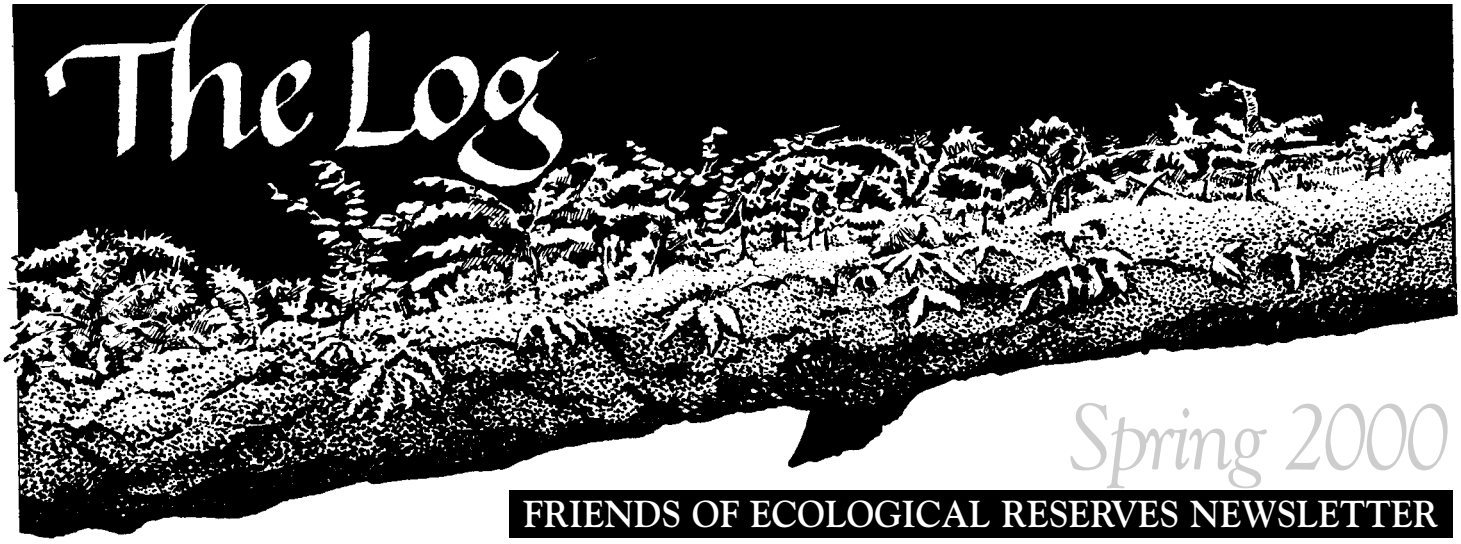

Spring 2000

FRIENDS OF ECOLOGICAL RESERVES NEWSLETTER

Strathcona District: Focus on Ecological Reserves

The Log is our major communication vehicle to British Columbia's Ecological Reserve wardens, and to the many 'Friends' of Ecological Reserves – members, who share a common interest in seeing these special places protected throughout the province. To help us ensure that the provincial scope of our readership is well represented we have begun to feature ER's by District. We begin in this edition of the Log, focusing on the Strathcona District, inspired largely by the commitment of warden Heather Kellerhalls and her husband Rolf, who have kept the Friends updated on logging developments surrounding the Claud Elliot Reserve. Heather's article is featured on page 6 of this issue.

I spoke to a number of people involved in research and conservation in the Strathcona area while putting this edition together. Heather encouraged me to speak with Kirby Villeneuve, the Area Supervisor for Nimpkish-Cape Scott. Kirby and Heather visited Claud Elliot together last fall.

Kirby shares a genuine love for Ecological Reserves, which he describes as more 'tangible' to deal with than larger protected areas – each having their own individual theme and purpose. I was impressed by Kirby's enthusiasm with his work. He knows many of the reserves well. As a relatively new Supervisor, Kirby looks forward to being able to get into some of the more remote reserves, like Mount Elliot which, frustratingly, remains wardenless. When asked what his first wish would be in working with ERs he replied the nearly inevitable – resources for management. Funding for more research, active incorporation of wardens with proceedings, and assurances for the safety of volunteers. These tasks may be realized through the new Conservation Stewardship Agreement for ER wardens, and questions and concerns will be addressed at the District Wardens meeting that will be scheduled for later this spring.

For more information about the upcoming wardens meeting or to find out more about reserves in this area you may contact the Strathcona District Office at

P.O. Box 1479, Highway 19
3 km S of Parksville
Parksville BC V9P 2H4
Phone: (250) 954-4600
Fax: (250) 248-8584

We hope you enjoy this issue – and look forward to receiving more updates from our wardens and friends. ■

Nichola Gerts

Inside . . .

The Log

Spring 2000

The Log is published by the Friends of Ecological Reserves, a not-for-profit society in British Columbia with a membership of approximately 250 scientists, naturalists, and concerned individuals. The Ecological Reserve system in British Columbia supports over 135 designated marine and land environments that have been set aside by the provincial government to protect rare, endangered and special ecosystems. *The Log* is distributed to members, volunteer wardens, affiliates, supporters, government and the inquiring public.

The views expressed in this newsletter are not necessarily those of the Friends.

