2004 ANNUAL REPORT

DEPARTMENT OF NATIONAL DEFENCE

ESAC

ENVIRONMENTAL SCIENCE ADVISORY COMMITTEE

CANADIAN FORCES BASE ESQUIMALT

National Defence / Défense nationale

Canada

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Cover Photos:

Top Left:
Anise Swallowtail (*Papilio zelicaon*)

Top Right:
Slimleaf Onion (*Allium amplectens*)

Bottom:
Cages used for rearing Anise Swallowtails in the field

Inset:
Anise Swallowtail (*Papilio zelicaon*) larva

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EXECUTIVE SUMMARY

The Department of National Defence (DND) Environmental Science Advisory Committee (ESAC) for CFB Esquimalt was established in 1994 as a multi-agency technical advisory committee that reviews proposals and issues permits for environmental studies on CFB Esquimalt properties. Each year, ESAC collects, reports, and archives the findings of the research activities in a printed and web-based annual report. ESAC also acts as an advisory body to CFB Esquimalt on various environmental issues occurring on CFB Esquimalt properties, and serves as a gateway to a network of scientists accessible to Maritime Forces Pacific (MARPAC) staff.

In 2004, the Committee reviewed 16 proposals to conduct research and collection activities on CFB Esquimalt properties including the following studies:

- COSEWIC Status Report for Foothill Sedge (*Carex tumulicola*);
- Monitoring of Winter Moth (*Operophtera brumata*) and the Parasites Introduced for its Control;
- The Late Prehistoric Mortuary Landscape of Southern Vancouver Island;
- Distribution, Abundance and Adaptation of Butterflies at their Northern Range Limit;
- Purple Martin (*Progne subis*) Origins and Relationships; and
- Sharp-tailed Snake (*Contia tenuis*) Habitat Suitability and Monitoring Project on Federal Lands.

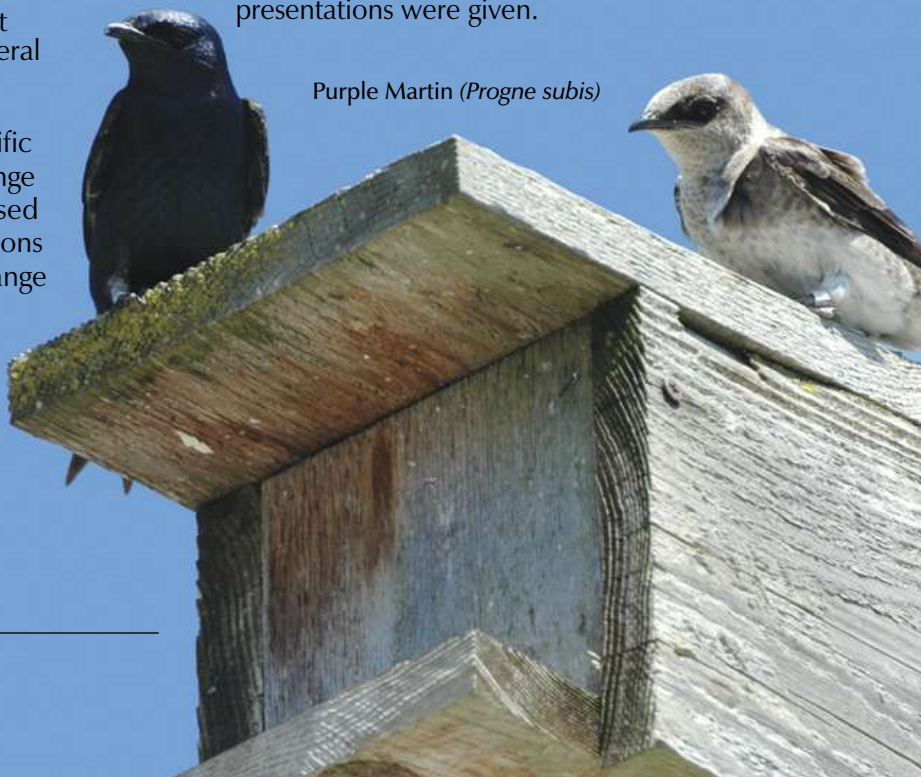
Each proposal was reviewed by ESAC for scientific content and forwarded to Base Operations, Range Control personnel to ensure that the proposed research did not interfere with military operations and activities. Once approved by ESAC and Range Control, each proposal was sent to the Base Commander at CFB Esquimalt for final approval. The Base Commander issued 16 ESAC research and collection permits to individuals and organizations authorizing environmental research on CFB Esquimalt lands.

This annual report is a compilation of the scientific reports obtained from each of these research projects in addition to a summary of the Committee's activities conducted throughout the year.

In 2004, an Environmental Assessment Project Evaluation Form was produced with the purpose of eliminating or reducing potential impacts on the environment before an ESAC recommended project commences. This project evaluation form will accompany all future ESAC applications. A new five-year Letter of Understanding (2004-2009) was prepared and signed by representative agencies and the Base Commander reconfirming ESAC as an official advisory body to MARPAC.

Where applicable, research findings obtained from research projects in 2004 were integrated into CFB Esquimalt's Natural Resources Geographic Information System (GIS) database. Several new coverages were integrated into the GIS and updated in 2004. The GIS database continues to be used for the production of practical maps delineating significant natural resources information that is readily available to MARPAC personnel.

To facilitate the sharing of this information, the Committee hosted its annual ESAC workshop on January 27th, 2005 at the Pacific Forestry Centre, Victoria, B.C. The workshop was a success with approximately 60 individuals in attendance, representing a wide variety of government and non-government agencies. A total of ten presentations were given.



Purple Martin *(Progne subis)*

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INTRODUCTION

Maritime Forces Pacific (MARPAC) constitutes Canada's Navy on the West Coast. Her Majesty's Canadian Dockyard at Canadian Forces Base (CFB) Esquimalt is home to the Navy's Canadian Fleet Pacific. The role of CFB Esquimalt is to support the ships of the Canadian Pacific Fleet and other key military units.

MARPAC is one of the largest government organizations in the Pacific Region, with 4,000 regular and reserve Canadian Forces members and 2,800 civilian employees. With approximately 4,200 hectares of land under its administration, distributed amongst 14 different municipalities and regional districts (Table 1), MARPAC has long acknowledged its responsibility to consider environmental impacts in the management of its training areas and in the planning and conduct of its activities. Efforts to minimize the adverse effects of training and operations, in conjunction with innovative management practices, will ensure continued protection and enhancement of the many remarkable natural areas and unique features located on CFB Esquimalt properties.

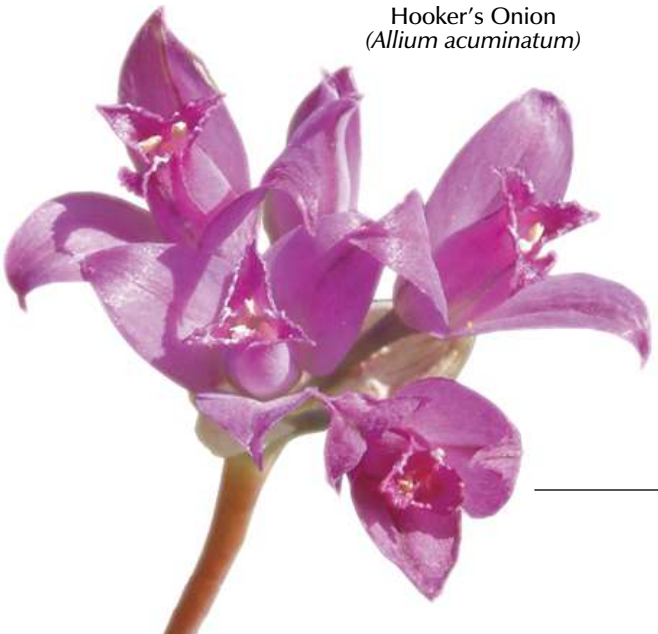
Over 3,200 hectares of MARPAC lands are forested. As human disturbance is minimal within these areas, they have become a refuge for many wildlife species.

Table 1: CFB Esquimalt Properties
Total Area in hectares (ha)

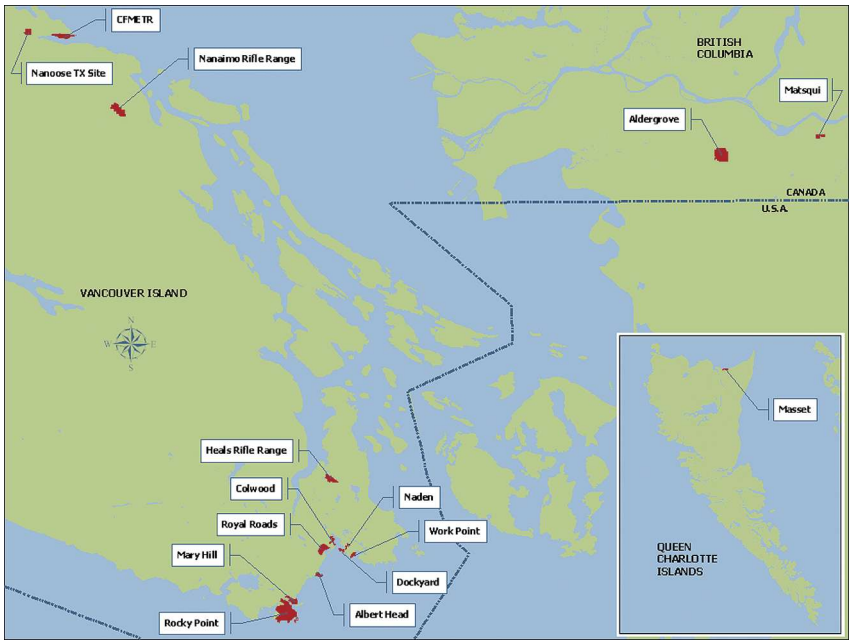
Albert Head	92.7
Aldergrove	514.0
Colwood	90.0
CFMETR / Nanoose Bay	288.4
Dockyard / Signal Hill / Yarrows	62.7
Heals Rifle Range	212.4
Mary Hill	178.1
Masset (Queen Charlotte Islands)	824.0
Matsqui	95.1
Naden	45.4
Nanaimo Rifle Range	351.0
Nanoose TX Site	105.0
Rocky Point	1078.0
Royal Roads	229.0
Work Point	66.0
TOTAL AREA	**4,232.8**

A number of CFB Esquimalt properties support remnants of sensitive ecosystems, such as Coastal Douglas-fir forests and Garry oak meadows, as well as a variety of rare flora and fauna, providing unique opportunities to conduct a number of environmental studies.

CFB ESQUIMALT PROPERTIES



Hooker's Onion
(Allium acuminatum)



BACKGROUND

Prior to 1994, various individuals and organizations carried out research on CFB Esquimalt properties. Research was ad hoc and the findings were not readily available to DND for its use in sound environmental management and decision-making. The recognized need for a process to track the research activities and associated findings resulted in the creation of the DND Environmental Science Advisory Committee (ESAC) for CFB Esquimalt, in 1994. Since then, ESAC has facilitated and coordinated environmental studies on CFB Esquimalt properties in conjunction with other environmental projects directly funded by DND.

The ESAC provides advice within the context of MARPAC's overall Natural Resources Program. This program encompasses the management of natural resources on CFB Esquimalt properties including rare species, sensitive ecosystems, forests, wildlife habitat, wetlands and riparian zones while ensuring sustainable military training and operations.

MEMBERS

ESAC is a multi-agency committee composed of two representatives from CFB Esquimalt (Formation Risk Management Branch and Base Construction Engineering Office) and one representative from each of the member agencies:

Canadian Forest Service
Canadian Wildlife Service
B.C. Ministry of Forests
University of Victoria
Royal Roads University

A complete list of ESAC members and contact information is located at the end of this report.

Wildlife Tree Stewardship Initiative:
Bald Eagle *(Haliaeetus leucocephalus)* Nest Tree Monitoring
at Rocky Point, Albert Head and Colwood (pg. 12)

ROLES AND RESPONSIBILITIES

Proposal Review and Tracking

The Committee's primary functions are to review, evaluate, and provide scientific expertise and advice to CFB Esquimalt on proposals received to conduct biological and environmental studies on its properties. The Committee maintains a formal permitting system to facilitate the tracking of proposals and permits to conduct research on CFB Esquimalt properties. Research activities requiring a permit include, but may not be limited to the following: observations; photography; surveys and inventories; tagging and banding; collection of wildlife specimens; and installation of scientific monitoring structures. Individuals interested in conducting environmental studies on CFB Esquimalt properties can obtain more information by contacting a member of ESAC at (250) 363-2313.

Each proposal is sent to and reviewed by ESAC. Subsequently, proposals are sent to the Formation Risk Management Branch, Environment Office and to Base Operations, Range Control personnel to ensure that the proposed activity does not result in any adverse environmental effects or interfere with military operations and activities. Lastly, each permit is sent to the Base Commander for final review, approval and permit issue.

Reporting of Activities

As part of the reporting process, permit holders are required to submit a report describing the research findings they have obtained throughout the year. ESAC compiles these scientific reports and makes them available to member agencies and other interested organizations through the production of an annual report.

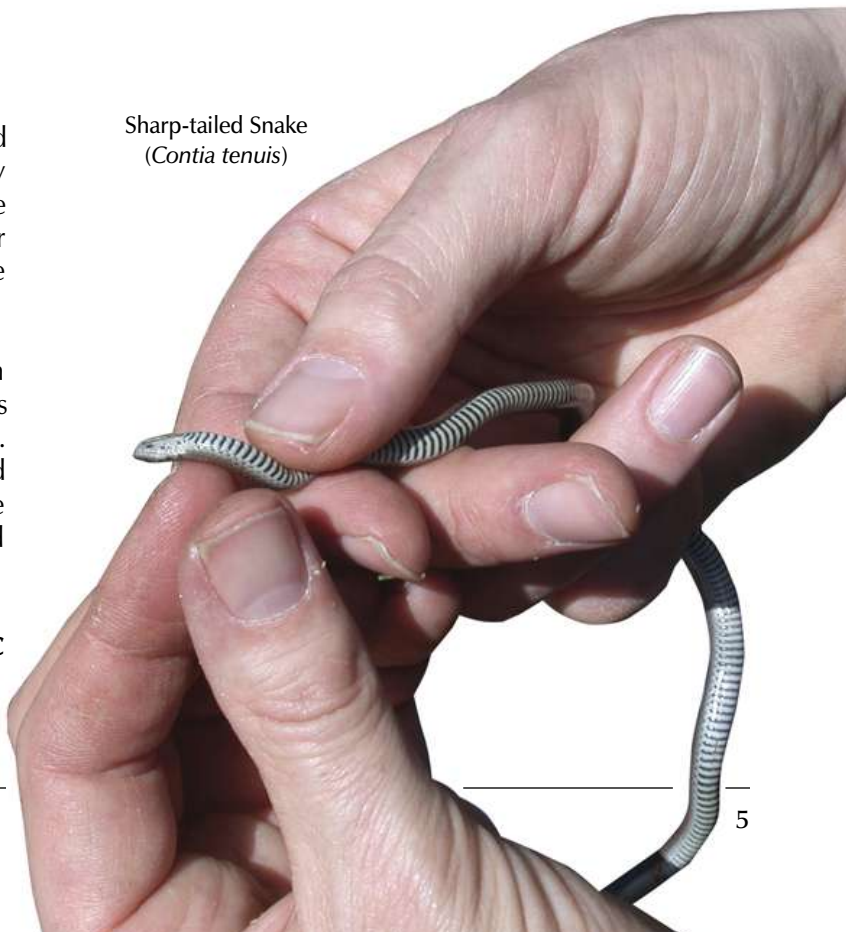
To facilitate the sharing of information and research conducted on CFB Esquimalt properties to other researchers and agencies, the Committee hosts an annual workshop. Further information on ESAC, the annual workshop, and an archive of past annual reports are available on the ESAC website. The website (listed below) is updated annually following release of the annual report.

www.pfc.cfs.nrcan.gc.ca/programs/esac

Other Committee Activities

ESAC also acts as an advisory body to MARPAC by providing direction and insight into various environmental issues occurring on CFB Esquimalt properties. ESAC members also provide MARPAC staff with the ability to connect with the broader scientific community for various environmental issues. In addition, the Committee oversees the activities of the Operating Committee for the Forest Canopy Research Station at Rocky Point.

Sharp-tailed Snake *(Contia tenuis)* Habitat Suitability and Monitoring Project on Federal Lands (page 25)



Sharp-tailed Snake
(*Contia tenuis*)

ESAC ACTIVITIES IN 2004

ADVISORY AND REPORTING ACTIVITIES

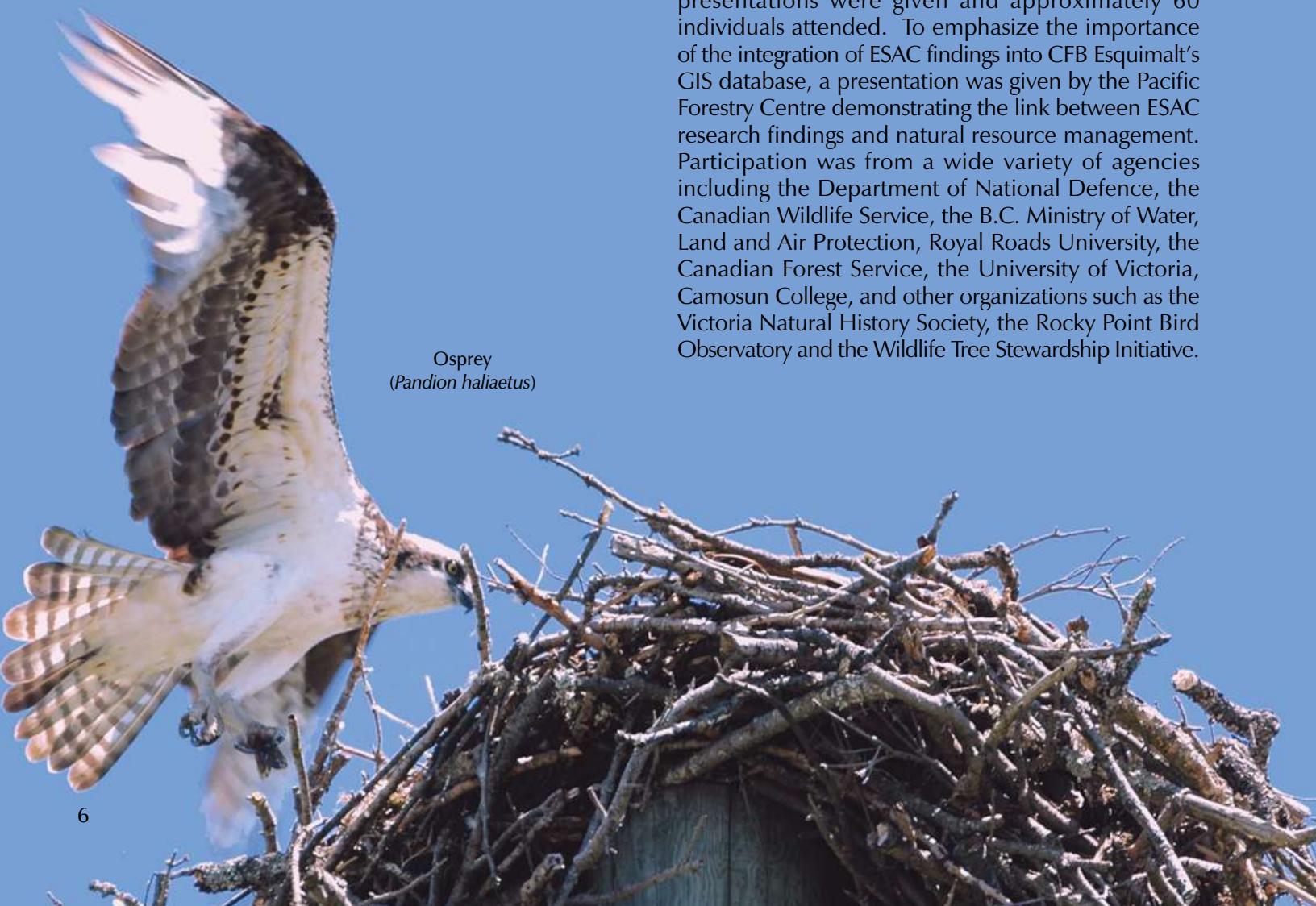
This year was the tenth full year of activity for ESAC. The Committee met three times during 2004 to review project proposals and status, plan reporting activities and advise CFB Esquimalt on other environmental issues.

The 2003 Annual Report was prepared and 300 copies of the report were distributed in 2004 to ESAC permit holders, DND bases across Canada, and other government and non-government organizations. The 2002 and 2003 ESAC Annual Reports were posted on the ESAC website as a component of an overall update to the website.

