THRUSH

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Volume Six

2005

Nanaimo Field Naturalists Club

THRUSH

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Thrush is a publication of the

NANAIMO FIELD NATURALISTS

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Editors' Message

THRUSH, a publication of the Nanaimo Field Naturalists Club, is intended to be a "journal of record" for natural history in the mid-Vancouver Island area. It contains articles which are generally too long or too technical for inclusion in the Club Newsletter. THRUSH is produced intermittently, that is whenever enough reports have been submitted to justify printing an issue. The last edition (Series 2, Volume 5) was produced in 1998.

The environment of the Nanaimo area has changed over geological time (see article by K. Ketchen in Vol. 5, 1998) and has been subjected to the onslaught of human development over the past century. Impacts on our flora and fauna are presently accelerating. There is an urgent need to document what we have if future naturalists are to detect changes and to propose conservation measures which will address undesirable trends. It is hoped that THRUSH may contribute in some small way to that effort.

Much remains to be done. We are fighting a rear-guard action, and natural history documentation is falling more and more on the shoulders of naturalists as government agencies like the Provincial Museum and Parks Branch abandon that function. (Fortunately, the Conservation Data Centre has taken up some of the slack, but it also depends on records from people like us.)

We urge all naturalists to keep records, field notes, etc. in their areas of interest. The Editors would be happy to help non-professionals put their records into report form. We also encourage submission of articles from the broader community, i.e. staff at Malaspina University, Pacific Biological Station, Provincial Government (Environment & Forestry) and consulting companies. In this way, THRUSH could appear more regularly and become a more complete record of mid-Island natural history.

In the meantime, we thank the authors who have prepared material for this issue. Gordon Hartman's in-depth paper on the Nanaimo River provides a unique baseline and encourages naturalists to spend a bit more time looking into the water. A variety of other reports document road kills, waterbirds, amphibians, bald eagles, breeding songbirds, fish and plants. These reports are much appreciated, as it is the cover illustration done by Peter van Kerkoerle.

Don Blood
Bill Merilees

October, 2005

RIVERS: PRECIOUS AND COMPLEX ENVIRONMENTS

Gordon F. Hartman

INTRODUCTION

Although this paper will focus on the Nanaimo River, I will write briefly about rivers in general. This may help us to appreciate the rivers that are at our `back door' and perhaps, to understand them better. In this regard, I wish to do three things in this paper:

First; To show, however briefly, the enormous value and vulnerability of rivers in general. They are too often `taken for granted',

Second; To provide an overview sketch of how rivers work. They are much more than a conduit of water passing by, and

Third; To provide some brief notes on the species of fish and their distribution patterns within some British Columbia coastal rivers, particularly the Nanaimo River. Fish don't just live scattered at random along or within a river.

The information that I have presented is intended to introduce readers to some ideas. The literature on river hydrology, stream ecology, and salmonid distribution and biology occupies tens of thousands of publications and books. This article is extremely `thin on the water'.

1) RIVERS: PRECIOUS ENVIRONMENTS

How much water in rivers of the world?

Although rivers have enormous value in their ecological functions and in the services they provide to humanity, they constitute a miniscule fraction of the total freshwater supply of the world. Freshwater makes up only 2.8 % of the total water supply on earth, the rest is ocean. Of the total water supply, 2.24 % is contained in ice caps and glaciers, 0.61% is in groundwater, 0.009% is in lakes, 0.001% is in the atmosphere, and only 0.0001% is in rivers (Allan 1995). Human demands on these precious environments are becoming excessive. If present levels of water use continue to expand as they have, 48% of the human population of the world will live in water-stressed river basins by 2025. In 11 major river basins of the world projected total water supply will be <500m^3 per person by 2025 (Northcote and Hartman 2004). Fresh water, the product of sun, sea and rivers, is more urgently needed in our lives than gold, oil or logs. It is not a commodity to be `developed' for profit. It is an urgent necessity of life.

This is the `global' background against which we might view the Nanaimo River and its 'First Inhabitants', the fish. We have something precious in our backyard. Before we consider the Nanaimo River and its fish populations, it may, however, be useful to consider some of the things that determine the nature and character of a river. It may also be instructive to have some sense of how the complex biological systems, that support life within a river, are determined by the physical features of the system. These influence where fish are and what they do.

2) HOW RIVERS WORK

Why are rivers different in different places?

Looking back across time, the very nature of rivers and streams is determined by the geology, landform and climate within the regions where they occur(Figure 1). The nature of the river, whether warm or cold, tumultuous or gentle, rich or unproductive, is determined by climate, elevation, landform and time. Young channels may be steep and sediment-rich. As they age, they flatten, widen, build flood plains and become more gentle. With time, the shape of the channel and conditions within it will, secondarily, be influenced by the forests that develop within the watershed. Fallen tree trunks and root masses determine many of the structural features of west coast streams.

Erosion, transport and deposition: changing profiles along a river

Along the length of a stream, there is a transition in sediment dynamics. In the steep uppermost parts of a stream, sediments, sand, gravel and large stones, are entrained through landslides and erosion. The mid-reaches of the stream channel are primarily transport zones through which sediment is carried. The sediments are deposited in the estuary and alluvial zones above the estuary. In the alluvial zones, the river channels may shift back and forth with floods, and movement and deposition of logs and sediment. People who are ignorant of river behavior, or are misguided, put houses and trailer parks in such river zones. They and/or society `pay the price' for such land use when the river floods, moves, and demolishes such buildings.

The hydrological cycle

Rivers form the essential link in the sun-powered hydrological cycle, They link the ocean to the land. From the mountain tops down, they link the land to the sea through precipitation, soil water movement, and stream-lake water transport (Figure 2). Excessive use of groundwater and river-damming can disrupt this cycle. Inadequate pollution prevention (mining, forestry, agriculture, urbanization and marine transport) can degrade the quality of water at key points within the cycle.

Within this cycle, forests play a critical role in the behavior of water and the condition of streams (Figure 3).

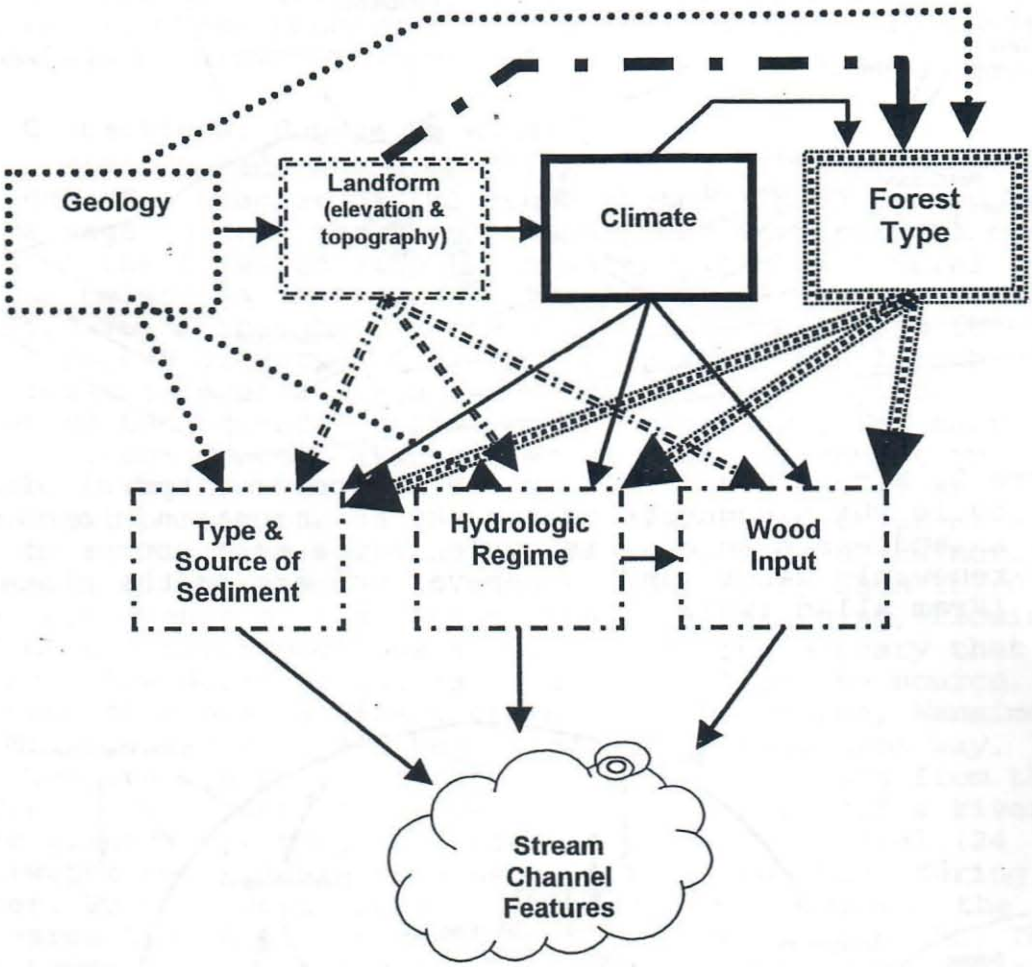

Figure 1. The basic character of a river or stream is determined by geology, landform, and climate. These elements determine sediment production and movement and flow regime. Over time, as forests develop, they further influence the shape and condition of stream channels. The Nanaimo River and the habitats of fish within it are the product of such elements and processes. (From Hartman and Bilby 2004).

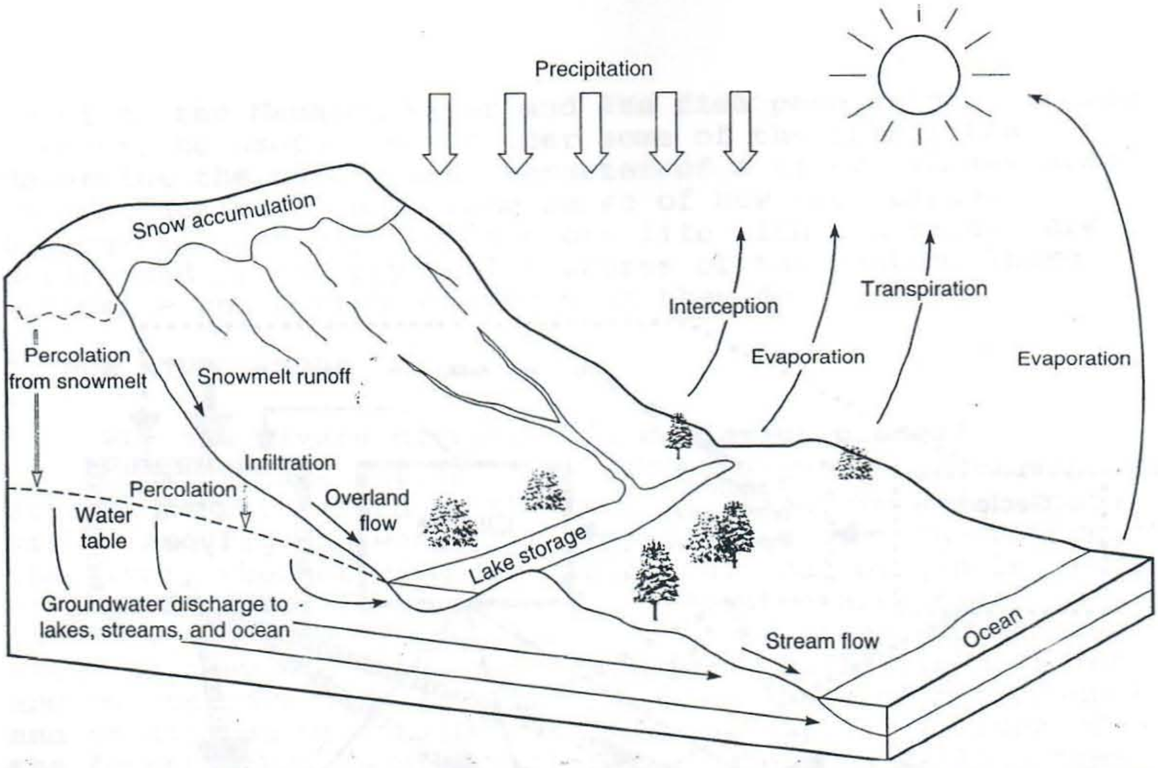

Figure 2. Rivers are driven by the sun-powered hydrological cycle which connects ocean, sky and mountain slopes in an endless circle. This cycle is the sole source of renewable water supply wherever you are on the planet. (From Allan 1995).

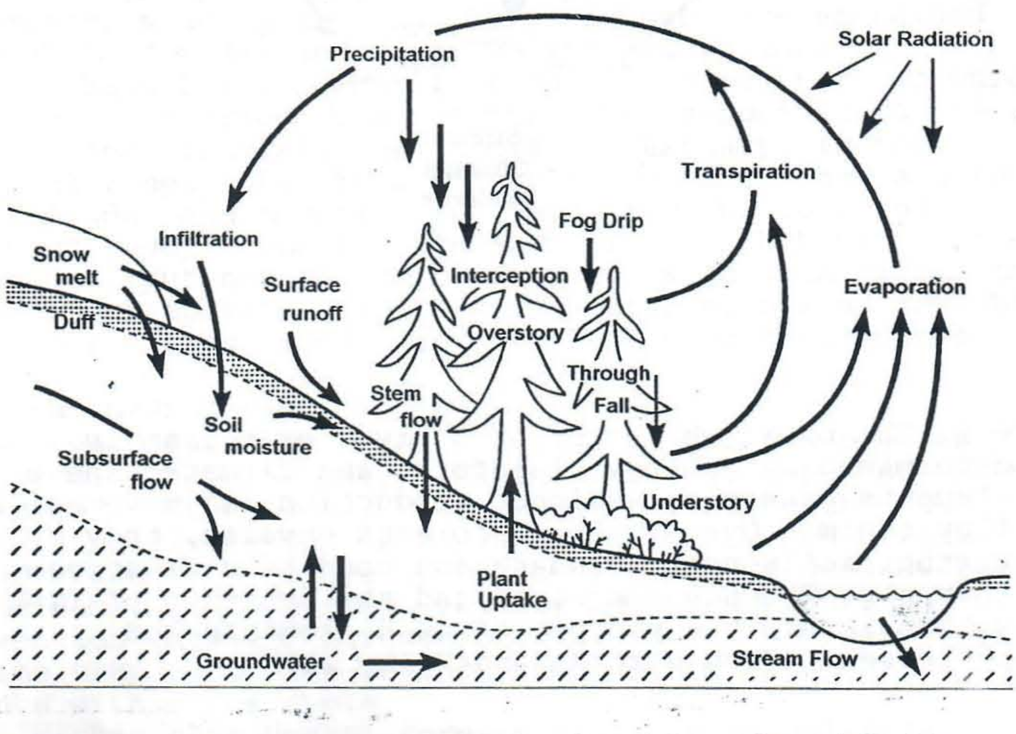

Figure 3. Within the hydrological cycle, forests re-circulate water. Forest soils and root systems slow the movement of water down slopes and prevent erosion. Forest play such a role in the Nanaimo River watershed, and their loss may result in erosion, water temperature increase and sedimentation.

Forests may recycle water and slow its movement to the stream. Their root systems stabilize soil and prevent erosion. Stable soils and vegetation reduce the severity of flooding.

The basic structural environment provides the setting in which physical and biological processes merge to produce fish habitat, and ultimately determine fish production (Figure 4). These processes need to be understood by those who manage natural resources.

Connections: Source to estuary

A river begins where the first drops of water drip from the edge of a glacier or fall through the alpine canopy. In its passage through the forest canopy and down through the soils of the forested slope, the water picks up mineral and organic molecules that provide the `chemical signature' of the stream. Although the stream is `connected' from its source to the estuary, it also changes along its length. In this regard, several years ago, a group of ecologists presented the concept of the `river continuum'. The heart of the continuum concept (Vannote at al 1980) is caught in Figure 5. The flowing part of a river begins in `first order' streams at the top of the figure. First order streams are the small, single channels, fed by seepage of raindrops or ice-melt. These merge to form second order, then third order components of the system. The ever-enlarging, flowing part of the river ends, usually, in a marine estuary that can be a few dozen or thousands of miles from the source. In spite of enormous size differences, the Amazon, Nanaimo and Millstone Rivers all begin and end in this same way.

Temperature patterns change as one progresses from the source to the mouth of a river. Near the source of a river, where groundwater seepage feeds the stream, the diel (24 hour)water temperature remains relatively constant during summer. Further downstream, 3rd and 4th order channel, the sun warms the stream in the day, and it cools at night. The diel temperature pattern is uneven. Far downstream, where the channel is too wide and deep to be influenced quickly by sun, and where the river combines the influence of many tributaries, the water temperature stays relatively constant around the clock.

The trophic (food production) systems of a stream change from source to mouth. Near the headwaters, insect production is based on leaves and litter that fall into the channel, decompose, and support a range of different feeding types of insects (Figure 5). However, most of the `headwater' insects are types that either `shred' fallen leaves and eat the pieces, or those that `collect' the ground-up leaf material and eat it. A small percentage of the insects may `graze' by scraping material from stones and logs. Progressing downstream, there is a <u>gradual</u> transition to a food production system that is based on photosynthesis; algal production based on sunlight and stream nutrients.

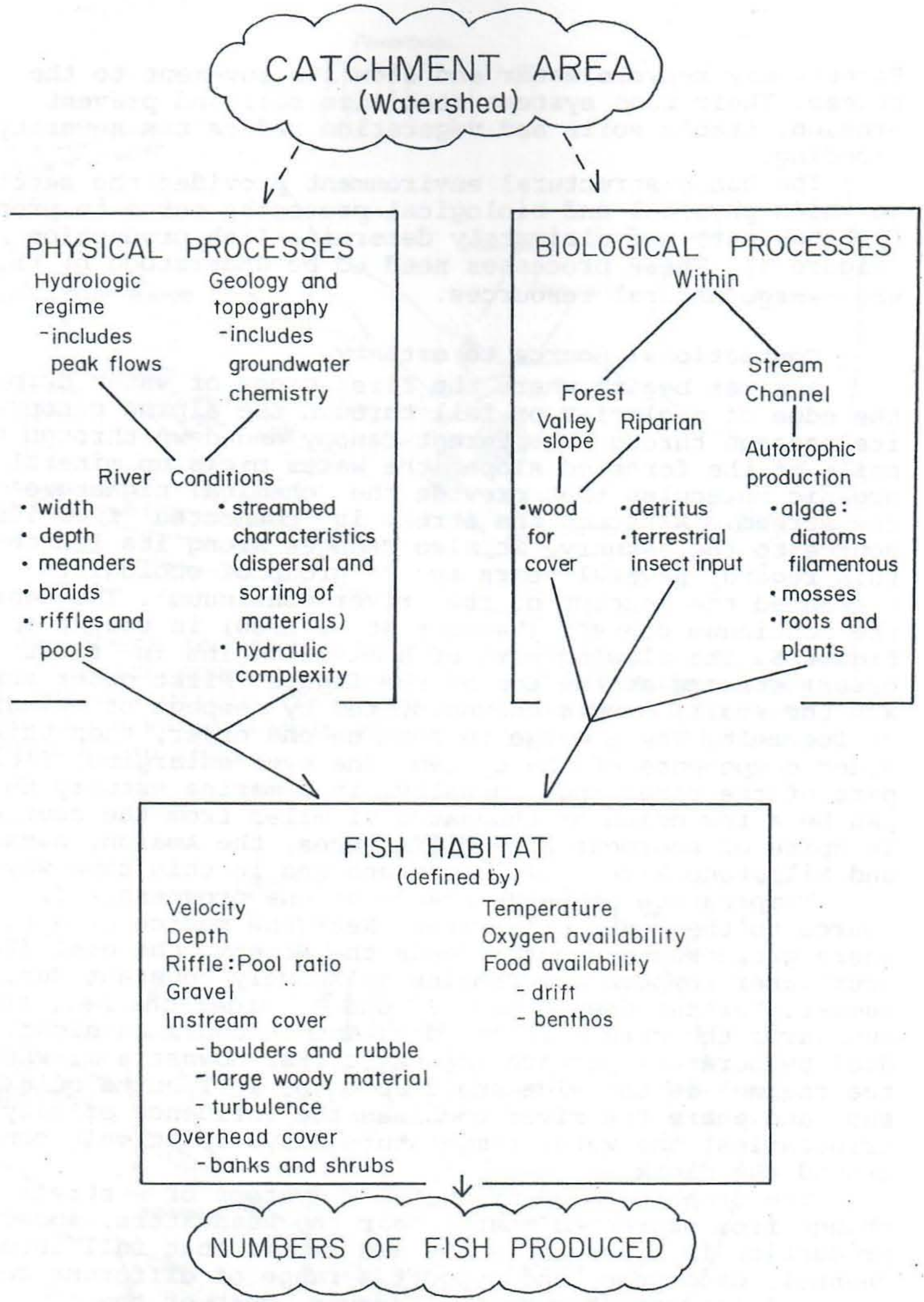

Figure 4. Within a river system there are intricate connections among the elements that ultimately determine fish production. Biological and physical processes work together to determine two main habitat elements, living space and food production, upon which all fish populations depend. (From Hartman and Bilby 2004).

With this transition, the composition of insect faunas shifts from shredders, to shredders and collectors, to more grazers and collectors, and finally to collectors (Figure 5). Note that the percentage of predators stays about the same all the way downstream.

Some or all of these features or processes within a river may influence where fish live and how productive their populations are.

3) SPECIES OF FISH - WHEN AND WHERE IN THE RIVER

Vancouver Island streams - fewer kinds of fish

Each coastal stream in British Columbia is occupied by an array of species. Vancouver Island rivers and streams characteristically have fewer species of fish in them than those in the lower mainland because there are no suckers here, nor minnows, except for Peamouth Chub.

The Nanaimo River - Size and shape

The Nanaimo River, with a drainage area of about 820 km^2, is a relatively small but complex system. The river system has a large estuary, two water storage reservoirs (Jump Lake and Fourth Lake), three in-river lakes, and about twenty small headwater lakes and ponds (Figure 6. The upper part of the river and its tributaries rise at elevations of 1,000 m or more, and then drop steeply down to lower gradient reaches of river. The mid-section of the river includes First Lake (Figure 7), Second Lake, and the river that joins them (Figure 7). These two lakes are important bodies of water for local recreation. Near its lower end the river passes through the White Falls Rapids (Figure 8) then under the Trans Canada Highway and down to the estuary (Figure 9). Along its full length, the river is fed by seven main tributaries and many small ones (Figure 6).

Nanaimo River - Salmonids

Nine species of salmonids use, or have used, the river for spawning and/or spawning and rearing. Chum and the remnants of a historically large pink salmon population use the river for spawning only. Sockeye salmon have used the river in low numbers. Coho and Chinook salmon spawn in the river and occupy it for an early part of their life history cycle. The Nanaimo River Chinook salmon exhibit three different early life history strategies with genetically isolated sub-populations (Carl and Healey 1984). One type spawns near the estuary and their young migrate to sea almost immediately after emergence. Another type spends two months in the river before going to sea, and the third life history type spends a year in the river. Coho salmon may spawn in small tributaries, with the young rearing in such habitat or moving downstream into the main river to rear. Steelhead and Sea-run Cutthroat trout use the river system, but may occupy different parts of it. For example, in other

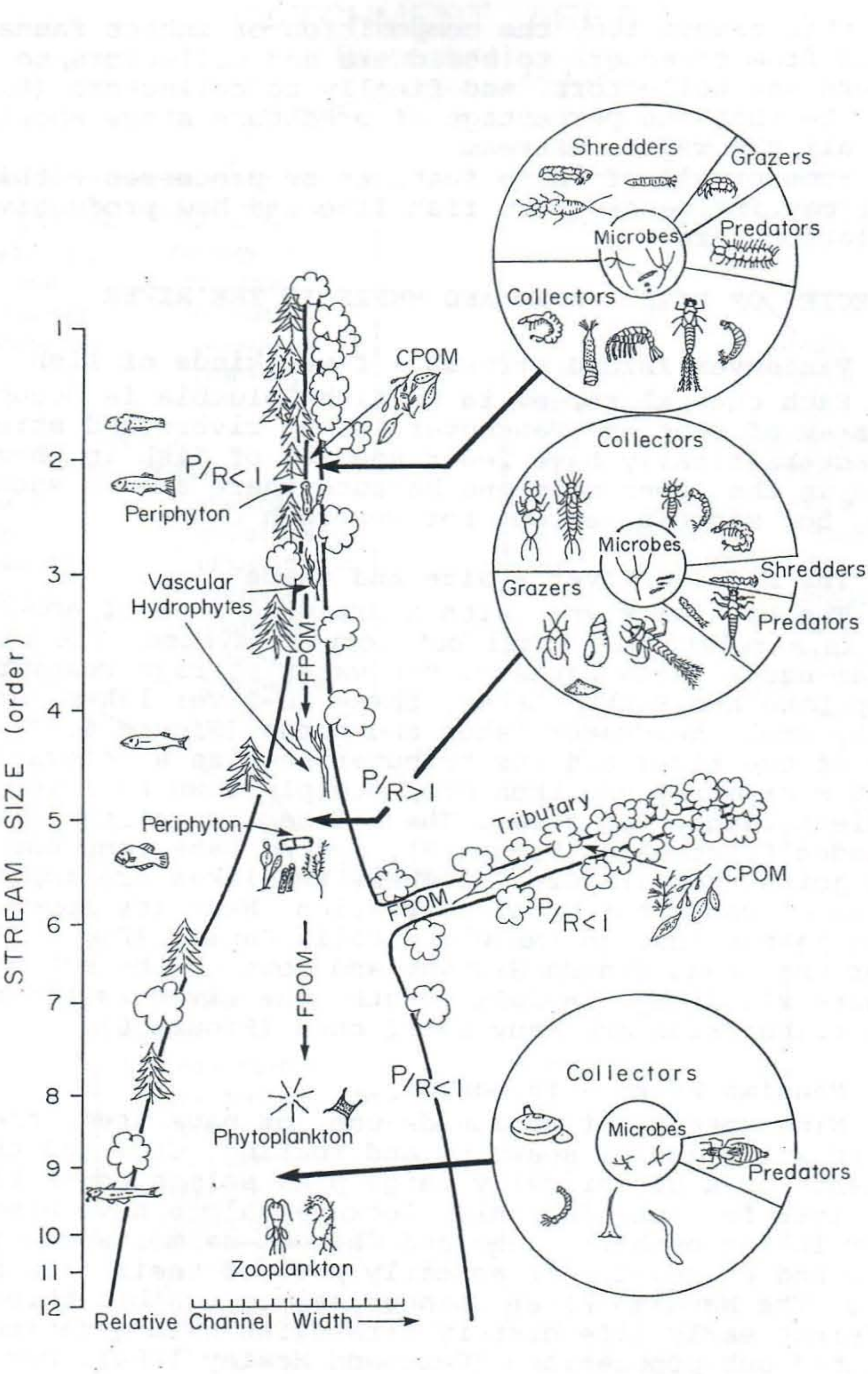

Figure 5. Along the length of a river a multitude of changes occur. Temperature patterns, flow volume and regime, trophic processes, invertebrate faunas and fish populations all change in a continuous sequence, the 'river continuum'. (From Vannote et al. 1980).

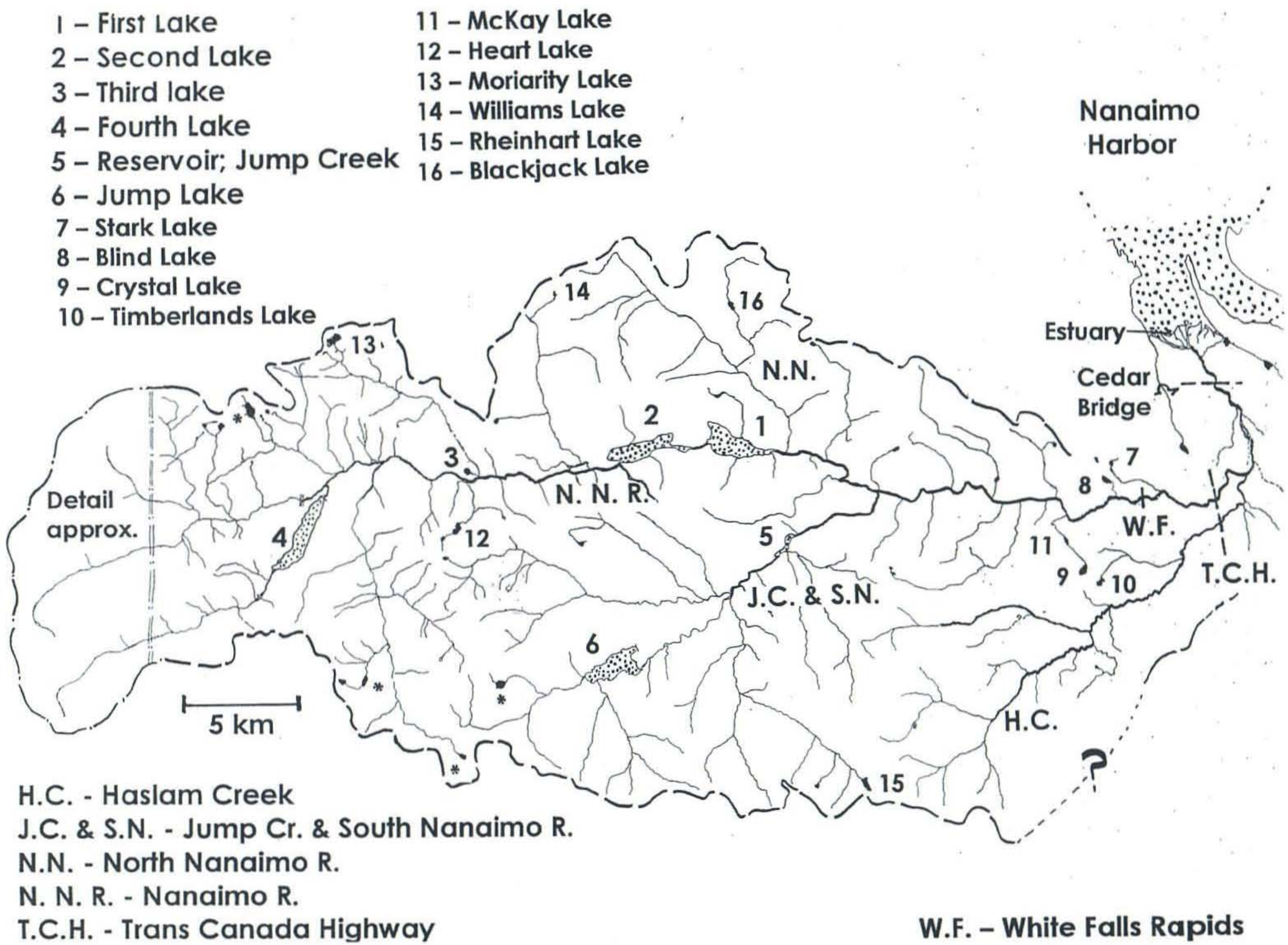

Figure 6. The Nanaimo River watershed with some of the main features and small lake locations indicated.

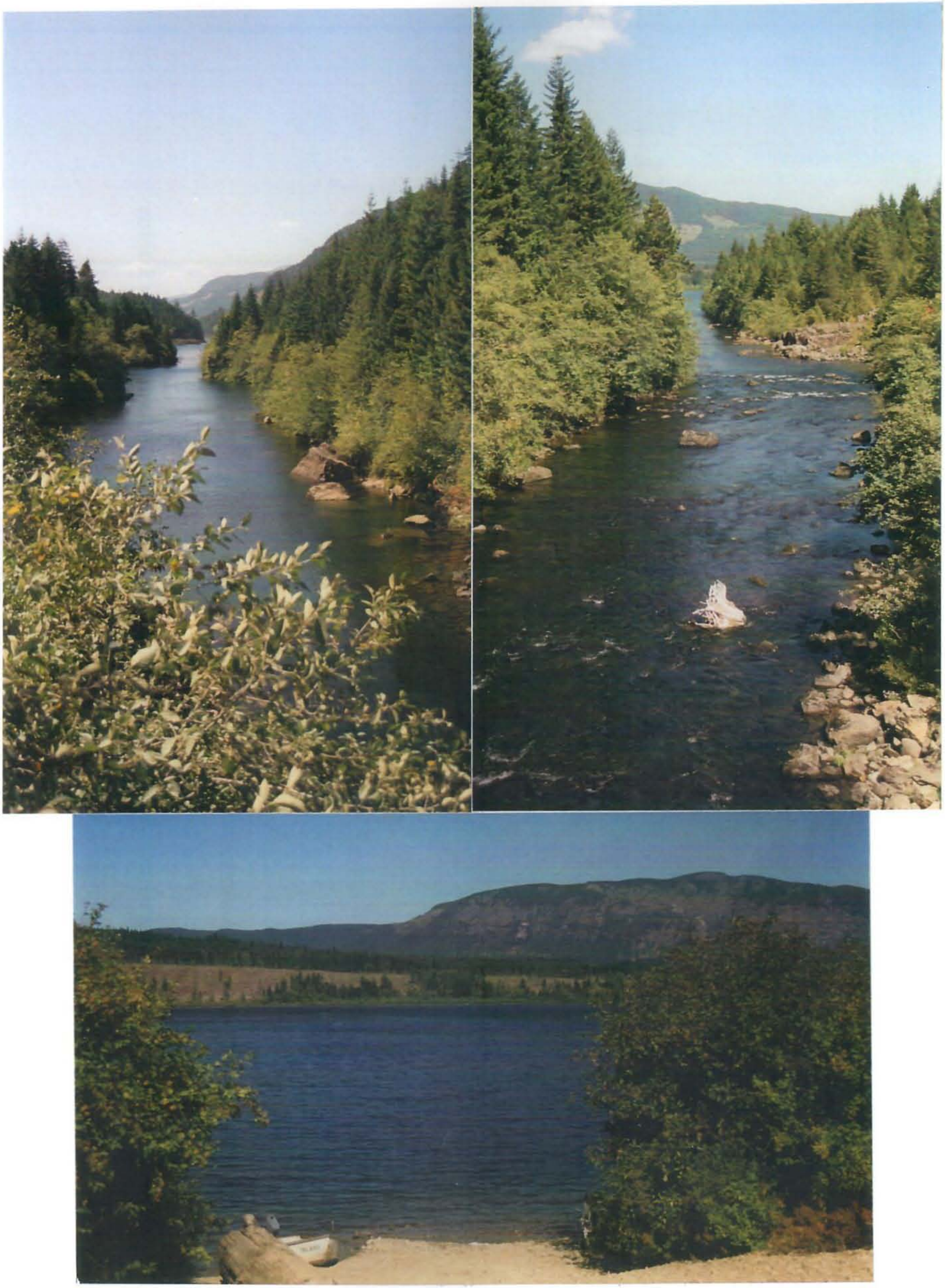

Figure 7. River below Second Lake upper left), entering First Lake (upper right), and First Lake (lower).

Figure 9. Estuary region: left channel (upper), `meadow' area (middle), and right channel from viewing tower.

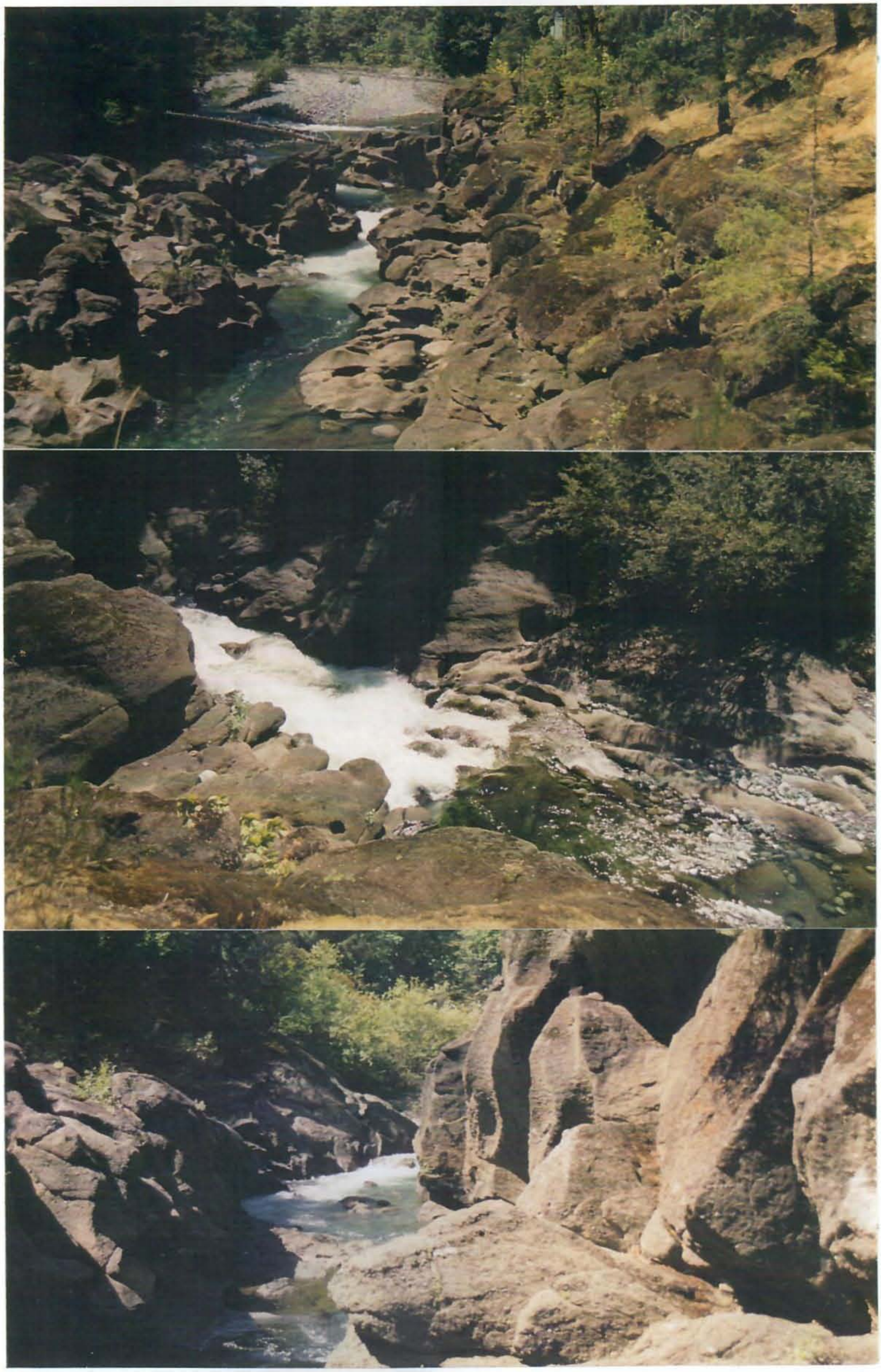

Figure 8. White falls rapids: upper end, middle section, and lower end, upper, middle, and lower panels respectively

B.C. lower mainland stream systems Cutthroat trout tend to be associated with small tributaries and slough systems while Steelhead spawn and rear in the main channels of streams (Hartman and Gill 1968). In addition to the above listed salmonids, resident Rainbow trout and Dolly Varden occur in the system.

The numbers of salmonids entering the Nanaimo River vary among species and fluctuate over time within species (Figure 10). Sockeye salmon enter the river in small numbers in some years. Pink salmon entered the river in large runs, 50,000+ long ago, but have been scarce since the 1950s (Figure 10). The three most abundant species of salmon are Coho, Chum and Chinook (Figure 10). The Steelhead catch (different from escapement) ranged from one to two thousand from 1965 to 1995. These escapement data show that the Nanaimo River is a valuable salmon system in spite of population losses.

Salmon, Cutthroat trout and Steelhead enter the river and spawn at different times. Fall-run chinook and Pink salmon begin to enter the river about the end of August. Chum and Coho and Cutthroat trout begin entry about the end of September, and Spring-run Chinook and Steelhead begin to ascend the river as early as the end of February (Figure 11). Most of these fish spawn shortly after river entry, however, Cutthroat trout and Chinook salmon spawn long after river entry (Figure 11). From 1995 to 2002 Chinook salmon entered the river over different time periods (Figure 12). The data in Figure 12 show that entry times may vary from year to year, and that methods of assessing run time influence apparent timing of river migration.

Nanaimo River - Non-salmonids

Two species of cottids (Prickly and Coastrange Sculpins), sometimes erroneously referred to as `Bullheads', live in the Nanaimo River system. There are Sticklebacks in the ditches and ponds in the estuarine part of the river. They can, during winter, be found dead in frozen, half-drained ditches near the main dyke that separates the Native-owned and conservation area of the estuary.

Holden Creek and Lake

Holden Creek is not an integral part of the Nanaimo River system, however, it is of interest that the Holden Creek and lake system support a native species of minnow, the Peamouth Chub. These fish are believed to spawn in the small creek that runs from Hemer Marsh into Holden Lake. I should add that I have looked for these fish many times, in this creek, and not seen them.

Patterns of zonation in rivers: General

The physiology and life history strategy of fish, in conjunction with channel structure, determine where they may occur along the river length. The behavior of fish and

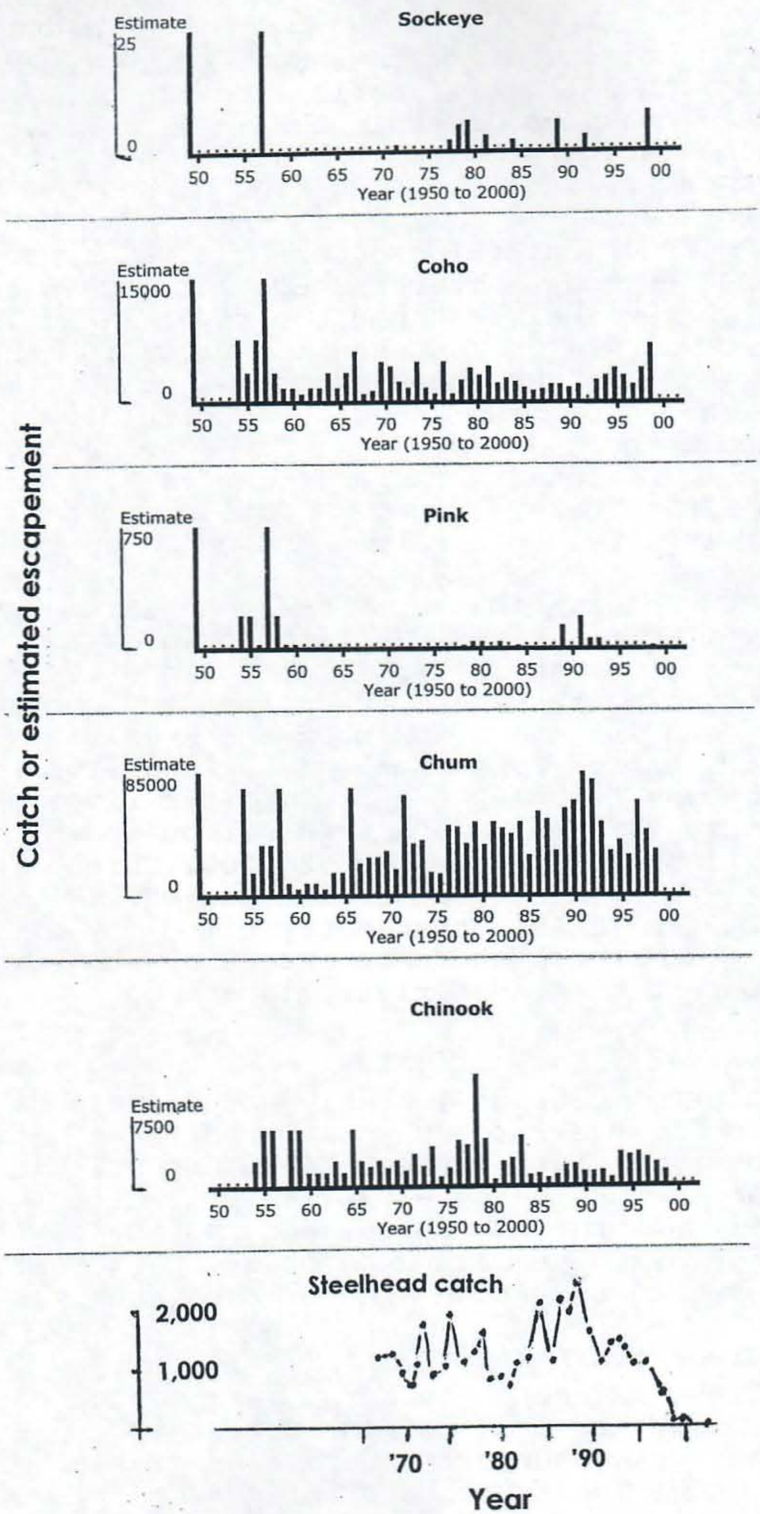

Figure 10. Numbers of salmon entering the river from 1950 to2002. The lower panel indicates the numbers of steelhead caught from 1967 to 1996. (http://pisces.env.gov.bc.escapement_graph.asp?str_id=1194&gazetted_name=Nanaimo).

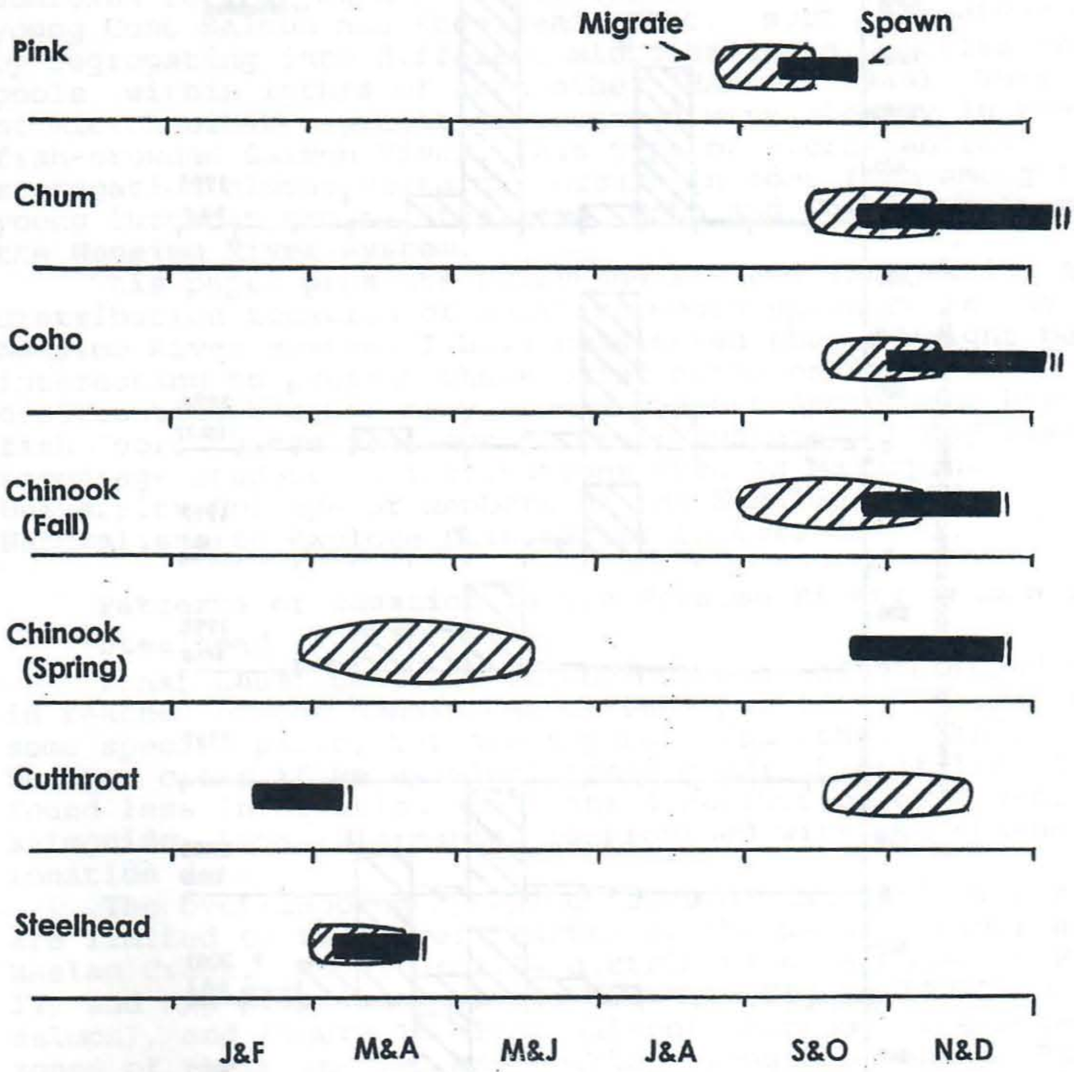

Figure 11. Approximate timing of migration and spawning of Pacific salmon, Cutthroat trout and Steelhead in the Nanaimo River. Note that the Cutthroat trout, that migrate in late autumn of one year, spawn in late winter or early spring of the next year.

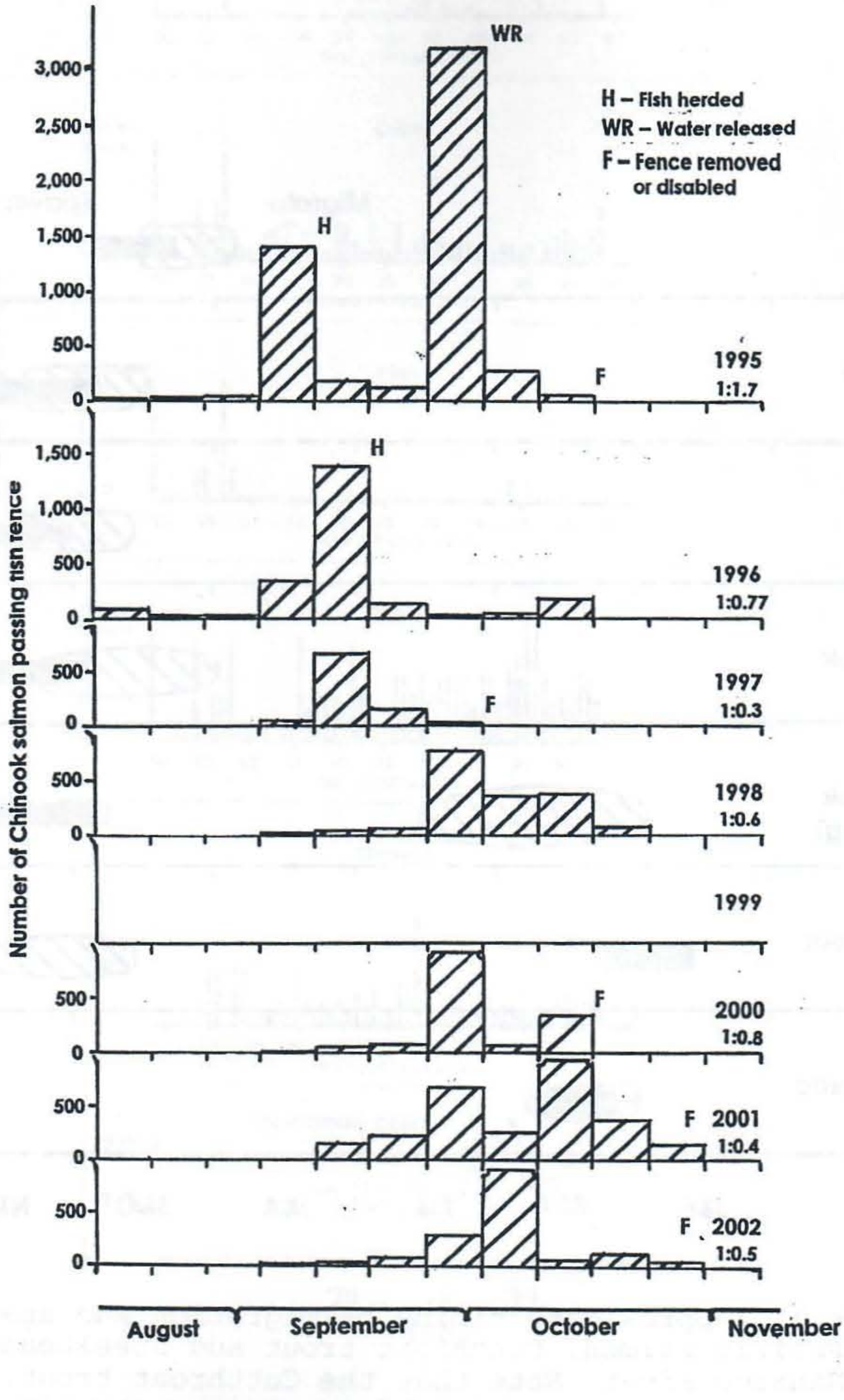

Figure 12. Timing of passage of Chinook salmon past the counting fence, 1995-2002, in the Nanaimo River. The fence is near the Cedar Road. River flow level, fence operation timing, and herding of fish all affect the apparent entry pattern.

interaction with other species determines the micro-habitat selected by the fish within the particular reach of the river that it occupies. In this regard, it has been known for many decades that fish distribute themselves in different zones along river systems (Huet 1959, Hartman 1968, Hartman and Gill 1968). Examples of zonation characteristics for complex fish faunas in the Salmon, Alouette and Chilliwack rivers are shown in Figure 13. In addition to this kind of separation, some species, e.g., young Coho Salmon and Steelhead trout, `sort themselves out' by segregating into different micro-habitats, riffles and pools, within inches of each other (Hartman 1965). This type of microhabitat segregation occurred very clearly in the fish-crowded Salmon River. This type of micro-habitat segregation almost certainly occurs in some form among the young Cutthoat trout, Steelhead, Coho and Chinook salmon in the Nanaimo River system.

This paper presents brief and limited information about distribution zonation of adult salmonid spawners in the Nanaimo River system. I have considered that it might be interesting to present these brief notes on fish distribution because many people may not appreciate how much fish `sort themselves' out in river systems. It may also encourage student in institutions such as Malaspina University College or members of the Nanaimo Field Naturalists to explore this matter in more detail.

Patterns of zonation in the Nanaimo River: Salmon & Steelhead

Pink, Chum, Coho and Chinook salmon and Steelhead spawn in reaches of the Nanaimo River that partially overlap for some species pairs, but are separate for others. This becomes clear if we examine stream gradient profiles. I found less information about the distribution of juvenile salmonids. Some information is provided with the spawner zonation data.

The over-lapping spawning zones of Chum and Pink salmon are limited to the lower reaches of the Nanaimo River and Haslam Creek. River profile distribution is shown in Figure 14, and map distributions are shown in Figure 15 (Chum salmon), and Figure 16 (Pink salmon). Although the spawning zones of these species may overlap along the Nanaimo River and Haslam Creek, they may select somewhat different kinds of spawning location within those reaches. The young Pink and Chum salmon migrate to sea almost immediately after emergence and require no specific rearing habitat in the river.

The spawning zones of Coho and Steelhead overlap partially in Haslam and Jump creeks, stream profiles shown in Figure 14, and map distribution shown in Figure 16. Steelhead, however, spawn along main-stem reaches of the Nanaimo River and Coho do not. Coho spawn upstream in the North Nanaimo River, Steelhead do not do so (Figures 14 &

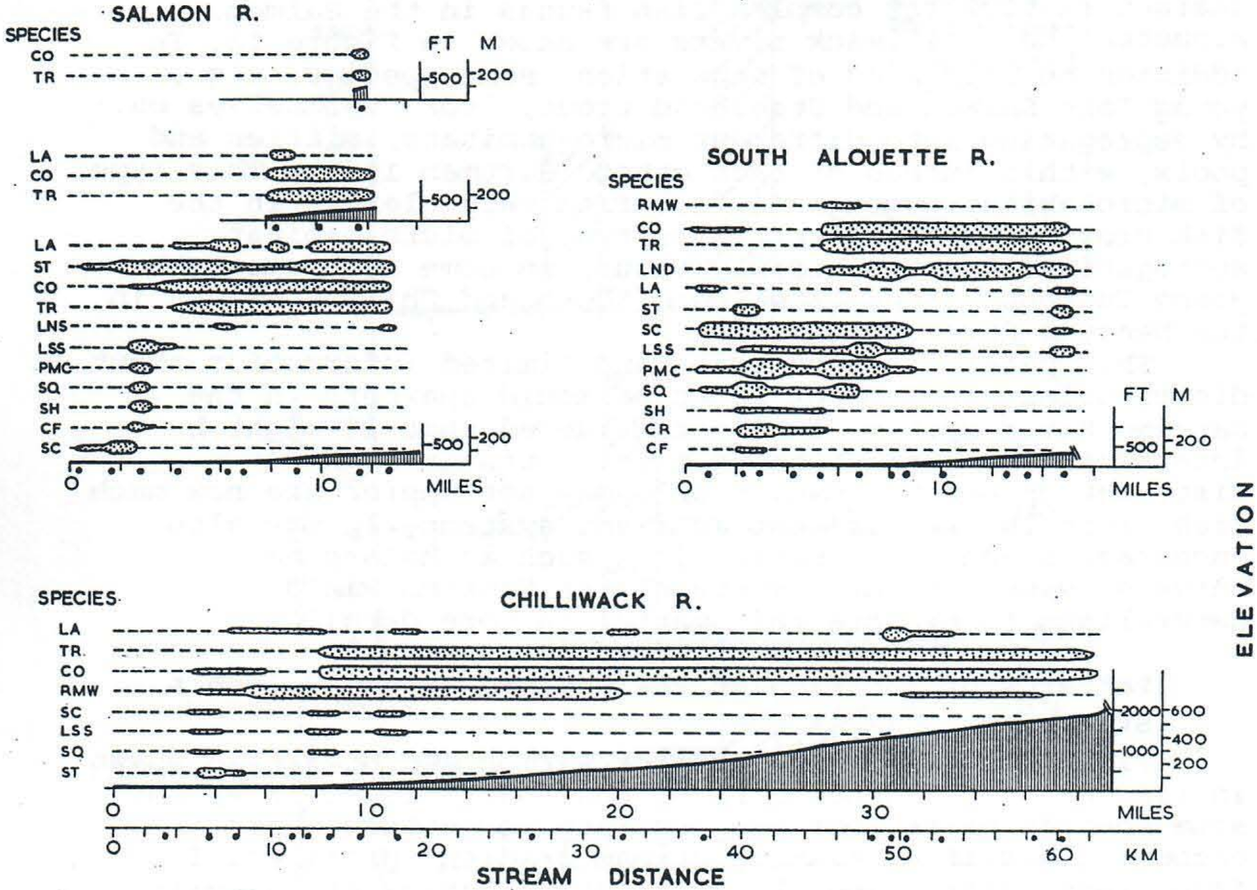

Figure 13. Distribution patterns of fish in three coastal British Columbia rivers of different size. Dots on the distance axis indicate the collection sites. Wide parts of the distribution bar indicate that the species was taken >3 times during the total sampling period. Narrow bars indicate that the species was taken once or twice. Species are CO-Coho salmon, TR-trout (Sp.), LA-lamprey, LNS-Longnose sucker, LSS-largescale sucker, PMC-Peamouth chub, SQ-Squawfish, SH-Redside shiner, RMW-Rocky Mountain whitefish, LND-Longnose dace, CF-Brown catfish, CR-Black crappie, SC-Sculpin (Sp.), ST-Threespine stickleback.

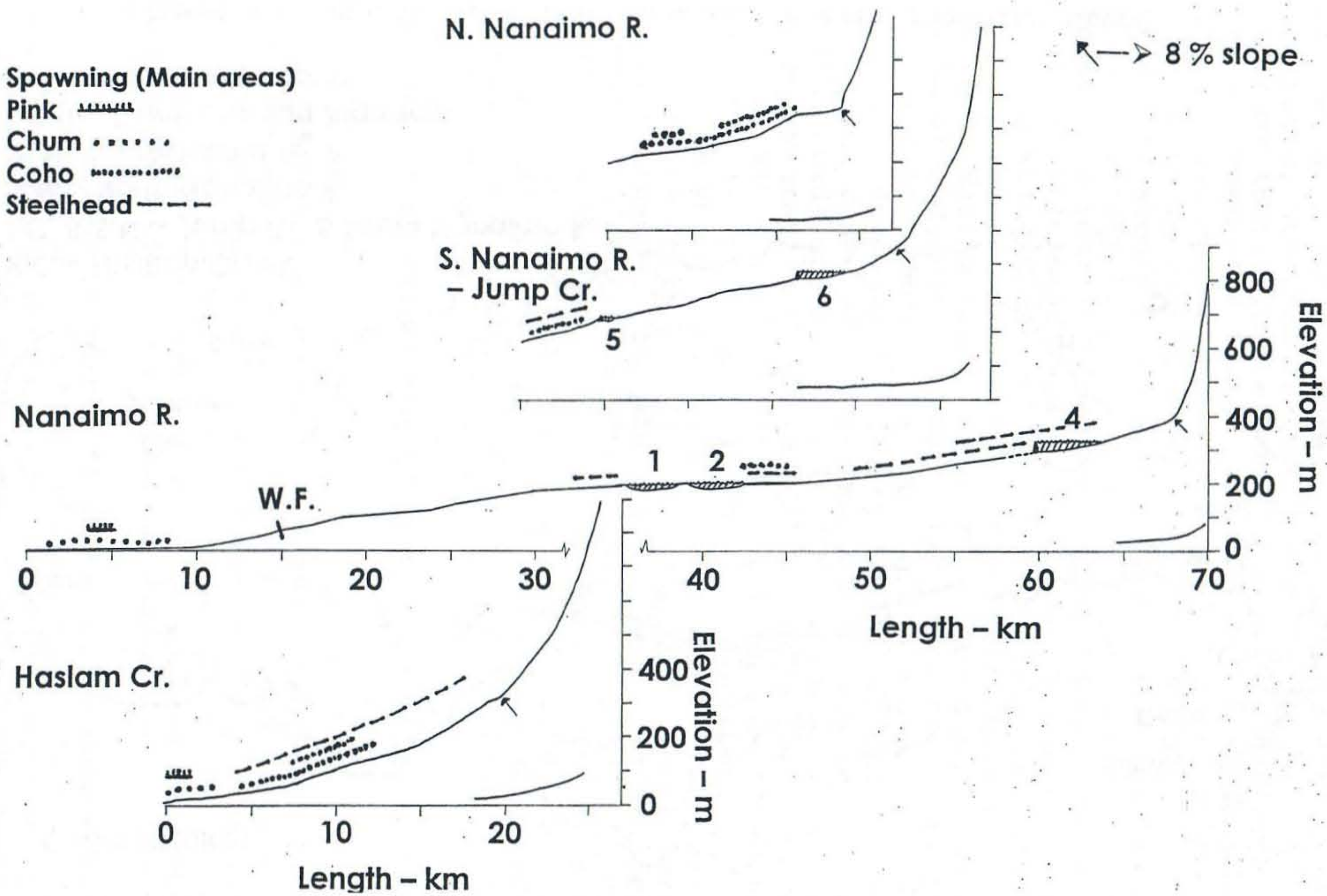

Figure 14. Approximate main spawning areas for Chum, Pink, and Coho salmon, and Steelhead in the Nanaimo River and tributaries. Double distribution marks indicate spawning in a small, un-named tributary adjacent to the stream for which the profile is shown. The numbers 1, 2, and 4, indicate First, Second and Fourth lakes.

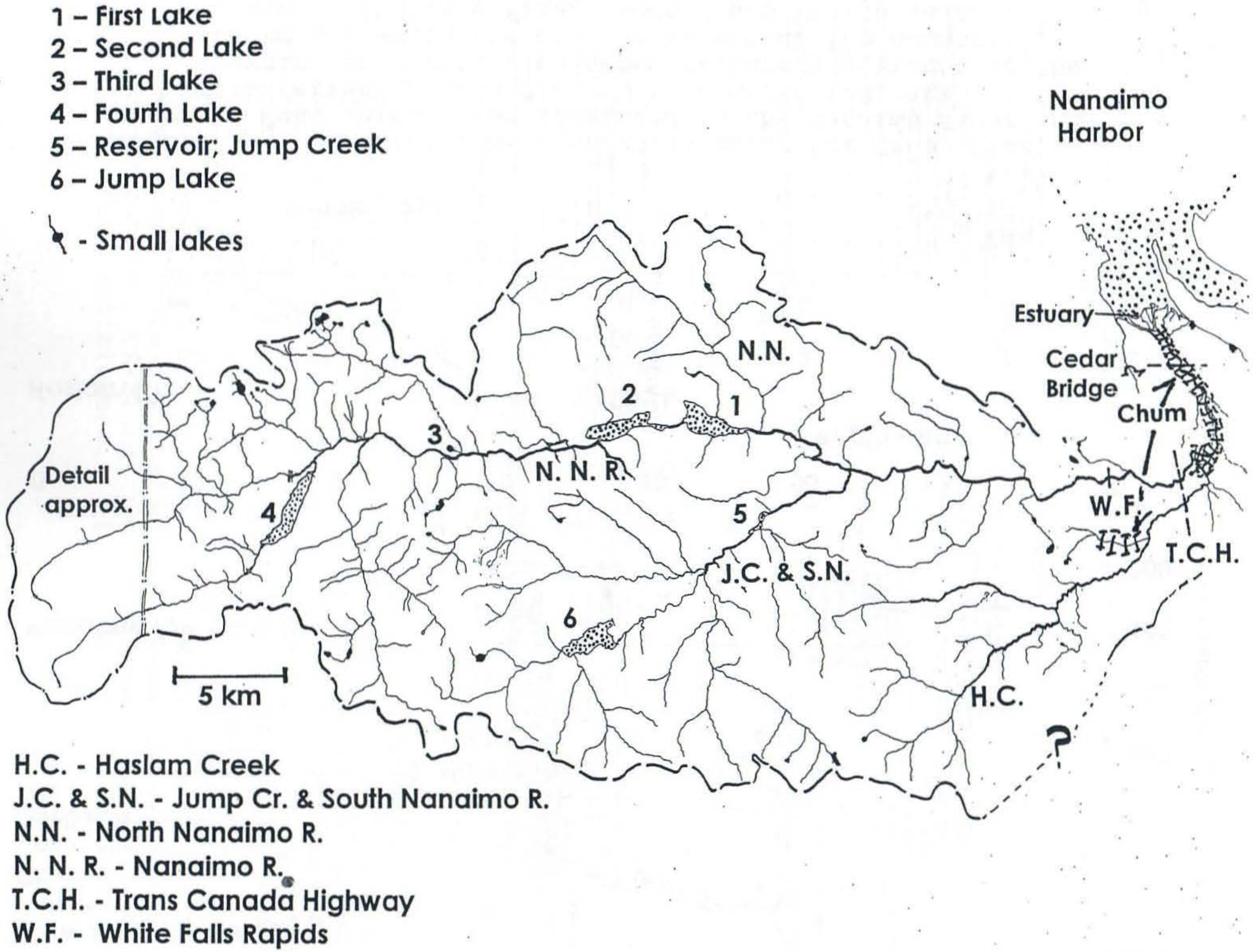

Figure 15. Approximate distribution of main spawning Chum salmon.

16). The juveniles of these two species occur together along many rivers and streams. However, during periods of high abundance in spring and summer, in small streams, they interact and select different microhabitats within the zones of overlap along the stream length. Coho select and `win' in the pools, Steelhead select and `win' in the riffles (Hartman 1965). In the Nanaimo River young Coho salmon may use a number of different rearing habitats. They will enter flood-plain channels and sloughs during the autumn and overwinter in such habitat. This type of habitat is visible under the wooden bridges on the path that runs from Morden Road, Colliery Historic site, out to the Nanaimo River. Young Coho rear in First and Second lakes along with young Chinook, Steelhead, and Cutthroat trout and Dolly Varden.

Spawning distributions of Steelhead and Chinook Salmon overlap in the main-stem Nanaimo River, however, Steelhead spawn in Haslam Creek, Jump Creek, and a small un-named tributary adjacent to Fourth Lake (See stream profile distributions Figures 14 & 17, and map distributions Figures 16 & 18). Spring and fall populations of Chinook spawn in different zones of the Nanaimo River (Figure 18). White Falls Rapids act as a partial or complete barrier to Chinook salmon migration when river flow volume is low. Under current water use and management these low flows may occur as early as April, and extend until November.

The young Chinook from the spawners that use the reach below White Falls Rapids migrate to sea almost immediately after emergence (Carl and Healey 1984). Young upper river `Spring' Chinook from emerge, feed for about 90, days then migrate to sea. `Spring' Chinook salmon with this type of life history are referred to as `Ocean type'. A second kind of `spring' Chinook emerges after hatching and remains in the river for a full year. This kind of Chinook is referred to as `Stream type'(Carl and Healey 1984).

NANAIMO RIVER WATERSHED: THE LAKES AND FISH IN THEM

Lakes

There are about two dozen small lakes and tarns within the watershed. The locations of 16 of the lakes and reservoirs are indicated in Figure 6. Jump Lake and Jump Creek reservoir were created as reservoirs for water storage for the pulp mill and Nanaimo. Fourth Lake lies behind a dam. First and Second lakes lie within the course of the main river.

The lakes contain different species combinations. Data from 1985 to 1989 indicate that Rainbow, Cutthroat and Steelhead trout were used for stocking. Stocking for angling sustains the fish populations in most of the small high elevation lakes. Cutthroat trout occur in 14 of the lakes, and Rainbow occur in 7 (Table 1). Resident Cutthroat and Dolly Varden occur naturally in the system. Kokanee salmon have been found in Second Lake (T. Gjernes, Nanaimo, Pers.

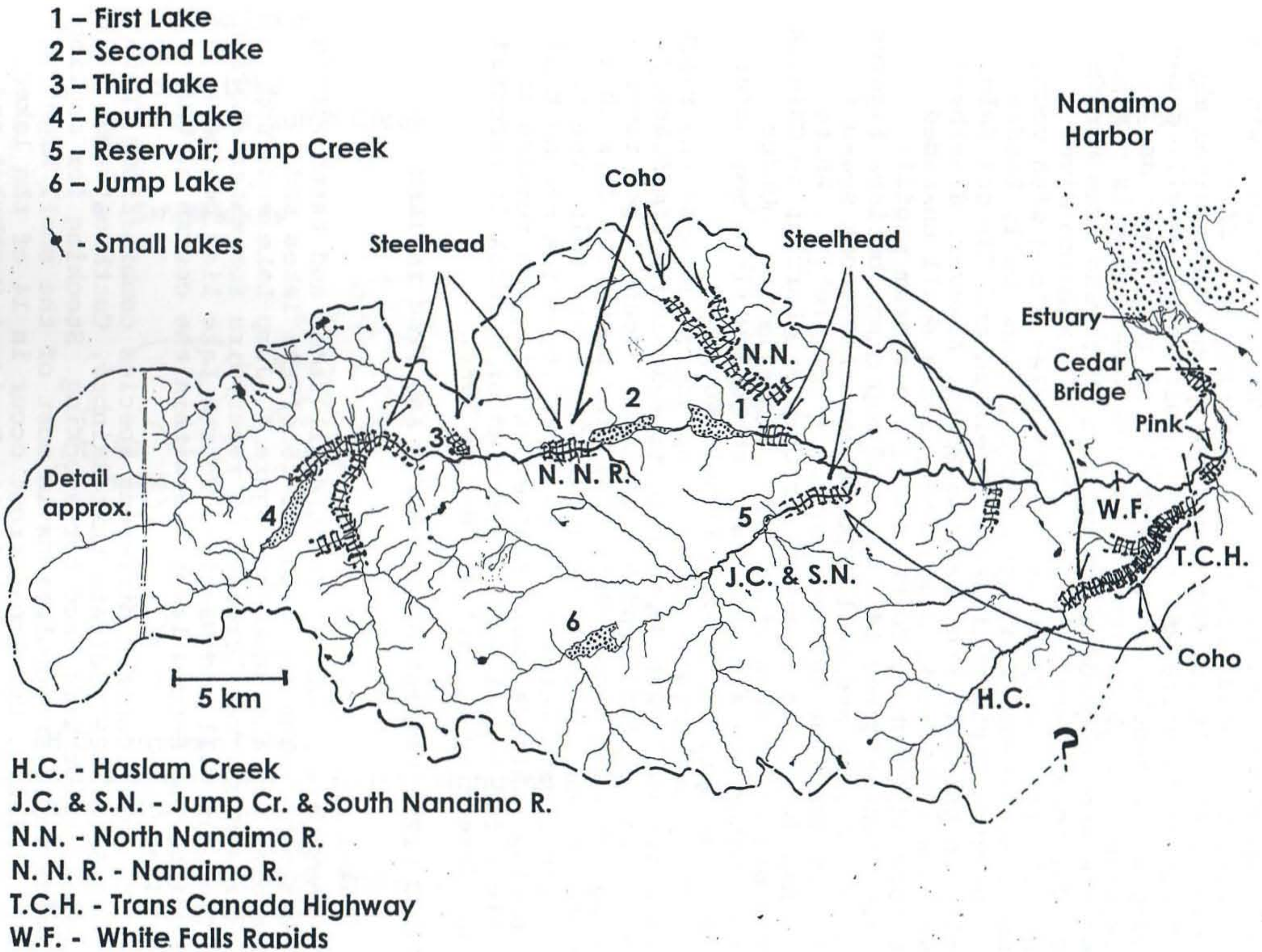

Figure 16. Approximate distribution of Pink and Coho salmon, and Steelhead main spawning areas.

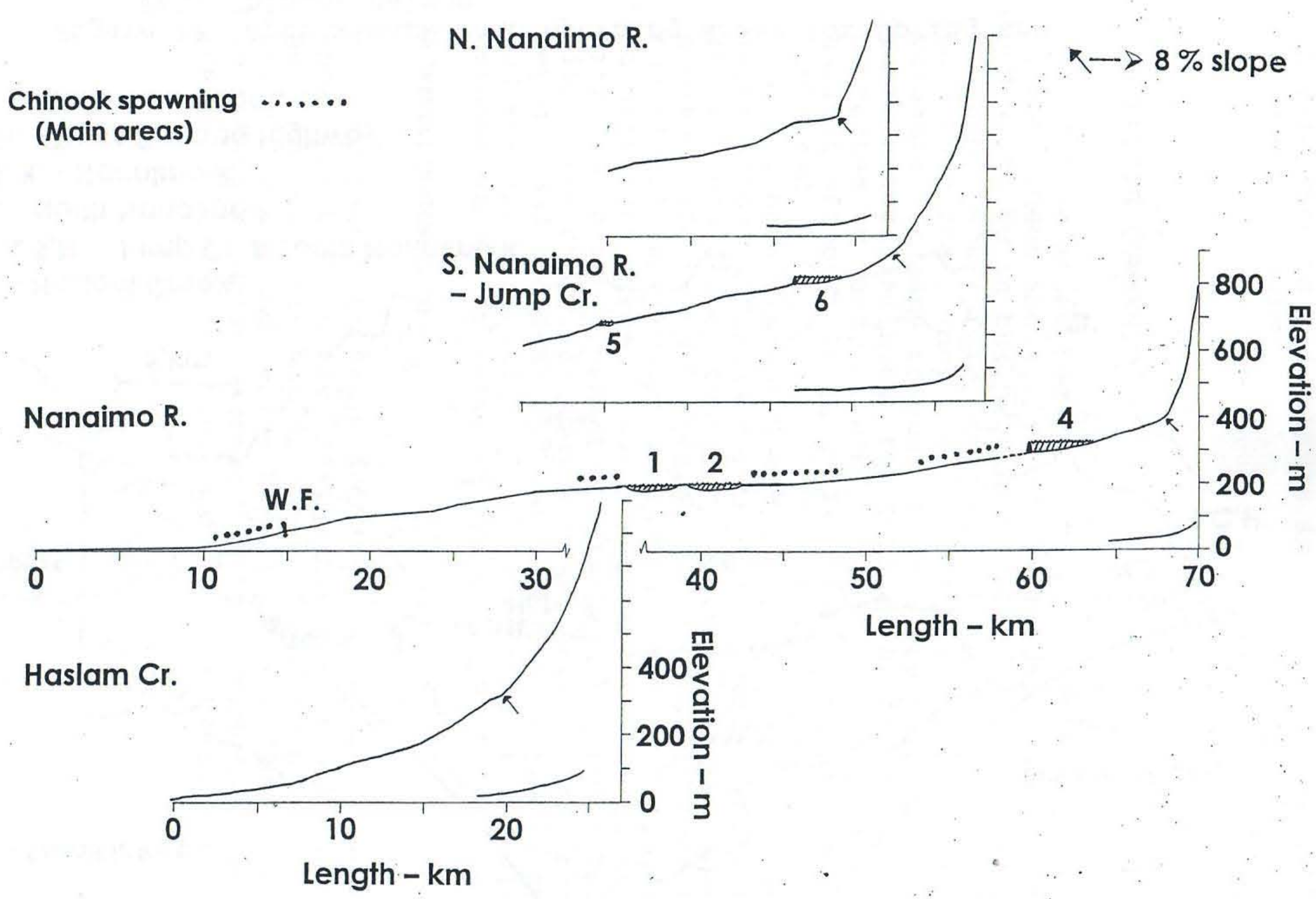

Figure 17.Approximate main spawning areas for Chinook salmon.

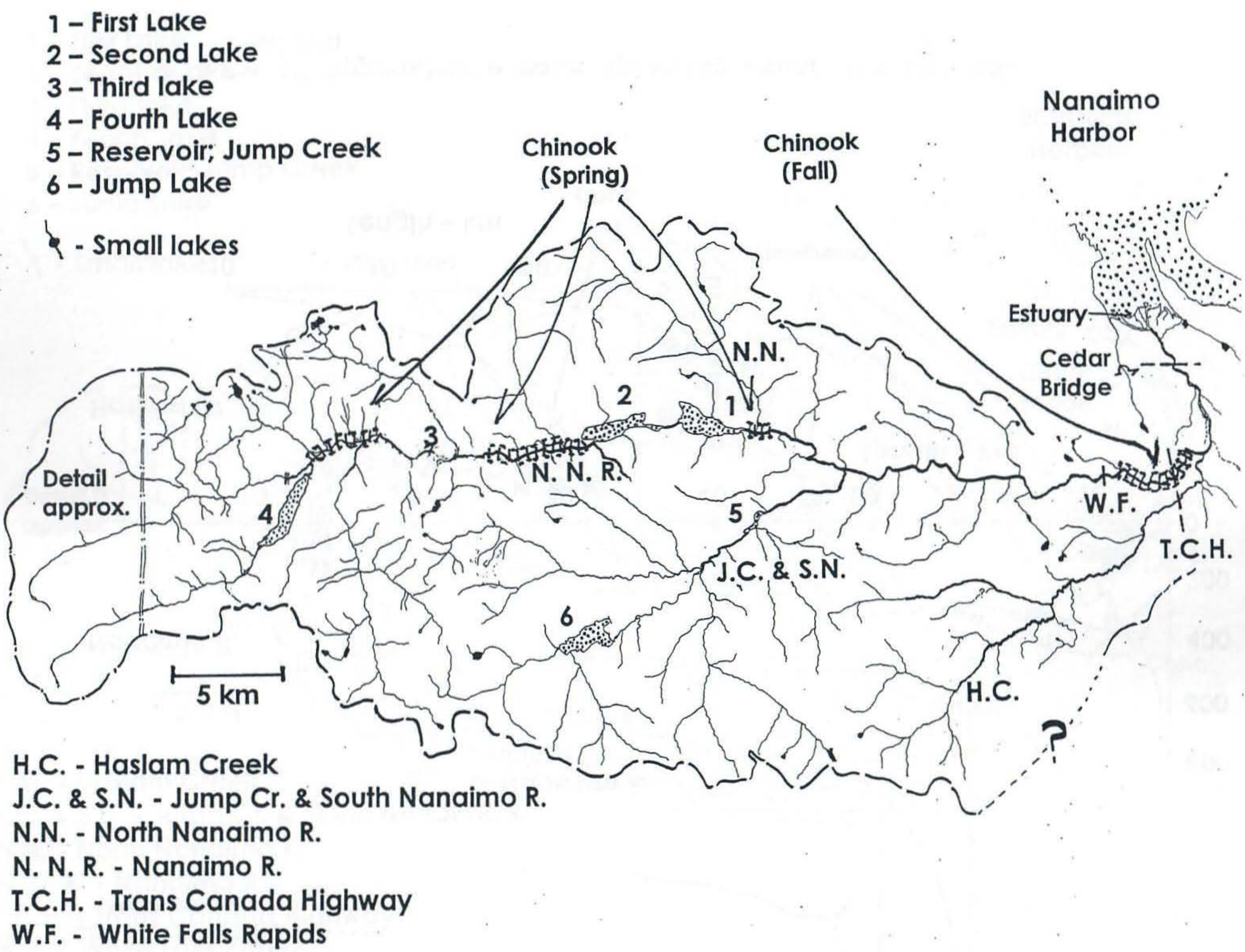

Figure 18. Approximate main spawning areas for Spring and Fall Chinook salmon.

comm.). (Except for Narver 1972, I have not listed the reports in Table 1 in the reference list. The information is in file reports and letters in the provincial fisheries offices in Nanaimo).

CONCLUDING COMMENTS

I have attempted to, very briefly, introduce readers to some ideas about rivers. While their main function may appear to be in the provision of the fastest way to transport water form the land to the sea, rivers are much more than that. They are intricately complex, beautiful, and valuable for many reasons. Rivers are precious, vulnerable environments. Although the Nanaimo River is partially disturbed by dams, altered flow regimes and land-based habitat effects, it is still a system to be treasured and protected.

I have presented a very brief summary of some of the information on fish distribution. This information, brief as it is, should show that the complexes of fish species have evolved life history strategies that permit them to share the river'' environments. They do this by coming and going at different times, living in different habitats, and having different ocean/freshwater life history requirements. The fish, like the river they live in, are a priceless heritage beyond food and fishing. The extent to which we appreciate and sustain them will tell us something of ourselves, and perhaps be an indicator of the quality of our own future.

ACKNOWLEDGEMENTS

My thanks to Henry Bob (Nanaimo River Hatchery), who knows the Nanaimo River like the back of his hand, and who gave me much information about the distribution of salmon. Terry Gjernes and George Reid also provided advice and information. Helen Hartman, as she often does, read the paper to find my writing errors, as I often make.

Table 1. Lakes within the Nanaimo River watershed and species of fish within them. Numbers indicate the locations of lakes on map, Figure 6. Kokanee occur in Second Lake (T. Gjernes, Pers. comm.). The references are for reports, letters and data sheets on file with the Provincial fisheries agency.

LAKE	SPECIES	REFERENCE
First Lake (1)	Coho & Chinook salmon, Prickly & Coastrange sculpin, Cutthroat trout, St/rainbow trout	Burns (1970)
Second Lake (2)	Coho & chinook salmon, Prickly & Coastrange sculpin, St/rainbow, & cutthroat trout, Dolly Varden char	Burn (1970), Anonymous checklist (no date)
Third Lake (3)	Cutthroat trout, Prickly sculpin	Burns & Tredger (1974)
Fourth Lake (4)	Rainbow & cutthroat trout, Dolly Varden	Burns (1970)
Jump Lake (6)	Rainbow & cutthroat trout, Dolly Varden char	Narver (1972)
Stark Lake (Private) (7)	Rainbow & cutthroat trout	G. Reid, Pers. comm.
Blind Lake (8)	Rainbow & cutthroat trout	G. Reid, Pers. comm.
Crystal Lake (9)	Cutthroat trout	G. Reid, Pers. comm.
Timberlands Lake (10)	Cutthroat trout	Anonymous (1979), Lorz (1963)
McKay Lake (11)	Cutthroat trout	Fish Data Sheet (1994)
Heart Lake (12)	Rainbow trout	Burns (1970)
Moriarity Lake (13)	Cutthroat trout	G. Reid, Pers. comm.
Williams Lake (14)	Cutthroat trout	" " "
Rheinhart Lake (15)	Cutthroat trout	" " "
Blackjack Lake (16)	Cutthroat tr. Coho	" " "

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"Flattened Fauna on Rural Roads"

By Joe Materi

Introduction

To many, the term "road-kill" conjures up images of red smudges along major highways, often unidentifiable at highway speed. In recent years, traffic-related mortality has received increased attention by wildlife researchers. In North America, investigation has focused almost exclusively on highway impacts (e.g. Evink *et al.* 1999). However rural roads (Figure 1), with their lower traffic volumes and slower speeds, may also exact a toll on wildlife. We suspect this from studies carried out in the U.K. and Europe, where the subject has been studied since the 1960's. That part of the world pioneered several techniques to reduce the impact of roads on wildlife, in both urbanized and country settings (Ryser and Groosbacher 1989).

Armed with this knowledge, I decided in early 2002 to conduct some "Citizen Science" by recording all road-killed wildlife I encountered on my weekly walks through South Wellington, a small community 3 km south of Nanaimo. My goal was to document the range of species impacted by rural roads or a full year, and determine if any seasonal or species-specific patterns could be teased out of the data.

Methods

Detailed recording extended over 11 months of 2002, commencing in January and ending in November. Additional observations recorded over the spring of 2005 have been included in the discussion of results. A 3.8 km circuit was walked weekly, during which time roads and adjacent ditches were searched for carcasses. The route passed through rural residential areas, wetlands, pastures, an elementary school and light industrial park. All road-kills encountered were recorded in field notes then removed to avoid double counting. Posted speed limits along the weekly route ranged from 30 to 50 km/hr, and traffic volumes were estimated to be approximately 100 vehicles/day.

Results & Discussion

As shown in Table 1, a total of 36 road-kills were recorded over the 11 month recording period, averaging 3.3 per month and 9.5 per km of road monitored. If these values seem trivial, consider extrapolating them to the nearly 150 km of rural roads in Electoral Area A of the Regional District of Nanaimo (RDN). Such an extrapolation produces an estimated annual road-kill of approximately 1,400 animals within Area A alone. With six similar rural Electoral Areas comprising the RDN (i.e. Areas B through G), rural road-kills in the region may approach 10,000 animals annually! While some species may have the reproductive capacity to persist despite high annual losses, those taking several years to reach sexual maturity might not.

Fig. 1. Scotchtown Road in South Wellington.

Table 1. Traffic-killed wildlife in the study area, January – November 2002.

Species / Group	Recorded Mortality Along Route	Proportion of All Recorded Mortality (%)	Estimated Road-kills in RDN Area "A" Annually
Garter Snake (unspecified)	11	30	440
Rough-skinned Newt	8	22	320
Pacific Treefrog	4	11	160
Shrew (unspecified)	4	11	160
Deer Mouse	3	8	120
Red-legged Frog	1	3	40
Western Red-backed Salamander	1	3	40
Mink	1	3	40
American Robin	1	3	40
California Quail	1	3	40
American Coot	1	3	40
Total Traffic-killed Wildlife	**36**	**100 %**	**1,440**

Table 1 suggests that few kinds of small wildlife are immune from collisions with vehicles. In total, 11 taxa were represented in the 2002 data set. Since the completion of the study, five other small species have been documented as road-kills (Eastern cottontail, Townsend's Vole, Northern Flicker, Chestnut-backed Chickadee and Northern Alligator Lizard).

Interestingly, no large mammals have ever been detected as road-kills along the route, probably due to their increased visibility, the potential for vehicle damage / human injury, and the low posted speed limits. Deer, raccoon, mink, beaver and corvid, waterfowl, and raptor road-kills have all been observed along the Island Highway in the Nanaimo area between 2002 and 2005.

Garter snakes were among the most commonly recorded taxa in 2002, representing 30% of all records. Both the Common Garter Snake and Northwestern Garter Snake (including an interesting melanistic dark form) are common in this area. Snakes are especially vulnerable to road-related mortality because of their linear bodies, slow movement relative to traffic, and their habit of basking on warm road surfaces (Rudolph *et al.* 1998). Looking at the mortality data by season (Figure 2) snake kills appeared at first to be strictly a summer phenomenon. However, recent observations revealed numerous snakes are also killed on roads during spring (Figure 3), shortly after emerging from hibernacula. Adults and juvenile snakes were evenly distributed among the 2002 road-kill data.

Fig. 2 Rural road-kills by season.

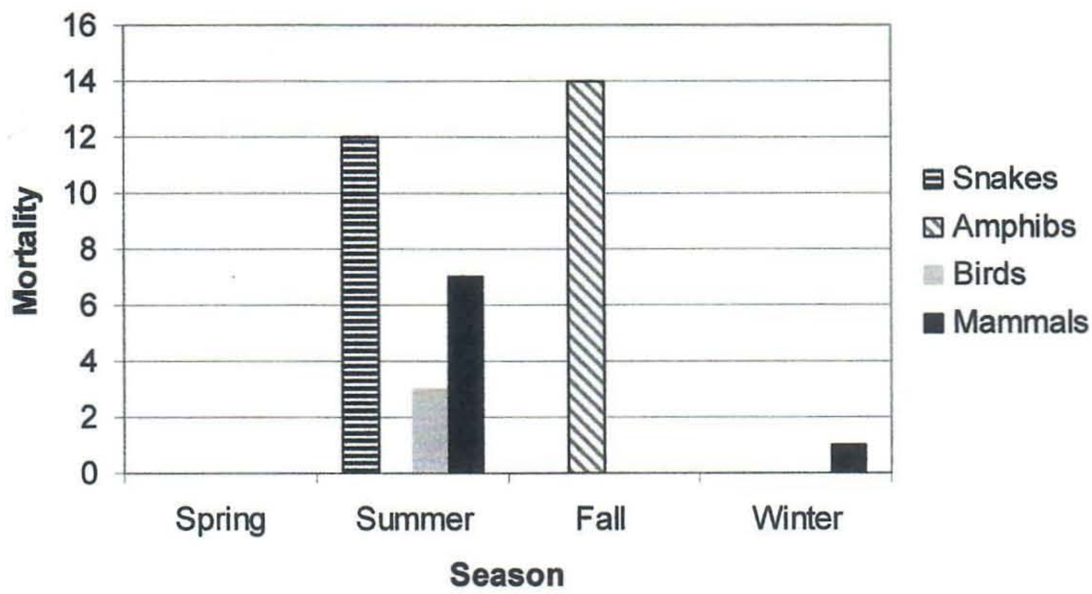

Fig. 3. Garter snakes formed a large proportion of rural road-kills.

The Northern Alligator Lizard, a fairly common native reptile of dry forests in the eastern part of my study area, had managed to evade vehicles over 2002, despite several observed close-calls. One was finally recorded as a road-kill in the summer of 2004. Low density and a preference for remaining near treed cover (Gregory and Campbell 1984) may be factors in the reduced susceptibility of this reptile to road-kill in comparison to snakes.

Taken together, amphibians accounted for nearly 40% of all recorded road-kills in 2002. Pond-breeding Rough-skinned Newts were the most frequently recorded species, representing 60 % of all amphibian mortality and 23% of the total annual mortality. Newts appear especially vulnerable while undertaking mass migrations to breeding ponds with the onset rainy weather in spring, and again during their autumn return to upland forests. For example, Blood and Henderson (2000) documented over 2,600 spring and over 600 autumn newt mortalities along a 0.5 km segment of Highway 4A, shortly after it opened in 1996. The newt mortalities recorded during my study all occurred in the autumn, with a cluster of six mortalities noted in the first week of November.

Overall, treefrog road-kills represented about 10 % of all recorded mortality in 2002, and approximately 30 % of all amphibian mortality. Since my move to South Wellington in 1999, I have noted Pacific Treefrogs breeding in a small (approx. 1 ha) seasonal pond at the eastern end of the study area. As this species breeds in ponds but uses other habitats outside of the breeding season, traffic-caused mortality was anticipated to occur as adults migrated to the breeding pond in the early spring, when juveniles dispersed from the pond in early summer, and when adults migrated back to uplands in early autumn. However, like the Rough-skinned Newts in this study, all traffic-caused treefrog mortality in 2002 occurred in the autumn. Recent observations indicate that some Pacific Treefrog road-kills also occur during the early spring, as predicted.

Within the study area, ponds supporting breeding by the Red-legged Frog, a species of Provincial and Federal conservation interest, have not been determined, but several wetlands are suspected. A single incidence of road-kill involving this species was recorded in the autumn of 2002. This individual was an adult, however, both adult and juvenile road-kills have since been detected in the area. The low level of recorded road-kills among Red-legged Frogs is similar to Blood and Henderson's 2000 study, where they found this species represented < 1% of all road-killed amphibians along Highway 4A. Such findings are probably a reflection of this species' low density, even within apparently suitable habitats, rather than any particular skill at avoiding vehicles.

Not all amphibians on Vancouver Island require ponds for breeding. There are three species of salamanders which are entirely terrestrial: the Western Red-backed Salamander, Clouded Salamander, and Ensatina. These amphibians generally live out their entire lives in a few square metres of moist forest. Such a lifestyle would seemingly spare them from contact with roads, but I recorded one terrestrial salamander road-kill in the autumn of 2002 (a Western Red-backed Salamander).

Three species of mammals represented approximately 20% of all recorded road-kills in 2002. Small mammals (i.e. shrews and mice) accounted for the bulk of mammal road-kills, although a single mink was recorded in the summer of 2002. This individual was killed while attempting to cross a rural road crossing an extensive wetland complex along Beck Creek. Although no Eastern Cottontails were recorded as road-kills in 2002, this species reaches high densities in South Wellington by mid-summer. A single cottontail road-kill was noted next to the brushy habitats they favour in spring of 2005.

Birds accounted for only 8% of all recorded road-kills in 2002. As might be expected, two of the species recorded (California Quail and American Robin) spend considerable time foraging on the ground. Two other species noted in 2005 frequently feed at ground-level, the Northern Flicker and Chestnut-backed Chickadee. The lone waterbird road-kill, an American Coot, was apparently struck while attempting to cross at the same location as the previously-mentioned mink.

Conclusions

While this study covered neither a large area nor a long period of time, it nevertheless demonstrates that low traffic levels do in fact generate road-kills in rural parts of Vancouver Island. This mortality affects a wide range of wildlife, primarily smaller forms which are difficult for motorists to see under all but ideal driving conditions.

The 2002 data, augmented by recent observations, suggest peak periods of vehicle-caused mortality for terrestrial wildlife on rural roads are as follows:

Amphibians:	spring and autumn
Reptiles:	spring and summer
Mammals:	summer

If the results of this study are representative of rural road impacts in the region, up to 10,000 vertebrates may be killed along roads in the RDN annually. In combination with habitat loss and fragmentation resulting from subdivisions, expansion of rural road networks should be viewed as a significant threat to local wildlife resources, particularly amphibians and reptiles, some of which are of conservation interest.

Acknowledgements

Special thanks to Tom Sohier, Regional District of Nanaimo Planning Department, for providing information regarding the total length of developed roads within RDN Electoral Area A.

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WATERBIRD SURVEY OF THE NANAIMO FRESHWATER LAKES, WINTER, 1984-1985.

Anthony B. Thompson and Anne Brenchley[1]

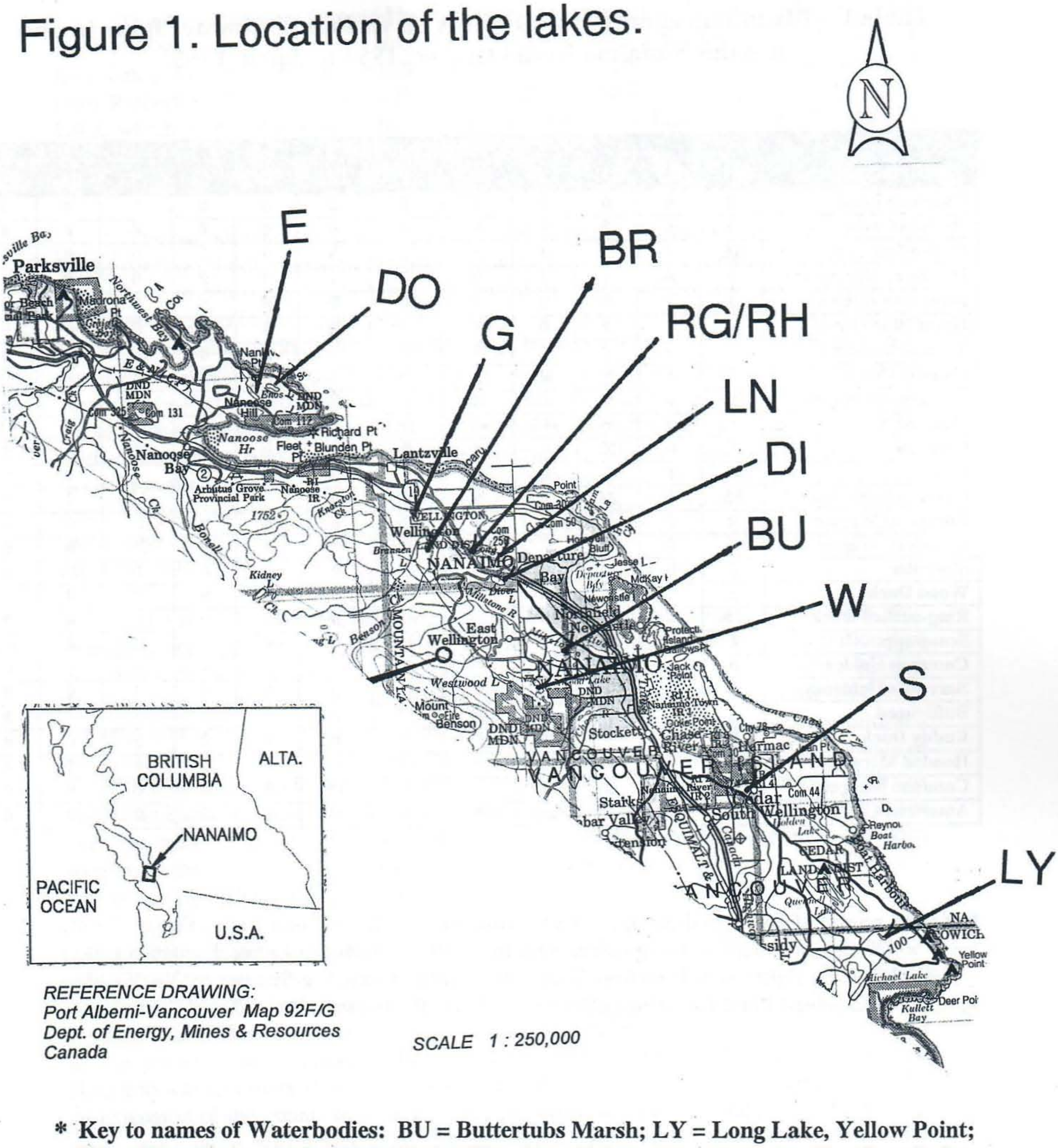
The freshwater lakes in and around Nanaimo, Vancouver Island, are an important refuge for waterbirds in winter. However, as there were no known regular counts available, the Nanaimo Field Naturalists Club embarked on the following project.

Counts of waterbirds were undertaken every two weeks on twelve freshwater bodies (Figure 1.) in and around Nanaimo from October, 1984 to April 1985 inclusive. These were (approximate areas in hectares in parentheses): swamp by York Lake [0.80], Enos Lake [9.25], Dolphin Lake [4.5], Long Lake Yellow Pt. [3.5], Rutherford Pond by highway [1.0], Rutherford Pond by mini-golf course [0.3], Buttertubs Marsh [9.75], Brannen Lake [98.0], Green Lake [12.5], Westwood Lake [59.7], Long Lake, Nanaimo [24.25], and Diver Lake [11.75]. The counts provided information on the use of these water bodies by each species, and to a lesser extent on the timing of bird migration. The counts were assumed to represent the actual number of birds on the water body. However, only parts of Westwood Lake and Brannen Lake were surveyed, and the dense covering of cat-tails (*Typha*) at Buttertubs Marsh meant that some birds were inevitably missed during counts.

The maximum recorded count for each species on each waterbody showed that Canada Geese and Mallards were ubiquitous, being particularly prevalent at Long Lake (Nanaimo) and Buttertubs Marsh (Table 1), where they are regularly fed by people. Canada Geese were also common on Rutherford Pond (by the highway), which has an adjacent area of grassland used for grazing, and roosts were occasionally recorded on Green Lake. The distributions of the other species were related to the depth of the lake and the type of vegetation. Dabbling ducks, mainly Green-winged Teal and American Wigeon, and to a lesser extent Gadwall and Northern Shoveler occurred on the shallow parts of waterbodies such as Buttertubs Marsh, Diver Lake and the swamp by York Lake, where food was plentiful. On the other hand, the diving species (Lesser and Greater Scaups, Ring-necked Duck, Bufflehead, Hooded Merganser, Common Merganser, Pied-billed Grebe and American Coot) were usually observed on deeper water, such as the deeper part of Diver Lake, Long Lake (Nanaimo), Dolphin Lake, Enos Lake and even on Buttertubs Marsh. The two largest waterbodies, Brannen Lake and Westwood Lake, failed to hold large numbers of waterbirds. Brannen Lake had moderate numbers of Common Mergansers and American Coots, whereas Westwood Lake was virtually devoid of waterbirds. However, the only records of Common Loon were at these two lakes. The low counts did not seem to be a result of counting only parts of the lakes, but rather a result of the lakes being unsuitable for most waterbirds.

[1] Reprinted from DISCOVERY, Van. Nat. Hist. Soc.,1986.

Figure 1. Location of the lakes.



REFERENCE DRAWING:
Port Alberni-Vancouver Map 92F/G
Dept. of Energy, Mines & Resources Canada

SCALE 1 : 250,000

*** Key to names of Waterbodies: BU = Buttertubs Marsh; LY = Long Lake, Yellow Point; DI = Diver Lake; LN = Long Lake, Nanaimo; DO = Dolphin Lake; E = Enos Lake; BR = Brannen Lake; W = Westwood Lake; G = Green Lake; S = Swamp by York Lake; RG = Rutherford Pond (by mini-golf course); RH = Rutherford Pond (by highway).**

Table 1. - Maximum counts of waterbirds on various freshwater lakes in and around Nanaimo from October, 1984 to April, 1985.

Bird Species	Waterbodies *											
	BU	LY	DI	LN	DO	E	BR	W	G	S	RG	RH
Common Loon	0	0	0	0	0	0	5	3	0	0	0	0
Horned Grebe	0	0	2	0	0	0	0	0	0	0	0	0
Pied-billed Grebe	10	1	18	3	1	1	5	0	2	0	0	1
D-crested Cormorant	0	0	1	1	0	0	1	0	0	0	0	0
American Bittern	1	0	0	0	0	0	0	0	0	0	0	0
Great Blue Heron	4	1	0	0	1	1	0	0	0	0	0	0
Trumpeter Swan	3	9	0	0	7	5	0	0	0	10	0	0
Canada Goose	149	6	9	58	2	21	2	0	122	4	0	85
White-fronted goose	0	0	0	2	0	0	0	0	0	0	0	0
Mallard	163	7	59	162	43	10	0	0	45	24	9	11
Gadwall	1	0	12	0	4	0	0	0	0	6	0	0
Pintail	3	0	0	0	0	2	0	0	0	4	0	0
Green-winged Teal	85	0	25	0	6	4	0	0	0	12	0	0
European Wigeon	0	0	2	0	0	0	0	0	0	0	0	0
American Wigeon	43	0	110	2	2	0	0	0	0	20	0	0
Shoveller	2	0	21	0	3	0	0	0	0	6	14	0
Wood Duck	2	0	0	0	11	0	0	0	0	0	0	0
Ring-necked Duck	15	5	2	5	27	43	0	0	0	3	0	0
Scaup spp.	1	15	12	18	12	25	0	0	2	13	0	12
Common Goldeneye	0	0	3	4	0	0	1	1	1	0	0	0
Barrow's Goldeneye	0	0	2	0	0	0	0	0	0	0	0	0
Bufflehead	4	7	23	8	44	23	0	9	2	3	3	5
Ruddy Duck	0	0	9	4	0	0	0	0	2	0	0	0
Hooded Merganser	10	3	4	12	4	11	0	1	0	0	2	4
Common Merganser	2	0	2	20	0	8	18	0	0	0	0	0
American Coot	18	0	71	20	0	0	51	0	0	0	0	0

*** Key to names of Waterbodies: BU = Buttertubs Marsh; LY = Long Lake, Yellow Point; DI = Diver Lake; LN = Long Lake, Nanaimo; DO = Dolphin Lake; E = Enos Lake; BR = Brannen Lake; W = Westwood Lake; G = Green Lake; S = Swamp by York Lake; RG = Rutherford Pond (by mini-golf course); RH = Rutherford Pond (by highway).**

Certain lakes were favoured by the less common species. Dolphin Lake and Enos Lake in Nanoose were regularly frequented by Ring-necked Ducks, Wood Ducks (not Enos Lake), Lesser Scaups and Buffleheads. Fourteen Northern Shovelers were recorded from Rutherford Pond (by mini-golf course) in April, 1985. Also, the swamp by York Lake, which is dry throughout the summer months, had a high diversity of dabbling ducks and the highest number of Trumpeter Swans on any freshwater lake counted (although large numbers occur on the Nanaimo River estuary).

The overall temporal pattern was of a high count in October or November, caused by the southward fall migration through Nanaimo, lower numbers throughout winter, and a small rise in March or April, during northward migration (Table 2.). This pattern was observed for Pied-billed Grebe, Canada Goose, Green-winged Teal, American Wigeon, Wood Duck, Ring-necked Duck, Bufflehead, Hooded Merganser, and American Coot. Numbers were usually highest in the fall. Counts should have been continued beyond April to show the drop in numbers for the species which leave Nanaimo in summer. There were no clear temporal patterns throughout the period studies for Trumpeter Swan, Gadwall, Northern Shoveler, and Common Merganser. Mallards had peak counts during the cold spells in January and February. This may have been caused by Mallards leaving small frozen ponds, ditches, etc., and collecting on the large water bodies which thawed most quickly. Regular counts, repeated over several years, would be required to draw any firm conclusions.

The winter of 1984-1985 was unusually severe for Nanaimo. There were long periods of ice cover on many of the water bodies which influenced the distribution and abundance of the waterbirds. The smaller, shallower bodies were frozen for the longest duration; for example, Rutherford Ponds were frozen throughout December and early January, and again for most of February. The large lakes usually had free water within a week of a freeze and these areas were rapidly utilized by returning waterbirds. Counts of waterbirds at two marine sites, Departure Bay and Piper's Lagoon, by Seriole Williams and Ernie Paget, showed that there was also a decline in the numbers of waterbirds at sea over the winter period. Therefore, there was no evidence that waterbirds assumed temporary residence at sea during periods when the freshwater lakes were frozen, but this idea is worthy of further investigation.

Winter waterfowl counts undertaken at Burnaby Lake in 1970-1972, Lost Lagoon in 1972-1973, and Trout Lake in 1979-1980 (all in or near Vancouver), showed that counts vary greatly from week to week and from year to year (Butler 1972, Barr *et al.* 1973, Weber 1980). The temporal patterns of the counts were generally similar to counts in the present study, although the drop in numbers during mid-winter observed in Nanaimo was less marked or even absent in the Vancovuer counts. It is worth noting that an extension of the counts into the summer period would be profitable. It is hoped that many more clubs will select a lake or an area of land and undertake regular counts throughout a year. Information on annual changes and the utilization of local areas would have much conservation value in the future.

Table 2. - The number of each species of waterbird per lake (averaged over all the lakes) each month from October, 1984 to April, 1985.

Bird Species	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
Pied-billed Grebe	2.8	1.4	1.2	0.1	0.2	1.0	1.2
Trumpeter Swan	0.6	0.9	0.3	0.4	0.4	0.6	0
Canada Goose	18.9	9.3	6.3	4.1	2.4	5.9	5.9
Mallard	16.5	12.8	13.4	26.5	30.9	18.2	11.3
Gadwall	0.2	0.4	0.7	0.1	0.3	0.3	0
Green-winged Teal	7.0	1.3	0.4	0.5	2.4	0.1	0
American Wigeon	14.3	6.4	3.8	5.1	0.1	1.5	0.7
Shoveller	0.7	1.0	1.2	0.9	1.1	0.7	2.2
Wood duck	1.2	0.5	0	0	0	0.2	0.3
Ring-necked Duck	4.6	4.1	2.3	1.0	1.8	2.7	3.8
Scaup (Lesser & Greater)	3.2	3.1	1.8	1.3	1.6	1.7	1.1
Bufflehead	1.8	6.0	4.2	1.0	2.8	4.6	4.6
Hooded Merganser	1.5	1.5	0.6	1.0	1.7	1.8	2.1
Common Merganser	0.3	0.7	0.8	0.7	1.2	0.7	1.9
American Coot	7.0	8.6	7.5	1.4	3.8	2.8	3.7

The following people undertook the counts used in this article: Mary Barraclough (swamp by York Lake), Don Blood (Enos Lake and Dolphin Lake), Ingrid Bonsel (Long Lake, Yellow Point), Mike Chutter (Rutherford Ponds), Rick and Katherine Ikona (Buttertubs Marsh), Karen Jacobs-Morrisson (Brannen Lake, Green Lake and Westwood Lake), Ernie Paget and Seriole Williams (Departure Bay and Pipers Lagoon) and the authors (Long Lake, Nanaimo and Diver Lake).

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Current Status of the Lakes/Ponds Surveyed in 1984-85

Donald A. Blood

It is now twenty years since NFNC members did the surveys described in the previous article by Thompson and Brenchley. It is timely to look at the conditions of the twelve freshwater habitats that were surveyed to determine how they have fared over the past twenty years. Although no baseline information on habitat conditions were recorded in 1984-85, it is possible to comment on recent land developments which may have affected some of the wetlands.

Dolphin Lake

This lake was in a completely pristine environment in 1984-85, prior to the Fairwinds development. A golf course now approaches one end of the lake, and residential lots are nearby. The wetland itself does not appear to have been directly impacted.

Enos Lake

No visible changes are apparent.

Green Lake

Little or no change over the past twenty years.

Brannen Lake

There has been minor beach development beside the boat ramp, and a new subdivision at the end of Mildmay Road, however the lake and its riparian zone vegetation are still generally the same as in 1984-85.

Rutherford Highway Pond

This pond originated at the time of construction of Rutherford Shopping Centre, when a narrow hardhack swamp was enlarged into a sediment detention pond. The pond was in a relatively raw state in 1984-85, but has matured and now supports a vigorous rim of alder trees and submerged pondweeds.

Rutherford Road Pond

This small pond was surrounded by forest in 1984-85, except along the edge of Rutherford Road. Since that time its environment has been affected by widening of Rutherford Road and by clearing of forest cover around it. Site work for townhouse construction was underway here in October, 2001.

Long Lake

Adjacent uplands have been incrementally cleared for housing (Long Lake Heights), a hotel and condominiums. The riparian shrub margin is now very narrow in many places. High levels of personal watercraft use now disturb waterfowl in summer.

Diver Lake

The lake and its marshy border have been little changed over the past twenty years, but some immediately adjacent upland has been lost to a car dealership, an adjacent subdivision and commercial development along Shenton Road.

Buttertubs Marsh

Increased visitor use encouraged by the completed circular trail and Jingle Pot parking area is the major change in recent years. The marsh itself is essentially unchanged, however land development in adjacent areas (Upper Catstream; Hawthorne Subdivision) could affect use by some mobile species of wildlife.

Westwood Lake

Minor development on uplands along north side, but the lake and most of its shoreline remain in a natural state.

Swamp by York Lake

The swamp appears to be unchanged, however the new highway to Duke Point is very close to it, resulting in some noise disturbance.

Long Lake at Yellowpoint

The lake is still in a quite pristine setting, almost entirely surrounded by forest. Some rural residential properties have been developed in the area in the past twenty years but they are generally not visible from the lake.

SUMMARY

In all cases the surface area of the lakes or ponds, and a narrow band of riparian vegetation around them, are generally still intact after twenty years. The City of Nanaimo Watercourse Bylaw requires a 15 m development setback around lakes, ponds and wetlands, and similar provincial guidelines exist on lands outside the City. Those requirements should ensure continued protection of the waterbodies themselves, however development of immediately adjacent uplands is of concern because many species of wildlife which utilize aquatic habitats also depend on nearby terrestrial habitats for part of their seasonal requirements. This includes several amphibians (e.g. Pacific Treefrog: Rough-skinned Newt) which move far from the wetlands in fall and winter, dabbling ducks which nest in dense upland cover, beaver which obtain food in adjacent forest and insectivorous birds like swallows which nest in cavities in upland snags and then forage for insects over the wetlands. Development of adjacent uplands also tends to isolate the lakes and ponds, resulting in less frequent use by Racoons, Mink and River Otters, and increased traffic kill. At some of the waterbodies surveyed in 1984-85 (e.g. Dolphin Lake; Rutherford Road Pond; Long Lake) those adverse effects have already occurred to some degree. At Rutherford Road Pond, which will soon be completely ringed by townhouses and streets, ducks will still be able to fly in and out but most other wildlife use will cease. Unfortunately, this trend toward diminished biodiversity is likely to apply to other lakes, ponds and wetlands in the region.

Less visible changes such as altered drainage patterns, decreasing water quality or the impacts of introduced fish or bullfrogs may also be adversely affecting some of these waterbodies.

PHOTOS (following two pages)

1. Dolphin Lake
2. Enos Lake
3. Green Lake
4. Brannen Lake
5. Rutherford Highway Pond
6. Rutherford Road Pond
7. Long Lake (Nanaimo)
8. Diver Lake
9. Buttertubs Marsh
10. Westwood Lake
11. Swamp by York Lake
12. Long Lake (Yellowpoint)


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Some Amphibian Occurrence Records for the Nanaimo Regional District.

Donald A. Blood

Introduction

The following list (Table 1) is presented to provide a permanent record of the locations where several species of amphibians have been found in the Nanaimo area. The locations are indicated generally on Figure 1 and more specifically by UTM coordinates in the table. Specific sources of the information are given under the heading of References so that anyone interested in doing so can assess the authenticity of the data.

The records include eight species, seven of which are native to Vancouver Island. We made few observations of the terrestrial amphibians (Ensatina, Red-backed and Clouded Salamander) because all sampling was in or near wetlands.

It is hoped that these distribution records will be of value to assess future changes in the occurrence of amphibians in this area. They should also provide a local contribution to the provincial amphibian database, now in a re-building phase after loss of all the locational information used to compile The Amphibians of British Columbia (Royal B.C. Museum Handbook No. 45 by D.M. Green and R.W. Campbell, 1984).

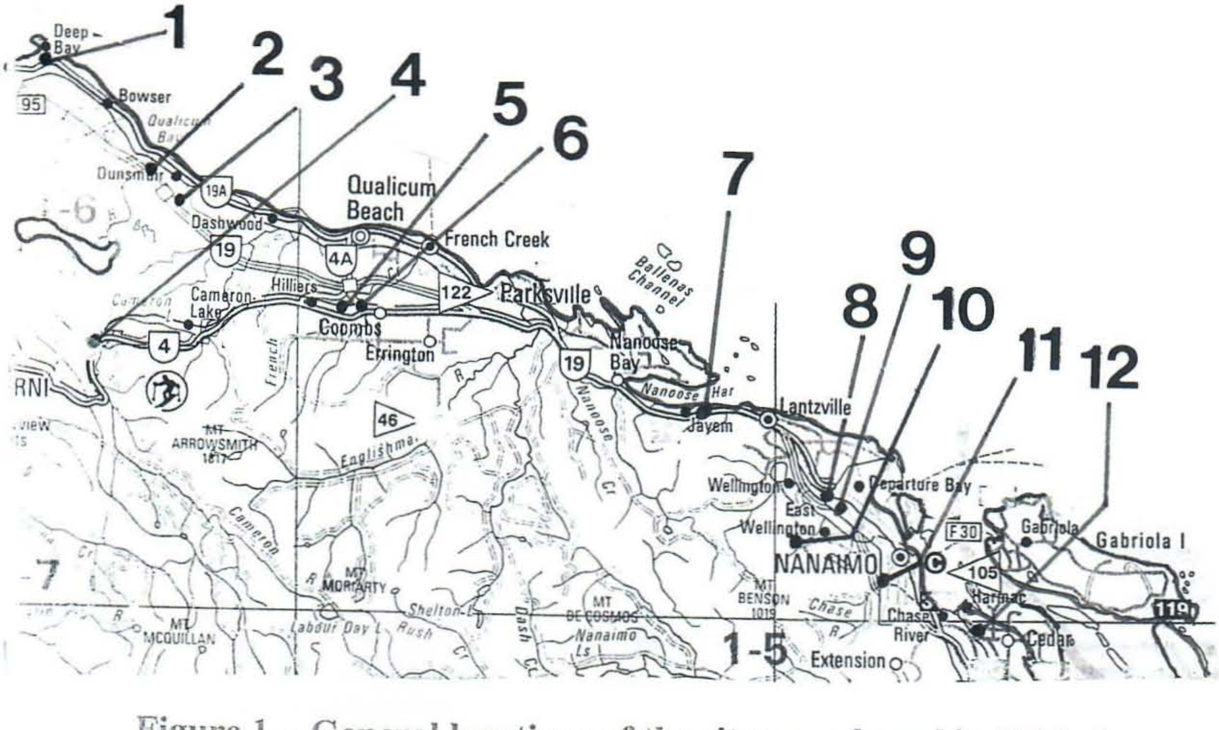

Figure 1. - General locations of the sites numbered in Table l.

Table 1. - Some amphibian occurrence records for the Nanaimo Regional District [1].

Location	UTM	Date	Species [2]	No. of records	Detection method	Habitat
1. Deep Bay Creek	3751-54794	Jul./88	Northwestern salamander	5 (larv.)	Dip net	Ditch in swamp.
2. Big Qualicum River	3816-54715	Feb.-Apr./00	Rough-skinned newt	157	Minnow trap	Pond in forest.
		Feb.-Apr./00	Rough-skinned newt	1	Pit-fall trap	Beside pond in forest.
		Feb.-Apr./00	Pacific treefrog	2	Visual	Beside pond in forest.
		Feb.-Apr./00	Pacific treefrog	1	Visual (egg mass)	Beside pond in forest.
		Feb.-Apr./00	Red-legged frog	1	Pit-fall trap	Beside pond in forest.
3. 2.75 km south of Big Qualicum River	3832-54693	Feb.-Apr./00	Rough-skinned newt	1	Visual	Pond beside highway.
		Feb.-Apr./00	Northwestern salamander	9	Visual (egg masses)	Pond beside highway.
		Feb.-Apr./00	Pacific treefrog	22	Visual (egg masses)	Pond beside highway.
		Feb.-Apr./00	Pacific treefrog	1	Visual	Pond beside highway.
		Feb.-Apr./00	Red-legged frog	2	Visual (egg masses)	Pond beside highway.
4. MacMillan Prov. Park	3787-54599	Jun.-Aug./96	Northwestern salamander	1	Visual (egg mass)	Gravel pit.
		Jun.-Aug./96	Red-legged frog	3	Visual	Forest near river.
		Jun.-Aug./96	Western toad	2	Pit-fall trap	Forest near river.
5. Hamilton Swamp	3940-54635	Oct.-Nov./95	Rough-skinned newt	10	Pit-fall traps (4)	Forest near swamp.
		Oct.-Nov./95	Rough-skinned newt	22	Minnow traps	Beaver pond.
		Oct.-Nov./95	Long-toed salamander	3	Pit-fall traps	Forest near swamp.
		Oct.-Nov./95	Red-backed salamander	9	Pit-fall traps	Forest near swamp.
		Oct.-Nov./95	Ensatina	1	Pit-fall traps	Forest near swamp.
		Oct.-Nov./95	Red-legged frog	6	Pit-fall traps	Forest near swamp.
		Aug.-Oct./95	Pacific treefrog	Numerous	Visual/vocal	Juveniles leaving swamp; adults in adjacent forest.
		Aug.-Oct./95	Bullfrog	Numerous	Visual/vocal	In swamp.
6. Highway 4A near Hamilton Swamp	3948-54633	Jun./96-May/97	Rough-skinned newt	3,261	Highway mortality	Highway thru wet forest.
		Jun./96-May/97	Pacific treefrog	122	Highway mortality	Highway thru wet forest.
		Jun./96-May/97	Red-legged frog	16	Highway mortality	Highway thru wet forest.

Table 1. - Continued.

Location	UTM	Date	Species[2]	No. of records	Detection method	Habitat
7. Nanoose First Nations Reserve	4187-54558	Jul./95	Red-legged frog	Several	Visual	Ponds along stream.
8. Northfield Swamp	4270-54490	Apr./94	Pacific treefrog	Many	Visual/vocal	Swamp and shoreline.
9. Stream below Northfield Swamp	4275-54486	Aug.-Sep./01 Aug.-Sep./01	Pacific treefrog Red-legged frog	2 2	Visual/vocal Visual/vocal	Along small stream. Along small stream.
10. McGarrigle Creek tributary	4236-54471	Jun./99 Jun./99	Rough-skinned newt Red-legged frog	1+ 1+	Minnow trap Visual	Pool in stream. Along small stream.
11. Upper Catstream Wetlands	4298-54461	Feb.-Mar./97 Feb.-Mar./97 Feb.-Mar./97	Rough-skinned newt Pacific treefrog Red-legged frog	11 Many 2	Minnow traps Vocal Minnow traps	In marsh. In marshes. In marsh.
12. Duke Point Hwy.	4369-54405	Jan.-Apr./95	Rough-skinned newt Long-toed salamander Red-legged frog Pacific treefrog	47 4 2 Many	Pit-fall traps (3) Pit-fall traps Pit-fall traps Vocal	Forest near wetlands. Forest near wetlands. Forest near wetlands. At breeding marshes.

[1] information sources for each location are given in References.

[2] scientific names as follows:

Rough-skinned Newt (*Taricha granulosa*)
Long-toed Salamander (*Ambystoma macrodactylum*)
Northwestern Salamander (*Ambystoma gracile*)
Western Red-backed Salamander (*Plethodon vehiculum*)
Ensatina (*Ensatina eschscholtzi*)
Pacific treefrog (*Hyla regilla*)
Red-legged frog (*Rana aurora*)
Bullfrog (*Rana catesbeiana*)

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2;3	Materi, J.J. and D.A. Blood. 2000. Wildlife use of some constructed aquatic habitats along the Inland Island Highway. Progress Report prepared for Vancouver Island Highway Project, Victoria, B.C. May 19, 2000. 24 pp. + photos and appendices.
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5	Cousens, N.B.F., J.C. Lee and D.A. Blood. 1996. Management Plan for Hamilton Marsh. Report prepared for MacMillan Bloedel Ltd., Cassidy, B.C. J.C. Lee and Associates Ltd., Nanaimo, B.C. 121 pp. + figures and appendices.
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9	Materi, J.J. and D.A. Blood. 2001. Environmental assessment of proposed Boxwood-Meredith flow diversion. Report prepared for Newcastle Engineering Ltd., Nanaimo, B.C. D.A. Blood and Asosciates Ltd. 12 pp. + figures and photos.
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TECHNICAL REPORTS OF BIOLOGIST/NATURALIST
Richard Glenn (Rick) Davies, 1946 to 1996.

Compiled by D.A. Blood.

Rick Davies died tragically and before his time in October, 1996. Employed as a Wildlife Biologist by the Ministry of Environment, Lands and Parks in Nanaimo, Rick carried out many surveys on Vancouver Island, providing the basic inventory information upon which conservation and management programs are based. The following list shows that he was very diligent with respect to recording his findings.

A versatile biologist, Rick gathered information on big game animals, waterfowl, raptors, grouse, and habitats. Also an accomplished photographer, many of his reports are illustrated with high-quality photos. In the 1970's, Rick undertook the first wildlife surveys in many remote watersheds on Vancouver Island. He carried out the only detailed research done to date on Ruffed Grouse in British Columbia, in the Cariboo region of the province.

Most of the following reports are housed at the B.C. Ministry of Environment, Lands and Parks Library in Nanaimo; some are in other locations such as the Habitat Conservation Trust Fund library in Victoria.

Reports on Grouse

Davies, R.G., and A.T. Bergerud. 1972. Production of chicks and behavior compared between red and gray color morphs in a ruffed grouse population in British Columbia. Unpublished Report, Univeristy of Victoria, Department of Biology, Victoria, British Columbia. 23 pp.

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Compiled by: D.A. Blood
May 11, 2001

COMPARISON OF BALD EAGLE NUMBERS FROM NANAIMO CHRISTMAS BIRD COUNTS AND MID-WINTER EAGLE SURVEYS

Donald A Blood

Nanaimo Christmas Bird Counts (CBC's) have been done each December from 1963 to the present, and mid-winter eagle counts in early January from 1987 through 2003. The purpose of this report is to compare the number of bald eagles tallied on those two surveys from the winter of 1987-88 through 2001-02, a period of fifteen years (Table 1). If there is a relatively good correlation between the two sets of data then it might be concluded that the Christmas counts, even though not specifically aimed at eagles, could provide a reliable trend in eagle abundance in the Nanaimo area.

Absolute numbers of eagles recorded on the two kinds of surveys can be expected to vary for the following reasons:

- The mid-winter eagle survey area was larger than the CBC area (Figure 1).
- Observers on the CBC's were busy searching for every possible species, not just eagles.
- The eagle counts lasted half a day, the CBC's all day.
- Variable weather between the two count days, even though only about two weeks apart.
- Variable effort on the January eagle counts (i.e. number of observers; inconsistent use of boats, kayaks, etc.)

However, if the two kinds of surveys are each fairly reliable, then both might show the same trend in eagle abundance. Figure 2 suggests that the two sets of eagle count data do not exhibit a good correlation. The CBC's have shown relatively constant numbers of eagles, while the January eagle surveys suggest a downward trend over the fifteen year period of analysis. The latter agrees with my personal recollections. Having taken part in all the January eagle counts, I recall the hundreds of bald eagles perched along Gabriola Bluffs in the 1988-94 period when a large stock of herring staged in Northumberland Channel, which in turn attracted over 1,000 sea lions and record numbers of piscivorous seabirds. (Up to 2,000 Western Grebes, 6,000 Cormorants and 15,000 Glaucous winged Gulls, were counted on single CBC's during those years). By 1997 the herring were gone, along with most of the sea lions, and eagle numbers dropped to between 200 and 300.

I am at a loss to explain the big discrepancy between the two surveys in 1987/88 when eagles were very abundant in the Gabriola-Harmac area, but only 37 were counted on the CBC, and the opposite relationship in 1997/98 when the CBC reported a lot more eagles than the January eagle count, despite the smaller survey area of the former.

CONCLUSION

1. The CBC does not appear to provide a reliable indication of long-term trends in abundance of bald eagles wintering in the Nanaimo area.
2. Winter counts aimed specifically at bald eagles may provide a reasonable measure of eagle numbers and population trends. However, the results could be improved by means of more rigorous methods, i.e. a standard number of observers and consistent use (or non-use) of boats in areas where shoreline views from land are poor.

ACKNOWLEDGEMENTS

I sincerely thank all those keen naturalists who took part in the CBC's and mid-winter eagle counts. Your data provide a long-term baseline against which to compare future results. CBC data were kindly provided by Mr. Guy Monty, Nanaimo Field Naturalists Club.

Table 1. - Comparison of Bald Eagle Numbers from Christmas Bird Counts and Mid-Winter Eagle Counts [1].

	Number of Bald Eagles	
Winter [2]	Christmas Count [3]	Bald Eagle Count [4]
1987/1988	37	742
1988/1989	241	543
1989/1990	182	449
1990/1991	160	425
1991/1992	148	318
1992/1993	213	715
1993/1994	232	498
1994/1995	196	220
1995/1996	165	303
1996/1997	83	304
1997/1998	384	216
1998/1999	102	168
1999/2000	79	261
2000/2001	240	250
2001/2002	194	209
Mean	177	375
Range	37 - 384	168 - 742

[1] See Figure 1 for geographic areas covered by the two counts.

[2] Christmas counts done in late December, Bald Eagle Counts in early January of the same winter.

[3] Data provided by G. Monty, Nanaimo Field-Naturalists Club.

[4] Data from files of D. Blood (Bald Eagle Count Coordinator for Nanaimo Field-Naturalists Club).

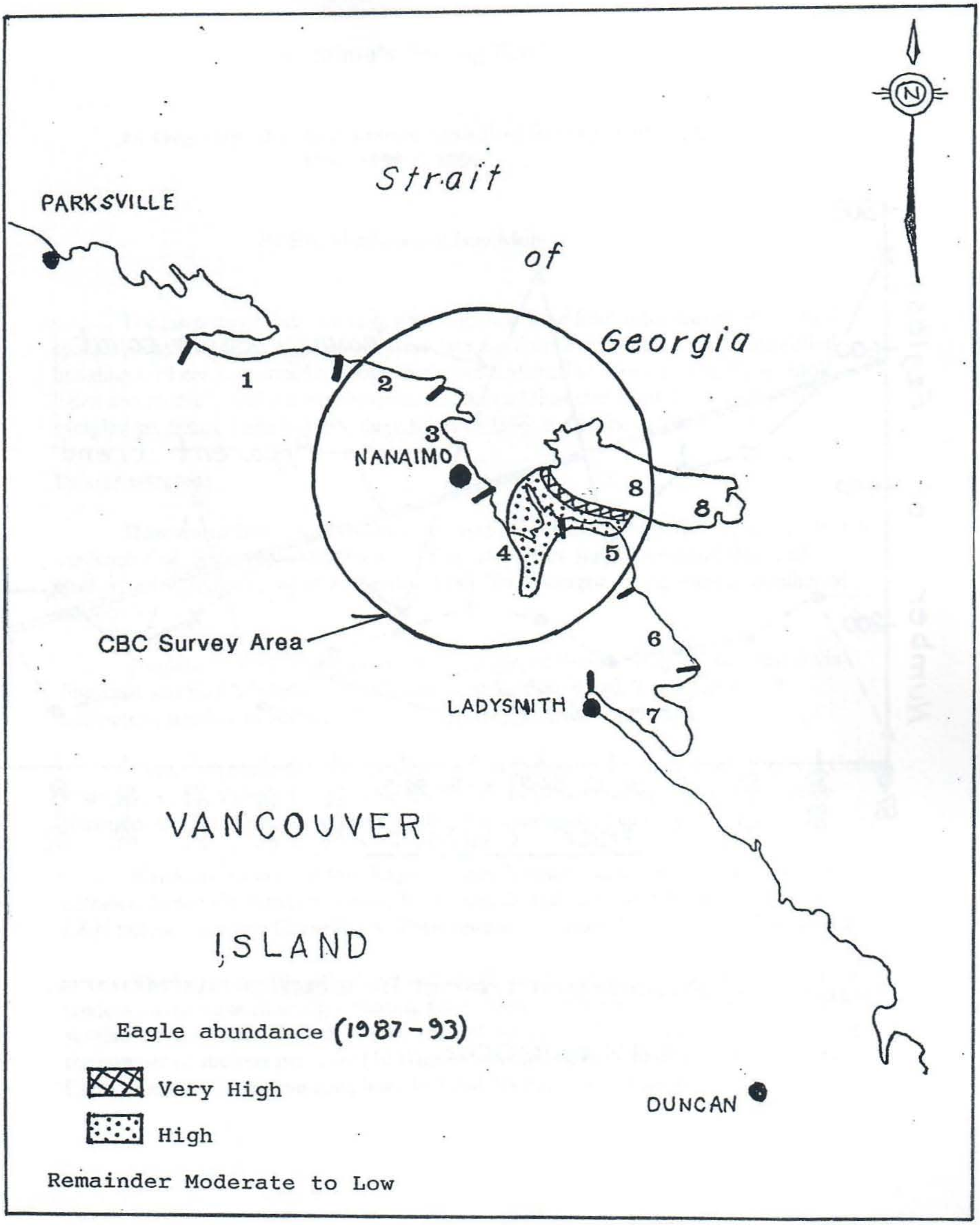


Figure 1- Location of the CBC area (circle) and mid winter eagle count units (1 to 8)

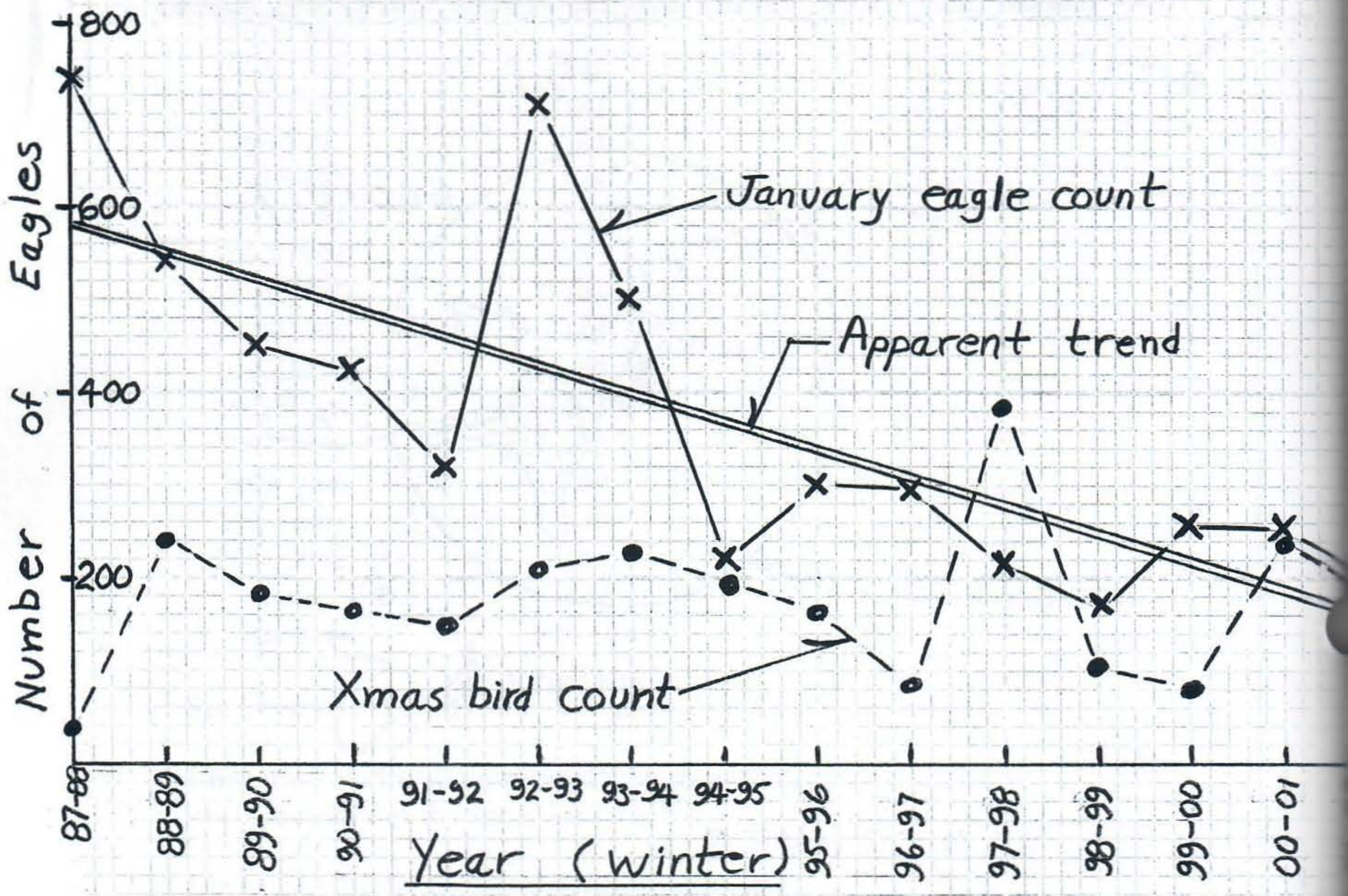


Figure 2. Apparent trend in eagle numbers, 1987 to 2002.

Nanaimo's Spring Birds

An Overview of some Nanaimo Area Bird Surveys Conducted in 1998, 1999 & 2000

By Bill Merilees and Guy Monty

The purpose of these surveys was to gather 'base line' information on the bird species present in Greater Nanaimo, from late April until mid June. Using a modified breeding bird census procedure, four routes were identified. Two minute, 'stop, look, listen and record', stations were established, half a kilometer apart. Each route was sampled six times, once in 1998, three times in 1999 and twice in 2000.

Routes selected:

Hammond Bay - Start: Rock City Road 50 m east of Departure Bay Road thence via Rock City, Smugglers Hill, Newton, Bay, Departure Bay, Hammond Bay, and Rutherford Roads, ending at Rutherford Mall. **Total length** 15 kilometers; number of stations 31.

Jinglepot - East Wellington - Start: Jinglepot Road at Biggs Road thence via Jinglepot and East Wellington Roads ending at Madsen Road. **Total Length** 9 kilometers; number of stations 19.

Cedar - Quennell - Start: Cedar Road at Nanaimo River Bridge thence via Cedar Road, Quennell, Yellow Point, Cedar and Adshead Roads ending at Bridge Road by Nanaimo Airport. **Total Length** 17.5 kilometers; number of stations 36.

Nanaimo Lakes - White Rapids - Start Nanaimo Lakes Road at Bungy Zone entrance thence via Nanaimo Lakes, White Rapids and Extension Roads, ending near E&N railway crossing Chase River. **Total length** 9.5 kilometers; number of stations 20.

The Hammond Bay/Jinglepot and the Cedar/Nanaimo Lakes routes were run in tandem on the same mornings. Starting times, were correlated to begin at or very close to sunrise and continued until all stations on both routes had been sampled. Depending on the number of stations per route (50 Hammond Bay/Jinglepot and 56 Cedar/Nanaimo Lakes) these surveys were completed in 2 and 3/4 to 3 and 1/4 hours.

Nanaimo's Spring Birds (Cont.) Page 2:

Results:

In total one hundred and one species of birds were recorded for the 636 stations with 10,138 individuals being recorded (Table 1). In the year 2000 surveys, 'territorial songs' were recorded separately in addition to those recorded by either sight, other sounds (i.e. drumming) or other vocalizations.

There are a great many ways these results can be tabulated, analyzed and compared. For the purpose of this general report only a listing of the species recorded, the number of individuals per species and the number of stations each specie was recorded are presented. A much more detailed report is in preparation.

There are many factors that come into 'play' when determining and interpreting the results from breeding bird surveys. General 'visibility' (i.e. robins, crows and swallows), flocking behaviour (i.e. starlings and siskins), stridency of calls (i.e. wrens, pileated woodpecker, quail and pheasant), and weather patterns (i.e. swifts) all contribute bias that need to be understood in analyzing the results and drawing conclusions.

The results of the surveys undertaken will help establish a 'snapshot' of the bird populations present during the time frame when the surveys were conducted. If, or when repeated in the future, these results will have comparative value by providing indications of changes in species composition and/or changes in populations.

Copies of the full data set are with the authors.

Acknowledgements:

The assistance of Candice Boyle and Tanya Giesbreckt during the May 2000 surveys is greatly appreciated.

Table 1 (cont.) – Nanaimo Breeding Bird Survey – Summation 1998-2000

Symbol	Species Name	# Individuals Recoded	# Stations Species Recorded	% of Stations Recorded	# Individuals Recorded/Station
VASW	Vaux's Swift	71	7	1.1	10.1
BRCR	Brown Creeper	68	54	8.5	1.3
BTPI	Band-tailed Pigeon	68	43	6.8	1.6
CEWA	Cedar Waxwing	62	20	3.1	3.1
WIFL	Willow Flycatcher	62	50	7.9	1.2
TRSW	Tree Swallow	56	33	5.2	1.7
CAVI	Cassin's Vireo	55	41	6.4	1.3
WETA	Western Tanager	51	49	7.7	1.1
GWGU	Glaucous-winged Gull	50	31	4.9	1.6
VATH	Varied Thrush	46	36	5.7	1.3
WIWA	Wilson's Warbler	45	38	6.0	1.2
BTGW	Black-throated Gray Warbler	42	37	5.8	1.1
YEWA	Yellow Warbler	41	38	6.0	1.1
KILL	Killdeer	35	29	4.6	1.2
RBNU	Red-breasted Nuthatch	33	30	4.7	1.1
BUSH	Bushtit	32	20	3.1	1.6
MALL	Mallard	32	12	1.9	2.7
GCSP	Golden-crowned Sparrow	24	14	2.2	1.7
BAEA	Bald Eagle	20	17	2.7	1.2
HAFL	Hammond's Flycatcher	20	18	2.8	1.1
OSFL	Olive-sided Flycatcher	16	16	2.5	1.0
PIWO	Pileated Woodpecker	16	15	2.4	1.1
MAGW	Magillivray's Warbler	15	12	1.9	1.3
MAWR	Marsh Wren	12	10	1.6	1.2
AMWI	American Widgeon	12	1	0.2	12.0
LESP	Least Sandpiper	10	1	0.2	10.0
TUVU	Turkey Vulture	10	6	0.9	1.7
DOWO	Downy Woodpecker	9	9	1.4	1.0
GWTE	Green-winged Teal	8	3	0.5	2.7
HUVI	Hutton's Vireo	8	8	1.3	1.0
AMPI	American Pipit	7	1	0.2	7.0
NRWS	Northern Rough-winged Swallow	6	4	0.6	1.5
WAVI	Warbling Vireo	6	5	0.8	1.2
RBSA	Red-breasted Sapsucker	5	5	0.8	1.0
RTHA	Red-tailed Hawk	5	4	0.6	1.3
ANHU	Anna's Hummingbird	4	4	0.6	1.0
BEKI	Belted Kingfisher	4	4	0.6	1.0
BHGR	Black-headed Grosbeak	4	3	0.5	1.3

Table 1: Nanaimo Breeding Bird Survey – Summation 1998-2000

Symbol	Species Name	# Individuals Recorded	# Stations Species Recorded	% of Stations Recorded	# Individuals Recorded/Station
EUST	European Starling	933	264	41.5	3.5
AMRO	American Robin	882	460	72.3	1.9
PISI	Pine Siskin	839	190	29.9	4.4
VGSW	Violet-green Swallow	491	230	36.2	2.1
CBCH	Chestnut-backed Chickadee	402	248	39.0	1.6
SPTO	Spotted Towhee	376	290	45.6	1.3
OCWA	Orange-crowned Warbler	355	258	40.6	1.4
WCSP	White-crowned Sparrow	347	243	38.2	1.4
NOCR	Northwestern Crow	338	181	28.5	1.9
HOFI	House Finch	307	189	29.7	1.6
BEWR	Bewick's Wren	262	202	31.8	1.3
CLSW	Cliff Swallow	235	34	5.3	6.9
SOSP	Song Sparrow	192	158	24.8	1.2
BLSW	Black Swift	176	13	2.0	13.5
SWTH	Swainson's Thrush	171	118	18.6	1.4
BRBL	Brewer's Blackbird	164	61	9.6	2.7
BHCO	Brown-headed Cowbird	161	122	19.2	1.3
PSFL	Pacific-slope Flycatcher	150	125	19.7	1.2
DEJU	Dark-eyed Junco	148	121	19.0	1.2
YRWA	Yellow-rumped Warbler	145	118	18.6	1.2
BASW	Barn Swallow	140	54	8.5	2.6
SAVS	Savannah Sparrow	131	63	9.9	2.1
RUHU	Rufous Hummingbird	129	117	18.4	1.1
TOWA	Townsend's Warbler	123	94	14.8	1.3
COYE	Common Yellowthroat	114	82	12.9	1.4
GCKI	Golden-crowned Kinglet	107	76	11.9	1.4
RWBL	Red-winged Blackbird	107	63	9.9	1.7
CORA	Common Raven	104	86	13.5	1.2
WIWR	Winter Wren	104	81	12.7	1.3
AMGO	American Goldfinch	102	65	10.2	1.6
CHSP	Chipping Sparrow	101	79	12.4	1.3
PUFI	Purple Finch	98	87	13.7	1.1
CAQU	California Quail	90	73	11.5	1.2
CAGO	Canada Goose	88	27	4.2	3.3
RECR	Red Crossbill	87	27	4.2	3.2
RNPH	Ring-necked Pheasant	82	65	10.2	1.3
HOSP	House Sparrow	80	44	6.9	1.8
NOFL	Northern Flicker	75	68	10.7	1.1
RODO	Rock Dove	74	18	2.8	4.1

Table 1 (Cont.) Nanaimo Breeding Bird Survey – Summation 1998-2000

Symbol	Species Name	# Individuals Recorded	# Stations Species Recorded	% of Stations Recorded	# of Individuals Recorded/Station
BLOY	Black Oystercatcher	4	2	0.3	2.0
COSN	Common Snipe	4	4	0.5	1.0
WODU	Wood Duck	4	3	0.5	1.3
HETH	Hermit Thrush	3	3	0.5	1.0
WWPE	Western Wood-Pewee	3	2	0.3	1.5
PEFA	Peregrine Falcon	3	3	0.5	1.0
COME	Common Merganser	2	2	0.3	1.0
EVGR	Evening Grosbeak	2	2	0.3	1.0
GWFG	Greater White-fronted Goose	2	2	0.3	1.0
MERL	Merlin	2	2	0.3	1.0
STJA	Steller's Jay	2	2	0.3	1.0
AMBD	American Black Duck	2	2	0.3	1.0
COHA	Cooper's Hawk	1	1	0.2	1.0
FOSP	Fox Sparrow	1	1	0.2	1.0
GBHE	Great Blue Heron	1	1	0.2	1.0
PBGR	Pied-billed Grebe	1	1	0.2	1.0
RCKI	Ruby-crowned Kinglet	1	1	0.2	1.0
SSHA	Sharp-shinned Hawk	1	1	0.2	1.0
VESP	Vesper Sparrow	1	1	0.2	1.0
VIRA	Virginia Rail	1	1	0.2	1.0
BAOW	Barred Owl	1	1	0.2	1.0
BWTE	Blue-winged Teal	1	1	0.2	1.0
COLO	Common Loon	1	1	0.2	1.0

Number of Species 101
Total Individuals 10,126

Do Native Plants Bloom Earlier in Victoria or Nanaimo ? Results of a Five Year Phenology Study

by Bill Merilees

In 1998 I had the audacity to question the 'bragging rights' Victoria had to the earliest blooming dates for spring flowers. This question arose with the opportunity to compare data gather in Nanaimo in 1997 and 1998 with data gathered by Ms. M.C. Meldrum for Victoria in 1954. (published in the Victoria Naturalist 44.4 1978) When these first flowering dates were compared for six common species (See Table 1) the results were very ambiguous.

Table 1: First Flowering Dates – Victoria 1954 vs. Nanaimo 1977 and 1978

Species	Victoria 1954	Nanaimo 1977	Nanaimo 1978
Spring Gold	March 14	March 31	March 22
Large-flowered Blue-eyed Mary	March 14	March 13	< March 6 *
White Fawn Lily	March 21	April 6	March 23
Chickweed Monkey-flower	March 21	March 13	< March 6 *
Dull Oregon Grape	April 7	April 6	March 16
Salmonberry	April 11	April 3	March 25

* < means first flowering before this date.

These flowering dates are hardly conclusive due to a variety of factors; notable the small sample size and variable weather conditions one year to the next. As a result, to test the hypothesis that Victoria has or has not the earliest spring flowering of native plants a co-operative survey was initiated in 2000 that continued for five seasons. A number of observers were recruited in Victoria, Nanaimo, Gabriola Island, Parksville/Qualicum and Courteny/Comox.

Each participant was sent a recording form that listed ten species of flowering shrubs and twenty-four species of spring flowers that were common, easily identified and easy to observe. Dates of first flowering were recorded and a cumulative summation of this data for seven species (those most frequently reported) was prepared and distributed to all observers at the end of each season. The 2004 summation is provided as Appendix 1 to this article.

With five years data 'in hand' it was decided to look at this information to see what insights or answers these comparative observations might provide.

Method:

The method used to calculate mean blooming dates was to number each day with January 1st being day 1, and continuing this process with July 19th becoming day 200. Years 2000 and 2004 were Leap Years so day numbers after February 29th were adjusted accordingly, one day higher.

Results:

Are the 'dates of first flowering' earlier in Greater Victoria than 'up island' communities?

Based on our sample the answer is a definite '**YES**'. For the six species (Ox-eye Daisy was excluded due to a very small number of observations for Victoria) Greater Victoria's average mean first flowering time was approximately nine days earlier than Nanaimo, eight days earlier than Gabriola, nine earlier than Parksville/Qualicum and thirteen days earlier than Courtenay/Comox.

Table 2:Mean First Flowering dates.

Victoria	N=104	Day 92.93	(April 3rd)
Nanaimo	N=118	Day 102.33	(April 12th)
Gabriola Island	N=71	Day 100.73	(April 11th)
Parksville/Qualicum	N=58	Day 101.72	(April 12th)
Courtenay/Comox	N=64	Day 106.38	(April 16th)

N= Number of observations

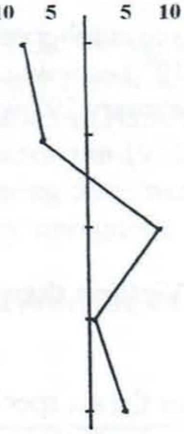
Was the arrival of Spring early or late in any particular year?

Comparing the annual date of first flowering to the mean flowering date for a particular species, provides a measure of the earliness or lateness of the season. For the five year duration of this study, almost all species flowered earliest in 2004 and latest in 2002.

The remarkable similarity of yearly first flowering patterns for Red Flowering Currant, Salmonberry and Blue-eyed Mary (that bloom mid to late March) – and – Saskatoon, Common Camas and Thimbleberry (that bloom late April to early May) is noteworthy. (Table 3)

Table 3: Yearly First Flowering Dates Compared tp Mean First Flowering

Red Flowering Currant
$\bar{X}$ = 78.64
(March 19th)



<days earlier 10 5	5 10 days later >
2004	-8.64
2003	-5.64
2002	+9.16
2001	+0.16
2000	+4.96

Saskatoon
$\bar{X}$= 112.68
(April 22nd)

<days earlier 10 5	5 10 days later>
2004	-10.88
2003	+ 3.32
2002	+ 5.72
2001	+ 2.32
2002	- 0.48

Salmonberry
$\bar{X}$= 84.28
(March 25th)

< days earlier 10 5	5 10 days later>
2004	-4.28
2003	-5.28
2002	+7.72
2001	+3.32
2000	-1.48

Common Camas
$\bar{X}$= 115.07
(April 25th)

<days earlier 10 5	5 10 days later >
2004	-9.07
2003	+0.73
2002	+6.13
2001	+4.68
2000	-2.47

Blue-eyed Mary
$\bar{X}$=87.84
(March 28th)

<days earlier 10 5	5 10 days later>
2004	-1.84
2003	-4.44
2002	+7.56
2001	-1.64
2000	-0.36

Thimbleberry
$\bar{X}$= 131.62
(May 11th)

<days earlier 10 5	5 10 days later >
2004	-10.82
2003	- 0.42
2002	+ 4.38
2001	+ 5.98
2000	+ 0.88

This appears to tell us that these species are responding in a similar manner each season so that their blooming chronology or sequence can be used and an indicator of how fast or how slow spring is advancing at a particular point in any particular year.

What is the variability in the arrival of spring from one year to the next?

On the data provided during this brief five year series of observations spring 'arrived' within a twelve day period for Blue-eyed Mary and within an eighteen (17.8) day period for Red Flowering Currant as compared to the mean flowering date for a these species. For Salmonberry (13.0); Common Camas (15.2; Saskatoon (16.6) and Thimbleberry (16.8) the range of dates was intermediate.

Conclusions:

The data set on which these observations are based is indeed small. Therefore coming to any firm conclusions is tentative and somewhat problematic. Those better versed in statistical analysis might interpret these results differently.

Until a larger survey is completed the results of this survey provide some interesting indications that indeed native plants bloom earlier in the Greater Victoria area than their up island counterparts; that the time a species first blooms can vary widely from one year to the next and that it would appear that by comparing the 'first' blooming of a large number of species to their mean blooming date through a number of seasons a keen observer might be able to track the ebb and flow of Spring's progress.

The latter is my next challenge!

References:

Anon, 1988: Chronological Plant List (Part 1) (compiled by M.C. Meldrum), Victoria Naturalist 1954-55) Victoria Naturalist, Vol. 44.4, January-February, 1988. pages 10-11.

Anon, 1988: Chronological Plant List (Part 2) (compiled by M.C. Meldrum), Victoria Naturalist 1954) Victoria Naturalist, Vol. 44.5, March – April, 1988. pages 14-15.

Merilees, Bill, 1998: Victoria and Nanaimo – Spring has Come. Victoria Naturalist Vol. 54.6 May-June 1998.

Acknowledgements: I would like to thank the following observers for their assistance in this study. The number in ( ) indicates the number of years each participated.

Greater Victoria Area:

Linda Beare (3)	Tracy Fleming (2)	Catherine Fryer (4)
Terry Morrison (5)	Ruth Cleary-Dohan (3)	Mikkel & Ann Schau (5)
(Swan Lake Christmas	Pat Johnston (5)	John Arnold (1)
Hill Nature Sanctuary)	Susan Bastin (1)	

Greater Nanaimo Area:

Mollie Byrne (5)	Kathy Jackson (5)	Ray & Sue Gullison (1)
Gwen Johnston (1)	Tom Hutton (1)	Guy & Donna Monty (1)
Irene Malthouse (5)	Jay Rostagi (2)	A. & L. Gast (1)
Peter & Anneke vanKerkoerle (4)		

Gabriola Island:

Jean Rhodes (3)	Mary Butt (5)	Jane James (1)
Phyllis Fafard (5)	Edna Sikavish (1)	

Parksville – Qualicum Area:

Will Lemmon (5)	Pamela Helem (5)	Margaret Kent (1)
Gillian Spencer-Sinclair (1)		

Courtenay – Comox:

Fred Constable (5)	Helen Robinson (5)	Fran Johnson (2)

Appendix 1: Flowering Phenology Study Southeastern Vancouver Island
2000 to 2004 – Cumulative Observations
(Selected Observations)

The number in ( ) is the number of observations for that area averaged to give the date that follows.

Red-flowering Currant

	Victoria	Nanaimo	Gabriola	Parksville Qualicum	Courtenay Comox
(2000)	(7) Mar. 20	(7) Mar. 29	(4) Mar. 11	(4) Mar. 31	(2) Apr. 1
(2001)	(6) Mar. 16	(4) Mar. 19	(3) Mar. 13	(2) Mar. 22	(2) Mar. 29
(2002)	(4) Mar. 24	(4) Mar. 30	(3) Mar. 26	(3) Mar. 26	(2) Apr. 7
(2003)	(5) Mar. 9*	(3) Mar. 11	(2) Mar. 14	(2) Mar. 18	(3) Mar. 18
(2004)	(3) Feb. 24 (Feb. 12 to Mar. 8)	(4) Mar. 16 (Mar. 11 to Mar. 17)	(3) Mar. 8 (Mar. 4 to Mar. 11)	(2) Mar. 9 (Mar. 3 to Mar. 14)	(3) Mar. 26 (Mar. 17 to Apr. 4)

*** January 22nd flowering (Swan Lake) not included in summation**

Thimbleberry

	Victoria	Nanaimo	Gabriola	Parksville Qualicum	Courtenay Comox
(2000)	-	(8) May 9	(2) May 10	(3) May 15	(2) May 16
(2001)	(2) May 8	(4) May 17	(2) May 15	(2) May 28	(2) May 20
(2002)	(2) May 7	(3) May 20	(3) May 18	(3) May 18	(2) May 17
(2003)	(2) May 8	(4) May 13	(2) May 10	(2) May 11	(3) May 14
(2004)	(2) Apr. 26 (Apr. 22 to Apr. 28)	(4) May 6 (Apr. 28 to May 18)	(2) Apr. 29 (Apr. 21 to May 6)	(2) Apr. 29 (Apr. 17 to May 10)	(2) May 4 (May 1 to May 6)

Salmonberry

	Victoria	Nanaimo	Gabriola	Parksville Qualicum	Courtenay Comox
(2000)	(3) Mar. 20	(6) Apr. 7	(3) Mar. 10	(2) Mar. 21	(2) mar.30
(2001)	(3) Apr. 4	(2) Mar. 25	(3) Mar. 28	(2) Apr. 2	(2) Mar.22
(2002)	(4) Apr. 24	(4) Mar. 18	(2) Mar. 25	(3) Apr. 3	(2) Apr. 2
(2003)	(2) Mar. 21	(3) Mar. 19	(2) Mar. 25	(2) Mar. 17	(3) Mar. 18
(2004)	(2) Mar. 30 (Mar. 18 to Apr. 10)	(3) Mar. 19 (Mar. 15 to Mar. 26)	(3) Mar. 9 (Mar. 1 to Mar. 19)	(2) Mar. 9 (Mar. 4 to Mar. 14)	(3) Apr. 7 (Mar. 28 to Apr 10)

Saskatoon

	Victoria	Nanaimo	Gabriola	Parksville Qualicum	Courtenay Comox
(2000)	(2) Apr. 20	(5) Apr. 20	(3) Apr. 23	(2) Apr. 20	(2) Apr. 28
(2001)	(4) Apr. 23	(4) Apr. 28	(3) Apr. 24	(2) Apr. 18	(2) May 2
(2002)	(2) Apr. 25	(3) May 3	(2) Apr. 29	(2) Apr. 26	(2) Apr. 29
(2003)	(5) Apr. 20	(5) Apr. 29	(2) Apr. 21	(2) Apr. 25	(3) May 5
(2004)	(2) Apr. 9 (Apr. 6 to Apr. 10)	(4) Apr. 11 (Apr. 9 to Apr. 12)	(3) Apr. 14 (Apr. 9 to Apr. 20)	(1) Apr. 6 (Apr. 6)	(2) Apr. 19th (both Apr. 19)

Appendix 1: Flowering Phenology Cumulative Observations 2000-2004 (Cont.)

Oxeye Daisy

	Victoria	Nanaimo	Gabriola Island	Parksville Qualicum	Courtenay Comox
(2000)	-	(4) May 21	(3) May 29	(3) May 25	(2) May 21
(2001)	(2) May 26	(3) May 22	(1) June 2	(2) June 4	(2) May 26
(2002)	(1) July 14	(3) May 17	(2) May 26	(2) June 3	(2) May 26
(2003)	-	(4) May 21	(1) June 5	(2) May 28	(3) May 29
(2004)	-	(3) May 19	(2) May 8	(2) May 15	(3) May 16
		(May 13 to May 24)	(Apr. 19 to May 28)	(May 11 to May 17)	(May 10 to May 25)

Common Camas

	Victoria	Nanaimo	Gabriola Island	Parksville Qualicum	Courtenay Comox
(2000)	(6) Apr. 14	(3) Apr. 28	(2) Apr. 26	-	-
(2001)	(7) Apr. 10	(4) May 3	(2) May 2	-	(2) May 14
(2002)	(6) Apr. 20	(3) May 6	(1) May 5	(2) Apr. 26	(2) May 9
(2003)	(5) Apr. 2	(5) May 4	(2) May 1	(1) Apr. 26	(2) May 6
(2004)	(4) Mar. 28	(3) Apr. 26	(2) Apr. 20	(1) Apr. 7	(2) Apr. 30
	(Mar. 11 to Apr. 11)	(Apr. 21 to Apr. 29)	(both Apr. 20)		(Apr. 26 to May 3)

Blue-eyed Mary

	Victoria	Nanaimo	Gabriola Island	Parksville Qualicum	Courtenay Comox
(2000)	(4) Mar. 26	(5) Mar. 27	(3) Apr. 4	(2) Mar. 30	(2) Mar. 28
(2001)	(3) Mar. 25	(3) Mar. 10	(2) Apr. 10	(2) Apr. 10	(2) Mar. 19
(2002)	(2) Apr. 12	(2) Apr. 5	(2) Apr. 8	(1) Apr. 10	(2) Mar. 23
(2003)	(2) Mar. 23	(2) Mar. 21	(1) Mar. 23	(2) Apr. 6	(2) Mar. 18
(2004)	(2) Mar. 21	(4) Mar. 24	(2) Mar. 23	(2) Apr. 2	(2) Apr. 3
	(both Mar. 21)	(Mar. 5 to Apr. 3)	(Mar. 19 to Mar. 26)	(Mar. 24 to Apr. 10)	(Mar. 27 to Apr. 8)

Dramatic Changes in Breeding Seabird Populations near Nanaimo, B.C.

by Bill Merilees & Guy Monty

Hudson Rocks, Five Fingers, Snake Island and the Gabriola Island Bluffs, facing Northumberland Channel, are noted seabird nesting areas within Greater Nanaimo. For nearly 50 years these cliffs or rock knuckles have been visited by naturalists for the purposes of bird banding, population censusing or strictly for pleasure. The purpose of this article is to summarize the 'historic' information available on the colonial seabirds nesting at these locations, to present information gathered during visits in 2000, 2001 and 2003, and to discus some of the changes that have taken place.

Hudson Rocks became a provincial ecological reserve in 1996. Five Fingers and Snake Island are unalienated crown reserves. Gabriola Bluffs are believed to be private waterfront properties, that due to their shear, near perpendicular cliff faces, are virtually inaccessible. Human disturbance on the islands is visible in the form of navigation markers (Hudson Rocks and Snake Island) and by the presence of exotic vegetation, notably common lilac *Syringa vulgaris* on Snake Island and periwinkle *Vicia minor* on Five Fingers. Many other non-native plants make up a considerable and conspicuous element of these island's flora.

In the late 1950's, members of the Vancouver Natural History Society's 'bird banding group' made a number of visits (1958, 1959 and 1960) primarily to band juvenile glaucous-winged gull and pelagic cormorant chicks before they were ready to fly. These visits provided the first estimates of nesting numbers for these species (Drent and Guiguet, 1961). Sporadic visits by Canadian Wildlife Service and Royal British Columbia Museum staff between 1970 and 1986 provided additional census information (Campbell, 1976 and Campbell et al 1990). With the assistance of BCParks, the Pacific Biological Station and privately owned or rented vessels, the authors made a number of visits to these colonies in 2000, 2001 and 2003. In addition to censusing nesting colonial seabirds, counts were made of all bird and mammal species encountered. Appendix 1 lists the bird species and numbers, by location and date.

Double-crested Cormorant:

Summary Table 1 lists the observations on record for this species. Except for the two nests seen on Gabriola in 2000, no other active nests of Double-crested Cormorants were seen during our visits. On the northern-most knuckle of Five Fingers, 20+ stick nests of this species were present indicating nesting had been attempted previously but this location had been totally abandoned previous to our visits. In the authors (WM) field note book, along with a photo taken May 1st, 1997, is a record of a visit, labeled Hudson Rocks, showing a number of Double-crested Cormorants on nests, with additional birds nearby. Could this possibly be Five Fingers?

At the time of our visits it was speculated that human disturbance, possibly from fishermen, but more likely from the considerable number of loud, low flying seaplanes, that are continually entering or exiting Departure Bay, during landings and takeoffs, as being the probable cause for abandonment.

Double-crested Cormorants have been slowly expanding their breeding range in the Gulf of Georgia northward during the past half century. Compared to the nesting colonies on Mandarte Island and now at Mitlenatch Island, the Nanaimo Islands would not appear to offer the sloping, high cliff topography (or the tree nesting capability of Ballingall Islet also noted abandoned in June, 2002, WM personal observation), favoured by this species. Some portions of the Gabriola Cliffs may be more suitable.

Pelagic Cormorant:

Summary Table 1 and Figure 1 present the nesting population numbers for this species. It is interesting to note that about the time (1978) of the construction of Duke Point Industrial Site, there was a sizable shift in nesting away from the Gabriola Cliffs, particularly to Snake Island and Five fingers. Duke Point was being leveled by blasting at this time. The noise from this work could be heard in Nanaimo so the sound coming directly across Northunberland Channel must have had a considerable effect on this colony. In 1987 no nesting was reported on these cliffs but the Pelagic Cormorant now appears to be recolonizing this site.

Glaucous-winged Gull:

Summary Table 3 and Figure 2 present the information available on the nesting of this species. The very low numbers of nesting Glaucous-winged Gulls presently found on Five Fingers, Hudson Rocks and Snake Island might be due to a number of factors. It is known, but a thorough census has yet to be made, that this species is now nesting on roof tops in downtown Nanaimo. A sizable colony, tentatively estimated at upward of 100 pairs, (Sandy Shaw, personal communication) has also been using roof areas at the 'Harmac Pulp Mill' as nesting sites. Colony disturbance by predators, Bald Eagles and River Otters, harassment by territorial Canada Geese (a number of pairs nest on each island), human visitation and methods of handling (covering) garbage at the Nanaimo Area Landfill site in Cedar, might all combine to explain the greatly reduced numbers of island nesting Glaucous-winged Gulls in Greater Nanaimo..

Other Species:

Appendix 1 provides a summation of the of all the other bird species recorded during our visits to these colonial seabird nesting areas.

Acknowledgements:

The authors would like to thank Colin Bartlett, John Brighton, Drew Chapman, Rick Harbo, Mike Kattilakoski, Carlo Pavan and Jennifer Toole for their help, assistance and 'good companionship' during our field trips.

Figure 1: Pelagic Cormorant Nest Numbers – Hudson Rocks, Five Fingers, Snake Island and Gabriola Bluffs, Nanaimo, B.C., 1958 to 2003

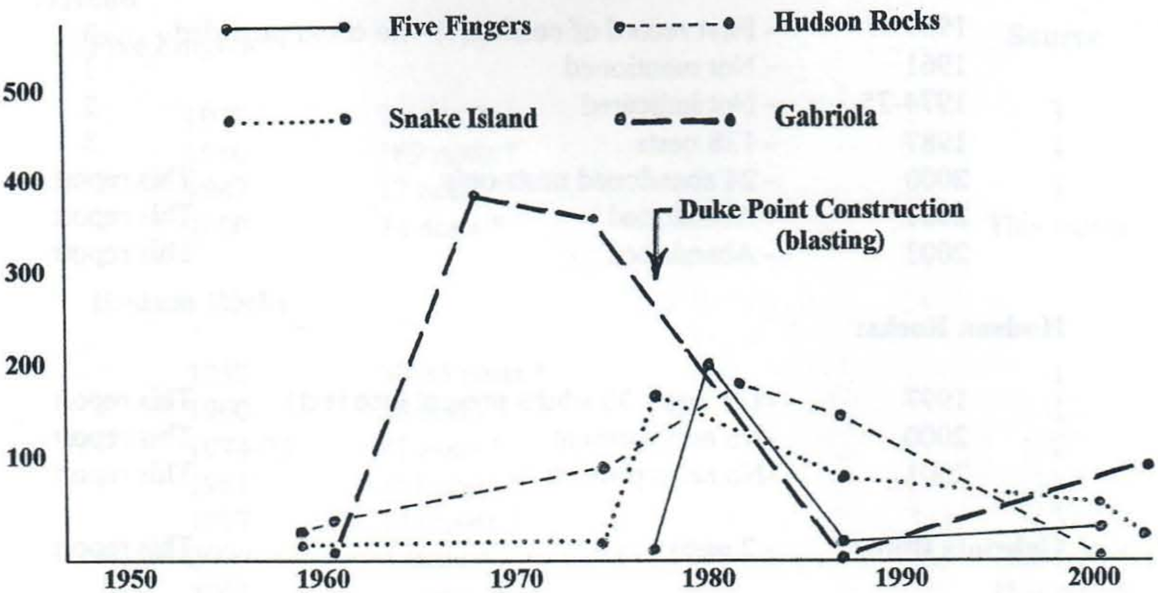
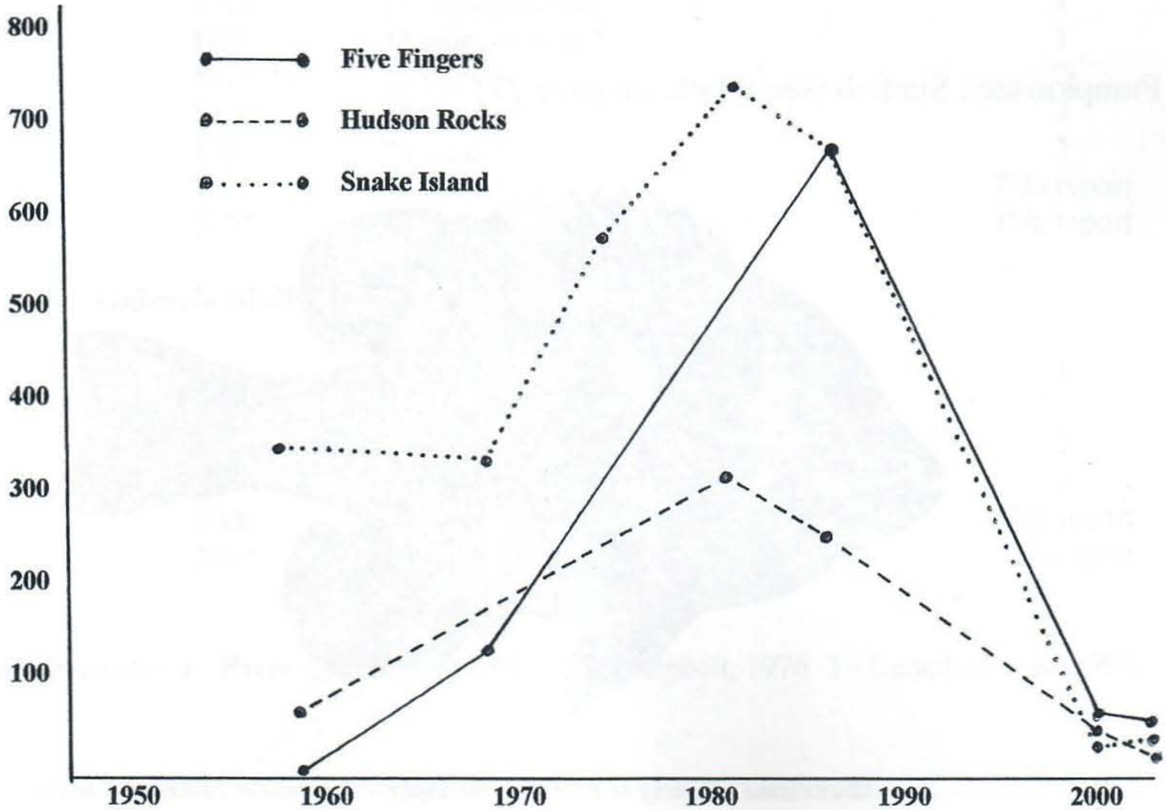


Figure 2: Glaucous-winged Gull Nest Numbers – Hudson Rocks, Five Fingers and Snake Island, Nanaimo, B.C., 1955 to 2003



Summary Table 1: Double-crested Cormorant Nesting History – Greater Nanaimo

Five Fingers:		**Source:**
1959	- First record of nesting(?) - no count provided	3
1961	- Not mentioned	1
1974-75	- Not indicated	2
1987	- 138 nests	3
2000	- 24 abandoned nests only	This report
2001	- Abandoned	This report
2003	- Abandoned	This report
Hudson Rocks:		
1997	-13+ nests 33 adults present (see text)	This report
2000	-No nests present	This report
2001	-No nests present	This report
Gabriola Bluffs:	- 2 nests	This report

References: 1- Drent & Guiguet, 1961. 2- Campbell, 1976. 3- Campbell et all, 1990.

Pumpkinseed Sunfish (see article on page 77)

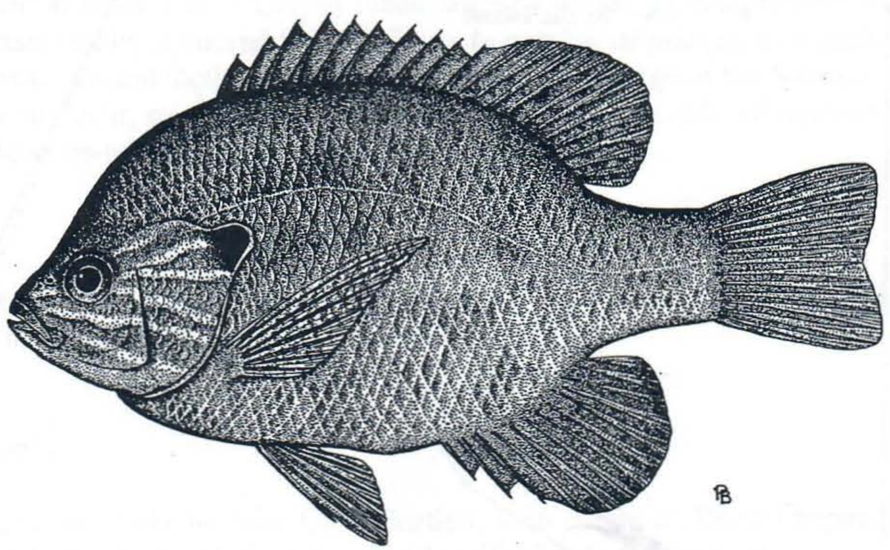


Illustration courtesy of Peter Buerschaper – *Freshwater Fishes of Canada*

Summary Table 2: Pelagic Cormorant Nesting History – Greater Nanaimo

* Denotes information graphed in Figure 1:

Site	Year	Count	Source
Five Fingers			
	1977	7 nests *	3
	1980	189 nests *	3
	1987	17 nests *	3
	2000	34 nests *	This report
Hudson Rocks			
	1959	30-35 nests *	1
	1960	38 nests *	1
	1974-75	91 nests *	2
	1981	181 nests *	3
	1987	142 nests *	3
	2000	4 nests *	This report
	2001	6 empty nests	This report
	2003	No nests	This report
Snake Island			
	1958	15 young banded	1
	1959	15 pairs nesting *	1
	1974-75	22 pairs *	2
	1978	174 nests *	3
	1987	74 nests *	3
	2000	49 nests *	This report
	2003	18 nests *	This report
Gabriola Bluffs			
	1960	6-7 pairs *	1
	1968	390 nests *	3
	1974-75	367 nests *	2
	1987	No nesting *	3
	2000	22 nests	This report
	2003	88 nests *	This report

References: 1 - Drent and Guiguet, 1961 2 - Campbell, 1976 3 - Campbell et al, 1990.

Summary Table 3: Glaucous-winged Gull Nesting History - Greater Nanaimo.

* Denotes information graphed in Figure 2:

Hudson Rocks			**Source**
	1958	Nesting noted	1
	1959	75 pairs *	1
	1960	nesting – young present, no count made	1
	1974-75	Included with Five Fingers – Total nests 559	2
	1981	308 nests *	3
	1986	247 nests *	3
	2000	68 nests *	This report
	2001	2 nests	This report
	2003	19 nests *	This report
Five Fingers			
	1959	5 nests *	1
	1968	110 nests *	3
	1974-75	Included with Hudson Rocks – Total nests 559	2
	1986	671 nests *	3
	2000	57 nests (mid July - 49 empty, 8 with eggs, no live young found) *	This report
	2003	50 nests *	This report
Snake Island			
	1947	Nesting	4
	1958	300-400 pairs (313 young banded) *	1
	1959	Approx. 500 pairs noted	1
	1960	300-400 pairs estimated	1
	1968	330 nests *	3
	1974-75	558 nests *	2
	1981	719 nests	3
	1986	673 nets *	3
	2000	42 nests *	This report
	2003	32 nests *	This report
Gabriola Bluffs			
	1974-75	4 nests	2
	2003	4 nests	This report

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Appendix 1: Summation of Bird Species and Number of Individuals Recorded on Each Visit.

*** Indicates nesting observed.**

YEAR	2000					2001		2003				
LOCATION	**HUDSON ROCKS E.R.**		**FIVE FINGERS**	**SNAKE ISLAND**	**GABRIOLA BLUFFS**	**HUDSON ROCKS E.R.**	**FIVE FINGERS**	**HUDSON ROCKS E.R.**	**FIVE FINGERS**	**SNAKE ISLAND**	**GABRIOLA BLUFFS**	**ENTRANCE ISLAND**
DATE	June 15	July 13	July 31	July 31	August 2	July 19	July 19	June 17	June 17	June 17	June 17	June 17
Brant			2									
Canada Goose	2	1								3		
Harlequin Duck	2	14		8		6		22				48
Surf Scoter			2									
White-W. Scoter												3
Com. Merganser												
Brandt's Cormorant								1		1	1	
Dbl..Cr.Cormorant	*			*		2	*	1	0*	1	4*	
Pelagic Cormorant	4*	16*	5*	22*	54*	18*		11	5	50*	107*	4
Bald Eagle				2	3-4	1						
Peregrine Falcon											3*	
Bk.-bellied Plover				2								
Killdeer												2
Bk.Oystercatcher		6*	4*	6		2		9*	5	4*		2
Wandering Tattler			3	3		2						
Ruddy Turnstone				1								
Black Turnstone			4	18		6	6					
Surfbird				2								
Western Sandpiper		1					5?					
Bonaparte's Gull							6					
California Gull			1	27			15					
Gl-winged Gull	108*	21*	37*	57*		20	*	48*	66*	115*	7*	53
Caspian Tern		2										
Common Murre			4									1
Pigeon Guillemot		1	14	4*			3+	1	6	8	10*	1
Marbled Murrelet								8	6	7		2
Rhinocerous Auklet										5		
Steller's Jay											1	
Northwestern Crow								2				
Violet-Gr.Swallow											2*	2
No. R-w. Swallow											1*	
Barn Swallow												1
European Starling				3								7
Savannah Sparrow			1									
Song Sparrow		1	8			2	5+		4			

Newcastle Island Mystery Solved -
How Pumpkinseed Sunfish Got to Mallard Lake!
By Bill Merilees

It had always been a bit of a mystery - How did the Pumpkinseed Sunfish get into Mallard Lake on Newcastle Island? This largely man made lake was created for water storage to enable the operation of steam driven mining equipment. When the actual dam was constructed is a matter of conjecture, but two opinions are available. The earliest goes back to the operation of the Newcastle and Fitzwilliam coal mines that ceased operation prior to 1887. A rusted boiler at the west end of Mallard Lake lends support to this theory. The second possibility dates to 1899 when the New Vancouver Island Coal Company sank its Kanaka Bay shaft more than 100 metres to intercept the coal seams then being worked from 'downtown' Nanaimo. Whenever it was constructed, this impoundment became a recreation destination to which muskrat and beaver were eventually liberated for 'wildlife viewing pleasure' in 1931 by the Canadian Pacific Resort. When *Newcastle Island - A Place of Discovery* was published in 1998, the question was asked "How did the Pumpkinseed Sunfish arrive in Mallard Lake?" (page 19). Thanks to Armand Caillet we now have an answer.

BC Parks had been puzzled by this question, which they passed on to the Provincial Fish and Wildlife Branch of the day. One suggestion was that the pumpkinseeds arrived with Smallmouth Bass from the introductions to Florence and Langford Lakes on southern Vancouver Island in 1901. Indeed, around this time bass, both largemouth and smallmouth, were appearing and/or being transplanted to a number of sites across southern British Columbia. While the documentation for bass transplants is fragmentary the record of pumpkinseed arrival is virtually blank. We do know however, that by the mid 1950's, Pumpkinseed Sunfish were locally distributed along the east side of Vancouver Island from Victoria to Nanaimo and in the area of Port Alberni.(see Carl, G.C. et al, 1959, Fresh-water Fishes of British Columbia)

According to Armand, Mrs. Margaret (Lotus) Alexander, a daughter of Mark Bate, Nanaimo's first Mayor, was responsible. She was a 'regular' at the Lotus Hotel (hence her 'nick name') where she occupied a corner seat in the pub. One day about 1915, along with 2 male friends she transported a number of Pumpkinseed Sunfish to Newcastle Island where they were released into Mallard Lake (then known as Beaver Lake). The rest is now history. The Pumpkinseeds continue to flourish - and - the question of their arrival to Mallard Lake has an answer. Thank you Armand.

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Vancouver Island Beggarticks

Bidens amplissima

By Bill Merilees

The Vancouver Island Beggartick is considered a species that is nationally and internationally significant because its entire range is appears confined to the Pacific Northwest. In British Columbia it is listed as a Species of Special Concern (Klinkenberg and Klinkenberg, 2001) and is Blue Listed (with a G3 S3 ranking (Globally rare or uncommon – and Provincially (S) rare and uncommon) (Douglas, Straley and Meidinger, 1998). The main areas where this beggartick is found are along southeastern Vancouver Island and the Lower Fraser Valley. Coastal Washington State, Port Alberni and the Kimsquit Estuary, on the central B.C. Coast, are other locations where it has been collected. For the Greater Nanaimo Area this species was 'unknown' until specimens were collected by Guy Monty in Jinglpot Marsh in 2001.

This sometimes robust plant is a sun loving annual that prefers openings in wetlands, particularly pond margins that are subject to annual flooding. A member of the Aster Family, its flowers are quite sunflower like in appearance though relatively diminutive, being only 3 to 4 cm across (see photos). It may grow to a metre in height, its leaves are often tripartite with the petioles winged (see illustration) but the really distinguishing feature, and what gives beggarticks their name, are their seeds! Crowned with backward spined barbs (see photo) these projections are superbly designed to catch in ones clothing (sox in particular!), bird's feathers or mammal's fur, whereby they 'hitch a ride' to new locations. Once imbedded in clothing they are very difficult to remove!

Possibly one reason the Vancouver Island Beggartick is considered 'rare' and it's distribution and status poorly know, is that it blooms rather late in the season. John Macoun, Naturalist to the Geological Survey of Canada, collected the first specimen August 12th, 1887, from the bank of the Somass River, Port Alberni. At this time of year most botanists will be looking to mountain meadows for their specimens rather than low elevation wetlands! In 2005, the beggarticks at Jinglepot came into bloom about August 18th and while the ray flowers seemed to soon disappear, the disk flowers remained 'open' until early October (personal observation).

In addition to the Jinglepot Wetlands, the V.I. Beggartick has been reported from at least one other area in Greater Nanaimo, but this site has apparently been destroyed by development (Guy Monty, personal communication).

As virtually every wetland has the potential to have Vancouver Island Beggartick in its floral inventory, biologists, botanists and naturalists need to be aware what this species looks like – and - knowing that it is a 'late bloomer', to look for this species in late August and September. After all, not that many plant species are endemic to our 'corner' of this planet, and those that are, are worth knowing and worth keeping! The first consideration must be to ensure their preferred habitat is preserved in the long term and then managed to satisfy the species 'personal' needs.

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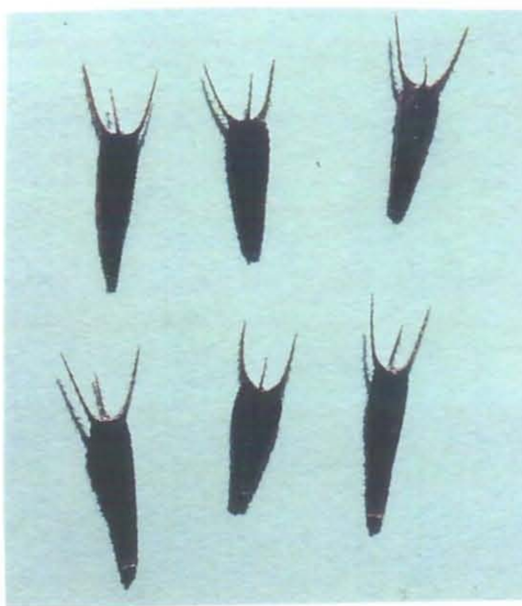
Vancouver Island Beggarticks

Bidens amplissima

Fresh apical stem flower – late August

Axial flower stem with heads of green seeds.

Illustration from *Illustrated Flora of British Columbia*
Courtesy Province of British Columbia.



Vancouver Island Beggartick seeds.
Note: 'crown' of three barbs. In this photo, shadows give the appearance of additional barbs.