, *Kami Ramcharan, Director General, Pacific and Yukon Region, Canadian Forest Service*

9:15 PRESENTATIONS
Moderator: Chris Junck, Species at Risk Outreach Specialist, GOERT

Robin Annschild – Salt Spring Island Conservancy [CANCELLED]
Mt. Tuam Garry Oak Ecosystem Special Management Area

Helena Mahoney, Hailey O'Neill – Parks Canada
Fort Rodd Hill Camas Meadow Progress Report

Hoke Holcomb – Horticultural Centre of the Pacific (HCP)
Oak Savannah Habitat in the HCP Conservation Park

10:15 Announcements and Break

10:45 PRESENTATIONS

James Miskelly
Introduction to Garry Oak-associated Wetlands in Victoria

Elizabeth Elle – Simon Fraser University
Habitat Fragmentation, Pollinator Diversity, and Pollination in Garry Oak Ecosystems

Jennifer Lucas – University of Victoria
Holocene Vegetation History in a Dry Douglas-fir Forest

12:00 Announcements and Lunch Break

1:00 PRESENTATIONS

David A. Jordan – Trinity Western University
Dendrochronological Investigation of Coarse Woody Debris from Crow's Nest Ecological Research Area, Saltspring Island, BC

Cameron Reed – Trinity Western University
Linking Ecologically Sustainable Economic Activity and Restoration in Remnant Garry Oak Meadows on Saltspring Island, BC

Adam Martin – Centre for Natural Lands Management, Olympia, WA
Ghost Invasions: Legacy of *C. scoparius* Alters Plant Community Structure

2:20 Break

2:45 SPECIAL SESSION ON CONSERVATION PLANNING

Joe Bennett – Centre for Applied Conservation Research, UBC
Native and Exotic Plant Distributions in Garry Oak Ecosystems: Implications for Conservation

Peter Arcese – Centre for Applied Conservation Research, UBC
The Indirect Effects of Humans on Conservation and its Implications for Reserve Design in the Georgia Basin

Marlow Pellatt – Parks Canada
Using a Down-scaled Bioclimate Envelope Model to Determine Long-term Temporal Connectivity of Garry Oak (*Quercus garryana*) Habitat in Western North America: Implications for Protected Area Planning

Kate Emmings and Mark van Bakel – Islands Trust Fund
Navigating Site Selection in an Information Rich Area: Modeling Site Priorities for the Islands Trust Area

4:00 Announcements and Closing Remarks

POSTER PRESENTATIONS

The Value of a Comprehensive Volunteer Program for Imperiled Ecosystems
Audrey Lamb, Center for Natural Lands Management

Biodiverse or Barren School Grounds: Their Effects on Children
Sylvia Samborski, University of Victoria

The Importance of Collaboration for Restoration in the South Puget Sound Prairies: Native Plant Nurseries
Laney Widener, Center for Natural Lands Management South Puget Sound Prairies Program

Habitat Surrounding Oak-savannah Fragments Influences Pollinator Community Composition
Julie Wray, Simon Fraser University

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Presentations

GARRY OAK MEADOW RESTORATION PROJECT WITH PARKS CANADA

Hailey O'Neill and Helena Mahoney
University of Victoria co-op students based at Fort Rodd Hill

Fifty-four hectares of land is protected within Fort Rodd Hill and Fisgard Lighthouse National Historic Sites of Canada. Significant examples of remnant Garry Oak and associated ecosystems exist on site and have been the focus of ongoing ecosystem restoration efforts managed by Parks Canada's Species-At-Risk Team over the last 10 years.

In 2010, the "Camas Meadow Project" was initiated with the goal of restoring both natural and cultural aspects of Garry Oak ecosystems. The development phase spans a period of five years and includes establishment of a native plant propagation program, site preparation, naturescape design, signage, development of monitoring methodologies, and ongoing community outreach opportunities.

