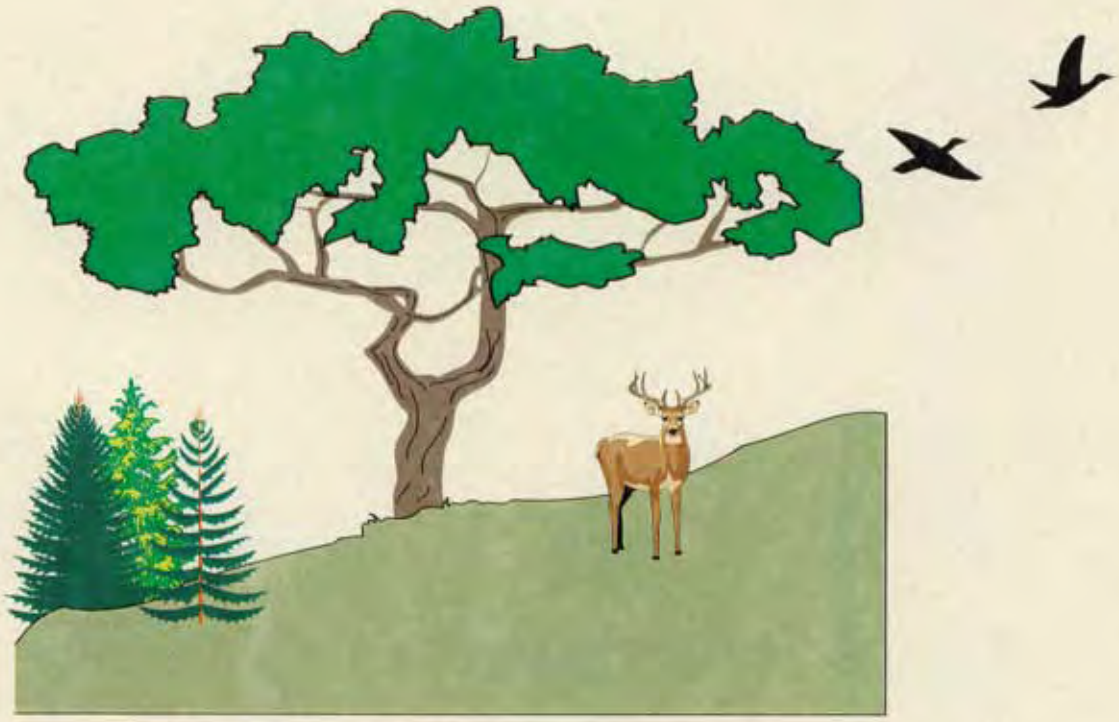
Department of National Defence – CFB Esquimalt
Environmental Science Advisory Committee

REPORT

2000 Annual Report

Prepared for the Committee by
Arthur Robinson
J.A. Trofymow
Heather O'Leary
October, 2001



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The Department of National Defence Environmental 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 Resources 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.

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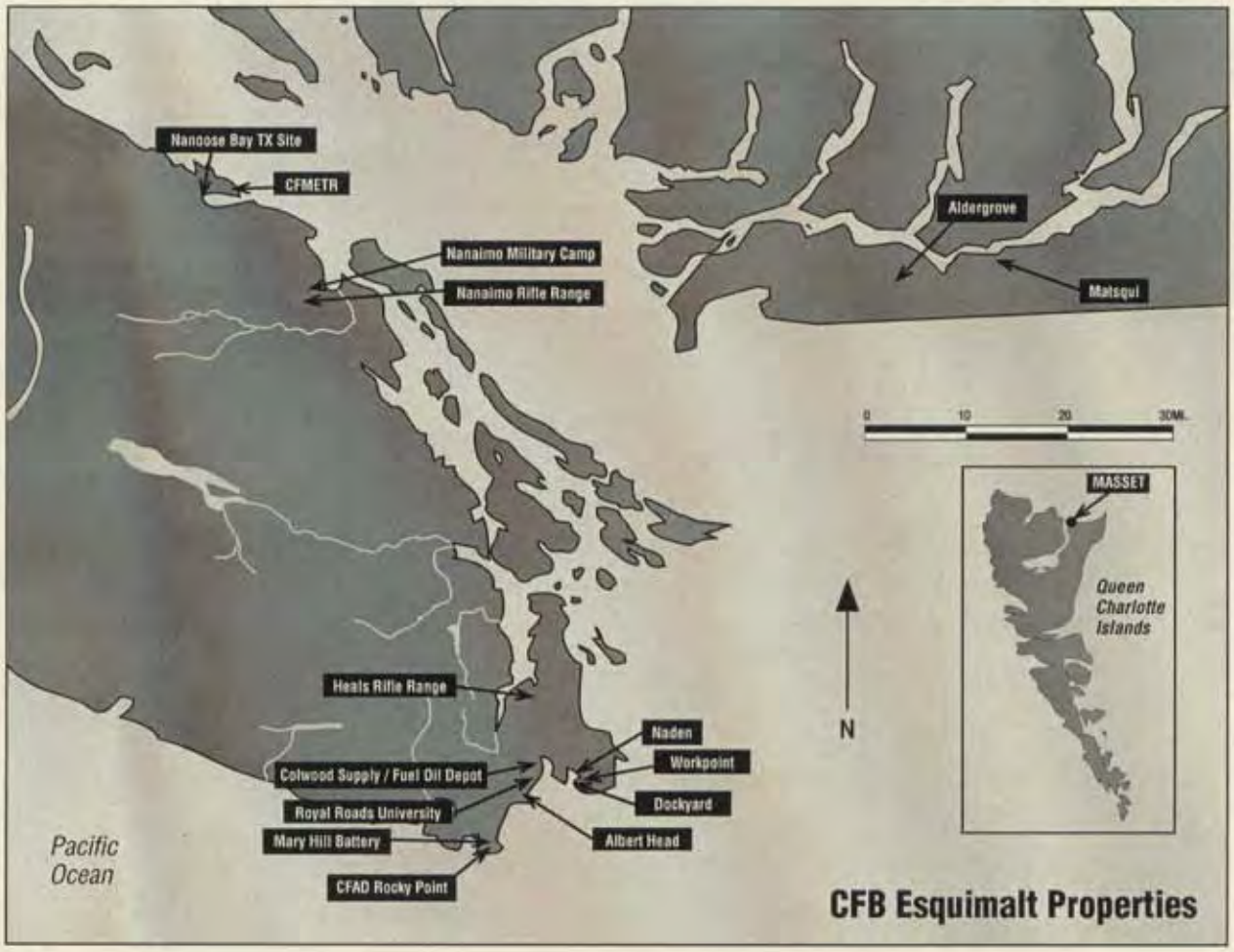

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Natural Resources Canada
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Environmental Science Advisory Committee member agencies:

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

The report was funded through the Department of National Defence Natural Resources Management Program, jointly managed by the Department of National Defence and the Canadian Forest Service.

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DND Environmental Science Advisory Committee - CFB Esquimalt

2000 Annual Report

1. Summary

The DND Environmental Science Advisory Committee (ESAC) 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 2000, a total of 19 proposals were received and 16 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 CFB Esquimalt properties to member agencies as well as amongst researchers working on CFB Esquimalt lands, the committee co-sponsored 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 nine papers. The workshop was attended by 29 representatives from various organizations and backgrounds.

A GIS database, initiated in 1997, of forest cover, ecological types, special features and research areas was updated in March 2000. Map corrections and updates on forest cover, various map features, archaeological data, and rare species data were added to the database. A total of 26 map sheets were formatted to provide printed coverages for 12 properties. 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 revised and updated during 2000. The 1999 ESAC Annual Report was posted onto the web at <http://www.pfc.forestry.ca/programs/esac/index_e.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 research summaries of reports for projects completed in 2000 and annual reports for projects continuing in following years. A cumulative bibliography of reports on environmental research conducted on CFB Esquimalt properties since 1994 is available at the Pacific Forestry Centre Library and is outlined in Appendix 1.

2. Introduction

Over the years various individuals and organizations carried out environmental research projects on Department of National Defence (DND) properties. 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 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 multiagency committee to oversee research being carried out at Rocky Point. The DND Environmental Science Advisory Committee - CFB Esquimalt was established in 1994 under a letter of understanding (LOU) as a technical advisory committee reporting to the joint DND/CFS Forest Resources 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 CFB Esquimalt properties. 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 multiagency 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 (Lester B. Pearson College of the Pacific withdrew in 1998), 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 outlines the responsibilities of the committee which 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 of and reviewed projects for the Forest Canopy Station operating under the auspices of the 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 proposed projects and recommends to the DND/CFS Forest Resources 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 CFB Esquimalt 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 to the CFB Esquimalt properties for which they are 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 CFB Esquimalt 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 CFB Esquimalt 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 2000 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 is also available on the web at: http://www.pfc.forestry.ca/programs/esac/index_e.html.

