"Nature was the Provider": Traditional Ecological Knowledge and Inventory of Culturally Significant Plants and Habitats in the Atleo River Watershed, Ahousaht Territory, Clayoquot Sound

by

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B.Sc., Simon Fraser University, 1993

A Thesis Submitted in Partial Fulfillment of the
Requirements for the Degree of

MASTER OF SCIENCE

as an Interdisciplinary pursuit through the School of Environmental Studies

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ABSTRACT

In 1995, the *Scientific Panel for Sustainable Forest Practices in Clayoquot Sound* recognized the valuable role of First Nations' knowledge and perspectives in working towards sustainable forest practices in British Columbia. This research project, which stemmed from the recommendations of the Scientific Panel, was developed as a collaborative, community-based research project which explored culturally important food and material plants of the Ahousaht First Nation, including traditional use and management of these plant species, their availability and abundance in the Atleo River watershed, and potential for their future use and management as well as issues surrounding such use.

Among the plants investigated in this study were species with the following culturally important values: 17 berry-producing plants, four shoot vegetables, three tea plants, two root vegetables, six species providing materials and five floral plant species. Traditional ecological knowledge of these plants held by elders and other people in and from Ahousaht is presented, including practices and strategies for sustainable plant use and management, worldviews pertaining to plants and the surrounding forests, and communication and exchange of plant and ecological knowledge. As well, results and discussion of surveys of culturally significant plants in the Atleo River watershed are presented including the relative availability and abundance of these species. Finally, issues surrounding the future use and management of these plants are addressed including over-

harvesting, accessibility, the recognition of special sites, holistic management, and the integration of traditional forest practices into future management.

By reflecting on the past and assessing the present, I hope that this research can be used to provide guidance for the careful and sustainable management of culturally important plants and their habitats in the future, for the benefit of Nuu-Chah-Nulth and other local peoples.

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ACKNOWLEDGMENTS

I would like to extend my gratitude and appreciation to Umeek, Dr. Richard Atleo, for inspiring me with new perspectives and for giving me permission to work within his *ha hoolthe*. I am also very grateful to former Chief Councilor Sidney Sam Sr., the Ahousaht Band Council, and the Ahousaht people for allowing me to work in their traditional territory and for making me feel welcome in their community. I am especially honoured to have worked with elders and other members of the Ahousaht community who shared their knowledge, their experiences and their time with me during this project: Clifford Atleo, Flossie Atleo, Greta and Pete Charlie, Archie Frank, Gertrude Frank, Chief Earl Maquinna George, Murray John, Lena and Carl Jumbo, Arlene Paul, Stanley Sam, Sidney Sam Sr., Morris Sutherland, Rosie Swan, Irene Thomas, Robert Thomas, and Morris Sutherland.

I very much appreciate the work of the Ahousaht researchers both in the field and in the community: Daphne Frank, Paul Frank Jr., Greg Hayes, and Travis Thomas. I would also like to recognize the work of Pam Jack for her assistance with administration of summer students. Many thanks are also due to Matthew Lucas for providing guidance and advice. I extend great thanks to Jason "Scotty" Dunham, Anna Bass, and Dr. David Duffus for their support during the project. As well, I am extremely grateful to Brenda Costanza at the University of Victoria herbarium for her assistance in plant identification.

I appreciate financial support which was generously provided by Long Beach Model Forest Society and the Natural Sciences and Engineering Research Council. As well, I wish to acknowledge Bill Perry, MacMillan Bloedel, who generously shared information and resources.

I am deeply grateful to have worked with my colleague and friend, Robin Smith, with whom I closely shared my personal growth during this project. Finally, I would like to extend special thanks to my supervisor and friend, Dr. Nancy Turner for her encouragement, support, knowledge and advice.

Dedicated to my mother

who has taught me to believe in myself.

CHAPTER 1: INTRODUCTION

The Natives are a part of the cycle of nature... we knew [how nature works] right from five, ten thousand years back, because we had to live with nature. It was the provider. It was the garden that we depended on, and that's where everything came from, anything you wanted — medicine, food ... everything was provided by nature. Not a thing is missing.... [We] couldn't do without nature, impossible, and we knew it all along because we lived ... without having to buy things. It was a beautiful life.

Archie Frank[1]

1.0 Introduction

Clayoquot Sound, on the west coast of Vancouver Island, British Columbia, has been the homeland of the Nuu-Chah-Nulth First Nations[2] for thousands of years[3]. The rich temperate rainforests and the adjacent coastline provided the basis for clothing, foods, medicines and other needs. The purpose of this research is to investigate traditional use and management of culturally important plants of the rainforests and in particular, to assess the availability and abundance of these plant species in a watershed in Ahousaht traditional territory. Further, this research is intended to provide recommendations for future use and management of these important cultural resources.

This chapter provides information on the background and context of this project, a history of Nuu-Chah-Nulth First Nations' interactions with plants, involvement of First Nations with forestry practices, the current forestry and cultural issues and processes in Clayoquot Sound, and the importance of ethnobotany for sustainable forest practices. As

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[1] Unless otherwise stated, all quotations are taken from interviews held with Ahousaht elders and other members of the community during this research project (1996). For more information, see Section 2.3 of this thesis.

[2] The Nuu-Chah-Nulth First Nations are comprised of fourteen First Nations, one of which is the Ahousaht First Nation within whose traditional territory we worked during this research project. In 1991, the membership of the Ahousaht First Nation was 1114 people, 410 of them living on the reserve on Flores Island (Archeo Tech 1991).

[3] Archeological evidence indicates that humans have occupied the area for at least 4200 years (Dewhirst 1978). Deglaciation began approximately 14 000 years ago and is thought to have been complete by 12 500 years before present (Wilson 1988).

well, this chapter outlines the purposes and goals of this research project and provides an outline of this thesis.

1.1 Nuu-Chah-Nulth First Nations

The Nuu-Chah-Nulth First Nations have occupied coastal British Columbia since time immemorial. The name *Nuu-Chah-Nulth* means "along the mountains" and the homeland of the Nuu-Chah-Nulth peoples encompasses the entire west side of Vancouver Island from the high coastal mountains where the yellow-cedar trees grow, down through the lush temperate rainforests, alive with berries, shoots and roots to the ocean, rich with salmon, whales and other marine life (Arima and Dewhirst 1990). The coastal ecosystems of the west coast of British Columbia supported "one of the highest densities of nonagricultural human settlements on the continent" (Schoonmaker *et al.* 1997:1). In terms of plant resources, the temperate rainforest provided fresh green vegetables, delicious berries, strong fabrics and excellent basket materials. As Archie Frank, an elder from Ahousaht, stated, nature "was the provider, it was the garden that we depended on".

The diet and lifestyle of Nuu-Chah-Nulth peoples is most frequently described as focusing primarily on marine resources. For example, marine foods historically contributed significantly more protein to the diet than terrestrial resources with one estimate being that 90% of the protein of pre-contact west coast peoples in British Columbia was obtained from marine sources (Chisholm *et al.* 1983). An analysis of the food items of the Nuu-Chah-Nulth First Nations that were mentioned by John R. Jewitt in his diaries of life with the Nootka (1803 to 1805) revealed that marine resources such as fish, sea mammals and their by-products, and shellfish were mentioned significantly more than terrestrial foods such as berries, bulbs, waterfowl and land mammals (Folan 1984).

Although fish and other marine resources made up a substantial proportion of traditional diets and influenced peoples' lifestyle in major ways, the role of plants was also extremely important. Plants were an integral part of virtually all activities. For example,

fishing lines and nets were made from stinging nettle fiber, seafood was supplemented with shoots, berries, and root vegetables, clothing, hats and mats were made of plant fiber, and houses and canoes were made from the wood of local trees, especially western red-cedar (Turner and Efrat 1982: Turner *et al.* 1983). Virtually all species of trees and shrubs and numerous other plants are culturally important to the Nuu-Chah-Nulth as sources of materials, medicines and foods (Archeo Tech 1991). Over 200 different plant species have been recognized and used for foods, medicines and other purposes by coastal First Peoples in British Columbia (Turner 1995).

Extensive knowledge was required in order to sustainably harvest and use these resources. As Ruth Kirk states in her book *Wisdom of the Elders* (Kirk 1986:17):

> *[These] bountiful resources commonly described were available only to those who knew precisely when, where and how to gather and store them — and Northwest Coast Indians had developed that knowledge over thousands of years.*

Through close interaction with the environment, the Nuu-Chah-Nulth First Nations developed detailed understandings of their local environment and the processes within them.

Although the Nuu-Chah-Nulth First Nations did not practice "agriculture" in terms of tended and irrigated fields, coastal ecosystems were not "pristine" and "untouched" wilderness but rather were heavily influenced and nurtured by their human inhabitants (Turner and Peacock 1997). As Blackburn and Anderson (1993:16) suggest, "[a]ll human societies... have therefore been involved over many millennia in an ongoing process of domesticating the environment...". The Nuu-Chah-Nulth First Nations, like other aboriginal peoples, developed strategies to promote sustainable living, including practices designed to enhance populations of culturally significant plants, diversify selected habitats, and promote careful and sustainable use of the resources they produced.

This rich knowledge of the environment, conventionally termed "traditional ecological knowledge" or TEK, can be defined as the "cumulative body of knowledge and

beliefs, handed down through generations by cultural transmission about the relationship of living things (including humans) with one another and with their environment" (Berkes 1993:1). The knowledge system includes a detailed classification of culturally significant plants and animals, observations of changes in environmental conditions, and complex understandings of the relationships and interconnections between species and ecosystems (e.g. Freeman 1992). As well, because indigenous peoples, such as the Nuu-Chah-Nulth First Nations, have relied for survival on their local resources over many generations, they have developed practices and strategies that were designed to promote the sustainable use of these resources.[4] In today's search for sustainable resource use and management, the Nuu-Chah-Nulth First Nations, like indigenous peoples around the world, have much to offer about careful and respectful ways of using and tending their resources. In particular in British Columbia, sustainable forest use is critical, and Nuu-Chah-Nulth peoples have much cultural experience and understanding of forests and forest resources.

1.2 A context for research in Clayoquot Sound

Despite the long and sustainable interaction between the Nuu-Chah-Nulth First Nations and their environment, modern forest practices have given little or no attention to First Nations' values and perspectives (Scientific Panel 1994; Scientific Panel 1995a). Clayoquot Sound has been recognized internationally for its large clearcuts and ecologically unsustainable logging practices (e.g. ad in New York Times, January 13, 1993; Diringer 1993). According to many aboriginal elders, these timber harvesting activities and their associated damage to the environment, are not consistent with First Nations' values and perspectives (Scientific Panel 1995a).

Opposition to such logging activities, and recognition of the diverse values in Clayoquot Sound including forestry, recreation, fisheries, tourism and wildlife, have

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[4] For a discussion of the differences between "ecosystem people" who rely on local resources and "biosphere people" who obtain resources from throughout the globe, see Dasmann (1976).

created an intensive search to define and prescribe sustainable use of the forests. The necessity for developing sustainable forest practices was recognized explicitly in 1993 after the British Columbia (BC) Provincial Government released a Land Use Decision for Clayoquot Sound which designated, among other things, areas for protection, areas available for logging, and special management zones (British Columbia 1993a; British Columbia 1993b). The Government's decision was met with dissatisfaction by various groups and individuals for different reasons. Some felt that the decision did not protect enough temperate rainforest, while others felt that it protected too much.

Perhaps the most visible signs of discontent about the decision were the numerous protests that occurred in Clayoquot Sound and the surrounding area during the summer of 1993. More than 800 people were arrested for participating in actions such as standing in the roadway to block logging trucks, chaining themselves to logging equipment and fixing themselves to logging roads using concrete, making the Clayoquot protests of 1993 the largest disobedience case in Canadian history (Robson 1994). Among those who met the Clayoquot Sound Land Use Decision with opposition were the Nuu-Chah-Nulth First Nations who asserted that the decision did not respect Nuu-Chah-Nulth values and perspectives and that there had been little consultation with the Nuu-Chah-Nulth in developing this decision.

From this discontent, a strong recognition of the important role of the knowledge and participation of the Nuu-Chah-Nulth First Nations in the management of Clayoquot Sound was developed and several processes were established to provide opportunities for First Nations to participate in land use decisions. These include Treaty negotiations, the *Interim Measures Extension Agreement* (following the original *Interim Measures Agreement*), the *Central Region Board*, and the *Scientific Panel for Sustainable Forest Practices in Clayoquot Sound*. Recognizing these processes is part of understanding my research project since they provide a context for working with First Nations in Clayoquot Sound, conducting inventories of culturally significant plants, respecting traditional

ecological knowledge, and recognizing the importance of the meaningful involvement of First Nations in resource planning and management in Clayoquot Sound.

Treaty negotiations

Currently in British Columbia, modern-day treaties are being negotiated between the federal and provincial governments and First Nations with whom treaties were never previously signed. Among the First Nations who are negotiating treaties with the federal and provincial Governments of Canada are the Nuu-Chah-Nulth First Nations. A Framework Agreement was signed on March 27, 1996, and currently negotiations are under way towards an Agreement-in-Principle which is expected to take two years to develop (Central Region Board newsletter, Spring 1996).

Interim Measures Agreement and Interim Measures Extension Agreement

The original Interim Measures Agreement (1994-1996) was designed to ensure that the interests of the Nuu-Chah-Nulth First Nations, including aboriginal rights, were taken into account, and to provide opportunities for aboriginal peoples to be involved in the decisions affecting their traditional territories and the management of these areas until Treaty negotiations have been completed. The IMA was signed by the *Hawiih* (hereditary chiefs of the Nuu-Chah-Nulth First Nations)[5] and the Government of BC in March, 1994.

The Interim Measures Agreement expired in 1996 and was subsequently replaced by the Interim Measures Extension Agreement (IMEA) which was signed in 1996 to be in place for a period of three years. It is the intent of the IMEA to "conserve resources for future generations by implementing the recommendations of the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound and by accepting and recognizing

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[5] Central Region Tribes included in this agreement are the Tla-o-qui-aht First Nations, the Ahousaht First Nations, the Hesquiaht First Nation, the Toquaht First Nation and the Ucluelet First Nation.

traditional ecological knowledge" (Central Region Board 1996:2). As well, the IMEA outlines the roles and responsibilities of a co-management board (Central Region Board) for Clayoquot Sound, which had been previously established by the Interim Measures Agreement. As Clifford Atleo, Ahousaht Chief Negotiator for Treaty, stated:

> *... no law accommodates our interest. We had to create a model that does accommodate our interest. And one of the strong provisions of the treaty task force recommendations was this concept of interim measures that accommodated First Nations' interests. But not only First Nations' interest, but business and government and municipality and citizens and we like that concept. In fact we supported it very strongly. And in our negotiations we said, because no law exists that considers our interests, we have to create something where all the planning process has to flow through the Central Region Board. Then and only then can our interests be considered because we get the opportunity to review whatever plan, whether it be tourism, scenic corridors, all of those things, the Science Panel recommendations even have to go through the Central Region Board. It's the first time.*

Central Region Board (CRB)

As a direct result of the Interim Measures Agreement, the Central Region Board was established as a co-management board for Clayoquot Sound. The Board is comprised of an equal number of aboriginal and non-aboriginal members, including representatives from the five Central Region Tribes of Clayoquot Sound (see Footnote 5), and representatives from local non-aboriginal communities. The Board is co-chaired by one aboriginal and one non-aboriginal chair who are responsible for facilitating discussions, helping the Board come to informed decisions, and communicating the Board's decisions to others.[6]

Some of the responsibilities of the Central Region Board, as outlined by the IMEA, are:

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[6] Ross McMillan, Former Co-Chair of the Central Region Board. Personal communication, November, 1996. Current co-chairs are Nelson Keitlah and Bob Peart.

- to promote more sustainability, economic development, and diversification for communities within Clayoquot Sound, including infrastructure within those communities;
- to provide a viable, sustainable forest industry in Clayoquot Sound;
- to assess compliance with world class forest standards, such as the Scientific Panel Recommendations and the Forest Practices Code. The assessment shall also incorporate the perspective of First Nations;
- to respect and protect aboriginal uses of resources in Clayoquot Sound.

Thus, all decisions affecting land use and management in Clayoquot Sound must go through the Board and meet with its approval. The Board uses the IMEA to provide guidelines for decision-making and other activities and decisions are reached through a consensus-based approach which is consistent with traditional aboriginal process.[7]

Scientific Panel for Sustainable Forest Practices in Clayoquot Sound

In keeping with the goals of sustainable resource use and the inclusion of First Nations in resource management, the *Scientific Panel for Sustainable Forest Practices in Clayoquot Sound* (Scientific Panel or the Panel) was established in 1993 by the provincial government as a result of recommendations from the Commission on Resources and Environment (CORE). The Panel had the challenging goal to "develop world-class standards for sustainable forest management by combining traditional and scientific knowledge" (Scientific Panel 1995a:3). The Panel was composed of both respected scientists from many disciplines (e.g. soils, wildlife, hydrology, forest ecology), and Nuu-Chah-Nulth members who were recognized for their extensive knowledge regarding local ecosystems and Nuu-Chah-Nulth culture. Recommendations from the Panel were to

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[7] See Scientific Panel (1995a:5-6) for more information on the consensus approach and Nuu-Chah-Nulth peoples' traditional approach to decision-making.

include and reflect the perspectives of the Nuu-Chah-Nulth First Nations as well as those of academic scientists. As Clifford Atleo states,

> *We're the ones that insisted on our doctorates being part of the Science Panel. When the government made the announcement and they thought they were doing the world's greatest thing, we said "Whoa. You cannot go ahead and do that without our knowledge." And by that I mean the knowledge from our Elders. And we said "our people are just as knowledgeable as any one of your doctorates who have specialties in soil or water or plants or whatever. They know about all of those things. They are multiple-disciplinary doctorates in our community."*

The incorporation of traditional ecological knowledge into environmental planning, inventory, monitoring and research not only addresses local issues and concerns, but also reflects broader local trends in the increased role of indigenous peoples in managing their resources and of the changing nature of scientific research (Lalonde and Akhtar 1994). For example, the value of traditional knowledge received global recognition as a result of *Agenda 21*, one of the documents produced from the United Nations Conference on Environment and Development held in Rio, Brazil, in 1992. This document recognized the importance of indigenous knowledge in promoting sustainable development, as well as the need to strengthen the role of indigenous peoples in development decisions and actions.

Dr. Richard Atleo, Co-Chair of the Scientific Panel, explained the significance of the Scientific Panel, in his view:

> *On the Scientific Panel, I think the important part of our [First Nations'] contribution were in two areas. One was in providing the environment for dialogue, for discourse. The protocol that we developed for it which is ours, which is our way of making decisions. And then [the other was] the knowledge that our elders had...*

The Scientific Panel succeeded in coming to consensus on over 120 recommendations for developing sustainable forestry practices, all of which were accepted by the British Columbia Provincial Government in 1995 (Scientific Panel 1995c). One of

the fundamental principles of the Panel is to work towards ecosystem-based management in which ecosystem integrity and holistic management are an essential component of any resource use. For example, the Scientific Panel proposed area-based timber planning, rather than conventional volume-based planning which is used throughout British Columbia. This concept means that the volume of timber taken from a site is determined by assessing how much timber can be extracted without serious impacts on the ecosystem. The Scientific Panel also recommended maximum cutting levels (based on the percentage of forest cut), variable-retention cutting (in which stands of forests are undisturbed throughout a logged area) and other forest practices which work towards ecosystem-based management.

Of most relevance to my research project were the Scientific Panel recommendations which support the inclusion of traditional ecological knowledge, cultural forest values, and First Nations' peoples in future forest practices. One of the five documents produced by the Scientific Panel, *First Nations' Perspectives Relating to Forest Practices Standards in Clayoquot Sound*, reviews the inclusion of First Nations' knowledge and interests in current land use planning, and makes recommendations about how new forest practices can include First Nations' interests and concerns in research, monitoring, planning, and harvesting (Scientific Panel 1995a; Scientific Panel 1995b). It was these Panel recommendations which provided the impetus for my research project. Specifically, recommendations from the Panel (1995a:51-54) which guided my research were the following:

- Before the completion of any ecosystem planning process in Clayoquot Sound, the Nuu-Chah-Nulth of the area within which the planning is undertaken must be given the opportunity to identify, locate, and evaluate culturally important sites and areas.

- Research and inventory must be undertaken to complement Nuu-Chah-Nulth traditional ecological knowledge and experience.

- Opportunities and imperatives for research on impacts of past, present, and future forest practices on Clayoquot Sound ecosystems, and in possibilities for employment identified by the Nuu-Chah-Nulth of Clayoquot Sound must be developed, in full consultation with and participation of the Nuu-Chah-Nulth of Clayoquot Sound to enhance the effectiveness of sustainable ecosystem management.

1.3 Ethnobotany and sustainable forest practices

By accepting the Scientific Panel recommendations and the movement towards ecosystem-based management, the importance of traditional ecological knowledge and the meaningful role that First Nations can play in resource management have been recognized in Clayoquot Sound. Research in ethnobotany, which is the study of the relationships between plants and people, is an important part of working towards sustainable ecosystem-based forestry practices. More specifically, learning about traditional plant use and management of First Nations can contribute significantly towards sustainable forest practices[8] for a number of reasons.

First, there is a growing recognition that many indigenous peoples have achieved "sustainability" throughout history and that their knowledge systems may provide some insights into sustainability in the future. For example, UNESCO suggested a global initiative for "understanding the principles that have guided Indigenous peoples over time, and identifying the technologies and structures that have allowed them to live sustainably within their environment" (Streather 1991:1). Insights into sustainable use and management of forests can be gained by learning from the Nuu-Chah-Nulth First Nations who have been living sustainably in Clayoquot Sound, and who have been depending on and using forest resources for thousands of years. Traditional world views and

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[8] Sustainable forest management has been defined by the Canadian Council of Forest Ministers (1995) as forest management which maintains the following six criteria: 1) conservation of biological diversity, 2) maintenance and enhancement of forest ecosystem condition and productivity, 3) conservation of soil and water resources, 4) forest ecosystem contributions to global ecological cycles, 5) multiple benefits to society and 6) accepting society's responsibility for sustainable development. The term " forest practices" refers to "any human activities that affect the forest" (Hammond 1993:11).

philosophies can provide models of appropriate ways of relating to the environment. As Peter Knutdson and David Suzuki states in their book *Wisdom of the Elders* (1993:xxxv):

> *We need a radically different way of relating ourselves to the support systems of the planet. My experiences with aboriginal peoples have convinced me, both as a scientist and as an environmentalist, of the power and relevance of their knowledge and world view in a time of imminent global ecocatastrophe.*

As well as worldviews and philosophies, traditional knowledge includes a detailed understanding of the local environment that can aid in understanding forest ecosystems (Clayoquot Biosphere Symposium 1995). Another important role of ethnobotany is incorporating this long-term local knowledge into research to help provide information about specific areas and ecosystems. This baseline data is extremely useful in determining how resources have changed over time, what features a "healthy" ecosystem might possess, and where and how to plan resource use. Since scientists doing inventories of areas often make only brief visits to study sites, or apply "universal" rules to specific locations, the knowledge generated by a lifetime of exposure to a given locality is extremely valuable and relevant.

A third reason why ethnobotany is important to ecosystem-based management is because the temperate rainforest ecosystems have evolved for thousands of years under the cultural influences of the Nuu-Chah-Nulth peoples. Since a primary goal of ecosystem-based management is to restore and maintain ecosystems in a healthy state, traditional forest practices are an important part of re-creating "natural" ecosystem processes. In order to re-establish ecosystem integrity and biodiversity, the traditional land management practices which helped create and maintain these qualities must be recognized (e.g. Chipeniuk 1989).

A fourth important role of ethnobotany is to provide valuable information regarding diverse forest uses. The shift from a volume-based to an area-based management strategy in Clayoquot Sound (as recommended by the Scientific Panel), will require alternative local economies that are not dependent on large quantities of timber

(M'Gonigle and Parfitt 1994). The wide array of First Nations' use of the forest includes not only timber, but other products such as berries to supplement the diet, materials to make traditional baskets and other objects, and medicinal plants to promote healthy communities. The broad range of forest plants used by First Nations can guide future sustainable forest practices by indicating plant products, other than timber, that can be used to diversify the economy (e.g. Freed 1995). As Arlene Paul, an elder from Ahousaht, said, "they [my ancestors] used to say you can walk a thousand feet and find many things of use, right from nature." Dennis Martinez (1993), a native restorationist, suggests that developing a wide variety of traditionally used items (such as different materials and foods) for today's modern market would be one way of integrating native land stewardship towards sustainable local economies in today's industrial world.

In Clayoquot Sound, interest in alternative forestry practices has been indicated by the Ahousaht First Nation, among others, through their involvement in hosting the Clayoquot Sound Symposium on Alternative Silvicultural Systems in March, 1996 (Ambrose 1996). Sustainable use of non-timber forest plants, one of the topics of this symposium, could potentially provide a suitable form of employment and use of the forest that is consistent with First Nations' values and perspectives (Mater 1996). As the Scientific Panel stated (1995a:35):

> *In addition to cultural and spiritual interests, the Nuu-Chah-Nulth have economic interests in sustaining and developing the resources of their traditional territories to improve their situation. Their close links to the land and traditional knowledge of plants provide a strong base for harvesting "special forest products" such as wild edible mushrooms, floral greenery, medicinal plant products, fruits, berries, herbs, edible plants, and landscaping and craft products.*

Research into the past use and management of culturally important plants and assessment of the availability of these species for modern use and harvesting is a component of ethnobotany which has cultural, practical and economic value.

A fifth reason why ethnobotany is important to sustainable forest use and management is in providing information for forest inventories which includes non-timber resources. Documenting the abundance, frequency, and productivity of culturally important plants provides a more holistic and culturally appropriate inventory of the forest which incorporates values other than timber. Such documentation can indicate the availability and accessibility of cultural resources, provide insights into impacts of logging on these plants, and guide future management and restoration plans. As Darling and Keogh (1990:20) mentioned when discussing research and inventories in Clayoquot Sound, "the level of our understanding of a wild species depends on its past or present, direct, economic value." Thus, if a species does not have economic value according to western views, it is not often studied. As a result, plants other than timber are virtually forgotten in land use planning and policies. Wickens (1991/92:4) states:

> *For the most part, non-timber forest products constitute a neglected resource: this neglect must cease. In the formulation of land-use and forest policies and the evaluation of development projects, the impact on non-timber forest product resources and their potential role in the rural and wider economy should be considered routinely and without exception. This will require changes to ensure that non-timber as well as timber assets of forest land are valued, conserved and developed.*

1.4 Related research in Clayoquot Sound

Two major studies have focused specifically on ethnobotany, including research with the Hesquiaht First Nation (Turner and Efrat 1982), as well as with the Dididaht First Nation to the south (Turner *et al.* 1983). These studies include thorough compilations of plants recognized by members of these First Nations and their uses. As well, these studies documented traditional management and harvesting strategies that were used to enhance populations of these plants, narratives featuring plants, and other aspects of traditional knowledge. Ethnobotanical interviews and a review of published sources were conducted

by Alison Davis (1994) from her work with the Tla-o-qui-aht First Nation. As well, plants identified from vegetation surveys were cross-referenced with recorded uses for the Tla-o-qui-aht First Nation (Cleland 1994). Other studies which have documented traditional ecological knowledge of the Nuu-Chah-Nulth First Nations have been carried out, many of which focus primarily on marine resources (Clutesi 1967; Ellis and Swan 1981; Webster 1983; Clutesi 1990; Darling 1992; Scientific Panel 1995a).

In terms of cultural inventories, archaeological studies have taken place throughout Clayoquot Sound (e.g. Calvert 1980: Haggarty 1982: Arcas Associates 1984, 1986, 1988: Wilson 1988: Arcas Consulting 1995: Stafford and Eldridge 1995). For example, inventories of medicinal plants are conducted by Aboriginal Liaison Officers who are hired by the major forest companies operating in Clayoquot Sound (MacMillan Bloedel and Interfor) before harvesting takes place in an area. These inventories are done in private by First Nations' representatives and the actual plants and other medicines they identify remain confidential. Other cultural inventories which include plants have also taken place in Clayoquot Sound, focusing primarily on inventories of culturally modified trees (Arcas Associates 1984: Wilson 1988: Campbell 1993: Arcas Consulting 1995). Nuu-Chah-Nulth names and descriptions of culturally significant sites, including berry-picking and other plant harvesting sites, have also been documented (Bouchard and Kennedy 1990).

With the exception of Culturally Modified Trees (CMTs), to my knowledge, inventories specifically of food and material plants have not been conducted in Clayoquot Sound. Although plant inventories have taken place, many of these vegetation surveys have been done to investigate wildlife habitat and other values (e.g. Bryant 1997: Burger *et al.* 1997: van den Driche *et al.* 1997). As researchers in Clayoquot Sound have stated, "for the majority of species even superficial inventories have not been attempted" (Darling and Keogh 1990: 20).

An exemplary inventory of food plants has been conducted in Nuxalk territory (Lepofsky *et al.* 1985). In this study, temporary plots were set-up in varied cover types

throughout Nuxalk territory, the abundance of traditional food plants was measured using percent cover, and the accessibility of these resources was also determined. This type of study is useful in Clayoquot Sound in order to assess the availability and abundance of food and material plants.

1.5 Goals of this research project

In recognition of the value of traditional ecological knowledge in understanding ecosystems, the importance of ethnobotanical research for sustainable forest practices, and the value of inventories of culturally significant plants, this interdisciplinary project had several goals:

1) to develop a community-based project which conducted research in an ethical and mutually beneficial manner, integrating both scientific research techniques and traditional ecological knowledge.

2) to compile information on the Atleo River watershed, within the inherited authority, or the *ha hoolthe* of Dr. Richard Atleo, including past and present use of the area.

3) to document traditional ecological knowledge relating to culturally significant plants with elders in Ahousaht, including traditional use and sustainable management practices for culturally significant plants, modern uses of plants, world views pertaining to forests and the environment, and histories of the Atleo River watershed.

4) to conduct an inventory of culturally significant plants and habitats in the Atleo River watershed, focusing on plants identified by the Scientific Panel as being used and/or important to the Nuu-Chah-Nulth First Nations.

5) to assess future use and management of culturally significant plants in the Atleo River watershed and surrounding areas by considering both traditional ecological knowledge and field inventories from this study.

6) to provide recommendations to the community of Ahousaht and Long Beach Model Forest Society for future use and management of culturally significant plants and further research projects.

Information gained from this project through field work and documenting traditional ecological knowledge provides insights into sustainable forest management which includes First Nations' perspectives and values. The field data from this research provides information on the availability and abundance of culturally significant plants and their habitats, which may be applied to developing management plans for the Atleo River watershed. More specifically, field data may be used to identify non-timber forest resources and ways in which they can be harvested sustainably.

Information from interviews provides equally valuable information, including histories of the Atleo River watershed, identification of areas that have been used traditionally, recognition of plants that people harvest and use today, and communication of visions for how forests could be used in the future in ways that are consistent with Ahousaht traditional perspectives and values. Together with field data, this information will, I hope, prove to be beneficial for forestry practices and management in the future in assessing impacts of logging on traditional patterns of plant use, identifying critical habitats for special management, and providing a base inventory of culturally significant plants and areas in the Atleo River watershed. Learning about how logging has affected these plants and habitats can aid in establishing appropriate restoration plans and in guiding sustainable forest use for the Atleo River watershed.

This project was carried out in collaboration with Robin Smith, a graduate student at Trent University together with four Nuu-Chah-Nulth researchers from Ahousaht. The focus of Robin Smith's research was the incorporation of traditional Nuu-Chah-Nulth knowledge into restoration of damaged habitats (Smith 1997). We collaborated in gathering information but her thesis focuses on environmental history and restoration of the Atleo River watershed[9] whereas mine focuses on traditional knowledge surrounding

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[9] Smith, Robin Y. 1997. *Hishuk ish ts'awalk - All Things are One: Traditional Ecological Knowledge and Forest Practices in Ahousaht First Nations' Traditional Territory, Clayoquot Sound, BC.* Master of Arts Thesis, Trent University, Peterborough, Ontario.

use, management, and stewardship of culturally significant plants and the availability and accessibility of these species in this watershed. We hope that our theses will be read and considered together to form a more holistic picture of plant use and management in the Atleo River watershed.

1.6 Outline of thesis

Each of the goals of this research project is addressed in the following chapters of my thesis. This introductory chapter provided a background and context for the research project, including history of Nuu-Chah-Nulth interaction with plants, involvement of Nuu-Chah-Nulth First Nations with current forestry practices, the importance of ethnobotany in sustainable forest management, and the specific goals of my project.

Chapter 2 discusses the methods used to develop and conduct this research project. The chapter includes a discussion of how the project was developed, how interviews were conducted and reviewed, how field work was carried out, and methods of promoting community benefits from the project.

Chapter 3 presents a description of the study area, the Atleo River watershed, including biophysical features, past use of the area as remembered by elders or documented in archeological studies and other literature sources, and recent forest practices in the area.

Chapter 4 presents traditional ecological knowledge of plants as discussed by elders during this project and as drawn from published sources. Knowledge of such topics as traditional plant use and management, worldviews pertaining to plants and the environment, and narratives of culturally significant plants, are presented. This chapter is written using the direct quotations of elders whenever possible.

Chapter 5 presents field work results describing the abundance and distribution of culturally significant plants in the Atleo River watershed. Data collected on berries, green

vegetables, root vegetables, cedar bark and other basket-making materials, and plants used by the floral industry are presented and discussed.

Chapter 6 is a discussion which integrates field results and traditional ecological knowledge shared by elders during this project. The chapter includes discussions of the potential for using and recognizing culturally significant plants in future forest ecosystem-based management, the issues and concerns raised by elders regarding culturally significant plants, and a context for future use of these plant species.

Chapter 7 presents conclusions from the main findings of this project. This chapter includes recommendations for future use and management of culturally significant plants and habitats and for future research projects.

The nature of this thesis, this research project, and the subject matter to which it is connected is necessarily holistic. For example, the plant species studied are a result of the place in which they grow, their meaning is connected to the histories and traditional cultures of the Ahousaht people, and the traditional ecological knowledge presented about these plants is part of a broader whole. By structuring this thesis in a western scientific format (e.g. the study area is described separately from the methodology, and the results are presented separately from their discussion), the holistic perspective of this project is diminished. However, like this research project, this thesis format was chosen as an attempt to integrate traditional ecological knowledge with western science. Perhaps the benefits and problems associated with this format can convey broader issues by reflecting the difficulties of interpreting knowledge and information when it is removed from its cultural context. It is important for the reader to maintain the holistic view of this project at all stages, and to consider all chapters in this thesis as integrated and inter-related, especially if this information is being used for decisions surrounding forest practices and the future use and management of culturally significant plants and their habitats.

CHAPTER 2: METHODS

And so in our view we cannot do without traditional knowledge and I say that because we are not prepared to accept knowledge gained over only a few hundred years of presence for ones that have been developed over thousands and thousands and thousands of years for good reason....

Clifford Atleo

I have consistently maintained that the two systems [conventional science and traditional ecological knowledge] can complement one another... the strength of science, conventional science, has been the less human you make it, the better it is... And so from that perspective then, people in that tradition, who live in that tradition require humanization which the other process can bring.

Dr. Richard Atleo

2.0 Introduction

This project aimed to provide a model for community-based research, encouraging input and direction by the community at all phases. Our intention was to incorporate both traditional ecological knowledge and scientific methodology in research and to incorporate First Nations' values and perspectives throughout the project. The project was developed and carried out by Robin Smith (graduate student from Trent University) and myself, in collaboration with Dr. Nancy Turner (University of Victoria), Dr. Richard Atleo (hereditary chief of Ahousaht), other members of the Nuu-Chah-Nulth First Nations and researchers from Ahousaht. Together, we envisioned a mutual learning process, with both aboriginal and non-aboriginal researchers contributing skills and knowledge. Efforts were made to conduct research in an ethical and considerate manner (see Appendix A). Because of these goals, the methods of developing and conducting the project were as important as collecting the data itself.

2.1 Developing the project

As a first step, we wrote a proposal which we submitted to Long Beach Model Forest Society (LBMFS). The Long Beach Model Forest (LBMF) is one of eleven Model Forests throughout Canada and was established in 1995. LBMFS, like other Model

Figure 2.1: Project researchers Travis Thomas, Daphne Frank, Paul Frank Jr., Greg Hayes, Juliet Craig and Robin Smith (left to right).

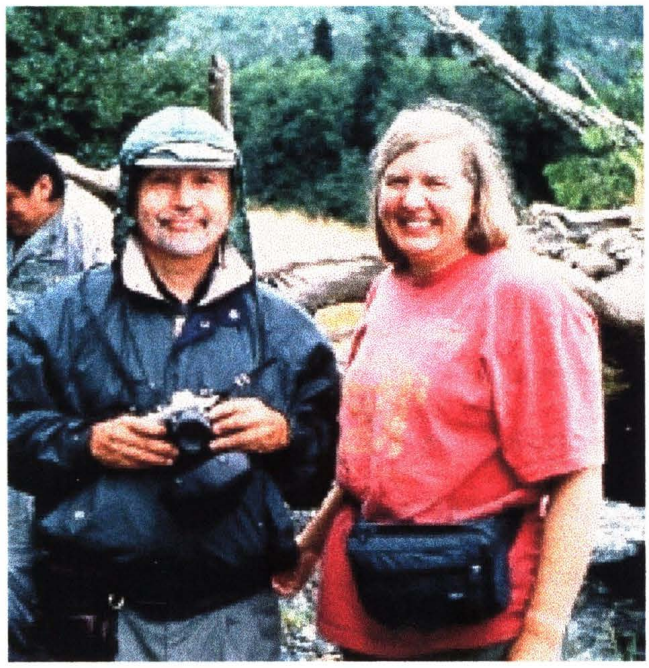

Figure 2.2: Project supervisors Dr. Richard Atleo and Dr. Nancy Turner.

Forests, is designed to provide an area where innovative and sustainable forestry and management practices can be researched and applied. Although not established as a direct result of discontent with land use planning in Clayoquot Sound, this organization encourages community-based research incorporating both traditional ecological knowledge (TEK) and western science, and provides information that can be used to develop sustainable resource practices in Clayoquot Sound.

LBMFS, like the other Model Forests, asserts that sustainable use of forests cannot occur without community involvement and the development of sustainable communities. LBMFS promotes the inclusion of First Nations in research, and encourages recognition of and research regarding traditional ecological knowledge. However, they recognize the issues of intellectual property rights surrounding the documenting and publishing of traditional ecological knowledge, especially by researchers who are not from Clayoquot Sound.[1] To address these issues, LBMFS developed a *Traditional Ecological Knowledge Working Group* (TEK Group) comprised of elders and other knowledgeable people from Clayoquot Sound. The Group was established to discuss these issues, and to develop a protocol for researchers to follow.

The *Traditional Ecological Knowledge Group: Draft Protocols for Researchers* has been developed for this purpose (see Appendix B). For researchers involved in "western scientific" research in Clayoquot Sound, these protocols are designed to promote inclusion of First Nations in research projects, to assist communication between researchers and communities, and to ensure that researchers provide benefits to the communities, such as copies of data and reports. In addition, for researchers investigating traditional ecological knowledge, the protocols require researchers to clearly state their intent and receive appropriate approval for their research, to train and include community

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[1] For further discussion of these issues, see symposium synopsis for workshop on "Ecosystems in Clayoquot Sound: Research Challenges" which was organized by the Clayoquot Biosphere Project and held at Middle Beach Lodge, November 8-10, 1995 (Clayoquot Biosphere Symposium 1995).

members in their projects, and to respect wishes for limited or unacceptable circulation of data, especially those related to private or spiritual matters.[2]

For purposes of our work, we revised our research proposal to focus only on plants used primarily for food and material purposes as identified by the Scientific Panel Appendices V and VI (Scientific Panel 1995b) and did not include medicinal plants in our study (see Table 2.3). Although there are issues surrounding documenting knowledge on these types of plants, the concerns do not appear to be as strong, and the subject of study is not as sensitive. Also, there was an interest in having this knowledge recorded for the benefit of the community. For example, Trudy Frank stated:

> *I think you need to know what is good for you. It's important because I don't think it's being passed on, like we passed it on long time ago. I would hesitate to record medicinal [knowledge] because I guess my belief is the same as theirs [First Nations' ancestors] was, that if you're going to be distributing medicines... there's a way they do it. Their belief is that they're given the power to make it work, handed down. They only pick certain people who they want to leave it with, to continue on after they're gone, provide for that. But with all the other stuff, like the use of salal, I guess in a sense, some of it is sacred, but I think today, like I said, they don't hand it down to the young generation like they did long time ago.*

2.2 Selecting a study area

We chose to focus our research on the Atleo River watershed based on guidance and permission given to us by Dr. Richard Atleo, Chief Umeek. Dr. Atleo is a hereditary chief of the Ahousaht First Nation and as such, owns a traditional stewardship area or *ha hoolthe*. As Dr. Atleo explained,

> ***ha hoolthe...*** *is a multi-dimensional concept. And in the political dimension, then, it very definitely refers to boundary areas, ownership of resources within those boundary areas, and ownership by a person.*

The importance of the concept and respect for *ha hoolthe* was recognized by the Scientific Panel. Specifically, the Panel (Scientific Panel 1995a:51) recommended that:

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[2] Concerns of sharing knowledge tended to focus around research into traditional medicinal plant knowledge (see Section 6.2.4 of this thesis).

In consultation with the co-chairs of the Nuu-Chah-Nulth Tribal Council, ***ha hoolthe****, the traditional system for ecosystem management, must be recognized in ecosystem co-management processes of Clayoquot Sound.* ***Ha hoolthe*** *will be used in determining ecosystem management within traditional boundary lines.*

As well as receiving permission and support from Dr. Richard Atleo, we also received permission from the Ahousaht Band Council to live and work in their traditional territory. With this final proposal and permission, we received funding from Long Beach Model Forest Society for the project, including salaries for four researchers from the community: Daphne Frank, Paul Frank Jr., Greg Hayes and Travis Thomas. Working with researchers from Ahousaht helped to foster both scientific and interview skills within the community, and also provided opportunities for mutual learning.

Before we began our field work, we did an exploratory walk in the Atleo River watershed. We hiked the watershed to develop a plant species list, to gain an understanding of the distances and accessibility of areas within the watershed, and to familiarize ourselves with the area. We also surveyed aerial photos, taken between the years 1952 and 1996, in order to track physical changes in the watershed, particularly those associated with industrial logging activities. In addition, we studied all relevant published sources of information about the area. As well, we interviewed knowledgeable elders about the Atleo River watershed and discussed how it came to be part of Ahousaht traditional territory. These diverse sources of information about the study area showed us that various avenues of gaining knowledge can complement one another to provide a more holistic understanding of the local environment.

2.3 Documenting traditional ecological knowledge

A major component of the project included interviews with the present inhabitants of Clayoquot Sound, specifically the Ahousaht people. The main purpose of the interviews was to gain an understanding of traditional systems of managing lands and

resources, and traditional use of the Atleo River watershed and surrounding areas. As well, we discussed contemporary use and management of plant resources, and visions for future use of the area.

Our intent was to have two interviewers for each interview — Robin Smith or myself and one Ahousaht researcher. The interviews incorporated a combination of open-ended questions and conversation to encourage people to share their knowledge and memories in any way they felt comfortable. Topics covered in the interviews included not only plant management and use, but many other different aspects of Ahousaht culture and history. Concerns and issues surrounding the documentation and publication of traditional ecological knowledge were also discussed in order to address intellectual property rights and other concerns about this project and similar research activities in the future. This inclusive approach to interviews provided a wider breadth of understanding to our research.

We interviewed primarily Ahousaht elders who were recommended to us by others in the community as knowledgeable. In defining an elder, Stanley Sam explained that:

> *There's no limit to our life when to be an elder... you don't have to wait until you get to be 65. It's just when you're interested in a culture and when you start to understand culture and start to become knowledgeable, and that's the time they recognize you as an elder, our people. It doesn't say you have to be that age ... some people think we have to be gray hair or whatever to be an elder. No it's not. It's just how you want to support your tribe... how you feel about your people. How you feel about it, that's the way my father used to teach me. In my young days he used to tell me that.*

We interviewed a total of nineteen people. Interviews ranged from 15 minutes to 2 ½ hours. Interviews were conducted in English, in which all participants were fluent. Due to the broad nature of the project and the differences in interest and experience of elders, topics varied between interviews. Greta Charlie, Trudy Frank, Lena Jumbo, Arlene Paul, Rosie Swan and Irene Thomas described the uses and traditional management of plants, issues surrounding documenting plant knowledge, and personal knowledge of plant

Clifford Atleo

Flossie Atleo

Luke Atleo

Greta Charlie and Rosie Swan

Trudy Frank

Archie Frank

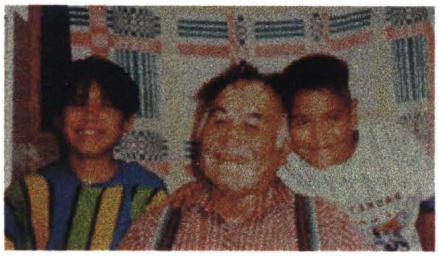
Earl George

Murray John

Figure 2.3a: People in and from Ahousaht who participated in interviews for this research project.

Lena and Carl Jumbo

Arlene Paul



Stanley Sam
with his grandsons

Sidney Sam Sr.

Irene Thomas
with her granddaughter

Robert Thomas

gure 2.3b: People in and from Ahousaht who participated in interviews for this research project.

Figure 2.4: Archie Frank and his grandson Paul Frank Jr. Archie Frank was one of the elders we spoke with as part of this project.

Figure 2.5: Trudy Frank and her grandson Greg Hayes. Trudy Frank taught us about traditional plant use and management.

harvesting. Clifford Atleo, Archie Frank Sr., Murray John and Carl Jumbo spoke of forestry issues and forestry management. Flossie Atleo, Earl Maquinna George, Stanley Sam and Robert Thomas recounted histories of the Atleo River watershed and surrounding areas. Sidney Sam Sr. discussed histories of the Atleo River watershed and contemporary forestry issues. Dr. Richard Atleo spoke about *ha hoolthe* and the importance of traditional ecological knowledge. Luke Atleo and Morris Sutherland discussed issues and concerns surrounding documenting traditional knowledge. In addition, we also interviewed Bill Perry, a forester with MacMillan Bloedel, who discussed the history of logging activity and forestry management in the Atleo River watershed. Unfortunately, we did not have the opportunity to contact or speak with all of the people that were regarded by the community as highly knowledgeable.

In accordance with the *University of Victoria Ethics Review Committee on Research and Other Activities Involving Human Subjects*, we developed a *Letter of Informed Consent* for project participants (See Appendix C). The letter was designed to clearly indicate the research we were doing, to explicitly state that the ownership and control of information participants provided was theirs, and to outline provisions for review and transfer of the transcripts and tapes from the interviews. Interviews were transcribed *verbatim* and the transcripts were sent to the participants who were asked to review it within three months to delete any private or confidential information, and make any additions or corrections necessary. In addition, participants received bound copies of the final transcripts and the interview tapes. This process ensured that elders maintained control of their knowledge including which information was to be included in publication and which was to be kept private.

2.4 Assessing the availability and abundance of culturally significant plants

In addition to interviews, we undertook field work for this research between May 30 and September 6, 1996. Based on the preliminary walks and aerial photos, we divided

the study area into three broad cover types: forest, logged areas, and riparian areas. Forest was classified as either hemlock-amabilis (HA) or cedar-hemlock (CH) based on the dominant tree species and stand structure in the area. Logged areas were divided into areas harvested during three time periods: 1979-1981 (> 15 years), 1985-1986 (>10 years), and 1993-1995 (< 5 years). Riparian areas sampled included logged and unlogged lakeshore, logged and unlogged riverside, and estuarine areas. Seektukis Reserve was also surveyed, and this area was logged in 1959 and 1967 (see Section 3.5)[3].

Three plots were conducted in clearcut, forest and estuarine areas. This number was chosen because three plots and travel comprised a full work day. At the river and lake edges, only two plots were conducted because they sampled a long strip of the habitat. A total of 56 plots were sampled throughout the field season (see Table 2.1).

Field methods were based on a similar study conducted in Nuxalk territory on the mainland of British Columbia (Lepofsky *et al.* 1985). We used a stratified random sampling design for vegetation surveys. In other words, within a selected area, plot locations were chosen randomly. We selected a random compass bearing and distance within the range of the selected habitat area from a random numbers table to locate the corner of the plot. In forests, logged areas, and estuaries, we set up 20 m by 20 m plots while at lake and river edges, plots were 80 m by 5 m parallel to the water edge (see Figure 2.7).

Data collection in each plot included general comments about the area as well as more detailed measurements on plants traditionally used for food and material purposes. Among our data for each site, we included names of all species present, descriptions of all visible damage to the area, signs of animals, accessibility, restoration comments, decay stage of down wood, and any other notable features. We estimated canopy closure within

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[3] Of the three plots conducted in Seektukis Reserve, one was located in a selectively logged area that contained large trees (near the ocean), while the other two were in a clearcut area that had single aged trees with a dense canopy. Thus, Seektukis Reserve was considered to be a unique habitat during this field work.

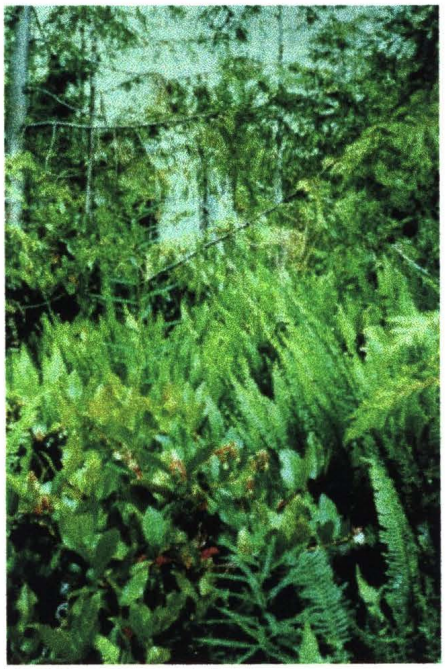

Figure 2.6: Examples of the habitat-types sampled in the Atleo River watershed during field work including old-growth forest, recently logged areas, and riparian habitats such as

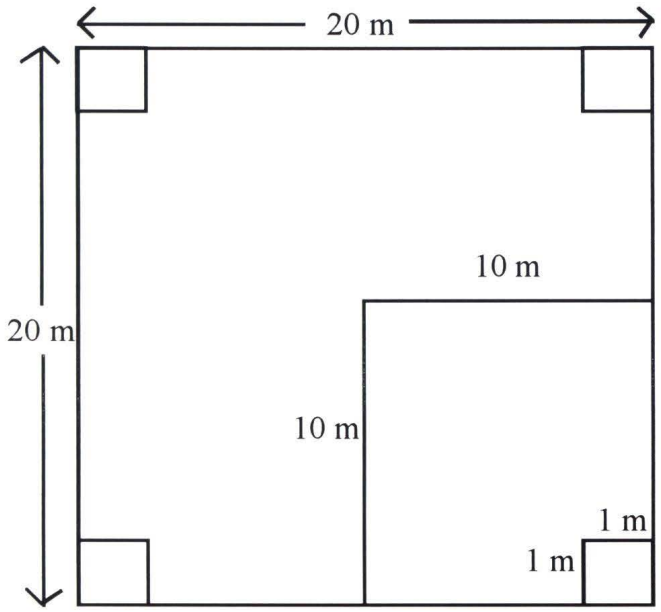

Figure 2.7a: Plot dimensions used to sample vegetation in forests, clearcuts and estuaries. *Not to scale.*

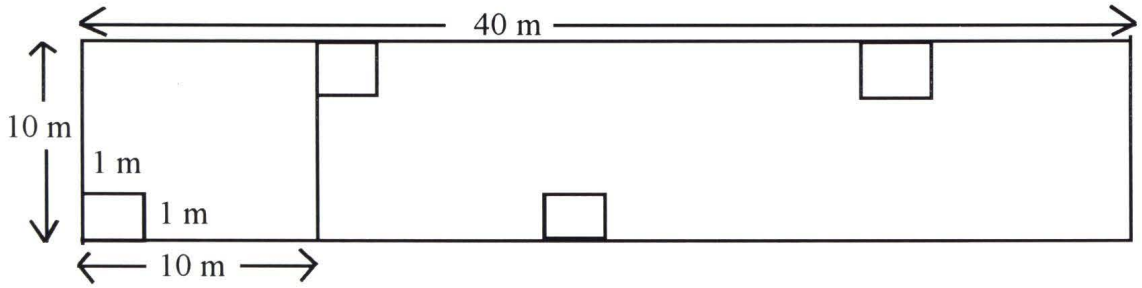

Figure 2.7b: Plot dimensions used to sample vegetation at lake and river edges. *Not to scale.*

Table 2.1: Vegetation plots by cover types sampled in the lower Atleo River Watershed in 1996.

Habitat-type	Habitat	Side of watershed	# areas	Total # plots
Riparian	Estuarine	east	1	2
		west	1	2
	Lake - logged	north	1	1
		south	1	1
	Lake - unlogged	east	1	1
		west	1	1
	River - logged	north	1	2
		south	1	2
	River - unlogged	north	1	2
		south	1	2
Forest	Cedar-hemlock	north	1	3
		south	1	3
	Hemlock-amabilis	north	1	3
		south	1	3
Logged	< 5 years ago	north	1	3
		south	1	3
	> 10 years	north	2	6
		south	NA	
	> 15 years	north	2	6
		south	2	6
	Seektukis reserve	north	1	4
TOTAL			**23**	**56**

assigned cover classes by a visual survey at the four corners and center of the plot. To determine the canopy closure for the plot, I assigned a numerical percentage based on the cover class, and the average of these measurements was used (see Table 2.2).

For each of the three cover layers (tree, herb and shrub), we recorded the percent cover of each species based on visual estimation (Luttmerding *et al.* 1990:112). Herbaceous plants which were present in a sampling area but not within any of the quadrats were assigned a cover value of .01% cover for the plot so that they were numerically included in the evaluation of the habitat but did not strongly influence percent

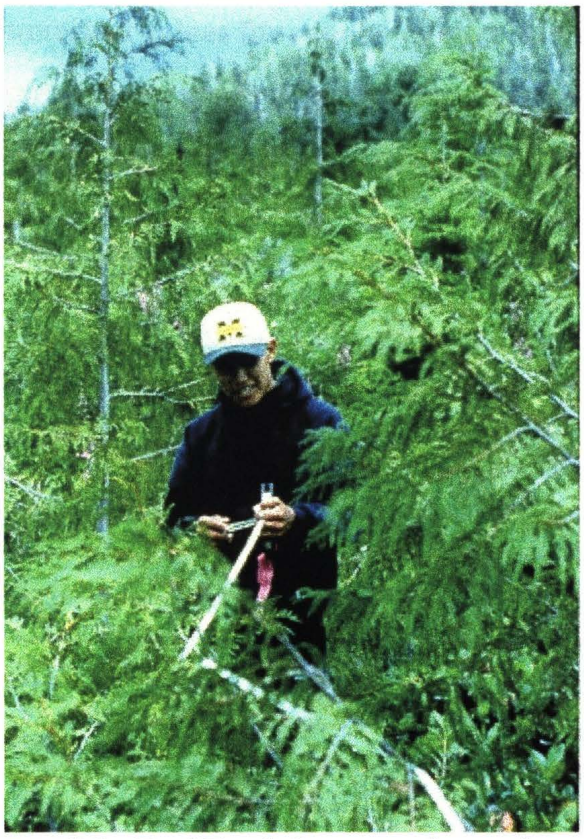

Figure 2.8: Paul Frank Jr. measuring a plot perimeter. This was one of the first steps in conducting a vegetation survey.

Figure 2.9: Daphne Frank marking the corners of the plot perimeter.

Table 2.2: Cover classes and assigned numerical values for canopy closure and vegetation cover estimations.

Canopy Closure or Vegetation Cover range	Cover Class	Absolute Value assigned for numerical calculation (%)
<1	0	1
	0+	3
	1-	5
1-20%	1	10
	1+	15
	2-	25
21-40%	2	30
	2+	35
	3-	45
41-60%	3	50
	3+	55
	4-	65
61-80%	4	70
	4+	75
	5-	85
81-100%	5	90
	5+	95

cover values for the area. As well as percent cover of plants species, we measured other attributes of plants with documented cultural significance for food and material purposes (Scientific Panel 1995a:33; See Table 2.3).

In the tree layer, we measured the circumference and estimated the height of each tree, and recorded additional comments such as the potential for cedar bark collection in the area. In addition, we made note of and roughly mapped any culturally modified trees[4], and took additional measurements on the size, aspect, and type of scar. Ahousaht researchers identified culturally modified trees based on their knowledge. In general, these trees have scars with most of the following characteristics (Arcas 1984): 1) no bark on the scar face; 2) large branches not present on scars; 3) tool marks; 4) scars start above

[4] A culturally modified trees (CMT) can be defined as "a tree which has been intentionally altered by Native people participating in the traditional utilization of the forest" (Arcas Associates 1984:1). Evidence of use includes scars from strips where bark has been removed, or where planks have been taken. These trees exemplify the sustainable way by which First Nations use forest materials and indicate past use of an area.

the base of the trunk; 5) scars typically long and tapered; 6) diameter does not normally exceed 60 cm at the time of stripping; 7) presence of multiple scars; 8) presence of scarred tree clustering and 9) usually in high-volume, dense stands of cedar.

Table 2.3: Culturally significant plants investigated in vegetation surveys. (For Nuu-Chah-Nulth and Scientific names, see Appendix D.)