The restoration site covers 1 acre of previously mowed turf field. Its high visibility will be used to increase the variety of experiences visitors can have at the historic site. Through interpretation and volunteer involvement, this project will increase public awareness of endangered Garry Oak ecosystems and add invaluable research to the fields of restoration and conservation.

OAK HABITAT IN THE HORTICULTURE CENTRE OF THE PACIFIC CONSERVATION PARK

Hoke Holcomb
Horticultural Centre of the Pacific

The Horticulture Centre of the Pacific (HCP) is a nonprofit society that has a 45-year lease on 42 hectares of crown land in the Municipality of Saanich. Throughout most of its 30 year history activities have focused on: (1) development and maintenance of about 2 hectares of demonstration gardens and (2) an education program that includes an accredited horticultural college. About 10% of the HCP land base is used to support these activities. In the mid-1990s the decision was made to develop the remainder 38 hectares of the land into a conservation area.

The resultant HCP Conservation Park includes endangered Garry oak habitat, the covenanted 18-hectare Viaduct Flats wetlands area and second growth coastal Douglas-fir (CDF) forest. The restoration plan developed for the park specifies the following habitat areas: riparian; open water - 9.7 ha.; water edge - 3.2 ha.; open meadow - 4.6 ha.; new CDF corridors - 2.5 ha.; second growth CDF - 12.2 ha.; oak savannah - 5.4 ha.; swale - 0.4 ha.

The area supports many avian species and the wetlands are a major migratory waterfowl stop. Increasing numbers of salmon have been returning to Colquitz Creek, and the HCP portion of this watershed is being rehabilitated as winter feeding grounds for Coho salmon fry. A small population of tiny cutthroat trout inhabits the inlet stream to the flats. A carefully planned trail and viewing station system has been developed to strike a balance between conservation and public access. The park and trail system are incorporated into larger conservation efforts including 130 ha Glendale Lands site. An effort to manage this conservation area as a functioning CDF forest is in early stages of development.

Development of the Park has been accomplished primarily with volunteer labour and grant money. Between 1997 and the end of 2009 about $220,000 has been spent on infrastructure development

and over $100,000 has gone into habitat restoration. Volunteer hours on restoration projects exceed 16,000. In 2001 the Conservation Park Volunteers were formed and they still work every other Saturday morning throughout most of the year. In addition to the 5.4 ha of oak savannah listed above there is about one hectare of scrubby Garry oak (oceanspray/moss habitat) distributed throughout the second growth CDF and other areas that may be rehabilitated as oak marsh. Thus, we are currently managing over eight hectares of oak habitat.

In 1997 this habitat was dominated by broom and blackberries, and is now more or less free of these plants. The 14 year years of invasive plant removal have been characterized by various research elements ranging from general interpretations of what is working and what is not to systematic, quantitative analysis of the most cost effective methods of dealing with these plants. We have recently reached an agreement with the Institute of Applied Ecology in Corvallis, Oregon to participate in a climate change study on Kincaid's lupine, an endangered oak savannah species. The only record of Kincaid`s lupines in Canada is four herbarium collections made in Oak Bay, B.C. between 1922 and 1929. The species is now believed to extirpated in Canada. Next fall we begin habitat performance trials of Kincaid's lupine seeds collected from three latitudes ranging from Oregon's Umpqua Valley to Washington's Chehalis Valley.

Further work on the Garry oak habitat at the HCP Conservation Park includes opportunities for projects ranging from continued invasive plant control through restoration planning to sophisticated experimental work.