In 2004, an Environmental Assessment (EA) Project Evaluation Form was produced with the purpose of eliminating or reducing potential impacts on the environment before an ESAC recommended project commences. The short project evaluation form is designed to alert the Committee to the portions of the proposed project/activity that may trigger the environmental assessment process. The EA Project Evaluation Form will accompany all future ESAC applications.

The Terms of Reference for ESAC was reviewed and a new five-year Letter of Understanding (2004–2009) was prepared and signed by representative agencies and the Base Commander reconfirming ESAC as an official advisory body to MARPAC.

During the 2004 ESAC Annual Workshop, held January 27th, 2005 at the Pacific Forestry Centre, 10 presentations were given and approximately 60 individuals attended. To emphasize the importance of the integration of ESAC findings into CFB Esquimalt's GIS database, a presentation was given by the Pacific Forestry Centre demonstrating the link between ESAC research findings and natural resource management. Participation was from a wide variety of agencies including the Department of National Defence, the Canadian Wildlife Service, the B.C. Ministry of Water, Land and Air Protection, Royal Roads University, the Canadian Forest Service, the University of Victoria, Camosun College, and other organizations such as the Victoria Natural History Society, the Rocky Point Bird Observatory and the Wildlife Tree Stewardship Initiative.



Osprey
(*Pandion haliaetus*)

RESEARCH AND COLLECTION ACTIVITIES

A total of 16 proposals were received and reviewed by ESAC. Of the 16 proposals received, 16 permits were issued (12 were renewals of previous years and two were postponed until 2005). Table 2 shows the number of proposals received and permits issued annually since 1995. Table 3 lists all research and collection activities conducted in 2004 under the auspices of ESAC.

Bush Tit
(Psaltriparus minimus)

Table 2: Number of environmental research proposals received and permits issued since 1995

Year	# of proposals	# of permits
2004	16	16
2003	26	24
2002	21	20
2001	14	14
2000	19	16
1999	25	25
1998	26	26
1997	24	24
1996	25	24
1995	22	20

The wide variety of projects conducted in 2004 greatly enhanced the knowledge and understanding of the species and ecosystems found on CFB Esquimalt properties; and, contributed to the sound decision-making and environmental management by CFB Esquimalt personnel and Canadian Forces members. The knowledge gained could also be applied, in varying degrees, to neighbouring and similar ecosystems under different jurisdictions, thus adding to the value of the research carried out on CFB Esquimalt properties.

2004 Rocky Point Bird Observatory Society Activities (pg. 21)

Red-breasted Sapsucker
(Sphyrapicus ruber)

Table 3: Summary of environmental research conducted under ESAC in 2004

ESAC Permit Title	Project Leader	Permit #	Prop.#	Property
Wildlife Tree Stewardship Initiative: Raptor Nest Monitoring at Rocky Point, Albert Head and Colwood	Greenwood	P074-04*	04-01	RP, AH, CO
Wildlife Tree Stewardship Initiative: Bald Eagle *(Haliaeetus leucocephalus)* Nest Tree Monitoring at CFMETR	Gray	P089-04*	04-02	CFMETR
A Phenological Comparison of Flower Meadows on Nanoose Hill and Harewood Plains	Thirkill	P101-04*	04-03	CFMETR
2004 Rocky Point Bird Observatory Society Activities	Kelly	P003-04*	04-04	RP, RR
Sharp-tailed Snake *(Contia tenuis)* Habitat Suitability and Monitoring Project on Federal Lands	Engelstoft	P100-04*	04-05	AH, CO, DY, NA, HR, MH, RP, RR, WP
Purple Martin *(Progne subis)* Origins and Relationships	Finlay	P044-04*	04-06	CO
Distribution, Abundance and Adaptation of Butterflies at their Northern Range Limit	Hellmann	P090-04*	04-07	RP, CFMETR
Royal Roads University - Microclimate Monitoring Station Upgrade at Rocky Point	Dushenko	P087-04*	04-08	RP (FCRS)
Pilot Monitoring Program for Plethodontid Salamanders on Vancouver Island, B.C.	Paige	P088-04*	04-09	RP, RR
The Late Prehistoric Mortuary Landscape of Southern Vancouver Island	Mathews	P104-04	04-10	AH, MH, RP
Monitoring of Winter Moth *(Operophtera brumata)* and the Parasites Introduced for its Control	Otvos	P031-04*	04-11	NA
Garry Oak (*Quercus garryana*) Acorn Production Study	Courtin	P079-04*	04-12	CFMETR, MH, RP
Phantom Orchid (*Cephalanthera austiniae*) Inventory	Chatwin	P105-04**	04-13	HR
COSEWIC Status Report for Foothill Sedge *(Carex tumulicola)*	Miller	P106-04	04-14	AH
Impact of Scotch Broom *(Cytisus scoparius)* on Rare Native Plants in Garry Oak Meadows Mediated through Soil Chemistry	Shaben	P107-04**	04-15	RP, AH
Victoria and Sooke Christmas Bird Count	Allinson	P095-04*	04-16	AH, HR, MH, RP

Properties: AH: Albert Head; **AL:** Aldergrove; **CFMETR:** Canadian Forces Maritime Experimental and Test Ranges; **CO:** Colwood; **DY:** Dockyard; **HR:** Heals Rifle Range; **MH:** Mary Hill; **MS:** Masset; **MT:** Matsqui; **NA:** Naden; **NT:** Nanoose TX Site; **RP:** Rocky Point (**FCRS** – Forest Canopy Research Station); **RR:** Royal Roads; **WP:** Work Point.

* Renewed from previous years. ** Research project postponed to 2005.

ROCKY POINT FOREST CANOPY RESEARCH STATION

Constructed in 1994, the Forest Canopy Research Station at Rocky Point consists of five old-growth Douglas-fir trees located within a mature stand at the southern end of the property. Each of the five trees was originally fitted with platforms and rope and pulley systems in the canopy, in addition to ladders leading to higher levels in the canopy. The canopy station towers above the northern edge of a one hectare Ecological Monitoring and Assessment Network (EMAN) plot. Originally configured to measure temperature and relative humidity within the canopy, the station has also been used as an Environment Canada microclimate station. An Operating Committee has been overseeing its operations and is responsible for the station's maintenance and use.

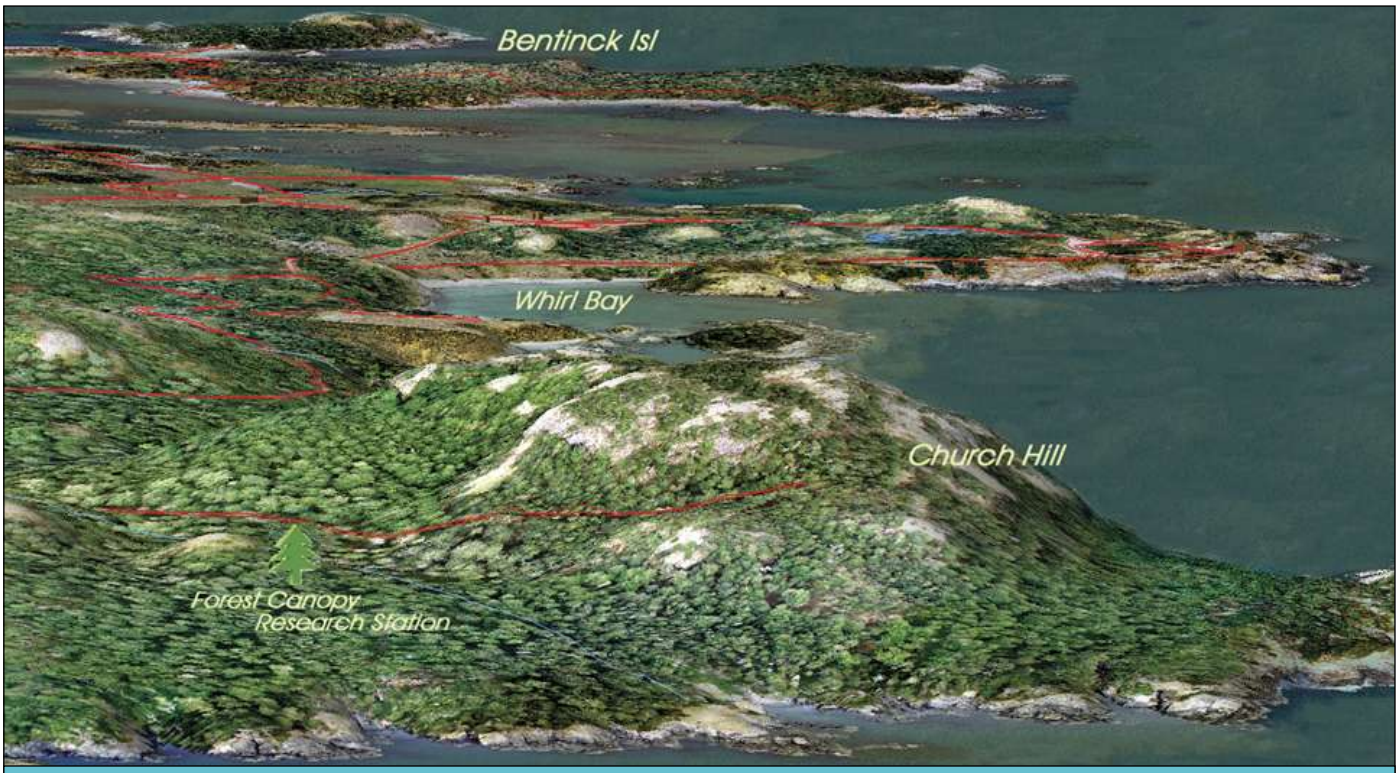
Ownership of and responsibility for the Rocky Point Forest Canopy Station was transferred to Royal Roads University in 2002, as part of the University's efforts to monitor climate change and atmospheric transport

Royal Roads University - Microclimate Monitoring Station Upgrade at Rocky Point (page 36)

Royal Roads University - Microclimate Monitoring Station Upgrade at Rocky Point (page 36)

of contaminant chemicals. Since the transfer, all sensors associated with the microclimate station were recalibrated, and a new environmental sensing strategy for the site was developed. This included the installation of an aerial ladder between two trees to support temperature/relative humidity profiling within the canopy. Equipment at the site, including a data-logger and sensors, is powered by a solar panel supported by a 60 ft. tower on a knoll adjacent to the canopy station.

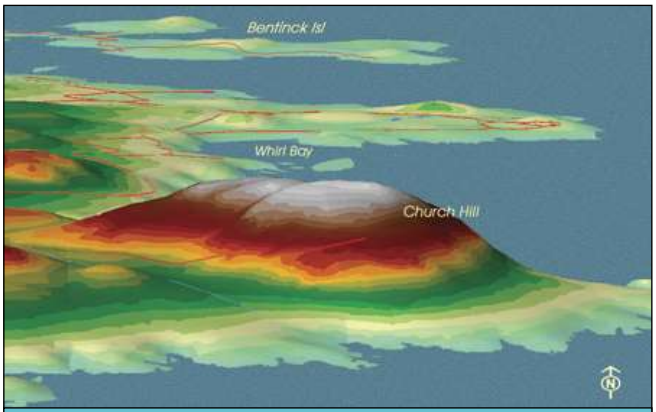
A safety inspection of the canopy trees was completed in 2003, recommending that a major upgrade and overhaul of the canopy platforms and access system was required. The Operating Committee has since completed a detailed assessment of the work needed to complete this upgrade. This will include decommissioning platforms and rope-pulley systems from two of the three trees and replacing the original rope and pulley system from the ground with lower-maintenance ladder systems on the remaining three trees. Funding is anticipated in 2005 to complete these activities.



Orthophoto draped over a DEM of southern Rocky Point.

GEOGRAPHIC INFORMATION SYSTEM

The research findings obtained from all ESAC research projects are incorporated into CFB Esquimalt's Natural Resources Geographic Information System (GIS) database in an effort to produce practical natural resources maps accessible to MARPAC personnel. The maps depict all significant natural resources information collected to date for each CFB Esquimalt property. Information presented on these maps includes the location of rare species, sensitive ecosystems, wetlands and riparian zones, terrestrial ecosystem mapping as well as archaeological features. For several properties, new GIS coverages were added in 2004 including Sensitive Ecosystems Inventory mapping, invasive shrub species infestations, Garry oak ecosystems and high-resolution orthophotos. In addition, significant updates were made to the rare and endangered species and hydrology coverages.



Digital Elevation Model (DEM) of southern Rocky Point.

The use of the spatial data within the Natural Resources GIS database, combined with high-resolution orthophotos and detailed elevation data, have proven to be a powerful tool for MARPAC personnel. This information aids MARPAC personnal when performing a wide variety of activities including the preparation of environmental assessments, environmental awareness and training, planning and designing construction engineering projects, and conducting military exercises. Selected GIS data are available to member agencies.

DEPARTMENT OF NATIONAL DEFENCE

ESAC

ENVIRONMENTAL SCIENCE ADVISORY COMMITTEE

CANADIAN FORCES BASE ESQUIMALT

SCIENTIFIC REPORTS

Research and Collection Activities Conducted in 2004

Wildlife Tree Stewardship Initiative: Raptor Nest Monitoring at Rocky Point, Albert Head and Colwood

Gwen Greenwood

Wildlife Tree Stewardship Initiative (WiTS) 8590 Alec Rd, Saanichton, B.C. V8M 1S4
Tel: (250) 652-2876 • Email: tggreenwood@shaw.ca

Permit #: *P074-04*
Location: *Albert Head, Colwood, and Rocky Point*
Start Date: *January 2004*
Completion Date: *December 2004*

Introduction

The Bald Eagle Nest Tree (BENT) monitoring program began on Vancouver Island in 2000 to establish a baseline of the success of nesting eagles and to monitor the stability of nest trees. The program also monitors the adaptability of Bald Eagles to overall habitat changes.

In 2002, the Wildlife Tree Stewardship (WiTS) initiative of the Vancouver Island Region of the Federation of B.C. Natrualists was formed. Since its formation, WiTS has continuously been monitoring Bald Eagle (BAEA) nest trees as well as other raptor nests such as Osprey and Red-tailed Hawk. The expansion of the program has augmented the focus to include community education, habitat protection, and stewardship agreements.

Bald Eagle nest *(Haliaeetus leucocephalus)*

Osprey *(Pandion haliaetus)*

Bald Eagle nest trees at Rocky Point have been monitored since 2001. In 2003, Albert Head was added to the scope of the study and in 2004, nests were monitored at the Colwood site. The monitoring will be carried out each year to provide a long-term observation of these sites. The monitoring on DND lands adds to the overall view of the productivity and proximity of the nests of large raptors such as Bald Eagle, Osprey, and Red-tailed Hawk.

This project is supervised by Kerri-Lynne Wilson of the Federation of B.C. Naturalists, and Karen Morrison and Terri Martin of the B.C. Ministry of Water, Land and Air Protection.

Study Area and Methodology

In 2004, Bald Eagle and osprey activity was monitored at Rocky Point and Colwood. Albert Head was not accessed in 2004. Nests were located by sound, with the use of binoculars and telescopes, and by generally observing acvtivity. The known nests were observed with binoculars and telescopes, and all activity was documented. All documented BAEA activities at Rocky Point and Colwood during the 2004 monitoring season are to follow.

Wildlife Tree Stewardship Initiative: Raptor Nest Monitoring at Rocky Point, Albert Head and Colwood

Results

Rocky Point:
Six Bald Eagle nest trees have been located and identified.

NEST ID	TREE /CLASS	LOCATION	2004 ACTIVITY	COMMENTS
A (E102-007)	Fallen Douglas-fir	Fossil Point (just off the East Perimeter Road)	Inactive	The nest tree was uprooted in a storm in December 1999.
B (E102-008)	Douglas-fir, decay class 1	Fossil Point (just off the East Perimeter Road)	Inactive	This nest fledged one young in 2001 and has not been productive since. In 2003, the nest appeared to be disintegrating. In the spring of 2004 (April 24), one adult was perched nearby and one adult was heard in the vicinity of the nest. The nest appeared to have increased in size. No further activity was heard or seen on subsequent visits.
C (E102-005)	Douglas-fir, decay class 3	Church Hill, on the west side of Whirl Bay	Active	This nest is of unknown age. Apparently the nest was active in 2000 as reported by fishing boats. The nest was not active in 2001, 2002, or 2003 and the nest has been deteriorating. In the spring of 2004 (April 24), the nest was larger and one adult was perched on the edge of the nest and two eggs were observed in the nest. On May 31, two adults were observed at the nest along with two grey eaglets in the nest. On July 19, one dark brown young eaglet was observed in the nest with an adult perched beside the nest.
D (E102-026)	Douglas-fir, decay class 2	West side of Church Hill	Active	The nest was first discovered in May 2002 and fledged two young that year. No activity was observed at this nest in 2003. In the spring of 2004 (April 24), one adult was observed on the nest and one adult was seen flying nearby. On May 31, one adult was perched near the nest and two small grey eaglets were observed in the nest. On July 19, two adults were perched, and then observed flying; two dark brown young were observed in the nest.
E (E102-027)	Douglas-fir, decay class 1-2	East side of Whirl Bay (~ 70 m inside gate #10)	Inactive	The nest was discovered from the top of Church Hill in April 2003. One eaglet was observed. No activity was seen or heard at this nest in 2004.
F (E102-028)	Douglas-fir, decay class 4	West side of Church Hill	Inactive	The nest was discovered in May 2003 with one adult sitting on the nest and one in the perch tree. No activity was observed on subsequent visits and the nest appears abandoned.

One osprey nest was monitored at Rocky Point. The osprey pair built their first nest in 2003 on top of a power pole located within the CFAD Rocky Point Compound, approximately 150 metres from the main gate. When the young fledged, in September 2003, an alternate pole and platform were erected approximately 30 metres East of the nest. In April 2004, a few attempts were made at nest building on the power poles, but eventually the osprey used the platform. Three osprey chicks successfully fledged in 2004. While the osprey nest was not located in a tree, monitoring nest activity may be of interest for future mitigation and for territorial monitoring.

Wildlife Tree Stewardship Initiative: Raptor Nest Monitoring at Rocky Point, Albert Head and Colwood

Colwood

Bald Eagle nest tree monitoring began at Colwood in the spring of 2004. Five site visits were made between July 14 and August 19, 2004. Two Bald Eagle nest trees were located and monitored at the Colwood site. Both nest trees will be monitored in 2005.

NEST ID	TREE /CLASS	LOCATION	2004 ACTIVITY	COMMENTS
A (no # yet)	Douglas-fir, decay class 2	Northeast portion of the property; the nests are located approx. 6 m to the West of the road between bunkers 45 and 48.	Inactive	Two nests were found in the same tree. Bald Eagles were heard and seen nearby but no activity was recorded at the nest sites during 2004 site visits. Several prey items, mostly bones, were noted under the tree.
B (no # yet)	Fir, decay class 1	Located approximately 75 metres southwest of Bunker 44	N/A	While no activity was recorded during visits to this nest, droppings were observed at the base of the tree and a white feather and some down was observed at the edge of the nest.

An osprey nest located on a man-made platform on top of a Douglas-fir tree, located approximately 150 metres northwest of "F" Jetty, was observed and monitored. On 23 July 2004, an osprey was observed landing briefly on the platform. On 12 August 2004, an osprey landed on the platform with a fish and was soon chased off by another osprey. An osprey then returned to the platform with a branch. No other activity was seen at the site.

Discussion

Bald Eagle activity in the Rocky Point area in 2004 appears to be successful. Several immature eagles and numerous adult eagles were documented flying over Rocky Point and occasionally noted on Bentinck Island and Fraser Island.

Further investigations at the Albert Head site for the Red-tailed Hawk nest are anticipated for 2005.

Observations at the Colwood site commenced late in the year, however, our understanding is that the Bald Eagle nest has traditionally been active for several years. Observations will resume in February-March 2005.

The osprey platform at Colwood is located within close proximity of the nest on the light standard in the Juan de Fuca playing field, which is adjacent to the Colwood site. The Juan de Fuca osprey nest was active in 2004 fledging two chicks, however the nest may have been predated at the end of June or early July. This could potentially be the same nesting pair as at the Colwood site. Both osprey nests will be monitored at the beginning of the 2005 season.

Conclusion

In general, there appears to be more Bald Eagle activity at Rocky Point than in the past monitored years. Two productive nests, both located on Church Hill, resulted in a record number of three eaglets surviving to an age to fledge. The osprey at Rocky Point successfully fledged three young.

With three nests in close proximity of each other, an active Bald Eagle nest at Colwood appears to be very likely. There are no other documented Bald Eagle nests within that territory of approximately 500 to a 1 km radius. All three eagle nests and the osprey nest will be monitored in 2005.

