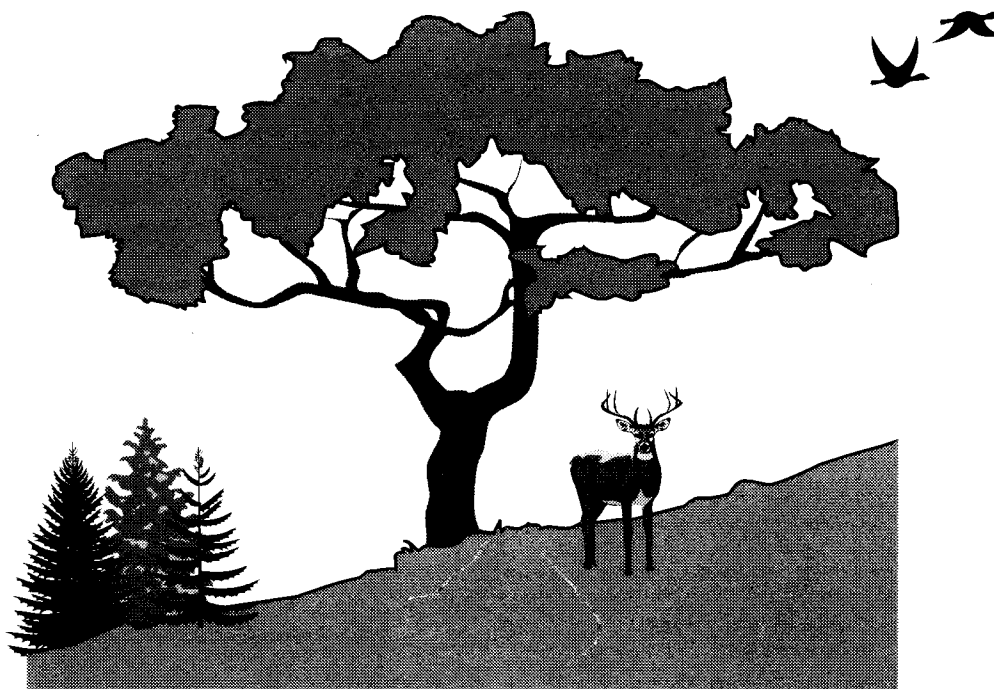


Department of National Defence— CFB Esquimalt
Environmental Science Advisory Committee

REPORT

1999 Annual Report

Prepared for the Committee by
Arthur Robinson
J.A. Trofymow
May, 2000



Natural Resources
Canada

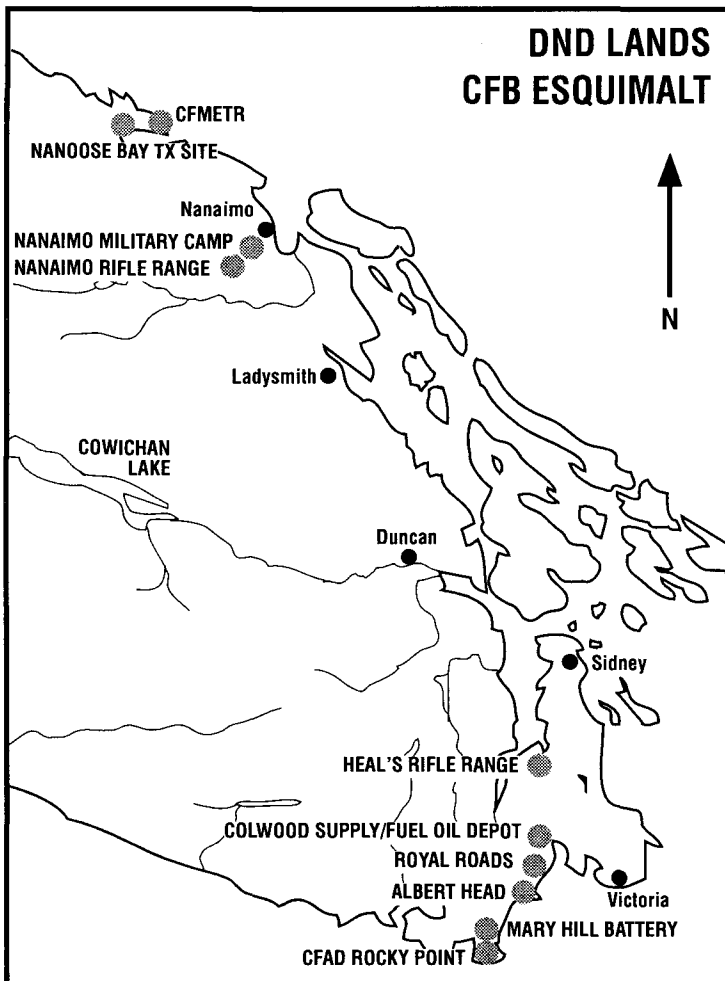
Ressources naturelles
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Canadian Forest
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The Department of National Defence Science Advisory Committee (ESAC) – CFB Esquimalt was established in 1994 under a letter of understanding as a technical advisory committee reporting to the joint Department of National Defence / Canadian Forest Service Forest Resource Management Committee. ESAC is a multiagency committee composed of representatives from the Department of National Defence, Canadian Forest Service and Canadian Wildlife Service and representatives from Universities and other interested provincial agencies. The committee has the responsibility of providing professional expertise, advice and supervision of research being conducted on CFB Esquimalt properties and providing opportunities for dissemination of the research results.



Limited copies of this report are available
at no cost through:

The Federal Land Forester
Natural Resources Canada
Canadian Forest Service
Pacific Forestry Centre
506 West Burnside Road
Victoria, BC V8Z 1M5

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Natural Resources Canada
Canadian Forest Service
Pacific Forestry Centre
506 West Burnside Road
Victoria, B.C.
V8Z 1M5

Environmental Science Advisory Committee member agencies

- * Department of National Defense
- * Canadian Wildlife Service
- * University of Victoria
- * Canadian Forest Service
- * B.C. Ministry of Forests
- * Royal Roads University

The report was funded through the DND Forest Resource Management Program, jointly managed by the Department of National Defense and the Canadian Forest Service.

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DND Environmental Science Advisory Committee - CFB Esquimalt

1999 Annual Report

1. Summary

The DND Environmental Science Advisory Committee was established in 1994 as a multi-agency technical advisory committee reporting to the DND Forest Resources Management Committee. The committee set up a formal permitting system to facilitate the tracking of proposals to do research on CFB Esquimalt lands. During 1999 a total of 25 proposals were received and 25 permits were issued. The committee met four times during the year to review proposals and project status.

To facilitate the communication and transfer of results of research on DND properties to member agencies as well as amongst researchers working on CFB Esquimalt lands the committee cosponsored one workshop during the year. The workshop was open to interested agencies and all project proponents who had done research on DND lands during the year and was held at Royal Roads University in Victoria. Researchers presented ten papers. The workshop was attended by 31 representatives from various organizations and backgrounds.

A GIS database of forest cover, ecological types, special features and research areas initiated in 1997 was updated in March 1999. Map corrections and updates on forest cover, various map features, archaeological data and rare species data were added to the database. A CD ROM disc containing the data update was distributed to member agencies.

A web site containing an introduction to ESAC and the full text of ESAC annual reports from 1995 – 1998 was completed in November 1999 and posted onto the web at <http://www.pfc.forestry.ca/fedlands/esac/index.html> .

The purpose of this report is to provide background on the committee, its terms of reference and information on the permitting process. As well the report provides summaries of research reports for projects completed in 1999 and annual reports for projects continuing in following years. A cumulative bibliography of reports on environmental research conducted on CFB Esquimalt lands since 1994 and available at the Pacific Forestry Centre Library is also provided.

2. Introduction

Over the years various individuals and organizations carried out environmental research projects on Department of National Defence (DND) lands. As these lands have been relatively undisturbed due to the nature of their use, they have provided researchers with a unique opportunity, and hence their popularity. Much of this research was ad hoc and uncoordinated and no attempt was made to keep track of it.

As environmental issues and concerns became more important, attention began to be focused on the research and conservation values of the properties. In 1993 a workshop was sponsored by DND to determine what research had been carried out on the properties. Researchers and others were invited to the workshop to make presentations on their work. A report was produced that gave a compendium of the work done. It became evident that there was a need to track this research.

3. DND Environmental Science Advisory Committee - CFB Esquimalt

As a result of the recognition of the need for a more formal arrangement to review and track research projects, DND and the Canadian Forest Service (CFS) worked together with the Canadian Wildlife Service and other agencies to organize a multi-agency committee to oversee research being carried out at Rocky Point. The DND Environmental Science Advisory Committee (ESAC) - CFB Esquimalt was established in 1994 under a letter of understanding (LOU) as a technical advisory committee reporting to the joint Department of National Defense/Canadian Forest Service Forest Resource Management Committee. Soon after the committee was formed it became apparent that the committee's mandate for only the one property (Rocky Point) should be expanded to other properties. In 1995 the committee increased its mandate to include all DND properties under CFB Esquimalt command. In 1996, the membership of the committee was expanded to include one representative from Royal Roads University. The first five-year term of the committee's LOU came to an end in December 1998. In 1998, Lester B. Pearson College of the Pacific withdrew as a member agency of the committee. Early in 1999 the committee reviewed its terms of reference and a new LOU was prepared and signed.

A. Organization and Terms of Reference - ESAC is a multi-agency committee composed of representatives from the Department of National Defence, Canadian Forest Service, Canadian Wildlife Service, the B.C. Ministry of Forests, University of Victoria, and Royal Roads University, with the responsibility of providing professional expertise, advice and supervision of research being conducted on CFB Esquimalt properties. The terms of reference of the committee are to review and evaluate research proposals for projects on DND lands, advise DND on the proposals and other research issues, to track the projects and permits, and to report on them. The committee also reviews and provides advice on the annual silviculture plan.

The committee facilitated the establishment and reviews projects for the Forest Canopy Station operated under the auspices of a Forest Canopy Research Station Operating Committee (FCRSOC), a subcommittee reporting to ESAC. The Operating Committee is led by the University of Victoria and is responsible for the day to day operation and safety and maintenance of the station. The Lester B. Pearson College of the Pacific originally built this facility in 1994 to allow researchers and student assistants access into the tree crowns in a stand of old Douglas-fir located on the Rocky Point property. In 1998 Lester Pearson College relinquished ownership of the Forest Canopy Station to DND and withdrew as a member agency of the committee.

B. Research and Collection Activities Permit System - To facilitate the tracking of the proposals the committee developed and implemented a formal permit process. Proposals are submitted to ESAC which reviews and evaluates the projects proposed for the properties and recommends to the DND/CFS Forest Resource Management Committee which should be permitted. As well, ESAC has the responsibility for collecting and archiving resulting research reports, making them available to member agencies of the committee as well as other interested agencies for use or subsequent cataloguing.

A Research and Collection permit is required for natural science activities within DND properties. Activities for which a permit is required include but may not be limited to:

- the collection of flora, fauna or geological specimens;
- research that involves being in an area to which general access by the public is restricted or prohibited;
- research that involves physical disturbance to the land or any other adverse effect on the environment;
- research that involves the setting up of scientific monitoring instruments or of structures used in connection with scientific research; and
- research that requires the exclusive use of any portion of a DND property.

Permits are issued on an annual basis and are applicable for the DND property (ies) for which they were issued. Permits may be issued for longer term projects (a maximum of three years in duration) but must be renewed annually.

Research by qualified researchers and institutions is encouraged on DND property especially research which contributes to the knowledge and understanding of the functioning of ecosystems and environmental management.

C. Reporting Activities - To facilitate the communication and transfer of results of research on DND properties to member agencies as well as amongst researchers working on CFB Esquimalt Lands the committee sponsors one workshop during the year. The workshop is open to interested agencies and all project proponents who have done research on DND lands during the year. Further details on the workshop are provided below.

Each permittee is required to submit an annual report on the results of the work done during the year or a final report if the project is completed. These reports are compiled and published by ESAC in an annual report. Further details on the research reports for permitted projects completed in 1999 and annual reports for permitted projects continuing in following years are detailed in the following sections and appendices. Reports on environmental research conducted on CFB Esquimalt lands since 1994 are archived at the Pacific Forestry Centre Library. A cumulative bibliography of these reports is provided in Appendix 1. Complete text of all past annual reports are also available on the web <http://www.pfc.forestry.ca/fedlands/esac/index.html>

4. Research Projects and Activities on DND Esquimalt Properties During 1999

This past year, 1999, was the fifth full year of activity for ESAC, which received a total of 25 proposals during the year for research on CFB Esquimalt properties. Table 1 summarizes information on the proponent, title and brief description for each proposal received.

The committee met four times during the year to review and track the status of the various proposals that were received. Of the 25 proposals received, 25 were approved and received permits. The status of these 25 approved proposals is shown in Table 2. Researchers submitted written annual reports (Appendix 3) on activity for 14 continuing projects and final reports (Appendix 4) for 11 completed projects.

A. ESAC Workshop - In January of 2000 at Royal Roads University, Victoria, the ESAC sponsored a workshop, providing an opportunity for the investigators to present the results of their studies. Thirty one individuals attended the workshop (Appendix 2). Ten presentations were made and final and annual reports from these presentations are included in Appendices 3 and 4.

B. Forest Canopy Research Station Activities - During 1998 Lester B. Pearson College of the Pacific relinquished ownership of the Forest Canopy Station to DND. The University of Victoria assumed responsibility for the facility and reorganized the Forest Canopy Research Station Operating Committee. The FCRSOC is committed to increasing the use of the facility by more actively promoting it to the scientific community. Early in 1999 a new terms of reference for the committee was prepared and operating procedures reviewed.

This facility consists of four old growth trees that have been fitted with platforms in the canopy and ladders leading from the platforms higher into the canopy. Tree No. 1 is isolated from the other three trees by about 75 meters. A boardwalk made of "Superwood" (made from recycled plastic bags) connects the four trees on the ground. Trees No. 2, 3, and 4 are situated close to each other and are connected by "Burma" rope bridges. Access to the canopy of Tree No. 1 is by means of a bosun chair and a hand operated winch attached to a nearby smaller tree. The person in the bosun chair is winched up to the platform. From there access to the upper part of the tree is by ladders attached to the trunk. Access to the canopy of the other three trees is by means of a winch that hauls the person up to the platform of Tree No. 4. From this platform access to the other two trees is by means of "Burma" rope bridges. In addition, another "Burma" bridge connects Tree No. 4 to another large tree about 25 meters away.

Many field trips, television crews and writers of popular articles visited the Canopy station site during 1999. The Canopy station was accessed on two occasions by University of Victoria personnel. The canopy access system was inspected in October, 1999 for safety purposes and in December the site was accessed to inspect the microclimatic station.

In 1996 a microclimate monitoring station was installed on Tree No. 4. Various sensors were set up on the tree ranging from the forest floor to the upper branches to monitor the microclimate within the canopy and the forest floor. An automatic rain gauge was also set up in a nearby clearing. The data was relayed to and stored in a data logger at the base of the tree. Unfortunately, due to technical difficulties and equipment failure the system never operated properly and a climate record was not recorded. In early 1999 the station underwent an overhaul and was brought up to a proper operating condition.

C. Geographic Information System Database Compilation and Conversion - Over the last six years, staff from the Department of National Defence, Canadian Forest Service, Canadian Wildlife Service and other agencies have collaborated extensively through the Environmental Science Advisory Committee in the delivery of environmental programs on DND properties, particularly on southern Vancouver Island. During that period much information has been gathered to assess the ecological character of these lands. The committee initiated a project to merge these new data sets with the existing data and to begin a process of analysis to develop conservation management plans for these very significant properties.

As much of this information was in varying formats and quality a common Geographic Information System (GIS) format, Arc/Info, was decided upon. The GIS project funded by DND in January, 1997, compiled and converted the existing spatial data sets. The initial phases of the project were completed with the preliminary compilation and conversion of all the identified baseline data sets on 19 properties into a common Arc/Info format. Additional point data (on rare species, special sites, etc.) was converted into map coverages. The data is stored as Arc/Info coverages at the Canadian Forest Service where it is available to the three federal agencies through the use of Arc/View as the tool used to view data, display plans, produce small maps and query the database.

Remote access to this data by DND and other agencies was not possible due to technical difficulties. Instead, in 1998 and 1999 CD-ROM copies of the data were made and delivered to DND and CWS. It is anticipated that each year, pending funding, map coverages and point data will be reviewed for accuracy, databases updated and new versions of the database distributed. DND provided funding to conduct an update in early 1999. The thematic layers in the DND GIS database were updated, spatial and attribute errors corrected, and new information added to the database for the following properties – Albert Head, CFAD Rocky Point, CFMETR, Colwood Supply/Fuel Oil Depot, Dockyard, Heals Rifle Range, Mary Hill Battery, Masset, Matsqui TX Site, Naden, Nanaimo Rifle Range, NRS Aldergrove, and Richmond Armory. Table 3 contains a summary of the database including properties, coverages and the latest update.

D. ESAC Web Site <<http://www.pfc.forestry.ca/fedlands/esac/index.html>> .

In 1999 the committee undertook the development of a web site to improve the availability of the research results described in the ESAC annual reports. The site includes an introduction to the CFB Esquimalt properties and to ESAC explaining how the committee developed, the permitting process, and committee activities to date. Links to member agencies are included allowing web users to check on members' area of expertise and advice and also provides the members the recognition they deserve for their work on these areas. A table listing the names and contact information for individuals serving on the committee is included.

Most of the site consists of the complete text of all annual reports from 1995 - 1998. Site users can access the individual project annual reports through the table of contents in each annual report or through a table in the introduction that lists all projects conducted under the auspices of ESAC since 1994. The table provides a direct link to the individual project reports in each annual report. A consolidated list of all other reports and papers is also included in the introduction.

In keeping with government of Canada standards, the introductory section of the site is provided in English and French. The URL to the ESAC web site has been provided to DND Headquarters – Environment, the CFS-PFC, and other member agencies to provide links from their web sites.