INTRODUCTION TO GARRY OAK-ASSOCIATED WETLANDS IN VICTORIA

James Miskelly
Biologist

Oak-associated wetlands are an often overlooked component of Garry oak ecosystems in British Columbia. Wetlands are a feature of Garry oak ecosystems throughout the Georgia Basin/ Puget Trough/ Willamette Valley ecoregion and are present throughout the Canadian range of Garry oak. Given the scale of the historical conversion of both wetlands and deep-soiled oak parkland, oak-associated wetlands were probably much more common in the pre-contact landscape than they are today. Oak-associated wetlands contain some of the same species as vernal pools, as well as a suite of more generalist wetland plants. Species frequently observed in oak-associated wetlands in the Victoria area include *Carex exsiccata*, *C. obnupta*, *C. unilateralis*, *Eleocharis palustris*, and *Veronica scutellata*. These wetlands and the surrounding transitional areas also support many species at risk. Garry oak-associated wetlands should be considered in recovery planning, restoration, Garry oak ecosystem classification, and public education.

HABITAT FRAGMENTATION, POLLINATOR DIVERSITY, AND POLLINATION IN GARRY OAK ECOSYSTEMS

Elizabeth Elle
Simon Fraser University

Pollination is an essential ecosystem service, with close to 90% of flowering plants relying on insects for reproduction. Habitat fragmentation is expected to reduce the biodiversity of insect pollinators, and if so, the reproduction of wildflowers in small habitat fragments may also be reduced. We have surveyed pollinators in numerous remaining Garry Oak Ecosystem fragments both in the Saanich Peninsula and the Cowichan Valley, and have identified about 150 species so far (including some new to science). In a study of 19 fragments in the Greater Victoria area, we found that the diversity and abundance of some pollinators (primarily bees that nest either in the ground or in cavities in wood) declined with fragment size. Wildflowers in small fragments tended to produce fewer seeds, possibly because of reductions in bee diversity and abundance. However, experimental estimates of pollen limitation in common camas did not vary with fragment size, although plants were more pollen limited in fragments with high density of the invasive scotch broom. Finally, the type of landscape surrounding fragments—forest vs. urban or suburban neighborhood—affects the composition of the bee community within fragments, although not bee diversity or abundance. Different bee species may differentially utilize the landscape surrounding habitat fragments for nest sites (better in forests) vs. food resources (better in gardens). These combined results suggest that more attention should be paid to pollinator nesting requirements and the way they utilize both Garry Oak Ecosystem fragments and the surrounding landscape.

VEGETATION HISTORY IN A DRY DOUGLAS-FIR ECOSYSTEM

J. Lucas and T. Lacourse
University of Victoria

Paleoecological studies can provide high resolution records of forest dynamics over long temporal scales that can help inform management and conservation of protected areas, particularly in relation to vegetation responses to changing climate and fire regimes. A 9 m lake sediment core was collected from Roe Lake on North Pender Island to document long-term changes in forest composition and fire regime using fossil pollen and charcoal analyses in combination with radiocarbon dating. Preliminary data from pollen analyses show that early Holocene open woodlands were dominated by *Pseudotsuga menziesii*, *Alnus rubra,* and various herbaceous and fern species. *Pseudotsuga menziesii, Quercus garryana,* and *Alnus* spp. dominated increasingly closed middle and late Holocene forests, and were accompanied by *Thuja plicata* and *Acer macrophyllum*. *Q. garryana* reached maximum abundance on North Pender Island between about 7500 to 5000 calendar years before present. Charcoal analyses on the same sediments will reveal the island's long-term fire history and provide a fire return interval that could aid management of the dry forests of southwestern British Columbia.

DENDROCHRONOLOGICAL INVESTIGATION OF COARSE WOODY DEBRIS FROM CROW'S NEST ECOLOGICAL RESEARCH AREA, SALTSPRING ISLAND, BC

David A. Jordan
Trinity Western University
Department of Geography and Environmental Studies