4. Research Projects and Activities on CFB Esquimalt Properties During 2000

This past year, 2000, was the sixth full year of activity for ESAC. A total of 19 proposals were received 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 19 proposals received, 16 were approved and received permits. The status of the 16 approved proposals is shown in Table 2. Researchers submitted written annual reports (Appendix 3) on activities for 13 continuing projects and submitted final reports (Appendix 4) for 3 completed projects.

At the May 2000 meeting the committee also reviewed and provided advisory comments on the CFB Esquimalt 2000/01 Silviculture Operating Plan.

A. ESAC Workshop - In January of 2001, ESAC sponsored a workshop at Royal Roads University, Victoria, providing an opportunity for the investigators to present the results of their studies. Twenty-nine individuals attended the workshop (Appendix 2). Nine presentations were made. Final and Annual Reports from these presentations are included in Appendices 3 and 4.

B. Forest Canopy Research Station Activities - When Lester B. Pearson College of the Pacific relinquished ownership of the Forest Canopy Station to DND in 1998, the University of Victoria assumed responsibility for the facility and reorganized the Forest Canopy Research Station Operating Committee (FCRSOC). The FCRSOC is committed to increase use of the facility by more actively promoting it to the scientific community. During 2000, FCRSOC oversaw the maintenance and operation of the Forest Canopy Station.

The Canopy station was accessed on five occasions by University of Victoria personnel. The canopy access system was inspected in March 2000 for the annual safety inspection and again later in May for maintenance of the "Burma" rope bridges and canopy access systems for Trees No. 1 and 4. Safety training and routine practice was carried out twice in May. On May 31, 2000, a group of 16 delegates at a UVIC symposium and 2 UVIC personnel visited the Forest Canopy Station and 13 of the

people were taken up to the platforms in the trees. There were other visits by UVIC personnel periodically throughout the year to check on weather data and carry out routine safety measures

During the year a number of field tours visited the site to look at the Forest Canopy Station but during these occasions the trees were not accessed.

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.

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 guage 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.

The microclimatic station was up and running and weather data was downloaded during the year. In December of 2000, a nearby tree was blown over and as it came down it brushed against Tree 4 where the microclimate station is installed. A number of sensors were damaged including the humidity sensor unit. The damage is to be inspected and repaired during 2001.

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 CFB Esquimalt 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, CD-ROM copies of the updated data were made on an annual basis 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.

During 1999 archaeological surveys were carried out on a number of CFB Esquimalt 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.

CFB Esquimalt provided funding to conduct an update of the GIS database in early 2000. The thematic layers in the DND GIS database were updated, spatial and attribute errors corrected, and new information including various map features, archaeological data and rare species data 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 and NRS Aldergrove. A total of 26 map sheets were formatted to provide printed coverages for the 12 properties. A CD ROM disc containing the data update was distributed to member agencies.

D. ESAC Web Site <http://www.pfc.forestry.ca/programs/esac/index_e.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 with 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 - 1999. In 2000, the site was revised to improve its usability and updated with content from the 1999 ESAC Annual Report. 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 2001

The committee will continue its activities in 2001 reviewing and tracking the status of various research projects on CFB Esquimalt lands, advising on the 2001/02 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 the last part of 2000, a Terrestrial Ecosystem Mapping (TEM) inventory was initiated on 14 CFB Esquimalt properties to be completed in 2001. As well, additional data on rare species is expected to be compiled from various sources during 2001. The results of these surveys and compilations are expected to increase the amount of data on the properties. During 2001, 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 CFB Esquimalt Properties 2000

Prop	*Organization*	*Project Title*	*Applicant*	*ESAC Contact*	*Project Description*	*Location*
00-01	CFS	Screening High Breeding Value Douglas-fir for Resistance to A. ostoyae	Mike Cruickshank	n/a	Locate possible host resistance to A. ostoyae in a population of Douglas-fir and monitor.	RP
00-02	VNHS	Purple Martin Nestbox Program	Darren Copley	Ken M.	To maintain and monitor Purple Martin nestboxes	CSFOD
00-03	UVic	Community Ecology of the Canopy Forest Floor Insect/Anthropod Fauna from an Old-Growth Forest	Neville Winchester	Richard R.	The activity for 2000 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.	RPFCRS
00-04	CWS	Microclimate Monitoring Station	Ken Morgan	Ken M.	To provide repair and maintenance to the microclimate station in order to provide the necessary data capture and reporting.	RPFCCS
00-05	UVic	Sustainable Harvesting Potential of Salal	Wendy Cocksedge	Andy M.	To establish biological and ecological criteria in order to prevent the possibility of over-harvesting forest resources and to develop reasonable and effective regulations or licensing for NTFP harvesting.	RP

Prop	Organization	Project Title	Applicant	ESAC Contact	Project Description	Location
00-06	MES	Georgia Strait Bald Eagle Nest Tree Inventory	Terri Martin	Ken M.	To inventory and assess Bald Eagle next locations for the Ministry of Environment; assessing sites and summzrizing info into a report with photos and maps.	AH, MHB, NTX, RP, RR
00-07	VNHS	Green Spaces Inventory	N. Mogensen	Art R.	Identify lands containing important ecological features to foster conservation and protection of both regional wildlife habitats and interconnecting corridors.	MHB, RR
00-08	CFS	Management of Spruce Weevil	Michael Hulme	Tony T.	Release parasites into cages to control Pissodes strobi (spruce weevil); visit site to observe progress and effects; remove tree leaders with insects inside for future lab studies.	NTX, CFMETR
00-09		Field Observation of Birds	Fritz Karger	n/a	Observe and record species of birds.	RP
00-10	CFIA	Gypsy Moth Phermone Trapping Survey	Gordon Henry	Richard R.	To survey for the introduction of quarantine insects, molluscs and plant diseases.	All DND sites
00-11	CWS	Monitoring of Neotropical Migratory Birds	Wendy Easton	Ken M.	Will conduct non-intrusive surveys and observations of birds and record all birds seen and heard.	RP

Prop	Organization	Project Title	Applicant	ESAC Contact	Project Description	Location
00-12	HEC	Wetland Habitat Enhancement Initiative	Habitat Enhancement Club	Bill D.	To restore the natural habitat of undeveloped areas by identifying restrictions to the affluence of aquatic and terrestrial species, and planning enhancement works that can be used to implement improvements.	RR
00-13	BER	Gypsy Moth-Songbird Study	Biolinx-Sopuck	Ken M.	To determine the effects of B+K spray on the density species composition and breeding success of song birds in the Victoria area	MHB, Naden/Fort Rodd areas
00-14	UBC	Habitat Inventory and Use by Salish Suckers	Mike Pearson	Art R.	Researching the distribution, habitat, needs and life history of Salish sucker and Nooksack dace. The informaiton will be used to develop a recovery plan for the species.	Ald
00-15	BER	Surveys for Rare and Potentially Endangered Gastropods (Slugs and Snails)	Biolinx - Ovaska/Sopuck	Bill D.	To conduct surveys for native species of slugs and snails in different habitats on Vancouver Island and the lower mainland.	AH, RP, RR, Ald, Mat
00-16	UBC	Bird-Habitat Relationships in the Garry Oak	Richard Feldman	Ken M.	This study will determine the birds that use the remaining Garry oak ecosystem on southeastern Vancouver Island.	MHB, RP

Prop	Organization	Project Title	Applicant	ESAC Contact	Project Description	Location
00-17	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
00-18	CFS	Measurement of Fungal Biodiversity on Downed Alder Logs	Brenda Callan	Tony T.	To collect and identify rare and unusual wood decay fungi which grow on dead, fallen, undisturbed aspen, alder, maple, oak and arbutus.	RP
00-19	UVic	Advanced Field Methods of Restoration Course	Richard Hebda	Art R.	Field work for course in Ecosystem Restoration Program at UVic. Establish temporary vegetation plots, use airphotos to map, look for wildlife signs, measure slopes-examine stability	RR

Table 2: 2000 Proposal/Permit Summary
DND Environmental Science Advisory Committee - CFB Esquimalt

Prop #	*Permit #*	*Applicant*	*Phone #*	*Project Title*	*ESAC Contact*	*Approved*	*Expiry Date*
00-01	--	Mike Cruickshank	(250) 363-0641	Screening High Breeding Value Douglas-fir for Resistance to A. ostoyae	n/a	Rejected	n/a
00-02	P018-00	Darren Copley	(250) 479-6622	Purple Martin Nestbox Program	Ken M.	14 Mar 00	31 Dec 00
00-03	P006-00	Neville Winchester	(250) 721-7099	Community Ecology of the Canopy Forest Floor Insect/Anthropod Fauna from an Old-Growth Forest	Richard R.	14 Mar 00	31 Dec 00
00-04	--	Ken Morgan	(250) 363-6537	Microclimate Monitoring Station	Ken M.	Pending	n/a
00-05	P068-00	Wendy Cocksedge	(250) 721-6352	Sustainable Harvesting Potential of Salal	Andy M.	31 Jan 00	31 Dec 00
00-06	P069-00	Terri Martin	(250) 285-2060	Georgia Strait Bald Eagle Nest Tree Inventory	Ken M.	14 Mar 00	31 Dec 00
00-07	P046-00	N. Mogensen	(250) 477-9144	Green Spaces Inventory	Art R.	14 Mar 00	31 Dec 00
00-08	P030-00	Michael Hulme	(250) 363-0733	Management of Spruce Weevil	Tony T.	14 Mar 00	31 Dec 00
00-09	--	Fritz Karger	(250) 478-5443	Field Observation of Birds	n/a	Rejected	n/a
00-10	P071-00	Gordon Henry	(250) 363-6046	Gypsy Moth Phermone Trapping Survey	Richard R.	14 Mar 00	31 Dec 00
00-11	P003-00	Wendy Easton	(604) 940-4673	Monitoring of Neotropical Migratory Birds	Ken M.	14 Mar 00	31 Dec 00