Wildlife Tree Stewardship Initiative: Bald Eagle *(Haliaeetus leucocephalus)* Nest Tree Monitoring at CFMETR

Sandra Gray

Arrowsmith Naturalists / Wildlife Tree Stewardship
PO Box 285 /1300 Grafton Avenue, Errington, B.C. V0R 1V0
Tel: (250) 248-5565 • Email: saninerr@shaw.ca

Permit #: *P089-04* ***Start Date:*** *January 2004*
Location: *CFMETR* ***Completion Date:*** *31 December 2004*

Introduction

As part of a larger project with over a decade of field work on Vancouver Island, naturalist groups have been searching for, identifying and monitoring wildlife trees, particularly Bald Eagle (BAEA) nest sites. This past season, 21 volunteers from the Arrowsmith Naturalists (Federation of B.C. Naturalists) based out of the Parksville/Qualicum area, monitored or received reports from over 70 BAEA territories between Deep Bay and Nanoose Bay, Vancouver Island. The Wildlife Tree Stewardship (WiTS) initiative aims to document wildlife usage and locations of wildlife trees to help conserve the remnant habitats of Vancouver Island's altered ecosystems.

Study Area and Methodology

Monthly visits to CFMETR were made to observe BAEA activity on their territories. Nest trees were located and the base of the trees was visited to assess tree health and recent usage of the site. The location of perch sites was also determined and visited when accessible. Other bird activity in the area was observed, identified and counted.

Results

Currently there are two active BAEA nest territories on CFMETR. Several favoured perch sites exist, some of which are old nest sites or are the tallest and/or oldest trees that afford a good view for territory defence and hunting purposes. Observations of BAEA territory activity during the 2004 monitoring season at CFMETR are listed below.

Territory: E105-045 – Richard Point Nanoose Harbour (DND campground) – Active, two chicks fledged

DATE	BAEA ACTIVITY	NOTES
February 3	Two adults and one immature BAEA perched on territory	New sticks in the nest, whitewash at the base of the nest, and a favoured perch located approx. 100 m South on the point
March 12	Incubation	Herring spawn in full swing with over 102 BAEAs in the area and over 20,000 Gulls in Nanoose Bay
April 6	Incubation	
May 14	One chick observed in the nest, feeding, and moving within the nest	One adult close by and one immature BAEA flying around
June 11	Chick calling in the nest	One adult perched in favoured perch
July 9	Two large brown chicks in the nest, wings flapping and moving around the tree tops	One adult close by
August 13	No BAEA activity	Older prey items at the base of the tree, no whitewash
September 10	One immature BAEA in favoured perch tree and nest tree	No adult BAEA observed
October 8	No BAEA activity	
November 12	One adult 300 m NW of the nest tree	
December 10, 15	Two adults in favoured perch tree	

Wildlife Tree Stewardship Initiative: Bald Eagle *(Haliaeetus leucocephalus)* Nest Tree Monitoring at CFMETR

Territory: E105-300 - Mid Nanoose Harbour (Ranch Point) -Active, uncertain whether this nest was used in 2004. An alternate nest is suspected, however the location is unknown. Two immature BAEAs seen in June 2004.

DATE	BAEA ACTIVITY	NOTES
February 3	Two adult and one immature BAEA perched approx. 200 m NE of the nest	Whitewash at the base of the tree and at several sites within 100 m of the nest
March 12	Pair of BAEA perched above the nest and close by	12 BAEAs within 200 m of the nest; herring spawn in full swing
April 6 and May 14	No BAEA activity	
May 29	One adult perched 100 m from the nest	Observations made from Lantzville
June 11	Two immature and one adult BAEA observed in the meadow area East of the nest	One immature Red-tailed Hawk observed; no whitewash or prey items at the base of the tree
July 9	One adult perched 200 m SW of the nest	
August 13 and September 10	No BAEA activity	
October 8	Two adult BAEA flying and perching in the territory	Prey items present in the meadow
November 12	Two adult BAEAs observed leaving the nest	
December 10 and 15	One adult flying near East Wharf	

Territory:
E105-124 - Mid Nanoose Harbour (DND Tower East)
Class 2, Douglas-fir, old nest site circa 1993. BAEA pair moved to E105-300. Used as perch site in 2004.

Territory:
E105-125 - Wallis Point (CFMETR)
Class 3 Douglas-fir, old nest site used as perch site in 2004. Two other 'enhanced' Douglas-fir trees that had branches removed in 2001 to make an easier entry and exit for eagles, continue to serve as frequent perches.

Territory:
E105-092 - Wallis Poing Ridge (DND Ridge)
No nests found to date perhaps because some areas are difficult to access. At least eight Douglas-fir veterans are frequently used as perches. Species observed on the Ridge: Bald Eagle, Turkey Vulture, Cooper's Hawk, Sharp-shinned Hawk, Common Raven.

Other wildlife seen or reports received from local residents: Black-tailed Deer (numerous and plentiful population), Racoon, Red Squirrel, Black Bear, Cougar, and 89 bird species (Appendix 1).

Discussion

The rich food source in the waters surrounding CFMETR provides sustenance for at least 11 known Bald Eagle pairs. The conifers and deciduous tree species that make up the forests on CFMETR are a small fraction of what once existed on the East Coast of Vancouver Island. Bald Eagles prefer veteran Douglas-fir as nest trees, of which a very limited number exist on CFMETR. Due to minimal human activity at nest and perch tree locations on CFMETR, the eagles have little tolerance for humans near their nest especially during incubation and when chicks are young (January-May). Campers at the Richard Point Campground may impact the eagle pair with wood clearing and cutting near the base of the nest tree.

Conclusion

Due to the continued loss of wildlife habitat by forestry activities and urbanization on the East Coast of Vancouver Island, the preservation of the forest and shoreline of CFMETR, Nanoose Hill and surrounding remaining undeveloped lands may be critical to current and future wildlife populations.

Wildlife Tree Stewardship Initiative: Bald Eagle *(Haliaeetus leucocephalus)* Nest Tree Monitoring at CFMETR

APPENDIX 1: List of bird species observed at CFMETR in 2004.

Pacific Loon
Common Loon
Horned Grebe
Red-necked Grebe
Brandt's Cormorant
Double-crested Cormorant
Pelagic Cormorant
Great Blue Heron
Turkey Vulture
Canada Goose
Trumpeter Swan
American Wigeon
Mallard
Harlequin Duck
Surf Scoter
White-winged Scoter
Black Scoter
Bufflehead
Common Goldeneye
Barrow's Goldeneye
Common Merganser
Red-breasted Merganser
Bald Eagle
Sharp-shinned Hawk
Cooper's Hawk
Red-tailed Hawk
Merlin
Peregrine Falcon
California Quail
Killdeer
Black Oystercatcher
Black Turnstone
Bonaparte's Gull
Mew Gull
Ring-billed Gull
California Gull
Herring Gull
Thayer's Gull
Glaucous-winged Gull
Pigeon Guillemot
Band-tailed Pigeon
Great Horned Owl
Rufous Hummingbird
Belted Kingfisher
Red-breasted Sapsucker
Downy Woodpecker
Hairy Woodpecker
Northern Flicker
Pileated Woodpecker
Olive-sided Flycatcher
Willow Flycatcher
Pacific- slope Flycatcher
Hutton's Vireo
Steller's Jay
Northwestern Crow
Common Raven
Violet-green Swallow
Chestnut-backed Chickadee
Bushtit
Red-breasted Nuthatch
Brown Creeper
Bewick's Wren
Winter Wren
Marsh Wren
Golden-crowned Kinglet
Ruby-crowned Kinglet
Swainson's Thrush
American Robin
Varied Thrush
European Starling
Cedar Waxwing
Orange-crowned Warbler
Yellow-rumped Warbler
Black-throated Gray Warbler
Western Tanager
Spotted Towhee
Chipping Sparrow
Savannah Sparrow
Fox Sparrow
Song Sparrow
Golden-crowned Sparrow
White-crowned Sparrow
Dark-eyed Junco
Purple Finch
House Finch
Red Crossbill
Common Redpoll
Pine Siskin
American Goldfinch

** Bird species and numbers were noted on all but one visit to CFMETR as time and personnel allowed. The average visit ranged from 2 to 4 hours.*

A Phenological Comparison of Flower Meadows on Nanoose Hill and Harewood Plains

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Permit #: *P101-04* ***Start Date:*** *1 January 2004*
Location: *CFMETR* ***Completion Date:*** *31 December 2004*

Introduction

The phenology (the study of seasonal timing of life cycle events) of native wildflowers on the B.C. coast is of interest to local naturalists. Compressed between the winter rains and summer drought, wildflowers have approximately three months to emerge, grow, mature and bloom before the summer drought commences. The presence and abundance of wildflowers on Nanoose Hill (CFMETR) is well known, however, many species appear a month or so in advance of similar locations in the immediate area. One of the factors affecting wildflower phenology could be the microclimate.

Two study sites, Nanoose Hill and Harewood Plains, have been chosen for this study. The Nanoose Hill site is well known for its wildflowers, particularly for the wild onions and the Prickly-pear Cactus. The wildflower populations are striated by elevation and scattered according to ground moisture levels. The wild onions are clustered in easily identifiable sites, and the Prickly-pear Cactus (*Opuntia fragilis*) is scattered across the lower elevations. A patch of Blue-eyed Grass (*Sisyrinchium idahoense var. macounii*) lies close to the shoreline, and Common Red Paintbrush is found on the lower rocks, to about 50 metres above sea level. The site is closed to the public, therefore protected from large-scale disturbances. The Harewood Plains site boasts 14 red- and blue-listed plant species, including approximately 1500 Bog Bird's-foot Trefoil (*Lotus pinnatus*) plants (Donovan, 2004), which constitutes approximately 75 per cent of all Bog Bird's-foot Trefoil plants in Canada.

The purpose of this study is to compare the phenology of two similar wildflower meadows, Nanoose Hill and Harewood Plains. This study will also provide the opportunity to produce a portfolio of wildflower photographs for both sites.

Study Area and Methodology

Nanoose Hill, which forms the northern shore of Nanoose Bay, is located on Department of National Defence land. The study site is a south-facing, sloping rocky outcrop, from sea level to an elevation of 250 metres. The underlying rock is terraced and highly fissured, and provides a level ground with moist soils, steep slopes and numerous seepage areas. The area of interest is predominantly vegetated by Garry oak/Arbutus meadow, with Douglas-fir forming a perimeter forest. There are moss covered outcrops and grasslands with Hedgehog Dogtail (*Cynosurus echinatus*) and other non-native plant species.

The Harewood Plains site is on the southern limits of the city of Nanaimo. The meadows are located on a large, unbroken slope of conglomerate rock, covered with Douglas-fir/Arbutus trees. The elevation range is from 80-120 m. A few Garry oak trees can be found, which may be a relict population. The section of the property within the city of Nanaimo limits is privately owned and has been considered for residential development several times in the past decade. The property outside the city limit is owned by Weyerhaeuser, and it has been harvested at least twice in recent history, the latest being in 2002. Log harvesting has little impact on the major wildflower meadows but a BC Hydro right-of-way cuts through the middle of the meadows and has provided access for off-road vehicles.

Weekly site visits were made to Nanoose Hill and Harewood Plains, from 25 January to 30 June 2004. The emergence and development of the common flower species was recorded. Nanoose Hill was visited on 15 different occurrences while Harewood Plains was visited 19 times. Over fifty species were monitored at both sites and 15 species were used to compare the phenology.

A Phenological Comparison of Flower Meadows on Nanoose Hill and Harewood Plains

Results

There are exceptions, such as the Fairy Slipper, but the overall trend is that flowers bloom on Nanoose Hill approximately 11 days earlier than on Harewood Plains (Table 1). The total number of species is about the same, but the abundance of the wild onions, Harvest Brodiaea and Blue-eyed Grass are much higher on Nanoose Hill. On the other hand, Sea Blush and Camas thrive on the level plains, more than on the rocky outcrops of Nanoose Hill. Bog Bird's-foot Trefoil is found on Harewood Plains, which supports a majority of the specimens in Canada (Table 2). Nanoose Hill has the Prickly-pear Cactus that is absent on Harewood Plains.

Prickly-pear Cactus *(Opuntia fragilis)*

TABLE 1: Summary of the emergence of common plant species found on Nanoose Hill and Harewood Plains

SCIENTIFIC NAME	COMMON NAME	EMERGENCE NANOOSE HILL	EMERGENCE HAREWOOD PLAINS	NO. OF DAYS DIFFERENCE
Collinsia parviflora	Small-flowered Blue-eyed Mary	1-Mar	12-Apr	42
Calypso bulbosa	Fairy Slipper	3-May	12-Apr	-21
Saxifraga integrifolia	Grassland Saxifrage	5-Apr	19-Apr	14
Plectritis congesta	Sea Blush	12-Apr	19-Apr	7
Mimulus guttatus	Yellow Monkey-flower	5-Apr	19-Apr	14
Camassia quamash	Common Camas	12-Apr	26-Apr	14
Fritillaria camschatcensis	Chocolate Lily	12-Apr	26-Apr	14
Dodecatheon pulchellum	Few-flowered Shooting Star	5-Apr	26-Apr	21
Trientalis latifolia	Broad-leaved Starflower	17-May	10-May	-7
Orobanche uniflora	Naked Broomrape	26-Apr	17-May	21
Zygadenus venenosus	Meadow Death-camas	19-Apr	18-May	29
Castilleja miniata	Common Red Paintbrush	17-May	17-May	0
Allium amplectens	Slimleaf Onion	17-May	7-Jun	21
Brodiaea coronaria	Harvest Brodiaea	8-Jun	10-Jun	2
Lonicera hirsuta	Hairy Honeysuckle	14-Jun	14-Jun	0
NUMBER OF SPECIES: 15			**AVERAGE DIFFERENCE: 11**	

A Phenological Comparison of Flower Meadows on Nanoose Hill and Harewood Plains

Table 2: Red-and blue-listed species on Harewood Plains (Summary by Bill Beese, Weterhaeuser - September 2004)

NO.	SCIENTIFIC NAME	COMMON NAME	BC CDC LISTING RED	BLUE	HABITAT
1	*Agrostis pallens*	Dune Bentgrass		X	sand dunes, rocky sea cliffs
2	*Allium amplectens*	Slimleaf Onion		X	dry fields and hillsides
3	*Anagallis minima*	Chaffweed		X	riverbanks, saltmarsh, vernal pools, ponds
4	*Carex scoparia*	Pointed Broom Sedge		X	moist to wet sites
5	*Carex tumulicola*	Foothill Sedge	X		open Garry oak sites, dry grassy meadows
6	*Centaurium muehlenbergii*	Muhlenberg's Centaury	X		moist meadows
7	*Epilobium densiflorum*	Dense Spike-primrose	X		moist to dry meadows, roadsides and waste areas
8	*Isoetes nuttallii*	Nuttall's Quillwort		X	vernal pools, ephemeral winter seepage
9	*Lotus pinnatus*	Bog Bird's-foot Trefoil	X		wet to moist meadows
10	*Piperia elegans*	Elegant Rein Orchid		X	streambanks and clearings
11	*Carex feta*	Green-sheathed Sedge	X		ditches, marshes, wet meadows
12	*Rupertia physodes*	California Tea		X	mesic, open forests
13	*Viola Howellii*	Howell's Violet		X	mesic to moist woodlands and forests
14	*Sagina decumbens ssp. Occidentalis*	Western Pearlwort		X	margins of vernal pools, mesic for openings & dry hillsides

Note: No. 1-10 provided by A.Ceska and H.Williams; No. 11-14 from CDC element occurrence records.
Habitat Descriptions: Douglas, Meidinger and Penny, 2002. Rare native vascular plants of BC. Province of B.C.

Discussion

There is no doubt that both of these wildflower meadows have high aesthetic values. They also have high heritage values, arising from the abundance and diversity of plant communities they support. From the perspective of a naturalist, it is hoped that both sites can be afforded similar protection in the future, and that they will continue to support healthy populations of wildflower species which are becoming increasingly fewer in numbers and correspondingly harder to find. It is suggested that the abundance of flowers should be monitored over the long-term in these locations, to evaluate the protective measures over time.

References

Donovan, M. 2004. COSEWIC status report on the Bog Bird's-foot Trefoil (*Lotus pinnatus*) in Canada, in COSEWIC assessment and status report on the Bog Bird's-foot Trefoil (*Lotus pinnatus*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa 1-33 pp.

2004 Rocky Point Bird Observatory Society Activities

David Kelly

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Permit #: *P003-04*
Location: *Rocky Point and Royal Roads*

Start Date: *1 January 2004*
Completion Date: *31 December 2004*

ROCKY POINT MIGRATION MONITORING STATION
Project Leader: David Kelly

Introduction

Large-scale population declines in forest songbirds, particularly neotropical migrants, have been documented across North America. Many of these bird species are inadequately monitored in Canada by traditional surveys such as the Breeding Bird Survey and Christmas Bird Counts. Breeding bird and migration monitoring at Rocky Point targets a large number of songbird species that utilize the Garry Oak meadows and Coastal Douglas-fir ecosystems of Rocky Point for breeding or critical stopovers during migration. To detect changes in the numbers and distribution of songbirds at Rocky Point, the site should be monitored annually for 20 or more years.

Study Area and Methodology

The Rocky Point Bird Observatory (RPBO) is located on Department of the National Defence land at the southern tip of Vancouver Island. In 2004, 13 mist nets were operated daily for the first six hours of daylight from 20 July to 18 October at Rocky Point following a standard methodology (Derbyshire 2000).

Results

The 18th of October, 2004 was the final day of the 11th season at the Rocky Point Bird Observatory. Many records were set in 2004; for example, total captures (newly banded birds) came to 4,051 individuals, surpassing the record set in 2003 by more than 300. A total of 19 species set new banding highs for a season, with Yellow Warbler (*Dendroica petechia*) and Golden-crowned Sparrow (*Zonotrichia atricapilla*) topping the list. Season lows also occurred in 2004; notably, American

Yellow-rumped Warbler *(Dendroica corondia)*

Goldfinch *(Carduelis tristis*, lowest ever), Chipping Sparrow (*Spizella passerina*, a high was set in 2003), and Savannah Sparrow *(Passerculus sandwichensis)* and Wilson's Warbler *(Wilsonia pusilla*) (both lowest since 1998). Long-term declines in Savannah Sparrow continued. For the first time since 1997, swallows were not banded during the season.

The importance of Rocky Point for returning migrants, can be implied by the level of site tenacity noted. A total of 408 birds (39 species) were re-traps from previous years. Among these "old" birds, two individuals were older than five years of age; one was a "Puget Sound" White-crowned Sparrow (*Zonotrichia leucophrys)* and the other was an "Oregon" Dark-eyed Junco *(Junco hyemalis oreganus)*. However, two re-trap records stand out in particular. First, on September 9, a Chestnut-backed Chickadee was recovered that had originally been banded on June 4 at the Royal Roads University Monitoring Avian Productivity and Survival (MAPS) site. The re-trap highlight of the year was the recapture on September 18 of a Chestnut-backed Chickadee *(Parus rufescens)* that was originally banded as an After-Hatch Year bird at RPBO on August 2, 1997 by Beverley Glover (band number 2120-06883). This observation set a new North American longevity record of 8 years, 3 months for Chestnut-backed Chickadees. The previous record for this species, from the Bird Banding Lab at the Patuxent

2004 Rocky Point Bird Observatory Society Activities

Wildlife Research Center, Maryland, was 7 years, 9 months. This new record holder has been re-trapped a total of seven times, but until this season, not since 2001.

Numerous regional rarities were recorded in 2004, including a Rose-breasted Grosbeak *(Pheucticus ludovicianus)* banded July 18, during a volunteer workshop before the official start of the season (this bird remained in the area until August 4), a Manx Shearwater *(Puffinus puffinus)* on August 8 (seen and photographed just off Race Rocks), a Bar-tailed Godwit *(Limosa lapponica)* on August 29, and a White-winged Dove *(Zenaida asiatica)* on October 7.

The overall total number of species recorded at the RPBO now stands at 293 species. To put that in context, that number equals slightly less than 80% of the total number of species recorded in the entire Victoria/Southern Vancouver Island areas.

Discussion

The record number of birds caught in 2004 is even more significant when one considers that daily effort remained the same as the previous four seasons; as well as having lost more days/net-hours to rain compared to 2003. After a slow start in July/August, the average capture/day rate picked up dramatically, with approximately 46 new birds banded/day. If the MAPS numbers, the non-standard banding numbers, the hummingbird bandings (28), and the owl bandings (411) are included, almost 5000 birds were banded in 2004. During September, there were six days where 100 or more birds were banded (each day). Those six days alone represented 20% of total captures for the season.

Overall, 2004 appears to have been a good breeding year for most species. Amongst the many questions that remain unanswered, it is unclear whether most of the captured birds were from Vancouver Island/south-western B.C., and/or from interior sites in British Columbia or perhaps from even further away such as the Yukon or Alaska.

References

Derbyshire, D. 2000. RPBO Field Protocol, ver 1.41 October 2004 available on RPBO website: (www.islandnet.com/~rpbo/).