Garry oak (*Quercus garryana* Dougl.) is the cornerstone species of one of Canada's most biodiverse yet threatened ecosystems. The Garry oak ecosystem in Canada is found only in extreme southwestern British Columbia on the southern Gulf Islands and on the eastern side of Vancouver Island. Trinity Western University's (TWU) Crow's Nest Ecological Research Area (CNERA) on Saltspring Island, British Columbia, consists of 29 hectares of spatially continuous forest habitats including four prominent Garry oak meadow patches within the conifer forest matrix and a number of probable remnant meadows. These remnant meadows, most likely resulting from conifer encroachment, were recently discovered and mapped as part of an on-going restoration and management program conducted by TWU. In order to better understand the temporal dynamics of meadow encroachment and to extend the existing CNERA tree-ring chronology backwards in time, a pilot project involving the dendrochronological assessment of coarse woody debris was initiated. Moreover, to test whether dead and partially decayed coarse woody debris could be accurately cross-dated with a living, site specific, tree-ring chronology, five trees, including one standing snag and four downed boles, were randomly selected from east Twin-Lichen meadow. Cross-sections, approximately 5 cm thick, were cut with a chain-saw and returned to the tree-ring laboratory at TWU for preparation and subsequent analysis using standard dendrochronological techniques. Garry oak wood anatomy, physiology, bark loss, and sapwood ablation made cross-dating challenging. However, four of the five cross-sections were successfully visually and statistically crossdated ($p < 0.01$). Individual series correlations of the crossdated sections range from 0.416 to 0.564. Marker rings, which are exceptionally narrow or wide rings useful for cross-dating, were positively identified on four of the cross-sections.

The most significant marker rings were 1884-1885, 1899, 1900-1909, 1954-1955, 1975, and 1982-1983. The absolute number of tree-rings ranged from 96 on Section 5 to 155 on Section 3. Approximate senescence dates were calculated on three of the five cross-sections still containing sapwood and bark, however, exact senescence remains approximate due to severe growth suppression around the terminal rings. Death occurred in approximately 1987 on Sections 1 and 4 and in approximately 2005 on Section 2. Section 5 with a pith date (initial year of growth) of 1808 and an outer ring of 1904 is notable for three reasons: (1) it extends the existing living tree-ring chronology backward in time by 17 years, (2) it highlights the durability (outer ring 1904) of Garry oak coarse woody debris as a potential source of dendroecological data, and (3) it contains a probable fire scar from 1864 which corresponds well with a known period of oak establishment on the property. Section 3 which is currently undated, exhibits no sapwood, and contains 155 annual rings, may well date into the mid to early 1700's. Confirmation of this hypothesis will have to await further sampling efforts of more coarse woody debris from the CNERA. This pilot project shows it is possible to successfully crossdate coarse woody debris from the CNERA with an existing living tree-ring chronology, thus extending the chronology backward in time and gaining valuable dendroecological data in the process.

RESTORATION OF REMNANT GARRY OAK (*QUERCUS GARRYANA*) MEADOWS ON SALTSPRING ISLAND, BC, THROUGH SELECTIVE HARVESTING OF DOUGLAS-FIR

Cameron Reed, David A. Jordan, and Geraldine J. Jordan
Trinity Western University
Department of Geography and Environmental Studies

Trinity Western University's Crow's Nest Ecological Research Area (CNERA), located on Saltspring Island, BC, is home to over 40 acres of current and remnant Garry oak meadow ecosystems. Our research builds on previous studies which reported extensive conifer encroachment throughout the existing meadows. The encroachment by conifers, especially Douglas-fir, is largely related to the suppression of a historical fire disturbance regime. The rate of Douglas-fir encroachment endangers the survival of many Garry oaks and dependent biological communities. In a pilot project conducted during the fall of 2011, firs felled in 2009 were removed from the largest existing meadow on the property utilizing low disturbance, hand-logging techniques. Logs were milled locally on Saltspring Island in cooperation with a local eco-forester and a number of small wood products were crafted and locally marketed. The main goal of our project is to provide an innovative way forward for Garry oak restoration efforts on the CNERA as a long-term management strategy which includes the selective harvesting of Douglas-fir from the existing and remnant meadows. Our approach uses three main methods: (1) a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis with stakeholder input, (2) geographical information system (GIS) analyses to determine standing conifer volume and optimal harvesting locations, and (3) identification of sustainable harvesting techniques suitable for the sensitive ecology and rugged terrain of the CNERA. It is hoped that our study will provide an impetus for the implementation of restoration measures by linking them to ecologically sustainable economic incentives.