Prop #	Permit #	Applicant	Phone #	Project Title	ESAC Contact	Approved	Expiry Date
00-12	P057-00	Habitat Enhancement Club	(250) 386-9929	Wetland Habitat Enhancement Initiative	Bill D.	14 Mar 00	31 Dec 00
00-13	P060-00	Biolinx-Sopuck	(250) 656-8981	Gypsy Moth-Songbird Study	Ken M.	03 Apr 00	31 Dec 00
00-14	P043-00	Mike Pearson	(604) 732-9399	Habitat Inventory and Use by Salish Suckers	Art R.	25 May 00	31 Dec 00
00-15	P072-00	Biolinx - Ovaska/Sopuck	(250) 656-8981	Surveys for Rare and Potentially Endangered Gastropods (Slugs and Snails)	Bill D.	18 Apr 00	31 Dec 00
00-16	P073-00	Richard Feldman	(250) 380-3744	Bird-Habitat Relationships in the Garry Oak	Ken M.	03 May 00	31 Dec 00
00-17	P044-00	Finlay/Darling	(250) 479-9833	Purple Martin Origins and Relationships	Ken M.	07 Jul 00	31 Dec 00
00-18	P047-00	Brenda Callan	(250) 363-0744	Measurement of Fungal Biodiversity on Downed Alder Logs	Tony T.	22 Aug 00	31 Dec 00
00-19	P041-00	Richard Hebda	(250) 387-5493	Advanced Field Methods of Restoration Course	Art R.	22 Aug 00	31 Dec 00

Table 3

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

	File Type		Themes										
Location	**DXF Files**	**Arcview Shape-Files**	**Contours**	**Roads**	**Water**	**Man-made**	**Forest Cover**	**Cons. Mgmt Zones**	**Rare Species**	**Birds**	**Archaeo-logical Sites**	**Research Plots**	**Contam-inated Sites**
CFB Esquimalt													
Albert Head		1998	1993	2000	2000	2000	2000	1998	2000	1998	1998		1999
CFMETR – Nanoose		1998	1993	2000	2000	2000	2000	1998	2000	1998	1998	1999	1999
Colwood S/FOD		1998	1993	2000	2000	2000	2000		2000	1998	1998		
Dockyard		1998	1998	1999	1999	1999		n/a	1999		1998		1999
Heals Rifle Range		1998	1993	2000	2000	2000	2000		2000	1998	1998		
Mary Hill Battery		1998	1993	2000	2000	2000	2000	1998	2000	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	2000	2000	2000	2000		1998	1998	1998		1999
Nanoose TX Site	1993		1993	1993	1993	1993	1993						
NRS Aldergrove		1998	1993	2000	2000	2000	2000		2000				
Pat Bay		1998	1998	1999	1999	1999		n/a					
Rocky Point		1998	1993	2000	2000	2000	2000	1998	2000	2000	1998	2000	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						

APPENDIX 1

Cumulative Bibliography of Environmental Science Reports on CFB Esquimalt Lands

Located in the Pacific Forestry Centre Library

Cumulative List of
Environmental Science Reports on CFB Esquimalt Lands
located in the Pacific Forestry Centre Library

Reports for Projects Prior to 1995

- Crippen Consultants. 1981. Engineering Feasibility and Environmental Impact Study for a Proposed Highway Bypass Route of Nanaimo, May 1981. Crippen Consultants, North Vancouver, B.C. for Ministry of Transport and Highways. 11 sections + app.

- 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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- Knopp, Denis and Larkin, Lee. 1995. An Inventory of the Significant Flora and Fauna of Canadian Forces Base Chilliwack, B.C. B.C.'s Wild Heritage Consultants, Sardis, B.C. 295p.

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- Bradshaw, Paul A. 1995. The Physical Nature of Vertical Forest Habitat and its Importance in Shaping Bat Species Assemblages. Unpublished manuscript. Department of Biology, University of Regina, Regina, SK.

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- Smith, Dan and Lewis, Dave. 1996. Reconnaissance Tree-Ring Studies at CFB Esquimalt. University of Victoria Tree-Ring Laboratory, Department of Geography, University of Victoria, Victoria, B.C. UVTRL Report 96-04. 14p.

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- 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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- Levelton Associates Consulting Engineers. 1997. Proposed Septage Facility - Report of Geotechnical Investigation. Rosebank Road, Colwood, BC. 16p.

Reports for Projects in 1997

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- 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.

- Anon. 1997. Proceedings of the Ecosystem Monitoring and Assessment Network (EMAN) Southwest Georgia Basin - Indicators Workshop 31 March 1997. Westland Resource Group, Environment Canada. 16 p. + appendices.

- 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).

Reports For Projects in 1998

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- Fuchs, Marilyn Ann. 1998. Seedling Ecology of Garry Oaks in British Columbia and Dispersal of Garry Oak Acorns by Steller's Jays. Thesis. The faculty of 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.

- Fuchs, Marilyn A., Pam G. Krannitz, Alton S. Haresad, and Fred L. Bunnell. 1997. Seeds That Fly on Feathered Wings: Acorn Dispersal by Steller's Jays. Published as pp. 648-650 in Pillsbury, N.H., J. Verner, and W.D. Tietje, tech. Cords. 1997. Proceedings of a symposium on Oak Woodlands: Ecology, Management, and Urban Interface Issues, 19-22 March 1966, San Luis Obispo, CA. Gen. Tech. Rep. PSW-GTR-160. Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture, Albany, CA.

- 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.

- 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.

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- Rohlfs, 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.

- 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.

- 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.

- Engelstoft, 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.

- 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.

- 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.

- Robinson, Arthur and Trofymow, Tony. 2000. DND Environmental Science Advisory Committee – CFB Esquimalt Annual Report – 1999. Canadian Forest Service, Victoria B.C. (Includes reports done under Permit Nos. P003-99, P006-99, P010-99, P017-99, P018-99, P023-99, P030-99, P032-99, P034-99, P035-99, P037-99, P044-99, P051-99, P054-99, P055-99, P056-99, P057-99, P058-99, P060-99, P061-99, P062-99, P063-99, P064-99, P065-99, and P066-99). 115p.

- 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.

Reports for Projects in 2000

- Winchester, Neville N. and Richard A. Ring. 1999. The Biodiversity of Arthropods from Northern Temperate Ancient Coastal Rainforests: Conservation Lessons from the High Canopy. Selbyana 20(2): 268-275. 1999.

- Povck, Monique and Laurens Hitman. 2000. Rocky Point Tree Tops – an Eye Witness Report about the Research in the Canopy of Old Growth Forest on Vancouver Island. Unpublished Manuscript. 14 p. + Appendix.

- Derbyshire, Daniel. 2000. A Report on Migration Monitoring at Rocky Point: Fall 2000. Rocky Point Bird Observatory. Daniel Derbyshire, 7 Barry Drive, Brantford, ON. 28 p.

- Feldman, Richard. 2001. The Avian Community of Southeastern Vancouver Island's Garry Oak Ecosystem: The Influence of Vegetation Structure and Landscape Development - interim report and preliminary results from the 2000 breeding season. Richard Feldman, Centre for Applied Conservation Biology, UBC, Vancouver, BC. 17 p.

Updated September 2001
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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Department of National Defence - CFB Esquimalt

Environmental Science Advisory Committee

ANNUAL WORKSHOP

AGENDA

8:15 a.m., February 1, 2001

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. **Richard Ring** - Permit No. P006-00 - Community Ecology of the Canopy-Forest Floor Insect/Arthropod Fauna from an Old Growth Forest

2. **Bill Dushenko** - Permit No. P034-00 - Establishment of EMAN Long-term Ecological Monitoring Plots at Royal Roads

3. **Norm Mogenson/Tony Embleton** - Permit No. P046-99 - VNHS GreenwaysInventory Project

4. **Brenda Callan** - Permit No. P047-00 - Measurement of Fungal Biodiversity on Downed Alder Logs

5. **Wendy Easton** - Permit P003-99 - Monitoring of Neotropical Migratory Birds (Rocky Point Bird Observatory) Presented by Suzanne Beauchesne

10:00 - 10:15	Break
10:15 - 11:30	Presentations

6. **Michael Hulme** - Permit P030-99 - Management of Spruce Weevil - *Pissodes stobi*

7. **Oluna Ceska** - Mushrooms at Rocky Point

8. **Raj Prasad** - Scotch Broom and Gorse Control

9. **Tony Trofymow** - Demonstration of the new ESAC Web Site.