BIRD BANDING WORKSHOP
Project Leader: Paul Levesque

Summary

During 26-28 March 2004, Rocky Point Bird Observatory held a workshop at the Royal Roads property on bird banding and ageing techniques which was open to the general public. Eighteen participants, from as far away as the Yukon and Oregon, took part in the workshop. On the mornings of the 27 and 28 March, four mist nets were opened and 34 birds were captured and banded. One of the highlights was banding a male and female Hairy Woodpecker *(Picoides villosus)*. The afternoons and evenings were filled with lectures and labs where participants practiced on frozen specimens.

Black-headed Grosbeak *(Pheuticus melanocephallus)*

2004 Rocky Point Bird Observatory Society Activities

MONITORING AVIAN PRODUCTIVITY AND SURVIVAL (MAPS)
Project Leader: Ann Nightingale

Introduction

Monitoring Avian Productivity and Survival (MAPS) is a breeding songbird monitoring project, conducted at over 500 North American sites, designed to fill information gaps on reproductive success, breeding site fidelity and over-winter survival. The purpose of the MAPS project (at Royal Roads and Rocky Point) is to inventory the breeding songbird populations using a standardized methodology, and to record sightings of other species occurring at the sites to facilitate comparisons of populations and avian diversity between the two sites.

Study Area and Methodology

MAPS monitoring was conducted at Royal Roads and Rocky Point, following the MAPS Manual Protocol (DeSante et al. 2004). Songbirds were captured and banded in mist nets during standardized sampling sessions; and the sampling sessions were conducted once per ten-day period, from the beginning of June to the first ten days of August. In addition to the bird banding and observations, the MAPS Habitat Structure Assessment was completed for each banding site.

Results

Sampling was conducted between 4 June and 8 August, resulting in each study site being sampled seven times. Although the number of birds banded was more than double the 2003 totals, the Royal Roads site continued to support fewer birds and a lower diversity of species compared to Rocky Point. A total of 214 individuals (24 species) were banded at Royal Roads in comparison to 339 (33 species) banded at Rocky Point.

An individual's breeding status was determined by noting the breeding condition of adults while in the hand; by the location of active nests; and by "formulae" prescribed by the Institute of Bird Populations. Twenty-two species were "defined" as breeding at the Royal Roads site and 33 species at Rocky Point.

Overall, a total of 71 species were observed at Rocky Point compared to 55 species at Royal Roads.

Rocky Point Bird Observatory volunteers and Royal Roads University students committed more than 500 volunteer hours to this project.

References

DeSante, D.F., K.M. Berton, P. Velez, and D. Froehlick 2004. MAPS Manual 2004 Protocol. The Institute for Bird Populations, Point Reyes Station, CA. 67 pp.

NOCTURNAL OWL MONITORING
Project Leader: Paul Levesque

Introduction

Forest-dwelling owls are increasingly becoming a conservation concern in North America. As predators, this group feeds at high trophic levels, limiting their population densities at the landscape level and making them susceptible to bioaccumulation of toxins. In British Columbia, five species of "small" owls are secondary cavity nesters; this trait makes them "dependant" on mature forests. Due to their nocturnal behaviour and remoteness of breeding areas, collecting population data for long-term monitoring is often labour intensive and costly. In the fall of 2002, an attempt was made to monitor the fall migration of small owls at Rocky Point. The attempt has proven to be very successful for Northern Saw-whet Owls *(Aegolius acadicus)* and to a lesser extent for Barred Owls *(Strix varia)*.

Study Area and Methodology

Owl monitoring at Rocky Point was conducted during the first six hours of darkness on 34 evenings, from 24 September to 10 November, 2004. Six mist nets and an audio lure broadcasting Northern Saw-whet Owl calls were used to attract and capture migrating owls. Once captured, the birds were removed from the nets, marked with an aluminum leg band, measured, aged and then released.

2004 Rocky Point Bird Observatory Society Activities

Results

During the fall of 2004, a total of 403 Northern Saw-whet Owls and eight Barred Owls were banded. All of the Barred Owls were hatch years. Of the 403 Northern Saw-whet Owls caught, 239 (59.3%) were hatch years; down from 72% and 67% noted in 2002 and 2003, respectively. The unit effort, measured as the number of mist nets open per hour or "net hours", has varied between years. However, the rate of capture (owls/net hour) has remained relatively consistence, with 0.32 in 2002, 0.42 in 2003 and 0.39 in 2004.

A Northern Saw-whet Owl was captured on 1 October 2004 that had been originally banded on 17 May, 2000 at Forks, Washington. This bird was captured in a nest box and was raising five chicks. Also recaptured were two Northern Saw-whet Owls that were banded at Rocky Point as hatch year birds in 2002. The recapture of the two birds suggests that there may be fidelity to Rocky Point during migration. Perhaps the most interesting observation of the season was when a Northern Saw-whet Owl, originally banded at RPBO on 24 September, 2004, was recaptured on Bainbridge Island (near Seattle) on 5 November, 2004. Owl reasearchers at Bainbridge Island have to date captured two Northern Saw-whet Owls originally banded at Rocky Point.

Banding a Northern Saw-whet Owl *(Aegolius acadicus)*

Discussion

The purpose of conducting the owl banding project at Rocky Point was to determine the feasibility of developing a long-term monitoring project. It's now known that the fall influx of Northern Saw-whet Owls at Rocky Point is a reliable annual event, and that the monitoring methodology is effective in describing this movement. RPBO is now in a position to attempt to answer more questions, such as where are these owls coming from and where are they going? With over 900 Northern Saw-whet Owls banded at Rocky Point, the probability of banded birds being recaptured at other banding operations is likely. In the fall of 2005, monitoring at Rocky Point will continue, and hopefully continue to expand the project to new locations in B.C. and perhaps in Washington State as well.

Sharp-tailed Snake *(Contia tenuis)* Habitat Suitability and Monitoring Project on Federal Lands

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Permit #: *P0100-04*
Location: *Albert Head, Dockyard, Heals Rifle Range, Mary Hill and Rocky Point*

Start Date: *March 2004*
Completion Date: *On-going*

Introduction

The Sharp-tailed Snake (*Contia tenuis)* is rather widely distributed in coastal California and Oregon, but its range is highly fragmented farther north in Washington state and British Columbia. The species' entire Canadian range is restricted to a few sites in southwestern British Columbia, on the Gulf Islands and Vancouver Island. Known Sharp-tailed Snake sites are generally small in spatial extent and the number of snakes appears to be correspondingly low. The assessment of Sharp-tailed Snake habitat on CFB Esquimalt properties began in 2003 when all the properties in the Capital Regional District region were assessed and areas with potential habitat delineated. In 2004, attempts were made to identify the key habitat requirements of the Sharp-tailed Snake to identify potential new sites and better manage known sites. The objectives of this study are: to monitor artificial cover objects installed during the first phase of the project; to determine the extent of the populations on Mary Hill and Heals Rifle Range (Cole Hill); and to characterize Sharp-tailed Snake habitats.

Study Area and Methodology

The study area included the following CFB Esquimalt properties: Albert Head, Dockyard, Heals Riffle Range, Mary Hill, and Rocky Point. Other federal properties located on the south end of Vancouver Island and the Gulf Islands were also included in the study area. In an effort to locate the Sharp-tailed Snake, artificial cover objects (ACO) were installed in 24 plots in areas previously identified as having potential Sharp-tailed Snake habitat (Engelstoft 2004). Artificial cover objects are boards made of asphalt roofing paper with a dimension of 40 x 60 cm. These boards were installed in appropriate micro-habitats and checked for snakes during the spring and fall when snakes are known to emerge from subterranean areas and surface activity is most likely. Botanists were consulted to avoid positioning these boards on top of rare and endangered plant populations. The boards allow the snakes to come and go freely, and have proven to be the most cost effective and least intrusive method for determining the presence of the Sharp-tailed Snake. To characterize Sharp-tailed Snake habitat, we compared physical habitat features such as aspect, slope, vegetation, and ground cover on known and potential Sharp-tailed Snake sites and these attributes were also measured on randomly chosen nearby locations. The data were analyzed using univariate and multivariate statistical methods.

The underside of a Sharp-tailed Snake *(Contia tenuis)*

Sharp-tailed Snake *(Contia tenuis)* Habitat Suitability and Monitoring Project on Federal Lands

Results

All of the 36 artificial cover object plots were monitored approximately five times from 10 March to June 24, 2004 and approximately four times from 9 September to 20 October, 2004. Select areas were visited more frequently because they were part of other studies. The most commonly encountered reptile was the Northern Alligator Lizard *(Elgaria coerulea)*, while the Northwestern Garter Snake *(Thamnophis ordinoides)* was the most abundant snake (Table 1).

TABLE 1 : Result of artificial cover object inspections from March – October 2004

AGENCY	PROPERTIES	NO. SITES	NO. ACO	NO. VISITS	NO. STS	NO. NWGS	NO. WTGS	NO. COGS	NO. NALI
Coast Guard	Prevost Isl. (S)	1	6	7	0	0	0	0	0
	Discovery Island	1	5	3	0	2	0	0	0
	Total	**2**	**11**		**0**	**2**	**0**	**0**	**0**
Parks Canada	Prevost Isl. (N)	3	15	7	0	13	0	1	12
	Roe Lk.	2	15	5	0	42	4	1	3
	Mt.Norman	4	19	3-4	0	0	0	0	3
	Saturna Isl.	1	10	11	0	3	0	0	67
	Total	**10**	**59**		**0**	**58**	**4**	**2**	**85**
DND	Albert Head	4	20	10	0	13	0	0	30
	Heals Rifle Range	2	97	7-15	6	10	1	0	13
	Rocky Point	11	70	9-10	0	14	0	0	15
	Mary Hill	6	131	9-11	5	19	5	0	73
	Dockyard	1	5	8	0	0	0	0	2
	Total	**24**	**323**		**11**	**56**	**6**	**0**	**133**
Grand Total		**36**	**393**		**11**	**116**	**10**	**2**	**218**

DND = Department of National Defence
STS = Sharp-tailed Snake, NWGS = Northwestern Garter Snake *(Thamnophis ordinoides),* WTGS = Western Terrestrial Garter Snake *(Thamnophis elegans)*, COGS = Common Garter Snake *(T. sirtalis)*, NALI = Northern Alligator Lizard *(Elgaria coerulea)*.

A new Sharp-tailed Snake population was discovered at Heals Riffle Range on March 10, 2004.

To determine the extent of the Sharp-tailed Snake populations on both Mary Hill and Heals Riffle Range, additional artificial cover objects were installed on May 31 and June 1, 2004, respectively. These boards were subsequently checked, and an additional five snakes were found on Heals Riffle Range after the initial discovery. A total of four Sharp-tailed Snakes were found in the spring on April 1, May 31 and June 7, 2004 at this location. During an experimental visit to Heals Riffle Range during the very hot night (24^{o} C at 11:17 pm) of 23 July, 2004, one Sharp-tailed Snake was found under an artificial cover object. Sharp-tailed Snakes were not found in the fall at this location. On Mary Hill, no Sharp-tailed Snakes were found during the spring, but one was found on both September 29 and October 13, and three snakes were found on October 20, 2004. Of the 11 Sharp-tailed Snakes that were found, seven were adult male snakes, and the remaining four were juvenile snakes.

At both sites, the Sharp-tailed Snakes were found relatively far apart. At Heals Riffle Range, the furthest distance the snakes were found was approximately 165 m from each other. At Mary Hill, the greatest distance between located snakes was 120 m.

The variability of parameters used to characterize Sharp-tailed Snake habitat was high, both within and among site/location categories. Nonetheless, significant differences were identified between known and potential sites and between those locations and random ones. Overall, locations known to be used by snakes had a more southerly aspect, more rock cover, shallower soil and litter, and less shrub cover than other sites.

Sharp-tailed Snake *(Contia tenuis)* Habitat Suitability and Monitoring Project on Federal Lands

Discussion

The Sharp-tailed Snake population on Heals Riffle Range and Mary Hill are the only known populations on federal lands and the only populations that are directly protected by the Species At Risk Act. The Heals Riffle Range population is located in the most pristine habitat of all the known populations in British Columbia, which provides an opportunity for learning about the biology of the Sharp-tailed Snake in the relative absence of human infrastructure and activity. Interestingly, the ratio between the Sharp-tailed Snake and other reptiles reflected by this study is almost one to one at Heals Riffle Range, but this is not the case on Mary Hill. The Mary Hill site has been altered considerably by the construction of military structures, which have probably created good habitat for the Northern Alligator Lizard and the Northwestern Garter Snake in particular. The Western Terrestrial Garter Snake has also been encountered on both Sharp-tailed Snake sites, but in low numbers.

Adult Sharp-tailed Snake *(Contia tenuis)*

Even though the artificial cover objects are an effective means of finding the snakes with a relatively low impact on the habitat, many visits are required before a site can be characterized as uninhabited by the Sharp-tailed Snake. A case on Pender Island illustrates this point. Here, a landowner checked installed boards in her garden more than 50 times over a period of one and a half years before she came across a Sharp-tailed Snake. Because it is logistically impossible to inspect all boards at the optimal time, it could take more than 50 inspections before conclusions can be made, with any certainty, that the snake is not present.

The Sharp-tailed Snake habitat characterization study was constrained by the small number of known sites for Sharp-tailed Snakes in southwestern British Columbia, which consequently limited the sample size and the strength of the statistical analyses. Thus, our conclusions are suggestive rather than definitive, but nonetheless identify potentially important variables.

Conclusion

The two known Sharp-tailed Snake sites on CFB Esquimalt lands appear to cover a larger area than expected, but more work needs to be undertaken to determine where the Sharp-tailed Snake goes in the fall at Heals Riffle Range and in the spring at Mary Hill. These populations also provide an opportunity for studying the Sharp-tailed Snake to learn more about seasonal and daily habitat use and movement.

Inspection of the other sites where artificial cover objects are installed should continue, as it cannot yet be determined that the snake is absent from these sites.

Future work to characterize Sharp-tailed Snake habitat should include the variables measured during this study as well as others that were not measured. One useful approach might be to undertake habitat studies elsewhere in the range of the Sharp-tailed Snake where it is more common. Although there are risks in extrapolating from one area to another, this might be a way of determining some of the species' fundamental characteristics.

Purple Martin *(Progne subis)* Origins and Relationships

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Permit #: *P044-04* ***Start Date:*** *1 April 2004*
Location: *Colwood* ***Completion Date:*** *30 August 2004*

Introduction

The Purple Martin *(Progne subis)*, red-listed in British Columbia, is at the northwestern limit of its range. In the early 1980s, Purple Martin numbers decreased to less than five nesting pairs in B.C. That decline subsequently led to the B.C. Purple Martin Stewardship and Recovery Program, which consisted of a population monitoring and banding study. In direct response to this program, the total number of nesting pairs in 2004 was 338; all using human-supplied nest boxes. These nest boxes have been erected, monitored and maintained by volunteers under the program.

In 2004, there were 26 known Martin colonies utilizing man-made nest boxes in B.C.; this was up from the 18 known colonies in 2003. Purple Martins in B.C. have been banded with individually numbered bands for the past seven years to determine inter-colony movements and relationships. The nest box colony at the Colwood site is one of the oldest and most productive of all B.C. colonies. The objectives for 2004 were to continue banding nestlings in nest boxes; to monitor nest success and productivity; and to monitor for band returns, particularly looking for coloured bands on early returns at the beginning of the season.

Study Area and Methodology

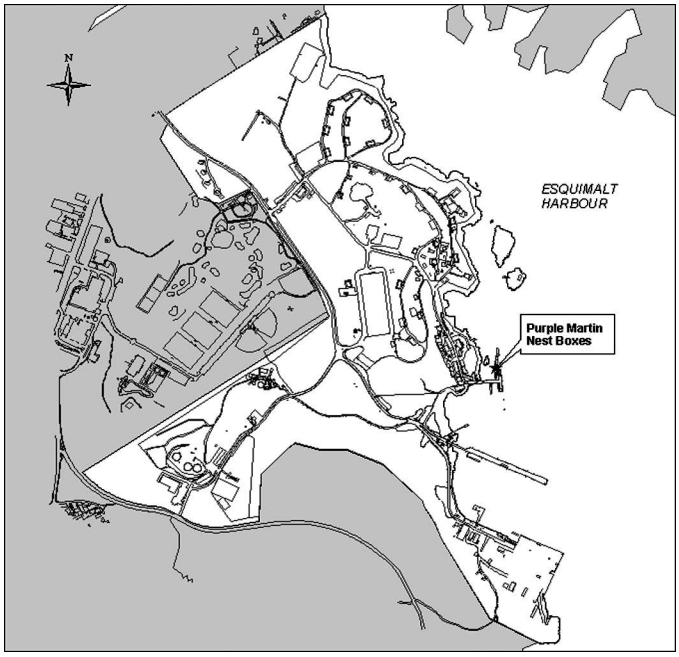
The Colwood site, located on southern Vancouver Island, is one of several nest box sites in British Columbia (Figure 1). At least 98 per cent of all nestlings, produced at known breeding locations in B.C. over the past five years, have been banded with individually numbered coloured plastic bands. These bands are visible and readable with a spotting scope, binoculars and a trained eye. In addition, the number of eggs and/or nestlings have been recorded in all open accessible nest boxes. Productivity was determined for the whole colony, on a per basis, and by nest box type.

In 2004, Purple Martin colonies throughout southwestern B.C., including Colwood, were visited to identify individuals banded in B.C. in previous years. Between April and August, 2004, 18 visits were made to the Colwood site for observation purposes, to check nest boxes and to band nestlings. As in previous years, standard body measurements of all adults captured incidentally on the nest, were taken. All band return records (re-sightings of identified individuals) were submitted to the banding office.

Purple Martin nest box at Colwood

Purple Martin *(Progne subis)* Origins and Relationships

FIGURE 1 : Location of Purple Martin nest boxes at Colwood



Results

In 2004, 155 nestlings were banded at the Colwood site; this was up from the 115 nestlings banded in 2003, and the 58 nestlings banded in 2002. Of the 52 nest boxes at the site, 41 contained eggs or young averaging 4.3 young per pair. Sixteen adult birds sighted had been banded in British Columbia in previous years. Of the 16 adult birds, five had been banded at the Colwood site. At other sites in the province, 18 colour-banded Martins were recorded that had been banded at the Colwood site in previous years.

Single nesting pairs colonized two new sites in the Victoria area in 2004. One of these sites was at Royal Roads, where a single subadult (first nestling year) male successfully fledged three young despite losing his mate during the nesting period.

Discussion

Purple Martin nestlings that were banded from 1997 through 2003 have been re-sighted at other colonies (different from their natal colonies) including Washington, Oregon and California. We suspect the B.C. colonies are part of a meta-population that ranges from at least Oregon north (and possibly California as well). Purple Martin populations are on the increase in B.C. and American coastal states. Their recovery appears to be associated with the availability of man-made nest boxes.

Preliminary analysis of DNA, from blood samples, indicates an absence of a genetic bottleneck or inbreeding. Instead, there is an extremely diverse genetic makeup to the meta-population. There appears to be an influx of birds coming north from Washington, Oregon and most likely from California as well. Final results are anticipated in early 2005.

The DNA analyses are part of an overall study examining the origin of the western Purple Martin (B.C., Washington, Oregon and California) as well as that of samples taken from Martins east of the Rockies (Alberta, Manitoba, Ontario and Pennsylvania). Determining the relationship between the western and eastern populations of Purple Martins is an important research question linked to the effective management of B.C.'s endangered Martins.

Male Purple Martin *(Progne subis)*

Distribution, Abundance and Adaptation of Butterflies at their Northern Range Limit

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Permit #: *P090-04*
Location: *CFMETR and Rocky Point*
Start Date: *1 April 2004*
Completion Date: *1 August 2004*

Introduction

This report summarizes the second of two years of research pursued in Garry oak meadows at Rocky Point and CFMETR. Studies at these sites are part of a larger, multi-site project with two objectives: to inform management of the status of Garry oak invertebrates and provide recommendations that promote their occurrence; and to serve as a model study of the potential impacts of climate change on species with contrasting life history traits. Garry oak meadows and their associated invertebrates on Vancouver Island represent the northern-most limit of the oak-grassland ecoregion in North America. If regional climate change alters natural systems, we expect to see responses in populations at the edge of their range. Species may differ in their responses to change, however, as determined by their traits and characteristics. This research aims to test if such differences occur in a model ecosystem.

The research outlined in this report will be continued over the coming seasons to build a multi-year perspective of the dynamics of butterfly populations inhabiting Garry oak ecosystems. A minimum of three years of monitoring and experimentation is necessary to provide an adequate analysis that acounts for inter-annual variability and the complexity of natural populations.