GHOST INVASIONS: LEGACY OF *C. SCOPARIUS* ALTERS PLANT COMMUNITY STRUCTURE EVEN AFTER RESTORATION

Randall A. Martin
The Center for Natural Lands Management

The spatial and temporal impacts of invasions are a fundamental question in invasional ecology. In this study we used the initial invasion of a landscape and subsequent removal by restoration as a natural experiment to evaluate legacy effects of an N-fixing shrub on native and non-native plant community composition in a remnant prairie. Using a combination of GIS, orthophotography, and plant community sampling we evaluated how areas historically invaded by *Cytisus scoparius* differed from areas which escaped invasion, and how potential effects varied within a matrix of restoration management history. We found non-native plants at the community level were positively facilitated by a legacy, while native plants decreased or disappeared completely when there was a legacy. We also found the more intensive the restoration, the more magnified the influence of *C. scoparius* on community dynamics. Our findings suggest the impact of plant invasions can last well after their aboveground structures are gone, and belowground legacies can confound even intensive restoration efforts.

NATIVE AND EXOTIC SPECIES IN GARRY OAK MEADOWS: CURRENT PATTERNS AND RECOMMENDATIONS FOR PROTECTION AND MANAGEMENT

Joe Bennett
Centre for Applied Conservation Research
University of British Columbia

Protecting and maintaining the remaining high-quality Garry oak ecosystem (GOE) patches is vital to the survival of several rare species, and to the long-term persistence of the ecosystem itself. Exotic species are widely perceived as a major threat in the GOE. They are known to dominate some patches and may threaten rare species populations. Removal of invasive exotic species once they dominate can be expensive, time consuming, and in some cases, ultimately futile. In addition, dominance by exotic species may be the result rather than the cause of ecological degradation. Preventing dominance by exotic species therefore requires proactive efforts at understanding processes leading to their spread among and within patches.

Using survey results from 86 GOE patches in BC and Washington State, I compared native and exotic species distributions to test for the roles of environmental change, competition and latent invasions in native and exotic community patterns. I also tested for factors predicting the distributions of common native and exotic species, as well as rare native species. I found the following: 1) competition does not appear to be the primary factor leading to dominance by exotic species. Rather, exotic species appear to respond to environmental degradation, and native species still dominate the best-preserved patches. 2) Native and exotic species share many of the same environmental predictors at small scales. Therefore, efforts to manipulate the environment at small scales to favour native species over exotic species may be difficult. 3) At larger scales, the dominance of native species on more isolated patches means that time still exists to preserve these sites, some of which are still unprotected. 4) Rare species are also more often found on isolated patches, contrary to biogeographic theory. Thus, protecting isolated

sites probably represents the most efficient conservation measure to protect native diversity in the GOE.

INDIRECT EFFECTS OF HUMANS ON CONSERVATION AND IMPLICATIONS FOR RESERVE DESIGN IN THE GEORGIA BASIN

Peter Arcese
Centre for Applied Conservation Research
University of British Columbia

The direct effects of humans on native species and ecosystems via land conversion and harvest are well-documented, but the indirect effects of humans on native species distribution and the 'integrity' of natural ecosystems are still assumed to play comparatively minor roles. We highlight several case studies to demonstrate how humans indirectly affect the abundance, distribution and demography of native birds and plants in the Georgia Basin of the Pacific Northwest. For example, that the abundance of black-tail deer accounted for about half of all variation in native shrub species richness and cover across >230 study plots throughout and Southern Gulf Islands and Vancouver Island, and a large fraction of variation in bird species abundance. We then show how occupancy maps developed for widespread native species can be used in combination to estimate the indirect effects of humans on species richness and occurrence at broad spatial scales, and how these composite maps can be used to facilitate the prioritization of land management and conservation investments to maintain examples of native species communities. Our results indicate clearly how composite indexes based on native and exotic species distribution can be used to vastly improve existing methods used to identify high value conservation areas likely to contribute positively to maintaining 'ecological integrity' in future.