5. Outlook for 2000

The committee will continue its activities in 2000 reviewing and tracking the status of various research projects on DND Lands, advising on the 2000 Silvicultural Plan, sponsoring an annual workshop for researchers and compiling these results in an annual report. As well the committee will update the web site with the information in this annual report to further facilitate the dissemination of research findings.

During 1999 archaeological surveys were carried out on a number of DND properties. As well, additional data on rare species was compiled from various sources. The results of these surveys increased the amount of data on the properties. In early 2000 the GIS will be updated to include this information and other updates of the data (including proofing of the map coverages and point data, and the updating of additional data). The updated Arc/Info coverages will be copied onto CD-ROM and made available to DND and CWS. Specific coverages will also be made available to other member agencies.

This increased capacity should greatly help highlight areas of significance or research interest to current and future investigators and to DND personnel conducting operations and training activities on these properties.

Table 1: Research Project Proposals for DND Properties 1999

<i>Prop</i>	<i>Organization</i>	<i>Project Title</i>	<i>Applicant</i>	<i>Contact</i>	<i>Project Description</i>	<i>Location</i>
99-01	RBCM	Bat Use of Man-Made Structures on DND Lands	David Nagorsen	Andy M.	To modify structures to prevent human disturbance and improve structures for roosting of Townsend's Big Eared Bats. Monitor population and field studies of bat colonies.	MHB, RP
99-02	VPS	Fossil Point Study	Victoria Paleontology Society (Macphail)	Jody W.	The project will study the area known as Fossil Point to determine the fossil types.	RP
99-03	VNHS	Purple Martin Nestbox Program	Darren Copley	Ken M.	Purple Martin nestboxes on the site will be inspected and cleaned in the spring and fall. The population of purple martins using the site will be monitored and biological data collected including nestbox use, clutch-size, mortality, parasites, fledging dates, success, etc.	CSFOD
99-04	CWS	National Science Meeting (EMAN) field trip	Michael Dunn	Ken M.	To provide participants an opportunity to learn about the research projects being carried out at RR, MH and RP.	RP, RR, MHB and RPPCCS.
99-05	CWS	Microclimate Monitoring Station	Michael Dunn	Mike D.	To provide repair and maintenance to the microclimate station in order to provide the necessary data capture and reporting.	RPPCCS

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<i>Prop</i>	<i>Organization</i>	<i>Project Title</i>	<i>Applicant</i>	<i>Contact</i>	<i>Project Description</i>	<i>Location</i>
99-06	RR	5th Annual EMAN National Conference Field Trip and Workshop	Bill Dushenko	Bill D.	Field trip to RRU EMAN sites for EMAN conference participants and a workshop to teach grade 7 & 8 students about environmental issues.	RR
99-07	RR	Habitat Enhancement Initiative	Habitat Enhancement Club (John Bartell)	Bill D.	Restoration of natural habitat of undeveloped areas by identifying restrictions to the affluence of aquatic and terrestrial species.	RR
99-08		Breeding Biology of Spotted Frogs	Russ Haycock	Ken M.	Observe and record Oregon spotted frog egg laying sites.	Aid
99-09	VNHS	VNHS Greenways Inventory Project	Victoria Natural History Society	Jody W.	To identify the eco-systems on Capital Improvement District lands, map them and list species found.	AH, CSFOD, MHB, RP, RR
99-10	CFS	Study of the Impacts of Btk on non-target Lepidoptera in Garry Oak ecosystems.	Tim Boulton	Richard R.	The project will measure the impact of BtK spraying for Gypsy Moths on populations of non-target moths and butterflies. Caterpillars will be collected from Garry Oak stands.	MHB, RP, Naden
99-11	BER	Gypsy Moth - Song Bird Study	Lennart Sopuck	Ken M.	The project will monitor the effects of BtK spraying for Gypsy Moth control on song birds. Breeding bird density, species composition and territory maintenance will be examined. Surveys will be carried out in Garry Oak habitat.	AH, MHB, RP, RR, WP, Colville

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Prop	Organization	Project Title	Applicant	Contact	Project Description	Location
99-12	UVic	Marbled Murrelet Habitat Assessment	Anna Young	Ken M.	Resample and expand 1998 observation stations and produce maps of nexting capability.	RP, RR
99-13		Sampling Protocols for Small Mammals on DND Properties	John White / Shizen Consulting	Jody W.	The project will develop sampling protocols for small mammals on DND properties. Trapping of small mammals will be carried out at Rocky Point to establish some baseline data for a long-term monitoring site.	MHB, RP
99-14	UVic	Community Ecology of the Canopy Forest Floor Insect/Anthropod Fauna from an Old Growth Forest	Neville Winchester	Richard R.	The activity for 1999 is a continuation of the project and will consist mainly of maintenance of the site and extension and demonstration activities such as filming and lecturing in situ.	RP
99-15	UVic	Establishment and Monitoring of Plots in Garry Oak Ecosystem	Richard Hebda	Andy M.	This project is a continuation of last year's project. The established plots will be monitored and species cover data collected. Broom will be removed from designated plots.	MHB
99-16	UVic	Garry Oak Symposium Tour	Richard Hebda	Andy M.	Tour to show Garry Oak Ecosystem monitoring plots to show effects of broom removal and to show Stellars Jay study sites.	MHB
99-17	Mal.U.	Garry Oak Ecosystems Field Trip	Allan Hawryzki	Andy M.	Observation of central Vancouver Island Garry Oak site.	CFMETR

<i>Prop</i>	<i>Organization</i>	<i>Project Title</i>	<i>Applicant</i>	<i>Contact</i>	<i>Project Description</i>	<i>Location</i>
99-18	Mal.U.	Demographic Study of Allium Amplectens	Allan Hawryzki	Andy M.	This project is a continuation of last year's project. The population of the slim leafed onion in the established plots will be monitored and individual plants counted.	CFMETR
99-19	UVic	Geological Study of the Metchosin Complex	Kathryn Gillis	Art R.	The project involves a regional study of the Metchosin Igneous complex which is interpreted to be an ancient piece of oceanic crust.	RP
99-20	CWS	Monitoring of Neotropical Migratory Birds	Wendy Easton	Ken M.	Monitoring the Rocky Point site to detect changes in the numbers and distribution of songbirds.	RP
99-21	RR	Snuneymuxw First Nation Non-Timber Forest Products Integrated Management Project	Signy Fredrickson	Bill D.	To measure and record non-timber forest product species along reconnaissance lines and in vegetation plots.	NRR
99-22	MELP	Rare Plant Survey for COSEWIC	Jenifer Penny	Jody W.	to Survey for two rare plants for the purposes of writing status reports for COSEWIC.	AH, GH, MP, BI
99-23	MELP	Urban Cooper's Hawk Nesting Habitat	Andy Stewart	Ken M.	To study breeding ecology of Cooper's Hawk in urban Greater Victoria	Naden

<i>Prop</i>	<i>Organization</i>	<i>Project Title</i>	<i>Applicant</i>	<i>Contact</i>	<i>Project Description</i>	<i>Location</i>
99-24	VNHS	Purple Martin Origins and Relationships	Finlay/Darling	Ken M.	Color band all nestlings of Purple Martins to determine relationships of these birds to other martins in B.C. and Washington and Oregon.	CSFOD
99-25	CFS	Management of Spruce Weevil	Michael Hulme	Tony T.	Release parasites into cages to control <i>Pissodes strobi</i> (spruce weevil); visit site to observe progress and effects; remove tree leaders with insects inside for future lab studies.	NTX, CFMETR

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Table 2: 1999 Permit Summary
DND Environmental Science Advisory Committee - CFB Esquimalt

<i>Permit</i>	<i>Prop #</i>	<i>Applicant</i>	<i>Phone</i>	<i>Project Title</i>	<i>Contact</i>	<i>Approv</i>	<i>Expiry Dat</i>
P003-99	99-20	Wendy Easton	(604) 940-4373	Monitoring of Neotropical Migratory Birds	Ken M.	2 Jun 99	31 Oct 99
P006-99	99-14	Neville Winchester	(250) 721-7099	Community Ecology of the Canopy Forest Floor Insect/Anthropod Fauna from an Old Growth Forest	Richard R.	29 Apr 99	31 Dec 99
P010-99	99-01	David Nagorsen	(250) 387-2933	Bat Use of Man-Made Structures on DND Lands	Andy M.	12 Jan 99	31 Dec 99
P017-99	99-18	Allan Hawryzki	(250) 753-3245 Local 2315	Demographic Study of <i>Allium Amplectens</i>	Andy M.	23 Apr 99	01 Sep 99
P018-99	99-03	Darren Copley	(250) 479-6622	Purple Martin Nestbox Program	Ken M.	12 Jan 99	01 Oct 99
P023-99	99-05	Michael Dunn	(250) 363-6501	Microclimate Monitoring Station	Mike D.	12 Jan 99	31 Dec 99
P030-99	99-25	Michael Hulme	(250) 363-0733	Management of Spruce Weevil	Tony T.	05 Oct 99	31 Dec 99
P032-99	99-15	Richard Hebda	(250) 387-5493	Establishment and Monitoring of Plots in Garry Oak Ecosystem	Andy M.	23 Apr 99	31 Dec 99
P034-99	99-06	Bill Dushenko	(250) 391-2580	5th Annual EMAN National Conference Field Trip and Workshop	Bill D.	12 Jan 99	21 Jan 99

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<i>Permit</i>	<i>Prop #</i>	<i>Applicant</i>	<i>Phone</i>	<i>Project Title</i>	<i>Contact</i>	<i>Approv</i>	<i>Expiry Dat</i>
P037-99	99-08	Russ Haycock	(604) 730-5798	Breeding Biology of Spotted Frogs	Ken M.	09 Apr 99	30 Apr 99
P044-99	99-24	Finlay/Darling	(250) 479-9833	Purple Martin Origins and Relationships	Ken M.	06 Jul 99	30 Aug 99
P051-99	99-12	Anna Young	(250) 383-2070	Marbled Murrelet Habitat Assessment	Ken M.	23 Apr 99	31 Aug 99
P054-99	99-21	Signy Fredrickson	(250) 226-7063	Snuneymuxw First Nation Non-Timber Forest Products Integrated Management Project	Bill D.	2 Jun 99	15 Dec 99
P055-99	99-02	Victoria Paleontology Society (Macphail)	(250) 477-4899	Fossil Point Study	Jody W.	12 Jan 99	18 Apr 99
P056-99	99-04	Michael Dunn	(250) 363-6501	National Science Meeting (EMAN) field trip	Ken M.	12 Jan 99	21 Jan 99
P057-99	99-07	Habitat Enhancement Club (John Bartell)	(250) 391-2600	Habitat Enhancement Initiative	Bill D.	23 Feb 99	31 Aug 99
P058-99	99-09	Victoria Natural History Society	(250) 477-9114	VNHS Greenways Inventory Project	Jody W.	18 Mar 99	31 Oct 99
P059-99	99-10	Tim Boulton	(250) 361-9532	Study of the Impacts of Btk on non-target Lepidoptera in Garry Oak ecosystems.	Richard R.	18 Mar 99	17 Dec 99
P060-99	99-11	Lennart Sopuck	(250) 655-4602	Gypsy Moth - Song Bird Study	Ken M.	30 Mar 99	15 Jul 99
P061-99	99-13	John White / Shizen Consulting	(250) 414-0336	Sampling Protocols for Small Mammals on DND Properties	Jody W.	23 Apr 99	31 Aug 99

<i>Permit</i>	<i>Prop #</i>	<i>Applicant</i>	<i>Phone</i>	<i>Project Title</i>	<i>Contact</i>	<i>Approv</i>	<i>Expiry Dat</i>
P062-99	99-16	Richard Hebda	(250) 387-5493	Garry Oak Symposium Tour	Andy M.	23 Apr 99	09 May 99
P063-99	99-17	Allan Hawryzki	(250) 753-3245 Local 2315	Garry Oak Ecosystems Field Trip	Andy M.	23 Apr 99	09 May 99
P064-99	99-19	Kathryn Gillis	(250) 472-4023	Geological Study of the Metchosin Complex	Art R.	29 Apr 99	30 May 99
P065-99	99-22	Jenifer Penny	(250) 356-5244	Rare Plant Survey for COSEWIC	Jody W.	02 Jun 99	31 Aug 99
P066-99	99-23	Andy Stewart	(250) 387-9780	Urban Cooper's Hawk Nesting Habitat	Ken M.	14 Jun 99	01 Jul 99

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Table 3

**Status of DND/CFS Forest Management/ESAC GIS Database
Year of Last Update**

Location	File Type		Themes										
	DXF Files	Arcview Shape-Files	Contours	Roads	Water	Man-made	Forest Cover	Cons. Mgmt Zones	Rare Species	Birds	Archaeological Sites	Research Plots	Contaminated Sites
CFB Esquimalt													
Albert Head		1998	1993	1999	1999	1999	1999	1998	1999	1998	1998		1999
CFMETR – Nanoose		1998	1993	1999	1999	1999	1999	1998	1999	1998	1998	1999	1999
Colwood S/FOD		1998	1993	1999	1999	1999	1999		1999	1998	1998		
Dockyard		1998	1998	1999	1999	1999		n/a	1999		1998		1999
Heals Rifle Range		1998	1993	1999	1999	1999	1999		1998	1998	1998		
Mary Hill Battery		1998	1993	1999	1999	1999	1999	1998	1999	1998	1998	1998	
Masset Ops Site		1998	1993	1993	1993	1993	1999				1998		
Matsqui TX Site		1998	1993	1993	1993	1993	1999				1998		
Naden		1998	1998	1999	1999	1999		n/a			1998		1999
Nanaimo M.C.	1993		1993	1993	1993	1993	1993						
Nanaimo Rifle Range		1998	1993	1999	1999	1999	1999		1998	1998	1998		1999
Nanoose TX Site	1993		1993	1993	1993	1993	1993						
NRS Aldergrove		1998	1993	1999	1999	1999	1999		1999				
Pat Bay		1998	1998	1999	1999	1999		n/a					
Rocky Point		1998	1993	1999	1999	1999	1999	1998	1999	1999	1998	1999	1999
Royal Roads		1998	1993	1998	1998	1998	1998	1998	1998	1998	1998		
Work Point		1998	1998	1999	1999	1999		n/a	1999		1998		
CFB Chilliwack													
Columbia Valley	1993		1993	1993	1993	1993	1993						
Keith Wilson	1993		1993	1993	1993	1993	1993						
Richmond		1998	1993	1993	1993	1993	1993						
Salmon Arm R.R.	1993		1993	1993	1993	1993	1993						
Vernon M.C.	1993		1993	1993	1993	1993	1993						

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APPENDIX 1

**Cumulative Bibliography of
Environmental Science Reports on DND Lands**

Placed in the Pacific Forestry Centre Library

**Cumulative List of
Environmental Science Reports on DND Lands
in Pacific Forestry Centre Library**

Reports for Projects Prior to 1995

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2. Juan de Fuca Environmental Consultants. 1990. Nanaimo Inner Route: Recreation and Landscape Assessments Constraints Report - Initial Identification of Park, Recreation and Landscape Constraints, March 1990. Juan de Fuca Environmental Consultants, Victoria, B.C. Draft 26p. + app.
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5. Blood, D.A. 1992. Deer Collision Hazard and Mitigation, Nanaimo Inner Route, Sept, 22, 1992. D. Blood and Associates Ltd., Nanaimo, B.C. Prepared for Ministry of Transport and Highways and Westland Resource Group Ltd. 31p.
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July 22, 1993. Golder Associates Ltd. Burnaby, B.C. Prepared for Vancouver Island Highway project Management Team. 13 p. + maps.

10. Kent, M.J. 1993. Nanaimo Parkway Project No. 0-6462-5280: Harewood Mines Road to East Wellington Road Vancouver Island Highway Project, December 1993. Par Terr Design Environmental Planners, Victoria, B.C. Prepared for Highway Environment Ministry of Transport and Highways. 39p.
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16. Robinson, Arthur and Trofymow, Tony. 1996. DND Environmental Science Advisory Committee - CFB Esquimalt Annual Report - 1995. Canadian Forest Service, Victoria, B.C. (Includes reports done under Permit Nos. P002-95, P003-95, P004-95, P005-95, P007-95, P007-95, P008-95, P009-95, P010-95, P011-95, P012-95, P013-95, P014-95, P015-95, P016-95, P017-95, and P018-95).

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22. Robinson, Arthur and Trofymow, Tony. 1997. DND Environmental Science Advisory Committee - CFB Esquimalt Annual Report - 1996. Canadian Forest Service, Victoria, B.C. (Includes reports done under Permit Nos. P002-96, P003-96, P005-96, P006-96, P008-96, P009-96, P010-96, P017-96, P018-96, P021-96, P022-96, P023-96, P024-96, P025-96, P026-96, P027-96, P028-96, P029-96, P030-96, P031-96, P032-96, P033-96, P034-96, and P035-96)
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26. Hartwig, Carol and Eastman, Don. 1998. Relationships between the Primary Cavity Nester, Pileated Woodpecker, Dryocopus pileatus, and Wildlife Tree Densities and Coarse Woody Debris in Coastal Western Hemlock Biogeoclimatic Zone on Vancouver Island. Completion Report for Contributions. Graduate Project at the University of Victoria, Victoria, B.C. March 31, 1998. 30 p.
27. Haycock, Russ. 1998. Amphibian Survey With Special Emphasis on the Oregon Spotted Frog Rana pretiosa - Selected Wetland Sites: Fraser River Lowlands

and Corridors to the Interior Plateau. Hyla Environmental Services, 1680 - 56th Street, Suite 458, Delta, B.C. Prepared for Wildlife Branch, B.C. Ministry of Environment. 230p.