11:30 - 12:00 Wrap up

Environmental Science Advisory Committee

ANNUAL WORKSHOP

REGISTRATION LIST*

8:15 a.m., February 1, 2001

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

NAME	AGENCY	PHONE #
Beauchesne, Suzanne	Rocky Point Bird Observatory	744-4460
Burgess, Tom	Victoria Natural History Society	642-0015
Callan, Brenda	Canadian Forest Service	363-0744
Campbell, Jennifer	Department of National Defence	363-7516
Ceska, Adolf	Conservation Data Centre	477-1211
Ceska, Oluna	Conservation Data Centre	477-1211
Dunn, Michael	Canadian Wildlife Service	363-6501
Dushenko, Bill	Royal Roads University	391-2586
Fox, Michael	Victoria Natural History Society	727-0076
Hulme, Mike	Canadian Forest Service	363-0600
Kyle, Douglas	CFIA	363-3433
MacKinnon, Andy	BC Ministry of Forests	387-6536
Mogensen, Norm	Victoria Natural History Society	477-9114
Morgan, Ken	Canadian Wildlife Service	655-1987
Potter, 2Lt. Al	Department of National Defence	363-4914
Prasad, Raj	Canadian Forest Service	363-0600
Pratt, Chris	Victoria Natural History Society	478-3817
Robinson, Arthur	Canadian Forest Service	363-0729
Smith, Cmdr Don	Department of National Defence	363-4744
Trofymow, Tony	Canadian Forest Service	363-0600

* Note. There were 8 people who arrived late and did not register.

Appendix 3

Annual Reports for Projects Worked on in 2000

Permit No.: P003-00

Title: Monitoring of Neotropical Migratory Birds

Project Leader: 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: February 1, 2000

Completion Date: December 31, 2000

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. Migration monitoring and local monitoring in specific habitats play a key role in filling this gap. 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. To band and census migrating birds daily during fall migration at Rocky Point.

Accomplishments to Date:

We have observed 264 species at Rocky Point (Table 1). Of the 290 landbird species found in all of Canada, over half of the species (n=151) have been observed at Rocky Point from 1994 - 2000 using standard survey techniques. Most of the landbirds surveyed at Rocky Point are considered target species for migration monitoring (n=102) and are recognized nationally as species with a medium to high priority for conservation (Table 2). On average, approximately 38% of the individuals banded at Rocky Point are neotropical migrants. This group of species is of recent conservation concern given evidence of declines in some populations and threats to both breeding and non-breeding habitat. Most of the birds banded at Rocky Point are generally associated with riparian (31% of banded birds), conifer (30%), or shrub (22%) habitats. Analysis of long-term populations trends and comparisons of data with other banding stations are underway.

We banded 2723 birds of 57 species during the 2000 fall migration monitoring season (21 July to 18 October 2000). The10 most common species comprised 64% of the total number of birds banded in 2000 (Table 2). Only Spotted Towhee had not ranked as one of the 10 most common

species in previous years. As in 1999, coverage of migrating birds during the 2000 field season was consistent and thorough. The use of three additional mist-nets was tested during the 2000 season and proved to be successful in producing high capture rates, particularly for target species such as Black-throated Gray Warblers and Townsend's Warblers.

Research Activities:

None.

Extension and Demonstration:

Volunteers have published articles in the Victoria Natural History Society's "The Victoria Naturalist". Maintenance of a website with species lists and information about the monitoring station (www.islandnet.com/~rpbo).

Table 1. Bird species observed at Rocky Point (n=254). List compiled by David Allinson, December 2000. Red-throated Loon

Pacific Loon
Common Loon
Yellow-billed Loon
Pied-billed Grebe
Horned Grebe
Red-necked Grebe
Eared Grebe
Western Grebe
Black-footed Albatross
Northern Fulmar
Pink-footed Shearwater
Buller's Shearwater
Sooty Shearwater
Short-tailed Shearwater
Black-vented Shearwater
Fork-tailed Storm-Petrel
Leach's Storm-Petrel
Brown Pelican
Brandt's Cormorant
Double-crested Cormorant
Pelagic Cormorant
Great Blue Heron
Green Heron
Turkey Vulture
Greater White-fronted Goose
Emperor Goose
Snow Goose
Canada Goose
Brant
Mute Swan
Trumpeter Swan
Tundra Swan
Wood Duck
Gadwall
American Wigeon
Mallard
Blue-winged Teal
Cinnamon Teal
Northern Shoveler
Northern Pintail
Green-winged Teal
Canvasback
Ring-necked Duck
Greater Scaup
Lesser Scaup
Harlequin Duck
Surf Scoter
White-winged Scoter
Black Scoter
Oldsquaw (Long-tailed duck)
Common Goldeneye
Barrow's Goldeneye
Bufflehead
Hooded Merganser
Red-breasted Merganser
Common Merganser
Osprey
White-tailed Kite
Bald Eagle
Northern Harrier*
Sharp-shinned Hawk*
Cooper's Hawk*
Northern Goshawk
Broad-winged Hawk

Swainson's Hawk
Red-tailed Hawk
Rough-legged Hawk
Golden Eagle
American Kestrel
Merlin
Gyrfalcon
Peregrine Falcon
Blue Grouse
Ruffed Grouse*
California Quail
Virginia Rail*
Sora*
American Coot
Sandhill Crane
Black-bellied Plover
Pacific Golden-Plover
Semipalmated Plover
Killdeer
Black Oystercatcher
Greater Yellowlegs
Lesser Yellowlegs
Solitary Sandpiper
Wandering Tattler
Spotted Sandpiper
Upland Sandpiper
Whimbrel
Ruddy Turnstone
Black Turnstone
Surfbird
Red Knot
Sanderling
Semipalmated Sandpiper*
Western Sandpiper*
Little Stint
Least Sandpiper*
Baird's Sandpiper
Pectoral Sandpiper
Rock Sandpiper
Dunlin
Stilt Sandpiper
Short-billed Dowitcher
Long-billed Dowitcher
Common Snipe
Wilson's Phalarope
Red-necked Phalarope
Red Phalarope
South Polar Skua
Pomarine Jaeger
Parasitic Jaeger
Long-tailed Jaeger
Franklin's Gull
Little Gull
Bonaparte's Gull
Heermann's Gull
Mew Gull
Ring-billed Gull
California Gull
Herring Gull
Glaucous Gull
Thayer's Gull
Western Gull
Glaucous-winged Gull
Black-legged Kittiwake
Sabine's Gull
Caspian Tern
Common Tern
Arctic Tern
Forster's Tern
Common Murre
Pigeon Guillemot
Marbled Murrelet
Ancient Murrelet
Cassin's Auklet
Rhinoceros Auklet
Tufted Puffin
Rock Dove
Band-tailed Pigeon
Mourning Dove
Barn Owl
Western Screech-Owl
Great Horned Owl
Snowy Owl
Northern Pygmy-Owl
Burrowing Owl
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
Lewis's Woodpecker
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
Bewick's Wren*
House Wren*
Winter Wren*
Marsh Wren*
Golden-crowned Kinglet*
Ruby-crowned Kinglet*
Western Bluebird
Mountain 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*
*Blackpoll 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-colored 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. 2000 and 1994-2000 banding summaries for the ten most common species banded in 2000 at Rocky Point during fall migration monitoring. Banding data were compiled by Daniel Derbyshire, December 2000.

Species	2000			1994-2000		
	# banded	% of birds banded	Rank	# banded	% of birds banded	Rank
Ruby Crowned Kinglet	295	10.8	1	1034	9.3	1
Winter Wren	265	9.7	2	673	6.0	5
Pacific Slope Flycatcher	228	8.4	3	732	6.6	3
Wilson's Warbler	177	6.5	4	652	5.8	6
Lincoln's Sparrow	171	6.3	5	858	7.7	2
Yellow Warbler	139	5.1	6	473	4.2	9
Orange Crowned Warbler	125	4.6	7	633	5.7	7
Song Sparrow	120	4.4	8	581	5.2	8
Savannah Sparrow	115	4.2	9	683	6.1	4
Spotted Towhee	100	3.7	10	313	2.8	14
All Species	2723			11169		

Table 3. 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.

American Pipit
Lincoln's Sparrow
Orange-crowned Warbler
Swainson's Thrush
Wilson's Warbler
*Blackpoll Warbler**
Northern Waterthrush
Savannah Sparrow
*Tennessee Warbler**

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

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

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.

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

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: P006-00

Title: Community Ecology of the Canopy-Forest Floor Insect/Arthropod Fauna from an Old-Growth Forest.

Project Leader: Dr. N. N. Winchester

Organization: Department of Biology,
University of Victoria
P.O. Box 3020, Victoria V8W 3N5
Ph: 721-7099 Fax: 721-7120, email tundrast@uvvm.uvic.ca

Location: Rocky Point Canopy Station (DND/University Victoria)

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 an 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 ancient forest research on arthropods and will be used to form an integral part of an international network on global canopy studies.