USING A DOWN-SCALED BIOCLIMATE ENVELOPE MODEL TO DETERMINE LONG-TERM TEMPORAL CONNECTIVITY OF GARRY OAK (*QUERCUS GARRYANA*) HABITAT IN WESTERN NORTH AMERICA: IMPLICATIONS FOR PROTECTED AREA PLANNING

Marlow G. Pellatt, Simon Goring, Karin M. Bodtker, Alex J. Cannon
Parks Canada

Under the Canadian Species at Risk Act (SARA), Garry oak (*Quercus garryana*) ecosystems are listed as "at-risk" and act as an umbrella for over one hundred species that are endangered to some degree. Understanding Garry oak responses to future climate scenarios at scales relevant to protected area managers is essential to effectively manage existing protected area networks and to guide the selection of temporally connected migration corridors, additional protected areas, and to maintain Garry oak populations over the next century.

We present Garry oak distribution scenarios using two random forest models calibrated with down-scaled bioclimatic data for British Columbia, Washington, and Oregon based on 1961 – 1990 climate normals. The suitability models are calibrated using either both precipitation and temperature variables or using only temperature variables. We compare suitability predictions from four General Circulation Models (GCMs) and present CGCM2 model results under two emissions scenarios. For each GCM and emissions scenario we apply the two Garry oak suitability models and use the suitability models to determine the extent and temporal connectivity of climatically suitable Garry oak habitat within protected areas from 2010 to 2099. The suitability models indicate that while 164km^2 of the total protected area network in the region (47,990km^2) contains recorded Garry oak presence, 1635km^2 and 1680km^2 of climatically suitable Garry oak habitat is currently under some form of protection. Of this suitable protected area, only between 6.6 and 7.3% will be "temporally connected" between 2010 and 2099 based on the CGCM2 model. These results highlight the need for public and private protected area organizations to work cooperatively in the

development of corridors to maintain temporal connectivity in climatically suitable areas for the future of Garry oak ecosystems.

NAVIGATING CONSERVATION SITE SELECTION IN AN INFORMATION RICH AREA: MODELING SITE PRIORITIES FOR THE ISLANDS TRUST AREA

Kate Emmings
Islands Trust Fund

The Islands Trust Area is a region of undeniable beauty which has attracted people for thousands of years. Part of the reason for its beauty is the rich diversity of life which makes the Islands Trust Area ecologically significant, not only locally, but globally. Most of the region is within the Coastal Douglas-fir zone, one of the rarest of British Columbia's 16 biogeoclimatic zones. The Douglas-fir ecosystems of this zone, including Garry oak and associated ecosystems, are globally rare – in the entire world they occur only on the east coast of southern Vancouver Island, the islands of the Georgia Basin, and a small area of the mainland. The Islands Trust Area is also home to several other sensitive ecosystems and hundreds of rare terrestrial and marine plants and animals.

Despite its ecological significance, biodiversity in the Islands Trust Area is exposed to some of the highest threat levels in British Columbia. With more than 65% of the Islands Trust Area in private land ownership and over 3.3 million people living in the surrounding areas, the pressures to develop and change the natural landscape in the islands are tremendous. In addition to these human-induced pressures, the region faces threats from stresses such as climate change and invasive species.

Because of the significance of the ecosystems found in the Islands Trust Area and the threats that they are under, conservation planning is an important tool to ensure that the natural beauty that draws so many to the region is not lost.