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29. Robinson, Arthur, J.A. Trofymow. 1998. Department of National Defence Environmental Science Advisory Committee - CFB Esquimalt Annual Report - 1997. Canadian Forest Service, Victoria, B.C. 69 p. (Includes reports done under Permit Nos. P002-97, P003-97, P005-97, P006-97, P010-97, P017-97, P018-97, P021-97, P022-97, P023-97, P024-97, P030-97, P031-97, P032-97, P035-97, P036-97, P037-97, P038-97, P039-97, P040-97, P041-97, P042-97, and P043-97).
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31. Haycock, Russ. 1998. Amphibian Survey With Special Emphasis on the Oregon Spotted Frog Rana pretiosa - Selected Wetland Sites: Fraser River Lowlands and Corridors to the Interior Plateau. Hyla Environmental Services, 1680 - 56th Street, Suite 458, Delta, B.C. Prepared for Wildlife Branch, B.C. Ministry of Environment. 230p.

Reports For Projects in 1998

32. Robinson, Arthur. 1998. Conservation Management Planning, DND CFB Esquimalt Properties, Results of Workshop Held at Royal Roads University, Victoria, March 17, 1998. Canadian Forest Service, Victoria, B.C. 20 p. + appendices.
33. Pearson, Mike. 1998. A Review of the Distribution, Status, and Biology of the Endangered Salish Sucker (*Catostomus sp.*) and Nooksack Dace (*Rhinichthys sp.*). Province of British Columbia, Ministry of Fisheries. 24p.
34. Robinson, Arthur and Trofymow, Tony. 1998. DND Environmental Science Advisory Committee – CFB Esquimalt Annual report – 1997. Canadian Forest Service, Victoria B.C. (Includes reports done under Permit Nos. P002-97, P003-97, P005-97, P006-97, P010-97, P017-97, P018-97, P021-97, P022-97, P023-97, P024-97, P030-97, P031-97, P032-97, P035-97, P036-97, P037-97, P038-97, P039-97, P040-97, P041-97, P042-97, and P043-97). 69p.
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Graduate Studies, Centre for Applied Conservation Biology, Department of Forest sciences, Faculty of Forestry, University of British Columbia, Vancouver, B.C. August 1998. 96 p.

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37. Burger, Alan E., Katy Holm, Anna Young and Stephen Young. 1999. Assessment of Nesting Habitat for Marbled Murrelets in the Coastal Douglas-fir Zone on SE Vancouver Island in 1998. Department of Biology, University of Victoria, Victoria, B.C. 32p. + appendices and map.
38. Robinson, Arthur. 1998. Conservation Management Planning, DND CFB Esquimalt Properties – Results of Workshop Held at Royal Roads University. Canadian Forest Service, Victoria B.C. 41p.

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39. Rohlf, Doris A. 1999. A Study of Acorn Feeding Insects: Filbert Weevil and Filbertworm on Garry Oak in the Southeastern Vancouver Island Area. A thesis submitted to the Department of Forest Sciences, Faculty of Forestry, University of British Columbia, Vancouver, BC. 157 p.
40. West, Angela. 1999. Preliminary Observations of the Effect of Temperature and Pathogens on Seed Germination of Scotch Broom under Laboratory Conditions. Work term report, the Department of Biology, University of Victoria, Victoria, BC. 24 p.
41. Ward, Peggy; Radcliffe, Gillian; Kirby, Jan; Illingworth, Jeanne; Cadrin, Carmen. 1998. Sensitive Ecosystems Inventory: East Vancouver Island and Gulf Islands 1993-1997. Volume 1: Methodology, Ecological Descriptions and Results. Technical Report Series No. 320, Canadian Wildlife Service, Pacific and Yukon Region, B.C. 146 p.
42. Engelstoff, Christian and Ovaska, Kristiina; Alula Biological Consulting. 1999. Sharp-Tailed Snake Study on the Gulf Islands and Southeastern Vancouver Island, March-November 1998. Ministry of Environment, Lands and Parks, Victoria, B.C. 69 p.
43. Hartwig, Carol Lee. 1999. Effect of Forest Age, Structural Elements, and Prey Density on the Relative Abundance of Pileated Woodpecker and South-eastern Vancouver Island. A thesis submitted to the Department of Biology, University of Victoria, Victoria, BC. 162 p.

44. Hugh Hamilton Limited. 1999. Department of National Defence, CFAD Rocky Point, Review of Alternate Training Areas. Natural Resources Canada and Department of National Defence, CFB Esquimalt, Victoria BC. 18 p + appendices.
45. Robinson, Arthur and Trofymow, Tony. 1999. DND Environmental Science Advisory Committee - CFB Esquimalt Annual Report - 1998. Canadian Forest Service, Victoria, BC. (Includes reports done under Permit Numbers P003-98, P005-98, P006-98, P010-98, P017-98, P018-98, P024-98, P030-98, P031-98, P032-98, P034-98, P35-98, P037-98, P041-98, P042-98, P044-98, P045-98, P046-98, P047-98, P048-98, P049-98, P050-98, P051-98, P052-98, P053-98, P054-98). 107p.
46. Fotsch, Melissa, Kevin Brooks, Wade Ewen, John White, Michiyo Furuhashi. 1999. Progress Report: The Development of Sampling Protocols for Scientific Research on DND Lands on Southern Vancouver Island. Royal Roads University, Environmental Science Program, Victoria, BC. 11p + 3 appendices + 2 maps.

May 2000

c:\ESAC\ESAC Reports in CFS Library

APPENDIX 2

ESAC Committee Members, Participants in ESAC Workshop, and ESAC Workshop Agenda

DND Environmental Science Advisory Committee

List of Members and Addresses

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**Annual Workshop
Environmental Science Advisory Committee**

January 26, 2000

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Arthur Robinson	Canadian Forest Service	363-0729
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Cameron Carlyle	Royal Roads University	474-3436
Ed Rain	Royal Roads University	391-2600-5505
Gillian Kerr	Royal Roads University	391-2600-5630
George Edwards	FTB	477-4757
John White	Royal Roads University	391-2600-4070
Michael Fox	Victoria Natural History Society	727-0076
Tom Burgess	Victoria Natural History Society	642-0015
Tony Embleton	Victoria Natural History Society	595-6812
Andy MacKinnon	Ministry of Forests	387-6536
Norm Mogensen	Victoria Natural History Society	477-9114
E. J. Sellentin	Royal Roads University	
Mike Meagher	MDM Forgene	727-7675
Gloria Simmins	EHEA	474-1046
Tina Nordstrand	Royal Roads University	391-2600-5306
Ian Foreman	EHEA	391-0249
Sarah Harrigan	Royal Roads University	478-3995
Don Beamish	Department of National Defence	363-7960
Bill Dushenko	Royal Roads University	391-2580
Al Potter	Department of National Defence	363-4914
Sheila Felker	Department of National Defence	363-7516
Matt Dodd	Royal Roads University	391-2583
Leonard Sopuck	Biolinx Environmental Ltd.	656-8981

Department of National Defence - CFB Esquimalt
Environmental Science Advisory Committee
ANNUAL WORKSHOP
AGENDA

8:15 a.m., January 26, 2000

Mews Conference Centre, Building 22,
Royal Roads University,
Colwood, B.C.

- | | |
|---------------|---|
| 8:00 - 8:15 | Registration |
| 8:15 - 8:30 | Welcome |
| 8:30 - 10:00 | Presentations:

1) <u>Richard Ring</u> - Permit No. P006-99 - Community Ecology of the Canopy-Forest Floor Insect/Arthropod Fauna from an Old Growth Forest

2) <u>Bill Dushenko</u> - Permit No. P034-99 - Establishment of EMAN Long-term Ecological Monitoring Plots at Royal Roads

3) <u>John White</u> - Permit No. P061-99 - Sampling Protocols for Small Mammals on DND Properties.

4) <u>George Edwards/Mike Meagher</u> - Permit No. P035-99 - Genetic Variation in Garry Oak

5) <u>Norm Mogenson/Tony Embleton</u> - Permit No. P046-99 - VNHS Greenways Inventory Project

6) <u>Lennart Sopuck</u> - Permit No. P060-99 – Gipsy Moth – Song Bird Study |
| 10:00 - 10:15 | Break |

10:15 - 11:30

Presentations:

- 7) Wendy Easton – Permit P003-99 - Monitoring of Neotropical Migratory Birds. Presented by Michael Settingington
- 8) Russ Haycock - Permit No. P037-99 - Breeding Biology of Spotted Frogs
- 9) Michael Hulme - Permit P030-99 - Management of Spruce Weevil - *Pissodes stobi*
- 10) Tony Trofymow - Demonstration of the new ESAC Web Site.

11:30 - 12:00

Wrap up

Appendix 3

Annual Reports for Projects Worked on in 1999

Permit No.: P003-99

Title: Monitoring of Neotropical Migratory Birds

Project Contact: Wendy Easton
(604) 940-4673

Organization: Canadian Wildlife Service
Pacific Wildlife Research Centre
5421 Robertson Road, RR#1
Delta, BC V4K 3N2

Location: CFAD Rocky Point, Victoria

Start Date: April 1, 1999

Completion Date: December 31, 1999

Project Overview:

Large-scale population declines in forest songbirds, particularly neotropical migrants, have been documented by scientists in North America. Many of these bird species are not adequately 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 Garry Oak Meadow 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 must be monitored annually for 5-20 years.

Objectives:

To monitor the use of habitat at Rocky Point by breeding and migrating songbirds. To detect changes in population trends of birds breeding and stopping over at Rocky Point.

Accomplishments to Date:

We have observed 254 bird species at Rocky Point (Table 1). Of the 297 landbird species found in all of Canada, almost half of the species (n=155) have been observed at Rocky Point from 1994 -1999 using standard survey techniques. Most of the landbirds surveyed at Rocky Point are considered target species for migration monitoring (n=101) and are recognized nationally as species with a medium to high priority for conservation (Table 2). Long-term trends in their populations are currently being analyzed.

From 23 July to 13 October 1999 specifically, we banded 2172 birds of 54 species. The 7 most common species comprised 56% of the total number of birds banded. They were Wilson's Warbler (n=257), Pacific-Slope Flycatcher (n=223), Orange-crowned Warbler (n=189), Ruby-crowned Kinglet (n=170), Lincoln's Sparrow (n=152), Savannah Sparrow (n=111), Yellow Warbler (n=105). We had the most consistent and thorough coverage of migrating birds during the 1999 field season in the history of migration monitoring at Rocky Point.

Table 1. Bird species observed at Rocky Point (n=254). List compiled by David Allinson, December 1999.

Red-throated Loon	Oldsquaw	Semipalmated
Pacific Loon	Common Goldeneye	Sandpiper*
Common Loon	<i>Barrow's Goldeneye</i>	Western Sandpiper*
<i>Yellow-billed Loon</i>	Bufflehead	<i>Little Stint</i>
Pied-billed Grebe	Hooded Merganser	Least Sandpiper*
Horned Grebe	Red-breasted	<i>Baird's Sandpiper</i>
Red-necked Grebe	Merganser	Pectoral Sandpiper
<i>Eared Grebe</i>	Common Merganser	Rock Sandpiper
Western Grebe	Osprey	Dunlin
<i>Northern Fulmar</i>	<i>White-tailed Kite</i>	<i>Stilt Sandpiper</i>
Sooty Shearwater	Bald Eagle	Short-billed Dowitcher
<i>Short-tailed Shearwater</i>	Northern Harrier*	Long-billed Dowitcher
Fork-tailed Storm-Petrel	Sharp-shinned Hawk*	Common Snipe
<i>Leach's Storm-Petrel</i>	Cooper's Hawk*	Red-necked Phalarope
Brown Pelican	Northern Goshawk	<i>Red Phalarope</i>
Brandt's Cormorant	Broad-winged Hawk	<i>Pomarine Jaeger</i>
Double-crested	<i>Swainson's Hawk</i>	Parasitic Jaeger
Cormorant	Red-tailed Hawk	<i>Long-tailed Jaeger</i>
Pelagic Cormorant	Rough-legged Hawk	<i>Franklin's Gull</i>
Great Blue Heron	Golden Eagle	<i>Little Gull</i>
Green Heron	American Kestrel	Bonaparte's Gull
Turkey Vulture	Merlin	Heermann's Gull
Greater White-fronted	<i>Gyr Falcon</i>	Mew Gull
Goose	Peregrine Falcon	<i>Ring-billed Gull</i>
<i>Emperor Goose</i>	Blue Grouse	California Gull
Snow Goose	Ruffed Grouse*	<i>Herring Gull</i>
Canada Goose	California Quail	Thayer's Gull
Brant	Virginia Rail*	Western Gull
Mute Swan	Sora*	Glaucous-winged Gull
Trumpeter Swan	American Coot	<i>Black-legged Kittiwake</i>
<i>Tundra Swan</i>	Sandhill Crane	<i>Sabine's Gull</i>
<i>Wood Duck</i>	Black-bellied Plover	Caspian Tern
Gadwall	<i>Pacific Golden-Plover</i>	Common Tern
American Wigeon	Semipalmated Plover	<i>Arctic Tern</i>
Mallard	Killdeer	<i>Forster's Tern</i>
<i>Blue-winged Teal</i>	Black Oystercatcher	Common Murre
<i>Cinnamon Teal</i>	Greater Yellowlegs	Pigeon Guillemot
Northern Shoveler	Lesser Yellowlegs	Marbled Murrelet
Northern Pintail	<i>Solitary Sandpiper</i>	Ancient Murrelet
Green-winged Teal	Wandering Tattler	Cassin's Auklet
<i>Canvasback</i>	Spotted Sandpiper	Rhinoceros Auklet
Ring-necked Duck	<i>Upland Sandpiper</i>	Tufted Puffin
Greater Scaup	Whimbrel	Rock Dove
<i>Lesser Scaup</i>	Ruddy Turnstone	Band-tailed Pigeon
Harlequin Duck	Black Turnstone	Mourning Dove
Surf Scoter	Surfbird	<i>Barn Owl</i>
White-winged Scoter	<i>Red Knot</i>	<i>Western Screech-Owl</i>
Black Scoter	Sanderling	Great Horned Owl
		<i>Northern Pygmy-Owl</i>

Barred Owl*
Long-eared Owl
Short-eared Owl
 Northern Saw-whet
 Owl*
 Common Nighthawk*
 Black Swift
 Vaux's Swift
*Calliope Hummingbird**
*Rufous Hummingbird**
 Belted Kingfisher
Red-naped Sapsucker
Red-breasted
Sapsucker
 Downy Woodpecker*
 Hairy Woodpecker*
 Northern Flicker*
 Pileated Woodpecker*
 Olive-sided Flycatcher*
 Western Wood-Pewee*
 Willow Flycatcher*
 Hammond's Flycatcher*
*Dusky Flycatcher**
 Pacific-slope
 Flycatcher*
Say's Phoebe
Western Kingbird
*Northern Shrike**
 Cassin's Vireo*
 Hutton's Vireo*
 Warbling Vireo*
Red-eyed Vireo
 Steller's Jay*
*Blue Jay**
Clark's Nutcracker
 Northwestern Crow
 Common Raven
 Horned Lark
 Purple Martin
 Tree Swallow
 Violet-green Swallow*
 Northern Rough-winged
 Swallow*

Bank Swallow
 Cliff Swallow
 Barn Swallow*
 Chestnut-backed
 Chickadee*
 Bushtit*
 Red-breasted Nuthatch*
 Brown Creeper*
Rock Wren
 Marsh Wren*
 Bewick's Wren*
 Winter Wren*
 House Wren*
 Golden-crowned
 Kinglet*
 Ruby-crowned Kinglet*
 Western Bluebird
Townsend's Solitaire
 Swainson's Thrush*
 Hermit Thrush*
 American Robin*
 Varied Thrush*
 European Starling*
Gray Catbird
 American Pipit
 Cedar Waxwing*
Tennessee Warbler
 Orange-crowned
 Warbler*
 Nashville Warbler*
 Yellow Warbler*
 Yellow-rumped Warbler*
 Black-throated Gray
 Warbler*
 Townsend's Warbler*
Pine Warbler
Palm Warbler
Black-and-white Warbler
*American Redstart**
 Northern Waterthrush*
*Mourning Warbler**
 MacGillivray's Warbler*
 Common Yellowthroat*

Wilson's Warbler*
 Western Tanager*
 Black-headed
 Grosbeak*
*Lazuli Bunting**
Dickcissel
 Spotted Towhee*
 Chipping Sparrow*
Clay-coloured Sparrow
Vesper Sparrow
 Savannah Sparrow*
 Fox Sparrow*
 Song Sparrow*
 Lincoln's Sparrow*
 Swamp Sparrow*
 White-throated
 Sparrow*
 White-crowned
 Sparrow*
 Golden-crowned
 Sparrow*
 Dark-eyed Junco*
*Lapland Longspur**
Snow Bunting
*Bobolink**
 Red-winged Blackbird*
 Western Meadowlark
Yellow-headed
Blackbird
Brewer's Blackbird
 Brown-headed Cowbird*
 Bullock's Oriole
 Purple Finch*
 House Finch*
 Red Crossbill*
White-winged Crossbill
 Pine Siskin*
 American Goldfinch*
 Evening Grosbeak*
 House Sparrow*

Italics indicate accidental species (five or fewer records)

*Bird species mist-netted

Table 2. BC landbirds observed at Rocky Point. Category titles in bold delineate target species that are not adequately monitored by the Breeding Bird Survey (BBS). Species in italics are recognized nationally as medium to high priority for conservation (n=92). Species with an asterisk were accidental observations (n=27).

A. Species with <50% of North American (Canada & U.S. only) breeding range covered by BBS, and <60% of their winter range in U.S. and Canada.