Objectives:

A large part of this project continues to 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 survivourship will be examined in the field to elucidate variables that contribute to the observed community structure.

Accomplishments to Date: (see previous reports, 1994-1999)

a) Highlights:
Analysis of results is **dependent on identifications to species** in the target taxa groups. To date this data is 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 now complete (December, 2000).

b) Research Activities (2000)
Final mounting and identification of the Asilidae, Staphylinidae and Arachnida are now complete.

c) A paper on the robber flies of Rocky Point is in prep, authors are R.A. Cannings and N. N. Winchester. This paper will be submitted to ESBC in the New Year. A second paper on the Alechorines (rove beetles) is nearing completion and should be submitted to the Canadian Entomologist, April, 2001.

d) Extension and Demonstration

Documentary with the Nature of Things (CBC) will be aired in February, 2001. There is a segment on the ancient forest canopy system and the importance of canopies to the maintenance of biodiversity in these forests.

Permit Number: PO18-00

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, 2000

Completion Date: October 1, 2000

Project Overview:

This site is one of only 15 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 that 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:

a) Highlights of findings to Date/Project:
Western Purple Martins are adaptable to human disturbance and can co-exist with humans in a high traffic area. Accurate population estimates can only be attained by physically opening and checking for active nestboxes, as well as using the natural mobbing tendency of Martins to count adults in the air.

b) Research Activities:
Nestlings have been banded for the past 4 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.

c) Extension and Demonstration: None.

Permit No.: P041-00

Title: Adanced Field Methods of Restoration Course, University of Victoria

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: September 18, 2000

Completion Date: December 31, 2000

Project Overview:

Provide instruction to students in observation of slope stability, terrestrial ecosystem mapping, stream monitoring using Royal Roads' gravel pit, forested ecosystems and Cottonwood Creek respectively.

Objectives:

To instruct 18-20 senior Restoration students in restoration (Advanced) techniques.

Accomplishments to Date:

From September 18-22, 2000, twenty students participated in the Advanced Field Methods course visiting several sites and collecting data according to Provincial standards required for terrestrial ecosystem mapping. Observations were made on species cover, coarse woody debris, soil texture, site topography, moisture regime, and other factors. Student plots were located in the Douglas-fir, Garry oak and western red cedar-dominated stands mostly east of Cottonwood (Colwood) Creek. Terrestrial ecosystem data were also collected in the estuary of Cottonwood Creek. Students were shown how to take standard measurements such as temperature, dissolved oxygen and others in the creek itself at the foot bridge.

Students were instructed in collecting slope stability data and carry out an assessment in the gravel pit off Metchosin Road. Four groups surveyed four transects from the top of the pit to the bottom observing and recording critical features. They also recorded species cover for different plant communities in the pit and placed the communities in order of seral stages.

The students also each prepared a Terrestrial Ecosystem map for the Royal Road area which was marked by the instructor.

Permit No: P043-00

Title: Habitat Inventory and Use by Salish Sucker (Catostomus sp.)

Project Leader: Mike Pearson, PhD Candidate
Institute for Resources and Environment
Level 4 Library Processing Centre
2206 East Mall
University of British Columbia
V6T 1Z3

Location: NRS Aldergrove

Start Date: June 1999 **Completion Date** August 2000

Project Overview:
To assess the quality and quantity of Salish sucker habitat in the mainstem of the Salmon River as it flows through the base and to estimate the resident population size using mark-recapture methods.

Objectives:
1. To assess the size and spatial distribution of the Salish sucker population in the Salmon River in NRS Aldergrove.
2. To relate sucker presence and density to reach-scale habitat features (this analysis will include the NRS Aldergrove data, but is based on information from across the Canadian range of the species)
3. To make management recommendations to DND regarding the river.

Accomplishments to Date:
The survey habitat survey was completed during the last week of July 1999 and trapping was conducted in August and October. There was no surface flow in the river during the study period although large pools remained particularly behind the numerous beaver dams in the upstream (eastern) portion of the river. Salish suckers were found throughout the river's length on the property. Adults were concentrated in the beaver ponds of the upstream portion. Juveniles were found throughout.

A total of 155 suckers were caught of which 93 were individually marked. A population estimate for one isolated beaver pond was obtained, but trapping was abandoned as 5 fish died in the traps from lack of oxygen (due to lack of flow combined with eutrophic conditions). The experiment will be resumed in the spring when the river is flowing well and water quality has improved.

Extension and Demonstration: None

Permit Number: PO44-00

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: 01 July 2001

Completion Date: 30 August 2001

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 1997-1999 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 made be hampered by a genetic bottleneck and inbreeding.

Objectives:

1) 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.

Accomplishments to Date / of Project:

a) Highlights of findings to Date:

123 nestlings and two adults were banded in 2001, up from 119 nestling Purple Martins were banded at the site in 2000 – up from 109 plus 2 adults in 1999, 76 nestlings in 1998 and 47 nestlings plus 1 adult in 1997. Of the 53 solid nestboxes at the site, 41 had eggs or young (7 of these failed to produce live young at time of banding), with 4.56 eggs per pair recorded, up from 4.03 in 2000, and equal to the BC average. Productivity at this colony has remained stable or perhaps slightly increasing. A number of nest boxes that previously held eggs or very young nestlings were found empty at the last nest check – because the eggs and nestlings were not found in the nests predation is a possible cause. Thirty-two previously banded birds were observed at this site in 2001 – 16 were banded as nestlings at this site and 16 were banded at other colonies. Band returns from this site constitute 25% of this year's 116 re-sightings – a high percentage because of the relative ease of re-sighting access on the wharf.

b) Research Activities:

We collected a small drop of blood from one nestling per nest in 21 nestboxes at the DND site in 1999. We began analysis of these samples in early 2001, along with those from other sites in BC, Washington, Oregon, Alberta and Manitoba, through 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. Preliminary analyses of half the samples indicated significant genetic difference of the west coastal population from the eastern sub-species, and the variation within the west coast population was greater than that within the eastern samples. The completion of the analysis is underway with a small amount of funding yet to find.

c) Extension & Demonstration:

A paper has been submitted to AUK, a scientific journal specialising in avian biology and management, describing the productivity and inter-colony movements of Purple Martins in BC and the Pacific northwest, 1996 to 2000, including data from the DND colony.

Permit Number: P046-00

Title: Inventory of Mary Hill Battery Lands.

Project Leader: Tony Embleton (Overall Green Spaces Project leader)
Norman Mogensen (Mary Hill inventory leader)

Location: Mary Hill Battery

Start date: October 11, 2000

Completion Date: Ongoing

Project Overview:

Based on our ecological inventorying experience in recent years on various other sites in this region, the existing eco-system maps of the Mary Hill Battery site appeared to us as un-naturally simplistic (especially in the western sectors) and therefore were suspected of not serving as ideal evaluation tools, nor adequate for sensitive land use planning purposes. In January 2000, we learned that the future of this land is uncertain. Thus we considered it urgent that a very careful (on-the-ground) survey be conducted, and the results be quickly supplied to land use planners, other stakeholders and decision makers.

Objectives:

Year 2000 inventorying objectives had to be limited because the DND access permit was not issued until the height to the summer dry season, by which time important potential ecological features were no longer discernable, and our resources had by then been committed elsewhere. Thus in 2000, we undertook to only map (to the extent our time and resources permitted) eco-system polygons at a detailed level, and identify any other obvious features of importance from a conservation perspective. We applied for a year 2001 permit renewal in August, 2000, with the intention of completing the general inventory and conducting detailed species inventories on various parts of the site, during the spring of 2001.

Accomplishments:
Methodology:

Using compasses, retractable measuring tapes, laser scopes, a hand held GPS device to confirm precise feature locations, and using the services of 12 volunteers (473 field person hours, plus 87 support person hours), we performed a detailed ground survey, by way of a series of parallel crossings of each of 3 defined sub-blocks of the property, at 50 meter separations. We created a separate, detailed field data record for each crossing of the property, on which all findings and measurements were recorded. Later that data was transcribed and carefully positioned (scale: 1/2500) on a cadastral map we created of each of the three defined sub-blocks of the property. All features are situated on the maps in accordance with their UTM coordinates. Through this method, we believe we have correctly identified and mapped the ecosystems in the western part of the property. Due to the 50 meter separations between the survey lines, it is likely we have missed many smaller features, such as some archaeological sites, similar to the many others that were found and mapped in our paths.

In addition, we consulted Mr. Grant Keddie, senior professional archaeologist associated with the Royal BC Museum, about the veracity of our presumed archaeological findings. We also consulted two reputable amateur naturalists/local historians, Mr. Ron Wier and Mr. Christopher Pratt, who have been intimately familiar with the Mary Hill site for their entire long lives, and in one case, whose family has lived adjacent to these lands since 1854. They were most helpful in providing historical information about the site, some of which is outlined in this report.