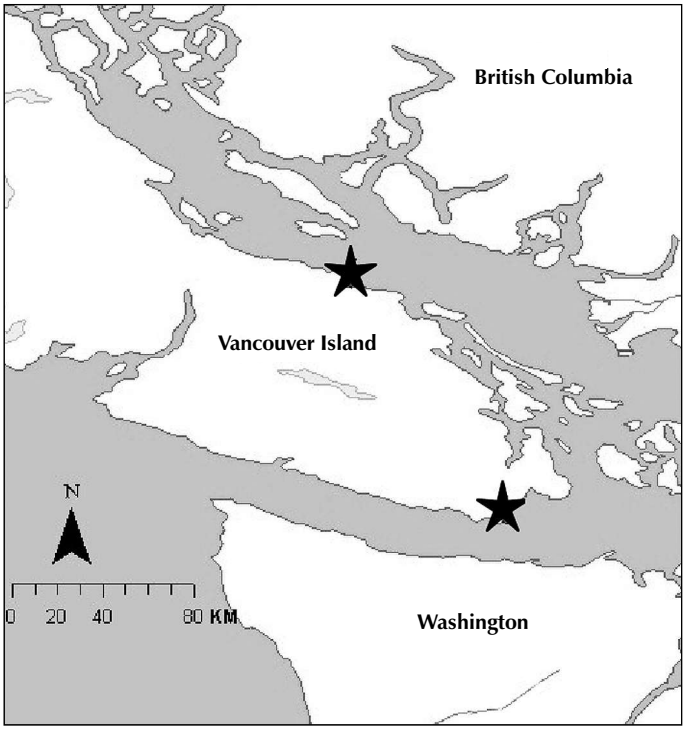
Of all butterflies that occur in Garry oak meadows, two are of particular interest for this study. These are the large-bodied generalist, *Papilio zelicaon* (Anise Swallowtail), and the small-bodied specialist, *Erynnis propertius* (Propertius Duskywing). *P. zelicaon* feeds on Lomatium spp. within Garry oak meadows and other umbellifers outside the meadows. *E. propertius* feeds exclusively on Garry oak in British Columbia. Both species require abundant flowering plants as nectar sources.

In addition to butterly and habitat surveys (also performed in 2003), we executed a translocation experiment in 2004 to test the adaptation of butterfly populations to different locations across the edge of their range on Vancouver Island. Genetic samples of these species were also collected to perform analysis of gene flow among the study populations.

Study Area and Methodology

The following methods were employed in 2004 at Rocky Point and CFMETR (Figure 1).

FIGURE 1:
Locations (★) of the CFB Esquimalt study areas on Southern Vancouver Island.



Distribution, Abundance and Adaptation of Butterflies at their Northern Range Limit

Anise Swallowtail *(Papilio zelicaon)* larva

Note that items 1-3 and 6 were also performed in 2003; item 4 was expanded from that pursued in 2003; and item 5 was expanded in 2004 from preliminary studies executed in 2003. All activities will be repeated in 2005.

1) To measure the plant community (quality of each patch for butterflies), 1x1 m quadrats were placed evenly across each study patch. The number of quadrats per site was set by the size of the patch (Table 1). Within each quadrat, we measured shrub and ground cover, the number of Lomatium spp., Garry oak stems, *Camas quamash* and Vicia spp., the number of open flowers, and the grazing intensity.

2) To quantify butterfly diversity and abundance, we regularly surveyed transects composed of 30 m segments evenly spread across each study patch. As with plant surveys, the number of segments was scaled to patch size. All butterflies observed within 5 m of the transect line were recorded. Transects were walked at a steady pace on sunny days approximately once per week. In this way, sampling effort was standardized for patch size and was constant within and across seasons. Comparisons of relative abundance, therefore, can be made using this approach (Table 1).

3) The phenology of each site was measured over time using leaf size on four reference oak trees, and we noted which plant species were in flower in each site on each visit. These phenology data also can be compared across years to indicate variation in the timing of the growing season.

4) To measure the climate of each site, electronic devices that record air temperature, relative humidity, and rainfall were placed at each site (Figure 2). These devices recorded data every five minutes over the entire study season (April-July).

5) To measure butterfly performance in the study sites, larvae were reared at Rocky Point, CFMETR, and four other sites. Adult females were captured and held in cages for 2-4 days with host plant material and hand-fed sugar water twice daily. The eggs laid by these females were moved to mesh enclosures according to the design in Appendix 1. Enclosures were regularly surveyed for hatched larvae, and the length and width of larvae were measured repeatedly over time (Table 2). Enclosures prevented larval escape, and enclosures were exhaustively searched at the end of July so that all larvae were returned to their native site at the end of the study period.

6) To assess gene flow and genetic similarity among sites, samples of *E. propertius* were collected at both Rocky Point and CFMETR. These samples augmented those gathered in 2003. A rear leg of up to 20 individuals were collected from each site and stored in ethanol vials. Leg removal did not affect flight capacity (or likely survivorship) as on several occasions, five-legged individuals were recaptured. All genetic samples have been processed to extract DNA in the Hellmann Laboratory at Notre Dame. These samples will be analyzed for microsatellites, sequence variation in select mitochondrial genes, and amplified fragment length polymorphisms (AFLP).

In 2004, voucher specimens (one male and one female of *E. propertius* and *P. zelicaon* from each study site) that had been collected in 2003 were given to the Royal BC Museum for addition to their collection.

Distribution, Abundance and Adaptation of Butterflies at their Northern Range Limit

Results

As in 2003, *E. propertius* was the most common species in these two sites, despite its blue-listed status in B.C. A trend toward increasing density with increasing latitude on Vancouver Island also appears in this species in both 2003 and 2004, with Rocky Point on the lower side and CFMETR on the higher side of that trend. Table 1 indicates the richness of butterfly species observed at Rocky Point and CFMETR in 2003 and 2004. (Appendix 2 lists the identity of these butterfly species and the date of their observation). Table 1 also provides the index of population density for *E. propertius* and *P. zelicaon* based on the area under the curve of abundance versus time. Though the data have not yet been calculated, similar estimates can be determined for all of the species observed.

Propertius Duskywing *(Erynnis propertius)* larva

Cage on a Garry oak tree used for rearing *E.propertius*.

TABLE 1:
Information for Rocky Point and CFMETR.

	ROCKY POINT	CFMETR
Latitude and longitude of study patch	N 48°19.5169′ W 123°32.6033′	N 49°16.2799′ W 124°09.5288′
Patch area[1]	5.1	29.2
Butterfly species richness[2]	13 (2003) 11 (2004)	16 (2003) 14 (2004)
Density estimate of *E. propertius*[3]	8.2 (2003) 26.2 (2004)	31.7 (2003) 23.7 (2004)
Density estimate of *P. zelicaon*[4]	0.18 (2003) 2.85 (2004)	1.63 (2003) 0.64 (2004)

1 in hectares
2 as recorded on regular butterfly surveys or seen during any site visit (see Appendix I)
3 an estimate of density of *E. propertius* adults as recorded in regular butterfly surveys; estimate approximates the area under the observance curve (number seen versus time)
4 an estimate of density of *P. zelicaon* adults as recorded in regular butterfly surveys; estimate approximates the area under the observance curve (number seen versus time)

As of December 2004, analysis of the larval translocation experiment was still on-going, but preliminary results suggest that *E. propertius* shows greater performance at the most northerly sites than does *P. zelicaon* (result drawn from data summarized in Table 2).

Distribution, Abundance and Adaptation of Butterflies at their Northern Range Limit

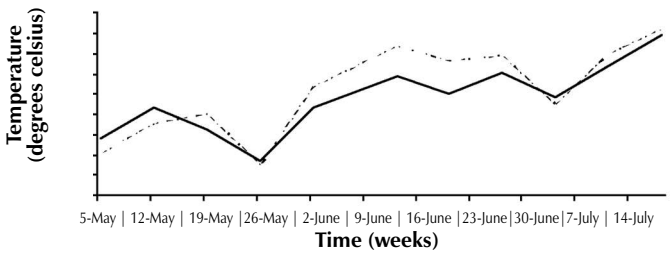
TABLE 2:
Estimated rates of growth for *E. propertius* and *P. zelicaon larvae* reared in enclosures at Rocky Point, CFMETR, or any other locale. Rates were estimated as a linear fit to log-transformed data and are given as the average among several enclosures.

E. propertius			
Native Site	**Rearing Site**	**Growth Rate (mm^3/day)**	**R2**
Rocky Point	Rocky Point	0.024	0.903
Rocky Point	Other	0.016	0.87
Other	Rocky Point	0.0675	0.918
CFMETR	CFMETR	0.0672	0.906
CFMETR	Other	0.0244	0.924
Other	CFMETR	0.0648	0.967

P. zelicaon			
Native Site	**Rearing Site**	**Growth Rate (mm^3/day)**	**R2**
Rocky Point	Rocky Point	0.1226	0.824
Rocky Point	Other	0.1423	0.884
Other	Rocky Point	0.0865	0.71
CFMETR	CFMETR	0.0672	0.906
CFMETR	Other	0.0243	0.924
Other	CFMETR	0.1476	0.92

All of the monitoring and experimental data collected in this study will be related to weather variables. In general, 2004 showed slightly different patterns of weather among the seven sites of this study than that observed in 2003, but more northerly sites (i.e. CFMETR) tend to be consistently wetter than more southerly sites (i.e. Rocky Point) in both years. Temperature data as recorded at Rocky Point and CFMETR in 2004 are shown in Figure 2.

FIGURE 2:
Average weekly day-time temperature at Rocky Point (solid line) and CFMETR (dashed line).



Discussion

Our data suggest several factors that appear to promote the abundance of the flagship Garry oak species, *E. propertius*. The most notable, is that with increasing habitat area (among seven sites studied), population size increases. This implies that reducing conifer encroachment and enhancing meadow size may enhance populations of this species. The trend of increasing population density with increasing latitude in this species may be explained by the inverse relationship between urbanization and latitude on Vancouver Island, but it may also indicate that the most peripheral of populations of this species are relatively fit, a factor that may be relatively unique to this species.

Data from the translocation experiments can be used to determine if larvae are adapted to conditions at their native site or to more southerly (central) locations. The preliminary observation of fast larval growth among the most northerly of sites in these experiments does support the hypothesis that *E. propertius* is adapted to the most extreme edge of its range, likely more so than *P. zelicaon*.

Additional results from data collected in 2003 and 2004 will emerge as data are further analyzed.

Conclusion

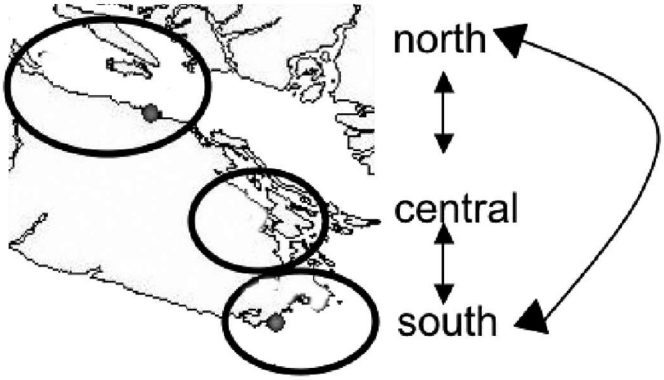
The studies described here will be repeated in 2005 (with continued permission of land owners). Graduate students will be joining field activities in 2005. The preliminary data outlined in this report and a similar report of 2003 provide useful information for managing Garry oak meadows, including those on CFB Esquimalt property. As a result of this project, we are gaining considerable knowledge about the distribution, abudance, and factors controlling butterfly populations in an ecosystem of national significance. Additional field seasons will provide an even more complete picture of the dynamics and status of these systems.

For more information on this research project, please contact Jessica Hellmann at hellmann.3@nd.edu. Please do not publish or distribute information related to this project without the consent of J. Hellmann as these studies are part of a research program in progress. The author of this report acknowledges the Endangered Species Recovery Fund of the World Widlife Fund and Environment Canada for financial support.

Distribution, Abundance and Adaptation of Butterflies at their Northern Range Limit

APPENDIX 1

Design of translocation experiments
Eggs were collected from females at sites in each of the circled areas: south, central, and north (Rocky Point and CFMETR are shown as dots in the southern and northern regions respectively). Larvae hatching from the collected eggs were reared at their native site and at one site in each of the other two study regions. Translocation studies were performed with *E. propertius*, a small-bodied specialist, and with *P. zelicaon*, a large-bodied generalist.



APPENDIX 2

List of butterfly species observed at Rocky Point and CFMETR.
These data indicate presence/absence (1=present), based on observations made while researchers were simply visiting the site or during specific butterfly surveys. The most abundant butterfly species seen at both sites was *E. propertius* (Table 1). Note that in the species list below, the category "Sw" captures swallowtails (*Papilio*) that could not be identified to the species level.

ABBREVIATION	LATIN NAME	COMMON NAMES
EP	*Erynnis propertius*	Propertius skipper
PZ	*Papilio zelicaon*	Anise swallowtail
SA	*Celestrina echo*	Spring azure
CW	*Pieris rapae*	Cabbage white
GH	*Strymon melinus*	Grey hairstreak
SO	*Anthocharis sara*	Sara's orangetip
AW	*Polygonia spp.*	Anglewing
MC	*Nymphalis antiopa*	Mourning cloak
AS	*Carterocephalus palaemon*	Arctic Skipper
PC	*Lycaena helloides*	Purplish Copper
LA	*Limenitis lorquini*	Lorquin's Admiral
El	*Incisalia iroides or Icisalia mossii*	Elfin (Western or Moss')
MF	*Boloria bellona*	western meadow fritillary
Fr	*Speyeria hydaspe or Speyeria zerene*	Hydaspe/Zerene fritillary
Sw	*Papilio spp.*	Tiger/Pale/Anise Swallowtail
TSw	*Papilio rutulus*	Tiger swallowtail
PSw	*Papilio eurymedon*	Pale swallowtail
Cr	*Phyciodes mylitta*	Mylitta crescent***
WS	*Ochlodes sylvanoides*	Woodland Skipper
WN	*Cercyonis pegala*	Common woodnymph

*** Misreported in 2003 as Western meadow fritillary, *Clossiana epithore*

Distribution, Abundance and Adaptation of Butterflies at their Northern Range Limit

APPENDIX 2:

Rocky Point

Date	EP	PZ	SA	CW	GH	SO	AW	MC	AS	PC	LA	El
04/06/04	1	1									1	
04/16/04	1	1	1		1							1
04/24/04	1	1	1				1					1
04/30/04	1		1		1							1
05/15/04	1	1										
05/24/04	1	1										
06/14/04		1								1	1	
06/22/04	1										1	
06/30/04				1							1	
07/07/04												

Date	MF	Fr	Sw	TSw	PSw	WN
04/06/04				1	1	
04/16/04					1	
04/24/04						
04/30/04						
05/15/04				1		
05/24/04						
06/14/04				1	1	
06/22/04				1	1	
06/30/04				1	1	1
07/07/04						1

CFMETR

Date	EP	PZ	SA	CW	GH	SO	AW	MC	AS	PC	LA	El
04/07/04	1					1						
04/19/04	1				1	1						
04/25/04	1		1	1	1	1	1					
05/06/04	1	1	1		1	1						1
05/19/04	1	1	1				1				1	
05/31/04	1	1										
06/04/04	1	1		1								
06/15/04	1	1										
06/25/04											1	

Date	MF	Fr	Sw	TSw	PSw	Cr
04/07/04						
04/19/04						
04/25/04						1
05/06/04	1				1	
05/19/04			1	1		
05/31/04				1		
06/04/04			1	1	1	
06/15/04					1	
06/25/04						

Royal Roads University - Microclimate Monitoring Station Upgrade at Rocky Point

Dr. Bill Dushenko

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Permit #: *P087-04*
Location: *Rocky Point (Forest Canopy Research Station)*
Start Date: *January 2004*
Completion Date: *On-going*

Introduction

This project involves the on-going enhancement of the microclimate monitoring station as part of the existing Ecological Monitoring and Assessment Network (EMAN) site and forest canopy research station at Rocky Point. This includes the installation of two towers and new solar panels to power the existing instrumentation and support the existing rain gauge, installation of soil moisture probes in the existing EMAN plots, and the set-up of a small storage shed to house some of the existing and future monitoring equipment from the elements. This information will be used to support other research activities relating to climate change and forest ecosystem response.

The general objective of this project is to enhance the current capabilities of the existing microclimate monitoring station at Rocky Point for the purposes of downloading information from the data logger on a regular basis using remote technology.

Study Area and Methodology

The Forest Canopy Research Station, established in an old growth Douglas-fir forest, is located on the Rocky Point property situated at the extreme southern tip of Vancouver Island (Figure 1).

In 2004, the microclimate monitoring station upgrade involved the installment of sensing levels established at 10, 20 and 30 m elevations for recording temperature and relative humidity. Other activities included: the installation of a 3 m tripod stand within the salal ground cover to provide a sensing level at the surface of the vegetation cover; the set up of three soil moisture probes at three different profiles within the EMAN site; and the installation of two towers on the rock outcrop adjoining the microclimate tree. The larger tower was set at 19 metres above ground level, representing the top of the forest canopy. It was equipped with a 750 watt solar panel. The smaller tower was set at 10 metres above ground level and was equipped with a tipping bucket rain gauge.

Results

Continuing upgrades of the microclimate monitoring station at Rocky Point are anticipated for 2005. Once the upgrade is complete, the downloading of climate information from the data logger will commence.

Discussion

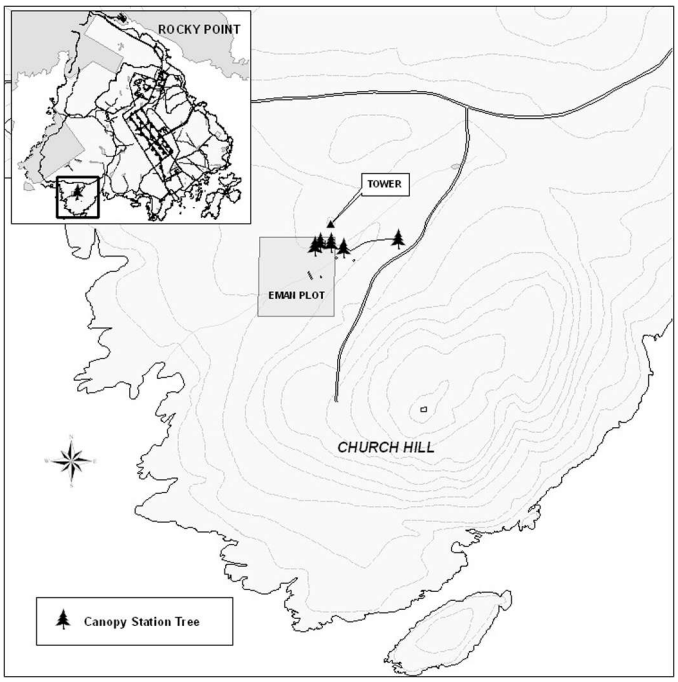
The improvements to the micrclimate station will help to support the longer-term project of monitoring climate conditions and atmospheric pollutants (both local and long-range), as well as indicators of environmental health in temperate coastal forest ecosystems. The current upgrade has been slower than anticipated, contingent upon the availability of infrastructure funds, but will likely be completed by spring 2005. A quantum radiation sensor; temperature and relative humidity sensors and a wind speed and direction sensor will be attached to the larger (19 m) tower in 2005. The smaller (10 m) tower will also be equipped with an antenna for cellular communication between Royal Roads and the data logger in 2005. A full ambient monitoring station at Christopher Point along the Strait of Juan de Fuca is being developed, located just southeast of the microclimate station. A memorandum of understanding is being established, with the ambient station expected to be operational by spring 2005, in collaboration with Environment Canada.

Royal Roads University - Microclimate Monitoring Station Upgrade at Rocky Point

Conclusion

The Rocky Point site constitutes the southern Vancouver Island node of the Georgian Basin, and is part of a larger global environmental monitoring network. The acquisition of data by the microclimate station situated by the EMAN site adjacent to the the forest canopy research station at Rocky Point will be an important component of this project. The microclimate station will also serve as an important vehicle for research, education and extension activities in the future.

FIGURE 1: Location of the microclimate monitoring station at Rocky Point.



Pilot Monitoring Program for Plethodontid Salamanders on Vancouver Island, B.C.

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Permit #: *P088-04*
Location: *Rocky Point and Royal Roads*
Start Date: *April 2004*
Completion Date: *On-going*

Introduction

Forest-dwelling salamanders of the family Plethodontidae are very sensitive to environmental perturbations that cause changes to the moisture or temperature regimes on the forest floor, and can be used as indicators of ecosystem health and biodiversity values (Brooks 1992, Sugar et al. 2001, Welsh and Droege 2001). Plethodontid salamanders are deemed to be particularly sensitive to droughts and other predicted events associated with global climate change, because of their terrestrial life cycle, lack of lungs and reliance on respiration through the moist skin, and requirements for moist retreat sites on the forest floor (Ovaska 1997).