<i>American Pipit</i>	<i>Savannah Sparrow</i>
<i>Lincoln's Sparrow</i>	<i>Swainson's Thrush</i>
<i>Northern Waterthrush</i>	<i>Tennessee Warbler*</i>
<i>Orange-crowned Warbler</i>	<i>Wilson's Warbler</i>

B. Species with <50% of North American breeding range covered by BBS, but 60% of winter range in U.S. and Canada.

<i>Dark-eyed Junco</i>	<i>Snow Bunting*</i>
<i>Fox Sparrow</i>	<i>Swamp Sparrow</i>
<i>Golden-crowned Sparrow</i>	<i>Varied Thrush</i>
<i>Lapland Longspur*</i>	<i>White-crowned Sparrow</i>
<i>Yellow-rumped Warbler (Myrtle)</i>	<i>White-throated Sparrow</i>
<i>Northern Shrike*</i>	<i>White-winged Crossbill*</i>
<i>Ruby-crowned Kinglet</i>	<i>Palm Warbler*</i>
<i>Short-eared Owl*</i>	

C. Species with <60% of their Canadian and Alaskan breeding range (but 50% of North American range) covered by BBS, and <60% of their winter range in U.S. and Canada.

<i>American Redstart*</i>	<i>MacGillivray's Warbler</i>
<i>Bank Swallow*</i>	<i>Olive-sided Flycatcher</i>
<i>Barn Swallow</i>	<i>Pacific-slope Flycatcher</i>
<i>Black Swift</i>	<i>Red-eyed Vireo*</i>
<i>Black and White Warbler*</i>	<i>Rufous Hummingbird</i>
<i>Black-throated Gray Warbler</i>	<i>Say's Phoebe*</i>
<i>Cassin's Vireo</i>	<i>Townsend's Warbler</i>
<i>Chestnut-backed Chickadee</i>	<i>Tree Swallow</i>
<i>Chipping Sparrow</i>	<i>Vaux's Swift</i>
<i>Clay-coloured Sparrow*</i>	<i>Violet-green Swallow</i>
<i>Cliff Swallow</i>	<i>Warbling Vireo</i>
<i>Common Nighthawk</i>	<i>Western Tanager</i>
<i>Common Yellowthroat</i>	<i>Western Wood-Pewee</i>
<i>Dusky Flycatcher*</i>	<i>Yellow Warbler</i>
<i>Hammond's Flycatcher</i>	<i>Yellow-headed Blackbird*</i>

D. Species with <60% of their Canadian and Alaskan breeding range (but >50% of North American range) covered by BBS, but >60% of their winter range in U.S. and Canada (includes some irruptive species and irregular migrants).

American Robin
Belted Kingfisher
*Brewer's Blackbird**
Brown Creeper
Cedar Waxwing
Downy Woodpecker
European Starling
Golden-crowned Kinglet
Hairy Woodpecker
Hermit Thrush
Horned Lark
*Long-eared Owl**

Marsh Wren
Northern Flicker
Northwestern Crow
Pine Siskin
Purple Finch
Red-breasted Nuthatch
*Red-breasted Sapsucker**
Red-winged Blackbird
Song Sparrow
*Townsend's Solitaire**
*Vesper Sparrow**
Winter Wren

E. Species with >60% of both their Canadian and North American breeding range covered by BBS, and <60% of their winter range in U.S. and Canada.

Band-tailed Pigeon
*Bobolink**
*Calliope Hummingbird**
*Gray Catbird**
*House Wren**
Hutton's Vireo
Lazuli Bunting

*Nashville Warbler**
Northern Oriole
Northern Rough-winged Swallow
Purple Martin
Western Bluebird
*Western Kingbird**
Willow Flycatcher

F. Species with >60% of both their Canadian and North American breeding range covered by BBS, and >60% of their winter range in U.S. and Canada.

American Goldfinch
Bewick's Wren
*Blue Jay**
Brown-headed Cowbird
Evening Grosbeak

House Finch
Mourning Dove
*Red-naped Sapsucker**
Spotted Towhee
Western Meadowlark

Permit Number: P006-99

Title: Community ecology of the canopy-forest floor insect/arthropod fauna from an old-growth forest.

Project Leader: Dr. N.N. Winchester, Department of Biology,
University of Victoria
P.O. Box 3020, Victoria V8W 3N5
Ph: (250) 721-7099 Fax: 721-7120
email tundrast@uvvm.uvic.ca

Location: Rocky Point and Rocky Point Pearson College Canopy Station

Start Date: June 1994

Completion Date: Ongoing

Project Overview:

Community structure of forest canopy and ground arthropods in the coastal ancient forests on Vancouver Island is virtually unknown and information concerning responses of these communities to forest management practices is lacking. Conservation of biological diversity is a major environmental issue and this study area is a high priority area in terms of biodiversity research, conservation area planning and land use planning. The reasons for maintaining biodiversity have been clearly identified and results from my six years of study in the Carmanah Valley and four years of study at the Rocky Point canopy station support the theory that a unique ancient forest insect community exists, with several new species that are specific to microhabitats within these forest systems. In addition, the canopy fauna seems to contain a unique set of individuals that have evolved to form a separate arboreal community. The study at the DND site continues to offer an opportunity to explore trends in canopy arthropod communities and apply this information across a wide geographic region that includes different ancient forest mosaics. These canopy studies represent the only long term Northern temperate old-growth forest research on arthropods and will be used to form an integral part of an international network on global canopy studies.

Objectives:

I propose to document the community composition of the canopy and ground insect/arthropod fauna in this ancient forest, correlate this with biogeoclimatic zone, microclimate conditions and compare this community with 3 other canopy projects. These results will then be used to isolate factors that structure these communities across a wide geographic area (e.g. global canopy network). This project will involve systematists from across North America and I will concentrate on community composition structure and patterns in order to record changes that occur due to shifts in environmental gradients. A large part of this project will be dedicated to resolving taxonomic problems with the aim of cataloguing and describing the unique and previously undescribed species that make up biologically distinct communities (eg canopy fauna). The influence of environmental factors on insect/arthropod distributions, host-plant interactions and survivorship will be examined in the field to elucidate variables that contribute to the observed community structure.

Accomplishments to Date:

Highlights:

Analysis of results is **dependent on identifications to species** in the target taxa groups. To date these data are only available for the Asilidae. A summary of these results can be found in the following: Cannings, R., Green, G., Winchester, N. 1995. Selected invertebrate inventory. In Baseline Inventories of Rare Species and Ecosystems of Department of National Defense Properties of Southern Vancouver Island. (Ed.) K.H. Morgan. Canadian Wildlife Service, Environment Canada. pp. 120. Identifications for the Arachnida, Sphecidae, Staphylinidae, and Curculionidae are continuing.

Research Activities:

Trap coarse sorting where successfully completed and target taxa from the samples are currently being mounted for identification. The total samples sorted from each component of the research program are:

- 1) Malaise traps: 432 (all sorted)
- 2) Pan traps: 384 (40 sorted)
- 3) Pitfall traps: 144 (not sorted)
- 4) Beetle traps: 144 (all sorted)
- 5) Branch clipping: 120 (all sorted)

Target taxa processed from these traps included the Asilidae (robber flies). Identifications were completed by Rob Cannings (RBCM). These specimens are currently being catalogued and stored. The Symphyta (sawflies) were sorted from the Malaise traps and sent to Dr. H. Goulet (BRD) where they are currently being identified. The Arachnids (spiders) from the branch clipping program have been sorted and sent to D. Buckle in Saskatoon where they are currently being identified. The Aculeate wasps and spiders have been sorted from all Malaise traps and are currently being mounted. For identification. In addition, over 60,000 specimens from a variety of arthropod orders have been sorted from the Malaise traps. The Coleoptera fauna from the beetle interception traps have been sorted, labeled and integrated into the old-growth forest collection at PFC (Pacific Forest Centre). These specimens form the database of a highly successful directed research project that was completed by Mr. Tim Boulton as part of his BSc. degree.

A paper on the robber flies of Rocky Point is in prep, authors are R.A. Cannings and N. N. Winchester. This paper is nearing completion.

A paper on the Arachnids of Rocky Point is currently being prepared by N. N. Winchester. To date, the number of species identified are 78. These data were used as part of a publication submitted to Selbyana. The paper was accepted and is now in press.

Extension and Demonstration

Field research concentrated solely on the extension and demonstration of arthropod biodiversity. This aspect of the research program **was** facilitated by conducting tours at the Rocky Point research site. In conjunction with Environment Canada (see Dr. M. Dunn) The microclimate station is now up and running and we continue to develop partnerships with members from the University Victoria.

- Presented four papers on aspects of the canopy projects at a number of Universities and scientific meetings. For example, Department seminar at University of Roehampton/University of Surrey was given in late November, 1999.
- Microclimate station update—system is now running and data are being down-loaded at the University of Victoria.
- Article by Phil Jensen, for details contact Dr. R.A. Ring

New Extension:

- Completed a film sequence for the Nature of Things, producer, Caroline Underwood. The finished product should be out by March, 2000.

Previous Extension:

- CBC midday show interview was filmed and aired live from the canopy station at Rocky Point.
- Finished filming with Discovery.com, documentary was aired in September/October, on the Discovery station.
- Completed interviews (publications) and filming with:
 - ✦ Mark Moffett; National Geographic, Vol 191, No. 1, January 1997. Tree Giants of North America..
 - ✦ Gary Braasch, Journalist, BBC Wildlife, Vol. 14, No.8, August 1996. The High Life.
 - ✦ Douglas Cowell, Journalist, Canadian Wildlife, July/August 1996. A Green New World.
 - ✦ Douglas Cowell, Journalist, Canadian Federation Naturalist Magazine for children, Going Buggy in the trees. (Note, at present I do not have a complete citation for this, only a photocopy of the article.)
 - ✦ National Film Board of Canada. Completed a 3 day film shoot of the canopy research program and facility at Rocky Point. Expected release of this film, September, 1997.
 - ✦ Ring, R.A. and N.N. Winchester, 1996. Coastal Temperate Rainforest Canopy Access Systems in British Columbia, Canada. Selbyana, Vol. 17, 1: 22-26.
- Completed a 3-day extension and demonstration set of field trips organized with the Society of Conservation Biology. In total 14 international visitors were given tours into the canopy at Rocky Point.
- Completed the canopy web page that is launched out of the University of Victoria. The Rocky Point canopy work is included in the site.

Permit No: P010-99

Title: Bat use of Man-made Structures on DND Lands

Author: David Nagorsen (250) 387-2933
e-mail: dnagorsen@RBML01.rbcm.gov.bc.ca

Organization: Royal British Columbia Museum
PO Box 9815 Stn Prov Govt
Victoria V8W 9W2

Location: Mary Hill Battery (primary study site).

Start Date: 1 January 1999

Completion Date: 31 December 1999

Project Overview:

In 1993, a nursery colony of Townsend's big-eared bat (*Corynorhinus townsendii*) was found in the Command Post at Maryhill. A rare bat on the provincial Blue List, only four other nursery colonies are known for this species in BC. All are unprotected roosts in buildings. The three tunnels associated with gun emplacements at Maryhill are potential hibernacula for Townsend's big-eared bat. A survey of other man-made structures on DND properties in 1995 revealed that the Maryhill structures supported the only significant bat colony roosting in buildings. To improve temperature regimes, increase accessibility for bats, and prevent human disturbance/vandalism the steel doors of the Maryhill structures (tunnels #1 and 2, command post, building #1020) were modified into "bat gates" with secure locks. Tunnel #3 was left unaltered as a control. The Maryhill site is now the only protected roost of Townsend's big-eared bat in BC and it offers an ideal research setting to study the roosting requirements and general biology of a rare bat at the northern periphery of its range in Garry Oak -Douglas-fir habitat. In May 1996, Optic Stow Away (Hoskins Scientific) data loggers were placed in the 3 tunnels, command post, and building #1020 to record continuous temperatures throughout the year. A recorder is also set outside to record ambient temperatures. My research is an long term study designed to monitor bat use and roosting requirements in the Maryhill structures.

Objectives (1999):

1. Inventory the command post bimonthly from May to October to determine population, seasonal pattern, and parturition date for the nursery colony.
2. Collect faecal pellets from floor of nursery colony to assess potential for diet study.
3. Inventory tunnels monthly throughout the winter to determine the use of tunnels for roosting and hibernation.
4. Download temperature/humidity loggers every 6 months.
5. Continue to advise DND on bat conservation issues and protection of the Maryhill colony.

Accomplishments 1999

Project site was vandalized early in the season and project was deferred to future date.

Permit Number: P017-99

Title: Demographic Study of *Allium amplexans* Torr.

Project Leader: Allan R. Hawryzki, B.Sc.
(250) 753-3245 Local 2315

Organization: Malaspina University-College
900 5th Street
Nanaimo, B.C. V9R 5S5

Location: CFMETR (Nanoose) Site

Start Date: May 15, 1999

Completion Date: September 1, 1999

Project Overview:

Long term study to monitor changes in birth, growth, and death rates of individuals and "in summary" population trends of the rare and endangered native onion species *Allium amplexans* Torr.

Objectives:

To better understand the population dynamics of this rare species and therefore, the proportional significance of demographic, environmental and stochastic events towards these changes. Information incorporating such information as population distribution, breeding biology and microhabitat preferences will be used to establish a predictive model of future population viability.

Accomplishments to Date:

Unfortunately, due to circumstances no field work was carried out during 1999 and no data was collected. The project is ongoing and the field work and data collection will resume in 2001.

Research Activities:

Nil.

Permit Number: PO18-99

Title: Purple Martin Nestbox Program

Project Leader: Darren R. Copley, B.Sc.
657 Beaver Lake Road, Victoria, B.C.
V8Z 5N9, (250) 479-6622

Location: Colwood Supply/ Fuel Oil Depot

Start Date: March 1, 1999

Completion Date: October 1, 1999

Project Overview:

This site is one of only 11 Purple Martin colonies in the entire province. It is the largest colony with over 75 birds. This large swallow is on British Columbia's Red List and presently nests only in human-made nestboxes which must be maintained and monitored throughout the year.

Objectives:

To increase the population of breeding birds to a size that will provide scout birds to start up other local colonies. This will make the Purple Martin less vulnerable if we can spread the population around to many different sites on Vancouver Island, especially protected areas. With a larger, stable population, we can start some research pertaining to life history, migration patterns, etc...

Accomplishments to Date/of the Project:

Highlights of findings to Date:

Western Purple Martins are adaptable to human disturbance and can co-exist with humans in a high traffic area.

Accurate population estimates can be attained only by physically opening and checking for active nestboxes, as well as using the natural mobbing tendency of Martins to count adults in the air.

There were close to 75 returning birds this year.

Research Activities:

Nestlings have been banded for the past 3 years, however not under this permit (contact Laura Darling of Wildlife Branch or Cam Finlay at 479-9833 for a detailed report). Our work consisted of cleaning-out and maintaining the nestboxes, as well as monitoring of the population for any possible disturbances to a successful breeding season.

Permit No.: PO23-99
Title: Microclimate Monitoring Station
Author: Michael Dunn
Organization: Pacific Wildlife Research Centre
University of Victoria, Biology
Location: Rocky Point - Church Hill Forest Canopy Research Station
Start Date: January 1, 1999
Completion Date: December 31, 1999

Project Overview:

The instrument array for the microclimate station was installed in 1996 on one of the trees (Tree #1) that form part of the Forest Canopy Research Station. The microclimate station was designed to operate in association with the Forest Canopy Research Station and the Smithsonian Institute and Man and the Biosphere Study plot in the Coastal Douglas-fir sub-zone. The instrument array includes temperature, humidity and insulation sensors deployed from the forest canopy to below the soil surface. An automated, self tripping rain gauge was also installed. An In Situ data logger was installed at the base of the tree. Problems with sensors and the data logger were to be resolved and the station to become fully operational.

Trouble shooting was to be carried out during the year to make the station fully operational. Regular visits were to be made on an 18 day cycle to collect the data.

Objectives:

To provide long term, reliable climate data for the forest canopy and soils in support of the Forest Biodiversity Permanent Plot work and the Forest Canopy Research work.

Accomplishments to Date:

The Microclimate Monitoring Station was re-activated this year when the datalogger, regulator and battery were replaced. This was accomplished under the aegis of the Biology Department, University of Victoria. Data retrieved will be the responsibility of UVic, and the data will be distributed to all interested parties. In the Spring, a meeting was held and it was agreed by all that some of the probes be relocated to microhabitats within the tree canopy to better reflect microclimatic conditions and to improve the station's effectiveness to everyone's satisfaction.

The first set of data was downloaded in the fall of 1999 which is now available to all interested parties. Microclimatic data will now be downloaded on a regular basis, but a protocol will have to be established to decide where the data will be distributed.

Many field trips, television crews and writers of popular articles visited the canopy/ microclimate site this year, and the importance of the Microclimate Station was emphasized at every opportunity. Kevin Jordan, Arbornaut Access, visited the site in October 1999 and inspected the canopy access system for safety purposes. Everything was in good working condition. Gilbert Ethier visited the site in early December 1999 to inspect the Microclimate Station and reported that everything was dry and the system was working well. Annual inspections of both the Microclimate Station and canopy access system will be carried out again early in the year 2000.

Permit Number: P030-99

Title: Management of spruce weevil, *Pissodes strobi*

Project Leader: Dr. Michael Hulme, (250) 363 0600

Organization: Canadian Forest Service,
Pacific Forestry Centre
506 West Burnside Road, Victoria

Location of Study Sites: Nanoose TX and CFMETR

Start Date: April 1 1997

Completion Date: Continuing

Project Overview:

The most damaging plantation pest of spruce throughout the province is spruce weevil (*Pissodes strobi*), but no satisfactory way is known to manage the insect damage. In 1989 a small area of spruce was planted at Nanoose TX and CFMETR with the objective of using these trees to study management techniques for the spruce weevil. The trees have now grown to a point where heavy weevil attack and damage has occurred naturally. The time is now ideal to begin the insect studies. We plan two activities. One is to collect the weevils for laboratory studies in Victoria. The second is to release an insect parasite (parasitoid), *Eubazus semirugosus*, well known to attack only *Pissodes* species of weevils. The two DND sites were selected and developed for this work 10 years ago because they are isolated from other spruce sites. The isolation makes it less likely that spruce-dwelling insects will move in and out of the plantations, which would complicate our assessment of parasitoid and weevil activity.