The Purpose of the Islands Trust Fund Regional Conservation Plan
The Regional Conservation Plan is a tool used by the Islands Trust Fund to focus its resources–staff, board, financial–on areas with the highest biodiversity values and greatest need for conservation. It will also be used by Islands Trust decision makers to support ecologically

responsible land use planning and has also been designed as an information resource for citizens and organizations working towards conservation of biodiversity within the Islands Trust Area.

Goals of the 2011-2015 Regional Conservation Plan

The 2011-2015 Regional Conservation Plan sets out seven long-term goals that reflect the enduring aspirations of the Islands Trust Fund to work with landowners and partner organizations to protect the rich biodiversity of the Islands Trust Area:

1. Secure core conservation areas that effectively conserve biodiversity priorities within the Islands Trust Area and within individual local trust areas or island municipalities. 2. Investigate the protection of biodiversity priorities on lands outside of core conservation areas, including working landscapes. 3. Work with partner organizations to conserve marine ecosystems and habitats. 4. Work with the Islands Trust Council, local trust committees and island municipalities to implement and accentuate Regional Conservation Plan goals and objectives within official community plans and land use bylaws. 5. Promote community participation in conservation within the Islands Trust Area through effective stewardship and management of private lands, information sharing and support of conservation education. 6. Support and enhance the work of conservation partners working in the Islands Trust Area. 7. Monitor and manage existing Islands Trust Fund conservation areas to maintain and enhance existing biodiversity and cultural features, with the understanding that ecosystems are continuously in a state of change.

Implementation of the 2011-2015 Regional Conservation Plan

To move towards these goals within the scope of this 2011-2015 Regional Conservation Plan, the Islands Trust Fund has developed a set of thirty objectives to be achieved in the next five years. Associated with each of these objectives is a set of measurable action items. These action items will guide the work plans of Islands Trust Fund staff and will serve as measures for evaluating the progress of the Regional Conservation Plan on a regular basis and at the end of five years. This evaluation will help to ensure that the objectives of the 2011-2015 Regional Conservation Plan will be met and that the Islands Trust Fund will continue to devote appropriate resources towards successful conservation of biodiversity within the Islands Trust Area. One of the measurable action items is the creation of a GIS based model to prioritize sites for conservation.

Site Prioritization within the Islands Trust Area

Because land prices in the Islands Trust Area are so high, the Islands Trust Fund began work on a prioritization model to identify high conservation value sites. The model uses Arc GIS Desktop as a platform for a multiple-criteria decision analysis (MCDA) of the landscape. MCDA is a means or standard for judging a single course of action where a number of conflicting spatial factors exist. The spatial factors used for the site prioritization model include measures for habitat composition (e.g. representative habitats, sensitive ecosystems, rare ecosystems, "naturalness" measures and habitat threat), spatial context (e.g. connectivity and contiguity measures) and cost (property values in $/square metre). The model has been built to incorporate adjustability, by weighting desirable factors higher than less desirable factors, and adaptability, by providing a framework for incorporating better and more diverse data layers as they become available. Once completed, the model will inform both the initiation of new conservation projects as well as reactions to opportunities that present themselves.

Poster Presentations

THE VALUE OF A COMPREHENSIVE VOLUNTEER PROGRAM FOR IMPERILED ECOSYSTEMS

Audrey Lamb
The Center for Natural Lands Management

Conservation organizations, particularly organizations operating in rare or imperiled ecosystems, can significantly extend the size and scope of restoration efforts, as well as have a positive impact on the local community by incorporating a dynamic, cohesive, and welcoming volunteer program into their conservation plan. I will discuss the added value of a volunteer program for prairie and oak woodland restoration efforts through: first-hand experience as a liaison between the Center for Natural Lands Management's (CNLM) South Puget Sound Program and their volunteer group, analyzing data measuring the impact of the volunteers in CNLM's restoration plan, and drawing on an extensive thesis examining the value of CNLM's 17-year volunteer program. It is vital to know how a volunteer program can enhance a non-profit's engagement with the local community, creating a prolonged and widespread restoration effort that extends far beyond the extent that a non-profit would be able to reach on their own, and thus centering the organization in a wider spectrum of committed restoration partners.