In December 2002, a pilot salamander monitoring program was initiated using cover-boards at two sites on southern Vancouver Island with the Western Red-backed Salamander (*Plethodon vehiculum*) as the focal species (Ovaska et al. 2003). The set-up of the program followed recommendations for a national monitoring protocol for plethodontid salamanders developed jointly by the Ecological Monitoring and Assessment Network (EMAN) and Parks Canada (Zorn and Blazeski 2002). One of the study sites is in an old growth coniferous forest at Rocky Point, on lands managed by the Department of National Defence. The other site is within a mature second-growth coniferous forest on the campus of Royal Roads University (upland forest ecological monitoring plot). A total of 45 cover-boards (in three plots of 15 boards) were placed at each site in association with vegetation plots monitored by researchers from the Royal Roads University. Cover-boards are an effective method for sampling salamanders and allow for repeated surveys with minimal disturbance to the forest floor (Davis 1997, Zorn and Blazeski 2002).

The intent of the project is to gather long-term data on population trends of salamanders at these sites and to correlate possible changes with environmental parameters (such as climate trends and vegetation composition and structure). Additional strategic sites can be added to the program as opportunities arise. The boards at the Rocky Point and Royal Roads sites were first inspected in the spring of 2003 (Ovaska et al. 2003).

Study Area and Methodology

In 2004, the existing cover-boards at both Rocky Point and Royal Roads were inspected three times in May and early June, a period that is usually optimal for salamander activity on southern Vancouver Island.

Western Red-backed Salamander *(Plethodon vehiculium)*

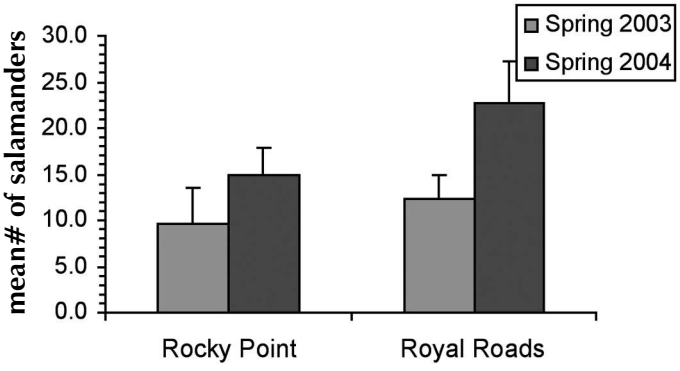
Pilot Monitoring Program for Plethodontid Salamanders on Vancouver Island, B.C.

Results

Inspection of boards

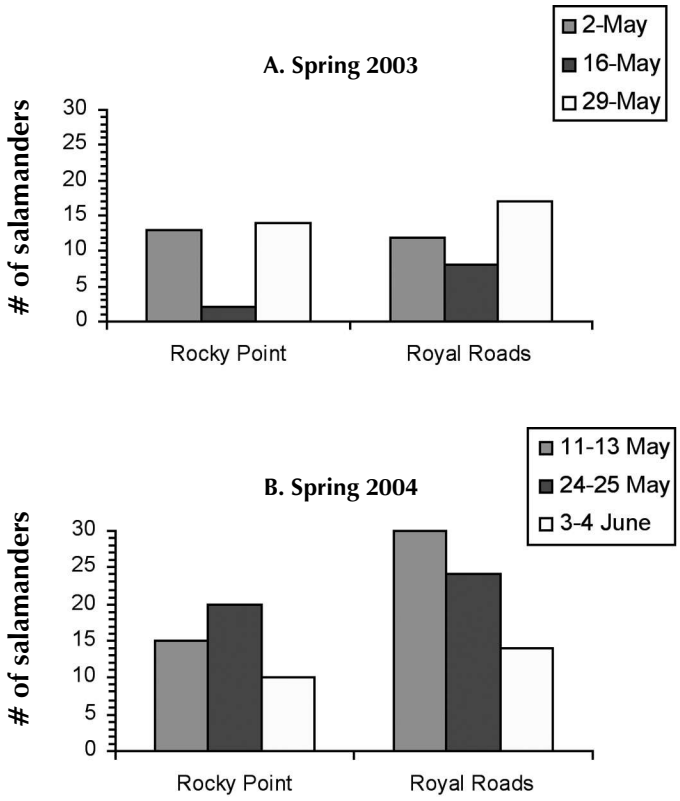
The 2004 surveys resulted in a total of 45 captures of the Western Red-backed Salamander at Rocky Point and 68 captures at Royal Roads; the corresponding numbers in 2003 were 29 and 37 captures for the two sites, respectively. An increase in captures from 2003 occurred at both sites in 2004 (Figure 1). Cover-boards typically continue to improve in effectiveness for the first year after installation, as more salamanders find them, and as the boards weather. Interestingly, salamander numbers increased from 2003 despite unusually dry conditions in April and May 2004. Any effects of droughts might be delayed and most deleterious to small juveniles, which are under-represented in samples from cover-boards. The number of captures continued to be higher at Royal Roads than at Rocky Point in 2004 (Figure 1).

FIGURE 1:
Mean number of Western Red-backed Salamanders caught with cover-boards per site in the spring of 2003 and 2004.



There was little variation in salamander numbers between the first and second survey period, but at both sites numbers were depressed during the last survey in early June, possibly reflecting higher temperatures and drier conditions on the forest floor (Figure 2).

FIGURE 2:
Number of Western Red-backed Salamanders caught with cover-boards per sampling period in the spring of 2003 (A) and 2004 (B).



In 2004, captures of the Western Red-backed Salamander were equally distributed among boards that were old (weathered in the forest) and new when installed, suggesting that any effects of board aging at that time were minimal (Table 1). In 2003, in contrast, salamanders were more frequently associated with old than new cover-boards.

Pilot Monitoring Program for Plethodontid Salamanders on Vancouver Island, B.C.

TABLE 1:
Use of old (weathered) and new boards by the Western Red-backed Salamander at the Rocky Point and Royal Roads monitoring sites in spring 2003 and 2004. There were 15 old and 30 new boards at each site. Old board- (weathered in forest from 1996 to 2002); New board - (new in 2002)

A. SPRING 2003

Site	Old	New	Total
Rocky Point	17	13	30
Royal Roads	17	23	40
Total (observed)	34	36	70
Expected	23.33	46.67	
X^2 =	**7.31**	**P < 0.01**	

B. SPRING 2004

Site	Old	New	Total
Rocky Point	17	27	44
Royal Roads	13	54	67
Total (observed)	30	81	111
Expected	37.00	74.00	
X^2 =	**1.99**	**0.2 < P >0.1**	

In addition to the Western Red-backed Salamander, the Rough-skinned Newt (*Taricha granulosa*) was found under the boards at both sites in 2004 (Rocky Point: 2 captures; Royal Roads: 1 capture). As in 2003, we also recorded the occurrence of selected macro-invertebrates (molluscs, carabid beetles, and millipedes) from the boards.

Relocation of a plot at Royal Roads

Plot 4 at the Royal Roads site produced only two salamanders during inspections of the boards in the spring of 2003, and no salamanders were found there in 2004. In contrast, Plots 1 and 2 were productive for salamanders in both years. Therefore, we decided to move the 15 boards from the unproductive Plot 4 to a nearby location at Plot 3. The plot numbers refer to vegetation plots established by researchers from the Royal Roads University. The relocation of the salamander boards from Plot 4 to Plot 3 took place after their inspection on 4 June 2004.

Individual identification of salamanders

In 2003, we identified individual salamanders through pattern mapping. This information provides additional demographic and movement information that is useful for interpreting observed population trends. However, because of the relatively large number of salamanders caught and time and funding constraints, individual identification was deemed beyond the scope of the present project and discontinued after the first survey session in 2004. The data that have been collected so far on individual identification are available as Microsoft PowerPoint files and can be resurrected as needed.

New plot at Butterfield Park

A new salamander monitoring plot was set up on 4 June 2004 in Butterfield Park on Saanich Peninsula. The plot consists of 16 boards, in four parallel lines of four boards; the boards are approximately 5 m apart and the lines approximately 10 m apart from each other. The boards were set up at the request of Jenny Hyndman from the Park, who hopes to work with high-school students from Stelly's School on this project. The Western Red-backed Salamander is present at this site, as confirmed during a site visit with students in May 2004.

Discussion

The establishment of additional monitoring sites within the range of the Western Red-backed Salamander should be considered to provide information on region-wide patterns in relation to global climate change, pollutants, or other atmospheric or wide-scale environmental changes.

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The Late Prehistoric Mortuary Landscape of Southern Vancouver Island

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Permit #: *P104-04*
Location: *Albert Head, Mary Hill and Rocky Point*

Start Date: *July 2004*
Completion Date: *On-going*

Introduction

Mortuary rituals are an expression of social relations among and between people after the death of a community member. In many cultures, burials are the result of formalized practices that often produce objects or patterns that can be observed by archaeological means. In the millennium prior to the arrival of Europeans, Straits Salish peoples on southern Vancouver Island constructed burial cairns as part of their funerary practice. Burial cairns are piles of rocks arranged over the dead in a variety of shapes, sizes, and orientations. Although there is considerable variation in cairn construction, they typically vary between 1-5 m in diameter and consist of a visible, discrete pile of rocks purposefully placed over the dead, typically in a patterned way. Some cairns exhibit elaborate secondary features such as concentric rings of stones and radiating linear rows of stones. Cairns also appear to be laid out in patterns throughout the landscape, much like modern graveyards are structured into sections with unique grave markers representing the identity of the people interred there.

Burial cairns present a unique opportunity to investigate, in unusually great detail, people's concepts of society, status, ideology and landscape are expressed through mortuary practice. Burial cairns in Victoria have received little contemporary archaeological attention, as the majority of them have been altered or destroyed by development in the Twentieth century. Cairns were present throughout Greater Victoria and were one of the area's earliest types of archaeological sites investigated. Recognized by European immigrants due to their similarity with burial cairns in their homelands, early cairn studies were rudimentary, generally consisting of dismantling cairns in the search for grave goods. The majority of cairns in Victoria were subsequently destroyed during the construction of houses and streets; little real information on these sites was ever systematically collected or interpreted.

Department of National Defence properties provide a refuge for some of the last remaining intact burial cairn sites on southern Vancouver Island. For example, over 600 burial cairns are known to exist on CFB Esquimalt properties in the Victoria area. This research utilizes the three landscapes of Rocky Point, Mary Hill, and Albert Head as representative samples of cairn sites on southern Vancouver Island. These three properties encompass a significant portion of Metchosin with coastline that exhibits very different terrain, bedrock exposure, visibility and other physical landscape attributes. Additionally, all three localities exhibit different spatial arrangements of cairns. For example, the largest remaining cairn site in the province, DbRv-3 at Rocky Point, has a concentration and variety of several hundred cairns, whereas Albert Head has several diffuse cairn sites with less than 20 cairns each.

It is proposed that these three distinct and different landforms, with varying types, sizes and concentrations of cairns, will provide a range of meaningful variation within the local landscape, potentially reflecting social processes at play in the selection of the sites for the construction of burial cairns.

These significant and largely undisturbed concentrations of burial cairns—likely some of the last of their kind in British Columbia— provide a unique opportunity to investigate how these monuments may have established a symbolic link between the landscapes of the living and the dead.

This research examines how the spatial distribution of burial cairns functioned as a symbolic expression of social relations between peoples and how these societal structures were materially reflected on the landscape. The premise is that the mortuary landscape, as illustrated through burial cairn distribution, is the direct result of a society constructing and interpreting the world around them. The construction of burial cairns may reflect a people's understandings about their world and about their social identities.

The Late Prehistoric Mortuary Landscape of Southern Vancouver Island

The objective of this project is twofold. Firstly, collection of data on the physical form and spatial location of individual burial cairns is being undertaken. Patterns in cairn size, construction and orientation, in addition to spatial analytical variables, may be reflective of underlying local social structures, such as group identity and status. Secondly, intersite landscape spatial data is being collected. The geographic layout of cairn sites in relation to each other and to the natural and cultural elements of the local landscape are informative regarding larger scale regional concepts of space and group identity.

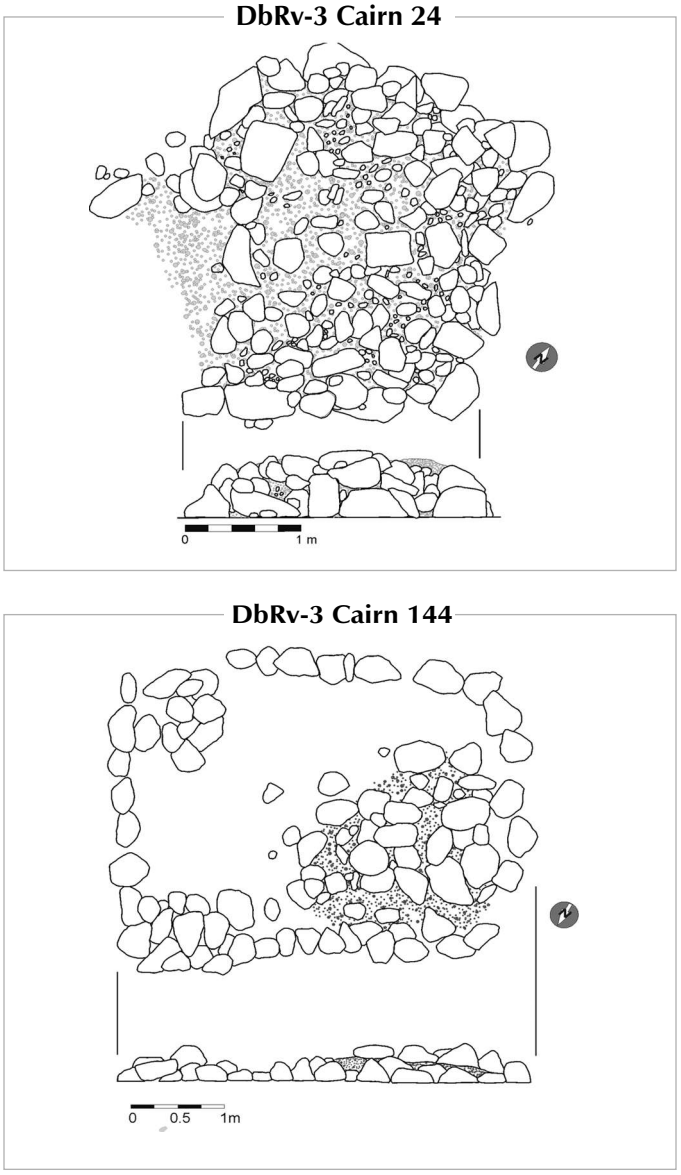
Study Area and Methodology

The majority of the data was supplied from a large cairn site (designated DbRv-3) in the vicinity of Edye Point at Rocky Point, with supplemental data collected from other sites at Rocky Point, Mary Hill and Albert Head. Interpretation of the data was facilitated by a spatial analysis using a Geographical Information System (GIS) to identify patterns within individual sites as well as among sites and how these patterns related to the larger landscape of southern Vancouver Island. From this spatial database, social theory regarding burial monuments and landscape was applied.

In order for the intrasite spatial analysis of DbRv-3 to be successful, it was necessary to first inventory the site with systematic pedestrian transects. A crew of 3-5 experienced archaeologists walked systematic transects with a 2-m interval between surveyors, marking each petroform feature with a high-visibility pin flag. Each pin flag was labelled with the feature number. The entire site was traversed east-west in this manner, then again north-south to ensure thorough coverage. The site was over-surveyed 200 m in each direction to ensure that all features associated with DbRv-3 were accounted for. Accurate spatial data for each cairn was collected with a Trimble back-mounted 4700 GPS and a TSC1 data collector. Based on the capability of the instrument and the specific satellite telemetry during data collection, accuracy was estimated to be within 20 cm. Cairnswere collected as point data and larger landscape features were plotted as polygonal data. The spatial data was converted to a database and imported into a Geographic Information System.

For the analysis of individual cairns, a total of 18 analytical variables were collected, in addition to the production of photographs, contour maps and diagrams of significant cairns (Figure 1). The metric attributes of each feature; information on the specific type, amount, shape, and size of the constituent rock; and the structure of each cairn were recorded on a standardized form. Some cairns required at least partial clearing of accumulated vegetal matter, particularly from invasive species such as Scotch broom and gorse. Cairns were otherwise not to be affected by the proposed research and the Scia'new First Nation expressed in writing that they were satisfied with this methodology. This clearing substantially enhanced the amount of visible data and, therefore, the interpretative potential of the site.

FIGURE 1: Cairns at Rocky Point, DbRv-3.



The Late Prehistoric Mortuary Landscape of Southern Vancouver Island

Results

Prior to this research, there had not been a comprehensive and encompassing examination of the spatial distribution of burial cairns in the Strait of Georgia, despite being one of the earliest types of archaeological sites studied in the region. Additionally, there had not been a comprehensive inventory of burial cairns in the Victoria Region. From a culture history perspective, this research generated a systematic and detailed survey of over 1400 hectares of land in Metchosin (and 20 km of shoreline), the largest systematic archaeological survey conducted in the Victoria area. In addition, over 600 cairns were inventoried, mapped, and entered into a GIS spatial database. Detailed analysis of the individual burial cairns at DbRv-3 at Rocky Point is approximately 20% complete.

Discussion

This research explores ways in which social practices are linked to particular forms of relationships between peoples and to particular forms of power. Most themes of monumentality view burial cairns as indicators of social hierarchy and elite control of surplus non-elite labour rather than as the outcome of processes that are characteristic ofthe changing relations and strategies between agents in society. This research proposes that the spatial distribution of burial cairns in the southern Strait of Georgia are material elements of a socially constructed landscape and can therefore be used to examine social relationships between peoples who constructed burial cairns. The mortuary landscape, as illustrated through burial cairn distribution, is the material process of a society constructing and interpreting the world around it.

Field research will continue in 2005. The aim of the research will continue to focus on gathering detailed information on individual cairn morphology from DbRv-3 and using this information to spatially and statistically test associations between individual cairns within the site, but also to test the spatial associations between DbRv-3 and other cairn sites and the natural landscapes of Rocky Point, Mary Hill and Albert Head.

Conclusion

While spatial and morphological data is still being collected from burial cairns at DbRv-3, there are promising preliminary results suggesting that there are discernable practices relating to emergent complexity in concepts of social identity within precontact Straits Salish communities. For example, there are two distinct clusters of burial cairns closest to Edye Point. The cairns within the first cluster are all manufactured from the same white granitic rock. The rocks that people used there are also generally the same size, however the cairns themselves are different shapes and sizes. The adjacent cluster of cairns, along the same stretch of shoreline, exhibits a similar phenomenon of people consistently selecting the same size and type of rocks, in this case much larger basaltic boulders, with which to construct cairns. Again, while there is consistency within the cluster of people using the same type and size of rock, there is considerable variation in the shape and size of the actual cairns. So while peoples had equal geographic access to the same rocks, they chose in these two instances, to distinguish the two clusters by using different types and sizes of rocks, possibly to differentiate one group of people from another, yet within each of these clusters, people were constructing very different shapes and sizes of cairns from the same types of rocks, suggesting internal divisions within each of these larger groupings. While these and other results are tentative pending further data collection and analysis, it suggests that the materiality and positioning of burial cairns has the interpretive potential to identify different social processes, and by extension larger themes of group identity and the maintenance and contesting of societal structures, as they are materially expressed through the creation of the mortuary landscape at Rocky Point.

Monitoring of Winter Moth *(Operophtera brumata)* and the Parasites Introduced for its Control

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Permit #: *P031-04*
Location: *Naden (Colville Officers' Mess on Hotham Street)*
Start Date: *1 May 2004*
Completion Date: *31 May 2004*

Introduction

The winter moth (*Operophtera brumata)* is an introduced pest that originated in Europe. It was first introduced into Nova Scotia in 1949, and was first detected in the Victoria area in 1976. By 1977, this insect was defoliating over 120 km^2 on south Vancouver Island. Its principle host on southern Vancouver Island is the Garry oak, *Quercus garryana Dougl.*, a unique tree with restricted distribution.

In 1979, the Canadian Forest Service commenced the introduction of two natural enemies of this insect, both from Europe and from Nova Scotia, where a similar introduction program had been successful. During the successful release program in Nova Scotia, six parasitoid species (three parasitic wasps and three parasitic flies) were introduced, of which two species became established and are credited with controlling the winter moth in Nova Scotia. These same two successfully introduced natural enemies, a parasitic wasp, *Agrypon flaveolatum*, and a parasitic fly, *Cyzenis albicans*, were released over a four-year period at a total of 33 different locations in the Victoria area. One of these locations is on Department of National Defence (DND) land adjacent to the Colville Officers' Mess on Hotham Street, Victoria.

Following the completion of the release program in 1982, a monitoring program was established to track the success of the introductions and the stability and value of the newly established host-parasitoid complex.

The objective of this study is to monitor the current population density of the winter moth on Hotham Street, one of the sites used for parasite releases between 1979 and 1982, for comparison with data collected during the last 20 years. Winter moth larvae will be collected and reared to determine percent parasitism by the introduced parasites at this and other sites in the Greater Victoria area. These data will be compared with those collected in previous years to determine whether the introduced parasitoids have become established and are effective in controlling winter moth populations.