Objectives:

To collect *Pissodes strobi* for study in Victoria, and to test a promising new method of managing the pest using natural enemies.

Accomplishments to Date:

a) Highlights of findings to Date:

Feeding and oviposition by *Pissodes strobi* has led to the destruction of many tree leaders in the plantations. Attack in a plantation occurs once a year during the spring, and each year a higher proportion of the leaders are attacked and killed as the weevil population naturally increases. As usual with this insect the spread of damage is not uniform but shows a clumped distribution. Damage is expected to further increase as

more trees are attacked, because the weevil population still appears to be in a vigorous stage of expansion. Parasitoids that attack only *Pissodes* weevil pests have been introduced into the *Pissodes strobi* population. The adult parasitoids were initially confined in cages with ovipositing weevils at the tops of trees where the parasitoids successfully laid eggs through the bark of the tree into the eggs of the weevil, and the parasitoid progeny has developed to completion. Once this phase of the insect's development was successfully demonstrated in the field, the adult parasite was allowed to search the plantation for weevil eggs. Again the parasite successfully established a new generation in these weevil eggs.

b) Research Activities:

These were limited to enclosing weevils and parasitoids in sleeve cages at the top of spruce trees, and assessing the egg-laying capabilities of the weevil and parasitoid by continuous monitoring of tree damage, and of the insects present in these damaged trees.

c) Extension and Demonstration:

None

Permit No.: P032-99

Title: Establishment and Monitoring of Plots in the Garry Oak Ecosystem Restoration and Monitoring Program

Project Contact: Richard Hebda
(250) 472-4569

Organization: Restoration Program, Environmental Studies
University of Victoria
P.O. Box 1700
Victoria, B.C. V8W 2Y2

Location: Mary Hill Battery, CFAD Rocky Point (Victoria)

Start Date: April 20, 1999

Completion Date: December 31, 1999

Project Overview:

Monitoring plots were established in Garry Oak stands on two sites at Mary Hill and Rocky Point. The plots contained broom as a major component. The treatment plots were treated by having the broom removed in 1997. The plots were revisited this year and percent coverage of plant species on these plots was documented.

Objectives:

1. Establish and characterize monitoring plots for plant species in Garry oak meadow vegetation at DND Properties on South Vancouver Island.
2. Develop and implement experimental design for exotic species removal in Garry oak meadow vegetation.
3. Remove major exotic species and monitor the effects of the removal.

Accomplishments to Date:

In the fall of 1998, Anne Stewart, a Biology Co-op student began a long term study of Mary Hill and Rocky Point sites as part of a B.Sc. thesis project at the University of Victoria. Preliminary visits were made to the sites in preparation for planning a regular schedule of visits and plant species data collection in 1999.

Ann Stewart, a student carrying out observations for her Honours thesis in Biology at the University of Victoria, visited the monitoring sites at Rocky Point and Mary Hill throughout the year. She began visiting sites and collecting plant species cover data in February. Sites were visited every two weeks through the middle of May. Sites were then visited once a month until the middle of October. By the end of July most of the grasses and ferns had gone brown. In the plots where broom had been removed initially there were numerous seedlings but none had reached flowering stage yet. At Rocky Point, where grasses dominate, the broom removal plot, few broom seedlings had grown.

Ann Stewart will be compiling her data and that from previous years, this year.

Permit number: PO51-99

Title: Marbled Murrelet Habitat Assessment in the Coastal Douglas-fir Zone

Project leader: Dr. Alan Burger (250) 721-7127

Contact: Anna Young (250) 474 4300
e-mail - syoung@pacificcoast.net

Organization: Biology Department
University of Victoria
PO Box 1700
Victoria, BC V8W 3N5

Location: Rocky Point and Royal Roads

Start date: May 1998

Completion date: Fall 1999

Project Overview:

This pilot project was the first to look for Marbled Murrelets (*Brachyramphus marmoratus*) in the Coastal Douglas-fir (CDF) biogeoclimatic zone of south-east Vancouver Island. The Marbled Murrelet is a red-listed species in British Columbia and faces threats to its continued survival throughout its range on the Pacific North American coast. Loss of nesting habitat due to logging is the main threat facing the bird in B.C., but other threats include increased nest predation due to forest fragmentation, oil spills and gill net fisheries. Although the CDF zone represents a small portion of the bird's potential breeding range, it is likely to support remnants of the dwindling Georgia Depression breeding population, which is one of the problem areas identified by the Marbled Murrelet Recovery Plan.

Marbled Murrelets remain at sea for most of the year and during the breeding season are extremely secretive and difficult to observe. The birds are unique among seabirds in nesting on suitable limbs of large old-growth coniferous trees, up to 70km inland from the ocean. A single chick is raised during the breeding season, fed several times a day by both parents. The breeding biology of the Marbled Murrelet has in large part been shaped by the risk of nest predation, the major cause of nest failure and the reason for the secrecy surrounding their nesting attempts.

Objectives:

- 1) To re-sample the stations used in 1998 in order to provide the 2 years of sampling required by the RIC (1997) standards;
- 2) To establish further stations in the area between Victoria and Nanaimo, with associated vegetation plots.
- 3) To produce GIS maps of the distribution of suitable habitat remaining for Marbled Murrelets in the CDF and CWHxm1 zones, and of the distribution of occupied stands where murrelet behaviour indicates nesting. These maps will assist management of remnant old-growth forests in the CDF and CWHxm1 zones.
- 4) To locate nest trees through tree-climbing and describe macro- and micro-habitat features of nest stands, trees and sites.

Accomplishments to Date:

- Areas of forest potentially suitable as murrelet nesting habitat were identified using air photographs, maps and contacts with knowledge of old-growth forest. Once identified, forest stands were ground-checked and trees were assessed for their suitability. Approximately 218 forest stands were visited or assessed this season and last, with about 69 selected as suitable for murrelet occupancy.
- Forty-nine murrelet survey stations were established in and around selected stands and audio visual surveys were carried out at the stations using standard murrelet survey techniques. Two stations were located at DND Rocky Point in older forest with suitable trees, while one was located in the grounds of Royal Roads.
- A total of 45 stations were surveyed this year and 17 (37.78%) had detections on at least one visit. Of the 17, eight stations had occupied detections on at least one visit (17.78% of all stations).
- At the majority of stations established in 1998 the minimum number of surveys recommended in the RIC (1997) guidelines have now been done, so no further surveys are planned. We consider that murrelets are nesting in the Victoria watershed and Sooke Hills Wilderness Regional Park. For the eight stations first established in 1999, only provisional conclusions can be drawn until work is completed next season, but murrelets are likely nesting in two of the forest stands surveyed.
- Vegetation surveys were carried out close to survey stations. Analysis indicates that suitable trees for murrelet nesting are present in the CDF zone, with similar densities and characteristics to trees in areas known to contain nesting murrelets elsewhere on Vancouver Island. The small sample of trees climbed all had suitable branches and moss/lichen mats, known to be important for murrelet nesting.
- Potential predators of Marbled Murrelets were found in nearly all dawn surveys suggesting that nest predation is an important limiting factor, which might be affected by logging and other fragmentation that encourages nest predators.
- Data analysis is still ongoing, so these conclusions will be presented in the final project report.

Research activities:

Audio-visual surveys at murrelet survey stations are non-invasive. An observer remains at the station for a two hour period around sunrise or sunset when murrelets are most active. Any sighting or hearing of murrelets or potential predators is recorded.

Vegetation surveys are again non-invasive and involve the establishment of a 30 x 30 m temporary quadrant. Characteristics of all trees (greater than 10 cm diameter at breast height) are noted in detail together with percentage cover of other vegetation in the quadrant.

Permit Number: P057-99
Title: Royal Roads Habitat Club
Project Leader: John Bartell
3430 – 210 Street, Langley B.C.
V2Z 2E5, (604) 533-0339
Project Location Royal Roads University
Start Date: September 25, 1999
End Date: Ongoing

Project Overview:

The objective of the Habitat Club is to research previous environmental data collected at Royal Roads, collect information on species presents and abundance, identify wildlife and aquatic habitat and enhancement opportunities, promote educational activities, and make club available to next years class so they may continue with works.

Accomplishments to Date:

Research Activities:

Research activities completed prior to August 1999 included an overview of several watercourses and aquatic populations at Royal Roads. Historical habitat information that has been relayed by past employees and users of the Royal Roads campus has also been recorded. This research provided interesting information regarding the historical land use at Royal Roads. Information on aquatic populations was collected and recorded through field study.

Some concerns, such as erosion problems and possible sources of water pollution were noted. Several initiatives to protect and enhance fish and wildlife habitat, and to raise awareness of existing habitat were brought forward by club members.

Research activities on campus revealed unmapped wetlands and watercourses that supported thriving salmonid populations. Many wildlife species were also found to utilize the unique habitat that the Royal Roads Campus offers. Although there is much more work to be done in these areas, the Habitat Club has provided the preliminary information necessary to identify where future efforts should be directed.

Educational Activities:

Presentations focusing on fish and wildlife habitat at Royal Roads were given to students, faculty and university administrative staff. On occasion, Habitat Club members asked to provide information on campus habitat and perform various educational activities for staff, students, and community stewardship groups. A professional trainer from the Department of Fisheries and Oceans was also brought in to provide club members and other students with an educational overview on aquatic habitat assessment.

Conclusion:

Students in charge of the Royal Roads Habitat Club have now completed their studies, and the Club has been introduced to a new class of environmental science students. Whether or not the club continues to exist is yet to be seen. Michael Vaters of the 99/00 Environmental Science class has expressed his interest in continuing with club efforts.

The Club has left Royal Roads with several Government and non-government contacts within the community. More people are now aware that there is habitat on Royal Roads worth preserving, and there is more of an initiative to do so. Royal Roads University has subsequently provided funding for a permanent position to coordinate environmental initiatives at Royal Roads. This position will likely provide a means to carry out habitat Club initiatives, and help ensure habitat is protected during day to day activities.

The Club Founder (John Bartell) is currently preparing a report that compiles information about habitat at Royal Roads, areas of concern, and recommendations. This report will likely be complete by the end of March 2000. If there are any questions regarding club activities, findings, or other concerns, please call John Bartell at **(604) 533-0339**.

Permit No.: P058-99

Title: VNHS Greenways Inventory Project

Project Contact: N. Mogensen
(250) 477 9114 (phone & FAX)

Organization: Victoria Natural History Society
3760 Crestview Road
Victoria, B.C. V8P 5C6

Location: Albert Head, Belmont Park, Colwood Supply/Fuel Oil
Depot, Mary Hill Battery

Start Date: March 15, 1999

Completion Date: October 31, 1999

Project Overview:

This project is a survey of the ecosystems on natural and semi-natural lands within the capital Improvement District. The ecosystems were mapped and the individual species found in each were identified. A list of species found on each property was prepared.

Objectives:

To survey the ecosystems on selected DND properties and to identify the species found in the ecosystems.

Accomplishments to Date:

Selected sites on the four properties were reconnoitered and surveyed by crews of volunteers. Distinct plant communities were mapped and identified according to S.E.I. Ecosystem classifications. Special features (singularities) within these ecosystems were identified and mapped. All species found at sampling locations were identified and listed. Maps of the plant communities and special features were prepared. Lists of species occurring on the properties were also prepared. Seven reports, one for each site, were prepared. Each report contained a descriptive text, maps and species lists. The text of these reports is presented below. A complete copy of the reports has been placed in the PFC Library.

Research Activities:

None

The following reports were submitted by the Victoria Natural History Society as part of its Greenways Inventory Project for 1999:

<u>Report No.</u>	<u>Title</u>
DND #3	Report on Mary Hill East Shore (Mary Hill)
DND #4	Summary of Inventory of DND's Mary Hill (Mary Hill)
DND #5	Report on Albert Head West (Albert Head)
DND #6	Partial Inventory of Natural Features of lands North of Belmont Park (to Ocean Boulevard) (Belmont Park)
DND #7	Report on Belmont/Rosebank Triangle (Belmont Park)
DND #8	Report on Lands East of Tank Farm Road (Colwood Supply/Fuel Oil Depot)
DND #9	Report on Ocean Boulevard at South Belmont (Belmont Park)

**VICTORIA NATURAL HISTORY SOCIETY'S
GREENWAYS INVENTORY PROJECT
REPORT ON MARY HILL EAST SHORE (DND #3)**

During the summer of 1999, a Victoria Natural History Society Greenways Inventory Project team (VNHS) proceeded under DND Research and Collection Permit number P046-99, to closely examine and inventory ecological, topographical and cultural features on part of the DND's Mary Hill military lands. This report deals with that part of those lands that lay east of William Head Road to the Parry Bay shoreline, and extend approximately 1.2 kilometers, from 70 meters south of the junction of Mary Hill Road and William Head Road, to the fence of William Head Prison.

The purpose of this inventory was to identify lands containing important natural features, in pursuit of the following two VNHS aims:

1. permanent conservation of important and threatened regional eco-systems; and
2. protecting regional wildlife habitats and inter-connecting corridors between them (greenways).

VNHS believes that it is very important to preserve and protect most of the remnant sensitive ecology (examples: "woodland" and "terrestrial herbaceous" eco-systems) of this dry coastal zone, especially as most of it has already been destroyed or heavily impacted by human occupation. It is especially important to protect those still intact and relatively undisturbed shorelines that enable the unimpeded use by wildlife whose interacting natural habitats include ocean, ocean shore and adjacent uplands.

This report consists of:

1. this summary report;
2. a hand drawn map (scale 1:2500) of the lands east of William Head Road, showing all ecosystems (each color-coded on it, and then described separately on an accompanying table entitled "CDC's Sensitive Eco-System Codes"), numbered observation areas at which separate detailed species lists were compiled, and letter referenced singularities that may be of interest in this context;
3. a table entitled "Victoria Natural History Society Inventory of Eco-Systems, Species Distribution & Site Conditions" with supplementary notes prepared by the inventorying team, describing Mary Hill - East Shore - DND #3.

LIMITATIONS:

As with other DND inventories in 1999, we were unable to immediately field a volunteer team on this site by the time the DND Research and Collection Permit was issued on April 19, 1999. Our early volunteers had by then already been assigned elsewhere. Many of them were university biology students, who, by then were already in exam and summer employment search mode. Thus we were not on the site when spring species were visible. This is a serious defect, as among those species may be a number of rare and endangered species that do occur in this kind of area.

FINDINGS:

Within the "coastal Douglas Fir" and "mixed dry woodland" ecological zones that once dominated much of the southeast coast of Vancouver Island and the Gulf Islands, there is little left that is not destroyed, heavily modified, in other ways dominated by human occupation, or else imminently threatened. In fact, we are informed by experts at both the BC Ministry of Forests and the BC Ministry of Environment that there are approximately only 1100 hectares of mature "coastal Douglas Fir forest" eco-system left in British Columbia (less than .1% of what once existed). This has been classified as a rare and endangered eco-system, many of whose remnants are still unprotected and under pressure from logging interests and from urban expansion. In fact only about 2% of this tiny remnant of mature Coastal Douglas Fir forest is within protected areas. This is far below the level targeted for conservation.

Although once logged and used in various other ways, these lands, although not containing "mature" and pristine eco-systems, have largely recovered in that direction. Douglas Fir diameters indicate the second growth forest is at least 100 years old in most places on this site. This site then is an increasingly rare example of intact and near natural ecology, predominantly consisting of maturing coastal Douglas Fir, mixed woodlands and terrestrial herbaceous types.

As such this site may be valuable for essential conservation purposes. Essential conservation purposes include preserving genetic stocks of species that have evolved to cope with the climate, soil and terrain conditions of this region, to help to eventually restore or maintain viable populations of these species here and in surrounding areas. With increasing human populations and coming climate change, we and other communities around the world would do well to quickly establish and then safeguard sufficient "ecology banks" to safeguard our species' own future, as it is unlikely we will ever escape dependency on the ecological systems of which we are a part. It is highly unlikely that the current target 12% of our land base (which we have not achieved in this area) will prove sufficient to do this.

This diverse forested site, with its close proximity to the sea, provides valuable habitat for a variety of fauna that depends for its survival on having access to both land and sea. Such sites are becoming increasingly rare, to the detriment of those species.

Field work done by VNHS volunteers Crystal Campbell and Vesa Adler. This report prepared by:

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VICTORIA NATURAL HISTORY SOCIETY'S

GREENWAYS INVENTORY PROJECT

Summary of Inventory of DND's Mary Hill - South Shore (DND #4)

Introduction

This report summarizes information gathered through an eco-system inventory conducted by Victoria Natural History Society volunteers (VNHS) during the summer of 1999 on that part of DND's Mary Hill lands, defined as follows:

east boundary: William Head Road, from the prison gate to a secondary westerly road approximately 190 meters north of it;

north boundary: the secondary road described above;

south boundary: William Head Prison fence, and then the Pedder Bay shoreline; and

west boundary: initial objective - the Pearson College property boundary, but truncated at 1,000 meters west of William Head Road.

The inventory was conducted under DND Research and Collection Permit #P046-99. Its purpose was to identify and evaluate the various ecological systems represented on the site. It characterized them primarily by the dominant class of vegetation, and as well the inventory noted significant or unique natural features in the area. However, because the inventory was unable to report on the spring vegetation which potentially includes important rare species, and did not cover the western half of the site, this report is only presented in preliminary form. VNHS is hoping to continue this inventory in the spring of 2000, if a renewed permit can be obtained. That will result in a final report on this site.

Areas of Significance

Areas of significance on this site (may be expanded after a spring botany survey) include the large sections of Garry Oak/Arbutus woodland and tracts of old growth Douglas Fir. Both of these ecosystem types have been identified as rare or endangered within British Columbia.