In the spring of 2001, in addition to completing the general survey, we intend to compile detailed species lists on various parts of the site. Some photographs were, and will yet be taken, to illustrate some of the features of this property.

Highlights of Inventory Findings to Date:

It should be noted that the ecology of the site is much more complex and interesting than is shown on previous maps. Printed on extra margin space beside each new VNHS map are some of the highlights of findings, which are repeated and elaborated upon here.

1. Of the 98 hectares inventoried in Blocks 1 to 3, approximately 50 hectares are comprised of true old growth "coastal arid" climate zone habituated, dominant Douglas Fir forest, of which we are informed by BC Ministry of Forests (and Environment) experts, that there are only about 1,100 hectares left anywhere. Accepting that, this site contains 4.5% of the world supply of that rare old growth forest type. We suspect the 1100 hectare estimate could be over-stated, as much more of this site is mapped similarly to that by the Ministry of Environment, than could be proved upon our detailed ground inspection. Much was old "woodland" eco-system, instead.

2. The old growth forest on Block 1 is most pristine of all the eco-systems examined on the three blocks, and as such should be regarded as highly valuable, ecologically. However, as viable habitat and to maintain genetic health and diversity, it needs to remain broadly connected to a larger undisturbed system.

3. There is a limited amount of disturbance by modern culture on Blocks 2 and 3. Most of this is comprised of ruts left by heavy military vehicles, which, although still quite prominent, are now well vegetated, primarily by native species, and do not pose erosion problems.

4. Most of the human caused disturbance on the parts of the site that have been inventoried, was from repeated burning, possibly for several millennium, by First Nations cultures, primarily to promote Camas bulb (and possibly Garry Oak acorn) growth as food source. The open space effects of this were continued after the cessation of native burning, by a further 75 years of sheep grazing at the site. The result is now re-emergent forests in patterns that very interestingly reveal the history of this land. We know of no other sites in the Greater Victoria area where interacting human and natural history, over such a long period, are so clearly evident. Both for this and the excellent condition and limited supply of the old growth forest referred to above, we regard this site as a unique and very important outdoor museum.

5. We found 17 old first nations grave cairns, many culturally modified trees (in several patches), and what appear to be an old First Nations' fortified observation post (at least 3

strategically located pits), at Wier's Point. During periods of warfare that would have been a natural forward warning/defensive post for the old village site that was situated at the head of Pedder Bay (but whose view if the seaward approaches was otherwise blocked). We expect there were several more of these features that still have not been found, due to the 50 meter separations between our survey transect lines.

6. There are human and wildlife hazzards that should quickly be removed from all blocks seen so far, apart from any lost and dangerous ordinance (we found only one such item at UTMs 5,354,702 and 458,896). They are barbed wire patches (strung up, laying prone and spooled on bunches) that were too numerous to map and too difficult to see, often until directly encountered. They are most dense on block 3, but there is some on Block 2 and there are collapsed fences along both sides of the Galloping Goose corridor. Apart from possible human injuries (through tripping and tearing), they must pose a real additional hazzard for deer and other fauna fleeing from predators. On Block 2 there is a cluster of abandoned corrugated iron shacks, a nearby abandoned wooden bridge and a communication line strung to them, that could pose a hazzard if they remain in place.

7. We found that parts of the Pedder bay shoreline are not exactly where shown on the DND map that was provided. Similarly, privately owned lands at the northeast corner of the site (north end of Block 4) are erroneously included as DND land. The southern connection of the gated interior service road (through the new campsite), with William Head Road, is shown on the DND map we were provided with, as being 175 meters farther south from where it really is. In fact the area now dedicated as a military personnel campsite, is larger than shown on the DND map we were provided with.

8. While Broom and Himalayan Blackberry are the two invasive species most out of control on the south slope of the site, they are still relatively benign and controllable on the north slope. Other very pernicious invasive species that are present and still able to be controlled with early eradication action, are Ivy, Holly and Daphne Laureola.

Conclusions:

While clearly we regard this as a very high value site, both in terms of its intact natural ecology and its still evident role in the early human history of the area, we will refrain from making specific recommendations at this time. We will complete our inventory of the site. True to our purpose in undertaking this arduous task, and based on the importance of our findings to date, we can state that we intend to work in a collaborative manner with responsible stakeholders, to foster the permanent protection of the site, which we believe is warranted by the facts. We would be pleased to show and explain any aspects of our inventory findings to representatives of the Department of National Defense, and help subject them to an independent expert review, where that is appropriate. Assuming our permit renewal early in 2001, we will resume work on the site in late February.

Permit No.: P047-00

Project Title: Measurement of Fungal Biodiversity on Cut Alder Logs

Project Leader: Dr. Brenda Callan, Mycologist

Organization: Natural Resources Canada, Canadian Forest Service
Pacific Forestry Centre
506 West Burnside Rd.
Victoria, BC V8Z 1M5
Tel. (250) 363-0744 Fax (250) 363-0775
Bcallan@pfc.forestry.ca

Start Date: Sept. 1, 2000

Completion Date: Sept. 1, 2002

Project Overview:

There are few tested sampling protocols for studying the biodiversity of pioneer saprophytic fungi on thin-barked trees. We wish to develop a sampling technique that is reliable, using trees that are easily accessed from Pacific Forestry Centre, yet are relatively protected from vandalism. The mature alder stands at Rocky Point provide excellent potential study sites because they are protected and relatively undisturbed. Large, windthrown alder logs on the site currently are known to serve as repositories for a number of pyrenomycetes unknown from other regions North America (ref. to report on Permit P047-98). Although some preliminary species lists have been compiled we have no data on how these fungi develop on the tree after it falls, and how the decay succession takes place. For comparison purposes we propose to start with similar-aged sound trees which will be dropped in situ and monitored for two seasons.

Objectives:

To use 6 felled *Alnus rubra* logs (mature) with intact bark and no external indicators of decay to measure the pattern of fruiting body development of saprophytic fungi (pioneer decay fungi, predominately ascomycetes). This study will also generate biodiversity (host-fungus association, frequency) data.

Accomplishments to Date:

Six trees at two sites were selected (see attached map). In late October, the alder stands were surveyed for candidate trees while still bearing some foliage, to ensure that only trees with sound crowns (no dead tops or branches) were chosen. The candidate trees were flagged, and on November 21, after most of the leaves had fallen, they were cut down. Length, diameter, aspect, and slope of each tree was recorded. The trees were also marked with signs and orange and black-striped flagging tape. The first survey for fungi will take place in February, 2001.

Extension and Demonstration: None

Permit No.: P057-00

Title: Wetland Habitat Enhancement Initiative at Royal Roads University

Project Leader: Michael Vaters
618 Vancouver Street, Victoria, BC
V8V 3V1, (250) 386-9929

Location: Wetland located between Mews and CEDAR buildings at Royal Roads University

Starting Date: April 1, 2000 **Completion Date:** September 1, 2000

Project Overview:

To restore the natural habitat of undeveloped areas by identifying restrictions to the affluence of aquatic and terrestrial species, and planning enhancement works that can be used to implement improvements. The Enhancement Club worked to improve habitats that were previously degraded by human activity.

Objectives:

- Identify and initiate enhancement activities focussed on aquatic and terrestrial wildlife habitats
- To research previous environmental data collected at Royal Roads, collect information on species presence and abundance, identify habitat and enhancement opportunities, and plan for enhancement
- Remove invasive species growth from wetland, including Blackberry (*Rubus discolor*) and Scotch Broom (*Cytisus scoparius*) and replace with native species
- Prepare plans to re-establish stream course on wetland through the removal of old piping and section of former roadway to return area to its natural state
- Quantify the impact of invasive species by establishing permanent monitoring plots on wetland and other select sites at Royal Roads
- Produce interpretive signage for natural habitat surrounding Royal Roads
- Provide information for future students that will allow for the continuation of the Habitat Enhancement Club

Accomplishments to Date:

a) Highlights of Findings to Date/Project:

After several weekends of invasive species removal from the wetland and a vegetative recovery period of 30 to 40 days, Habitat Enhancement Club members observed significant growths of horsetail in the area or invasive removal. Salmonid have been observed in Colwood Creek. Work has not been conducted on the wetland since July 2000; however, there are plans to develop and erect signage outlining sensitive and unique habitats that encompass Royal Roads.

b) Research Activities:

Informal field surveys were conducted within the area located between the Mews and CEDAR buildings, and to the south of the main road extending to the shoreline. There appeared to be sufficient flow of water in the lower sections of the three small streams to support salmonids.

c) Extension and Demonstration: None

Permit No.: P068-00

Title: Sustainable Harvesting Potential of Salal (*Gaultheria shallon*)

Project Leader: Wendy Cocksedge

Organization: University of Victoria
PO Box 1700 STN CSC
Victoria BC V8W 2Y2
250-721-6352

Location: Two plots at Rocky Point

Start Date: February 2000 **Completion Date:** September 2000

Project Overview:
There is currently very little information on most non-timber forest products (NTFPs), including salal. Few to no studies have been completed regarding habitat requirements, regeneration ability, and effects of harvesting. These biological and ecological criteria must be established in order to prevent the possibility of over-harvesting forest resources, and to develop reasonable and effective regulations or licensing for NTFP harvesting.