Study Area and Methodology

Two sampling methods were employed at the Colville Officers' Mess site located on the Naden property, to monitor winter moth populations and the interaction between the host and parasitoids.

Winter moth population densities were determined by making collections of 20 branches from four oak trees (five branches per tree) at six permanent sample locations in the Greater Victoria area, one of these being located on the Naden property on Hotham Street. The branch samples were collected when winter moth larvae had reached late 3rd or early 4th instar, usually during early- to mid-May. Four trees were randomly chosen at each of the permanent sample locations. A pole pruner with a basket attached below the cutting head was used to collect an oak branch that had newly flushed leaf clusters. The branch was cut so that it will fall into the basket, and any larvae that were dislodged were retained in the basket. The branch was then cut into smaller pieces and placed into a 20 lb brown kraft paper bag along with the contents of the basket attached to the pole pruner. The bag was then sealed and the process repeated until five branches were collected from each of the four trees (for a total of 20 branches) at each sample location. The samples were then taken to the Pacific Forestry Centre and stored in at –20° C until they could be examined to count the number of winter moth larvae, leaves and leaf clusters on each branch. Winter moth larval densities were then expressed as the number of larvae per leaf or leaf cluster to monitor changes in the winter moth population over time.

Monitoring of Winter Moth *(Operophtera brumata)* and the Parasites Introduced for its Control

Parasitoid populations were monitored when the larvae reached early- to late 4th instar, just before the mature larvae completed feeding and dropped to the ground to pupate in the duff layer. Winter moth larvae were collected and reared in the laboratory because the parasitoid larvae hatch and feed inside the host, and cannot be identified until they complete development later in the year. Two collections were made to ensure that parasitized winter moth larvae were collected. Trees were selected at random at the permanent sample location. A large (2 m x 3 m) white sheet was placed on the ground part of the crown of one tree, and a 2 m pole was used to beat all the branches located over the sheet to dislodge the larvae from the tree. This procedure was repeated until either 200 or more larvae were collected, or the amount of time required to collect the insects exceeded one hour. All the winter moth larvae that had fallen on the sheet were collected and placed in a cardboard bucket containing some oak foliage and a layer of moist peat moss in the bottom for the mature larvae to pupate in. Once the larval collection at the location was completed, the bucket was covered with a fine mesh lid and the insects transported back to the Pacific Forestry Centre for rearing. The winter moth larvae were reared in the buckets until they spun down into the peat moss and pupated. Once the winter moth finish pupating (at the beginning of June), the peat moss was removed from the buckets and sieves were used to separate the winter moth cocoons from the peat moss, frass and oak leaf debris. The cocoons were then placed in large (100 x 20 mm petri dishes) that contain a layer of moist sand covered with a filter paper. The filter paper and cocoons are moistened as required to prevent desiccation of the pupae. The pupae were reared at room temperature until mid-September, then transferred to a growth chamber and will be reared at 5°C-8°C until the spring. Adult moths started emerging around mid-November and are expected to finish emerging in mid-December, while the parasites will not emerge until the spring.

Results

In 2003, winter moth populations averaged 0.26 larvae per leaf in the Greater Victoria area, and increased only slightly in 2004 to an average of 0.30 larvae per leaf. This population density caused trace defoliation (damage) to the leaves. At the Naden site, winter moth populations almost doubled, increasing from 0.07 to 0.12 larvae per leaf.

Percent parasitism by both parasitoid species, *Agrypon flaveolatum* and *Cyzenis albicans*, can only be determined in the spring after the overwintered parasitoid pupae emerge. In 2001 and 2002, parasitism of winter moth by both species declined. However, in 2003 there was a significant increase in percent parasitism by both species. Parasitism by *Agrypon flaveolatum* decreased from 0.7% to 0.2% in the Greater Victoria area, and no *Agrypon flaveolatum* were reared from insects collected at the Colville site in either 2001 or 2002. However, rearings of collections made in the Greater Victoria area in 2003 showed that 1.8% of larvae were parasitized by *Agrypon flaveolatum*,

Researchers knocking winter moth larvae out of a Garry oak tree.

Reasearchers searching for winter moth larvae through foliage and debris knocked down by tree beating. The larvae are then reared in the lab to determine parasite populations.

Monitoring of Winter Moth *(Operophtera brumata)* and the Parasites Introduced for its Control

an almost 10-fold increase. Adult *Agrypon flaveolatum* were also reared from winter moth larvae collected at the Naden property for the first time since 1998. During the same two years (2001 and 2002), percent parasitism by *Cyzenis albicans* decreased from 11.8% to 7.4% in the Greater Victoria area, and decreased from 15.0% to 1.2% at the Naden site. As with the parasitic wasp, percent parasitism by *Cyzenis albicans* increased to an average of 26.7% in the Greater Victoria area, and 21.2% at the Naden site.

Discussion

Winter moth populations at the Naden site were lower than the regional average, but this is not unusual since winter moth populations have been consistently lower at this location than the overall average population levels for the Greater Victoria area since 1991. Winter moth populations during 2003 and 2004 are the highest recorded in the last 10 years. Although population levels of this magnitude occurred in 1993, the population collapsed the following year. However, parasitism by *Cyzenis albicans* was considerably higher then (about 57%). Therefore, one cannot predict if the population levels will continue to increase over the next 2-3 years, or if the population will return to its previous endemic levels. Only continued monitoring in the Greater Victoria area will reveal this.

With regards to the parasitoids, the predictions from last year were inaccurate. Initially, it was predicted that parasitism by *Agrypon flaveolatum* was likely to remain low (less than 1%), as this parasitoid has never been found to cause more than 6% parasitism in a single year in B.C. since its introduction 20 years ago. However, last year parasitism by *Agrypon flaveolatum* reached almost 2%, double the predicted value. The experience in Nova Scotia indicates that *Agrypon flaveolatum* attacks winter moth at low population levels, and with a reduction in percent parasitism by Cyzenis albicans, the number of insects attacked by *Agrypon flaveolatum* may increase. Interestingly, percent parasitism by the parasitic fly, *Cyzenis albicans*, also increased (from 7.4% to 26.7%), indicating that it, too, is recovering from whatever environmental factor caused its abrupt decline.

At this time it is still too early to make any long-term predictions on winter moth populations and the associated parasitoids. It is still possible that the decline in rate of winter moth parasitism by *Cyzenis albicans* may allow winter moth populations to again increase to the point where they cause light to moderate damage to Garry oak in the Greater Victoria area. However, if the current trend continues, the populations of the introduced parasitoids will continue to increase, causing a decline of the winter moth population below a level that would cause noticeable damage.

Conclusion

The results of the past 20 years of monitoring winter moth populations in the Greater Victoria area suggest that the introductions of the two parasitoids, *Agrypon flaveolatum* and *Cyzenis albicans*, particularly the latter, has resulted in control of the introduced winter moth in the Greater Victoria area. The case for the establishment of a stable host-parasitoid complex is complicated by the two gypsy moth treatments that were conducted in 1998 and 1999 in the Greater Victoria area to eradicate the European strain of gypsy moth. These applications of the bioinsecticide, *Bacillus thuringiensis* subsp. *kurstaki,* or *Btk* (a naturally occurring soil bacterium) also reduced winter moth populations on the previous occasion when it appeared that the winter moth populations would increase. Although this application of *Btk* may have disrupted the equilibrium reached between the winter moth and the two introduced parasitoids in the treated areas (including the Naden site), it does not explain the decline observed throughout the Greater Victoria area. Therefore, it is important to continue the monitoring to observe the long-term interaction and stability of the winter moth and parasitoid populations. The monitoring will reveal if the host-parasitoid complex has reached an equilibrium or not, and whether this equilibrium is affected by the periodic use of *Btk* that might be required to prevent the establishment of another invasive species, the gypsy moth (be that either the European or Asian strain), on the West Coast.

Garry Oak *(Quercus garryana)* Acorn Production Study

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Permit #: *P079-04*
Location: *CFMETR, Mary Hill and Rocky Point*
Start Date: *August 2004*
Completion Date: *On-going*

Introduction

The Garry oak (*Quercus garryana*) acorn productivity study was initiated in the summer of 1999 to explore factors influencing acorn production. Reasons for conducting this study include: Garry oak ecosystems are rapidly disappearing or changing due to the introduction of exotics, fire suppression and land conversion for agricultural and urban uses. Acorns are a rich source of food for many wildlife species and are important for oak regeneration and dispersal. There is little published information on acorn crop sizes in Garry oak. This project is intended to be long-term and range wide. A minimum of 10 years data collection is anticipated in order to evaluate acorn production periodicity and climatic influences. The 6th season of data collection has been completed and analysis is under way, though not complete as of this writing. The sample range includes sites from British Columbia to northern California or approximately the northern 2/3 of the range of the tree form of the species. Because the range of the species is so large and the sampling season so short (late August to late September), we depend on a network of volunteers and cooperators to help collect acorn abundance data. In British Columbia, our cooperators since 2001 have been Paul Courtin of the B.C. Ministry of Forests and Kevin Brown, a private contractor. To assist our volunteers and inform the general public, we have created a website with background information, methods and forms used in the survey and results of the survey (www.fs.fed.us/pnw/olympia/silv/oak-studies/acorn_survey).

The project will determine how common good and bad acorn crops are, the variation in production between places and the environmental and biological factors that influence production. We want to understand the conditions contributing to both individual tree and stand level production. This includes both local and regional environmental factors, biological interactions and community succession. We want to obtain as wide a sample as possible to determine if regional differences in acorn production exist.

Study Area and Methodology

Ranging from British Columbia to northern California, the acorn survey is conducted using an ocular estimation method developed by Graves (1980) for survey of oaks in California. Acorns are surveyed from the latter part of August to the end of September, depending on the site and acorn development. Acorn production is scaled with a 1-4 coding system with 1 indicating no acorns and 4 indicating a heavy crop. The method was designed for use with volunteers and tests with volunteers have shown it to be reliable (Graves 1980). Mean acorn codes are used in this report to indicate relative acorn production between sites. It should be understood that acorn codes are not evenly spaced estimates of abundance. An acorn code of 4 can indicate many more acorns than a code of 3. In total, acorn counts from a small sample of trees in 1999 code 3 trees averaged about eight times as many acorns as code 2 trees. Site data such as slope, elevation, aspect and others are collected to characterize the physical setting of the tree which affects tree vigor and acorn production. Also collected are data indicating the anthropogenic setting such as irrigation, fertilization, urban or agricultural settings. Tree data including diameter at breast height (dbh), tree height, crown diameter, tree shape, health and others allow evaluation of the tree's

Garry Oak *(Quercus garryana)* Acorn Production Study

vigor, size and competitive position. Acorn classes of three CFB Esquimalt properties were compared to each other and to other Vancouver Island sites using means and Kruskal-Wallis ANOVA (p=0.05). Comparisons were made on the basis of data collected in 2001, 2003 and 2004 since data was not collected in 2002 at CFB Esquimalt properties. Rocky Point and Mary Hill represent southern Vancouver Island Garry oak woodlands while CFMETR represents Vancouver Island Garry oak woodlands near the northern extent of Garry oak distribution.

For full methods and data forms:
www.fs.fed.us/pnw/olympia/silv/oak-studies/acorn_survey

Results

The number of trees annually monitored on or near Vancouver Island has grown from 54 trees in 2001 to 220 trees in 2004. Figure 1 shows the distribution of sample sites with 2004 mean acorn codes for selected sites. Observations of acorn production are now being made as far south as northern California. Currently more than 1400 trees are being monitored.

The largest acorn crop since 1999 occurred in 2004. Large acorn crops were recorded from northern California to Vancouver Island. In general, all kinds of sites except the very driest sites averaged better production in 2004.

Table 1 Shows mean acorn codes from Vancouver Island classified by broad production classes. Southern locations have produced better than more northern locations. Trees near wetlands and in lawns or similar cultivated locations produced best.

FIGURE 1: Sample sites on and near Vancouver Island and selected 2004 mean acorn codes.

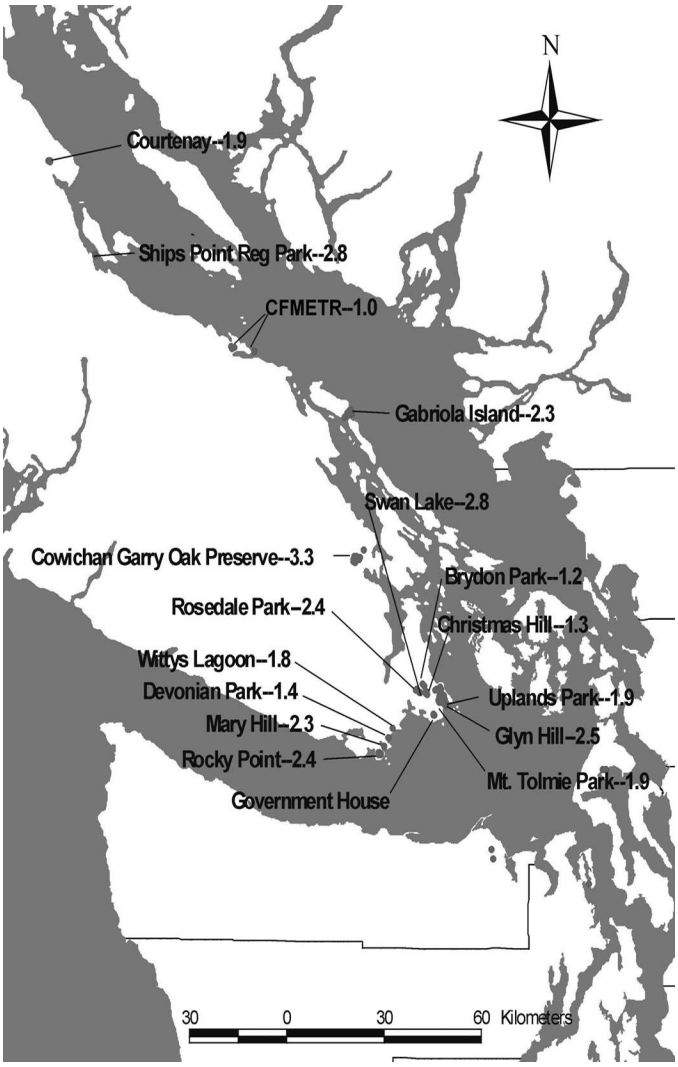

TABLE 1. Acorn code by year for several productivity categories from Vancouver Island

	2001 mean	2002 mean	2003 mean	2004 mean	mean for all years**
North	1.0	1.5	1.2	1.9	1.4
South*	1.8	1.5	1.3	2.2	1.7
Trees < 5 cm dbh	1.0	1.5	1.2	1.9	1.4
Lawns, etc.	1.8	1.5	1.3	2.2	1.7
Wetland Edges	1.0	1.5	1.2	1.9	1.4

** Includes all Duncan sites and all sites farther south*
*** Includes 2001-2004 data.*

Garry Oak *(Quercus garryana)* Acorn Production Study

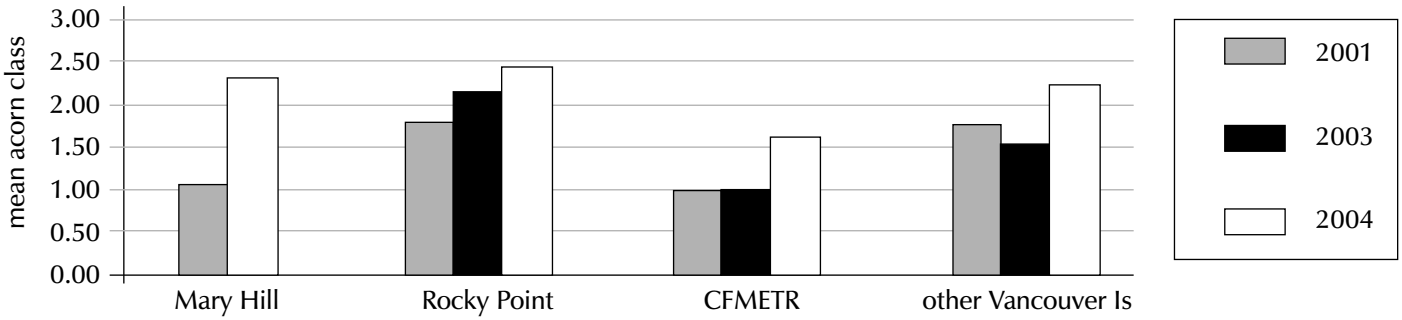

FIGURE 2: Mean acorn class by year for CFB Esquimalt sites and other Vancouver Island sites. CFMETR represents more northern Garry oak woodlands on Vancouver Island while Mary Hill and Rocky Point represent southern Vancouver Island Garry oak woodlands.

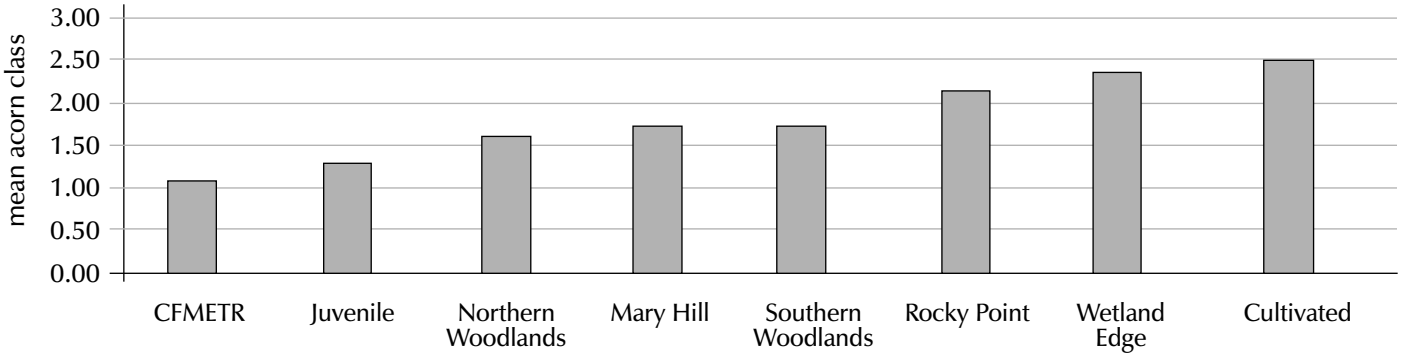

FIGURE 3. The overall mean acorn class for 2001, 2003 and 2004 for Vancouver Island oaks. CFMETR trees are a northern woodland CFB Esquimalt site. Mary Hill and Rocky Point are southern woodland CFB Esquimalt sites. Juvenile trees are trees with less than 5 cm dbh. Cultivated trees are in parks or other sites that are mowed, irrigated or fertilized.

Compared to other Vancouver Island sites the CFB Esquimalt sites range from above average (Rocky Point), to average (Mary Hill) to below average (CFMETR) (Figure 2). The differences were not significant between Mary Hill, Rocky Point and other Vancouver Island sites, but CFMETR was significantly lower than all of these groups ($p=0.05$). In fact, CFMETR is the lowest producing site of the Vancouver Island sites and one of the lowest in the entire acorn survey. Figure 3 shows Vancouver Island CFB Esquimalt sites in relation to juvenile trees and other kinds of sites and communities.

From California to Vancouver Island the most productive sites are warm and well watered. Eastern Washington riparian sites averaged 2.7 (acorn codes current through 2003). A site near Medford, Oregon with a high water table averaged 2.2. Wetland edge sites from Vancouver Island to Oregon averaged 2.2, but trees actually in wetlands have only averaged 1.4. Cultivated sites throughout the survey area including lawns, gardens and cultivated pastures averaged 1.9. Young trees are poor producers. Trees, with a diameter of 5 cm or less, averaged only 1.1 across the survey area. The youngest producing trees in the survey (about 10 years old) are trees planted by a freeway interchange in southern Vancouver Island, but elsewhere trees have generally not produced acorns until about 20 years.

Acorn production is influenced by competition, moisture, age, and fire history. Productivity was highest on well watered, but well drained sites on trees at least 60-80 years old growing with little competition from neighbours. Our data suggests that prescribed underburning reduces acorn production in the year immediately following burning, but also contributes to higher production for 6-10 years after underburning.

Garry Oak *(Quercus garryana)* Acorn Production Study

The results of the 1999 survey were analyzed and published in Northwest Science (Peter and Harrington 2002). Summaries of data and findings are available from our website: (www.fs.fed.us/pnw/olympia/silv/oak-studies/acorn_survey). Other information about the project including background, protocols and contact information are also available at the website.

Discussion

The largest acorn crop since 1999 occurred in 2004. High production was recorded from California to Vancouver Island. The data have not been fully analyzed as of this writing, but two unusual climatic characteristics were widespread in 2004 throughout the range of Garry oak. One was an unusually warm early spring which could have facilitated pollination. The second was a wet end to the summer, which might have allowed for better acorn retention.