Garry Oak ecosystems

Garry Oak ecosystems are found in Canada only on the southeast coast of Vancouver Island, the southern Gulf Islands and very isolated small populations in the Fraser Valley. Garry Oak landscapes may include woodlands containing Garry Oaks and Arbutus, meadows, grasslands, scattered Douglas-Fir stands and open rocky areas. In spring, the meadows are generally lush with a variety of wild-flowers including the blue camas, white Easter lily and western buttercup, the satin flower, chocolate lily and monkey flower. The open oak woodlands are home to a diverse bird community, both in summer and winter. Garry Oak ecosystems have been identified as "hot-spots of biological diversity."

A report by the Ministry of Environment, Lands and Parks (MELP) states "Garry Oak ecosystems may have a special role to play in B.C.'s adjustment to global warming. It is predicted that our climate will become more like that of California. With Douglas-Fir ecosystems retreating from their

current range, the Garry Oak eco-systems could provide the essential feed-stock of biological material to repopulate the void.'

In B.C. very little of the Garry Oak landscape remains in an unaltered state. Garry Oak eco-systems have declined dramatically in extent over the past two decades and much of what remains continues to be strongly modified and reduced by human encroachments. There is growing public and scientific concern about preservation of these remnant Garry Oak ecosystems, as they may be key to our future.

While much of the Garry Oak habitat at the Mary Hill site has experienced substantial past disturbance, it is felt that if determined efforts were made to remove invasive/non-native plant species, an equilibrium of characteristic native species in these areas could be re-established. It is notable that there are numerous young Garry Oaks on the Mary Hill property. This is important because for several years Garry Oaks had experienced a very low germination rate for a variety of reasons, not least of which are stress conditions typical of plants at the extreme edge of their range.

Coastal Douglas-fir Ecosystems

Old-growth Douglas Fir forests are an essential part of the unique bio-diversity of British Columbia. The coastal Douglas-Fir forests once dominated a narrow strip of low-lying land along the southeastern coast of Vancouver island, the Gulf Islands, and parts of the Lower Mainland and Sunshine coast. Now a study estimates that only .1% (about 1100 hectares) of these undisturbed old forests remain. As old forests tend to contain the greatest genetic diversity, this is far below what scientists consider to be a safe minimum area for the continued healthy survival of these forest types. Only 2% of Coastal Douglas Fir forests (including 2nd growth) are protected in BC.

In these forests, the Douglas Fir is the "keystone" species - a species that is the major influence on the nature and functions of the whole ecosystem. When the canopy of Douglas-Fir trees is removed, the under-storey plants are exposed to the elements and many species tend to be quickly displaced by plants more suited to harsher conditions, thus for a long period or permanently, changing the entire eco-system. In total, there are about 100 species of plants - trees, shrubs, vines, herbs and mosses in coastal Douglas-Fir forests. The intrinsic value of such naturally diverse environments is well recognized, and protecting these forests will help maintain the habitats and viability of many individual plant and animal species. For these reasons, it is important to protect those few mature Coastal Douglas-fir ecosystems that remain.

Fauna

The Mary Hill site provides habitat for an array of fauna. While conducting this study, there were regular sightings by VNHS volunteers of large birds of prey including vultures, Bald Eagles, hawks, in addition to two separate sightings of Great Horned Owls. Evidence of use of the area by other large mammals was noted on the site including wolf scat and large tracks possibly indicating the presence of cougars. Further human encroachments at Mary Hill would compromise the essential values of wildlife habitat and sanctuary that the area presently provides.

Unique features

A number of unique features were observed in this area. These include:

- clusters of old growth douglas fir (up to 2m diameter)
- large Garry Oaks (1m diameter)
- large old arbutus trees (up to 1.7m diameter)
- large yew
- a large midden
- heritage fruit trees

The 1994 Ecological Assessment conducted by G. Radcliffe, et al., notes that several of the DND sites, including the site at Mary Hill have been used for biological research. Educational and research values of the site would be eliminated if substantial further human encroachment and development was to occur here.

Next Steps:

VNHS will apply for a year 2000 renewal of its permit, to enable it to complete this inventory. Then it will provide maps, species lists and fuller details of the ecology at Mary Hill, along with more specific recommendations for its future treatment.

Field work done by numerous volunteers, directed by Ms. Nitya Harris. This report was prepared by Nitya Harris. Contact person: Norm Mogensen (477 9114).

VICTORIA NATURAL HISTORY SOCIETY'S
GREENWAYS INVENTORY PROJECT
REPORT ON ALBERT HEAD WEST (DND #5)

During the summer of 1999, a Victoria Natural History Society Greenways Inventory Project team (VNHS) proceeded under DND Research and Collection Permit number P046-99, to closely examine and inventory ecological, topographical and cultural features on the westerly 75 meters of the Albert Head military lands, extending from Albert Head Lagoon to Parry Bay. The purpose was to identify lands containing important natural features, in pursuit of both long term conservation and regional greenways aims. VNHS believes that it is important to preserve and protect much of the remaining sensitive ecology of this area, including wildlife corridors that can connect larger remnant natural habitats (in this case, Latoria Creek/Albert Head Lagoon to the vicinity of Witty's Lagoon/Bilston Creek).

This report consists of:

1. a hand drawn map (scale 1:2500) of the westerly 75 meters of DND's Albert Head lands, showing ecosystem boundaries (each referenced by a separate number and described separately), photo locations/directions, and probable archaeological sites;
2. a table that briefly describes each of the ecosystems found on this site, and a further table showing the Conservation Data Centre's definitions of sensitive eco-systems in this region;
3. some photographs illustrating the general character of parts of the site; and
4. this summation.

FINDINGS:

Except for a small part of the building zone at the Albert Head Road security gate and short sections of seldom used vehicle track at both the north and south ends of this site, the site is in a slightly disturbed, but largely natural state. It is well worth preserving as a north/south wildlife corridor, although the wire mesh fencing detracts from this somewhat at present, especially because the potential corridor is closed off at each end.

Note that in addition to the considerable variety of ecology on the site, we believe we have located three old first nations grave sites (very similar to several other first nations grave sites that we have found elsewhere and had confirmed by archaeologists). We regret that this inventory was done too late in the season to capture spring plant species, among which might be some of the rare plants that can be found in such conditions.

Field work done by VNHS volunteers. This report prepared by:

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**VICTORIA NATURAL HISTORY SOCIETY'S
PARTIAL INVENTORY OF NATURAL FEATURES OF:
LANDS NORTH OF BELMONT PARK (TO OCEAN BOULEVARD)**

VNHS SITE: DND # 6

TERMS OF REFERENCE:

During April 1999 Victoria Natural History Society (VNHS) obtained a DND Research and Collection Permit (number P046-99) from CFB Esquimalt, Base Construction Engineering Office (DND), to examine the unused DND property extending from the east end of Rosebank Road to the church opposite the entrance to Fort Rodd Hill, and between the Belmont Park sub-division and Ocean Boulevard. That site is herein referred to by VNHS as DND Site #6.

The purpose of this examination (and inventory) was to identify lands containing important natural features, in pursuit of the following two VNHS aims:

1. permanent conservation of important and threatened regional eco-system remnants; and
2. protecting regional wildlife habitats and inter-connecting corridors between them (greenways).

This permit was sought by VNHS, because of its concern about potential destruction of natural values on this land, that might result from its sale or re-deployment to an alternate use.

METHODOLOGY:

VNHS reconnoitered the site to determine its general characteristics. Then, using Ocean Blv'd. as a base line, it flagged that margin of the property at 50 meter intervals. At each flag point it conducted a parallel eco-system survey, using compass, measuring tape and survey data forms to record the natural characteristics of the property, including every eco-system type and its boundaries. That data was then transcribed (to scale) to a map of the property, and used as a basis for establishing the size, shape and location of all eco-systems and special natural and cultural features found on it (the same method was used for other DND sites in 1999). During that process, 39 representative locations were selected in this site, at which detailed plant species inventories were conducted. Individual species were inventoried within the lesser of, a maximum radius of 30 meters from each observation area's centre or, the boundaries of the eco-system concerned.

Outputs from this inventory consist of:

1. this report;
2. a hand drawn site map, showing some findings, to an approximate scale of 1:2500;
3. a list of the species and interesting features observed, as distributed over the 39 observation areas; and
4. Photographs to illustrate some natural features of the property.

REPORT LIMITATIONS:

Permit # P046-99 was received too late to capture much of the spring botany, so VNHS opted to simply proceed whenever suitable volunteer resources became available. This site was used by volunteer coordinator, N. Mogensen, as a demonstration site, to train a group of new VNHS volunteers. 10 people were involved in this inventory, which was conducted in 11 day long sessions from July 12 to August 4, 1999.

While the trainee volunteers were closely supervised in the field and much of their work was directly re-checked, particularly when inconsistencies were observed, some minor subtle features may have been overlooked.

The 39 observation areas were chosen to represent each eco-system, to cover a diversity of plant communities, and to give representation to every part of the site. No inventorying was done between the 39 observation areas. It is probable that some species exist on the site, that were not found within any of the 39 observation areas.

Typical seasonal drought in this coastal arid region by July/August, had eliminated all traces of many early spring annual plant species. Undoubtedly many such species exist on this site (potentially, including some endangered ones) that were no longer readily identifiable.

No attempt was made to identify fauna, much of which is not bound to, or as dependent on the site as flora is. Various plant community habitats are indicative of certain types of abundant fauna. Any rare fauna observed would have been identified. Unfortunately most large and unusual fauna is well aware of the presence of our volunteers, and is able to move away before being detected.

From the eco-system types, nesting cavities and ideal habitats observed, we can safely predict the seasonal or year-round presence of a large number of additional fauna species. Solid evidence of these additional species could be produced by a more prolonged inventorying effort.

Due to seasonal conditions, time pressures and resource limitations, no attempt was made to identify individual species of grasses, mosses, lichens (of which there is much evidence).

All measurements in this report are approximate, but are probably accurate to within 15 meters. A 60 meter measuring tape and compass were used to correctly position the main features of the site. If anyone re-visits any of the features, indicated to scale on the accompanying map, they should readily find what we found, unless continuing drought renders more small species seasonably invisible.

While topographical observations were made, as they generally appeared to conform to the accompanying topographical map, they are not recorded here.

FINDINGS:

Topography:

The site has considerably more topographical variation than is readily visible from Ocean Blv'd. On the map we have prepared, the eco-system polygons indicated for "terrestrial herbaceous" are generally situated on rocky hill tops, some of which have views of surrounding and distant areas. "Woodland" eco-systems are generally on rocky hills with plenty of sun exposure. "Second growth" and "older forest" polygons are generally on more level areas which act as water catchment areas, where run-off moisture is concentrated from the nearby rocky (non-permeable) hills. There are

several seasonal watercourses and seasonally moist areas on the site, some of which hold the extra moisture for long enough each year to attract and hold water loving plants.

Those drainage patterns have resulted in shallow to no soils on the heights of land, and soil accumulations in the more level areas. The first and final pages of the "species lists" provide some additional information on topography.

The General Eco-systems Present:

The site map we have prepared and the first page of each "species list" provides the eco-system classifications, as interpreted from the criteria used by the BC Ministry of Environment's Sensitive Eco-Systems Inventory (SEI). We have reduced their codes to a single digit, to fit our table. We have added new codes to cover disturbed portions of the site (of no interest to the SEI inventory).

Most of this site was not covered by the Ministry of Environment's SEI inventory. Our survey, done in more detail and using larger scale maps, is more accurate than theirs.

Many of the trees on the site were measured and the results contributed to the eco-system classifications given to the observation areas. There were some trees on various part of the site that measured from one to two meters in diameter. In categorizing "second growth" and "older forest" eco-systems, we assumed rates of Douglas Fir tree growth in this area of 50 to 70 cm. of diameter at breast height, per century. As older logged areas around here are self re-seeded, we expect a wide range of tree ages in a stand, and so look for a homogeneous mix of the oldest (largest) trees. Most of this property has not been logged for a very long time, indeed parts of it may never have been logged, or only logged selectively.

Interpretation of Findings:

The site, as is evident from the map we prepared, is rich in eco-system variety. It contains an abundant variety of plant species, that are well representative of the original natural flora of this micro-climate region. While the site contains many invasive species, generally they have not overwhelmed the native species and can probably still be controlled by benign means. There is much evidence of abuse (dumping) and some over-use, but these too can easily be corrected.

The site contains sizable patches of increasingly rare older coastal Douglas Fir forest and extensive woodlands that are rich in mixed groves of threatened Garry Oak eco-system. This site is now a valuable link in the wildlife corridor that connects the Millstream Creek basin to Fort Rodd Hill and Esquimalt Lagoon. We found evidence of limestone karsts on the site (this is close to the reported caves near the DND tank farm).

A mutant sword fern was discovered on the site. It is a type never before seen by VNHS or by a Ministry of Environment specialist that VNHS consulted.

This site could form a very high quality link in the new regional greenway (the South Coast Marine Access Corridor) being planned by the CRD, Provincial Capital Commission, and adjacent municipalities.

Prepared by: N. Mogensen (477 9114)
Representing Victoria Natural History Society
August 7, 1999.

**VICTORIA NATURAL HISTORY SOCIETY'S
GREENWAYS INVENTORY PROJECT
REPORT ON BELMONT/ROSEBANK TRIANGLE (DND #7)**

During the summer of 1999, a Victoria Natural History Society Greenways Inventory Project team (VNHS) proceeded under DND Research and Collection Permit number P046-99, to closely examine and inventory ecological, topographical and cultural features on part of the DND's unused lands associated with Belmont Park. This report deals only with that part of those lands, known as Remnant 2, that lays between Ocean Boulevard, Belmont and Rosebank.

The purpose of this inventory was to identify lands containing important natural features, in pursuit of the following two VNHS aims:

1. permanent conserving important and threatened regional eco-system remnants; and
2. protecting regional wildlife habitats and inter-connecting corridors between them (greenways).

This report consists of:

1. this summary report;
2. a hand drawn map (scale 1:1250) of the site, showing its 2 ecosystems (indicated by symbol, and then described separately on an accompanying table entitled "CDC's Sensitive Eco-System Codes"), numbered observation areas at which separate detailed species lists were compiled, and dotted line indications of where pedestrian greenways (trails) could connect with adjoining properties;
3. a table entitled "Victoria Natural History Society Inventory of Eco-Systems, Species Distribution & Site Conditions" with supplementary notes prepared by the inventorying team, describing Belmont/Rosebank Triangle - DND #7.

LIMITATIONS:

As with other DND inventories in 1999, we were unable to immediately field a volunteer team on this site by the time the DND Research and Collection Permit was issued on April 19, 1999. Our early volunteers had by then already been assigned elsewhere. Thus we were not on the site when spring species were visible.

FINDINGS:

Within the "coastal Douglas Fir" ecological zone that once dominated much of the southeast coast of Vancouver Island and the Gulf Islands, there is little left that is not destroyed, heavily modified, in other ways dominated by human occupation, or else imminently threatened. Although once logged and used in various other ways, the western end of this site (the largest part), although not pristine, has largely recovered as natural Douglas Fir forest. Douglas Fir tree diameters indicate most of the forested aspect of the site has likely not been logged for at least 100 years (the author of this report has re-inspected the site and accordingly changed the volunteer's classification of its forest from "second growth" to "older forest"). The east end of the site has all been logged and is now a mixture of indigenous and invasive scrub species.

most of this site is an example of a near natural remnant of Douglas Fir forest that has connectivity with other important surviving larger remnants of forest and with an existing regional greenway. This forested site provides valuable bird and small mammal habitat and it contains a variety of species that are increasingly under pressure in this region.

Field work done by VNHS volunteers Fherman and Fran Rapaport. This report prepared by:

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VICTORIA NATURAL HISTORY SOCIETY'S

GREENWAYS INVENTORY PROJECT

REPORT ON LANDS EAST OF TANK-FARM ROAD (DND #8)

During the summer of 1999, a Victoria Natural History Society Greenways Inventory Project team (VNHS) proceeded under DND Research and Collection Permit number P046-99, to closely examine and inventory ecological, topographical and cultural features on unused parts of the DND's lands southeast of the road extending from Ocean Boulevard to its fuel tank-farm, and continuing to extend along the northeastern boundary of Lot 5. While it was not originally our intention to inventory this site, upon viewing its apparent ecological richness from the adjacent Lot 5, and upon receiving permit authority to do so, we decided to proceed.

The purpose of this inventory was to identify lands containing important natural features, in pursuit of the following two VNHS aims:

1. permanent conservation of important and threatened regional eco-system remnants; and
2. protecting regional wildlife habitats and inter-connecting corridors between them (greenways).

VNHS believes it is very important to preserve and protect most of the remnant sensitive ecology of this dry coastal zone, especially as most of it has already been destroyed or heavily impacted by human occupation.

This report consists of:

1. this summary;
2. a hand drawn map of the site (scale 1:2500), showing its ecosystems (indicated by color coding and symbols, and then described separately on an accompanying table entitled "CDC's Sensitive Eco-System Codes"), numbered observation areas at which separate detailed species lists were compiled, and various other symbols showing photo locations, shell middens and some drainage and topographical features;
3. a table entitled "Victoria Natural History Society Inventory of Eco-Systems, Species Distribution & Site Conditions" prepared by the inventorying team, listing some of the species and conditions found at this site; and
4. one page of photographs of aspects of the site.

LIMITATIONS:

As with other DND inventories in 1999, we were unable to immediately field a volunteer team on this site by the time the DND Research and Collection Permit was issued on April 19, 1999. Our early volunteers had by then already been assigned elsewhere. Thus we were not on the site when spring species were visible.