Objectives:
To provide a better understanding of the effects of commercial harvest on salal. By comparing yearly plant increase of vegetative matter (ie branches and leaves) with yearly commercial removal of vegetative matter, the sustainable harvesting levels can be better identified. The effect of harvest on re-growth patterns and quantity is also important to determine short and potentially long term effects of commercial levels of harvest.

Accomplishments to date:

a) Highlights of Findings to Date/Project:
The data from Rocky Point is being integrated with data from the Capital Region Watershed. Commercial harvesting levels and techniques have been discussed with salal harvesters and buyers, and applied to the research sites and to the findings. It would appear at this preliminary stage that it is possible to harvest salal sustainably, but that the main issue is in the permit system and education to the harvesters.

b) Research Activities:
Two plot areas were identified as containing sufficient commercial quality salal within the Rocky Point forest. Within each plot area, 3 sample subplots, each 5 metres square, were identified and marked. One subplot per area was harvested using current commercial harvesting techniques, and one subplot per area was sampled for 1999 growth rates. The third plot was left as a control for the 2000 growth rates. Canopy cover, dominant vegetation, and basic soil types were recorded.

c) Extension and Demonstration:
The second data set (based on 2000 growth rates) has not been sampled. The anticipated completion is 30 June, 2001, with the majority of the sampling being completed in the early spring. It is therefore requested that access be allowed to continue for this extra time period.

Permit No.: P069-00

Title: Georgia Strait Bald Eagle Nest Tree Inventory

Project Contact: Terri Martin
(250) 285-2060

Organization: Martin Environmental Services
Box 311
Heriot Bay, B.C. V0P 1H0

Location: Albert Head, Mary Hill Battery Nanoose TX Site, CFAD Rocky Point, and Royal Roads

Start Date: March 1, 2000

Completion Date: December 31, 2000

Project Overview:

In the Georgia Depression, the bald eagle resident breeding population is associated with habitat that is in rapid decline; specifically mature trees along the coastline that are used for nesting. The Ministry of Environment (MELP) designed a project to inventory and assess bald eagle nest locations along the coast of southern Vancouver Island from Campbell River to Victoria. The location of each nest tree found was to be recorded and a corresponding data or information form filled out. The resulting information was to be compiled and entered into the MELP GIS system and linked to the Sensitive Ecosystem Inventory.

Objectives:

1. Inventory and access all bald eagle nest sites in the coastal locations of Vancouver Island from Campbell River to Victoria.

2. Compile photographs and map binders for all of the sites.

3. Prepare a report summarizing the information by regional districts.

Accomplishments to Date:

Due to lack of funding the project did not proceed as planned and there was no survey done on DND properties within the survey area.

Research Activities: None

Permit No.: P071-00

Title: Gypsy Moth Pheromone Trapping Survey

Project Leader: Gordon Henry / Douglas Kyle
118-816 Government Street, Victoria, BC
V8W 1W9, (250) 363-3618

Location: Albert Head, CFMETR, Colwood Supply/Fuel Oil Depot. Heals Rifle Range, Mary Hill Battery, Matsqui TX, Nanaimo Rifle Range, Nanoose TX Site, NRS Aldergrove, Rocky Point, Rocky Point Forest Canopy Research Station, Royal Roads and other CFB Esquimalt properties.

Start Date: June 1, 2000

Completion Date: October 26, 2000

Project Overview:

The CFIA is responsible for surveying for the introduction of quarantine insects, molluscs and plant diseases. Every year the CFIA surveys for the gypsy moth (*Lymantria dispar*) by placing pheromone traps on a grid pattern in rural and urban areas in British Columbia. Legal Authority; Plant Protection Act, s.c. 1990, c.22 and Plant Protection Regulations, SOR/ 95-212. The directive, D-98-09 contains the plant protection requirements governing the movement within Canada, export from Canada to the United States and import into Canada of regulated articles which can harbor any life stage of the North American gypsy moth.

Objectives:

To confirm freedom of gypsy moth by conducting annual pheromone surveys in British Columbia.

Accomplishments to Date:

Method:

Pheromone traps were placed in a grid pattern. The traps are constructed of cardboard, coated with wax and inside with Tangle foot glue. A pheromone string lure (500 milligrams (+) Disparlure) is stapled inside the trap.

Results:

No Gypsy Moths were found in the traps at the above locations.

Permit No.: P072-00

Title: Surveys for Rare and Potentially Endangered Terrestrial Gastropods and their Forest Habitats in Southwestern British Columbia

Project Leader: Kristiina Ovaska

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

Location: Royal Roads, Environmental Monitoring Plots 1 and 2, other sites on Vancouver Island and the Lower Mainland

Start Date: Spring 2000

Project Overview:

The terrestrial gastropod fauna of British Columbia has received little study, and most areas have not been surveyed systematically. In spring 2000, we received funding from the World Wildlife Fund (Endangered Species Recovery Fund) and Department of Forest Sciences, University of British Columbia, to carry out surveys for rare and potentially endangered species of terrestrial slugs and snails on Vancouver Island and the Lower Mainland. The sites that we have surveyed so far include Environmental Monitoring Plots 1 and 2 on the campus of the Royal Roads University on DND lands.

Objectives:

The specific objectives are as follows.

1. To obtain information on distribution of rare and potentially endangered species of terrestrial gastropods in southwestern British Columbia with emphasis on old-growth, mature forest, and riparian habitats.
2. To obtain information on status and persistence of populations of rare species at historic collection sites.
3. To assess habitat protection needs based on habitat requirements, distribution, range size, and abundance of target species

Accomplishments to date:

Overall progress

During April-October 2000 field-season we surveyed 40 potential sites for our target species of terrestrial gastropods on Vancouver Island and the Lower mainland of British Columbia. The surveys focused on sites where historical records of rare gastropods existed as well as sites in similar habitats (e.g., old growth forests). The surveys have resulted in the location of two new sites for the Dromedary Jumping Slug (*Hemphillia dromedarius*), a species newly discovered in Canada, thus bringing the total number of known localities for this species to three. Our surveys so far suggest that the Canadian distribution of this and another species of Jumping Slug (H. glandulosa) is restricted to portions of Vancouver

Island. In contrast, all species of tail-droppers that we have found (*Prophysaon andersonii, foliolatum*, and *vanattae*) appear to be relatively widespread and locally abundant. However, there is much morphological variation, and we suspect that each may represent a complex of species, some of which may have restricted distributions. Molecular methods are needed to help solve the problem.

We have confirmed the presence of the large snail *Allogona townsendiana* at several localities on the lower mainland of British Columbia and have discovered a number of new sites for this species. This species was historically found at only a few sites in the lower mainland and its present distribution was poorly known. These observations will help in better delineating its restricted distribution in Canada and in assessing its status.

We did not find the snail *Cryptomastix devia*, for which historical records from the 19th century exist from Vancouver Island and the lower mainland. This species may be very rare or even extirpated from its Canadian range.

Preliminary results for work on DND lands

In 2000), visited the two ecological Monitoring plots on Royal Roads campus three times, on 29 July, 30 August, and 20 November. We have found 15 species of gastropods, of which 6 are introductions from Europe. We located 13 species on Plot 2 and 7 on Plot 1. We did not locate our target species, such as Jumping Slugs (*Hemphillia* spp.). Interestingly, however, the upper, forested portion of Plot 2, particularly Sections 9 and 10, supported a high density of the large land-snail Pacific Sideband (*Monadenia fidelis*). Although the species appears to be widespread in coastal forests in British Columbia, dramatic shrinkage of its geographic range has been noted in parts of Oregon. The population biology and ecology of the Pacific Sideband are very poorly known, and Plot 2 would provide an ideal setting for student projects of this species and for monitoring long-term population trends.

The species that we found on the Royal Roads campus are as follows:

Slugs:
Arion ater (Black Slug; introduced)
Arion intermedius (Hedgehog Slug, introduced)
Ariolimax columbianus (Banana Slug)
Lehmannia valentiana (Three-band Gardenslug, introduced)
Limax maximus (Giant Gardenslug, introduced)
Prophysaon andersonii (Reticulate tail-dropper)

Snails:
Ancotrema hybridum (Oregon Lancetooth)
Columella edentula (Toothless Column)
Haplotrema vancouverense (Robust Lancetooth)
Lauria cylindracea (Chrysalis Snail, introduced)
Monadenia fidelis (Pacific Sideband)
Oxychilus alliarius (Garlic Snail, introduced)
Punctum randolphii (Conical Spot)
Striatura pugetensis (Northwest Striate)
Vespericola columbianus (Northwest Hesperian)

Future activities:

The field-work in 2001 will build on the findings of the first year and focus on the following:

a) A further delineation of the geographic range and habitat requirements of *A. townsendiana*. In particular, it is essential to find out whether the snails are restricted to small remnants of deciduous or mixed-wood forest in the lower Fraser Valley, or whether they are able to use fringes of agricultural lands and urban areas.

b) Surveys for new localities of Jumping Slugs on Vancouver Island to find out the extent of their distribution and habitat requirements here, and searches of known localities to obtain information on seasonal abundance.

c) Continued surveys of likely habitats at historical localities and potential habitats for *Cryptomastix devia*. These include DND lands in Metchosen.

d) Continued surveys of all gastropod species in undisturbed habitats (eg old growth forest) that may support unknown rare species.

APPENDIX 4

Final Reports for Projects Completed in 2000

Permit Number: P030-00

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: Nanoose TX and CFMETR

Start Date: April 1 1998

Completion Date: Continuing

Project Overview:

The spruce weevil (*Pissodes strobi*) is the most damaging plantation pest of spruce throughout the province, but no satisfactory way is known to manage the 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:**

Many tree leaders in the plantations have been destroyed through feeding and oviposition by *Pissodes strobi*. Attack in each plantation occurs once a year during the spring when the weevil lays its eggs, and in each subsequent year a higher proportion of the leaders has been attacked and killed as the weevil population naturally increased. The spread of damage has not been uniform throughout the plantations but has shown a clumped distribution, typical of the behaviour of this insect. Damage is expected to further increase as more trees are attacked, because the weevil population is healthy,

and 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 confined in sleeve cages with ovipositing weevils at the tops of trees. The parasitoids successfully laid eggs through the bark of the tree into the eggs of the weevil, and the parasitoid progeny developed within the weevil larvae. The parasitoid successfully overwintered under the bark at the tops of the trees ready to complete their development to ovipositing adult the following spring and thus ready to parasitize any fresh weevil eggs that may be laid.

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.: P060-00

Title: Responses of Songbirds to Aerial Spraying of the Biological Pesticide *Bacillus thuringiensis* (var. *kurstaki*) on Southern Vancouver Island British Columbia, 1999-2000

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

Location: Mary Hill, Naden and other non-DND sites in Greater Victoria

Start Date: April 1, 1999

Completion date: January 31, 2001

Project Summary and Conclusions:

As part of ecological monitoring by the Ministry of Forests associated with the Gypsy Moth (*Lymantria dispar*) eradication program conducted 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. The insecticide was applied on three occasions in 1999 (on 9–10 and 19–21 May and 8–9 June) and resulted in a significant reduction in caterpillar abundance in Garry Oaks (*Quercus garryana*), according to a separate, concurrent study. We examined the hypotheses that (a) densities of breeding songbirds, particularly leaf-gleaning, insectivorous species, would be depressed in sprayed areas in relation to pre-treatment densities and when compared to densities in unsprayed areas, and that (b) the incidence of renesting and second broods, as reflected by numbers of 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. To test these hypotheses, we conducted standard songbird point-count surveys on 41 study plots at 14 sites in Btk-sprayed areas and the same number in unsprayed areas in Garry Oak-dominated habitats in 1999 and, one year after Btk-application, in 2000. In 1999, one point-count survey was in April before spraying and three were after spraying in May-June. There were four point-count surveys in April-June 2000. In June of both years, we also conducted two intensive searches of the plots to obtain an index of the number of broods produced and additional information on the relative abundance of adult birds in sprayed and unsprayed areas (a total of 58 plots in 1999 and 60 plots in 2000 were searched).

We detected a total of 61 species of songbirds, 44 of which were considered to include caterpillars in their diet during the breeding season. Sufficient sample sizes existed for 10 species that have a moderate to high proportion of caterpillars in their diet to compare total counts of adult birds and singing males per survey between sprayed and unsprayed areas. These species were the Bewick's Wren, Chipping Sparrow, Dark-eyed Junco, House Wren, Red-breasted Nuthatch, Spotted Towhee, White-crowned Sparrow, Chestnut-backed Chickadee, Bushtit (brood-survey data only), and Orange-crowned Warbler. Additionally,

sufficient sample sizes permitted a more detailed analysis of the pattern of abundance (mean number of birds per plot) across surveys for five of these species (Bewick's Wren, Chipping Sparrow, White-crowned Sparrow, Spotted Towhee, Orange-crowned Warbler). The remaining species were analyzed in groups of species having similar foraging behaviour.

The point-count surveys in 1999 and 2000 revealed no patterns consistent with adverse effects of the treatment on the relative abundance of adults or singing males for any of the species examined individually or when combined into foraging guilds. An exception was the Spotted Towhee, which in 1999 occurred at significantly lower numbers in sprayed than unsprayed plots after Btk-treatment when compared to corresponding values during the pre-spraying period. The number of singing males of this species showed a similar decline in sprayed plots in 1999. This reduction occurred prior to the main decline in the abundance by lepidopteran prey in June, but adverse short-term effects of the spraying on this species remain a possibility. No differences in the relative abundance of the Spotted Towhee were found in 2000, indicating that the possible effects of the Btk-spraying in 1999 did not affect breeding numbers the following year.

During intensive, post-spraying surveys in 1999 and 2000, we found consistently fewer adult Bushtits on the sprayed than unsprayed plots. However, differences in habitat suitability and flocking habits of these birds (the presence of a few flocks inflated the total counts on the unsprayed areas) most likely accounted for this pattern. Few Bushtits were detected during point-count surveys, precluding comparisons with pre-spraying densities.

We located a total of 127 songbird broods (fledged, dependent young with adults) in 1999 and 179 broods in 2000 during post-spraying surveys. We detected no significant differences in numbers of broods between sprayed and unsprayed areas for any of the species examined in either year but did not examine more subtle effects on productivity, such as the number of young per brood. These data, together with comparisons of the relative abundance of singing males suggest that the Btk-application had no detectable effects on the pattern of territory maintenance or frequency of renesting by songbirds in 1999 and 2000.

The results of this 2-year study indicate that the use of Btk to control Gypsy Moth populations had few or no detectable effects on songbird abundance. However, as a precaution to prevent any potential minor effects on songbirds, particularly on rare species, future spray-programs should target only areas known to harbour Gypsy Moths or their eggs to minimize the size of continuous areas with depressed caterpillar prey.

Permit No.: P073-00

Title: Bird-Habitat Relationships in the Garry Oak Ecosystem of Southeastern Vancouver Island

Project Leader:
Richard Feldman
Centre for Applied Conservation Biology
3rd Floor, Forest Sciences Centre
University of British Columbia
2424 Main Mall, Vancouver, BC V6T 1Z4
(604) 822-0501

Location: Rocky Point and Mary Hill

Start Date: May 1, 2000

Completion Date: October 25, 2000

Project Overview:

As part of my Master's thesis research to investigate the bird community of the Garry oak ecosystem, breeding bird surveys and fall foraging observations were conducted in a Garry oak patch and its adjacent forest in each of Mary Hill and Rocky Point. Vegetation composition and structure was also measured at these locations. The DND sites were among 14 sites surveyed in the greater Victoria region (7 Garry oak patches, 4 conifer forests and 3 urban areas). Due to the relatively low degree of development in the landscape surrounding the DND sites, the Mary Hill and Rocky Point patches were at the low impact (rural) end of an urban-rural gradient of sites.

Objectives:

1) to determine the birds that breed and forage in southeastern Vancouver Island's Garry oak patches.

2) to compare the Garry oak breeding bird community (i.e. number of species and their abundance) to the community of adjacent habitats (Douglas-fir forest and urban residential areas).

3) to quantify the influence of vegetation structure and degree of landscape development to the types and abundance of breeding birds in oak and forest patches.

4) to quantify acorn production and correlate this to foraging behaviour of autumn species.

Accomplishments to Date:

a) Research activities:

Two 400m transects were surveyed in June of 2000 in the Garry oak and in the adjacent forest at Mary Hill. Two 350m transects were surveyed during the same period at the Rocky Point oak and forest patches. The four locations were visited five times over the course of the month. Recordings of birds were summarized and territories delimited according to the spot mapping method. Species richness and abundance was determined for each patch. In July of 2000, vegetation was sampled along 14- 50m transects at the Mary Hill sites and 12- 50m transects at Rocky Point. A suite of vegetation variables were measured (tree density, shrub cover, etc.). The bird survey transects were sampled in September and October for observations of foraging birds. Acorn production was qualitatively and quantitatively determined along these transects three times during the fall.

b) Highlights of Findings to Date:

When all sites surveyed in the project are considered, the DND oak and forest patches had comparable numbers of species to the oak and forest patches of all but the most severely impacted sites (i.e. sites surrounded by urban development). The Rocky Point Garry oak patch contained, overall, the most number of species (27). The Rocky Point forest site had 18 species, the Mary Hill oak patch had 17 species and the Mary Hill forest had 16 species. This preliminary result indicates that the degree of development in the landscape may influence species richness. Further analysis on all factors and variables is needed before this result can be confirmed. The results also show that the communities of forest and oak patches are not substantially different. Only one species, the white-crowned sparrow, was found to breed in Garry oak but not forest patches. When compared to adjacent urban areas, however, bird diversity is greater in the Garry oak patches.