Significance of plant	Species investigated	Measurements
Food:		
Berries	Alaskan and oval-leaved blueberry; bog cranberry; bunchberry; elderberry; gooseberry; red huckleberry; evergreen huckleberry; salal; salmonberry; saskatoon; thimbleberry; trailing blackberry; black raspberry; Pacific crabapple; wild currant; wild strawberry	berries/bush or berries/m^2; shoots/m^2; time to pick 500 ml
Shoots	salmonberry; thimbleberry; cow-parsnip*; horsetail*	diameter and length of five longest shoots
Teas	Labrador tea; wild rose; trailing blackberry	average # leaves/plant
Root/rhizome vegetables	Pacific silverweed; springbank clover	stems/m^2; time to collect 250 ml
Material:		
Basket materials	tall basket sedge; American bulrush; cattail; tule; stinging nettle	# stems/m^2; average height
Cedar bark	western red-cedar	observation of potential for cedar bark collection; CMTs
Floral purposes	evergreen huckleberry; salal; falsebox; sword fern; deer fern*	usable stems/m^2; height of 3 longest stems

* Specific data on these plant species were not collected but information on these culturally significant plants was interpreted from general vegetation data.

In the shrub layer, we took additional measurements on food plants, shoots, floral plants and teas. For berry plants, we counted the number of berries per bush for a typical bush in the plot. For pre-fruiting species, we counted flowers per bush and for post-fruiting plants, we counted berry-stem scars. In addition, we counted the number of stems

per m^2 for these species in a typical berry patch for the plot. For plants with edible shoots, we measured the length and diameter of the five largest shoots on a typical bush. Length of the shoot was measured from appearance at soil to tip of the shoot, which includes a longer length than the edible section. We measured the diameter of the shoot at its base.

For plants with potential floral uses, we counted the number of usable stems/m^2 with aesthetic value, based on our best judgment of their appearance. We measured the length of the three longest stems in a typical bush and calculated the average to provide a measurement for the plot. Although we considered collecting data on plant species used for beverage teas, none of these species were encountered in any of the plots.

In the herb layer, we measured fibrous and root vegetable plants. We counted the stems/m^2 and measured the average length of the leaves for plants with material purposes. We also counted the stems/m^2 for root vegetable foods. For all measurements in the herb layer, the average value for the four herb plots was calculated to provide one representative value for the plot. Field data were entered and analyzed on Microsoft Excel using the statistical tools package.

To determine whether categories of habitat-type were appropriate for classifying data, and to identify variables influencing the distribution of culturally significant plants, an ordination of the data was done. Data were analyzed using a detrended correspondence analysis (DCA) with rare plants removed. Most analyses were done with estuarine plots removed from the data set, since this habitat type was very different from the others. PC ORD was used for analysis (McCune and Mefford 1997).

2.5 Community interaction and benefits

As well as formal interviews and field work, the project encompassed many other activities which were important in achieving the goal of a community-based research project. In order to facilitate discussion on research involving traditional ecological knowledge, and to inform people of our activities, we attended several meetings and gave

presentations throughout the summer (1996). In June, we attended an Ahousaht Band meeting to introduce ourselves, explain our research activities, and gain direction from the community. At the end of the summer, we hosted a slide show at the Band Council office to share our research experiences, to present copies of raw data, slides, and aerial photos to the Band Council, and to acknowledge and thank the people who participated in the project. In early September, we attended staff meetings (both elementary and secondary) for the Maaqtusiis School teachers to tell them about the project and about the educational resources we had developed and were leaving in Ahousaht. In March, 1997, Arlene Paul, Dr. Nancy Turner and myself conducted a highschool program discussing Nuu-Chah-Nulth traditional ecological knowledge with the senior science students.

On several occasions we attended meetings outside Ahousaht, including a presentation to the Central Region Board and to the Aboriginal Liaison Officers for BC Ministry of Forests. In March, 1997, Dr. Nancy Turner and Juliet Craig presented a slide show on traditional ecological knowledge and this research project to the communities of Tofino and Ucluelet. We kept the Ahousaht Band Council informed of our research project by writing reports every two weeks which outlined our activities. We also wrote two brief articles for the local Ahousaht newsletter to introduce ourselves and our project to the community, and to acknowledge and thank those who helped us during the field season (see Appendix E).

During this project, we were committed to ensuring that the information we gathered would be accessible to the community of Ahousaht. We left copies of all our data forms, labeled slides, and aerial photos that we acquired with the Band Council office for them to use in any way they choose. We also developed a labeled plant collection mounted in photo albums which included the English, Latin and Nuu-Chah-Nulth names of plants, and information about some of their uses. We left these albums, along with a plant press and plant identification book, at the local school in Ahousaht. Raw data, in the form of excel spreadsheets, was transferred to the Ahousaht G.I.S. project (a village-based

and controlled geographic information system) for them to use as they wish.[5] As well, over 30 copies of the final report (Craig and Smith 1997) and two theses were left in Ahousaht.

2.6 Summary

This research project aimed to incorporate both scientific and traditional knowledge to learn about culturally important plants, their use and management, and their abundance. This project was conducted in the Atleo River Watershed, under the guidance of Dr. Richard Atleo, Chief Umeek of the Ahousaht First Nation. Field data was gathered using vegetation surveys which were conducted in various habitat types. Data included standard site and vegetation data and additional information on productivity and abundance of plants with food and material purposes.

The other important aspect of this research was speaking with knowledgeable people in and from Ahousaht. Topics discussed included past uses of the Atleo River watershed, traditional plant use and management, impacts of logging on traditional patterns of plant use, and issues surrounding research into traditional ecological knowledge. Every effort was made to conduct research in an ethical and appropriate manner, welcoming advice and suggestions from members of the Ahousaht community and by adhering to the *Traditional Ecological Knowledge Group: Draft Protocols for Researchers.*

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[5] For more information on the Ahousaht G.I.S. program, see "Validating Vernacular Knowledge: The Ahousaht G.I.S. Project" (Backus 1997:299-301).

CHAPTER 3: STUDY AREA

That belongs to Dr. Atleo, his family. They bathed in there. They got the things they need from the forest from there. That was their territory to look after, the Atleo family, that was their river. Still today...

Murray John

People of yesterday always emphasized the importance of ***ha hoolthe****. The knowledge of yesterday is going to be very important to our people.*

Stanley Sam
[Quoted in *Ha-Shilth-Sa*, June 15, 1995]

3.0 Introduction

The indigenous peoples of Clayoquot Sound have been living in the area for many generations. Over this time, they have developed a deep and meaningful relationship with the land. The physical and natural features of the area shaped and were shaped by their presence and interaction with the natural ecosystems. Land stewardship encompassed in the traditional system of *ha hoolthe*, ensured that resources were carefully managed and monitored within the well defined boundary lines between First Nations. In recent times, the area has changed considerably through intensive industrial logging activities. Describing the Atleo River watershed requires an understanding of these many aspects of the area, including the biophysical features, histories of the area, traditional forms of stewardship and use, and recent activities occurring in the watershed .

3.1 Biophysical features of the Atleo River watershed

The Atleo River watershed lies on the west coast of Vancouver Island, Clayoquot Sound, in traditional Nuu-Chah-Nulth territory (see Figure 3.1). Clayoquot Sound is a 260 000 hectare area composed of mountains reaching elevations of 1700 m and long inlets of up to 11 km (Archeo Tech 1991). The Atleo River watershed is approximately 2820 hectares and is located on the mainland of Vancouver Island, to the north-east of Flores Island. The lower watershed encompasses ecosystems from sea level, at the Atleo

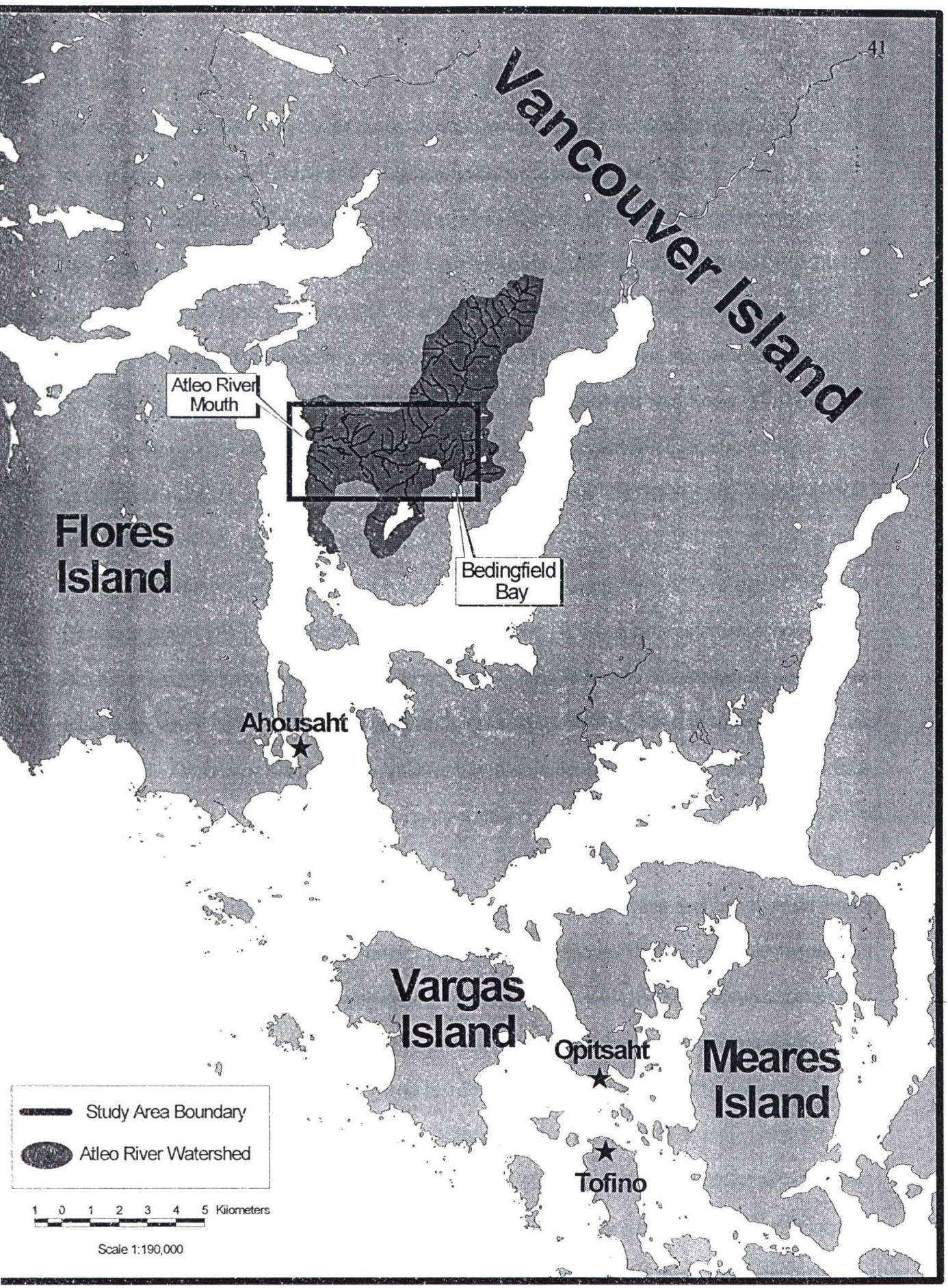

Figure 3.1 : Map showing study area for Atleo River watershed ethnobotany project.

River mouth and Bedingfield areas, to 896 m (see British Columbia Ministry of Forests topographical map 92E.040) at the highest local mountain peaks.

The watershed falls within the Coastal Western Hemlock Biogeoclimatic zone (Meidinger and Pojar 1991). Before industrial logging activity, this area was dominated by a continuous cover of western hemlock (*Tsuga heterophylla*), western red-cedar (*Thuja plicata*) and amabilis fir (*Abies amabilis*). Precipitation in this zone usually falls between approximately 1000 and 4400 mm annually (Meidinger and Pojar 1991:56). The most heavy precipitation occurs in December, with heavy rains or light snowfall characteristic of the area. July is the driest month for the CWH zone, with a characteristic precipitation of 16 mm to 150 mm.

The Atleo River watershed is comprised of two subzones of the Coastal Western Hemlock zone, CWH vm1 and CWH vh1. CWH vm1 is identified as being a very wet maritime area, having a mean annual precipitation of 2787 mm, and ranges in temperature from a mean of 0.3° C in the coldest months to a mean of 16° C in the warmest (Klinka *et al.* 1991). Dominant plants in this subzone include western red-cedar, western hemlock, amabilis fir, deer fern, salal, heart-leaved twayblade, false azalea, Alaskan and oval-leaved blueberry, and bunchberry (Pojar *et al.* 1991). CWH vh1 is referred to as a very wet *hyper*maritime climate. This subzone is found at higher elevations and has a mean annual precipitation of 2951 mm, being wetter than vm1. Similar to CWH vm1, this subzone is characterized by the following vegetation: yellow-cedar, western hemlock, western red-cedar, Sitka spruce, deer fern, false lily-of-the-valley, salal, heart-leaved twayblade, Alaskan and oval-leaved blueberry and bunchberry (Pojar *et al.* 1991).

Within the Coastal Western Hemlock zone are two primary forest types: the hemlock-amabilis (HA) forest and cedar-hemlock (CH) forest. Hemlock-amabilis forest type is the main habitat at the floor of the watershed near the river. As the name implies, these forests are dominated by western hemlock and amabilis fir trees. Dominant plants include blueberry, salmonberry, red huckleberry, deer fern and sword fern. Cedar-

hemlock forest is the dominant forest type for most of the remainder of the watershed, especially the areas on the mid- and upper-slopes. Although cedar-hemlock forests are similar to hemlock-amabilis in terms of structural diversity, CH forests are more prone to blowdown so there are more canopy openings, woody debris and wildlife trees. The understory is dominated by salal and deer fern.

Until 40 years ago, the Atleo River watershed was a continuous cover of old-growth forest. This type of forest has a diverse structure which includes trees with a variety of sizes and heights, from young seedlings to trees as tall as 95 m, allowing for wildlife trees and diverse habitats. Tree branches are laden with moss, and there is a diversity of undergrowth. Gusting winds are the primary natural disturbance, causing fallen trees which allow patches of light to penetrate the forest canopy. Down wood decomposes fairly readily and many turn into nurse logs which provide nutrients and habitat for species such as western hemlock seedlings and red huckleberry.

The meeting of marine and terrestrial ecosystems in Clayoquot Sound provides a multitude of rich and diverse habitats. The river mouths open into the ocean, creating mudflats and estuaries. Forest meets the ocean at the west, south and east sides of the watershed, providing intertidal zones. Barra Lake and the four-kilometer Atleo River provide riparian habitats for freshwater species. Riparian areas tend to be very diverse in terms of the number of vascular plant species, and have been considered "hotspots of diversity" (Alaback and Pojar 1997:75). Abundant water tends to provide these habitats with nutrient-rich sediments and organic debris, making the soils rich and fertile. A mosaic of habitat types within these zones is provided by complex disturbance patterns.

As well as old-growth forest and riparian areas, clearcut areas provide a third broad habitat type in the Atleo River watershed. Intensive logging activity over the past twenty years has dramatically transformed the area and created a multitude of second-growth forests (see Section 3.5). These are primarily of three age classes: less than 5

years (cut in 1993-1995), 10 years (cut in 1985-1986) and greater than 15 years (cut in 1979-1981) (see Section 3.5).

Western hemlock forests have low species richness but high productivity compared to other temperate rainforests that have been studied (Alaback and Pojar 1997). It has been estimated that over 4500 species of plants and animals inhabit Clayoquot Sound (Darling and Keogh 1990). The diversity of animal life ranges from gray whales and northern fur seals in the sea, to Roosevelt elk and black bears on land. Smaller animals, such as the silver-haired bat, clouded salamander and deer mouse are important parts of the complex ecosystems. In the Atleo River watershed, black-tail deer, river otters, bears and waterfowl (including Canada geese and unidentified ducks), have been known to inhabit the area, particularly near Barra Lake (Moir 1976).[1] Twenty-four bird species have also been identified in the area during field surveys in 1976, including winter wrens, varied thrushes, Stellar's jays and rufous hummingbirds (Moir 1976).

The forest itself is an intricate web of interactions and habitats. Krajina (1975:4) described the coastal western hemlock forest as a "highly complex ecosystem which remains at or approaches a dynamic equilibrium, and in which all the components (plants, animals, micro-organisms and non-living substance) closely interact, forming an inseparable web-like network". Ongoing natural disturbances, such as wind blown trees creating gaps in the forest canopy, constantly transform the forest ecosystem (Lertzman *et al.* 1997).

3.2 Histories of the Atleo River Watershed

Klah-keest-ke-uss (Chief Simon Lucas) from the Hesquiaht First Nation described old-growth forest (Lucas 1989:44):

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[1] It is very possible that these animal populations were impacted by forestry practices since the conclusions of this report stated that habitat protection and wildlife consideration are presently "unimportant and need not be considered in the logging plans" (Moir 1976:8).

> *Most importantly, old-growth forests are areas which are full of life; in which 'life' in all its wonderful diversity is immanent. Old-growth forests have a tremendous variety of life forms, layered from the tops of the highest trees to the deepest parts of the living soil. The decay which is an important part of old-growth forests provides a great variety of different habitats. It is this aspect of old-growth forests - the fact that they are so full of life - that forms the basis of their social, cultural and environmental importance.*

Human interactions with the forests of the Atleo River watershed have been occurring for thousands of years. Learning about the meaning and histories of the Atleo River watershed is an integral component of describing this study area within Ahousaht traditional territory. As Stanley Sam told us:

> *... history always tell the [truth], that's the most important thing when your try to talk of something. History always bring up the truth of everything.*

The Atleo River watershed originally belonged to the Otsosat First Nation. It was a rich watershed that provided an abundance of food and other resources.

> *...they [Ahousaht] didn't own this territory of Flores Island and all this inlet, Moyeha, White Pine and Atleo River, (what histories you want), and Megin. That was the territories of Otsosat, that time before for thousands of years these people owned this territory.* (Stanley Sam)

> *So, we're beginning now to talk about Atleo River. I said earlier that it belonged to Otsosat Nation. A great big tribe that had as many as 10 000 members all through. Each one of those rivers belonged to certain families and they were from that nation, Otsosat Nation.... Otsosat owned all that whole area, that part of Clayoquot Sound. They wouldn't allow any other tribe to come in at that imaginary boundary line. If anybody passed by that boundary line without permission, they killed them. Or chased them away, told them not to go any further than that line, that imaginary line.* (Earl Maquinna George)

According to Stanley Sam, the wars between the Ahousaht and Otsosat First Nations began in the early nineteenth century.[2] At that time, he notes, the Ahousaht people owned relatively few salmon streams. One of the Ahousaht *mus chum* (tribal members), *Hayupinutl*, was married to an Otsosat woman. He asked for permission to fish within the Otsosat *ha hoolthe*. As Stanley Sam said:

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[2] For a more comprehensive account of this war, see Bouchard and Kennedy (1990:224-241).

*And when **Hayupinutl** told his wife, "go and see your father [who was Otsosat], see if he can share any of his rivers." The Ahousahts were starving at that time. They were starving, they were short of food. And that's why he wanted to ask. But when she come back [her] father said, "no you can't. That's our **ha hoolthe**. You have your boundary line out there. Where it lays you stay on that side." Every time Ahousaht tried to fish over the line, an Otsosat used to cut their lines when they were fishing. Or sometimes they'd find them in a herring spawning at Bawden Bay. The Otsosat would kill them there... So that's how important the **ha hoolthe** is... Still is today. Very important to us, our boundary lines. Still is today. We still respect that boundary line. It's been respected for thousands of years, that boundary line called **ha hoolthe**.*

The war started in 1804 or 1811[3] according to your book... your history book. Going by that at the time they started when a Tla-o-qui-aht blow the ship up behind Leonard island called Tonquinn. And we look at that year, that's the time the war started.

Prior to the wars between the Otsosat and Ahousaht, Ahousaht people lived primarily on western Vargas Island and in the Calmus Passage and Cypress Bay areas (Kennedy *et al.* 1993). Since the wars, several Nations, (including Keltsomaht, Quatsweaht, Owinmitisaht and Manousaht) amalgamated to form the Ahousaht First Nations. As Murray John explained:

What happened was there was three different ...bands, I guess we could call it. The Keltsomaht, Manousaht, and Ahousaht. They joined together as one. That's why there's so many Ahousahts. So the rivers that [were] owned by the different bands, Ahousaht owns them all now. I don't know how many rivers we got. Thirteen rivers, I think we own, Ahousaht.

The wars were devastating to the Otsosat First Nation and the population was virtually exterminated. Thus, it is difficult to learn of the ancient history of the Atleo River watershed through oral testimony. However, many histories of the watershed and surrounding areas from the time of the wars, approximately twelve generations ago, are known by Ahousaht elders.

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[3] Stanley Sam relates the start of the war as occurring at the same time as the destruction of the Tonquinn, a ship which was lost in July, 1811 (Lillard 1987).

According to Earl Maquinna George, during the wars, the Atleo River was settled by Maquinna. He states that:

> *Maquinna settled at the Atleo River. He said "I choose this spot as my homeland, my new homeland, because of the richness of fish going up that river, because of my contribution to our war... with Otsosat Nation". And so Maquinna built a house [at the mouth of the Atleo River] and started a family.*

Maquinna's life there was interrupted when members of the Otsosat Nation attacked him and killed his wife. Maquinna escaped by traveling up the Atleo River watershed and over the ridge to Shark Creek. The wars continued until the Otsosat Nation was "virtually exterminated" (Earl Maquinna George). Stanley Sam expressed the meaning of the Atleo River watershed territory:

> *And on that day [after the wars], Ahousaht's move into the territories of Otsosat and now we have titles of all the inlets, what the Otsosat owned one day. So this is something that people have to understand, why our people and how they got the titles of our inlets of Clayoquot Sound. And it's good to let these people know about how we respected our Chief at that time. And now it's taken care of by Atleo's, the territories of war...*
>
> *This means that... we have all these histories behind us to prove how we own territories...around us by war. Which caused us a lot of blood. Lots of people aren't here today on a count of that war, Ahousaht. So this place and this territories, Atleo River, it wasn't given to us. It was a struggle of war. And that's how we own the territories.*

3.3 *Ha hoolthe* ownership of the Atleo family

The wars between Ahousaht and Otsosat occurred during the time of *Kwat-sits-mak-nee*, an ancestor of Dr. Richard Atleo. According to Stanley Sam, the great warriors, *Kamina* and *Hayupinutl*, conquered Otsosat territory, which included the title of the Atleo River watershed *ha hoolthe*, and handed it over to *Kwat-sits-mak-nee*'s son, *Ah-in-jit*.

> *...So **Kamina** and **Hayupinutl** took lots of territories. Because they were the head warriors at that time. And they, the people, was very jealous of **Kamina** because he wasn't the chieftain but he was a great warrior... And [**Kamina**] said to the people "Now, today, I'm giving all what I claimed through the war to **Ah-in-jit** [son of **Kwat-sits-mak-nee**]. He's going to be the one. Take care of this war*

territory." So that means the Atleos got that rights to look after the war territory because it was transferred to him from ***Kamina****.*

Before *Ah-in-jit*, Stanley Sam notes, the title of the Atleo River *ha hoolthe* was transferred to *Ah-in-jit*'s father, *Kwat-sits-mak-nee*, who was killed during the wars.

Otsosat come down. They must've been hiding up the river of Atleo River. They come down and they attacked Ahousaht at midnight, mid-dark. But ***Kwat-sits-mak-nee*** *got all stabbed up. His son escaped and what happened was... [****Kwat-sits-mak-nee****] died. That's how* ***Ah-in-jit*** *took over his father's place. So this is the histories of that place, of Atleo's.*

Through this hereditary line of chieftainship and title, the Atleo River watershed became the *ha hoolthe* of Umeek (Dr. Richard Alteo), one of the hereditary chiefs of Ahousaht and a descendant of *Kwat-sits-mak-nee*. Stanley Sam recounted the early ancestral lines of the forefathers of Umeek: Title was passed from *A-ik-wash-in* to his son, *Ha-shi-ak-mis*, to his brother, *Tah-u-nism*, to his son *Wa-su-up* and then to his son, *Kwat-sits-mak-nee*.

Ha-shi-ak-mis *was the son of* ***A-ik-wash-in****. And that's the timing of the splitting of the chiefs, three chiefs. I'm talking about twelve generations back... And there was 10 brothers in that family what* ***A-ik-wash-in*** *had... He was teaching all he can to his sons but only one that really minded him was named* ***Tah-u-nism*** *and was the youngest brother of all ... And after years went by,* ***Ha-shi-ak-mis*** *owned alot of territories. And after when* ***Ha-shi-ak-mis*** *for years he used to share with his people. He was very generous like his father,* ***A-ik-wash-in****.*

Ha-shi-ak-mis *was a generous chief. And he got sick. And he said to his brothers, he asked them, "who loves me the most? Tell them to come and see me." His brother, older brother, just asked to transfer all the ownership of* ***ha hoolthe*** *to him but he didn't say a word. And the second one said little bit. Didn't offer too much at all. But the third one, he offered to buy it off him. To give him something on his death bed.*

But ***Tah-u-nism*** *come in with two big canoe loads of warriors. And asked, he said, "I come here to sit with you and share things what we can. I have lots of respect for you as a brother. I know that you're going now." And he said "When you pass on, I will have two dead whales on your burial site. I'm going to have two dead whales there. And I'm not going to touch or let the people touch it. Let it rot there. That's how much I respect you as you're my brother. And I will invite 10 tribes of Nuu-Chah-Nulth to announce your burial. Your funeral."*

Figure 3.2: View of the project study area, Atleo River watershed.

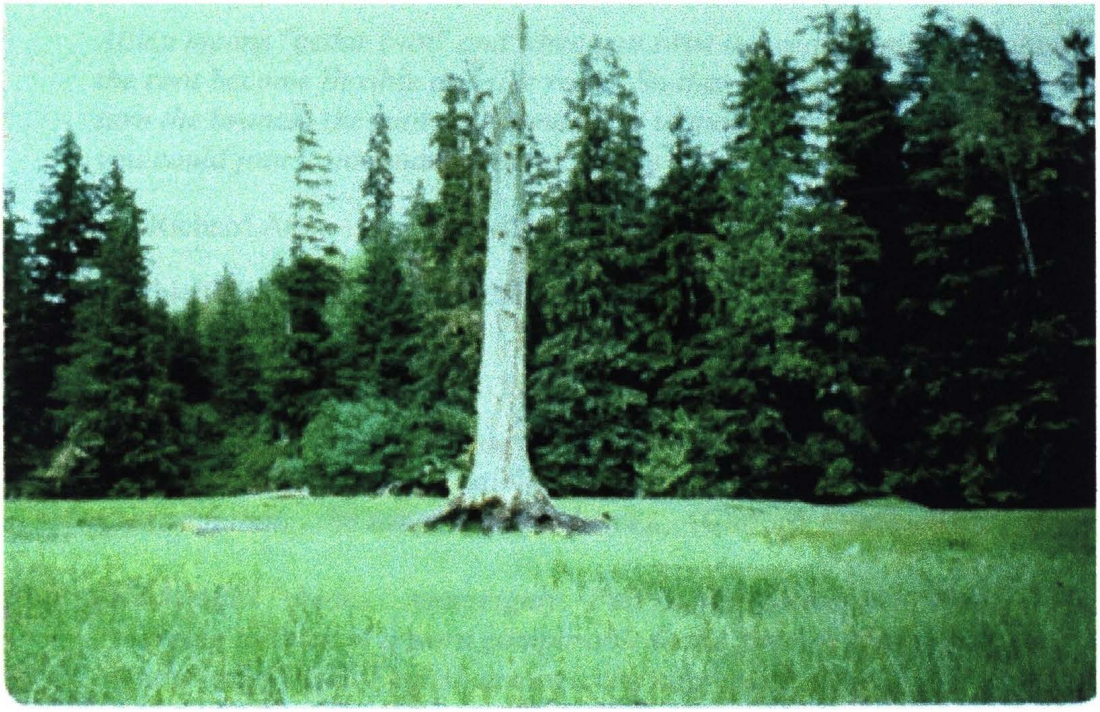

Figure 3.3: View of the mouth of the Atleo River. This area was formerly the site of a fall fishing village.

*So when **Tah-u-nism** mentioned all these things to his brother and he sitst up, the very sick man sit up, **Ha-shi-ak-mis** said to him "now what I owned, all the **ha hoolthe**, you will have it all" he said to **Tah-u-nism**, "that you showed the respect of me, that you showed all the respect you will have the titles of all the titles I had **ha hoolthe**. So he said "but leave your elder brother with just the name of chieftainship." So that's the way it went... **Tah-u-nism** is the title owner of **ha hoolthe** in our tribe of Ahousaht...*

*Now after **Tah-u-nism** got a son named **Wa-su-up**. And **Wa-su-up** got a son named **Kwat-sits-mak-nee**. Had become the third chief of our band Ahousaht. That's why we're three chiefs today, because it happened many generations back.*

Thus, the Atleo River watershed *ha hoolthe* has been passed on from *A-ik-wash-in* through the hereditary lineage to its current ownership, Dr. Richard Atleo. Earl Maquinna George (personal communication, June 10, 1997) explained that the name *Atlieu* came from the time of the wars and that it refers to the strength and other qualities of the cedar root.

Atlieu means "cedar root" and when you twist the cedar root the stringy parts of the root become flexible and like rope. So that when you make length of it, you turn the branch, the root, back and forth to make flexible and not break so that you could join it into many lengths, splice it, and make it into rope.

Dr. Richard Atleo is recognized by Ahousaht First Nations as having the traditional chieftainship rights to this land. People from Ahousaht spoke of the meaning of *ha hoolthe*:

***Ha hoolthe** is such an all encompassing word. **Ha hoolthe** means the ownership and jurisdiction of all that belongs to a chief. Land, resources, people. All that goes with that... the songs and the dances.* (Clifford Atleo)

*[**Ha hoolthe**] means... sovereignty. Full rights. Ownership. **Hawiilh** meaning ... I'm trying to think of a word comparable to the English language. Well the highest order in the English crown is the king and the queen. That's exactly how high the **ha hoolthe** is to our people.... and one of my grandfathers used to say it means the same idea as you would say the king and the queen of the land.* (Earl Maquinna George)

> ***Ha hoolthe*** *is what you see across there. Mountains and lands.* ***Ha hoolthe.*** *That belongs to the hereditary chiefs.* (Murray John)

The concept of *ha hoolthe* also includes a sense of stewardship. As the late Roy Haiyupus, a Nuu-Chah-Nulth participant on the Scientific Panel stated, the concept "indicates... that the hereditary chiefs have the responsibility to take care of the forests, the land and the sea within his *ha hoolthe* and a responsibility to take care of his *mus chum* or tribal members" (Haiyupus 1992 from Scientific Panel 1995a:9).

3.4 Past use of Atleo River watershed

As well as through oral histories, evidence of the past use of the watershed can be found through archeological and archival information. In the area at the mouth of the Atleo River, shells are present in the dirt floor of the forest approximately 30 m from the shoreline, suggesting a shell midden site and indicating that the area was an early village site.[4] Both the late George Louie and the late Peter Webster identified the area as *7ahnikwus*, a former camping and clam digging area (Bouchard and Kennedy 1990:319). Although there has been no formal archeological investigation at the Atleo River watershed, a shell midden has been identified at *mutskwi7as* (Salmon Creek) and at *mamach7aktlnit* (Shark Creek), north of the Alteo River mouth, indicating that such sites are likely to be present in the Atleo River watershed (Wilson 1988).

Other historical information, particularly about plant use in pre-contact times can be gleaned from writings of early Europeans. Berries were described as a food resource, including many species of *Vaccinium*, elderberry, strawberry, and salal (Turner 1978). Root vegetables, such as licorice fern, northern rice-root, and wild clover, are also recognized as foods in Captain Cook's early writings. Items that were made from plants are also described in the diaries, including materials such as western red-cedar and yellow-

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[4] It is presumed that sites along the existing shoreline date to the last 4000 years and that older sites will be inland on old raised beaches (Wilson 1988).

cedar bark, yew wood, and basket sedge. Indeed, all the foods, medicines, and materials that were necessary for life were provided by the forest and surrounding oceans.

A dramatic change in history occurred in Clayoquot Sound after 1774, when Juan Perez, a Spanish explorer, arrived in the area followed by Captain James Cook in 1778 (Lillard 1987). With the arrival of Europeans began the Maritime Fur Trade during which sea otter pelts were bought from local peoples and sold in China for large profits. In 1790, the Nootka Convention between Britain and Spain provided equal rights for these countries to deal in fur with Nuu-Chah-Nulth Nations. There is little written information of histories of the area during the following 50 years (Heizer 1975: Lillard 1987).

In 1860, a saw mill opened up in Alberni (which is today Sproat Lake and Port Alberni). At this time, Captain Edward Stamp, a master mariner from England, reached the west coast of Vancouver Island with two timber surveyors. Five years later, the mill closed down, a failure attributed to the location of the mill and the scarcity of first-rate timber (Lillard 1987). Gilbert Malcolm Sproat, a business pioneer, predicted that this mill would be the first and last of industry of its type and size ever to be built on Vancouver Island (Lillard 1987).

Little information exists regarding the Alteo River watershed during these times. According to the notes of Gilbert Sproat, in 1864 Europeans visited the village of Seektukis (at the mouth of the Atleo River) with orders to destroy all the house and canoes (Lillard 1987). Supposedly, members of the Ahousaht First Nation were accused of destroying the trading schooner, the *Kingfisher*. At this time, Seektukis was said to be the residence of *Ayah-kahchitl*. In a despatch from Rear-Admiral Denman to the Governor of Vancouver Island, Denman states:

> *On the 3rd [October, 1864], I proceeded up Herbert Inlet to Moo-yah-kah, and sent the Devastation to Sik-tok-kis [Seektukis], Obstruction Inlet, and Shelter Arm, with orders to destroy the canoes, houses, &c., but not to fire on the natives unless resistance were offered. Commander Pike was not able to find the village in Destruction Inlet, but he destroyed Sik-tok-kis and those in Shelter Inlet, and*

> *found in each of them letters, accounts, and other property belonging to Kingfisher (Lillard 1987:133-134).*

Written histories of Seektukis are sparse after this time. The area was visited in 1889 by reserve Commissioner Peter O'Reilly and was established as Indian Reserve No. 24 shortly thereafter. At the time of his visit, Peter O'Reilly noted that there were five houses at the mouth of the river when he designated this reserve (Bouchard and Kennedy 1990). The establishment of this reserve, like other reserves in the area, represents, among other things, the misunderstanding of the full use and value of land to First Nations. As Sproat writes about the attitudes of American woodmen:

> *They considered that any right in the soil which these natives had as occupiers was partial and imperfect as, with the exception of hunting animals in the forests, plucking wild fruits, and cutting a few trees to make canoes and houses, the natives did not, in any civilized sense, occupy the land (Lillard 1987:7-8).*

The lack of understanding and the differing views of land use is further exemplified by Sproat, who justifies European settlement by stating that "all the land lying waste without prospect of improvement" (Lillard 1987:8). Today, the Ahousaht land base is comprised of 24 reserves with a total of 1370 ha (Archeo Tech 1991).

After the establishment of the reserve, several families continued to live in the area. In 1914, there were more reports of five houses present at the Seektukis reserve. It was reported that people stayed there for the fishing season in the fall (Canada and British Columbia 1914a as cited in Bouchard and Kennedy 1990). The late Peter Webster and the late George Louie recalled several houses in the area north of the river mouth in the 1920's (Bouchard and Kennedy 1990). Among these was a large smokehouse belonging to "Old kiista" who was Chief Atleo's (George Shamrock's) father. The late James Swan remembered a smokehouse in the area in the early 1940's belonging to John Keitlah's father as well as other houses standing in the area (Bouchard and Kennedy 1990).

Trudy Frank, aunt of Dr. Richard Atleo, recalled that her grandfather used to have a big smokehouse at the Atleo River mouth and they would go there with his wife every

fall to catch and smoke fish. She remembered another couple who lived there in a smokehouse during their stays at the river mouth. Stanley Sam also recalled fishing and hunting activities in the area:

> *They had a lot of fish traps that was stakes on the beach when I was young yet, I used to go there hunting some times. And these people... Atleo's moved there to live there, some of the people went there with them. I know Titians lived there some time, but to gather lots of clams on the beach there. It's a very rich place for food.*

Although the Atleo River watershed is most recognized for its marine resources and fishing activities, plants were an important part of the past use of the area. For example, when Trudy Frank discussed the activities of her relatives smoking fish at the Alteo River mouth, she said, "They were so particular about what kind of wood to burn, it was always the alder they'd use". She also recalled the careful and sustainable use of these resources, even at a time when they were abundant:

> *My grandfather used to have a big huge smokehouse at Atleo River... They used to go there in the fall, get all the fish, they can and smoke them. They used to make these [baskets], what they call* ***yahaak*** *out of cedar bark, and they'd make them about that big, almost like a container... Maybe about that long [one or two feet], square... and that's where they used to put their [fish] ...they saved every little piece, my grandma used to, she used to just amaze me! She never ever threw hardly anything of the fish away. I guess because it was such hard work for them... Then she'd string them in a stick, like this piece, she'd put a stick through it, and she'd have them hanging there... In them days fish were plentiful, but still, you know, we were not ever wasteful.*

The remains of shellfish are seen in the midden-like site at the river mouth. The preparation of these shellfish undoubtedly included the use of plants. For example, these shellfish may have been cooked by layering them with thimbleberries and pressing them with planks to make clam-and-berry cakes which could be dried and stored (Koppel 1985). Cedar matting was used to steam salmon (Clutesi 1967). Sphagnum moss was used for wiping and placing fish upon; other plants were used to lay fish upon and keep

them clean such as sword fern, and hedge nettle (Turner and Efrat 1982). Wild black currant and salmonberry sticks were used for salmon spreaders when barbequing salmon as these woods do not easily burn (Scientific Panel 1995b) and ocean spray wood was used for making skewers for drying clams (Scientific Panel 1995b).

Seafood gathering equipment included yew wood and crabapple for clam-digging sticks (*ch'iityak),* red-cedar or Douglas fir for sea-urchin spears *(t'utsḥtaa)*, and stinging nettle, red-cedar, cherry bark and spruce root for sea urchin dip nets (*ts'miiḥtama*) (Ellis and Swan 1981). The clam-digging stick used to collect shellfish, *chi'iityak*, was also made of plant material, usually yew or crabapple wood (Ellis and Swan 1981). Devil's club and red elderberry stems were used for carving fish lures and catching octopus (Scientific Panel 1995b).

Many types of wood were used for fishing and related activities (Scientific Panel 1995b). Red-cedar was used for canoes, boxes, and fishing weirs. Red-cedar withes were used for baskets, ropes and fishing traps. Yellow-cedar wood was used for paddles and boxes. The knots from Douglas fir, amabilis fir, grand fir, and hemlock were used to make hooks for halibut fishing. Vine and Rocky Mountain maple were used to make parts of salmon weirs. Stinging nettle fiber was used for fishing line and nets and hemlock bark was used as a preservative for fishing line.

At least two species of non-native plants were cultivated at the Atleo River mouth — domestic cherry trees (*Prunus avium*) (from trees likely planted by owners or inhabitants of the smoke houses of the past) and potatoes (*Solanum tuberosum*) which were mentioned by commissioner Peter O'Reilly in 1889 (Bouchard and Kennedy 1990). According to the late George Louie (Bouchard and Kennedy 1990) there were "lots and lots of wild crabapples" in the area just south of the river mouth. However, nobody picked these fruits because "silver haired giants" were thought to live there. The late George Louie recounted that Chief Atleo [George Shamrock] told him never to go there

because of the giants. He also recounted that a sasquatch was once seen in the area coming out of the bushes (Bouchard and Kennedy 1990).

It is possible that other areas near settlements had crabapple trees that were cut down in the 1800s. Gilbert Malcolm Sproat, a pioneer businessman wrote in 1868 (Lillard 1987:43):

> *The natives are as careful of their crab-apples as we are of our orchards; and it is a sure sign of their losing heart before intruding whites when, in the neighbourhood of settlements, they sullenly cut down their crabapple trees, in order to gather the fruit for the last time without trouble, as the tree lies upon the ground.*

Direct evidence of sustainable use of plants in the past is suggested by the presence of culturally modified trees (CMTs). These trees, which are living trees with some part of them removed (e.g. bark, wood plank), provide living testimony of sustainable plant harvesting. Although a comprehensive inventory of CMTs in the Atleo River watershed has not been conducted, we located 14 CMTs in the watershed during our field work. Thirteen CMTs of western red-cedar were identified near the edge of Barra lake in the forest areas on the northeast and northwest sides of the lake and one was located in the forest adjacent to Bedingfield estuary. Although we did not obtain dates for the trees during this research project, those on Meares Island, which falls partially within Ahousaht territory, were dated from 1642 to 1948 (Arcas Associates 1984).

Although none of the elders we spoke with had specific memories of cedar bark collecting in these areas, there have been accounts of people living at Barra Lake and Bedingfield estuary which are the areas in which CMTs are present. The late George Louie recalled that a woman had a house at Barra lake where she stayed while fishing coho (Bouchard and Kennedy 1990). The late Peter Webster recalled his uncle going to this lake to fish. According to Stanley Sam, the area at Bedingfield Bay, known as ***t'a7aa***

was formerly an Otsosat winter village and was occupied by the Otsosat (Bouchard and Kennedy 1990:329).

No CMTs have been recorded on the west side of the Atleo River watershed such as in the Seektukis Reserve and surrounding area. The area around the Atleo River mouth and to the north and south has been extensively logged so it is not surprising that CMTs are not present. However, it is likely that CMTs were present in the area before logging occurred since numerous CMTs have been identified on the western side of Shark Creek (also known as MacGregor Creek) watershed just north of the Atleo River. In a survey done in this area in 1994, 59 CMTs were identified including stumps, bark-stripped cedars, planked windfalls and stepped stumps (Arcas Consulting 1995). CMTs have also been identified in the area 500 m east from the mouth of Millar Creek, just south of the Atleo River mouth (Arcas Consulting 1995). Forty-six CMTs were identified in this area, including stumps, planked logs, an aboriginally-chopped standing cedar and bark-stripped cedars.

The physical and oral evidence of use and history is only one aspect of the importance of the Atleo River watershed. A less tangible but extremely important value of the land is its spiritual significance. For example, when describing the Atleo River to Randy Bouchard and Dorothy Kennedy (1990:319), the late George Louie recalled a large rock near the northern boundary of the Seektukis Reserve with a hole on top of it. He said that if you put your hand in this hole and stir it around, there will be a southeast storm (Bouchard and Kennedy 1990:319).

Dr. Richard Atleo emphasized the importance of Sacred Areas during his work with the Scientific Panel. He states (Scientific Panel 1995a:21):

> *Sacred Areas are pivotal to Nuu-Chah-Nulth culture. They are important to the well-being, survival, and sustenance of the Nuu-Chah-Nulth in the same way that any logging company may consider forests to be [to the company's survival].*

Spiritual places and their significance, histories, and use are not always public information. There may be several spiritual places in the Atleo River watershed that were used as traditional prayer pools or other areas. Although this information is not always recorded or publicly shared, these values of land and place are highly important. Murray John indicated that spiritual sites are in the Atleo River watershed:

> *...That waterfall at Atleo River... I heard, my dad used to talk about it, he was friends with the chief, they sit there for days before they go out whaling. Soak in the river, pray in the river, pray in the mountains, in the valley up there... The Indians must have used to go a long way up in the back just to pray, get medicine from back there.*

Although the Atleo River watershed is not visited as much as it was in the past, it is still an extremely important area to the Ahousaht people. After visiting the Atleo River watershed as part of this research project, Dr. Richard Atleo described a spiritual experience that he had there:

> *Then when we went to the Atleo River and we sat in the forest, I had an experience there. It felt as though I was home. It felt like home to me. And that was very surprising because I never lived there. To my knowledge, I never lived there. But there is... it's hard to explain the kind of feeling, feeling at home, feeling... there was a strong sense deep within side of me that felt very good, that felt very warm...*

3.5 Recent use of the Atleo River Watershed

Due to the provincial government's forest tenure system, the traditional ownership system of *ha hoolthe* has been disregarded in modern resource use and extraction. With the exception of the Seektukis Reserve (I.R. 24) at the mouth of the Atleo River, the lower watershed falls under the timber license of MacMillan Bloedel. Tree Farm License No. 44 (which includes the Atleo River watershed) was granted to MacMillan Bloedel in 1955 by the BC Provincial government. The license provides exclusive rights to log in

more than half of Clayoquot Sound. Clifford Atleo explained why he felt this tree farm license did not include First Nations' interests nor long-term sustainability:

> *... TFL 44 is the major part of the Central Region of Clayoquot Sound. But that same TFL actually flows into Port Alberni and into Bamfield where one of our tribes has 76 000 hectares of forested land. They have estimated that six and a half cubic meters per hectare grows within their region. And so they're saying, based on that, the sustainable level of cut should be at least 250 000 cubic meters a year. But instead what M & B is proposing because that's their TFL is 700 000 cubic meters a year which puts a definite ceiling on how long that forest is going to last and it's about 30 years. And they're saying " uh" [no]. And what they've done and what our problem is that TFL crosses all boundaries, TFL 44. And they don't really care if they've lost anything in the in the Central Region because they can pick it up elsewhere and that's exactly the way they plan. And we had to say "no, you can't do that because that's unsustainable, it excludes First Nations' interests of special sites, sacred sites, medicinal sites, and CMTs".*

Due to the changes in responsibility between the licensee and the government under Timber License agreements in the last few decades, responsibilities of MacMillan Bloedel have varied. In the mid-70s, it was the licensee's responsibility to log and leave the sites prepared for planting. After 1980, the licensee was responsible for planting the area and then the lands were reverted to the Crown. Since 1987, the licensee is responsible for all silviculture activities until the area is declared "free to grow" (Bill Perry, personal communication, 1996).

Since the mid-1970s, industrial logging activities have been occurring in the watershed (Bill Perry, personal communication, 1996). The dramatic physical changes due to logging can be seen by comparing air photos from 1970 through 1996 (see Figures 3.4 through 3.6). Before 1970, the lower Atleo River watershed was a continuous cover of forest. However, this forest was not pristine: it has been used by First Nations for many generations and such signs as small paths and clearings, tended estuary plots, and enhanced plant populations are likely components of this forest. In 1970, one area of logging can be detected in the vicinity of Seektukis Reserve at the mouth of the Atleo River (See Figure 3.4). This area was logged in 1959 by Bourasso and again in 1967

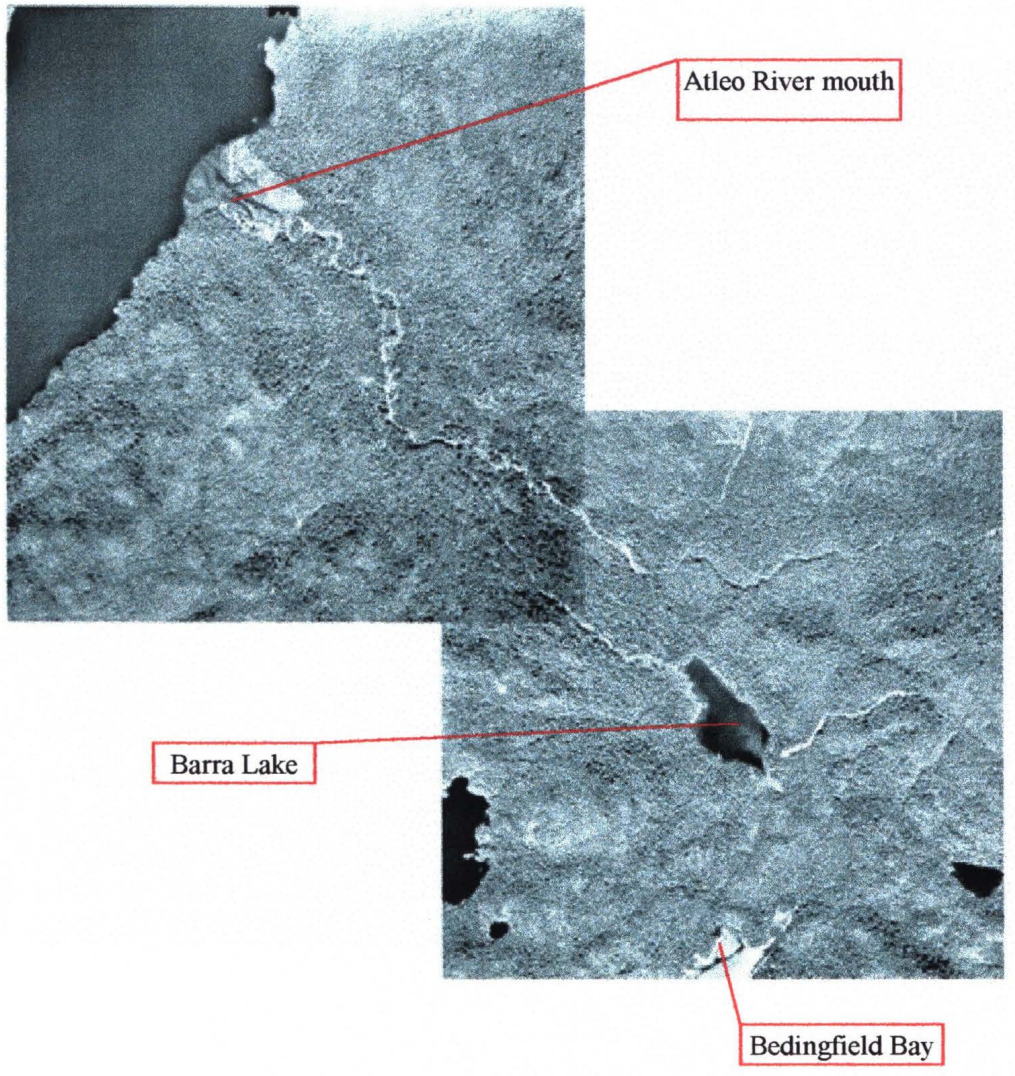

Figure 3.4: Air photo of the Atleo River watershed, 1970.

Source: BC Government air photos BC7237 No. 252 and BC7238 No. 010 used with permission of Geographic Data BC, Ministry of Environment, Lands and Parks.

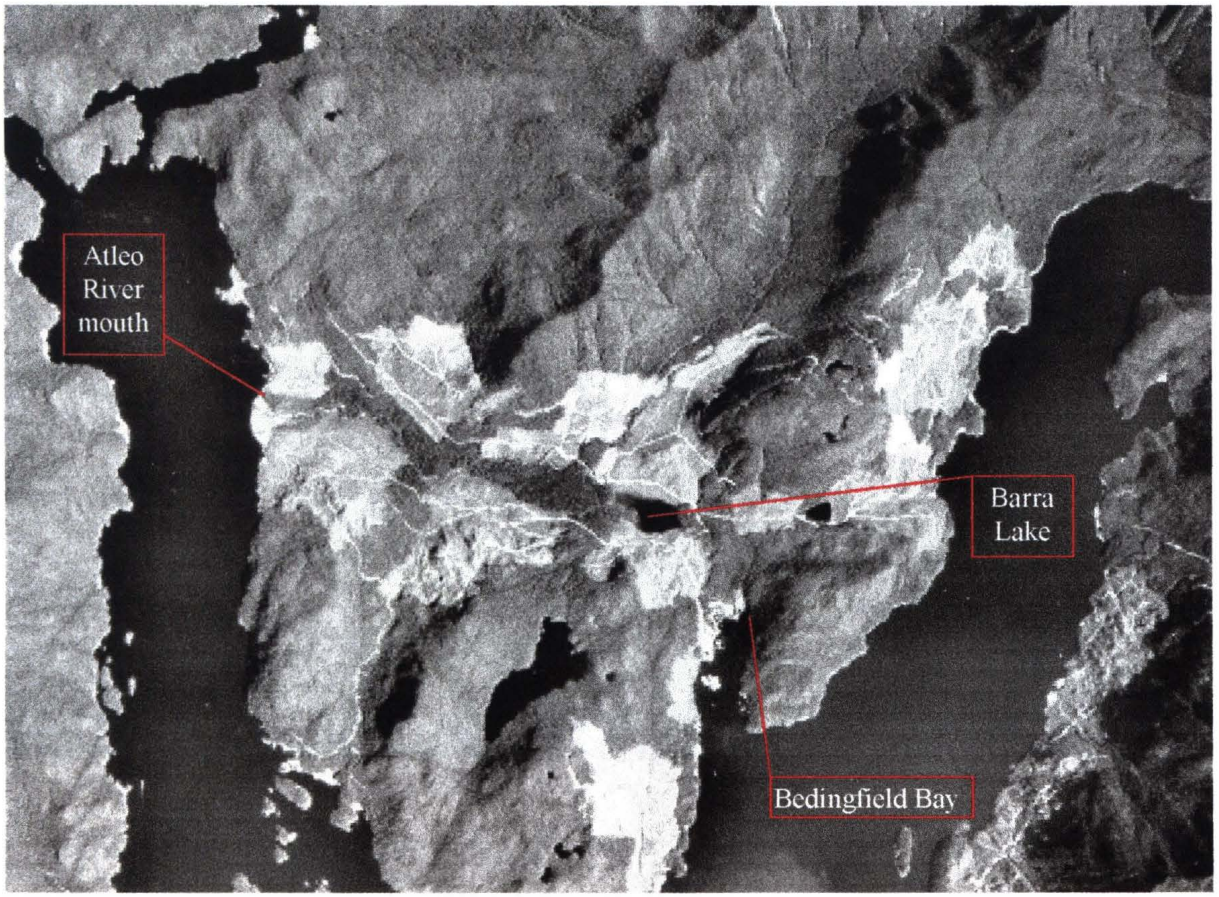

Figure 3.5: Air photo of the Atleo River watershed, 1987.

Source: BC Government air photo BC87046 No. 28 used with permission of Geographic Data BC, Ministry of Environment, Lands and Parks.

Figure 3.6: Air photo of the Atleo River watershed, 1996.

Source: BC Government air photo 30BCC96007 No. 089, No. 091, No. 146, and No. 148 used with permission of Geographic Data BC, Ministry of Environment, Lands and Parks.

(West Coast Information 1980). During this period, many reserve lands were cut. As Carl Jumbo described, the "reserves are pretty well logged out". By examining this air photo carefully, some parts of the reserve appear to have been selectively logged.

Dramatic changes can be seen in the most recent air photos (see Figures 3.5 and 3.6). Bedingfield Bay, a former logging camp, can be seen in the lower left-hand edge of the photo. In these photos, relatively little continuous forest remains. Most of the logging was carried out over three main time periods: 1979-1981, 1984-1986 and 1993-1994. During these time periods, the Forest Practices Code and Scientific Panel recommendations had not been established and extensive tracts of old-growth forests were harvested.

There has been some involvement of First Nations' communities in forestry activity (Bill Perry, personal communication, 1996). In 1982 and 1983, planting contracts were awarded to Ahousaht for Bedingfield (Atleo River watershed) and White Pine Cove. Since 1995, there have been ongoing contracts with crews from Ahousaht. Dr. Richard Atleo, the hereditary chief of this area, has never been consulted regarding any forestry activities in the Atleo River watershed (personal communication, 1996).

When Ahousaht band members were involved in logging, it was under the supervision and control of the logging companies. Members of the Ahousaht First Nations were ordered to log right down to the stream and lake edges. Some of the rivers in Clayoquot Sound are now considered "dead" because of the damage and lack of rehabilitation to the streams (Archeo Tech 1991:35). During the Steering Committee for Sustainable Development in Clayoquot Sound, the Ahousaht and Tla-o-qui-aht First Nations attributed the destruction of salmon streams to the erosion from clearcuts and unregulated logging.

Since the government's acceptance of the Scientific Panel recommendations in 1995, there has been no logging activity in the Atleo River watershed. Silvicultural activity is still occurring in the form of brushing, weeding, spacing and replanting. The

majority of seedlings planted are western red-cedar and western hemlock, along with a smaller component of Sitka spruce and amabilis fir. On steeper south slopes, Douglas-fir is planted. In general, areas are planted with a mix of conifer species, with a goal of reaching 1200 stems per hectare. In the past, mono-cultures were planted with the anticipation that natural seed-ins would result in mixed stands.

According to Bill Perry, there has not been any harvesting of non-timber forest plants in the Atleo River watershed. The only non-timber plant activity that has occurred in the area is the seeding of landslide areas or areas with unstable soil. Non-native legume species and grasses, are planted to stabilize the soil.[5]

3.6 Vegetation surveys in the Atleo River watershed

These histories and descriptions of the Atleo River watershed provide a rich background for plant research in the area. The study area focused on for vegetation surveys extended approximately 5 km from east to west, and 2 km from north to south representing approximately 1000 hectares of the lower watershed (see Figure 3.1). Although the elevation of the lower Atleo is between sea level and 896 m (see Ministry of Forests topographical map 92E.040), all vegetation plots were surveyed at elevations of less than 200 m, due to constraints of accessibility and time. We sampled a variety of sites in the lower watershed. Areas of similar size and cover types were sampled on the north and south sides of the watershed. Lake plots were conducted on the edge of Barra Lake, which had both logged and forested edges. We sampled river edge sites on the Atleo River (which extends 4 km from Barra Lake to the River mouth) and surveyed estuaries both at the Atleo River mouth and Bedingfield Bay (see Section 2.4).

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[5] For more information on restoration activities, see Robin Smith's thesis (Smith 1997).

3.7 Summary

The Atleo River watershed lies within Nuu-Chah-Nulth First Nations' traditional territory. The watershed, which is approximately 2820 hectares, falls within the coastal western hemlock zone, which is dominated by western red-cedar, western hemlock and amabilis fir. The watershed is comprised of fragmented old-growth temperate rainforest, riparian areas, and relatively recent cutblocks.

This area is rich in meaning and histories for the Ahousaht people. Historically, this area has been a source of abundant salmon and other foods. People lived at the river mouth in the fall to catch and smoke fish. Cedar bark was harvested in many areas of the watershed, as documented by culturally modified trees which are still standing today. The title of the Atleo River watershed *ha hoolthe* was acquired through wars and handed down through many generations by the Ahousaht people. Today, people in Ahousaht recognize the *ha hoolthe* as belonging to Umeek (Dr. Richard Atleo), hereditary chief of Ahousaht.

The provincial government recognizes this area as belonging to MacMillan Bloedel's TFL 44. Dramatic changes to the watershed have occurred in the past decades. A sequence of aerial photos witness intensive logging activity which has occurred throughout the watershed. Both the traditional activities and resources in the area, and the current vegetation and habitat types, are important in providing information towards future use and management of the area, specifically with regards to culturally significant plants.