Articles for publication are invited. The deadline for submissions for the next issue of *The Log* is May 1, 2000.

Editors for this issue:
C. M. Borris
Nichola Gerts

Design & Production
Indigo Sky Graphic Design

Contributors to this issue
Cheryl Borris, Nichola Gerts,
Heather Kellerhals, Dave Oppenheim
Tom Reimchen, Jane Watson

Memberships are based on a calendar year.
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Students/Seniors: $15
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ecoreserves@hotmail.com

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PRESIDENT'S MESSAGE

This issue of the Log, marks my last message to you, as President. This year, at the Annual General Meeting, I relinquished the Chair to Lynne Milnes, who will be your president for 2000. I do not need to introduce Lynne to you – she is well-known to FER members and supporters for her enthusiasm and passionate commitment to the ecological reserve system in British Columbia. I shall enjoy supporting Lynne in my capacity as past-president.

In this issue, we profile Strathcona District and, in particular, activities and issues regarding Claude Eliott Lake Ecological Reserve. As well, Jane Watson and Tom Reimchen give us updates on their research projects.

In response to the Autumn 1999 issue, we heard, loud and clear, from you that you don't want us to include the membership renewal form as part of the *Log*! So we won't do that again. If you haven't sent in your 2000 dues yet, please take the time to complete the enclosed form and make out a cheque to the Friends. Your support, through dues and generous donations ensure strong and healthy finances. We continue to operate as economically as we can: administrative costs represent only 11%, and the Log production expense represents only 7% of our total expenses. We do not have any full time staff – we pay modest fees for service to our part-time administrator and our bookkeeper. These measures help us to put your support where it is most needed: in our land acquisition, research and education activities.

Our major fundraiser this year is a raffle of a beautiful painting of a meadowlark by Fenwick Lansdowne. The draw will be at the Meadowlark Festival in Penticton May 20th. The odds of winning this painting are truly excellent – only 1200 tickets have been printed, at $5 each. To buy a ticket, please contact any board member, send us an e-mail, or call Nichola at (250) 385-9246.

Cheryl Borris, Past President

FROM THE EDITOR

While not everyone has a computer, or is computer literate, it is becoming more and more apparent that e-mail has joined Canada Post, the telephone and the fax machine as a way to communicate. Particularly in the conservation community, the immediacy of e-mail communication has a certain appeal, especially when there is fast breaking news about government announcements and decisions on environmental issues, and when public support for an issue is needed in timely manner. Electronic communication has become a cheap and effective way to communicate on short notice.

One of the problems, of course, is that our e-mail inboxes tend to get clogged up with junk mail, in much the same way that we are often inundated with door-to-door flyers, advertisements and other commercial blandishments in our mailboxes.

We don't want to contribute to your information overload, but we do want to use technology in a way that benefits our members and the objectives of our society. Recently, for example, you will have noticed that we no longer mail the Log in an envelope with a stamp. While this may mean that your Log doesn't arrive as fresh and as prettily as it might have done in the past, the change has resulted in considerable savings and, of course, uses much less paper. We are also exploring the feasibility of sending the Log electronically to those of you who would like us to.

Back to e-mail… We are doing our best to collect e-mail addresses of our members. If you wish to share your e-mail address with us, please send us a short note to ecoreserves@hotmail.com. Be assured that we respect your privacy and, just as we do not share our mailing list of members, we will not share your e-mail address. We will use it, however, to communicate with you – and to better meet your needs as a member of the Friends of Ecological Reserves.

The Editor

SPRING CALENDAR

APRIL 1, 2000
Deadline for research assistance applications. (See criteria on p. 5 of this issue).

APRIL 18, 2000
FER research scholarship recipient Leanna Warman will be in Victoria to give a lunchtime (12:00–1:00) presentation on "A systematic method for identifying priority areas to conserve rare species using 'irreplaceability'; a test case for the South Okanagan, British Columbia". 712 Yates Street, 3rd floor boardroom. For more information: Andy MacKinnon. Ministry of Forests, Research Branch phone: (250) 387-6536

APRIL 29, 2000
Annual Spring Field trip to Trial Island Ecological Reserve, with Adolf & Iluna Ceska. Meet on the beach at the foot of Transit Road, in Oak Bay at 9 a.m. for a short crossing by Zodiac to this small island with unique plantlife. Wear waterproof clothing, and bring your camera, sketchbook, and a lunch.

MAY 1–7, 2000
Pitch-In Canada Week. Participate in a shore-line clean-up in your community. For more information, write to Pitch-In Canada, PO Box 45011, Ocean Park PO, White Rock V4A 9L1. Phone: (604) 290-0498 E-mail: pitch-in@pitch-in.ca

For information and to register for FER's participation in the Capital Regional District (May 5-7), call Nichola at 250 385-9246.

MAY 19–22, 2000
When the Western Meadowlark returns and its carolling song rings over the grasslands and sagebrush of BC's Southern Interior, spring has truly arrived. Celebrate spring and experience the unique landscapes of the south Okanagan and lower Similkameen Valleys during the third annual Meadowlark Festival. For more information: http://www.meadowlarkfestival.bc.ca/ ■

LETTERS

Dear Friends,

We have spent two one month sessions at Coldfish Lake in Spatsizi Park as volunteer hosts, once in August/ September 1997, and again in August/ September 1999. Both from our own observations and from reading in the Coldfish Host Log, there are many infractions and abuses occurring in the Gladys Lake Ecological Reserve.