In general, Garry oak produces more acorns on warm, fertile, well watered sites with adequate soil aeration. High production on well watered eastern Washington and southern Oregon sites show the importance of warm summers with adequate moisture. Production is high next to streams, but drops rapidly upslope with increasingly droughty soils. Even so, eastern Washington sites generally produce more acorns than western Washington sites, but acorn production is often arrested before maturity in the driest upland sites. The importance of late summer soil moisture is also shown by higher production along wetland edges where roots can reach a dependable source of water without being inundated. Irrigated lawns and parks provide similar conditions and have produced well on average. Acorn production drops when trees grow in wetlands where inundation creates anaerobic conditions in the rooting zone for long periods of time. Garry oak can tolerate considerable inundation, but survey trees growing in Slough sedge (*Carex obnupta*) wetlands have produced few to no acorns during the survey period.

Competition from other trees can reduce acorn production when it becomes severe. In the South Puget Sound, woodland and savanna trees outproduce oak or oak-conifer forest trees. The response of Garry oak to fire may reflect both a fertilization effect and competition control. Fire, even relatively low intensity burns, can damage acorn production in the year following the fire. However, if the trees are not severely damaged acorn production recovers in 2-3 years. Thereafter, acorn production in underburned trees is greater for up to ten years than in trees that have not been underburned.

The three CFB Esquimalt sites represent the range of acorn production on Vancouver Island quite well. CFMETR has so far produced very few acorns, Mary Hill has produced average crops for Vancouver Island and Rocky Point production is above average for Garry oak woodlands. Sites approaching the northern limits of oak distribution, such as the CFMETR, appear to produce poorly. At CFMETR, acorns were produced only in 2004 suggesting that late summer precipitation resulted in a larger crop here as elsewhere in the study area. However, the trend of lower production at CFMETR and other more northerly Garry oak sites suggests temperature or growing season length may also be important.

Conclusion

Conclusions at this point are tentative; however several patterns are emerging from the data. Acorns are produced most heavily in warm, sunny climates with long growing seasons and abundant late summer moisture. Irrigation, fertilization, and competition control typical of yards, parks and pastures enhance acorn production.

Ground fires of lower intensities can increase production, probably through competition control of both under and overstory and ash fertilization. Higher intensity fires can seriously damage or kill Garry oaks. If the tree survives it will take years to recover acorn production although a few acorns may be produced in 2-3 years.

Young trees begin production between 10 and 20 years of age although under natural conditions the average is probably closer to 20 years.

Conifer competition is especially serious for Garry oaks because conifers, especially Douglas-fir grow so much taller and shade it. Garry oaks tolerate little shading and produce very few acorns under these circumstances.

Garry Oak *(Quercus garryana)* Acorn Production Study

Garry oak tolerates an extremely large range of conditions as long as it is not overtopped by other trees. It is capable of growing on some of the driest, rocky sites throughout its range and also in wetlands that may only be dry in the summer and then only near the surface. However acorn production is poor and trees in these situations may not produce acorns at all in most years.

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COSEWIC Status Report for Foothill Sedge *(Carex tumulicola)*

Mike Miller

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Permit #: *P106-04*
Location: *Albert Head*
Start Date: *26 July 2004*
Completion Date: *31 December 2004*

Introduction

Foothill sedge (*Carex tumulicola*) is a red-listed plant species documented in Canada from just three areas on Vancouver Island: Rocky Point, Greater Victoria, and Nanaimo (Ceska and Ceska 2000, HERB database 2004). The largest known population, consisting of several contiguous patches, is at Rocky Point. However, most occurrences consist of just one or two contiguous clumps, probably representing single genetic individuals, or genets.

Due to its rarity, highly fragmented distribution, and apparent threats to its habitat, foothill sedge is a likely candidate for federal "at risk" status. Accordingly, the British Columbia Conservation Data Centre (B.C. CDC) has undertaken a detailed assessment of the current population, distribution, and conservation status of the species for formal review by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). One of the goals of the B.C. CDC project is to survey as much potential habitat on southern Vancouver Island as possible for additional populations of foothill sedge, as part of the requirements of the COSEWIC status report. Albert Head appears to support suitable habitat for foothill sedge, but has never been formally surveyed for this species.

The specific objective of the current project was to conduct a non-intrusive, one day survey of potential foothill sedge habitat at Albert Head in order to determine whether, and in what abundance, the plant occurs at this site. The data obtained will be used in writing the COSEWIC status report for the species.

Study Area and Methodology

The Albert Head property was surveyed for foothill sedge (*Carex tumulicola*) on August 4, 2004. The survey was conducted by foot over a four hour period by Mike Miller. The search focused on suitable areas of habitat on the eastern half of the property, especially grassy bluffs close to the coast but also forested areas up to 500 m inland. A GPS unit was used to record the locations of any foothill sedge populations found.

Results

One population of foothill sedge was located during the survey. The population consisted of two small (possibly attached) clumps extending over a 4 m^2 area. The population was located under 70% tree canopy in a forested area 15 m east of a north-south access road, approximately 300 m west of the grenade range. Due to tree coverage, it was only possible to obtain an approximate GPS reading.

The forest at the site was a mix of Douglas-fir (*Psuedotsuga menziesii*), Arbutus (*Arbutus menziesii*), Grand fir (*Abies grandis*), Red alder (*Alnus rubra*), and Garry oak (*Quercus garryana*), with an understory of ocean spray (*Holodiscus discolor)* Daphne (*Daphne laureola*), Sword fern (*Polystichum munitum*), and Himalayan blackberry (*Rubus discolor*). The soil supporting foothill sedge was a thinly vegetated, dark clayey humus.

Discussion

This project was successful in locating foothill sedge at Albert Head. This is the first known record of this species between Rocky Point, on southwestern Vancouver Island, and Greater Victoria, and thus helps to fill an important

COSEWIC Status Report for Foothill Sedge *(Carex tumulicola)*

gap in its local and Canadian distribution. The information obtained from this study will be incorporated into the COSEWIC status report for this species (currently under preparation).

Aside from Rocky Point and Albert Head, foothill sedge has now been recorded at Uplands Park (District of Oak Bay); University of Victoria, Mt. Tolmie, Rithets Bog (District of Saanich), and Harewood Plains (City of Nanaimo). The small number of plants found at the Albert Head site appears to be typical of many of the Vancouver Island occurrences. The reasons for this highly patchy distribution remain unclear. It is possible that extant populations represent the last remnants of a once wider distribution in Canada. It is also possible that the species is still in the process of expanding into this area, and that extant occurrences represent more recent long-range dispersal events (the closest U.S. populations of foothill sedge occur on the San Juan Islands).

Because only a few plants were located at Albert Head, the findings from this survey do not significantly alter the estimated total population size of the species in Canada. However, given the low number of sites where the species is currently known, the discovery of even a single additional population represents a substantial increase (approximately 15%) in the total occurrence count for the country.

Conclusion

Results from this study suggest that foothill sedge, although certainly rare, probably remains somewhat undercollected on southern Vancouver Island. Foothill sedge is a relatively inconspicuous plant (to the casual observer it resembles a clump of grass), and is also difficult to distinguish from other sedges in the field (plants in the genus Carex are notoriously difficult to identify to species). This suggests that, as more surveys are made for this species, the number of known populations is likely to increase. As the search undertaken at Albert Head was quite brief (only half a day by one individual), it is strongly recommended that additional surveys of this species at Albert Head and other DND properties in the vicinity be carried out by qualified botanists in the near future.

References

Ceska, A. and O. Ceska. *Carex tumulicola* - an overlooked sedge in British Columbia. Botanical Electronic News (BEN) No. 252. website: http://www.ou.edu/cas/botany-micro/ben/ben252.html

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Victoria and Sooke Christmas Bird Counts

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Permit #: *P095-04*
Location: *Albert Head, Heals Rifle Range, Mary Hill and Rocky Point*

Start Date: *December 2004*
Completion Date: *December 2004*

Introduction

To census winter bird populations, the Christmas Bird Count (CBC) has been carried out in Victoria for over 50 years and in North America for over 100 years. As part of the on-going annual Victoria-wide CBC, surveys conducted at four CFB Esquimalt properties (Albert Head, Heals Rifle Range, Mary Hill and Rocky Point) provide valuable information. The properties have proven to harbour significant bird populations that are not normally covered by this census. The primary objective of the study is to obtain a more complete picture of bird distribution in both the Victoria and Sooke count areas for the Christmas Bird Count.

Study Area and Methodology

A winter bird survey was carried out in December 2004 at Albert Head, Heals Rifle Range, Mary Hill and Rocky Point. Depending on the site, a two to four hour survey was carried out with all birds observed and heard in the area being identified and recorded. Teams of two to six observers participated in the coverage efforts.

Results

Excellent weather conditions and a concerted effort by many volunteers resulted in the Victoria Christmas Bird Count area establishing a new Canadian record with a remarkable total of 154 species seen or heard on 18 December 2004. That total surpassed the old record of 152 species, established in 1991. The Sooke CBC, held on December 27 2004, was also blessed by good weather, resulting in 115 species recorded; this was just shy of its own record.

A total of 88 species and 11,129 individuals were recorded at Albert Head, Heals Rifle Range, Mary Hill and Rocky Point during the Victoria and Sooke CBC's. A total of 68 and 77 species were found at Rocky Point and Albert Head, respectively. The smaller properties of Mary Hill and Heals Rifle Range produced some interesting results (33 and 22 species respectively). Among the four properties, Rocky Point had the highest individual number with 7,544 individuals recorded. This number is substantially higher than the 2,511 recorded at Rocky Point in 2003 perhaps due to a large flock of Mew Gulls (*Larus canus*, estimated at 4400) recorded offshore. Summaries of the winter bird counts at all four CFB Esquimalt properties follow.

Victoria and Sooke Christmas Bird Counts

Albert Head Christmas Bird Count

The mixed forest, especially its intact groves of Arbutus, and a point of land that extends out into the water, provide shelter for many individuals and species of birds. A number of key rare/uncommon birds were recorded here including: Northern Goshawk (*Accipiter gentiles*) (only one seen on the Victoria CBC), Turkey Vulture (*Cathartes aura*), Bonaparte's Gull (*Larus philadelphia*), Townsend's Solitaire (*Myadestes townsendi)*, Spotted Sandpiper (*Actitis macularia*), and Orange-crowned Warbler (*Vermivora celata*). Other highlights were: 1 Yellow-rumped Warbler (*Dendroica coronata*), 2 Hermit Thrush (*Catharus guttatus*), 1 Anna's Hummingbird (*Calypte anna*), 162 Ancient Murrelet (*Synthliboramphus antiquus)*, 11 Northern Shoveler (*Anas clypeata*), 16 Ring-necked Duck (*Aythya collaris*), 3 Mute Swan (*Cygnus olor)*, 1 Dunlin (*Calidris alpina*), 37 Black Turnstone (*Arenaria melanocephala*), 19 Surfbird (*Aphriza virgata*), and 220 American Robin (*Turdus migratorius*).

Totals – 2,950 individuals of 77 species.

Species	# sightings
Canada Goose	5
Mute Swan	3
American Wigeon	26
Mallard	47
Northern Shoveler	11
Northern Pintail	7
Ring-necked Duck	16
Harlequin Duck	3
Surf Scoter	7
Long-tailed Duck	8
Bufflehead	38
Hooded Merganser	4
Common Merganser	12
Red-breasted Merganser	16
Red-throated Loon	2
Pacific Loon	4
Common Loon	2
Horned Grebe	2
Red-necked Grebe	44
Western Grebe	2
Brandt's Cormorant	136
Double-crested Cormorant	52
Pelagic Cormorant	23
Great Blue Heron	1
Turkey Vulture	1
Bald Eagle (adult) 1 (imm) 2	3
Sharp-shinned Hawk	1
Cooper's Hawk	1
Northern Goshawk (*)	1
Black Oystercatcher	2
Spotted Sandpiper	1
Black Turnstone	37
Surfbird	19
Dunlin	1
Bonaparte's Gull	2
Mew Gull	850
Thayer's Gull	640
Glaucous-winged Gull	175
Common Murre	45
Pigeon Guillemot	12
Marbled Murrelet	7
Ancient Murrelet	162
Rhinoceros Auklet	1
Anna's Hummingbird	1
Belted Kingfisher	3
Downy Woodpecker	2
Hairy Woodpecker	2
Northern Flicker	9
Steller's Jay	2
Northwestern Crow	5
Common Raven	6
Chestnut-backed Chickadee	14
Bushtit	10
Red-breasted Nuthatch	3
Brown Creeper	6
Bewick's Wren	3
Winter Wren	11
Golden-crowned Kinglet	35
Ruby-crowned Kinglet	7
Townsend's Solitaire	1
Hermit Thrush	2
American Robin	220
Varied Thrush	18
European Starling	2
Orange-crowned Warbler	1
Yellow-rumped Warbler	1
Spotted Towhee	21
Fox Sparrow	14
Song Sparrow	9
Golden-crowned Sparrow	9
Dark-eyed Junco	39
Purple Finch	6
House Finch	21
Red Crossbill	8
Pine Siskin	22
American Goldfinch	3
Evening Grosbeak	2
Total Species	**77**
Total Number of Birds	**2950**

*(*) Field Notes Required*
 # hours (on foot): 2.5 *Distance (on foot): 4.5 km*
# of observers: 5 *Date: 18/12/2004*

Victoria and Sooke Christmas Bird Counts

Heals Rifle Range Christmas Bird Count

With increased rainfall, standing water produced more waterfowl than in 2003, including 12 Green-winged Teal (*Anas crecca*) and 50 Mallard (*A. platyrynchos*). Diurnal raptor numbers were also of note here, with seven individuals of four species. A jump in species' numbers was also noted with seven more species recorded in 2004 than 2003.

Totals – 407 individuals of 22 species.

Species	# sightings
Mallard	50
Green-winged Teal	12
Bald Eagle (adult) 1 (imm) 1	2
Sharp-shinned Hawk	1
Cooper's Hawk	2
Red-tailed Hawk	2
Glaucous-winged Gull	44
Downy Woodpecker	1
Northern Flicker	10
Pileated Woodpecker	1
Steller's Jay	1
Northwestern Crow	52
Common Raven	1
Chestnut-backed Chickadee	22
Winter Wren	5
Golden-crowned Kinglet	12
Ruby-crowned Kinglet	15
American Robin	50
European Starling	110
Song Sparrow	2
Golden-crowned Sparrow	10
Red Crossbill	2
Total Species	**22**
Total Number of Birds	**407**

 # hours (on foot): 2 *Distance (on foot): 2.0 km*
 # hours (owling): 0.5 *Distance (owling): .5 km*
# of observers: 2 *Date: 18/12/2004*

Mary Hill Christmas Bird Count

The mixed forest and geography of this site produced some interesting results, including the only Turkey Vultures (3) recorded during the Sooke Christmas Bird Count. The continued expansion around Victoria of Anna's Hummingbirds was evident with two different birds observed. A Great Horned Owl (*Bubo virginianus*) was observed roosting just off the dirt road near the main gate. All five of the regularly occurring woodpeckers were found at this site; their presence related, no doubt, to the presence of the old growth forest.

Totals - 228 individuals of 33 species.

Species	# sightings
California Quail	16
Turkey Vulture	3
Bald Eagle (adult) (imm) 1	1
Sharp-shinned Hawk	1
Red-tailed Hawk	2
Great Horned Owl	1
Anna's Hummingbird	2
Red-breasted Sapsucker	1
Downy Woodpecker	2
Hairy Woodpecker	3
Northern Flicker	8
Pileated Woodpecker	1
Steller's Jay	19
Northwestern Crow	3
Common Raven	4
Chestnut-backed Chickadee	13
Bushtit	4
Red-breasted Nuthatch	14
Brown Creeper	2
Bewick's Wren	2
Winter Wren	13
Golden-crowned Kinglet	52
Ruby-crowned Kinglet	3
American Robin	12
Varied Thrush	3
Spotted Towhee	6
Fox Sparrow	2
Song Sparrow	6
Golden-crowned Sparrow	3
Dark-eyed Junco	3
House Finch	2
Red Crossbill	17
Pine Siskin	4
Total Species	**33**
Total Number of Birds	**228**

 # hours (on foot): 1.5 *Distance (on foot): 4.5 km*
 # hours (by car): 0.5 *Distance (by car): 4 km*
# of observers: 2 *Date: 24/12/2004*

Victoria and Sooke Christmas Bird Counts

Rocky Point Christmas Bird Count

Although the number of individual birds of some species, especially certain songbirds, was lower than normal, overall more birds were recorded in 2004. A system of storms and windy conditions in the period just before the count may have pushed some birds out of the area. In comparison to 2003, conditions in 2004 were far more favourable for offshore surveys. Cormorant numbers were significantly higher this year, likely because of the better weather conditions, as well as the additional census of Race Rocks by boat (thanks to the staff at Pearson College). A large feeding flock of more than 4,000 Mew Gulls, just west of Bentinck Island, was observed from shore and boat. Among this group were the Sooke CBC's only Ring-billed Gull (*Larus delawarensis*) and Bonaparte's Gull (3). An American Pipit (*Anthus rubescens*) on Race Rocks was the only one recorded for the Sooke CBC. A single Great Horned Owl and a Northern Pygmy-Owl (*Glaucidium gnoma)* were recorded during two hours of owling in the early morning. A second Northern Pygmy-Owl was heard later in the morning at a different location. Other highlights included 34 Black Oystercatcher (*Haematopus bachmani*), 6 Surfbird, 1 Red-breasted Sapsucker (*Sphyrapicus ruber*), 1 Hutton's Vireo (*Vireo huttoni*), 45 Steller's Jay (*Cyanocitta stelleri)*, and 2 Marsh Wren (*Cistothorus palustris*).

Totals - 7544 individuals of 68 species.

Species	# sightings
Canada Goose	147
American Wigeon	5
Mallard	16
Ring-necked Duck	2
Harlequin Duck	4
Surf Scoter	89
White-winged Scoter	3
Bufflehead	70
Common Goldeneye	7
Hooded Merganser	12
Common Merganser	37
California Quail	24
Red-throated Loon	1
Pacific Loon	2
Common Loon	1
Brandt's Cormorant	773
Double-crested Cormorant	147
Pelagic Cormorant	132
Great Blue Heron	3
Bald Eagle (adult) 9 (imm) 6	15
Cooper's Hawk	2
Red-tailed Hawk	4
Black Oystercatcher	34
Black Turnstone	33
Surfbird	6
Bonaparte's Gull	3
Mew Gull	4400
Ring-billed Gull (*)	1
Thayer's Gull	462
Glaucous-winged Gull	405
Common Murre	36
Pigeon Guillemot	6
Ancient Murrelet	100
Great Horned Owl	1
Northern Pygmy-Owl	2
Belted Kingfisher	4
Red-breasted Sapsucker	1
Downy Woodpecker	2
Hairy Woodpecker	1
Northern Flicker	15
Pileated Woodpecker	1
Hutton's Vireo	1
Steller's Jay	45
Northwestern Crow	19
Common Raven	8
Chestnut-backed Chickadee	19
Red-breasted Nuthatch	3
Brown Creeper	1
Bewick's Wren	1
Winter Wren	18
Marsh Wren	2
Golden-crowned Kinglet	45
Ruby-crowned Kinglet	11
American Robin	75
Varied Thrush	12
European Starling	24
American Pipit	1
Spotted Towhee	18
Fox Sparrow	1
Song Sparrow	15
Golden-crowned Sparrow	12
Dark-eyed Junco	32
Red-winged Blackbird	9
Purple Finch	1
House Finch	12
Red Crossbill	71
Pine Siskin	70
House Sparrow	9
Total Species	**68**
Total Number of Birds	**7544**

 # hours (on foot): 6 *Distance (on foot): 7.0 km*
 # hours (by boat): 1 *Distance (by boat): 3 km*
# of observers: 5 *Date: 27/12/2004*

OUTLOOK FOR 2005

ESAC will continue to track and review research projects on CFB Esquimalt properties, sponsor the annual workshop, prepare an annual report, and update the CFB Esquimalt Natural Resources GIS database and the ESAC website. New additions to the website will be made so that information on current ESAC permitted research is easily accessible for use by DND personnel.

In addition, the Committee will confer on issues related to the upgrade and maintenance of the Forest Canopy Research Station and provide advice to MARPAC on environmental issues occurring on CFB Esquimalt properties.

In 2005, an updated ESAC permit, including information on Environmental Assessments and Species at Risk, along with the Environmental Assessment Project Evaluation Form will be utilized.

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All 2004 ESAC permit holders for their cooperation and contribution to the knowledge of flora and fauna on CFB Esquimalt properties.

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The Canadian Forest Service – Pacific Forestry Centre for coordinating and hosting the annual workshop.

All of the individuals who presented and attended the ESAC annual workshop in January 2005. Your attendance and participation are valued.

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