BIODIVERSE OR BARREN SCHOOL GROUNDS: THEIR EFFECTS ON CHILDREN

Sylvia Samborski
University of Victoria

Citation: Samborski, Sylvia (2010). "Biodiverse or Barren School Grounds: Their Effects on Children." *Children, Youth and Environments* 20(2): 67-115. Available through www.colorado.edu/journals/cye or email the author.

This child-centered study compares the effects on children of two Canadian public school grounds chosen for maximum variability of vegetation, one (Strawberry Vale Elementary) richly biodiverse, the other (Glanford Elementary) relatively barren. A total of 349 students (grades 1 to 7, aged 6 to 13) participated by 1) indicating their use of the school ground through drawings, 2) stating their preferences for various school ground elements through a survey, and 3) sharing their perceptions of each school ground through group brainstorming sessions and individual "walkabout" interviews on the grounds. Results of the analyses indicated that on the biodiversified school ground the quality of the children's outdoor experience was richer, the children's stated preferences more diverse and more oriented toward nature, and the use of their outdoor environment more complex. This was especially true for primary children (grades 1 to 3, aged 6 to 9) and intermediate girls, but less so for the intermediate boys (intermediate: grades 4 to 7, aged 10 to 13). The biodiverse school ground afforded children more opportunities for functional, constructive and symbolic play. It also offered children more places for reflection and conversation. This research has implications for curricular integration of environmental education and the healthy development of children.

THE IMPORTANCE OF COLLABORATION FOR RESTORATION IN THE SOUTH PUGET SOUND PRAIRIES: NATIVE PLANT NURSERIES

Laney Widener
The Center for Natural Lands Management

Over the past twelve years plant production has become one of the most important components of restoration of western Washington's South Sound Prairies, constantly evolving in scope and sophistication to meet the increasing demands of an entire region. A broad array of collaborative partners has and continues to support expanding production loads and research needs. Today, The Center for Natural Lands Management works closely with these partners at a number of production facilities including Shotwell's Landing Native Plant Nursery, Department of Natural Resources' Websters Nursery, Stafford Creek Correctional Center and other contracted sites. Along the way important lessons and strategies have been creatively explored regarding native plant seed collection, production, processing, storage, propagation and planting as well as native plant plug production, care and planting. Exploring each of these topics has solved many challenges, while simultaneously raising important questions for the future including seed sourcing and tracking, harvesting techniques and increased connectivity within and beyond our region.

HABITAT SURROUNDING OAK-SAVANNAH FRAGMENTS INFLUENCES POLLINATOR COMMUNITY COMPOSITION

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Fragmentation of natural areas via urbanization has the capacity to disrupt interactions among plants and animals. The surrounding matrix of urban or semi-natural areas can sometimes support biodiversity in fragmented landscapes, but this depends on species-specific traits and life history strategies. In the oak-savannah ecosystems near Victoria, BC, diversity of some pollinators is reduced in small fragments, but the importance of the surrounding matrix for pollinator diversity has not yet been examined. I used data on bees collected in 19 oak-savannah fragments to ask whether surrounding land-use type (forest, suburban and urban) affected their diversity or distribution. Ordination showed that oak-savannah fragments within forest matrix supported different bee communities than those surrounded by urban matrix. Forest-associated species included floral specialists, bees with larger body sizes, and those with earlier flight periods. There was a non-significant trend for increased body size in forest and suburban matrix fragments, and a trend ($p = 0.11$) for increased floral density and decreased bare rock within forest and suburban matrix fragments. I hypothesize that size differences between forest and urban matrix fragments are related to variation in resource requirements: large bees with greater resource requirements are found in fragments with more floral resources, while small bees are able to exist in areas of low resource availability. Future research will investigate the role of matrix quality and other factors that contribute to urban bee diversity by sampling pollinators in matrix habitats in addition to natural remnants.