These range from the explicitly prohibited consumptive uses, such as fishing and hunting, to the more generally disallowed, such as organized recreational use and commercial exploitation.

As volunteer ER Wardens, seeing this situation has us quite concerned. We have had discussions with BC Parks Skeena District Manager Hugh Markides, and Operations Officer Gary Glinz, as well as written communication with them and Area Supervisor Dave Zevick. They have been quite responsive to many of our concerns, but they have severe limitations on what is possible.

Among other things, we have suggested to them that a volunteer Host for the ER, possibly in the form of some local group, could help greatly with their management problems. Unfortunately, we have no one to suggest, and were wondering if the Friends has any contacts in the Smithers/ Terrace area (or further north). If you can help with this, or have any questions, we suggest getting in touch with Gary Glinz at 250-847-7655.

Sincerely, David and Claire Oppenheim

Dave and Claire have been the wardens for ER 122 – Tsitika Mountain since July 25, 1991.

Friends of Ecological Reserves

FIELD TRIPS
Spring 2000

Saturday April 29, 2000
TRIAL ISLAND ECOLOGICAL RESERVE

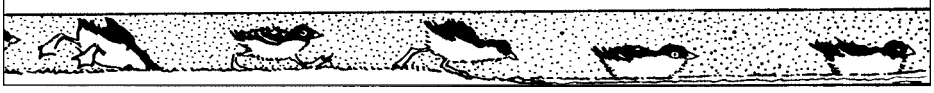
with Adolf & Iluna Ceska

Meet on the Beach at the foot of Transit Road, in Oak Bay at 9 a.m. for a short crossing by Zodiac to this small island with unique plantlife

Wear waterproof clothing, and Bring your camera, sketchbook, a lunch

FEE: FER Members: $10
non-members: $30 – seniors/students: $25
(includes a 1-year membership to FER)

TO REGISTER or FOR MORE INFORMATION: 385-9246



Report on the Annual General Meeting

The Annual General meeting of the Friends of Ecological Reserves was on February 18, 2000, at the University of Victoria. President Cheryl Borris welcomed participants and reported briefly on the highlights of 1999:

"In 1999, FER successfully completed a third year FER's participation in the **Landowner Contact Project**, where we have worked with owners and operators of interior ranch lands advising them of the ecological importance of their property and acquainting them with options for stewardship and conservation actions. Solid funding from grantors such as Eden Conservation Trust, EcoAction 2000, the MacLean Foundation and the Vancouver Foundation ensured that we were financially capable of managing this ambitious project.

"**Bill Turner** and **Nichola Gerts** have co-authored a Canadian Edition of the book *Preserving Working Ranches in the West*. This publication will be completed in 2000, and will be distributed throughout the province describing the work we have been involved in, remaining as a tool to encourage the conservation of BC's grasslands. Conservation agreements and legal negotiations that are a result of this program will be continued through our project partner The Land Conservancy of BC.

"With financial assistance from FER, **Dr. Jane Watson** continues her study of sea urchins and sea otters in Checleset Bay ER, **Dr. Tom Reimchen** continues his research investigating the relationships between salmon, bears and coastal forests; **Leanna Warman** and **Dr. Tony Sinclair** continue to explore complementarity and a systematic method for identifying priority areas to conserve rare species using 'irreplaceability' in the Okanagan, **Chris Engelstoft** works with sharp-tailed snakes in the Gulf Islands, and **Pam Janszen** continues her study of macrofungi in ER 15 on Saturna Island.

"In 1999, FER established the **Vicky Husband Scholarship** for environmental studies, here at UVic. I am pleased to report that **Lindsay Cole** was the first recipient of this award. Lindsay is finishing fourth year this spring and is the co-founder of the UVic Sustainability Project – a student-based initiative that will result in policy recommendations for campus sustainability in solid waste management, energy efficiency, curriculum, purchasing practices, environmental health, and campus ecology.

"In 1999, we participated in the **International Coastal CleanUp**, an annual event that targets the removal of marine debris from coastal waterways and shores. We have secured the interest of the BC Ministry of Environment, Lands and Parks and, in 2000, anticipate a major effort directed towards all marine ecological reserves in BC. New important contacts with Fisheries and Oceans Canada have ensured that FER has a seat at the table during discussions involving Marine Protected Areas on the West Coast. As well, as a result of our participation in the BC Parks Legacy process, we have been invited to participate in policy discussions with the government regarding the creation of new ecological reserves and the management challenges of existing ecological reserves.

"In 1999, our 15th anniversary year, it seemed appropriate for the Board of Directors to do some introspective thinking, with a view to setting future directions and priorities. We spent a day and emerged, successfully, with a renewed purpose to communicate with and support the network of volunteer wardens that care for ecological reserves in British Columbia.