CHAPTER 4: TRADITIONAL ECOLOGICAL KNOWLEDGE OF CULTURALLY SIGNIFICANT PLANTS

*... it's **sanix̲mapt** [cattail]. This is for basket. **sanix̲mapt** ... We used to go on this side ... going with our dad, and get this... We call it "**sanix̲mapt** ". My mum used to use it for inside of her baskets so she wouldn't use too much cedar bark. It gets flat this. [showing leaf]. We'd get real lots for our mother. You don't just pick any kind, though. You don't pick ones like this. You pick it when it's flat... It's on the outside [of the channel]. It's outside. We never found it inside.*

Rosie Swan

4.0 Introduction

The long term occupation of the Nuu-Chah-Nulth peoples of Clayoquot Sound has resulted in the acquisition of an incredible amount of knowledge about local plants and other parts of the ecosystem. For example, the ability to make baskets of various shapes, sizes, strengths, and weaves was a necessary skill for survival. The names of the materials, where they are found, how they are collected and prepared, how much to pick, how to make the basket, and how to ensure sustainable resource use are all part of the knowledge required. Thus a basket presents a large body of history, knowledge, culture and skill.

Traditional ecological knowledge (defined in Chapter 1, Section 1.1) can be described as having three broad components (Turner 1997). At the core of traditional ecological knowledge (TEK) is the possession of a world view or philosophy that contributes to sustainable resource use and management. These philosophies include respect for all life, recognition that one should take only what one needs and not waste resources, belief in the spirituality and power of all things, and an understanding of the interconnectedness of all life (Turner 1997). As well, TEK contains "knowledge and application of sustainable resource use, including inventory, monitoring, use of ecological indicators, environmental modification and harvesting strategies" (Turner 1994b). Another component of TEK is the means by which the knowledge is transferred (Turner 1997). Traditionally, knowledge was acquired and shared through both formal and

Figure 4.1: Postcard of Mrs. Nellie Jacobson, "well-known maker of Nootka baskets". This picture was probably taken in the early twentieth century, and shows some traditional basket weaving designs.

Figure 4.2: Lena Jumbo making a Maquinna hat. The art of weaving and associated knowledge has been handed down through generations. Lena Jumbo is a highly skilled weaver in Ahousaht, using traditional designs and materials.

informal methods. On a daily basis and through informal settings, knowledge was gained through experiential learning, detailed observations of the ecosystem, and oral communication such as story telling, songs and oral teachings. Communication of knowledge and experience was also shared more formally in gatherings such as potlatches, feasts and ceremonies.

Thus traditional ecological knowledge represents a holistic knowledge system interwoven with values, practical information, and features of communication. TEK indicates a deep understanding of the local system, including the place of humans in that web. To learn about culturally significant plants, their traditional management, and their cultural meaning, it is essential to include the traditional ecological knowledge of local people.

Because the Ahousaht First Nation is comprised of several nations that were originally separate and distinct, knowledge and information shared by Ahousaht elders may have originated in other areas. However, most plant species in Clayoquot Sound are distributed throughout the west coast area and are not specific to one nation. With few exceptions, plants used for food and material purposes, and knowledge surrounding these plants, is shared between Nuu-Chah-Nulth First Nations and with other First Nations of the west coast of British Columbia.

The purpose of this chapter is to present the traditional ecological knowledge shared by elders in Ahousaht about plants, which was documented over many hours of interviews and discussion. Focus is given to practices and strategies for sustainable living, the availability and abundance of culturally significant plants, and the inter-relationships between the Ahousaht people and their plant environment. In order to provide a context for sustainable strategies used by the Nuu-Chah-Nulth First Nations and to maintain a more holistic approach to documenting traditional ecological knowledge, this chapter also includes world views associated with plants and the environment, oral teachings and

narratives featuring plants, and cultural meanings of the forest and land around Ahousaht. We focused on plants with food and material purposes.

The information in this chapter was primarily gathered during interviews with elders and others in 1996. This information represents only a fraction of the knowledge that is held by the elders we spoke with in Ahousaht and only a small part of the complex ecosystems with which they live. Supplementary information from other Nuu-Chah-Nulth sources is also provided from published literature. Whenever possible, traditional knowledge in this chapter is presented in the words of the elders with whom we spoke.

4.1 Sustainable use and management of culturally significant plants

4.1.1 Plant use and management

Berries and other fruits

> *We used to pick them ... cranberries, there was lot of cranberries there [Jack Dale's property]. We used to pick lots for my mother so she could jar them, she'd mix them with berries, we'd have jarred fruit in the winter... It was quite an interesting life, when you look back...*
>
> Greta Charlie

Berries and other fruits in Clayoquot Sound are an important part of the traditional Ahousaht diet. Berry species identified as important food resources to the Nuu-Chah-Nulth by the Scientific Panel (1995a: 33) include: blackcaps, wild blueberries, bunchberries, wild black currants, stink currants, wild gooseberries, red huckleberries, evergreen huckleberries, salal berries, salmonberries, wild strawberries, thimbleberries, bog cranberries, highbush-cranberries and Pacific crabapples.

Like most of the local plants in Ahousaht, berries have Nuu-Chah-Nulth names. For some species, the name for the berry is different than the name for the entire plant. The following names are compiled from interviews with Rosie Swan, Trudy Frank, and Lena Jumbo and from the Scientific Panel (1995b):

hes-shitl	bog blueberry
tl'aach7aalh	thimbleberry
y'am'a	salal
qawii	salmonberry
ch'ihsmapt	black twinberry (not eaten)
siinamuxs7its	evergreen huckleberry
his7inwa	red huckleberry
qa7wi	himalayan blackberry (introduced)
chismapt	trailing blackberry
hisshitl	black raspberry
situp	Alaska blueberry
tl'itsxwaanush	oval-leaved blueberry
p'ap'a7is	bog cranberry
hulh7iiwa	stink currant
tsiiyin	red elderberry
milhk'iw'a	coastal gooseberry

The earliest berries to come out are the salmonberries and red huckleberries which ripen in the spring and early summer. Trudy Frank told us that "normally they [red huckleberries] come the same time as salmonberries." These berries are followed by strawberries, stink currants, gooseberries, red elderberries, thimbleberries and bunchberries. Salal is ripe in July and August but after that time it is "full of worms". As Trudy Frank explained:

> *I don't know, they used to tell us, when it gets wormy... the berries. They used to tell us not to pick it anymore, it's got worms in it... same with the salal. In about August it gets wormy... I don't know what it is, but they have worms inside. They look good, the berry, but you squish it open and its got little worms inside. [laughter].. It's alright, like July, but at ending of August when it's full of worms. And then later on they're all out again. My mom used to go later on, get the late ones, like there's always late ones going ripe.*

Himalayan blackberry (an exotic species) is abundant around Ahousaht and is ripe in late August and early September. Evergreen huckleberry is one of the latest berries and is ripe in October. Rosie Swan told us these berries ripen at the same time as the dog salmon return, and they ate these berries with these fish in the fall. Robert Thomas remembered having evergreen huckleberry on the Christmas table. Crabapple and rose hips also ripen in the fall and bog cranberry is ripe in October and November.

Figure 4.3: Bag of *p'ap'a7is* (cranberries).

Figure 4.4: Cellar of Trudy Frank, filled with jams and jellies made from wild berries.

Not all berries are edible. People have learned which ones they can eat and which ones are poisonous. In some cases, cultural context plays a role in which berries are considered edible. For example, Rosie Swan said that some First Nations eat twinberry, but the Nuu-Chah-Nulth consider them to be poisonous:

> *Prince Rupert area. It's [twinberry] poison here. But over there it's not... They eat it over there but we don't. Just birds eat it. Bird's eat it... we don't eat it.*

Like other resources, people had an understanding of where berry patches were abundant and what time of year to visit them. This knowledge allowed people to move with the seasons to gather berries, and to determine when to go on their expeditions. These expeditions were described by John R. Jewitt in his diaries of 1802-1805 when he was a captive of the Nuu-Chah-Nulth (Heizer 1975:51):

> *To procure it [salal], large companies of women go out on the mountains, accompanied by armed men, to protect them from wild beasts, where they frequently remain for several days, kindling a fire at night, and sheltering themselves under sheds constructed of boughs. At these parties, they collect great quantities. I have known Maquinna's queen and her women return loaded, bringing with them upwards of twelve bushels. In order to preserve it, it is pressed in the bunches between two planks, and dried and put away in baskets for use. It is always eaten with oil. Of berries of various kinds, such as strawberries, raspberries, blackberries, etc. there are great quantities in the country, of which the natives are very fond, gathering them in their seasons and eating them with oil, but the* ***y'am'a*** *[salal] is the only one that they preserve.*

People in Ahousaht today remember these large expeditions and the great quantities of berries collected. Trudy Frank identified some of the areas where she remembers going:

> *Same thing with picking berries, like salmonberries. They'd go, maybe one or two canoes up to the inlet there to pick salmonberries and the huckleberries.*
>
> *We used to make an effort to go somewhere else to pick, like Ginny's beach. We'd go there to pick, or in Dickson's Bay we'd go there to pick salal. Now they're just picking around locally. The thing about it is, you know, they'd go out in canoes, they'd paddle, they'd row, they didn't have the motors.*
>
> *They did some [logging at Vargas]. I'm not sure if it's the area I was talking about. And other than that, we used to go either out there, or up the inlet to*

> ***Moyeha**, what do you call **Moyeha** in English? Herbert Arm, Herbert Arm. That's where they'd go pick the salmonberries... It's got a big river and you go up the river, just all along the edges where you find them.*
>
> *Vargas has quite a lot of this [red huckleberry] on the outside. That's where we used to go pick it... it's clear, you can walk in the woods, like it's really clear and easy to walk around... And you see this, just full of berries.*

Many elders described large quantities of berries being gathered in the past and some felt that there were not as many berries today as there used to be. They also noted that not as many different kinds of berries are being picked today.

> *We used to go out... we used to have these big huge baskets, you've probably seen a picture of it, and you'd get baskets full of it... Sometimes it [red huckleberry] would be mixed with the purple, that blueberry [*Vaccinium sp.*].* (Trudy Frank)
>
> *There's even blueberries, wild. And there used to be cranberries, there used to be wild strawberries that used to look real big... There used be strawberries there [where the Ahousaht General Store is]... **kalhkintapiih**. We had some on that hill. We used to eat it when we were kids. Now it's full of trees and I don't think kids even look for it now... But we used to go up there and have it.* (Rosie Swan)
>
> *There was real lot of berries up there [Bear River] too, in July. Oh, it was plentiful, the blueberries and the red huckle. We used to just get branches and just shake it off, put a mat [underneath]...now you can hardly get one, two when you go pick those wild berries now, huckleberries, blueberries.* (Irene Thomas)

Methods were developed for making berry picking efficient. Brushing a branch with the fingers harvested many berries at a time. Leaves and other inedible pieces that mixed with the berries were then sorted using a board-like trough.

> *...And the way they used to have us pick it [red huckleberry], like you'd just take a branch and just brush it off like this, but you get a lot of leaves. They used to make this trough like thing, a board with two sides to it, and you'd wet it, and roll the berries down it, the leaves would get stuck on there, and the berries would just roll down! That's how they used to clean it, like if they got lots, otherwise it's a real tedious chore, just picking the berries, picking out the stuff... I canned some of that stuff, it was good.* (Trudy Frank)
>
> *We used to just pull it down like that and just use our hands and do it, go on the mat, then we'd put it into buckets. Then we'd go home, we'd take the leaves if*

there was leaves on it, blow it off and clean it and get into jars. Use as jam or just fruit. I used to like that. I used to like to go pick. Now I hardly see any. Never see it anymore. (Irene Thomas)

Once berries have been gathered and sorted, there are several methods of preparing and storing them. Before the introduction of refrigeration, berries were dried, usually on mats or skunk cabbage leaves, and stored in cedar boxes. These methods of storage allowed people to have fruits in the winter.

She [my mom] used to get them berries, them little black, like huckleberries [evergreen huckleberry]. She'd lay it out, dry it. Imagine how those little things form crystals, they use own natural sugar. When it was right dry, she'd just shake it dry in the hot sun. In winter time, you know, you chew on it, really has that strong flavour, fresh flavour. Other than that she'd put it in water, let it sit overnight, it would start getting its shape. She tried that just to show us. She preserved them through the winter. (Arlene Paul)

See it's [salal] dried up, dried... in the sun ...like a cake. And she breaks it up and puts it in... soaks it in the water and we have ***chumus*** *like that [even in the spring].* (Robert Thomas)

I remember as a kid we used to see a lot of the ***y'am'a*** *laying in the sun, they'd be drying it... and then they'd just sort of soak it, I guess, when they want to eat it. Kind of like the dried apples.* (Trudy Frank)

We had ***y'am'a****, you call it* ***y'am'a*** *in my language... that's salal berries. It's good. My grandma used to pick it and they're juicy. There's juice in them little berries and when you squeeze them they stick together and my grandmother used to have them about this big, so long as it can fit into that box again, that* ***mak-ay-u,*** *and she'd keep them in there... they put away like that. No sugar. When you get enough money to get sugar you go buy sugar and you have* ***chumus*** *like that.* (Robert Thomas)

Some [elders today] make jelly out of it [salal]. Long ago they'd crush it, dry it, sun-dry it. Then put it away. And when they were going to have it they'd soak it and it would be like fresh. We don't do it. Even my parents, I guess it was long ago that it was done. They'd save it for wintertime. (Rosie Swan)

Commonly today, many elders freeze berries or make jams and jellies. In Ahousaht, jam is primarily made out of red huckleberries, blueberries, salal, and

Himalayan blackberries. Rosie Swan told us that she jars or makes jam out of blackberries, but making jelly is more difficult:

> *My mom would even make jam out of wild crabapples. Now I don't think anybody makes jam out of that, there's lots around.*

As well as being jarred, most types of berries are eaten fresh. Robert Thomas remembers his grandmother eating fresh blackberries and salal berries. Rosie Swan said that she eats blackberries and salmonberries fresh, but other berries (bog blueberry, thimbleberry, evergreen huckleberry) she eats crushed up with sugar and water. She said that if you eat them fresh without sugar and water, you get a sore mouth:

> *Elder [evergreen huckleberry] ... it's good to eat but you can't eat it off the branch. You have to crush it up too and put water and sugar in there. You get sore tongue from this.* ***Siinamuxs7its*** *... Late elderberries we had with our smoked fish in the fall, they're blue.*
>
> *... individual people had it in their yards [gooseberry]. It's good to eat. But you've got to cook it. You can't have it raw. It's too sour... My mum used to jar it. It's good like green grapes...But you have to use lots of sugar. She never ever made jam out of it. Just food...* ***milhka7um****.*

Berries were also eaten with animal oil including oil from whale, hair seal, dogfish and bear before the introduction of sugar (Turner and Efrat 1982).

According to Rosie Swan, picking berries does not reduce the amount for the next year. It is a sustainable food supply that is available every year:

> *It keeps coming back. See, any plant, any berries, like the cranberries, it keeps coming back. And strawberries. Any kind of berries.*

Despite the fairly dependable supply of berries, Nuu-Chah-Nulth people practiced methods which were designed to promote berry production. For example, when people picked berries, they broke off the tops of the bushes as a form of pruning. As Robert Thomas explained:

> *So she [my grandmother] can pick faster, they took the whole branches off, like the little [salal berry branches]... they pick them like that and put them in their back... You call it* ***ka'uts*** *[basket made out of cedar roots].*

This method not only allowed people to pick faster, but was also a strategy to enhance berry production for the following year. Just as with other plants in a garden, pruning and coppicing promotes healthy growth of the plant. Lena Jumbo told us that wild berry bushes might be like cultivated blackberries:

> *... it's better to break it off too, like blackberries. If you go to a blackberry farm they prune it every year, after the season's over they trim the tops right off. That way it doesn't go all over... and then these big ones that come out, they're real big. They have it on the bottom like, but after the berry season they'll trim the tops off where the berries were, and they'll move these big ones up, and that, that's for the next year.*

This strategy of coppicing and pruning berry bushes to enhance growth has been used by other First Nations in British Columbia (Turner and Peacock 1997). Landscape burning, another strategy used to promote berry growth, will be discussed in the section on habitat management.

Shoot foods and other green vegetables

As well as berries, a variety of fresh vegetables were eaten in the form of new shoots of various shrubs. These foods include *m'aayi* (salmonberry shoots), *hum'aaq* and *qilhtsuup* (cow parsnip), *ch'aashxiw'a* (thimbleberry) and *qwaqtl* (horsetail). The young shoots are picked in April and May, peeled and then eaten fresh or with sugar. Trudy Frank explained how they made *kwi'ka*, a form of "cheese", that they ate with salmonberry shoots:

> *For the salmonberry growth they used to let us have it with dried fish eggs... and my granny used to make, it was almost like a cheese it was from the dog fish, you know when they have young ones that are attached to these, they're like, almost like the yellow of an egg? They hang on that, I don't know what for, if that's their life support or what it is, but she used to take all those and she'd mix it with milk, she'd mix it in, but it was almost like a cheese.* ***Kwi'ka*** *they'd call it.*

In the past, shoot foods were abundant and harvested in large quantities. Women were primarily the ones who gathered and prepared this plant:

> *Indian ladies would go out for it [**m'aayi**], get a armload, all ladies. And they'd have parties with it... Now you don't see that anymore.* (Rosie Swan)

> *...we used to pick it all the time, in May. Some people would bring home a whole armful of it [salmonberry shoots]... five people could come join them... We called it **m'aayi, m'aayi**. My aunt used to bring me an armful, every summer she'd pick some. When she first moved across there, it was so plentiful over there, she'd just make a day of it, and just pick, and bring it over.* (Trudy Frank)

Cow-parsnip is another green vegetable that was commonly eaten. As Rosie Swan explained, this plant needs to be peeled before it can be eaten because otherwise it results in a "burning of lips":

> ***Makt**. Indian rhubarb. They used to eat this... Peel it and eat it like **m'aayi**. ...They had to eat it like this because it burns your lips. It's good to eat, too.*

This burning reaction is caused by the phototoxic nature of the plant, since cow-parsnip contains furanocourmarins which react when they are exposed to sunlight, and can cause skin damage (Kuhnlein and Turner 1986). Trudy Frank described some of the shoots that could be eaten:

> *... there's the thimbleberry bush, you use that for eating purposes when it's new growth on there, and same with salmonberries, then they used to pick that, what they'd call the wild rhubarb, another one with huge leaves on it, it's almost like a celery [cow parsnip]... They used to pick that. Not as often as they picked the other stuff, because they used to not let little kids eat it, only if you knew not to let it touch your lips, you'd get blisters or something [on your lips] when you ate it... but they used to melt sugar. They used to have us dip in there and eat it.... Like rhubarb.*

By developing methods of preparing the leafstalks and budstalks through careful harvesting and peeling of this plant, cow-parsnip became an important fresh vegetable food. Innovations such as this preparation method increased the local food supply by allowing use of food plants that would otherwise be unpalatable. Stinging nettle is another

plant food that would be difficult to consume if people did not have the knowledge of how to prepare the plant. Trudy Frank explained:

> *I guess everybody had their own thing they used. They knew how to use it. Like we always took the nettle for just something that hurt you, and it stings you when you touch it ... and you realize you can even make soup out of it! ... I'd never think I could! But they used to eat [it]...*

Like other traditional food plants, picking the shoots may enhance their growth by acting as a form of pruning. For example, during interviews with Kaigani Haida (First Nation in Alaska), several women remembered that plants that are regularly harvested grew taller (Norton 1981). These women said that cow-parsnip plants "needed to be picked" to enhance their growth.

Root vegetables

As well as shoots of plants, roots of some plants species can be eaten such as *tlitsy'upmapt* (Pacific silverweed) and *?a?iits'uqmapt* (springbank clover). Roots can be harvested in the late summer and early fall. Silverweed has also been recorded as being harvested in January or February (Fenn *et al.* 1979). Roots are gathered using digging sticks which were traditionally made from yew-wood or Pacific crabapple (Turner and Kuhnlein 1982). These sticks are thrust into the ground next to a clump of plants and pried upwards by pushing the top of the stick. Once soil is loosened around the clump, the bunch of roots can be pulled out. It is then shaken to remove dirt or sand, the tops are removed, and the roots are selected and placed in a basket.

Roots were traditionally cooked by steaming in a pit oven. Pits were dug and lined with large rocks and a fire was then made in the pit and burned for several hours until the rocks were hot. Sand or soil, and then a layer of vegetation (usually salal and sword fern) were placed in the pit and the roots were laid on top. Roots were usually tied in bundles, and in some areas, each woman had a special knot that she would tie to identify her roots (Turner *et al.* 1983). The roots were then covered by further layers of vegetation and soil.

A stick or pole was placed in the pit during the process of building it. Once the pit was filled, the pole was removed and water was poured down the remaining hole to allow steam inside. The pit was then covered with mats or burlap sacks. As well as being cooked and eaten immediately, roots were dried after cooking for winter use by laying them in the sun on mats (Turner and Efrat 1982). The development of these complex methods of preparation and storage allowed for the annual use of these plants and added to the diversification of food resources.

Drucker (1951:62) recorded that pit ovens were so filled with root vegetables that:

> *Tales of famous feasts speak of young men having to go on the roof of the house to pour in water [to the pit oven] to make steam, so high were the piles of clover roots.....*

Although from this description, it appears that root vegetables were harvested in large quantities, Drucker (1951:62-63) states that "if the average person ate a dozen or two meals of roots in the course of a year, it was a lot".

Sustainable methods of root harvesting were practiced by the Nuu-Chah-Nulth. For example, digging the roots in the manner described turned over the soil and was a form of tilling. These sites, due to the frequent harvesting and tending of the plants, had soil which was likely looser and easier to dig than in areas today (Turner and Kuhnlein 1982). As well, roots and rhizomes of plants were replanted. According to Alice Paul (from the Hesquiaht First Nation), the ends of the rhizomes of wild clover and roots of Pacific silverweed were placed back in the ground to ensure that plants would grow the following year (Turner and Efrat 1982). These activities likely promoted the growth of root vegetables so that harvesting the plants did not diminish the populations but rather, enhanced them. In contrast, Drucker (1951:57) noted that "so far as the informants knew,

Figure 4.5: Harvested *tlitsy'up* (Pacific silverweed) root vegetables. This traditional root vegetable was growing in abundance at the mouth of the Atleo River.

Figure 4.6: Bowls of root vegetables that we harvested during field work. On the right is *tlitsy'up* (Pacific silverweed) and the left is (*?a?iits'u*) (springbank clover).

there was not intentional clearing or weeding of clover patches - 'the plants just grew by themselves'". It is possible that by 1951, the use and stewardship of traditional root vegetables has decreased dramatically, influenced by (among other factors) the introduction of potatoes and other European foods.

Patches of root vegetables were marked out and owned by certain individuals and carefully monitored. Stanley Sam (as told to Bouchard and Kennedy 1990:335) recalled digging wild clover in an area just offshore from Moyehai Reserve when he was a young boy. These clover patches were owned by his father's mother who used to tend and cultivate these patches. Individual or family stewardship of these gardens was a factor in promoting their careful and sustainable use.

A few elders today recall eating root vegetable foods. Irene Thomas recalled the harvesting of forest root vegetables. "I don't know what else they used to go pick," she said, "I guess it's something like a sweet potato, you have to dig for it." She recalled this plant growing in the woods, not on the beach. The plant she is referring to is most likely bracken fern (*Pteridum aquilinum*). The roots of this plant were dug in the fall, boiled or pit-cooked, and then crushed and the middle parts eaten. Elders in Hesquiaht described these roots as tasting like sweet potatoes (Turner and Efrat 1982). Another possibility is the root of lady fern, which was dug in spring, roasted and eaten (Fenn *et al.* 1979).

Trudy Frank recalled eating some root vegetables, probably silverweed and clover. She suggested that the reason why many people today do not recall the harvesting and consumption of these plants is because of the restrictions in gathering them:

> *Last time I had some [root vegetables] was when my father-in-law picked some, that was the last time I ever ate it. Edwin was saying, "what are you eating?" and I said "taste it, they're real tasty!" ...he'd never had it in his childhood... I guess there's so many restrictions on some of this stuff, finding where to pick is not so easy.*

Fibrous Materials

As well as for the purpose of food, plants make up a very important component of materials used for technological purposes. Plants can be used for wood, fuel, fibers, dyes, resin, scents, cleansing agents, and other purposes. In addition, woven items of plant materials make up a large part of Ahousaht culture and survival. Clothing woven from cedar bark, mats made from cattail, and baskets made from grasses and roots were essential items for life.

Today, some local plants are used for material purposes on a regular basis.[1] Local wood is gathered for carving and artwork, for fuel in smoke houses, and for building materials. Cedar bark is gathered for ceremonial purposes, as well as for weaving hats, baskets, and other items. Grasses and other basket materials are also gathered for weaving purposes.

The knowledge and skill required to make baskets and other woven items is still very much alive in Ahousaht. Elders such as Lena Jumbo and Trudy Frank gather cedar bark and other basket making materials. Lena Jumbo is known for her outstanding weaving, making items such as baskets and Maquinna hats. Other elders, such as Robert Thomas, Rosie Swan and Greta Charlie, remember their elders gathering plants and weaving items when they were children.

Baskets have been made for many different purposes from storing food and gathering berries, to catching fish. Baskets are different sizes and shapes and are composed of different materials and weaves depending on what they will be used for.[2]

> *They used to make little baskets, like for holding seafood, or they'd make different sizes... They're quite sturdy.* (Trudy Frank)

> *Baskets they used to have? It was all closed, all covered up. When the lid is off, they could put their smoked fish, dried fish... whatever they had...They were made*

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[1] Many species of plants are used for ceremonial purposes in Ahousaht, but these plants were not investigated during this research project.

[2] For more information on baskets made by the Nuu-Chah-Nulth, see Turner and Efrat (1982) and Turner *et al.* (1983).

out of cedar. Cedar bark. They're about... half an inch wide, them strips. They made those things on them. You call it ***tla'pat****... That box...* ***tla'pat****. It looks like some cardboard boxes but it's woven. It's woven out of cedar bark.* ***tla'pat****. Oh, they'd be worth money now if they had them here.* (Robert Thomas)

... the basket is shaped like [an oval]... four sides to it.[3] *And it's got a handle anyway you want it. They used to carry it with their heads and put it on their back... put this weight on the back and you carry it with your head. The band is here [showing line across forehead] with the* ***ka'uts*** *on your back.* (Robert Thomas)

...I really wanted to learn how to make the kind of baskets they used to make for berry baskets, and it's really big, thick. My grandma used to have us pick the young cedar bough. That's what she'd use to bend around. (Trudy Frank)

Hemlock roots... the roots of the tree, that's what they use... They used to have a different kind of a mussel basket that had four sides to it like two hands and two sides and a bottom... that's the way they made the mussel [basket]. They were woven like a ***ka'uts*** *but square. They're called a mussel basket, they were also used for* ***haiyustuup****, just enough for a meal... was made out of the same thing... roots. And I never see them make it around now. It'd be something to make.* (Robert Thomas)

Rosie: Mom used to let us weave too, eh?
*Greta: Yes, she had us make little mats... She used to make shopping bags... Mats, little baskets. (*Rosie Swan and Greta Charlie — sisters)

She made the cedar basket too, like a four corner thing. Some were big, some were small. Some were for the bigger dried fish too, you know. They had them around in them days but they don't make them now... (Robert Thomas)

There are many different materials that can be used for weaving. These traditionally included tree materials such as *pits'ip* (cedar bark), *qwitlapt* (hemlock bough), and grasses and sedges, such as the *ch'itapt* (basket sedge/swampgrass), *t'ut'unaxk'uk* (three-cornered grass), *sanix̲mapt* (cattail), *t'unaax* (bulrush and tule). As well as these traditionally used plants, contemporary materials, such as raffia and industrial dyes are also used today. Each of these materials has a different purpose in weaving related to its

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[3] Robert Thomas told us later that this basket is tapered down to the bottom so the top is much larger than the bottom. The basket is two feet deep, one-and-a-half feet outwards, and as wide as your back (approximately two feet). The baskets were custom-made to fit the person who owned them.

strength, flexibility, size and texture. Lena Jumbo explained some of the materials she uses for weaving:

> *And I also make Maquinna hats with the [cedar] bark, which is nothing but the bark, and the black I use swampgrass. I save my heavier stuff to work with the Maquinna hat, and black which I dyed myself. The dye comes from the States, and raffia. Before I used to just use cedar bark working on it, but I prefer to use the raffia because it's so much stronger.*

> *You can also use it [three cornered grass] for small baskets if you like. I prefer to use the cedar bark for the basket itself and use the three-cornered grass for the lid, along with the swamp grass and the raffia I get from town.*

> *... the cedar bark, I use it for baskets, like those little baskets, molds I have there. This wood here... I use the bark for the strands, and I use the three-cornered grass to work the lids on it. This is the bottom, this is the top... I use this for the lids... Well, I work the swampgrass on the cedar bark, that's what I use to make the basket, the bottom part of it.*

There is a great deal of skill involved in making a basket. To learn, one must work with a talented basket-maker, such as Lena Jumbo. There are different types of weaves, tensions, and styles to learn. Trudy Frank said:

> *It's quite tedious [basket making], but it's fun, when you know how to. There's an art to it where you have to keep pulling, otherwise your weaving ends up like this [loose].*

Nuu-Chah-Nulth basket work and other weavings are widely known for their excellence. People have been making baskets for many generations. Rosie Swan and Greta Charlie (sisters) recall that their mother supplemented her income by selling baskets. Baskets, Maquinna hats, and other weavings are still made and sold today.

> *...We used to live on berries in the forest. Get cedar, grass for our mother, she'd sell baskets and make us eat.* (Rosie Swan)

> *It was another way of getting money, her [mother] basket work... [she would sell them] to people, to tourists that came in to Hot Springs.* (Greta Charlie)

Various types of grasses are harvested and used for weaving including *ch'itapt* (basket sedge/swamp grass), *t'ut'unaxk'uk* (three-cornered grass), *sanix̲mapt* (cattail), and *t'unaax* (bulrush and tule). Lena Jumbo described *t'ut'unaxk'uk*:

> *Long ago they used to get it somewhere like this three-cornered grass, and it's called* ***t'uxt'ux*** *[three-cornered grass], and it grows really long, and they used to use that in place of raffia, that's before the raffia, they found out about raffia I guess. They used to use it, but maybe I don't know if it's as strong, but that's what they used to use long ago... It's similar to this [three-cornered grass] but it's really long, and it's really tough and soft.*
>
> *The grandmas used to tell me they used to use* ***t'unaax*** *and they also used this* ***t'unaax*** *to make mats which they used in place of a mattress when they went out somewhere and they used to put it on their bed, under the mattress... it's like a mat to keep it clean I guess, because they used to just have, they used to just use boards to make their bunks, in all these cabins they made.*

Each grass has a specific time when it is to be harvested. Familiarity with each site is required to know when the grasses are ready. Lena Jumbo is knowledgeable about where to harvest these grasses:

> *... and July we pick the three-cornered grass which is also used similar to the cedar bark. You work on it, three-cornered grass is more used for mats and lids for baskets.*
>
> *July we'd get the three-cornered grass, and end of July get the swampgrass, August. It's a good time now... And September, early September I used to get it to go with my Maquinna hats, because it gets thicker and a little stronger then, wider and thicker, that's what I like... But after a while it's not any good anymore. It's like anything else I guess. It's like the briars. It becomes ... I don't know how you'd phrase it, like it's, it's more like a stick, it gets really stiff.*

Many people with whom we spoke recalled the areas that they used to visit to harvest basket materials with their mothers or other elders. These areas were in the traditional territories where they grew up:

> *[Three-cornered grass], it grows on the beach. Not everywhere, certain areas it grows. Get that from Vargas, next beach to Keltsomaht where they have the Bible Camp... I got that myself. Last time I went was about five years, six years ago I guess. I went with Uncle Peter and Jessie [Webster]. The last time I went with was then... It also grows at Grice Bay in Tofino Inlet. There must be other places. I*

heard about Fanny Bay, and there's some that grows at Hesquiaht on the outside beach there somewhere, but I've never gone there. (Lena Jumbo)

It [swamp grass and three-cornered grass] used to just grow everywhere, it seems. It's nice along the rivers, and there used to be some right along the reserve at Keltsomaht, but here just little blotches, and not so big like. She used to take me to Wickaninnish Island, that's where I learned to get it... (Lena Jumbo)

We [grandmother and I] used to go to near, just around, you know where Keltsomaht beach is? There's another, it's sort of like a bay like this, that's where we used to pick that other kind of grass [three cornered grass]. And they had special places they went for this [swamp grass], there's a beach out here, and there's an island just off Tofino they used to go to. They knew where to get the good stuff from... Or if they knew that a lot of people picked at a certain place, they would save that for another time, and go somewhere else. So they knew areas where, people sometimes shared, said there's a really good spot there, if you want to go pick there. (Trudy Frank)

*... We never ever went anywhere because we were there in June when it was in season. We never went anywhere else but that beach [near Hot Springs Cove]. Get it [**ch'itapt**] for our mother. Me and Greta had to go there... So if I had to get it for somebody, I'd go there because I know where it is.* (Rosie Swan)

Like plant foods, there are special ways to gather plant materials. Often expeditions of people would go together to harvest these resources. The grass was harvested selectively by pulling on the leaf at the length that was needed and cutting the bottoms. For the *ch'itapt*, only the female plant (non-flowering) is used. Many women we spoke with described how they would gather these plants:

And when we got a little older... my dad would go for basket-weaving grass... He'd take us all along, we'd be back with bundles of grass for mom. And then there's a certain time you pick it. (Greta Charlie)

They used to have expeditions [to collect swamp grass], like a whole bunch, a canoe load of women would go out... (Trudy Frank)

When she'd pick these [three-cornered grass], she'd look for the same size and pull it like this and have it in a bundle, because she had all day at just the next beach, she didn't have to travel from here, she just went to the next beach. And she'd gather what she wants and sometimes if she wanted long ones for handles she'd go back and pick the long ones. (Lena Jumbo)

Sometimes if you'd get the long ones [swamp grass], for making the shopping baskets then you don't have just a short piece left to work with. If you look at Lena's grass, hers is probably all white up to about there now, well, not really white, kind of greenish. (Trudy Frank)

*That [**ch'itapt**] was for our mother. But you don't just pick anyone... There's three layers, three [or] four layers.... When we get it when we start to have outside, second, third and middle part because they're different widths. And she'd bundle it like that. And every day went like [showing flattening motion with hands]... she used to keep it flat. Get it flat because it's curled up like this.* (Rosie Swan)

*... And she'd show me how to work it [Mary (Mamie) Tom], and even with the other kind, we call it the reed grass [three-cornered grass]. Like its got foam inside. It's almost like the swampgrass, but you get it down where the salt water comes in... Some get quite high, about there. Some are thick, some are fine, they vary in size... [some grow] about two feet tall I guess... They use it for basket weaving, or for making a lid, or if you want to make smaller things, because it's easier to weave. I have some at home. We call it **t'ut'unaxk'uk** [three-cornered grass]... Other people call it **t'uxt'ux** for short.* (Trudy Frank)

Once the grasses are harvested, they are taken back home to be sorted and cleaned. Methods used to prepare the grass include sun-drying, shaking off the dirt, soaking, and peeling the leaves into smaller strands. The leaves are separated by running the thumb down the middle ridge of the blade. The leaves are then flattened by running them between the thumb and the forefinger. Lena Jumbo explained how she sorts, prepares and works with the grasses:

I just picked everything [three cornered grass] and then when I got home I had to grab the top like this [shakes bundle] and put all the same lengths together and then I'd try to sort it. This was supposed to be sorted, like the different sizes. Separate the fine ones while it's still green. I used to just hang it up along the wall. If I put it outside for one day it was good. Put it out in the sun, you have to turn it, just move it around so each side gets the sun. It's always better when you get it nice and dry, rather than pull it like this so much, like the dirt comes off it with a cloth. My sister got started putting it through a wringer, and you could hear all the clicking as it was going through the wringer, you know like if air is in there, and it cracks as your pulling it [makes clicking sound] lots of noise.

Figure 4.7: *ch'itapt* (basket sedge) found growing on the edge of Barra Lake. This plant is used for weaving baskets.

Figure 4.8: Lena Jumbo outside her house drying *ch'itapt* (basket sedge). She uses this grass for weaving baskets and other items.

Figure 4.9: A basket woven by Lena Jumbo. This basket includes material made of *ch'itapt* (basket sedge) and *pits'ip* (western red cedar bark).

When you pick it [three-cornered grass], I'd rather sort it when it's still green. I just gather it together like this and grab the top and pull it like this... and that way I get the different lengths. If I just put it out and let it dry it would be the hardest thing to sort it. And then you tie it on the ends. I prefer to just hang it up and it'll get nice like this just from the room temperature... but it's nice to put it out too. And then there's, I don't know what you call it, silt I guess from the beach, like the tide comes in right on it and covers it... When the tide comes in it's all under water, therefore it's, when it gets a little bit dry you have to pull on it like this, and it makes a clicking sound and sometimes a little bit of the water comes out the end... and when you do that it stays nice and soft if you pull it through like that, see.

... And with the swampgrass I keep it out two, three days maybe, I find it nice if you have it out, like it doesn't have to be out in the sun, just the air. Especially in the evening, if you put it out in the evening. My grandma used to get a cloth, wrap around her thumb and her pointer and then just pull it, to kind of flatten them out... And in a sense that makes it, the green go away too, it makes it nice. Like if she used a cloth and pulled it like this, see the green. But you don't do this when it's dry... It's nice to work on it if it's damp. Like if I put it out at night and work on it in the morning, but I don't do that, I'm kind of impatient I just put it in the water [laughs]. Does the same work!

Like other plant resources, grasses were used sustainably. When grasses are gathered, picking them is a form of cutting and pruning. Selectively thinning and cutting areas promoted healthy plant communities and enhanced basket-material populations. As Lena Jumbo explained, areas where people have been gathering produce better crops than those that are left unattended:

Before I heard they didn't allow it [picking basket sedge in the park], but I told him [the park warden] that it's always better to get it cut, and prune it, it'll come out nice, because the way it was, the grass, the brown, it was brown eh, from years back, dry, and I had to use my knife to get in there and pull it up so I could see the roots... Yeah, yeah right [it's because people haven't been gathering there]... it's like pruning it, I was saying to him. It's always better to get, cut it all and I was just cutting what I want.

Thus, sustainable plant harvesting strategies not only allowed for the continued production of plants that were important for use, but also promoted and enhanced plant communities.

As well as grasses, cedar bark from both western red-cedar and yellow-cedar is an important material used for weaving. Cedar bark clothing was commonly worn by Nuu-Chah-Nulth people before the introduction of contemporary fabrics. The strength of cedar bark and its availability on the Northwest Coast, made this material a very popular one. Capes, hats, baskets, mats and other items were made from cedar bark.

> *I think the red-cedar falls apart. But if you ever saw those garments they have at the museum, I think that's what those were made of. Some of them are supposed to be waterproof... I don't know how they're woven, but my mother-in-law used to say that some of them are waterproof, the capes and the hats. They made use of a lot of things.* (Trudy Frank)

> *The only time these [cedar] mats were laid out is when they have a big feast like a pow-wow [or] potlatch or whatever. She laid them down all around the house. And everybody came in and sat down on them. And she'd pick them up again and clean it off until the next potlatch. Next potlatch, next pow-wow, whatever...Them things couldn't wear out. They're cedar...she used to work on it all day.* (Robert Thomas)

> *There's lots of uses for that cedar bark... like using it on fish.... you keep these things like seal meat, you use that and hang it up [using cedar bark]. Like any kind of meat that you want to keep for a while, they all smoked. They never had fridges or anything in their homes at that time... They put a hole in the meat and hang it up ... above the smoke and it keeps longer that way.* (Robert Thomas)

> *They said they always used yellow-cedar bark, real long strands, you know it can get very thin but it's strong. That's what they must have used. Now they buy raffia in the stores...I was told by my great-grandmother that they used yellow-cedar strands for twisting it on you know. Yeah, you can get it real thin, they're real strong.* (Arlene Paul)

For some items, cedar bark was dyed to other colours besides its natural brown. In one of his narratives, George Clutesi describes cedar bark that was "dyed the colour of the young coho salmon — as red as red can be" (Clutesi 1967:20). Different colours of the cedar bark were used to make decorative costumes and other ceremonial gear.

Cedar bark is harvested in the early spring when it peels easily from the tree. In Ahousaht, cedar bark is usually gathered during the months of May and June. Robert

Thomas remembers bark being collected earlier than this time in the past, usually in March or April.

> *You have to peel it a certain time of the year, you know when the sap.... when it's time to peel, when it's real easy to peel, a certain time of the year... Some go in May, April [or] May, used to but it's getting later and later. Everything's changing, you know. Somebody was telling me they get it in June. But in them earlier days, they used to get it in March, April. At the springtime, you know, when sap starts running I guess or whatever, whatever makes them easy to peel.* (Robert Thomas)

> *... The first part of spring, like May, May and June we collect cedar bark. That's when it's the best. After June, you can still pick it, but it gets pitchy. But I know about the cedar bark, and maybe around this time of the year I guess there's other stuff, plus this here [swampgrass]...* (Trudy Frank)

> *Well, first to gather is the cedar bark which is the end of May when it gets loose from the trunk, in end of May, June, and after awhile it gets full of sap. In September that's when it starts clinging to the tree again and you can't get it, and when you gather the bark you just have to cut near the bottom, a strip on each side, and then from there you start pulling the bark from the tree which is easy because it's not clinging to the trunk and it's always better to remove the bark from the inner bark right away, because if it gets a little bit dry it gets harder to separate the two, bark and the inner bark. This is in the end of May and early June...* (Lena Jumbo)

The gathering site for collecting cedar bark is extremely important in determining the quality of the material. Specific areas and habitat types are preferred. Several elders described going far back into the mountains, away from salt water, to gather bark. This journey was especially vital for gathering yellow-cedar bark since these trees grow primarily in the upper slopes of the watersheds. Cedar trees that grow in shade, protected by the forest, are preferred for better quality of their bark.

> *... but you have to look for a good spot to get that [yellow-cedar], you can't just pick any old one. Some get worn, some are black, they get moldy, like spots, so when you know that's happening with that grass you get, you know they'd avoid it, they'd get another spot. And cedar bark you can almost get anywhere, but it's wiser to get it in the woods. It makes a difference.* (Arlene Paul)

Outside part [of cedar] it always be full of pitch ... because it's in the open sun, you know. My mother used to always want to go into the forest to get it... it's just the fact that it's in the open. I guess, you know, like anything else like sweat or something, maybe that's how, what the sap is, I don't know, but you really find it like that in the open. If you wonder why you have to go in the mountains, there was reasons. Like way up in the mountains you could find them real fine, fine growth, you know when you pick it, no matter how tall a tree if you find them like that, real fine. You know, easy to split, really fine. Just like they used to say, the young ones are alright for that, you know, small trees. My grandmother would get all the big ones. We're only allowed to take one strap from the tree. (Arlene Paul)

Yes I did [go cedar bark collecting]. Yes, I went with them [grandmother and other relatives] and they had a special place to go, you know. And they knew where they were going. All we had to do was follow them. Follow them around...and we used to pack bark down for them, down the hill. Whatever we can pack. I don't think we can pack to much in them days... It's already peeled off the part they didn't need they throw away right there. (Robert Thomas)

...They have to go where they know where it is. They know where to get it... you see along the shore there's nothing but like hemlock trees and pine trees and whatever, but further back you get cedar, the kind of cedar they want. They're particular [about] what they want, you know. They know what they want. (Robert Thomas)

You get it [cedar roots] from the river... in the rivers. You can see the roots sticking up out of the trees that are still standing up and you cut that off. (Robert Thomas)

We'd be climbing the high hills for my mom's, cedar bark's supposed to be good when you get it up away from where people live... We used to go way up in the bushes for it! Then we'd pack it down the hill, and my mother used to work on it, in the sun until the bark was split, to work with. [Hot Springs Cove]. One side of Raphael Point we'd get her those real white ones. (Greta Charlie)

And so, in terms of the knowledge, you see culturally modified trees ... in many areas. Even into areas that Europeans don't think that we ventured so far and so high. They see canoe shapes thousands of feet up in the air, yellow-cedar. (Clifford Atleo)

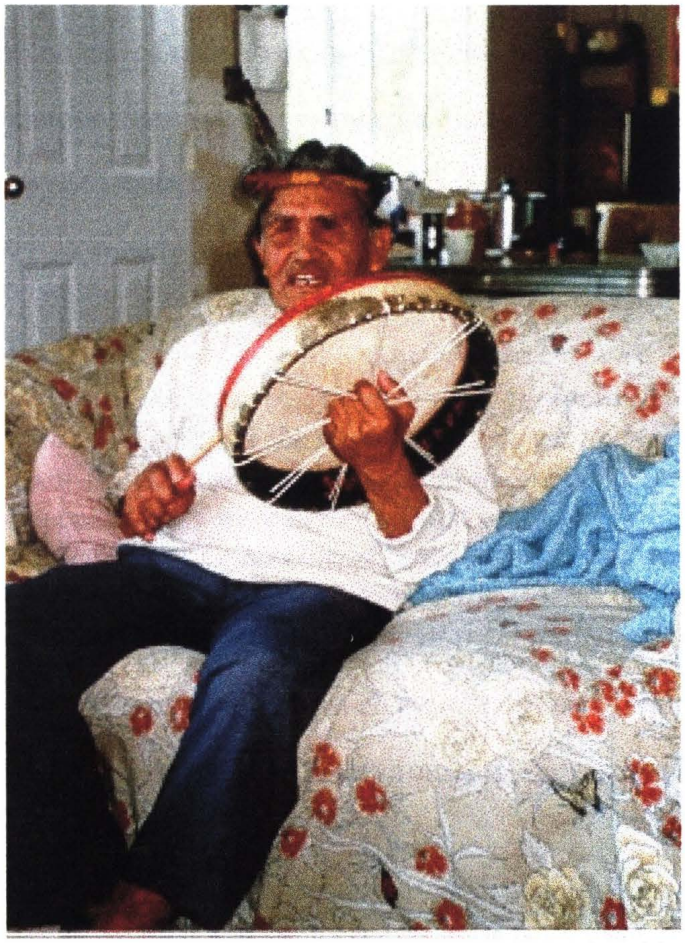

Figure 4.10: Robert Thomas, drumming and wearing a head band made of western red cedar bark.

Figure 4.11: Rope made from western red cedar bark.

As well as the use of cedar bark, western-red-cedar trees are used for canoe-making. People choose trees that are growing a distance from salt water, which selects for wood that does not crack as easily (Larry Swan to Bouchard and Kennedy 1990; Wilson *et al.* 1991; Kennedy *et al.* 1993). Murray John explained where his father used to collect cedar:

> *My dad [Johnny John] and them... they went out up in the mountains to get their whaling canoes. Way up in the mountain. And all their friends, when it was done, all their friends went up there. Help them pack it down. The reason for that was the cedar trees were better up way up in the mountain than down below. They had better grain, I guess. And better wood. That was the reason. My dad said "Oh, this is nice canoes." 35-foot canoes. Whaling canoes they call that. I was too late, my time. I never saw any of them big canoes.*

To find the good quality trees at such a great distance, landmarks are used which require a detailed knowledge of the local environment. For example, according to Alice Paul (as told to Turner and Efrat 1982: 67):

> *Whenever a person went out to make a canoe or look for a canoe tree and wanted to tell others where he had been, he would invariably say, 'you pass this* ***sitmapt*** *(Alaska blueberry bush) and* ***his7itqmapt*** *(red huckleberry bush), and then you'll find the place'.*

Within an area or specific habitat, individual trees were chosen for bark collection based on their appearance, size, and aspect. For example, Roy Haiyupus said that he "... used to look for long straight cedars, the less branches the better, about six inches in diameter" (quoted in *Ha-Shilth-Sa*, November 13, 1991:3). Other people from Ahousaht described appropriate trees for cedar bark harvesting:

> *... they are [better] when there's no branches on them. It's just the bark they're looking for. There's all kinds of cedar right there in the front but there's lots of branches on them. They don't want that. They want one without branches so they can peel a long ways and then break it off when they want it...* (Robert Thomas)

> *... like my grandmother used to tell us, and my dad he used to say, weather conditions, [cedar bark] was bad if you were on the island, and it's facing away from the mountainside, the tree. He always told us to get it from this side, not*

southeast side because that's protection, the bark of the tree. So we always really believed that, you know, we do it that way. Protect the tree still. (Arlene Paul)

You can't peel a big cedar. You gotta take the right sized tree. And where it's facing the sun, and away from the sun, those kind of things. (Murray John)

Bark is harvested by cutting a horizontal strip at the bottom of the tree and then grasping the edge. The bark is then pulled upwards, peeling off the tree in a long, tapered strip. Because only one or two strips are taken from each tree, the tree is not girdled and continues to live. Once a strip of bark is taken, the outer layer of bark is removed. Only the softer, inner layer, is used for weaving and making items. Cedar bark is prepared by drying it in the sun and hanging it until it is ready to be woven. It is usually soaked down before it was worked with.

...when it's freezing, you can't use it [cedar bark] because it gets brittle. In the winter, because you have to keep wetting it... they used to pick the yellow-cedar bark too. It's quite different... They used to pound it or something, and it becomes quite [soft], like a cloth almost. (Trudy Frank)

Then they hang up the inside part of the cedar bark and dry it like that in the sun... I guess they hang it up right away and after they peel that bark part, the no good part, you know, they just hang the good part up, like the inside part of the cedar. And when it gets dry they fold it up neatly like that and put it in the ***mak-ay-u****, ... it's a cedar, cedar box...it's made out of cedar, woven like a mat and closes like that. It's what they put it in and keep it until they start working on it. That's in the winter time. They do this in the summer time like when it's no rain... And they put that away and keep it for the winter.* (Robert Thomas)

With the cedar bark, once you get it off, I prefer to have it folded away two, three days before putting it out in the sun, and ... fold it down nice and as compact as you can. If you put it out right away it would be the hardest thing to put away... because once it gets used to the fold you can put it out in the sun and still fold it away although it's dry. I prefer to wait in the evening when it gets a little bit damp, then it's easier to fold away... I just bring it home. It's always too much mosquitoes out there to work in the bush! [laughs]... if it's a nice day like this, one day will be good enough but two days, three days is nice. I think it's better when you have it out longer because that way the inside will get kind of red too, not so white, like how mine is. I just had those out for one day, and I find if I have it out in the rain it will get nice and red right to the center. (Lena Jumbo)

Like the harvesting of other life forms, prayers were said before cedar bark was taken from the tree to show gratitude and respect. Rosie Swan remembers her father praying before harvesting cedar bark:

> *And my dad would cut the tree. He'd pray first.... cause it was real hard, that cedar bark. And he'd take the bark off just to go for the inside. And he'd have us roll it up and put it on a basket on our shoulders.*

The presence of culturally modified trees in First Nations' territories attributes to the sustainable harvesting techniques used for cedar bark collection. These trees, still living today, are testimony of the respect and careful management of plant resources by aboriginal people.

> *And so if you didn't need the whole tree, you didn't cut the whole thing down so readily ...if you only needed a few planks, that's all you took... So you ended up with CMTs. If you only needed the bark, that's all you took. You didn't take the whole tree down just to get at the bark. And so you see some evidence where those planks are taken out where the tree heals itself, you know. It starts curling in like that and eventually it closes up. You see those in different stages, depending on how long ago it was done.* (Clifford Atleo)

> *... we went there recently, just to walk up at Moyehai side. There was [culturally modified] trees, you can tell it's regenerating. It's not smooth, but you could see where it was, and it was pretty neat to see that tree was alright.* (Arlene Paul)

4.1.2 Habitat and landscape management

As well as strategies for sustainable plant use, people had knowledge of the land and its resources on a larger scale. Habitat management occurred through understanding the relationships between organisms, using ecological indicators, understanding how to monitor and inventory resources, and through modifying habitats to promote sustaining populations of plants and animals. As well, seasonal movements, diverse use of resources and the system of *ha hoolthe*, promoted careful and sustainable plant use.

Understanding ecosystems

As part of their integral tie to the land, aboriginal peoples observed nature closely and understood the interactions between parts of the ecosystem. This detail can be illustrated by looking at the writings of George Clutesi (1967:101) of the Tse-Saht First Nation. He relates his understanding of the relationship between many different species in one of his stories as he describes the day of a tournament in his narrative, *Ko-ishin-mit and Paw-qwin-mit.* He writes:

> *At this particular time of season when the sun was warm, when the buds on all the reawakening plants were bursting forth in their pale green crowns, and the salmonberry blossoms in their bright flaming red jackets swayed and beckoned the humming-bird small to sip nectar, when the nettle shot from the loam, the bracken unfurled its golden crown from the mossy glens and the tree-toad voiced his cracky song — then was the spear-throwing season heralded in.*

Even small and seemingly insignificant species were observed and recognized. For example, caddis-fly larvae were named and recognized by the Nuu-Chah-Nulth First Nations. Their name, *qwiqwiaaq*, literally means "inside hemlock" because they construct their stick houses using hemlock needles.

Relationships between animals and plants have also been well understood. For example, deer and bear are known to dig and eat skunk cabbage roots (Turner and Efrat 1982). This type of knowledge allows decisions to be made about appropriate times to harvest resources. For example, skunk cabbage is thought to taint deer meat, so deer were not hunted during this time (Fenn *et al.* 1979: Scientific Panel 1995b). Observations of animals also provided information on potential uses of plants by human beings. For example, Rosie Swan explained that some plant medicines were learned from watching animals:

> *That's how they got their Indian medicine, [by] seeing animals eating it. They must have seen this deer getting it's antler off at the tree, and what things they've seen it eating, so they had that for Indian medicine for healing any sores. That's how they learned to have Indian medicine.*

The timing of events were also used as a form of calendar which provided cues for harvesting and other activities. For example, the time to start halibut fishing was indicated when stinging nettle plants were exactly four finger-widths high (Turner and Efrat 1982). Months were designated according to moon cycles, and given appropriate names such as *Tahklahdkamilh* which means "before the end of this month the salmonberry has just begun to ripen and a small bird, with a single human sort of whistle, has arrived"[4] (Lillard 1987:87). Histories were also based on events in the environment by relating events to seasonal cycles. For example, Stanley Sam said:

> *The start of the war was in March when the herring spawn was on. Of course, there was no writing but we go by the date what the Mother Earth was doing, you know. The spawn, the spawn is March every year in this territory, Clayoquot Sound.*

Through these detailed observations of the environment, an understanding of local populations, seasonal fluctuations, and abundance of resources was developed. People knew when resources were particularly abundant, or when they were sparse and in danger of being over harvested and management strategies could be adapted accordingly.

Sustainable strategies for habitat management

To help reduce the chances of low abundance of foods, strategies were employed which were designed to "sustain and enhance the productivity and reliability of culturally important plant resources" (Turner and Peacock 1997:1). Strategies used for specific plant species have already been discussed in this chapter. In addition to these, practices were carried out at the habitat level. These strategies included transplanting, tending of patches of resources, and landscape burning.

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[4] This bird was likely the Swainson's thrush which is associated with the ripening of salmonberries (Pojar and MacKinnon 1994).

Transplanting of plant species from one habitat to another provides greater access to plant resources. By growing plants that are used for foods, materials or other purposes, close to villages or commonly visited sites, the populations of these plants are supplemented and there is a greater likelihood that they will be abundant enough for use. Robert Thomas recalled that his father planted evergreen huckleberry and bog-cranberry in Maaqtusiis (on Jack Dale's property). These berries are still gathered today and provide a fall berry resource to people living in Ahousaht.

In a project on Pacific Rim ethnobotany in 1978, Peter Webster mentioned that black raspberry was not at Ahousaht when he was a child (Fenn *et al.* 1979). When he was a teenager, one bush was brought in and now it grows everywhere. He suggested that crows might be responsible for the spread of this plant. It is possible that he was referring to Himalayan blackberry (*Rubus discolor*) which is an introduced plant that is not native to British Columbia, and spreads rapidly when it is introduced to an area. Today, this shrub lines many of the roads in Ahousaht, and has become an important berry food for the people who live there.

Transplanting of species requires trial and error and attests to the fact that aboriginal peoples were conducting experiments and learning over thousands of years. For example, Arlene Paul remembers her great-grandmother experimenting with transplanting cranberries:

> *... what you find here you sometimes don't even find on another island. I don't know how come. And they tried transplanting some stuff from the school, old place out here, out to Vargas, to a mossy place as well. It never worked... Even cranberries, we tried that. My grandmother, my great-grandmother tried that... She ripped out the whole square from here, moss and all, brought it out to the mossy area out there. It never become, no plantation out there... Just to see if it would survive out there. It never did. The place is more open than here and. . . I don't know, maybe it's just got it's way to survive I guess, plants.*

Transplanting of plant resources was not unique to Ahousaht. Several plants in Hesquiaht are likely growing there from being transplanted including camas, black hawthorn, cattail, and tule (Turner and Efrat 1982).

Another method for enhancing plant growth was tending and cultivating patches of plants, just like a garden. For example, estuary habitats were modified for the purposes of cultivating and harvesting root vegetable foods such as silverweed and clover (see Section 4.1.1). Poles were laid out to mark Pacific silverweed and springbank clover patches and there was a strong sense of ownership of these patches (Jessie Webster to Bouchard and Kennedy 1990). One site in Hesquiaht territory which is where people used to harvest and tend Pacific silverweed is called *shishp'iḵa* which means "cultivated" (Alice Paul in Bouchard and Kennedy 1990).

One of the most severe methods of modifying local ecosystems for the purposes of sustainable living was landscape burning. George Louie (personal communication to Nancy Turner) said that an area called *iiḥatis* near Herbert Inlet in Ahousaht territory was deliberately burned to stimulate the growth of berries (Turner in press). Stanley Sam has also confirmed that this area was burned (Bouchard and Kennedy 1990). According to Larry Paul who was told by his mother, Alice Paul, the meadow lands behind Hesquiaht village were burned in order to provide firewood (Turner in press).

In 1868, Gilbert Malcolm Sproat (European pioneer) noted that burning had taken place in Nuu-Chah-Nulth territory. He writes:

> *The traveller, accustomed elsewhere to trees of smaller growth, and to pleasing varieties of verdure and freshness, finds himself here amidst old, gigantic, thick-barked pines with branches to a considerable height from the ground, and with dark-green bristling foliage that hardly ever changes. The tops of these great trees are in many places so densely mingled as to scatter, if not to exclude, the rays of the sun. Here and there in the forest are open spaces where the trees burnt by a fire — caused perhaps by the careless Indians — lie blackened on the ground, or where they appear lying white and withered, as if destroyed by some blast or circle of wind that left the surrounding trees uninjured. (Lillard 1987:16-17).*

The skill and knowledge required to conduct these landscape burns was far from "careless". For landscape burning to be effective, extensive wildfires and hot burns are avoided (Gottesfeld 1994). If burns reach temperatures that are too high, rhizomes of berry-bushes and the surface layer of the soil can be destroyed. Thus, in order to incorporate fire as a management strategy, knowledge of habitats types, faunal relationships between habitat types, varying effects of fire on different ecosystems and successional growth of species have to be mentally documented (Lewis 1989). As well, to conduct a controlled burn, knowledge of wind patterns, weather conditions, heat intensity, type of habitat, topography, and the size of the area are required to determine optimum burning sites and techniques. As Sproat notes, trees surrounding the burn, he witnessed, were left "uninjured", indicating that the burn had likely been controlled (Lillard 1987).

Areas that have been burned by fire provide gaps in the forest canopy and light, which enhances berry growth. Stanley Sam has said that berries such as Alaska blueberries, red huckleberries and salal berries grow better after an area has been burned (Bouchard and Kennedy 1990). Arlene Paul has observed that when an area is logged, initially the berry bushes grow better and are abundant:

> *... The thing about berries, you can cut them down and they reduce. Like the* ***y'am'a****, salal, they come out really good when they first log a place out and it comes up, it always is really good stuff. So I guess once they really start overgrowing, I don't know, it doesn't seem very good. I mean it produces really good berries when you get a logged out place.*

Improved berry production may be due to increased light availability, and burning of logged areas may play a role in the increased production of berries by releasing nutrients.

As well as for the promotion of berry crops, landscape burns may have been traditionally used for northern rice-root populations. This important root vegetable is a good source of carbohydrates and grows primarily in floodplain meadows. The burning of

these habitats can reduce competing vegetation and may enhance the populations of Northern rice-root (Gottesfeld 1994).

Although there is little information regarding traditional landscape burning activities of the Nuu-Chah-Nulth, burning has been used as a management tool by First Nations throughout British Columbia for tending important root crops, clearing underbrush to make traveling easier, and for improving the productivity of berry-picking areas (Gottesfeld 1994: Turner 1994a). It was very likely a tool for resource management and a factor in shaping ecosystems in Clayoquot Sound.

Diversification of plant resources

Another sustainable strategy used by the Nuu-Chah-Nulth was to incorporate a diversity of resources into their lifeways. For example, a wide range of foods in the diet helped to assure that other foods would be available during times of low abundance. Over 200 plant species were recognized by coastal First Nations for food, materials, and other purposes (Turner 1995). Like other First Nations, certain foods were used as staples and others were considered "famine foods" and were eaten only when preferred foods were in low abundance (Turner and Davis 1993). The diversification of resources meant that when species were in low abundance they could be conserved and alternative plants could be used.

Diversity was promoted through trade and potlatches. Potlatches and other feasts where people of many families, tribes and Nations gathered, included the distribution of food and other wealth throughout the area. As Richard Atleo and Nancy Turner describe (Turner and Atleo in press:8):

> *From a resource perspective its function was to redistribute wealth to promote the well-being of the community without doing damage to the environment, without violating the principles of balanced stewardship over the land, and in such a way as to render respect and honour to chiefs, nobility, people, plants, animals, spirit powers, and through all these, to the Creator.*

Diversification of resources was also achieved through trade. For example, camas has been mentioned as a food plant of the Nuu-Chah-Nulth but is not native to their territory (Fenn *et al.* 1979; Turner and Efrat 1982). This plant was acquired through trade with the Coast Salish or other First Nations. Trading meant that in years where resources were not plentiful, they could be acquired from other areas which helped promote sustainable, local harvest levels.

Another method of attaining diverse resources was through seasonal movements. Villages moved throughout the territories during the course of a year according to the abundance of resources in each area.

> *... we had a system of living, a way of life, which was governed by the seasons so we moved inland during the stormy weather and moved to more pleasant outer areas for the pleasant weather time, in the summer time. And so we had like portable homes ... and our territories were such as to provide us with this kind of living.* (Richard Atleo)

> *My grandpa had a house just about every stop because we used to travel with the seasons. Spring we'd be at Robert's Point, summer we'd be at Keltsomaht, and [when] fall time came, we moved inland where my grandma would be doing dog salmon, smoking fish. And winter time we'd be way inland where my grandfather and my uncle would be trapping in the winter, and then spring came along we moved back out to Robert's Point, back to Keltsomaht traveling with the season. And we travelled by canoe.* (Lena Jumbo)

> *We had cargo canoes, we had framed homes that were moved from site to site where all you did was take the planks and load them in the canoes and move them to the next site and just take those planks and throw them up again. So there was incredible sophistication in terms of design, you had the frame up there, planks sized and everything. Take those same things and haul it somewhere else. And, you know, like all the exercise of taking down, putting up, those didn't just happen, you know.* (Clifford Atleo)

Seasonal movement coincided with the availability of resources. People had knowledge of where and when resources were abundant. As well, they understood that areas needed "rest", in order to recuperate from use (Clutesi 1990:171). Periods of time

where lands were unused could be considered a form of restoration, allowing habitats to recover from the impacts of humans.

Ha hoolthe

Seasonal movements and the harvesting of resources were overseen by chiefs within their *ha hoolthe* jurisdiction. The system of *ha hoolthe* was a form of tenureship of land wherein areas were owned and managed by hereditary chiefs. Monitoring of populations, ecological indicators, quality of resources and other understandings of the ecosystem, guided chiefs to manage resources sustainably.

Within the *ha hoolthe*, natural resources were considered to be owned. Philip Drucker (1951:247) noted that the Nuu-Chah-Nulth "carried the concept of ownership to an incredible extreme". As well as the ownership of marine resources, plant resources such as berry patches, root vegetable plots, and stands of red-cedar were considered to be private property (Turner and Efrat 1982). Ownership may not have been consistent through all Nations or in all areas of the territory. For example, Dan David from the Tla-o-qui-aht First Nation said that there was no ownership of berry patches in the Opitsaht area (Fenn *et al.* 1979).

Traditional stewardship areas were looked after at the watershed level. According to Stanley Sam, *ha hoolthe* extends inland as far as the salmon go and as far up the mountains as people go to collect cedar (as told to Bouchard and Kennedy 1990). The division between *ha hoolthe* lies at the height of land between watersheds. For example, according to Earl Maquinna George, a hereditary chief of the Ahousaht, the Atleo River watershed lies in the *ha hoolthe* jurisdiction of Richard Atleo and the Shark Creek watershed, just north, lies in his own *ha hoolthe*.

The concept of *ha hoolthe* included stewardship and was a form of management. For example, the responsibilities of owning a river included exclusive rights to the first run of salmon, keeping the stream clear, determining who can fish and receiving payment from

those who do (Bouchard and Kennedy 1990).[5] Permission and reciprocation was required for the harvesting of plant resources. For example, the first harvest of berries were picked for the chief who then gave a feast for his people (Larry Swan to Bouchard and Kennedy 1990). According to Drucker (1951:56-57), salmonberries, red huckleberries and blackberries were claimed. The chief sent a party of women to pick berries for him and would provide a feast with this harvest. Following the feast, people could pick berries for themselves.

The size and quality of the first harvest would have provided necessary information on the abundance of resources which could guide chiefs in determining appropriate harvesting levels and management activities. For example, although the Atleo River was rich in fish and other marine life at one time, Stanley Sam explained that these resources were carefully monitored and managed within the *ha hoolthe*:

> *Atleo's owned all those fish traps on the beach. When the river is flooded with fish the Chief used to tell them to close it off. It's called over-spawned. They closed it off to make sure that next run of fish would have a chance to survive... there used to be all kinds of fish when I was young, in my young days in 1939, '38, the fish jumping all over the beach there.*

Stewardship as a component of *ha hoolthe* was also recognized (although not necessarily understood) by Gilbert Malcolm Sproat, an early pioneer, who wrote in 1868 (Lillard 1987:59):

> *I know, also, an instance of a man of rank in one tribe who controlled ingress to a lake and would allow no one to pass without his permission. But this may not have been so much for his own benefit as that someone should have authority, in the interest of the whole tribe, to prevent the salmon from being disturbed in their ascent up the river.*

The connections between habitats and landscapes within the *ha hoolthe* were also acknowledged and understood. For example, as Earl Maquinna George (personal

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[5] Aboriginal participants in this study included James Swan, Alice Paul, Larry Paul, Mary Hayes, Stanley Sam, Jessie Webster, Peter Webster, Margaret Joseph, Joe Tom, Ben Andrews and Viola Louie.

communication 1996) explained, people had knowledge of the hydroriparian system, including the movements and cycles of water:

> *[The Nuu-Chah-Nulth people] knew a standing tree drank up gallons and gallons and gallons of water. So that if a tree were felled, rain water falling from the sky would have nowhere else to go but seep out to the watershed. And mud, rock, gravel would loosen around where the tree was and there would be terrible slides. So each individual tree had a name, and was recorded in the mind of the people that looked after the territory and area.*

The system of *ha hoolthe* was deemed extremely important by the Scientific Panel. Among the reasons for this recognition is that this concept recognizes First Nations' historical management of resources (including plants) and that it embodies the concept of using resources sustainably (Scientific Panel 1995a). Elders from throughout Nuu-Chah-Nulth territory also recognize this concept:

> *Being a **Qu'as** means knowing from the beginning of life that the ocean and its resources and the land and its resources were given to us by the Creator for us to use. This means being able to provide for your family from these resources. It means knowing who the **Hawiih** Chiefs were and respecting their authority over their **hahuulhi** [territories] and their authority over their resources. It means respecting their rank and what they owned — their songs, their dances and their names.* (Sayings of our First Peoples 1995:22).

4.2 Communication and exchange of plant knowledge

The concept of *ha hoolthe* and other strategies for sustainable living were passed down from generation to generation over thousands of years. Although the Nuu-Chah-Nulth had no formal written language, they had many ways to transfer and gain knowledge through generations. Learning about this component of traditional ecological knowledge (communication and exchange of knowledge) is important in trying to learn about traditional plant management and world views associated with plants and the environment. It also provides a context for the information that was described in the previous sections. Murray John explained how First Nations use the oral tradition:

He [my dad] said, "You've got to learn this prayer"... So still today I know that prayer in my own language... which just my family knows. It's sort of a sacred thing in our family. All families are different, a little bit different, in our prayers. But my dad, he said "Our teachings, from my dad's teachings, now I pass it to you" he said... the First Nations, it's passed on by voice. Passed on. Passed on. Passed on. Today, what my dad learned from his dad, and I teach my children. And they've got their own children now. It's entirely up to my children to tell their children right and wrong, and the prayer song. We don't write our teachings down. We just pass it on by word.

Many elders in Ahousaht have never written down their histories, Nuu-Chah-Nulth words, narratives, or other traditional knowledge that they hold. This knowledge is held by them and is shared with other people through traditional forms of communication such as orally or experientially. In turn, their ancestors shared knowledge with them in the same way.

One has to start, I think, from the understanding that nothing is written. I shouldn't say nothing because we had what they call ***muy-a-puk-um****, the curtains that tells the story. Those and masks and poles were the only thing that can be understood as something that's recorded. Other than that it was all verbal teachings. And so if you can appreciate that, this ability to be able to retain and this ability of our people to understand that in order for it to stay with people, speakers got up and repeated things four times. If you listen to exactly what they were saying, is that it went [circling with hands] like this and think "Boy these guys talk a long time". Well, there was a reason for all that.* (Clifford Atleo)

I learned the art of weaving when I was five. I used to watch my grandmother [Mamie (Mary) Tom], and she started a mat for me. I knew how to weave, but I didn't know how to add on, and I didn't know how to change the grass when it gets short... So, my grandmother... if I'd go out to play, get tired of weaving I'd go out to play, she'd leave my work at the door, put it in a manner like it was crawling and when I'd come back in she'd tell me my work was crying after me [laughter]. (Lena Jumbo)

If anybody was going to take over from their Elder in that family they would have to learn at a very young age, lots of years, it isn't just an overnight thing, show them and use it tomorrow!... I'm sure that's why doctors take eight years to become a doctor. Same thing. (Arlene Paul)

...I used to know as a little girl some medicines that were good for, like my cousin had an ulcer on her leg... And my grandmother used to send me for this plant. She showed me once, so I used to go for it and it healed her leg... (Lena Jumbo)

> *.... like the other year I had my daughter out on the island, we were walking, I was telling her, if you're ever caught, lost in the woods, this is what you eat, because that's what they used to tell us...* (Trudy Frank)

> *My dad, he showed me which ones to get with which plant is for what. Because he said "Remember which is which"... my dad never wrote anything down for me. He never had no diary. "You've got to remember" he said. And I remember. And I showed my children... medicines and berries.* (Murray John)

The communication of knowledge and information also occurs through group discussions and meetings. Nuu-Chah-Nulth Nations use an inclusive approach to decision-making in which everybody is allowed to speak and express views and ideas (Richard Atleo, personal communication 1996). Knowledge is shared and decisions are made through listening and learning from one another.[6]

Since traditional knowledge is passed on by oral traditions, documenting the knowledge of elders can be difficult. Translations between Nuu-Chah-Nulth and English may be inaccurate or lose meaning. Also, writing words may take them out of context. For example, *Sayings of our First People* (1995:11), a book devoted to sharing the wisdom of Nuu-Chah-Nulth elders with their communities, states:

> *Putting the information together in the form of a book was not an easy task for two reasons. First, our people never used a written system for teaching, and second, teachings were presented differently as a person went through life. Traditionally, our people developed their powers of memory systematically and passed on knowledge orally.*

Knowledge is not held equally between all individuals in a group. Gender, age, family history and other factors influence the information that people gain and share. Traditionally, activities involving plant gathering and preparation were carried out by women while hunting and fishing activities were primarily male activities. Thus knowledge of basket-making, berry-picking, root-gathering, and other food and material collections is held primarily by women. For example, *m'aayi* (salmonberry shoots) has

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[6] Inclusive-decision making was used as a working protocol for the Scientific Panel (1995a:5-6) and was considered to be one of the key elements to the success of the Scientific Panel (Nancy Turner, personal communication).

been called a "woman's plant" by Earl George (as told to Dr. Nancy Turner as part of a university project in 1994) because women were the primary people who gathered and prepared this food. Bunchberry has also been recorded as only being consumed by women, although no harm would come to men if they consumed them also (Fenn *et al.* 1979). Timber harvesting for canoes or other items, wood harvesting and other plant gathering for the purpose of fishing and hunting implements are more familiar to men. These gender differences in knowledge were apparent during interviews. Women tended to share knowledge regarding plant use and management, while men primarily shared their knowledge of forestry, histories of the area, and wood products.

Family history is another factor which affects the knowledge held by an individual. Luke Atleo, younger brother of Richard Atleo, explained that certain information was the property of the eldest son of a family and was shared only to him. For example, the eldest son may learn certain information, such as medicinal plant knowledge, that was not known to his siblings.

A person's age also affects knowledge acquisition and sharing. Since traditional knowledge is acquired through experience over time, older people may have accumulated more knowledge than younger individuals. Elders today were youngsters in the 1920s and 1930s before television, roads, and other 'modern' technologies were introduced to Ahousaht. They may have had more experiences with their parents or been more active in plant harvesting and preparation than in modern times.

Fluency in the Ahousaht language (a dialect of Nootka) may also affect knowledge since the passing down of the Nuu-Chah-Nulth language is an important part of sharing information regarding sustainable plant use and management. For example, traditional place names may feature a plant.[7] Kennedy *et al.* (1993:35) note that place names on Blunden Island attest to the presence of spruce roots and abundant food. The traditional

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[7] For a more comprehensive review of Nuu-Chah-Nulth place names, including plant harvesting areas and sites named after culturally significant plants, see Bouchard and Kennedy 1990.

name of an island known today as Shot Island is *Ihayipkwapiih* which means 'salal bush on island' as there is plenty of salal growing there (Bouchard and Kennedy 1990:261). An area just offshore from Moyehai Reserve is called *t'iikwukwis* which means "root-digging beach" and is a site where clover was cultivated and gathered (Stanley Sam to Bouchard and Kennedy 1990:335). Rosie Swan explained to us that Keltsomaht is named after *qilhtsuup* which is a Nuu-Chah-Nulth word for cow-parsnip, a plant which has edible bud stalks and leafstalks and which was abundant at that place.

As well as indicating where plants grow, traditional names may also describe a plant in a way that helps to identify it. For example, Trudy Frank explained where the name for stink currant originated:

> *... But we were allowed to eat, that one you were telling about,* ***hashp'uuna*** *, the stink berries [probably Ribes bracteosum, stink currant]...* ***Hashp'uuna****... it's got a connection with like, when you have a wet diaper it's* ***hash'pu'ks****. So it's, I guess that's what they connected it to, the smell!*

Names of plants may also indicate their origin, such as *mamniqici kalhkintapiih* (cultivated strawberries) meaning "strawberries belonging to the European" and *kalhkintapiih* (wild strawberries) meaning "strawberries belonging to the native person" (Turner and Efrat 1982: 72). Plant names may also indicate the use of the plant. For example, *wita'pt* for the yew tree means "warring" as this wood was used for making war clubs. Names may also contain ecological information. For example, a moss (*Alectoria*) which grows predominantly on Pacific crabapple trees is called *cicih'aqmapt pu upuk* which means "crabapple moss".

Traditional plant names may also be descriptive in showing how a plant is revered. For example, trees are thought of as living beings. A site on the east side of Millar Channel where there has been extensive hand-logging of Douglas fir is called *chichixwas.* This name can be translated as "scar on cheeks" (Bouchard and Kennedy 1990:324).

The detailed knowledge of the environment that was required for sustainable living is exemplified by traditional plant identification. Nuu-Chah-Nulth names of species are

very similar to the scientific division of species in that there are categories for the life-forms of plants (e.g. seaweed, grasses, trees) and for hundreds of plant species. In addition, there are names for the specific parts of plants that are used for food, material, or other purposes. For example, a salmonberry bush is called *qawashmapt*, the berries called *qawii*, and the shoots called *m'aayi*.

In addition to language, much of the knowledge and teachings about plants are handed down through narratives and stories. Not only are the narratives used to teach the younger generations information, but also are used to communicate traditional values and teachings. George Clutesi (1967:9-10) of the Tse-Saht First Nation describes the important role of narratives in the beginning of his book, *Son of Raven, Son of Deer*:

> *Quaint folklore tales were used widely to teach the young the many wonders of nature; the importance of all living things, no matter how small and insignificant; and particularly to acquaint him with the closeness of man to all animal, bird life and the creatures of the sea. The young were taught through the medium of the tales that there was a place in the sun for all living things. This resulted in a deep understanding and love of man for all animal life... It was not long before the child realized that all animal life was an integral part of all creation.*

Some narratives which feature plants contain information and instill values related to their sustainable use and management. Rosie Swan recounted the story of the yellow-cedar tree:

> *... and **co-oh-shin-imit** [Raven the copycat] come around and she blew on the wool, on the wool. "Mother" he was saying "I'm bear". He was pretending to be a bear. The ladies weren't scared but he said "I'm a wolf". He was making noise like a wolf. The ladies left their fish, ran in the woods. They ran and ran. They got tired of it at the bottom of the mountain. They stood there. They become yellow-cedar tree. That's why yellow-cedar is the best wood you can use for carving because they're made out of women. The **co-ho-shin-imit** must have just wanted to eat up their fish... you have to go way in the woods to get yellow-cedar. Good for carving.*

A similar story was recounted by Alice Paul who is also from Hesquiaht (Rosie Swan is originally from Hesquiaht) called "Raven and Miss Yellow-cedar" (told in Turner and Efrat 1982: 33). In this version, the women were afraid of owls so Raven hid behind

a bush and imitated owl sounds. The women ran away and stopped on the side of a mountain and turned into yellow-cedar trees. Alice Paul explained that is the reason why yellow-cedars are found on the sides of mountains and they are such nice looking trees with smooth trunks and few branches.

Another story shared with us by Rosie Swan describes the origin of the *hast'aachi* (bunchberry) berries:

> *There's a story to this **hast'aachi** my dad used to tell us. And Peter [Webster], what he told us... this one time they [the elders] put this ... young girl on a tree. Four days and four nights. No food or water. And somebody was at the foot of the tree watching her every minute. While she was up there, she got her period. It went down. The berries come out. That's how the **hast'aachi** come around. It's always around a tree, **hast'aachi**. **Hast'aachi**. That's how **hast'aachi** come around, red berries.*

In Alice Paul's version of this story, the woman was stranded at the top of a red-cedar tree by her angry husband. When her brother came by she told him that he could eat the berries that formed from her blood, and that they would always be around the red-cedar tree. The idea that food, such as the *hast'aachi* berries, are a gift given by an ancestor such as this young girl who gave the berries to the people for food, conveys the teaching that berries should be appreciated and be treated with appropriate respect. This story also contains ecological information of where the berries grow, since they are usually found around the base of red-cedar trees. This story, one of many traditional narratives, exemplifies the way that Nuu-Chah-Nulth people learned what they needed to in order to live sustainably with their environment and be guided by respect:

> *What these stories then indicate... is that there's tremendous training involved but also there is a necessity for an incredible amount of cognitive power. The capability to keep... in conscious memory, tremendous amounts of information for instant recall. ... And they had no memory aids in those days.* (Richard Atleo)

> *I'll tell you the truth, our people are trained at the time they're born, that's when they get medicines. They're trained and their grandparents...talk to them right until they start to learn how to talk. And it's still here today, I can hear my grandfather, still here today, I can hear him. And I can hear my mother singing*

> *to me. And few people have just improved their things. Now today you call that computer. We're the computer, we've got the knowledge, we're the computer. You ask me what you want to, what you want to hear, and I can tell you. Like if you want to do that to your computer, you push that button there, and there it is. All there it is.* (Stanley Sam)

4.3 World views pertaining to plants and the environment

Within the narratives and stories that are shared by elders, and at the core of traditional plant use and management of the Ahousaht First Nations, are traditional teachings and perspectives. These philosophies and world views traditionally guided activities and lifeways and indicated appropriate ways to behave and interact with the environment. For example, the sentiment that *hishuk ish ts'awalk*, "everything is one", expresses the recognition of the interconnection between all things, including the living and "non-living", forest and ocean, human beings and other beings, and the physical and spiritual. Ahousaht people recognize that actions in one part of the ecosystem affect everything else. Clifford Atleo explained that resource management has treated each part of the ecosystem separately:

> *... along with that mentality [of conventional resource values] comes this attitude of cubby-holing [depicting sections with hands], you know, environment, forestry, oh that's way over here, you know. And it's like a separation. We say you can't separate it. There's a paddle... says* ***hishuk ish ts'awalk****, that means all things are one. From the Creator. And it's true. And we can't ever escape that. As soon as we do we end up in trouble. And it's so true. When we don't pay attention [to] that we end up in trouble.*

Plants, like all other aspects of the environment, are thought to be living beings. As such, they are treated with respect, are recognized as gifts from the Creator, and are thought to have spiritual powers which can influence humans. Although biologists and other people living in the "western" perspective recognize that forests, trees, and plants are alive, Richard Alteo explained the difference in recognizing them as "living beings":

> *I know one scientist in particular who had thought of trees only from a technical perspective. A tree has, is looked at and represents so many board feet. It represents economic terms only. So this person had never thought of that tree as*

> *a living entity, as a living thing, before. Although it's not a big deal either, if someone had brought it up to him he would have said, "oh yeah, a tree's a living thing." But what kind of living thing? Then we have two different perspectives about that because he would describe the living tree in terms of its sap and the technical aspects of it. And we would interpret it as much more than that. A tree is a living being and is capable of being communicated with. One can communicate with the tree.*

Along with the recognition that everything is connected and that plants are living beings comes the understanding that every part of the ecosystem is important and plays a role in the functioning of the whole. For example, Archie Frank recognized the importance of trees in creating habitats for other plants:

> *We're taught that by our ... grandfathers, and we don't just take any old tree. If you're going to make a canoe you've got to go to the mountains where it was shaded. That's why I was just telling you that those trees up there are meant for something, and the tree that's been shaded by other trees, that canoe never chips or cracks, whereas when you take it from out here the canoe always crack in the sun. They knew what to do because they knew what nature does for him, what nature provides for him. Same with the herbs and the plants, they're all under the cover, that big umbrella called the forest. It's a big umbrella that nurtures the living things underneath it, it keeps the silt from going into the river.*

Respect for all of nature, including the plants and animals, is a fundamental value which promotes sustainable living. As Clifford Atleo stated, "... the value that seemed to be so strong and exercised was life itself and the respect for that."

> *Respect is the very core of our traditions, culture and existence. It is very basic to all we encounter in life... Respect for nature requires a healthy state of stewardship with a healthy attitude. It is wise to respect nature. Respect the Spiritual... It is not human to waste food. It is inhuman to over-exploit. "Protect and Conserve" are key values in respect of nature and natural food resources. Never harm or kill for sport. It is degrading to your honour... It challenges your integrity and accountability. Nature has that shield or protective barrier [that], once broken, will hit back at you.* (Roy Haiyupus quoted in Scientific Panel 1995a:6-7)

> ***Qu'as*** *[aboriginal people] held respect for life in all things, the spirit in all things. They had respect for self, for other people, for the land, the ocean and all the resources of food, clothing and shelter.* (The Sayings of our First People 1995:21)

Respect includes a recognition that plants and animals are gifts from the Creator. As Archie Frank expressed in his words at the beginning of this thesis, nature "was the provider". People feel a gratitude and honour towards plants and other resources, recognizing that they are gifts and should not be over-exploited or misused:

> *Nothing is isolated from other aspects of life surrounding it and within it. This concept is the basis for the respect for nature that our people live with, and also contributed to the value system that promoted the need to be thrifty, not to be wasteful, and to be totally conscious of your actual needs in the search for foods. The idea and practices of over-exploitation are deplorable to our people. The practice is outside our realm of values.* (Roy Haiyupus quoted in Scientific Panel 1995a:6)

> *Like I say, we never took too much [bog cranberry]. We just took what we needed. That's what we're taught, not to take more than what you need. Just take what you need.* (Rosie Swan)

> *So everything always had a history to it, things you should do with it, you know, treat it like you would your own child, not abuse it. Seems like it's always the Natives' main concern.* (Arlene Paul)

Treating the environment with respect included the recognition that plants and animals have innate spirituality. As Richard Atleo explained, harvesting plants and animals is not viewed as "taking". Rather, the living beings offer themselves as food so that humans can live, but only if appropriate respect and recognition have been given:

> *... when we talk about hunting then, [a] human being hunts an animal and the success of the hunter depends on the technology, on the knowledge that is acquired about the habits of the animal and so on. But not so in our tradition. The success of a hunter, or one who secures another living thing such as a whale ... which I'm trying to think of new ways of expressing because the relationship between the whaler and the whale are not the same as the relationship between the hunter and the hunted, and the animal, in Western tradition. It's a more equitable relationship. It's very much like in Western tradition when within the same species, when a male woos a woman, right. And so in the very same way the whaler woos the spirit of the whale and pays it great respect.*

Spiritual beliefs and practices are not considered to be separate from the physical realm. Rather, the spiritual and physical are linked and both realms are recognized in interactions with the environment (Turner and Atleo in press:3):

> *Deliberate interaction with the spiritual realm is thought necessary to ensure the maintenance and continuation of necessary provisions. This is the reason 'you give thanks'.*

If one is respectful and acts appropriately, animals and plant will offer themselves. These beings are thanked for their offerings when they are being harvested. This prayer is a recognition that the plant has given of itself, that it is being harvested respectfully and that only what is needed is being taken. The purpose of taking parts of the plant is explained to the Creator and to the plant itself. For example, Rosie Swan explained that before cedar bark is harvested, a prayer or words of praise are made to the Creator:

> *This is the cedar bark. [Western-red] Cedar. The bark they use for basket weaving. They cut at the bottom and then rip it way up. But before they do, they pray to the Creator that they're just going to take what they need and they're doing it for a good purpose... for a basket.*

People's prayers and praises are considered to be personal and private. Rosie Swan explained, as she laid her hand on her heart, that this was something she did inside. Richard Atleo explained that although the prayers of people are individual, they all express the same sentiment:

> *There were hundreds and perhaps thousands of "do's and don'ts" and "do it this way not that way". Everything was ritualized. How to take a tree down... And I think it should be clearly understood that there wasn't a single way to approach a tree. That thousands of people didn't approach the tree the same way. They might approach it in a thousand different ways but they would all approach it with the same kind of principle. That is, they would treat the tree as a living being ... But they might have different words with which they approach the tree. In the same way that a suitor will woo a woman with words and another suitor will woo a woman also but maybe with different words. Right. But with the same intention, the same principal, the same spirit involved. So the approach to a tree, the approach to taking a salmon, the approach to collecting roots and medicines, all of these had their multiple do's and don'ts... And they would be specific to*

families... and it would pass from one generation to the next. "This is how we do things. This is how we do it."

The relationship between plants and human beings is considered to be a mutual one. As well as the ability of humans to influence plants, plants are thought to have influence over humans. For example, plants are attributed as having power to influence what a child will be good at and the curliness of their hair:

> *... the bark off the tree, different kind of trees... they used to say it doesn't steal, it doesn't take away stuff, it'll keep it... They'd put in there [the bark] whatever they wanted the child to be good at... It's the balsam bark they use to wrap it [the afterbirth of the child] up. He ties it with a certain kind of a branch, and he buries it under a tree, because it's a growing tree... I guess because a tree has strong roots - all these little symbols, you know. They don't like [to use cedar], they used to say that cedar bark is easy to get at, but it's like a thief, it will dispose of it, but the balsam never steals, it just keeps it.* (Trudy Frank)

> *Anything that's just coming to a bud, any wild berry, when they know you're pregnant. "Here eat this, your baby will have curly hair!"... My mother had Gladys, and Winnie, our sister had curly hair. My dad used to give it to her when he first found out she was pregnant. I don't know if that's just imagination or if it is true.* (Rosie Swan)

> *There's the fern itself [perhaps deer fern], some of it we get the tips with double head, that's what my mom used to bring me for my pre-natal nutrition... So I would have a smart kid!* (Trudy Frank)

These traditional philosophies and teachings are strong today and are being passed down to the younger generation. For example, when we were in the Atleo River watershed conducting field research, we came across *n'aap'aalhmapt* (Devil's club). The four Ahousaht researchers explained to us that this plant was very powerful and they were told by their elders not to touch it. Although we usually collected plants to include in a herbarium collection, we did not pick this plant in respect of their values and teachings.

4.4 Impacts of forest practices on culturally significant plants

> *...in order for it to provide we have to respect, that's the main thing, is respecting and not abusing. ...they want to take everything without giving it a chance to recycle, it's in a way real dangerous. If you don't respect nature it will never respect you...*
>
> Archie Frank

Archie Frank's concerns reflect the feelings of many of the elders with whom we spoke. Forest practices in Clayoquot Sound have given little consideration to First Nations' values and perspectives. The Scientific Panel noted that "impacts of forest practices on the lives of First Nations have often been ignored or, at best, recognized only casually and incompletely" (Scientific Panel 1995a:1).

Impacts of forestry on the traditional lifeways of First Nations affects harvesting and use of traditional plant resources. Many elders have noticed that culturally significant plants are not as available or of as good quality as the plants that they used to harvest:

> *...when they logged it here, and I couldn't find medicine any more. I got to go in the boat now and go where they're not logging. That's what scares the First Nations. If they keep on logging, logging, it's just like you and I can't go to the drug store any more. We can't go get aspirin or Tylenol. Like the First Nations, we go in the mountains, go in the bush, get our medicine. But if they keep on logging, logging, they'll be no more medicine for the First Nation.* (Murray John)

> *Because a lot of these plants are not just taken and stored, these plants are just taken on the spot immediately. You use a lot of stuff, you need small green plants all over. There are some of these things you can't find anymore in places like back here. You don't find them anymore. I guess the trees, maybe the trees protected them or whatever. You don't find them too much now, whereas in other areas you can find it there and it's like it was planted, you know, certain areas. It doesn't, you don't get it out there at all in spite of all the water and swamps stuff, you don't find it.* (Arlene Paul)

> *No, they [plants] aren't as available. I remember when they got plants for internal, especially internal, purpose of internal healing I guess, plants they needed were always in the forest, where the streams were especially. Like I was saying about that well, they covered it, it used to be really full of stuff there, and the potent things they needed. And there was certain kinds of ferns too, different types. That's gone, it used to be down there, and then what was left was on this*

side and now it's been cut away and there's no shelter, no protection for the plants at all. (Arlene Paul)

Several people attributed the loss of local plants to the reduction of the forest canopy. They emphasized the importance of the trees as "umbrellas" that helped to protect and shade understory plants:

The trees, it's like an umbrella for things that are developing on the ground. They don't know that! My grandfather knew that. There's a reason for them trees to be there with their branches, so close together so the heat won't hit the plants that's growing underneath there.

Without this critical element of the forest, small plants are exposed to direct sunlight, heavy rains, and slides. According to Arlene Paul and others, culturally significant plants are more difficult to find now, and have been impacted by the extensive logging in the area:

Further that way. It was like that here too. But it's just disappearing [plants], I guess all the trees that are gone now might have been protection for those plants. You can't find them anymore.

That's how we're losing it I think, when they start cutting them away like that. All the effect it has on all the important plants. Even things for basket weaving and stuff like that, aren't as great as it used to be, that needs shade.

The loss of local culturally significant plants, among other factors, have led people from Ahousaht to look elsewhere for their plant resources. As Murray John mentioned, he has to go where they are not logging to gather his medicines. Sometimes finding other areas is difficult and access to plant resources has been a concern. For example, picking plants in designated parks is not consistent with park mandates to "preserve" wilderness areas. Trudy Frank discussed the necessity of receiving permission to harvest swampgrass in the local National Park:

Even like with this [swampgrass], we had to get permission to pick that in the parks [Pacific Rim]... Somebody went there last year and they were told to leave it alone. I guess she just dropped by to pick and didn't get permission.

Robert Thomas mentioned that access to cedar bark has also been a concern for people of Ahousaht:

> *Anything you do around here right now is wrong. You can't go in the woods and peel the bark off a cedar tree. You're not supposed to. Some kind of a government law...*

Lena Jumbo mentioned that obtaining permission to pick plants in the park was not difficult, but that she just needs to let the parks people know that she is going to be there:

> *There was still real lot of small ones there. I wouldn't mind going back [Pacific Rim]. I had to have permission from the warden, I have his number here somewhere... it just lets them know that we're going to be there.*

The necessity to go further to harvest culturally significant plants may in part be because plants that are growing in nearby areas (in logged or developed land) may not be of appropriate quality. For example, the quality and taste of edible root vegetables are also thought to be a factor of local populations. In a study on root vegetables, the authors "could only conclude that certain strains or local populations of silverweed had bitter-tasting roots while others did not" (Turner and Kuhnlein 1982:428).

Cow-parsnip was said to be tastier in some areas than in others and people would go to the sites where the plants had the most flavour (Turner and Efrat 1982). Some aboriginal people from the Dididaht have noted that plants that grow in the shade have a longer period of being edible than those growing in the sun and are also more tender (Turner *et al.* 1983).[8] Aboriginal people, through trial and error, determined which were the best harvesting areas in terms of the quality of these vegetables.

Differences in the qualities of plants are also noticed when people gather medicines. For example, plants growing in clearcuts are not thought to be effective. Stanley Sam told us:

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[8] When the chemical composition of peeled stalks of cow parsnip from two sites were analyzed, at one site the major agent was xanthotoxin and at the other, it was angelicin (Kuhnlein and Turner 1986).

When I was talking about this, roads and just plants that... we don't use it for Indian medicine unless if it's stepping in the water where it's running, river. But it's poison when it's on the dry land. Same kind of a plant. So that means when it's raped by clearcut and if it seeps in the river, who knows...

Poor forest practices have affected more than plants. The concept of the interconnections between all things, *hishuk ish ts'awalk*, encompasses the knowledge that harm to one part of the ecosystem will effect the rest of the ecosystem. For example, roads and large clearcuts affect the hydroriparian systems, causing landslides and silty streams which impact the rivers and lead to a decline in fish habitat and populations. Stanley Sam said:

... those big scars on the mountains are those truck roads. It will never heal again. It's going to be like that for thousands of years. And all that silt and stuff that come out of the rocks seeps into the river, kills the fish.

Chief Charlie Jones, a Dididaht hereditary chief, attributed the disappearance of animals such as deer, elk and wolf to logging in the area (Scientific Panel 1995a:8). Many elders in the area have noted a decline in the number of salmon in local watersheds. Stanley Sam attributed these declines to logging in the watersheds and to the presence of fish farms at the entrance of the watersheds (Scientific Panel 1995a:7).

They used the forest, the ancestors. They, like I mentioned, they took canoe out of there and I don't know how they cut their logs to make shacks. They had no house like this... They looked after the forest. That was the reason why there was so much wildlife... deer, black bear, mink, otter...because they never cut it down like what we did. We used power saws. Made the mountains bare. (Murray John)

Yeah, everything's destroyed up, it's affected everything - the plants, medication, our fish, our fish habitat. I know because I worked in a logging camp for nine years. (Archie Frank)

We logged across rivers, across lakes, and we ruined a lot of rivers logging. But that was the company's way of doing it and they knew, probably knew that they were wrong. And we cut all the trees right down to the rivers. All the standing trees right around the local area here. That had lots to do with the bed of the rivers. The fish were not returning any more. (Murray John)

Another impact of logging on traditional lifestyles has been the destruction of spiritual sites such as prayer pools. These areas were not recorded, as they have traditionally been considered the private knowledge of the family who uses them; thus, they have been given little to no consideration in forest management. Murray John said:

> *The logging has affected alot of things. Especially where... our people used to go up in the mountains and pray, and bathe in the waterfalls. Every family had their own sacred place. Now today it's wide open. And everything's changed. The streams have changed all account of logging.*

Perhaps this destruction of local ecosystems is, in part, a result of the lack of respect and adherence to traditional world views and perspectives of local aboriginal peoples. Many Ahousaht people shared their concerns over the exploitative philosophies that have dominated resource practices in Clayoquot Sound, and are concerned over the future of their traditional territories. Archie Frank shared his concerns:

> *Nature is the biggest thing in the world created by God, and he set the rules of how to live with it, that's maybe ten, twenty thousand years when we had the highest standard of living in British North America. We had whales, seals, fish in every description because of our knowledge of conservation, our knowledge of taking what we need from the forest. If we needed a canoe, go out there and carve it up in the hills and bring it down. Today they just took what was there for us to use. You go up the mountains now there's nothing, nothing. Absolutely nothing, your medicines and things that you depended on, all destroyed. I'm just wondering what, what's going to happen in the next ten years.*

4.5 Summary

Sustainable living of the Nuu-Chah-Nulth in their traditional territories over many generations required an incredible amount of traditional ecological knowledge. Strategies were practiced by the Ahousaht, as with other First Nations throughout British Columbia, to promote the productivity and reliability of culturally significant plants and to maintain healthy ecosystems. Such strategies included only taking what was needed (e.g. cedar bark), cultivation of plants including digging, tilling and weeding (e.g. silverweed), pruning and coppicing (e.g. berry bushes) and selective harvesting (e.g. basket sedge).

Thus, plants were not merely "gathered" from the "wilderness", but were tended and looked after to promote and enhance populations for the following years.

As well as species management, systems of habitat and landscape management were employed which required knowledge of the connection between plants, animals and the environment and careful monitoring of these resources. Plant resources were enhanced by activities such as cultivation, transplanting, and landscape burning. The use of diverse resources allowed for conservation of rare species and the monitoring of sustainable harvesting levels. Resource use and management were overseen through the system of *ha hoolthe*, in which hereditary chiefs were stewards of their territories, and were responsible for ensuring that resources were used carefully, sustainably, and with respect. These world views and philosophies were summarized by the Scientific Panel (1995a:15) as four statements:

> *The Creator made all things one.*
> *All things are related and interconnected.*
> *All things are sacred and must be respected.*
> *Balance and harmony are essential between all life forms.*

Knowledge about sustainable practices was gained and transferred over many generations. Through living in close association with the environment, people acquired detailed understandings of local ecosystems. Knowledge was also transferred through narratives, oral teachings and language. This transfer of knowledge included information about the environment, and appropriate ways of relating to nature.

In the past, First Nations' values and perspectives have not been considered in forestry practices in Clayoquot Sound. Industrial logging has damaged their local environment and affected the plants they use for foods, materials, and other purposes. People have noticed that these plants are more difficult to find, and that they are of poorer quality. In order to sustain populations of culturally significant plants and other parts of the ecosystem, resource activities must promote the traditional teachings of respect for nature and a recognition of the interconnection between all life forms.

... it's really something when they get elders speaking about how they knew about the mountains and trees because it's all connected, everything - rivers, mountains, trees, and it was very important to keep it intact because if you didn't shade those things underneath the trees, you're asking for trouble, and that's what's happening today. We're destroying ourselves because we have no knowledge of nature. (Archie Frank)

CHAPTER 5: INVENTORY OF CULTURALLY SIGNIFICANT PLANTS IN THE ATLEO RIVER WATERSHED

... so we committed ourselves to do... a total inventory of everything, of every tree, all the plants and all the wildlife because our view is that how can you manage an area without knowing what you have?

Clifford Atleo

5.0 Introduction

Documenting traditional ecological knowledge of elders in the community of Ahousaht provided valuable information including traditional use and management of plants in the Atleo River watershed and surrounding areas, contemporary uses and knowledge of plants, and visions for future use of the forest. Vegetation field surveys focusing on culturally significant plants in the Atleo River watershed supplement this information by providing data on the availability and abundance of these plant species in the watershed, including information on critical habitats and potential collecting sites.

Several factors contribute to the evaluation of the availability and abundance of a plant species. Accessibility of sites is important in determining if areas can be reached with relative ease and speed. Frequency and percent cover of the plants gives insight into the abundance of the species in various habitats. Finally, the productivity of the species themselves (e.g. berries, shoots) also contributes to the evaluation of the species productivity for harvest. This chapter presents the field data for the frequency, availability and abundance of culturally significant plants in the Atleo River watershed. The following chapter (Chapter 6: Discussion) integrates and reflects upon both traditional knowledge shared by elders and data gathered from field work.

5.1 Species list for the Atleo River watershed

A total of 152 plant species (not including fungi or non-vascular plants such as mosses) was found in the lower Atleo River watershed (see Appendix E). Of these plants, there were 15 species of trees, 25 of shrubs, 105 of herbaceous plants and 7 fern species.

Among these plants were many species that have been recorded as having cultural significance to the Ahousaht people. However, of the 27 species of plants used primarily for food and material purposes that were focused on during this study (see Table 2.3), eight of them were not found in the Atleo River watershed. These plant species included: Labrador tea, Saskatoon berry, gooseberry, wild currant, bog cranberry, falsebox, American bulrush, and tule. Culturally significant plants that were found in the watershed will be discussed further in Section 5.3.

Culturally significant food and material plants that were not found in the Atleo River watershed have been recorded in other areas in Clayoquot Sound. Highbush cranberry (*Viburnum edule*), pink fawn lily (*Erythronium revolutum*), Saskatoon berry (*Amelanchier alnifolia*), and cow parsnip (*Heracleum lanatum*) were found in areas surrounding Clayoquot Lake and Clayoquot River (Kunze 1993). Labrador tea (*Ledum groenlandicum*), trailing black currant (*Ribes laxiflorum*), and bog cranberry (*Vaccinium oxycoccus*) have also been recorded in Clayoquot Valley (Schwagerl *et al.* 1994).

According to the Scientific Panel (1995b), at least 111 plant species[1] are considered to have cultural significance to the Nuu-Chah-Nulth First Nations. Of these, 71 species were present in the Atleo River watershed, representing approximately 65% of the plants listed in the Panel report. Plants in this report documented to be significant to the Nuu-Chah-Nulth First Nations that were not found in the Atleo River watershed include 4 tree species, 12 shrub species, 23 herbaceous species, and one fern species. It should be noted, however, that the Scientific Panel appendices are not necessarily complete listings of all plants important to the Ahousaht people.

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[1] A total of 111 vascular plant species from this report were considered . Plants not included in this count that are included in the Scientific Panel document are those species that 1) do not grow in the Clayoquot Sound area (e.g. *Sheperdia canadensis*); 2) are recorded as being eaten by animals but are not necessarily significant to humans (e.g. buckbean); 3) are under a general name (e.g. grass); or 4) are unidentified in this document. Given these conditions, 2 shrubs, 17 herbaceous plants and 1 fern listed were excluded from analysis.

To compare the plant species present in the Atleo River watershed to an unlogged watershed in Clayoquot Sound, plant species found in the Clayoquot River watershed were investigated (Schwagerl *et al.* 1994). At least 56 plant species were found in this watershed that were not found in the Atleo River watershed. At least 82 plant species were found in the Atleo River watershed that were not found in the Clayoquot Valley. It should be noted, however, that the sampling regime was less rigorous for the Clayoquot Valley study, as sampling only took place over 8 field days. Further investigation of plant species which are found in unlogged watersheds but not in logged watersheds would provide more information on the impacts of forest harvesting on traditional patterns of plant use.

Although the focus of this study was plants, many animals and their signs were observed during the summer of field work. Black bears appear to be abundant in the watershed since we came across a bear almost every day in the field. Other signs of bears that we observed include a resting area (with bear fur), tracks, and abundant scat. Other animals and their signs which we saw during the summer were: claw marks on an alder tree (probably of cougar), a salamander, a red-legged frog, red squirrels, bald eagles, hummingbirds, and abundant mosquitoes.

5.2 Accessibility of culturally significant plants and habitats

A factor which strongly influences the availability of plants is the accessibility of harvesting areas. The length of time to reach a site or the difficulty of travel within the habitat may preclude use of the area. Walking in the wilderness is not always easy and can result in areas being inaccessible to those people who have difficulty walking or managing strenuous terrain. Different habitats within the Atleo River watershed vary in their accessibility due to their distance from boat access (either at Bedingfield Bay or the Atleo River mouth) or from the difficulty of the terrain. For each site, comments were made of the difficulty and length of time required to reach the area (see Table 5.1).

Table 5.1: Accessibility descriptions for each area surveyed in the Atleo River watershed. More than one area was sampled for each habitat type in the watershed. Therefore, some habitats may be listed in more than one category in this table.

Time (minutes)	Difficulty level*				
From Bedingfield Bay or Atleo River mouth	easy	fairly easy	moderate	difficult	very difficult
1-10	• Seektukis • estuary • estuary				
11-20					
21- 30					
31-40			• CH forest	• clearcut > 15yrs • clearcut > 10yrs	
41- 50		• HA forest • forest lake			
51- 60				• clearcut > 15yrs • logged lake	• logged lake
Over 1 hour		• HA forest • clearcut < 5yrs • forest river • forest river • logged river • logged river	• CH forest • forest lake	• clearcut < 5yrs	• clearcut > 15yrs • clearcut > 15yrs • clearcut > 10yrs

*Difficulty level was defined using the following scale: **easy** - even ground, open walking; **fairly easy**- slight incline and some climbing; **moderate**- steady incline, relatively open understory but with some dense sections to penetrate and some climbing; **difficult**- steep terrain, a moderate amount of dense shrub layer to penetrate, regular climbing; **very difficult**- steep terrain, poor visibility, thick understory, scrambling and climbing required, hidden drops.

The most easily accessible areas were the estuaries. Boats can pull up to these areas relatively easily, and the habitats themselves are open and flat. Seektukis Reserve is also accessible for these reasons: it is close to the river mouth, a relatively open forest, and there are trails cut into the area. Forests also provided relatively easy walking. Hemlock-

amabilis forests are often open and easy to navigate through. Cedar-hemlock forests are more difficult since they are more prone to blowdown and the resulting woody debris necessitates climbing and scrambling in some areas. As well, cedar-hemlock forests take longer time to reach since they tend to be distributed at higher elevations.

River habitats were fairly easy to reach. A trail from the bridge where the river and road intersect makes access to the river easy. There are some trails along the edge of the river, and in other areas, the river is shallow enough to walk in. The lake edge habitats were relatively accessible through the forest while access to the lake through the cutblocks on the north and south sides was more difficult.

The most difficult areas for travel were the clearcuts. The dense shrub and seedling layers and large logs render this type of habitat somewhat inaccessible, especially to those people with limited physical endurance. Travel in cutblocks harvested between 1979 and 1981 (> 15 years) was strenuous and difficult. These factors were similar in areas harvested between 1985 and 1986 (> 10 years), but since seedlings are smaller in these areas, travel is slightly easier. The easiest of the cutblock habitats for travel were areas harvested between 1993 and 1994 (< 5 years) since they are open and have little or no shrub layer. Roads which extend throughout the watershed make traveling distances fairly easy. These logging roads are well maintained, and with a vehicle, sites are quick to reach. However, vehicles need to be transported into the area by barge, and the only vehicles currently there belong to the forestry companies.

In a similar study in Nuxalk territory in which the availability and abundance of food plants was determined, habitats that were over 1 hour and difficult to reach were not considered available (Lepofsky *et al.* 1985). If these criteria are used, the only habitats which could be considered accessible are estuaries, hemlock-amabilis forest, the forested lake edge and the Seektukis reserve. Other habitats will be included for the Atleo River watershed. However, if the purpose of plant harvesting is for personal use, it is unlikely that people will gather plants in any of the other habitats.

5.3 Distribution of culturally significant plants and habitats

Throughout this research project, plant communities have been defined by habitat-type (e.g. forest, logged areas and riparian zones) and habitat (forest structure, age of clearcut and type of riparian area). To determine whether habitat was in fact an appropriate variable for analyzing vegetation data, an ordination of the data was done to determine which variables, including habitat, habitat-type, elevation, aspect, moisture and slope, were most influential in grouping plant communities (see Appendix F). As predicted, habitat appeared to be the best variable for grouping plant communities as it strongly influenced the distribution of plants along Axis 1 of the ordination (see Figure 5.1). Estuaries were the most distinctive habitats, with the estuarine plots being separate from all others upon the initial ordination scatter plot. After removing estuaries from further ordination analysis, lake and river edge, and the Seektukis Reserve, were also distinct from other areas. The separation of riparian areas means that they should be classified by specific habitat (e.g. river, lake, estuary) as was done in this study, rather than under a broad umbrella of riparian habitats. The apparent grouping of plots by habitat through ordination implies that grouping plots in this way during field inventories and to analyze the data was appropriate. Habitat, especially forest and logged areas, appear to fall along Axis 2 also. Many of the variables which influence logged and unlogged sites, such as canopy closure and moisture, are also indicative of Axis 2.

Another factor which appears to influence Axis 1 is aspect indicating that the side of the watershed influences the plants growing there and their abundance. Moving along Axis 1, the aspect of the slope changes from north to south. Aspect also appears to be correlated with Axis 2, which is not surprising since it may be linked to variables such as slope, elevation and moisture.

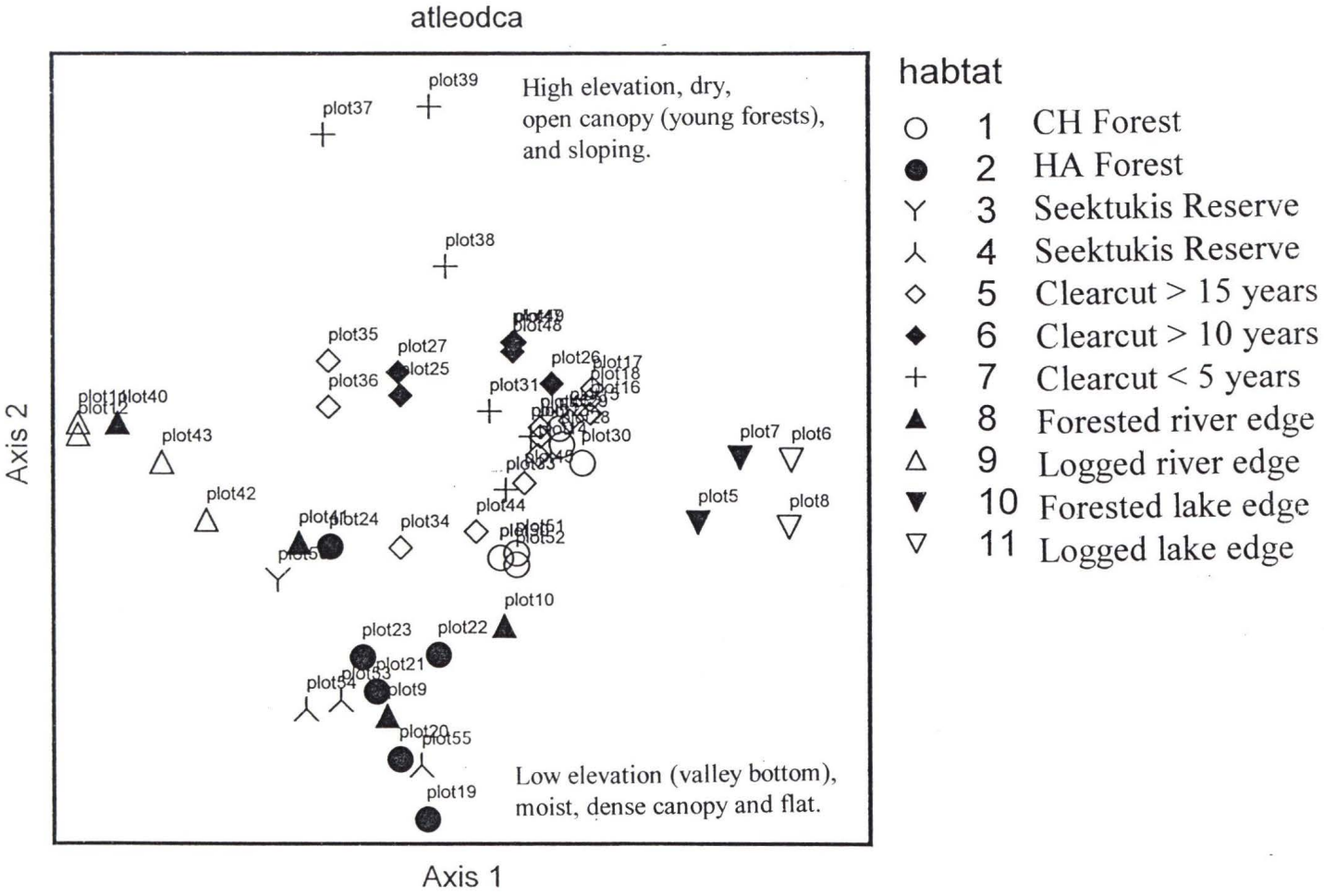

Figure 5.1: Ordination scatter plot of plants and habitats. Estuarine habitats are removed. Each symbol represents a plot that was sampled during the field season. Plots are clumped based on similarities of plant communities. Trends in Axis 1 and Axis 2 are noted and refer to ordination analysis (see Appendix F).

Other variables, apart from habitat and aspect, appear to influence the distribution of culturally significant plants as indicated by Axis 2 of the ordination. Elevation correlated with the distribution of plants on Axis 2 (r=.582; n=52)[2], since plant communities were separated by increasing elevation. As well as influencing Axis 1, aspect of the vegetation communities appeared to be influencing Axis 2. Slope of the habitats also appears to be correlated with Axis 2 (r=.544; n=52) since plant communities change with increasing slope. Canopy closure appears to be negatively related to both Axis 1 (r=-.459; n=52) and Axis 2 (r=-.493; n=52). Since the forest and logged habitat-types differ in canopy closure, it is not surprising that this variable influences both Axis 1 and 2. In summary, it appears that habitat and aspect are the most prominent factors influencing plant communities. Axis 2, indicates that other influencing factors of plant communities may include canopy closure, moisture, slope, and elevation. Each of these factors could be investigated during further research. Before discussing each culturally significant plant species, general characteristics of each habitat type will be summarized, providing a background for the distribution, availability, and abundance of culturally significant plants.

Forest Areas

Cedar-hemlock forest is the dominant forest type for most of the watershed, especially the areas on the mid and upper-slopes. Although cedar-hemlock forests are similar to hemlock-amabilis in terms of structural diversity, these forests are more prone to blowdown so they tend to have more canopy openings, woody debris and wildlife trees. The average canopy closure of this forest is 21.2% (±2.78; n=6), and the understory of this forest type is comprised mainly of salal and deer fern. Plants found only on the north side of the watershed and not on the south side within this habitat type are sword fern, twinberry and thimbleberry.

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[2] The linear correlation is significant for 52 plots if r > .279 (Johnson 1980:102).

Hemlock-amabilis forest habitats dominate the lower watershed, especially near the river. The forest had a canopy closure of 38.5% (±12.07; n=6). Dominant plants include blueberry, salmonberry, red huckleberry, deer fern and sword fern. Many species were found in the hemlock-amabilis forest on the north side of the river which weren't found on the south. These species include maidenhair fern, lady fern, skunk cabbage, false lily of the valley, red elderberry, basket sedge and Douglas fir. Single delight was only found on the south side of the watershed.

Logged Areas

The clearcut areas in the watershed were very different from the forests, especially in terms of diversity of structure. Canopy closure for 1993-94 clearcuts was 0% (±0; n=11). This habitat was one of the two habitat types that had fewer than 10 species in one of the plots. The ground of these cutblocks was dominated by deer fern and short salal. Other culturally important species present in this habitat include salmonberry, red huckleberry, fireweed, blueberry and evergreen huckleberry. On the north side of the watershed, sword fern, Himalayan blackberry, wild raspberry, thimbleberry, and red elderberry were also growing.

The > 10 year (1985-86) clearcuts were composed of seedlings, (predominately red-cedar and hemlock), which grew to approximately 4-5 m in height and the areas had an average canopy cover of 7% (±13.3; n=6). The areas also contained Douglas fir, Sitka spruce and red alder seedlings. This habitat is dominated by salal, deer fern, salmonberry, thimbleberry and fireweed. Other culturally important plants present include Himalayan blackberry, red elderberry, red huckleberry, red alder and sword fern. In addition, the area near the river mouth contained blueberry, and an upper area clearcut contained trailing blackberry.

One of the plots in the 1985-86 cutblock near Millar Channel had a large number of species (28) and was one of the most diverse areas in the watershed. This plot was on

flat land and had a river nearby which formed swampy pools. In this regard, the area was influenced by riparian features. Culturally significant species present here included maidenhair fern, lady fern, basket sedge, bunchberry, cattail, common rush and twinberry.

The > 15 year (1979-81) cutblocks are composed primarily of seedlings and a large undergrowth of salal, salmonberry and thimbleberry. All of the cutblocks contained hemlock and red-cedar seedlings and the average canopy closure from these trees was 11.7% (±12.9; n=11). Three of the areas contained Douglas fir, two eastern areas contained red alder, and three of the areas contained amabilis fir. The > 15 year cutblocks are dominated by deer fern, salal, thimbleberry, salmonberry, red huckleberry and fireweed. Other species present include false azalea, red alder, blueberry, sword fern, pearly everlasting and evergreen huckleberry. Culturally important plants that were found in the northern areas that were not found in the southern areas are stink currant, trailing blackberry, and red elderberry.

Seektukis Reserve

Seektukis reserve, at the mouth of the Atleo River represents a unique area in the Atleo River watershed in that it has both clearcuts and selectively logged sites. As well, it is situated by the river and the seashore with easy access to both of these habitats. The area is dominated by red-cedar and hemlock, as well as salmonberry, elderberry, red alder and Sitka spruce. In the clearcut area, the canopy is quite closed being 33.6% (±17.7; n=3), providing little light to the undergrowth. One plot in this area had only 10 plant species.

One habitat-type not included in the sampling regime, but which contains a unique association of plants, was the shore line where the forest meets the ocean. This area, north of the Atleo River mouth, contains relatively common plant species such as thimbleberry and Douglas fir. As well, this area included several plant species known to have cultural significance, some of which we only found in this habitat. For example,

Nootka rose is an important plant for food, tea, and material purposes and was only found in this area. Rocky mountain maples also grew along the shoreline and were not found in any other areas, while big-leaf maple grew in this habitat and the forest river edge only. Two green vegetables that were included for study in this project, stinging nettle and cow-parsnip, were only found in this shoreline area, and not in any of the sampling plots.

Riparian Areas

Riparian areas tended to be very diverse in terms of the number of vascular plant species. It is not surprising, since riparian areas are considered to be "hotspots of diversity" (Alaback and Pojar 1997:75). River edges had the largest number of species with a total of 54 vascular plant species, 49 on the north side and 28 on the south. These areas were dominated by red alder, western hemlock, amabilis fir, western red-cedar and Sitka spruce. Other dominant plants included salmonberry, salal, red huckleberry, stink currant, blueberry and sword fern. Forested river edges had a canopy closure of 54.3% (±10.1; n=4). Logged river edges had a more open canopy, with an average canopy closure of 42% (±26.5; n=4). This area had the second largest number of species (along with the 1979-81 clearcuts) having a total of 46 species with 33 on the north side and 37 on the south. These habitats were dominated by red alder, salmonberry, stink currant, and sword fern. They also contained western hemlock, western red-cedar and amabilis fir. Other plants in these habitats included thimbleberry, red huckleberry, and western red-cedar. One river edge also contained red elderberry and horsetail.

Lake edge habitat was sampled along the shoreline of Barra Lake. The north and south edges of the lake interface with clearcut areas (1979-81) which has an average canopy closure of 4% (n=1), and the east and west edges interface with hemlock-amabilis forest which has an average canopy closure of 50% (n=1). All edges of the shoreline had Pacific crabapple, basket sedge, western red-cedar, western hemlock, salal, blueberry (Alaska and/or oval-leaved), red huckleberry, and twinberry. Most edges of the lake also

had salmonberry, evergreen huckleberry and deer fern. Bunchberry and sword fern were found in the east and south edges of the lake. Although some plant species were found exclusively on one edge of the lake, due to the small sampling size, it is difficult to determine if these species are influenced by the side of the watershed, logging activities, or other factors. For example, the logged edge on the north had thimbleberry while the south logged edge had branched horsetail.

At the mouth of the Atleo River and at Bedingfield Bay are estuarine areas where fresh water rivers meet the saline ocean. The area is open, with only a herbaceous plant layer, although shrubs and trees may be present on the edges of estuaries where the forest meets the ocean and river edge. Estuarine habitats are saline and include moisture tolerant plants such as sea milkwort, sea arrow grass, and lyngby's sedge. Results from the ordination indicated this habitat to be very different from all other habitats in the watershed. Culturally significant plants present in these areas are springbank clover, Northern rice-root and Pacific silverweed. These three important root vegetable foods were found only in estuarine habitats.

5.4 Frequency of culturally significant plants

Relative availability of culturally significant plant species can be estimated by the frequency of plots in which they appear. For example, a plant species present in 40 out of 56 plots can be considered more available than one found in 10 of 56 plots. For herbaceous plants, 4 quadrats were conducted in each of 56 plots, so there were a total of 224 herbaceous plots sampled for these plants during this research project.

The most frequent species in the watershed were salmonberry, red huckleberry, deer fern and salal, which were all found in at least 46 of 56 plots surveyed (see Table 5.2). Three of the culturally important species included in this study were restricted to only one habitat within the watershed. Pacific silverweed and springbank clover were

found only in estuaries, and cattail was found only in an area of standing water in a clearcut logged between 1985 and 1986. In addition, several culturally important species were found in only one habitat-type (e.g. riparian, clearcut or forest). Cattail, Himalayan blackberry, black raspberry and trailing blackberry were only found in the clearcut areas, and horsetail was only found in riparian areas.

5.5 Percent cover of culturally significant plants

One limitation of using frequency as a measure of availability is that the presence of a plant species in an area is not necessarily an indication of its abundance. Species may be present in many areas, but in very low numbers. Alternatively, species may be present in only a few areas, but may be highly abundant within those habitats. Percent cover values provide an estimate of the abundance of the plant species in each habitat. Percent cover of culturally significant plants was estimated for each area, habitat and habitat-type (Tables 5.3a and 5.3b).

Based on percent cover, many berry species were found in high abundance (>10%) in the Atleo River watershed. Salmonberry was abundant in hemlock-amabilis forest, in clearcuts over 15 years and 10 years and in river edge habitat. Salal occurred in high abundance in the cedar-hemlock forest, all ages of clearcuts, forested river edges and all lake edges. Red huckleberry had high percent cover in hemlock-amabilis forest, clearcuts over 15 years and the forested river edge. Other species occurring in high percent cover (> 10%) in at least one area in the Atleo River watershed were: Pacific crabapple, stink currant, blueberry, thimbleberry, and evergreen huckleberry.

It should be noted that the scale used to express percent cover as incidental (< 1%), low (1-4.9%), medium (5-9.9%) and high (>10%) was relative. Ten percent cover

Table 5.2: Frequency of culturally significant plants for plots, areas and habitats sampled in the Atleo River watershed. The number shown is for the number of quadrats, plots, areas, and habitats that were sampled in which the plant was growing. ** These species also have edible berries*

Primary use	Species	# quadrats (224) for herbaceous plants only	# plots (56)	# areas (23)	# habitats (12)	# habitat types (3)
Berries and fruits	Pacific crabapple	-	5	5	3	2 (Seektukis and lake)
	Bunchberry	3	7	5	4	3
	Stink currant	-	9	6	5	3
	Himalayan blackberry	-	6	3	2	1 (logged)
	Black raspberry	-	4	2	2	1 (logged)
	Trailing blackberry	-	4	3	3	1 (logged)
	Elderberry	-	13	9	7	3
	Red huckleberry	-	48	21	11	3
	Blueberry	-	33	17	10	3
Shoots and edible greens	Thimbleberry*	-	21	12	8	3
	Salmonberry*	-	49	20	11	3
Root vegetable	Pacific silverweed	15	4	2	1 (estuary)	1 (riparian)
	Springbank clover	3	2	1 (Seektukis)	1 (estuary)	1 (riparian)
Floral greens	Salal*	-	46	21	11	3
	Evergreen huckleberry*	-	20	12	7	3
	Sword fern	22	35	17	11	3
	Deer fern	117	47	19	11	3
Fibrous materials	Basket sedge	14	7	7	6	3
	Cattail	0	1	1	1 (1985-86)	1 (logged)

interpreted may not actually be high for some species. Thus, data should be interpreted with caution and depending on which criteria are used, some species may not be abundant enough for practical use.

In a similar study in Nuxalk territory, plants were only considered available in a habitat if they appeared in more than 15% of the plots sampled for that habitat. All of the plant species that are classified as high percent cover in my study have a minimum of 15% frequency of sampling for that habitat. The designation of a minimum percent cover provides precaution against over-harvesting plants.

5.6 Overview of culturally significant plants in the Atleo River watershed

Rather than using one indicative criteria like percent cover, the following discussion will describe each species, with consideration given to frequency, percent cover, productivity and accessibility. The relative importance of each of these measures is dependent upon the purpose of evaluation.

5.6.1 Berries and other fruits

A number of fruit and berry-producing species were growing in the Atleo River watershed (see Tables 5.3a and 5.3b). Species varied in their abundance and availability throughout habitats. It appeared that the productivity of berries (in terms of the number of berries per bush) was not necessarily linked to percent cover of berry species (see Tables 5.3a and 5.4). In other words, a berry species with a high percent cover in a specific habitat may produce the most berries per bush in another habitat. For example, the highest productivity of thimbleberry was in clearcuts > 15 years (see Table 5.4) but this was not the habitat with the highest percent cover of this species (see Table 5.3a). Areas considered especially important for berries are those habitats with > 5 percent cover

Table 5.3a: Relative abundance of berry and fruit-producing species based on percent cover. Abundance of these species was categorized as * (Incidental < 1%), ** (Low 1-4.9%), * (Medium 5-9.9%) and **** (High >10%). Actual percent cover is also displayed in brackets.** *Note: There were no berry producing species found in estuaries.*

Plant species	Forest		Clearcut			Reserve	River		Lake	
	Hemlock-Amabilis forest	Cedar-Hemlock forest	> 15 years	> 10 years	< 5 years	Seektukis Reserve	Forest river	Logged river	Forest lake edge	Logged lake edge
Pacific crabapple *tsitsih7aqtlmapt*						* (.0025)			**** (30)	**** (65)
Bunchberry *hast'aachiqmapt*		** (2.5)		** (1.45)					* (.005)	* (.005)
Stink currant *hulh7iqmapt*			* (.001)			* (.005)	** (1.26)	**** (25)		*
Himalayan blackberry *qa7wi*				** (1.002)	** (1.84)					
Black raspberry *hisshitlmapt*			* (.001)		** (1.67)					
Trailing blackberry *chismapt*			* (.083)	** (1.67)	** (3.33)					
Red elderberry *ts'iwiipt*	* (.833)		* (.834)	* (.17)	* (.002)	*** (5.0)	* (.0025)	* (.0075)		
Red huckleberry *his7itqmapt*	**** (16.67)	*** (5.003)	**** (10)	*** (6.67)	*** (6.84)	** (2.5)	**** (31.25)	** (2.75)	** (2.5)	** (2.5)
Blueberry sp. *tsi7tup/tl'itsxwaanush*	**** (11.835)	*** (5.16)	** (1.75)	* (.335)	* (.17)	* (.005)	*** (7.5)	* (.0025)	** (3.0)	*** (5.0)
Thimbleberry *tl'ach7alhmapt*		* (.002)	** (2.29)	**** (12.5)	*** (5.17)	* (.0025)	** (3.75)	*** (5.0)		* (.005)
Salmonberry *m'ashmapt*	**** (15.17)	*** (6.0)	**** (15.5)	**** (15.0)	*** (6.84)	**** (12.5)	**** (30)	**** (57.5)	*** (5.0)	* (.005)
Salal *y'am'apt*	*** (8.5)	**** (47.5)	**** (50.1)	**** (50.8)	**** (10.8)	** (2.75)	**** (10.0)	** (1.5)	**** (12.5)	**** (17.5)
Evergreen huckleberry *siinamuxs7itsmapt*	* (.003)	** (3.83)	** (1.75)	** (1.83)	* (.837)				**** (15.5)	** (1.0)

Table 5.3b: Relative abundance of culturally significant plants based on percent cover. Abundance of these species was categorized as * (Incidental < 1%), ** (Low 1-4.9%), * (Medium 5-9.9%) and **** (High >10%).**

	Forest		Clearcut			Reserve	River		Lake		Estuary
	Hemlock-Amabilis	Cedar-Hemlock	> 15 years	> 10 years	< 5 years	Seektukis	Forest river	Logged river	Forest lake edge	Logged lake edge	Estuary
Thimbleberry *tl'ach7alhmapt*		* (.002)	** (2.29)	**** (12.5)	*** (5.17)	* (.0025)	** (3.75)	*** (5.0)		* (.005)	
Salmonberry *m'ashmapt*	**** (15.17)	*** (6.0)	**** (15.5)	**** (15.0)	*** (6.84)	**** (12.5)	**** (30)	**** (57.5)	*** (5.0)	* (.005)	
Pacific silverweed *tlitsy'upmapt*											**** (22.2)
Springbank clover *?a?iits'uqmapt*											** (2.06)
Salal *y'am'apt*	*** (8.5)	**** (47.5)	**** (50.1)	**** (50.8)	**** (10.8)	** (2.75)	**** (10.0)	** (1.5)	**** (12.5)	**** (17.5)	
Evergreen huckleberry *siinamuxs7itsmapt*	* (.003)	** (3.83)	** (1.75)	** (1.83)	* (.837)				**** (15.5)	** (1.0)	
Sword fern *7itsmapt*	** (4.17)	* (.835)	** (2.75)	* (.837)	* (.377)	*** (7.76)	*** (6.25)	*** (6.88)	* (.005)	* (.005)	
Deer fern *kaatskuuxsmapt*	**** (10.04)	**** (30.17)	**** (28.7)	**** (14.4)	**** (13.4)	* (.01)	* (.815)	* (.0025)	* (.01)	* (.005)	
Basket sedge *ch'itapt*	* (.002)		* (.001)	** (2.08)			* (.0025)		**** (22.75)	**** (54.5)	
Cattail *sanixmapt*				* (.002)							

Note: These categories are relative. Other factors to consider when evaluating abundance include productivity of plants and frequency. Factors to consider for harvesting potential include accessibility, minimal critical population, damage to plants when harvesting and sustainable harvesting rates.

(see Table 5.3) and with at least 25% of maximum berry productivity (see Table 5.4). Each species will be discussed in the following section.

Unfortunately, only three species had fruit that was ripe and abundant enough to be picked when we visited each plot over the summer field season. For two people to pick two cups of berries (500 ml) in total, the time for berry picking was:

• Salmonberry	*qawii*	7 minutes
• Red huckleberry	*his7inwa*	20-28 minutes
• Salal	*y'am'a*	12 minutes
• Bog cranberry[3]	*p'ap'a7is*	15 minutes

Often when berries are picked quickly, leaves, insects and small pieces of wood fall into the berry mixture. Time is required to clean the berries before they are eaten. The times that we have listed are for berries that were picked carefully and required little cleaning before they were eaten. Of the berries picked, salmonberry appeared to be relatively quick to harvest in large quantities. Salal was also very quick to pick and was abundant in many sites. Red huckleberry was more sparse, and time to pick two cups ranged from 20 to 28 minutes for two people.

It is interesting to note that when the researchers from Ahousaht were picking berries, they broke the berry-laden branches off the bush, found a place to sit, and then picked the berries off the branches. According to Dr. Nancy Turner (personal communication), this method of breaking branches was one of the traditional methods of enhancing berry populations by First Nations throughout British Columbia. Breaking branches is a form of pruning which allows bushes to grow back healthier the next season. When branches were brought back to village sites to Elders who were not able to travel to berry-picking grounds, they could sit and pick the berries and continue to participate in berry harvesting.

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[3] In addition to berries found in the Atleo River watershed, I recorded the time to pick bog cranberries when I visited Ahousaht in November, 1996.

Table 5.4: Average number of berries per bush of berry-producing species for different habitats in the Atleo River watershed. As well as numerically, berries per bush are denoted as a percentage of the maximum number found for that species: *** (maximum), **** (75-99%), *** (50-74%), ** (25-49%), and * (less than 25%).**

Habitat	Salmon berry	Thimble berry	Blueberry sp.	Red huckle berry	Ever-green huckle-berry	Salal*	Bunch berry*	Red elderberry	Black rasp-berry	Him. black berry
HA forest	* (13)		**** (60)	* (35)						
CH forest	* (1)		** (23)	* (18)	*** (158)	* (23)				
> 15 years	* (30)	***** (374)	** (35)	*** (100)	* (31)	*** (200)	***** (25)	***** (390)	***** (30)	
> 10 years	* (23)	* (27)		** (46)	**** (278)	*** (175)				***** (45)
< 5 years	***** (125)	* (40)		*** (110)	** (100)	*** (195)				
Seektukis selective				* (8)						
Seektukis clearcut										
Forest river	* (30)	* (15)	*** (40)	***** (150)		** (80)				
Logged river	** (46)	* (74)		* (20)						
Forest lake			** (35)		***** (300)	*** (140)				
Logged lake			***** (76)			***** (275)				
Estuary										
Grand Average	35	110	39	77	169	165	25	390	30	45

* These species are measured in berries per m^2 rather than berries per bush.

Table 5.5: Estimates of berries per 100 m² for different habitats in the Atleo River watershed. Values were generated by multiplying the number of berries per bush (see Table 5.4) with the percent cover of the species in each habitat (see Table 5.3). Since bushes were not always 1 m², this table may over estimate the abundance of berries.

Habitat	Salmonberry *qawii*	Thimble-berry *tl'aach7aalh*	Blueberry *tsi7tup tl'itsxwaanush*	Red huckleberry *his7inwa*	Evergreen huckleberry *siinamuxs7its*	Salal* *y'am'a*
HA forest	156	0	61	351	0	9
CH forest	2	0	8	9	80	25
15 years cutblock	175	144	23	461	4	8624
10 years cutblock	44	16	2	248	86	5456
< 5 years cutblock	1180	254	2	1073	0	1584
Seektukis selective	0	0	0	8	0	0
Seektukis clearcut	0	0	0	0	0	0
Forest river	419	56	5	393	0	213
Logged river	900	94	3	52	0	32
Forest lake	5	0	88	3	4501	1900
Logged lake	0	0	380	3	1	3875
Estuary	0	0	0	0	0	0
Grand Average	**280**	**71**	**30**	**311**	**180**	**2830**

* This species is measured in berries per m² rather than berries per bush.

Salmonberry (qawii)

Salmonberry (*qawii*) was present in almost all habitats, being in 49 of 56 plots (see Table 5.2). Salmonberry reached over 5% cover in all habitats except the logged lake edge and estuary. Salmonberry was particularly abundant at the logged river edge (having a mean of 57.5% cover) and in the selectively logged area of the Seektukis reserve (with 35% cover), although no berries were found in the latter habitat.

Salmonberry was the fastest berry-food to harvest since it took two people only seven minutes to harvest two cups of the berries in the forested river habitat. The most productive berry producing bushes were in the 1993-94 clearcuts where the average salmonberry bush had 125 berries (see Table 5.4), although there was less than 10% cover of salmonberry in this habitat (see Table 5.3). Salmonberry production was lowest in the forest habitats (see Table 5.4) although there was greater cover of the shrub species (see Table 5.3). In estimates of the number of berries per $100m^2$, the newest clearcuts and logged river habitats were the most productive (see Table 5.5). The logged river edge had a large number of berries in the plot resulting from the high percent cover in this area. Although the percent cover of salmonberry varied between seral stage, the differences were not significant (see Figure 5.4). In summary, habitats with abundant salmonberries are logged areas < 5 years and logged river edges. Accessibility of these sites may be limited (see Table 5.1).

Thimbleberry (tl'aach7aalh)

In contrast to salmonberry, thimbleberry (*tl'aach7aalh*) was less frequent in the watershed, appearing in only 21 of 56 plots (see Table 5.2). This species is more common in southern areas, and inhabits moist to mesic open forests, roadsides and stream banks in the lowland to montane zones (Douglas *et al.* 1991). The only habitat in which thimbleberry covered more than 5% were clearcuts > 10 years, clearcuts > 5 years, and the

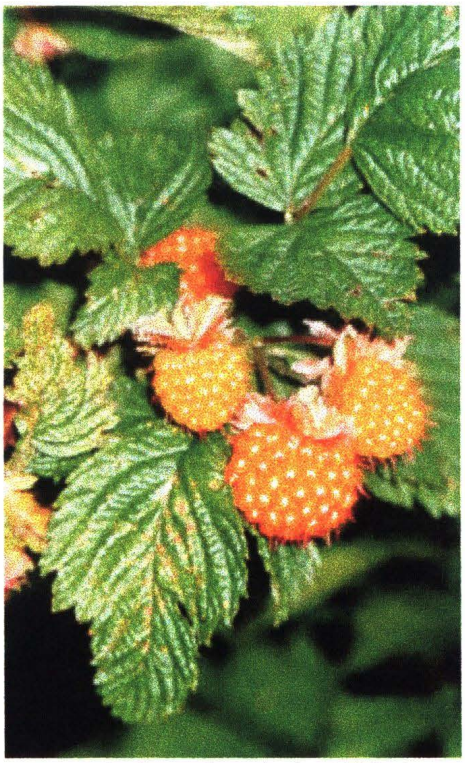

Figure 5.2: *qawii* (salmonberries). This is a traditional food plant; both the young shoots and the berries of the plant were traditionally harvested.

Figure 5.3: *tl'ach7alhmapt* (thimbleberry bush).

logged river edge (see Table 5.3b). Although the highest percent cover was in clearcuts > 10 years, these habitats only produced an average of 16 berries per bush (see Table 5.4). Thus, like salmonberry, the most productive thimbleberry bushes were not in the habitats in which the species had the highest percent cover. The most productive thimbleberry bushes were in the clearcuts > 15 years old which produced an average of 374 berries per bush (see Table 5.4). Thus, when both percent cover and number of berries per bush are considered, there do not appear to be any habitats suitable for thimbleberry harvesting (see Table 5.6).

Alaskan and Oval-leaved blueberry (tsi7tup and tl'itsxwaanush)

Due to the difficulty of distinguishing between Alaskan (*tsi7tup*) and oval-leaved (*tl'itsxwaanush*) blueberry in the field, values for both blueberry species (*Vaccinium sp.*) were primarily used together for estimation of cover of these species. However, the Nuu-Chah-Nulth peoples differentiated between these species, identifying them with distinct names (see Section 4.1). The difference between the species is also noted economically since oval-leaved blueberry is used commercially whereas Alaskan blueberry is used in BC for personal use only (de Geus 1995).

Blueberry frequency was fairly high with the species appearing in 33 of 56 plots (see Table 5.2). The only habitats in which the cover of this species was greater than 5% were in cedar-hemlock forests, hemlock-amabilis forests and logged lake edge (see Table 5.3a). In terms of berries per bush, the most productive berry-producing habitats were the logged lake edge and the hemlock-amabilis forest (see Table 5.4). When both percent cover (> 5%) and berry production (at least 25% of maximum) are considered, logged lake edges, hemlock-amabilis forest, cedar-hemlock forest, and the forested river edge have the most abundant blueberries and may provide the most suitable harvesting areas (see Table 5.6).

Red huckleberry (his7inwa)

Red huckleberry (*his7inwa*) has high frequency in the watershed, being present in 48 of 56 plots (see Table 5.2). The highest percent cover was in the forested edges of the river, where this species had a percent cover of over 30% (see Table 5.3a). In contrast, on the logged river edges, the cover value was less than 3%. Red huckleberry also had cover values of over 5% in cedar-hemlock and hemlock-amabilis forests, where it was often growing from nurse logs (see Table 5.3a). As well, the percent cover was over 5% in all stages of clearcuts. In terms of berries per bush, the most productive berry habitat for this plant appeared to be in > 15 years and < 5 year cutblocks and in the forested river edge (see Table 5.4). In summary, red huckleberries are abundant in all three ages of cutblocks and the forested river edge (see Table 5.6).

The only habitat in which red huckleberry was ripe and abundant enough to pick during the field surveys were the < 5 years (1993-94) clearcuts. These areas had a high number of berries per bush, but low cover in the area. Picking two cups of berries took two people between 20 and 28 minutes.

Evergreen huckleberry (siinamuxs7its)

Evergreen huckleberry (*siinamuxs7its*) has low abundance in the Atleo River watershed. The only area which had a cover value of greater than 5% for this species was the forested lake edge (see Table 5.3b). In terms of the number of berries per bush, forested lake edge bushes produced 300 berries/bush and clearcuts greater than 10 years old had 278 (see Table 5.4). When both percent cover and number of berries are considered, the forested lake edge appeared to be the most important area for berry productivity.

Salal (y'am'a)

Salal (*y'am'a*) was one of the most abundant plants in the Atleo River watershed in terms of frequency, growing in 46 of 56 plots (see Table 5.2). The cover of salal was over 5% in all habitats except Seektukis Reserve, the logged river edges and estuaries (see Table 5.3b). An ordination scatter plot indicated that salal is most abundant in cedar-hemlock forests, including the old-growth stands, clearcuts > 15 years and clearcuts < 5 years (see Appendix F). The most productive salal berry habitats in terms of the number of berries per m^2 were in logged areas (see Table 5.4). All three ages of cutblocks and the logged lake edge produced a large number of berries, averaging 175-275 berries/m^2. When considering percent cover and estimating berries per 100 m^2, salal berries are abundant in the forested lake edge and forested river edge (see Table 5.5).

Based on frequency, percent cover and berry productivity, habitats that appear to be important for berry production of salal are clearcuts of all ages, lake edges and the forested river edge (see Table 5.6). However, accessibility would limit harvesting in these logged areas to those with high fitness and endurance (see Table 5.1).

Pacific crabapple (tsitsih7aqtl)

Although the frequency of Pacific crabapple (*tsitsih7aqtl*) was low (5/56 plots), this tree species was growing abundantly in all four edges of Barra Lake (see Table 5.3a). Pacific crabapple is known to inhabit moist, open forests, stream banks and bogs in the lowland zone and is common on coastal islands and adjacent mainland (Douglas *et al.* 1991). The mean percent cover was 47.5% by the lake, being 30% on forest edges and 65% on the logged edges of the lake (see Table 5.3a). Although Pacific crabapple was also present in the Seektukis Reserve, only one small tree was growing in this area. No data were collected on the fruit productivity of the trees on the lake edges. However, it appears that lake edges are an important habitat for Pacific crabapple and would produce sufficient fruits to make fruit harvesting in this area worthwhile. The accessibility of these

areas if fairly easy to difficult, depending if travel is through the cutblocks or the forest (see Table 5.1). Lake edge habitats should be considered critical habitat for this culturally important species (see Table 5.6).

Berries with low abundance

There were several fruit and berry producing species that were present in the sampling plots of the watershed, but in low abundance and frequency. Although they have little potential for harvesting, these species should be recognized as important cultural resources in the watershed. The abundance of bunchberry was never over 3% cover. The only berry data that were collected on this species was in one plot where there were 25 berries/m^2. Red elderberry also had low percent cover, being less than 1%, but producing many clusters of small berries. The low frequency and abundance of Himalayan blackberry was considered beneficial since this species is a noxious weed introduced from Asia, and can invade natural habitats to the detriment of native species.[4] Black raspberry and trailing blackberry were both found in only 4/56 plots, and had low berry productivity. In summary, the following species have low abundance but should be considered culturally important resources in the Atleo River watershed:

- bunchberry — *hast'aachiqmapt*
- stink currant — *hulh7iqmapt*
- Himalayan blackberry — *qa7wi*
- black raspberry — *hisshitlmapt*
- trailing blackberry — *chismapt*
- red elderberry — *ts'iwiipt*

Effects of seral stage on berry production

The field work for this project was designed to provide and inventory of culturally significant plants rather than to specifically examine the effects of logging on these species.

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[4] For more information, see Smith (1997).

As such, sites for vegetation surveys were chosen randomly rather than using an experimental design of selecting sites of different seral stages with similar initial composition, aspect, slope, and elevation. However, since surveys were conducted in cedar-hemlock forests and in cedar-hemlock cutblocks of > 15 years (1979-81) and < 5 years (1993-94), some insight can be gained into the effects of logging on berry production by comparing berry species and productivity from these three habitats. Hemlock-amabilis forests were not looked at more closely for two reasons: cutblocks for HA forest were only present from the 1985/86 clearcut stage so effects of longer time periods could not be determined, and these cutblocks were only on the north side of the watershed, so comparisons could be attributed to aspect rather than seral stage. Salal, salmonberry, evergreen huckleberry and red huckleberry were chosen as examples of berry-producing plants since it was these species that were consistently found in all three habitats and for which data is available on the berry production in all three areas.

It appears that for some species, such as salal, salmonberry and red huckleberry, the abundance of berries increases after logging (see Figure 5.5). However, these differences are only statistically significant for salal and red huckleberry (see Figure 5.5). Many factors may influence the increased productivity of berries in these areas. Shade is thought to be a strong influencing factor on berry production (Haeussler 1987). Many berry species have their greatest vigour in full sunlight or partial shade while production is poor in areas of deep shade. These conditions may correspond to canopy closure which is influenced by logging activity. Logging activities which reduce tree cover but do not cause deep disturbance to superficial soil layers may enhance berry production for species such as Alaska and oval-leaved blueberry and red huckleberry (Haeussler 1987).

Many other factors, in addition to seral stage, have been identified that affect berry growth and quantity. For example, genetic makeup, plant vigour, climatic and weather factors and biological agents such as animal and microbial pests may influence berry production (Haeussler 1987). None of these factors were considered in detail in this

project. Such an analysis would require a long-term, more focused project which would be an interesting direction for future research.

Evergreen huckleberry, appears to be negatively impacted by logging, although the high variability means that differences seen are not statistically significant (see Figures 5.4 and 5.5). The percent cover and productivity of this species is higher in old-growth areas. It is possible that large-scale logging has reduced the abundance of this species.

Table 5.6 Areas with high relative abundance of berry and fruit producing species, considering percent cover (> 5%) and berry productivity (>25% of maximum) (from Tables 5.3a and 5.4). Clearcuts are referred to by how long ago they were logged (> 15 years, > 10 years and < 5 years).

Berry species	Habitats with relatively high abundance*	
Pacific crabapple *tsitsih7aqtl*	• forest lake edge • logged lake edge	
Red huckleberry *his7inwa*	• > 15 years • > 10 years	• < 5 years • forest river
Blueberry *tsi7tup* *tl'itsxwaanush*	• logged lake • HA forest	• CH forest • forest river
Thimbleberry *tl'aach7aalh*	• none	
Salmonberry *qawii*	• < 5 years • logged river	
Salal *y'am'a*	• > 15 years • > 10 years • < 5 years	• forest river • forest lake • logged lake
Evergreen huckleberry *siinamuxs7its*	• forest lake	

* These habitats had both a minimum of 5% cover of the species (see Table 5.3a), and at least 25% of the maximum average number of berries per bush (see Table 5.4)

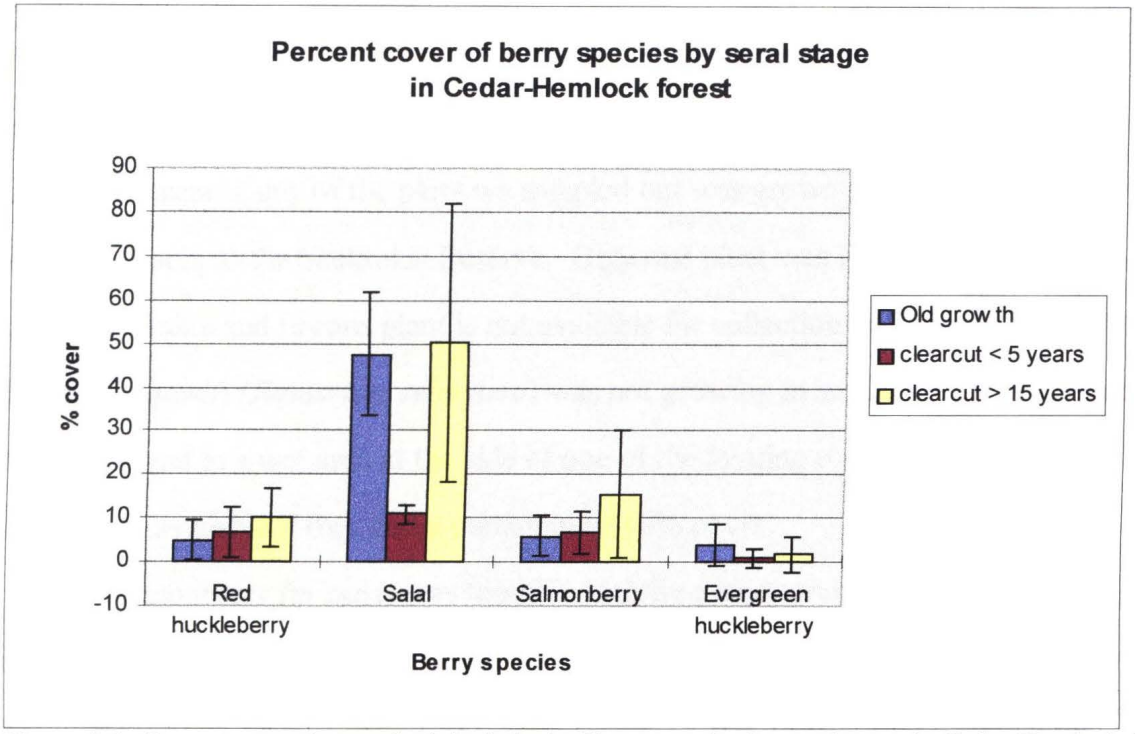

Figure 5.4: Percent cover (± standard deviation) of berry species by seral stage in Cedar-Hemlock forest.

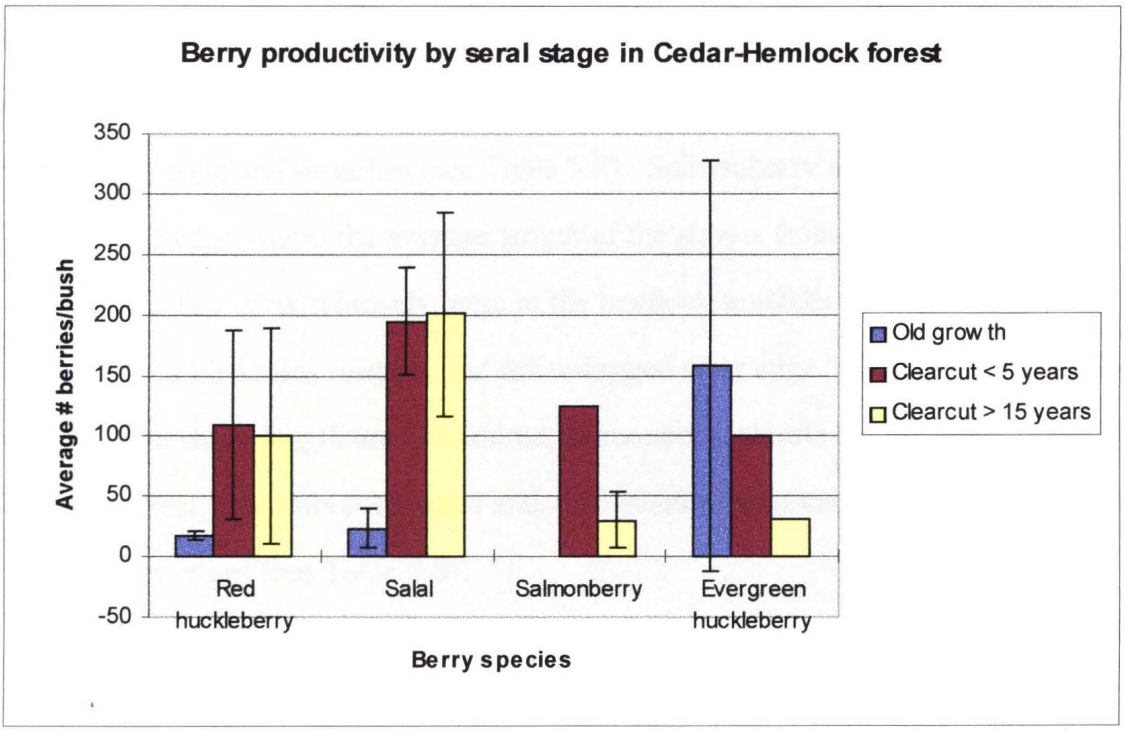

Figure 5.5: Berry productivity (# berries per bush ± standard deviation) by seral stage in Cedar-Hemlock forest.

5.6.2 Shoots and other green vegetables

Four traditionally used green vegetables (salmonberry, thimbleberry, horsetail and stinging nettle) were growing in the Atleo River watershed. Stinging nettle (*?ilhmakt*) was not present in any of the plots we sampled but was growing at the edge of the forest near the beach, at the Seektukis Reserve. Only one plant was found, indicating that this green vegetable and fibrous plant is not available for collection and use in the watershed. Horsetail (*qawii*) (*Equisetum telmateia*) was not growing in any of the plots we sampled, but was found in a wet area at the side of one of the logging roads. Shoots species were considered available if they had a minimum of 10% cover.

Salmonberry (*m'aayi*) was found in high frequency and cover in the Atleo River watershed (See section 5.5.1). There was over 10% cover of this species in hemlock-amabilis forest, > 15 year (1979-81) clearcuts, > 10 year (1985-86) clearcuts, the selectively logged area of the Seektukis reserve, and both logged and unlogged river habitat (see Table 5.3b). Salmonberry was particularly abundant at the logged river edge and in the selectively logged area of the Seektukis reserve. Edible shoots, or evidence of new growth, was present on salmonberry bushes in all habitats with the exception of the logged lake edge and estuaries (see Table 5.7). Salmonberry shoots were largest along the logged river edge where the average length of the shoots from base to tip was over 150 cm. Shoots also grew relatively large in the hemlock-amabilis forest, all stages of clearcuts, the Seektukis reserve, and the unlogged river edge. If areas with > 10% cover and > 50 cm shoot length are considered, salmonberry shoots are abundant in hemlock-amabilis forest, clearcuts > 15 years and > 10 years, Seektukis reserve, and both forest and logged river edges (see Table 5.8).

Thimbleberry (*ch'aashxiw'a*) was not as abundant as salmonberry in the Atleo River watershed (see Figure 5.6). This species was present in 21 of 56 plots (see Table 5.2) and there was only one area where thimbleberry covered more than 10% which was > 10 year (1985/86) clearcut (see Table 5.3b). In these clearcuts, thimbleberry shoots were

not relatively large (see Figure 5.7). In other habitats, thimbleberry was either not present or present in very small quantities (see Table 5.7). Although thimbleberry was growing in the Seektukis reserve and both hemlock-amabilis and cedar-hemlock forests, there was no new growth on these bushes (see Table 5.7 and Figure 5.7). If areas with > 10 percent cover and shoots of over 50 cm are considered, thimbleberry shoots are abundant only in clearcuts > 10 years (see Table 5.8).

Table 5.7: Shoot abundance of thimbleberry and salmonberry in various habitats of the Atleo River watershed. Abundance includes the percent cover of salmonberry and thimbleberry and the average shoot length and diameter of the three largest shoots in a typical bush. Note: areas with no available shoots were given a 0 for calculating the average.

Habitat		Salmonberry				Thimbleberry			
		shoot length (cm)	shoot diameter (mm)	n (sample size)	% cover	shoot length (cm)	shoot diameter (mm)	n (sample size)	% cover
Forest	CH forest	24.37	1.37	4	6	0	0	0	0
	HA forest	76.94	5.07	4	15.2	0	0	0	0
Clearcut	> 15 years	87.08	5.62	12	15.5	49.97	2.37	4	2.25
	> 10 years	80.27	6.73	6	15	83.07	6.8	6	12.5
	< 5 years	65.63	4.27	5	6.84	32.27	3.53	4	5.17
Reserve	Seektukis (selective logging)	97.8	4.6	1	35	0	0	0	0
	Seektukis (clearcut logging)	31.87	1.27	1	5	0	0	0	0
Lake	Forest lake edge	15.1	1.8	1	5	0	0	0	0
	Logged lake edge	0	0	0	0.01	0	0	0	0.01
River	Forest river edge	87.55	5.9	4	30	32.35	1.25	1	3.75
	Logged river edge	150.6	9.2	4	57.5	67.4	4.65	2	5
Estuary	Estuary	0	0	0	0	0	0	0	0

Table 5.8: Areas with high relative abundance of shoots and green vegetables (based on > 10 % cover and > 50 cm length of shoots).

Salmonberry shoots *m'aayi*	Thimbleberry shoots *ch'aashxiw'a*	Horsetail *qwatl*	Stinging nettle *?ilhmakt*
• HA forest • Clearcuts > 15 years • Clearcuts > 10 years • Seektukis reserve • Forest river edge • Logged river edge	• Clearcuts > 10 years	• none	• none

There is evidence of a linear relationship between shoot size and percent cover for both thimbleberry and salmonberry shoots. In other words, areas with high percent cover of thimbleberry and salmonberry also tend to have large shoots. For salmonberry, linear relationships are evident between percent cover and length (r=.599; n=42), percent cover and diameter (r=.5681; n=42) and length and diameter of the shoot (r=.7597; n=42). For thimbleberry, linear relationships also exist between percent cover and length of shoot (r=.541; n=16) and length and diameter of the shoot (r=.577; n=16). Evidence of a linear relationship between percent cover and diameter of thimbleberry was not found (r=.387; n=16). This may have been a result of the small sample size or difference between species.

This relationship between percent cover and shoot size may be useful for interpreting vegetation surveys in other areas where culturally significant plants have not been considered. The ability to assume that areas with a high percent cover of thimbleberry and/or salmonberry also contain longer edible shoots would allow for an interpretation of standard vegetation data that may be useful for First Nations. Further investigation of the relationship between the length of a new shoot from base to tip and the amount of edible material is necessary in order to test the assumption that a longer shoot length does indeed indicate a greater abundance of shoot food.

To determine if shoot length and diameter were a reflection of the time of sampling rather than the habitat type, correlation between time of sampling and shoot size were

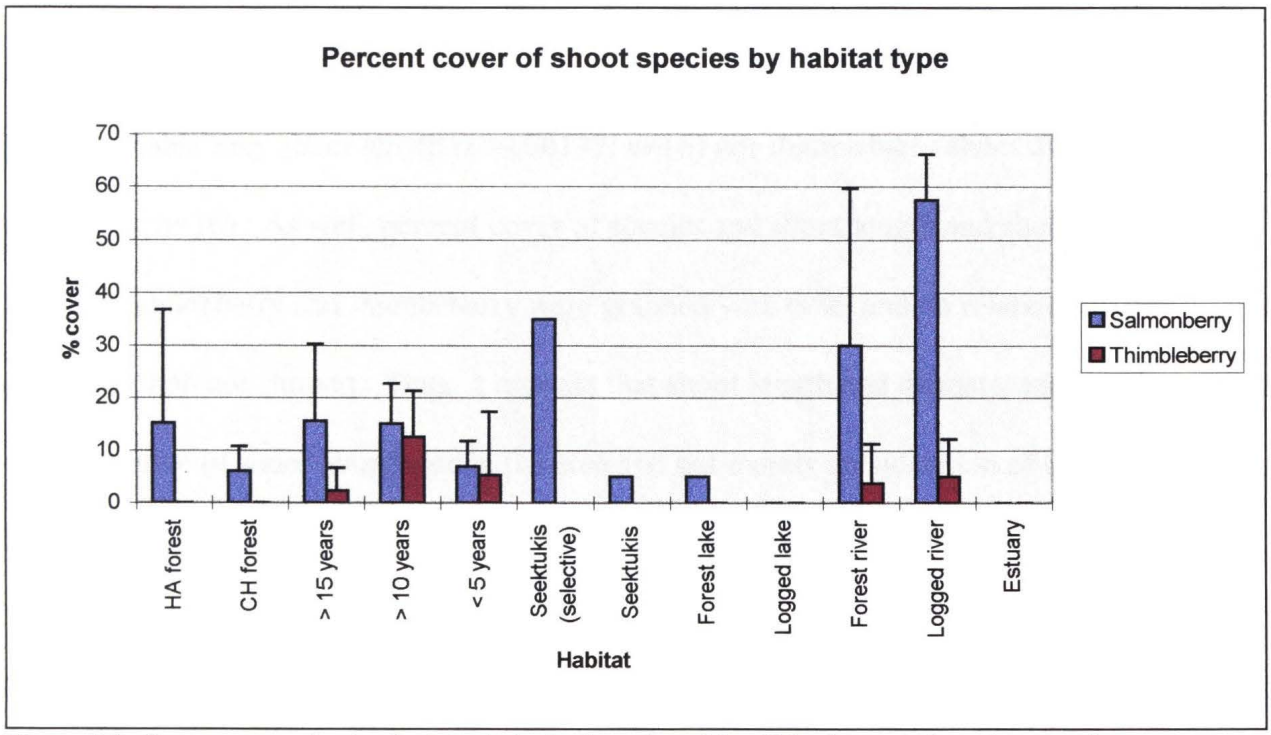

Figure 5.6: Percent cover (+ standard deviation) of species with edible shoots (salmonberry and thimbleberry) by habitat type.

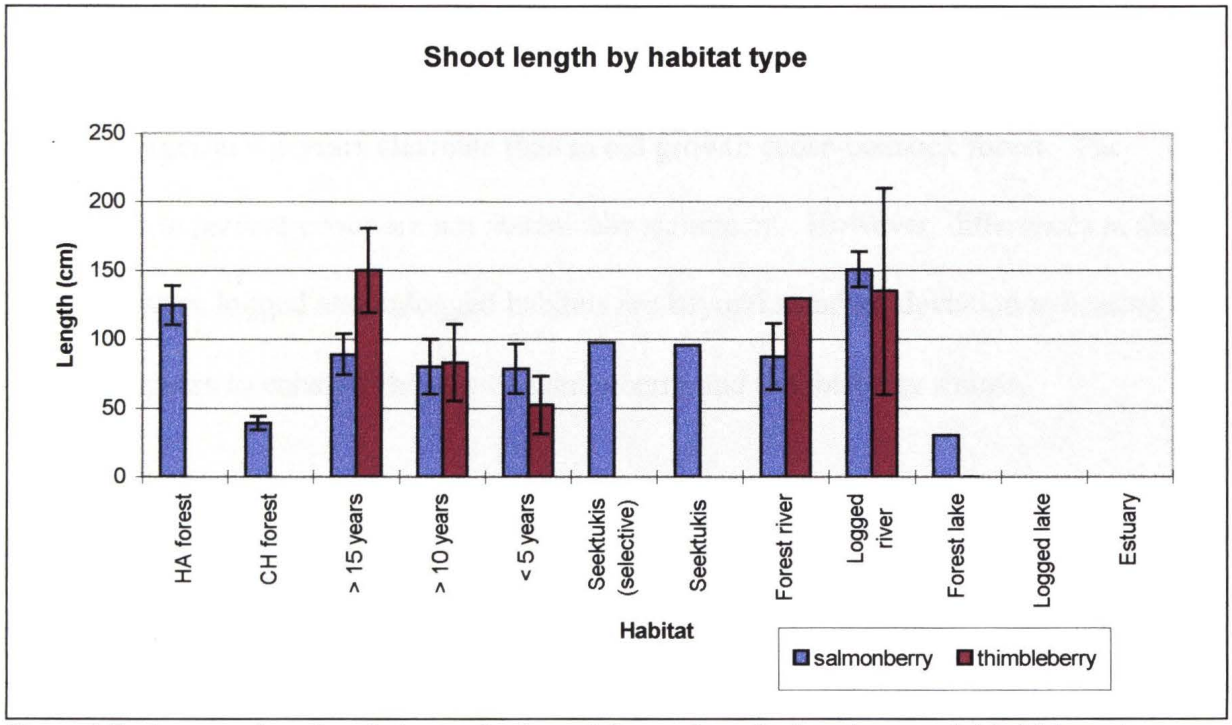

Figure 5.7: Average shoot length (± standard error) for patches of salmonberry and thimbleberry by habitat type. Note: areas with no shoots were not included in the average.

examined. There was no evidence of a linear relationship between time of sampling and salmonberry shoot length (r= -.0081016; n=42), salmonberry shoot diameter (r= -0.2425; n=42), thimbleberry shoot length (r= -.00177; n=16) nor thimbleberry shoot diameter (r=0.1783; n=16). As well, percent cover of species and shoot length and shoot diameter for both salmonberry and thimbleberry were graphed with time, and no relationship was evident (graph not shown). Thus, it appears that shoot length and diameter may be representative of shoot abundance in the area and not merely an indication of the time of the growing season.

By comparing shoot length and percent cover of salmonberry and thimbleberry in the cedar-hemlock forest with logged areas of > 15 years and < 5 years (which were originally cedar-hemlock forest), insights into the effects of logging on shoot productivity can be gained. As can be seen in Figures 5.6 and 5.7, both percent cover and shoot length are larger in clearcuts > 15 years than in old growth cedar-hemlock forest. As well, shoot length is larger in < 5 years clearcuts than in old growth cedar-hemlock forest. The differences in percent cover are not statistically significant. However, differences in shoot length between logged and unlogged habitats are beyond standard deviation indicating that logging appears to enhance the size of salmonberry and thimbleberry shoots.

5.6.3 Root vegetables

Four root vegetables (Pacific silverweed, springbank clover, bracken fern and northern rice-root) were growing in the Atleo River watershed although data on two of these species is limited. Northern rice-root (*kuuxwapiihmapt*) was not present in any of the quadrats sampled in the watershed and was recorded only at Bedingfield Bay estuary. At this site, the population consisted of only a few individual plants. Although bracken

Abundance of root vegetables

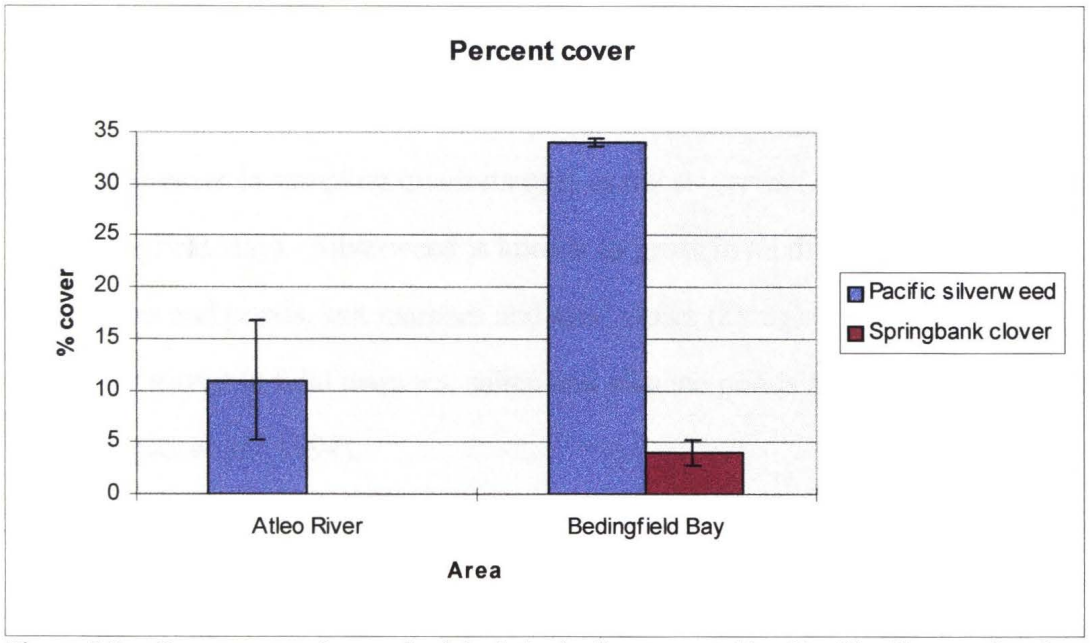

Figure 5.8a: Percent cover (± standard deviation) of root vegetables (Pacific silverweed and springbank clover) found at the mouth of the Atleo River and Bedingfield Bay estuary.

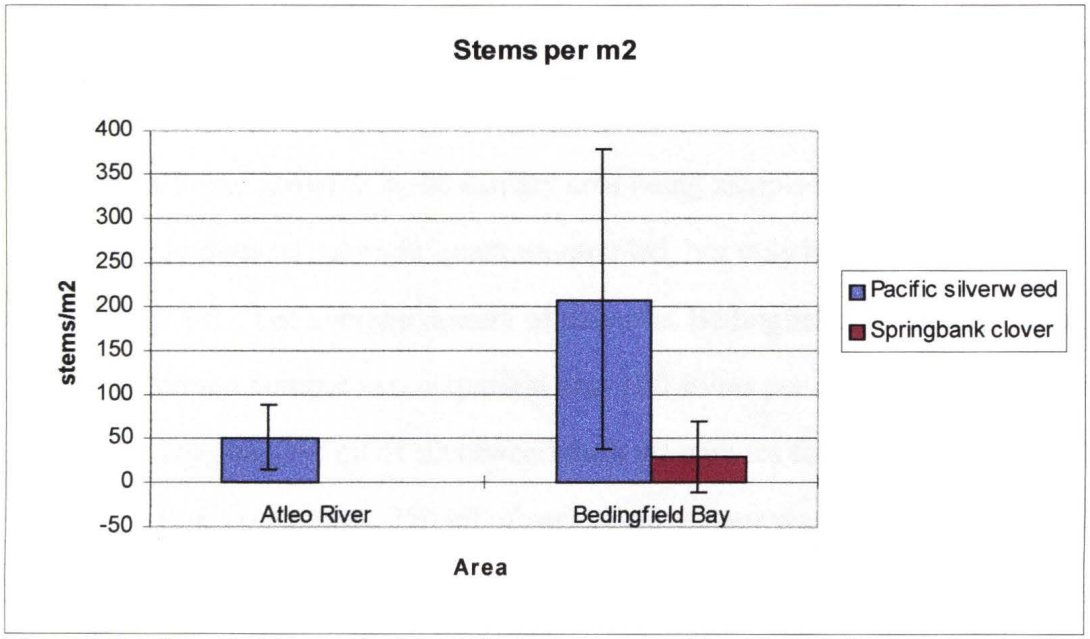

Figure 5.8b: Stems/m² (± standard deviation) of root vegetables (Pacific silverweed and springbank clover) found at the mouth of the Atleo River and Bedingfield Bay estuary.

fern rhizomes (*shitlmapt*) are also a traditional root vegetable of the Nuu-Chah-Nulth, this species was not investigated in this study since it has been recorded to have carcinogenic properties and caution has been issued for its consumption (Turner 1981).

Both Pacific silverweed (*tlitsy'upmapt*) and springbank clover (*?a?iits'uqmapt*) were present in sampling quadrats only in the estuaries (Atleo River mouth and Bedingfield Bay). Silverweed is known to grow in mudflats, as well as at the margins of streams and ponds, salt marshes and sand dunes (Douglas *et al.* 1991). Springbank clover grows in tidal marshes, saline and alkaline ponds and wet sites throughout BC (Douglas *et al.* 1994).

At the Atleo River mouth, silverweed was present in all eight quadrats and at Bedingfield Bay, was present in seven of the eight quadrats sampled. The percent cover of Pacific silverweed was over 10% at the Atleo River mouth and over 33% at Bedingfield Bay (see Table 5.3b). The average density of Pacific silverweed in the estuary was relatively high, being 130 stems/m^2 (see Figure 5.8). Since roots from these plants are used and not the leaves, perhaps the stems per m^2 is a more accurate measure of the abundance of this food resource than percent cover.

Although springbank clover was present on the beach at the Atleo River mouth, it was not found growing in the estuary area being sampled. At Bedingfield Bay, clover was present in three of the eight quadrats sampled, but only had an average cover of 4% (see Figure 5.8a). The average density of clover at Bedingfield estuary was 29 stems/m^2 and the maximum number in one quadrat was 100 stems per m^2 (see Figure 5.8b).

Digging 250 ml of silverweed took 40 minutes for two people at a relaxed pace. Due to time constraints, 250 ml of springbank clover was not collected. However, based on a similar study in Nuxalk territory, the time to dig clover is approximately 50 percent greater than the time to dig silverweed (Lepofsky *et al.* 1985). Although the time to collect 250 ml of these plants is relatively long, the estuary habitat where it grows in the

Figure 5.9: Plant species with edible roots, including northern rice-root and Pacific silverweed, growing in estuary.

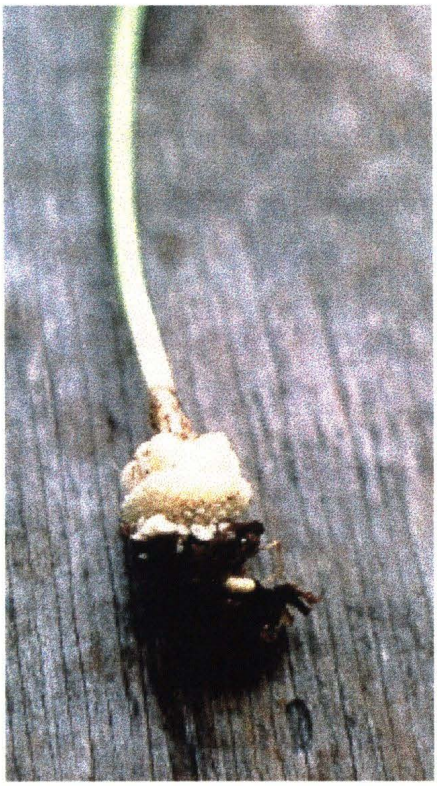

Figure 5.10: Edible bulb with rice-like bulblets of *kuuxwapiih* (rice root). This traditional food plant was found in the estuary at Bedingfield Bay.

Atleo River watershed is the closest to boat access and provides easier travel than any of the other habitats (see Table 5.1).

5.6.4 Fibrous Materials

As well as plants used for food purposes, many plant species which provide fibrous materials are growing in the Atleo River watershed. These species include cattail, common rush, basket sedge, and western red-cedar. Common rush (*tl'i7ich*), used primarily for tying and binding purposes and cattail (*sanix̲mapt*), used primarily for mats and baskets, were each found in one of the 56 sampling plots. This plot was in a 1985-86 clearcut just north of the Atleo River mouth. The area was fairly flat, and a small creek was running nearby. Common rush is known to have a wide range of habitat tolerance, including mesic to wet disturbed areas, fields, forest margins, marshes and peat bogs, but is more common in the steppe and montane zones (Douglas *et al.* 1994). Cattail is common in wet sites, such as ponds, lake shores and marshes (Douglas *et al.* 1994). The low abundance of these two species in the watershed provides little potential for their future use for anything more than a small-scale personal level.

Basket sedge (ch'itapt)

Basket sedge (*ch'itapt*) was present in 7 of the 56 plots sampled (see Table 5.2). This plant was predominantly found in riparian areas, or in other habitats with riparian characteristics. At the edge of Barra Lake, basket sedge was present in all four plots and within those, was growing in 13 of 16 herb quadrats (see Table 5.9). Basket sedge was also growing within the 1985-86 clearcut (north) area which was very moist and had a small creek nearby. At that site, basket sedge was present in one of the four herb quadrats sampled with a cover of 50% (see Table 5.9). Although not found within other quadrats, basket sedge was present in the following areas: one plot of the north unlogged river edge, one plot of the 1979-81 clearcut (south) areas, and in one of the hemlock-amabilis

forest (north) plots. All of these areas were very moist sites and had standing water or a small creek running through them. Basket sedge commonly grows in swamps, marshes, riverbanks, wet meadows and forests in coastal BC (Douglas *et al.* 1994) so it is surprising that this plant was not found in more habitats.

Table 5.9: Frequency, abundance and distribution of *ch'itapt* (basket sedge) in the Atleo River watershed.

Side of lake/ watershed	Habitat type	Habitat	# of herb quadrats present (4)	Height (cm)	Stems/m²	Mean % cover
North	lake	logged	3	50	453	45
South	lake	logged	4	85.75	397.5	64
West	lake	forest	4	62.5	800	26.75
East	lake	forest	2	47.25	447.25	18.75
North	clearcut	1985-86	1	50	258	12.5

There appears to be a weak linear correlation between the percent cover of basket sedge and height of the plants (r=.588; n=12)[5]. This correlation means that height of basket sedge can be estimated by percent cover from standard vegetation surveys. No correlation was found between height of basket sedge and stems/m² (r=.231; n=12), indicating that these two variables are independent. As well, no correlation was found between percent cover and stems/m² within patches with basket sedge (r=.245; n=12). This lack of correlation may indicate sampling error since ideally, those plots which were estimated to have higher percent cover should have had more stems/m². This discrepancy may be due in part to the difficulty in estimating the percent cover of grasses, given their narrow profile. The lack of correlation indicates that stems/m² for basket sedge is more likely to be an accurate measure of abundance than estimates of cover.

[5] For n=12, the decision point is r=.576 (Johnson 1980: 102).

Abundance of basket sedge (*ch'itapt*) at Barra Lake

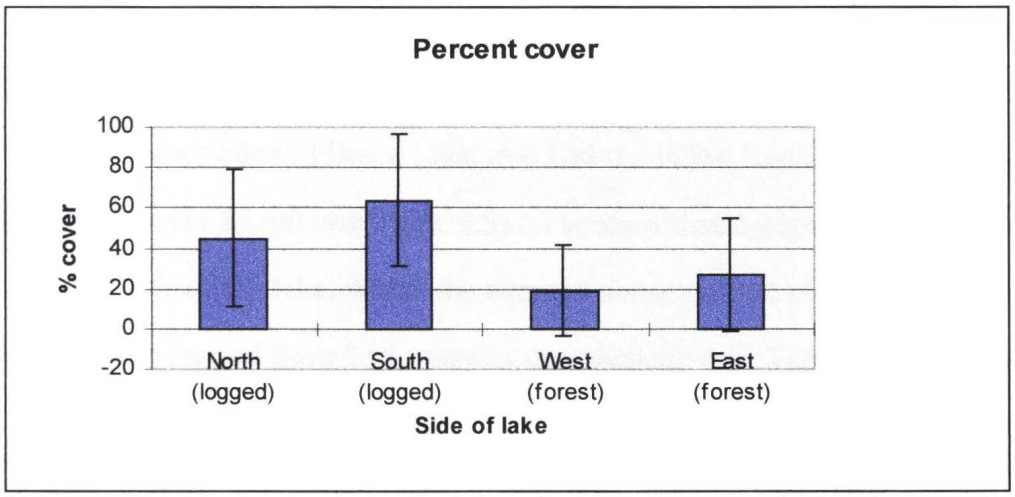

Figure 5.11a: Average percent cover (± standard deviation) of basket sedge (***ch'itapt***) at Barra Lake.

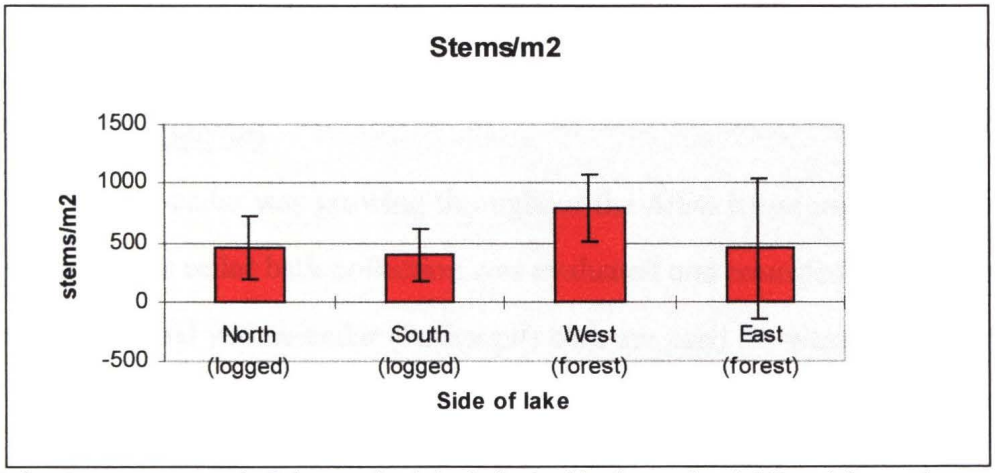

Figure 5.11b: Averages stems/m2 (± standard deviation) of basket sedge (***ch'itapt***) in quadrats where it was present at Barra Lake

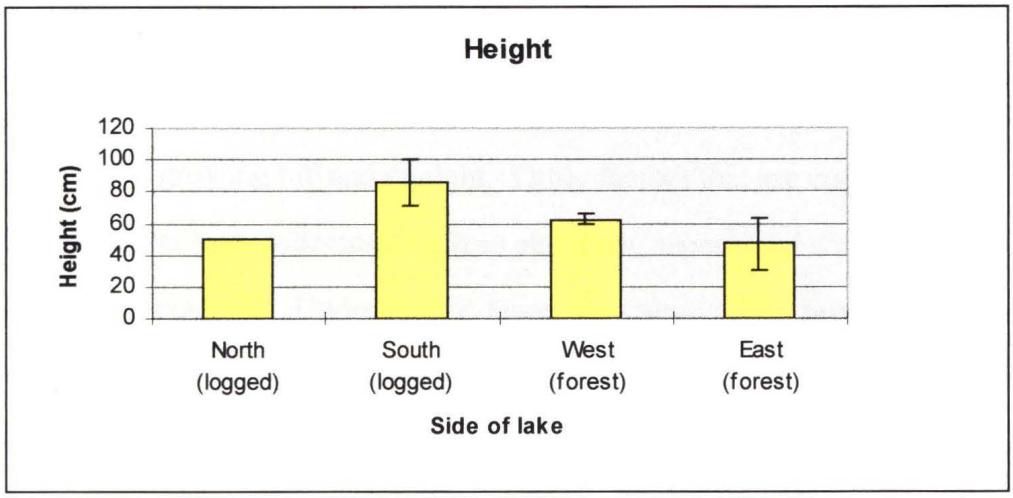

Figure 5.11c: Average height (± standard deviation) of basket sedge (***ch'itapt***) in quadrats where it was present at Barra Lake

At all edges of Barra Lake, basket sedge was growing at greater than 15% cover, and reached a mean percent cover of as high as 64% on the south edge of the lake (see Table 5.9). The south edge of Barra Lake also had the tallest basket sedge, with an average height of over 85 cm (see Table 5.9). The most dense population of basket sedge was on the east side of the lake, where the average density of the plant was 800 stems/m^2. Access to this area ranged from fairly easy to very difficult (see Table 5.2). The easiest method to collect basket sedge in this habitat would be to travel by water, either by using a boat or wading in the lake, although bringing a boat into this lake might be a difficult task.

5.6.5 Cedar bark (*pits'ip*)

Western red-cedar was growing throughout the Atleo River watershed. In each site, the potential for cedar bark collection was evaluated and recorded. Both western red-cedar (*pits'ip*) and yellow-cedar (*?alhmapt*) bark are used for weaving and other material purposes (see Chapter 4, Section 4.1.1). Although yellow-cedar is said to be present in the upper slopes of the watershed (Bill Perry, personal communication 1996), it grows in areas that were inaccessible for the purposes of this research project. Thus, only data for western red-cedar trees were gathered during this research project.

Trees were deemed suitable for potential cedar bark collection if they had few branches and were growing tall and straight. Other factors that are considered by knowledgeable cedar bark collectors, such as elevation, aspect, and distance from the ocean, were not considered. Undoubtedly, fewer sites would have been suitable for harvesting cedar bark if all these criteria were considered.

Cedar bark was found to be available primarily in the cedar-hemlock forests. The cedar-hemlock tree plots (400 m^2) usually contained two trees suitable for cedar bark collection. The only other habitat in which there were cedar trees with suitable bark was in the forest at the river edge. Trees that were evaluated as having suitable bark in these

habitats were between 68 cm and 216 cm in circumference. Elders may consider these trees too large for bark collection (see Section 4.1.1).

There is little doubt that modern forestry practices have had an impact on the availability and abundance of cedar bark. Although cedar seedlings having an appropriate diameter (15 cm) are relatively abundant in cutblocks, they grow in dense clumps and have a large number of branches along the length of the stems rendering them inappropriate for collecting bark. Remaining cedar-hemlock forests in the watershed are restricted to small patches on the upper slopes.

Table 5.10: Areas with high relative abundance of fibrous materials.

Basket sedge *ch'itapt*	**Common rush** *tl'i7ich*	**Cattail** *sanixmapt*	**Western red-cedar bark** *pits'ip*
• forest lake edge • logged lake edge	• none	• none	• CH forest • forest river edge

5.6.6 Culturally Modified Trees

Fourteen trees which were probably culturally modified trees (CMTs) were identified in the Atleo River watershed (see Table 5.11). All of the CMTs identified were western red-cedar and had long tapered scars vertically on the trees, most likely resulting from previous bark collection. Two of the trees had deeper scars and may have had cedar planks removed from them.

One CMT was identified in the forest near Bedingfield Bay. This area was recorded as an Otsosat winter village site, and has also been used more recently as a clam-digging area (Bouchard and Kennedy 1990). The other thirteen of the CMTs were found near Barra Lake. Three of these were located in the forest at the northwest side of the lake, and eight were located in the forest on the northeast side. One potential CMT was identified in the cutblock in the north side of the lake. This tree was the only large tree

Table 5.11: Culturally modified trees (CMTs) identified in the Atleo River watershed.

CMT	Location	Tree Height (m)	Tree Diam. (cm)	Scar height (m)	Scar width (cm)	Scar shape	Side of tree	Comments
1	Bedingfield Bay	40	110	10		long bark strip removed	NE	Cut marks at bottom have greenish tinge.
2	NW side of Barra Lake	40	80	10		stripped area thinner at top	NW	
3	NW side of Barra Lake	40	65	10	40		E	Tree is leaning over.
4	NW side of Barra Lake		30					Not positive about identification.
5	N side of Barra Lake (single tree standing in clearcut)	15	45	5	28	long strip up tree	SW	Tree is leaning.
6	NE side of Barra Lake	40	63	6	56	long strip that goes into a point at top	SE	
7	NE side of Barra Lake	45	41	10	38	deep groove which narrows very gradually. Can't see top.	SW	Bark present on scar but smoother.
8	NE side of Barra Lake	45	83	10	45	stays quite wide right to top.	S and twists to E	Possibly a second scar to the east of the first about 40 cm.
9	NE side of Barra Lake	50+	160	8.5	25	very deep groove. Rectangular shape.	NE	Possibly a plank removed
10	NE side of Barra Lake	50+	123		15	wedge-like cut into tree. Groove about 30cm deep	E	Possibly plank and/or bark removed. Greenish deposits along sides of grooves.
11	NE side of Barra Lake	15	32		37	bark strip goes almost to the top of the tree	E	
12	NE side of Barra Lake	40		3	15		W	Tree is dead and leaning over. Scar is green.
13	NE side of Barra Lake	40	90	20	42	very shallow	W	Tree is dead. Second scar on east side is 35 cm in width.
14	NE side of Barra Lake	40	63	15	45	long strip	N	

Figure 5.12: Travis Thomas beside a culturally modified tree.

Figure 5.13: A bunch of salal, picked and bundled for floral purposes.

5.6.7 Floral Greens Plants

Plant species used for floral greens (as identified in Schlosser *et al.* 1992) that are present in the Atleo River watershed include salal, evergreen huckleberry, sword fern and deer fern. Although scotch broom, another floral green, is growing in the watershed, only two individual plants were found. Due to the invasive and noxious qualities of this plant, the further spread of this species is strongly discouraged in management plans and decisions (see Smith 1997).

Although our data indicate that cutblocks have the largest number of stems per m^2 of floral greens (see Table 5.12), an interview with a local salal picker in May, 1997, revealed that logged areas were unsuitable for salal picking since they do not provide the quality of salal necessary for floral greens. Schlosser *et al.* (1992) also state that most floral green species require at least partial shade to meet the product quality requirements of the deep green, broad spreading leaves or fronds desired by floral greens producers. Thus, the standards used to evaluate "usable stems" for floral plants in this study were not necessarily rigorous enough to be consistent with standards used by the floral industry.

Salal greens

Salal was one of the most abundant plants in the Atleo River watershed (see Section 5.5.1). This shrub was growing in almost every area sampled (with the exception of estuaries). The cover of salal was over 10% in cedar-hemlock forest, all ages of clearcut stands, the forest river edge and logged and unlogged lake edges (see Table 5.3b). The largest number of "usable" stems per m^2 of salal was in clearcuts (See Table 5.12).

Desirable salal for a floral green includes branches that are free of leaf blemishes and dirt and have dark green leaves. Regular salal bunches have branches of 60-75 cm and short bunches (Johnny bunches) are approximately 45-50 cm long (Schlosser *et al.* 1993). Thus, areas that have a length of less than 45 cm for the mean length of the three largest stems would be unsuitable for floral plant gathering. If areas with less than 45 cm

Table 5.12: Usable stems per m², length and percent cover of floral plants in habitats of the Atleo River watershed. Usable stems per m² were derived from counting the number aesthetically pleasing stems in one square meter in a typical portion of the plot. Length refers to the average length of the three largest stems in a typical portion of the plot.

		Salal			Evergreen huckleberry			Sword fern		
		stems/ m²	length (cm)	% cover	stems/ m²	length (cm)	% cover	fronds/ m²	length (cm)	% cover
Forest	Cedar-Hemlock forest	5.4	49	47.5	8	57.2	3.8	12	84.7	0.8%
	Hemlock-Amabilis forest	4.5	87.6	8.5	-	-	-	10.8	105.9	4.2
Clearcut	> 15 years	10.3*	63.9	50.1	4*	-	1.8	7.5*	93.1	2.8
	> 10 years	9*	36.9	50.8	6*	21.3	1.8	2*	62.7	0.8
	< 5 years	7.6*	38.0	10.8	3*	42.3	0.8	12.3*	91.2	0.3
Reserve	Seektukis near shoreline	4	40.0	5	-	-	-	9	128.3	0.1
	Seektukis logged area	0	17.7	2	-	-	-	5.5	89.3	10.3
Lake	logged lake edge	5	43.2	17.5	-	-	0.5	-	-	-
	unlogged lake edge	5	95.0	12.5	NA	NA	15.5	-	-	-
River	logged river	5	40.9	1.5	-	-	-	13.3	91.0	6.9
	unlogged river	4	53.7	10	-	-	-	10.3	98.1	6.3
Estuary	Estuary	-	-	-	-	-	-	-	-	-

* note: floral plants in clearcuts are not considered to be of high enough quality for use in the floral industry (Schlosser *et al.* 1992; personal communication with a local salal picker)

length of three largest stems, less than 10% cover, and logged are considered unsuitable for salal picking, sites with harvesting potential are cedar-hemlock forests and the forest edges of the lake and river (see Table 5.12). Perhaps cutblocks of over 15 years could also be considered, as they have considerable shade.

Evergreen huckleberry greens

In terms of percent cover, evergreen huckleberry has relatively low abundance in the Atleo River watershed. Percent cover was greater than 10% only in the forested lake edge. Unfortunately, due to initial adjustments with research methodology, the stems/m^2 and the length of stems for this habitat were not measured. The abundance of this plant is low in all other areas, reaching the second highest abundance of less than 7% in one of the 1979-81 clearcut plots. Four habitats (the CH forest and the three cutblock habitats) appeared to have suitable evergreen huckleberry (see Table 5.12). The highest number of usable stems per m^2 was in the cedar-hemlock forest, which contained 8 stems/m^2, but the percent cover of the species in this habitat was less than 4%.

Based on percent cover, it appears that the only suitable area with a potential for evergreen huckleberry collection is the forested lake edge of Barra Lake (see Table 5.13). Evergreen huckleberry branches should be 60-75 cm long and have dark green and upward facing leaves (Schlosser *et al.* 1993) and this length was not reached in any of the habitats measured. Thus, although some habitats appeared to have suitable floral greens, the length of the stems and the abundance of this species are too low for collection.

Sword fern fronds

Sword fern was relatively frequent, appearing in 35 of 56 plots in the watershed (see Table 5.2). However, the percent cover of this species was low throughout the watershed (see Table 5.3b). The greatest percent cover of sword fern was on one forested river plot where the percent cover was 12.5% but the average for this habitat was only 6.3% (see Table 5.3b). In terms of "usable" quantities of sword fern, the most abundant areas for sword fern were the logged river edges (13.3 stems/m^2), clearcuts of less than 5 years (12.3 stems/m^2) and cedar-hemlock forest (12 stems/m^2) (see Table 5.12).

In defining usable stems, sword fern fronds should be 45-60 cm long (Schlosser *et al.* 1993). The largest fronds in a typical patch of the plot exceeded this length.

However, fronds can be cut at the appropriate length, leaving some of the frond on the bush. This form of harvesting is selective and more sustainable since only the usable portions of the plant are taken and remaining fronds can still release spores and reproduce. In terms of appearance, sword fern should have dark green fronds free from blemishes and discoloration so logged habitats may be unsuitable for sword fern collection because they do not provide enough shade for plants to produce a dark green colour. However, habitats of late seral stage may be appropriate. Given these data, it appears that the only potential for the harvesting of sword fern for the floral industry in the Atleo River watershed is at the Seektukis Reserve, although these plants may not have a deep enough green colour due to the canopy closure.

Deer fern fronds

Deer fern was not evaluated during this study for its potential as a floral green. However, this species is used in the floral industry and it appears to be abundant in the Atleo River watershed. Deer fern was growing in every habitat with the exception of the estuaries (see Table 5.3b). It is particularly abundant in the cedar-hemlock forests (30% cover) and the 1979-81 clearcut areas (28% cover) (see Table 5.3b). However, given that quality floral greens grow only in forested areas that provide significant shade, cedar-hemlock and hemlock-amabilis forests are the only habitats with suitable potential for deer fern collection.

One of the difficulties with interpreting field data for floral plants is the lack of information on the minimum number of stems per m^2 required for sustainable harvesting. There is little information on sustainable harvesting levels and on abundance of floral plant species before harvesting (de Geus 1995). Without this information, it is very difficult to provide recommendations for floral plant harvesting. Thus, whether the abundance of

floral plants in the Atleo River watershed is suitable for commercial collection of these plants remains uncertain. Further discussion of the issues associated with commercial harvesting of floral greens and other plants will be explored in Chapter 6 (see Section 6.2.3).

Table 5.13: Areas with high relative abundance of suitable floral greens. Sites were considered suitable if they had a minimum of 10% cover of floral greens species, contained stems and fronds of the suitable size category, were in habitats that did not have an open canopy, and were aesthetically pleasing.

Salal ***lhayiipt***	**Evergreen huckleberry** ***siinamuxs7itsmapt***	**Sword fern** ***7itsmapt***	**Deer fern** ***kaatskuuxsmapt***
• cedar-hemlock forest • forested river edge • forested lake edge • (clearcuts > 15 years)	• (forested lake edge)*	• (Seektukis reserve)	• CH forest • HA forest • (clearcuts >15 years)

* These fronds were slightly shorter than the acceptable length, but only by less than 3 cm.

5.7 Limitations of Data

As with all field studies, there are problems and limitations associated with data collection that must be recognized when data is being interpreted. These issues include reliability, sampling design, accuracy and choice of measurements. Since decisions are based on available information and may not always evaluate the credibility of this information, it is important to recognize limitations of the field data when interpreting and applying information (McQuisten and Gebhardt 1983).

Sampling design

One potential problem with this study is the adequacy of the sampling regime. Random sampling has been used to estimate the abundance of plants in the watershed.

Random sampling has been known to be unaffected by clumped distributions and more consistently estimates population frequencies than systematic design in clumped spatial design computer simulations (Whysong and Miller 1987). Their study found that the likelihood of Type I errors (of rejecting a null hypothesis that is actually true) increased with systematic sampling so, based on their study, random sampling likely reduced potential biases resulting from clumping of plant species in the Atleo River watershed. However, it is only a sampling method and it is possible that it does not completely reflect actual plant abundance.

Another difficulty in determining the adequacy of the sampling regime is through an analysis of variance of data. If cover type is indeed an appropriate strata for division, there should be more variance of measurements between cover types than within them (Freese 1962). As indicated by the standard deviation of percent cover (see Appendix H), several plant species showed more variation within their cover type than between cover types. Although ordination revealed that the habitat category that I used to describe sites is a primary factor in the description of plant communities, the side of the watershed is also a major influencing factor and was not closely examined in my study. As well, with the exception of the ordination, slope, aspect, canopy closure and elevation were not considered when analyzing vegetation data.

For better estimates, the sampling intensity in each habitat should be weighted to the size of the habitat (Freese 1967). For example, large cutblocks should have more plots conducted than smaller cutblocks. In my study, three plots per area were conducted (except for two in riparian areas) regardless of the size of the cutblock or forest. However, since total estimates of culturally significant plants for the Atleo River watershed were not made and only relative abundance was compared, an unweighted sampling regime may not be as critical.

Another potential problem with this sampling design was the buffers between habitats. Plots were conducted at a minimum of 50 m from the edge of another habitat

type (e.g. 50 m into clearcuts or forest habitats) to reduce edge effect. However, a recent study by Judith Toms, an undergraduate honors student, indicates that edges can have an effect on understory plants for up to 150 m into old growth western hemlock forests (Toms 1997). She concluded that an edge effect of 150 m to 200 m would be appropriate for old-growth management. Given this information, it is highly possible that the forest sites sampled were affected by their distance to clearcuts, and that representative old-growth dependent plant species may have been under-sampled.

Multiple characteristics of each habitat may also affect vegetation sampling by habitat. For example, in two areas that were classed as "clearcuts", standing water was present. This water likely provided suitable habitats for riparian species that may have not otherwise grown in that cover type. Since the west coast temperate rainforest of Clayoquot Sound is characterized by a large network of streams and other hydroriparian features, it was difficult to avoid the presence of water.

Estimation

One potential problem with this data is whether or not the measurements taken were indicative of actual abundance of culturally significant plants. Very little work has been done on estimating the quantity of culturally significant plants in British Columbia. Further research will be required to determine how precisely estimates of the abundance of culturally significant plants reflect their actual quantities. For example, shoot foods were measured from base to tip, whereas the edible portion of the shoot is less than this length. As well, counting the stems/m^2 of root vegetable foods may overestimate the actual number of roots available for harvest.

One of the measurements for the abundance of plants was estimation of percent cover. Although this method is commonly used and accepted, cover-values may overestimate the abundance of grasses and other small or rare plants (Floyd and Anderson 1987: Kennedy and Addison 1987). For example, the difference in percent cover and

stems per m^2 was apparent for basket sedge (see Figures 5.11a and 5.11b). However, for small culturally significant plants studied, such as Pacific silverweed, springbank clover and basket sedge, stems per m^2 was also measured as well as percent cover.

Because percent cover was estimated by six different observers in various plots, there may be errors attributed to differences in estimation for each person. In one study, the percent cover estimates were accurate for small plots of 4 m^2 but became less reliable for larger plot sizes (Sykes *et al.* 1983). Efforts were made to train the entire crew at the beginning of the field season to encourage consistent data collection. However, there is the possibility that different people had different biases in their measurements. To reduce this possibility, researchers generally conducted consistent data collection throughout the summer. For example, certain researchers tended to measure the shrub layer while others measured the tree layer.

Another potential source of error was estimations of measurements. For example, slope of the plot and tree height were based on visual estimation and may not be accurate. However, since neither of these data played an important role in data analysis, the error that they contributed to this study is minimal.

The classification of trees as being culturally modified was another potential source of error. Undoubtedly, there are numerous other CMTs in the watershed of various species and types. Due to the lack of experience in identification of CMTs of this field crew, and other goals for field work, western red-cedars were the only trees identified as being culturally modified. However, the bark and wood from many other tree species is used and can be identified by experienced field crews. Due to the difficulty in identifying CMTs, trees identified should be verified by more experienced CMT surveyors.

Temporal variability

Another difficulty associated with this project was that of seasonal variation of culturally significant plants. For example, berries fruit at various times during the year.

Due to constraints of access and time, each area was only visited once during the summer. Kennedy and Addison (1987) indicated that sampling between mid-June and mid-August may help control the source of error of changes in vegetation. However, they suggested that changes of less than 20% should be attributed to annual fluctuation and measurement error. Thus, there may be error involved in attributing differences in percent cover to habitat-types rather than to measurement error.

Temporal variability may also affect the measurements of culturally significant plants, such as usable floral stems that are not browned, or berries per bush, and may not accurately reflect the productivity for the area. As Mark Savage (1995:7) notes with regards to the floral industry, "a salal patch... may be fine in July, but aphids or fungal growth may render them commercially worthless in August." In a study which monitored sword fern over six years, the author concluded that "fern crops fluctuate from season to season, both in height growth and number of fronds, just as farm crops do" (Isaac 1945:9). As well, 1996 may have been a time of relatively low or high abundance when annual or multiyear cycles are considered. For example, time and spatial scale can affect conclusions drawn and metapopulations (in which there is one core population and several satellite populations that may go extinct periodically) cannot be understood without long-term studies. Thus, it must be recognized that this project represents a snap-shot of one watershed at one time. Variations in abundance of plants occur seasonally, annually, and in longer time frames. Since, there are no baseline data for culturally significant plants in this watershed, comparisons and changes in the watershed are difficult to draw.

Summary

A number of plant species traditionally used for food and material purposes are growing throughout the Atleo River watershed (see Table 5.14). Some of the species, such as cattail, horsetail, tule, bulrush and stinging nettle were found at very low frequency. Other species were found in higher abundance in the watershed.

A number of berry species were growing abundantly in the watershed, and have the potential to be harvested. Salal, salmonberry and thimbleberry were found in high frequency in the watershed and were relatively abundant in clearcut areas although access to these habitats is difficult. Evergreen huckleberry, in contrast, was found primarily in shaded areas such as forest and lake edge habitats. Pacific crabapple was growing abundantly on all edges of Barra Lake. If greater access is provided to this habitat, crabapples would be an available and abundant food source in this area. In addition, many species including bunchberry, stink currant, Himalayan blackberry and red elderberry, were found in small patches throughout the watershed and could provide supplemental food resources on a small scale.

Thimbleberry and salmonberry shoots are relatively abundant in clearcut areas. Salmonberry shoots were also found to be abundant along the river edge and in the hemlock-amabilis forests. Pacific silverweed and springbank clover, traditional root vegetables, were found only in estuary habitats. Easy access to these habitats and relatively high abundance of these species provides high availability of these root vegetables.

Basket sedge was abundant at all edges of Barra Lake. This fibrous plant was growing in high density and substantial quantities could be collected if traditional harvesting practices were used. Cedar bark was also found in the watershed, but suitable trees were difficult to find. Forestry activities have reduced the availability and abundance of this material to small patches of cedar-hemlock forests in the upper slopes of the watershed.

Floral greens, such as salal and evergreen huckleberry stems and sword fern and deer fern fronds are also less abundant in logged areas. The deep green colour desired by the floral industry in these floral greens is only acquired in forested areas. Substantial logging in the watershed has reduced potential gathering sites to remaining forested

habitats. Large-scale harvesting should be approached with caution and care should be taken not to over-harvest these species.

As well as the reduction of habitats for floral greens, cedar bark, and some berry species, forestry practices have also impacted traditional patterns of plant use by making areas less accessible. Although logging roads have provided access to a number of habitats throughout the watershed, cutblocks were the most inaccessible areas in terms of the time required to reach the areas and the difficulty of travel within the habitats.

Culturally significant plants and habitats are an important cultural resource for the Ahousaht First Nations. Even if people do not currently gather plants in the Atleo River watershed, the importance of theses resources should still be respected. Plants were and are an integral part of Ahousaht culture, and recognizing their role as foods, materials, and other essential resources broadens the definition of culturally significant sites, provides potential opportunities for sustainable uses of the forest and works towards establishing priorities for restoration.

Table 5.14: Summary of culturally significant plants and habitats in the Atleo River watershed.

Habitat type	Habitat	Accessibility (most difficult level in habitat) (see Table 5.1)	Culturally significant species with availability/abundance	Other culturally significant species present (excluding incidental (< 1% cover) species) (see tables 5.3a&b)
Forest	**Hemlock-Amabilis**	fairly easy	blueberries; salmonberry shoots	salal; red huckleberry
	Cedar-Hemlock	moderate	salal greens; western red-cedar bark; deer fern fronds; blueberries	bunchberry; red huckleberry; blueberry; salmonberry
Clearcut	**> 15 years**	very difficult	red huckleberries; salmonberry shoots; salal berries; (salal greens)	thimbleberry; blueberry
	> 10 years	very difficult	thimbleberry shoots; salmonberry shoots; salal berries; red huckleberries	bunchberry; Himalayan blackberry; trailing blackberry; basket sedge
	< 5 years	fairly easy to difficult	salal berries; salmonberries; red huckleberry	Himalayan blackberry; black raspberry; trailing blackberry; thimbleberry;
Reserve	**Seektukis**	fairly easy	red elderberry; salmonberry shoots	red huckleberry; salal
Riparian	**Forest river**	fairly easy	red huckleberries; blueberries; salmonberry shoots; salal berries; salal greens; western red-cedar bark	blueberry; thimbleberry; cedar bark
	Logged river	fairly easy	stink currant; salmonberries; salmonberry shoots	red huckleberry; thimbleberry; salal
	Forest lake	moderate	Pacific crabapples; salal berries; salal greens; basket sedge; evergreen huckleberries; (evergreen huckleberry greens)	red huckleberry; blueberry; salmonberry
	Logged lake	very difficult	Pacific crabapples; salal berries; basket sedge; blueberries	red huckleberry; blueberry
	Estuary	easy	Pacific silverweed;	springbank clover; northern rice-root

CHAPTER 6: DISCUSSION

Well, hopefully this is going to work, what we're doing today to help and sit down with the governments and sit down with the logging companies, sit at one table and decide how we should work this forestry and fishing. So my grandchildren can see forests, my grandchildren can see fish. That's why we want to slow things down...

Murray John

6.0 Introduction

Field results on the availability and abundance of culturally significant plants, as presented in Chapter 5, are one aspect of evaluating future use and management of forests. These results indicate where plants are available in the Atleo River watershed by evaluating their frequency, abundance, distribution and productivity. This information can be used to determine critical areas for culturally significant plants, and habitats with high potential for future use, management and restoration.

Traditional ecological knowledge of plants, which was presented in Chapter 4, provides further information about culturally significant plants by describing past and current uses, traditional management and harvesting strategies, and ecological information. As well, traditional forms of communication and exchange of knowledge, as presented in Chapter 4, are important for integrating into future research, education and monitoring of forest practices. Worldviews and teachings shared by elders is another important component of traditional ecological knowledge and can be used to provide a model of appropriate and respectful ways of relating to forest ecosystems.

Many other factors influence future use and management of plants such as impacts of forest practices, interest in contemporary use, conservation concerns, health issues, and accessibility of sites. All of these factors must be considered in order to assess the potential future use and management of culturally significant plants. This chapter considers these factors, reflects on field results and traditional ecological knowledge, and

explores the potential for future use and management of plants. As well, this chapter includes a discussion of issues and concerns to consider regarding the use and management of culturally significant plant species for foods, materials, medicines and floral greens.

6.1 Future use and management of culturally significant plants: a context

Plants have different values to different people. To some, they provide a means of supplementing their diet and providing materials to use for baskets and other arts. To others, they embody a spiritual presence that only *qu'as* (First Nations' people) can fully understand. Yet to others, they provide an untapped source of income as a potential economic resource. The values that people hold about these plants species are an integral part of future use and management decisions.

The cultural significance of plants is one context for future use and management. As witnessed by the many elders we spoke with in Ahousaht, the temperate rainforests have been used for thousands of years for a diversity of purposes by the Nuu-Chah-Nulth people. There are very few traditional aboriginal activities that do not include the use of plants. For thousands of years, ancestors of Ahousaht people have been eating the same plant foods, weaving baskets and making implements, clothing, houses and canoes with the same plant materials, and healing their people with the same plant medicines. Plants today still have a role in ceremonies and other sacred events which are integral parts of First Nations' culture. Although these activities and values are not discussed in this chapter, the spiritual importance of plants, and the right of First Nations to monitor use and management of these resources, is fundamental to this discussion.

Another context for culturally significant plant resources is their economic value. According to the Scientific Panel recommendations (1995c), and their interpretation by Ecotrust (1997), past forestry activities in the Atleo River watershed do not comply with Scientific Panel Recommendation 3.1, for which the maximum cut rate should be no more

than 5% in 5 years. Bill Perry, a forester working for MacMillan Bloedel with whom we spoke during our field season, estimated that a clearcut in TFL 44 (of which the Atleo River watershed is a part) would be suitable for a second harvest after 80 years. If this is the case, further timber harvesting in the Atleo River watershed would not be a viable option until at least the 2050's.

In the meantime, and for many generations to come, First Nations are and will be pursuing a means to make a living. In 1991 there was an unemployment rate of 60-70% for Nuu-Chah-Nulth First Nations (Archeo Tech 1991). According to the Scientific Panel, First Nations desire economic pursuits that are consistent with their values and perspectives (Scientific Panel 1995a). One fundamental value of First Nations identified in the Scientific Panel documents and by elders with whom we spoke, is to maintain healthy ecosystems and to consider long-term benefits for future generations. As Clifford Atleo described:

> *We're not opposed to development, we're not opposed to economic development, we're not opposed to jobs, we're not opposed to logging. All we want to do is Right. There's no reason why we can't benefit from our forests and still look after it. None whatsoever. And the key to all of that is going to be our so-called traditional ecological knowledge because it's never ever been used before... because it is different...*

The sustainable use of culturally significant plant resources may be one such economic option. Botanical forest products[1], including wild edible mushrooms, floral and greenery products, wild berries and fruit, herb and vegetable products and craft products, are becoming the basis of a growing industry in British Columbia and the Pacific Northwest (de Geus 1995). Currently, 211 different types of botanical forest products are recognized in British Columbia (de Geus 1995). Over 30 species of fruits and berries

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[1] Non-timber forest products include botanical forest products and special forest products. Botanical forest products are those products not derived from timber sources and are referred to in this thesis. "Special forest products" are derived from trees (usually salvage timber). These products include fence posts, firewood, pickets, rails, shakes, and Christmas trees. These items are regulated under the Forest Act and Special Forest Products Regulation (de Geus 1995).

are harvested on a personal basis and at least seven berry species are harvested for commercial purposes (de Geus 1995). These include oval-leaved blueberry, blackberry, highbush cranberry and red huckleberry. Despite their widespread use, there is a lack of information about the supply and markets of berries. A study in Saskatchewan concluded that field identification and inventory of wild berry and fruit resources was necessary and that an economic development opportunity was available with these resources (de Geus 1995). As well as berries, floral and greenery products are a component of botanical forest products in British Columbia. These include floral greens, conifer boughs and cones, aromatic oils, basketry filler (such as moss), and fresh or dried flowers. Market opportunities for many botanical forest products have been identified for Clayoquot Sound, including salal, sword fern and deer fern, cedar boughs, evergreen huckleberry and red huckleberry (Mater 1996).

The economic value of these products is significant. In 1989, the market for floral greens and Christmas ornamentals generated an estimated US$128.5 million and employed over 10 000 people in western Oregon, Washington and southwestern British Columbia (Schlosser *et al.* 1991). In 1993, a total of 7300 kg of pine mushrooms were harvested on Vancouver Island alone, generating $230 000 to harvesters (de Geus 1995:17). Interest in these products is only increasing. In the Pacific Northwest, the industry for special forest products is growing at a rate of 12% per year (Freed 1996). The value of salal to a harvester in 1989, for example, averaged US$.90 for a bunch defined as 1.63 pounds of a product ready for shipment.

Seeking employment opportunities that are culturally appropriate and economically viable could have immense benefits to aboriginal people. First Nations, including Ahousaht First Nation, have the potential to be leaders in initiatives for the sustainable use of botanical forest products. James Freed (1994:7), an expert in botanical forest products writes:

> *Because of the importance of these plants to them [First Nations] spiritually and culturally, they will have a major say in how far and how fast this industry [botanical forest products] grows... I see native peoples developing industries based around their knowledge and usage of plants that will enable the communities they live within to make better use of the natural resources and lands that they harvest from.*

If harvesting is done with care and respect, an economy of trade and "marketing" of plant resources may be consistent with Nuu-Chah-Nulth traditional practices. Harvesting and trading plant resources has been practiced for thousands of years by Nuu-Chah-Nulth peoples. On a local level, plant foods, materials and manufactured products, such as berries, cedar bark and baskets, were sold and traded in Clayoquot Sound and further afield. For example, Gilbert Malcolm Sproat, a pioneer businessman, wrote about Nuu-Chah-Nulth trading in 1868:

> *For instance, a tribe that does not grow potatoes, or make a particular kind of mat, will go a long way, year after year, to barter for those articles which, if they liked, they themselves could easily produce or manufacture (Lillard 1987:18).*

Irene Thomas told us that she remembers trading berries when she was a young girl.

> *Our family, the whole family would go, and then when we'd come out, people would trade us for things. They'd see our berries and trade us, give us something.*

Today, traditionally gathered and prepared items are still traded and sold informally.

The economic potential of botanical forest products has not been widely recognized by foresters. It was only recently that botanical forest products became a focus of the Ministry of Forests. Some of the plants that are overlooked by foresters are considered highly valuable to First Nations. This difference in values attributed to plants can be illustrated by bear-grass in Oregon. This plant was used as a traditional basket-weaving material by First Nations in the area and also by people from Southeast Asia. It was only when Southeast Asians (who were tree planting in the area), began harvesting the bear-grass leaves for floral decorations that attention was brought to this plant species (J. Johnson 1992). One of the managers of the area said:

> *We always considered bear-grass to be a weed that takes over a site and slows the growth of trees. Then suddenly everyone wanted a permit to collect a product we didn't know existed.* (quoted in J. Johnson 1992:29).

It is unfortunate that plants often have to have a high economic value before they are given high regard.

The following discussion aims to provide ideas for potential future uses of culturally significant plants, on both small and more widely distributed scales. The spiritual and cultural importance of these plants cannot be measured nor can it be fully understood by non-aboriginal people. Increasing the awareness of culturally significant plants and promoting their increased use must come with a respect for the cultural and spiritual importance of these species and thus, should be guided by First Nations. Although the focus of this chapter is on the Atleo River watershed in Ahousaht First Nation's traditional territory, this information has applicability to a much larger area.

6.2 Future use and management of culturally significant plants

6.2.1 Foods

The temperate rainforests within Ahousaht territory are rich in wild plant foods. The introduction of European foods and lifestyles, as well as numerous other factors, has resulted in a decline in use of traditional foods and materials and for some species, cessation of use altogether. For example, domestic cherry trees and potatoes were planted in the Seektukis Reserve in the 1800s despite the abundant native fruits and vegetables growing in the area. The introduction of grocery stores and fast foods, and the changing lifestyles of aboriginal peoples, means that the potential of many traditional food resources has not been realized in recent years.

Native wild plant foods currently eaten by people we spoke with in Ahousaht include berries (such as salal, thimbleberry, salmonberry, bog cranberry, blueberry, evergreen huckleberry, and red huckleberry), giant kelp which is eaten with *qwaqmis* (herring eggs), and salmonberry shoots (*m'aayi)* and thimbleberry shoots (*ch'aashxiw'a*)

in small quantities. However, over 100 food plants used by First Nations in Canada have been identified as having potential to be used more widely (Turner 1981; Kuhnlein and Turner 1991). Among these are food plants found in the Atleo River watershed, including cow parsnip, miner's lettuce, yellow pond lily, licorice fern, wild rose, western dock, bulrush, dandelion, cattail, and stinging nettle. These and other plant foods are both nutritious and palatable.

Traditional food plants are not always considered to be a valuable local resource. Although the role of food plants in the economy of indigenous peoples has been recognized in developing countries (e.g. Pimentel *et al.* 1997), their importance in the Pacific Northwest of Canada has rarely, if ever, been considered in forestry planning. Available and abundant plant foods can provide a good supplement to local diets and a non-monetary economy for local people.

Wild food plants also have the potential of being introduced into more formal cuisine. For example, the Sooke Harbour House Restaurant near Victoria utilizes and features traditional foods in a modern context (Turner *et al.* 1995). Recipes include stinging nettle sauce for halibut, salmonberry and thimbleberry shoots in salad mixtures, and wild berries (such as salal, thimbleberry, salmonberry, and wild crabapples) used for jellies, in salads, or as garnishes. In Tofino and Ucluelet, where tourism is a growing industry and people tend to enjoy the temperate rainforest and all of its treasures, incorporating traditional foods into modern cuisine could not only provide increased recognition of the diverse values of the rainforest, but also could provide employment opportunities to First Nations communities for harvesting and preparing these plant foods.

Berries and other fruits

Several fruit species were found in relatively high abundance in the Atleo River watershed. These included salal in many habitats, Pacific crabapple at the edge of Barra Lake, red huckleberry in clearcuts and forest river edge, blueberries in forested and

riparian habitats, salmonberry in early clearcuts and riparian areas and evergreen huckleberry in forested riparian areas (see Table 5.6 in Chapter 5). These traditional fruits are generally high in vitamin C and other nutrients and are considered by elders to be very tasty. As many people from Ahousaht explained, they can be eaten fresh, used to make jams and jellies, or jarred or frozen for use throughout the year. Many of these fruits could be used more widely for these household purposes. In addition, small "cottage industries" selling these products to galleries and cafés in Tofino and other towns, could provide economic opportunities for First Nations.

Berries are relatively efficient to pick. For two people to pick a total of two cups of berries during field work, it took 7 minutes for salmonberry, 12 minutes for salal, 15 minutes for bog cranberry and 20-28 minutes for red huckleberry. Supplementing family diets using traditional berry foods, and harvesting berries on a larger scale, is a sustainable and nutritious activity.

According to my field data, most berries are more abundant in logged areas (see Chapter 5, Section 5.5.1). Thimbleberry, salmonberry, salal, Himalayan blackberry (introduced), and black raspberry had higher percent coverage in areas that had been logged (as interpreted from mean percent cover for forest and clearcuts). The number of berries per bush was also greater in logged areas for thimbleberry, salmonberry, red huckleberry and salal. Arlene Paul has also noticed that "it produces really good berries when you get a logged out place". Since much of the Atleo River watershed and other areas in traditional Ahousaht territory have been logged, berries provide a potentially sustainable and economically viable industry.

As noted, Pacific crabapple is another abundant fruit species in the Atleo River watershed and one that elders recognize as being a good food plant. This species had a percent cover of 47.5% on the edges of Barra Lake. The cultural importance of the edges of Barra Lake should be recognized in future management planning.

Traditional management strategies that have been used for berry foods in the past could be applied today. Breaking branches off berry bushes is a form of pruning practiced by the Nuu-Chah-Nulth First Nations and may enhance berry productivity and encourage growth. Through encouraging traditional berry picking techniques, areas rich in berries can be tended as a garden to restore culturally important areas and to enhance the abundance of berries.

Another traditional management technique that could be re-introduced to enhance berry productivity is landscape burning. As Stanley Sam explained, burning helps berries to grow better. The BC Forest Service actively suppressed traditional burning in BC since the 1930s and 1940s (Gottesfeld 1994). However, reserve lands are not subject to the policies of the BC Forest Service so today, traditional burning could take place in reserves. As a result of the banning of forest fires over many decades, experts in traditional burning practices may be difficult to find, and experimental techniques would need to be developed to learn how to create controlled, effective burns. Fire management strategies would have to be carefully considered and used cautiously. Since traditional burning is becoming increasingly recognized as an important element in shaping ecosystems and enhancing cultural resources, perhaps strategies could be developed collaboratively with the BC Forest Service to re-introduce landscape burning.

Although burning and logging may enhance some berry populations, these practices may have a detrimental effect on others. For example, based on percent cover and berry productivity of my field results, blueberry is more abundant and available in forests than in logged areas (see Chapter 5: Section 5.6.1). When Irene Thomas was discussing blueberries and huckleberries, she told us that there used to be lots of berries up at Bear River but "you can hardly get one, two when you go pick those wild berries now." In order to promote a diversity of berry foods, the entire ecosystem and the diversity it holds must be considered. By cutting small patches within the forest rather than large clearcuts, open canopy would be maintained for some species, while the surrounding areas

would be suitable for shade-tolerant species. As well, moisture would be maintained in the soil, which enhances juicier and tastier berries (Nancy Turner, personal communication).

Edible shoots

Shoot foods are another type of traditional food that could be more widely used today. These tasty fresh vegetables can provide an excellent supplement to the diet of both aboriginal and non-aboriginal people. For example, salmonberry and thimbleberry shoots contain calcium, protein, carbohydrates, vitamin C, niacin and riboflavin (Kuhnlein and Turner 1991). Cow-parsnip, which was not growing in the Atleo River watershed but may be abundant in other areas such as Keltsomaht, is also an excellent green vegetable when properly harvested and peeled. It is similar in nutrient qualities, taste and texture to marketed foods like celery (Kuhnlein and Turner 1986).

Salmonberry and thimbleberry wild greens are growing throughout the Atleo River watershed. We found salmonberry shoots to be growing in relative abundance in hemlock-amabilis forest, in clearcuts of over 10 and 15 years, on the Seektukis Reserve, and on both logged and unlogged river edges. Thimbleberry shoots were more limited in their distribution, being relatively abundant only in clearcuts of over 10 years.

One traditional management strategy used in the past for enhancing this resource was to simply pick them. Harvesting the shoots may increase the productivity and vigour of this food by acting as a form of pruning. As mentioned by other First Nations, these plants "needed to be picked" in order to enhance their growth (Norton 1981). As Trudy Frank described, people used to harvest these shoots by the armload in the spring. Perhaps armfuls of these vegetables could be gathered again today to provide fresh vegetables to local people, as well as to local small businesses.

Root vegetables

Roots are another important food source for Nuu-Chah-Nulth First Nations. The roots and rhizomes of Pacific silverweed and springbank clover are excellent sources of carbohydrates, which could substitute for potatoes and other root vegetables (Kuhnlein and Turner 1991). Steamed silverweed and clover roots are high in carbohydrates and also contain protein, magnesium, phosphorous, iron and vitamin A (Kuhnlein and Turner 1991). Although digging the roots of these plant species is relatively time consuming compared to harvesting other plant foods, within one hour, enough roots could be gathered to supplement the diet of a few people.

Root vegetables, including silverweed and clover, are found in the estuary areas of the Atleo River mouth and Bedingfield Bay. These habitats are relatively easy to access by boat, and are in flat open terrain. This habitat-type can be considered critical for root vegetable foods in the Atleo River watershed since this is the only habitat in which they were found during this study. It is possible that root vegetable populations were higher in the past, since the plants were carefully tended and cultivated (see Bouchard and Kennedy 1990).

Sustainable harvesting strategies used traditionally to harvest root vegetables that could be applied today include selective harvesting and replanting pieces of roots or rhizomes. As described in Chapter 4 (see Section 4.1.1), silverweed and clover plants were dug and the soil was tilled. Smaller roots were replanted to enhance the plant population for the following year and plots were cleared of other plants to promote larger populations of root vegetables. If such strategies were used today, the abundance and ease of harvesting of these plants could probably be enhanced. Thus, it is possible that the re-introduction of root vegetables into contemporary cuisine would not only increase the recognition of these culturally important resources, but would also promote the restoration of culturally modified estuarine habitats.

There are many factors to consider when widening the recognition of root vegetables and other food plants (Turner 1981). One of these is the potential toxicity of wild foods. In some cases, these plants are highly nutritious and beneficial in small quantities but can be toxic when consumed in high doses. Some species, such as bracken fern, are thought to be carcinogenic even in small quantities and caution must be taken. Conservation of traditional wild food plants, which is another major issue of concern regarding the wider recognition and use of these plants, will be discussed in Section 6.3.4 of this chapter.

6.2.2 Plant materials

As discussed in Chapter 4, there were few activities carried out by the Ahousaht First Nation which did not include the use of plants. Today, items such as cedar bark headbands and traditionally woven baskets remain an integral part of aboriginal culture. The spiritual and cultural worth of these plants is immense and immeasurable.

Plants with material purposes are also an important resource economically. Many people, especially women, supplement their income through selling and trading items which they have made. Lena Jumbo explained how she makes a variety of handicrafts:

> *I also cover Bic lighters when it's ordered, with the three-cornered grass* [Scirpus americanus]. *Sometimes I use the cedar bark, work with it and I got some beargrass [*Xerophyllum tenax*] which is from the States... I make little Maquinna hat earrings out of the beargrass, and also our own swampgrass* [Carex obnupta]. *It's real popular, they buy it for a friend, or birthday present, Christmas present, whatever they want it for... And I started making little basket earrings which weren't as popular. My baskets are various sizes, from two and a half, two inch... and I work on the little whiskey bottles too.*

Such an economy illustrates how forest use can be both ecologically sustainable, economically viable and culturally appropriate. As well, preparing and weaving with forest plants demonstrates the concept of value-added forest products, in which plant materials are worked with and sold as a final product, rather than as raw material. Not

surprisingly, this concept has been valued and promoted by First Nations for thousands of years.

Several plant species with material purposes are growing in the Alteo River watershed, and should be considered in management and restoration plans. *Ch'itapt* (basket sedge or "swampgrass") is growing abundantly on the edges of Barra Lake. This location could provide a rich source of materials for local basket makers if it was more accessible. A trail leading down to the lake on the north-west side provides relatively easy access, but further access could be provided by developing a trail on the southeast side of the lake, nearer to Bedingfield Bay.

Another material plant species that was found in the Atleo River watershed is cattail, occurring in the 1985/86 clearcut just north of Seektukis Reserve. Although there was only a small population of these plants, their growth may be enhanced with traditional management strategies such as selective harvesting, thinning and pruning. All of these activities are intertwined. Lena Jumbo explained that harvesting basket sedge ["grass"] allows room for new plants to grow and promotes a healthier crop for the following year. As Arlene Paul said:

> *Just like my Aunty Lena was talking about the grass. You have to pick them in order to have a better crop the following year. I think [other] plants are like that too.*

Cedar bark from red-cedar and yellow-cedar is another important plant valued for its material applications. Specific qualities of cedar bark are sought, and the best bark is found away from salt water, at higher elevations, and on tall, straight trees with few branches. In the Atleo River watershed, the only areas with trees suitable for bark collecting were the intact forests (primarily cedar-hemlock). However, these habitats are at relatively high elevations in the watershed and may be difficult for some people to reach. Although cedar trees were growing in logged areas, these were seedlings or

saplings that were generally too small, or had too many branches to be considered useful for bark collection.

In order to protect the remaining cedar bark trees in the Atleo River watershed, an area rich in history and cultural importance, consideration should be given to designating the remaining cedar-hemlock forest as a tribal park. As well, second growth cedar forests should be monitored with input from elders to determine whether any of the bark is suitable for harvesting. If trees remain dense with branches after they become an appropriate size, cedar bark sources will be drastically reduced with increased timber harvesting.

The sustainable techniques of harvesting cedar bark provide a model for future use and management of this and other species. Only the portion of the tree that was needed was taken and the rest of the plant remained standing and growing. In addition, only one or two strips from each tree were taken, so the method was a form of selective harvesting or "sparing".

One example to which sustainable harvesting could be applied is Sitka spruce. This wood is used for making guitars, a value-added venture that is currently being developed in Ucluelet. Since Sitka spruce grows primarily in riparian areas, and buffer zones are required so these areas are not available for logging (Scientific Panel 1995c), access to Sitka spruce is difficult. Although Sitka spruce wood does not split in the same way as cedar, perhaps strategies of taking only one plank from a tree could be explored for guitar manufacturing. The traditional teaching of only taking small quantities selectively could also be applied to the harvesting of floral greens and other commercially harvested species.

6.2.3 Floral greens

As well as traditionally valued plant species, species with contemporary value are gaining increasing importance to First Nations (Freed 1995; Ambrose 1996). Floral

greens are one such potential resource. Ahousaht First Nation's territory lies within the Coastal Western Hemlock zone (as well as the Mountain Hemlock and Alpine Tundra zones) which has been noted as being the most accessible and productive, and having the highest potential for floral greens production (Schlosser *et al.* 1992). This zone is the best forest type for salal as a floral green, and has also been considered an excellent place for sword fern quality and quantity and for the constancy of evergreen huckleberry (Schlosser *et al.* 1992).

According to published sources, seral stage (and thus large-scale logging activity) has a significant impact on floral plant quality (Schlosser *et al.* 1992). Floral greens are thought to be suitable only when they are of the dark green colour characteristic of plants grown in the shade (Schlosser *et al.* 1992). Schlosser *et al.* (1992) indicated that salal and evergreen huckleberry reach commercially harvestable levels only at mid-successional stages of forest growth. The highest quality of sword fern for floral greens is during the mid- to late-successional stages where there is greater overstory and shade. Thus, although these species are relatively abundant in logged areas in the Atleo River watershed and could be considered by some to be aesthetically pleasing, they are not acceptable for commercial use and harvest when they grow the light green colour characteristic of growth in clearcuts.

Since early-aged clearcuts are not deemed suitable for floral greens, there are relatively few areas in the Atleo River watershed for their collection (see Chapter 5: Table 5.13). Evergreen huckleberry is growing at the forested edge of Barra Lake, but this patch is relatively small and would likely not be suitable for commercial harvesting. Deer fern and salal are abundant in the cedar-hemlock forests. Salal is also abundant in the forested riparian areas, and possibly in older-aged clearcuts if they provide enough shade.

Since management for most floral greens requires at least partial shade, maintaining forest conditions at or near this optimal growing condition increases floral greens productivity (Schlosser and Blatner 1993). According to Schlosser and Blatner

(1993), the only floral species which are benefited by clearcuts and seed-tree management are a special variety of red huckleberry (which grows a red colour in the sunlight) and scotch broom (an introduced species that, for restoration purposes, should be eradicated). Shelterwood management is beneficial for salal, evergreen huckleberry and sword fern, but only in the first two harvests (up to 10 years). After the third and final cut, floral greens are no longer suitable since they become exposed to open canopy. In any form of logging activity, ground skidding can severely impact the herb layer and destroy potential floral greens (Schlosser and Blatner 1993).

Uneven-aged management has been considered an excellent way to promote floral greens (Schlosser and Blatner 1993). An initial reduction in floral greens may occur at a site directly following logging, but remaining shade and some forest gaps promote appropriate growth and appearance of these species. With timber harvesting entries at every 15 to 30 years in small patches, salal, evergreen huckleberry, sword fern and deer fern can be harvested.

Small harvesting blocks are consistent with Scientific Panel recommendations which suggest that clearcuts should be no larger than 0.3 ha on cutting units with significant values for resources other than timber (Scientific Panel 1995c:239). As well, the Scientific Panel promotes a variable-retention harvesting system, in which trees are left to maintain ecosystem integrity and to continue to provide shade (Scientific Panel 1995c:238). If these recommendations are adhered to, floral greens production may be less impacted by future timber harvesting systems.

As well as logging, another important factor to consider for the future management of floral greens is their abundance. There is little information regarding the minimum number of stems per m^2 or percent cover required for sustainable harvesting of floral greens (de Geus 1995). In other words, whether 10%, 30% or 50% cover of a species is abundant enough for sustainable long-term harvesting has yet to be determined. Further research and monitoring of harvesting sites will be required.

Another issue of concern for floral plants is the lack of information regarding sustainable harvesting rates. How much of the plant should be harvested to maintain high floral quality and genetic diversity has yet to be investigated (see Section 6.3.4). Although it has been noted that a harvester of floral greens rarely removes the majority of the plant and almost never removes enough of the plant to destroy it or reduce its vigour (Schlosser and Blatner 1993), other sources indicate that botanical plant populations are diminishing (e.g. Foster 1991; McNaughton 1995). Thus, whether the abundance of floral plants in the Atleo River watershed, specifically the cedar-hemlock forest habitat, makes them suitable for commercial collection remains uncertain and will depend, in part, on the philosophies which guide their collection.

