"*HISHUK ISH TS'AWALK* - ALL THINGS ARE ONE": TRADITIONAL ECOLOGICAL KNOWLEDGE AND FOREST PRACTICES IN AHOUSAHT FIRST NATION'S TRADITIONAL TERRITORY, CLAYOQUOT SOUND, BC.

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ABSTRACT

"*Hishuk ish ts'awalk* - All Things are One": Traditional Ecological Knowledge and Forest Practices in Ahousaht First Nation's Traditional Territory, Clayoquot Sound, BC.

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This thesis investigates the significance of traditional ecological knowledge to forest use and management in Clayoquot Sound BC, with specific reference to the traditional territory of the Ahousaht First Nation (one of the Nuu-Chah-Nulth First Nations on the west coast of Vancouver Island). My goal is to develop an understanding of the ways in which the Ahousaht have traditionally used the forest, and to consider how traditional knowledge and practices might provide a basis for sustainable forest use within the context of current trends in resource management in the area. I give particular attention to the potential for ecological restoration in the area, and how traditional Ahousaht knowledge might inform restoration plans. Other topics discussed include: research methods and ethical issues, the environmental history of Clayoquot Sound, and oral histories of the Atleo River Valley (the site of our fieldwork in the summer of 1996). In addition, I describe the current status of forest ecosystems in the Atleo River Valley, including habitat descriptions and lists of species present in the different habitats, as well as Ahousaht knowledge and observations concerning these habitats. Throughout the thesis, information from a variety of different sources is integrated including: academic literature, archival materials, field data and observations, and personal interviews. Based on this information, I suggest specific recommendations for "ecocultural restoration" in the Atleo River Valley. By reflecting on the intersection of history, culture, and ecology in Ahousaht traditional territory, I hope to show that indeed "all things are one;" that the past can not be separated from the present or the future, and that facts, values, the scientific, and the spiritual, all make up the relationships that bind us together as living beings to one another, and to the places we inhabit.

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Chapter 1
Introduction:
"Well, hopefully this is going to work."

"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. . . we want our forests back, and we're going to get them back. 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. . . 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." Clifford Atleo (1996)

"Well, hopefully this is going to work, what we're doing today to help and sit down with the governments and then 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 (1996)

Introduction

During the course of our fieldwork in the summer of 1996, blackbear sightings were a regular occurrence. However, I remember with particular clarity the first time we encountered one of the big, black four-leggeds. We had just been dropped off by boat in the Atleo River Valley, and were about to start an exploratory walk of the area. We rounded the first bend in the logging road, and there in front of us was a blackbear investigating some road-side berry bushes. Well, we made lots of noise yelling and banging rocks together, until the bear noticed us and plunged into the bush. She stopped halfway up a small hill, and stood watching as we passed into the valley. I remember that my palms were tingling as we laughed nervously about the auspicious beginning to our summer fieldwork.

Later that week, we were talking to one of the project supervisors, Dr. Richard Atleo (Chief Umeek of the Ahousaht First Nation) and we described the incident to him; how we had been frightened and made lots of noise until the bear went away. Chief Umeek admonished us, saying that instead of yelling and scaring the bear away, we should have greeted the bear respectfully, and thanked her for sharing the valley with us. I was humbled by this advice, and vowed that the next time I encountered a bear in the valley I would approach her with respect and friendship rather than with fear. Chief Umeek warned us, however, that communication might prove to be difficult, since the bears in that valley only understand the Ahousaht language.

* * *

This thesis investigates the relationship between traditional ecological knowledge and forest practices[1] in Clayoquot Sound, British Columbia, focusing specifically on the traditional territory of the Ahousaht First Nation. My goal is to develop an understanding of the ways in which the Ahousaht have traditionally interacted with the forest, and to explore how traditional knowledge and practices can provide the basis for sustainable forest use. In doing so, I will give particular attention to the potential for ecological restoration in Ahousaht traditional territory, and to how Ahousaht traditional knowledge can inform restoration plans. The primary research for this thesis was carried out in the summer of 1996 as part of a project funded by the Long Beach Model Forest based in Ucluelet, BC. This summer project, supervised by Dr. Nancy Turner and Dr. Richard Atleo[2], was carried out by myself, Juliet Craig[3], and four Ahousaht research assistants: Travis Thomas, Daphne Frank, Greg Hayes, and Paul Frank Jr. (see Appendix A).

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[1]Following Hammond (1993:11), I am using the term "forest practices" to refer to "any human activities that affect the forest."

[2]Throughout this thesis, I refer to Dr. Richard Atleo/Chief Umeek by whichever title is appropriate in each context (as academic supervisor or hereditary Ahousaht chief), as is his stated preference (pers. comm.).

[3]Juliet Craig is a graduate student at the University of Victoria. Her M.Sc. thesis (in progress) is also based on our summer research project, and should be read in conjunction with this thesis.

In this introductory chapter, I will outline the larger political and social context which frames the information discussed in the main body of the thesis. Specifically, I will provide some background information on events in Clayoquot Sound which precipitated the creation of the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound (hereafter the Scientific Panel), which in turn provided the impetus for this thesis. I will also consider the implications of treaty negotiations between Nuu-Chah-Nulth First Nations (of which Ahousaht is one First Nation) and the governments of British Columbia and Canada with respect to resource management issues in Clayoquot Sound. This will include a discussion of the establishment of the Interim Measures Agreement of 1994, and the subsequent creation of the Central Region Board which currently oversees resource management in the Clayoquot Sound area. Once this broad, contextual framework is established, I will discuss traditional ecological knowledge as the key concept around which this thesis revolves. Finally, in the summary and prospectus, I will outline the topics which will be addressed in the main body of the thesis.

Clayoquot Sound: People, Place and Politics

Clayoquot Sound is situated on the rain-drenched west coast of Vancouver Island (see Figure 1.1). Clayoquot Sound extends over approximately 350 000 ha, of which the total land mass is 262 600 ha. The entire area of Clayoquot Sound lies within the traditional territory of five of the fourteen Nuu-Chah-Nulth First Nations - the original human inhabitants of the area.[4]

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[4]These five First Nations represent the amalgamation of approximately eleven Nuu-Chah Nulth groups which traditionally occupied the Clayoquot Sound area (Scientific Panel 1995a:2). See Drucker (1951), Arima (1983) and Bouchard and Kennedy (1990) for discussion of these different groups and their relationships with one another.

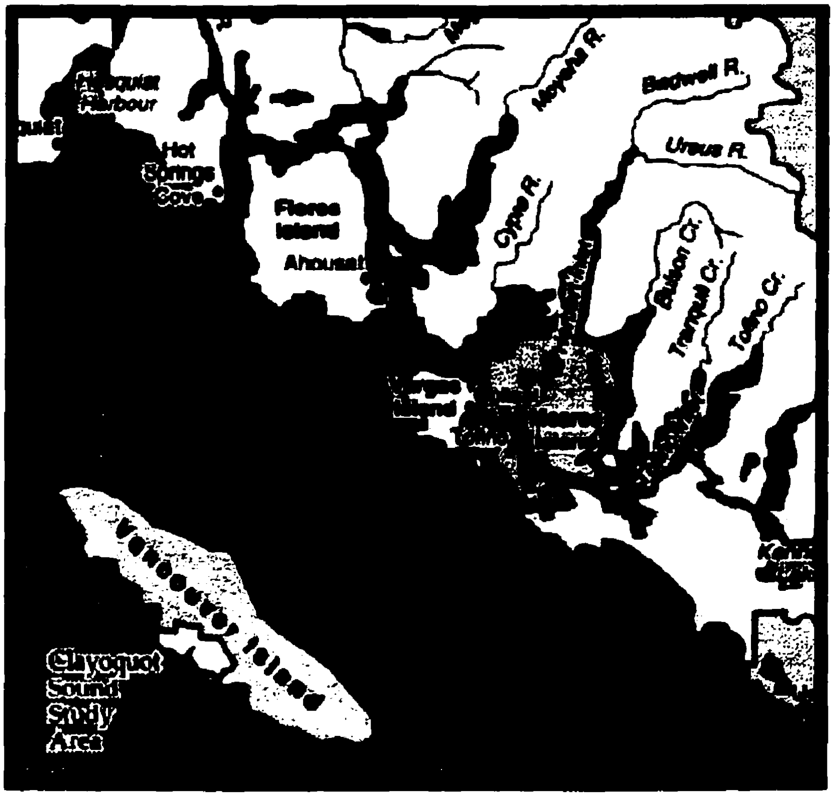

Figure 1.1: Map of Clayoquot Sound. For our summer fieldwork in 1996 we were based in the community of Ahousaht on Flores Island.

Source: Province of British Columbia (April 1993). *Clayoquot Sound Land Use Decision: Key Elements.*

The five First Nations with territories in Clayoquot Sound are: Tla-o-qui-aht First Nations, Ahousaht First Nation,[5] Hesquiaht First Nation, Toquaht First Nation, and Ucluelet First Nation. These First Nations have occupied Clayoquot Sound since time immemorial, and have made use of the diverse resources available in the forests and oceans for both domestic purposes and for trade. In the twentieth century, First Nations have been involved in commercial marine mammal hunting, logging, and fishing, and more recently have entered the field of eco-tourism. Land claims for all Nuu-Chah-Nulth First Nations, including the five in the Central Clayoquot Sound Region, are currently under negotiation with the governments of Canada and British Columbia (Treaty News 1996).

The physical features which make up the environment of Clayoquot Sound include: ocean, islands, inlets, beaches, estuaries, mountains, and temperate rainforest ecosystems. Clayoquot Sound, which includes Pacific Rim National Park and Long Beach, is a popular tourist destination. Some of the recreational activities which form the basis of the tourism industry include: kayaking, whale-watching, bird-watching, hiking, camping, and sports fishing (Province of British Columbia 1993). Eco-tourism ventures, such as the Ahousaht Walk the Wild Side Trail on Flores Island (co-sponsored by the Ahousaht First Nation and Western Canada Wilderness Committee), and guided tours of Meares Island, have begun to make an important contribution to the regional economy. Environmental organizations are strongly represented in Clayoquot Sound by local groups such as the Friends of Clayoquot Sound (FOCS), regional

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[5]The Ahousaht First Nation (considered the Ahousaht "band" under the terms of the Indian Act) is comprised on the Ahousaht, Manhousaht, and Keltsmaht groups which amalgamated in historic times (see Chapter 4). For this reason, the designation of "Ahousaht First Nations" is sometimes used to reflect this plurality. For purposes of clarity, in this thesis I refer to a single Ahousaht First Nation.

organizations such as the Western Canada Wilderness Committee, and national groups such as Greenpeace Canada. Support for the environmental movement comes from local, regional, national, and international communities.

In addition to tourism and environmental interests, Clayoquot Sound is also the focus of major primary resource industries, most notably commercial fishing and logging. These activities have been a vital source of employment for the region since the first sawmill was established in Port Alberni in 1860. The regional centres of the resource industries are Port Alberni and Ucluelet. MacMillan Bloedel holds the majority of the timber licences for the Clayoquot Sound area (including the contentious Tree Farm Licence 44), although other large, integrated timber companies such as Interfor and Fletcher Challenge have also operated in the area. According to a study prepared for the Steering Committee of the Clayoquot Sound Sustainable Development Strategy (Sterling Wood Group Inc. 1991), the timber sector was the largest employer in the Alberni-Clayoquot Region in 1991. It was estimated at the time that 4977 people were directly employed by the sector, 4272 of whom lived within the region. In addition, it was calculated that approximately 0.933 indirect jobs are created for every direct job in the timber sector, giving a total of 8258 direct and indirect jobs for the region.

It is important to recognize, however, that this is a time of transition for the timber industry, precipitated by both political processes and shifts in the market for timber products. Changes in the regulation of forest practices as embodied in the *Forest Practices Code Act* of 1994 are altering the structures and responsibilities of tenure and licence holders. In addition, there has been a general decline in demand for commodity wood products, particularly in the case of plywood; and a concurrent increase in demand for semi-manufactured and value-added solid wood products which has influenced economic activities in the region (Sterling Wood Group 1991).

Clayoquot Sound first entered the public eye when controversy erupted over logging activities on Meares Island (*Wah Nah Jus/Hilth Hoo Is*). This island provides the water source for the District of Tofino, and lies in the traditional territories of both the Ahousaht and Tla-o-qui-aht First Nations. MacMillan Bloedel holds the Timber Licence (#T0140) for this island which has been declared a Tribal Park by the Ahousaht and Tla-o-qui-aht First Nations. Following protests of both Aboriginal and non-Aboriginal residents of Clayoquot Sound in the early 1980s, MacMillan Bloedel was granted an injunction against protesters in 1984. This decision, however, was overturned the following year when the Nuu-Chah-Nulth were granted an injunction of their own to halt logging activities on Meares Island while their Aboriginal rights to the land were being argued in court. This case was brought before the Supreme Court of British Columbia in 1991; however, it is currently adjourned in hopes that it will be resolved through negotiations as part of the treaty process (Notzke 1994).

Since then, controversy has escalated with the BC government's Clayoquot Sound Land Use Decision which divided the entire land mass of Clayoquot Sound into Protected Areas, Special Management Areas, and General Integrated Management Areas. Logging activities are allowed in both the Special and General Integrated Management Areas. This decision, which bypassed the Commission on Resource and the Environment (CORE) process, was announced on April 13, 1993. The Clayoquot Sound Land Use Dicision sparked widespread protest and eventually led to the arrest of over 800 people for civil disobedience in blocking logging roads and hindering access to the old-growth areas (Ingram 1994).

The politics of the Clayoquot Sound region have been characterized by both conflict and compromise. Protests, civil disobedience, litigation, and negotiation have all played a part in the controversy over logging activities in Clayoquot Sound. Although generally regarded as unsuccessful, ventures in negotiated decision-making such as the Clayoquot Sound Sustainable Development Task Force perhaps paved the way for present initiatives such as the Interim Measures Agreement, and the Central Region Board. Much has been written on the politics and dimensions of the Clayoquot Sound logging debate (Burney 1996; Berman *et al.* 1994). Table 1.1 provides a brief chronology of the key events (adapted from MacKinnon 1994; Ingram 1994) which will serve as a backdrop to this thesis research. This series of events, leading up to the decision to implement the recommendations of the Scientific Panel and the signing of a framework agreement between the Nuu-Chah-Nulth Tribal Council and the governments of BC and Canada, has brought about changes in the dynamics of resource management in the Clayoquot Sound region. These events are taking place within the larger contexts of international, national, and regional initiatives relating to the environment and land-use.

The Big Picture: Global, National, and Regional Contexts

As recognized in the Scientific Panel reports, there is a larger global context to forest practices in Clayoquot Sound. Of particular relevance is the UN Convention on Biological Diversity, which was signed and ratified in 1993, with Canada as one of the original signatories (Ingram 1994; Scientific Panel 1995c). Signing this convention confers responsibilities on the Government of Canada to abide by the principles of the convention, and to ensure that internal legislation is consistent with these principles in all jurisdictions within Canada. Specifically, this

Table 1.1: Chronology of Key Events in Clayoquot Sound

1905-1908: Timber rights on the west coast of Vancouver Island, including Clayoquot Sound are initially staked by early timber "entrepeneurs" under the new system of issuing transferable twenty-one year licences.

1955: Forest Management Licences 20 and 21 are awarded, these would later form MacMillan Bloedel's tree farm licence (TFL) 44 which is currently the main timber harvesting unit in the area.

1971: Road to Tofino (main non-Native community) is paved and Pacific Rim National Park is created.

1979: Friends of Clayoquot Sound (local environmental group composed mostly of Tofino residents) is formed in response to plans for logging on Meares Island.

1984: MacMillan Bloedel amalgamates its Tofino and Port Alberni tree farms into TFL 44.

1991: New Democrat Party (NDP) forms the new provincial government with Michael Harcourt as Premier, leading to a reversal of the Province of BC's position of not recognizing Aboriginal title.

1993: April 13, the Government of BC announces the "Clayoquot Land Use Decision" whereby the 350,000 ha land mass of Clayoquot Sound is divided into Protected Areas, Special Management Areas, and General Integrated Management Areas (the latter two allow logging activity) sparking widespread protest.

1993: June-September, "Clayoquot Summer," continual protests against logging activities during which over 800 people are arrested for civil disobediance, mostly for participating in blockades on logging roads.

1993: October, BC Government establishes the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound. The mandate of this panel is to "develop world-class standards for sustainable forest management [in Clayoquot Sound] by combining traditional [Nuu-Chah-Nulth] and scientific knowledge," (Scientific Panel 1995a:3).

1994: March, signing of the Interim Measures Agreement between Her Majesty the Queen in Right of the Province of British Columbia and the HawiiH of the Tla-o-qui-aht First Nations, the Ahousaht First Nation, the Hesquiaht First Nation, the Toquaht First Nation, and the Ucluelet First Nation. This provides the foundation for a co-management agreement between the BC government and the Nuu-Chah-Nulth.

1995: Spring, the Scientific Panel releases its final reports containing over 120 recommendations relating to forest practices in Clayoquot Sound. The government of BC announces that it will adopt all the recommendations contained in the Scientific Panel reports.

1996: April, signing of the Interim Measures Extension Agreement which extends and reaffirms the mandate of the original agreement for another two years.

1996: March 27, a framework agreement is signed by the Nuu-Chah-Nulth Tribal Council and the governments of BC and Canada, providing the foundation for treaty negotiations which will take place over the next few years.

convention calls for the identification and monitoring of biological diversity, along with measures to ensure the *in situ* conservation of that diversity. Other international agreements of relevance to forest practices in Clayoquot Sound include the *Framework Convention on Climate Change*, *Agenda 21*, and *Guiding Principles on Forests*. These documents emerged from the United Nations Conference on Environment and Development held in Rio de Janeiro, Brazil in 1992. *Agenda 21* is particularly relevant in that it recognizes the links between indigenous peoples and resource development, and the contribution that traditional ecological knowledge can make to ecologically responsible resource use and management.

One example of an international program which reflects the increasing attention given to issues of sustainable development and conservation is the UNESCO Man and the Biosphere Project (MAB). The International Biosphere Reserve Program recognizes areas which balance sustainable regional development with conservation efforts and scientific research. Since the program was launched in 1976, 276 Biosphere Reserves have been recognized world-wide, six of which are located in Canada. The structure of a Biosphere Reserve consists of a core area which is relatively undisturbed and which contains significant ecological features; a buffer area where low-impact human activity (including research, tourism, and traditional uses) may take place; and a zone of co-operation within which human activity, including resource extraction, is in voluntary compliance with biosphere objectives.

Biosphere Reserves differ from parks and other "protected" areas because they encourage some forms of resource use, particularly if directed by local communities; and they take into account the presence and activities of indigenous peoples. It is perhaps for this reason that a Biosphere Reserve designation for Clayoquot Sound is currently being pursued. Environmental groups such as the Clayoquot Biosphere Reserve Project (a local group formed in 1991) and the Western Canada Wilderness Committee have been actively researching and promoting the possibility of such a designation. In addition, following the government of BC's Land Use Decision of 1993, the Commission on Resources and Environment (CORE) recommended the pursuit of a Biosphere Reserve designation for Clayoquot Sound. The government of BC has publicly supported this recommendation (Western Canada Wilderness Committee 1996; Province of BC 1993).

On a national level, there are initiatives with similar goals of fostering sustainable regional development and conservation. One such initiative is the federally funded Model Forest Program. There are currently 10 Model Forests across Canada; one of which is the Long Beach Model Forest based in Clayoquot Sound. This program is designed to research and implement projects which encourage ecologically responsible resource use, with a strong emphasis on training and education, and with the involvement of local communities. It was through this program that we obtained funding to conduct our research in the summer of 1996.

There are also a number of regional initiatives which are significantly influencing resource use in Clayoquot Sound. Of primary importance is the Forest Practices Code. The *Forest Practices Code Act* was tabled in the provincial legislature in July 1994; it came into effect on June 15, 1995. This Code brings together 20 provincial statutes and over 700 policies and 300 guidelines which previously guided commercial forest and range operations (Fenger nd). It consolidates these regulations and guidelines and is based on evolving concepts of biodiversity conservation and sustainable (as opposed to sustained yield) forest use. The Act provides for a two-year transition period during which all existing and new licenses are brought into full compliance with the code. Part of this transition period is the *Cutblock and Road Review Regulation*, which reviews all previously approved silvicultural plans and cutting permits. If necessary, the review can require amendments to the plans in order to reflect the criteria of the Forest Practices Code (Province of BC nd).

Some of the changes brought about by the Forest Practices Code include a higher level of retention of old-growth and mature forests within areas designated for commercial harvesting, and increased attention to biodiversity and the concept of environmental stewardship (Fenger nd). In addition, a new body, Forest Renewal British Columbia (FRBC), has been established to develop a forest renewal plan for BC by funding research projects and training initiatives. The funds for FRBC come out of the increased stumpage fees (royalties on timber paid to the crown).

Aboriginal Rights and Resource Management: Recent Events and Initiatives

In addition to these international, national, and regional processes and initiatives, increasing recognition of Aboriginal rights and the progression of treaty negotiations have broadened the parameters in which resource use decisions in Clayoquot Sound are made. The Nuu-Chah-Nulth Tribal Council launched a comprehensive land claim in 1980; however, it was not until the election of the NDP government in 1991 that the province formally recognized the existence of Aboriginal title in BC, and the inherent rights of Aboriginal peoples to self-government. This effectively reversed the province's historic position of denying the applicability of the Royal Proclamation 1763 to British Columbia, and refusing to participate in treaty negotiations. The Treaty Commission of British Columbia began accepting statements of intent for treaty and land claim negotiations in December, 1993. Treaty negotiations between the

Nuu-Chah-Nulth Tribal Council (representing the interests of the fourteen Nuu-Chah-Nulth First Nations) and the governments of BC and Canada are currently underway. A framework agreement was signed on March 27, 1996, and negotiations are continuing to work towards the establishment of an agreement in principle. The anticipated time frame for reaching this goal is approximately two years from the signing of the framework agreement (Central Region Board 1996).

The Clayoquot Sound Land Use decision of 1993 was ostensibly made without prejudice to Aboriginal rights and the treaty process. However, logging activities as sanctioned in the decision continue to impact the health and integrity of traditional territories under negotiation. The British Columbia Claims Task Force Report (1991) recommends that where interests are being affected that could undermine the treaty process, interim measures agreements should be established to protect those interests. On the basis of this recommendation, the province entered into government-to-government talks with the Nuu-Chah-Nulth Tribal Council following the announcement of the Clayoquot Sound Land Use Decision; the result was the Interim Measures Agreement which was signed and ratified on March 19, 1994. The agreement is between Her Majesty the Queen (represented by the Government of British Columbia) and the HawiiH (Chiefs) representing the Central Region Nuu-Chah-Nulth Tribes (including the Tla-o-qui-aht First Nations, the Ahousaht First Nation, the Hesquiaht First Nation, the Toquaht First Nation, and the Ucluelet First Nation). The Interim Measures Agreement was renegotiated and extended by the signing of the Interim Measures Extension Agreement of April 1996. The Interim Measures Agreement provides a foundation for co-management of resources in the Clayoquot Sound area, and serves as a bridging mechanism to the completion of treaty negotiations.

Clifford Atleo (1996), Chief Treaty Negotiator for the Ahousaht First Nation, described the Interim Measures Agreement in the following way:

> We envision the Central Region Interim Measures Agreement as a stepping stone to the Treaty process because that's what interim measures [are] designed for. Until a treaty is completed, we have to have the means to be able to address First Nations' interest. And the beauty of the Interim Measures Agreement is that it's not just our interests, for the first time anywhere in the province, we've actually got community-based management involved.

Specifically, the Interim Measures Agreement addresses three key areas: the establishment of a Co-operative Forest Management Area (including Clayoquot River and Flores Island), economic development opportunities for Nuu-Chah-Nulth First Nations, and the establishment of a joint management process for resources and land use planning in the Clayoquot Sound area. The latter process is facilitated and directed by the Central Region Board (British Columbia and the HawiiH of Clayoquot Sound 1994).

Following the signing of the Interim Measures Agreement in 1994, the Clayoquot Sound Central Region Board was created in order to provide the structure for joint-management of resources between the government of BC and the Central Region Nuu-Chah-Nulth First Nations. Specifically, the Central Region Board is charged with reviewing any application, permit, decision, report, or recommendation concerning land use and resource management in Clayoquot Sound. In addition, the Board has been mandated to facilitate the implementation of the recommendations of the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound. The Central Region Board is comprised of ten members and two co-chairs. Board members include five representatives from First Nations, and five representatives from local communities appointed by the BC government. The Central Region Board (1996) operates under the following mission statement:

The Mission of the CRB is to manage lands and resources in Clayoquot Sound, prior to the conclusion of a treaty, in a manner that:

- provides opportunities for First Nations consistent with aboriginal resource uses and heritage, and considers options for treaty settlement
- conserves resources in Clayoquot Sound and promotes resource use that supports sustainability, economic diversification and ecological integrity
- encourages dialogue within and between communities and reconciles diverse interests

Clifford Atleo described the creation of the Central Region Board and its underlying rationale:

> No law accommodates our interest. We had to create a model that does accommodate our interest. . . 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. . . we like that concept. In fact, we supported it very strongly. And in our negotiations we said that because no law exists that considers our interests, we have to create something where all the planning process flows through the Central Region Board. Then and only then can our interests be considered because we get the opportunity to review whatever plan, be it tourism, scenic corridors, all of those things. The Science Panel recommendations even have to go through the Central Region Board.

The Interim Measures Agreement, Interim Measures Extension Agreement, and initiatives such as the Central Region Board will be important factors in mediating resource management in Clayoquot Sound prior to the completion of treaty negotiations. In the interim, they will provide a forum through which First Nations can participate in resource management decisions and attempt to ensure that their interests are not compromised through "talk and log" practices which have occurred in the past.

Scientific Panel for Sustainable Forest Practices in Clayoquot Sound

This thesis is both precipitated from and inspired by the work that was carried out by the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound. The Scientific Panel was established by Premier Mike Harcourt on October 22, 1993 in response to recommendations made by the Commission on Resources and Environment (CORE). The independent Scientific Panel, consisting of nineteen experts from both Nuu-Chah-Nulth and academic communities, was appointed to research and make recommendations on how forest practices should be carried out in Clayoquot Sound. The mandate of the Panel was to "develop world-class standards for sustainable forest management [in Clayoquot Sound] by combining traditional [Nuu-Chah-Nulth] and scientific knowledge," (Scientific Panel 1995a:3).

Both Dr. Richard Atleo (hereditary Chief Umeek) and Dr. Nancy Turner who co-supervised the summer research project on which this thesis is based, were members of the Scientific Panel. Dr. Atleo served as co-chair with Dr. Fred Bunnell, and Dr. Nancy Turner served as the panel expert in the area of ethnobotany. Both Dr. Atleo and Dr. Turner provided invaluable advice and support throughout the course of our summer research. Dr. Atleo (1996) described to us some of the ways in which First Nations perspectives were incorporated into the work of the Scientific Panel; particularly in developing the protocol by which the Panel accomplished its task, and in providing insights on forest use:

> The protocol that we developed for [the Scientific Panel]. . . is [the Nuu-Chah-Nulth] way of making decisions. And then the knowledge that our elders had, some of which I've talked to you about already, the principle of paying respect to the trees because they are living entities, provided a different kind of perspective about the forest than some of the scientists'.

Stanley Sam was one of the Ahousaht/Tla-o-qui-aht Elders appointed to the Scientific Panel, along with the late Roy Haiyupis (Ahousaht Elder) and Ernest Lawrence Paul (Hesquiaht Elder). We were fortunate in being able to speak with Stanley Sam as part of our summer research project. He shared with us many of the histories of the Ahousaht First Nation and their traditional territories (see Chapter 4). Stanley Sam (1996) also spoke to us of his experiences in serving on the Panel, and how he prepared for this task:

> I did the chants and I prayed to the Creator to guide me through the time with these people [on the Scientific Panel]. . . and I prayed for the scientists to have success. . . I knew it was going to be a great heavy work, what we were going through.

The Scientific Panel is notable for its attempt to include both Western "scientific" and Nuu-Chah-Nulth "traditional" knowledge in its recommendations. Of the five reports released, one focuses specifically on First Nations' perspectives relating to forest practices and includes twenty-seven recommendations and an extensive appendix detailing traditional Nuu-Chah-Nulth resource management activities and place names (Scientific Panel 1995a; Scientific Panel 1995b). The recommendations centre around the inclusion of traditional ecological knowledge in ecological planning, inventory, monitoring, and research. The Scientific Panel (1995a:ix) premises its recommendations on the belief that, "Clayoquot Sound can become a model for including traditional ecological knowledge and interests of indigenous people in sustainable ecosystem management." According to Dr. Richard Atleo, the key to this process is respect:

> I have consistently maintained that the two systems [scientific and traditional knowledge] can complement one another. And that's my personal view of it. . . if people who espouse either system respect each other's system, then I think it can work very well.

This belief in the importance of including and respecting First Nations' traditional knowledge in any ecosystem management plans is the underlying rationale for this thesis.

Key Concepts: Traditional Ecological Knowledge and Western Science

This thesis both draws from and contributes to the growing body of literature on traditional ecological knowledge.[6] The literature on traditional ecological knowledge includes work by such authors as Freeman and Carbyn (1988), Fast and Berkes (1994), Feit (1988), and Johnson (1992). These studies have tended to focus on the documentation of traditional ecological knowledge for the purpose of incorporating it into resource management systems. In this thesis, I take a slightly different approach by looking at the ways in which traditional ecological knowledge can be applied to the non-traditional practice of ecosystem restoration. This is important in demonstrating the flexibility and adaptability of "traditional" knowledge systems. There is a published literature on traditional ecological knowledge specific to the Clayoquot Sound area (Turner *et al.* 1976, 1983; Turner and Efrat 1982; Bouchard and Kennedy 1990; Scientific Panel 1995b) which provides a solid foundation for this thesis.

This thesis is predicated on the idea that while the Western science of ecology can certainly contribute to the understanding of natural systems in general, traditional ecological knowledge provides a complementary detailed understanding of and long-term experience with a specific area. According to Johnson (1992:4), "Traditional environmental knowledge, or TEK, can generally be defined as a body of knowledge built up by a group of people through generations of living in close contact with nature. It includes a system of classification, a set of empirical observations about the local environment, and a system of management that governs resource

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[6]Although this thesis focuses on First Nations' traditional ecological knowledge, it is also important to note that traditional ecological knowledge may also be held by non-Aboriginal groups who have spent considerable time living in close contact with the land. This knowledge is based, of course, on different cultural contexts and values.

use." It is important to note that "traditional" does not imply "static" (Johnson 1993:100). Traditional ecological knowledge is a cumulative and constantly evolving system of knowledge which may be revised and exercised in different ways. In order to avoid the impression of a finite and unchanging mass of information, I will approach traditional ecological knowledge as a *system* of knowledge rather than a *body* of knowledge. It is within this system that relationships between people and the environment are defined and interaction with that environment is regulated.

Traditional ecological knowledge includes not only specific ecological understandings and practices, but also an ethic or philosophy which rests on specific cultural values (Berkes 1988:7). This knowledge is characteristically transmitted across generations through oral traditions and is often expressed through stories (Feit 1988:72). Furthermore, traditional ecological knowledge tends to be qualitative in nature, holistic in its outlook, and often has a spiritual or moral context. In contrast with traditional knowledge systems, Western science has been described as reductionist, analytical, quantitative, synchronic, and abstracted from social context (Johnson 1992).

These are very broad characteristics which may be useful as a general framework for understanding. However, it is critical to recognize that traditional ecological knowledge takes different forms in specific cultural contexts and, similarly, that there are many different schools of thought which operate under the rubric of "Western science." The boundaries between these two knowledge systems, Western science and traditional knowledge, are not so clear-cut as they might appear at first glance. Traditional ecological knowledge has many characteristics in common with the Western scientific tradition; for example, it is based on careful observation and may involve systematic study and experimentation. Conversely, Western sciences such as ecology espouse a holistic outlook, and newly emerging fields such as conservation biology have a moral or social context. It is not my intention to set up a dichotomy between traditional ecological knowledge and Western science. Such an opposition would not reflect the complex nature of either system of knowlege.

It is only relatively recently that Western scientists and academics have begun to recognize traditional ecological knowledge as a valid and important source of knowledge with potential to inform resource management systems (Johnson 1992; Freeman 1995). Concurrently, there is a growing awareness that these two knowledge systems can be seen as complementary rather than mutually exclusive. However, it is also important to keep in mind that each system rests on a distinct view of the world and cultural value system. For this reason, it may not be possible or desirable to integrate them into a single system. In addition, it may not be possible for people outside of the cultural tradition to understand the full meaning and context of traditional ecological knowledge. Therefore, the full participation of First Nations knowledge holders in the interpretation and implementation of traditional practices and knowledge is of vital importance. As the involvement of Aboriginal peoples in resource management increases through processes such as treaty negotiations and the Central Region Board, the role of traditional knowledge in resource management activities will likely take on added significance and emphasis. As stated by Clifford Atleo (1996):

> In our view, we can not do without traditional ecological knowledge, and I say that because we are not prepared to accept knowledge gained over a few hundred years of presence for [knowledge] that has been developed over thousands and thousands and thousands of years for good reason.

Summary and Prospectus

There is a larger political, social, and academic context which surrounds and influences this thesis. Included in this contextual framework are events in Clayoquot Sound which led to the BC government's Clayoquot Land Use Decision of 1993. This decision sparked widespread protest, and also initiated the process culminating in the establishment of the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound in 1993, the signing of the Interim Measures Agreement in 1994, and the creation of the Central Region Board to monitor development and implement co-management in Clayoquot Sound. Concurrently, the Nuu-Chah-Nulth Tribal Council has been pursuing treaty negotiations and a larger role in resource management decisions. The inclusion of Western scientific and Nuu-Chah-Nulth traditional knowledge is one of the key features in evolving resource management structures in Clayoquot.

In Chapter 2, I will begin with a discussion of the process by which this thesis was researched and written. This process was an intense learning experience through which I learned about fieldwork, interview methods, the dynamics of interdisciplinary and cross-cultural research, and the process of designing and implementing a community-based and community-responsible research project. This chapter will include a discussion of ethical issues surrounding the documentation of traditional ecological knowledge, both in general and specifically with respect to the research for this thesis.

In undertaking resource management, it is necessary to have an understanding of the evolutionary history of an area, its specific biophysical characteristics, the indigenous plant and animal communities, and the historical relationship of people and the land. Chapter 3 will be devoted to exploring the environmental history of Clayoquot Sound. I will draw on secondary historical sources, as well as on oral histories collected during our research in the summer of 1996. In Chapter 4, I will continue with the historical theme; narrowing my focus to look specifically at the histories of the Atleo River Valley. The Atleo River Valley lies in Ahousaht traditional territory, and is under the *ha<u>h</u>uulhi*[7] jurisdiction of Chief Umeek. This was the site of our primary fieldwork in 1996.

Chapters 5 and 6 are embedded in the historical context provided by the preceding two chapters. Chapter 5 will be an exploration of the current status of forest habitats in the Atleo River Valley, and the Ahousaht traditional practices and knowledge that apply to these habitats. This chapter will draw heavily on field data and observations, and on the interview material collected in the summer of 1996. The information in this chapter, both ecological and cultural, will provide the basis for Chapter 6, which explores the potential for restoring forest ecosystems in the Atleo River Valley which have been damaged through industrial logging activities. By reflecting on the intersection of history, culture, and ecology in this particular place, I hope to show that indeed "all things are one"; that the past can not be separated from the present and the future, and that facts, values, the scientific, and the spiritual, all make up the relationships that bind us as living beings to one another, and to the places we inhabit.

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[7]As noted in the Scientific Panel (1995b), there is no standardized orthography for representing the sounds in the Nuu-Chah-Nulth languages. In this thesis, I follow the Scientific Panel orthography as follows: 7 (glottal stop); ʕ (pharyngeal); aa, ii, uu (long vowel sounds); apostrophe following a letter (e.g. y', t') indicates glottalization; underlining indicates sounds produced at the back of the throat.

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Chapter 2
Research Methods and Ethical Issues:
"These things were kept silent"

"These things [traditional 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 from here.' They never did that. That was a silent tradition. . . they never spoke of it. . . because [the medicine] loses its potency for healing." Arlene Paul (1996)

Introduction

In this thesis, I explore the interaction of traditional ecological knowledge and forest practices in Ahousaht First Nation's traditional territory - past, present, and future. As such, I draw on approaches and theoretical perspectives of a number of different disciplines including environmental history, ecology, and anthropology. In recent years, there has been a growing interest in interdisciplinary research which takes a more holistic approach than conventional disciplinary methods (Klein 1990, 1985; Kroker 1980; Bonner 1994). The distinctions often made between the "social" and the "natural" sciences, between "quantitative" and "qualitative" research methodologies erect barriers between different ways of knowing and forms of knowledge. In this thesis, I attempt to transgress some of these barriers by learning from a variety of perspectives and approaches. This inclusive approach is reflected in the theoretical framework which underlies this thesis, and the methods used to undertake research. In this chapter, I examine both the process through which our research project was developed, and the methods through which we implemented it. Finally, I will give some attention to the range of ethical concerns which came up during the course of our research.

Reflections on Process

Hoare *et al.* (1993:52) contend that, "Often, orthodox approaches [to research in First Nations' communities] are focused completely on the 'ends' of the research objectives. Little or no concern is given to the manner or means in which the research process can affect the lives of the study population." It is now being widely recognized in the ecological sciences that the *processes* operating in ecological systems are at least as important as the *products* of those systems. Similarly, we soon came to realize that our research was not only about "results" but about the way in which we obtained those results. I learned a great deal from participating in this research, not only about the forests and forest use in Clayoquot Sound, but about the process of developing and implementing a community-based research project and working in an interdisciplinary research team.

There are a few, although not many, models upon which we could base our research approach. Perhaps the most helpful was the pilot project on documenting traditional ecological knowledge among the Dene as described in Johnson (1992). This provided helpful suggestions on interviewing techniques using a structured conversational approach with a checklist of interview topics, on working with community members to design and implement the research project, and on following local channels of authority in establishing a research project in a community. Some of their suggestions, such as establishing a steering committee and an Elders advisory council, were not adopted due to organizational difficulties and time constraints. These might have been useful, particularly the latter. The Dene Project utilized a participatory action research approach. According to Johnson (1992:6):

'Participatory community' or 'action' research has become the accepted approach in

> studying traditional environmental knowledge. In such an approach, the host aboriginal community participates directly in designing and implementing the project, community members are trained in research methods and administration, and the community retains control over the research results.

Hoare *et al.* (1993:53) concur with this statement, suggesting that participatory action research (PAR) is inherently well-suited to research undertaken in First Nations' communities. The reasons that they give for the popularity of this approach are four-fold:

- PAR contributes to a balancing of the historical record in a Native voice;
- PAR increases the chance of development effectiveness and longevity;
- PAR contributes to the healing of social ills; and
- PAR methods are consistent with Native values.

Hoare *et al.* (1993) elaborate on these points, suggesting that social pathologies may be healed by increasing community control over local concerns, valuing oral traditions and Aboriginal cultures, and by building research capacity within the community by transferring skills. Colorado (1988) suggests that PAR is consistent with First Nations' values because it is process-oriented, collaborative, and experiential. Certainly, it was our goal to design a project which reflected these characteristics. In order to evaluate our success in achieving this goal, I believe it is important to describe how the research project which informs this thesis was originally conceived and implemented.

My own involvement in the project began in the autumn of 1995. I had recently arrived at Trent University, where I was beginning the M.A. program in Canadian Heritage and Development Studies. My undergraduate background is in Anthropology and Environmental Studies, and I hoped that my thesis topic would reflect that combination of interests. Ideally, I hoped to be involved in a community-based project, preferably in my home province of British Columbia. In order to explore options for research projects, I contacted Dr. Nancy Turner at the

University of Victoria. It was Dr. Turner who had first introduced me to the field of ethnobotany, and she has worked extensively in First Nations communities throughout BC, in addition to serving on the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound.

It was through Dr. Turner that I met Juliet Craig, a graduate student in the Environmental Studies Program. Dr. Turner and Juliet were interested in putting together a proposal to send to the Long Beach Model Forest Project (LBMF), a body which funds research in Clayoquot Sound. Subsequently, we developed a general proposal focusing on the documentation of traditional ecological knowledge and forest use in Clayoquot Sound, and the potential for ecological restoration based on traditional knowledge. We left the proposal very open, in the hope that we would receive some suggestions for more specific research topics from First Nations communities in the area with whom LBMF was consulting. Juliet and I had both followed events in Clayoquot Sound with some interest, particularly the work of the Scientific Panel on which Dr. Nancy Turner and Dr. Richard Atleo (the two supervisors of our summer research project) served. It was based on the recommendations of this Panel, in recognizing the knowledge of First Nations' people, and in carrying out collaborative research with First Nations' communities, that we designed our proposal.

It was our hope to design a research project that would be of interest and some practical use to the community of Ahousaht. In pursuit of this goal, we began by presenting a very generalized proposal and asking for specific direction from the community. In seeking advice and permission, we relied on community consultations which were being carried out by LBMF through their Traditional Ecological Knowledge (TEK) Working Group. There were definitely advantages to having a mediating body, particularly one based in and familiar with the region. In retrospect, it might have been preferable for us to have been more directly involved in the consultation process. This was not possible, however, due to financial and logistical constraints. We therefore greatly appreciated the assistance of Long Beach Model Forest staff, particularly Matthew Lucas and Karen Price, in facilitating our project.

We soon learned that there are a number of parties who should be consulted in designing and implementing a community-based research project, depending on the local situation. These include: hereditary or traditional holders of authority, elected officials, Elders and other respected community members. In our research project, we first obtained the support and permission of Dr. Richard Atleo (hereditary Chief Umeek and formerly Co-Chair of the Scientific Panel) to undertake the research in his traditional territory. Dr. Atleo agreed to act as co-supervisor of the project and his letter of support was included in our final proposal to the elected Ahousaht Band Council. Our project was approved through the Band Council as part of a resolution supporting the summer projects funded by Long Beach Model Forest. We moved to the community of Ahousaht, and began work on June 15, 1996, after an introductory visit at the end of May when we met the summer students with whom we would be working. While in Ahousaht, we stayed in the house of Chief Earl Maquinna George (who was in Port Alberni for the summer), along with a team of researchers from the University of Victoria, headed by Dr. Dave Duffus, doing long-term studies of gray whales in the area.

Finding the balance between the scientific fieldwork (which primarily took the form of vegetation surveys in the Atleo River Valley) and interviews with local knowledge holders was a difficult task. Juliet Craig's academic background is in ecology, while mine is in the social sciences. Both of us participated in all aspects of the project. Every effort was made to integrate the natural and social scientific components of the research instead of keeping them separate. Although bridging the "social" and "natural" sciences was challenging, I believe that a more holistic understanding of forest use in Clayoquot Sound was gained because of it. The research project also provided an opportunity to experience co-operative research, as it was carried out by a team of six people: two graduate students, four research assistants from the local community, and supervisors from three academic institutions.

Community employment was an important part of our research project. In general, working with people from the local area helps ensure accountability to the community in which the research takes place, as well as providing economic benefits to the community in the form of employment. This is important particularly in the case of First Nations' communities which have been subject to many studies from which they have received few tangible benefits. Of course, there are also benefits for the outside researchers, since local research participants are able to provide insights into community protocol and to facilitate introductions. In our project, the four Ahousaht research assistants were able to suggest and introduce us to knowledgable people in the community. This was a great advantage in developing the interview component of the project.

In choosing the research assistants, we relied on the advice of Pam Jack, the youth co-ordinator in Ahousaht, who posted the position and reviewed applications. We worked with one female (Daphne Frank) and three males (Travis Thomas, Greg Hayes, and Paul Frank Jr). Based on the experience of the Dene pilot project, Johnson (1992) recommends that there should be an equal gender balance on the research team (which there was on our project overall, as both the graduate researchers were women). There were some logistical difficulties, such as administrating payroll from the field, and generally co-ordinating the activities of six people;

however, the benefits of co-operative research far outweighed these difficulties.

In community-based research, it is vital to give people opportunities to express their concerns, and to acknowledge and respect these concerns. We attempted to provide these opportunities in a number of ways. We attended a Band Council meeting (after seeking permission from the Chief Councillor) to describe and ask for advice on our research project. We also met on a couple of occasions with a group of Aboriginal liaison officers working for the Ministry of Forests. Through these meetings, we learned much about the range of concerns and issues which surrounded our research. Some of these issues will be discussed further in the final section of this chapter.

The importance of seeking advice and listening to concerns relates directly to the quality and methods of communication between researchers and members of the research community. The following are some of the ways in which we attempted to maintain open channels of communication. The first was in working directly with community members. People in the community who may be reluctant to approach and question strangers might feel more comfortable asking local community members for details of the research. It is likely that many people learned about our project by talking with the Ahousaht research assistants. In addition, we lived in the community for three months, shopped at the local grocery store, and attended local events. This helped us to become familiar with people in the community and, more importantly, allowed people in the community to become familiar with us. We maintained continual contact with the Ahousaht Band Council throughout the summer. We met with several members of the council to discuss our research, attended a Band Council meeting, and submitted bi-weekly reports to the Chief Councillor. These reports were kept in a binder in the Ahousaht

Band Office. In order to reach a broader range of people in the community, we also wrote two short articles for the local newsletter describing our research activities.

An integral part of communication and accountability is ensuring that the results of the research are accessible to the community itself. This is an ongoing process which continues for the entire life of the project and beyond. We approached this responsibility in a number of different ways. At the end of the summer, we hosted a slide show presentation in the community (advertised in the local newsletter and via VHF radio) to describe our summer activities. At this time, we presented the Ahousaht Band Council with copies of all our "raw" field data, as well as labelled copies of our slides and air photos. Information on CMTs and plot locations was given to the Ahousaht GIS mapping team. An interim report was sent to the Band Council, and copies of our final report and two Master's theses will also be sent upon completion. The report will present the highlights of the research process and results in a more concise manner than the theses, which will be academic documents.

We also attempted to make our information available for educational purposes within the community. To this end, we met with the teachers of the local school at the end of the summer. At this time we described our research project and presented them with photo albums containing mounted herbarium specimens that we had collected in the course of the summer. Each plant had a label giving the scientific, common, and Ahousaht names for the plant; as well as any traditional uses of the plant which have been documented. This collection is being held as reference material in the school library.

In carrying out our research project, we learned a number of important things about community-based research as a process. We chose to work in an interdisciplinary research team which included members of the local community. We attempted to consult either directly, or indirectly through LBMF, with all appropriate parties (including hereditary and elected authorities, and respected community members) to seek advice and listen to concerns. We also made efforts to maintain open communications, and to provide opportunities for people to express concerns. We did our best to ensure that results from the study were accessible and in an appropriate format.

Research Methods

The primary research for this thesis was carried out from June to September in 1996. During this time, the field research team (see Appendix A) was based in the Ahousaht First Nation Reserve (*Maaqtusiis*) on Flores Island in Clayoquot Sound, BC. There were two main components to the research: fieldwork in the Atleo River Valley, and interviews with knowledgeable people in and from Ahousaht. In the preceding section, I reflected on the process of undertaking research. Here, I briefly describe the methods we adopted for these two components of the project, and the theory which informed these methods.

In the broadest terms, ethnobotany is the study of the inter-relationships between people and plants, and of the larger social and ecological systems in which these relationships are embedded. This includes the ways in which plants are used as food, materials, and medicines; knowledge about the local environment; traditional methods of harvesting and managing plant resources; stories about plants; and the role of plants in cultural practices.[1] Traditional ecological

[1]Ethnobotanists have tended to focus primarily on Aboriginal peoples and their interactions with indigenous plants. However, as Turner (1995) points out, it is just as valid to study cultural knowledge of plants in modern societies of all types. "Botany" itself is also a form

knowledge incorporates strategies and practices for living in the local environment, underlying philosophies and worldviews of a culture, as well as specific ways of communicating and exchanging this knowledge, .

Ethnobotany might be called an "interdiscipline," as it requires skills in both the natural and social sciences in order to understand the complex relationships between people and their local environment. As such, it fits in well with the current academic trends towards interdisciplinary research as mentioned. Some of the diverse disciplines which are integrated within the field of ethnobotany include botany, anthropology, archaeology, palaeoecology, and linguistics (Ford 1978; Matin 1995). For this thesis research, the two overarching fields are anthropology (which in itself encompasses ethnology, archaeology, and linguistics) and ecology (the study of the relationships between living organisms and their environment). The methods used to undertake ethnobotanical research reflect its mosaic composition. I will piece together some of this mosaic by outlining the methods used to research this thesis. These include archival/historical research; and primary fieldwork combining interviews with local knowledge holders and vegetation surveys in the Atleo River Valley.

The archival research for this thesis was carried out in the British Columbia Archives in Victoria, BC, and in the National Archives in Ottawa, Ontario. The goal of this research was to look for unpublished transcripts and historical records relevant to the research area, and to survey the historical photographs housed in the archives. Early photographers such as Frederick Dally, Edward Dossetter, and Edward Curtis left a legacy of historical images depicting the cultural and natural heritage of the region. It is important to keep in mind, however, that photographs have a

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of ethnobotany, dealing with Western knowledge of plants.

"sub-text." Reading this sub-text requires the observer to consider how and by whom images were chosen. In many cases, photographs were deliberately posed in order to portray the image of "traditional" aboriginal culture which a European audience expected to see (Francis 1996). The written historical record is also informed by these pre-conceived notions and stereotypes of First Nations' cultures.

The fieldwork in the Atleo River Valley consisted primarily of vegetation surveys to assess the availability and abundance of plants used traditionally by the people of Ahousaht for food or material purposes.[2] Our fieldwork methodology was adapted from a similar study carried out by Lepofsky *et al.* (1985) with the Nuxalk First Nation in the Central Coast region of British Columbia. In our research area, the Atleo River Valley, we identified three broad habitat types based on exploratory walks in the valley and examination of aerial photos. These habitat types include: old-growth forest (areas which had not been logged), logged areas, and riparian areas (vegetation adjacent to water, especially the Atleo River, Barra Lake, and estuaries).[3] The old-growth forest was further sub-divided into cedar/hemlock and hemlock/amabilis forest according to the dominant tree species [western red-cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*) and amabilis fir (*Abies amabilis*)]. The logged areas were further differentiated

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[2]This is the subject of Juliet Craig's M.Sc. thesis, entitled "Nature was the Provider: Traditional Ecological Knowledge and Inventory of Culturally Significant Plants in the Atleo River Watershed, Ahousaht Territory, Clayoquot Sound," currently being completed at the University of Victoria.

[3]With respect to terminology, in designing our fieldwork methodology, we referred broadly to all areas adjacent to water as "riparian." However, it is important to note that in the literature different terms may be used for ecosystems influenced by different kinds of hydrological systems. For example, the term "lacustrine" can be used to refer lakeshore areas, and "littoral" may be used to refer to estuarine areas.

into areas logged during three main time periods: 1979-1981, 1985-1986, and 1991-1994. The riparian areas included sites adjacent to the river and lake, and estuarine areas at the river mouth. We chose these habitat types in order to explore how the availability and abundance of different plant species vary according to habitat, and how different habitats have been impacted by industrial logging activities in the area.

We identified corresponding habitat types on both the north and south sides of the valley. For the riparian areas, two plots were surveyed in each area; for the forested and logged areas, three plots were surveyed in each area. The total number of plots surveyed during the course of the summer was 56 (see Table 2.1). We surveyed the valley using a stratified random sampling technique. In other words, the entire valley was first divided into meaningful units (habitat types as described above) which were relatively homogenous internally. Within these units, plots were located using a random numbers table to determine compass direction and distance from known reference points. In each plot, vegetation was divided into tree, shrub, and herb layers. The plots took the form of 20m x 20m quadrats. We made observations and took measurements on trees in the 20m x 20m area. Within this quadrat, we used a 10m x 10m area to examine shrub species, and four 1m x 1m quadrats for the herbs (see Figure 2.1).

Within each quadrat, we assessed the percent cover and vigour of vascular plant species. We made additional observations and measurements on plants which are considered culturally important; specifically, those which were traditionally used for food or materials. These plant species were identified by examining the published ethnobotanical record for the region (especially Turner and Efrat 1982; Scientific Panel 1995). For example, we measured the length and diameter of salmonberry (*Rubus spectabilis*) shoots; the number or trees suitable for cedar bark gathering, and the average number of berries on a red huckleberry *(Vaccinium parvifolium)* bush (see Appendix C for a sample data form). For riparian areas we used a slightly different format. In these areas, plots took the form of 80m x 5m strips adjacent to the water. This is the same surface area as the forest plots, but reflects the narrower dimensions of riparian habitat types (see Figure 2.2).

Table 2.1: Cover types sampled in the lower Atleo River Valley in 1996.

Cover Class	Cover Type	Side of Valley	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
	> 25 years	north	1	4
TOTAL			23	56

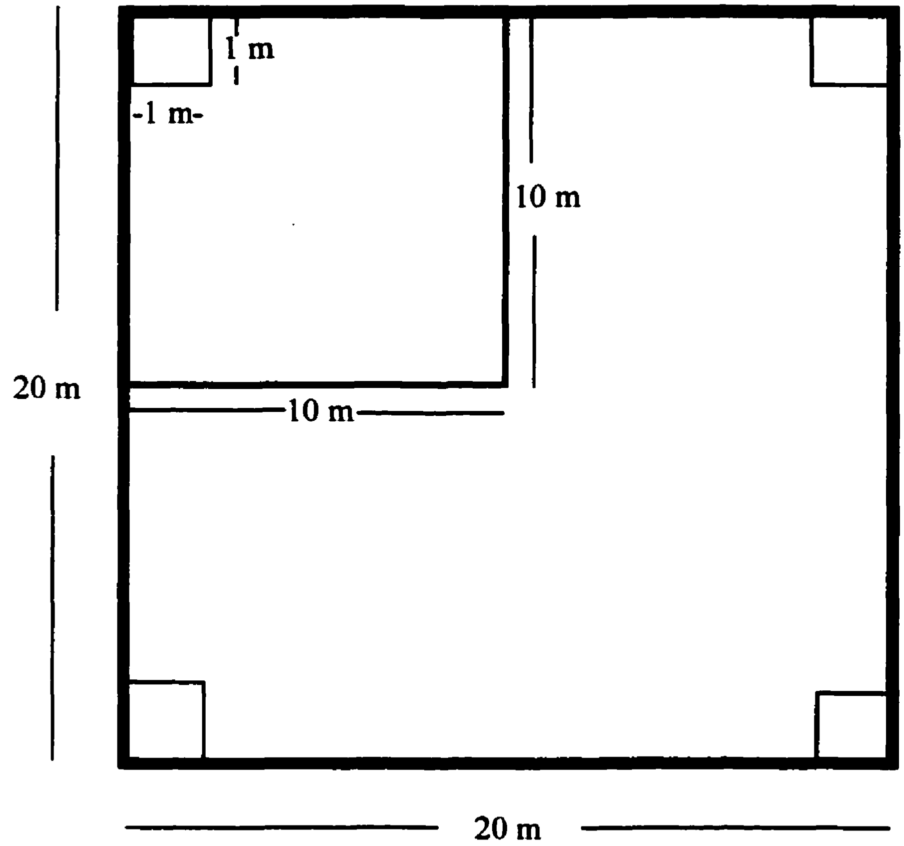

Figure 2.1: Dimensions of plot used to survey vegetation in forested, logged, and estuarine areas including: 20m x 20m plot for tree layer, 10m x 10m plot for shrub layer, and four 1m x 1m plots for herb layer.

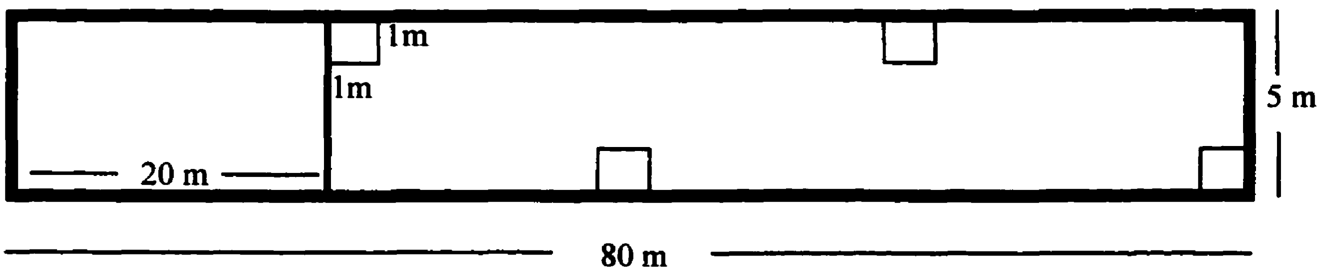

Figure 2.2: Dimensions of plots used to survey vegetation along lake and river edges (riparian areas) including: 80m x 5m plot for tree layer, 20m x 5m plot for shrub layer, and four 1m x 1m plots for herb layer.

In addition to these quantitative measurements, we also made qualitative observations in each plot. The first thing we did upon arriving at a plot was to write a brief descriptive summary of the area, including signs of wildlife (droppings, tracks, sightings), and evidence of disturbance to the area (eg., logging activities, soil erosion, windthrow). We also made note of all vascular plant species present in the area, as well as general observations on the surrounding area. This was done in order to avoid treating the plots as isolated units, instead of seeing them as part of larger ecological systems. In addition, we made note of any culturally modified trees (trees which show evidence of past human use, for example cedar trees with strips of bark removed) or other evidence of cultural use. This information was shared with the Ahousaht GIS mapping team, who are compiling an inventory of cultural resources within Ahousaht territory.

We conducted the vegetation surveys, as described above, in order to gain an understanding of the availability and abundance of culturally significant plants in the Atleo River Valley, and to assess the potential for restoring damaged areas. Learning about the forest requires not only an understanding of ecological systems, but also of the ways in which people interact with those systems. The forests of Clayoquot Sound have both shaped, and been shaped by the activities and values of its human inhabitants. The Atleo River Valley, which lies in the traditional territory of the Ahousaht people, is no exception. Therefore, interviewing knowledgeable people in Ahousaht was a central aspect of this research. The main purpose of the interviews, conducted in the summer of 1996, was to gain an understanding of the histories of the area, traditional and contemporary plant use and management, and visions for future forest use.

The interviews took the form of semi-directed conversation using open-ended questions. We prepared a list of interview topics to provide a general guide during the interview; however, this guide was very flexible in order to allow the interviews to flow naturally. As a result, the topics covered during the interviews were very wide-ranging. In our conversations with people, we learned a great deal not only about plants and plant management, but also many other aspects of Ahousaht culture and history. The work of the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound was guided by the Nuu-Chah-Nulth phrase ***hishuk ish ts'awalk*** ("all things are one"). We also tried to follow this philosophy in our work; recognizing that connections, whether subtle or obvious, exist between all life forms and the whole environment, as well as among many of the issues we are facing today in terms of ecosystem management.

The following is a brief summary of the topics covered in the interviews. As noted above, we covered a broad range of subjects in our conversations, depending on the particular experiences and expertise of the individual. We learned about the histories of the Atleo River Valley, the Ahousaht territory, and the Ahousaht people from Stanley Sam, Sidney Sam Sr., Robert Thomas, Chief Earl Maquinna George, Luke Atleo, and Chief Umeek (Dr. Richard Atleo). We spoke with Bill Perry from MacMillan Bloedel about the more recent history of logging activities in Clayoquot Sound and about current strategies for forest regeneration. Gertrude Frank, Arlene Paul, Lena Jumbo, and Rosie Swan taught us a great deal about plant use, plant harvesting techniques, and names of plants.

We spoke with several people, including Arlene Paul and Morris Sutherland (the Aboriginal Liaison Officer for the Ministry of Forests in Port Alberni) about the issues surrounding the documentation of traditional ecological knowledge, particularly medicinal plant knowledge. Carl Jumbo and Murray John shared with us some of their experiences of working in the forest industry, as well as their thoughts on traditional and contemporary forest use. We also learned about the latter from Archie Frank, Sidney Sam Sr., and Clifford Atleo, all of whom have considerable experience in Aboriginal politics and were able to give us some insight into the intersection of current political processes and resource management. In addition, Irene Thomas, Greta Charlie, Rosie Swan, and many other people told us about traditional lifestyles and their own personal histories (see Appendix A for more background on the people who participated in the project).

In preparing for our interviews we made use of several references on interviewing techniques, including McCracken (1988), Yow (1994), Slim and Thompson (1995), as well as Nancy Turner's *A Short Guide to Interviewing and Collecting Plants for Ethnobotanical Research* (1991). The time spent in each interview ranged anywhere from thirty minutes to two and a half hours. In most cases, interviews were conducted by two people, either myself or Juliet Craig along with one of the Ahousaht research assistants, although in some cases this was not possible (see Appendix B for interview schedule). One of the many ways in which the Ahousaht research assistants (Travis Thomas, Daphne Frank, Greg Hayes, and Paul Frank Jr.) contributed to the project was by offering suggestions of knowledgeable people in Ahousaht with whom to speak, and by arranging introductions.

The interviews were recorded on tape and subsequently transcribed. A draft transcript and copy of the interview tape was sent to each person we consulted. A three month period was allowed in which the knowledge holder was able to review the transcript and tape, and make corrections or deletions as desired. There are many issues surrounding the documentation and publication of traditional ecological knowledge. We did our utmost to be sensitive to these concerns during the course of our research. The return of information to the community, and provision for review and omission of private knowledge was one strategy for addressing these issues. As many of the concerns surrounding the documentation of traditional ecological knowledge centre around the private nature of medicinal plant knowledge, we made it clear that medicinal knowledge was not the focus of our study, and that specific medicinal information would not be included in final reports and publications including Masters theses. In fact, the nature of these concerns was one of the topics addressed in our interviews. The last section of this chapter will explore these issues in some detail.

Ethical Concerns

Ethical concerns relating to ethnobotanical research can be divided into two general categories: those relating to the subject matter of ethnobotanical research, and those relating to the way in which that research is carried out. In this section of the chapter, I will outline some of the concerns which arise in undertaking ethnobotanical research, focussing specifically on those concerns which relate to the research for this thesis. Following this, I will discuss some of the current trends in ethnobotanical research that reflect an awareness of or response to these concerns. The Traditional Ecological Knowledge Group established by LBMF has been working to develop a code of ethics and protocols for researchers working in the traditional territories of the Nuu-Chah-Nulth First Nations. Although these protocols are only in draft form at present, we attempted to conduct our research in a manner consistent with the goals and objectives of these protocols.

Ethnobotanical publications, similar to more general ethnographic descriptions, have the potential to be a double-edged sword for Aboriginal peoples. While they may be based on wellintentioned interest in and respect for Aboriginal cultures and traditions, they may also serve to reinforce stereotypes. The early works on North American ethnobotany, those published prior to 1896, generally took the form of herbals documenting knowledge of medicinal plants. In speaking of these early works, Ford (1978:35) suggests that,

> Tales of miraculous healing fed the romantic side of the Indian stereotype in the East [United States]. . . Ethnocentrism fostered an accentuation of cultural difference to create a new Indian, the Medicine Man. . . [this] did little to transmit accurate knowledge about North American beliefs as they pertain to health and illness.

According to Colorado (1988), this "romantic colonial vocabulary" degrades First Nations' science and knowledge systems by making them seem less serious than Western science.

Other stereotypes which relate to Aboriginal peoples and their ecological knowledge include the idea of First Nations as "natural preservationists." This has led to the appropriation of symbols, stories, and philosophies by members of the environmental movement who claim alliance with First Nations without having negotiated that alliance (Dwyer 1994; Greaves 1996). It is my belief that research on traditional ecological knowledge can help dispel some of these simplified understandings by looking at the mechanisms through which societies are able to persist in dynamic ways in specific environments. Rather than trying to transport or appropriate these mechanisms, it is possible to respect them and appreciate them as models of sustainable societies.

The process of creating stereotypes is facilitated by the existence of certain power relationships. There is an inherent power imbalance in one person being able to "study" and "analyze" a culture or cultural knowledge. Non-Aboriginal academics have traditionally been able to determine what and whom to study. While some researchers have used their position responsibly, others have exploited Aboriginal peoples through the publication and subsequent commercialization of their knowledge. According to Greaves (1996:26),

> When outsiders appropriate a key element of this knowledge - say, a clan symbol to place on T-shirts or a sacred plant for use in a new cosmetic - we thrust a wedge between the object and its meaning, attacking the worldview and cultural matrix of the society's members.

Some aspects of traditional knowledge which have commercial potential, and thus potential for exploitation, include: wild plant resources for food and medicine, craft materials, art designs, and stories. Medicinal plant knowledge has received the highest profile of these, possibly due to the considerable financial capacities of pharmaceutical companies, and the perceived benefits to the larger population from the discovery of new medicines and cures. Not surprisingly, many of the concerns relating to ethnobotanical research centre on the documentation of medicinal plant knowledge. I would like to discuss these in some detail, as they have direct relevance to the research carried out for this thesis. Before doing this, however, it is important to emphasize that situations will vary cross-culturally, and some of the concerns discussed here may not be as sensitive in other cultural settings. Conversely, there may be issues which did not come up in our experience, but which may have great significance elsewhere.

There are a number of concerns associated with the documentation of medicinal plant knowledge.[4] The first I will discuss is the danger posed to the plant itself. Often the location of plants with medicinal properties, such as the yew tree, is found with the help of indigenous peoples who traditionally used them, or by reviewing published ethnobotanical information.

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[4]While discussing these concerns, it is important to keep in mind that they may also apply more generally to other aspects of traditional ecological knowledge. Furthermore, the distinction made between "medicinal plants" as opposed to plants used for other purposes (such as for food or materials) is a distinction which may not be held by some Aboriginal peoples.

Once a plant has been found to possess healing properties, it may be over-exploited in order to obtain the medicine. A good example which is relevant to the Northwest Coast area is the case of the western yew (*Taxus brevifolia*) whose bark has been found to contain taxol, an anti-cancer agent. As a species, the yew tree tends to grow individually, rather than in large plantations, and is extremely slow-growing. As a result, this species is particularly ill-suited and vulnerable to any large scale harvesting (McAllister *et al.* 1992). Of course, the flip side to this concern is that an area which was slated for "development" might be protected if it is known to contain plants with medicinal properties.

Another danger which arises from the publication of medicinal knowledge of plants, is that people may use the medicine incorrectly. Many plants with medicinal properties may be highly toxic if taken in large quantities, or if prepared incorrectly. This may cause serious physical harm to people experimenting with traditional medicines based on information published in ethnobotanical descriptions. Arlene Paul (1996), a community health representative at the medical clinic in Ahousaht, spoke to us of this:

> If I were to have a mixture for something I couldn't just tell you, and tell you to use it. Because of the ingredients mixture. . . it could be more dangerous than helpful.

An example of this on the West Coast occurs in the case of false hellebore (*Veratrum viride*). This plant was, and still is, a highly important medicine used by most of the First Nations on the Northwest Coast. However, it is also one of the most toxic plants on the coast. Loss of consciousness and death may result from consuming only a small quantity of it if it is not prepared in the correct way (Pojar and MacKinnon 1994).

A third serious concern about the documentation and publication of medicinal plant knowledge, and one which I would like to explore in some detail, relates to the potential negative consequences for the knowledge holders, their families, or their communities. Publication of medicinal plant knowledge (as with other forms of cultural knowledge) may violate internal partitions over who may hold this knowledge, thus undermining the social and cultural mechanisms for holding and transmitting knowledge within the society (Greaves 1996). This takes control of the knowledge away from the individual knowledge holder, the family within which the knowledge is held, and the community itself. In addition, it takes the knowledge out of its social and cultural context. The social and spiritual aspects of medicinal plants are rarely documented, and it is doubtful that they could be adequately described outside the cultural context. It is important to note that a traditional medicine is not analogous to a "herbal remedy." The use of traditional medicines is far more complex than merely knowing the physical ingredients and quantities; it is inherently bound to the cultural knowledge and spiritual beliefs of the First Nation to which the medicine belongs. In turn, this knowledge flows from the inhabitation of particular places since time immemorial. The effectiveness of the medicine may depend on the strength of the beliefs of those using the medicines, and these cannot be easily transported from one culture to another.

Within the Ahousaht First Nation medicinal knowledge is passed down within families and is considered to be private knowledge held by those families or by individuals within these families. There is a high degree of respect given to the fact that different families have their own traditions and knowledge.[5] The privacy of that knowledge is respected within the community,

[5]This applies not only to medicinal plant knowledge, but also to other things such as knowledge of traditional territories and their resources, ways of preparing traditional foods, and family histories.

and should be respected by researchers working within those communities. Arlene Paul (1996) explains that,

> Family have their own ways. I may know some things about something, and yet my neighbour can know something else about the same thing. Different things, you know?

Many people we spoke with expressed a similar sentiment. Even within families, only certain people are given the ingredients for and knowledge of specific medicinal plants. Ahousaht Elder Stanley Sam (1996) explained to us some of the ways in which medicinal knowledge is passed down in families,

> That [knowledge] was his own because the Creator is just giving that person the medicine. Not to all the families like that, [even] in the family, not [to] all of them. If my brother was an Indian doctor it wasn't given to me, it was given to him, or my sister.

Aside from violating internal divisions of knowledge, another potential negative impact of publishing medicinal knowledge is that the medicine itself may weaken, according to the traditions of the Ahousaht. This impacts the knowledge holder, the knowledge holder's family, and the community which may depend on that medicine for healing. We were told by many people in Ahousaht that a medicine loses its potency if the ingredients and preparation are shared outside the family. This is not to say that the medicine itself may not be given out - people know who to go to for certain medicines in the community - but the ingredients, their location and preparation, often remain private. According to Arlene Paul (1996),

> These things [traditional 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 from here.' They never did that. That was a silent tradition. . . they never spoke of it. . . because [the medicine] loses its potency for healing.

This belief remains very strong in Ahousaht, and was expressed by many of the people we spoke with during the course of our research. This is one of the primary reasons that we did not include medicinal plants in our research.

The issue of recording medicinal knowledge, and traditional knowledge in general, is by no means clear-cut. While taking into account the concerns listed above, there is a range of opinions within First Nations, as well as academic, communities about whether or not this knowledge should be documented. One of the reasons put forward for documenting traditional knowledge is that some of this knowledge is no longer being passed down orally to the younger generation and is thus disappearing with Elders. Arlene Paul spoke of this a great deal, and how her own opinion has changed over the years as she has watched many knowledgable Elders pass away. She explains that,

> I used to [believe that traditional knowledge should not be recorded] 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. . . we've lost lots of things.

This may be an important reason for writing down information that was traditionally passed on orally and within certain families. However, there is a range of opinion on how much, or what aspects of this knowledge should be written down. In the draft protocols for researchers developed by the LBMF TEK working group (1996:1), it is stated that, "Some people [in Nuu-Chah-Nulth communities] wish to document endangered knowledge for their community, but are concerned about the protection of this knowledge." It is possible that some particularly sensitive and private information, such as medicinal plant knowledge, should not be recorded for the reasons listed above. For example, when asked how she felt about recording traditional knowledge, Gertrude Frank (1996), who is also a community health representative in Ahousaht, told us that,

> 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 was, that if you're going to be distributing medicines - because 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.

Medicinal knowledge is certainly a very important component of traditional knowledge. It is also imbued with a sacredness which makes it a particularly sensitive topic for outside researchers to be documenting.

We chose to restrict our study to those plants used for food or material purposes as there is less sensitivity in documenting these types of plant uses. If there is internal interest in Ahousaht for recording medicinal plant knowledge, then perhaps the research will be initiated and carried out by the community itself. It would then be their prerogative to request assistance from outside researchers, and to define the role those researchers should play. This is one reason why training of research assistants was a large component of our project. Transferring research skills to community members enables them to undertake their own research projects. In this way, communities can have full control over research topics and methods. I do believe that there is a great deal of value in collaborative research in terms of fostering cross-cultural learning and understanding, but the power balance must shift in favour of the First Nations communities. Future trends in research on traditional ecological knowledge are towards collaborative efforts with Aboriginal peoples directing their own projects.

There is currently an international debate on the implications of intellectual property rights for indigenous peoples (see Brush and Stabinsky 1996, and Greaves 1994). While perhaps providing some protection for the rights of indigenous peoples, there is also the possibility that mechanisms for establishing "intellectual property rights" such as patents and copyrights, could be used against indigenous groups through practices dubbed as "biopirary," (Burrows 1994). For example, seed varieties developed by indigenous farmers over generations have been appropriated by agrochemical corporations and research institutes, genetically altered, and then patented, effectively denying the indigenous farmers recognition or benefits (Burrows 1994). The process of applying for patents is costly, time-consuming, and requires specialized skills and legal expertise that large corporations might have an advantage in obtaining. In addition, the whole notion of "intellectual property" may not be appropriate in discussing First Nations traditional knowledge, which in some cases is owned by groups or families as opposed to individuals, and may be developed over hundreds of years of cumulative experience, rather than a few years of experimentation.

Research topics are often chosen by academics primarily to meet their own research agendas and interests. In many cases, there is inadequate attention given to how the publication of information might impact the study community. One way for researchers to be aware of and sensitive to these issues is to work in collaboration with First Nations communities. According to Greaves (1996:34) the days of the "uninvited ethnographer" (or ethnobotanist) are ending. Increasingly researchers will have to make themselves accountable to the community in which research takes place. This includes obtaining permission to undertake research, and carrying out the research in a way that is acceptable to the local community, including making the final results accessible. According to Martin (1995:251), "from a perspective of conservation and community development, the way ahead for ethnobotanists is to follow a path of participatory research guided by explicit research agreements and contracts that define the rights and obligations of all participants at each stage of the project."

Summary

The focus of this chapter has been on the methods and approaches used in researching this thesis. As discussed above, I believe that the research *process* is just as important as the research *results*. Following an initial literature and archival search, primary research was carried out from June to September, 1996. During this time, we lived in the Ahousaht First Nation, on Flores Island which is located in Clayoquot Sound, BC. We combined scientific fieldwork with interviews of local knowledge holders. The approach we took involved consulting and working directly with community members. During the course of our research, we faced a number of ethical dilemmas, including how best to carry out our research in a responsible and accountable way, and the question of which topics to avoid due to cultural sensitivity.

In the following chapters, I will share some of the things I learned about forest ecosystems, and forest use in Ahousaht First Nation's traditional territory. Chapters 3 and 4 will be historical, outlining the dynamics of human interaction with forest ecosystems in the Clayoquot Sound area. In these chapters, I will draw on archival documents, secondary literature, and oral histories. Following these historical chapters, I will shift my perspective towards the future, discussing the current status of forest ecosystems in our field study area, and the potential for future restoration of areas which have been damaged through logging activities. This discussion will be guided by the historical, cultural, and ecological information gained through the research process as described in this chapter.

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Chapter 3
Environmental History of
Clayoquot Sound:
"History always brings up the truth of everything."

"That's the most important thing when you try to talk of something. History always brings up. . . the truth of everything. But if we just use todays, it doesn't do nothing." Stanley Sam (1996)

"When first immigrants came, which was Spanish up in Nootka, they found us here. We'd been here for thousands of years prior to contact, so it hurts a lot of the old people that passed away, knowing that the land was not bought or taken by concede, but stolen, stolen right before their eyes. . . they always cherished the land." Archie Frank (1996)

Introduction

The burgeoning field of environmental history is concerned with the relationships between humans and the rest of nature, and the way in which these relationships have changed over time. By reflecting upon these relationships, it is possible to gain insight into the way in which ecological systems shape the options available to humans, and in turn how the decisions and actions of humans impact on the physical world around them. There are many different scales at which environmental history may be explored: global, continental, regional, and local. The broader historical trends are articulated in specific ways at the local level, and are mediated by particular cultural and natural contexts (Gaffield and Gaffield 1995). One approach to the study of environmental history involves reconstructing both physical and cultural landscapes as they have changed and interacted over time (Worster 1995).

The reconstruction is made more complex, and infinitely more interesting, by the co-existence of more than one vision of the past. There is no single chain of events which can be laid out in a clear and unambiguous chronology. This is also part of the challenge of environmental history: to move beyond simple, linear analyses of change, and to recognize the many different ways of knowing which can contribute to our understanding of the past (Wadland 1995:14; Gaffield and Gaffield 1995:4). For this reason, I will approach my study of the environmental history of Clayoquot Sound as a narrative in which there are many different voices[1]. The sources of information which will contribute to the narrative in this chapter include: geological and biophysical processes, archaeological evidence, journals of early European explorers and settlers, ethnographic descriptions, and First Nations' history contained in oral traditions. The latter has not historically been given the same recognition (at least in Western academia) as the other sources; it will be explored in detail in subsequent chapters.

The Forest Today: Reflections on Past, Present, and Future

The forest takes many different forms in the ecologically diverse province of British Columbia. There are fourteen recognized biogeoclimatic zones (areas of broad climatic, topographical, and biological similarity) in BC (see Figure 3.1). These range from the bunchgrass-ponderosa pine zone, characterized by open woods and treeless grasslands which receive only 19-36 cm of annual precipitation; to the coastal western hemlock zone, one of the wettest climates in Canada, being drenched by 100 to 500 cm of annual precipitation. Twenty-three percent of the productive forest land in Canada, as well as 50% of its conifer volume, lies within the province of BC. The area known as Clayoquot Sound on the west coast of Vancouver Island lies within the latter zone, and includes 350 000 ha of islands, ocean, and land extending

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[1]In describing environmental history as a narrative, I am cognizant of the dangers of extreme relativity, when everything becomes a "text"to be deconstructed. I use the idea of a narrative to draw attention to the creativity and positionality of environmental history rather than to undermine its "reality" (see Soule 1995 and Hayles 1995 for a discussion of this point).

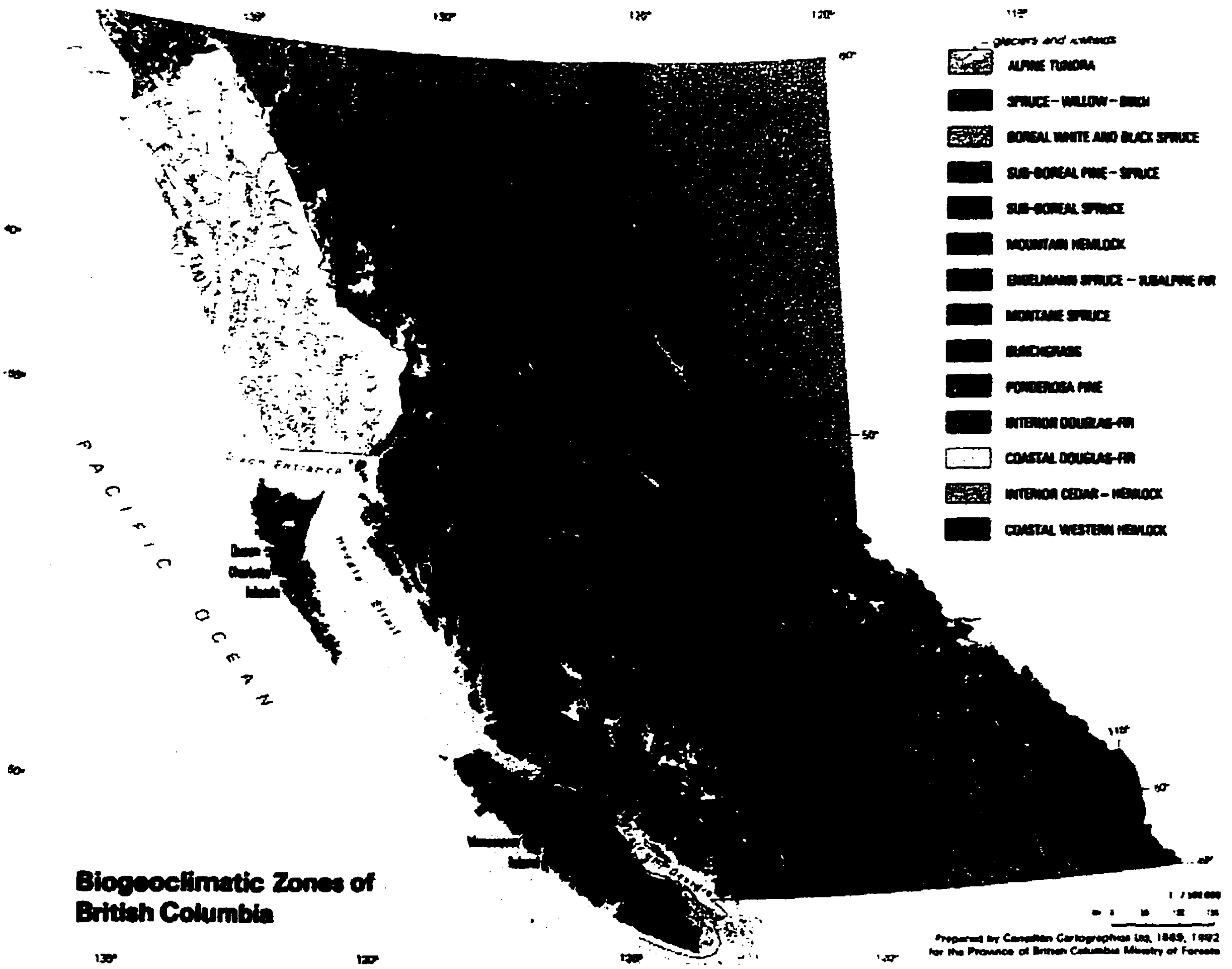

Figure 3.1: Biogeoclimatic zones of British Columbia

Prepared by Canadian Cartographics Ltd., 1989, 1992 for the Province of British Columbia Ministry of Forests. Obtained from the Ministry of Forests Research Branch, Victoria, BC.

from Escalante point in the north to Quisitis point in the south (British Columbia 1993:1). The land area of Clayoquot Sound comprises approximately 262,000 ha on Vancouver Island, 93% of which is forested (Scientific Panel 1995c). This area is characterized as a temperate rainforest ecosystem, based on its mild climate, high levels of annual precipitation, complexity in forest structure, and rarity of fire disturbances (MOF nd; Pojar and Mackinnon 1994). Temperate rainforests are among the most productive and biologically diverse ecosystems in the world. Within this broadly defined zone, variation in climate and species composition occurs on gradients from north to south, and upper to lower elevations, including three variants of the coastal western hemlock zone, and one mountain hemlock subzone (Sterling Wood Group Inc. 1991:29). The climate and ecology of the region are shaped by the interaction of the Vancouver Island Range (a subdivision of the Coast Mountains on the mainland) and the Pacific Ocean. Air masses pushing against the mountain barriers bring large amounts of precipitation, and the Pacific Ocean serves to moderate the temperatures, producing a mild climate which varies little from summer to winter (MOF nd).

The forest which exists in the region today is dominated by large coniferous trees. Depending on elevation and latitude, these include the western hemlock (*Tsuga heterophylla*), western red-cedar (*Thuja plicata*), Sitka spruce (*Picea sitchensis*), Douglas fir (*Pseudotsuga menziesii*), silver fir (*Abies amabilis*), yellow cedar (*Chamaecyparis nootkatensis*), and Pacific yew (*Taxus brevifolia*). Deciduous trees in the region include red alder (*Alnus rubra*), willow (*Salix* sp.), and Pacific crabapple (*Pyrus fusca*) among others. The lush, often dense understorey consists of numerous shrub and fern species. The forests of Clayoquot Sound are considered to be "old growth." Sometimes called "ancient forests," the precise nature and definition of these ecosystems remains a point of contention and confusion (Maser 1994). There are, however, a number of commonly recognized "old growth" characteristics (see Chapter 5 for further discussion of this point). These include, but are not limited to: the presence of trees of a variety of ages and species; structural complexity in terms of having many canopy layers, standing dead trees (snags), and fallen trees (coarse woody debris and nurse logs); relatively long periods between stand-destroying disturbances, although there are often gaps in the canopy created by smaller disturbances which allow light to reach the understorey and create patches where shrubs and seedlings flourish; and large accumulations of biomass, created through nutrient cycling and well-developed decomposition processes (Maser 1994; Pojar and MacKinnon 1994; MOF nd). A forest, however, is not just a collection of trees, or even plants, but a complex web of relationships involving living and non-living entities. In turn, forests are not isolated systems, but exist within the context of larger landscapes and ecological communities.

To walk through the forest today on the west coast of Vancouver Island is to catch a glimpse of it at a particular moment in time. While at first glance things may appear stable, static even, this is the illusory result of the time scale at which humans function. E.O. Wilson (1984) calls this "organismic time," where crucial events and perceptible changes take place over minutes or seconds. However, change is taking place in the forest at scales beyond our comprehension . At one end of the scale is "biochemical time" during which chemical reactions occur in plants, animals, and microorganisms. At the other extreme is "ecological time" encompassing evolutionary processes and broad shifts in climatic and geological conditions (Wilson 1984:41-3). It is at the latter scale that I will begin the process of tracing the history of the forest, and the relationship between humans and the forest in Clayoquot Sound.

Glaciers and Migration in Clayoquot Sound

Like other areas of North America, the west coast of present day British Columbia was subject to the movement of ice sheets and glaciers during the successive ice ages that have ebbed and flowed at various times in the evolutionary history of the Earth. The most recent series of glaciations occurred over the last 20,000 years during the Wisconsin stage of the Pleistocene epoch. There is disagreement over the extent and duration of glacial movements during this period. The area around present day Port Hardy (on northern Vancouver Island) is believed to have experienced the earliest deglaciation 13,630 $\pm$ 310 years before present (BP). In contrast, the glaciers may have retreated as recently as 4,000 years ago in the Prince William area (Hebda 1983; Pojar and MacKinnon 1994).

The movement of the ice was neither uniform nor continuous, but consisted of longer trends of climate change interspersed with shorter "tropical" periods when the ice would melt back. It is likely that some areas of the province, for example along the coast and the adjacent islands, remained free of ice throughout these glacial movements, thus providing important refugia and migration corridors for plants and animals. This allowed the temperate rainforest ecosystem an incredibly long period of time in which species could adapt and co-evolve, resulting in the rich species diversity which is present today (Pojar and MacKinnon 1994).

The movement of the ice over the surface of the province resulted in particular geological formations and conditions, superimposed on the slower and more ancient eruption of the coast mountains. As a result of these larger physiological and climatic changes, the West Coast rainforests have been engaged in a constant process of change and adaptation with respect to distribution, range, and composition of the ecological communities. Palaeobotanical research has uncovered evidence of this process in ancient pollen samples. The study by Hebda and Mathewes (1984) which charts the distribution of *Thuja plicata* (western red-cedar) following the most recent glacier retreat is particularly germane to this thesis. On the basis of pollen curves for this species, Hebda and Mathewes suggest that *T. plicata* migrated northwards from present day Washington state as the climate and precipitation levels became more favourable to its growth on the Northwest Coast. Sometime between 6,000 and 2,500 BP it reached its peak in abundance and distribution, becoming a dominant tree species, along with *Tsuga heterophylla* (western hemlock) in many areas along the north and central coast of BC. This is significant as archaeological evidence suggests that it was during this time period that Aboriginal populations developed highly sophisticated woodworking technology, based largely on the availability of red cedar (Matson and Coupland 1995). This woodworking complex is one of the most distinctive features of First Nations' material culture on the Northwest Coast (Suttles 1990; Matson and Coupland 1995). Hebda and Mathewes suggest that the lack of red cedar prior to 6,000 BP acted as a constraint on the development of this aspect of Northwest Coast culture. This demonstrates the way in which culture and ecology are interwoven, and hence the need to consider "natural" and "cultural" change as part of the same historical process.

Archaeological Record of Clayoquot Sound

Before discussing the archeological record for the west coast of Vancouver Island, it is important to note that the Nuu-Chah-Nulth people (the present day Aboriginal inhabitants) have their own traditions describing their origins and occupation of Clayoquot Sound since time immemorial. I take these traditions seriously, and the following discussion of the archeological record is intended neither to supersede nor to validate the oral traditions. Both are valid in their own right, offering different (and not necessarily incompatible) interpretations of this era in the environmental history of Clayoquot Sound.

Although a topic of much debate, it is widely believed by archaeologists that human populations entered North America sometime between 14,000 and 11,500 years ago during the Late Wisconsin glacial advance when Beringia (a broad, ice-free plain spanning the Bering Strait) would have provided an ice free passage from Northeast Asia (Matson and Coupland 1995:94). Archaeological research on the Northwest Coast has been sporadic both in temporal and geographical terms. Some areas, such as the Strait of Georgia, have been relatively well-excavated and described. Others have received only the most cursory and preliminary of investigations. Unfortunately, the west coast of Vancouver Island falls into the latter category. To date there have been only two major archaeological projects in this region. The site of Yuquot, or Friendly Cove, in Nootka Sound[2] was excavated by John Dewhirst in 1966-1968, and provides the most accessible and detailed evidence. The other major archaeological work in the region was carried out in Hesquiaht Harbour in Clayoquot Sound proper in the 1970's (Calvert 1980).

Aside from these two major projects, few excavations have been undertaken. Recently, however, there has been an increase in reconnaissance work. Reasons for this increase include the requirements placed on logging companies to carry out heritage impact assessments prior to

[2]Nootka Sound is located North of Clayoquot Sound and is occupied by the Mowachaht band of the Nuu-Chah-Nulth First Nations. Yuquot was the site of the first encounter between Europeans and Native peoples on the west coast of Vancouver Island in 1774.

resource extraction, and the need to gather information for land claim disputes and resource use conflicts (Kennedy and Bouchard 1993:31). This has resulted in the identification and registration of 203 archaeological sites with the Archaeology Branch of the BC government, although few of these have actually been investigated beyond the initial survey (Arcas Associates 1989:124). This number does not include culturally modified tree (CMT) sites. CMTs, most commonly *T. plicata*, are trees which have had bark or planks removed by Aboriginal peoples for the purposes of woodworking or textile production (a practice which will be described in greater detail later). One advantage of these sites, particularly with respect to land claim issues, is that they clearly demonstrate cultural use and can be dated relatively precisely using radiocarbon techniques.

Based on the archaeological research which has been carried out, it is possible to sketch out a general sequence of cultural adaptation on the west coast of Vancouver Island. This can provide insight into the way in which First Nations interacted with the forest ecosystem prior to the arrival of the Europeans. Again, I stress the fact that the Nuu-Chah-Nulth people have their own record of these events as passed down through oral traditions. The extensive traditional ecological knowledge held by these people is in itself a testament to and reflection of this long-term relationship and will be explored in greater detail in the main body of this thesis.

Prior to 4,500 BP, the archaeological record on the Northwest Coast suggests a North-South division in terms of cultural adaptation. From the time of initial human colonization (between 14,000 and 11,500 BP) to approximately 4,500 BP, human populations in the central and southern coast regions (including present day Clayoquot Sound) represent what archaeologists have termed Old Cordilleran culture (Matson and Coupland 1995: 81). This culture's technology is characterized by leaf-shaped bifaced lithic tools. There is evidence that a wide range of marine and terrestrial resources were utilized at this time by migratory groups of people. After 4,500 BP, the previous north-south axis of cultural differentiation changed to coastal versus inland adaptations, and there was a lessening in mobility.[3] It was after this time that distinctive cultural adaptations emerged along the coast. This date also marks the earliest cultural horizon at the Yuquot site, and thus the beginning of the archaeological record specific to the west coast of Vancouver Island.

The results of over twenty-five radiocarbon tests date the oldest component of the Yuquot site to 4,200 BP, although Dewhirst speculates that the site is closer to 5,000 years old (Dewhirst 1977; Matson and Coupland 1995). There are two important points which can be distilled from the archaeological research at Yuquot. First, beginning at the oldest stratigraphic level, the material recovered from this site is markedly different from the assemblages of other contemporaneous sites on the Northwest Coast. Most sites along the Northwest Coast dated at 5,000 to 3,000 BP share a number of general characteristics; most notably a reliance on chipped stone tools, and the beginnings of bone and ground stone tool assemblages. At Yuquot, however, there is a noticeable absence of chipped stone tools and very little, if any, similarity to assemblages found at sites either to the south or the north (Matson and Coupland: 1995:122). This suggests that a distinctive group of people was occupying the site from this early date. The

[3]The emergence of permanent village sites (occupied seasonally) did not occur until approximately 3500 BP. This was probably related to the development of technology for storing food (salmon in particular) which would increase the carrying capacity of the area and lessen the need for mobility. This time is also associated with the development of woodworking technology based on the availability of cedar. The massive art and architecture (cedar plank houses, carved houseposts, storage boxes, etc.) made of cedar would have facilitated and been facilitated by a more sedentary settlement pattern.

other point of particular note is the conservative nature of the culture at this site across the various stratigraphic levels (and hence over time) as suggested by the artifact assemblages.[4] This is in marked contrast to other regional sequences which show a great deal of change in the period between 5,000 BP and contact.[5] This supports the argument that the site has been occupied continuously and by the same ethnic group, almost certainly the direct ancestors of the Nuu-Chah-Nulth people, rather than successive waves of human populations moving into the area (Dewhirst 1977:2; Matson and Coupland 1995: 178; Wilson *et al.* 1991:4). This is consistent with claims made by the present day Nuu-Chah-Nulth of being the first and original inhabitants of the Clayoquot Sound area . Furthermore, the absence of dramatic shifts in material culture suggests that strategies initially developed for living in the local environment were highly successful and well-suited to the physical environment, requiring only minor adjustments and refinements.

The period from 3,500 to 2,500 BP shows the first evidence of large-scale woodworking on the Northwest Coast. Evidence for this at the Yuquot site are the stone celts (woodworking tools) found at the level dated 3,000 to 1,200 BP. As mentioned, the range of *T. plicata* was expanding northwards at this time and the species was becoming more abundant along the Northwest Coast, thus providing raw material well suited to woodworking (Hebda and Mathewes

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[4]By "conservative" I mean that the material culture is characterized by continuity over time, showing few changes in its basic features. In saying this, I am cognizant of the difficulties in extrapolating conclusions based on the material culture to the culture as a whole.

[5]Archaeologists, and anthropologists in general, tend to either be "lumpers" or "splitters." The lumpers emphasize similarities, while the splitters focus on differences. This apparent contrast could be due in part to the particular inclination towards lumping or splitting by the archeologists excavating the sites.

1984). In addition, bone awls, needles, and cedar bark beaters provide evidence of basketry and textile work (Matson and Coupland 1995:226). Nuu-Chah-Nulth women are renowned for their woven baskets and hats (see Figure 3.2), and in particular for the distinctive conical whaling hats which are still made today. Cedar baskets and dug-out cedar canoes were traded to other Aboriginal groups on the Northwest Coast in exchange for food and materials not available in the local area. After contact, baskets were also traded or sold to European settlers and travellers, providing an important source of income.

Dewhirst (1977) suggests that the early Aboriginal inhabitants developed a two-part cycle of resource use.[6] This cycle was based on the seasonal and geographical distribution of resources, most importantly maritime but also terrestrial, and required seasonal shifts in residence to take advantage of the fluctuations in availability. If consistent with historical patterns, members of certain families would occupy the same sites year after year within a prescribed territory. Many of the people we spoke with in Ahousaht in the summer of 1996 recalled patterns of seasonal movement. For example, Lena Jumbo (1996), an Ahousaht Elder, told us that,

> We used to travel with the seasons. Spring we'd be at Robert's Point, summer we'd be at Keltsmaht, and 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 Keltsmaht.

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[6]Social scientists often use the term "subsistence" to describe the economic systems of First Nations. As pointed out to me by Dr. Richard Atleo (pers. comm.), the term subsistence is often used to describe "less developed" economies which are not directed towards maximizing profits. From this perspective, the term subsistence has the connotations of minimum survival, or poverty. However, where the underlying ethic of resource use is to only take what is needed, what is described as subsistence from one perspective, becomes great wealth from another.

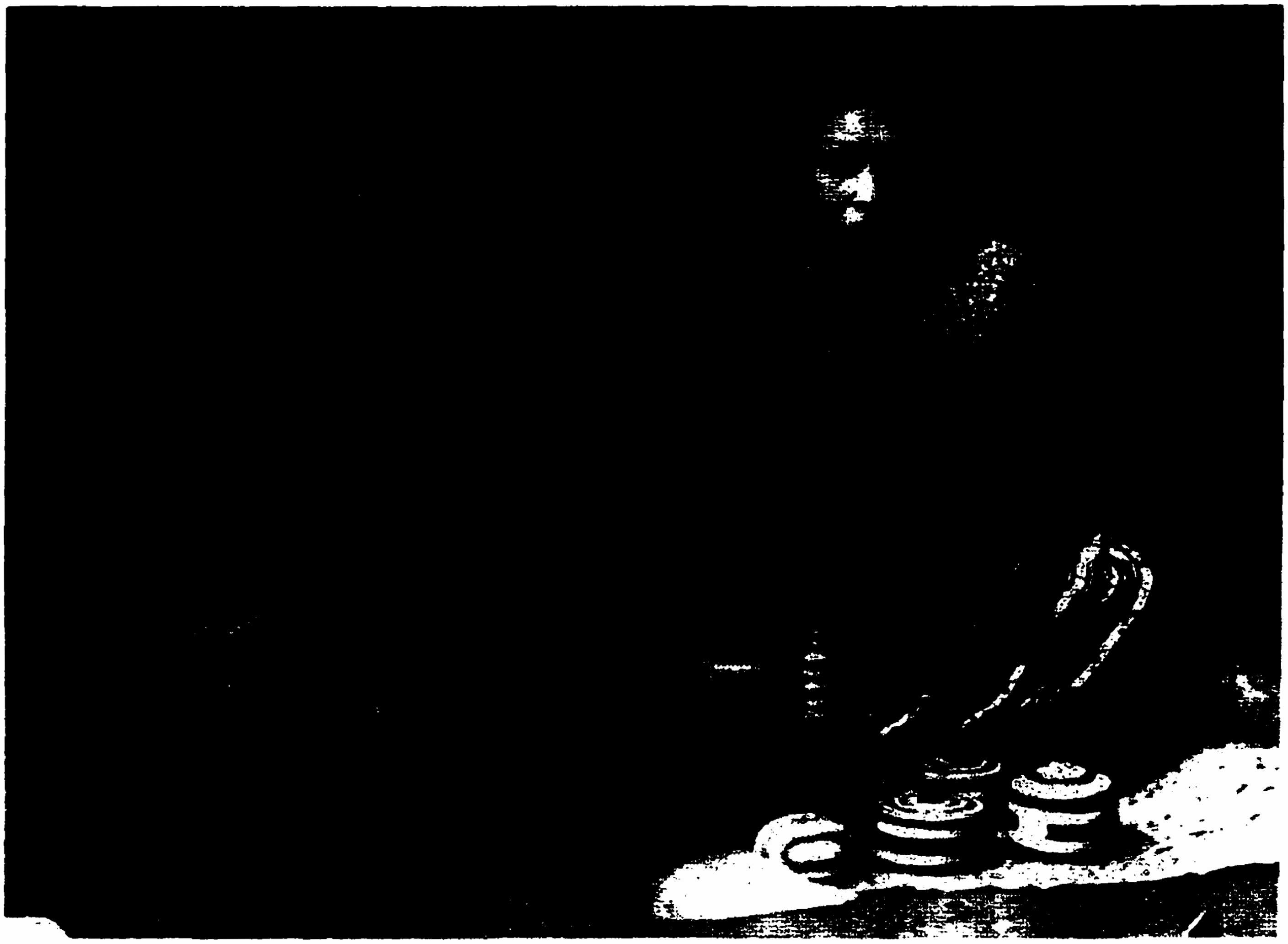

Figure 3.2: Nuu-Chah-Nulth women weaving baskets, early twentieth century (photographer unknown). The woman on the right is Ellen Curley from Opitsat (Meares Island). This picture was probably taken at the St. Louis World Fair in 1904, where Ellen Curley and another woman demonstrated basket-making skills.

Source: British Columbia Archives, photo #H-04543.

Similarly, Greta Charlie (1996) noted that different families travelled through different areas:

> We usually just moved into our own [territory], like my mother was from Keltsmaht, so we'd be in their territory because of her. My dad was from here, [so] we could move from their territory, the Ahousaht Band.

With respect to the archaeological evidence of seasonal movement, Dewhirst contends that this was an adaptation to "inside" and "outside" environmental zones. The inside zone consists of the long inlets and rivers which supported salmon runs varying in type and quantity. Inside sites, located at the mouths of creeks or in sheltered inlets, would be occupied in the winter months. In addition to salmon runs, these sites offered access to forest resources and terrestrial mammals such as deer and elk. The outside zone encompasses the exposed coastline, the coastal sounds, and the island groupings within these sounds. Outside sites, of which Yuquot is an example, would be occupied in the summer months when the weather was more favourable. At this time, hunting focused on sea mammals such as seals, California grey whales, and humpback whales. This seasonal shift in residence was likely complemented with various inter-tribal trading arrangements. It has been suggested that critical resource locations were owned, and exclusive village territories established by 1,000 BP (Matson and Coupland 1995:296; Dewhirst 1977; Calvert 1980).[7] This general pattern was refined over time, placing increasing emphasis on maritime resources supplemented by a variety of plant foods. The annual round was being actively practised at the time of the European arrival on the coast in 1774, and continued on into the twentieth century.

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[7]If consistent with historical patterns, these territories and resource locations would have been the *haḵuulhi* of hereditary chiefs .

Explorers, Ethnographers, and Ecclesiasts: Descriptions of the Other

European presence on the Northwest Coast is relatively recent in relation to other parts of North America. It was late in the summer of 1774 when Spanish explorer Juan Perez and his ship the *Santiago* entered what is now known as Nootka Sound.[8] The first contact between the Spanish and the resident First Nation (the Mowachaht First Nation, previously referred to as the Nootka band) was a brief encounter, consisting of some inaugural trading. Perez did not come ashore, due to adverse weather conditions, and therefore failed to officially "claim" the area as Spanish territory. It was four years later that Captain James Cook, in the course of searching for the elusive Northwest Passage, arrived on the west coast of Vancouver Island. Since this time, successive waves of explorers, traders, missionaries, settlers, and academics have come to the West Coast and written accounts of their experiences and impressions.

These accounts contain descriptions of the West Coast environment and the peoples who occupied it. These documents provide one (indisputably Eurocentric) vehicle for tracing the way in which the relationships between humans (Aboriginal and non-Aboriginal) and the forest ecosystem have changed from the time of contact to the present. In these narratives, both the environment and the Aboriginal peoples are represented as the Other, emphasizing what seemed

[8]The origin of the term "Nootka" is a source of some confusion. According to Arima *et al.* (1991:7), "Cook's error with 'Nootka' arose when he asked for the name of the sound and the people, assuming that the navigator wanted to know if it continued around the large island...replied, 'no:tka'" meaning to circle about." Another possibility is that it came from the word "no:tkshitl' meaning "get around," as the people directed the ship to go around the island. Yet a third possibility is that the term originates from the word for mountain, "nut-chi." Regardless of its precise origin, the Nootka designation is another example of European categories being imposed on Aboriginal peoples. In 1978, the "Nootka" people officially rejected this misnomer and adopted the collective name "Nuu-Chah-Nulth," meaning literally "all along the mountains."

different and exotic to the European observer, and evaluated using European conceptual frameworks. This written record has been used to construct the official history of the west coast of Vancouver Island. I present it here as one interpretation or voice in the larger narrative of the environmental history of this region.

The published journals of early explorers provide a wealth of information concerning plant and animal species present in Clayoquot Sound at the time of contact, and the way in which First Nations used and interacted with these resources. The journals of Captain Cook are less informative than others from an environmental history perspective. One reason for this may be that the expedition naturalist was in poor health and died before returning to Britain (Turner 1978). Nevertheless, it is possible to glean some useful information from these journals, particularly with respect to plant foods and materials utilized by the Nuu-Chah-Nulth people. There are references to edible wild fruits such as various species of *Rubus* (for example, salmonberry and blackberry) and *Vaccinium* (including blueberries and huckleberries), root foods (such as fern roots and lily bulbs), and green vegetables. There are also descriptions of the important role that plant materials played in the technology of the Aboriginal people. Of particular note are the detailed descriptions of the many uses of *T. plicata* (western red cedar): the fibrous inner bark was woven into clothing, ropes, and baskets; and the wood was used in the construction of canoes, houses, and storage boxes.

Cook remarked on the Nuu-Chah-Nulth people's well-defined system of territorial and resource ownership. This is expressed in the following passage, "Here I must observe that I have no were [sic] met with Indians who had such highly developed notions of every thing the Country produced being their exclusive property as these" (Beaglehole 1967:306; Arcas

Associates 1989:11; Wilson *et al.* 1991:11). The observations made by early explorers such as Cook are significant, particularly in light of contemporary land claims issues, in that they document territorial ownership of land and resources pre-existing contact. However, these descriptions may not fully reflect the meaning of concepts such as "property" and "ownership" in the context of Nuu-Chah-Nulth culture. The non-Aboriginal descriptions tend to emphasize rights of exclusive ownership, reflecting European attitudes towards natural resources as private property to be exploited for the benefit of the owner. The Nuu-Chah-Nulth concept of ownership, embodied in the term *ha̲huulhi*[9] and described by contemporary Nuu-Chah-Nulth people, recognizes these rights of ownership; however, they also recognize the *responsibilities* associated with these rights. According to the late Roy Haiyupus (1992:2), a Nuu-Chah-Nulth Elder,

> The *ha wilth* [hereditary chief] has a responsibility to take care of the forests, the land, and the sea within his *ha hoolthe*, and a responsibility to look after his *mus chum* [tribal members]. *Ha hoolthe* is the land and seas and their resources.

Furthermore, Ahousaht Elder Stanley Sam (1996) describes the concept of *ha̲huulhi* like this:

> We have a respect for our *HawiiH*, like your queen of England. . . *ha̲huulhi* means the territories of the nation. . . and we have respect for that, using the word *ha̲huulhi*. . . the ocean, the mountains and all that what's around our tribes with the ownerships - that is called *ha̲huulhi*. That's a word for our people. . . it has been for many generations, many thousands of years. It has been used, this word, for protections of areas and also the protections of boundary lines. . . boundary lines that people couldn't go over in use of that territory without any permission from the other tribe, because it's meaning a lot to them.

This understanding of "ownership" may be contrasted with observations made by non-Aboriginal people from the time of contact to the present day, and has relevance to contemporary

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[9]There are variations in spelling of this word. In this thesis, I adopt the spelling used by the Scientific Panel, *ha̲huulhi*; however, in some quoted sources it may appear with the spelling *ha hoolthe*

resource management issues.

The notes from the Spanish expedition of Bodega y Quadra in 1792, entitled *Noticas de Nutka*, are another source of information concerning the people and environment of Vancouver Island at the time of contact. The *Noticas* were written by Jose Mariano Moziño, a trained botanist and naturalist, and therefore contain a plethora of details about the indigenous flora and fauna of the area. The following passage reveals not only a physical description of the land, but also the culturally defined values and attitudes which shape that description. Moziño (1970:4-8) views the land in terms of its potential for cultivation, a theme which runs through many of the early European descriptions of the area.

> When seen from the sea, the island [Nootka Island] presents at first glance a most picturesque view, because its high mountains, always covered with pine [possibly western hemlock] and cedar, appear never to lose their verdancy. But upon going ashore one finds nothing anywhere except small sandy beaches, thickets, precipices, large sharp rocks, and huge craggy masses in disorderly array...The topsoil has very little thickness. This can be recognized without the slightest difficulty because it began to be formed by the decomposition of mosses and other tender plants just a few centuries ago. It is almost impossible for even the most resolute person to penetrate the interior [of the island], because it contains a multitude of deep gorges and the thick underbrush common to all forests...Possibly a new fertilization of these lands, debilitating its vegetative force a little in some parts and augmenting it in others, would provide nearly a mile of planted fields from the lagoon to the Maquinna River on a strip of not less than thirty feet across at its narrowest. It is obvious that a successful harvest of a crop of grain on such a plot would sustain a small garrison, which in turn could maintain this establishment. But how many trees would have to be rooted out? How many rocks would have to be removed? And how much tenacity would be necessary to clear out the roots and burn out the seeds of the many wild plants that occupy this terrain? Among them one finds many grasses, several brushwoods, andromedas, and berry bushes whose present luxuriance, it seems to me, does not forecast the failure for the more useful plants that might be cultivated later.

Moziño's *Noticas* also include a catalogue of plant and animal species which is useful as a benchmark against which to measure subsequent changes in the composition of the ecological community. Moziño attempted to classify the newly encountered species according to the

Linnaean taxonomic system. It is likely that several plants were classified as physically similar European species, or misclassified due to a lack of information (Wilson 1970). For example, Moziño includes fulmitory (*Fumaria cuculata)* in his inventory, a plant which is not found on Vancouver Island (see Figure 3.3). It is likely that Moziño was referring to the Pacific bleeding heart (*Dicentra formosa*) which belongs to the same family as *Fumaria* and is similar in appearance (Turner 1978).

Another difficulty arises from the fact that the Linnaean classification system has continued to evolve over time, and few of the names bestowed by Moziño have endured to the present day. For example, northern rice root (called the Kamchatka lily by Moziño) was originally identified as *Lilium kamschatkense;* it is now classified as *Fritillaria camschatcensis* (see Figure 3.4). Despite the potential for confusion, Moziño's descriptions are extremely significant, not only as an eighteenth century botanical inventory but as an illustration of the way in which European categories and ideas were superimposed on the "New World." This was true for descriptions of the human, as well as the non-human, indigenous populations.

Another source of information from the early days of colonial presence on the coast is the *Narrative* of John Jewitt, recounting the years he spent as a captive of a Nuu-Chah-Nulth chief from 1803 to 1805. Doubtless the events of the story were dramatized to appeal to European readers and conform to their preconceived notions of Aboriginal peoples, and should therefore be read with a healthy dose of skepticism. Nevertheless, his narrative provides a first hand account of pattens of resource use. For example, the following passage (Jewitt 1987:49) describes the processing of cedar bark for textile production:

A quantity of this bark is taken and put into fresh water where it is kept for a fortnight to

Figure 3.3: "*Fumaria cuculata*, fulmitory."
[*Dicentra formosa*]
Illustration from Mozino's journal.

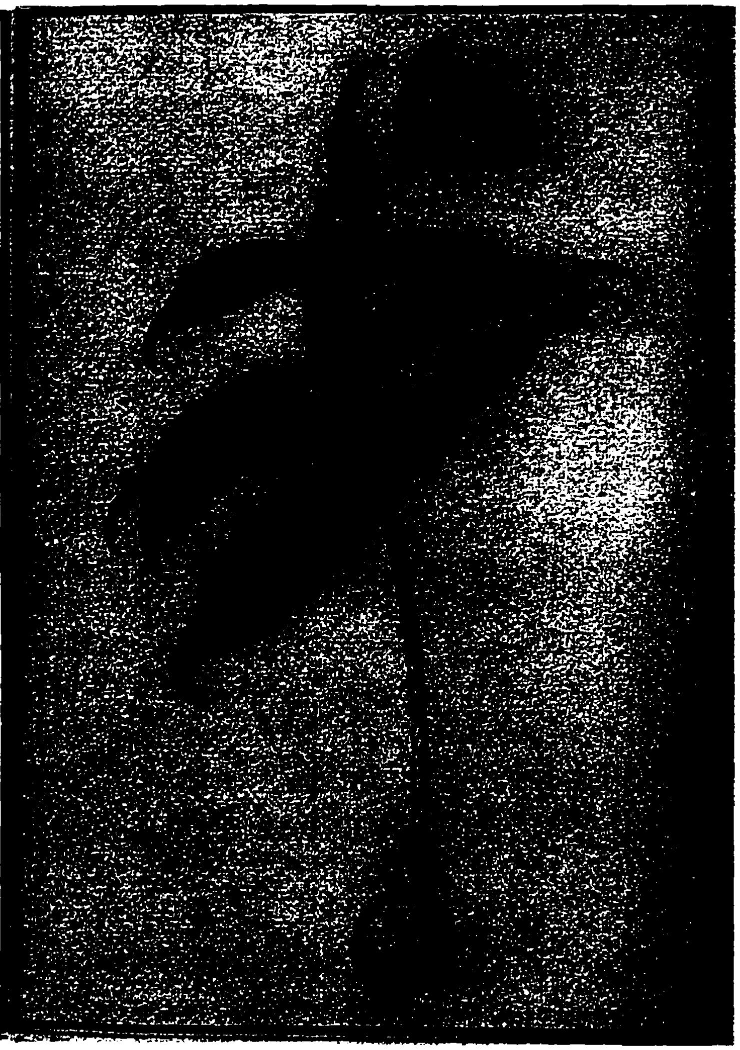

Figure 3.4: "*Lilium kamschatkense*, Kamchatka lily."
[*Fritillaria camschatcensis*]
Illustration from Mozino's journal.

Source: Mozino, Jose Mariano. *Noticas de Nutka: An Account of Nootka Sound in 1792.* Translated and edited by I.H. Wilson. Toronto: McClelland and Stewart Ltd., 1970.

> give to time to completely soften. It is then taken out and beaten upon a plank with an instrument made of bone or some very hard wood [possibly yew], having grooves or hollows on one side of it, care being taken to keep the mass constantly moistened with water in order to separate with more ease the hard and woody from the soft and fibrous parts which, when completed, they parcel out into skeins, like threads.

The practice of gathering cedar bark continued to be an important activity among the Nuu-Chah-Nulth people well into the twentieth century, and is still practised. In his memoirs, Ahousaht Elder Peter Webster recounts going with his grandmother to gather cedar bark. This was still being used to make mats, capes, containers, hats, and clothing in the early twentieth century. Peter Webster (1983:20) describes the process in this manner:

> My grandmother, the other women from the camp and I boarded a large dug-out canoe. This they paddled down to Bedwell Sound until they reached a small bay at the bottom of the mountain. Once there we climbed out of the canoe and pulled it above the high water mark. Next we climbed the mountain in search of suitable cedar trees. A 'suitable' tree was one that had a long expanse of trunk without branches. When this was located the bark was peeled from the tree. It was then pulled apart to separate the inner and outer layers. The inner bark was folded up and strapped, in bundles, to the back of each woman...Next morning the bark was unfolded and spread out to drying the air. After about a day it was dry enough to fold again and store until it was needed for weaving.

Lena Jumbo (1996), a contemporary weaver in Ahousaht, told us about the process of gathering cedar bark for basket materials. This is done at certain times of the year:

> First to gather is the cedar bark which is the end of May when it gets loose from the trunk . . . 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. 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. 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.

Jewitt also describes pit cooking methods, the felling of trees for canoes, berry picking expeditions, and details of trade patterns. The latter is useful in suggesting which resources were used by various groups, and which were highly valued as trade items. With respect to plants, the group with which Jewitt was staying (the Mowachaht) collected, pressed and dried large quantities of *yama* (salal berries, *Gaultheria shallon*) for trade, and received in return quantities of *quawnoose* (common camas, *Camassia quamash*) which grew in abundance on Southern Vancouver Island. Jewitt (1987:65) describes the camas as,

> An excellent root...the size of a small onion, but rather longer, being of a tapering form, like a pear, and of a brownish colour. It is cooked by steam, is always brought in baskets ready prepared for eating, and is in truth a very fine vegetable, being sweet, mealy and of a most agreeable flavour. It was highly esteemed by the natives.

Jewitt also refers to the harvesting of the edible roots of the Pacific silverweed (*Potentilla pacifica*), a coastal cinquefoil. The process by which these roots were obtained could arguably be considered a form of cultivation, although one which was certainly not recognized by Europeans. Digging for the roots would have turned over the soil and facilitated the dispersal of seeds, thereby improving the patches where the plants grew. Recent ethnobotanical studies have documented another traditional way of cultivating this plant. Owners of cinquefoil patches would leave the ends of the roots in the ground in order to ensure that the plant would grow again the following year, thus creating cinquefoil "gardens" (Bouchard and Kennedy 1990:23; Turner and Efrat 1982:73).

It was in the mid-nineteenth century that the west coast of Vancouver Island began to attract white settlers. The first sawmill was built at the head of Alberni Inlet in 1860, only to be shut down in 1865, ostensibly due to its remote location and the difficulty of accessing merchantable timber (Lillard 1987). This was perhaps the first of the "boom and bust" single industry settlements on Vancouver Island, and the beginning of a new episode in the story of changing human/forest relationships in the area. Gilbert Malcolm Sproat was in charge of the sawmill, and the first government agent for the west coast of Vancouver Island from 1860-1865. Sproat left an account of his experiences which provides insight into the early years of the logging industry on Vancouver Island, and its implications for the Aboriginal populations. His descriptions (Sproat 1987:15) of the land reflect the way in which European attitudes and aesthetic standards were transposed onto North America, a theme which has already been identified.

> The whole country - valley and mountain - is covered with pines [sic], which, though rough-looking trees, yet by the deep verdure of their tops, preserve the scenery from the bareness and hardness which, for instance, characterizes many of the west of Scotland lochs. There are lakes, however, in the district which are deep, dark, and wild, and solitary beyond conception. I never knew what utter solitude meant till I went among these lakes; all is in silence except for the melancholy cry of the loon, the breaking of a decayed branch in the woods, or the rush of a torrent; and the feeling of loneliness is increased by the thought that you are in a savage country far from civilized men

In the passage above, Sproat suggests a contrast between the "savage country" and that of "civilized men." Also, Sproat describes the terrain in relation to a familiar landscape: the Scottish lochs. This culturally shaped response to the landscape is elaborated on the following passage.

> The traveller, accustomed elsewhere to trees of smaller growth, and to pleasing varieties of verdure and freshness, finds himself here amidst old, gigantic, and thick-barked pines without branches to a considerable height from the ground, and with dark green bristling foliage which 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.

Sproat gives the impression of being overwhelmed, perhaps threatened by the massive trees of the West Coast rainforest, the "gigantic, thick-barked pines" with their "dark green bristling foliage." This reaction to an unfamiliar terrain can also be seen in the work of some contemporary landscape artists (see Figure 3.5). Sproat's aesthetic response to the landscape is tempered by his economic interests, and he assesses the forest in light of its commercial potential,

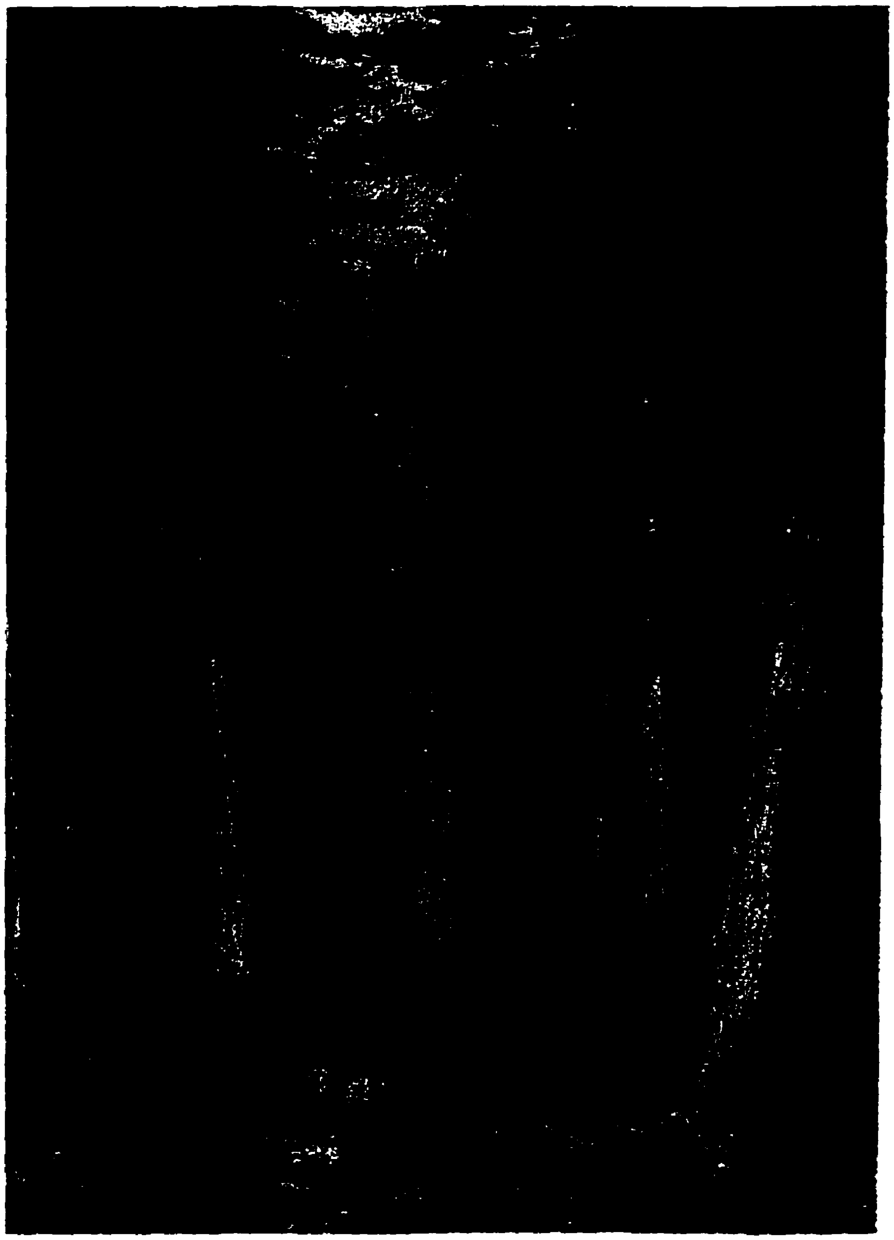

Figure 3.5: Sketch of the temperate rainforest of British Columbia, by Marquis of Lorne, late nineteenth century. National Archives of Canada.

Source: Harris, R.C., and J. Warkentin. *Canada Before Confederation: A Study in Historical Geography.* New York: Oxford University Press, 1991.

> Probably there is nothing in Vancouver Island more interesting to the stranger than the aged forests of pine - nearly all of one species, *Abies Douglasii* [Douglas fir] - which cover the country. Viewed commercially, though the wood is of first-rate quality, these forests are of little value, owing to the difficulty of getting the logs or spars over a rugged surface to a sawmill or place of shipment (Sproat 1987:16).

This assessment would prove to be accurate until the development of technology and infrastructure to facilitate the extraction of the massive trees from the rugged terrain of the west coast.

Sproat also discusses the ways in which First Nations interacted with the forest. Primarily, he describes hunting and gathering activities, and little acknowledgement is given to the role of Aboriginal peoples in shaping or managing the land and its resources. This is most likely because the management was carried out in a form not recognized or valued according to European standards. However, as mentioned earlier, it is possible that activities such as digging for roots and harvesting plant foods and materials may have facilitated the growth and regeneration of certain plant species. One form of land management used by Aboriginal peoples in other parts of North America and abroad which is only now being recognized by Western scientists, is the practice of controlled burnings.[10] This practice creates open patches in the forest where new seedlings can flourish, and encourages the growth of shrubs and other plants. These areas would have been excellent sites for gathering plant materials and foods, such as edible berries. The new growth would also provide important forage for wildlife in the area. As yet, there has been little evidence of prescribed burnings on the west coast of Vancouver Island; however, there is an intriguing hint in the following statement made by Sproat (1987:17),

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[10]See Cronon (1983) for a discussion of the way in which controlled burns were used by the First Nations of present day New England. Lewis (1989) has documented this practice among the Cree of Northern Alberta, and the Australian Aborigines.

> 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.

Like earlier visitors to the area, Sproat laments the poor prospects for "improving" the land through cultivation. In his eyes, because the land was not being used, i.e. cultivated, it was justifiable to appropriate it from the Aboriginal population. This attitude is consistent with European notions of property as articulated by philosophers such as John Locke. Locke was writing in the seventeenth century, prior to the industrial revolution and the second wave of the enclosure movement in Europe. His work reflects this particular historical context. In the highly influential *Second Treatise of Government*, Locke's dissertation on property states that, "As much Land as a Man Tills, Plants, Improves, Cultivates, and can use the Product of, so much is his Property." This idea is reflected in Sproat's rendition of the dialogue which took place between himself and the chief of the Sheshaht band,

> [The chief of the Sheshaht said] "we do not wish to sell our land nor our water; let your friends stay in their own country." [Sproat replied] "My great chief, the high chief of the King George men, seeing that you do not work your land, orders that you shall sell it. *It is of no use to you.* The trees you do not need; you will fish and hunt as you do now, and collect firewood, planks for your houses, and cedar for your canoes. The white man will give you work," (Sproat 1987:5, my italics).

This is further illustrated by the ensuing debate which took place between Sproat and his companions about whether they were justified in taking possession of the land. Ultimately, they decided that because the Aboriginal population "did not, in any civilized sense, occupy the land" and that "all the land was lying waste without prospect for improvement" that they were morally and legally justified in appropriating the land, leaving the Native inhabitants with "title to a limited and sufficient property, enjoyable under certain conditions," (Sproat 1987:8).

The European emphasis on cultivation was not only an economic concern, but a religious one as well. This is also reflected in the work of Locke, who couches his discussion of property in religious terms, stating that,

> God gave the World to Men in Common; but since he gave it them for their benefit, and the greatest Conveniencies of Life they were capable to draw from it, it cannot be supposed that he meant it should always remain common and uncultivated. He gave it to the use of the Industrious and Rational (and Labour was to be his Title to it).

The promotion of agriculture and the Christian religion were intimately connected to one another, and both were an integral part of the colonial project. It was through this project that the wilderness would be transformed into a garden, and the savage rendered civilized. For example, Reverend A.J. Brabant who established the first mission in the Clayoquot Sound area at Hesquiaht in 1875 was given a mandate to "see to it that the Indians themselves shall acquire property and settlement and improve their condition of life," (Moser 1926:5). In accordance with the instructions, fruit trees and other garden plants were brought up from Victoria (Turner and Efrat 1982).

The introduction of the residential school system had serious implications for the relationship between First Nations and the natural environment. First, missionaries and government agents pressured families to abandon their seasonal moves between the summer and winter villages, as sedentary settlements were deemed to be more "civilized." In addition, they disrupted the intergenerational transmission of traditional ecological knowledge by separating children from their families, and undermining the linguistic and spiritual context in which this knowledge was communicated. This is illustrated in Reverend Brabant's diary (Moser 1926:67):

> This being Sunday, quite a number were at Mass. I availed myself of the opportunity to speak again against their superstitions...and finished by exhorting them to abandon their

old Indian, pagan belief.

It is also evident in Brabant's diary that the Aboriginal peoples did not submit passively to this process; however, their ability to engage in resistance was impaired by the population losses they suffered as a result of introduced diseases such as small pox and tuberculosis, and other factors such as increased economic hardships.

The next wave of non-Aboriginal people to enter the area and record their impressions of it were the anthropologists of the twentieth century. While providing a profusion of interesting descriptions of the land, the people, and the relationship between the two, they still represent the gaze of the Western observer being cast on the non-Western other. This is evident in the classification systems used to describe the people, and the framework used to "analyze" the culture, reducing it into constituent parts of economic systems, social systems, kinship patterns, and religious beliefs, all of which fit neatly into chapters of the definitive ethnography. Equally problematic is the propensity to describe these cultures in the "ethnographic present." This attempts to reconstruct the culture as it would have existed in its "pure" form prior to contact with Europeans. The result is a frozen tableau based on a romantic stereotype of "Native culture." Philip Drucker wrote what is considered to be the seminal ethnography of Nuu-Chah-Nulth culture, based on fieldwork carried out in 1935 and 1936. Later ethnographies are essentially a reworking of this earlier material, still focusing on an ethnographic horizon of pre-contact culture, with little, if any attention given to processes of cultural change. While keeping these limitations in mind, there is still a great deal of useful information to be gleaned from these works. Especially pertinent to this thesis are descriptions of traditional patterns of ownership and resource utilization.

Cook's observation about the ownership of territories and resources among the Nuu-Chah-Nulth is echoed over 150 years later by Drucker (1951:247) who remarks that,

> The Nootkans [Nuu-Chah-Nulth] carried the concept of ownership to an incredible extreme. Not only rivers and fishing places close at hand, but the waters of the sea for miles offshore, the land, houses, carvings on a house post...names, songs, dances, medicines, and rituals, all were privately owned.

Drucker elaborates on this system of ownership which he discusses in terms of "privileges" which can be divided into two broad categories: economic and ceremonial. He goes on to outline how these privileges are acquired (through inheritance, or as a reward for bravery) and the various rights which they confer (for example rights to fish in certain local, harvesting rights for berry and root patches, salvage rights along the beach). The extent of the territorial rights of the hereditary chiefs, known as *hahuulhi*, were (and still are) demarcated by natural landmarks such as hills, mountains, points, beaches, or islands. According to Drucker, the resources within these territories were available to anyone belonging to the "house" of the chief, and could be made available to non-group members on the basis of certain conditions such as paying some form of tribute. Chief Umeek (1996) provided us with an articulate, and more culturally appropriate, explanation of this concept:

> So *hahuulhi* then refers to resources, refers to physical resources as well as other kinds of human resources and perhaps spiritual resources. And these become commonly known and they are ascribed and become hereditary in a sense that if I have some gifts and if I have resources, multiple kinds of resources, I will attempt to reify this, transfer it to my son. . . but *hahuulhi*, then, 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. And specific protocols were attached to the resources so if someone wanted to access resources - for example, if I had a clam bed then a family that wished to get some clams would get permission first and then in taking the clams, the first bunch would be brought to the owner, right? That's a form of taxation. . . it's an acknowledgment of who owns the property, who owns the resources.

Similarly, Clifford Atleo (1996) described the all-encompassing nature of *hahuulhi*, including rights to land, resources, songs, and dances. It is also important to note that both the term *hahuulhi* and the word for Chief (*HawiiiH*) are rooted in the word for the Creator. This gives some indication of the respect conferred on *hahuulhi* rights and responsibilities.

Summary

Moving beyond the "ethnographic present" to events of the twentieth century, it is possible to see both continuity and change. As outlined in Chapter 1, the environmental movement, the growth in the tourism industry, declining timber stock, and increasing political activism on the part of First Nations have all led to new parameters within which the relationship between people and the forest is played out. This chapter has attempted to track the dynamics of this changing relationship between people and the forest in the Clayoquot Sound region. In the next Chapter, I will draw my historical focus more closely around the Atleo River Valley. This watershed which lies in Ahousaht traditional territory has been logged extensively in the latter half of this century. The Atleo River Valley was the site of our fieldwork activity in the summer of 1996. The historical information in Chapters 3 and 4 will provide the context for a discussion of traditional ecological knowledge and ecosystem management in the area today; which will be the subject of Chapters 5 and 6.

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Chapter 4
Histories of the Atleo River Valley: "Our territories are very important to us as nations of Ahousaht."

"*First of all I'd like to start with telling you about the histories. Histories of Ahousaht. We have to be very honest because our territories are very important to us as nations of Ahousaht. How we own the territory, and who the chiefs were before contact with the Europeans. . . how the ownerships is by different tribes of Nuu-Chah-Nulth people. That's the important part.*" Stanley Sam (1996)

"*[The Atleo River] 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 [is] today. . . 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.*" Murray John (1996)

Introduction

The preceding chapter is concerned with the environmental history of the Clayoquot Sound area, describing how the land and its human inhabitants have both shaped and been shaped by one another over time. Within this larger historical context, the purpose of this chapter is to look at the histories of the Atleo River Valley. The Atleo River Valley lies in the traditional territory of the Ahousaht First Nation in Clayoquot Sound, BC. Our primary fieldwork in the summer of 1996 was carried out in this valley. The purpose of the fieldwork was to assess the availability and abundance of culturally significant plants in different habitat types in the valley, and to consider how these habitats have been affected by logging activities.

Before discussing the potential for ecological restoration and future human activity in the valley, it is important to understand the changes which have occurred in the physical environment and in patterns of human use. When we visited Stanley Sam, an Elder and historian in Ahousaht, and asked about the Atleo River, he explained that it is not possible to just start talking about a place without knowing its histories. He went on to tell us about the beginnings of the Ahousaht people, and how they descended through generations of chiefs. According to Stanley Sam (1996), "You can't just talk of a history. You've got to speak of Ahousaht where the history comes from." He then went on to describe the events of the war which took place in the early 19th century between the Ahousaht and Otsosat. It was at this time that the Ahousaht people gained control of a vast territory, including Flores Island and various inlets on Vancouver Island. The Atleo River Valley was also part of this territory acquired through conquest. Stanley Sam explained that only through knowing these histories is it possible to appreciate the significance of the Atleo River Valley to the people of Ahousaht. This river was obtained through inter-tribal war at the expense of many lives. In turn, as an important traditional fishery it has helped sustain generations of Ahousaht people. Thus, the significance of life and death is contained in the histories which define this place and its relationship to the people of Ahousaht. In the words of Stanley Sam,

> We have all these histories behind us to prove that how we own territories around us [is] by war. . . It cost us a lot of blood. . . lots of people aren't here today on account of that war, Ahousaht. So this place and these territories, Atleo River, it wasn't given to us. It was a struggle of war. And that's how we own the territories. And on that day, and Ahousahts 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. . . how [our people] got titles of our inlets in Clayoquot Sound.

I will proceed with this chapter in roughly chronological order, beginning with some of the earliest known histories, and moving on to discuss more recent events in the area. The information contained in this chapter comes from a variety of sources including published reports, oral testimony, aerial photographs, and archival material. Each of these sources provides a different perspective, and adds a different layer to the histories.

Early Occupation

Ownership and occupation of traditional territories in Clayoquot Sound by the various Nuu-Chah-Nulth First Nations stretches back to time immemorial. Ownership of these territories has shifted over time between different families and tribes as a result of population changes and intertribal relations. Populations of First Nations in the area have been influenced by factors such as intertribal warfare, introduced disease, and tribal amalgamation. Some groups have been diminished to the point of extinction (for example, the Otsosat), while others have grown through amalgamation (for example, the Ahousaht Nation which is an amalgamation of the Ahousaht, Keltsmaht, and Manhousaht Nations). It was the Otsosat First Nation which occupied Flores Island and the adjacent inlets of Vancouver Island prior to the Ahousaht/Otsosat war in the early 19th century. As a result of this war, the territory of the Ahousaht First Nation was significantly expanded, incorporating the lands of the vanquished Otsosat (Sam 1996; Arima *et al.* 1991). Before this time, the Ahousaht were a relatively small group, with territories primarily on Vargas Island and the adjacent mainland of Vancouver Island. Chief Earl Maquinna George (1996) spoke to us about the wars and the histories of the Atleo River Valley:

> He [Peter Webster] told me what I'm going to tell you about the history of Atleo River. Long ago, the whole of that area where you were around Atleo River. . . that whole area in latter 1700's, and I could say mid-1700's and going back into the 1800's, that whole area belonged to a tribe called Otsosat Nation. They owned all of Flores Island, all the rivers and streams that cross Flores Island, Bawden Bay, a fish producing river, White Pine Cove, also a fish producing river. . . and the Atleo River was one of the richest rivers during that time. And even up until lately in this last decade, it's rich in chum salmon. Never failed, every year the chum salmon came in by the thousands into that stream. . . so now we're beginning 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. . . the war was on in through

> the 1800's, the war between Otsosat and Ahousaht. Ahousahts were living on Vargas Island.

It is difficult to find information on the pre-Ahousaht ownership and occupation of the Atleo River Valley, due to the fact that the Otsosat no longer exist as a distinct cultural group. Arima *et al.* (1991) state that the Otsosat were formerly a numerous people, but that their numbers were drastically reduced through warfare with the Ahousaht. Drucker (1951:238), an anthropologist carrying out research among the Nuu-Chah-Nulth peoples in 1935, refers to the Otsosat as an extinct tribe, stating that "the few scattered individuals who can today trace their descent from Otsosat are of Manoisat [Manhousaht] lineage." The survivors of the war in the early nineteenth century (of which there were apparently very few) intermarried and amalgamated with other Nuu-Chah-Nulth peoples. In doing so, they would have brought with them their traditions and histories. Chief Earl Maquinna George (1996) told us that,

> Even before the Otsosat Nation was completely exterminated - I call it exterminated [but] they weren't fully exterminated because some of the Otsosat Nation fled down south. . . they showed up over there [in Neah Bay in Washington]. In later years they showed up singing songs, the same songs that came from their tribe. They brought their songs with them.

It is likely that there are people with Otsosat ancestry living among the present day Nuu-Chah-Nulth First Nations.

The <u>Clayoquot Sound Indian Land Use Study</u> prepared by Bouchard and Kennedy (1990) is one of the few sources of specific information on the early occupation of the Atleo River Valley. This study records place names throughout Clayoquot Sound, and includes historical information provided by local knowledge holders. As mentioned above, there are no living Otsosat historians; therefore, most information comes from Ahousaht, Tla-o-qui-aht, and

Hesquiaht Elders. According to this study, prior to their defeat in the early nineteenth century, the Otsosat occupied a fall fishing village at the mouth of the Atleo River. The Atleo River is an important traditional fishery, with significant populations of chum and coho salmon, as well as smaller numbers of sockeye salmon and steelhead. Following the victory of the Ahousaht over the Otsosat in the early nineteenth century, the river was awarded to the son of the third chief of Ahousaht. The Atleo family is descended from this man, and the *hahuulhi* in which the Atleo River lies is currently under the traditional jurisdiction of Chief Umeek.

Traditional Territories to Reserve Lands

The histories of the Atleo River enter the colonial period in 1849 with the establishment of the Colony of Vancouver Island. The presence of Europeans in the Clayoquot Sound area increased significantly with the establishment of the settlement at Alberni in 1860 and the arrival of missionaries on the west coast. The Catholic Mission at Hesquiaht was founded in 1875 by Father Brabant, and the Christie Indian Residential School located at the foot of Lone Cone Mountain on Meares Island soon followed in 1899. In 1876, the Joint Reserve Commission (also known as the Indian Reserve Commission) was mandated by the governments of Canada and British Columbia to define the lands which were to be set aside for the use of the Aboriginal peoples in the wake of European settlement. At this time, the lands which had been given to the Ahousaht people by the Creator, passed on through family inheritance, and won through conquest were reduced to postage stamp size parcels of land in the official records.

Joseph Trutch was appointed the Chief Commissioner of Lands and Works in 1864, following the retirement of James Douglas as Governor of the colony of Vancouver Island. In

1871 Trutch became the first Lieutenant Governor for the newly formed Province of British Columbia. Trutch was largely responsible for defining Indian land policy in British Columbia, both before and after the Terms of the Union were established. He adhered strongly to the colonial mentality, and was adamant that Aboriginal claims to land should not hinder settlement and development in the province. It was Trutch who implemented the policy of allowing only 10 acres per family in the allotment of Indian reserves.[1] He was also largely responsible for the reduction of reserves in the interior of BC which had been previously surveyed under the governorship of Douglas. It has further been speculated that Trutch influenced the wording and substance of Clause 13 in the Terms of the Union relating to Indian affairs which states that, "a policy as liberal as that hitherto pursued by the British Columbia Government shall be continued by the Dominion Government after the Union." It is quite clear that the policy of the British Columbia government with respect to Indian affairs and land policy had been anything but liberal (Fisher 1971).

Reserves on the west coast of Vancouver Island were defined in 1890 under the supervision of Indian Commissioner Peter O'Reilly. In a letter detailing the minutes of decision for allotment of reserves for the different tribes in Clayoquot Sound, Commissioner O'Reilly (British Columbia Archives, BC Joint Reserve Commission minutes of decision) states that, "except as fishing stations, [the reserves] are very worthless, the land being unsuitable for cultivation. They do not encroach on the claim of any white settler, nor is it likely they will

[1]This was a distortion of the earlier policy of James Douglas to allot a *minimum* of 10 acres per family for Indian reserves. The 10 acre policy was not even in line with national standards. For example, in 1873, Ottawa suggested allotments of 80 acres per family (Fisher 1971).

retard settlement at any future time." This statement clearly reflects the criteria which were used to define the reserves. The site of the former Otsosat, and later Ahousaht, fall fishing village was designated Indian Reserve No. 24, "Seektukis," belonging to the Ahousaht First Nation. The reserve is an area of 30 acres at the mouth of the Atleo River. At the time the reserve was established, several families were known to still be occupying the site in the fall and winter months.

Twenty-four years later, as part of the Royal Commission on Indian Affairs for the province of BC, hearings were held in various First Nations communities to gather testimony about the situation of Aboriginal peoples and their land holdings. At a meeting held on the Marktosis Indian Reserve (the present day village of Ahousaht) in May of 1914, an Ahousaht man identified as "Keitler" (most likely a member of the Keitlah family) described the Seektukis Reserve as good land with timber on it. In addition, he claimed that there were approximately five houses at the river mouth where families stayed while fishing for dog salmon in the fall. According to Keitler, some minor cultivation took place there; for example, he mentions the planting of potatoes (British Columbia Archives, Royal Commission on Indian Affairs for the Province of BC 1914).

Oral Testimony

More detailed and personal information about the recent histories of the Atleo River Valley was related to us by present day occupants of Ahousaht. On a sunny afternoon in the summer of 1996, we sat with Florence (Flossie) Atleo in her home in Ahousaht as she told us about some of her memories from her childhood. Flossie Atleo told us that her father's parents had a smokehouse at the mouth of the Atleo River. She was very young when she visited the smokehouse at the Atleo River, but she remembers eating in the smokehouse, and that the smokehouse had two rooms attached to the side. This is probably the "large smokehouse belonging to 'Old *kiista*' who was the father of Chief Atleo [George Shamrock]" described in Bouchard and Kennedy (1990:321) by Peter Webster, an Ahousaht Elder. According to Peter Webster, fish were smoked at both ends of this house. The study also mentions three other smokehouses at the river mouth belonging to Joe Titian, Peter Webster's father, and John Keitlah. On our initial exploratory visit to the Atleo River valley, Juliet Craig and I camped at the river mouth, probably on the site where these smokehouses, and before them the fall fishing village, were located. Immediately adjacent to our campsite, we found extensive shell middens and depressions in the ground which indicate former occupation. We also discovered domesticated plants in the area; for example, domesticated cherry trees (*Prunus avium*). These were probably planted by the more recent occupants of the site as an orchard, as was the practice on many reserves in the area. As mentioned in the previous chapter, missionaries and colonial authorities encouraged the planting and cultivation of domestic plants as part of the process of "civilization." However, as also discussed in Chapter 3, the Ahousaht traditionally practiced a form of cultivation by tending and gathering from regular patches of certain plant foods such as the Pacific silverweed (*Potentilla pacifica*).

Other memories of the Atleo River valley were shared with us by Gertrude (Trudy) Frank. Trudy Frank is the daughter of George Shamrock (the former Chief Atleo) and grand-daughter of Kiista mentioned above. Trudy Frank (1996) told us that,

My grandfather used to have a big smokehouse at Atleo River. . . They used to go there in

> the fall, get all the fish they can and smoke them. . . my grandfather and his wife, and there was another couple that had a place up there, and it was huge! They'd live right in the smokehouse! . . . It was one part of a building. I guess they didn't mind it. They used to build the smokehouse where it had a roof, and they had a hole on the roof, and they'd build another roof over it, that way it drew out the smoke.

Trudy Frank also told us about some of the activities that took place at the fall smokehouse. In particular, she described the activities of her grandmother in preparing the fish:

> It was a tedious thing, looking after fish in their time, because they looked after it so careful. They'd spend the whole morning working on their fish. . . They could store away for all winter if they were thoroughly dried. . . [my grandma] 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. She used to save even the fin where you cut, I cut that off and throw it away! Then she'd string them on a stick, like this piece, she'd put a stick through it, and she'd have them hanging there. . . Even the heads sometimes, they just split them in half and smoke them. It was just unreal, they never threw anything away. . . in them days fish were plentiful, but still, you know, we were not ever wasteful.

Trudy Frank told us that her grandparents would spend a couple of weeks at the Atleo River in the fall, catching and preparing fish for the winter. In the smokehouse, her grandmother laid boards across the ceiling where the fish would hang from, and she had a ladder up to these boards that she could stand on while she worked on her fish. The wood that they used to smoke the fish was always alder (*Alnus rubra*) wood. Still today, in the smokehouses in Ahousaht, alder is the preferred wood for smoking. Rosie Swan (1996), an Ahousaht Elder, explained to us that,

> Alder's good for firewood for smokehouse. . . the wood is good for smoking. . . they use it because it smokes a lot. And when you use a different kind, your fish tastes different. I guess we're just used to this kind of wood.

Chief Umeek, nephew to both Trudy Frank and Flossie Atleo, explained to us that his generation has had much less direct experience with traditional sites in Ahousaht territory, aside from the main villages. This, he believes, is due primarily to the imposition of the colonial reserve system discussed earlier. Chief Umeek (1996) stated that,

> The reserve system was imposed in the last century which means our movements then were severely restricted, particularly at the time that I was born, and we were stationary then in the community. . .and all the other traditional sites that we had then over time not only fell into disuse but many of the reserve sites are unknown by the current generation.

Therefore, even though Chief Umeek is the hereditary owner of the Atleo River Valley, he has spent very little time there. He described some visits he made there as a young boy with his family. On these visits, his family would fish and have picnics. More recently, Chief Umeek visited the Atleo River Valley as part of his role as co-supervisor of our summer research project in 1996. Chief Umeek (1996) described his visit in the following way:

> 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've never lived there. To my knowledge I've never lived there. There is - it's hard to explain the kind of feeling at home, feeling. . . there was a strong sense deep inside of me that felt very good, that felt very warm, not in the sense of heat, warm in the sense of love. . . The power that one feels when you have a group of people come together at a feast and enjoying their company, their fellowship with one another and the feasting and the songs and the dances and they all culminate in a tremendous sense of empowerment of oneself.

Chief Umeek's words eloquently describe his sense of deep attachment with the land, suggesting that even if an area is not currently in active use or occupation, it may still hold a latent power to evoke strong feelings in its traditional inhabitants.

Logging Activities in the Atleo River Valley

As described above, the Atleo River valley has been used by the Ahousaht, and before them the Otsosat, for various purposes. The river continues to be a prominent source of fish for the Ahousaht people. It is important to keep in mind that the health of the fish stocks is intimately related to the health of the river and surrounding forest. This was recognized by a number of the people we spoke with in Ahousaht, and is reflected in the phrase ***hishuk ish ts'awalk*** ("all things are one"). The forest ecosystems in the valley have been used for gathering wood products, as evidenced by the fourteen culturally modified trees that we identified during the course of our fieldwork.[2] The culturally modified trees we identified were all western red-cedar (*Thuja plicata*) showing evidence of bark collection. As mentioned in the previous chapter, cedar bark was traditionally used for making clothing, hats, baskets, mats, ropes and other items, and is still collected by people in Ahousaht today.

Obviously, there have been substantial changes in patterns of human use since the creation of reserves and the increasing encroachment on First Nations' traditional territory by Euro-Canadians. According to Chief Umeek (1996), "The changes brought by colonization were extremely dramatic, traumatic I suppose in a sense. . . because it reduced our experiences, our way of life, transformed our way of life completely." These changes have mostly taken place over the past few generations. Since the Atleo River Valley has not been occupied for some time and there are only a few people with specific remembrances of it, it is necessary to draw some conclusions from the information related to us about uses of other areas in Ahousaht traditional territory. The assumption which underlies these conclusions is that resources would have been used in a similar way throughout Ahousaht territory where they were available, and that this resource use would be guided by common cultural values and attitudes towards the land. These values and attitudes were reflected and reinforced in the conversations we had with the present occupants of Ahousaht.

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[2]As described in Chapter 3, a culturally modified tree (or CMT) is a tree which shows some evidence of past traditional use; for example, the removal of a plank or strip of bark.

Some specific evidence of Ahousaht use is described above in the oral testimony of Florence Atleo, Gertrude Frank, and Chief Umeek, and in the published study of Bouchard and Kennedy (1990). The culturally modified trees, and evidence of the village site are further tangible indications of occupation and use of the Atleo River Valley. It is likely that many other products, including foods and medicines, were gathered from the valley by Ahousaht and Otsosat people. In our fieldwork, we found the valley to be rich in food plants including berries and wild root vegetables.[3] Of course, the availability and abundance of these plants have been affected (both positively and negatively) by logging activities in the area. This will be described in greater detail in the following chapter. Here, I describe some of the changes which have occurred in the physical environment of the valley. This will provide a foundation for discussing how restoration might by undertaken to repair some of the damage done by industrial logging activities.

The physical changes which have occurred in the Atleo River Valley over the past 50 years as a result of logging activities are clearly illustrated by aerial photographs. These photographs were taken by the Province of British Columbia Ministry of Environment, Lands and Parks for survey purposes. Prior to undertaking fieldwork in the summer of 1996, we obtained a series of these photographs spanning the years 1952-1991 from the Surveys and Resource Mapping Branch Library in Victoria. When examined in chronological order, these images chart the history of logging activities and their impacts in the Atleo River Valley. Figures 4.1 through 4.4 are taken from this series of photographs, representing the years 1952, 1970,

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[3]As mentioned in Chapter 2, we did not examine the availability or use of medicinal plants. The reasons for this are outlined in some detail in that chapter.

1987, and 1991. I will examine each one in turn to tease out the information they contain about patterns of human use in the Atleo River valley.

The earliest aerial photograph available for the Atleo River valley was taken in 1952 (see Figure 4.1). This is a relatively high level shot; therefore, some of the details are obscured. The land mass to the west of the river mouth across Millar Channel is Flores Island. In the photograph, the relatively uniform tree coverage shows little evidence of human use; however, it is important to keep in mind that this by no means represents a "pristine" wilderness area. As discussed in Chapters 3 and 4, the area in question has been used extensively by First Nations, notably the Ahousaht First Nation. The impacts which have resulted from this traditional use are of a subtle nature: small clearings and paths, individual plants and patches of plants which have been harvested, and the intentional planting of some species. The land management strategies that have shaped these ecosystems will be discussed in greater detail in Chapter 5.

If the photograph is examined closely, it is possible to see a small patch of forest land at the mouth of the river where some trees have been harvested. The area in question corresponds roughly to the dimensions of the Seektukis Indian Reserve. This becomes more clearly evident in the next photograph in the series (Figure 4.2) which is a lower level shot taken in 1970. Note the sharp, linear dimensions of the harvested area. These rigid lines were imposed arbitrarily on the landscape by the Reserve Commission, and then the timber licensing authority. Common sense suggests that logging would have taken place first in the most accessible areas. The river mouth is an ideal location to harvest trees, since the logs can then be easily removed by water. The small patch of cleared land at Bedingfield Bay, immediately west of the main lake in the river valley, also reflects this logic. In later years, this site at Bedingfield Bay became the

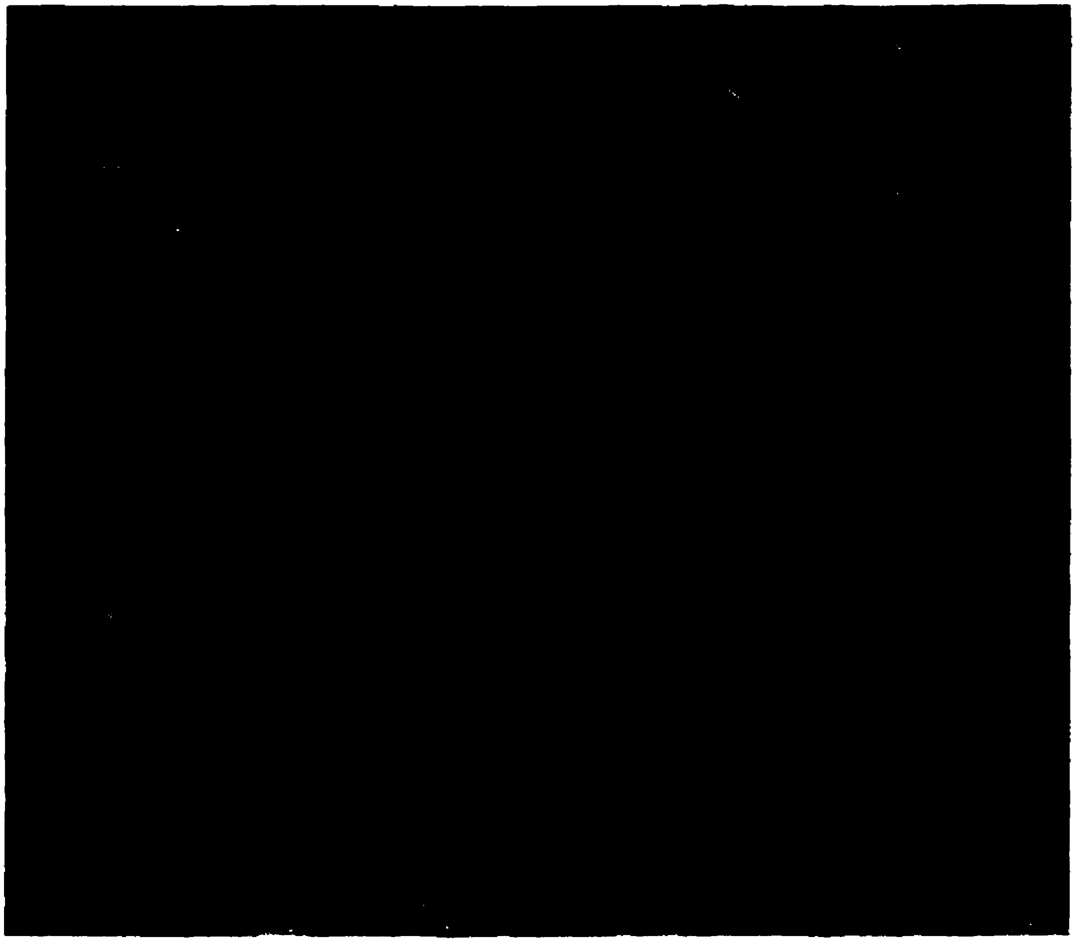

Figure 4.1: Air photo Atleo River Valley, 1952. This photograph shows the Atleo River Valley prior to any major industrial logging activity. Note that there are no major gaps in the forest cover. The blue dot indicates the mouth of the Atleo River, the red dot indicates Barra Lake, and the green dot indicates Flores Island.

Source: BC Government air photo BC1855:99 used with permission of Geographic Data BC, Ministry of Environment, Lands, and Parks.

Figure 4.2: Air photo, Atleo River Valley, 1970. As with the previous figure, this photo does not show evidence of extensive logging activities. However, there is a section at the mouth of the river which has been logged (indicated by the lighter colour). Note the sharp lines of this cutblock; these correspond roughly to the dimensions of the Seektusis Indian Reserve. The blue dot indicates the mouth of the Atleo River, the red dot indicates Barra Lake, and the yellow dot indicates Bedigfield Bay.

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.

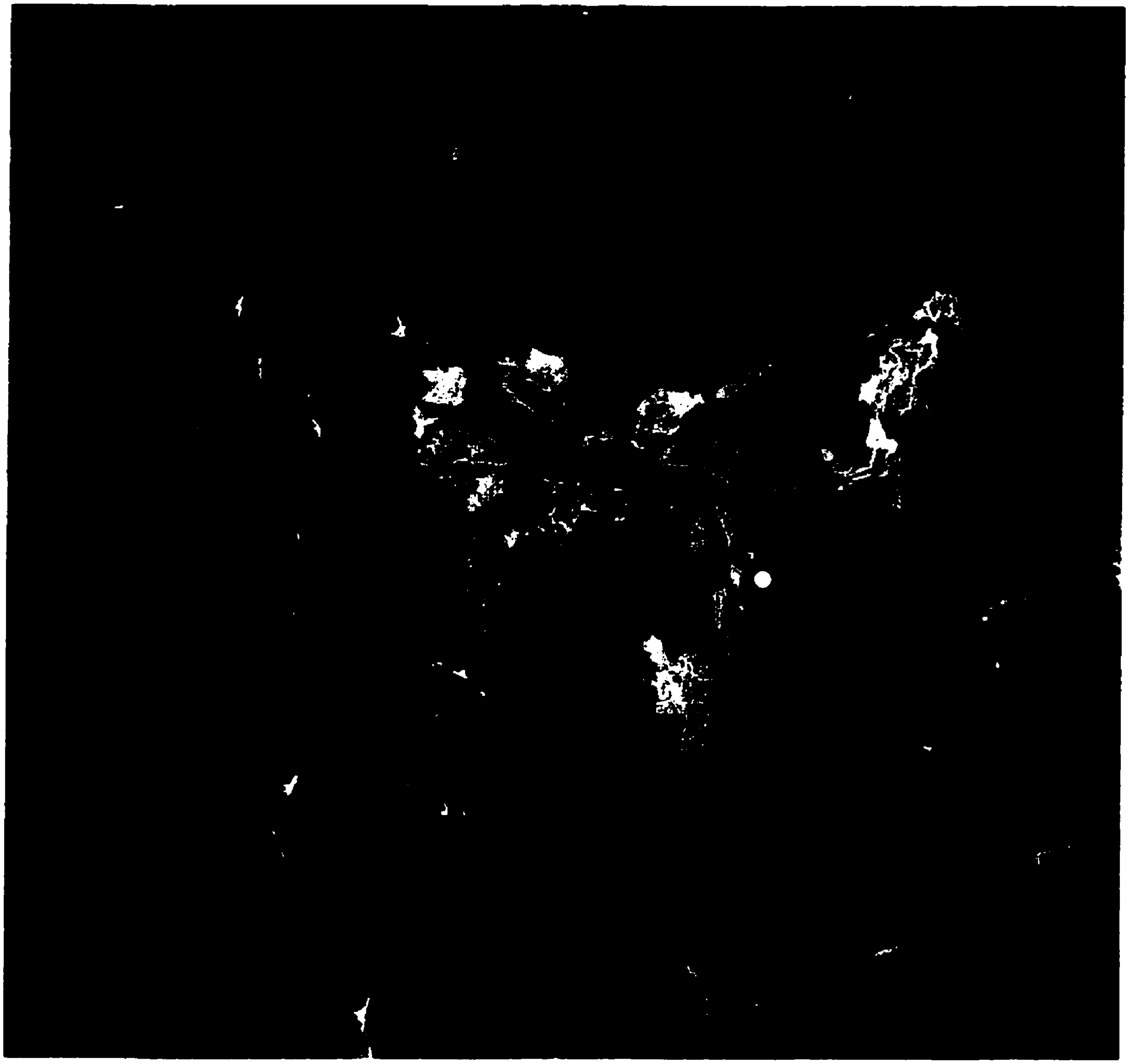

Figure 4.3: Air photo, Atleo River Valley, 1987. This high level shot gives some indication of the extent to which the forest ecosystems of the Atleo River Valley and surrounded area have been fragmented through industrial logging. The light areas represent areas that have been logged. In general, the lighter the area, the more recent the logging activity has taken place. As in the other photos, the green dot indicates Flores Island, the blue dot indicates the mouth of the Atleo River, the red dot indicates Barra Lake, and the yellow dot indicates Bedingfield Bay.

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

Figure 4.4: Air photo, Atleo River Valley, 1991. This composite picture shows the status of the valley in 1991. This is a relatively low level view; therefore, it is easy to see where intact forest ecosystems remain; mostly in a thin strip along the Atleo River itself. In carrying out our fieldwork in the summer of 1996, this was the most recent series of air photos we had to work with. Since this photo was taken, additional logging has taken place in the valley in small scattered cutblocks.

Source: BC Government air photos BCC91018 No. 126, 111, and 156 used with permission of Geographic Data BC, Ministry of Environment, Lands, and Parks.

location of one of the main logging camps in the area. However, the questions still remain: why was the Indian Reserve specifically targeted for harvesting, and who carried out the logging done in these early years?

Subsequent to the establishment of the reserve system in British Columbia, strict regulations were put in place to restrict the way in which First Nations could use reserve land. The archival record gives some evidence of these regulations, and how they impacted First Nations on the west coast. In 1908 Alan Neill, the Indian Agent for the Alberni district of the West Coast Indian Agency (which included in its jurisdiction the Ahousaht First Nation) wrote to A.W. Vowell, the Indian Superintendent for BC at the time, in reference to this issue. Neill stated that the question of the rights of Aboriginal peoples to the timber on their reserve land is a matter of serious contention in his district. Neill explained:

> With the appreciation in value of timber most of the Govt. [sic] timber land has been taken up and on the remainder the Indians are not allowed to cut logs or even firewood for sale without taking out a costly license good for a year and paying a royalty as well and there is practically no vacant Govt. land. The Indians are not allowed to cut logs or firewood on their reserves for sale as I have lately had to tell them and they are feeling very sore about it.

Neill suggested that the regulations about harvesting timber and firewood from reserve land be relaxed in order to provide Bands with some income, particularly in the winter months (NAC, letter from AW Neill 1908). In turn, Superintendent Vowell forwarded Neill's letter to the Department of Indian Affairs in Ottawa. Vowell did not exactly endorse Neill's suggestion in the note which accompanied the forwarded letter:

> In so far as I am aware Indians were never allowed to cut timber from off their reserves for sale without having first been granted the permission of the Department [of Indian Affairs] to do so, and then only on the understanding that within a limited time, specified in each instance, those responsible for the cutting were to place the land cut over under

> cultivation or pasture, and that if promiscuous cutting has been indulged in on any of the reserves from time to time without full Departmental sanction therefor [sic] the preceding was certainly irregular. (NAC, letter from AW Vowell 1908)

Vowell's statement is interesting in that it reflects the attitude found in the journals of the early Europeans who arrived in the late eighteenth century concerning landuse, and the role of cultivation in taming the wilderness and establishing "civilization" in the Americas (for example, see the quotations from Mozino and Sproat in Chapter 3). The return letter from the Secretary at the Department of Indian Affairs in Ottawa confirms Vowell's contention that the cutting of timber or firewood on reserves was not allowed, except in the case that the wood was to be used for "Band purposes" (such as construction) and that the land cleared must subsequently be placed under cultivation.

Under this regulation, in 1955 the Ahousaht First Nation applied for permission to remove timber from their reserve land to construct a Band Community Hall in the village of Ahousaht (Marktosis Indian Reserve) on Flores Island. They originally intended to remove the timber from the Seektukis Indian Reserve No. 24 (i.e. the mouth of the Atleo River), but decided instead to remove the wood from the Marktosis Reserve (NAC, letter from NW Garrand 1955). A Band Council resolution was passed to this effect on November 16, 1955 (NAC, Ahousaht Band Council Resolution 1955). Therefore, the harvested area at the mouth of the river in the aerial photograph was not a result of logging by the Ahousaht First Nation.

Instead, the archival record shows that the logging was carried out by W.F. Gibson & Sons on behalf of Aero Timber Products Limited (Vancouver, BC). In 1943, Aero Timber Products applied for and received permission to log Seektukis Indian Reserve No. 24 at the mouth of the Atleo River (NAC, letter from Aero Timber Products Limited 1943). The company proposed to log spruce timber from the reserve over a period of one year, with the following prices to include royalties and stumpage: $8.00 per thousand feet for No. 1 spruce, $5.50 for No. 2 spruce, and $1.60 for No. 3 spruce. Arrangements were made through the Indian Agent at Port Alberni (P.B. Ashbridge), the Indian Commissioner for BC (D.M. Mackay), and the Superintendent for Reserves and Trusts in Ottawa (D.J. Allan). Permission was given in the form of a Timber License (#278), and the company was required to pay a licensing fee of $50. It is unclear in the records to what extent the Ahousaht Band was consulted, and whether or not they received any financial benefits from the logging which took place on their reserve land. In his letter granting permission, D.J. Allan chastises the timber company for assuming they could remove timber from an Indian Reserve without seeking the permission of the Band or the Department of Indian Affairs (NAC, letter from DJ Allan 1943). This suggests that consultation prior to logging was minimal, at least for this specific case. There is some intimation that the logging company used the excuse that the demand for timber to supply the war effort gave them extraordinary rights to harvest timber on reserves without going through official channels.

During the summer of 1996, we spoke with a number of people in Ahousaht who had been involved in logging activities. This has been an industry of some importance in providing wage employment for the people of Ahousaht, particularly between the 1950's and 1970's. According to a report prepared by Archeo Tech Associates (1991) the forestry sector previously employed a significant number of Nuu-Chah-Nulth people in the Clayoquot Sound area, particularly in the winter months when there was no commercial fishing. However, employment decreased steadily throughout the 1980's for both Aboriginal and non-Aboriginal forestry workers. In 1991, tourism had overtaken forestry in employment for the Nuu-Chah-Nulth, and it was predicted that this trend would continue. It is possible that this is no longer the case, with the introduction of new forestry regulations and increasing involvement of Nuu-Chah-Nulth peoples in resource use decisions following the recommendations of the Scientific Panel reports.

Carl Jumbo, an Ahousaht Elder, spoke to us about his experiences working for logging companies. Carl Jumbo began working as a logger in 1943, during World War II. At this time, there was great demand for timber to service the war effort. He started working for W.F. Gibson & Sons in the year that they applied for and received permission to log at the mouth of the Atleo River, although he did not mention working specifically in the valley. Gibson's Mill was located on Flores Island, near the village of Ahousaht, and it is likely they employed a number of people, such as Carl Jumbo, from the local area. Carl Jumbo (1996) spoke of logging on reserves throughout Clayoquot Sound:

> Our reserves are pretty well logged out, you know, most of them. . . In 1943 I remember we were, I guess that's when the war broke out, World War II, when I went to a logging camp, Gibson's logging camp it was, all spruce. Cleared out that reserve, all the way.

Carl Jumbo noted that there have been significant changes in the technology used in logging since he was first involved in the industry. In addition, the trend has been towards larger companies carrying out the logging in the area. These technological and industrial changes have accelerated the pace of logging activities, resulting in more extensive impacts as seen in the later aerial photographs.

Figure 4.3 is a high level shot taken in 1987 which clearly shows the extent of logging activities in the Atleo River valley and surrounding area. According to MOF Forest Cover Maps, most of the logging took place in the valley in the 1970's and 1980's, with the three main periods of harvesting being 1979-1981, 1985-1986, and 1991-1994. Logging continued up to 1994, when most of the few remaining patches of forest were logged. As far as we were able to ascertain in our conversations with representatives of Ministry of Forests and MacMillan Bloedel in Port Alberni, there are no plans for further logging in the valley (Figure 4.4, the aerial photo from 1991, gives a good indication of why this is the case). At the present time, the main logging-related activities in the valley are road decommissioning, brush control, and thinning of replanted areas. Most areas were replanted following logging. The species used for replanting varies according to the different elevations and soil types in the valley. The favoured species are the commercially valuable conifers: western red-cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), and Douglas fir (*Pseudotsuga menziesii*). The latter does not naturally occur in abundance in this particular region; we rarely encountered Douglas fir in unlogged sites. It is more suited to the drier conditions of Southern Vancouver Island; subsequently, it also does well in the open, dry environment of a clearcut. Thus, the large-scale planting of Douglas fir in clearcuts represents a shift in species composition in the area.

The Atleo River Valley falls under two main logging jurisdictions: the Arrowsmith Timber Supply Area (TSA), and Tree Farm License (TFL) 44. A TSA is described by the MOF (1993) as, "an area defined by an established pattern of wood flow from management units to the primary timber-using industries." Within these management areas, timber companies may obtain Timber Sale Licenses. Timber Licenses are agreements which define a specific volume of timber which may be harvested from within the management area. The volume may be expressed as the annual allowable cut. In contrast, a TFL is an agreement encompassing management and harvesting rights within a specific area which may be either Crown or Private land. The important distinction between a Timber License in a TSA, and a TFL is that the former is volume based, while the latter is area based, conferring much wider-reaching management rights.

It was in the years following World War II that the majority of forest lands in BC came under various forms of tenure. It was in 1947, based on the recommendations of the province's Chief Forester, C.D. Orchard, that the forerunner to the current TFLs was established in the form of perpetual Forest Management Licences (Drushka 1993). The history of the current forest tenure system in BC dates back to the first Forest Act which was passed in 1912. From the beginning of the Colonial Period to World War I (1859-1913) there were four primary ways of disposing of timber (Cail 1974). These were:

- Through the outright sale of land with timber on it. According to Douglas' Land Proclamation of 1859, all land acquired through crown grants or purchase included the rights to all timber on the land without royalty.

- Through the leasing of land, established by the land ordinance of 1870. Through the leasing system, unlimited crown lands could be leased for purposes of cutting spars, timber, and lumber. The lessee payed a royalty for timber cut, and a yearly rent. Under this system the province retained ownership of the land. Most leases were granted for a period of twenty-one years, and lease-holders were required to build a sawmill.

- Through the granting of a timber licence. a licencing system was established in 1884, and was in place until 1913. Under this system, licences were granted for a period of four years (general licence) or one year (special licence) to cut timber on 1,000 acres of land. These licences were not transferable, and holders were limited to one licence. Both rent on the land, and royalties on timber secured revenue for the government.

- Through the sale of timber. This system was initiated by the Forest Act of 1912, and replaced all other methods of timber disposal until the introduction of tree farm licences and public sustained yield units in 1947. Through the timber sale system, the BC Forest Branch cruised and surveyed an area, after which they set a stumpage (royalty) price. Subsequently, the standing timber was sold to the highest bidder through public auction, while land ownership remained vested in the Crown.

The Forest Act was established on the recommendation of the first Royal Commission on BC's forests which was carried out in 1910. This Commission suggested that some administrative controls be put in place to regulate the exploitation of forest resources in British Columbia (Cail 1974; Scientific Panel 1995c). Major industrial logging activities in BC began in the 1890s. In 1920, the total timber production for BC was 9.9 million cubic metres. Since then, it has doubled approximately every twenty years (Hartman and Scrivener 1990). It was around the turn of the century that silvicultural techniques such as clearcutting, tree plantations, and brush control were imported from Germany into North America (Hammond 1993). These techniques formed the basis for institutionalized forest management which was taught in forestry programs and entrenched in government forest policy as "sustained yield management." In the early years of industrial logging activities, the forests of BC provided raw materials for the British colonial economy, and were regarded as virtually inexhaustible. Although there is much written to the contrary, in practical terms there is little evidence to suggest that this attitude has undergone any degree of significant change.[4]

The main form of logging which has taken place in the Atleo River Valley is the clearcutting silvicultural system. Historically, this has been the standard technique used throughout the west coast area. This system involves the removal of timber from an area which is then replanted with an even-age stand of trees. The habitat created through this system is an open clearing with full light exposure i.e. no canopy cover. Openings are usually at least 1 ha in area. The site is "prepared" for replanting by manual, mechanical, and/or chemical means. This may include burning the slash (wood debris left after logging) and treating the soil with

[4]It is also important to note, however, that this is a time of transition for the forest industry and forest practices in BC. With the introduction of the new Forest Practices Code, and initiatives such as the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound, and the Commission on Resources and Environment (CORE) process I am hopeful that changes in attitude will begin to be reflected on the ground in practice.

chemicals to impede the natural herb and shrub growth. The area is then replanted, using commercially valuable species which are suited to the microclimate.[5]

The visual results of clearcut logging in the Atleo River Valley are clearly evident in the aerial photograph taken in 1991 (Figure 4.7). Large patches of the biologically diverse forest ecosystem have been transformed into open areas. This process is described by Hammond (1991:104) in the following way: "Conventional 'forest' practices alter or remove most of the elements in the forest web, but replace only one - the trees." This is in marked contrast to traditional systems of forest use, in which materials are selectively harvested for specific uses. The emphasis in traditional systems of land management is on using a diverse range of gifts from the forest ecosystem. This type of use favours the maintenance of biological diversity, instead of concentrating on only one product.

Summary

The forests of Clayoquot Sound have been used and occupied by humans since time immemorial; this use and occupation has been informed by specific cultural attitudes and worldviews. The Atleo River Valley is no exception. Following the war with the Otsosats (another Nuu-Chah-Nulth First Nation) in the early nineteenth century, the Ahousaht gained control of a vast land area which included the Atleo River Valley. Families visited the salmon-rich river in the fall to catch and dry fish for the winter months. Evidence of this past use is found in the oral testimony of contemporary Ahousahts, and in the physical remains of use and

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[5]Of course, the microclimate has been significantly altered by the logging activities. Thus, the dominant species that were growing at a site previously may no longer be suited to the area.

occupation. The imposition of colonial authority and the reserve system restricted access and rights of the Ahousaht First Nation to their traditional territories. The increasing non-Aboriginal population in the area brought new attitudes towards the land and landuse, represented most dramatically by the introduction of industrial logging activities. The aerial photographs presented in this chapter illustrate the extent of logging activities on the Atleo River Valley over the last 40 years. These activities have resulted in significant physical changes in the valley, affecting plant species and their habitats. In turn, these changes have implications for future patterns of resource use in the valley.

As mentioned in the introduction to this thesis, this is a particularly dynamic period of time in Clayoquot Sound, and many recent events will affect the nature of resource use in the future. These include the introduction of the new Forest Practices Code, and the decision to adopt the recommendations of the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound. In addition, the entire area of Clayoquot Sound is being considered for designation as a United Nations Biosphere Reserve. Finally, and of great importance, is the progress of treaty negotiations between the Nuu-Chah-Nulth First Nations and the governments of Canada and BC. All of these events will have significant ramifications for resource use and human relationships with forest ecosystems in Clayoquot Sound in the years to come.

In the next two chapters, I will shift my perspective towards the future. In Chapter 5, I will discuss the present state of the Atleo River Valley in greater detail, and some of the traditional forest management strategies which have been, and are being, employed by the Ahousaht First Nation in their traditional territory. Then, in Chapter 6, I will explore how these strategies, in conjunction with new forestry practices and philosophies, can inform the process of restoration which needs to take place in the Atleo River valley, as in other areas of Clayoquot Sound. This discussion will focus both on the cultural and physical aspects of restoration, as both of these aspects need to be considered in order to develop a holistic plan for restoration.

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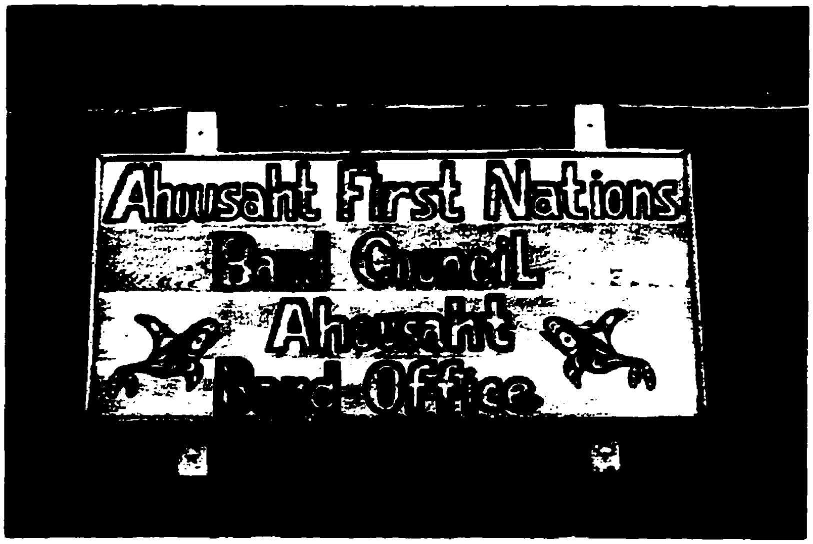
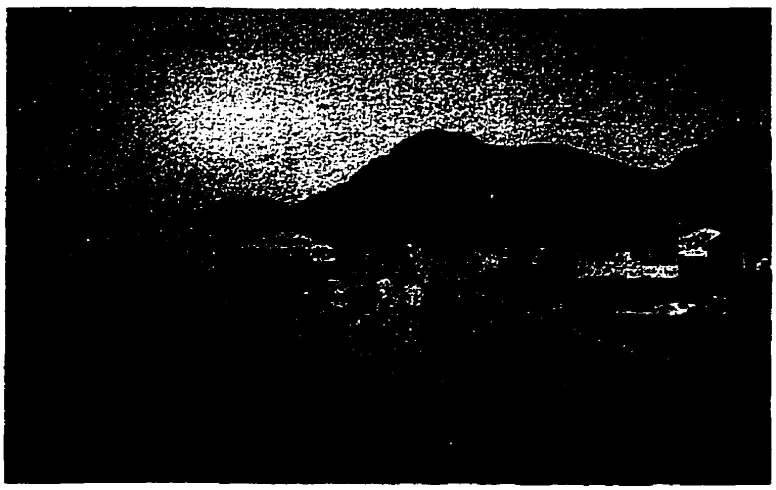
Colour Plates *

Ahousaht Village



1. Ahousaht Band Council sign.



2. Main dock, village of Ahousaht (*Maaqtusiis*).

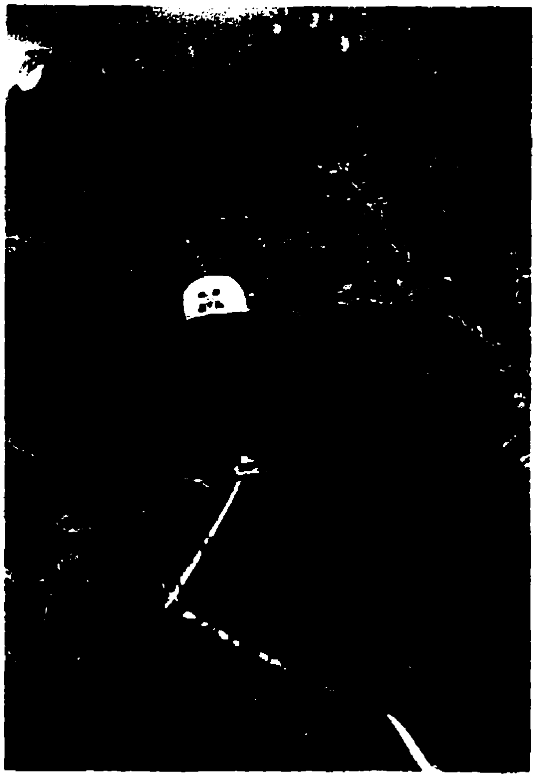
*All photographs were taken by either Juliet Craig or Robin Smith.

The Atleo River Valley, Ahousaht First Nation's Traditional Territory.

3. Panoramic view, Atleo River Valley looking east towards Barra Lake and Bedingfield Bay.

4. Mouth of the Atleo River, looking west across Millar Channel to Flores Island.

Fieldwork in the Atleo River Valley



5. Paul Frank Jr. setting up a vegetation plot to be surveyed (left).

6. Travis Thomas and Greg Hayes, preparing for fieldwork (below).

Habitat Types in the Atleo River Valley

7. View of different habitat types: slash from a recent cut in the foreground, forest in the mid-ground, and logged slopes in the background.

8. Greg Hayes on fallen tree, old-growth forest, Atleo River Valley.

Old-Growth Forest Habitat - Atleo River Valley

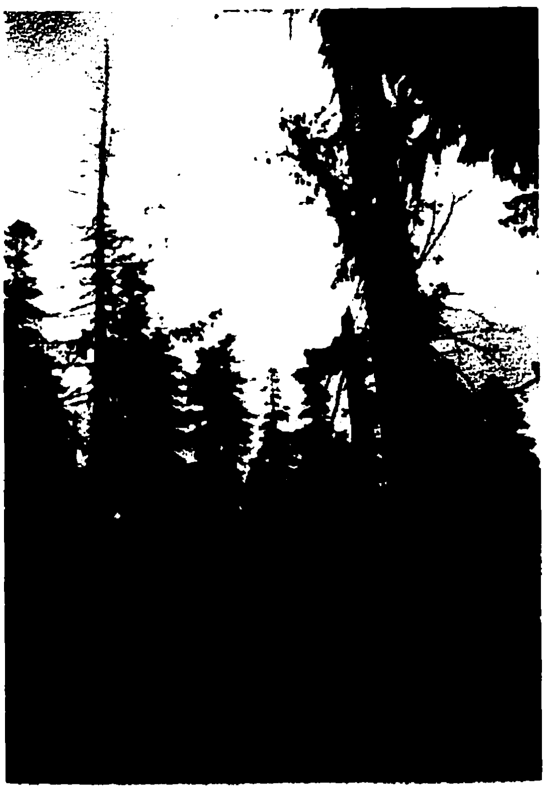
9. Old-growth forest, Atleo River Valley. In both pictures, note the patches of sunlight, and structural diversity of the forest.

10. Old-growth forest, Atleo River Valley.

11. Nurse log, with young plants and moss growing on it.

12. Licorice Fern (*Polypodium glycyrrhiza*) growing on mossy log.

13. "Edge effect," disturbed forest habitat adjacent to logging road.

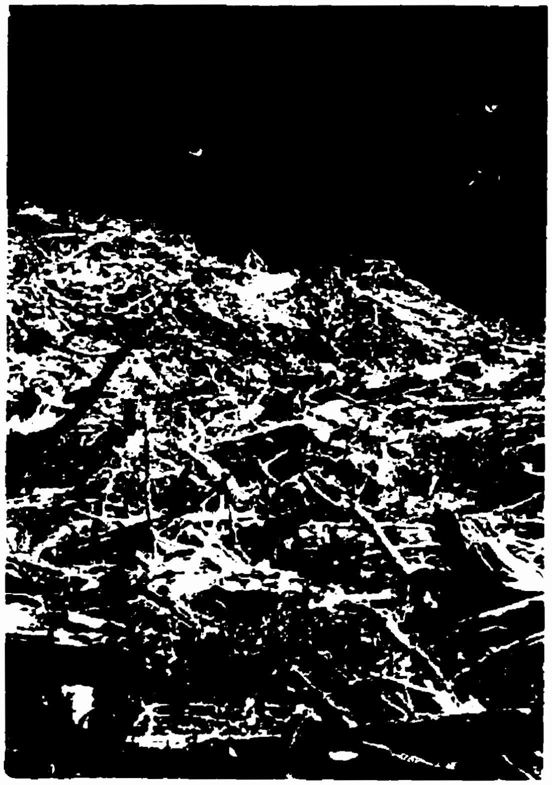


14. Forest adjacent to logging road. Note the many "spike top" trees.

Recently Logged Areas (1991 - 1994) - Atleo River Valley

15. Recent clearcut on mid-upper slope of the Atleo River Valley.

16. Slash left in a recent cutblock, Atleo River Valley.



17. Recent clearcut (logged 1993/94).

18. Recent clearcut (logged 1993/94) with slash, Atleo River Valley near Barra Lake.

Areas Logged 1978-1985 - Atleo River Valley

19. Slash in clearcut, logged 1985. This area is just north of the Atleo River mouth.

20. Deer fern (*Blechnum spicant*), salal (*Gaultheria shallon*), and young red-cedar (*Thuja plicata*) growing in area logged 1978/79.

Barra Lake - Atleo River Valley

21. Barra Lake with yellow pond lilies (*Nuphar polysepalum*). This picture was taken on the west (forested) side of Barra Lake.

22. Fallen tree in Barra Lake. Note the many young plants growing on the fallen log. This picture was taken on the south (logged) side of Barra Lake.

Riparian Areas - the Atleo River

23. Along the banks of the Atleo River.

24. Cut-bank along the Atleo River. This shaded pool is ideal habitat for young salmon.

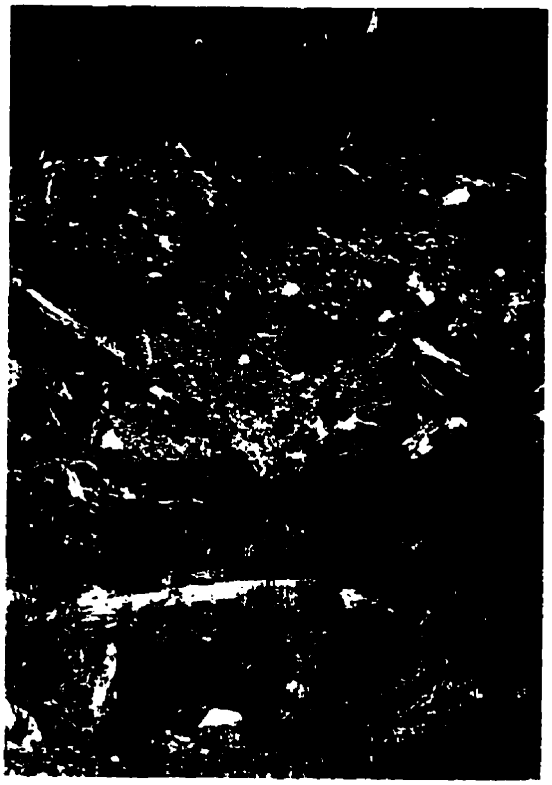
Estuary - Atleo River Mouth

25. Estuary at the mouth of the Atleo River, with forest and logged slopes in the background.

26. Wildlife tree in the estuary at the mouth of the Atleo River.

Impacts of Logging Activities

27. Landslides near Hesquiaht (north of Flores Island).



28. Exposed soil on slope at the side of a logging road, Atleo River Valley. This area has been seeded with a mix of grasses, some of which are non-native.

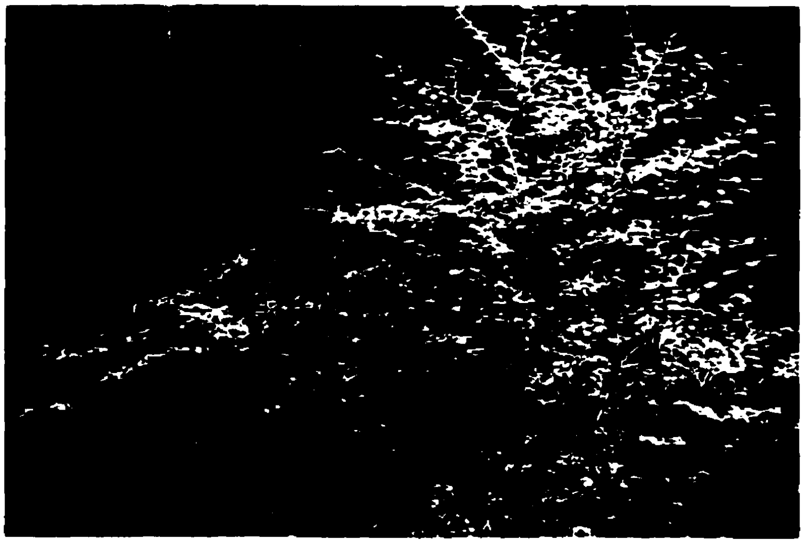
29. Logjam in the Atleo River. We encountered this massive accumulation of debris when looking for one of our riparian plots.

30. Himalayan blackberry (*Rubus discolor*). This non-native plant species invades disturbed areas and spreads quickly, often at the expense of native species. We found this plant in a logged area in the Atleo River Valley.

31. Scotch broom (*Cytisus scoparius*). This is another exotic species which invades disturbed areas. We found this species along a logging road in the Atleo River Valley.

Culturally Significant Plant Species

32. Thimbleberry (*Rubus parviflorus*). This shrub, which is found in both clearcuts and forested areas, produces delicious berries. In addition, the new shoots were traditionally eaten by the Ahousaht in spring, much in the same way as salmonberry (*Rubus spectabilis*) shoots.

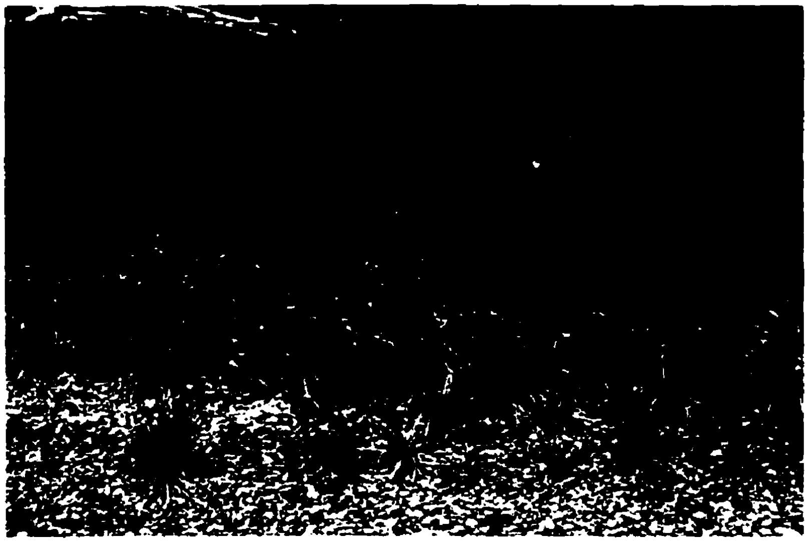


33. Red huckleberry (*Vaccinium parvifolium*). This shrub produces deliciously tart red berries (see below).

34. Red huckleberries in a bowl, the fruits of our labour!

35. A trio of plants (left): basket sedge (*Carex obnupta*), false hellebore (*Veratrum viride*), and bunchberry (*Cornus canadensis*). The basket sedge, an important basket-making material, is the tall, slender plant with the dark-brown inflorescence. The false hellebore is the broad-leaved plant beside it. The bunchberry is the small plant with white flowers. These plants were found near a small lake in the Atleo River Valley.

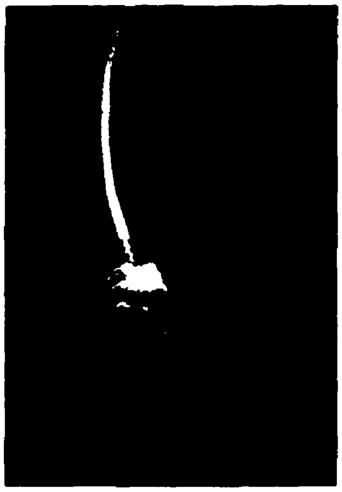
36. Close-up of bunchberry in fruit (below). The red berries are edible, and this plant is the focus of a traditional narrative, described to us by Rosie Swan.



37. Patch of Pacific silverweed (*Potentilla pacifica*) growing in the estuary at the mouth of the Atleo River (above). The edible roots of this species were traditionally gathered in fall.

38. Northern rice-root (*Fritillaria camschatcensis*) growing with Pacific silverweed in the estuary at Bedingfield Bay (left). The root of this beautiful plant in the Lily family is also edible (see next page).

39. Close-up of Northern rice root (flower).

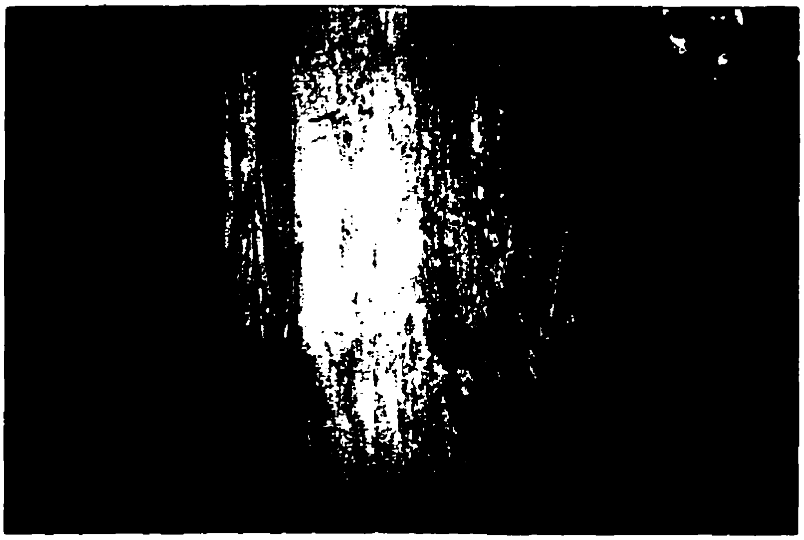


40. Close-up of the edible bulb of the Northern rice root.

41. Springbank clover (*Trifolium wormskjoldii*) and rhizomes. We harvested a small sample of the clover rhizomes from the estuary at the mouth of the Atleo River. These rhizomes were traditionally eaten in fall, around the same time as the Pacific silverweed, and the two species are often found growing together.

42. Lena Jumbo with basket sedge (*Carex obnupta*) drying outside of her home in Ahousaht. Basket sedge, or *ch'itapt*, is an important traditional weaving material.

43. Rosie Swan picking cranberries near Ahousaht.



44. Culturally modified tree near Barra Lake (above). This red-cedar (*Thuja plicata*) has had a strip of bark removed at some point in the past. Although the scar is visible, the tree is still healthy and living.

45. Lena Jumbo with Maquinna hat in progress (below). This is a traditional whaler's hat made from the inner bark of western red-cedar.

Chapter 5
Traditional Ecological Knowledge of Forest Ecosystems and Habitat Descriptions of the Atleo River Valley: "The trees are an umbrella."

"The trees, it's like an umbrella for the 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, and so close together so the heat won't hit the plants that's growing underneath there. . . 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." Archie Frank (1996)

"There was real lot of berries up there [at Bear River] too, in July. Oh, it was plentiful, the blueberries and the red huckleberries. We used to just get branches and just shake it off. . . we used to just pull it down like that and just use our hands to do it, go on the mat, then 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 it 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. . . at Bear River, that's where we always used to go, it's far but we'd go over there and pick. . . the whole family would go, and then we'd come out, people would trade us for things. They'd see our berries and trade us. give us something. Even the Japanese - we used to live at Clayoquot a lot and there used to be some Japanese girls, Japanese ladies coming to bring us something that we'd trade for our berries."
Irene Thomas (1996)

Introduction

The previous chapters outlined the historical context of relationships between people and the forest ecosystems of Clayoquot Sound, focusing particularly on the Atleo River Valley. This chapter will build on that historical foundation. Specifically, I will consider the current ecological status of forest ecosystems in the Atleo River Valley, and traditional land management strategies and knowledge concerning forest ecosystems in Ahousaht First Nations territory. I will organize my discussion according to the habitat types (old-growth forest, logged areas, and riparian areas) which formed the basis of our sampling methodology during our fieldwork in the summer of 1996.

A large part of our summer fieldwork was collecting inventory data on the species, vigour, and abundance of plants growing in different habitat types of the Atleo River Valley; and gathering additional information on plants traditionally used for food or materials. Clifford Atleo (1996), who is a treaty negotiator for Ahousaht First Nation, explained that,

> Our Interim Measures Agreement, in our negotiations we envisioned at least a 20 to 30 year process of total inventory of the Sound. . . we committed ourselves. . . to do a total inventory of everything, of every tree, all the plants and wildlife because our view is that how can you manage an area without knowing what you have?

Hopefully, the information gathered through our fieldwork can form part of this baseline inventory of Clayoquot Sound, providing specific information for Ahousaht First Nation traditional territory. In this chapter, I will give a general description for each habitat type based on our field data, including lists of species present and plant life form distribution (Tables 5.1 through 5.14), ecological observations, and evidence of disturbance. I will also include some of the knowledge and observations concerning these habitats that people in Ahousaht shared with us during the course of our interviews. In doing so, it is my intention to provide both quantitative, and qualitative information on the different habitat types. It is important to note, however, that the main quantitative measurement I am using in this chapter is number of species present.[1] This measurement does not reflect biological diversity, which includes genetic, species, and community diversity. Therefore, caution should be used in making any inferences regarding the health of forest ecosystems based on this measurement alone. It is essential to also consider the processes operating within those systems, as well as the integrity of the relationships between life forms and their environment. Some discussion of this is provided in the qualitative descriptions of habitat types, and in Chapter 6.

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[1]See Juliet Craig's thesis, "'Nature was the Provider': Traditional Ecological Knowledge and Inventory of Culturally Significant Plants in the Atleo River Watershed, Ahousaht Territory, Clayoquot Sound" (University of Victoria, in progress) for more in depth statistical and quantitative analysis of field data.

Old-Growth Forest

Information gathered about old-growth forest habitat in the Atleo River Valley is important for a number of reasons. First, these areas can provide valuable insights into the structures and processes operating in local forest ecosystems. This information can inform and guide restoration and management activities in the area. Second, they provide a benchmark against which to compare the status of areas which have been clearcut at various times in the past. This can help determine the nature and extent of the damage caused by logging and other activities. Third, these forest ecosystems most closely resemble the types of areas that First Nations in the area traditionally occupied and used; thus, much of the local traditional ecological knowledge is based on experience with these types of ecosystems. It is important to keep in mind, however, that both forest ecosystems and traditional ecological knowledge systems are continually co-evolving. This is reflected in the statements of contemporary Ahousaht people. and in the ecological conditions of the forest.

Walking in the shade of ancient trees over forest floors carpeted in moss was a much different experience than stumbling over piles of burned slash in clearcut areas exposed to the full heat of the mid-day sun. We very much appreciated and looked forward to our fieldwork days spent in the forest. Finding areas of old-growth forest large enough to contain a core area relatively undisturbed by the effects of nearby logging was a difficult task in an area as highly fragmented as the Atleo River Valley. As standard practice, we located plots by first identifying relatively homogeneous areas on aerial photographs and forest cover maps, and then taking a sample of randomly located plots within these areas. We distinguished between old-growth forest dominated by western red-cedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*) (hereafter cedar-hemlock forest); and forest dominated by western hemlock and amabilis fir (*Abies amabilis*) (hereafter hemlock-amabilis forest). We made this distinction in order to reflect the differences in plant communities and ecological conditions in these two forest types. We surveyed six plots in each of the cedar-hemlock and hemlock-amabilis forests, giving a total of 12 old-growth forest plots. Lists of plant species found in these habitat types are presented in Tables 5.1 and 5.2; Table 5.3 summarizes the distribution of different plant life-forms (trees; shrubs; flowering non-woody plants; grasses, sedges, and rushes; and ferns and fern allies) in these areas.

All six of the cedar-hemlock forest plots surveyed showed some evidence of disturbance, particularly near the edges of the forest which abutted onto logging roads and clearcut areas. Signs of the so-called "edge effect"include: the presence of species associated with open, disturbed sites such as fireweed (*Epilobium angustifolium*), pearly everlasting (*Anaphalis margaritacea*), and red alder (*Alnus rubra*); and significant amounts of windthrow. The natural disturbance regime of cedar-hemlock forest, as with other coastal temperate rainforest ecosystems on the West Coast, is dominated by wind factors, and to a much lesser extent, fire. Therefore, windthrow (or blowdown) in the form of downed individual trees or small clumps of trees is a naturally occurring phenomenon in these old-growth forests. In fact, this disturbance regime is vital to the perpetuation of the forest community. The gaps in the canopy created by windthrow allow sunlight to reach the understorey of the forest, facilitating the growth of shrubs and young seedlings, a process termed "advanced regeneration." In addition, the soil which is turned up by the uprooted tree is an ideal location for young seedlings to flourish (Scientific Panel 1995c). However, the frequency and intensity of blowdown is significantly increased by close proximity to large, clearcut areas where the forest edge is abruptly exposed to the force of the wind.

The plots surveyed in old-growth cedar-hemlock areas were characterized by an open stand structure. The canopy was punctured with numerous gaps, allowing sunlight to reach the forest understorey in patches. As a result, the shrub layer was well developed in scattered areas, and there were many seedlings and young trees present. In addition, there was abundant coarse woody debris on the forest floor. The downed trees were in various stages of decay from the newly fallen, to the completely decomposed. These downed trees were covered in moss and were acting as "nurse logs" for the young plants growing on them. The presence of epiphytic plants (plants growing on other plants) is one of the characteristics which is well expressed in temperate rainforest ecosystems. There were also many snags (standing dead trees) in the area, which are important as wildlife habitat. The blowdown in the three plots surveyed on the south side of the valley was particularly prominent, possibly due to the very small size of the forested area. Signs of wildlife in the cedar-hemlock plots included: fresh bear scat, animal trails, and an unexpected visit by a young black bear while we were setting up our second plot. We also noted the presence of mosquitoes, blackflies, and hummingbirds.

The tree canopy in the cedar-hemlock plots was dominated by - not surprisingly - western red-cedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*). The western red-cedar tended to form the highest layer of the canopy, reaching 35m to 40m in height, with a subcanopy of western hemlock. As noted in the general description of this habitat type, there were many large downed trees and snags. In four out of six plots in this habitat type, western yew (*Taxus brevifolia*) was also present in the form of single individuals or small groups of two or three trees. Western yew is a small tree which ranges in height from 2m to 15m. In recent years, western yew has come to be viewed by the forest industry as something more than an unwanted non-commercial species of tree, since the discovery of the anti-cancer drug taxol which is derived from yew bark. However, because western yew is a slow growing tree which does not form stands, but tends to grow individually in moist, mature forests; it is extremely vulnerable to over-exploitation (Pojar and MacKinnon 1994). Western yew was valued and respected by the Nuu-Chah-Nulth peoples long before it caught the attention of Western society. The hard, resilient wood of the yew tree[2] was traditionally used for making implements such as digging sticks, wedges, and spear shafts; and is still sought by carvers today (Scientific Panel 1995a; Pojar and Mackinnon 1994). It was wonderful to come across the gracefully curving trunk, and papery red bark of this respected tree.

The numerous gaps in the tree canopy and generally open stand structure of the cedar-hemlock forests facilitated the growth of a well-developed shrub layer. As indicated in Table 5.1 there was a high degree of consistency in shrub species composition in the six plots surveyed. With the exception of twinflower (*Linnaea borealis*) and thimbleberry (*Rubus parviflorus*), which were only found in one or two plots, the same shrub species were found in all six plot locations. Of these species, salal (*Gaultheria shallon*) was the predominant shrub, accounting for at least 50% of the shrub cover. Other shrubs found in all six plots were various *Vaccinium* species (red huckleberry, evergreen huckleberry, blueberry), and salmonberry (*Rubus*

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[2]Although the western yew is classified as a coniferous tree, and thus considered one of the "softwoods," its physical properties are such that it is an extremely hard and durable wood, comparable in this respect to "hardwoods"such as oak and maple trees (Al Mitchell, Canadian Forest Service, Victoria, BC, pers. comm).

spectabilis).

These fruit-bearing shrubs made an important contribution to the traditional diet of First Nations in the area, and the wild fruits are still enjoyed as *chumus* (treats) by people in Ahousaht. Traditionally, fruit would be picked and then stored for the winter. This could be done in a number of ways. According to Ahousaht Elder Rosie Swan (1996),

> Just our age group [Elders] still pick [salal] and make jam. Some make jelly out of it. 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. . . they'd save it for the wintertime.

The vitamins from the fruit would complement the protein rich seafood diet of the Ahousaht, and it is easy to imagine how good the fruit would taste in the winter months. In addition to drying, fruit could also be jarred and stored, or eaten right away. Rosie Swan told us that the evergreen huckleberries, which come into fruit around October, would be eaten with the dog salmon that runs in late fall.

In previous times, berry picking expeditions would go much farther afield, whereas today people generally just pick locally around Ahousaht. As Trudy Frank (1996) described them to us, these picking expeditions would often be enjoyable social occasions:

> Actually they used to have expeditions, like a whole bunch, a canoe load of women would go out. . . 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. I think today it's just the salal berries that women pick around here, not very many. . . we used to make it an effort to go somewhere else to pick, like Ginny's beach we go there to pick, or in Dickson's Bay, we'd go there to pick salal.

Thus, people would go to the areas that they knew to be particularly abundant. In picking the berries, it is likely that people facilitated the propagation of these culturally important plants. Trudy Frank (1996) described to us the method for picking huckleberries:

> The way they used to have us pick it, 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!

Brushing off the branch would cause many stray berries to fall on the forest floor. These might then provide the seeds for new growth the following year. Furthermore, the seeds contained in the berries would be dispersed as they were carried between berry-picking areas. In this way, humans have probably been an important agent of seed dispersal in the forests of Clayoquot Sound.

The forest floor in the cedar-hemlock plots was textured by the presence of abundant coarse woody debris providing nurse logs for herbaceous plants, young shrubs, and small seedlings. Moss covered the forest floor and the downed trees in the latter stages of decay. The ubiquitous deer fern (*Blechnum spicant*) was growing abundantly in all six plots. The soil was dark brown, with lots of organic litter. This layer of organic matter is extremely important to the health of the forest, supplying nutrients and protecting the soil from erosion. Some of the plants present in the herb layer of the cedar-hemlock plots included: twisted stalk (*Streptopus amplexifolius*) and false hellebore (*Veratrum viride*) of the *Liliaceae*; and ferns such as licorice fern (*Polypodium glycyrrhiza*), sword fern (*Polystichum munitum*), and maidenhair fern (*Adiantum pedatum*). Also of particular interest in the herb layer of the cedar-hemlock plots was the presence of bunchberry (*Cornus canadensis)* on many of the mossy nurse logs. This tiny plant with its edible red berries, like many plants the forest, is the focus of a traditional narrative. Rosie Swan (1996) told us the story about how the bunchberry came into existence, and why it is often found at the bases of large trees in the forest:

> There's a story to this *hast'aachi* [bunchberry]plant. My dad used to tell us, and Peter [Webster] what he told us. Like when our kids are bad we have to take them to the Elders for them to talk to them, because there was no punishment [long ago]. There was no need because kids respected their parents and Elders. But when they did do anything wrong - this one time, they put this lady on the tree, a 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 *hast'aachi* come around. It's always around a tree, *hast'aachi. Hast'aachi.* That's how *hast'aachi* come around, red berries.

This story illustrates the way in which ecological knowledge (for example, where to find bunchberry in the forest) is wrapped up in cultural values (that children should respect their Elders), and how it may be transmitted across generations (through an oral story-telling tradition). Other versions of this story have been documented elsewhere (Turner and Efrat 1982; Scientific Panel 1995b).

Table 5.1 (below) is the first in a series of tables presented in this chapter. These tables identify the plant species found in each habitat type. In each table, plants have been grouped according to major life form categories: trees, shrubs, and herbs. These are separated by the dashed lines. Herbaceous plants are further sub-divided into: flowering non-woody plants; aquatics; grasses, sedges, and rushes; and ferns. These sub-divisions are indicated by the smaller dashed lines. Within each category, plants of the same taxonomic family are grouped together. As noted in the Scientific Panel (1995b), there is no standardized orthography for representing the sounds in the Nuu-Chah-Nulth languages. In this thesis, I follow the Scientific Panel orthography as follows: 7 (glottal stop); ʕ (pharyngeal); aa, ii, uu (long vowel sounds); apostrophe following a letter (e.g. y', t') indicates glottalization; underlining indicates sounds produced at the back of the throat.

Table 5.1: Species found in old-growth cedar-hemlock forest.

Common name	Latin name	Nuu-Chah-Nulth name
[redacted]		
amabilis fir	*Abies amabilis*	[illegible]
Sitka spruce	*Picea sitchensis*	*ch'uhsmapt*
[redacted]		
red alder	*Alnus rubra*	*qaqmapt*
[redacted]		
twinflower	*Linnaea borealis*	NA
[redacted]		
thimbleberry	*Rubus parviflorus*	*tl'ach7alhmapt*
twisted stalk	*Streptopus amplexifolius*	*muwach ha7um7ak*
false hellebore	*Veratrum viride*	*haw'ah*
foamflower	*Tiarella trifoliata*	NA
goat's beard	*Aruncus dioicus*	sisixbuxwaxs
[redacted]		
skunk cabbage	*Lysichiton americanum*	*ti7maat*
[redacted]		
licorice fern	*Polypodium glycyrrhiza*	*hihit'aqtimapt*
sword fern	*Polystichum munitum*	*7itsmapt*
maidenhair fern	*Adiantum pedatum*	*yumapt*

Legend and Table Summary	
Species present in one of six plots	8
Species present in two of six plots	4
Species present in three of six plots	1
[redacted]	2
[redacted]	0
[redacted]	9
Total number of species present	24

The plots surveyed in the hemlock-amabilis forest displayed many of the same characteristics as the cedar-hemlock forests. These include: trees of various age and height classes, including some very tall individuals over 40m tall, and small seedlings on the forest floor; abundant coarse woody debris in various stages of decay; the presence of snags; and abundant moss covering the bases and trunks of large trees, downed logs, and the forest floor. There were differences, however, in the composition of plant communities, stand structure, and light availability. In three of the six plots surveyed, the forest canopy was quite closed, with dense crowns in the upper canopy. As a result, there was less light reaching the forest floor, which tended to be clearer and with less developed shrub layers than those seen in the cedar-hemlock plots. There were, however, patches of sunlight created by gaps in the canopy left by windthrown trees. In these patches, shrubs such as *Vaccinium* species and salmonberry (*Rubus spectabilis*) flourished. In the other three plots surveyed, the canopy was less closed, possibly as a result of more trees downed by wind.

In the tree layer of these plots, western hemlock (*Tsuga heterophylla*) was the dominant species, with a subcanopy of amabilis fir (*Abies amabilis*). There were many tall, mature hemlocks, as well as smaller trees and seedlings. New growth was seen on the tips of the hemlock branches, indicating good health and vigour of the trees. Many cavities were seen in the older trees, and a woodpecker was heard during the course of surveying one of the forest plots. Nurse logs on the ground were providing good habitat for young plants. Moss and bracket fungus were growing abundantly on some of the older trees. As mentioned above, the hemlock-amabilis plots on the north side of the river had a more open stand structure, possibly as a result of larger amounts of blowdown. In contrast with the cedar-hemlock plots, no western yew (*Taxus brevifolia*) trees were identified in the hemlock-amabilis plots. In general, there was less diversity in tree species.

The large ancient trees found in these plots constitute an impressive amount of standing biomass, a characteristic of temperate rainforest ecosystems. These forests act as "carbon sinks," capturing carbon dioxide from the air and storing this carbon in their biomass. This keeps large amounts of carbon from entering the atmosphere and contributing to global warming (Scientific Panel 1995c). The large conifers also contribute to biological diversity by providing habitat and favourable ecological conditions for the plants growing underneath. As eloquently stated by Archie Frank in the quote at the beginning of this chapter, the trees are the umbrella of the forest, shading and protecting the small plants underneath. This observation was also made by Arlene Paul (1996), who noted that many of the smaller herbaceous plants are no longer found in areas which have been logged:

> 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. . . I guess all the trees that are gone now might have been

protection for those plants, you can't find them anymore.

This observation is something which is often overlooked when the forest is treated primarily as a crop of trees. The statements by Arlene Paul and Archie Frank reflect a more holistic perspective, one which considers all aspects of the forest important, not just the commercially important conifers.

In the shrub layer of the hemlock-amabilis plots, salal (*Gaultheria shallon*) was less predominant in comparison with the cedar-hemlock plots. Instead, the various *Vaccinium* species, notably red huckleberry and blueberries, were the most abundant shrub species. These grew in scattered patches with individual plants up to 3m tall, reaching for the sunlight that streamed in through gaps in the canopy. In the plots on the north side of the river, salmonberry (*Rubus spectabilis*) vied with the *Vaccinium* species in abundance.

In addition to the berries, as described above, some of these shrubs have other edible parts. The new shoots of both salmonberry and thimbleberry were traditionally harvested and eaten fresh in spring. These are not commonly eaten today, but many of the people we spoke with recalled their use in earlier times. For example, Trudy Frank (1996) told us that,

> We used to pick [salmonberry shoots] all the time, in May. Some people would bring home a whole armful of it. . . we called it *m'aayi, m'aayi*. My aunt used to bring me an armful, every summer she'd pick some. . . it was so plentiful over there, she'd just make a day of it and just pick and bring it over.

This memory was also echoed by Rosie Swan (1996), who recalled that,

> Indian ladies would go out for [*m'aayi*], get an armload, all ladies. And they'd have parties with it. . . now you don't see that anymore. They dip it in sugar and it's good.

In addition to salmonberry, which was abundant in many of the areas we surveyed in the Atleo River Valley, the shoots of other plants were collected and eaten. Two of these, thimbleberry

(*Rubus parviflorus*) and cow parsnip (*Heracleum lanatum*), were mentioned by Trudy Frank:

> There's the thimbleberry bush, you use that for eating purposes when its new growth is on there, and same with the 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, or you'd get blisters. . . when you ate it.[3]

As this quote indicates, in addition to knowledge of *which* plants to eat, it is also important to pass on the knowledge of the *ways* in which the plants are to be eaten.

The herb layer of the hemlock-amabilis plots contained a wide array of species. The species present varied considerably between plots, as indicated by the shading in Table 5.2. Many of the species were only found at one or two sites, with the exception of deer fern (*Blechnum spicant*) and sword fern (*Polystichum munitum*) which were found in all six plots. The plots surveyed on the north side of the Atleo River contained many plants typical of riparian habitats. The area in which the plots were surveyed was very moist, and contained some small streams and swampy areas. As a result, species such as skunk cabbage (*Lysichiton americanum*) and basket sedge (*Carex obnupta*) were found in these plots. Most of the herbaceous species found in the hemlock-amabilis plots are adapted to moist, shady forests and streamside areas. These included: plants in the *Liliaceae* such as twisted stalk (*Streptopus amplexifolius*), false lily of the valley (*Maianthemum dilatatum*), and false hellebore (*Veratrum viride*); foamflower (*Tiarella trifoliata*); false bugbane (*Trautvetteria caroliniensis*); and single delight (*Moneses uniflora*). The latter favours forest habitat with rich humus containing decomposing organic matter. The presence of these species is a good indicator of the ecological conditions in the

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[3]This blistering is caused by the presence of phototoxic chemicals in the "skin" of the shoot (Scientific Panel 1995b; Dr. Nancy Turner, pers. comm.)

hemlock-amabilis old-growth forest areas.

Table 5.2: Species found in old-growth hemlock-amabilis forest.

Common name	Latin name	Nuu-Chah-Nulth name
[redacted]		
false azalea	*Menziesia ferruginea*	*ʕats ʕanixsmapt*
[redacted]		
devil's club	*Oplopanax horridus*	*n'aap'aalhmapt*
[redacted]		
fasle lily of the valley	*Maianthemum dilatatum*	*kuuw'iikmapt*
false hellebore	*Veratrum viride*	*haw'ah*
[redacted]		
false bugbane	*Trautvetteria caroliniensis*	NA
single delight	*Moneses uniflora*	NA
Cooley's hedge nettle	*Stachys cooleyae*	*tushksmaqk'uk*
sweet-scented bedstraw	*Galium triflorum*	*qats'alhp'uqs*
skunk cabbage	*Lysichiton americanum*	*ti7maat*
nodding trisetum	*Trisetum cernuum*	NA
basket sedge	*Carex obnupta*	*ch'itapt*
[redacted]		
spiny wood fern	*Dryopteris expansa*	*shishitlmaptk'uk*

Common name	Latin name	Nuu-Chah-Nulth name
lady fern	*Athyrium filix-femina*	*shishitlmaptk'uk*
oak fern	*Gymnocarpium dryopteris*	NA
maidenhair fern	*Adiantum pedatum*	*yumapt*

Legend and Table Summary	
Species present in one of six plots	10
Species present in two of six plots	5
Species present in three of six plots	0
[redacted]	4
[redacted]	0
[redacted]	7
Total number of species present	**26**

Table 5.3: Comparison of plant life form distribution in cedar-hemlock and hemlock-amabilis forests.

	Cedar-Hemlock	Hemlock-Amabilis
Trees	6 (25%)	2 (7%)
Shrubs	8 (33%)	7 (27%)
Flowering non-woody plants	6 (25%)	9 (35%)
Grasses, sedges, and rushes	0	2 (7%)
Ferns and fern allies	4 (17%)	6 (23%)
Total	**24 (100%)**	**26 (99%)**

Logged Areas

In this section, I will describe areas in the Atleo River Valley which have been logged during the past seventeen years (since 1979). This accounts for the majority of logging which has taken place, with the exception of the area at the mouth of the river which was logged in the 1940's. For purposes of sampling, we further subdivided the clearcut habitat type into areas that were logged in three main time periods: 1991-1994, 1985-1986, and 1979-1981. With these three sub-divisions it is possible to gain insights into how ecosystems are recovering from logging activities in intervals of five years. The ecosystems in the 1991-1994 plots have had less than five years to recover, those in the 1985-1986 plots have been recovering for approximately ten years, and those in areas logged in 1979-1981 have been recovering for approximately fifteen years. By comparing the information for these three sub-categories of the logged habitat type, it is possible to examine over space ecological processes such as succession which occur over time. This information can be useful in designing strategies for ecological restoration, which will be discussed in the following chapter.

In total, we surveyed six plots in areas which had been recently clearcut (between 1991 and 1994). A list of plant species found in these plots is presented in Table 5.4. Three of the plots were on the south side of the river, and three were on the north side. All six plots were located at relatively high elevations in the Valley on the middle or upper slopes. The general ecological conditions at all six sites were very similar. The ground was covered with piles of slash that appear to have been burned after logging in the area was completed. There were many large stumps; however, no large trees had been left standing in any of the plots we surveyed or in their immediate surroundings. The slash left on the ground did not show signs of decomposition, and the charred bark remained intact on the log. Signs of wildlife included bear scat on the logging roads near the plots, and bird calls heard in the area. In one plot on the south side of the Valley, there was a small stream choked with slash where no tree buffer had been left.

There was no tree layer to speak of in any of the six plots. Since these areas were very recently logged, we were not able to obtain complete information on them from forest cover maps. As indicated by the species list, western red-cedar and western hemlock were present in all six plots; however, these were only in the form of very small seedlings generally less than 2m in height. These seedlings did not contribute significantly to vegetation cover in the plots. The most recent forest cover map indicates that the 1994 clearcut on the south side of the Valley was replanted in 1995. There is no replanting information available for the plots on the north side of the Valley. The seedlings which are present are probably a mixture of planted seedlings, and colonizers from adjacent areas.

This lack of large, ancient trees is a major (and immediately evident) difference with the old-growth forest sites. Chief Umeek (1996) described to us his reaction to these clearcut areas, which he saw when flying over the valleys of Clayoquot Sound as part of his work on the Scientific Panel:

> It was so beautiful, like floating through the air. And the helicopter was so quiet. And as we flew over the clearcut areas, I began to weep and that was a tremendous surprise. I didn't expect that, I didn't anticipate it. In fact, I've never - because I grew up in residential school, literally grew up in concrete, I never felt much of an affinity for the earth or for the plants or for animals because I grew up in concrete. . . but when I flew over Clayoquot Sound area and all of a sudden I was weeping, I knew it had something to do with the clearcuts. I knew it had something to do with the devastation of the land. But even now I would have difficulty explaining adequately what it all meant.

I agree with Chief Umeek that it is difficult to express the depth of emotion which these devastated landscapes invoke.

Some species, however, are doing well in these open conditions. The shrub layer showed the greatest signs of vigour in the recently cut areas. The shrubs which were found at all six plots were: salal (*Gaultheria shallon*), red huckleberry (*Vaccinium parvifolium*), and salmonberry (*Rubus spectabilis*). In general, these were also the most abundant of the shrub species. The salal and salmonberry were small, but in most cases showed abundant new growth. The red huckleberry bushes tended to be quite tall. Most of the shrubs were growing individually or in scattered patches. The vigour of fruit-bearing shrubs is one of the positive attributes to clearcut areas, enjoyed by both humans and wildlife alike. Arlene Paul (1996) told us that,

> *Y'ama*, salal, they come out really good when they first log a place out and it comes up, it's always really good stuff. . . it produces really good berries when you get a logged out place.

However, she also recognized that even though the fruit-bearing shrubs were thriving in these areas, other culturally important plants which do not survive or recolonize in areas were disappearing:

> That's how we're losing [these plants] I think, when they start cutting them away like that. All the effect it has on the important plants. Even for things for basket weaving, and stuff . . . that needs shade.

Aside from these shrubs found in all six plots, there were some differences in species composition between the south and north sides of the valley. In the plots on the south side of the valley, blueberry (*Vaccinium ovalifolium* and/or *V. alaskense*), evergreen huckleberry (*V. ovatum*), and thimbleberry (*Rubus parviflorus*) were present; as well as individual false azalea (*Menziesia ferruginea*) and twinflower (*Linnaea borealis*). On the north side of the valley, thimbleberry (*Rubus parviflorus*), black raspberry (*R. leucodermis*), and Himalayan blackberry

(*R. discolor*) were also present. These species are commonly found in disturbed, open conditions. Himalayan blackberry is an exotic (i.e. non-indigenous) plant species which is notorious on Vancouver Island for its ability to colonize disturbed sites and propagate quickly and extensively, often at the expense of native plant populations. The importance of native plant species, and their contribution to global biological diversity will be discussed further in the next chapter.

The herb layer in the 1991/94 plots was not very well developed. In some cases, it was difficult to find the herb layer due to the large piles of slash covering the ground. The open, exposed conditions limit the types of plants that can grow in these areas. Thus, even though the number of species may be similar to those found in the old-growth forest areas, the composition of the plant communities is quite different. The common denominators in the herb layers of all six plots were fireweed (*Epilobium angustifolium*) and deer fern (*Blechnum spicant*). During the course of our summer field work, I was struck by the adaptability of deer fern, which seemed to flourish in old-growth and clearcut sites alike. It was often found growing on slopes at the sides of logging roads, and may have an important role to play in restoration activities in the valley. Fireweed, as suggested by its name, flourishes in areas which have been recently burned, as well as in clearings and other disturbed areas. The other species found in the recently logged sites which are indicative of the disturbed conditions include: purple-leaved willow herb (*Epilobium watsonii*), wall lettuce (*Lactuca muralis*), and pearly everlasting (*Anaphalis margaritacea*).

Table 5.4: Species found in clearcuts, logged 1991-1994.

Common name	Latin name	Nuu-Chah-Nulth name
[illegible]		
blueberries	*Vaccinium spp.*	*tsi7up or tl'itsxwaanushmapt*
evergreen huckleberry	*Vaccinium ovatum*	*sitnamuxs7itsmapt*
[illegible]		
false azalea	*Menziesia ferruginea*	*ʕats ʕanixsmapt*
twinflower	*Linnaea borealis*	NA
red elderberry	*Sambucus racemosa*	*ts'iwiipt*
[illegible]		
thimbleberry	*Rubus parviflorus*	*tl'ach7alhmapt*
black raspberry	*Rubus leucodermis*	*hisshitlmapt*
Himalayan blackberry	*Rubus discolor*	*qa7wi*
false hellebore	*Veratrum viride*	*haw'ah*
foamflower	*Tiarella trifoliata*	NA
goat's beard	*Aruncus dioicus*	*sisixbuxwaxs*
[illegible]		
purple-leaved willowherb	*Epilobium ciliatum*	NA
wall lettuce	*Lactuca muralis*	NA
pearly everlasting	*Anaphalis margaritacea*	NA
sweet-scented bedstraw	*Galium triflorum*	*qats'alhp'uqs*
sedge	*Carex sp.*	NA
[illegible]		
sword fern	*Polystichum munitum*	*7itsmapt*

Common name	Latin name	Nuu-Chah-Nulth name
maidenhair fern	*Adiantum pedatum*	*yumapt*

Legend and Table Summary	
Species present in one of six plots	8
Species present in two of six plots	2
Species present in three of six plots	8
[illegible]	0
[illegible]	0
[illegible]	7
Total number of species present	**25**

According to MOF forest cover maps, no areas on the south side of the Atleo River Valley were logged in the time period 1985-1986. Most sites on that side of the valley were logged in the 1979-1981 time frame, with some more recent cuts in 1991-1994. Therefore, all six of the 1985-1986 plots surveyed during the course of our fieldwork were located on the north side of the valley. A list of plant species found in these plots in presented in Table 5.5. The first three of these plots were just north of the mouth of the Atleo River. The forest cover maps indicate that this area was replanted in 1987 with western red-cedar and western hemlock. The other three plots are in an area marked NSR (not satisfactorily restocked) and there is no date of replanting noted for this area. In general, all six of the plots were quite open, and there was evidence of burning in the form of dry slash and burned stumps. In the three plots just north of the river mouth, there were dried up creeks and some swampy areas. In the three plots located in the NSR area, there was a very steep cliff bare of soil or vegetation. Signs of wildlife included a bear den and a bird's nest sighted in the area north of the Atleo River mouth, as well as animal trails.

The tree layers in the six plots contained a mix of different species, generally all the same age and height. Western red-cedar was found in all six plots; however, it was generally not the tallest species. The cedar ranged in height between 3m and 5m tall. Western hemlock was found in five out of six plots, but was not the dominant tree species in any of these plots. The hemlock was growing about the same height as the cedar, with the exception of one plot north of the river mouth, where the hemlock was growing up to about 16m in height. Red alder was found in one plot in this area, where it was the dominant species growing up to 16m in height. In the NSR area, the plots surveyed were dominated by Douglas-fir (*Pseudotsuga menziesii*), which was generally the tallest tree species up to 9m in height. These plots also contained the western red-cedar and western hemlock, as mentioned above, all at about three to 5m in height. To a lesser extent, Sitka spruce and red alder were also present in the NSR area. There was no canopy closure in any of the plots, due to the small height and sparsity of the trees.

The shrub layers of the 1985-1986 logged areas showed many similarities in species composition in comparison with the recent (1991-1994) clearcut sites described above. They were, however, more developed with taller individual plants and more abundant patches of vegetation. Like the 1991/94 plots, the dominant species were in the shrub layer of the 1985/86 plots were: salal, red huckleberry, salmonberry, and thimbleberry. Of these species, salal and salmonberry were the most abundant within the plots. Himalayan blackberry was present in four of the six plots surveyed. As discussed above, this is an exotic species which is capable of fast and extensive colonization of disturbed areas, and which poses some threat to the native vegetation. Also of interest was the presence of Sitka willow (*Salix sitchensis*) and hardhack (*Spiraea douglasii*), two species which are commonly found along rivers and streams. These two species were found in the plot where the dry creek bed was located. This plot still retained its moist conditions, and was swampy in some areas.

In addition to these two shrub species suited to riparian habitats, there were many plants found in the herbaceous layer of this plot which reflected its moist conditions. These include: false bugbane (*Trautvetteria caroliniensis*), Pacific silverweed (*Potentilla pacifica*), Pacific water-parsley (*Oenanthe sarmentosa*), marsh speedwell (*Veronica scutellata*), common plantain (*Plantago major*), cattail (*Typha latifolia*), and basket sedge (*Carex obnupta*). Both the cattail and the basket sedge are important traditional basket making materials. Basket sedge will be discussed in the section on lake edge riparian habitats, since it was found in greater abundance at those sites. The presence of cattail, however, was notable in that it was not found anywhere else in the valley. Although it does not seem to be used as commonly today as some of the other basket making materials such as basket sedge (*Carex obnupta*), three-cornered grass (*Scirpus americanus*), and cedar bark; Rosie Swan (1996) recalled gathering cattail when she was young:

> We used to go on this side [of Rafael Point on Flores Island] going with our dad, to get this [cattail]. . . we call it *sanix̱mapt*. My mom used to use it for the inside of her baskets so she would use too much cedar. It gets flat this. We'd get real lots for our mother. You don't just pick any kind, though. . . you pick it when it's flat.

Although this stand of cattail was not particularly extensive, it was quite accessible, being in close proximity to the river mouth. Tule (*Scirpus lacustris*), a bulrush which is often found in habitat very similar to that of the cattail (although we did not come across any in the course of our fieldwork), was also traditionally used in basket making and weaving. Lena Jumbo (1996) told us that,

> The grandmas used to tell me they used to use *t'unaax* [tule], they also used this *t'unaax* to make mats which they used in place of a mattress when they went out somewhere.

Also of note in this particular plot, was the presence of cascara (*Rhamnus purshiana*), a small tree which we did not come across very often. The bark of this tree, in addition to traditional domestic use, was harvested by Ahousaht people in the mid-twentieth century to sell. Irene Thomas (1996) recalls doing this herself:

> They'd go up the [Megin] river to get the cascara bark they were buying then. . . I used to have to clean the cascara bark and put it out to dry.

Similarly, Rosie Swan (1996) told us about this practice:

> Cascara bark. They used to pick, get the bark and sell it. I don't know what they made of it. White people bought it off Indians. . . everybody used to get it and sell it.

The traditional use of cascara bark as a laxative has been documented elsewhere (Turner and Efrat 1982; Scientific Panel 1995b), and its effectiveness in this capacity has been confirmed scientifically (Pojar and MacKinnon 1994).

Like the riparian habitat types we surveyed, this plot in which the cattail was growing was very high in species diversity. In fact, all twenty-four of the species listed in Table 5.5 which were only found in one of six plots, were found at this site. It is important to note that this significantly increases the number of species listed for this habitat type. Without the twenty-four species found only at this one plot, there would only be eighteen species listed for this habitat type, which is the lowest of all the habitat types surveyed. The only herbaceous plant species which were found consistently in this habitat type were: fireweed (*Epilobium angustifolium*), pearly everlasting (*Anaphalis margaritacea*), deer fern (*Blechnum spicant*), and sword fern

(*Polystichum munitum*). The first two of these species are typical of disturbed sites.

Table 5.5: Species found in clearcuts, logged 1985-1986.

Common name	Latin name	Nuu-Chah-Nulth name
[redacted]		
cascara	*Rhamnus purshiana*	*shuts7iqmapt or shumapt*
[redacted]		
blueberry	*Vaccinium spp.*	*tsi7up or tl'itsxwaanushmapt*
evergreen huckleberry	*Vaccinium ovatum*	*siinamuxs7itsmapt*
[redacted]		
false azalea	*Menziesia ferruginea*	*[illegible]*
twinberry	*Lonicera involucrata*	*ch'ihsmapt*
red elderberry	*Sambucus racemosa*	*[illegible]*
[redacted]		
hardhack	*Spiraea douglasii*	NA
Sitka willow	*Salix sitchensis*	NA
false lily of the valley	*Maianthemum dilatatum*	*kuuw'iikmapt*
false bugbane	*Trautvetteria caroliniensis*	NA
coastal strawberry	*Fragaria chiloensis*	*kalhkintapiih*
Pacific silverweed	*Potentilla pacifica*	*tlitsy'upmapt*
giant vetch	*Vicia gigantea*	*k'wak'watlmapt*

Common name	Latin name	Nuu-Chah-Nulth name
Pacific water-parsley	*Oenanthe sarmentosa*	*wa7uu*
marsh speedwell	*Veronica scutellata*	NA
wall lettuce	*Lactuca muralis*	NA
bunchberry	*Cornus canadensis*	*hast'aachiqmapt*
common plantain	*Plantago major*	*titimatk'uk*
small bedstraw	*Galium trifidum*	NA
skunk cabbage	*Lysichiton americanum*	*ti7maat*
cattail	*Typha latifolia*	*sanixmapt or lhuchmapt*
narrow-leaved bur-reed	*Sparganium angustifolium*	NA
basket sedge	*Carex obnupta*	*ch'itapt*
common rush	*Juncus effusus*	NA
rush	*Luzula sp.*	NA
lady fern	*Athyrium filix-femina*	*shishitlmaptk'uk*
licorice fern	*Polypodium glycyrrhiza*	*hihit'aqtimapt*
maidenhair fern	*Adiantum pedatum*	*yumapt*

Legend and Table Summary	
Species present in one of six plots	24
Species present in two of six plots	1
Species present in three of six plots	3
[redacted]	6
[redacted]	1
[redacted]	7
Total number of species present	**42**

By the end of our summer field season, we would shudder at the mere mention of the dreaded "79/81 plots." Through experience, we learned that these plots were the most difficult to access and survey. Unfortunately, this was the habitat type for which we surveyed the largest number of plots! Over the course of our fieldwork, we surveyed a total of twelve plots in areas which had been logged between 1979 and 1981. We decided to do this because, according to forest cover maps, this was the period in which the majority of the logging activities in the Atleo River Valley took place. Six of the plots were located on the south side of the valley, and six on the north. A list of plant species found in these plots is presented in Table 5.6. The process of surveying these plots began by plunging into seemingly solid walls of salal and salmonberry that fringed the logging roads we took as our starting points. We then walked a randomly chosen distance and compass direction into the area to locate the plots.

As a general pattern, the shrubs soon gave way to stands of young seedlings of various species, depending on what had been chosen for replanting at each particular site. The most common species we encountered in replanted plots were: western red-cedar, western hemlock, and Douglas-fir. These seedlings reflected the dense, uniform planting strategies designed to satisfactorily "restock" an area. Generally, the young trees were of a single age and height class, with some smaller seedlings underneath. Travelling further into replanted areas, we would often find that the dense stands of young seedlings would give way to more open areas dominated by shrubs and deer fern.[4] Much of the vegetation in these exposed areas showed evidence of scorching and drought. Most areas appeared to have been burned prior to replanting, and retained piles of dry slash. In some areas, however, particularly in three of the plots surveyed on the north side of the valley, there were logs on the ground that showed some signs of decay. These areas were more moist, and the young replanted trees were growing quite well.

As above, the tree layer in the 1979/81 plots generally consisted of young trees and seedlings of a single height and age class. Western red-cedar and western hemlock were found in all twelve of the plots surveyed. These were on average about 5m tall, and in many cases showed signs of ill-health in the form of yellow needles and sparse new growth.[5] This did, however, vary between plots. The Douglas-fir was found in eight out of twelve plots surveyed, in conjunction with red cedar and/or hemlock. In these plots, the Douglas fir was generally taller (up to about 10m in height) and more robust than the cedar and hemlock. Red alder was found in only four of the twelve plots surveyed; however, our plots were generally at least 50m in from the logging roads where alder tends to grow. There were also isolated sightings of western yew (*Taxus brevifolia*) and Sitka spruce (*Picea sitchensis*). The young trees resembled more of a "crop" than

[4]This pattern is explicitly recognized in our field notes for six of the twelve plots we surveyed in the 1979/81 clearcuts.

[5]The presence of yellow needles on cedar trees was noted in five of the twelve plots we surveyed in this habitat (1979/81 clearcuts).

a forest, with their dense, uniform spacing, and single age and height class. This reflects the emphasis placed on replanting trees for the purpose of harvesting in the next rotation, which on the west coast of Vancouver Island is generally considered to be about 80 years. It is possible that, given time, these replanted areas would develop some characteristics of old-growth forest ecosystems. In the next chapter on restoration, I will discuss some strategies for facilitating this process.

The shrub layer in the 1979/81 plots was generally quite well developed in the more open areas further in from the logging roads, and in the few open patches in the dense stands of young trees. As with the plots logged in 1985/86, and 1991/94; the three most widely occurring shrub species were: salal, red huckleberry, and salmonberry. These three species occurred in twelve out of twelve plots surveyed. Thimbleberry (*Rubus parviflorus*) and the other *Vaccinium* species (blueberry and evergreen huckleberry) were also common to a lesser extent. Also mixed in the shrub layer were small seedlings of conifers (primarily red cedar and Western hemlock) less than 2m tall.

Both the shrub and herb layers were influenced by the way in which the young conifer seedlings had been planted. As mentioned, some areas had dense stands of young seedlings. In these areas, shrubs would for the most part be confined to the small open patches of sunlight. Similarly, in the dense stands of young trees, the forest floor was mostly clear with some scattered deer fern. In the open areas, where the shrub layer was more developed, it was often difficult to find the forest floor to examine the herb layer due to the slash covering the ground. In these areas, fireweed (*Epilobium angustifolium*) would be the most obvious flowering non-woody plant; along with deer fern (*Blechnum spicant*) and sword fern (*Polystichum munitum*).

Without question, deer fern was the most widespread plant in the herb layer of the 1979/81 plots. This was particularly evident in plots characterized by steep, exposed slopes. As noted in the general description for this habitat type, some of the plots surveyed contained streams, or evidence of dried up streams. In these plots, there was much greater diversity in herbaceous plants, as indicated in Table 5.6. For example, streambank springbeauty (*Montia parvifolia*), foamflower (*Tiarella trifoliata*), skunk cabbage (*Lysichiton americanum*), and various sedges (*Carex* spp.) were found in these plots with high moisture regimes.

Table 5.6: Species found in clearcuts, logged 1979-1981.

Common name	Latin name	Nuu-Chah-Nulth name
[redacted]		
western yew	*Taxus brevifolia*	*tlatmapt*
Sitka spruce	*Picea sitchensis*	*ch'uhsmapt*
red alder	*Alnus rubra*	*qaqmapt*
[redacted]		
twinberry	*Lonicera involucrata*	*ch'ihsmapt*
red elderberry	*Sambucus racemosa*	*ts'iwiipt*
[redacted]		

Common name	Latin name	Nuu-Chah-Nulth name
thimbleberry	*Rubus parviflorus*	*tl'ach7alhmapt*
black raspberry	*Rubus leucodermis*	*hisshitlmapt*
hardhack	*Spiraea douglasii*	NA
stink currant	*Ribes bracteosum*	*hulh7iqmapt*
cascara	*Rhamnus purshiana*	*shuts7iqmapt or shumapt*
twisted stalk	*Streptopus amplexifolius*	*muwach ha7um7ak*
false lily of the valley	*Maianthemum dilatatum*	*kuuw'iikmapt*
streambank springbeauty	*Montia parvifolia*	NA
foamflower	*Tiarella trifoliata*	NA
coast boykinia	*Boykinia elata*	NA
goat's beard	*Aruncus dioicus*	*sisixbuxwaxs*
purple-leaved willowherb	*Epilobium ciliatum*	NA
pearly everlasting	*Anaphalis margaritacea*	NA
wall lettuce	*Lactuca muralis*	NA
bunchberry	*Cornus canadensis*	*hast'aachiqmapt*
sweet-scented bedstraw	*Galium triflorum*	*quats'alhp'uqs*
skunk cabbage	*Lysichiton americanum*	*ti7maat*
nodding trisetum (grass)	*Trisetum cernuum*	NA
bluejoint (grass)	*Calamagrostis canadensis*	NA
basket sedge	*Carex obnupta*	*ch'itapt*
star sedge	*Carex echinata*	NA
dagger-leaved rush	*Juncus ensifolius*	NA
small-flowered wood-rush	*Luzula parviflora*	NA
lady fern	*Athyrium filix-femina*	*shishitlmaptk'uk*

Common name	Latin name	Nuu-Chah-Nulth name
[redacted]		
maidenhair fern	*Adiantum pedatum*	*yumapt*
spiny wood fern	*Dryopteris expansa*	*shishitlmaptk'uk*
[redacted]		

Legend and Table Summary	
Species present in 1-2 of twelve plots surveyed	27
Species present in 3-4 of twelve plots surveyed	3
Species present in 5-6 of twelve plots surveyed	2
[redacted]	4
[redacted]	2
[redacted]	6
Total number of species in all twelve plots	**44**

Table 5.7: Comparison of plant life form distribution in areas logged 1991-1994, 1985-1986, and 1979-1981.

	1991-1994	1985-1986	1979-1981
Trees	2 (8%)	5 (12%)	7 (16%)
Shrubs	11 (44%)	13 (31%)	13 (30%)
Flowering non-woody plants	8 (32%)	14 (33%)	13 (30%)
Grasses, sedges, and rushes	1 (4%)	5 (12%)	6 (14%)
Ferns and fern allies	3 (12%)	5 (12%)	5 (11%)
Total	**25 (100%)**	**42 (100%)**	**44 (101%)**

Riparian Areas

During the course of surveying our old-growth forest plots, we encountered some areas where small streams were running. The vegetation in these plots reflects their moist surroundings. However, in order to make comparisons and obtain consistent data, we tried to survey the riparian areas in a separate category. The plots surveyed in riparian habitat type were intentionally located adjacent to the major water systems of the Atleo River Valley (the Atleo River itself, Barra Lake, and estuaries). These plots contained distinctive vegetation communities, and were impacted in specific ways by logging activities. In this section, I will describe the plots surveyed in the riparian habitat type, sub-divided into categories of lake edge (logged and unlogged), river edge (logged and unlogged), and estuaries.

Lake Edge

We surveyed a total of four plots around the edges of Barra Lake which is the main fresh water body in the Atleo River Valley. The dimensions of the plots surveyed at the lake edge, as well as adjacent to the Atleo River, were rectangular: 80m x 5m. These plots have the same surface area as the square forest plots (20m x 20m), but reflect the narrower dimensions of the riparian ecological communities. The slopes surrounding Barra Lake have been logged on the north and south sides, while the east and west slopes remain forested. We surveyed two plots each in the logged and unlogged lake edges. Table 5.8 presents a list of plant species found in the forested lake-edge plots, while Table 5.9 provides a list of plant species found in logged lake-edge plots.

The forested riparian areas on the east and west sides of Barra Lake showed some evidence of disturbance as a result of forest fragmentation and close proximity to logged areas.

Symptoms of the edge-effect, most noticeably large quantities of blowdown both in the forest and in the water, were clearly visible. In addition to blowdown, there was evidence of stress to the plant communities in the form of yellowed needles on individual coniferous trees, and many examples of trees with dead "spike" tops. The latter is a naturally occurring phenomenon in cedar-hemlock forests; however, there their presence was particularly pronounced in this area. The forested areas adjacent to the lake exhibited several old-growth characteristics: trees of many different ages and heights, from very old and large individuals to small seedlings; lots of downed trees in various stages of decay; abundant moss and litter on the forest floor; and several nurse logs providing habitat for young plants, notably red huckleberry seedlings (*Vaccinium parvifolium*), bunchberry (*Cornus canadensis*), and licorice fern (*Polypodium glycyrrhiza*). The habitat was very wet, with some boggy areas where the river entered the lake. There were large insect populations (especially mosquitoes!), and evidence of bears in the form of scat, tracks, and dens.

The species found in the tree layer were western red-cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), Pacific crabapple (*Malus fusca*), and lodgepole pine (*Pinus contorta*). The last was represented by only one tree. The dominant species at both sites were western red-cedar and Pacific crabapple. The trees varied in height from young cedar trees 5m tall, to large cedars and western hemlocks reaching up to 35m in height. There were many large trees further back from the lake edge. In addition, we found several culturally modified trees on both the east and west side of the lake in the forest adjacent to the shore.

Culturally modified trees, as described in Chapter 3, are trees (usually western red-cedar) which show evidence of past resource use by people. Scars on the tree indicate whether it was used for bark collection or for removal of cedar planks. We believe that all the trees we encountered with such scars were used for bark collection. Cedar bark is still commonly collected by people in Ahousaht for the purpose of basket making. Lena Jumbo, a highly skilled Ahousaht basket maker, uses the inner cedar bark for the insides of her baskets, and for her Maquinna hats, as described in Chapter 3. The collection of cedar bark, as with other culturally important plants, is undertaken with an attitude of respect and conservation. Rosie Swan (1996) described this process in the following way:

> 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.

I believe that the important distinction between materials collected in this way, and the harvesting of trees through industrial clearcutting methods, is in this attitude of respect and conservation. The Ahousaht would sometimes cut down entire trees for the purposes of making canoes or constructing cedar plank houses. However, as Clifford Atleo (1996) pointed out to us, this was done with discretion:

> The value that seemed to be so strong and exercised was life itself and the respect for that. And so, if you didn't need the whole tree, you didn't cut the whole thing down so readily. It's not that we didn't do that. Yes, we had to. When you see the size of some of our canoes in the old days, you had to have some pretty big cedars to do those... if you only needed a few planks, that's all you took... if you only needed the bark, that's all you took. You didn't take down the whole tree just to get at the bark.

This is in marked contrast to the clearcutting practice of removing all vegetation from a site in order to harvest the commercially viable conifer species. Both clearcutting and the removal of bark from a cedar tree for basketry represent resource use which is informed by particular cultural values. The culturally modified trees which are still found alive and healthy in the forest, are a testament to this traditional attitude of respect and conservation. Arlene Paul (1996) came across one of these trees when she was hiking in the Moyeha area of Clayoquot Sound. She told us that:

> You see trees from *way* back. We don't even go way up the mountain anymore, to do that, but we were there recently, just to walk up at Moyeha side. But there was 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. 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 Native's main concern.

It is important to keep in mind, however, that First Nations have been involved in the logging industry throughout this century, and it has made an important contribution to wage employment in Ahousaht and other Nuu-Chah-Nulth First Nations. When treaties and land claims are resolved, First Nations may choose to continue with logging activities in their traditional territories. However, this might not necessarily include practices such as clearcutting. As pointed out to me by Chief Umeek (pers. comm), industrial logging is one of the legacies of colonization, replacing traditional economies and systems of life and land management. The tensions created between these two systems, traditional First Nations and Euro-Canadian, are still in existence. How they are resolved through the treaty process will influence the future direction of First Nations' economies, including resource use and land management.

The shrub layers on either side of the lake showed some differences. On the west side of the lake, shrubs were dominated by hardhack which had an estimated percent cover of 60%. There were also a number of *Vaccinium* species such as red huckleberry, evergreen huckleberry, and blueberries, present at this site. On the east side of the lake, Pacific ninebark (*Physocarpus capitatus*) and evergreen huckleberry (*Vaccinium ovatum*) were predominant in the shrub layer.

The evergreen huckleberry in general looked quite healthy (although some leaves were yellow with small holes) with abundant new growth. Hardhack was present; however, in patches less dense than those on the west side of the lake. The shrubs were represented by both young and older individual plants.

The herbaceous plants in the forested lake edge sites included some species which were not found anywhere else in the valley. This reinforces the importance of recognizing the variation among plant species in the different habitat types. Some of the herbaceous plant species which reflect the particular ecological conditions of the lake-edge habitat include: yellow pond lily (*Nuphar polysepalum*), narrow-leaved bur-reed (*Sparganium angustifolium*), and the various sedges (*Carex* spp.). On the moist forest floor of the plot on the East side of Barra Lake, we found a single slender bog orchid (*Platanthera stricta*); and a small cluster of delicate mountainbells (*Stenanthium occidentale*). Mountainbells, as their name suggests, are usually found at high elevations; therefore, we were surprised to come across them so close to sea level. Many plants in the orchid family (Orchidaceae) require certain fungi in the forest soil in order to survive, illustrating the important relationships that have evolved between plant species and their habitats. This particular association with soil fungi would make the re-establishment of the bog orchid on logged sites extremely difficult. Neither the mountainbells, nor the bog orchid were found in the logged riparian plots.

Basket sedge (*Carex obnupta*) was also found in the herb layer of these plots, growing in dense clumps near the lake edge. This is an extremely important traditional basket-making material, and is still used extensively by weavers such as Lena Jumbo. Basket sedge (locally known as swampgrass or *ch'itapt*) is gathered around the end of July. The quality of a basket depends on the qualities of the materials that go into it. Arlene Paul (1996) told us that,

> You have to look for a good spot to get that [basket sedge], you can't just pick any old one. . . and cedar bark you can almost get anywhere, but it's wiser to get it in the woods. It makes a difference. . . My mother used to always want to go into the forest to get it. . . 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. . . easy to split. . . we were only allowed to take one strap from the tree.

The importance of knowing which plants to harvest was made clear to us when, after gathering some basket sedge from around Barra Lake, we brought it to Lena Jumbo. She swiftly sorted through our thick bundle of grass and pulled out the usable strands. Afterwards, we were left with a much thinner bundle! She then showed us how to split and prepare the grass, before hanging it up to dry. People would traditionally have favourite gathering spots which they would return to year after year as described by Trudy Frank (1996):

> They had special places they went for this [basket sedge], there's a beach out here, and there's an island just off Tofino they used to go to. They used to know where to get the stuff from.

Trudy Frank (1996) also told us that this information might be shared so that people could co-ordinate their gathering expeditions:

> If they knew that a lot of people picked [basket material] at a certain place, they would save that for another time, and go somewhere else. . . people sometimes shared, said there's a really good spot there, if you want to go pick there.

The process of gathering the basket sedge is one form of land management traditionally practiced by Ahousaht people. By gathering the materials, people would in a sense prune the patches, thus improving their availability and abundance for the following year. In addition, pickers might cut some of the old, dead stems, thus providing more room for new growth. Lena Jumbo described to us her experience when she went to pick basket sedge in Pacific Rim National Park.

Apparently, the area had not been picked for some time, and there were a lot of dead and unhealthy plants. Lena Jumbo (1996) told us,

> Before I heard they didn't allow it [picking basket sedge in Pacific Rim park], but I told him [the 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 it was brown from years back, dry [because people hadn't been gathering it]. . . it's like pruning it.

Similarly, Arlene Paul (1996) observed that,

> It used to be known that if you pick them, a better crop would always be coming out. 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.

Thus, one of the ways that the Ahousaht people traditionally cared for the forest was by actually using it. This is in contrast to the modern preservationist stance that the only way to "save" nature is to protect it from human use. This example illustrates that responsible use of the forest is not necessarily harmful, and in some cases may be ecologically beneficial.

The knowledge of where to gather materials, and how to use them to create baskets, mats, and hats has been passed down through generations. One way of transmitting knowledge is experientially, by watching and doing. For example, Lena Jumbo (1996) told us about how she learned her weaving skills from her grandmother:

> I learned the art of weaving when I was five. I used to watch my grandmother, and she started a mat for me. . . my grandmother used to, if I'd. . . get tired of weaving I'd go out to play, she'd leave my work at the door, put in a manner like it was crawling and when I'd come back in she'd tell me my work was crying after me!

Similarly, children would learn through experience how and where to gather the materials. Greta Charlie (1996) told us about how she and her sister Rosie Swan would accompany their father when he collected the materials for their mother to use:

> My dad would go for basket weaving grass. . . he'd take us along, we'd be back with

> bundles of grass for mom. And then there's a certain time you pick it. . . same with cedar bark. We'd be climbing the mountains. . . 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.

Many of the people we spoke with emphasized the importance of gathering cedar wood and bark far up the hills, and away from the ocean. Apparently, cedar gathered near the ocean is not as highly valued, particularly for making canoes, since it easily cracks. In contrast, cedar gathered high up in the mountains, or back in the woods, has exceptionally fine grain. This preference for cedar wood and bark gathered in certain locations illustrates the importance of sustaining the *habitats* of culturally significant plants, and not just the plants themselves.

In the past, as today, baskets and hats woven from the grasses and cedar bark were an important source of income as they were sold to tourists and collectors. According to Greta Charlie (1996),

> It was another way of making money, her basket work. . . [my mother would sell them] to tourists that came to Hot Springs.

The basket work for which Nuu-Chah-Nulth women are renowned is still an important source of income for weavers such as Lena Jumbo who can sell their work to tourists directly or through stores in Tofino and Victoria. This has been particularly true in recent years, when there has been a growing interest in and appreciation for First Nations' artwork. This is one of the many ways that the forest can provide resources and income from non-timber products, and that these may be alternative or supplementary ways of using the forests in years to come.

Table 5.8: Species found in forested riparian areas around Barra Lake.

Common name	Latin name	Nuu-Chah-Nulth name
[redacted]		
western yew	*Taxus brevifolia*	*tlatmapt*
[redacted]		
evergreen huckleberry	*Vaccinium ovatum*	*siinamuxs7itsmapt*
[redacted]		
twinflower	*Linnaea borealis*	NA
[redacted]		
false hellebore	*Veratrum viride*	*haw'ah*
mountainbells	*Stenanthium occidentale*	NA
twisted stalk	*Streptopus amplexifolius*	*muwach ha7um7ak*
false lily of the valley	*Maianthemum dilatatum*	*kuuw'iikmapt*
slender bog orchid	*Platanthera stricta*	NA
great burnet	*Sanguisorba officinalis*	NA
[redacted]		
bugleweed	*Lycopus uniflorus*	NA

Common name	Latin name	Nuu-Chah-Nulth name
bunchberry	*Cornus canadensis*	*hast'aachiqmapt*
[redacted]		
narrow-leaved bur-reed	*Sparganium angustifolium*	NA
[redacted]		
beaked sedge	*Carex rostrata*	NA
Sitka sedge	*Carex sitchensis*	*ch'ich'itapqk'uk*
star sedge	*Carex echinata*	NA
bristle-stalked sedge	*Carex leptalea*	NA
[redacted]		
deer fern	*Blechnum spicant*	*kaatskuuxsmapt*
[redacted]		
maidenhair fern	*Adiantum pedatum*	*yumapt*
sword fern	*Polystichum munitum*	*7itsmapt*

Legend and Table Summary	
Number of species present only on East side of Barra Lake	12
Number of species present only on West side of Barra Lake	7
[redacted]	19
Total number of species found in lake-edge riparian plots	**38**

The plots surveyed on the logged (north and south) sides of Barra Lake provide good comparison data for the forested sites. Logging activities around the lake took place approximately eighteen years ago in 1979, according to MOF forest cover maps. The conditions on both the north and south sides of the lake were quite similar. On both sides, the walk down to the lakeshore from the logging road was quite difficult. The steep slope (estimated at an approximate 25% gradient) was covered with burned slash and charred stumps. The logs on the ground were mostly intact (i.e. not decaying). The vegetation on the slopes was different at the various gradients. At the top of the slope adjacent to the logging road there was a dense wall of salmonberry (*Rubus spectabilis*) and salal (*Gaultheria shallon*). Beyond this first barrier, the shrubs gave way to a stand of young western red-cedar and Douglas fir; the Douglas fir trees were slightly taller. These trees, planted in 1981, were even aged, very thin and close together, with a closed canopy. Further down the slope, the conditions became more open. Instead of seedlings, the dominant vegetation consisted of young shrubs and deer fern (*Blechnum spicant*). There were many large stumps, dry logs, and down trees which were not visibly decaying (although they collapsed rather treacherously underfoot!).

There were a number of hummingbirds sighted on both sides of the lake. On the south side we spotted some cougar tracks and bear scat, indicating the presence of wildlife in the area, and many frogs near the water. Logging activities continued right down the shore of Barra Lake. A fringe of trees was left at the water's edge; however, many of these trees have since blown down and now lie in the lake. In the tree layer, the dominant species at both sites was Pacific crabapple (*Malus fusca*) which provided approximately 80% and 50% of the tree cover at the north and south sides respectively. The cedar trees which were present were generally small seedlings (between 3m and 7m tall) and made up approximately 20% of the tree cover at both sites. On the south side of the Lake, a few individual western hemlock (*Tsuga heterophylla*) and lodgepole pine (*Pinus contorta*) seedlings were present, as well as one lone western yew (*Taxus brevifolia*). With a couple of exceptions, the only trees of any significant height had fallen into the water.

In the logged plots around Barra Lake, the shrub layer was well expressed, with shrub species making up 42% (thirteen out of thirty-one) of the total species. It is important to keep in mind, however, that many of these were represented by only one or two individual plants in the plots. On the north side of the lake, hardhack (*Spiraea douglasii*) and salal (*Gaultheria shallon*) together comprised approximately 90% of the shrub cover (60% and 30% respectively). On the south side of the lake, it was hardhack and twinberry (*Lonicera involucrata*) which were the dominant shrub species. Many of the shrubs which were found at the south side plot were growing out of stumps and nurselogs. In general, the plot on the south side of the lake had greater quantities of coarse woody debris which was not burned and which showed some signs of decay. Much of this downed wood was right at the water's edge, or in the water itself. It is possible that the nutrients released from these decaying trees, as well as the habitat provided by the nurse logs, contributed to the greater species diversity on the south side of the lake. The shading on the species list for the logged sites around Barra Lake (Table 5.10) indicates that fourteen out of thirty-one species were found only on the south side of the lake.

In particular, there was one large cedar tree down in the water on the south side of the lake which had a plethora of young plants growing on it. On this tree alone, we found at least thirteen species of plants including: seedlings of western red-cedar (*Thuja plicata*), lodgepole pine (*Pinus contorta*), and red alder (*Alnus rubra*); young salmonberry (*Rubus spectabilis*), salal (*Gaultheria shallon*), oval-leaved blueberry (*Vaccinium ovalifolium*), hardhack (*Spiraea douglasii*), Pacific ninebark (*Physocarpus capitatus*), false azalea (*Menziesia ferruginea*) and western bog-laurel (*Kalmia microphylla*) as well as deer fern (*Blechnum spicant*), bunchberry

(*Cornus canadensis*), basket sedge (*Carex obnupta*), and various other sedges (*Carex* sp.). In a plot which contains a total of thirty species, this is quite significant. Some of these species, including the lodgepole pine, oval-leaved blueberry, and bunchberry, were not found anywhere else in the plot. This is a good illustration of the important role that nurse logs play in forest ecosystems, and suggests that they may be an important consideration in undertaking restoration.

The herb layer of the logged plots showed a marked contrast with the herb layers of the plots surveyed in the forested sides of the lake. In forested lake riparian plots, there were twenty-two herbaceous plants identified in the herb layer, comprising 57% of the total species present. In contrast, herbaceous plants in the logged plots make up only 39% of the total species (see Table 5.10). There was a noticeable dearth of the flowering non-woody plants which contribute to the diversity of the old-growth areas. Among those species not present at the logged sites were the slender bog orchid (*Platanthera stricta*) and various plants from the lily family that were present in the forested plot. It is difficult to know if these plants were formerly present at this site; however, it is very clear that they are not present now.

Table 5.9: Species found in logged riparian areas around Barra Lake.

Common name	Latin name	Nuu-Chah-Nulth name
[redacted]		
lodgepole pine	*Pinus contorta*	*tl'akmapt*
red alder	*Alnus rubra*	*qaqmapt*
[redacted]		

Common name	Latin name	Nuu-Chah-Nulth name
[redacted]		
western bog-laurel	*Kalmia microphylla*	*tiitiimaptk'uk*
twinflower	*Linnaea borealis*	NA
[redacted]		
Pacific ninebark	*Physocarpus capitatus*	*pipitš'k'uk*
salmonberry	*Rubus spectabilis*	*m'ashmapt or qawashmapt*
thimbleberry	*Rubus parviflorus*	*ti'ach7alhmapt*
[redacted]		
king gentian	*Gentiana sceptrum*	NA
marsh speedwell	*Veronica scutellata*	NA
bunchberry	*Cornus canadensis*	*hast'aachiqmapt*
sweet-scented bedstraw	*Galium triflorum*	*qats'alhp'uqs*
skunk cabbage	*Lysichiton americanum*	*ti7maat*
[redacted]		
green sedge	*Carex viridula*	NA
[redacted]		
sword fern	*Polystichum munitum*	*7itsmapt*
common horsetail	*Equisetum arvense*	*qwaqtl*

Legend and Table Summary	
Species present only on South side of Barra Lake	14
Species present only on North side of Barra Lake	1
[redacted]	16
Total number of species present	**31**

Table 5.10: Comparison of plant life form distribution in forested and logged riparian plots around Barra Lake.

	Forested Plots	Logged Plots
Trees	5 (13%)	5 (16%)
Shrubs	11 (29%)	13 (42%)
Flowering non-woody plants	10 (26%)	5 (16%)
Aquatics	2 (5%)	1 (3%)
Grasses, sedges, and rushes	5 (13%)	2 (6%)
Ferns and fern allies	5 (13%)	5 (16%)
Total	**38 (99%)**	**31 (99%)**

River Riparian Areas

Over the course of the summer, we surveyed a total of eight plots in riparian areas adjacent to the Atleo River. