# THE POLITICS AND SCIENCE OF ENVIRONMENTAL PROTECTION - THE CASE OF FORESTRY - UNGULATE MANAGEMENT IN THE NIMPKISH WATERSHED ON VANCOUVER ISLAND, B.C.

by

KARL MARTINS STURMANIS

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Department of Community + Regional Planning

The University of British Columbia
2075 Wesbrook Place
Vancouver, Canada
V6T 1W5

Date September 15, 1986.

## ABSTRACT

Wildlife management in British Columbia has experienced over the last two decades a situation where continued pressure from logging and other forest uses has forced wildlife into an ever shrinking island of survival. What is needed from a resource planner's point of view is a means of elevating and sustaining public concern in the issue of forestry-wildlife management and to ensure that an appropriate management program to protect critical ungulate habitat is designed and implemented by resource managers.

Lord Eric Ashby has proposed a model that describes the components necessary for successful political action in protecting environmental values, namely: an aroused public conscience, a feasible technology of protection, an objective and disinterested assessment of the hazard to the environment and an effective tool for administration. Ashby argues that each component is a step of a process and that each is necessary to act as a catalyst for the succeeding steps, resulting ultimately in the implementation of a political decision. Ashby's model in a slightly modified form is used to analyze the forestry-ungulate management program in the Nimpkish watershed on northern Vancouver Island. The Nimpkish watershed was chosen as a case study in that it has an emerging forestry-ungulate management program and also because of the considerable public interest that has been expressed in the area.

The Tsitika Integrated Resource Plan is also looked at to compare the approach taken there with the one taken in the Nimpkish watershed. Of special interest is the design of the public consultation program and the melding of the scientific data with the issues and aspirations of the different interested

publics and industry.

The Nimpkish case study reveals that Ashby's first component of an arousal of public conscience has occurred although it has been somewhat fractured and erratic over time. However, there has been a convergence of some of the interests of the different groups that has created sufficient pressure for the government to analyze the situation and to commit itself to make a policy decision on the issue of habitat reservation for ungulates.

Ashby's second component of scientific assessment and prescription of appropriate management action is fulfilled, but only at the technical level. There still remains some difficulty with regard to the assignment of monetary value to intangible resource values such as wildlife.

The third component, an effective tool for administration, has not been totally satisfied in the case of the Nimpkish management proposal. While there is substantial co-operation and collaboration at the operational level between the ministries of Forests and Environment, a serious inertia remains at the senior policy decision-making level.

Some possible approaches that could alleviate the Nimpkish situation and others like it include a strengthening of legislation to help facilitate inter-agency resource planning. The public could also be better informed regarding resource conflict issues and thus be better prepared for the consultative stages of the planning process. There appears to be a strong public reaction against the use of benefit-cost analysis in determining value for intangibles such as wildlife protection. Finally, there is a need to create situations where politicians are

comfortable in making policy decisions regarding resource use conflicts. One approach would be the encouragement of incremental decisions that lead eventually to a broader policy position in favour of protection of wildlife habitat. Another approach is to blend scientific and non-scientific views as occurred in the Tsitika Integrated Plan. While the Tsitika experience may not appear to alter present modes of decision-making significantly, it is possible that prolonged exposure to the process may indeed alter the manner in which resource conflicts are resolved - hopefully in favour of a more balanced approach to resource use where conservation holds equal value with exploitation.

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## Island Clearcut

miles of clearcut
like shaved heads
lined up along the
once shaggy wild island

the wind clears a view south
to the Olympic peninsula

'that's progress' says Byron
sweeping a hand over
land that had lost
all reason for being

just so many numbers
of days
of sweat
of paycheques
and deer hunts
of cold rain and fog
and hot coffee
at the end of a cattrack
and the big boys
who once but only once
visited the island operation
because the weather
and market were exceptionally good

but they didn't climb
the side hills or scramble thru
the blowdown
where bears are black as burnt slash
and big bucks gorge themselves
on late August fireweed

and they'll never see
the icy horizon of Olympus
where a lone tree
traces a thousand years
of wind
in a single branch

ks

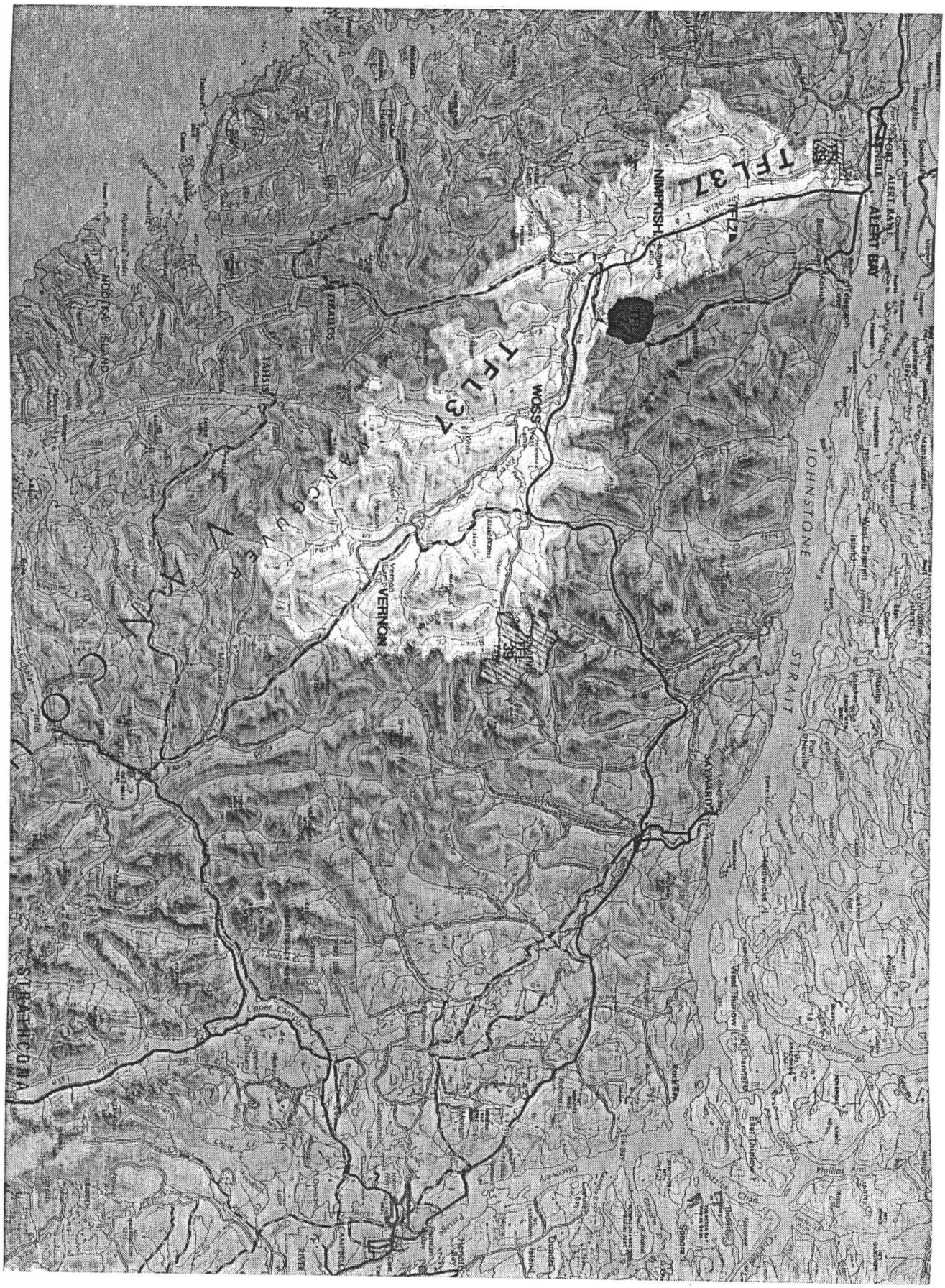
# CHAPTER ONE A Story of Trees, Deer and Men. How Can We Better Manage Ungulates in the Nimpkish Watershed.

## 1.0 Introduction

This thesis looks at the process of co-operative ungulate-forestry management in British Columbia and appraises the steps involved from raising of the issue of ungulate habitat needs through the subsequent stages of scientific assessment of the issue, feasibility of management action and finally administrative implementation of management prescriptions. A theory of issue advancement and subsequent program implementation has been proposed by Eric Ashby (1975) and it will be his model by which the ungulate-forestry program will be evaluated. The Nimpkish watershed on northern Vancouver Island has been chosen as a case study in that it has an emerging ungulate-forestry management program and also because of the considerable public interest that has been expressed in the area.

The first chapter presents background on the land use conflict that exists between forestry and ungulate management in the Nimpkish watershed and argues that a need exists for its resolution. The chapter will look at the nature of the forest and how changes wrought by commercial logging have affected the resident populations of deer (Odocoileus hemionus columbianus) and elk (Cervus elaphus roosevelti). The second chapter elaborates on the biological and resource use factors that are central to the forestry-ungulate situation.

FIGURE 1
THE NIMPKISH WATERSHED



Chapter 3 looks at the first component of Ashby's model, namely the presence of "an aroused public conscience." In the case of the Nimpkish watershed the focus will be on the arousal of public interest in the preservation of wildlife habitat, particularly for ungulates. Chapter 4 will address the second and third components of Ashby's model which includes the need for an objective scientific assessment of the problem and a feasible management practice to ensure resolution of the problem. In Chapter 5 the final component of Ashby's chain reaction of events is the presence of an adequate and effective administrative structure to allow for implementation of management prescriptions. The final chapter evaluates the Nimpkish situation using Ashby's model and also evaluates Ashby's model in light of lessons learned from the chain of events that occurred in the Nimpkish watershed. Finally, recommendations are made regarding resolution of forestry-ungulate conflicts specifically and "wilderness" and land use conflicts in general.

## 1.1 Do deer need trees? Who really cares?

The late 1960s witnessed the emergence of an "environmental consciousness" that swept across North America and much of the developed countries of the world. Although initial attention was focused on issues such as over-population, pollution and over-exploitation of natural resources, there was a general trend to view the environment holistically, rather than an array of independent raw resources to be exploited by society. This new environmental ethic found particularly fertile ground in British Columbia where a strong grass roots environmental lobby, consisting of a variety of advocacy groups, was formed during the 1970s.

It was during this time of environmental activism that people in the general public, government, schools and the private sector were sounding warnings on the state of the province's forests which supported the number one industry both in employment and government revenue. It was becoming evident that in many cases forests were being over-cut and not being replanted sufficiently to ensure a continuous supply of timber. Also biologists were concerned that wildlife dependent on old growth were being threatened, in some cases with local extinction. The forest industry was facing a dilemma that would resurface regularly from the 1960s through the 1980s - namely that an ever increasing demand was being placed on a steadily shrinking resource.

To understand why trees are important to deer and elk - commonly referred to as ungulates - it is important to have some understanding of the biological relationship that exists between the animals and the forest of the Nimpkish watershed. For sake of convenience and economy the following discussion will focus on black-tailed deer, realizing that some differences exist between the habitat requirements of deer and Roosevelt elk.

The following account of black-tailed deer biology is very much simplified and is intended to give only a general understanding to the lay person. In the Nimpkish watershed there are three broad vegetation zones utilized by deer: Alpine tundra - 1400 m+; Mountain hemlock 900 - 1200 m, and Western hemlock 0 - 900 m (see Chapt. 2, Sec. 2.5). The discussion will centre on the Western hemlock zone, which generally speaking is the habitat type most frequented by deer.

Fred Bunnell (1979) has summarized the results of over a decade of research on the relationship between black-tailed deer and forests on northern Vancouver Island. According to Bunnell some key factors affecting deer abundance include deer movement (daily and seasonal), deer forage, snow depth, predation, bedrock and forestry practices. Studies have shown that deer move to areas or 'ranges' where food is most abundant during the different seasons of the year. Generally deer winter ranges (November to mid-April) are located at the lowest elevations where preferred food is plentiful and easily accessible. As the snow pack melts the deer move to higher elevations in spring and summer; retreating again to the valleys as winter snows accumulate in the higher summer ranges. Besides these vertical movements some deer have been observed to make horizontal migrations while others shift their intensity of use of mature forest and logging slash (recently logged area).

Black-tailed deer have been observed to consume a variety of food; including young fir trees, shrubs and arboreal lichen. Of particular interest to biologists is the heavy dependence of black-tailed deer in winter on arboreal lichen which is blown down to the ground. Winter litterfall which includes twigs, needles and lichen is in certain stands equal or greater in importance, as a food source, than all other rooted forage. Most commonly the arboreal lichen is found in mature stands of trees - 200 years of age and greater. There is also some evidence that shrub productivity in deer winter and spring ranges acts to control deer numbers in some forest types.

Snow depth is a very important factor in controlling deer mobility and food availability (Jones, 1974). It has been found that snow depths greater than 60 cm will seriously curtail deer movement. A mature tree canopy is therefore of critical importance during winter in the Nimpkish watershed where some areas can receive over 750 cm of snowfall annually. On deer winter ranges snow packs can reach 200 cm in open areas, 110 cm in areas with 30 percent canopy, or crown closure, and only 30 cm in areas where the crown closure is 70 percent.

Another important factor controlling deer abundance is the presence of predators including wolves, cougars, black bears and golden eagles; the latter known to take fawns. Man is also a predator and his activities will be discussed in greater detail in subsequent chapters. It is enough to say that sports hunting in the Nimpkish was very popular in the late 1960s and early 70s; gaining a province- wide reputation as a deer "hot spot". Deer hunting success has declined steadily since the mid-1970s to the point where parts of the watershed have now become deer "deserts". At the same time there has been a steady increase in wolf numbers and there is strong evidence that suggests wolves are killing large numbers of deer to the point where deer numbers are on the verge of local extinction in specific sections of the watershed. There is also some evidence that logging roads are frequently utilized by wolves while hunting for deer and that deer are more vulnerable during winter in heavily logged areas where they concentrate in "islands" of mature trees containing adequate food and cover. The Fish and Wildlife Branch has responded by undertaking more wolf research as well as implementing a wolf control program in 1982 which calls for the reduction of wolves by 75 percent over the next five years over 50

percent of the watershed.

A more indirect control on deer numbers is the nature of local soils and bedrock. Deer abundance correlates well with anadesitic till soils underlain by Bonanza Group rocks. Anadesitic soils are generally higher in nutrients, particularly in nitrogen - which has been shown to be essential for ungulate survival - than are tills overlaying other types of bedrock. This kind of correlation has obvious implications in managing logging practices and deer. Simply there are some areas which have little inherent capability to sustain deer numbers and can thus be withdrawn from consideration for deer ranges from the outset.

Present forestry practices on Northern Vancouver Island include a continuation of large-scale clear-cuts, where all trees are cut within a given area. The cumulative effect of clear-cuts has been the reduction of mature forest to approximately 25 percent or less of the original forest in the lower mid-elevations in the Nimpkish watershed. This reduction has in turn reduced the quantity and quality of black-tailed deer winter and spring ranges and has created specific problems mentioned previously such as restricting deer movement both to obtain forage and to escape wolves; and reducing shrub and arboreal lichen production which are of critical importance during the winter.

Aside from a few special interest groups there has been little sustained public interest in the plight of the deer in the Nimpkish watershed. Sports hunters certainly have expressed concern over the decline in deer since the mid 1970s and have more recently shown support for both deer

habitat protection and a wolf control program. Conservation and environmental groups have reacted negatively to the wolf control program and have suggested that wildlife managers improve their management of the forest habitat for the use of all wildlife; not just ungulates. There has also been a campaign by naturalists and conservationists to save an exceptional stand of Douglas fir in the Nimpkish watershed. The latter group's efforts have been widely publicized through television, magazines and newspapers over the last three years - making the Nimpkish watershed much more visible to the public at large.

Daryl Hebert (1979), the regional biologist for Vancouver Island, describes the logging - wildlife situation in the late 1970s:

> "... logging can produce a definite NET LOSS (Hebert's emphasis) to black-tailed deer populations which could reach 80 - 90% if the decline is measured between winter ranges in second growth versus mature forest. . . . black-tailed deer populations in snowbelt areas may be a NON-RENEWABLE resource if timber harvest proceeds in its present form." (p.6)

On the forest industry side we are witnessing a real concern for the depletion of trees both in quantity and quality and the further constraints this places on managing forests for other resource uses, including ungulates. The forestry industry has admitted - not always unanimously - that timber shortages are occurring in specific regions and that a general crisis is imminent. Speaking at a 1980 forestry conference in Toronto, Bill Young, the Chief Forester for B.C., delivered some startling statements regarding the condition of the forestry industry. Young

challenged the prevailing view that the forest industry could continue to grow and said that any expansion "will be very selective in nature and in many parts of this country will simply not exist." (The Province, 1980).

A report published by the Ministry of Forests in 1980 provided a comprehensive examination of the state of the forestry industry and its relationship to other resources in the province. The two volume report entitled Forest and Range Resource Analysis Technical Report predicts that if logging were to be maintained at its current levels, shortages relative to sawmill demands would occur within 5 to 20 years in some areas of British Columbia. It also states that approximately 25 percent of the province's forest land will be lost in the next 20 years. The other uses would include such things as parks, wildlife areas, urban growth, hydro-electric dams, agriculture and transportation corridors. While wildlife areas are figured into the Ministry's equation the total amount of forest reserved for wildlife is insufficient to maintain levels of wildlife, including ungulates, that have been identified by the Fish and Wildlife Branch's provincial Proposed Wildlife Management Plan (1979).

The statements by Hebert and Young cannot be dismissed as the ravings of publicity seekers or political radicals. Their comments are backed by years of rigorous studies and analysis that have revealed a state of affairs frightening in its implications, yet understandable considering the exploitive frontier ethic that prevailed in British Columbia from the turn of the century until the 1960s. It was an era when the forest was first viewed as an imposing obstacle and later as a limitless resource (Taylor, 1975). Initially the forests were not much affected by the efforts of

loggers who were, relatively speaking, working with inefficient tools and at a small scale. The advent of more sophisticated and efficient machinery and a quantum leap in the scale of logging operations beginning in the late 40s and hitting their peak in the 50s and 60s has, however, had a significant effect in altering the nature of the forest and the wildlife that dwell there.

Perhaps the greatest problem facing wildlife managers in B.C. is the accelerating loss and deterioration of existing forest habitat. Much of this loss can be attributed to the nature of legislative mandates of provincial resource agencies. The Ministry of Environment, specifically the Wildlife Branch (name changed from Fish and Wildlife in 1984), is charged with responsibility for managing wildlife. However, it has direct control or tenure on only 8,748 square kilometres or nine-tenths of one percent of the province's land base (Walker, pers. comm.). This is contrasted with the Ministry of Forests which has management control - in the form of harvest tenure - over 60 percent of the province. Until recently the Ministry of Forests has had no mandate to take into account wildlife values when setting harvesting rates.

Fred Bunnell (1982), a forestry-wildlife researcher from U.B.C., summarizes the problem as follows:

> "It is important to appreciate that our present problems lie not in the fact that foresters produce changes in the habitat for most of our wildlife species, but in the fact that these changes have not been effectively understood or administered. Over most, if not all, of North America we can observe individuals from one government agency

administrating changes in the habitat while individuals in another attempt, largely independently, to administer the populations residing in that habitat. Forest wildlife interactions straddle both jurisdictional (institutional) and disciplinary boundaries. The phenomenon generating the greatest confusion is the fact that nature is not divided up the way government agencies and universities are." (emphasis Bunnell).

## 1.2 How do we solve the deer - forestry problem?

What we see in British Columbia is a situation where continued pressure from logging and other forest users has forced wildlife into an ever shrinking island of survival. What is needed from a resource planner's point of view is a means of elevating and sustaining public concern in the issue of forestry- wildlife management and to ensure that an appropriate management program to protect critical ungulate habitat is designed and implemented by resource managers responsible for ungulates and the habitat they require.

## 1.3 Ashby's Theory of Issue Advancement as a Diagnostic Tool for Strategizing the Better Management of Nimpkish Ungulate Habitat

Lord Eric Ashby (1975) has proposed a model that describes the components necessary for successful political action in protecting environmental values:

i. An aroused public conscience.

ii. A feasible technology of protection.

iii. An objective and disinterested assessment of the hazard to the environment.

iv. An effective tool for administration.

In his model Ashby argues that each component is a step of a process and that each is necessary to act as a catalyst for the succeeding steps, resulting ultimately in the implementation of a political decision. This thesis will use Ashby's model in a form slightly modified to fit the B.C. forestry- ungulate situation to analyze the forestry-ungulate management program currently in progress in the Nimpkish watershed on northern Vancouver Island. The thesis chapters will be structured so that each of the steps will be looked at from arousal of the public conscience (Chapter 3) to scientific assessment of the the issue and adoption of an appropriate management action (Chapter 4) to the final step of decision-making and implementation of a management prescription (Chapter 5). Chapter 2 will provide a brief background on the biophysical and administrative characteristics of the Nimpkish watershed so that we can understand the context for the existing forestry-ungulate conflict and the opportunities and constraints that exist there. Chapter 6 will assess the previous chapters and make conclusions on both the effectiveness of the management process in the Nimpkish based on Ashby's model and also on the validity of Ashby's model as reflected by the experience in the Nimpkish watershed.

In Ashby's model the first ingredient of issue advancement is the excitation of the public conscience. Ashby argues that unfortunately it is often necessary to dramatize events in order to arouse the public's interest (Ashby, 1978, p. 22).

> "... Is it morally defensible to use shock tactics, to exaggerate, to distort the facts or colour them with emotive words, or to slant the television camera in order to excite the public conscience? My experience leads me reluctantly to believe that in the present social climate some dramatization is necessary."

Ashby points out that had Rachel Carson's Silent Spring or Dennis Meadows' Limits to Growth restricted themselves to dry scientific facts their now famous books would have gone relatively unnoticed. It was their embellishment of the "facts" with emotion and dramatization that caught the media's attention and subsequently the public's attention. Ashby (1978) goes on to say that once the public conscience is stimulated the momentum of interest must be kept up and often raised to a "flash point", or crisis stage where the public is compelled to action. According to Ashby the use of the mass media, particularly television, has greatly enhanced the chances of environmental issues being embraced by the public.

The second stage in issue advancement calls for the identification of a feasible technology of protection. Ashby argues that one must be confident that procedures or technologies do indeed exist that can resolve the environmental issue at hand. Without a means of treating the problem it makes no sense to proceed to the final stages of the process, namely the scientific assessment of the problem and finally administrative control.

A very important component in the 'politics of the environment' is the third stage - the scientific assessment of the environmental problem. While the initial stage calls for some degree of dramatization, even

distortion, it is necessary for there to be a cool, unbiased and rational appraisal of the problem. Ashby (1975) cites a case in the late 1960s in the United States where there was concern for pollution of water by phosphates in detergents. Without a "cooling down" period where scientists could assess the actual danger and possible solution to phosphate pollution the public pressured politicians to enact hasty legislation, which banned phosphates in several states and drastically reduced their use in others. The result of this action was the introduction of an untested substitute to phosphate - NTA - which was later proven by scientists to be potentially more hazardous to human health than the original phosphates. Legislation was then reversed and production of NTA was halted. It was a situation where the initial emotional outcry of the public was left untempered by a more rational assessment by scientists causing ultimately bad decisions to be made.

The fourth component of the process is an effective tool for administration. Once an issue is raised and advanced through public concern, an appropriate management action is identified and a technical assessment made by scientists, there remains the final stage of implementing appropriate measures to insure that the environmental protection measures are carried out. Most commonly implementation is preceded by elected politicians making decisions which result in legislation and/or regulations. Ashby (1978) points out that those entrusted with environmental regulation often have to weigh several factors - including social, economic and ethical - in carrying out their duties and are in effect called upon to make political decisions themselves.

A real concern for Ashby is the use of economists' cost-benefit analysis in contributing to the decision-making process where different natural resource uses are given monetary value. Ashby maintains that while the cost-benefit technique may be appropriate in treating quantifiable values it is inappropriate if used to weigh fragile, unquantifiable values such as the quality of the environment. Ashby (1978) goes on to state that cost-benefit analysis "... embodies an unacceptable premise, namely that the question to be answered is 'What is efficient for society?' rather than 'What is good for society?' For some enterprises - industry, for instance, where the aim is to maximize efficiency - this premise may be acceptable. For the protection of the environment this premise is not acceptable because it warps the perspective of the policymaker. By all means use the most cost-effective way to achieve the end, once the end has been determined; but do not used cost-benefit analysis to determine the end." (p. 56).

While Ashby is concerned primarily with larger, more dramatic examples of environmental disruption, his framework for an "issue advancement process" may be useful when applied to less global and life-threatening situations of environmental change. Although concerns such as the destruction of ungulate habitat may not have as great and immediate an impact, as say nuclear testing, it can have an insidious cumulative impact, which in the long run may be just as harmful as other more glamorous environmental issues.

Anthony Downs (1972) has proposed another view of the phenomenon of issue raising and advancement in the public domain. He has put forward a model of an "issue-attention cycle" that breaks down into five stages:

1. The pre-problem stage.
2. Alarmed discovery and euphoric enthusiasm.
3. Realizing the cost of significant progress.
4. Gradual decline of intense public interest.
5. The post problem stage.

Unlike Ashby, this model suggests that the public - specifically American - is rather naive in its initial enthusiasm to tackle an environmental issue and that as it discerns the real costs and even sacrifices that are required to resolve the issue motivation wanes to be replaced by newborn interest in another more appealing issue.

Downs draws exclusively from American experience in describing how the public is eager to achieve quick technological solutions. He also points out that an American tradition exists where obstacles to social progress are viewed as being external to the structure of society itself. Once a problem reveals itself to require some fundamental reordering of society there arises a more pessimistic view within the public domain and Downs argues that many lose heart and go on to seek other more interesting issues. However, Downs does concede that in the post problem stage some general improvements are possible; that new institutions, programs and policies may have been created to help solve a particular problem and that

they may persist and be effective after public attention has shifted elsewhere.

Downs' model places considerable emphasis on the fallibility of human behaviour, particularly with regard to the public's ability to sustain interest in a given environmental issue. Unlike Ashby, Downs places minimal importance on such things as the scientific assessment of an environmental problem and the design of an appropriate solution to the problem. His brusque treatment of these topics coupled with no real discussion of political decision-making or the need for an effective administrative structure makes Downs' model less appealing than Ashby's, which takes a more comprehensive and in depth view of issue advancement. This thesis will therefore focus on Ashby's model, recognizing that Downs' model may have some validity in specific phases of issue advancement.

## 1.4 Assumptions

This thesis assumes that:

i. in the face of competing interests in a limited resource it is necessary that wildlife species (and their habitat) are managed to ensure their continued survival and well being.

ii. the Fish and Wildlife Branch is the government institution responsible for managing wildlife in B.C. and that it is desirable that the Branch carry out its policy:

   (a) to maintain the diversity of species representative of the major biophysical zones of the province, and

(b) to ensure that within the constraints of land capacity and biological limits of each species, wildlife is available in sufficient abundance to meet the recreational and economic needs of society.

iii. co-operation between the Wildlife Branch and other government and private institutions is necessary if wildlife management is to be effective.

## 1.5 Limitations

The scope of this research looks at a particular wildlife management plan in British Columbia. However the planning principles and framework that are being evaluated may be applicable to jurisdictions outside of the province.

## 1.6 Research Plan and Methodology.

A literature review was conducted to provide a description of the historical development of wildlife management. Government reports, legislation, newspapers as well as interviews were utilized in this endeavour. A similar procedure was used in determining the present situation with regard to land use and wildlife management, specifically in the Nimpkish watershed. Although a historical review was done of land use in the Nimpkish, a more detailed analysis was made for the period 1970-82 a time when traditional concepts of resource management were being challenged and in many cases modified.

Field work was conducted in Alert Bay and Vancouver from May 1980 to May 1981. The first six months were spent in Alert Bay researching biophysical and administrative information on the Nimpkish watershed and completing a series of interviews with foresters, biologists, native people and government administrators. The time spent in Vancouver was devoted mostly to analysis, cartography, some further interviews and writing of reports. A presentation of part of the study finding was delivered to the Pearse Royal Commission on Pacific Fisheries in the fall of 1981. Follow-up interviews with Wildlife and Forestry officials were undertaken in 1984-86. See Appendix I for specific sources of information.

# CHAPTER TWO Wildlife and Forestry in the Nimpkish Watershed: Historical Use Patterns and Biophysical Background

## 2.1 Introduction

This chapter provides background information and gives context to the present ungulate-forestry management program in the Nimpkish watershed. In section 2.2 a brief history of land use is given to show how the influence of white settlement has changed land use patterns in the watershed, especially in the past hundred years. A more detailed account is given of the emergence of a large-scale commercial logging operation within the watershed and its rapid growth, especially since 1960 when Canadian Forest Products Ltd. (CANFOR) was granted Tree Farm Licence 37 which covered the majority of the watershed.

Subsequent sections (2.3 - 2.5) describe the physiography, climate and vegetation of the watershed which are important factors in determining the capability of sustaining both timber and ungulates. Of particular concern for ungulates are such things as: terrain, snow depth and temperature (especially in winter); age of trees; arboreal lichens and understory vegetation. Foresters are also concerned with climate, soils and topography as they affect day to day operations but also in determining the growth rates of trees which is of particular concern in reforestation.

A general introduction to the wildlife of the Nimpkish watershed is presented in section 2.6, while past and present utilization of wildlife are covered in sections 2.6.1 and 2.6.2 respectively. A more detailed description of wildlife biology is contained in Chapter 4 where the methods of wildlife assessment and management are addressed.

## 2.2 History of the Resource Use in the Nimpkish Watershed

### Aboriginal Occupation - First White Explorers - The Fur Trade

Occupation of the Nimpkish watershed by aboriginal peoples dates back some 9,000 years shortly after the retreat of the last ice sheets that covered large portions of northwestern North America (Ham, 1980). The first contact that the ancestors of the Nimpkish people had with whites might have been with the Spaniard, Juan Perez, who sailed to the Queen Charlottes and to Nootka to trade in 1774. Subsequent visits by Russians, English, French, Yankees and Spanish explorers and traders stimulated the growth of a fur trade which lasted until the late 1800's. Central to this trade was the establishment by the Hudson's Bay Company of Fort Rupert (near present day Port Hardy) in 1849. By 1873 the trade in furs had diminished substantially and the fort was sold to Robert Hunt, the former post manager.

A more detailed account of aboriginal use and occupancy of the Nimpkish watershed is contained in section 2.6.1 of this chapter.

### White Exploration of Nimpkish Watershed

Although Captain George Vancouver landed at the mouth of the Nimpkish River in 1792 it wasn't until sixty years later that a documented white expedition was mounted into the interior of the watershed. In 1852, a Hudson's Bay employee named Hamilton Moffat was guided by Nimpkish Indians through the watershed along an established native trading route to Nootka Sound. Moffat travelled along the Nimpkish mainstream to Woss Lake and passed over the mountains into the Tahsis drainage to the west. In his journal Moffat describes the presence of villages and of an abundance of food. He also noted the richness of the timber resource which would foretell the importance of logging in future years.

**Surveys, Land Grants, Homesteads and Land Speculation**

The entry of British Columbia into Canadian Confederation in 1871 marked the beginning of a more concerted and systematic exploration and survey of the new territory - including the Nimpkish watershed. Several surveyors were dispatched in 1873 and 1877 to ascertain the possibilities for settlement of lands - initially with an eye to agricultural potential, which they found to be minimal. By 1892 several lots and sections had been Crown granted to white settlers in lowlands west of the lower Nimpkish River. Although a few homesteaders actually lived in the Nimpkish watershed, much of the Crown lands were held for speculative purposes and would later be turned over to the forest industry which would dominate activity in later years.

As a result of this land "speculation" the establishment of Indian reserves in 1880 took on a forced and awkward configuration to accommodate existing land pre-emptions. A total of six relatively small reserves were established: three along the lower Nimpkish River, for fishing purposes, and three on Cormorant Island (present-day Alert Bay) for residential and burial purposes. The imposition of a reserve system was insensitive to the traditional hunting, fishing and gathering cycles of the Nimpkish Indians and acted to restrict their movement and continued use of the watershed. It was in effect a form of expropriation.

**The Start of the Commercial Fishing Industry**

While the agricultural potential failed to be realized in the Nimpkish watershed, other previously neglected resources soon came to the attention of white entrepreneurs and businessmen. The establishment of a fish saltery as

early as 1862 and a subsequent larger scale cannery in 1881 in Alert Bay signalled the first serious threat to the Nimpkish traditional resource economy. While trading was viewed more as a partnership between the white trader and native trapper, the establishment of a commercial fishery came in direct conflict with established Nimpkish fish harvesting patterns.

Displaying a high level of shrewdness the cannery operators enticed the Nimpkish Indians to work at the cannery by having a village constructed complete with a church mission, general store, post office and wharf. Alert Bay soon replaced Fort Rupert as the region's economic centre. While the Nimpkish people were the majority labour force in the cannery's first years, they were not totally happy with the work - mostly due to the dramatic differences in the work ethic of the two cultures. However, the cannery remained in operation - with a couple of years break - until 1941. Alert Bay remains a fishing centre to this day, being the home of a substantial seine boat fishing fleet - predominantly native owned and operated.

The Nimpkish people adapted to the changes of the fishing industry from the early 1900's to the present day by maintaining a sizeable fishing fleet - mostly seine boats - that has earned a reputation of being very efficient and successful. Much of this fishing success can be attributed to the Nimpkish fishermen's intimate knowledge of the fish and their movements which has been passed down from generation to generation. A relatively small, but locally significant, food fishery centred on the Nimpkish River is still maintained. Many of the village people (Alert Bay) still rely on these fish as a major food source and a major household canning operation is undertaken in late summer and fall coinciding with the different spawning runs.

**The Start of the Forest Industry - The "Green Gold Rush"**

To understand the story of the forest industry and especially its birth at the turn of the twentieth century, one must inevitably look at the granting of land timber rights. The newly formed Confederation of Canada viewed the forest lands as a resource of the commons, not owned by anyone, but having rights vested in the Crown. The privatization of this timber resource ultimately led to the type of resource exploitation experienced in the Nimpkish watershed.

The initial Crown granting of rights to land took place in 1879 when 160 acres were made available to early homesteaders at Beaver Cove. By the 1890's close to 11,000 acres of land were granted by the Crown. It was at this time that the first timber rights were given in the form of a Timber Lease - a total of 5,271 acres. Several other grants, both Crown and Timber leases, were made prior to 1905 - covering an area of over 47,000 acres of the richest and most productive timber land in the Nimpkish and Kokish (south of the Nimpkish) watersheds.

In the early 1900's the Provincial Government found itself in a weakened economic condition due to years of debt charges and disabilities. To counter this and raise much needed revenue, Premier McBride's government embarked on a policy of large scale land sales and timber alienation. The atmosphere surrounding the forest lands could at this time be best described as a "gold rush". From 1905 to 1907 approximately 9.6 million acres of forests were alienated by Special Timber Licence. Included in this total were 140,665 acres in the Nimpkish and Kokish watersheds. This represented over one third of the watershed and basically all the most productive timber land.

In the early 1900's small scale commercial logging was practised by both white settlers and by a number of Kwakiutl bands. For some of the bands it was their principal source of cash income (Knight, 1978). However, new provincial regulations introduced in 1908 governing the forest industry limited logging to people registered on voters lists or those who were eligible to be registered (Knight, 1978). This effectively eliminated native participation in logging "Crown" lands and restricted their activities to reserve lands.

**Forestry Comes of Age: W.W.I - 1980**

World War I created a demand for wood products from B.C. and resulted in a mill complex being built at Beaver Cove as well as the start of a railroad system for log hauling within the Nimpkish watershed. Between the wars several changes and consolidations of timber rights occurred. In 1944 Canadian Forest Products acquired the major interest to logging rights in the Nimpkish Watershed. This was also a time when new mills were being built and the railroad system improved.

In 1960 Canadian Forest Products (CANFOR) was granted Tree Farm Licence (TFL) 37 which covered approximately 90 percent of the Nimpkish watershed. Parts of two other TFLs extend into the watershed: MacMillan Bloedel's TFL 39 in the northwestern corner of the watershed as well as lands draining into Schoen Lake in the southern portion of the watershed, and Crown Forests' (name changed from Crown-Zellerbach) TFL 2 with two small areas; one on the upper Steele Creek drainage and an area of less than a square mile east of Nimpkish Lake (Fig. 1).

The granting of the TFLs, especially TFL 37, created a significant change in the approach taken in logging the Nimpkish watershed. Where previously only the alienated bottom lands were being cut, the new tenure opened up previously untouched timber areas at higher elevations. This extension into new areas has enabled CANFOR to develop a harvesting strategy of summer logging on higher elevations and winter logging on valley bottom lands. The rate of harvesting has increased dramatically in the 24 years since the granting of the TFL. The total trees cut is estimated to account for over half of the total commercial harvest taken from the watershed (Nimpkish Band, 1982).

The Tree Farm Licence is a form of forest tenure granted by the Ministry of Forests that gives the licencee a secure supply of timber (21 year renewable term) that must be managed on a sustainable yield basis. The annual rate of harvest or annual allowable cut (AAC) is calculated by the licence (based on growth criteria) and is reviewed and approved by the Ministry of Forests. The Licencee is obligated to harvest the AAC within specified limits as well as carrying out other management activities such as reforestation. The AAC is presented in detail in five year management and working plans that are submitted by the licencee to the Ministry of Forests and also referred to other government resource agencies that may have an interest, including the Wildlife Branch. This referral process is discussed in greater depth in Chapter 5 (sec. 5.3).

The increases in the AAC in TFL 37 from 1960 - 1976 has been 98 percent. Although substantial, this is low compared to other TFLs in the province, many of which range from 200 to 300 percent. According to Pearse (1976) there are several reasons for the increase:

> "To an overwhelming extent the increases are the result of revisions in estimates of the forest inventory, recalculations of recoverable volumes and growth using assumptions of closer utilization standards, and shortening of the growing period assumed for new crops."

The Nimpkish Band (1982) suggests that the amount of merchantable timber has increased by over 40 percent through recalculation by CANFOR. At the same time CANFOR has experienced shortfalls in fulfilling the wood requirements of its processing mills and has increased its need to buy timber from the open market by 182 percent between 1957 and 1975 (Nimpkish Band, 1982). It is evident that CANFOR is under severe economic pressure to keep its AAC at the highest level possible which has serious implications for other resource values - including ungulates - within the Nimpkish watershed.

## 2.3 Geography and Physiography

The Nimpkish watershed encompasses all those lands that drain into streams and rivers which ultimately flow into Broughton Strait via the Nimpkish River. The headwaters of the Nimpkish arise in the mountains of the Vancouver Island Range (2,500 m+) in an area northwest of Gold River from where it flows in a northeasterly direction, collecting waters from tributaries and associated sub-systems. Some of the major systems include: Schoen Lake/Klaklakama Lakes/Davie River, Vernon Lake/Sebahall Creek, Woss Lake/Woss River, Anutz Lake/Atluck Lake and Creek and the Kipala/Karmutzen Creek drainage area. Overall the drainage covers an area of 1,670 $km^2$, making it one of the largest watersheds on Vancouver Island.

The Vancouver Island Range was formed prior to the Pleistocene epoch and was a result of an uplifting of the tertiary surface layer. This uplift was in turn modified by glacial erosion during the Pleistocene resulting in a smoothing and

rounding of most major peaks. Major faults within the Nimpkish are common and contain the larger drainage systems. The U-shaped valleys are characteristic of past glacial action.

## 2.4 Climate

The climate of the Nimpkish watershed is characterized by cool, wet winters contrasted with warm, relatively dry summers (Klinka et al, 1979). Total annual precipitation ranged from 1,850 to 2,400 mm. Snow accumulation varies dramatically over time with elevations above 700 m generally maintaining a complete snow cover from December to March. At elevations above 1,400 m on south aspects and 1,200 m on north aspects the growing season is very short, regeneration is severely limited and forest productivity is very low.

The Valley Lowlands, below 700 m, can go several years without significant snow cover, but in any given winter there can be a very significant (1.3 m) accumulation that can remain for days or weeks which is an important factor in deer survival.

During summer, lower elevations have a frost-free period of approximately 170 days and a low ratio of actual evapotranspiration to potential evapotranspiration indicates that water deficits occur during the growing season.

The Nimpkish watershed has experienced many natural forest fires, some of which were very large by today's standards (Table 1). For instance, fires covering up to 50 square miles are known to have occurred around Vernon Lake between 1560 and 1759. Other smaller fires, generally less than five square miles, have been recorded in the 1800s and 1900s.

TABLE 1

Source: Willms, 1971

FIRE HISTORY OF THE NIMPKISH VALLEY

| Approximate Date of Burn | Age of Present Stand | Size $(mile)^2$ | $(km)^2$ | Location |
|---|---|---|---|---|
| 1940 - 59 | | 6 - 10 | 10 - 16 | Vernon Camp |
| 1920 - 39 | 17 | 1 - 5 | 1.6 - 8 | SW Vernon Lake |
| | | 1 - 5 | 1.6 - 8 | NE Vernon Lake |
| 1914 | 41 - 60 | 1 | 1.6 | NE Vernon Lake |
| | | 1 | 1.6 | NE Woss Lake |
| | | 1 | 1.6 | N Woss Camp |
| | | 1 | 1.6 | NE Kaipit Creek |
| 1894 | 61 - 80 | 1 | 1.6 | E Vernon Camp |
| | | 1 - 5 | 1.6 - 8 | S Woss Camp |
| | | 1 - 5 | 1.6 - 8 | SE Nimpkish Lake |
| 1844 | 120 | 11 - 15 | 18 - 24 | NW Woss Lake; along Nimpkish River to S end Nimpkish Lake and S to Atluck Lake |
| | | 1 - 5 | 1.6 - 8 | NE Nimpkish Lake |
| 1560 - 1759 | 270 | 1 - 5 | 1.6 - 8 | NE Edge Woss Lake |
| | | 41 - 50 | 66 - 80 | Vernon Lake |
| 1360 - 1559 | 400 | 21 - 30 | 34 - 48 | Nimpkish Lake |
| | | 16 - 20 | 26 - 32 | Woss Camp to Schoen Lake; along Nimpkish River |
| | | 1 - 5 | 1.6 - 8 | NW Woss Lake |
| | 540 | 6 - 10 | 10 - 16 | Woss Camp, Woss Lake, Vernon Lake |
| | | 16 - 20 | 26 - 32 | SE Corner of Timber License |
| 960 - 1359 | 620 | 1 - 5 | 1.6 - 8 | W Klaklakama Lake<br>S Vernon Camp |
| | 750 | 1 - 5 | 1.6 - 8 | W Klaklakama Lake |
| | | 1 - 5 | 1.6 - 8 | S Woss Lake |
| | 1000 | 1 | 1.6 | W Klaklakama Lake |
| Before 960 | 1000+ | 400+ | 640+ | On higher altitudes (7,200') |

## 2.5 Vegetation

### Biogeoclimate Zones

The vegetation of the Nimpkish watershed is represented by three major bioclimatic zones with one zone being represented by two subzones (Krajina, 1969).

1. Alpine Tundra

   This zone is fragmentary and restricted to higher elevations - greater than 1,400 m. A few stunted trees (Amabalis Fir and Mountain Hemlock) may grow here but generally the area is bare except for groundhugging shrubs, hardy grasses, sedges and mat-forming herbs.

2.(a) Mountain Hemlock Zone - Parkland Subzone

   Continuous with the previous zone the Mountain Hemlock Parkland Subzone extends down to approximately 1,200 m. The dominant trees are Mountain Hemlock and Amabalis Fir. The forest floor is sparsely covered with shrubs and herbs.

(b) Mountain Hemlock Zone - Forested Subzone

   This is below and continuous with the previous zone and can be found as low as 900 m. Dominant tree species again include Mountain Hemlock and Amabalis Fir, but this zone is also home for Yellow Cedar. The forest floor has more shrub and herb cover, but only a sparse moss cover.

3. Coastal Western Hemlock Zone - Wetter Subzone

This is the most extensive zone in the Nimpkish cover and is found from sea level up to 900 m. It is dominated by Western Hemlock, Amabalis Fir and Western Red Cedar. The shrub, herb and moss layer are rich except in some instances of climax stands where the tree canopy is closed.

There are several other smaller azonal vegetation types within the Nimpkish watershed occuring in bogs, swamps, streamside lowlands, slide areas and salt marshes.

## 2.6 Wildlife in the Nimpkish Watershed

The Nimpkish watershed supports a diverse wildlife population that is typical of the moist mixed conifer forest of the coastal part of northwestern North America. A total of 171 bird species, 28 mammals and 14 species of amphibians and reptiles occur within the watershed (Godfrey, 1966; Cowan and Guiget, 1965; Carl, 1959, 1960). Of particular interest to this thesis are the two species of ungulates found in the Nimpkish: black- tailed deer and Roosevelt elk.

Population surveys made by the Wildlife Branch revealed a deer population of approximately 12 - 16,000 animals in 1972 (Davies, pers. comm.). There was subsequently a sharp decline, of about 80 percent, from 1972 to 1979 (Jones and Mason, 1979). The population decreased further during the early 1980s due largely to increased wolf predation (Davies, pers.comm.). Deer reside throughout the watershed; using lower elevation stands of mature hemlock/balsam and Douglas fir during winter. Mature tree stands on steeper side-hills with southern exposure are preferred as winter range as there is less snow accumulation, more food and better escape from predators. Summer ranges can be

either mid-elevation sites or higher sub-alpine areas.

The resident elk population in the Nimpkish is relatively small - a total of 45 - 50 animals in three herds was estimated in the early 1980s (Janz, pers. comm.). There are other herds that migrate in and out of the Nimpkish watershed which can double or triple the population at any given time. Elk differ from deer in that they tend to use lower parts of valley bottoms during summer - there being abundant grasses and herbs which elk prefer. During winter elk can survive deeper snow conditions due to their greater height and strength, but also require mature tree stands for thermal and hiding cover and also as a source of food.

Geologists hold that as recently as 10,000 years ago massive ice sheets covered large parts of the Nimpkish watershed. The wildlife of the Nimpkish are thus, relatively speaking, "newly arrived" when compared with non-glaciated areas of the continent. Water bodies that separate Vancouver Island from the British Columbia mainland have acted as an effective filter in wildlife dispersion. Only 28 out of a total of 126 species of mammals native to B.C. have found their way to Vancouver Island.

The wildlife capability of the Nimpkish watershed is determined primarily by climate, topography and vegetation. Over the last 80 years there has been a continually increasing influence by humans on the wildlife community. Logging has been the dominant activity in changing the vegetation from a climax forest to a forest of young, growing trees in even-age patches ranging in size from a few acres to hundreds of acres.

## 2.6.1 Past Utilization of Wildlife and Wildlife Habitat

### Native Use

We can speculate that the first human use of wildlife in the Nimpkish was by the Indian culture that settled on the coast some 9,000 years ago (Ham, 1980). More recent evidence exists of Kwakwala speaking people (ancestors of the Nimpkish Band) inhabiting the Nimpkish watershed. Village sites have been uncovered in the watershed that date back to 1750 and possibly earlier (Ham, 1980).

The first recorded use of wildlife involved the trading of furs - most notably sea otter - between coastal Indian bands and early white Maritime explorers from England and Spain in the late 1700's and early 1800's. A second phase of fur trading occurred with the construction of Fort Rupert (near the present day site of Port Hardy) in 1849 by the Hudson's Bay Company. The Company's records show that mink, rabbit, marten, racoon and beaver were the most abundant furs traded. The inclusion of rabbit as well as other mainland mammals such as fisher, fox and lynx reflect the nature of the trade at Fort Rupert which collected from both Vancouver Island, the inside coastal islands and the mainland. By 1859 the sea otter had been severely reduced in number and was only a minor item on the trader's inventory. Fur trading ended at Fort Rupert in 1873 when the Hudson's Bay Company holdings were bought by Robert Hunt.

Prior to 1860 it is believed that the Nimpkish had settlements in the upper reaches of the Nimpkish watershed (Ham, 1980). The only site located to date is situated at the junction of the Woss and Nimpkish rivers. Other major settlement sites have been identified between the mouth of the Nimpkish River and the outlet of Nimpkish Lake. The most recently occupied site was Xwalka,

situated on the west bank of the Nimpkish River mouth (Ham, 1980).

Spring, summer and early fall were times of fishing, berry picking, plant gathering and preserving food while winter was a time for hunting and trapping. Deer and elk were hunted along the lower Nimpkish River, at the outlet of Nimpkish Lake and further up the valley (Ham, 1980). Trapping of mink and other small mammals was carried out along the lower Nimpkish River, around the mouth of Woss River and in the Vernon Lake area.

In the 1860's-70's the Nimpkish Indians moved from Xwalka to Yalis (Alert Bay) on Cormorant Island to work at the newly established fish saltery. There is good evidence that the Nimpkish Band continued their traditional food gathering in the Nimpkish Valley until at least 1930 (Ham, 1980).

**The White Settlers**

In the early 1900's businessmen, entrepreneurs and opportunists staked claims to the timber resource of the Nimpkish watershed. Initial logging was small scale and included some participation by Kwakiutl bands (Taylor, 1975). Large scale logging was undertaken in the late 1920's and has continued to the present day. In 1925 a sawmill was built at Beaver Cove which in turn brought in new settlers and further increased the level of logging activity. From 1920 through 1940 logging was restricted to the area around Beaver Cove, Thiemer Lake and south end of Nimpkish Lake.

Although little good information exists for the period between 1900 and 1930 we can assume that white settlers were hunting and trapping in the Nimpkish in addition to the activities of the Nimpkish Band. In 1948 the community of Woss

was established by Canadian Forest Products (CANFOR) to serve as the administrative centre for its Englewood Logging Division, which encompasses most of the Nimpkish watershed. Other CANFOR logging communities within the watershed include Nimpkish, Vernon Lake, a mobile camp at Atluck Lake and Beaver Cove at the mouth of the Kokish River. From 1940 on there was increased penetration by loggers into the upper end of the Nimpkish watershed. Improved technology, particularly the introduction of an extensive logging railway, by the late 1950's facilitated logging of as yet untouched areas, including the area bounded by Woss Lake, Hoomak Lake and Vernon Lake. This area besides being rich in high quality timber is also the most productive habitat for ungulates (Davies, pers. comm.).

A dramatic increase in the deer population was noted by resident hunters in the Nimpkish in the early 1960's. Large clear cuts made in the 1950's created ideal forage conditions and, combined with mild winters, deer numbers quite naturally increased. The opening of logging access roads in the early 1960's and the establishment of "permanent" logging camps within the watershed contributed to escalate the intensity of deer hunting. The Nimpkish watershed enjoyed a reputation of being one of the "hot-spots" in the entire province for black-tailed deer from the mid 1960's to 1973 when deer numbers and hunter success began to decrease.

## 2.6.2 Present Utilization of Wildlife

### Hunting

There are designated hunting seasons for black-tailed deer, black bear, cougar, wolf, fox and racoon. In addition there is a limited entry season for elk in the Kokish drainage system (Fig. 1). There are also open seasons for grouse, ducks, snipe, geese, pheasants and band-tailed pigeons (Ministry of Environment, 1980).

The most important species, in terms of hunter numbers, money spent while hunting and number of animals killed, is the black-tailed deer. A Fish and Wildlife Branch report (Hebert, 1979) states that Vancouver Island was from 1965 - 1973 an area renowned for its deer hunting, with the Nimpkish being particularly outstanding:

> "The black-tailed deer harvest from the island contributes 30 - 45% of the total deer harvest (all species) on Vancouver Island. Specifically, the Nimpkish River Valley provides about 12% of the total deer harvest in B.C. from a land base which comprises only 0.2% of the total deer range."

The deer harvest records for Management Area 1-11 (Nimpkish and Kokish watersheds) kept by the Fish and Wildlife Branch for the period from 1964 - 1978 varied from a low in 1964 of 385 to a high of 3,374 in 1973 (Table 2). The harvest increased dramatically from 1964 on, until 1973 when a sharp decline was recorded.

The total number of hunters increased from 174 in 1964 to 2,902 in 1974. The decline in hunter numbers follows the decline in hunter success which dropped from 2.19 deer per hunter in 1964 to .21 deer per hunter in 1983. What these

TABLE 2

Source: B.C. Fish and Wildlife Branch, Nanaimo

HUNTER SUCCESS IN NIMPKISH WATERSHED

| Year | M.U. 11 Number Of Hunters | 1964-1984 Number of Deer Harvested | Number of Deer/ Hunter |
|---|---|---|---|
| 1964 | 175 | 384 | 2.19 |
| 1965 | 289 | 414 | 1.43 |
| 1966 | 636 | 1,231 | 1.93 |
| 1967 | 648 | 1,243 | 1.92 |
| 1968 | 854 | 1,718 | 2.01 |
| 1969 | 781 | 1,138 | 1.46 |
| 1970 | 1,199 | 1,348 | 1.12 |
| 1971 | 1,436 | 2,043 | 1.42 |
| 1972 | N.A. | N.A. | N.A. |
| 1973 | 2,096 | 3,374 | 1.61 |
| 1974 | 2,903 | 3,282 | 1.13 |
| 1975 | N.A. | N.A. | N.A. |
| 1976* | 2,682 | 1,360 | .53 |
| 1977 | 2,167 | 1,455 | .67 |
| 1978 | 2,173 | 1,299 | .60 |
| 1979 | 1,819 | 712 | .39 |
| 1980 | 1,618 | 728 | .45 |
| 1981 | 1,185 | 417 | .35 |
| 1982 | 974 | 342 | .35 |
| 1983 | 664 | 141 | .21 |
| 1984 | 734 | 326 | .44 |

* Estimates from provincial hunter sample, 1976-1984
N.A. Not Available.

figures reveal is that, while hunter numbers and number of deer killed continued to increase from 1966 to 1973, actual hunter success was decreasing.

**Recreation**

There exists a great potential for recreational use of the Nimpkish watershed. In a report to the Nimpkish Band Council, Frieda Schade (1979) outlined some of the possibilities and problems. Photography, observation and angling would be the major activities that would involve wildlife. Obviously there is a tremendous potential for viewing deer and, to a lesser degree, elk. Wolves being much more secretive would more likely be heard than seen. Birdlife is abundant and varied and contributes to a "wilderness" experience.

There are seven campsites administered by CANFOR and one Provincial park (Schoen Lake) within the Nimpkish watershed. The total overnight camping capacity is 107 spaces; though this number varies due to the "undesignated" spaces used by campers inside and outside designated campgrounds. All major campgrounds are located beside lakes and this has created concern for the Nimpkish Band Council who are conscious of the need to protect fish habitat and particularly spawning areas which are found on some of the watershed's lakes (Schade, 1979). The opening of the new Island Highway in 1979 will undoubtedly increase recreation traffic on Vancouver Island, which already ranks as the second most important tourist region in the provinces (B.C. Department of Travel Industry, 1977).

**Scientific Study**

The Nimpkish watershed has been used by various people in conducting major studies of terrestrial wildlife over the years. Most of these studies have concentrated on deer (Willms, 1971; Ellis, 1974; Jones, 1974; Harestad, 1979; Rochelle, 1980; Bunnell, 1979). The Fish and Wildlife Branch has carried out some studies on deer, elk, wolves and waterfowl, and these are available in report form from the Branch office in Nanaimo.

The Nimpkish presents an ideal location for studying the impact of logging on wildlife and will probably see increased attention as forestry and wildlife management becomes a greater priority for the provincial government. The proposed "Nimpkish Island" ecological reserve - already designated as an Internation Biological Program (IBP) site - also provides a potential opportunity to study the climatic and soil conditions that have contributed to growing a stand of some of the tallest coniferous trees in Canada and, in some cases, in North America.

A critical concern would be to carefully plan recreational activities and facilities so as to preserve the wildlife species and their habitat that are deemed valuable.

**Aesthetic and Spiritual Values**

Aesthetic or spiritual value is often overlooked or under-rated simply because it is subjective by nature and thus difficult, if not impossible, to measure. For native people, in this case the Kwakiutl, and for some white people, the value of wildlife goes far beyond just a sense of appreciation that wild animals are living in a free state. Certainly, it is important for the feeling of well

being for many people that wildlife are preserved and that wildlife management areas, ecological reserves such as the "Nimpkish Island proposal, and parks are set aside for this purpose.

The value of wildlife to native people is difficult to assess since it exists in every part of their culture. The history of the Nimpkish Band reflects their respect and closeness to animals. This affinity is reflected in the language, dances, carvings, legends and tribal identities and acts as a cultural foundation for the original inhabitants of the Nimpkish Valley.

## 2.7 Conclusion:

There are several highlights that emerge from the preceding historical overview of resource use in the Nimpkish watershed:

i. First human use of the Nimpkish watershed was by the ancestors of the Nimpkish Band who engaged in a seasonal cycle of harvesting plants, fish and wildlife from the watershed. Commercial logging was started in the early 1900's but only became a major activity in terms of harvest after the Second World War. The granting of a Tree Farm Licence (37) to Canadian Forest Products committed the entire watershed to timber production to be managed on a sustained yield basis.

ii. As a result of commercial logging, mature stands of trees are rapidly disappearing in the Nimpkish watershed and there is severe economic pressure on the present TFL to maintain harvest levels at as high a level as possible to satisfy sawmill operations on the south B.C. coast.

iii. The Nimpkish watershed is regarded by the Wildlife Branch as an important area for black-tailed deer sport hunting. At its peak in 1973 the watershed produced 45 percent of deer harvested on Vancouver Island and approximately 12 percent of the provincial total from a land base of less than 0.2 percent of the total deer range in B.C. Deer harvested by hunters increased from 1964 to 1973 at which time a sharp decline was recorded. While hunter numbers and number of deer killed increased during this time, actual hunter success was steadily decreasing.

iv. There exist other values within the Nimpkish aside from forestry and deer hunting. These include outdoor recreation, scientific study and spiritual values. Of particular interest is the "Nimpkish Island" ecological reserve proposal, which would provide a unique opportunity to study the environmental conditions that have created an exceptional stand of coniferous trees in the heart of the Nimpkish watershed.

# CHAPTER THREE An Aroused Public Conscience

## 3.1 Introduction

In Chapter 2 we looked at the biophysical features of the Nimpkish watershed to gain an understanding of the forest habitat and its use by people and ungulates. The forest is dynamic by nature; forever changing through natural causes such as wind, flooding, fires and simple aging, or by the activities of man, such as commercial logging. In this chapter we will look at the level of public awareness and concern for our environment with a focus on the British Columbia scene and the forestry/ungulate situation in the Nimpkish watershed in particular. We will in fact look at the first component of Ashby's decision-making model, namely the presence of "an aroused public conscience."

In the chain reaction of events involved in the politics of environmental protection, Ashby (1978) identifies an initial phase where the public conscience is excited, once it has learned of a particular environmental hazard or "issue". This arousal of public concern is translated into lobbying by interest groups seeking to stop decisions - either administrative or political - that threaten their interests. The revelation of the environmental issue can be some unexpected incident that shocks the public sensibility or it can be through the disclosure of scientists, warning us of an impending environmental threat.

Ashby (1978) argues quite vigorously that, "in the present social climate some dramatization is necessary" to excite the public conscience. While Ashby draws on examples that are more immediate and life threatening - toxic chemicals and air pollutants for instance - the same argument can be used for other, seemingly more innocuous environmental concerns; such as the loss of ungulate habitat in

the Nimpkish watershed. If we look at the Nimpkish we in fact do see dramatization of the forestry-ungulate situation and from a somewhat surprising source; the scientists. In the next section we will see that it has been the biologists and foresters - at least some of them - who have sounded the loudest warnings concerning the fate of Nimpkish wildlife resources.

In the case of the Nimpkish watershed forestry-ungulate situation there has also been a parallel tracking of concerned interest groups: the hunter/sportsman lobby; environmental/naturalist groups and the Nimpkish Band. All are interested in preserving wildlife habitat within the watershed; however each group has a different end use of the wildlife in mind and each has adopted a different strategy to achieve their specific end. The hunter lobby has enjoyed good relations with the Fish and Wildlife Branch and has most often lobbied the Branch in an informal manner, without publicity or fanfare. Until recently the hunters' interests could, for the most part, be achieved through the adjustment of hunting regulations. However, in the last 15 years in particular, the greater issue of habitat loss has been recognized by hunters as being the number one priority in maintaining wildlife populations. With this recognition has come an increased effort in more publicized lobbying of the Ministry of Forests for habitat protection which has resulted in alliances with environmental and naturalist organizations in opposing the logging of pristine watersheds, such as the Tsitika and Stein River basins.

The environmentalists' tack has been one of drawing attention to the aesthetic and symbolic value of the forest and its wildlife resources. Two issues that have surfaced in the last ten years have been the wolf control program implemented in the Nimpkish watershed in August, 1982 and a proposal to preserve

an exceptional stand of trees - known as the "Nimpkish Island" stand - as an ecological reserve. Having no close liaison with either the Ministry of Environment or the Ministry of Forests the environmentalists have taken their message to the media and have received substantial publicity through the newspapers, magazines and television.

The third group that has a general interest in the protection of the forest habitat in the Nimpkish watershed is the Nimpkish Band form Alert Bay. The focus of the Band's concern has been the protection of salmon habitat; particularly spawning areas in the streams and lakes of the watershed. They have gained some public attention over the larger issue of aboriginal land claims, when in 1974 they issued a Declaration of Sovereignty, affirming their ownership of the watershed and its resources.

A fourth group, the academics and professionals, have also provided critical support to the issue of habitat protection in the Nimpkish watershed. In their role as "experts" they have provided objective assessments of the resource conflicts within the watershed; but they have also provided their own subjective views on the state of affairs and have garnered considerable support from both the government and the public. Having a dual role as scientist and citizen has in effect given these people what might be called an "elevated" status, where they appear to have a greater ability to say and influence the news media which is invariably naive of the scientific facts. Later in this chapter we shall discuss now important this factor has been in organizing and maintaining interest in the Nimpkish watershed.

It is apparent that while the three interest groups differ on the specifics of forest and wildlife use, they do share a common goal of protecting the forest habitat. It is this convergence of interests that has, to a large extent, put pressure on the government to implement a study of the forestry-ungulate problem on northern Vancouver Island. It is interesting to note that the title of initial April, 1982 discussion paper, Old Growth and Ungulates of Northern Vancouver Island, was transformed to, Reservation of Old Growth Timber for the Protection of Wildlife Habitat on Northern Vancouver Island, on the final report released in January, 1983. The change is significant, in that it recognizes a richer representation of interests that have been expressed in the Nimpkish forestry-wildlife issue.

### 3.2 Environmental Awareness in British Columbia

At the turn of the twentieth century British Columbia was viewed by the colonists from Europe as a hinterland of unimaginable resources waiting to be taken. This attitude with regard toward natural resources never really changed until the 1960s. It has recently changed because even the most optimistic "captains of industry", who are furthest from the conservationist camp, have acknowledged that the well is running dry. It was unimaginable in the early days of commercial logging, that one day we would be faced with serious shortages of economically accessible timber. But indeed this is exactly what has happened.

In 1966, R.M. Fowler, then president of the Canadian Pulp and Paper Association, made the following statement at a national forestry conference in Montebello, Quebec:

> "... the first thing is to convince political leaders and the public that a problem exists - that the old happy, easy affluent days of unlimited forest resources are nearly over." (Vancouver Province, Sept. 23, 1980, p. C4)

There is a general high level of concern for the environment and in particular for wildlife in British Columbia that is revealed by a joint federal-provincial survey of Canadians' attitudes toward wildlife (B.C. Ministry of Environment, 1983). Unfortunately, there is no break down of cultural groups such as native vs. non-native which may have provided some interesting results. The survey reported the following results:

- 22% of B.C. residents (vs. 19% of Canadians) made outings specifically to view wildlife - and spent an average of 18 days and $1,000 each during a year;
- 8% of B.C. residents (vs. 10% of Canadians) hunted and spent an average of 16 days and $1,245 each during a year;
- 87% of B.C. residents are interested in non-hunting wildlife activities;
- 24% of B.C. residents are interested in hunting;
- almost 90% of B.C. residents think it is very or fairly important both to maintain wildlife diversity and to preserve endangered species.

Concern for the environment has come from many levels of the public and can be broken into five broad categories:

1. Aboriginal peoples
2. Sports hunters
3. Naturalists
4. Environmental groups
5. Academics and Professionals

## 1. Aboriginal people

The aboriginal people of British Columbia have always had a close relationship with the land which they perceive as a provider and a spiritual base. There has been a strong and continued commitment by native people to affirm their aboriginal rights to the land and its resources. However, the provincial government has steadfastly refused to acknowledge these rights.

In a 1980 proposal to undertake a comprehensive resource study of the Nimpkish watershed, the Nimpkish Band made the following comment on the people's relationship to the land, especially the Nimpkish River Valley (Nimpkish Band, 1982):

> "... we have continued to insist that we be recognized as the people who have the right to a controlling voice in the development of those resources; that, in the river is the source of our traditions; the representation of our cultural continuity, the sustenance of our people in the fish it provides for food and commerce, in the rich resources it offers to our children in their education .... There are striking parallels between the lack of control that we, as Indian people, have over our natural resources and the lack of control that, until now, we have had over our health care."

The Nimpkish Band attracted media attention to the Nimpkish watershed in 1980 when they erected a roadblock on the the newly-established Island highway. While some viewed the protest as being specifically related to the legality of land surrender - of using reserve land to build the road - the Band itself saw it as a more general protest against insensitive resource development in a watershed they regarded as their homeland.

The blockade was ended when the Attorney General of B.C., David Vickers, agreed to meet with the Band. The meeting resulted in an assurance by Vickers of another meeting between senior government officials - who were active in resource decision making in the Nimpkish watershed - and the Band to clarify exactly what kind of resource development plans the provincial government had. From the Band's perspective it was clear that the provincial government had no long term vision of integrated resource development and that the interests of the Band were in no way represented (Nimpkish Band, 1982). The Nimpkish Band thus undertook its own comprehensive resource study of the Nimpkish watershed in 1980 so as to determine past resource use and development and suggest ways in which the Band could participate in future resource use decisions - specifically forestry and fish management.

The purpose of the study was two-fold. Firstly, the Band documented traditional use of the land and its renewable resources and also assessed the inherent biological capability of the land to provide these resources. The study also looked at historical white development and exploitation of renewable and non-renewable resources and attempted to identify ways in which native people can participate in future management of the resources.

A follow-up to this study has been the Musgamagw Demonstration Project which was initiated in 1985 by the federal Department of Indian Affairs to look at the co-ordination of fisheries, forestry and other natural resource programs with the aim of fostering Indian economic and social development (Gordon, pers. com.). The project includes three other Bands - Hopetown, Kingcome and Guilford - besides the Nimpkish Band which has several ongoing projects;

including a salmon hatchery at Telkwa Creek, off the southern end of Nimpkish Lake. The project will also be looking closely at the interaction of the forestry and fishery management programs and how they can become participants in programs such as fish habitat enhancement, silviculture and monitoring of fish and forestry activities.

## 2. Sports Hunters

For many of the first European settlers in B.C. hunting, fishing and trapping of wildlife was essential to their survival. This activity was at the time assumed as a "right" in that it was a bounty that was readily and sufficiently available to satisfy everyone's needs without depleting the populations. Over time both the need for and availability of animals has decreased and consequently hunting and trapping have become more a recreational activity with the added bonus of providing "wild" meat, much preferred by serious hunters.

While there is no longer a dependence on wild game for food there still lingers the sentiment amongst hunters that they have a traditional "right" to hunt for game for both the food value and sometimes as a trophy. Underlining this desire to pursue hunting is a strong conservationistic ethic that puts the protection of the environment as a high priority. It is this mix of both conservationist and consumptive interests in the hunting fraternity that on occasion causes conflicts with the strictly conservationist naturalist organizations.

John Dixon, a past president of the B.C. Wildlife Federation - which represents sports hunters and fishermen - focuses on the hunter-environmentalist controversy:

> "We will continue to be in the forefront of the environmental movement fighting for the preservation of habitat and natural resources to the best of our ability. We shall continue to resist any attempt to take away our right (emphasis mine) to harvest that resource.
>
> "All this argument may leave you with the impression that there is no bond between the hunter and the anti-hunter (read environmentalist) but that simply isn't true.
>
> "Try sitting them down together over a succulent brace of roast mallard stuffed with wild rice .... " (Vancouver Sun, Oct. 24, 1978, p.6)

A serious rift that has occurred between the hunters and environmentalists/naturalists camps is over the recently initiated wolf control program in the Nimpkish watershed. The hunters claim - as do the regional Fish and Wildlife biologists - that since the forest and ungulates are both heavily managed it only makes sense that the wolves, which prey on deer and elk, should also be managed. In other words, their number should be reduced either by poisoning, hunting or trapping. Wayne Harling, president of the Vancouver Island chapter of the B.C. Wildlife Federation, offers his view of the wolf control program:

> "We don't want to wipe the wolves out, but we do have an artificial situation with the habitat (read clear-cut logging), and if you're going to try to manage the deer and elk, the forest, you'd better start managing all aspects of the ecosystem, and that includes wolves, because otherwise you throw the whole thing out of balance." (Nature Canada, Jan/March 1984, p.38)

The environmentalists point out that the wolves are not the sole predators of ungulates and that sport hunting should be stopped to see if the deer can come back on their own. While there is agreement between the two groups that forest habitat should be protected there are distinct differences in what these protected areas should provide - either hunting or non-consumptive use.

The Fish and Wildlife Branch in its management plans has identified that managing habitat for deer and elk for sport hunting is their first and second priorities respectively for Vancouver Island; including the Nimpkish watershed. This emphasis on consumptive use is at the crux of the hunter-environmentalist disagreement which is derived from a fundamental difference in values that the two groups hold. Unfortunately this disagreement in values has the effect of tainting any other dialogue which deals with less divisive concerns regarding actual conservation of the forest environment and the methods required to do so.

With a membership of over 30,000 the B.C. Wildlife Federation is one of the most powerful public interest groups in the province and has often joined coalitions with other groups to oppose a variety of environmentally destructive development proposals. The Federation has been especially vocal in its attempt to prevent the logging of forest habitats such as the Stein basin, the Tsitika watershed (adjacent to the Nimpkish) and Northeast coal development. This is not to say that the Wildlife Federation is always in agreement with environmental organizations; often the leadership of the day may put more emphasis on the consumptive aspect of hunting rather than on conservation. However, as a general trend, the Federation has recognized

the environmental movement as a growing and politically powerful voice and a potential ally to achieve common goals, such as habitat protection where the entire watershed integrity is maintained such as the Tsitika and Stein (Harling, pers. comm.).

There has been an ongoing interest on the part of hunters (many of whom belong to the Wildlife Federation) in the management of ungulates in the Nimpkish. This interest is highlighted by the fact that the Nimpkish gained a reputation as being a deer haven for hunters from the mid-60s to the early 70s. As a result of this "built-in" interest the hunter lobby has worked closely with the Fish and Wildlife Branch, mostly on an informal basis, and has, more than any other interest group, been responsible for the initiation of the 5 year Integrated Wildlife Intensive Forestry Research (IWIFR) program for Vancouver Island (Janz, pers. comm.; Harling, pers. comm.). Wayne Harling, the Vancouver Island representative for the Wildlife Federation, has stated that his organization has intentionally kept a low profile not wanting to "stir up a hornet's nest" of public debate on the ungulate-forestry issue in the Nimpkish watershed.

### 3. Naturalists

The naturalists of British Columbia enjoy a long tradition of promoting and lobbying for environmental protection, either through local chapters or the provincial umbrella organization, the Federation of B.C. Naturalists. This lobby group has taken a conservative approach in addressing environmental issues, preferring to work with other moderate groups such as the Sierra Club or Society for Pollution and Environmental Control (SPEC) in joint efforts or through existing government channels to secure funding for

conservation activities.

One of the major objectives of the naturalists is to preserve as pristine an environment as possible for the non-consumptive enjoyment of the public. Generally the public image of naturalists is one depicting a gaggle of binoculared, gumbooted "birders" out on a Sunday morning field trip. However, naturalists have been in the forefront of various causes lobbying for habitat protection, pollution control, improved wildlife management of non-game species and endangered species, to name only a few.

On Vancouver Island local naturalist organizations represented by the Tsitika Conservation Committee were very much involved in the 1978 approval of an integrated resource plan for the Tsitika watershed (Tsitika Planning Committee, 1978). The Tsitika is adjacent to the Nimpkish watershed but received much greater attention due to the fact that it was the last major unlogged or "virgin" watershed on northern Vancouver Island. In 1972 conservationists proposed that the entire watershed be reserved as an ecological reserve and that provincial parks be established around Schoen and Gold Lakes at the western edge of the watershed. In the Nimpkish there has been a proposal since 1973 for an ecological reserve to preserve an exceptional stand of mature Douglas Fir, believed to be some of the tallest trees in Canada.

A group of conservationists and academics joined forces in January of 1983 to create a non-profit society to give support to the Ecological Reserves Unit of the provincial government. Calling themselves "Friends of Ecological Reserves," this group was particularly effective in creating

public interest in the plight of the trees in the Nimpkish, known as the "Nimpkish Island" stand. Articles appeared in magazines such as Horizon and Equinox and in The Vancouver Sun as well. Some local television stations picked up the story and ran a series of in-the-field human interest clips on the proposed ecological reserve.

There is a definite bias by naturalist/conservationist organizations to place high value on pristine habitats, witnessed by their involvement in lobbying for preservation of unlogged areas such as the Tsitika and Stein watersheds and islands such as Meares and South Moresby. These groups have recognized that there is wide public appeal, and just as important, media interest, in issues involving unique or rare habitats and have utilized this sentiment in helping establish ecological reserves, wildlife areas and parks throughout the province. It is therefore not surprising that the conservationists' interest in the Nimpkish has been limited to a relatively small stand of trees, a mini-virgin forest, while the rest of the watershed has been in effect "written off".

More recently concern was expressed for a wolf control program initiated by the Fish and Wildlife Branch in the Nimpkish watershed. In a position paper for the Canadian Nature Federation, Rosemary Fox, a well-known B.C. conservationist, questioned the validity and motivation for the control program, claiming that "... historically, wildlife management in B.C. as elsewhere has been management of game species to benefit hunters.... wildlife managers are responding to political pressures." (Nature Canada Jan./Mar. 1984, p.37).

In addressing the larger issue of habitat protection Fox suggests that the wolf control program "may be treating a symptom but not the cause of the problem. Whether or not wolves are the cause of the deer decline, is it in the public interest to remove wolves for the benefit of hunters who are a small proportion of the public? Should not hunting be managed so as to enable wildlife populations to maintain their natural equilibrium." (Nature Canada Jan./March 1984, p.40). While Fox's comment has a ring of truth to it, it does not take into consideration the very "unnatural" situation vis-a-vis the extensive logging of the watershed that has created not only ideal conditions for the deer but also for the wolves which are using logging roads as hunting routes and are concentrating on deer that are congregating especially in winter in the remaining winter ranges of the watershed (Janz, pers. comm.).

**4. Environmental Groups**

One of the products of the 1960s was the birth of a so-called environmental movement which spawned an array of public interest groups. Reflecting the diversity of society itself, these groups adopted a variety of ideologies as well as means of operation ranging from low profile, diligent research/lobby groups such as SPEC to radical confrontation-oriented groups like Greenpeace. While Greenpeace has gained much media attention in such issues as the wolf control program in B.C., it generally deals only with high profile single species issues, often ignoring the broader issues of habitat protection. It has been left up to more restrained groups such as SPEC or the Sierra Club to work at the overall issue of habitat needs for wildlife.

Environmental groups have paid relatively little attention to the Nimpkish watershed, especially before the 1970s, when environmental activism was at its peak. More conservative groups such as the Sierra Club have expressed concern over forestry and wildlife management practices in a general manner, and have also lent support to conservation/naturalist groups in lobbying for the establishment of an ecological reserve in the Nimpkish.

In the 1980s the emergence of a wolf control program in different parts of the province, including the Nimpkish watershed, elicited a response from organizations such as Greenpeace. However, most of the attention was focused on northeastern B.C. where Paul Watson, an ex-Greenpeace member, created considerable controversy that in turn attracted considerable newspaper and television attention. Some members of Greenpeace also established a field camp in the Nimpkish to protest the wolf program there but the level of protest and media attention were not nearly as great as experienced in the Watson expedition (Gregory, pers. comm.).

**5. Academics and Professionals**

The academic community of British Columbia has played a key role in raising the consciousness of the general public with regard to environmental protection, especially the forest lands of the province. Foresters, biologists and botanists have, through their academic work and through involvement with naturalist or environmental groups, been able to influence significantly the way in which forest lands are managed.

One of the most well known and influential of all the academics is Vladimir Krajina who developed a system of classifying forest vegetation - biogeo-climatic zones - that has been adopted by several provincial government ministries. Krajina was also instrumental in establishing, in 1968, an Ecological Reserve program - which is aimed at preserving unique and important features of B.C.'s natural environment. Krajina has attended numerous meetings and interviews while spreading his message for the continuing need to establish more reserves; at least 0.5 percent of the province's land area. An ecological reserve is still being actively pursued for a stand of exceptionally tall Douglas Firs in the Nimpkish watershed. Krajina, full of passion in his campaign to save the Nimpkish trees, points to their uniqueness and value to forests and the public in general:

> "Today, the Nimpkish Island trees are unique. Originally, there were a few other such prime sites, but all have been cut down. If these trees are cut, the biological conditions - this marvellous combination of nutrients that allowed them to grow - will deteriorate because of erosion. If these trees are cut, it's likely we will never have such trees in Canada again. We must save them." (Equinox May-June, p.38.)

A group of academics from Vancouver and Victoria that includes foresters, botanists, biologists, lawyers and others have come together as "Friends of Ecological Reserves" to gather money to compensate CANFOR for the release of the "Nimpkish Island" Ecological Reserve. In co-operation with the provincial government - Ministry of Lands, Parks and Housing, which is responsible for ecological reserves - the group has raised $14,000 toward the purchase of the Nimpkish stand which is valued by CANFOR at over $1 million dollars (Horizon, 22:1, p.26.) Over the last five years considerable publicity through newspapers, magazines and television has arisen over the Nimpkish ecological reserve proposal and has certainly turned the public's attention to the watershed. (Equinox May-June 1983).

In the 1970s a good deal of concern was expressed by the Forestry faculty at the University of British Columbia concerning the state of the province's forests (Bunnell, pers. comm.). There was a burst of activity in student research work in the Nimpkish watershed during the 1970s and carrying through the 80s looking at the relationship between wildlife - particularly ungulates - and the forest habitat. Much of the work was under the direction of Fred Bunnell of U.B.C., who has established a close working relationship with the Fish and Wildlife Branch and has helped facilitate several joint U.B.C. - Branch applied research projects.

The work of Bunnell and his students has received fairly good publicity through conferences and public meetings.[1] The research work has helped stimulate and facilitate proposed forestry/ungulate management options in the Nimpkish watershed (Ministry of Forests, 1983).

### 3.4 Public Concern for Nimpkish Watershed

Over the years the Nimpkish has drawn attention from different segments of the general public; usually in connection with forestry and logging and their effect on the resident fish and wildlife. The following is an abbreviated chronology of public interest in the Nimpkish watershed over the last 80 years:

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1. Wildlife Management Opportunities Through Intensive Forestry. - Seminar, Victoria, B.C. Spring, 1981. Threatened and Endangered Species and Habitats in B.C. and the Yukon. Symposium. Richmond, B.C. March 8-9, 1980. British Columbia Land for Wildlife Past Present and Future. Symposium. Simon Fraser University, Burnaby, B.C. Oct. 23-24, 1981.

1900 - 1959 - Native use of wildlife decreased by 1930s but reliance on fisheries remains strong to the present. Non-native interest is relatively small; restricted to sports hunting, fishing and hiking.

1960 - 1969 - The Nimpkish gains attention province-wide as the "hot spot" for deer (Davies, pers.comm.). A combination of open browsing areas created by logging and a series of mild winters creates ideal conditions for deer which explode in numbers and attract deer hunters by the thousands. There is a general concern for low numbers of Vancouver Island wolf, which is subsequently put on the endangered list by Canadian conservationists (Janz, pers.comm.).

1970 - 1975 - Deer numbers are steadily decreasing and concern is expressed by hunters that perhaps adequate habitat will not be left after logging is completed. In 1974 the Nimpkish Band issues a Declaration of Sovereignty, claiming rightful ownership to the Nimpkish watershed and its resources. The Band was especially concerned about the effect of logging practices on fish and their habitat in the watershed. A major protest is mounted by a coalition of the B.C. Wildlife Federation, naturalists and environmental groups to stop logging of the Tsitika watershed adjacent and south of the Nimpkish Valley. The first wave of University of B.C. student researchers - Willms, 1971; Jones, 1974 - studying deer and forest habitat characteristics have swept into the Nimpkish. An ecological reserve is proposed for an exceptional stand of Douglas Fir on "Nimpkish Island" in the heart of the watershed.

1976 - 1983 - Decreases in deer numbers become even more severe. Public interest especially in wildlife is spurred by increased U.B.C. research within the Nimpkish Valley (Ellis, 1979; Harestad, 1979; Kale, 1979; Rochelle, 1980; Stevenson, 1978). A surprise eruption of the Vancouver Island wolf population is noted in the late 1970s. Greenpeace protests a subsequent wolf control program within the Nimpkish watershed and attracts some media attention. The proposed "Nimpkish Island" ecological reserve receives extensive media coverage through newspapers, magazines and television. In 1978 an integrated resource plan is implemented in the Tsitika watershed and is later used as a model to propose a similar management plan for the Nimpkish. In 1981-82 the Nimpkish Band conducts a comprehensive resource study of the Nimpkish watershed and makes a presentation to the Pearse Inquiry on Pacific Fisheries Policy in January, 1982.

## 3.5 Conclusion

It must be acknowledged that although an aroused public conscience concerning the protection of ungulates and their habitat in the Nimpkish does exist, it is diverse in nature and therefore difficult to put a handle on. While sports hunters, naturalists, aboriginal people and environmental activists may all seek a similar end product in terms of protection of wildlife and/or habitat, they often differ on how this is best done and who should have access to the natural resources. It is interesting to note that while the Nimpkish watershed has received considerable attention from different interest groups over the last ten years especially, there remains the challenge on the part of the government and the groups themselves to reconcile some of the fundamental value differences that each holds.

In the case of the Nimpkish watershed we have witnessed concern from different publics for specific elements of the resident fish and wildlife and their habitat. The Nimpkish Band has raised the issue of fish habitat protection especially regarding the effects of logging on such habitat. Meanwhile the hunter lobby is concerned with sustaining a healthy black-tailed deer and elk population. Their immediate concern is "controlling" wolves which are decimating the ungulates. The hunters are also supporting ongoing UBC - Branch research to determine whether second growth timber can be used as winter range by deer and elk. Many environmental and naturalist groups are strongly opposed to wolf control (especially through use of poison baits) and would like to see the wildlife and habitat left as they are - in theory to let nature take its course and return eventually to some ecological equilibrium. The naturalists as well as the hunters and the Nimpkish Band all support in principle the preservation of the "Nimpkish Island" stand of tall trees. As a general

principle the different groups also endorse the preservation of mature and unlogged (read pristine) forests; however each group has different perceptions of what "pristine" really means; what areas are really worth preserving. As we have already seen in this chapter, the difference in values is often found in how the different publics or interests wish to "use" the watershed.

If we compare the Nimpkish situation with Ashby's model we can see that an arousal of the public conscience has occurred; but that there are different publics each with its own concerns and mandate for achieving environmental protection. While many differences exist between the public interest groups there is a convergence of shared concern for the habitat within the watershed and this has stimulated the government to initiate resource studies and look at management options as we shall see in the following two chapters.

# CHAPTER FOUR Scientific Assessment of the Forestry-Ungulate Problem and Finding an Appropriate Solution

## 4.1 Introduction

In the last chapter we saw that concerns have arisen among various publics for the Nimpkish watershed generally, and for the ungulate populations as they are affected by forestry in particular. In Ashby's words, concern was been ignited. But to continue the "chain reaction" of advancing an environmental concern, requires that the issue "... be examined objectively, to find how genuine and how dangerous it is, and just what is at risk." (Ashby, 1978, p.14). A closely related need is that a feasible management practice is available to cope with the problem. In the present chapter we examine the adequacy of an objective assessment and availability of feasible management alternatives for dealing with the Nimpkish forestry/ungulate interactions.

## 4.2 The Evolution of Forestry-Ungulate Research in the Nimpkish Watershed

The earliest forestry-ungulate studies done on Vancouver Island were located on the southern half of Vancouver Island during the period from 1945 to 1968 (Cowan, 1945; Robinson 1958; Gates, 1968; Smith, 1968). Walter Willms (1971) was the fist researcher to look at the forestry-ungulate relationship on the northern part of Vancouver Island - specifically the Nimpkish watershed - where intensive logging had progressed to in the 1960s. Willms evaluated the influence of environmental factors such as forest edge, elevation, aspect, site index and roads on deer use of logged and unlogged forests. The results of his study indicated that mature forests were of significant importance for deer survival.

A study of deer winter range requirements conducted by Greg Jones (1974) was pivotal in gaining an understanding of deer habitat needs, especially the relationship of deer use in logged and unlogged areas. Jones' work built on the findings of Willms and went further in describing several key environmental factors such as crown closure, forage, seral type, timber type, terrain, slope, aspect and elevation. It was at about this time that other events were unfolding in the area of wildlife and forestry management. The logging companies' cutting plans were being referred to the Fish and Wildlife Branch via the provincial Forest Service for comment. This created a situation where both logging harvest policy and habitat preservation became part of the management process. As a consequence the Fish and Wildlife Branch was obliged to find methods of identifying key environmental factors controlling deer populations and secondly to infer capability of given forest areas to sustain deer. It was at this time that the Fish and Wildlife Branch had been given funding to undertake research, specifically on deer use of old growth forest. In a co-operative program with the Branch, the Faculty of Forestry at U.B.C. provided a significant research effort to study forestry-ungulate relations from 1975 to 1979. (Ellis, 1979; Harestad, 1979; Kale, 1979; Rochelle, 1980; Stevenson, 1978).

The following is a brief description of the deer-related work carried out by University of British Columbia graduate students (Bunnell, 1979):

| | |
|---|---|
| Rick Ellis | Subject: Biomass, nutrient and population dynamics of shrubs; exclosure and fertilizer studies. |

| | |
|---|---|
| Alton Harestad | Subject: Dispersal of deer including factors involved in habitat selection. |
| Wayne Kale | Subject: Refinement of deer harvest statistics, including hunter effect; deer-habitat relations. |
| Jim Rochelle | Subject: Nutrient dynamics of forage, in vitro digestibilities, VFA production, animal condition measures. |
| Barbara Scott | Subject: Food habits, population dynamics, and social organization of Vancouver Island wolves. |
| Susan Stevenson | Subject: Taxonomy and ecology of forage lichens, lichen litterfall, methods of quantifying lichen abundance. |

The studies used a broad conceptual framework developed by Bunnell and Eastman (1976) that looks at the changes in wildlife resource requirements following removal of tree overstory - in this case the effects of particular forestry management practices. The resources considered were energy, nutrients, water, temporary shelter (thermal cover, snow interception) habitation, escape cover and space. The following sections will discuss how these studies helped to flesh out the conceptual framework and the pioneer work done by Willms (1971) and Jones (1974).

A second research initiative was undertaken jointly by the Forestry and Environment ministries in assessing the potential of second growth forests to sustain deer; particularly during hard winters. A problem analysis was completed by the Ministry of Forests in early 1980 and a 5 year program, known as the Integrated Wildlife Intensive Forestry Research project (IWIFR), was launched in May 1980 (Ellis, pers. comm.). The impetus for this study came from a variety of interest groups, including the B.C Wildlife Federation and conservationists. There was also strong support from biologists within the Fish and Wildlife Branch, foresters within the Ministry of Forests and the forestry

companies; all agreeing that second growth deserved a look in that it was quickly becoming the dominant forest type on Vancouver Island. The research involved a study of deer and elk use of first growth and second growth as well as habitat requirements; response of forage to different silvicultural treatments and the relationship between crown closure and understory productivity (Ellis, pers. comm.).

The first phase of the IWIFR program was completed in March, 1986. A second 5 year phase now underway will be following up on the initial work and will attempt to initiate some forestry treatment demonstration projects, including a project on arboreal lichen potential in second growth (Ellis, pers. comm.). The results will have significant implications on forestry-ungulate management if it can be shown that second growth trees, with proper treatment, can sustain deer and elk through harsh winters.

Having outlined the historical development of research we will now take a closer look at the specific environmental factors that determine ungulate abundance.

### 4.3 Population Estimate of Ungulates in the Nimpkish Watershed

Unfortunately no reliable estimates exist of historical ungulate populations in the Nimpkish watershed. Earliest estimates from Canadian Forest Products (Willms, 1971) and from the Fish and Wildlife Branch indicate that deer numbers were relatively low in the 1950s and early 1960s. Deer numbers based on hunter harvest records from 1964 - 1977 show an increase in deer killed, from a low of 385 in 1964 to a high of 3374 in 1973 with a subsequent fall off. The number of hunters also increased dramatically during this time, 174 hunters in 1964 and peaking in 1974 with 2904 sportsmen, with a downturn in following years. Hebert

(1979) cautions that harvest-density declines may not reflect true changes in the population because second-growth forests can reduce visibility and consequently hunter success.

A mark-recapture system of obtaining deer harvest data has been in place since 1975 on Vancouver Island. The system involves the cross-referencing of hunting licences to hunter questionnaires (recapture phase) and licence numbers are recorded for hunters contacted (marking phase) in the field or at game checks. Kale (1979) has found that the mark-recapture estimates are much more accurate than questionnaires alone.

The two methods most commonly employed by the Fish and Wildlife Branch to estimate deer abundance are pellet (feces) counts and roadside counts. A major difficulty with pellet counts is the variation in the disintegration rates and visibility of pellets between wet and dry areas (Bunnell, 1979). Bunnell (1979) estimates that pellet counts can overestimate deer populations by up to three times, if conducted on uncleared plots.

Visual roadside counts of deer, using a spotlight technique, have been carried out by the Fish and Wildlife Branch in the Nimpkish since 1968 (Jones and Mason, 1979). Unfortunately, not all areas have received equal coverage and therefore a true picture for all areas is not available. The results of these surveys show a general trend of reduced numbers of deer since the mid-70s in almost all sections of the Nimpkish watershed (Jones and Mason, 1979). If we look at counts from 1975 and 1979 when coverage of survey areas was 87% completed, we see a decrease of 11 deer/km to 6.1 deer/km.

There are problems with roadside counts as well. Bunnell (1979) poses the dilemma as follows: "Variance in night counts decreases with increasing transect length; at a fixed effort, increase in transect length reduces the number of transects counted; a decrease in number of counts increases the variance." (p.91).

There are numerous sources of error in estimating any free ranging wildlife population and ungulates are no exception to this. Changes in weather, vegetation and in observers (especially over several years), are only a few of the more obvious variables that determine success or lack of it during any single count. It is acknowledged by biologists that estimating ungulate populations is an imperfect science and that for the most part it is much more practical and useful to talk in general terms such as population trends. It must also be remembered that ungulate populations are controlled by a number of natural environmental factors (aside from man-created factors) and that these cause populations to fluctuate, sometimes quite significantly, over time. It is for this reason that Wildlife Branch biologists are more concerned about wildlife habitat than actual numbers unless, of course, the numbers are so low that local extinction may result.

## 4.4 Environmental Factors Regulating Ungulates in the Nimpkish Watershed

Regulating factors for ungulates can be broken down into two broad categories:

1. Natural

   There are a number of factors controlling ungulate survival and reproduction such as disease (both of the animal itself, or the food it relies on); predators; vegetative succession; nutrients in soil, and climate.

Climatic factors that ungulates are particularly sensitive to include snow accumulation, temperature extremes, and forest fires.

2. Man-Created

This category would include activities such as logging and hunting. Other activities such as road building, outdoor recreation and scientific study also have effects on ungulate survival.

The following discussion will focus on those factors that are central to the topic of this thesis, namely what kind of habitat do ungulates require; do they at present have sufficient habitat and, if they do not, how might their habitat requirements be met. Due to the complex nature of ungulate management we will look briefly at how a number of factors including the role that predation, both by man and animals (wolf and cougar), play in regulating deer and elk.

### 4.4.1 Habitat requirements of Ungulates

**Deer**

Only one species of deer lives within the Nimpkish watershed - the coast black-tailed deer.

Deer are found throughout the watershed but surveys have shown that the most productive area is in the triangular area described by Woss Camp, Claude Elliot Lake and Vernon Camp (Davies, pers. comm.). Individual animals migrate up and down in elevation according to season and availability of food and seldom travel more than one or two miles along a valley (Jones, 1974).

In his study of deer response to forage abundance, Harestad (1979) found that seasonal deer movement corresponded to areas of highest food availability. Those movements most common were vertical migrations, up and down mountain slopes, but other horizontal migrations occur as well as shifts in intensity of use of logged and unlogged forests.

At one time it was believed that deer on the west coast increased their numbers in recently logged areas (Cowan, 1945; Robinson, 1958). This was the "popular wisdom" until the early 1970's when biologists found that while nutrient rich food was made available and deer often did thrive (at least initially) in clear-cut areas, a severe winter would cause a noticeably high mortality. It was found that deer require, among other things, mature (200 years old) stands of trees with high percentage crown closure to survive severe winter conditions (Davies, pers. comm.). Thus the concept of "deer winter range" as being of primary importance in maintenance of deer populations (in areas of heavy snowfall) was adopted as a management strategy by the Fish and Wildlife Branch.

Several studies done on Vancouver Island (Gates, 1968; Willms, 1971; Jones, 1974; Harestad, 1979; Rochelle, 1980) describe deer biology quite thoroughly. The more recent studies all stress the importance of "deer winter ranges" as a limiting factor in deer survival in the interior mountains of Vancouver Island.

According to Greg Jones (1974), a former biologist for Canadian Forest Products in the Nimpkish from 1974-1979, there are eight characteristics of deer winter ranges used during a severe winter:

1. Crown closure (area covered by tree canopy)

   - High deer use recorded in timber stands with crown closure of 65% or greater.
   - The single most important effect of high crown closure is the reduction of snow accumulation on the ground.
   - Timber stands with 45% or less crown closure sometimes is used but deer mortality is very high.

2. Food

   - Most important foods include red cedar, Douglas fir, salal, vaccinium species, arboreal lichens and western hemlock.
   - Lichens, red cedar and Douglas fir are eaten as litterfall from the tree canopy.

3. Seral type

   - All heavily used winter ranges were mature timber stands with a high percentage crown closure.
   - Logged areas are used when snow is hard crusted.

4. Timber type

   - Winter ranges most heavily used have Douglas fir and western hemlock as overstory - these species having a higher percentage crown closure than other fir species.

5. Rock Bluffs

   - Areas with small bluffs and high percentage crown closure are used frequently because of low snow accumulation and accessible food plants.

6. Slope

   - Most winter ranges are on slopes 50% or greater.
   - Snow accumulation is a key factor.

7. Elevation

   - Most winter ranges are below 790 m.
   - Snow accumulation is a key factor.

8. Aspect

   - The majority of winter ranges are on south aspects.
   - South aspects are not used if crown closure percentage is low.
   - North aspects with high percent crown closure and abundant food are used.

Roughly 75% of the total lower elevation (790 m) timber in the Nimpkish watershed has been logged. In specific areas this percentage is higher (Woss River; Hoomak Lake/Vernon Lake) or lower (Kilpala River). The overall effect of logging on deer has been a reduction in the availability of high quality winter ranges.

Rochelle (1980) continued work initiated by Jones (1974) on the evaluation of deer food habits, but also pursued a more intense study of deer-forage relationships - looking at monthly changes in the chemical composition of ten major forage plant species and relating them to digestibility and nutrient content. One result of particular interest was Rochelle's discovery that arboreal lichens are a significant component of deer diets in winter and spring; representing 35 percent of the total volume eaten. Rochelle also found that during winter the production of litterfall - lichens that have fallen from the tree canopy - was approximately equal in weight to the production of rooted forage. Finally, it was found that the digestibility of the lichens was 30 - 40 percent higher than key forage species such as vaccinium parvifolium (Blue huckleberry); Thuja plicata (W. red cedar) and Gautheria shallon (salal).

The results of work by Jones, Rochelle and Harestad suggests that shrub productivity is a major controlling factor of black-tailed deer numbers in some forest types during winter and spring (Bunnell, 1979). An integration of the work of the above researchers' works, as well as that of Stevenson and Ellis, is currently being undertaken by Fred Bunnell and should provide an insight to the degree of control that forage availability has on deer numbers (Ellis, pers. comm.).

**Elk**

The sub-species of elk found in the Nimpkish watershed is the Roosevelt elk (Cervus canadensis roosevelti).

Much less is known about elk biology than is known about deer in the Nimpkish. Historical evidence indicates that elk were probably present in the valley at least 100 years ago (Ham, 1980). Elk travel and feed in dense bush and in groups making it difficult to assess changes in population levels. Estimates made in the early 1980s by the Fish and Wildlife Branch put the number of animals at 45 - 50 in three "resident" herds centred around Woss Camp, Croman Lake and the lower Tsulton River (Janz, pers. comm.). There are other herds that migrate in and out of the Nimpkish watershed at Pinder Creek, Atluck Lake, Steele Creek, Kaipit Lake, Claude Elliot Lake, Upper Tsitika River, Nisnak Lake, upper Nimpkish River and possibly at the south end of Woss Lake (Fig. 1).

The habitat requirements of elk are somewhat different than those of black-tailed deer. Elk tend to feed closer to valley bottoms and in meadows where grasses and herbs make up a large part of their diet. However, elk will also browse on shrubs such as salmonberry, thimbleberry and huckleberry. There is, as yet, no good data on elk use of clearcut versus natural openings in the Nimpkish.

Present information suggests that the Croman and Woss elk do not leave the Nimpkish watershed in winter but remain in low elevation areas that provide adequate food, water and cover (Janz, pers. comm.). Generally elk can survive deeper snow conditions than deer because of their greater height and strength. In studies done on Rocky Mountain elk (Cervus canadensis nelsoni) it has been

shown that optimum elk habitat should have 20% hiding cover; 20% thermal cover and 60% forage area (Thomas, 1979). The crown closure of mature stands of trees that is required to provide adequate cover in winter is probably the same as for deer - around 70 - 80% (Thomas, 1979).

### 4.4.2 Ungulate Predators

The major predators of ungulates, besides humans, are wolves, black bears and cougars. Due to an effective bounty hunting program over the early 1950s (terminated in 1955), cougar numbers have been kept at a relatively low level and have consequently had little impact on the ungulate population in the Nimpkish. Hatter (1982) in reviewing the literature about cougar predation on elk and deer on Vancouver Island, concludes that cougars could take 5 - 12% of a fall deer population, which suggests that cougars, if abundant, could be a limiting factor in an ungulate population. Little is known about cougar predation on elk in the Nimpkish Valley or elsewhere on Vancouver Island.

Black bear predation on ungulates is restricted almost exclusively to very young calves of both deer and elk, but particularly of elk (Hatter, 1982). In an Idaho study, Schlegel (1976) reported that elk calf mortality due to black bears was as high as 65%. There is little quantitative data on bear predation on ungulates in the Nimpkish, although Hatter (1982) suggests that individual bears do specialize in hunting deer fawns.

As was mentioned earlier, the wolf population of Vancouver Island has fluctuated quite wildly since the early 1900's (Scott, 1979). There were few reports of wolf sightings on the north end of the island between 1950 and 1970. At the same time, there were even fewer sightings on the southern half of the island.

In 1970 the Vancouver Island wolf was placed on the endangered list of the Canadian Wildlife Federation. It must be remembered that sightings alone - which were of a random nature - would not necessarily reflect the true state of the population.

By the mid-1970's it became apparent to the Fish and Wildlife Branch that the wolf was, in fact, present in healthy numbers on the north island and had been increasing up to the 1980s (Hebert et al., 1980).

Wolf predation on deer and elk is thought to be significant by the Fish and Wildlife Branch:

> "... wolf predation rates have the potential to severely affect prey populations especially where logging reduced or totally removed mature timbered winter ranges, causing deer to concentrate to densities of 150 to 200/square kilometre in small timbered areas in moderate to severe winters.
>
> The potential of wolf predation on elk populations is less certain. To date, it appears that wolves are utilizing elk as food source but at a rate, in most areas, considerably below recruitment." (Hebert et al, 1980).

The report goes on to describe that predation of elk may increase in areas where deer populations are low or decreasing and that elk vulnerability may be increased considerably during moderate or severe winters, when elk congregate in low elevation timber stands.

A study conducted by Barb Scott (1979) in the Adam/Eve Watershed (adjacent to the Nimpkish) reveals that wolves are preying predominantly on deer and to a lesser degree on elk. Information gathered by the Branch from the Nimpkish suggests that there are five or more packs with 5 - 8 animals per pack. This is

probably a minimum figure, with a total population of 100 wolves a possibility. Assuming a Nimpkish wolf population of 50 - 100 animals, the total number of deer killed by wolves could be 1500 - 3000 per year (Davies, pers. comm.).

Wolves are very mobile and are known to travel 160 kilometres (100 miles) or more in a few days in some circumstances. Pack home ranges in the adjacent Adam River drainage were measured to be 64 - 75 square kilometres (24 - 29 square miles) (Scott, 1979). The extensive network of logging roads undoubtedly enables wolves to travel quickly and cover large areas in a short time (Davies, pers. comm.).

### 4.4.3 Hunting of Ungulates

Deer hunting has been described previously in Chapter 2 (See 2.6.2) and in Section 4.3 of this chapter. Wildlife Branch records show that during the best years of hunting in the late 1960s and early 1970s between 2,000 - 3,000 deer were being shot per season in the Nimpkish watershed. If that rate of harvest were sustained it would certainly have an impact on the deer population, however, both the number of deer and hunters have decreased drastically over the last ten years. The hunting statistics for Vancouver Island indicate that deer hunters are opportunists, concentrating on areas of deer abundance and avoiding areas of deer scarcity.

Biologists with the Wildlife Branch are confident that hunter pressure on the deer population is reasonable and easily controlled through the provincial hunting regulations, which are published annually (Davies, pers. comm.). The regulations are area specific and based on yearly population estimates that are in turn weighed against hunter effort and kill rates determined by hunter

questionnaires and road-side checks.

### 4.4.4 Summary of Regulating Factors

Changes in deer habitat, brought on by logging, can have a significant effect on deer use. Early stages of a clear-cut are often used intensively by deer as a source of forage (Willms, 1971). However, larger and older (15+ years) clear-cuts limit deer use by creating large dense second growth stands (Cowan, 1956) and in areas of heavy snowfall these clear-cuts lack the ability of old growth stands to provide shelter and food during severe winters (Jones, 1974).

Few detailed studies have been done on the effects of (sport) hunting on deer populations of Vancouver Island. While it is acknowledged that heavy hunting pressure can decrease deer numbers it is usually other environmental factors such as climatic conditions, habitat quality and level of natural predation that have the greatest effect in the long term on deer populations (Jones and Mason, 1983).

While few studies have been done on the relationship between predators and Vancouver Island deer, recent studies (Hatter, 1982; Hebert et al, 1982) would suggest that wolves can decrease deer numbers. Jones and Mason (1983) stress the importance of managing <u>all</u> regulating factors if predation control is contemplated. This means that habitat quality must be maintained and that hunting must be regulated in tandem with any predation control program that might be undertaken.

## 4.5 Management of Ungulates and Habitat Within the Nimpkish Watershed

The previous section describes some fundamental changes that occurred in the understanding of deer and their habitat requirements. This new thinking has had a significant influence on wildlife managers, making them much more sensitive to the need for specific habitat types (dependent on geography and climate) and incorporating these requirements within their management plans. In the Fish and Wildlife Branch's Proposed Wildlife Management Plan for British Columbia (1979), the following management prescriptions head the list for deer:

1. Identify and protect critical habitat. In winter this consists of low snow areas of south and west facing slopes and river banks. In areas of high snowfall deer require mature forests;

and for elk,

1. Identify and protect critical elk habitat. In winter this consists of ... mature forest and streams and estuaries for Roosevelt elk. Spring ranges (sunny areas where early spring plant growth appears) and migration routes between ranges are also critical.

The regional biologist for Vancouver Island, Daryl Hebert (1979, p.11) suggests that black-tailed deer of the interior mountains (of Vancouver Island) including the Nimpkish watershed have specific habitat requirements. He states that the habitat requirements could be met by "defining winter ranges in mature timber and deleting (withdrawing) these ranges from development plans for an indefinite period by 1) reducing the annual allowable cut (AAC); 2) providing migration

corridors; and 3) by utilizing rotational logging adjacent to winter ranges in order to maintain forage producing areas. In addition, redistribution of the logging over a larger portion of the watershed for any given period of time, reduction of the size of clearcuts, control of cutblock size between south and north aspects, and the extension of greenup for periods of 10-15 years (10-15 foot height class) would also be extremely beneficial."

The Tsitika Watershed Integrated Resource Plan (1978) in which Hebert played a key role did in fact endorse the removal of critical deer winter range from the AAC for a period of 150 years. Provision was also made for alternate areas should designated winter ranges be lost to blowdown or fire. Specific prescriptions for wildlife habitat management of the Tsitika include: location of openings (clearcut); opening size; opening distribution; timing of logging, and burning and bush control.

Hebert (1979) has criticized that lack of co-ordination at both the operational level - lack of a uniform classification system of forest types - and at the policy level between the Ministry of Forests and Ministry of Environment. There has been some progress in this regard in the 1980s and will be discussed in more detail in Chapter 6.

## 4.6 Conclusion

Although wildlife population management - particularly for ungulates - remains an imperfect science, good field work has been done in the field of habitat management in the last twenty years. Much of this work has been centered on Vancouver Island, with the Nimpkish watershed playing a major role in the understanding of ungulate habitat requirements (Willms, 1971; Jones, 1974;

Ellis, 1979; Harestad, 1979; Rochelle, 1980). Where in the past clearcut logging was viewed quite benignly, even endorsed in some cases, it has become apparent that in specific areas of high snowfall (such as the Nimpkish watershed), there is an urgent need to maintain critical winter ranges for both deer and elk. As a result of a recent flurry of scientific studies on deer-forestry relations, wildlife managers now have access to relatively good information on ungulate habitat requirements.

Lord Ashby (1978, p.33 et seq.) notes that difficulties remain with providing scientific evidence regarding an environmental issue. In Ashby's view there are three major kinds of difficulties. Firstly, there is the constraint of addressing only one facet of a problem in the face of complexity. This most often results in over-simplification of the problem and opens the door for unexpected and undesirable side-effects. A second and very important difficulty arises when responsible authorities "may not appreciate the reservations in the scientist's advice" (Ashby, 1978, p.34). Finally the scientists may not be "asked the right question (by 'right' I mean the question that will provide the answer needed for a political decision.)" (Ashby, 1978, p.37).

If we look at the first difficulty again we see some obvious examples in the Nimpkish ungulate-forestry situation of how complexity can confound research efforts. The sudden eruption of the wolf population on northern Vancouver Island has caught Fish and Wildlife staff off-guard and has created a situation where monitoring deer response to forestry treatment alone has become very difficult, if not impossible. Quite simply the wolves have become so efficient in killing deer that widespread areas have been decimated and this has created a situation where deer have become difficult to locate let alone determine changes

in population levels (Janz, pers. comm.).

Another difficulty with complexity has been the unexpected succession of relatively mild snow-free winters over the last decade. Much of the management prescriptions have been based on deer habitat requirements during a harsh winter of heavy snowfall and cold temperatures. Due to a lack of those conditions the ongoing deer-forestry research has been unable to make comparisons of deer survival in old growth and second growth forest stands and it has made it difficult to make further refinements on work done by Jones (1974) and the other University of B.C. researchers in the late 1970s.

In looking at the second category of difficulty, there exists a classic situation where scientists - in our case biologists - are reluctant to make final judgments on management prescriptions because of lack of sufficient information. Because of the complexity of ecosystems of which wildlife are a component, there often occur unexpected surprises that could perhaps have been avoided if more data was collected. A major concern in that regard is that intense research on wildlife populations rarely exceeds 2-3 years in duration; giving little insight into what changes might be expected over the longer term. The previously mentioned wolf population explosion and unexpected mild winters are cases in point.

While acknowledging that wildlife managers often do have reservations regarding implementation of specific management regimes there is the very real danger of waiting too long. During a Wildlife-Forestry seminar in Victoria, B.C. in 1981, Jack Ward Thomas, a wildlife biologist from Oregon, spoke of the danger that biologists may face if they defer management action for fear of inadequate

information:

> "We can't wait 25 years for information on wildlife - forest management will keep moving on without it. Biologists must learn to come on with the information and skills they have and refine them as they go. It's better than waiting and being too late."
> (B.C. Wildlife Review, Summer, 1981, p.22)

Thomas has developed a comprehensive forestry-wildlife management handbook, called Wildlife in Managed Forests, developed for the Blue Mountains of Washington and Oregon. The handbook stresses the importance of habitat in maintaining wildlife populations and provides alternative wildlife scenarios based on particular forestry harvest practices. It is useful in that it uses the best available biological and forestry information and synthesizes the information to predict long term consequences to both resources. This approach is being assessed by the B.C. Wildlife Branch which published a problem analysis paper on wildlife habitat handbooks for B.C. in 1984 (Harcombe, 1984).

The third difficulty, that of being asked the right question, is one that is faced with a certain amount of trepidation on the part of biologists and foresters alike in the Nimpkish forestry-deer situation. What biologists are faced with is a very hard reality of an economic climate where unemployment is high and considerable pressure is being put on government to do something about it. The forest industry which has traditionally been the largest employer in the province is being looked upon to alleviate the unemployment situation which has in turn resulted in giving priority management of forests for increased logging at a time when biologists are asking for reservations of old growth from logging. In response to this dilemma biologists and foresters have looked at alternatives to old growth resulting in the initiation of the IWIFR program,

which looks at the potential of second-growth trees in providing winter range for ungulates.

Using the available information on habitat, in general, wildlife managers are now able to draw up specific management plans regarding the maintenance of specific habitats over time. The only catch is that the power to implement these plans lies within another ministry - Forestry. While the technical information necessary for management is now readily available, there still remains an impasse at the implementation stage. What is now necessary is a mechanism whereby the resource agencies responsible for wildlife and habitat - in this case the Ministries of Environment and Forests - can establish a co-operative management plan that identifies and recognizes the needs of each others' jurisdiction. It is this relationship that will be looked at next, in Chapter 5.

# CHAPTER FIVE The Effectiveness of the Present Administrative Structure in Maintaining Old Growth Forest for Ungulates within the Nimpkish Watershed.

## 5. Introduction

Ashby's third stage is the melding of objective information, public advocacy and subjective political decision-making under the more general title of decision-making. Before a discussion can be made of what has happened on the Nimpkish ungulate-forestry issue, it is necessary to provide some background on the legislation, mandates and policies of the major agencies. In British Columbia the two ministries most directly involved in ungulate habitat management are the Ministry of Forests and the Ministry of Environment (Fish and Wildlife Branch). In the following section the legislation providing the mandate for these agencies will be examined with regard to specific provision for habitat issues. Policy, as embodied in formal statements released by the Ministries, will also be considered.

## 5.2 Statutes and Policy

Chapters 1 and 2 have argued that government inter-agency co-operation is paramount if wildlife habitat is to be adequately managed. A pre-requisite for such co-operation is the existence of a public will that in our society is commonly expressed in government policy and legislation. Chapter 1 outlined the different government resource agencies that have some control over wildlife habitat and pointed out that the Ministry of Forests has by far the greatest influence on forest wildlife habitat. The present discussion will therefore focus on the legislation and policy of the Ministry of Forests and the Ministry of Environment (Fish and Wildlife Branch) to understand the relationship these two agencies have with each other.

The new Forest Act proclaimed in 1978 replaced a sorely outdated and much amended Forest Act which had survived 66 years without a major overhaul. Indeed the new Act professed to make the government more responsive to the needs of the forest industry and users of the forest resource. Tom Waterland, the Minister of Forests, declared that the new Act would improve forest use and particularly that production of timber would be increased. Waterland (1978) emphasized the expected improvement on the forest industry side. He also stated that "The Act stresses the need for consideration for all uses of forest land.... It provides for consultation with other ministries and agencies so that forest management decisions reflect the concerns of other users of forest land." Waterland went on to say that the Chief Forester would no longer exercise the vast discretionary powers that were common in the past: "... A major thrust throughout the Act is to decentralize decision-making. The purpose here is to have forest management decisions made as close to the resource as possible."

If we look at the actual legislation we find that while some decentralization of decision making is in evidence and that some consideration is given to non-timber forestry resources (including wildlife), a wide gap still exists before these initiatives can be implemented. In Section 3 it states "The chief forester shall assess the land in the Province for its potential for c) providing forage for livestock and wildlife...". And Section 4 goes on to state that the chief forester "shall classify land as forest land if he considers that it will provide the greatest contribution to the social and economic welfare of the Province if predominantly maintained in successive crops of trees or forage, or both."

There are several other sections [5(4)(d), 7(3)(v), 11(4)(d), 27(5)(d), 34(6)(d)] that address the issue of consideration of wildlife resources on forest land.

Section 5 of the Forest Act states that Provincial forests (including Crown land in a tree farm licence area) shall be managed and used for a variety of purposes including timber production, forage production, forest oriented recreation and water, fisheries and wildlife resource purposes. In other sections of the Act the evaluation of applications for forest licences, tree farm licences and pulpwood agreements is undertaken by the chief forester who considers each case on its potential for "meeting objectives of the Crown in respect of environmental quality and the management of water, fisheries and wildlife resources...".

Within the Act there is no requirement to consult or co-ordinate with the Ministry of Environment in determining just what the "objectives of the Crown in respect of environmental quality and management of water, fish and wildlife resources" really are. No mention is made of how a provincial forest is to be managed for multiple use, integrated use or otherwise.

Another piece of legislation, the Ministry of Forests Act (1978), does address this apparent lack of direction in co-ordinating forest resources with other government agencies. Section 4(c) states that the purpose and function of the Ministry is to: "plan the use of the forest and range resources of the Crown, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are co-ordinated and integrated, in

consultation and co-operation with other ministries and agencies of the Crown and with the private sector." However, there is in fact no specific direction on how the integration is to be achieved within the Ministry of Forests or with other resource agencies.

Forestry policy in B.C. has most often been reflected by the Ministry of Forests' management practices, the content of Forestry legislation and by statements from Forestry officials. In a 1982 conference on wildlife and land Carl Highsted, a Director with the Ministry of Forests' Planning Branch, prefaced his address with the following (1982)

> "The ministry is charged by the Ministry of Forests Act to encourage maximum productivity of the province's forest and range resources. The act further charges that this production be managed through multiple resource use planning processes." (p.59).

Highsted also pointed out that the Ministry of Forests' Periodic Resource Analysis, presented as required by legislation for a first time in 1979, included a contribution from the Fish and Wildlife Branch which outlines areas of forestry-wildlife concern.

The lack of co-operation and integration of forestry practices with the needs of wildlife have been documented by resource managers (both foresters and biologists) and researchers (Bunnell, 1982; Ellis, 1980; Hebert, 1982). The shift in forest policy to incorporate consideration of other resources besides timber has only been a recent occurrence stimulated most directly by new forestry legislation and to some degree by the overall trend of government ministries to adopt a more integrated approach in their planning during the late

1970s. A first step toward the integration of management planning by the Ministries of Forests and Environment is the Integration of Wildlife and Intensive Forest Research that was launched in 1980. At the same time there has been increased pressure from public interest groups and an increased sensitivity in government staff - especially at the operational level - that has resulted in a broader outlook in the Ministry's approach to forest management (Janz, pers. comm.).

The other agency in this issue is the Ministry of Environment, which acts under the Wildlife Act (1982) in managing wildlife resources. There are other Acts such as the Environment and Land Use Act, the Environment Management Act and the Ecological Reserves Act that also consider wildlife and their habitat; but it is the Wildlife Act which actually guides regional Fish and Wildlife managers at the operational level.

The new Wildlife Act was proclaimed in 1982 after considerable discussion, both within the government and in the public. The majority of people with the Fish and Wildlife Branch and the public acknowledged that the nature of wildlife management had changed dramatically since the proclamation of the old Wildlife Act in 1966 (Walker, pers. comm.).

A discussion paper, entitled "A New Wildlife Act" was circulated for review in 1980 (B.C. Ministry of Environment, 1980). The document made strong recommendations that habitat acquisition, recognition of non-consumptive wildlife values and co-operative planning and management of other Crown lands be included in the new Act.

The Wildlife Act deals mostly with regulation and administration of the harvesting of individual game species, with only a few sections addressing the issue of wildlife habitat. While habitat acquisition eventually did become an important component of the new Act - in the form of a Habitat Conservation Fund (Sec. 11) - a vacuum continues in the areas of non-game wildlife management and inter-agency co-operation and planning. Section 3 of the Act does talk about acquiring, administering and entering agreements:

> "The minister, for the purpose of access to or the management or protection of wildlife, may
>
> a) acquire and administer land, improvements on land and timber, timber rights and other rights on private land, and
>
> b) enter into and carry out an agreement with a person, association or other body."

The section is vague and gives no direction as to how the minister may approach other ministries in engaging in co-operative resource planning and management. It is left up to the Environment Management Act (Sec. 2) to provide the Ministry of Environment with guidance in respect to resource planning. The section goes on at length specifying that the minister has power to plan, research, develop policy, design, construct and operate facilities for the "management, protection or enhancement of the environment" - which is also spelled out to include wildlife management along with a host of other resources including soil, water, fisheries, waste (man-made) and air. But again there is no directive for the integration of this internal planning with that of other ministries, most notably Forests.

Policy in government ministries is often elusive or of such a general nature that it defies elucidation. It is often not stated explicitly but is implicit in a ministry's legislation or in its planning, decision-making and management actions. In fact the Fish and Wildlife Branch has expended considerable energy in spelling out its policy with regard to wildlife management. In a 1979 publication entitled "Proposed Wildlife Management Plan for British Columbia" policy statements are clearly stated for public relations uses of wildlife management and regulations. Under the head of management eleven separate areas of concern are addressed. Encouragement of co-operative planning and management of wildlife (habitat) is expressed in the following sections:

"d) Habitat enhancement
On lands acquired for habitat management that are in a natural or near-natural state, management techniques will be limited to the control or maintenance of a particular stage of ecological succession through the use of thinning, prescribed fire, and domestic grazing. However, if it can be clearly demonstrated that active enhancement will result in a significant increase in productivity and associated benefits, a more comprehensive approach will be used. Lands acquired for habitat management that have been substantially modified by human use will be actively enhanced for the production of designated wildlife species, and managed where possible, for integrated resource use. Lands under the administration of other agencies will be enhanced when possible where they are managed for integrated resource use. Most species using an area will be given consideration when enhancement is planned.

"(e) Interagency co-operation
Co-operation of provincial agencies administering or using the land is encouraged. Greater effort must be made to integrate multi-agency planning at an early stage if the resource (vegetation and wildlife) is to be protected or enhancement opportunities realized.

"(f) Intergovernmental co-operation
Close co-operation is practised with other governments who share jurisdiction over the resource (migratory birds), the habitat, or who have similar management problems. Membership is held in several international associations whose main interest is conservation and wildlife management. Co-operation with local governments, other provinces, and the federal government will be

> continued to help solve wildlife problems of local and national interest."

The next section will describe the general system by which the Ministry of Forests and, separately, the Fish and Wildlife Branch decide on the fate of specific areas of forest land. Included in the discussion will be the means by which wildlife interests are accounted for by the Ministry of Forests and also how the Fish and Wildlife Branch is supposed to affect forestry decisions as they affect wildlife.

### 5.3 Decision-Making

It does not always follow that the decision-making process will reflect the intent of stated policy and legislation. This can be due to a variety of reasons: vague or overly generalized policy; policy not substantiated by data, and lack of resources to implement management actions are some of the most obvious difficulties. It is also important that decisions be made by the appropriate people at the appropriate levels. Ashby (1978) argues that civil servants at the operational level must be willing and able to look at not only the hard data but also at social values, all the while holding a bias toward an improvement or conservation of the environment. He also cautions against relying on a quantification of social values - sometimes attempted in cost-benefit analysis - and would rather see more time spent on understanding the ethical attitudes which underly the social values.

If we look at forestry-ungulate management in the Nimpkish watershed we can identify three levels of decision-making: i) the operational level - involving field staff which identifies site specific objectives; ii) the regional level -

usually representing ministry policy positions that identify regional objectives; and iii) provincial level - usually cabinet level, i.e. the Environment and Land Use Committee.

The vast majority of the Nimpkish watershed is under a form of forestry tenure known as a Tree Farm Licence (TFL). A TFL is a mixture of private land (Schedule A) and Crown land (Schedule B). Under this form of tenure the forest company is responsible for the forest inventory and silvicultural practices under a 21 year lease agreement. Productive land (for trees) can be withdrawn (Schedule B) at the discretion of the Minister of Forests for amounts up to five percent of the total land of the TFL. Any amount of non-productive land can be also withdrawn by the Minister, without compensation to the licence holder. The Crown must compensate the licence holder for deletions from the TFL greater than five percent. If agreement cannot be reached with respect to the compensation, then the issue will go to arbitration. According to Janz (pers. comm.) there had been no instances of mature timber being withdrawn by the Minister to protect wildlife values, although Western Forest Products has on its on initiative 'withdrawn' timber that has been designated by the Fish and Wildlife Branch as deer winter range.

A referral process where the Fish and Wildlife Branch reviews forestry management working plans - which describe size, location and sequencing of timber harvest - was initiated on Vancouver Island in 1974 (Janz, pers. comm.). The referral involves an annual review of the development/cutting plans which is in essence a more detailed annual operational plan, and allows the Branch to make suggestions regarding protection of wildlife values. Although there is no requirement through legislation that the suggestions be acted upon there has

been some progress in incorporating wildlife values in the forestry development/cutting plans (Davies, pers. comm.). We will discuss some of the progress as it relates to the Nimpkish watershed later in this chapter.

It became apparent in the early 1970s that logging operations on the B.C. coast were expanding at higher rates than ever before. Of particular concern, to wildlife managers especially, was the increased size of clearcuts and the construction of logging roads in unstable terrain and the consequent effects on fish and wildlife values. As a response to these concerns the Forest Service issued a directive in 1972 called "Planning Guidelines for Coast Logging Operations". The guidelines were viewed only as an interim measure by the Forest Service to help protect other resource values such as fisheries and wildlife, minimize erosion, reduce the aesthetic impact of logging and facilitate prompt reforestation.

At around the same time another initiative - the Resource Folio Planning System - was introduced by the Forest Service. This system involved the use of overlay maps describing all resource uses in the area as well as basic biophysical information on a watershed basis. The intention was that the different resource agencies would indicate their management objectives and explain what constraints might be necessary to protect their resource values. A follow-up meeting of the various agencies would take place to harmonize their objectives, co-ordinate logging restrictions and attempt to resolve conflicts. As a final step the Forest Service would consolidate the comments of the different agencies and forward them, as a map folio, to the licensee, for him to try and incorporate into the watershed development plan and design the cutting operations plan to meet the other agencies' requirements (Pearse, 1976).

However, some real problems were encountered with what appeared as sound planning on paper. First of all when the Fish and Wildlife Branch asked for reservations of mature timber for wildlife the Forest Service response was negative pointing out that they had to adhere to the annual allowable cut quotas (Dick, 1982). Another significant deficiency was the lack of quantitative wildlife information on the part of the wildlife managers. Quite simply, the Fish and Wildlife Branch was often unable to say exactly how many deer per unit area they hoped to maintain as a target population. Even when Fish and Wildlife has stated specific target populations, the real problem has been in determining how much habitat of specific types, arrangement, etc., is required to meet the population objectives. According to Janz (pers. comm.) the folio system never really progressed further than the issue identification stage due to lack of adequate biological information and policy on integrated resource planning.

John Dick (1982) explains the plight of the Ministry of Environment in the early stages of so-called integrated planning:

> "... pragmatic, operational processes, no matter how well conceived, cannot be fully effective in a policy vacuum. We were constantly being invited to participate in operational level planning processes initiated by people who had a clear idea of what their management objectives were. We had no such idea, and even if we had operational planning was an inappropriate level to attempt to integrate resource management objectives ..."

Despite the inherent problems of the folio system, there were a few instances where folios were completed (Toquart and Koprino watersheds) and there was even an integrated plan completed for the Nahmint watershed on the west coast of Vancouver Island (Janz, pers. comm.). These watersheds were relatively small in

size and did not possess the same intensity of resource conflicts exhibited by watersheds such as the Nimpkish and Tsitika. We will look at the Tsitika integrated plan as a "success story" later in this chapter and attempt to understand how another success might be created in the Nimpkish watershed and elsewhere.

The introduction of new forestry legislation in 1978 coupled with a new wildlife management policy (Proposed Wildlife Management Plan for B.C., 1980) and new legislation (Environment Management Act, 1981 and Wildlife Act, 1982) helped pave the way for more integration in planning, but unfortunately it still occurs mostly at the operational level. And while attempts have been made at folio planning and integrated planning the "guts" of the consultative process between the Forest Service and the Fish and Wildlife Branch remains with the referral system, initiated in the early 1970s (Janz, pers. comm.).

In the case of the Nimpkish watershed, the Fish and Wildlife Branch had prepared maps of critical deer and elk wintering areas as early as 1976-77. Over the next few years several meetings and discussions were held with the Forest Service and Canadian Forest Products (the major forestry operator in the Nimpkish) and eventually agreement was reached whereby most of the critical areas would be deferred from timber harvesting. The only qualification was that the moratorium on logging would be for only 20 years - in 1991 the ungulate winter ranges would be cut. The stage was thus set for the two ministries to come to some resolution of the forestry- ungulate issue in the Nimpkish watershed and resulted in a co-operative problem analysis released in April 1982.

## 5.4 The Reservation of Old Growth for the Protection of Wildlife Habitat on Northern Vancouver Island

The discussion paper entitled "Problem Analysis: Old Growth and Ungulates of Northern Vancouver Island" was released jointly by the Ministry of Forests and the Ministry of Environment. The document stated that a working group would be set up from the two ministries and that it would evaluate the supply and demand for timber and ungulates (in TFLs 37 and 39), determine the interactions between the two and prescribe options for presentation to government. (B.C. Ministry of Forests, 1982).

Adopting a tone of mutual co-operation Bill Young, Chief Forester, Ministry of Forests, made the following introductory remarks to the analysis paper:

> "We feel that our respective staffs can adequately describe the biological and economic aspects of the interactions between timber and wildlife, but we earnestly require input from the public and the industry on the social factors involved in the trade-offs that may be necessary. We urge the interested public to review our proposal, and give us their ideas and opinions on our problem outline and the issue itself." (Ministry of Forests, 1982, preface).

Despite a lack of media attention this joint effort between the two ministries was, in retrospect, quite a historic initiative in that a co-operative analysis was undertaken, where a legislative base was present; where the operational staff were co-operating; where senior administration were co-operating, and where even the public at large was invited to participate. The final stage of this process would see a report containing the recommendations of the Steering Committee to be forwarded to the Environment and Land Use Committee (ELUC) for a decision on what management option was to be pursued.

The objectives of the report to be produce included:

1. to define the interactions between ungulate production and timber harvesting in Tree Farm Licences 37 and 39 on northern Vancouver Island;

2. to divide the overall problem into component questions that can be individually assessed within existing data;

3. to define an orderly procedure which will result in the formulation of several management options for presentation to government.

(B.C. Ministry of Forests, 1982, p.2)

Included in the Terms of Reference for the program were directives on identifying "the social, economic and resource allocation problems arising from the interaction of the two resources" and "maintain an effective and ongoing liaison with the forest industry, environmental groups and the general public on all aspects of the program." (B.C. Ministry of Forests, 1982).

In developing allocation options the analysis paper outlines a set of assumptions:

1. Old growth timber is a necessity for the overwinter survival of deer and elk in critical snow years, although the latter species can endure greater snow depths than the former.

2. The old growth timber is contained within historic forest tenures which have specific legal and compensation implications if any modification is proposed.

3. The analysis will be concerned primarily with ungulate populations, not with all wildlife species. Where feasible, benefits to other wildlife will be identified where they can be easily related to old growth and winter range conditions.

4. The analysis will utilize only existing data - it is an interpretive exercise and is not intended to include a research component.

5. The analysis will be concerned with timber production and ungulate population targets for TFL 37 and the Vancouver Island blocks of TFL 39. It will not deal with production targets for individual specific areas within these TFLs.

6. Climatic trends of the last four decades will continue to the end of the century.

7. It is possible to control predation by wolves using existing management techniques.

(B.C. Ministry of Forests, 1982, p.5)

The problem analysis paper goes on to suggest the kinds of management options that the study should be entertaining, namely a regime of unrestricted timber harvest (minimal ungulate production); maintaining the existing level of timber harvest (low level of ungulate production); reduced timber harvest with reserves and scheduling of harvest in winter ranges (increased ungulate production) and no further timber harvest in important winter ranges (maximum ungulate production). For each of the scenarios the report is expected to provide a value for the timber and wildlife produced and should also describe the implications of any reduction in the meeting of demands and management objectives for both forest companies and management agencies.

The critical path of the old-growth ungulate study identifies two rounds of public consultation; one to review the problem analysis in April 1982 and another to review the draft report plus management options in October 1982. The first review was completed on time with written comments received from the public. As a result of the comments the Terms of Reference were expanded to include all wildlife habitat, not just ungulate habitat, and is reflected in the title change of the draft report - Reservation of Old Growth Timber for the Protection of Wildlife Habitat on Northern Vancouver Island - released in

January 1983, slightly behind schedule.

Initially the two co-operating ministries had scheduled public meetings to review the 1983 draft report. However, a late hour decision was made at the provincial cabinet level that no public meetings would be called (Addison, pers. comm.). What followed was a veritable deluge of mail to both ministries' offices - a total of 228 submissions from a wide array of individuals and interest groups, with the notable exception of Indian bands (Addison, pers. comm.).

**The January 1983 Draft Report on Old Growth and Wildlife Habitat**

The draft report on old growth and wildlife habitat needs was completed and released for public comment in January, 1983. In the report five different options for management of timber, and how these affect wildlife, are considered. Economic value was assigned to both resources, although both ministries acknowledged that other values might have been used but that it is difficult to assign "subjective" values that are acceptable by the majority of society.

It is worth looking at the results of the report in order that we can form an analysis of Ashby's third step of the chain reaction - namely the advancement of an environmental issue through the melding of objective information, public advocacy and subjective political decision-making.

**Forestry Concerns**

The report notes that the forest industry plays an important economic role on Vancouver Island and specifically in TFL 37 in the Nimpkish watershed. It provides employment and an economic base for several small communities such as

Woss, Port McNeill, Port Hardy, Beaver Cove, Kokish and Gold River. The Crown land timber supplies are expected to decline gradually over the next 100 to 150 years as logging of old growth gives way to production of second growth. Private supplies of timber will decline more rapidly which will result in a coastal timber supply deficit relative to the current mill capacity in the very near future. The current harvest rate for TFL 37 is 1,093,000 cubic metres and this quantity supports most of Canadian Forest Products' (CANFOR) coast lumber production.

**Non-Timber Concerns**

The land within TFL 37 is also valuable for other non-timber resource uses including hiking, boating, fishing, hunting, cross-country skiing and canoeing. The watershed has good year round access via Highway 19 and there are eight recreation sites managed by CANFOR situated by lakes and rivers along the Nimpkish drainage system. As well there are two areas - Nimpkish Island and Duncan Ridge - that have been proposed as Ecological Reserves.

**Wildlife Concerns**

The Ministry of Environment has noted an increasing demand for recreational hunting, photography and viewing of wildlife at a time when the wildlife resource is declining. Recreational hunting harvest and success rate for instance has dropped significantly from 1967 to 1979. There was a 70 percent deer harvest decrease and a drop from 74 to 34 percent in hunter success during this time. The Fish and Wildlife Branch is attempting to reverse this trend through strategic and regional planning.

The deer management objectives for Vancouver Island are as follows:

1. to maintain deer numbers at present day or historic levels;
2. to optimize deer production in second growth forests;
3. to maintain winter habitat necessary to sustain deer populations during severe winters; and
4. to provide a minimum harvest of 10,000 deer per year.

The major obstacles that are thwarting these objectives are the loss of mature timber used as winter range, predation by wolves and a lack of research effort.

To achieve long-term sustained deer and elk production the current scientific knowledge indicates that old growth winter range must be permanently reserved from logging. The existing deferral - until 1991 in TFL 37 - will allow only half of the natural deer population to survive a severe winter. If no winter ranges are reserved the deer populations will suffer a catastrophic collapse as was observed on southern Vancouver Island following a severe winter in 1968-69. Current knowledge also indicates that second growth timber stands up to 200 years old do not provide adequate winter range habitat and therefore old growth habitat is regarded as a non-renewable resource.

Northern Vancouver Island, particularly the north-central part, has been the most productive area for ungulates since the deer decline in southern areas in 1968-69. The northern area has a high ungulate capability which is not found in other portions of Vancouver Island due to land tenure, ecological features and past logging practices. The southeast part of the Island has high ungulate production capability but it is a relatively small area (15 percent of Vancouver

Island), has been heavily logged and is largely in private ownership.

The report recognizes that ungulates are not the only wildlife that are dependent on old growth for all or part of their life cycle. However, "because other species have not been directly sought out by society, there has been very little documentation of their value and dependence upon this habitat type." (p.12) It is assumed that old growth will provide adequate habitat for non-game species as well as game species. It is also noted that "species richness" is greater (30 percent) in old growth stands with snags and fallen trees than in second growth sites.

A compounding factor in the deer management issue is the sudden increase of wolves in the Nimpkish watershed since the mid 1970s. The deer density index has dropped 70 percent from 1976 to 1981 and the best available information indicates that wolves are primarily responsible for the decrease. A wolf study initiated in 1982 will assess the wolf problem and determine the feasibility of a wolf control program. The present impact of wolves on the ungulate population is expected to be short term while the effects of harvesting winter ranges will last 200 years or longer.

**Assumptions Concerning Winter Range Options**

In looking at winter range the Steering Committee - comprising the Chief Forester, Ministry of Forests and the Assistant Deputy Minister, Ministry of Environment - accepted ten basic conditions and assumptions. Some of these assumptions were listed in the Problem Analysis while other new ones were added on. The new assumptions of interest include:

1. The study is constrained by present practices. Some of the respondents to the Problem Analysis speculated that there may be management techniques that could be adopted in second growth to simulate old growth conditions. Many of these techniques are being studied in the Integrated Wildlife Intensive Forestry Research project being jointly undertaken by the Ministries of Environment and Forests, but they are currently unproven. This study focusses on current management options based on current conditions so that the land base question can be isolated. The management options may change when new practices are introduced.

9. The Guidelines for Benefit-Cost Analysis produced for the Environment and Land Use Committee are used as a primary reference for this study.

10. If the winter range reserves are to be effective, additional areas will have to be managed to provide spring forage adjacent to winter ranges. At present, this is achieved by deferring blocks of mature timber from harvesting for varying intervals of time. The cost involved in production of spring forage is not included in the economic evaluation because further study is expected to identify more cost-effective means of forage production.

(p. 13-14)

The forestry-ungulate management options looked at in the draft report vary somewhat from those listed in the Problem Analysis:

1. Elimination of winter ranges.
2. Minor winter range reserves.
3. Schedule B land winter range reserves.
4. Reservation of existing winter ranges.
5. Additional winter ranges.

(p. 15)

In each of the options, except the "Elimination" option, there is a provision for 500 hectares of elk winter range habitat to be reserved.

**Analysis of Different Option Scenarios**

The analysis for both ungulates and timber were carried out using computer simulation models. As well there was strict adherence to the ELUC Benefit- Cost Analysis guidelines in an attempt to standardize the values of timber and wildlife. To overcome problems of discounting value over time - for instance the value of winter range reservations - the analysis was divided into two intervals of twenty years each; 1982 to 2001 and 2002 to 2021.

**Wildlife Analysis**

The computer simulation allows a comparison of anticipated changes in deer numbers according to different harvesting regimes. The actual future number of deer are not predicted but will be dictated by the severity of the winters and the area of winter range reserved. The simulation also uses the logistical growth model which assumes that population growth will occur in a density dependent manner.

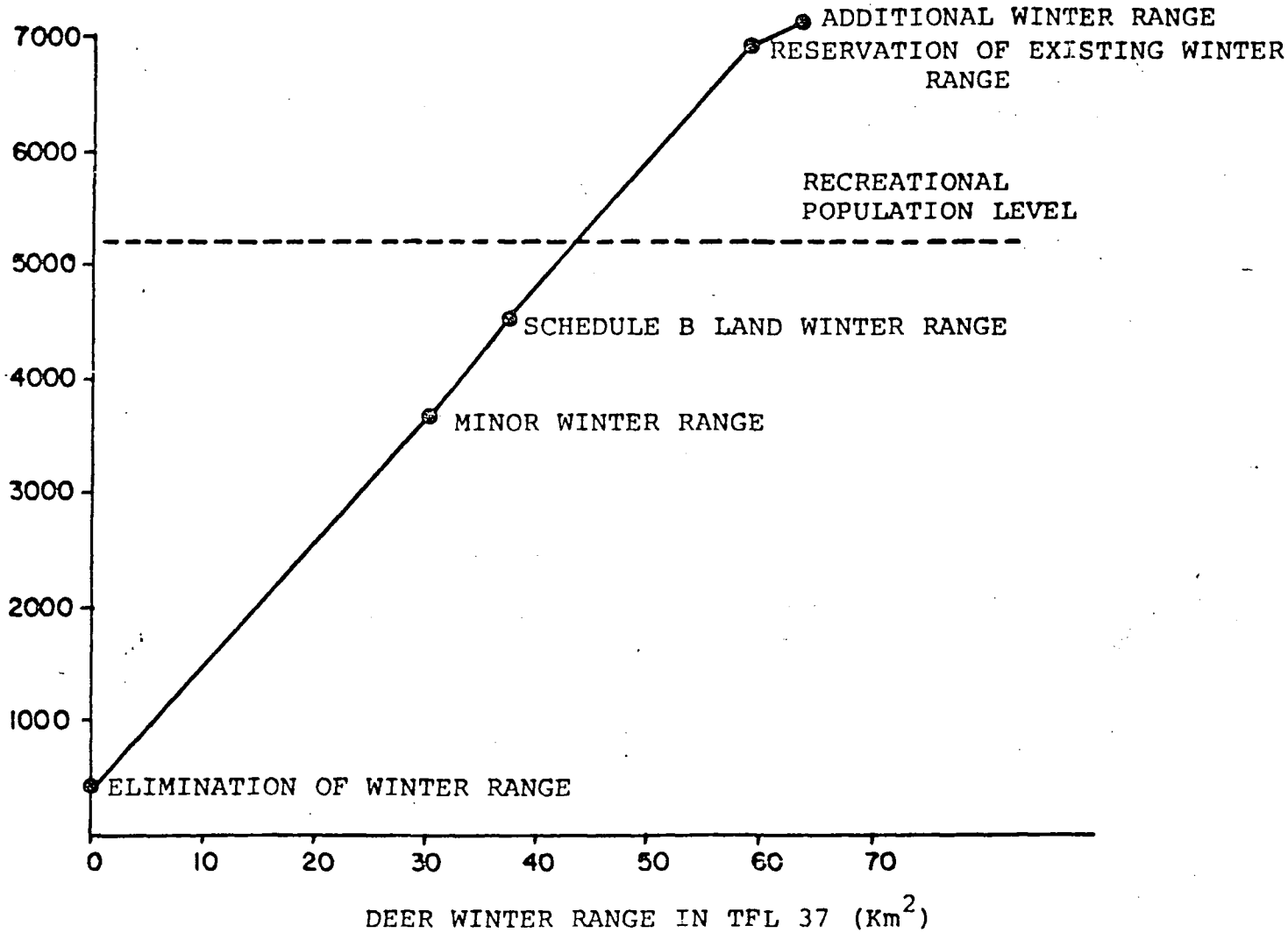
The simulation results show that of the five options only options 4 and 5 would support a recreationally usable population of deer in TFL 37 (Fig. 2). This assumes that a recreationally usable population is at least 5 deer/$km^2$, which is deemed by the Fish and Wildlife Branch to be the acceptable level for both recreational hunters and non-hunters.

**Timber Analysis**

The computer simulation model used for analyzing changes in timber supply is the Forest Estate Model used by the Ministry of Forests' Forest and Range Analysis 1980. This method projects future timber harvest under various management criteria and can discern impacts of various management options over time.

**FIGURE 2:** POTENTIAL 20 YEAR AVERAGE DEER POPULATION FOR EACH WINTER RANGE OPTION IN TFL 37.

Source: B.C. Ministry of Forests, 1983



Some of the major considerations in the timber model is the effect winter ranges would have on seasonal operations and also the effect on the transition of harvest of old growth to harvest of second growth. All management options also assume that regeneration will be carried out but no provision is made for improved forest management such as spacing, fertilization or genetic improvement.

The analysis shows that timber harvest rates will be maintained in a similar pattern of time regardless of management option and that only the overall harvest level would change. The present harvest levels can be maintained for the next 70 years before a decline would occur. A low point would be reached in 90 years and then rise to a sustainable level again. If the seasonal operations continue as they are the winter supplies are not a limiting factor in any of the options.

The analysis also determined that the harvest will consist of timber stands older than 140 years for the next 20 years and that after that time younger stands must supplement the harvest from old growth regardless of which option is chosen. In 80 years all stands older than 120 years will have been logged and the harvest will come from younger trees.

**Economic Implications of Different Option Scenarios**

There are two cautionary points made in the discussion of the Benefit-Cost Analysis. First, the ELUC guidelines state that benefit-cost analysis should attempt to measure the benefits and costs to a society as a whole, rather than to specific interests within society. Secondly, the benefit-cost analysis

compares the net values of the costs and benefits and not the gross values. In the case of timber harvest, it is the value of the timber produced, minus the costs necessary to produce it. When the benefits and costs are distributed over time, the benefits and costs are discounted to give a net present value.

**Wildlife**

The economic analysis for ungulates was based on a measurement of direct benefits to hunters associated with each management option. Concern was expressed that other wildlife species were not considered and that option and existence values of other species were not addressed. The option value is the value a person confers to the possibility or option to either hunt or view ungulates even though they do not choose to do so at present. Existence value is simply the value of knowing of the existence of deer and elk. As well, there is no attempt in the benefit-cost analysis to evaluate the active or incidental non-consumptive uses of wildlife, including viewing, feeding, and photographing. There is also no accounting of the indirect costs or benefits that arise in the direct consumptive use of ungulates.

Using a deer hunter day as a unit of value, estimates were made for the five management options. Values ranged from $121,000 (1982 dollars) in option 1 to $2,352,000 in option 5 for TFL 37. Elk hunting was valued at $72,000 if existing elk winter range was retained and at $11,000 if the winter ranges were removed.

**Timber**

The reduction in harvest of timber will cause government to lose revenues, the forestry industry will lose cutting rights and labour will lose income associated with a decrease on cutting, transport and milling. A summary of the breakdown of the timber values is as follows:

| | |
|---|---|
| Timber value | $\$10.25/m^3$ |
| Wage and Sal. | $3.75/m^3$ |
| Tax | $2.00/m^3$ |
| | $\$16.00/m^3$ |

(p.41)

A comparison of the value of wildlife and foregone timber rights for the twenty year interval 1982 to 2001 is presented in Table 3.

The draft report makes no recommendations regarding which,if any, of the management options is preferable. It is left up to the government to assess the technical and economic information and also to take into consideration other indirect and intangible values when making its final policy decision regarding forestry-wildlife management.

## 5.5 Reaction to the Report

The final report entitled "Reservation of Old Growth Timber for the Protection of Wildlife Habitat on Northern Vancouver Island" was released in January, 1983. The Vancouver Sun picked up the story with the headline "Old growth timber 'needed to save deer'" (Jan. 21, 1983, p. A10). The article attempted to dramatize the conflict between the survival of deer at the expense of lost forestry revenue and employment. However, the article also mentioned that the

present situation was different from the past, when short-term solutions were reached by simply temporarily protecting specific areas from cutting and designating them as ungulate winter ranges.

There was at the time of the release of the report a strong sentiment within the Ministry of Environment that wildlife values would be largely ignored unless each deer and elk was assigned a dollar value (Janz, pers. comm.) However it was not the Ministry's preference to take the benefit/cost approach. Ray Addison (pers. comm.) of the Ministry of Forests was involved in the preparation of the report and viewed the benefit/cost analysis as a major flaw in the document. He is convinced that it was the wrong analytic method for both wildlife and timber; the benefit/cost analysis being more suited to a much larger economic picture, such as the provincial economy. Addison also felt that because of the "forced" atmosphere of the benefit/cost analysis that many of the economic facts were distorted and that the values of both wildlife and timber were not accurately reflected in the report. It is commonly recognized by wildlife managers that much more work needs to be done in the field of assessing wildlife values; both consumptive and non-consumptive. This is especially true of unique and sensitive habitats (Hoover, 1976).

According to Addison and Janz (pers. comm.) the views of respondents to the report were split equally between those who wanted to cut all the trees and those who wanted to preserve the trees. Negligible interest was shown in the three compromise scenarios described in the report where portions of winter ranges would be left but logging would also be allowed to continue in some ungulate winter range habitats. This polarization of views is not uncommon in B.C. environmental issues, where the "good guys vs. bad guys" syndrome appears

to leave little room for rational dialogue, let alone negotiation or compromise.

### 5.6 Fate of the 1983 Report on Old Growth and Wildlife Habitat

The mass of written submissions in response to the draft report were analyzed and compiled by the respective ministries and along with the final report was sent to the Environment and Land Use Committee, as outlined in the original terms of reference. The Environment and Land Use Committee did not make a decision on the five management options but returned the document to the ministers of Forests and Environment (Addison, pers.comm.). Informed sources within the two ministries share the view that the Environment and Land Use Committee is reluctant to make recommendations based on the report and are awaiting the results of the continuing IWIFR program, which is looking into the potential of second growth forest in providing ungulate winter range.

There has been strong support from the forest industry, conservationists and the B.C. Wildlife Federation for IWIFR and the government has responded by initiating a second five year phase for the program. It appears that the government's strategy is to stall on making a decision on the old growth issue on the premise that the IWIFR program can show that second growth can with proper management fulfill the function of old growth; at least in terms of ungulate winter range requirements.

The reluctance to establish policy on reservation of old growth is also undoubtedly a result of the economic climate where both the forest industry and forestry unions are concerned about timber supply and employment respectively. As well the government could lose a significant amount of revenue from timber taxes and may also be required to make substantial compensation payments for

timber harvest withdrawals that are greater than 5 percent of TFL land. A decision on the Nimpkish watershed ungulate winter range reserves could have far-reaching consequences on a province-wide scale that the present government is not, at this time, prepared to accept.

There are some very real dangers if the government delays decision making too long. Although the present deferrals are effective until 1991, the IWIFR program is not guaranteed to provide a second growth solution to the ungulate problem. Even if second growth can substitute for old growth winter ranges to some degree, the time to grow and manipulate these stands prior to the replacement of the old growth is substantial (40 - 60 years plus). Indeed, if second growth is proven to be inadequate as winter range and if winter range habitat already identified is not permanently secured (or at least for 200 - 300 years), then catastrophic collapses in the ungulate populations could well occur. The loss of old growth would also have an adverse effect on non-game wildlife, fish and aesthetics which are all important values to different interest groups that have expressed an interest in the Nimpkish watershed.

To gain a better understanding of how wildlife issues can be successfully advanced we will now look at the case of a nearby watershed, the Tsitika, where an integrated resource plan was implemented in 1978.

## 5.7 Tsitika Watershed Integrated Resource Plan

While some individuals were not fully satisfied with the outcome of the Tsitika Integrated Plan, it is regarded by many as a high water mark in forestry-wildlife planning on Vancouver Island and quite possibly the province (Morrison, pers. comm.). In 1972 when a proposal was put forth to designate the entire

Tsitika drainage as an ecological reserve - the argument being that it was the last remaining unlogged watershed on northeastern Vancouver Island and was valuable as an undisturbed ecosystem. In 1973 the Minister of Lands, Forests and Water Resources announced a moratorium on logging and road construction on 300,000 acres including the Tsitika River and Schoen Lake drainages. There was at this time strong support from local and provincial conservation groups to preserve the Tsitika in its pristine state and to establish a park around Schoen Lake.

Soon after, Howard Paish, a consultant, was hired to co-ordinate an interdisciplinary study group (North Island Study Group) to organize public meetings and submit a final report to ELUC on land use options for the Tsitika - Schoen area. The report was completed in 1975 and described four land use options - ranging from complete preservation to large scale commercial logging. Public meetings were then held to gather opinions on the various options. Based on a review of the report and the results of the meetings ELUC decided to release 160,000 acres for commercial logging while retaining the remaining 140,000 acres in the Tsitika and Schoen Lake areas for further study (Tsitika Planning Committee, 1978).

In 1977 ELUC made further decisions on the fate of Schoen Lake, which was designated as a provincial park and on the Strathcona Park boundaries which were expanded. However, the Schoen Creek area, whose timber values are high, was removed from moratorium status and an integrated management plan for forest development of the Tsitika was requested; the moratorium continuing until such a plan was approved and implemented by ELUC.

Three basic considerations were identified by the Tsitika Planning Committee, taking into account ELUC's decision that timber harvesting should proceed, but that resource uses be integrated and that public opinion should be sought during the planning process. The three considerations were (Tsitika Planning Committee, 1978):

1. Forest industry employees and communities are dependent on continuing timber supply from the Tsitika in keeping with the TFL agreements (parts or all of three TFLs are situated in the Tsitika watershed: #39, #25 and #37).

2. Significant fish and wildlife, recreation and ecological values are found in the Tsitika.

3. There are strong significant instances of conflicting public, industry and government agency interest for both the preservation and development of the Tsitika's resources.

Based on these considerations the Planning Committee agreed to adopt three guiding objectives for their integrated resource plan:

1. A sustained harvest of economically viable timber must be insured.

2. Other resources including fish, wildlife and recreation, should be maintained and representative ecological areas should be set aside from development.

3. Adverse impacts of development on resource productivity and on sensitive areas must be minimized and where possible resource values should be enhanced.

(Tsitika Planning Committee, 1978, page 7)

The Planning Committee in its final report acknowledged that the guiding objectives in some instances would be incompatible and that "trade-offs" had to be made between the forestry interests and other competing interest groups. There was an overall consensus (with the exception of the United Fishermen and

Allied Workers Union) that the Tsitika Integrated Resource Plan met the general intent of the considerations and guiding objectives (Tsitika Planning Committee, 1978).

The success of the Plan was in large part due to the membership on the Planning Committee of all groups with an interest in the Tsitika. Representatives were included from government (Forest Service, Fish and Wildlife Branch and Fisheries and Marine Service); the public; organized labour and industry. Admittedly the public had a single seat to represent a diversity of interest groups, but it was in keeping with the overall theme of the Committee to keep membership of all interest groups to a minimum.

Another positive feature of the Tsitika plan was the comprehensive and well designed public involvement phase. Preparatory background information on the Tsitika issue was displayed in six communities while actual meetings were held at four communities on Vancouver Island. There was a thorough documentation of public concerns and the Planning Committee made modifications to their proposed Plan based on the concerns. One of the major concerns expressed was that there was an absence of government policy on trade-offs between major resource uses. Several other concerns were aired, many of which focused on specific issues such as logging methods; use of herbicides, lack of fish enhancement and a rather interesting concern regarding the desirability of cost/benefit analysis in determining trade-offs.

This last concern is particularly significant in hindsight as it became a major point of contention in the proposed Nimpkish land use options released in 1983. The Planning Committee response to cost/benefit analysis was as follows (Tsitika

Planning Committee, 1978, p.45):

> "The major problem in applying cost benefit techniques to the analysis of trade-offs is that the costs and benefits are often difficult to measure. While, for example, the cost/benefits to forestry of a particular set-aside may be readily defined in terms of employment, products, and revenue lost, the cost benefits of less tangible values are difficult to ascertain, requiring that value judgements be made."

Obviously the Steering Committee for the Northern Vancouver Island proposal chose not to heed the advice of the Tsitika group and was subject to considerable criticism in using the cost/benefit analysis to assign value to ungulates.

As a final note on the Tsitika planning process it must be recognized that the final approval of the Plan at the ministerial level was far from smooth sailing. Bill Otway, the then director of the B.C. Wildlife Federation, chastized the game-playing of the Minister of Recreation and Conservation, Sam Bawlf, who at first balked at the plan. It was pointed out to Mr. Bawlf, by the public interest representative on the Planning Committee, that he, Mr. Bawlf, should benefit from the consultation of his technical staff much as the Minister of Forests had done. Mr. Bawlf agreed to this and reconvened with the Minister of Forests, fully aware that time was running short. After considerable delay Mr. Bawlf informed the Planning Committee that he still did not wish to approve the plan (Otway, 1978, p.51).

It was rather fortunate in the case of the Tsitika that all the other parties involved did agree to the plan and ultimately the plan was approved and implemented. However, the incident illustrates the continuing difficulty of

achieving political commitment in resolving conflicting resource use issues, which in turn perpetuates the public's skepticism and mistrust of elected minister's ability to make judgements when they are called upon to do so.

It must also be remembered that the Tsitika "success" must be tempered with the fact that originally the entire watershed was proposed as an ecological reserve, to be left in its pristine state. Therefore while considerable concessions were made to wildlife interests, there was also a considerable compromise on the part of conservationists to allow substantial logging to proceed. In the case of the Nimpkish watershed it can be argued that the conservationists have fewer "bargaining chips" with which to negotiate with the forest industry, as the watershed has already experienced considerable commercial cutting.

Considerable attention was given to the implementation and follow-up of the Tsitika Plan. A Follow-up Committee, similar in composition to the Planning Committee, was formed to evaluate the effectiveness of the planning process, to monitor the implementation of the plan and to identify and co-ordinate any studies that were proposed in the plan. Most participants viewed the results of the implementation phase as being acceptable, although specific problems concerning location, size and timing of some cutting prescriptions were identified (Morrison, pers. comm.).

In her thesis on the implementation of the Tsitika plan Vreeswijk (1985) found the Follow-up Committee to be "an effective mechanism for adaptive plan implementation allowing for adjustments to environmental, socio-economic, and technological conditions." She also concluded that it provided for public accountability and accessibility and consequently promoted understanding between

conflicting interest groups. On the negative side Vreeswijk found that there was insufficient financial and staffing support to conduct planning process evaluations, operations surveillance and management prescription monitoring.

## 5.8 Conclusions

It will be informative in light of the different "fates" of planning for the Nimpkish and the Tsitika watersheds to compare both processes and outcomes. Why has one become an example for planning about these kinds of issues while the other has stalled without full implementation? In answering these questions we set the stage for conclusions regarding the "chain reaction" as it applies to the issue of ungulate-forestry management.

In looking at the planning process of the two watersheds we can compare the similarities and differences: who participated, use of objective analyses (technical and economic) and political decision-making.

### Participation

The involvement of the different interested publics in the two watershed plans reveals some significant differences. The Tsitika plan involved public on three levels: as members of the planning committee, through involvement in data collection and finally through participation at public meetings in reviewing the draft plan. The membership of the planning committee was comprehensive including representatives from the ministries of Forests and Environment; the forest industry, labour and public interest groups. Considerable attention was paid to ensure that the public involvement process was efficient and meaningful to those who participated.

In contrast the Nimpkish planning process had no representation on the working committee outside the ministries of Forests and Environment. The public involvement in the development of the management options for the watershed was limited to two rounds of written submissions - at the problem analysis stage and in a review of the draft management options report. Although public meetings were scheduled for review of the draft report a political decision was made by the respective ministers to cancel them. In addition the final report and compilation of responses to the draft options have never been made public.

**Use of Objective Analysis**

The technical evaluation of resource values for the Tsitika watershed was much broader in scope than that found in the Nimpkish evaluation. Whereas the Nimpkish options focussed primarily on the ungulate resource the Tsitika plan addressed other values such as non-game wildlife, fish, non-consumptive recreation and ecological reserves. To be fair the Nimpkish report did mention some of these other values but they were presented as addendums rather than integral concerns in the overall planning process.

In terms of economic analysis the Nimpkish report placed a great emphasis on the benefit-cost analysis that was used to compare ungulate and timber values. Despite some reservations expressed by the two ministries (MOF and MOE) the draft report made it clear that the benefit-cost methodology was used in an attempt to objectify the comparison of the two resource values. In contrast the Tsitika kept clear of the use of benefit-cost analysis and in its 1978 report clearly states resources other than timber as less tangible, difficult to ascertain and require value judgements to be made.

**Political Decision-Making**

In trying to understand the nature of political decision-making as it occurred (or failed to occur) in the two watersheds, it is useful to understand the context of what was being attempted in the two areas. The Tsitika was the last large unlogged watershed on northern Vancouver Island when it came to the public's attention in the early 1970s. An initial proposal was put forward in 1972 to preserve the entire watershed as a combination of ecological reserve and park. Eventually the government declared a moratorium on logging in the watershed and appointed a study group whose task was to consider land use options. This group evolved into a planning committee which made specific recommendations concerning areas to be preserved and other areas to be logged. The government was under continual pressure from industry and public interest groups to produce an integrated resource plan and was also committed in principle to implementing the plan or face a significant political backlash on the issue. The other significant aspect of the Tsitika plan was that the public interest groups were getting much less than they had initially wanted while the forest industry was at least getting something, when getting nothing was considered by some as a real possibility. In this light the government was able to appease the two opposing interests and maintain an image of fairness.

In the case of the Nimpkish the ungulate-forestry issue is focussed on the very specific requirement of reservation of old growth as winter range for ungulates. Having such a narrow issue focus has resulted on less public concern both in terms of breadth of interest and intensity. The ongoing IWIFR program has defused some of the concern of the major proponents of ungulate winter range reservations and the government is content to await the results before making policy decisions on old growth reservation. The economic climate, specifically

the unemployment rate in the province, has also deteriorated since the Tsitika plan was developed and has added pressure on the government to at least maintain current timber production levels.

# CHAPTER SIX: Conclusions and Recommendations

## 6.1 Arousal of the Public Conscience

Although the interest generated in the Nimpkish watershed has come from a diversity of advocacy groups there has been a certain degree of convergence in the issues especially over the question of maintaining old growth forests for both ungulates and non-game wildlife. The intensity of interest has fluctuated over the years depending on the particular issue of the day. While initially the deer decline was the dominant concern it was not that well publicized outside the hunting community. In the late 1970s a proposal for an ecological reserve on Nimpkish Island received considerable media attention - chiefly due to the magnificent and unique character of the trees that were being discussed. The media has certainly built up the aesthetic and symbolic nature of the trees - some were claimed to be the tallest in Canada - and has resulted in perhaps the most intensive and sustained media coverage of any environmental issue raised in the watershed.

Another issue that drew media attention in the early 1980s was the protest against the wolf control program in the Nimpkish watershed. However, the attention was rather short-lived because of more dramatic confrontations that were occurring in the northeastern part of British Columbia. The conservationists did generate some public discussion regarding the greater question of lack of adequate habitat management for all wildlife species. It was around this time that the public, including hunters, conservationists, environmentalists and academics was responding to the joint Ministry of Forests and Environment draft report on ungulate-timber management options for the Nimpkish

watershed. A brief flurry of interest and involvement was followed by a relative lull in activity as the government had failed to act on the options presented regarding ungulate winter range reservations. Public interest continues at a sustained but diminished level for both the Nimpkish Island ecological reserve and the wolf control program. The Nimpkish Band also has had a continuing interest in maintaining the ecological integrity of the watershed and they have a particular interest in maintaining adequate fish habitat in the Nimpkish drainage system.

We can say that Ashby's first component of an arousal of public conscience has occurred although it has been somewhat fractured and erratic over time. However, there has been a convergence of some of the interests of the different groups that has created sufficient pressure for the government to analyze the situation and to commit itself to make a policy decision on the issue of habitat reservation for ungulates and coincidentally also for non-game wildlife.

### 6.2 Scientific Assessment of the Problem and Its Solution

Research into the effects of logging on ungulates was initiated in 1971 in the Nimpkish and has been continued on an ongoing basis by University of B.C. graduate students and the Ministry of Environment field staff. Much of what is known about deer winter ranges was achieved by researchers such as Greg Jones, David Willms and Rick Ellis through the 1970s. While the biological requirements for maintaining deer populations have become better understood it has been left up to the Fish and Wildlife Branch to translate these requirements and present them to the Forest Service and logging companies for integration into their timber harvest work plans. A temporary deferral on cutting specific deer winter ranges has been agreed to by the three parties, but it extends only

to 1991.

A complicating factor in the Nimpkish is the recent explosion of wolf numbers on northern Vancouver Island. Studies done by researchers (Scott, 1979) indicate that deer numbers have dropped to near zero in known wolf ranges and that numbers have remained low in adjacent areas. Elk have also suffered relatively high mortality as a result of the recent wolf invasion. It is therefore difficult to assess in some areas whether the loss of habitat or the increase in wolf predation has caused a drop in the deer, although in the long term the loss of habitat is an over-riding factor in limiting deer numbers.

The economic benefit-cost analysis that was done for the Nimpkish ungulate and timber values has created considerable controversy with government staff as well as naturalist, environmental and hunter interest groups. The most fundamental problem is the lack of accounting for intangible values associated with the wildlife resource. There is also no consideration for the indirect benefits and costs associated with either ungulates or non-game species of wildlife. Ashby argued quite strongly that it is inappropriate to use benefit- cost analysis and assign monetary value to environmental protection. According to Ashby we run the risk of warping the perspective of politicians who must make the policy decisions regarding land use conflicts. Ashby prefers that politicians be left with the task of incorporating the unquantified values as they are into their decision-making process.

Recognizing that wildlife managers must often work with imperfect knowledge it is evident that a relatively good base of biological information does exist with regard to the habitat requirements of ungulates in the Nimpkish watershed. The

management prescription of leaving mature timber as ungulate winter ranges is based on several years of field study and has been adopted by wildlife managers in other jurisdictions in northwestern North America. We can therefore say that Ashby's second component of assessment and prescription of appropriate management has been fulfilled, but only at the technical level. With respect to the economic analysis the Nimpkish planning process falls short of Ashby's model, in that it displays the inappropriate use of benefit-cost analysis to assign value to intangible environmental resources.

## 6.3 The Effectiveness of the Present Administrative Structure in Maintaining Old Growth Forest for Ungulates within the Nimpkish Watershed.

Although Ashby sees political and administrative decision-making as the critical third step in the chain reaction, he does not provide much insight into what that decision-making must entail. He focusses on "two parameters" (p.74) - the politician's beliefs and the weight he attaches to them. But it would be extraordinarily difficult to locate and describe these beliefs and weights for the ungulate-forestry issue, given that it is not a major publicized topic of discussion in B.C. politics! Moreover, it seems important to look more broadly at the performance of the entire apparatus of decision- making; Ashby (1978, p.73 ff.) recognizes that the decision-maker is rarely one individual, suggesting that it is often a committee. In fact this is a great simplification since in most cases decisions are the output of a complex web of interacting players (Schon, 1971). Because of this, we will use some criteria that look at the overall administrative decision-making system. The approach used here is based on O'Gorman (1978) and Dick (1982).

i. Does each ministry (Forests and Environment) have clear policies and legislation directing its participation in the planning and management of wildlife on Crown forests?

We have learned from Chapter 5 that both ministries do indeed have direction to undertake co-operative planning. For the Ministry of Forests it is spelled out in the Ministry of Forests Act that other resource values are to be "co-ordinated and integrated, in consultation and co-operation with other ministries and agencies". On the Ministry of Environment side there is a clear policy statement made in the Proposed Wildlife Management Plan for B.C. which says that inter-agency co-operation in the planning stages is necessary to protect and enhance wildlife and their habitat. Other encouragement for co-operative planning comes from the Environment Management Act which stresses the need to develop an internal strategic planning process that would give a clear statement of the supply and demand of specific resources including land, water and wildlife. This ties in with the Ministry of Forests requirement - under the Forest Act - to submit periodic resource analysis of the timber resource including figures on supply and demand.

ii. Are both Ministries (Forests and Environment) acting in accordance with the requirements of their respective acts and policies?

The two ministries have in fact entered into co-operative planning at the operational level in the Nimpkish. After acknowledging that conflicting management objectives were unresolvable at the technical level a joint Steering Committee (comprised of the Chief

Forester and the Assistant Deputy Minister of Environment) was formed in April 1982. The committee set itself the task of analyzing the current forestry-wildlife conflict and to make recommendations on various resource use options to the Environment and Land Use Committee by the end of 1982.

iii. Is the present wildlife-forestry process effective in producing resource use decisions that are based on the best possible information. Specifically does it identify the following:

a) the public demand for each resource
b) the levels of use that a resource can sustain over time
c) the costs of management actions
d) the points of conflict with other resource users
e) the options that exist for conflict resolution
f) the implications of those options - both in the short and long term.

The above criteria have all been met in the present wildlife-forestry planning process. Details on the specific analysis are contained in a report - Reservation of Old Growth Timber for the Protection of Wildlife Habitat on Northern Vancouver Island produced jointly by the Ministries of Forests and Environment in January, 1983. One area of concern is the use of benefit-cost analysis in the valuation of ungulates. There was a fairly widespread sentiment among planning participants that the quantitative values were inflated significantly and that a qualitative approach would have been more appropriate. The report concludes with a list of five management options ranging from total elimination of ungulate winter range to reservation of additional (over and above the winter ranges currently deferred from harvest) ranges. One interest in the wildlife that is not accounted for in

the report is that of aboriginal people. Recent initiatives co-ordinated by the federal Department of Indian Affairs suggests that the Nimpkish Band has entered into co-operative forestry-fishery management planning with the Ministry of Forests and other provincial and federal agencies (Gordon, pers. comm.).

iv. Is there follow through by decision-makers at all levels to make a management decision once they are presented with all acceptable options?

In the case of the Nimpkish the decision-making process came to a grinding halt once the Forestry-Wildlife report reached the Environment and Land Use Committee. No decision has been made on the five management options that were presented in 1983 although there appeared to be a rekindled interest in late 1985 on the part of the Minister of Forests, Tom Waterland, to re-evaluate his ministry's position. The stand taken by the Environment and Land Use Committee is to defer making a decision until the expiration of the 1991 deer winter range logging deferral agreement or when results are known from the IWIFR program (Janz, pers. comm.). The Environment and Land Use Committee has in fact passed the report back to the two ministries concerned for their decision (Addison, pers. comm.).

v. Are management plans implemented once a resource use decision has been made?

Since a final management decision has not been made in the Nimpkish this question cannot be properly answered. If we look at a similar planning and management process - the Tsitika Watershed Integrated

Resource Plan - initiated in 1977 in an adjacent watershed, we find that aside from some specific problems regarding the lack of compliance with management prescriptions the implementation phase has been successful (Morrison, pers. comm.). The establishment of a follow-up Committee, comprising the same people as were involved in the initial planning committee, has ensured that monitoring and guidance in implementing the Plan is delivered.

This stage of Ashby's model has not been totally satisfied in the case of the Nimpkish management proposal. While there is substantial co-operation and collaboration at the operational level between the ministries of Forests and Environment, a serious inertia remains at the senior minister level. There exists strong economic pressures to maintain timber production and this is made explicit in provincial Forestry legislation and policy. There has also been a trend to minimize the public's role in contributing to the formulation of management plans. Finally, there has been a reluctance at the ministerial level - specifically at the Environment and Land Use Committee - to make decisions on resource trade-offs. While the Committee was originally intended as a final decision-maker in resource use conflicts where technical resolution was impossible, it has seldom exercised its power.

## 6.4 Recommendations

### Ignition of Public Concern

Public awareness and concern could be increased significantly if a better education and public relations program were established jointly by the ministries of Forests and Environment. Such a program would facilitate the

public's ability to participate in a more meaningful manner and it would aid both resource managers and politicians in fulfilling these tasks. For the managers it would provide both a source of information as well as an informed public opinion during the review of draft management plans. Politicians would also benefit by being able to "read" better the public sentiments on given resource issues. Another benefit of improved education and public relations would be that the communications media - newspapers, magazines, radio and television - could give more extensive and more accurate information for public consumption.

**Objective Analysis**

In reviewing the process of objective analysis in both the Tsitika and Nimpkish watersheds it is evident that the use of benefit-cost analysis confuses and confounds the decision-making process more than enlightens it. Further, it appears it would be desirable for scientists to give qualifications on the advice they give to decision makers, especially when the consequences are potentially undesirable. The loss of old growth stands raises questions that are perhaps more serious than just the loss of ungulate habitat. It may also result in the loss of the integrity of forest eco-systems which may have far-reaching consequences for all wildlife species.

While acknowledging that their knowledge is imperfect it is important that scientists use the best available information in designing management prescriptions. Otherwise politicians will be forced to make policy decisions regarding management actions that will be unscientific and potentially harmful both economically and environmentally. However, scientists should design their management actions in a manner that ensures that failure will not result in

irreversible changes in the environment. Holling (1978) stresses the importance of learning from our failures while at the same time avoiding irreparable damage to the subject being experimented with.

**Legislation**

The need for inter-agency co-operation in forestry-wildlife management has been identified by resource managers, academics and politicians for at least the last ten years. We have witnessed a sometimes slow and awkward but always steady progress - at least until the early 1980s - toward a more sophisticated approach to wildlife-forestry planning in British Columbia. Some important amendments and additions to the forestry legislation (Ministry of Forests Act) has opened the door to allow for a more integrated approach to wildlife-forestry planning, although it does not go far enough to compel ministers to incorporate other forest related values, unless there is a surplus supply of timber - a condition that has not existed in B.C. for the last twenty years.

The most recent joint effort by the Ministries of Forests and Environment suggest that an organized planning process is now possible. It would appear that the critical stage at which the process has fallen down is at the level of the Environment and Land Use Committee. This committee, made up of provincial cabinet members, has balked at making an immediate decision, with the result that resource managers are left without direction as to how to proceed in planning for future research and management actions. The experience of the Tsitika Watershed Integrated Resource Plan restates the problem of decision making and suggests that perhaps increased public attention acts to motivate cabinet to make decisions.

Some apprehension has been expressed by staff of the Wildlife Branch (name changed in 1984) that the structured planning approach used in the Tsitika is being abandoned in favour of looser open forums witnessed in the Tashish and Queen Charlotte Islands forestry-wildlife conflicts (Morrison, pers. comm.). These conflicts are characterized by their lack of structure resulting in quick polarization of views, due largely to ignorance on the part of interest groups in knowing what concessions are realistic within existing forestry policy and legislation. Rather than establishing dialogue, the looseness of public meetings has encouraged confrontational attitudes that benefit neither the forestry interest nor the wildlife people.

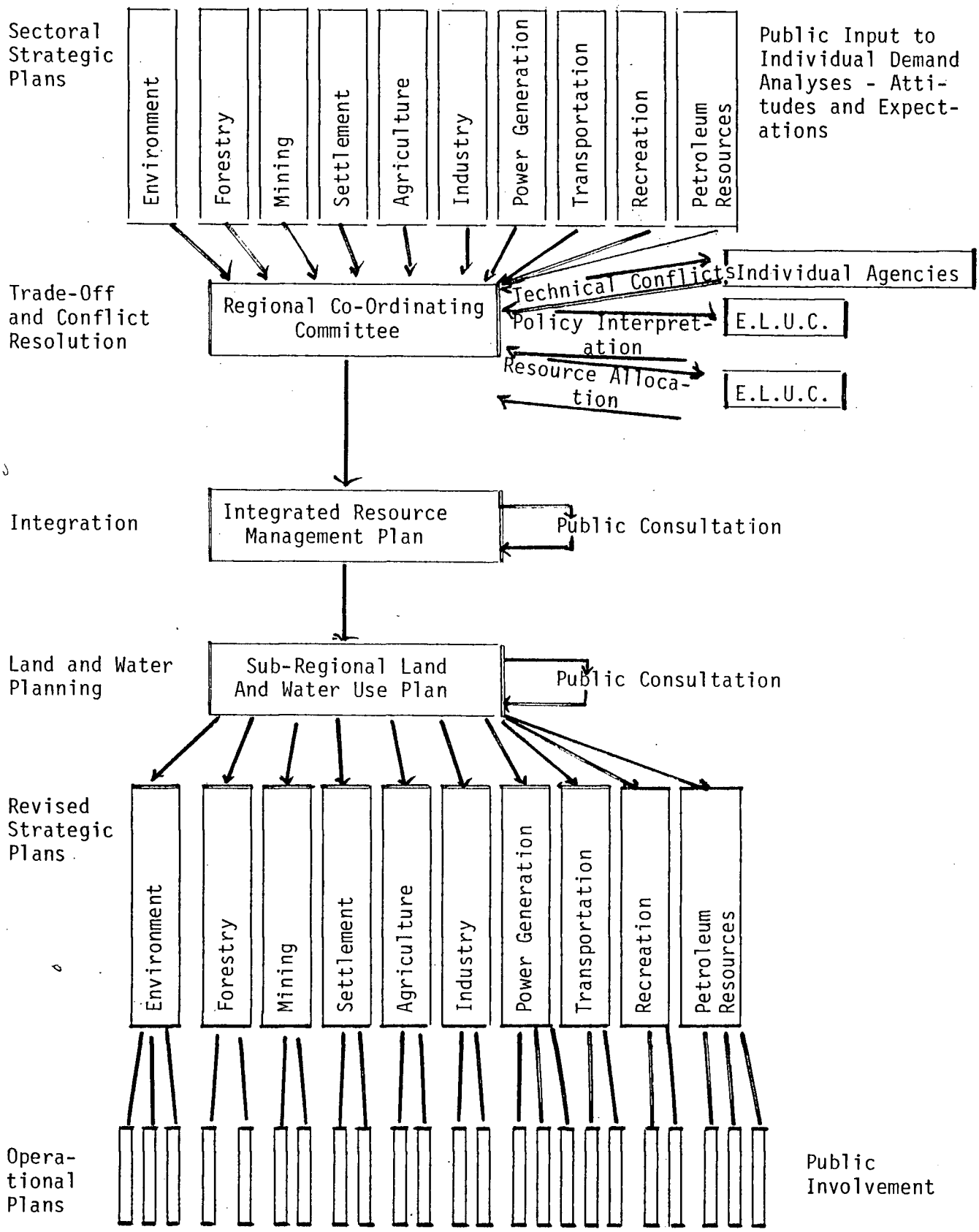
John Dick (1982) has proposed a model of resource management which would see each ministry integrate their plans at the strategic level through a Regional Co-Ordinating Committee (Fig. 3). The role of such a body would be to identify major conflicts between agencies and to direct the conflicts to the appropriate levels of government for resolution. What the process desperately needs is a legislative base such as a Land Use Act (tabled in the B.C. Legislature in 1982 but was never realized) that would provide a more formal vehicle for integrated resource planning. Unfortunately an earlier attempt to introduce similar legislation in the form of a Planning Act was also unsuccessful.

**Political Decision-Making**

One possible strategy that proponents of wildlife habitat protection could adopt is the use of phased or incremental management plans. We have already witnessed some reluctance on the part of politicians to make bold policy decisions on wildlife habitat protection measures in the Nimpkish and also in the Tsitika watershed which was a qualified success story. It might be useful to present

Figure 3. Strategic Level Resource Management Integration

Source: Dick, 1982



decision-makers with the kinds of issues where they can feel comfortable, or as Ashby (1978) states:

> "The password that the politician is waiting for is the word 'overdue'. When he hears that he knows it is becoming safe for him to act. The action he takes may be quite trivial; this is not important. The important contribution the politician can make is to ensure that the decision is incremental, that is, that it is a step in the 'right' direction." (p.80)

Once a politician has made this step, however small, he or she should be rewarded with public praise (and of course, electoral support) that will encourage them to take further, perhaps even bolder steps in future wildlife-forestry policy decisions.

A major problem with co-operative management of resources, in this case between the Ministries of Forests and Environment, is the lack of sensitivity and responsiveness to the different interest groups represented in society at large. Boschken (1982) argues that we are confronted by an industrialized, urbanized and bureaucratized society where we have traded off certain freedoms for more administrative control. If this is the case we must look for a means of opening up the decision-making process to a greater diversity of interests while retaining a degree of organizational efficiency.

While acknowledging that the problem we are faced with is historically deeply rooted and that behavioural changes will not occur overnight there are some avenues that might be worth exploring. Certainly we can look to some of the successes experienced in British Columbia. The Tsitika Integrated Plan demonstrated that a rational discussion and synthesis of information can occur

between government resource managers, industry and public interest groups. What the Tsitika Planning Committee did accomplish was the establishment of a set of management prescriptions which addressed the needs of loggers, fishermen, hunters and conservationists. There was a blending of hard scientific facts with more subjective values which has not often been witnessed in the province.

One of the greatest stumbling blocks in resource management has been an inability - despite many valiant attempts - of resource managers to weigh intangible values, such as aesthetics of ecological stability, in the same balance as raw resources that have a dollar value in the open market. It may turn out to be a futile struggle, in that intangible values simply are not and never will be amenable to monetary valuation. Perhaps we should instead look to establishing bodies such as the Tsitika Planning Committee where the intangible values are at least expressed and where possible incorporated in management plans. One would hope that senior politicians would accept management recommendations that have a basis in scientific knowledge, but that would also incorporate the sentiments of other interest groups whose interests are not always strictly economic. While the kind of 'success' that the Tsitika Plan enjoyed might be viewed as infinitesimal it could through continued practice bring about a broader acceptance of values presently expressed in resource conflicts.

## Bibliography

Ashby, E. 1975. "Politics and the Environment." in a Ditchberg Foundation Lecture delivered July 18, 1975.

Ashby, E. 1978. Reconciling Man with the Environment. Stanford Univ. Press.

B.C. Ministry of Forests. 1980. Forest and Range Resource Analysis Technical Report. Two volumes. Information Services Branch, Ministry of Forests, Victoria, B.C.

B.C. Ministry of Forests. 1982. Problem Analysis: Old Growth and Ungulates of Northern Vancouver Island. Victoria, B.C.

B.C. Ministry of Forests. 1983. Reservation of Old Growth Timber for the Protection of Wildlife Habitat on N. Vancouver Island. Victoria, B.C.

B.C. Ministry of Environment. 1979. Fish and Wildlife Branch. Proposed Wildlife Management Plan. Queen's Printer, Victoria, B.C.

B.C. Ministry of Environment. 1980. Draft Discussion paper on new Wildlife Act. Unpublished. Victoria, B.C.

B.C. Ministry of Environment. 29 August 1983. "Wildlife Interest Highest in British Columbia." News Release. Victoria, B.C.

B.C. Wildlife Review. Summer 1981. "Planning the Habitat with the Harvest." p.21-23.

Boschken, H.L. 1982. Land Use Conflicts - Organizational Design and Resource Management. University of Illinois Press.

British Columbia. 1977. Depart. of Travel Industry. Tourism Highlights.

Bunnell, F.L. 1979. Deer-forest relationships on northern Vancouver Island. Sitka Black-tailed Deer. Proc. of a Conf. in Juneau, Alaska: p. 86-101.

Bunnell, F.L. 1982. "Wildlife and Land: The Vancouver Island Example." in Proc. Symposium B.C. Land for Wildlife: Past, Present, Future. Burnaby, B.C. 1981: 111-130.

Bunnell, F.L. and D.S. Eastman. 1976. Effects of forest management practices on wildlife in the forests of British Columbia, in Proc., Div. I, XVI. IUFRO World Congress, Oslo, Norway. p. 631-689.

Carl, G.C. 1959. The Amphibians of British Columbia. Handbook No. 2. B.C. Provincial Museum. Victoria, B.C.

Carl, G.C. 1960. The Reptiles of British Columbia, Handbook No. 3. B.C. Provincial Museum. Victoria, B.C.

Cowan, I. McT. 1945. The ecological relationships of the food of Columbian black-tailed deer in the coast region of S. Vancouver Is., B.C. Ecol. Monogram 15(2): p. 110-139.

Cowan, I. McT. and C.J. Guiguet. 1965. The Mammals of British Columbia. Handbook No. 11. B.C. Provincial Museum. Victoria, B.C.

Dick, T.H. 1982. "Strategic Planning for Wildlife in B.C." in Proc. Symposium. B.C. Land for Wildlife: Past, Present, Future. Burnaby, B.C. 1981: 39-51.

Downs, A. 1972 "Up and down with ecology - the 'issue-attention' cycle'." The Public Interest 28 p. 38-50.

Ellis, R.M. 1979. Dynamics of understory vegetation in coastal forests. M.Sc. Thesis. Univ. of British Columbia, Vancouver.

Ellis, R.M. 1980. Intensive silviculture-wildlife interactions: research needs on Vancouver Island. Unpublished problem analysis, B.C. Ministry of Forests. Victoria, B.C.

Equinox. May-June 1983. "Embattled Brobdingnagians - In search of Canada's tallest trees: scientists and loggers eye a 700 year-old legacy deep in Vancouver Island." p. 24-40.

Gates, B.R. 1968. Deer food production in certain seral stages of the coast forest. M.Sc. Thesis, University of British Columbia, Vancouver.

Godfrey, W.E. 1966. The Birds of Canada. Queen's Printer. Ottawa, Ontario.

Ham, L.C. 1980. A Preliminary Survey of Nimpkish Heritage Sites. A report prepared for Umista Cultural Society, Hert Bay, B.C. and Heritage Conservation Branch, Ministry of the Provincial Secretary - Government Service, Victoria, B.C.

Harcombe, A.P. 1984. Wildlife Habitat Handbooks for British Columbia: Problem Analysis. Ministry of Environment, Fish and Wildlife Branch, Kamloops, B.C. Report R-10.

Harestad, A.S. 1979. Influences of forestry practices on dispersal black-tailed deer. Ph.D. Thesis. Univ. of British Columbia, Vancouver.

Hatter, J.W. 1982. Predator-Ungulate Relationships in Second Growth Forests on Vancouver Is. Problem Analysis. IWIFR-5. Victoria, B.C.

Hebert, D.M. 1979. Wildlife-forestry planning in the coastal forests of Vancouver Island. Sitka Black-tailed Deer: Proc. of a Conf. in Juneau, Alaska: p.113-159.

Hebert, D.M. 1982. "Implications of Forest Tenure for Wildlife Management in Coastal Ecosystems." in Proc. Symposium. B.C. Land for Wildlife: Past, Present, Future. Burnaby, B.C. 1981: 131-135.

Hebert, D.M., J. Youds, R. Davies, H. Langin, D. Janz. and G.W. Smith. 1982. Preliminary investigations of the Vancouver Is. Wolf (Canis lupus crassodon) prey relationships. B.C. Ministry of Environment. Fish and Wildlife Branch.

Highsted, C.J. 1982. "Ministry of Forests' Participation in Wildlife Habitat Management." in Proc. Symposium - B.C. Land for Wildlife: Past, Present, Future. Burnaby, B.C. 1981: 59-63.

Holland, . 1964. Landforms of British Columbia: a physiographic outline. British Columbia Dept. of Mines - Petroleum Resources. Bull. No. 48.

Holling, C.S. (editor) 1978. Adaptive Environmental Assessment and Management. John Wiley & Sons.

Hoover, R.L. 1976. "Incorporating Fish and Wildlife Values in Land Use Planning." in Transactions: Forty-first N. Am. Wildlife and Natural Resources Conference. March 21-25 1976. Washington, D.C.

Horizon. 1983. "Nimpkish Island on the Block." Vol 22:1. p.26.

Jones, G.W. 1974. Aspects of winter ecology black-tailed deer (Odocoileus hermionus columbianus) on northern Vancouver Is. M.Sc. Thesis. Univ. of British Columbia, Vancouver.

Jones, G.W., B. Mason. 1979. Nimpkish Valley Deer Population Indices: 1968-1979. British Columbia Ministry of Environment. Fish and Wildlife Branch. Draft report. Nanaimo, B.C.

Jones, G.W. and B. Mason. 1983. Relationships among Wolves, Hunting and Population Trends of Black-Tailed Deer in the Nimpkish Valley on Vancouver Island. B.C. Minsitry of Environment. Fish and Wildlife Report R-7.

Kale, W. 1979. Evaluation of hunter harvest statistics for management of black-tailed deer. M.Sc. Thesis. Univ. of British Columbia.

Klinka, K., F.C. Nuszdorfer and L. Skoda. 1979. Biogeoclimatic Units of Central and Southern Vancouver Island. B.C. Ministry of Forests. Victoria, B.C.

Knight, R. 1978. Indians at Work - an informal history of Native Indian Labour in British Columbia 1858 - 1930. New Star Books: Vancouver.

Krajina, V.J. 1969. The Ecology of Western North America. Volume II. Department of Botany, University of British Columbia.

Nature Canada. January/March 1984. "Caught in the Crossfire." p.35-40.

Nimpkish Band. 1982. Submission of the Nimpkish Band Council to the Royal Commission on Pacific Fisheries Policy. Commissioner Dr. Peter Pearse. January 1982.

O'Gorman, D.K. 1978. "Integrated Management of Resources: Parameters, Problems and Prospects. pp. 21-34 in Conference on Integrated Management of Resources. Centre for Continuing Education, University of B.C.

Otway, W.J. 1978. Comments of Reaction Panel in Integrated Management of Resources Conference. Vancouver, B.C. p. 43-53.

Pearse, P.H. 1976. Timber Rights and Forestry Policy in British Columbia. Two volumes. Report on the Royal Commission on Forest Resources Peter H. Pearse Commissioner. Victoria, B.C.

Pemberton, J.D. 1860. Hamilton Moffat's Journal of the trip through the Nimpkish watershed in July 1852. Appendix to Vancouver Island and British Columbia. London.

Robinson, D.J. 1958. Forestry and Wildlife relationships on Vancouver Is. Forestry Chronicle 34: 31-36.

Rochelle, J.A. 1980. Influences of forestry practices on nutrition of black-tailed deer. Ph.D. Thesis. Univ. of British Columbia.

Schade, F. 1979. Recreation, Tourism and Salmon Enhancement. Draft report prepared for Nimpkish Band Council June, 1979.

Schlegel, M. 1976. Factors affecting calf elk survival in north central Idaho. A progress report. Proc. West Assoc. State Fish and Game Comm. 56:342-355.

Schon, D.A. 1971. Beyond the Stable State. Temple Smith.

Scott, B.M.V. 1979. The Vancouver Island wolf (Canis lupus crassodon), an initial study of food habits and social organization. M.Sc. Thesis Univ. of British Columbia.

Smith, I.D. 1968. The effects of hunting and seral succession upon Vancouver Is. black-tailed deer. M.Sc. Thesis. Univ. of British Columbia, Vancouver.

Stevenson, S. 1978. Distribution and abundance of arboreal lichens used as winter food by black-tailed deer. M.Sc. Thesis. Univ. of British Columbia.

Taylor, G.W. 1975. Timber - History of the Forest Industry in B.C. Vancouver: J.J. Douglas.

The Province. 23 September, 1980. "Timber shortages threaten all regions." Province newspaper Vancouver, B.C. p. C2.

The Vancouver Sun. 24 October, 1978. "The hunter's right: To harvest a resource." Vancouver, B.C. p. A6.

The Vancouver Sun. 21 January, 1983. "Old growth needed to save deer." Vancouver, B.C. p. A10.

Thomas, J.W. 1979. "Introduction in Wildlife Habitats in Managed Forests." Agric. Handbook No. 553. US. Dept. of Agriculture, Forest Services. p. 10-21.

Tsitika Planning Committee. 1978. Tsitika Watershed Integrated Resource Plan Vol. II. Victoria, B.C.

Vreeswijk, W.J. 1985. Integrated Resource Management Plan Implementation: The Tsitika Watershed Example, B.C. Masters thesis in Natural Resources Management. Simon Fraser University, Burnaby, B.C.

Waterland, T.M. 1978. Forest and Range Legislation Highlight. A preface to new Forest Act. Victoria, B.C.

Willms, W.D. 1971. The influence of forest edge, elevation, aspect, site index and roads on deer use of logged and mature forest. M.Sc.F. Thesis. Univ. of British Columbia, Vancouver.

## Persons Interviewed

Addison, R. B.C. Ministry of Forests. Strategic Studies Branch, Victoria, B.C. Personal communication. July 1981.

Bunnell, F.L. Faculty of Forestry. University of British Columbia. Personal communication. 1982 - 1984.

Davies, R. B.C. Ministry of Environment, Fish and Wildlife Branch, Nanaimo, B.C. Personal communication. 1981-82. 1985.

Ellis, R.M. B.C. Ministry of Forests. Forest Service, Research Branch, Victoria, B.C. Personal communication. 1982, March 1986.

Gordon, D.C. Indian and Northern Affairs Canada. Property and Resources, Reserves and Trusts. British Columbia Region, Vancouver, B.C. Personal communication. November 1985.

Gregory, M. Greenpeace. 2108 W. 4th Avenue, Vancouver, B.C. Personal communication. July 1982.

Harling, W. British Columbia Wildlife Federation. Vancouver Island Region representative. Personal communication. March 1986.

Hebert, D.M. Ministry of Environment. Fish and Wildlife Branch, Nanaimo, B.C. Personal communication. 1981-82.

Janz, D. B.C. Ministry of Environment. Fish and Wildlife Branch, Nanaimo, B.C. Personal communication. 1981 - 1986.

Morrison, D. B.C. Ministry of Environment. Fish and Wildlife Branch, Nanaimo, B.C. Personal communication. October - November 1985.

Walker, J. B.C. Ministry of Environment, Fish and Wildlife Branch, Victoria, B.C. Personal communication. July 1981.