6.2.4 Medicines: a special case

Another category of culturally important plants are those used for traditional medicines. The potential for using indigenous knowledge for developing and marketing medicines has become a fast growing industry (e.g. Joyce 1991; McCutcheon *et al.* 1992; Greaves 1994; Posey 1994; Brush and Stabinsky 1996; Dasgupta 1996). Many plants used by First Nations' produce compounds which are of interest to pharmaceutical companies. According to Forest Service employees and industry participants, there are at least 26 plant species that are harvested for medicinal and pharmaceutical purposes in British Columbia (de Geus 1995). If plants used by First Nations for personal purposes were included, this number would increase dramatically.

There appears to be diverse opinions as to the potential for research into and development of medicines based on traditional knowledge. Although we did not directly study traditional medicinal knowledge during this research project or conduct inventories on medicinal plants (see Section 2.1), we discussed the issues regarding research into this subject during our interviews. This section is a summary of these concerns, and a reflection of the potential future use of medicinal plants.

One of the concerns of First Nations' elders with whom we spoke regarded the documentation and publication of traditional medicinal knowledge and the potential harm these powerful medicines might cause. For example, Arlene Paul explained that people are concerned over the safety of others:

> *Because of the ingredients mixture, you never know if it's going to work or not work... it could be more dangerous than helpful... They're [Ahousaht First Nations] very cautious about it.*

Another issue of concern about documenting medicines is the private nature of the information. According to Ahousaht traditional practices, medicinal knowledge is sacred and privately owned. Sharing medicinal knowledge with others is often inappropriate.

> *It's not public knowledge because it's owned knowledge, owned by the families. Just like songs are owned by families... There are some that are commonly known... but there are some that are very strict secret family knowledge taught only within each family.* (Luke Atleo)

> *These things [medicines] were kept silent because it was a sacred thing... like if a person had something for cancer they weren't going to go broadcasting it around, I get it [medicine] from here. They never did that. That was a silent tradition. . .* (Arlene Paul)

> *I go get it [medicine] myself, or I send my sons out, one of my boys out or I go. Like my friend there, he was going out for medicine a couple of days ago, and I asked him "can I come along?" And I said, "No, it's okay." I made a mistake. And I knew the answer would be "no" after I said that. Because his family's got their medicine. We don't know. His might be the same as mine. But that's sacred. His is theirs and mine is here.* (Murray John)

Ahousaht elders indicated that this secrecy is more that an issue of confidentiality but also one of spirituality since the power of plants is recognized by First Nations. Rosie Swan told us that people taking traditional medicines need to believe in this spiritual power in order for the medicine to be fully effective. In addition, plants need to be

collected in an appropriate and respectful manner. According to Ahousaht traditions, when medicinal knowledge is shared with others publicly, the medicines can lose their power:

> *So he [my grandfather] ended up all right. People would ask him what he took for it [tuberculosis]... he never told them what he took because my grandfather's belief was that if you gave away medicine, never give them what it was made out of, because it would lose its power.* (Trudy Frank)

> *They never spoke of it. They'd call it* ***nuumak****, because it loses its potency for healing, and the other person they're treating has to believe in it.* (Arlene Paul)

Another issue surrounding the sharing of medicinal plant information is a concern that the information might be exploited and used for personal gain by outsiders, such as pharmaceutical companies, leaving the Ahousaht people with little or no benefits.

> *I know of people that have been healed of cancer by our own achievements. And I've heard of non-aboriginal wanting to find out so that they can exploit it.* (Clifford Atleo)

> *Because of our family teaching, it stays in our family... there has been some medicines that have been leaked out by you younger generation that have never been taught properly. Our medicine stays in the family.* (Murray John)

Indeed, fears over the exploitation of indigenous knowledge are a concern shared globally. For example, the drug derived from the Madagascar or rosy periwinkle (*Catharanthus roseus*) which is used to treat childhood leukemia has generated a multi-million dollar drug industry in the US. By 1985, sales were estimated to have reached approximately $100 million, 88% of this amount being profit (Cunningham 1993). Yet none of the profits have been returned to the people of Madagascar where the plant originates; nor has any acknowledgment been awarded to show appreciation for the contribution that the people of Madagascar have made to medical advances (Lewis 1991).

The issues surrounding documenting plant knowledge are complex. Concerns regarding spirituality, confidentiality, exploitation and risks to both the plants and the people using them are strong. However, excluding medicinal knowledge from research in ethnobotany also raises concerns. For example, traditional medicines are powerful and effective and could be a valuable addition to local health care. Many people in the Ahousaht community spoke of the healing power of local plants. Luke Atleo said:

> *I had tuberculosis. At least, I was told I had tuberculosis... It was my grandparents who treated me... and give me that medicinal drink and it cured me better than any prescription medicine could ever do. I know we have very powerful medicines here that the medical profession knows nothing about.*

If these medicines are used wisely and with care, they could provide a source of sustainable, affordable, and culturally appropriate health care to benefit local communities. The careful harvesting of these plants and development of medicines could also provide a sustainable local economy. As well, medicinal plant knowledge is beneficial not only to indigenous peoples, but to humanity as a whole. Within traditional knowledge may be a cure for cancer or AIDS which could potentially save thousands of lives. Already, a potential cure for malaria has been recognized as being used among the Onges of India (Dasgupta 1996).

Another issue supporting the documentation of traditional medicinal knowledge is that of the endangered status of some indigenous knowledge. As elders pass away, much knowledge passes with them. As Arlene Paul said:

> *I used to [feel the information should be kept secret] a long time back when there was a lot left, but those people that knew about all of this stuff now are gone. And thirty years from there to here I still don't know what it was, what they used. And it's gone now. At that time I used to think it was really important everything was kept the way they always wanted it to be. But it's different now...*

Another issue regarding medicinal plants is their decline in abundance. Many elders shared concerns over the disappearance of plants they used to gather, and said they have difficulty finding these species now. Murray John told us that he goes to areas where they are not logging to find his medicines. Arlene Paul said that plants they need are found in forests. She suggests that the trees protect the smaller plants, and when they are logged, the plants disappear. It is a difficult dilemma. If sites are not recorded as having spiritual or medicinal significance, they may not be protected in logging plans.[2] However, sharing information about sacred sites or medicinal plants may not be appropriate and the loss of these sacred plants is devastating to many of the people in Ahousaht.

Perhaps a strategy for documenting medicinal knowledge would be for the Ahousaht people themselves to initiate, direct, and control such a project and to ensure that the information is not misused. As Murray John told us:

> *I think most of us know all our medicine yet. It's so easy now, you know, if they can't remember they go out there with a video camera. "This is the medicine" ... But maybe one day we'll share. We don't know. We'll decide how the governments are going to treat us. If they treat us well, maybe we'll share our medicine.*

The important contribution that indigenous knowledge can make towards health cannot be ignored. However, as the Mataatua Tribes of New Zealand have stated, although the knowledge of indigenous peoples is of benefit to all humanity, the first beneficiaries of indigenous knowledge must be the direct indigenous descendants of holders of such knowledge (Posey 1994).

6.3 Issues pertaining to culturally significant plants

Among the concerns raised regarding medicinal plants were common issues that have relevance to other culturally important plant species. Some of the issues identified by

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[2] In some areas, aboriginal liaison officers are hired by forestry companies to survey sites for medicinal plants. They work privately, and their medicines remain confidential.

elders during interviews included the accessibility of sites, concerns about over harvesting, lack of understanding by non-aboriginal people about the importance of plant-human interactions, changes in quality of plants, and single-species approaches to forest practices. It is important to recognize these issues when making decisions on the future management and use of culturally important plant species. This section is an overview of the concerns shared with us by elders and some potential strategies which can be used to address them.

6.3.1 "*It's like pruning it*"[3]: Anthropogenic plant communities

One of the concerns that was raised by people in Ahousaht was that forest managers and others do not understand the importance of traditional plant use and management in keeping plants healthy. As part of the long history of sustainable use of plant resources, temperate rainforests in Nuu-Chah-Nulth traditional territory have been shaped by interactions with people. These activities helped to create anthropogenic plant communities in which the forest was not in a "wild" state, but was carefully and selectively used and looked after by people. Thus, if the goal of forest management and restoration is to promote the growth of forests in their "natural" state, then understanding and including the role of humans along the continuum of disturbance patterns is important.

As described in Chapter 4, many methods have been used by First Nations which shaped the forest (Turner and Peacock 1997). One interaction of aboriginal peoples with their local ecosystems was pruning of basket sedge, shoots and berry bushes. Pruning promoted growth of the plants and helped to enhance resources for following years. Digging and tilling were also used to influence plant populations, primarily for root vegetable production, such as with Pacific silverweed and springbank clover, and may have dramatically influenced estuarine habitats. Landscape burning, although not used widely, was another form of forest management. Burning appears to have been used primarily to enhance berry resources and to create deer forage and may have caused

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[3] Lena Jumbo, Ahousaht elder.

extreme changes in small areas throughout Clayoquot Sound. Transplanting was another activity which directly affected and changed plant communities, since moving plant species from one habitat to another has had lasting effects on the distribution of certain plant species, such as bog cranberry and cattail.

Selective harvesting was another method which, over many generations may have dramatically influenced temperate rainforest communities. People did not forage randomly for plants. Rather, criteria were used to select plants which were best suited for the needs of the person. For example, only the bark of certain western red-cedar trees was peeled, depending on the size and structure of the tree, its distance from salt water, and its elevation. If the harvesting of plant materials affects the survival or reproduction of the individual plants, this non-random selection may have influenced the shaping of rainforest ecosystems by influencing forces of "natural" selection.

All of these plant management activities are forms of "gardening". As Archie Frank stated, nature "was the *garden* that we depended on". Just as with any other organism living in the ecosystem, human beings played a role in the web of life and had interactions with the forest that helped shape "natural" ecosystems. In the past, these activities likely enhanced culturally significant plant populations, creating more abundant resources and productive plant communities.

Despite the importance of these interactions, both to the plants and the people that harvest them, there was a feeling among some elders interviewed that there is a lack of recognition of the importance of these traditional activities, and access to some plant resources is limited. Inaccessibility has been attributed to the designation of parks and to legal policies prohibiting plant harvesting (see Chapter Four; Section 4.4). Concerns of access were raised with specific reference to cedar bark and basket sedge, but the principle of imposed harvesting regulations applies to all traditionally harvested plant resources.

The traditional world view that includes human beings as a part of the environment and believes that humans can have healthy interactions with the ecosystem is not always

Figure 6.1: Three culturally important plant species found growing along the edge of Barra Lake. These species include basket sedge, bunchberry and false hellebore.

Figure 6.2: Paul Frank Jr. and Daphne Frank on a stump in the Atleo River watershed. The circumference of this stump is 14.3 m.

recognized today (e.g. Eilers 1985). These concepts are not always promoted with the "western" philosophy of park creation in which humans are removed from nature in order to protect it, and any harvesting of plants and animals is forbidden. The interference of parks on traditional lifeways has been documented for Pacific Rim National Park Reserve (Berg 1990). As well, the resentment about the removal of traditional activities from parks was voiced by Nuu-Chah-Nulth First Nations during the Clayoquot Sound Sustainable Development Steering Committee (Archeo Tech 1991). During this process, Nuu-Chah-Nulth First Nations rejected the option of wilderness reserves because this option further alienated the resources from native access and use. Instead, First Nations accepted restructuring of the resource management process and co-management of resources as methods of working towards sustainable development in Clayoquot Sound. Their choices illustrate the concept of valuing human interactions with the forest.

Clifford Atleo also explained that First Nations believe strongly in sustainable forest use, and he feels that these goals can be achieved in partnership with using the forest:

> *And in our view, there's no reason why we can't retain old growth forever. How do you do that? Well, you keep monitoring the growth rate and you never cut more than what you have. But what you have to do is sacrifice over a period of time and reduce that cut rate so that you can keep building on the growth to what you had. Why not think about what we had 150 years ago? And still benefit... there are examples all over the place about just harvesting what grows. And that's just simple common sense... why doesn't the government who manages resources think about that and they would never have to worry about protecting areas, they would never have to have parks. Why do you want parks anyways? It's to protect them from us... Protected from people.*

Since First Nations recognize the importance of ecosystem health and integrity as an integral part of their interactions with the land (e.g. Scientific Panel 1995a), it is possible that aboriginal use and traditional management can be encouraged while still maintaining conservation goals in both protected and unprotected areas. For example, *ch'itapt* (basket sedge) harvesting areas could be designated by parks, and monitored

closely. These sites would not only increase access to these plants for local basket weavers, but could also be used as research sites to gather information on the effects of harvesting on basket sedge populations. Differing indigenous values and perspectives of forest use and management could then be considered and integrated into park policy (Dasmann 1976).

Traditional plant harvesting and management activities should be recognized as part of the processes which have created and formed the temperate rainforests of Clayoquot Sound. Promoting these activities by increasing access to these resources for Nuu-Chah-Nulth people and educating foresters of their importance to the ecosystem, could prove to be beneficial to both the plants and the people who harvest them.

6.3.2 *"Finding where to pick is not so easy"*[4]: Accessibility

Although the creation of parks have made some areas inaccessible to First Nations' people for gathering plants, perhaps a greater contribution to the difficulty of finding plant materials, foods and medicines has been made through intensive logging activities. As many people explained, the more areas that are logged, the more difficulties people have in finding plants that they need. According to some elders, clearcuts cause the reduction in culturally significant plants. Even if plants are present, logged areas may not be suitable for harvesting because of spiritual or other reasons.

Logging may also cause further inaccessibility of sites. Although forestry practices create roads which theoretically make traveling quicker and easier, often these roads are no longer practical for car use (because cars must be brought in by barge or due to road deconstruction). By foot, logged areas are more difficult to access than forested areas as they tend to require more climbing, balance, and penetration of dense understory, and are

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[4] Trudy Frank, Ahousaht elder.

more subject to extreme temperatures (see Chapter 5; Table 5.1). These conditions may render logged areas inaccessible to those people who have limited physical endurance.

Plant harvesting in the Atleo River watershed could be encouraged by making sites more accessible. Trails that exist through clearcuts and forests, such as those in the Seektukis Reserve or down to the river from the main bridge, increase access to those habitats dramatically. For other areas to which access is desired, trails could be established. Trails could be built to highly visited areas, or to areas with significant plant populations of desired species. For example, an easier trail into Barra Lake would provdie greater access to Pacific crabapple and basket sedge. A trail throug the 1985/86 clearcut just north of the Atleo River mouth would make a variety of basket-making material plants more convenient to access. However, these trails would require maintenance in order for them to continue to provide easy access. Ultimately, the Ahousaht First Nations should determine priorities for these management activities.

Transplanting of plant species, a traditional management practice, is another method of increasing access to plant resources. For example, *ch'itapt* (basket sedge) which is currently used by basket-makers such as Lena Jumbo and Trudy Frank, could be propagated in riparian areas near Ahousaht such as the small ditch near Jack Dale's property. Issues regarding the lack of access to these resources would be addressed, and the area could also be used as an educational site to explain and demonstrate traditional harvesting techniques and sustainable management. Landscaping of gardens with native plants is another method of applying traditional transplanting techniques and increasing access to sites. Of the approximately 44 native plant species that are used for landscaping in BC (de Geus 1995), many are growing in the Atleo River watershed. They include: bog laurel, bunchberry, devil's club, red elderberry, Scotch broom (introduced), cattail, deer fern, licorice fern, maidenhair fern, red columbine, sword fern and yarrow. Depending on the biology of the species and their availability in the wild, plants could be

collected from local areas (either through transplanting or collecting seed) or grown in local nurseries.

Planting native species in gardens in Ahousaht would have a multitude of benefits. Transplanted plant populations would enhance local populations of culturally significant plants, including local gene pools. As well, gardens would provide attractive landscaping which could potentially benefit the eco-tourism industry (especially since the "Wild Side Trail" has been built near the village). In addition, native plants can create habitat, reduce water requirements for gardens, and have greater resistance to insects (Pettinger 1996). Another benefit would be that these gardens, especially if they included interpretive signs, could increase the recognition of important plant species. In addition, through making foods and materials more accessible in Ahousaht, the younger generations may be more likely to learn to harvest and prepare these species. Local gardens could be developed and tended through school classes, for courses such as biology or cultural education. Such gardens have been developed by the Nuxalk Food and Nutrition Program in Bella Coola and the Secwepemc Cultural Education Society in Kamloops. They have provided many benefits to these communities.

Although there are many benefits to transplanting native plants to new areas, this technique must be done with caution. Since plants are adapted to the microhabitats within which they live, altering the gene pool by introducing plants from other areas may have deleterious effects. Gene pools of plants may vary between sites and mixing or altering these gene pools may result in the loss of less dominant or less frequent genes. As well, care should be taken when gathering plants from their habitats to ensure that the "stock" population is not over-harvested.

6.3.3 *"It's poison when it's on dry land, same kind of a plant"*[5]: Special sites

As well as recognition of traditional plant management and accessibility to sites, another important issue that arose during interviews with elders that affects the future use and management of plants is the change in quality of plants. Certain areas have plants with higher quality fiber, better taste, or stronger medicinal powers. Thus, the presence of a species in an area does not necessarily indicate the opportunity for harvesting.

The change in quality of plants was expressed specifically with regards to logged areas (see Chapter 4: Section 4.4). Many elders do not collect plants in clearcuts, even though plant species may be growing there. It is possible that different growth factors, such as canopy closure and soil nutrients, affect the chemical properties of the plants. It is also possible that the plants are no longer appropriate for use because of spiritual reasons.

Differences in plant quality in various areas should be an important consideration when interpreting field data. For example, although shoot foods were more abundant in clearcut areas in terms of percent cover of salmonberry and thimbleberry species, they may not have been as tender in these habitats and the edible stage of the shoots may have been shortened by the open canopy exposure (Turner *et al.* 1983). Although the field surveys ideally indicate the abundance, distribution and frequency of plants, the quality of the plants was not included in the analysis and may strongly influence the assessment of the species.

Another activity which affects the quality of culturally significant plants is the application of pesticides. Pesticides can render food plants, such as berries and leafy greens, inedible. As well, pesticides can affect plant species with material applications, since weavers often use their mouths during weaving and processing of grasses and other materials. Although pesticides are currently not being used in the Atleo River watershed or in any other areas within Clayoquot Sound by MacMillan Bloedel (Bill Perry, personal

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[5] Stanley Sam, Ahousaht elder.

communication), pesticide applications should be considered an issue of concern in other areas. As well, in terms of culturally significant plants and their protection, the banning of herbicides should continue.

Since the quality of plants differs between sites, a potential consideration for future management is to consider good plant harvesting areas (past, present and future) as culturally significant sites. Areas that are noted by elders as having tasty or otherwise high quality plants should be recognized and managed accordingly. These areas have valuable resources with high cultural significance.

Some traditional plant harvesting sites are protected and fall under aboriginal rights. For example, culturally modified trees are under protection through the Interim Measures Extension Agreement, which states (Statement 27) that "...Culturally Modified Trees in Clayoquot Sound, whether live or dead, be protected...". As well, areas that have the potential to be used as places for harvesting medicines are identified by aboriginal liaison officers of forestry companies before the area is harvested.

Culturally important sites used by First Nations also included areas for harvesting berries, root vegetables, wild greens, and basket materials. These types of areas are considered traditional use sites by the Ministry of Forests if they have been documented. Some of these areas have been listed in *Clayoquot Sound Indian Land Use* (Bouchard and Kennedy 1990). However, sites that are not listed as having traditional use, including sites with high densities of culturally significant plants, are not protected.

Since many people have not been actively using plant resources over the last century for a number of reasons, it is possible that important plant harvesting areas have been overlooked or left unrecorded. Sites which are not documented as having traditional use in the past, but which have high densities of culturally important plants and may be significant in the future, could be considered for special management. For example, estuaries could be recognized as critical areas for harvesting wild root vegetables.

Riparian areas, such as lake sides, should be surveyed for presence of basket sedge and other grasses.

One way to assess these sites is to include plant species identified by the Ahousaht First Nations as having cultural significance in vegetation surveys. For example, if there was interest in basket sedge, berry species, and cattail, then standard vegetation inventories could include the percent cover of these plants. In this way, the diversity of values of these areas can be appreciated and future use sites or areas with special consideration could be determined. Ultimately, First Nations themselves must designate culturally significant sites and determine appropriate management strategies.

6.3.4 "*Just take what you need*"[6]: Sustainable harvesting

> *Because we have the means to destroy, we have the means to alter ecosystems, we have the means to just focus on making money. And that's the thing that we're wanting to change. We're saying "whoa, if we want these resources forever, we've got to start taking care of them better than we have been".*
>
> Clifford Atleo

With increased value placed on culturally important plants, and movements toward wider recognition of these species, conservation becomes an increased concern. In order to achieve sustainable resource use, the primary focus for management decisions must consider ecological integrity for future generations. An overwhelming concern of elders with whom we spoke was a commitment to their grandchildren and future generations. The fundamental philosophy guiding future plant use and management must be long-term ecosystem health (rather than short-term financial gain).

The practices and strategies that First Nations have developed over many generations promoted harvesting resources in a careful and respectful manner. Worldviews and teachings were developed to promote respectful ways of interacting with

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[6] Rosie Swan, Ahousaht elder.

the environment. When plants are harvested for commercial purposes, these traditional teachings and values may not be understood or respected, and as a result, plant resources may become depleted, even to the point of putting the status of the species at risk. Other subjects of concern include conservation issues (ecosystem degradation, loss of diversity, increased human activity in forest ecosystems, inappropriate harvesting techniques), and conflict among people using the forest (de Geus 1995).

Currently, in British Columbia, there are no regulations regarding the harvesting of botanical forest products (de Geus 1995). The *Forest Practices Code of British Columbia Act* (BC Forests 1997), Section 104 (which applies to Crown land) states:

> *Unless a person holds a valid botanical forest product buyer's license, the person must not, as part of a commercial enterprise, buy a botanical forest product from a person, or otherwise engage in trade concerning a botanical forest product with a person who harvested the botanical forest product if it was a) harvested from Crown land in a provincial forest or Crown range and b) is designated in a regulation for the purpose of this section.*

There is currently no regulation to enforce this legislation (Sara Brown, personal communication, 1998). Further, the draft version of the regulation as it is written now would only affect license buyers, not pickers. As well, the regulation would only pertain to mushrooms so floral greens, berries and all other botanical forest products would not be regulated under the Forest Practices Code.

Lack of appropriate training and enforcement of pickers may result in the over-exploitation of species with commercial interest. The concerns over conservation and over-exploitation of non-timber plants were recognized by Clifford Atleo when he was discussing his interest in the potential for botanical forest products:

> *We have taken a serious look at alternatives, other than forest [timber] uses... we're going to take a look at the opportunities that exist for... products other than forest like salal and fern... But we want to do it, we want to look at that the same way we look at forest you know. Like you don't just go and exploit, exploit, exploit without mind of the impact that it has on what you're doing. We have to manage that the same way.*

The concerns of Clifford Atleo and others about over-harvesting may be realized if western world views and philosophies that have guided timber harvesting in the past are used to exploit botanical forest products — by viewing them as an everlasting renewable resource, by not recognizing the role of these plants in maintaining a functioning ecosystem, by creating artificial selection, by reducing populations of these species, and by being driven by the worldview that resources are there for the primary use of the current generation of humans. As said by David A. Taylor (1997:7), a researcher who has examined several cases of harvesting botanical forest products throughout the world:

> *For millennia before timber became an international commodity, forests provided people with food, medicine, fibers, and cash through trade in these items. But history shows that international demand for nearly any forest product is more likely to promote forest destruction than conservation - even if the product can be harvested without cutting trees.*

The issue of over-harvesting has been illustrated with two commercial medicines derived from plant species native to British Columbia: western yew (*Taxus brevifolia*) and cascara (*Rhamnus persiana*) (de Geus 1995). Cascara bark was prescribed as a useful laxative by doctors since about 1877 (de Geus 1995). By the early part of the 20th century, the cascara bark resource of the Pacific Northwest was declining. This trend finally changed in the 1960s when alternative drugs were developed and the pressure to harvest this species in the wild was released.

Another example of over-harvesting botanical products comes from the more recent interest in western yew. The bark of this tree contains taxol, a chemical used to treat cancer, notably ovarian and breast cancers. Since 1991, the bark from approximately 36 000 trees (330 000 kg of dry bark) has been required by the U.S. National Cancer Institute to treat more than 21 000 cases of ovarian cancer each year (de Geus 1995). In British Columbia, the amount of western yew bark harvested almost tripled between 1991 and 1993 (de Geus 1995). This large amount of harvesting raised concerns about the ecological impact of gathering this plant.

For both cascara and western yew, the bark of the species is desired. As living culturally modified trees indicate, it is possible to harvest bark without killing the tree if only a small amount is removed from the stem and the tree is not girdled. As Arlene Paul explained when describing cedar bark collection, people only take "one strap from the tree". If traditional harvesting practices such as this sustainable technique, were used today, the threat to western yew and cascara would have been diminished dramatically. This example illustrates the application of traditional practices in contemporary management.

There has been little research on sustainable harvesting quantities of most plant species that are gathered commercially. To my knowledge, only one study has been conducted on harvesting rates for floral greens. This research was conducted between 1938 and 1943 through the Cascade Head Experimental Forest in Oregon (Isaac 1945). Records were kept of the number and length of fronds of sword fern plants picked at levels of 25%, 50%, 75% and 100% five times during the year (February, July, September, October, December). The results indicate that an annual pick of more than 25% of fronds will result in a gradual decline of the number of fronds and height of the sword fern and that even a pick of 25% is harmful if harvesting is done in the fall or early winter.

Harvesters of botanical forest products themselves have noticed a decline in the abundance of plants in some cases. For example, concerns have been raised about the over-harvesting of salal as a floral green (McNaughton 1995). As well, concerns have been raised over the harvesting of wild medicinal plants in the United States, such as Pink Lady's Slipper Orchid (*Cypripedium acaule*), American ginseng, snake root (*Rauwolfia serpentina*), Himalayan mayapple (*Podophyllum hexandrum*), goldenseal *(Hydrastis canadensis*), *Echinacea spp.,* and *Trillium* species (Foster 1991).

Harvesting strategies are dependent upon each type of plant, and sustainable harvesting techniques must be explored on a species by species basis (Foster 1991). When harvesting involves taking the entire plant by digging up its roots and removing it,

harvesting is less likely to be sustainable than when only a portion of a plant (e.g. leaves, berries) is taken. Other factors to consider are the abundance and distribution of plants, reproductive strategy and capacity, rarity, resilience, habitat destruction, and economic incentives.

As recognized by the Scientific Panel (1995c), our understanding of the ecosystem and its complex connections and functions is limited. All harvesting and management strategies, including those designed for culturally significant plants, must recognize the precautionary principle. This concept promotes careful harvesting which underestimates sustainable harvesting levels and allows room for error. In other words, if culturally significant plants are to be harvested on a level larger than for personal use, initial harvesting rates should be low, and could be gradually increased over time if the impacts on the plant species itself and its ecosystem are carefully monitored.

If interest is shown in harvesting botanical forest products in the Atleo River watershed or surrounding areas, strategies for maintaining control and management of these activities need to be developed. In Washington, for example, training courses and workshops were provided to potential harvesters which covered plant growth and harvesting activities, thinning and pruning, plant identification, and resource inventories (Freed 1996).[7] The Quinault First Nations community in Washington started its own buying station supported by these trained harvesters. Similar strategies could be used by the Nuu-Chah-Nulth First Nations. In addition, certification of botanical forest products could be established (Freed 1996). Permits could be issued after successful completion of training courses, and First Nations and the Crown could authorize harvesting to only those people with permits.

Another strategy to address issues of over-harvesting is plant propagation. If species of plants are identified as being of high value (whether that be economic, cultural,

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[7] For more information about workshops, contact James Freed at the Washington State University. 11480 Highway 101, Shelton, WA 98584.

or other), they could be propagated and grown in nurseries. For example, the Sooke Harbour House, a restaurant which includes the use of native foods in their menu, grows their own plants in a garden near the restaurant. Propagation could include plants used for foods, such as root vegetables or wild greens, and plants used for material purposes such as cattail and basket sedge. Such strategies could be combined with the promotion of native plant species for landscaping (see Section 6.3.2). For example, plants used in native gardens in Ahousaht (e.g. people's houses, school yard, behind the Band Council office, Jack Dale's property) could include species which are harvested sustainably so they would not only provide an aesthetically pleasing and low-maintenance garden, but would also provide foods to supplement the diet and materials for making local arts.

6.3.5 "*Our approach is to exclude nothing*"[8]: *Hishuk ish ts'awalk*

> *Our approach is to exclude nothing in terms of consideration because that has been done far too often. Forests have always been looked at as trees to cut down and sell and as long as we have that... You see all these little signs on the highway that says "last cut in 1954, next cut..." sixty years down the road. And that's a farm. And we never had farms. We want our forests back. And we're going to get them back.*
>
> Clifford Atleo

Although this thesis revolves around culturally significant plants, these plant species are intricately entwined in a complex, little understood ecosystem. Fungi (including myccorhizal associations), bacteria and other micro-organisms, insects and other little recognized species may rely on these plants for food or habitat requirements. Larger animals may incorporate these plants into their diet, nests, or shelter. Many of these plant species may be necessary for soil stabilization.

Little is known about the autoecology and biology of these species. Thus, maintaining healthy ecosystems and abiding by Scientific Panel recommendations to do so,

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[8] Clifford Atleo, Ahousaht elder.

is a fundamental part of managing for one specific species. The concept of *hishuk ish ts'awalk*, (a recognition of the interconnectedness of all parts of the ecosystem) is essential for careful use of culturally significant plants.

In accordance with the Scientific Panel recommendations, forests should be managed in such a way that habitats are created for a variety of culturally significant plants. For example, gaps could be created through clustered-thinning of seedlings and through planting seedlings in clusters in recently logged areas. Over time, a mosaic of areas with various canopy closure could be created throughout the landscape. Gaps and other areas with open canopy would provide a suitable habitat for shoots and some berry species. Surrounding forested areas with greater shade would enhance populations of cedar for bark, shade-tolerant berries such as evergreen huckleberry, and floral greens. In this way, the availability and abundance of culturally significant plants in the Atleo River watershed could be maintained and, for some species, enhanced.

6.3.6 "*It's passed on by voice*"[9]: Communication and exchange of knowledge

Another factor to consider in the future management of plant resources is the incorporation of various elements of traditional ecological knowledge into forest practices, not just the practices and strategies for sustainable living. Traditional forms of communication and exchange of knowledge are important to recognize and include in education, training and forestry management. These include traditional ways in which knowledge was transferred between individuals and through generations (see Chapter 4: Section 4.2).

Written reports and computer-based information systems may not be as useful to First Nations as oral communications, both in receiving and in providing information. Encouraging researchers to provide a slide show on their studies in addition to providing

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[9] Murray John, Ahousaht elder.

written reports and computer-based data, may encourage more involvement of Nuu-Chah-Nulth people. In addition, providing elders and other knowledgeable people with an opportunity to share their knowledge (such as histories and observations of the study area), to those people involved in forestry, encourages mutual, two-way learning.

Experiential learning through direct experiences with the environment is another part of including traditional communication in contemporary resource management. By closely observing changes in the environment, traditional knowledge can be promoted and developed. For example, as the new planning process is being developed in Clayoquot Sound, people who are planning resource use and restoration for watersheds may have never visited these sites nor spent extended periods of time within these watersheds. Encouraging people to travel through these areas regularly over many seasons and many years can allow for monitoring of the areas, inventory of plants and animals, and assessment of seasonal cycles in populations. Such knowledge can then be included in forestry planning and monitoring.

One possibility to incorporate traditional approaches to information collection and use is to have watershed stewards. For example, two people (one aboriginal and one non-aboriginal) could be appointed to each watershed. They would have the responsibility of walking through the area, perhaps on permanent transect lines, at regular times throughout the year. Observing signs such as animal tracks and droppings, bird calls, animal behaviour, fruiting and flowering times of plant species, changes in populations, landslides, soil erosion, and water quality, would provide training in traditional observation techniques. As well, it would provide information required for adequate management of the areas. Stewards could also coordinate scientific surveys, such as bat, bird, or bear inventories within their watersheds. This approach would encourage the acquisition and transfer of knowledge in both traditional and scientific forms, allow for oral and experiential communication of knowledge, and provide training in traditional monitoring and management skills.

Figure 6.3: Rosie Swan teaching us and local children from Ahousaht about some local plants at the Keltsomaht rediscovery Camp.

Figure 6.4: This project provided opportunities for sharing knowledge and experiences. Robin Smith and I learning how to prepare salmon for smoking. (Photo taken by Marlene Atleo).

Aboriginal watershed stewards could educate foresters and others about the cultural significance of plant species that are often over-looked. For example, educating others about the potential for the incorporation of traditional foods into contemporary diets and into modern restaurant cuisine, the making and selling of handicrafts using native "grasses" and cedar bark, and selling jams and jellies in local shops are some of the ways that these plant species can be better appreciated and valued. These activities promote the concept of diversification of forest use and the appreciation of First Nations' perspectives and values.

6.3.7 "*That was their territory to look after, the Atleo family*"[10]: *Ha hoolthe*

Watershed stewardship is also consistent with the traditional management practice of *ha hoolthe*, in which areas were monitored and looked after under the authority of hereditary chiefs. As the Scientific Panel noted, *ha hoolthe* stewardship is an important concept in traditional resource management. Traditionally designated boundary areas provide resource management units that encompass watersheds and natural ecosystem boundaries.

Watershed stewards, or other forms of planning committees, could communicate closely with hereditary chiefs within whose traditional territory they have responsibility. This inclusion would allow the opportunity for hereditary chiefs to provide guidance and remain informed. It would also work towards providing appropriate respect to the authority of hereditary chiefs over their *ha hoolthe*.

Having people responsible for only one watershed, whether through existing planning committees or the development of watershed stewards, could promote diversification of forest use. The multiple resources within the area could provide foods and materials for personal or local use. As well, floral plants and other commercially

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[10] Murray John, Ahousaht elder.

harvested species could be inventoried and closely monitored. In the case of floral plants, people are more likely to tend their resources carefully when they will be returning to the area the following year (Schlosser and Blatner 1993).

6.3.8 *"If you don't respect nature it will never respect you"*[11]: Traditional worldviews and philosophies

> *... they want to take everything without giving it a chance to recycle, it's in a way real dangerous if you don't respect nature it will never respect you..... what there was there for my grandfather's all destroyed. Very little left of what he treasured, what he owned, and what he shared with his people because he was a part of nature, he became as part of the cycle, the circle. You had to, otherwise you'd never survive.... my grandfather used to say you can't have greed and expect to have respect, it doesn't go together, greed and respect, but love and respect are married. If you love nature, it will provide because you respect. Very important.*
>
> Archie Frank

As well as the concepts of traditional forms of communication and management systems, a fundamental component of traditional ecological knowledge is traditional worldviews and philosophies. These worldviews are often not included in contemporary forest management. For example, differences in worldviews between traditional and western resource use can be illustrated by examining the values of red alder (*Alnus rubra*). This tree is considered a "pest" to forestry companies and is actively killed through girdling (stripping bark around the circumference of the tree). Bill Perry, a forester from MacMillan Bloedel who has worked in the Atleo River watershed, described current forestry management practices:

> *After it [a cutblock] is planted the most common ones [management strategies] are brushing and weeding and spacing. Brushing and weeding is pretty well limited to girdling alder trees. We account for biodiversity by leaving smaller trees, ones that are missed and ones that are left because they're along creeks. We don't have concern with alder suppressing crop trees if under 10% of the stand is affected.*

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[11] Archie Frank, Ahousaht elder.

In contrast to this industry perspective, First Nations highly value the alder tree. Trudy Frank explained the presence of alder indicates clean drinking water:

> *They used to tell us certain kind of places, if there's no alder trees, don't drink the water... If there's alders around where the water is then it's good to drink.*

She also said that alder is valued as an excellent fuel wood for smoke houses:

> *They took the time to look after their fish. They were so particular about what kind of wood to burn [in smokehouses], it was always the alder they'd use.*

Reconciling these world views is a challenging goal. Learning to treat the forest with the respect, care, and stewardship that has been traditionally promoted by First Nations will require a major shift in the way forests are viewed. Valuing culturally significant plants that do not have economic value will be as important as valuing those that do.

Future importance of these plant species may be immense, even if we do not recognize their value today. For example, for most of the history of industrial forestry, snags and other dead trees were viewed as dangerous "wasted wood". Aboriginal peoples recognized these trees as providing habitat for wildlife. For example, George Clutesi, a Tse-Shaht writer, described *Ko-ishin-mit* (the Son of Raven) sitting on a "dead limb of a half-dead tree" (Clutesi 1967:50). Today, snags are recognized and valued as wildlife trees by the forest service and measures are taken to protect and even create these important wildlife habitats (British Columbia 1993c). This shift in world view provides hope that further education and increased respect can create a new form of forestry in which aboriginal perspectives are recognized, included and respected and a diversity of plants are considered to be valuable, rather than a few commercial timber species.

One way to work towards ensuring that aboriginal world views and philosophies are being respected is to develop culturally appropriate principles to evaluate forest practices. For example, in describing the "principles and protocol of using aboriginal

forest-based ecological knowledge" in the National Aboriginal Forestry Association (NAFA 1996:9), six principles were outlined:

1. *The Earth is our Mother*
2. *Co-operation is the only way to survive.*
3. *Knowledge is powerful only if shared.*
4. *The spiritual world is not distant from the Earth.*
5. *Responsibility is the best practice.*
6. *Everything is connected to everything.*

Whether or not aboriginal people should participate in a given forestry practice is evaluated through these themes and according to the amount of respect, equity and empowerment of First Nations included in the negotiation.

These principles are remarkably similar to the world views and philosophies shared by elders and those presented by the Scientific Panel (1995a). Perhaps Nuu-Chah-Nulth First Nations could develop criteria that are consistent with their traditional beliefs, and that they can use to evaluate forest practices. However, they will ultimately be the appropriate people to decide how their knowledge should be applied.

6.4 Summary

Every person and peoples ascribes different values to local native plant species. To some, they are an integral part of culture, both spiritually and historically. To others, they represent a basis for economic growth and employment. Yet all people share at least one value: we are all dependent on our local plant species. As foods, these plants may be used to supplement modern diets, add a unique touch to fine cuisine, or to generate economic opportunities. As materials, these plants provide the basis for cultural expressions, important weaving supplies, and value-added products. As floral greens, these species represent a promising future of living sustainably, both ecologically and economically, with the forests. And as medicines, these plants continue to heal.

There are many culturally significant plants that are growing in the Atleo River watershed and other areas in Ahousaht traditional territory which have the potential for wider use and recognition. Future forest use and management, while recognizing the potential for these plant species, must also address issues of concern. These include the availability and accessibility of plant species, the recognition of special harvesting areas, sustainable harvesting techniques, and respect for ecological integrity.

A key element in forestry management practices in Clayoquot Sound must be to recognize the essential interactions between the Nuu-Chah-Nulth and their local ecosystems. Environments evolved with people as part of them, and forests shaped and were shaped by interactions with people. Traditional plant management and other activities which influenced plant ecosystems included pruning, digging and tilling, landscape burning, transplanting and selective harvesting. Other traditional practices, such as communication and exchange of plant knowledge, *ha hoolthe* stewardship system, and respectful world views and perspectives, can be integrated into future plant use and management for careful and sustainable forest practices in the future.

Perhaps not all of us will ever understand what it would be like to weave a basket with the same grasses that our great-grandmothers used, or gather berries in the same way that our ancient relatives have. But appreciating these plants with the same respect that has been given them for thousands of years is a concept that we can all learn from, for all of our children's children. As Murray John remembers his father saying:

> *"We're just the holders. The Creator owns what we see. We see lands, mountains, ocean." My dad used to say "We're just the keepers to look after it, make sure things are running right and looked after". He always said that.*

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

7.0 Conclusions

During the course of this research project and my thesis, I have explored many aspects of forest use and management in Ahousaht traditional territory. I have learned about the histories of Atleo River Watershed (our study area) and other areas in Ahousaht territory by speaking with elders and other knowledgeable people. As well, many people shared their knowledge of traditional plant use and harvesting, including the ways in which the forest has been shaped by practices such as selective harvesting, coppicing, pruning and cultivation. These practices were guided by philosophies which promoted respectful forest use and stewardship.

In carrying out field work in the Atleo River Watershed, I gathered information to assess the availability and abundance of culturally significant plants, the habitats in which they grow, and the ways in which they have been impacted by industrial logging activities. I found a number of culturally significant plants growing in the watershed, including berries and shoots which grew abundantly in many habitat types, root vegetables which were found exclusively in estuary habitats, basket materials which were found at the edge of the lake (basket sedge) and in cedar-hemlock forests (cedar bark), and floral plants which are only available in forested areas.

This broad range of information reflects learning from the past and assessing the present to guide forest practices in the future in a way which respects First Nations' values and perspectives and specifically, culturally important plants. The following recommendations have emerged from my research and fall into two broad categories: facilitating and respecting traditional plant use, and directions for future research.

7.1 Facilitating and respecting traditional plant use and incorporating traditional ecological knowledge:

- Aboriginal people should have access to their traditional plant resources. In areas where access has been a concern, such as parks, consideration should be given to the selective harvesting of culturally significant plants by aboriginal people for personal, educational and research purposes. The extent to which plants are harvested in parks would have to be adapted as impacts were monitored.

- Traditional plant harvesting and management techniques should be encouraged and reintroduced where desired. Such techniques include:
    - selective harvesting (all species)
    - pruning (e.g. basket sedge and berry bushes)
    - tilling and weeding (primarily in estuarine habitats for promotion of root vegetable foods)
    - fire management (primarily in habitats used for berry harvesting)

- Traditional management strategies should be integrated into contemporary forest management. For example, peeling bark off trees, such as western yew, should be done using methods consistent with traditional worldviews and philosophies of only taking one strip off each tree. Floral plants harvested for commercial purposes should be guided by philosophies of selective and sustainable harvesting. the potential for taking planks off trees for value-added activities such as guitar-making for species such as Sitka spruce should explored.

- The potential for introducing traditional food plants into modern restaurant cuisine should be explored. As well, opportunities for encouraging cottage-industries of making jams, jellies, and other value-added traditionally-based items should be considered.

- Consideration should be given to culturally significant plant species for standard vegetation surveys in Clayoquot Sound. Foresters and others should be trained to recognize key species, record their presence, and provide this information to the appropriate First Nations' community.

- The definition of culturally significant sites should be expanded to include areas with high abundance of culturally significant plant species including: berries, root vegetables, wild greens, and basket materials. For example, estuaries are critical areas for harvesting root vegetable foods. Riparian areas, such as lake sides, may be rich in basket sedge and other grasses. Cedar-hemlock forest is a critical habitat for cedar bark.

- Trails should be considered as an option for increasing access to those sites which have culturally significant plants. In the Atleo River watershed, two such sites are:
    - Barra Lake: which has abundant basket sedge and Pacific crabapple.
    - 1985/86 clearcut just north of Seektukis Reserve: which has basket materials (basket sedge, cattail) as well as large shoots and berries.

- Further consideration should be given to the harvesting of botanical forest products (such as berries and floral greens) as a potential employment opportunity for First Nations. If such harvesting is desired:
    - The precautionary principle should be employed to use plant resources wisely and cautiously to avoid over-exploitation of these resources
    - Training programs for those people employed in the botanical forest product industry should be developed and delivered to include First Nations' perspectives and concerns, plant growth and harvesting techniques, plant identification and resource inventories.

- Propagation of plants in heavy demand should be considered. Sites within the community of Ahousaht could be identified, including the development of native gardens throughout the village.

- Consideration should be given to developing watershed stewards who are responsible for collecting data, observing, monitoring and coordinating activities in each watershed. Watershed stewards could include one aboriginal and one non-native person working together.

- Hereditary chiefs should be informed about activities occurring in their *ha hoolthe* and be given the opportunity to be involved in management decisions. They should be provided with the opportunity to be involved as stewards at all levels.

- Information regarding research and management should be shared through oral presentations and discussions as well as through written formal reports. Results should be presented to the First Nations' community if research is being carried out within their traditional territory.

- Culturally appropriate principles for forest practices could be developed by Nuu-Chah-Nulth First Nations. These would include traditional worldviews and philosophies and be the basis for evaluating forest practices.

7.2 Directions for future research

- **Develop methodology for research and inventory of culturally significant plants.** Further research should include a more rigorous development of field methodology. For example, floral industries should be consulted as to the best survey methods to use for evaluating the potential for floral products. In more long-term studies, tests could be conducted to determine if measurements are accurate or appropriate for determining availability and abundance of plant species. For example, various measurements could be taken on salmonberry and thimbleberry shoots, the edible shoot stalks could then be measured and weighed, and correlation between the survey measurements and actual food mass could be drawn. This research would be helpful in developing more efficient and accurate methods for surveying culturally significant plants.

- **Conduct similar field methodology in more watersheds.** The field work for this research project was conducted entirely within one watershed in Clayoquot Sound. Although it is hoped that the information will be useful for developing management plans for this watershed, the information from this study may not be applicable to other areas within Clayoquot Sound. For example, surveys of unlogged watersheds could be conducted to gain baseline data of culturally significant plants in these watersheds. Also, similar research projects could be conducted throughout Clayoquot Sound, allowing better interpretation of data, and inference of patterns of abundance and availability of culturally significant plants correlated to habitat type, elevation, aspect and other factors. Such studies would contribute significantly towards an inventory of resources, particularly those important to First Nations, within traditional territories.

- **Further document traditional ecological knowledge in Ahousaht.** Due to the short-term time period of this research project, our time for conducting interviews was limited. There are many more knowledgeable people in Ahousaht and other areas who undoubtedly have a rich knowledge and understanding of their local environment. As well, other topics could be investigated to record information beyond plant use and management.

- **Conduct a thorough CMT study of the Atleo River watershed.** The identification, mapping and documenting of culturally modified trees was a relatively small component of this project. There were many areas of the Atleo River watershed that we did not survey, including forested areas that may have contained CMTs. Further inventory in more remote areas of the watershed would provide a more complete inventory of these culturally significant trees which would contribute significantly to land use studies and other cultural inventories. Trees could be cored to provide an estimate of age. As well, other species of trees from which bark is collected (Stryd and Eldridge 1993) should be investigated. For example, bark has been recorded as being used by the Nuu-Chah-Nulth peoples from such species as western hemlock, red alder, yellow cedar and Pacific

crabapple (Turner and Efrat 1982). For a more comprehensive study on CMTs in the watershed, all potential species should be examined and the forests of the watershed should be more thoroughly explored.

- **Investigate, map and manage for the quality of culturally significant plants throughout Clayoquot Sound.** Although the field surveys ideally indicate the abundance, distribution and frequency of plants, the quality of the plants was not included in the analysis. Ideally, surveys should include measures of the quality of plants by including knowledgeable aboriginal people in their evaluation who can "test" plants by taste, texture, appearance, or other appropriate measures.

- **Conduct further research on the potential for botanical forest products including sustainable harvesting rates and impacts on the ecosystem.** Permanent plots could be established and harvested at various levels to determine appropriate harvesting levels. Other aspects of the ecosystem could be monitored to gain an understanding of impacts of harvesting.

- **Investigate the autoecology of culturally important plant species.** Such research could include factors which affect productivity and quality of culturally significant plants, including the abundance of berries, shoots and basket materials, and potentially influencing factors such as site characteristics, climate, and genetics.

PERSONAL COMMUNICATIONS

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Richard Atleo. Hereditary chief and Ahousaht elder. November 4, 1996.
Luke Atleo. Ahousaht elder. November 11, 1996.
Sara Brown. Researcher. Strategic Policy Section, Forest Practices Branch. February 16, 1998.
Archie Frank Sr. Ahousaht elder. August 26, 1996.
Gertrude Frank. Ahousaht elder. July 17, 1996.
Chief Earl Maquinna George. Hereditary chief and Ahousaht elder. August 20, 1996.
Murray John. Ahousaht elder. September 4, 1996.
Carl Jumbo. Ahousaht elder. August 22, 1996.
Lena Jumbo. Ahousaht elder. August 14, 1996.
Ross McMillan. Former Co-Chair of the Central Region Board, Tofino, B.C. November, 1996.
Arlene Paul. Ahousaht elder. July 25 and August 13, 1996.
Bill Perry. Forester, MacMillan Bloedel. August 12, 1996.
Stanley Sam. Ahousaht elder. July 23 & 24, 1996.
Sidney Sam Sr. Chief Councilor, Ahousaht Band. August 15, 1996.
Morris Sutherland. Aboriginal Liaison Officer, Ministry of Forests. August 12, 1996.
Rosie Swan. Ahousaht elder. August 14 and September 4, 1996.
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Appendix A: Personal Statement of Robin Smith and Juliet Craig submitted with original research proposal.

Personal Statement

As graduate students, we have chosen to devote time and energy to undertaking a major research project which we hope will result in worthwhile Master's theses. First and foremost, however, we hope that the process of undertaking this research is mutually beneficial with the primary focus being the goals and concerns of the community of Ahousaht. It is therefore essential that this research only be undertaken with the express interest, approval, and participation of members of the research community, without which the research will have no foundation or meaning.

We are personally deeply concerned with the nature of resource management on Vancouver Island. We feel that it is unrealistic and unethical to address resource management issues without taking as a starting point the recognition of aboriginal peoples as traditional owners and stewards of the land. Rather than a "pristine, untouched" wilderness, the forests of Vancouver Island evolved with aboriginal peoples and thus, to maintain and restore them in a healthy state, interactions and knowledge of aboriginal peoples must be considered. The documentation of traditional ecological knowledge may be critical to achieving sustainable resource use. We recognize that this knowledge is the property of the aboriginal communities from which it stems, and potential for misuse of such information may result in a hesitancy about sharing.

Over the past few months, as we have developed this project, we have questioned our role as outsiders to the community in doing this research, particularly as we come from an academic background. We are aware that, as 'outsiders', there are problems associated with our recording traditional knowledge and we hope to discuss these issues with the community and come to a place of mutual understanding. All too often, indigenous peoples are asked to give without receiving, and the taking of knowledge is no different. We have given a great deal of thought to how we can avoid this unequal and one-sided approach to research. We hope to approach this project as an exchange of knowledge and experience, recognizing that both aboriginal and non-aboriginal participants have something to offer.

It is an honour for us to be able to participate in the sharing of knowledge which we do not take lightly. Our purpose in writing this statement is to assure you that we are aware and thinking of these issues. We hope that this research project will not only help to build bridges between Western scientific and traditional ecological knowledge, but also between aboriginal and non-aboriginal communities.

Sincerely,

Robin Smith and Juliet Craig

Appendix B: Traditional Ecological Knowledge Protocols for Researchers (developed by the Long Beach Model Forest Traditional Ecological Knowledge Group)

LONG BEACH MODEL FOREST
RÉSEAU DE FORÊTS MODÈLES

Traditional Ecological Knowledge Group

DRAFT Protocols for Researchers

Communities in Clayoquot Sound and Barkley Sound share concerns over the sustainability of their resources. Information exchange, research and adaptive management can lead towards sustainability. The acceptance of the Scientific Panel's recommendations has opened the way for inventory, monitoring and research projects in the area. Forest Renewal BC has a large budget to spend on projects within Clayoquot Sound and has received hundreds of proposals for work this year.

Long Beach Model Forest (LBMF) is concerned that communities will not be involved in these research activities. Although some communities have their own research programmes and protocols for outside researchers, others do not. Nuu-chah-nulth community members have expressed concerns that researchers come from outside an area and take from the community without leaving any benefits. Other people are concerned about the lack of respect for Traditional Ecological Knowledge. Some people wish to document endangered knowledge for their community, but are concerned about protection of this knowledge.

TEK Group

The Long Beach Model Forest (LBMF) is interested in cooperating with Nuu-chah-nulth communities and researchers to explore intellectual property rights. The Traditional Ecological Knowledge (TEK) group includes individuals interested in ensuring that research meets community needs. It is open to anybody who wants to develop ethics for researchers who use our practitioner's knowledge.

Presently, LBMF does not have a process to address the rights of our practitioners. LBMF requires a mechanism to determine funding eligibility for proposals. In the TEK group, our initial work will be to draft a document of individual concerns that will ensure that Nuu-chah-nulth needs are addressed. The process was initiated with protocol and respect as guiding principles, and is not intended to begin research on the matter of very personal or private medicinal plant information. LBMF intends to support community initiatives, and to assist in the process of developing a "code of ethics" that is binding to researchers.

Protocol: the starting point

This document offers a suggested protocol for researchers coming into communities from outside an area. The suggestions are taken from discussions with community members and from codes of ethics published elsewhere. Communities are also developing internal protocols as foundations for research processes.

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Because research programmes fall into two categories in terms of community involvement, we suggest two levels of protocol. The first deals with general scientific research with low community involvement (this research may still meet community needs--e.g. in developing holistic resource management plans). The second is more involved, dealing with community-led research or projects with a large TEK component, where issues of protection of knowledge become critical.

Western Science

Intent and Approval

1) Research topics must be approved by band councils based on a written or oral presentation documenting the **intent, implications** (to knowledge and to the community) and mechanism of **data distribution**.

2) Researchers will allow the opportunity for community members to discuss issues related to the project.

Researchers

1) Researchers will provide the community with details about who is conducting the research, who supports the research (i.e. partners) and what are their qualifications.

2) Researchers will employ community members as assistants where possible.

Implications

1) Researchers will list possible benefits and costs of the work (to knowledge, to resources, to communities, to training).

Data Distribution

1) All data will be available for community use.

2) Researchers will provide copies of documents and data to interested community members.

3) Chief and council (and interested community members) will have an opportunity to read and review reports before publication. Strong community objections to research conclusions, perspectives and data will be noted and published.

Traditional Knowledge

Intent and Approval

1) Research topics will be directed by the communities and research strategies will be developed with collaboration among the researchers and the communities.

2) Community members will have the opportunity to discuss issues related to the project with the researchers.

3) Researchers will document the intent of the research (e.g. to answer community questions, to document knowledge for the community, to help in holistic resource management, to incorporate TEK and science in working towards sustainability)

4) Researchers will demonstrate that the project is cooperative and collaborative and will show flexibility. Community members can halt the project at any time subject to internal community protocols.

5) Research topics will be approved by community experts, elders and chiefs and council based on a written or oral presentation documenting the intent, implication (to knowledge and to the community) and the mechanism of data distribution.

6) Researchers will discuss the discipline necessary for research processes with community members.

Researchers

1) Researchers will provide the community with details about who is conducting the research, who supports the research (i.e. partners) and what are their qualifications.

2) Projects will employ community members as researchers and assistants.

3) Projects will offer the opportunity for training (both for and by community members).

Implications

1) Researchers will list possible benefits and costs of the work (to knowledge, to resources, to communities, to training).

2) Researchers and communities will discuss possible implications and come to agreement as to how to avoid negative implications.

Data Distribution

Data and knowledge will be categorized in three classes.

1) Data available for publication

a) Community will have a copy of all data (e.g. notes, data, recordings, photos) within two months of their production to use as they wish.
b) Community (experts and council) will have the opportunity to review document before publication.
c) Copyright--still needs investigation. Probably can be held by the community or the Tribal Council. Some portions may need special consideration (e.g. for university Master's theses).
d) Dialects and information differ between communities. These differences must be discussed fully before being recorded, so that everybody understands why something is written a certain way.

2) Data available for limited distribution

a) This data will not be published. It may be included in appendices in theses (which can be protected from distribution).
b) Distribution of data or knowledge arising from the study will be at the discretion of community members and will be agreed to in writing. Data could be available to the holder of the knowledge, within a family, within a tribe or throughout Nuu chah nulth territory.
c) Community members will stipulate where and in what form the data can be transmitted (e.g. just to community/family, in M.Sc. appendix, to other local communities, not in English).

3) Data unavailable for distribution

a) Information that is *klipt yuqiix* (for one person only; e.g. medicinal plants, sacred places, as determined by the holder of the knowledge) will not be distributed in any form. All private information identified by the expert will be omitted from reports.
b) If the holder of such information wishes, the knowledge could be documented with a single copy held by the expert. Any research notes would also be held by the expert.

Researchers will sign an agreement regarding the distribution of data. This agreement will stipulate that information cannot subsequently be used against First Nations communities, that off-record statements cannot be published and that data will be owned by the community

Compensation will be discussed and agreed upon in writing before the start of any study.

Appendix C: Letter of Consent

LETTER OF INFORMED CONSENT
(Two copies to be signed)

"A Rich Forest": Availability and Restoration of Culturally Important Plants and Habitats in the Atleo River Valley,
by Juliet Craig, Robin Smith, Dr. Richard Atleo and Dr. Nancy Turner.

I give permission to Juliet Craig and Robin Smith to interview me about:

- traditional systems of managing lands and resources by First Nations in British Columbia (including sustainable harvesting techniques, restoration methods, current and past plant use, effects of logging, and traditional stewardship systems), and

- traditional use of Atleo River Valley and surrounding areas (including plant gathering areas, important habitats, changes to the environment, and visions for the future use)

I understand that my participation is completely voluntary and that I may withdraw at any time without consequences.

I agree that my interview will be audio taped or videotaped and field notes taken. I understand that until such time as the notes and tapes are transcribed, they will be kept secure. I agree that Juliet Craig and Robin Smith and research supervisors Dr. Richard Atleo, Dr. John Wadland and Dr. Nancy Turner, will have access to these records.

I understand that I may be acknowledged as a participant/contributor to the final reports, tapes and collections and that copies of all tapes will be deposited to an appropriate Ahousaht repository, with one copy to myself. I, therefore, understand that unless I request it, my anonymity will not be protected and that all documentation will not be confidential.

I understand that any information I provide on these subjects will be returned to me in written form, and rechecked by myself (with assistance if I need it) to make sure the information is accurate. I will have an opportunity to deny publication or public distribution of any of the information I provide.

I agree to be paid $15.00 per hour for interviewing. I understand that I will receive copies of any photographs or tapes made with me.

I understand that ownership and control of the information I provide is mine, and can be published or used in lectures by Juliet Craig, Robin Smith, Richard Atleo or Nancy Turner, only with my permission.

( ) I agree to be identified as a contributor.
OR
( ) I do not agree to be identified as a contributor.

( ) I give permission for Juliet Craig and Robin Smith and/or their research advisors Richard Atleo and Nancy Turner to use the information obtained for the purpose of publishing, or for presentation at conferences and in lectures.

OR

( ) I do not give permission for Juliet Craig and Robin Smith and/or their research advisors Richard Atleo and Nancy Turner to use the information obtained for the purpose of publishing, or for presentation at conferences and in lectures.

_____ Date: _____

signed

Appendix D: Articles in Newsletter

THNOBOTANY PROJECT - CON'T

tleo, and Dr. Nancy Turner from niversity of Victoria.

his summer, we have been exploring the tleo River Valley, looking at the vailability and abundance of plants that ere traditionally used for food or material urposes. We've spent a lot of time getting know the different plants that grow in the alley. We've also been making friends ith the very large population of black ears that live in the Atleo, who are also uite curious about us! It's been really teresting looking at the plants that grow different areas or "habitat types" - arian areas (areas beside water), stuaries (around the river mouth), old-owth forest, and areas which have been gged. If you want to know where the almonberries and salal are growing in the tleo - look no further than the nearest earcut! (or - just ask us!) Copies of the formation which are gathering will be left the Ahousaht Band Office, as well as pies of the final reports once they are mpleted.

ne other part of our project has been lking with people in the village about the ays in which plants are traditionally used id managed, as well as visions for the ure of forest use. We've really enjoyed arning from the many knowledgeable ople in the community, and looking ward to speaking with more people as e summer progresses. If you would like speak with us, or have any questions out the project, please call Juliet or bin at - 9515, we're just over in nshine Bay.

e hope to give a final presentation at the d of our field season. We'll post the ails as soon as possible!

REMINDER - the newsletter is accepting news articles, announcements, reports from anyone. Again, "Congratulations to AHOUSAHT ATHLETES for the determination, sportsmanship and coming home with some trophies." "A Special Congratulations and Thank You to all the workers and volunteers. Good Luck to all who will be participating in the N.A. Indigeneous Games and the Tryouts next week.

NOTE: THE RESULTS OF THE INDIAN GAMES ARE NOT COMPLETED YET AND WILL BE PRINTED AS SOON AS ALL TRIBES ARE NOTIFIED.

Happy Anniversary to our buddies Gloria Jean and John Frank from your one and only niece Esther and nephew Wayne Robinson. We can't forget those grandchildren Shawn and Terri too!!!

Also, Happy Anniversary to one of my favorite uncle's and his wife John Albert and Lisa on there first anniversary this month of August. From your niece Kimberley Ann Frank "P.S. go ahead and try to pick on Steph again!!!!" Just kidding

That's it for now folks! Choo!!
Marla Jack - Communications Worker.

ATIVE JUSTICE - CON'T

ıey are planning a feast in memory of eir late mother Maude Jones and to ank all those who helped them during eir time of sorrow. It is so neat to connect with the families (that have oved away) for a celebration, rather than ıen a death or tragedy occurs.

though, I spend much of my time in my fice with my ears glued to the phone or uck in front of the computer, I enjoy acking down people and mixing ıusiness with pleasure" at their home, on e road or down at the float. Now where se can you have such fringe enefits...visit while you work?

/ell folks, I prattle on...I will have more formation on the RCMP grand opening elebrations soon.

AHOUSAHT TREATY- by P.Jack

ugust 8, 1996 the negotiating team, hiefs and Elders' had a meeting in egards to the Ahousaht Treaty Budget. ney expect to have a potential break-own of expenditures and an outcome. ndoubtedly, there will be enough nances to cover the remainder of the ear. How this matter will be dealt with e Chiefs & Elders intend to resolve it.

C.N.N. REPORTERS SEEKING....

CNN reporters arrived in Ahousaht on Thurs, August 8, 1996, interested in finding out what kind of relationship the Ahousaht tribe has with the environmentalists, logging resources, Provincial and Federal governments throughout the Treaty Negotiations. Louie Frank, Treaty Coordinator indicated that the Ahousaht tribe does have a good relationship with these sources. A meeting occurred most of the morning and the reporters had opportunity to do camera interviews with members of the negotiating team.

AHOUSAHT ETHNOBOTANY PROJECT UPDATE by Robin & Juliette

What plants did you eat for dinner last night? Ya'ma? Huckleberries? Sometimes people forget that even carrots and broccoli, vegetables that seem to come from the store rather than the ground, are related to plants that grow in the wild.

Ethnobotany is the study of the relationship between plants and people. This includes the way people use plants, for example as food or materials, as well as the role of plants in cultural beliefs and practices. We (Juliet Craig & Robin Smith) are two university students, and are working with Travis Thomas, Daphne Frank, Greg Hayes, and Paul Frank Jr. on the Ahousaht Ethnobotany Project. This is one of the summer research projects being funded through Long Beach Model Forest. We began work on June 15, and will continue until the first week of September. This project supervisors are Dr. Richard

Justin's Report Con't...

Boundary. To create these maps, two other GIS programs were used instead of ArcView: ArcEdit, which was used for editing map features like the boundary, and ArcPlot for Windows, which created maps with much more clarity and definition than ArcView. Commands in both these programs are executed using the keyboard, but there were some menus which could be accessed by the mouse. I have learned most of the basic keyboard commands used to create maps with these programs. These maps were also created using a template, which is a framework of commands the computer follows. With each template, I could tell the computer as to which layers of information I wanted to use, and in which order they were to appear on the map, as it was being created.

We created various other maps, including two showing the locations of both salmon and shellfish farms, and potential future locations of such farms. There was also a map created that will eventually show the "Walk the Wild Side" hiking trail, where a GPS unit was used to collect coordinates using four orbiting satellites. GPS is an acronym for Global Positioning System. This device was used to show the direction and location of the trail, by collecting coordinates around the GPS unit, from the satellites, and in turn creating focal points of the trail. Another map that was created showed all of the Ahousaht reserves and their names in the Nuu-Chah-Nulth language.

Although there were a few obstacles along the way, I met new people related to GIS and I enjoyed this summer job. I see the possible potential of me continuing in the field of GIS, sometime in the future.

Robin Smith & Juliet Craig - Ethnobotany Project

Thanks from the Ahousaht Ethnobotany Project! It is getting near the end of our field season. The summer went by so fast! We (Robin & Juliet) are going back to university in the beginning of September. Before we leave, we are planning to have a slide show to share our experiences this summer and some of the things we've learned. The slide show is on **Thursday, August 29th at 10:30 a.m. at the Resource Tech.** We welcome everyone to join us!

We would like to Thank you all of the Ahousaht people for welcoming us into your community this summer; Sid Sam Sr. and the Band Council for permission to work in Ahousaht traditional territory; all of the Elders and other knowledgeable people who have taught us so much about history, plants, and the forest including Pete and Greta Charlie, Trudy Frank, Chief Earl Maquinna George, Arlene Paul, Carl & Lena Jumbo, Stanley Sam, Sidney Sam Sr, Rosie Swan, Irene Thomas, as well as those we still hope to speak with; Felix Thomas and Ilene Sutherland, and Edwin Frank for the use of their boats for getting to Atleo River. We extend great thanks to Dr. Nancy Turner for her support this summer, Chief Umeek (Dr. Richard Atleo) for giving us permission to work in his hahoolthe and inspiring us with his wisdom. Special thanks to our field crew who did a wonderful job this summer; Travis Thomas, Daphne Frank, Greg Hayes, and Paul Frank Jr. We appreciate all you've done! Kleco! Kleco!

Appendix E: Updated plant list for the Atleo River Watershed

Six of the species on this list remain unconfirmed as they were not identified by Nancy Turner or Brenda Costanzo (UVIC botanists). Robin Smith and Juliet Craig identified the following four species; *Hydrophyllum tenuipes* (Pacific waterleaf), *Saxifraga mertensiana* (Merten's saxifrage), *Veronica beccabunga ssp. americana* (American brooklime) and *Ribes divaricatum* (Wild gooseberry). *Prunus emarginata* (Bitter cherry) was recorded as growing in the Seektukis reserve but this specimen may have been confused with the Domestic cherry growing in the same area. *Chamaecyparis nootkatensis* (Yellow cedar) was not observed during this project but is said to grow at upper elevations of the Atleo River watershed (Bill Perry, MacMillan Bloedel forester, personal communication) so it has been included on the plant species list.

Species (Latin name)	**English name**	**Nuu-Chah-Nulth name**[1]
Ferns		
Adiantum pedatum	Maidenhair fern	***yumapt***
Athyrium filix-femina	Lady fern	***shishitlmaptk'uk***
Blechnum spicant	Deer fern	***kaatskuuxsmapt***
Dryopteris assimilis	Spiny wood fern	***shishitlmaptk'uk***
Polypodium glycyrrhiza	Licorice fern	***hihit'a***
Polystichum munitum	Sword fern	***7itsmapt***
Pteridum aquilinum	Bracken fern	***shitlmapt***
Herbaceous plants		
Achillea millefolium	Yarrow	***shashaaxtan'uuh***
Adenocaulon bicolor	Pathfinder	
Agrostis alba	Creeping bentgrass	
Agrostis exarata	Spike bentgrass	
Anaphalis margaritacea	Pearly everlasting	
Angelica genuflexa	Kneeling angelica	
Angelica lucida	Sea-watch	
Aquilegia formosa	Red columbine	
Aruncus sylvester	Goat's beard	***sisixbuxwaxs***
Aster subspicatus	Douglas' aster	
Boykinia elata	Coast boykinia	
Bracket fungus		***k'itch7q***
Calamagrostis canadensis	Bluejoint	
Calamagrostis sp?	Grass	
Carex echinata	Star sedge	
Carex leptalea	Bristle-stalked sedge	
Carex lyngbyei	Lyngby's sedge	
Carex mertensii	Merten's sedge	
Carex obnupta	Basket sedge	***ch'itapt***
Carex rostrata	Beaked sedge	
Carex sitchensis	Sitka sedge	***ch'ich'itqpqk'uk***
Carex sp.	Sedge	
Carex viridula	Green sedge	
Cirsium sp.	Thistle	***sachkmapt***
Cirsium vulgare	Bull thistle	
Claytonia sibirica	Siberian miner's lettuce	
Corallorhiza maculata	Striped coralroot	

[1] These names are taken from the Scientific Panel (1995b). They are typed as accurately as possible within the limits of the MS word symbols.

Species (Latin name)	English name	Nuu-Chah-Nulth name[2]
Cornus canadensis	Bunchberry	***hast'aachiqmapt***
Dactylis glomerata	Orchard grass	
Deschampsia caespitosa	Tufted hairgrass	
Dulichium arundinaceum	Dulichium	
Elymus mollis	Dune grass	***ch'ich'itapqk'uk***
Epilobium angustifolium.	Fireweed	***7a7adakqii***
Epilobium ciliatum	Purple-leaved willowherb	
Equisetum arvense	Common horsetail	***qwaqtl***
Equisetum telmatiea	Giant horsetail	***qwaqtl***
Festuca rubra	Red fescue	
Fragaria chiloensis	Coastal strawberry	***kalhkintimapt***
Fritillaria camschatcensis	Northern rice root	***kuuxwapiihmapt***
Galium trifidum	Small bedstraw	
Galium triflorum	Sweet-scented bedstraw	***qats'alhp'uqs***
Gentiana sceptrum	King gentian	
Glaux maritima	Sea milk wort	
Grindelia integrifolia	Entire-leaved gumweed	
Heracleum lanatum	Cow-parsnip	***qilhtsmapt***
Hordeum brachyantherum	Meadow barley	
Hydrophyllum tenuipes	Pacific Waterleaf	
Juncus balticus	Baltic rush	
Juncus effusus	Common rush	***tl'i7ich***
Juncus ensifolius	Dagger-leaved rush	
Juncus tenuis	Slender rush	
Lactuca muralis	Wall lettuce	
Listera sp.	Twayblade	
Lolium perenne	Perennial ryegrass	
Luzula parviflora	Small-flowered wood-rush	
Luzula sp.	Wood-rush	
Lycopus uniflorus	Northern water horehound	
Lysichiton americanum	Skunk cabbage	***ti7maat***
Maianthemum dilatatum	Wild Lily-of-the-Valley	***kuuw'iikmapt***
Melica subulata	Alaska oniongrass	
Menyanthes trifoliata	Buckbean	
Moneses uniflora	Single delight	
Montia parvifolia	Small-leaved montia	***?i?anm'i7atl***
Nuphar polysepalum	Yellow pond-lily	***hach'lhsmapt***
Oeanthe sarmentosa	Pacific water-parsley	***wa7uu***
Plagiomnium insigne	Badge moss	
Plantago macrocarpa	Alaska plantain	
Plantago major	Common plantain	***titimatk'uk***
Plantago maritima	Seaside plantain	
Platanthera stricta	Slender bog-orchid	
Potentilla anserina	Pacific silverweed	***tlitsy'upmapt***
Prenanthes alata	Western rattlesnake-root	
Prunella vulgaris	Self-heal	
Rannunculus repens	Creeping buttercup	***k'ahk'ahshmapt***
Ranunculus uncinatus	Little buttercup	***k'ahk'ahshmapt***
Rumex crispus	Curled dock	
Rumex obtusifolius	Bitter dock	
Salicornia virginica	American glasswort	
Sanguisorba officinalis ssp. microcephala	Great burnet	

[2] These names are taken from the Scientific Panel (1995b). They are typed as accurately as possible within the limits of the MS word symbols.

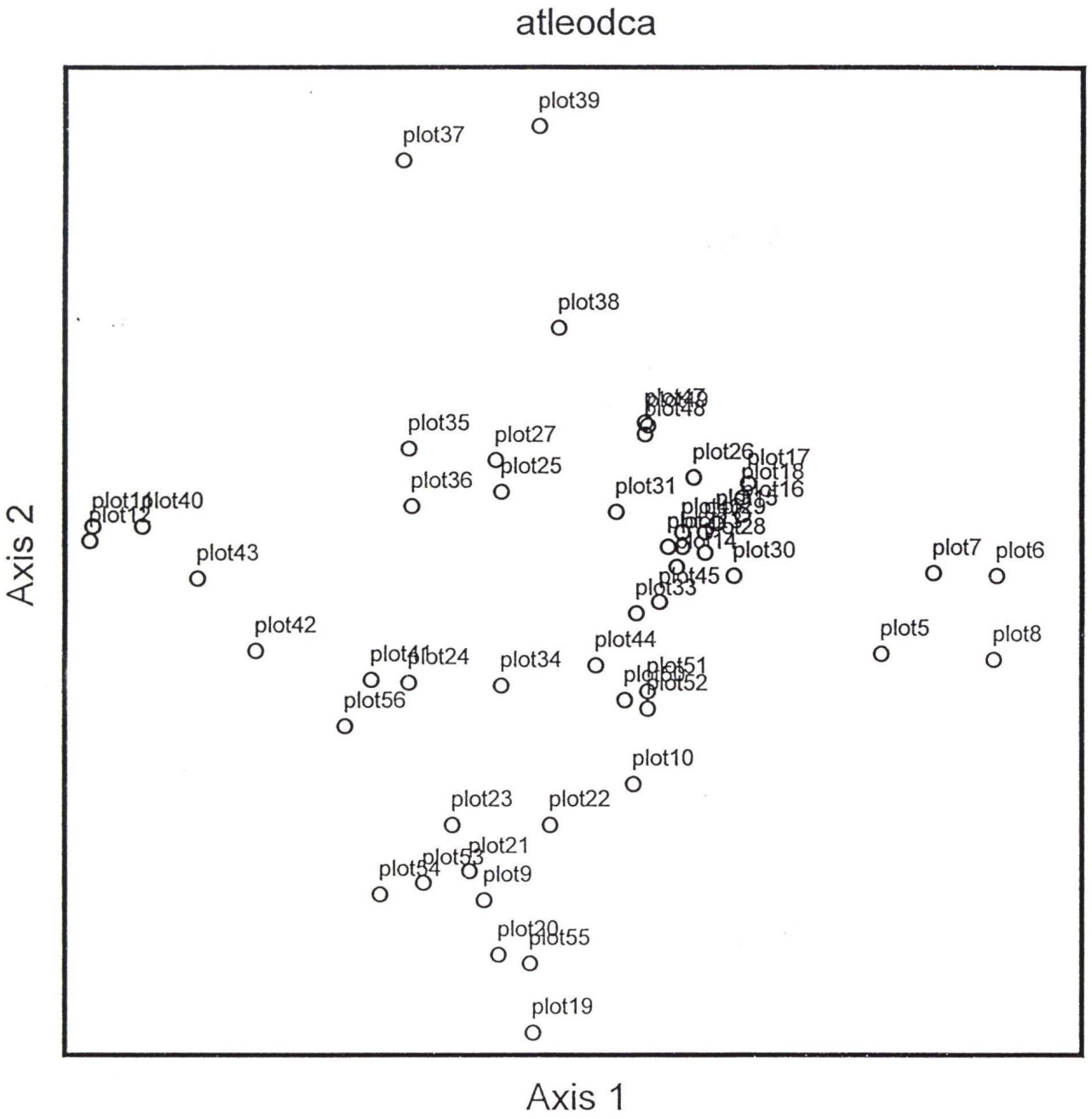
Species (Latin name)	English name	Nuu-Chah-Nulth name[3]
Saxifraga mertensiana	Wood saxifrage	
Sisyrinchium idahoense var. macounii	Blue-eyed grass	
Sparganium angustifolium	Narrow-leaved bur-reed	
Sphagnum angustifolium	Yellow-green peat moss	
Stachys cooleyae	Cooley's hedge-nettle	***tushksmaqk'uk***
Stenanthium occidentale	Mountainbells	
Streptopus amplexifolius	Clasping twistedstalk	***muwach ha7um7ak***
Taraxacum officinale	Dandelion	***tl'itl'its'aqtl***
Tellima grandiflora	Fringecup	***hahaptspaa***
Tiarella trifoliata var. lanciniata	Foamflower	
Tiarella trifoliata	Foamflower	
Tolmiea menziesii	Youth-on-age	
Trautvetteria caroliniensis	False bugbane	
Trifolium dubium	Small hop-clover	
Trifolium wormskjoldii	Springbank clover	***?a?iits'uqmapt***
Triglochin maritimum	Sea arrow grass	
Trisetum cernuum	Nodding trisetum	
Typha latifolia	Cattail	***sanix̲mapt***
Urtica dioica	Stinging nettle	***?ilhmakt***
Veratrum viride	Indian Hellebore	***haw'ah̲***
Veronica beccabunga ssp. americana	American brooklime	
Veronica scutellata	Marsh speedwell	
Vicia cracca	Tufted vetch	
Vicia gigantea	Giant vetch	***k'wak'watlmapt***
Catoneaster sp.	Catoneaster	
Alectoria sarmentosa	Old man's beard	***p'u7up***
Pilophorus acicularis	Devil's matchstick	
Shrubs		
Acer glabrum	Rocky Mountain maple	***daqcapt***
Cornus stolonifera	Red osier dogwood	***7ilhchsmapt***
Cytisus scoparius	Scotch broom	
Gaultheria shallon	Salal	***y'am'apt***
Kalmia polifolia	Bog laurel	***tiitiimaptk'uk***
Linnaea borealis	Twinflower	
Lonicera involucrata	Black twinberry	***ch'ihsmapt***
Menziesia ferruginea	False azalea	***?ats?anixsmapt***
Oplopanax horridus	Devil's club	***n'aap'aalhmapt***
Physocarpus capitatus	Pacific ninebark	***pipits'k'uk***
Rhamnus pershiana	Cascara	***q'ay'aaxwasmapt***
Ribes bracteosum	Stink currant	***hulh7iqmapt***
Ribes divaricatum	Wild gooseberry	***milhk'aq'mapt***
Rosa nutkana	Nootka rose	***pat?xmapt***
Rubus discolor	Himalayan blackberry	***qa7wi***
Rubus leucodermis	Black raspberry	***h̲isshitlmapt***
Rubus parviflorus	Thimbleberry	***tl'ach7alhmapt***
Rubus spectabilis	Salmonberry	***m'ashmapt***
Rubus ursinus	Trailing blackberry	***chismapt***
Salix scoueriana	Scouler's willow	
Salix sitchensis	Sitka willow	
Salix spp.	Willow	
Sambucus racemosa	Red elderberry	***ts'iwiipt***
Spiraea douglasii	Hardhack	

[3] These names are taken from the Scientific Panel (1995b). They are typed as accurately as possible within the limits of the MS word symbols.

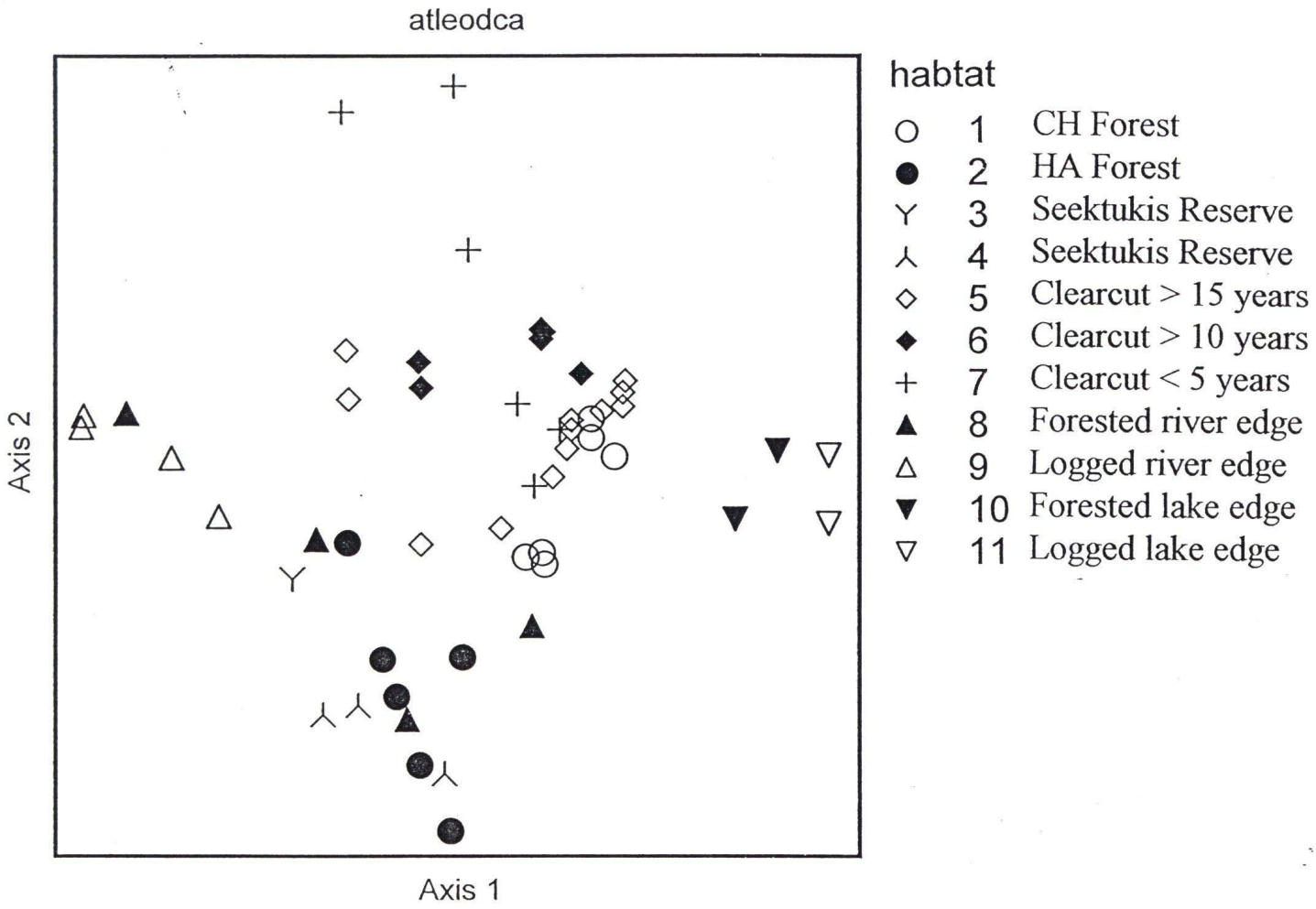
Species (Latin name)	English name	Nuu-Chah-Nulth name[4]
Vaccinium alaskaense	Alaskan blueberry	***tsi7tup***
Vaccinium ovalifolium	Oval-leaved blueberry	***tl'itsxwaanushmapt***
Vaccinium ovatum	Evergreen huckleberry	***siinamuxs7itsmapt***
Vaccinium parvifolium	Red huckleberry	***his7itqmapt***
Vaccinium sp.	Blueberry	
Trees		
Abies Amabilis	Amabilis fir	***w'ihmapt***
Acer macrophyllum	Bigleaf maple	***?amits'apt***
Alnus rubra	Red alder	***qaqmapt***
Chamaecyparis nootkatensis	Yellow cedar	***?alhmapt***
Picea sitchensis	Sitka Spruce	***ch'uhsmapt***
Pinus contorta	Lodgepole pine	***tl'akmapt***
Prunus avium	Domestic cherry	
Prunus emarginata	Bitter cherry	***qu7ushitlmapt***
Pseudotsuga menziesii	Douglas fir	***maawi***
Pyrus fusca	Pacific crabapple	***tsitsih7aqtlmapt/ q'ay'aaxwasmapt***
Taxus brevifolia	Western Yew	***tlatmapt***
Thuja plicata	Western red cedar	***pits'ip (inner bark)***
Tsuga heterophylla	Western hemlock	***qwitl'aqmapt***

[4] These names are taken from the Scientific Panel (1995b). They are typed as accurately as possible within the limits of the MS word symbols.

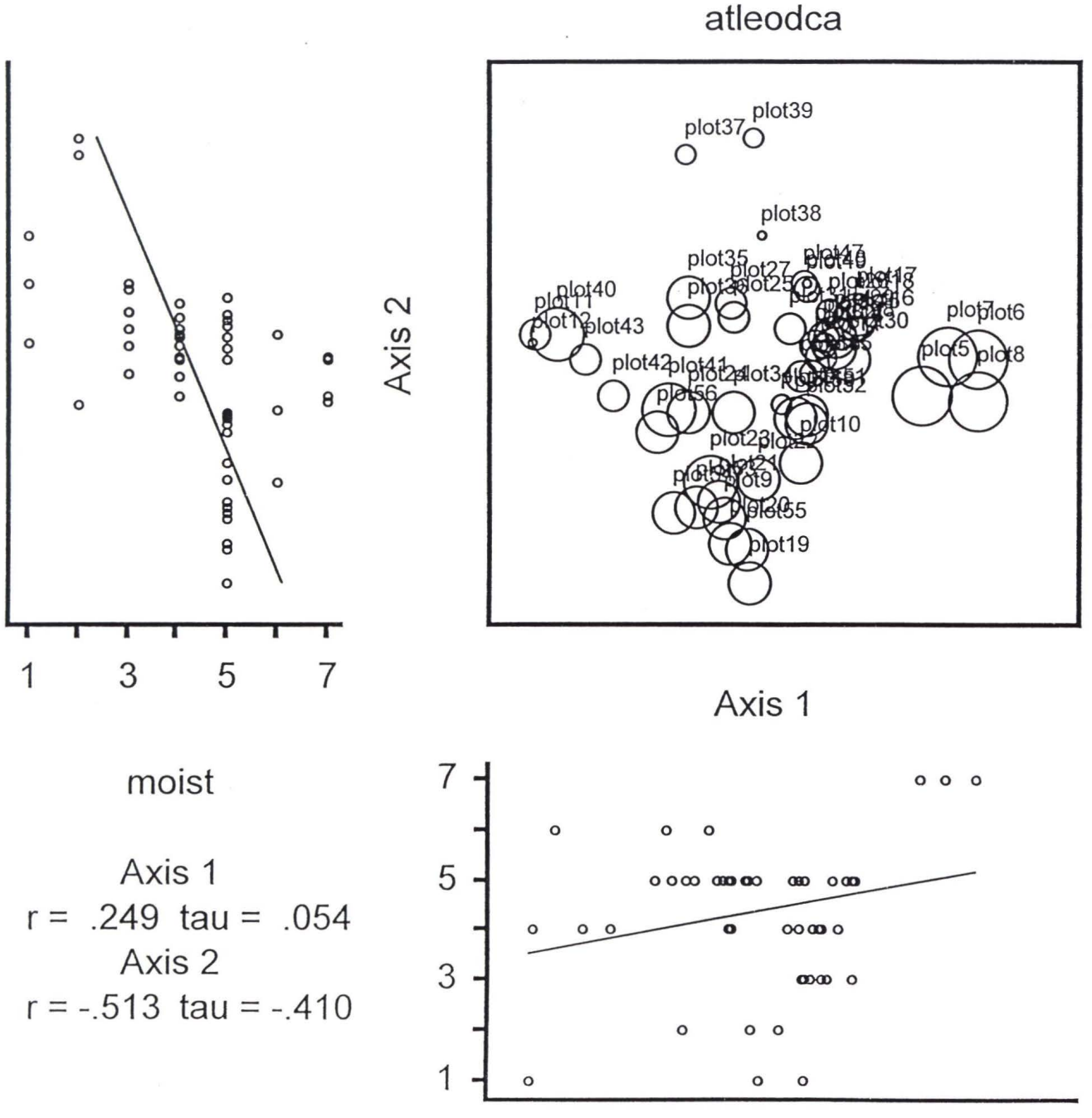
Appendix F. Ordination of data



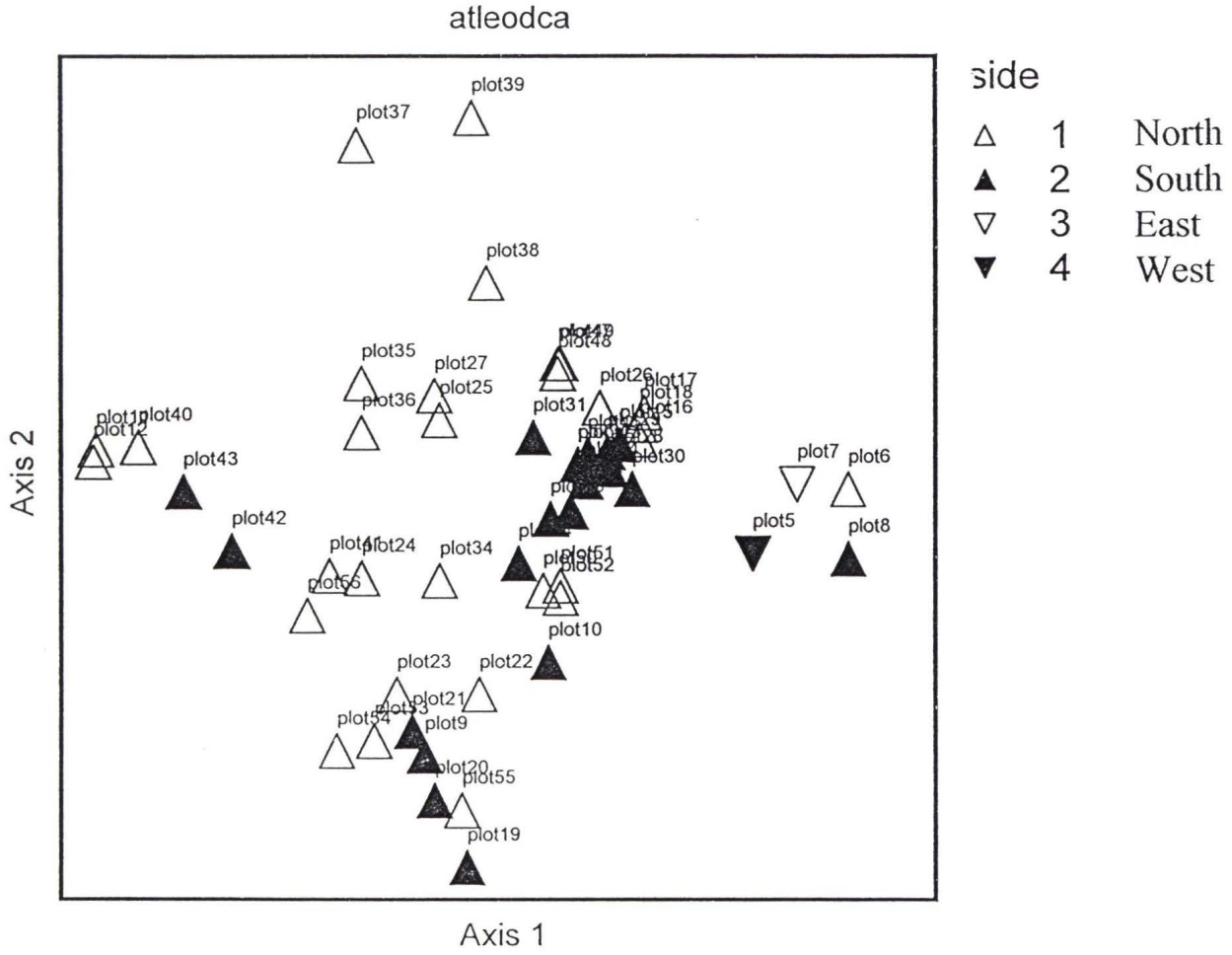
Ordination scatter plot generated by PC Ord to analyze aggregations of plant communities. Each circle represents a plot that was sampled.



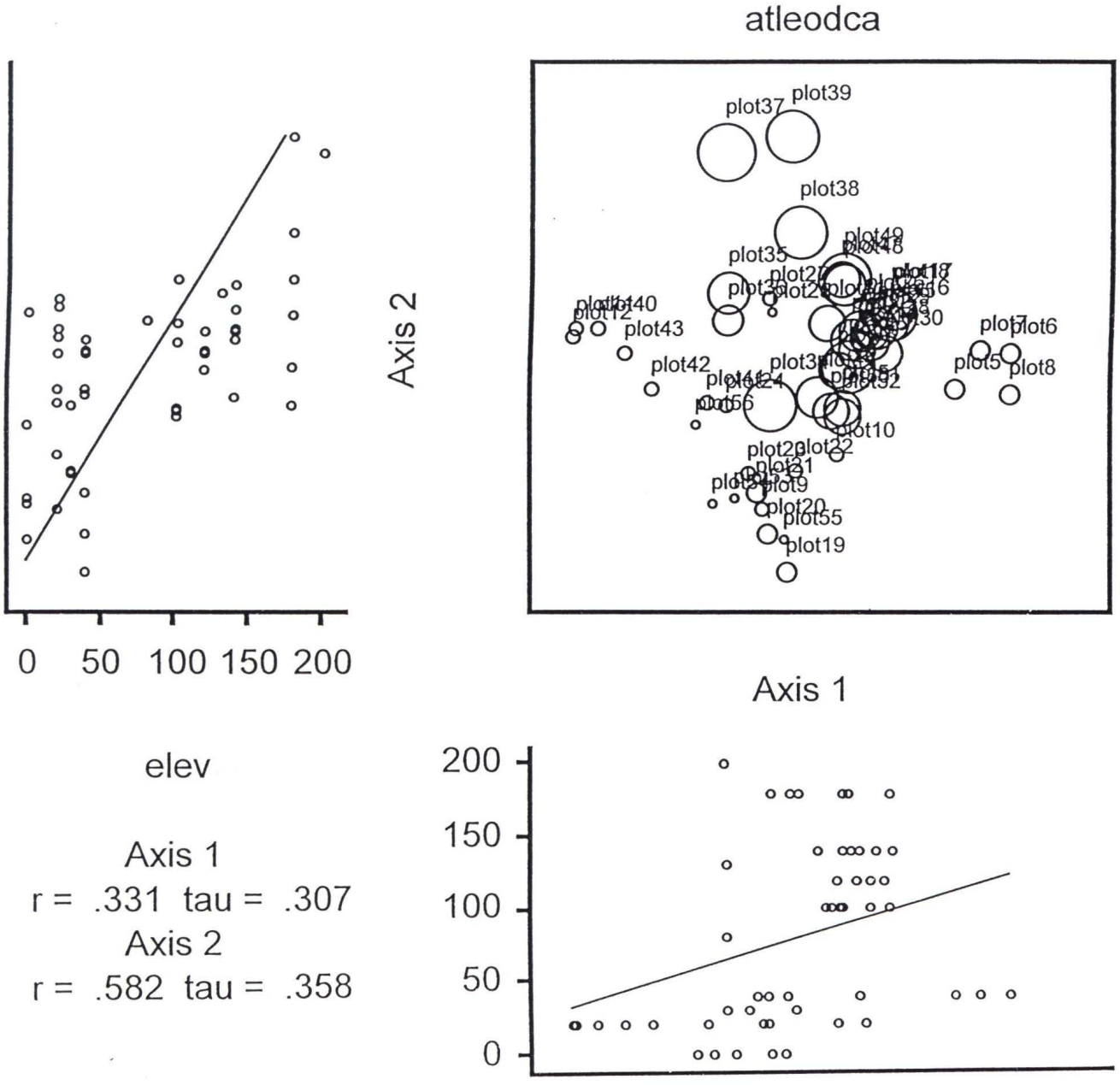
Ordination graph generated by PC Ord to analyze habitat type as a variable influencing plant communities. Habitat types include forest, logged areas and riparian zones.



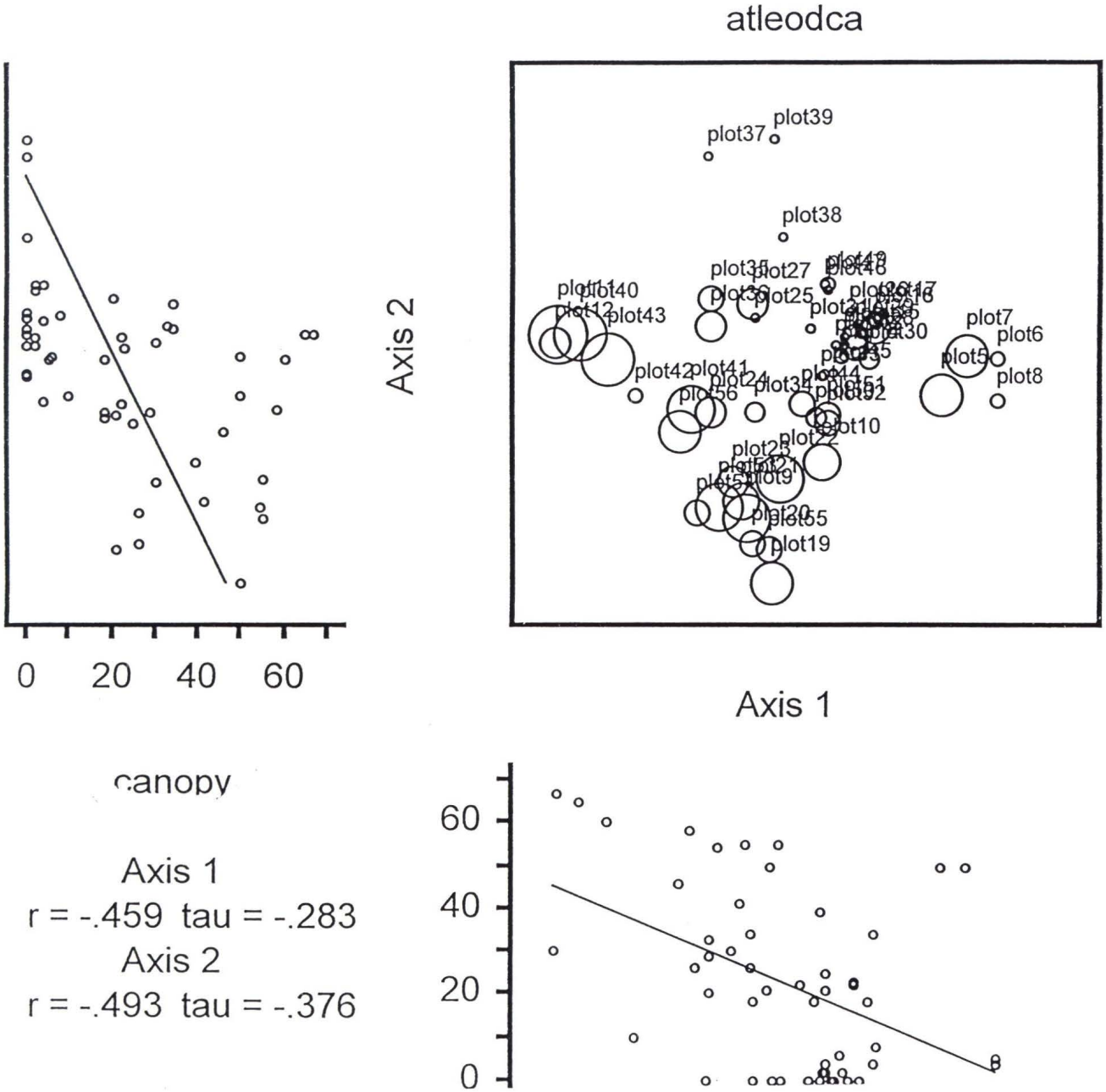
Ordination graph generated by PC Ord to analyze moisture as a variable influencing plant communities. The size of the circle on the upper right hand graph indicates the amount of moisture. The linear graphs and r values indicate correlation between moisture and each axis.



Ordination graph generated by PC Ord to analyze the side of the watershed (aspect) as a variable influencing plant communities.



Ordination graph generated by PC Ord to analyze elevation as a variable influencing plant communities. The size of the circle on the upper right hand graph indicates the relative size of elevation. The linear graphs and r values indicate correlation between elevation and each axis.



Ordination graph generated by PC Ord to analyze canopy closure as a variable influencing plant communities. The size of the circle on the upper right hand graph indicates the relative size of canopy closure. The linear graphs and r values indicate correlation between canopy closure and each axis.

Appendix G: Percent Cover of Culturally Significant Plants

	Fruits and Berries										
Habitat Type	**Pacific crab-apple**	**Bunch-berry**	**Stink currant**	**Hima-layan black-berry**	**Black rasp-berry**	**Trail. black-berry**	**Red elder-berry**	**Red huckle-berry**	**Alaskan blue-berry**	**Oval-leaved blue-berry**	**Blue-berry sp.**
HA forest (K)	0	0	0	0	0	0	0	18.333	2	0	18.667
HA forest (L)	0	0	0	0	0	0	1.667	15	1.667	0	5.003
HA forest	**0**	**0**	**0**	**0**	**0**	**0**	**0.833**	**16.667**	**1.833**	**0**	**11.835**
CH forest (N)	0	5.003	0	0	0	0	0	8.333	0.003	10	3.67
CH forest (V)	0	0.003	0	0	0	0	0	1.673	0.007	0.003	6.667
CH forest	**0**	**2.503**	**0**	**0**	**0**	**0**	**0**	**5.003**	**0.005**	**5.002**	**5.168**
Forest		***1.252***	***0***	***0***	***0***	***0***	***0.417***	***10.835***	***0.919***	***2.501***	***8.502***
1979-81 (I)	0	0	0	0	0	0	0	6.667	1.667	1.667	3.333
1979-81 (J)	0	0	0	0	0	0	0	10	0	0.333	0.333
1979-81 (P)	0	0	0.003	0	0.003	0.333	3.337	15	0	0	0
1979-81 (T)	0	0	0	0	0	0	0	8.333	3.333	0.003	3.337
1979-81	**0**	**0**	**0.001**	**0**	**0.001**	**0.083**	**0.834**	**10**	**1.25**	**0.501**	**1.751**
1985-86 (M)	0	2.917	0	2	0	0	0.333	6.667	0.007	0	0.67
1985-86 (U)	0	0	0	0.003	0	3.333	0.007	6.667	0	0	0
1985-86	**0**	**1.458**	**0**	**1.002**	**0**	**1.667**	**0.17**	**6.667**	**0.003**	**0**	**0.335**
1993-94 (O)	0	0	0	0	0	0	0	5.333	0.003	0.003	0.34
1993-94 (Q)	0	0	0	3.67	3.34	6.667	0.003	8.337	0	0	0
1993-94	**0**	**0**	**0**	**1.835**	**1.67**	**3.333**	**0.002**	**6.835**	**0.002**	**0.002**	**0.17**
Clearcut		***0.365***	***0.000***	***0.709***	***0.418***	***1.292***	***0.46***	***8.375***	***0.626***	***0.251***	***1.002***
selective cut	0	0	0.01	0	0	0	0	10	0	0	0
clearcut area	0.0033	0	0.00333	0	0	0	6.666	0.01	0.0067	0	0.0067
Seektukis	***0.0025***	***0***	***0.005***	***0***	***0***	***0***	***5***	***2.5075***	***0.005***	***0***	***0.005***
forest river (G)	0	0	0.005	0	0	0	0.005	32.5	0.005	0	10
forest river (R)	0	0	2.505	0	0	0	0	30	0.01	0	5.005
Forest river	**0**	**0**	**1.255**	**0**	**0**	**0**	**0.0025**	**31.25**	**0.0075**	**0**	**7.5025**
logged river (H)	0	0	35	0	0	0	0.005	0.5	0	0	0
logged river (S)	0	0	15	0	0	0	0.01	5	0	0.005	0.005
Logged river	**0**	**0**	**25**	**0**	**0**	**0**	**0.0075**	**2.75**	**0**	**0.0025**	**0.0025**
River	***0***	***0***	***13.1275***	***0***	***0***	***0***	***0.005***	***17***	***0.004***	***0.001***	***3.753***
forest lake (C)	30	0	0	0	0	0	0	5	0	1	5
forest lake (E)	30	0.01	0	0	0	0	0	0.01	0	0	1
Forest lake	**30**	**0.005**	**0**	**0**	**0**	**0**	**0**	**2.505**	**0**	**0.5**	**3**
logged lake (D)	80	0	0	0	0	0	0	5	5	2	5
logged lake (F)	50	0.01	0	0	0	0	0	0.01	0.01	0	5
Logged lake	**65**	**0.005**	**0**	**0**	**0**	**0**	**0**	**2.505**	**2.505**	**1**	**5**
Lake	***47.5***	***0.005***	***0***	***0***	***0***	***0***	***0***	***2.505***	***1.253***	***0.75***	***4***
Atleo River (A)	0	0	0	0	0	0	0	0	0	0	0
Bedingfield (B)	0	0	0	0	0	0	0	0	0	0	0
Estuary	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***

	Shoots and other green vegetables			Root vegetables		Floral plants				Basket materials	
Habitat Type (Area)	**Thimble-berry***	**Salmon-berry***	**Horse-tail**	**Silver-weed**	**Spring-bank Clover**	**Salal***	**Ever-green huckle-berry***	**Sword fern**	**Deer fern**	**Basket sedge**	**Cat-tail**
HA forest (K)	0	2.003	0	0	0	0.333	.007	3.34	6.75	0	
HA forest (L)	0	28.333	0	0	0	16.667	0	5.003	13.333	0.003	
HA forest	**0**	**15.168**	**0**	**0**	**0**	**8.5**	**.003**	**4.172**	**10.042**	**0.002**	
CH forest (N)	0	10	0	0	0	50	7	0	39.25	0	
CH forest (V)	0.003	2	0	0	0	45	.667	1.67	21.083	0	
CH forest	**0.002**	**6**	**0**	**0**	**0**	**47.5**	**3.833**	**0.835**	**30.167**	**0**	
Forest	***0.001***	***10.584***	***0***	***0***	***0***	***28***	***1.918***	***2.503***	***20.104***	***0.001***	
> 15 years (I)	0.337	8.667	0	0	0	56.667	.337	0.087	27.333	0.003	
> 15 years (J)	0	10	0	0	0	81.667	6.667	0.92	30.917	0	
> 15 years (P)	8.333	33.333	0	0	0	5.333	0	8.333	20	0	
> 15 years (T)	0.5	10	0	0	0	56.667	.003	1.67	36.333	0	
> 15 years	**2.2925**	**15.5**	**0**	**0**	**0**	**50.083**	**1.752**	**2.7525**	**28.646**	**0.001**	
> 10 years (M)	15	20	0	0	0	45	.333	1.667	8.833	4.167	0.00
> 10 years (U)	10	10	0	0	0	56.667	3.333	0.007	20	0	
> 10 years	**12.5**	**15**	**0**	**0**	**0**	**50.833**	**1.833**	**0.837**	**14.417**	**2.083**	**0.00**
< 5 years (O)	0	3.67	0	0	0	11.667	1.673	0	22.083	0	
< 5 years (Q)	10.333	10	0	0	0	10	0	0.753	4.753	0	
< 5 years	**5.167**	**6.835**	**0**	**0**	**0**	**10.833**	**.837**	**0.377**	**13.418**	**0**	
Clearcut	***5.563***	***13.2088***	***0***	***0***	***0***	***40.458***	***1.543***	***1.680***	***21.282***	***0.521***	
selective cut	0	35	0	0	0	5.000	0	0.01	0.01	0	
clearcut area	0.0033	5	0	0	0	2.003	0	10.34	0.01	0	
Seektukis	***0.0025***	***12.5025***	***0***	***0***	***0***	***2.753***	***0***	***7.755***	***0.01***	***0***	
forest river (G)	0	7.5	0	0	0	5.005	0	0.01	1.505	0	
forest river (R)	7.5	52.5	0	0	0	15	0	12.5	0.125	0.005	
Forest river	**3.75**	**30**	**0**	**0**	**0**	**10.003**	**0**	**6.255**	**0.815**	**0.0025**	
logged river (H)	2.505	60	1.25	0	0	2.5	0	7.505	0	0	
logged river (S)	7.5	55	0	0	0	0.5	0	6.25	0.005	0	
Logged river	**5.0025**	**57.5**	**0.625**	**0**	**0**	**1.5**	**0**	**6.8775**	**0.0025**	**0**	
River	***4.3763***	***43.75***	***0.313***	***0***	***0***	***5.7513***	***0***	***6.5663***	***0.4088***	***0.001***	
forest lake (C)	0	5	0	0	0	10	1	0	0.01	18.75	
forest lake (E)	0	5	0	0	0	15	30	0.01	0.01	26.75	
Forest lake	**0**	**5**	**0**	**0**	**0**	**12.5**	**15.5**	**0.005**	**0.01**	**22.75**	
logged lake (D)	0.01	0	0	0	0	30	2	0	0	45	
logged lake (F)	0	0.01	0.01	0	0	5	0	0.01	0.01	64	
Logged lake	**0.005**	**0.005**	**0.005**	**0**	**0**	**17.5**	**1**	**0.005**	**0.005**	**54.5**	
Lake	***0.0025***	***2.5025***	***0.003***	***0***	***0***	***15***	***8.25***	***0.005***	***0.0075***	***38.63***	
Atleo River (A)	0	0	0	10.875	.01	0	0	0	0	0	
Bedingfield (B)	0	0	0	33.5	4.125	0	0	0	0	0	
Estuary	***0***	***0***	***0***	***22.19***	***2.063***	***0***	***0***	***0***	***0***	***0***	

* These plants also have edible fruit and berries..

Appendix H: Coefficients of Variance of Percent Cover of Culturally Significant Plants

Area	Pacific crab-apple	Bunch berry	Stink currant	Hima-layan black-berry	Black rasp-berry	Trailing black-berry	Red elder-berry	Red huckle-berry	Alaskan blue-berry	Oval-leaved blue-berry	Blue-berry sp.
HA forest (K)	0	0	0	0	0	0	0	56.7	133	0	146
HA forest (L)	0	0	0	0	0	0	173	88	173	0	100
HA forest	**0**	**0**	**0**	**0**	**0**	**0**	**245**	**64.8**	**135**	**0**	**161**
CH forest (N)	0	132	0	0	0	0	0	34.7	333	0	150
CH forest (V)	0	333	0	0	0	0	0	176	143	333	43.3
CH forest	**0**	**200**	**0**	**0**	**0**	**0**	**0**	**89.3**	**200**	**110**	**82.4**
Forest	***0***	***288***	***0***	***0***	***0***	***0***	***345***	***91.9***	***210***	***181***	***160***
1979-81 (I)	0	0	0	0	0	0	0	433	173	173	86.7
1979-81 (J)	0	0	0	0	0	0	0	0	0	174	174
1979-81 (P)	0	0	333	0	333	174	173	88.2	0	0	0
1979-81 (T)	0	0	0	0	0	0	0	34.7	173	333	173
1979-81	**0**	**0**	**0**	**0**	**0**	**349**	**347**	**67.4**	**249**	**289**	**183**
1985-86 (M)	0	173	0	133	0	0	174	43.3	143	0	85.1
1985-86 (U)	0	0	0	333	0	173	143	86.5	0	0	0
1985-86	**0**	**245**	**0**	**200**	**0**	**245**	**241**	**61.2**	**333**	**0**	**155**
1993-94 (O)	0	0	0	0	0	0	0	84.6	333	333	166
1993-94 (Q)	0	0	0	150	173	86.5	333	91.5	0	0	0
1993-94	**0**	**0**	**0**	**219**	**244**	**155**	**0**	**85.4**	**0**	**0**	**241**
Clearcut	***0***	***490***	***0***	***316***	***488***	***261***	***443***	***71.2***	***358***	***410***	***238***
Seektukis	***400***	***0***	***200***	***0***	***0***	***0***	***115***	***199***	***200***	***0***	***200***
forest river (G)	0	0	200	0	0	0	200	97.9	200	0	70.7
forest river (R)	0	0	141	0	0	0	0	70.7	0	0	141
Forest River	**0**	**0**	**199**	**0**	**0**	**0**	**400**	**77.7**	**133**	**0**	**85.9**
logged river (H)	0	0	0	0	0	0	200	142	0	0	0
logged river (S)	0	0	0	0	0	0	0	0	0	200	200
Logged River	**0**	**0**	**46.2**	**0**	**0**	**0**	**13.3**	**95.6**	**0**	**400**	**400**
River	***0***	***0***	***113***	***0***	***0***	***0***	***200***	***115***	***250***	***0***	***155***
Forest lake	**0**	**200**	**0**	**0**	**0**	**0**	**0**	**141**	**0**	**142**	**94.3**
Logged lake	**32.6**	**200**	**0**	**0**	**0**	**0**	**0**	**141**	**141**	**141**	**0**
Lake	***49.7***	***200***	***0***	***0***	***0***	***0***	***0***	***115***	***200***	***128***	***50***
Atleo River (A)	0	0	0	0	0	0	0	0	0	0	0
Bedingfield (B)	0	0	0	0	0	0	0	0	0	0	0
Estuary	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***

Area	Thimble-berry	Salmon-berry	Horse-tail	Silver-weed	Spring-bank Clover	Salal	Ever-green huckle-berry	Sword fern	Deer fern	Basket sedge	Cat-tail
HA forest (K)	0	132	0	0	0	174	85.7	173	57.0	0	0
HA forest (L)	0	90.0	0	0	0	69.2	0	100	35.5	333	0
HA forest	**0**	**142**	**0**	**0**	**0**	**135.8**	**167**	**118**	**52.6**	**0**	**0**
CH forest (N)	0	0	0	0	0	0	74.2	0	34.8	0	0
CH forest (V)	333	132.5	0	0	0	48.4	86.5	172	53.7	0	0
CH forest	**0**	**44.3**	**0**	**0**	**0**	**29.5**	**125**	**244**	**49.7**	**0**	**0**
Forest	***0***	***147***	***0***	***0***	***0***	***84.9***	***198***	***159***	***74.7***	***0***	***0***
1979-81 (I)	169	81.8	0	0	0	40.7	170	161	69.4	333	0
1979-81 (J)	0	0	0	0	0	17.6	86.6	172	74.7	0	0
1979-81 (P)	69.2	67.5	0	0	0	84.6	0	34.6	55.5	0	0
1979-81 (T)	116	0	0	0	0	20.3	200	172	80.4	0	0
1979-81	**193**	**94.8**	**0**	**0**	**0**	**63.3**	**220**	**141**	**67.9**	**0**	**0**
1985-86 (M)	88.2	43.3	0	0	0	72.9	173	173	77.3	173	333
1985-86 (U)	0	0	0	0	0	20.3	173	143	90.1	0	0
1985-86	**70.4**	**51.7**	**0**	**0**	**0**	**45.0**	**219**	**244**	**94.6**	**245**	**0**
1993-94 (O)	0	149.8	0	0	0	24.8	172	0	8.6	0	0
1993-94 (Q)	165	0	0	0	0	0	0	87.6	142	0	0
1993-94	**235**	**71.8**	**0**	**0**	**0**	**18.8**	**244**	**156**	**78.1**	**0**	**0**
Clearcut	***157***	***88.5***	***0***	***0***	***0***	***74.1***	***222***	***183***	***81.6***	***489***	***0***
Seektukis	***400***	***123.9***	***0***	***0***	***0***	***95.5***	***0***	***191***	***0***	***0***	***0***
forest river (G)	0	47.2	0	0	0	141	0	0	136	0	0
forest river (R)	141	47.0	0	0	0	141	0	28.3		200	0
Forest River	**200**	**99.0**	**0**	**0**	**0**	**141**	**0**	**126**	**204**	**400**	**0**
logged river (H)	141	23.5	142	0	0	141	0	141		0	0
logged river (S)	141	0	0	0	0	142	0	28.3		0	0
Logged River	**141**	**15.1**	**200**	**0**	**0**	**159**	**0**	**90.8**		**0**	**0**
River	***155***	***57.1***	***281***	***0***	***0***	***181***	***0***	***97.5***	***357***	***0***	***0***
Forest lake	0	0	0	0	0	28.3	70.7	200	0	24.8	0
Logged lake	200	200	200	0	0	101	68.3	200		24.6	0
Lake	***400***	***115***	***333***	***0***	***0***	***72.0***	***94.6***	***200***	***0***	***52.2***	***0***
Atleo River (A)	0	0	0	53.6	0	0	0	0		0	0
Bedingfield (B)	0	0	0	1.04	30.0	0	0	0		0	0
Estuary	***0***	***0***	***0***	***60.7***	***121***	***0***	***0***	***0***		***0***	***0***

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Publications

Craig, J. 1994. *Bat Research in the West Arm Demonstration Forest.* B.C. Ministry of Forests, Nelson, BC. Research Summary RS-013.

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"Nature was the Provider": Traditional Ecological Knowledge and Inventory of Culturally Significant Plants and Habitats in the Atleo River Watershed, Ahousaht Territory, Clayoquot Sound

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July 22, 1998