"At this time, I would like to thank the board members for their contributions and dedication to the ecological reserve system in BC. We are a unique society – no other non-profit group is concerned with ERs. A special thank you goes to retiring board member **Briony Penn** who leaves us to continue important conservation work with the Salt Spring Island Conservancy and The Land Conservancy of BC. It is my personal hope that Briony won't go too far, as her wonderful artwork, her enthusiasm and inspired ideas will be sorely missed. I would like to thank the people who support the board, so that the work of the society continues efficiently – without their competence and commitment our work would be that much harder – **Nichola Gerts**, our able and creative manager, **Dianna Wootton**, our hard-working bookkeeper, **Tom Mace**, the editor of *The Log*. I would also like to thank members who have consistently volunteered their time and talents when there are tasks to be done: particularly, **Marilyn Lambert** – our marine field trips would not happen without her, and **Tom Gillespie**, who continues to maintain our mailing list so well.

"In closing, I would like to say that my five years as president of the FER has been a rich and rewarding time. I have learned an immense amount during this time and have made many friends. I will not seek a 6th year as president this year, but am confident that I leave the society in good hands and look forward to serving as past-president during 2000."

Cheryl presented the treasurer's report, saying that total operations expense for the society for 1999 was $49,000, of which $11,000 was allocated to the Landowner Contact Project. Corporate donations, largely in response to the Landowner Contact Project and our Research assistance program increased from $35,000 to $41,000 and, in 1999, fundraising revenues from lecture

admissions, field trip fees and placemat sales increased from $3500 in 1998 to $4100.

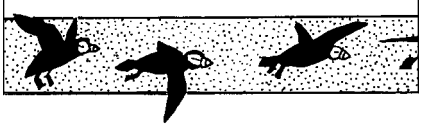
The Nominating Committee presented the election slate for the 2000 board of directors. Eleven directors stood for re-election. No additional candidates were put forward. All were elected by acclamation.

A special resolution was passed to amend the constitution and bylaws, in order to comply with BC Gaming Commission regulations. After the business portion of the meeting, members and guests partook of a light potluck supper. The meeting was followed by an illustrated lecture by 1999 award recipient Pam Janszen, who spoke about her research in ER 15 on Saturna Island. ■

JUNE MAYALL (1919–2000)

With great regret we report the recent passing of long-time Friend, June Mayall. June was an active naturalist and conservationist. An avid birder and botanist, she worked tirelessly with many groups in BC to protect areas of natural wilderness. Her enthusiasm, curiosity and zest for life were an inspiration to all who knew her.

Donations in her memory may be made to the Nature Conservancy of Canada, c/o #404–3960 Quebec Street Victoria V8X 4A3



THANK YOU TO 1999 DONORS

It is with great pleasure that we thank those who have supported the Friends of Ecological Reserves during 1999, both through their membership and generously with other gifts. The Society has no operational support from government funding and its activities are solely supported through donations and grants from private foundations. Without this support we would not be in a position to maintain our commitment to ecological reserves in British Columbia.

*eco***ACTION***2000*

The Vancouver Foundation

The Eden Conservation Trust

Diana Angus
J W Barber-Starkey
Katherine Beamish
Beryl & Harry Borris
Cheryl Borris
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Margaret Prevost
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Diane Richardson
Hans & Heidi Roemer
Audrey Woodward
Anonymous (2)

Funding For Research

The Friends welcome applications for funding to support biological and ecological research projects related to Ecological Reserves in British Columbia. The application should include:

- title of research project
- name of applicant(s)
- mailing address of applicant
- institutional (college or university) affiliation
- a brief description of the research and its relationship to Ecological Reserves in BC
- any other pertinent details
- two letters of reference supporting the project.

Financial information should include:

- total budget required for the project, with an indication of contributions from other sources
- amount requested from the Friends of Ecological Reserves.

Note: If the project is a multi-year proposal, provide an indication of how the project is to be supported/ funded throughout its duration.

Applications will be judged on the merit of the project, its financial viability and the financial need of the applicant. Research grants are generally between $500 and $2000. As a condition of award, applicants will be asked to submit a report and may be required to present a public lecture on their research findings. Applications for funding for 1999 should be received by April 1, 1999.

Send applications to:

The Friends of Ecological Reserves
PO Box 8466 Stn Central
Victoria BC V8W 3S1 ■

A Day in the Life of an Ecological Reserve –

Approaching Reserve from the south along Claud Elliot Creek looking towards Fickle Hole and the slopes of the Reserve on the right.

A clear fall morning and we're heading towards the reserve from the north. After leaving the Canfor log landing we alternately push and pull our canoe over a rough trail to Claud Elliot Lake. It is quiet paddling until we hit the mouth of the creek. Then a sudden splashing as two black bear high tail it into the trees. We soon see the reason why – the creek is full of fish. It's like a vision from the past this abundance and helps us understand why Claud Elliot Creek is rated among the top ten fish streams on Vancouver Island. As well as a summer steelhead run there is an early coho run here. Rainbow, cutthroat and Dolly Varden are also present, the latter being threatened almost everywhere.

We continue on downstream, zigzagging our way around and over old beaver dams. On both sides there are extensive wetlands, that like a gigantic sponge, prevent damaging floods. The current quickens and the sound of water dashing under a log jam prompts us to beach the canoe. Game trails meander through the tall grasses and bushes – tracks of elk, deer, wolf are everywhere. Visible now on our right is the active debris torrent track that is responsible for the fan deposits that block the valley and impound the lake and wetlands. Ahead and to the left above Fickle Lake are the forested slopes of the reserve, set aside as deer wintering range.

The walking becomes rugged. Deep channels are everywhere, many of them beaver tracked and muddy. We fall in – often. This place feels and smells like wilderness, a perfect pocket wilderness. Though there is extensive clearcutting on both ends of the Claud Elliot Valley, none of it is visible from here yet. But this is due to change this Spring. A logging road has been pushed up along Claud Elliot Creek from the Tsitika valley and has already been flagged across the steep slopes above Fickle Lake. In fact, MacMillan Bloedel requested permission to go across a corner of the new and very small Protected Area on the valley floor. Although they were turned down by Parks, the eventual road access and logging will bring many detrimental changes to this self contained valley.

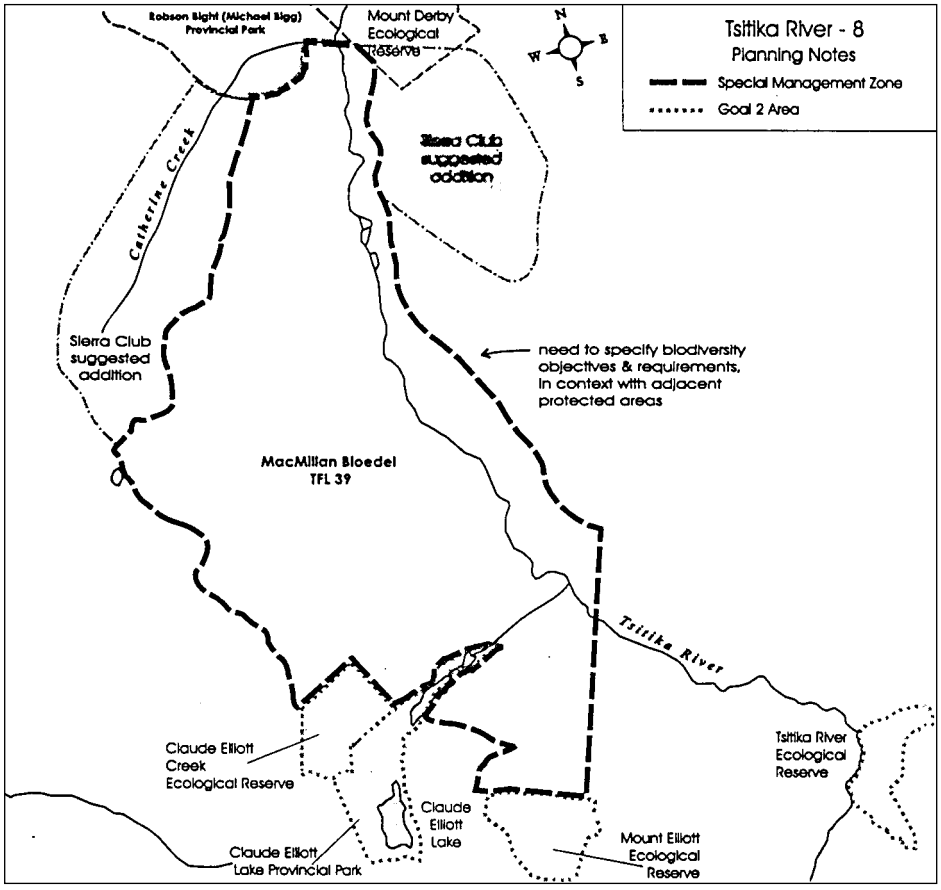
What about the wildlife? Can poaching be controlled? As we reach the shores of Fickle Lake and the edge of the Reserve, a herd of elk starts up. Twelve we count, including two magnificent bull elk. They move effortlessly through wetland and forested slopes where we struggled. We think back to what might have been: during the CORE process the whole Claud Elliot Valley was proposed as a protected area which would have encompassed the two adjoining ecological reserves, Mt. Elliot and Claud Elliot Creek. Indeed this area was given the highest rating during the Vancouver Island planning process. So what happened? The original protected area proposal was whittled down to bare bones, basically a line drawn around Claud Elliot Creek and Fickle Lake, leaving the forested slopes across from the Claud Elliot Reserve in a RMZ or general forestry zone. Not even Special Management designation!

Speaking in possibly over dramatic tones, this designation or lack thereof, is like a knife wedge driven between the two Ecological Reserves. There is nothing logical about the fragmentation of the Claud Elliot Valley and the

#126 Claud Elliot Creek in the Tsitika Valley

configuration of the surrounding Special Management Zones. We stare across Fickle Lake to the steep forested slopes where the road is to go. What will it look like? Viewsheds from Protected Areas are supposed to be maintained. What about the superb bear denning sites we have seen on those boulder and stump strewn slopes. Will road building there add to the natural debris torrents?

Many questions. But are they the questions that a volunteer warden should be asking? In the case of such a self contained valley with high fish, wildlife and scenic values, plus wildlife viewing potential, I think the answer must be a loud, resounding Yes. Logging and especially the construction of a new road threatens the integrity of the Claud Elliot Ecological Reserve. And so with these thoughts in mind we retrace our muddy way across the wetlands and locate our canoe. Upstream is not so easy. One of us gets soaked, trying to leap out. But nothing is easy in this valley, not even the questions asked, which is why it has remained as it is, until now. The fish are still lingering in the creek shallows. We see their shadows pass under our canoe. Have we asked the right questions we wonder? And have the public agencies responsible for the future of this valley honestly pondered the really tough questions? ■



From "Planning Framework Statements for Special Management Zones" p. 58.

Shows the rather patchwork way in which the Claud Elliot area has been treated! By the way, spelling is ***Claud*** *in the official (original) documents.*

Approaching Reserve from the north side along Fickle Creek and wetlands.

Heather Kellerhals is the warden for Claud Elliot Creek Reserve #126. She loves the area and visits the reserve several times a year. Heather keeps in contact through regular letters and e-mails, keeping the Friends up to date on activities in the area.

RESERVES WITHOUT WARDENS

Sadly, not every ecological reserve in British Columbia has a warden to care for it. Of the 31 ERs in the **Strathcona District**, eight are in need of wardens. If you are interested in becoming a volunteer warden for an ecological reserve, or want to know more about the ecological reserve program, call Kirby Villeneuve or Ian McLellan at (250) 949-2816.

 # 90: Sutton Pass, located west of Port Alberni. Protects the rare *Ophioglossum vulgatum* (adder's tongue fern)

#119: Tahsish Kwois-Tahsish River, on the west coast of Vancouver Island, south of Port McNeill. Protects a pristine west coast estuary

#120: Duke of Edinburgh Islands (Pine, Storm & Tree). Northwest of Port Hardy. The largest seabird nesting colony in Queen Charlotte Strait

#123: Robson Bight – Mount Derby. An alpine peak, with precipitous, partly forested slopes

#125: Mount Eliott. Representative subalpine subdrainage, surrounding cirque lake

#140: Comox Lake Bluffs, located on the northwest shore of Comox Lake, approximately 5 km southwest of Courtenay. Protects unique botanical phenomena such as the least moonwart

#141: Bowser, found on the east side of Vancouver Island, approximately 15 km north of Parksville near Qualicum Beach. A highly productive forest ecosystem, home to several rare species of vegetation restricted to specific types of peatland habitat. The reserve also protects a high diversity of dragonflies including some regionally rare species inhabiting wetland areas.

#142: Misty Lake, located 12 km. northwest of Port McNeill. Protects giant black stickleback, and other freshwater fish.

Sea Otter Research

Just a quick letter to let you know how the sea otter research went this summer. We had a successful season thanks to support from the Lichen Foundation and the "Friends".

We were able to install temperature recorders at each of the subtidal permanent sites. The eight permanently marked sites were established thirteen years ago to monitor long term changes in community structure originally associated with the arrival of sea otters. However, once kelp forests became established, it became apparent that successional processes within the kelp forest community were being strongly affected by water temperature. Water temperature affects what species of kelp recruit and survive. Since 1993 water temperatures of Southern BC have been warm. These "warm water anomalies", as well as El Nino events affect the type kelp that settles and survive once sea otters have removed grazers. Prior to 1992 the major species of kelp that dominated sites, which sea otters had occupied, was tree kelp *Pterygophora californica*. Since 1993 *Eisenia arborea* a species of kelp that had been fairly uncommon has been a major component of the newly grown kelp forests. Likewise, Bull kelp (*Nereocystis luetkeana*) which was once very common has been comparatively rare, whereas Giant kelp (*Macrocystis integrifolia*) has become more abundant. While it is difficult to attribute these differences solely to water temperature, it is interesting to note that the species that are doing well are species that tolerate higher water temperatures.

The temperature recorders or "thermographs" are small instruments that are about the size of a Loony. They are attached to the sea floor and record water temperatures tree times a day. They will be retrieved once a year and the data will be downloaded to a computer. The thermographs will be reset and re-deployed. I am very excited about having finally installed these instruments, as I suspect that much more of the variability we see in community composition will make more sense when examined with respect to water temperatures. Recognizing how and why ecosystems vary over time is an important consideration in conservation.

The sea otter population continues to grow. Sea otters now extend from just south of Estevan Point to Cape Scott, with a few otters on the east side of northern Vancouver Island. The sea otter population off the central coast of BC is also growing. As the population increases in size and expands in range it is becoming increasingly difficult to count and monitor. I am most grateful to the many fishermen, kayakers and boaters who have reported sea otter sightings from unusual locations. These reports are important in determining how far the sea otter population has spread and play an important role in directing efforts to assess population size.

Once again I would like to thank the Friends for their support of sea otter research in BC. The type of ongoing support that the Friends provide makes long-term projects such as this possible.

Sincerely, Jane Watson

Dr. Jane Watson is a professor at Malaspina University College and spends her summers with sea otters in Checleset Bay ER.

Nitrogen, Salmon and Bears in Coastal Forests

Research continues in Clayoquot Sound and Princess Royal Island on the cycling of salmon nutrients into coastal forests. My first investigation on this process, carried out in Bag Harbour on the southern end of the Queen Charlotte Islands, found that black bear were major foragers and scavengers on salmon and that bears carried an immense quantity of salmon into the forest. Among the eight bears which frequented the salmon stream at Bag Harbour, each captured about 700 mainly spawned-out salmon during the 45 day spawning period and carried most of these into the forest. Uneaten remnants of each carcass, typically about one-half of each salmon, including the belly, viscera, testes and fins, began to accumulate on the forest floor in a 50 m wide band adjacent to the stream. The carcass remnants provided a major nutrient source for a large diversity of scavengers including marten, eagles, ravens and large flocks of gulls and crows. Competing with these vertebrate scavengers were ground dwelling and flying insects. Flies laid eggs on the tissues and within several days, numerous carcasses were a mass of maggots feeding on the remnants. When no soft tissues remained, the maggots migrated out across the forest floor until another carcass was encountered or, alternatively, they bury and overwinter in the soil. High densities of insects would emerge the following spring and summer and certainly provide a major food source for insectivorous birds such as warblers, flycatchers and wrens as well as mammalian insectivores such as shrews.

GRAPHIC NOT AVAILABLE

Reimchen 1994. Further studies of predator and scavenger use of chum salmon in stream and estuarine habitats at Bag Harbour, Gwaii Haanas. Technical Report, Canadian Parks Service. Queen Charlotte City, B.C.

Abundance of bears in a watershed is an essential ecological component to this forest diversity since the bear is the major transfer agent of salmon from the stream into the forest. Other species such as eagles, marten and on the mainland, wolves and mink, could also transfer salmon but such transfer would be small compared with the 700 salmon that each bear relocates over the spawning period. Consequently, removal of bears from salmon streams, as was regularly performed by Fishery Agencies until the early 1970's, would lead to a reduction in nutrient cycling .

How representative are these interactions, observed at Bag Harbour, elsewhere on the British Columbia coast? The David Suzuki Foundation and the Friends of Ecological Reserves have provided funding for replication of these studies. With my graduate student, Deanna Mathewson, field assistants, and post-doctoral colleague Dr. Jonathen Moran, we are currently looking at bear-salmon interactions in six watersheds in Clayoquot Sound including Sydney River and Megin River with its accompanying Ecological Reserve and also further watersheds from Princess Royal Island. We visited each of the Clayoquot watersheds during summer of 1998, before the salmon returned to the rivers, and collected data on abundance of birds and mammals and took a diversity of leaf and needle samples from riparian vegetation in each watershed. We returned to each site during October for comparable data when salmon had returned to the rivers. Similar to the results from Bag Harbour on the Queen

Chalotte Islands, in Clayoquot Sound and Princess Royal Island, black bears congregated on the rivers where salmon were present and regularly carried their capture into the forest. We recorded distribution of carcasses throughout the forest and found that carcasses gradually declined in abundance with increased distance from the stream but carcasses could be found up to 150 meters into the forest. On the Megin River, the carcasses were particularly abundant on the steep forested slopes on the east side of the river. We saw a similar trend on Princess Royal Island, where in V-shaped forested valleys, carcasses were often scattered throughout the forested slopes including the top of the ridges some 100–200 m from the stream. We also found that in small watersheds like the Watta River, adjacent to the Megin River, the density of salmon carcasses on the forest floor was much higher than in the larger rivers where carcasses were more patchily distributed into the forests along the length of the river. Perhaps bears have an increased probability of encounters with other bears on small streams and this favours transfer of the salmon into the forest minimizing interference competition.

We are also focusing on analyses of stable nitrogen isotopes in the vegetation. One of the interesting discoveries of investigators in Alaska and Washington was that vegetation on the bank of a salmon stream contained elevated levels N^{15}, the nitrogen isotope which is particularly enriched in salmon and other marine fishes of higher trophic levels. Presence of elevated N^{15} levels in vegetation indicates that plants are using nitrogen directly or indirectly derived from the salmon carcasses. In our research, we have taken leaf and needle samples from huckleberry, false azalea, devil's club, salal, false lily of the valley and western hemlock to determine whether any of the nitrogen used by the vegetation is from salmon. Our results show an elevated N^{15} signature in most vegetation adjacent to salmon streams and a lower signature on control streams without salmon. This was important as it provides direct evidence for the cycling of salmon nutrients into vegetation. One can calculate the actual percentage of total nitrogen obtained from salmon for this riparian vegetation. Results indicate that from 20–30% of the nitrogen used by the plants comes from salmon. Our highest N^{15} signature occurred in several bugbane plants on the Sydney River, where close to 80% of the nitrogen was salmon-derived. In our field records, we found the greatest occurrence of carcasses adjacent to the streams and relatively few carcasses 100 m from the stream and we expected that the N^{15} results would parallel this trend. One of the peculiar results of our nitrogen analyses is that even in vegetation 100 m from the stream, and distant from any detectable salmon carcass, there are occasionally high levels of N^{15}. This suggests extensive horizontal transfer of salmon nutrients into the forest well beyond the physical distribution of carcasses probably due to movement and dispersal by insects, birds and mammals which have fed on the salmon closer to the stream. High abundance of scats on the forest floor might also account for the availability of enriched N^{15} for plant growth.

We are also trying to estimate historical movement of salmon into the forest. At Bag Harbour, I realized that yearly differences in abundance of salmon entering the stream might be measured from an analyses of yearly growth in tree rings such that with increased abundance of salmon, one would expect wider growth rings. Consequently, we have being taking thin (5mm) cores from western hemlock near streams with and without salmon and measuring ring size. Department of Fisheries and Oceans have recorded yearly salmon escapement for many British Columbia streams over the last 50 years and we are currently comparing growth rings with the Fishery data. We have also been measuring N^{15} in the tree rings as this provides a direct measure of the use of salmon nutrients by the tree. Measuring the amount of N^{15} in wood is very difficult as there is very little nitrogen in wood. The tree does not leave much of this valuable commodity locked up in its support structures. However, new development in the United States of technological precision in the measurement of N^{15} has allowed nitrogen isotope levels in wood to be accurately determined. Our first data back from Bag Harbour demonstrates that from 10 to 50% of the nitrogen used by western hemlock trees near streams comes from salmon. Furthermore, levels of N^{15} have fluctuated dramatically over the last 50 years and is highly variable among adjacent trees indicating yearly differences in salmon nutrient transfer into different parts of the forest. A very interesting result was that in one of six trees cored and analyzed for N^{15}, there was a strong statistical correlation between N^{15} in the rings and yearly salmon abundance. This shows the tremendous potential of tree ring analysis for reconstruction of past ecosystems. Not only can the presence or absence of salmon be determined in the distant past but potentially the N^{15} levels will provide a direct estimate of the relative abundance of salmon in past centuries.

This research is only beginning but current results are very encouraging. The zone of salmon influence may extend several hundred meters away from the stream and as such define a much wider riparian habitat than we previously thought. Given the discovery that a substantive proportion of nitrogen in some of these ancient large trees is derived from salmon, one must conclude that nutrients derived from the open ocean are integrally linked to forests in a highly integrated and dynamic ecosystem. The historical decline in numbers of salmon and bears, particularly on smaller watersheds, will have resulted in widespread reduction in the carrying capacity of coastal watersheds. ■

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Biodiversity Publications

Want to know more about ecoforestry and how to maintain biodiversity in your community forest or how to recognize endangered "Identified Wildlife"? Need to know which rare lichens are found only in old growth forests or the latest information on grizzly bear habitat requirements? If you are involved in land use planning, public education or want to manage your backyard more sustainably-read on.

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The 1997 ***Biodiversity Publications Catalogue*** and its 1999 addendum can be viewed at www.for.gov.bc.ca/hfd/pubs/docs/mr/mr086.htm.

By April 2000, the catalogues will be searchable. Some of the publications can be viewed, downloaded, and printed at no cost. Many biodiversity publications can also be found through the Queen's Printer's website www.publications.gov.bc.ca and Crown Publications www.crownpub.bc.ca. Access to these websites can be made through any Government Agent's Office and at many public libraries. ■

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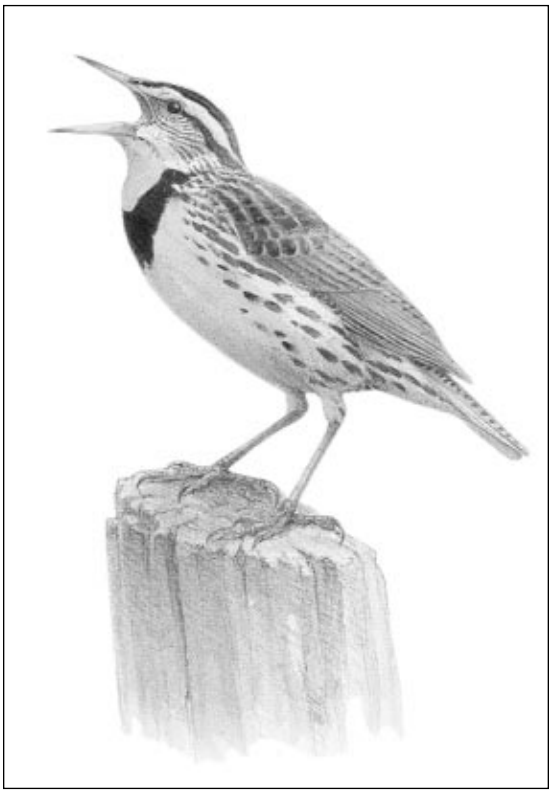

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Websites of Interest

STRATHCONA DISTRICT PROTECTED AREAS

Canadian Ministry of Environment presents an alphabetical listing of parks and ecological reserves in BC. Find summaries, and conservation and reservations information. This site allows one to 'visit' each protected area, explaining the rationale for protection, descriptions of the area, resource information for people interested in visiting and incredible updates on current conditions and activities. To explore protected areas in the Strathcona District (including ecological reserves) visit **www.env.gov.bc.ca/bcparks/explore/stradis.htm**. For more information on Ecological Reserves you can connect through this site to **www.env.gov.bc.ca/bcparks/ecoresrv.htm**

RACE ROCKS ECOLOGICAL RESERVE

Coming to a webpage near you: **www.racerocks.com** is an exciting website that is being produced by Lester B. Pearson College. This site provides an innovative alternative to real visits on the reserve by developing a technological link that will provide viewers with a means of visiting this fragile environment without environmental impact.

Through the installation of cameras and sensors, the website will provide a 24-hour live interactive connection from the Race Rocks Marine Protected Area that will relay high quality broadcast information that showcases the unique marine environment. It is hoped that this will create a compelling educational tool for use in Canadian schools, create instructional strategies to educate users about marine environment, environmental issues, historical and First Nations use of the Area and establish an electronic data bank of marine life and environmental conditions

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