FINDINGS:

Within the "coastal Douglas Fir" ecological zone that once dominated much of the southeast coast of Vancouver Island and the Gulf Islands, there is little left that is not destroyed, heavily modified, in other ways dominated by human occupation, or else imminently threatened. Only 1100 hectares of mature Douglas Fir Forest remains in BC. Although this site contains some disturbed parts, most of it has largely recovered as a natural remnant of older (maturing) second growth Douglas Fir forest. It also contains some increasingly threatened Garry Oak woodlands. It has two "terrestrial herbaceous" zones. These tend to be rich in the spring flora that is unique to this very small coastal arid region of Canada, and sometimes these zones contain species that are very rare anywhere. This remnant site is well integrated, ecologically, with similarly maturing forest lands on the adjacent Lot 5 (now possessed by Parks Canada) and other nearby DND sites, which amplifies its ecological value. It contains a variety of species that are increasingly under pressure in this region.

Field work done by VNHS volunteers Michael Fox, Sonja Zupanek, Alana Borg and Allan Fair. This report was prepared by:

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VICTORIA NATURAL HISTORY SOCIETY'S

GREENWAYS INVENTORY PROJECT

REPORT ON OCEAN BOULEVARD, AT SOUTH BELMONT (DND #9)

During the summer of 1999, a Victoria Natural History Society Greenways Inventory Project team (VNHS) proceeded under DND Research and Collection Permit number P046-99, to closely examine and inventory ecological, topographical and cultural features on parts of the DND's unused lands associated with Belmont Park. This report deals only with that part of those lands, situated between Ocean Boulevard, the dis-used southern-most section of Belmont, Biallie and Galiano, as well as the land north of that, fully enclosed within the rough circle made up of Galiano and Baillie.

The purpose of this inventory was to identify lands containing important natural features, in pursuit of the following two VNHS aims:

1. permanent conservation of important and threatened regional eco-system remnants; and
2. protecting regional wildlife habitats and inter-connecting corridors between them (greenways).

This small site (approximately 4 ha.), found to contain primarily Garry Oak woodland and older Douglas Fir forest (both increasingly endangered), is considered to be of high ecological value, particularly as it is adjacent to other similarly intact high ecological value sites. These sites in combination have amplified synergy as wildlife habitat and as eco-system reserves of sufficient size to have greater potential to remain viable. These combined sites include Lot 5, the Cavendish estate, Fort Rodd Hill perimeter lands, the DND lands northwest of this site, along Ocean Boulevard, and nearby Royal Roads University lands.

This report consists of:

1. this summary report;
2. a hand drawn map (scale 1:2500) of the site, showing its ecosystems (indicated by symbol, and then described separately on an accompanying table entitled "CDC's Sensitive Eco-System Codes"), numbered observation areas at which separate detailed species lists were compiled, and dotted line indications of where pedestrian greenways (trails) could connect with adjoining properties;
3. a table entitled "Victoria Natural History Society Inventory of Eco-Systems, Species Distribution & Site Conditions" prepared by the inventorying team, listing some of the species and conditions found at this site.

LIMITATIONS:

As with other DND inventories in 1999, we were unable to immediately field a volunteer team on this site by the time the DND Research and Collection Permit was issued on April 19, 1999. Our early volunteers had by then already been assigned elsewhere. Thus we were not on the site when spring species were visible. The site was inventoried by student naturalists. While their species lists were not checked in any detail, in general they are reasonable. The eco-system map that resulted, was checked in detail and found accurate.

FINDINGS:

Within the "coastal Douglas Fir" ecological zone that once dominated much of the southeast coast of Vancouver Island and the Gulf Islands, there is little left that is not destroyed, heavily modified, in other ways dominated by human occupation, or else imminently threatened. Although this site has had some disturbances and is not pristine, it has largely recovered as natural Garry Oak dominated woodland and a remnant of Douglas Fir forest (well over 100 years old), and it is well integrated with forest lands on the adjacent Cavendish estate.

Field work done by VNHS volunteers Angela West and Leah Westereng. Field work confirmed and this report prepared by:

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Permit No.: P059-99

Title: Study of the Impacts of *Btk* on non-target Lepidoptera in Garry Oak Ecosystems

Project Leader: Tim Boulton

Location: Mary Hill Battery

Start Date: April 1999

Completion Date: December 1999

Project Overview:

Gypsy moth, *Lymantria dispar* (L.) is a destructive defoliator of many broad-leaved trees in North America, particularly oak and orchard trees (Leonard, 1981). Gypsy moth has been recorded at several sites throughout southwestern British Columbia since the early 1970s. These populations have remained small and innocuous and have been effectively controlled by eradication programs involving the pesticide *Bacillus thuringiensis* var. *kurstaki* (*Btk*). The use of *Btk* against forest defoliators, has increased steadily since it entered the market place in 1970, and there are projections for further growth in the near future (van Frankenhuyzen, 1990; Lambert and Peferoen, 1992; Bernhard and Utz, 1993). The rising popularity of *Btk* is attributed to an increased awareness about its safety to humans and wildlife, specificity to Lepidoptera, and short residual activity (Betz *et al.*, 1990; Waage, 1995).

Accompanying the increased use of *Btk*, is a growing concern regarding its potential to harm non-target Lepidoptera (Oorton, 1987; Laird *et al.*, 1990). Concerns involve Lepidoptera that are valued for their rarity (Papp Herms, 1996), their aesthetic beauty (Brower, 1986; Leong *et al.*, 1992), or their utility as biological control agents (James *et al.*, 1993). Other concerns stem from beliefs that all species have inherent value (Oorton, 1987) and that high species richness and diversity are necessary for ecosystems to remain stable over time (see Tilman *et al.*, 1996; Finlay *et al.*, 1997). Perhaps the most important Lepidoptera are those which perform essential functions in ecosystems, either as pollinators, herbivores (see Nordlund *et al.*, 1988), or as a food source for insectivores (Hammond and Miller, 1998). Birds, bats, shrews and other small mammals are likely to be affected indirectly if *Btk* removes Lepidoptera from their food supply (see Innes and Bendell, 1989; Sample, 1991; Bellocq *et al.*, 1992; Rodenhouse and Holmes, 1992; Holmes, 1998). Several field studies assessing the direct impact of *Btk* sprays on non-target Lepidoptera have concluded that *Btk* treatments applied during early spring can cause immediate reductions in the population density of some immature Lepidoptera (Miller, 1990, 1992; Johnson *et al.*, 1995; Sample *et al.*, 1996; Wagner *et al.* 1996; Whaley *et al.*, 1998; Boulton, 1999). In spite of this common trend, data should be collected from each spray operation because impacts of *Btk* are influenced by weather, species composition, features of the landscape, and various spray parameters (Reardon *et al.*, 1994; Caddogen and de Groot, 1995; Schauber *et al.*, 1997).

In this project we studied the impacts of a gypsy moth eradication program that was conducted on the southern tip of Vancouver Island, British Columbia. The key objective of this research was to monitor the leaf-feeding guild of Lepidoptera on Garry oak (*Quercus Garryana* Dougl) to determine the severity of population reductions resulting from three aerial applications of *Btk*. An additional study was undertaken to determine if *Btk* had a secondary benefit of reducing

filbertworm (*Cydia latiferreana*) (Walsh.) which is a lepidopteran pest of Garry oak acorns. Garry oak was chosen as an indicator species because it is abundant on southern Vancouver Island, it is known to host many lepidopteran species, it is thought to be highly susceptible to gypsy moth defoliation, and it is a keystone species in Garry oak meadows and rock knolls. In addition, humans have caused natural Garry oak habitats to become highly fragmented (Hebda and Aitkens, 1993) which, in turn, may render them particularly sensitive to disturbances like *Btk* spraying. Continued loss of Garry oak habitat and insularity may reduce Lepidoptera population sizes to such low levels that they are vulnerable to extinction (see Wilson, 1988; Gaines *et al.*, 1992). For example, Garry oak is the larval food plant of a butterfly species *Erynnis propertius* (Scudder and Burgess) that disappears from urban areas even when Garry oak trees are left intact (Guppy *et al.*, 1994).

Objectives:

The key objective of this research was to monitor the leaf-feeding guild of Lepidoptera on Garry oak (*Quercus Garryana* Dougl) to determine the severity of population reductions resulting from three aerial applications of *Btk*. An additional study was undertaken to determine if *Btk* had a secondary benefit of reducing filbertworm, a know pest of Garry oak acorns.

Accomplishments to Date:

Research Activities:

A total of 28 Garry oak sites were sampled, including Mary Hill Battery: 14 treated sites located within the *Btk* spray zones were paired with 14 similar control sites located outside the *Btk* spray zones. The sites were selected in locations where Garry oak was the dominant tree species within a minimum 100m radius, the landscape was in a relatively natural state and not subjected to irrigation or past *Btk* spray applications, and the shrub layer was relatively well developed.

Two sample cycles were completed during the pre-spray from April 26 to May 6, 1999. The first pre-spray sample cycle began as soon as the majority of leaf buds on Garry oaks started to flush. Four sample cycles were completed during the post-spray period from May 10 to June 19, 1999. One additional cycle was added to the sampling regime after cycle six was completed. Immature Lepidoptera were collected using the beating method (see Harris *et al.*, 1972) and at each sample date (sample cycle) three trees were sampled per site. Each cycle required about five days to complete, and paired treatment and control sites were sampled on the same day. Each sample was obtained by vigorously striking the branch for ten seconds with a 2m wooden pole. The dislodged caterpillars fell onto a 2 m x 3 m white nylon sheet that was outstretched on the ground directly below the branch. The larvae were removed from the sheet and immediately placed in 70% ethanol. In the laboratory, the specimens were counted and identified. Larvae were identified by Robert Duncan, Entomologist, Pacific Forestry Centre, Victoria B.C.. Larvae that could not be identified to the level of species were assigned a morphotype identification number.

To determine filbertworm infestation, mature acorns were collected from the ground and placed in plastic bags for storage until they were processed. Each acorn was examined externally for the presence of filbertworm feeding, and/or emergence holes. After external examination, each acorn was sectioned longitudinally using a cone cutter and the kernel was examined for filbertworm larvae and feeding damage. An acorn was scored positive for filbertworm infestation if a larva was found inside the acorn, or an emergence hole of a filbertworm larva was present.

Highlights of Findings

An important conclusion of this study and others (Wagner *et al.*, 1996; Boulton, 1999) is that the Lepidoptera fauna was reduced but not removed by operational applications of *Btk*. Thus, birds and other ecosystem components could be unaffected by the *Btk* sprays provided lepidopteran biomass remained above some critical threshold.

The majority of the lepidopteran species on Garry oak, were exposed to *Btk* before their populations reached peak abundance. Most of the abundant moth species on Garry oak appeared to be reduced by the *Btk* spray applications. Life history characteristics appeared to protect four of the unharmed species. The majority of moths, however, were distributed too sparsely, and therefore collected too infrequently to provide data that could be analyzed statistically. *Btk* did not appear to reduce filbertworm populations but several other secondary pests were affected. Thus, *Btk* appears to reduce some, but not all lepidopteran pests in the short-term.

Our study on the initial impacts of *Btk* on non-target Lepidoptera is a crucial first-step in assessing the hazard of the 1999 gypsy moth eradication program on southern Vancouver Island. However, in isolation, it provides incomplete information to conservationists and decision-makers alike, because the ecological importance of the reduction depends on the extent to which the affected species recover. Thus, further monitoring is essential.

Recommendations

- The non-target Lepidoptera on southern Vancouver Island should be monitored for several more years to determine recovery rates, to record delayed effects, and to make the inventory of species more complete.
- A rearing program should be incorporated into the study in future years to facilitate the identification of rare lepidopteran species.

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Permit No.: P060-99

Title: Gypsy Moth - Songbird Study

Project Leader: Lennart Sopuck

Organization: Biolinx Environmental Research Ltd.
1759 Colburne Place
Sidney, BC V8L 5A2 (250) 656-8981

Location: Mary Hill, Naden, Fort Rodd, throughout Victoria

Start date: March 15, 1999

Completion date: December 31, 1999

Project Overview:

As part of ecological monitoring by the Ministry of Forests associated with the Gypsy Moth eradication program in spring 1999, we investigated the responses of songbirds to a reduced food supply resulting from aerial spraying of the microbial, lepidopteran-specific insecticide *Bacillus thuringiensis* var. *kurstaki* (Btk; Foray 48B) over a 12,803 ha area in and around Victoria on southern Vancouver Island, British Columbia.

Objectives:

We examined the hypotheses that (a) densities of breeding songbirds, particularly insectivorous species, would be depressed in sprayed areas in relation to pre-treatment densities when compared to densities in unsprayed areas and that (b) the incidence of re-nesting and second broods, as reflected by singing males in late spring, and (c) numbers of broods produced would be lower in sprayed than unsprayed areas due to high energetic costs associated with reproduction.

Accomplishments of the project:

During the surveys, we detected 59 songbird species, which included 26 year-around residents and 33 seasonal migrants and transients. Comparisons of point-count data revealed that birds occurred at similar densities and maintained similar numbers of territories in Btk-treated and reference sites during the pre- and post-spraying periods. This pattern was evident for seven of eight individual species for which sufficient data existed for detailed statistical analysis: the American Robin (*Turdus migratorius*), House

Finch (*Carpodacus mexicanus*), Brown-headed Cowbird (*Molothrus ater*), European Starling (*Sturnus vulgaris*), Bewick's Wren (*Thryomanes bewickii*), Chipping Sparrow (*Spizella passerina*), Dark-eyed Junco (*Junco hyemalis*), White-crowned Sparrow (*Zonotrichia leucophrys*), and Orange-crowned Warbler (*Vermivora celata*). An exception was the Spotted Towhee (*Pipilo maculatus*), the numbers of which were significantly lower in the treatment than reference plots after Btk-application when compared to corresponding values during the pre-spraying period. This result is surprising because (a) the reduction in numbers occurred after the first treatment (35% decrease from pre-spraying numbers in the treated area versus no change in the reference area), whereas the main reduction in caterpillar numbers occurred only after the second treatment and (b) these birds are omnivorous and frequently forage on the ground for a variety of invertebrates unaffected by Btk. The observed pattern could be a spurious effect of the single pre-treatment survey, but the possibility that it resulted from the Btk-treatment cannot be ruled out. Intensive post-spraying surveys of the same plots in June failed to reveal differences in the relative abundance of the Spotted Towhee or other species between sprayed and unsprayed plots. In addition, we detected no differences in numbers of broods between sprayed and unsprayed plots for any of the species examined but did not monitor the success of individual nests or the number of young produced per brood.

When divided into foraging guilds (a high, moderate, or low estimated proportion of caterpillars in the diet), the species diversity of songbirds was similar in both sprayed and unsprayed study-plots. Additionally, we detected no differences consistent with predictions of adverse effects of Btk-treatment in the total and mean numbers of individual birds per guild. In both sprayed and unsprayed areas, the number of birds in all guilds decreased markedly as the season progressed, likely due to decreased intensity of territory advertisement and hence lower detectability of birds.

The results of this and previous studies indicate that the use of Btk to control Gypsy Moth populations has few, if any, short-term effects on songbird abundance. However, future spray-programs, if required, should target only areas known to harbour Gypsy Moths or their eggs to minimize the size of continuous areas with depressed caterpillar prey and its possible consequences on rarer songbirds, such as vireos, that were not feasible to investigate during this study. Monitoring songbird numbers and productivity in the Victoria area should be continued next year to detect potential longer-term effects of reduced caterpillar prey, which may remain depressed for several years after treatment. Continued monitoring of populations of the Spotted Towhee, a species possibly affected by the treatment, would also be desirable.

Permit No.: P066-99

Title: Urban-nesting Cooper's Hawk Study

Project Contact: Andrew C. Stewart (250) 387-9780

Organization: Resources Inventory Branch
Ministry of Environment, Lands and Parks
P.O. Box 9344 Stn Prov Govt
Victoria, B.C. V8W 9M1

Location: Naden - Colville Road Property, Esquimalt

Start Date: June 21, 1999

Completion Date: December 31, 1999

Project Overview:

To study the breeding ecology of Cooper's Hawks in urban Greater Victoria. This project has been underway since 1994. The main focus of this research has been to determine the nesting density and breeding success of Cooper's Hawks in the urban landscape. An important aspect of this work has been to band nestlings.

Objectives:

1. Describe and measure the nest site on the Naden - Colville property (including nest & nest tree height, nest tree species & dbh, distance from nearest road, trail & occupied building, canopy closure, GPS co-ordinates, nest aspect, and site slope & aspect)
2. Capture both breeding adults for banding, to take measurement data including mass, and to determine molt pattern.
3. Band nestling(s).
4. Take feather samples from nestling(s) for trophic level analysis.

Accomplishments to Date:

The Naden - Colville site was one of 30 nest sites found in the 88.9 km² study area in 1999. The male of this pair was colour-banded as a nestling in 1996 and was nesting about 4.7 km from his natal nest. All site measurements, except for the GPS co-ordinates have been completed for this nest. On 25 June Dr. Bob Rosenfield (University of Wisconsin) and the proponent captured both adults using a mist net and live Great Horned Owl. Data was collected from the pair and the female was banded before both were released unharmed. On 29 June, the proponent returned to the nest with climber Bill Mackie and banded the single nestling and collected feather samples.

Research Activities:

The proponent is collaborating with Dr. Bob Rosenfield of the University of Wisconsin on research related to breeding mass relationships of Cooper's Hawk pairs and in determining the trophic level signature of this population.

Extension and Demonstration:

The adult male from this nest site was one of two birds the proponent featured in an article published in the January-February 2000 issue of the *Victoria Naturalist*. Re-sighting reports by the general public have proven extremely helpful in learning about the life history of these birds of prey.

APPENDIX 4

Final Reports for Projects Completed in 1999

Permit No.: P034-99

Title: Fifth Annual EMAN National Conference Field Tour and Workshop

Project Contact: Bill Dushenko (250) 391-2580

Organization: Royal Roads University
2005 Sooke Road, Victoria, B.C. V9B 5Y2

Location: Royal Roads

Start Date: January 21, 1999

Completion Date: January 21, 1999

Project Overview:

The fifth Annual EMAN National Conference was held in Victoria and as part of the conference a tour of research projects being carried out on EMAN sites at Royal Roads was carried out in the morning. In the afternoon school environmental workshops were held to teach grade 7-8 students about environmental issues, monitoring and stewardship.

Objectives:

- To educate conference participants about ecological monitoring in coastal Douglas-fir Biogeoclimatic Zone.
- To provide learning opportunities on the environment for grade school students through workshop activities on climate, tree-watch, plant-watch, worm-watch, frog-watch, rainforests, wetlands, and stewardship.

Accomplishments to Date:

In the morning about 30 people participated in the walking tour of EMAN sites located at the saltmarsh estuary by Esquimalt Lagoon and an upland old field site at Royal Roads.

In the afternoon about 180 grade school students (7&8) participated in one or more of the following outdoor workshops:

- Wormwatch –block soil sampling and collection of worms;
- Treewatch – demo exercises in tree and vegetation identification and measurement;
- Climate and You – tour of climate stations at RRU plots;
- Frogwatch – non-intrusive location and identification of frogs and amphibians in wet areas;
- Sustaining Wetlands (Ecoscope) – aquatic invertebrate sampling, wetland plant identification and water quality testing at saltmarsh estuary;
- Canada's Rainforest: from maps to Murelets – tour and observation in RRU plots.

Research Activities - None

Permit No.: P037-99

Title: Survey of Oregon Spotted Frog (*Rana pretiosa*)
Breeding Habitat

Project Contact: Russ Haycock
(604) 737-2911
rdh.hyla@home.com

Organization: #304 - 1688 Cypress Street
Vancouver, B.C. V6J 5J1

Location: Naval Radio Station Aldergrove, B.C. (District of Langley)

Start Date: February 26, 1999

Completion Date: April 30, 1999

Project Background:

An adult Oregon spotted frog (OSF; *Rana pretiosa*) was located at NRS Aldergrove in 1996 by Denis Knopp while undertaking a floral and faunal inventory. In 1997, a survey of NRS Aldergrove, which focused on OSF breeding habitat, revealed a total of 90 egg masses.

Project Objectives:

Breeding habitat of OSF at NRS Aldergrove was surveyed to locate communal egg laying sites. The project proposed to count egg masses and embryos, measure embryo diameters, and photograph various embryonic developmental stages. These morphologies are largely undocumented although it is essential information in order to distinguish between Oregon spotted frog egg masses and red-legged frog (*R. aurora*) egg masses.

Project Outcome:

Through the duration of this project, only 14 OSF egg masses were located. Due to the small number of egg masses located, I limited project objectives to recording environmental parameters associated with the timing of oviposition.

Accomplishments to Date of the Project:

Information gathered was incorporated into a National Status Report on the OSF. Upon review by Ministry of Environment, Lands, and Parks staff in Victoria, a request was made to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to list the species. In response, COSEWIC designated the OSF as endangered on September 13, 1999 in an unprecedented emergency listing.

Current Activities:

The DND has a significant role in recovery planning activities for the OSF and have recently approved a proposal by the writer to undertake inventory work at NRS Aldergrove for year 2000 breeding season and develop a management plan for OSF at this site.

Permit No. PO44-99

Title: Purple Martin Origins and Relationships

Project Leader: Cam Finlay & Laura Darling
270 Trevlac Place
Victoria, B.C. V8X 3Z1

Location: Colwood Supply /Fuel Oil Depot

Start Date: 14 July 1999

Completion Date: 30 August 1999

Project Overview:

The Purple Martin (*Progne subis*) is on B.C.'s Red List and it is found nesting at this DND site – one of 14 known colonies of man-made nestboxes in B.C. Nestlings banded at 11 sites in 1997 and 1998 have been re-sighted at different colonies than their natal colonies. We suspect the B.C. colonies represent a single intermixed population but further confirmation is required. Purple martin populations are on the increase in B.C. and the American coastal states, and they appear to be recovering in association with availability of man-made nestboxes. It is possible that the current population is derived from the few birds that adapted to man-made nestbox colonies. If so, Purple Martin recovery may be hampered by a genetic bottleneck and inbreeding.

Objectives:

- To continue banding nestlings in nestboxes at the site, to monitor nest success and productivity, and to monitor for band returns, as part of an on-going nestbox monitoring and maintenance program.
- To assess genetic variability (1) within the B.C. population, (2) among populations of B.C. and American western states, and (3) between the western populations (subspecies *arboricola*) and eastern populations (subspecies *subis*) – through blood sampling for mitochondrial DNA control region sequencing.

Accomplishments to Date:

a) Highlights of findings to Date:

109 nestlings and 2 adult Purple Martins were banded at the site in 1999 – up from 76 and 47 nestlings in 1998 and 1997, respectively. Of the 62 nestboxes at the site, 38 had eggs or young (8 of these failed to produce young to the age of banding), with 4.13 eggs per pair recorded and 109 young probably fledged. Eighteen previously banded birds were observed – 10 from 6 other nestbox colonies.

b) Research Activities:

We collected a small drop of blood from one nestling per nest in 21 nestboxes at the DND site in 1999. Several infertile eggs and a dead nestling were also collected for DNA tissue. We will submit these samples, along with those from 5 other sites, to the Avian Genetics lab at the Royal Ontario Museum (Centre for Biodiversity and Conservation Biology) for mitochondrial DNA control region sequencing analysis by Dr Alan Baker.

Permit No.: P054-99

Title: Nanaimo First Nations Non-Timber Forest Products Integrated Management Project

Project Contact: Signy Fredrickson, MSc
Environment and Management, RRU.
R.R.#1, S.15A, C.1
Winlaw, B.C., V0G 2J0 (250) 226-7063

Organization: RRU, Victoria BC.

Location: Nanaimo Rifle Range

Starting Date: October, 1998.

Completion Date: November, 1999.

Project Background:

My project included the initial phase of research for the Snuneymuxw First Nations Non-Timber Forest Product (NTFP) Pilot project, initiated in 1998. Non-timber forest products include mushrooms and plants harvested for food, medicine or nutraceuticals, or plants and tree boughs harvested for floral greenery. These products are sold domestically and exported to markets in the United States, Asia, and Europe. The NTFP industry in BC is a multi-million dollar enterprise, however, despite its current and potential economic and social value, the NTFP industry remains unregulated, with no sustainable management strategies in place. Basic management initiatives such as inventories and harvesting guidelines are currently lacking. Consequently, damage to these resources is likely as they become more and more exploited. Over-harvesting, land-use conflicts, and ecosystem damage are potential or existing problems.

To ensure the sustainability of the NTFP industry, research must be expanded to provide an understanding of acceptable harvest levels of these products, and knowledge of how various practices affect the productivity and longevity of this industry.

The purpose for the Snuneymuxw First Nations Non-Timber Forest Product (NTFP) Pilot project initiative is to provide a land base for research of NTFPs and an understanding of what practices and management will provide for their sustainable use. Community employment and education and an opportunity for holistic land stewardship are among the Snuneymuxw First Nation's objectives for this project.

Project Objectives:

The objectives for my project were to conduct an inventory of select commercial plant and fungus species, and conduct a commercial productivity study on salal, the most common NTFP on the Nanaimo rifle range lands.

Highlights and findings:

Ten species of NTFP mushrooms and 14 species of NTFP vegetation were identified. Chanterelles were found to be the most common and abundant commercial mushroom species present during the time of this study. Commercial salal was the most abundant NTFP vegetation species, and was found to exist in large enough quantities to support a viable commercial harvest. The site was found to have an average of 158 lbs. of commercial salal per ha at the time of study, summer of 1999.

My thesis includes a list of NTFP species that were discovered in the inventory, and provides recommendations for the most viable commercial prospects for these species. The Snuneymuxw First Nations will be able to use the inventory information to assist in developing sustainable management strategies that preserve traditionally important species for personal use, while allowing for the commercial development of others. Results of the salal productivity study may be used to establish the best management options for this product.

Extension and demonstration:

Although not part of my research project, I participated in a conference on commercial mushrooms, "The Growing Economy of Mushrooms", presented by the Mid-Island Science Technology and Innovation Council, the Snuneymuxw First Nations, and Mitchell Consulting Associates. It was held on the Nanaimo rifle range site in October 1999. My part was to organize a mushroom foray into the forests of the Nanaimo rifle range. For further information on this conference, contact the previously mentioned groups who organized this conference.

Permit Number: P055-99

Title: Fossil Point Study

Project Leader: Scott MacPhail
Victoria Palaeontology Society
1504 Shorncliffe Road
Victoria BC V8P 2T4
(250) 477-4899

Project Location Rocky Point

Start Date: March 21, 1999

End Date: April 18, 1999

Project Overview:

A site visit to Rocky Point to study the site at Fossil Point to determine if there are any fossils and the type.

Objective:

Members of the Victoria Palaeontology Society(VPS) to survey the area around Fossil Point (located at DND facility Rocky Point) to determine if in fact any fossils are to be found there.

Purpose:

- to determine if fossils are to be found at this site
- if fossils are found a representative sample is to be collected to be identified and used to aid in the understanding of the geology and palaeontology of the area.

Results:

Five members of the VPS visited the site on April 4, 1999. Despite extensive investigation of the shoreline in the area no evidence of fossils was found.

Conclusion:

Fossil Point is shown on geological maps as being made of Igneous rock. This type of rock contains fossils only in rare instances. It appears that Fossil Point may be mis-named in reference to a large glacial erratic of conglomerate on the shoreline.

Permit No.: P056-99

Title: National Science Meeting (EMAN) Field Trip

Project Contact: Michael Dunn
(250) 363-6501

Organization: Canadian Wildlife Service
P.O. Box 6000
Sidney, B.C. V8L 4B2

Location: Mary Hill Battery, Rocky Point, Rocky Point Forest
Canopy Station, and Royal Roads

Start Date: January 21, 1999

Completion Date: January 21, 1999

Project Overview:

The fifth Annual EMAN National Conference was held in Victoria and as part of the conference a tour of research projects on EMAN sites at Rocky Point, Mary Hill and Royal Roads was carried out. Researchers were on site to provide information on their projects.

Objectives:

- To provide the participants of the tour with an opportunity on site to learn more about research projects being carried out at EMAN sites.
- To give participants an onsite experience with the long-term monitoring sites which have been established to track trends and response of different organisms.

Accomplishments to Date:

About 40 participants traveled on three minibuses to visit the sites at Mary Hill, Rocky Point and Royal Roads. At the three sites, the SI/MAB sites, the Garry oak stand, the broom removal restoration sites, the bat colony monitoring the migration monitoring and the Forest Canopy Research station were highlighted. Researchers responsible for certain projects were on site to answer questions posed by the field tour participants.

Research Activities:

None

Permit No.: P061-99

Title: Sampling Protocols for Small Mammals on DND Properties

Project Leader: John J. White, B.Sc.
303 Langford Street, Victoria, BC
V9A 3C1, (250) 418-8505

Location: Two Ecological Monitoring Assessment Network (EMAN) Plots at Rocky Point

Start Date: 1 May 99

Completion Date: 30 June 99

Project Overview:

To develop a sampling program that could use existing ecological plots (EMAN Plots), and be flexible enough to monitor a number of different small mammal species. Each of these functions could add layers of data to established EMAN plots and, if used as a 'whole package', could be an additional method of quantifying ecosystem health in the future.

Objectives:

To identify gaps in existing Department of National Defence (DND) ecological data through a literature review of ESAC reports. This information was to be considered while developing the ecological sampling protocols. When the protocols were completed, DND required Shizen Consulting to TEST the protocols for ease of use and the identification of any problems that may occur during future sampling sessions. It is hoped that post-secondary students from the Greater Victoria Area will carry out future sampling sessions and the collection of ecological data.

Accomplishments to Date:

a) Highlights of Findings to Date/Project:

The sampling protocols developed by Shizen Consulting have successfully been integrated into existing EMAN Plots. The protocol is also adaptable and can successfully monitor a number of species, including *Sorex* sp.(Shrews), *Peromyscus maniculatus* (Deer Mouse), *Microtus* sp. (Moles), and Voles. During the short sampling session both Deer Mice and *Sorex* sp. were found.

b) Research Activities:

Forty-nine Haveahart® traps were systematically placed over the one-hectare EMAN plots at Rocky Point. Modified mark recapture techniques were used to test the protocols. Additionally, canopy cover and vegetation type was recorded at each trap location to determine relationships between cover/vegetation and the number/type of species trapped.

c) Extension and Demonstration: None

Permit No.: P062-99

Title: The Garry Oak Symposium Tour

Project Contact: Richard Hebda
(250) 472-4569

Organization: Restoration Program, Environmental Studies
University of Victoria
P.O. Box 1700
Victoria, B.C. V8W 2Y2

Location: Mary Hill Battery

Start Date: May 9, 1999

Completion Date: May 9, 1999

Project Overview:

Eight tour participants visited the Mary Hill monitoring plots on the morning of May 9, 1999. Tour leader R. Hebda pointed out the six ongoing monitoring plots and explained the treatments for each plot. In the upper three plots, an important observation was the death of many of the broom (*Cytisus scoparius*) bushes in the control plot where there had been no broom removal. The broom was assumed to have been killed by the drought of the previous year. In the three lower plots the tour participants were shown the relatively low rate of broom recolonization in the plots where grasses predominated. The tour continued to Devonian Regional Park in the afternoon to examine the effects of fire on the Garry oak meadow ecosystem.

Permit No.: P063-99

Title: Garry Oak Ecosystems Field Trip

Project Leader: Allan R. Hawryzki, B.Sc.
c/o Malaspina University-College
900 5th Street
Nanaimo, B.C. V9R 5S5
(250) 753-3245 Local 2315

Location: CFMETR (Nanoose) Site

Start Date: May 9, 1999

Completion Date: May 9, 1999

Project Overview:

This field trip was conducted as part of the extension component of the 'First International Garry Oak Symposium' at the University of Victoria.

Objectives:

The specific objective of this field trip was to make participants more aware of the significance of Garry Oak habitants in the Central Vancouver Island area with a particular emphasis on the CFMETR location. This site is probably the most extensive and pristine remaining Garry Oak site on this part of Vancouver Island. In addition; it has a significant number of rare and/or endangered plant species.

Accomplishments to Date:

- a) Increased awareness of significance (extensiveness) of Garry Oak habitat on central Vancouver Island.
- b) Increased awareness of number of rare/endangered plant species found in this area.
- c) Resolutions presented, as a consequence of the 'First International Garry Oak Symposium', to the federal government asking it to give this ecosystem endangered status equal to that accorded the 'Southern Okanagan' of British Columbia and Carolinian of Central Canada.

Permit No.: P064-99

Title: Geological study of the Metchosin Complex

Project Contact: Dr. Kathryn Gillis
(250) 472-4023

Organization: SEDS, University of Victoria
P.O. Box 3055
Victoria, B.C. V8W 3P6

Location: Rocky Point

Start Date: May 3, 1999

Completion Date: May 30, 1999

Project Overview:

The project involved a regional study of the Metchosin Igneous complex which is interpreted to be an ancient piece of oceanic crust. An honours student from the School of Earth and Ocean sciences, University of Victoria collected and studied samples from the site.

Objectives:

To study the petrology and geochemistry of the Metchosin Igneous Complex.

Accomplishments to Date:

The student visited the site and collected about three dozen geological samples from the Metchosin Igneous Complex site.

Research Activities:

The samples will be used in undergraduate geology courses at the university of Victoria.

End Products:

An honours thesis which may be published in a scientific journal.

Permit No.: P065-99
Title: Rare Plant Survey for COSEWIC
Project Leader: Jenifer Penny
Assistant Botanist, Conservation Data Centre
PO Box 9344, Station Prov. Govt
Victoria, BC V8W 9M1
Jenifer.Penny@gems3.gov.bc.ca (new)
(250) 356-5244 ph 387-2733 fax

Location: Bentinck Island, Albert Head and Golf Hill
Start Date: June 5, 1999
Completion Date: August 31, 1999

Project Overview:

In order to complete a Committee on the Status of Endangered Wildlife in Canada (COSEWIC) report, one must make a recommendation on the national conservation designation, 'endangered,' 'threatened,' 'vulnerable,' etc. for the species being considered. To determine what the status is, one must gather all information available on the species and check all known populations in the field. After completing the field work, one compiles a table of the known sites and any new sites discovered. Then one records the numbers of plants found over the number of square meters, the condition of the populations, the exact location, the habitat and site characteristics, and any threats to its persistence at the individual sites based on the observations.

Objectives:

To gather all the field data necessary in completing status reports on two Ministry of Environment, Lands and Parks listed species and prepare a report to be submitted to COSEWIC so a national designation can be established for the species in Canada.

Accomplishments to Date/of the Project:

a) Highlights of findings to Date:

Populations of *Sanicula arctopoides* (snakeroot or footsteps of spring) and *S. bipinnatifida* (purple sanicle) were relocated on D.N.D. lands, Albert Head and Bentinck Island. We were unable to locate *Sanicula bipinnatifida* at Golf Hill where the collector believes he collected it in 1976. It is apparently extirpated at this site.

Sanicula arctopoides was located on Bentinck Island in two areas on the point west of George Point, on the north side at the start of it and on the end of the point. A total population of 71 plants was observed over 21 m². This site is moderate to poor for this species compared with populations observed on Trial Island and Alpha Islet off Oak Bay. In these sites, thousands of plants are observed over good proportions of the islands.

Sanicula bipinnatifida was observed at Albert Head, west of the lighthouse. This is one of the best sites for this species known. There are at least a thousand plants in just over a hectare along the shoreline west from the lighthouse. There is only one other known site that has a larger population, Macaulay Point, east of the water pumping station and west to the municipal park at the point. There are at least 1100 plants here in a 170 m² area. Both sites are highly ranked for this species. In both sites, both first and second year individuals were observed, with large numbers of the small, single-leafed first year plants which suggest that these populations are faring well and regenerating.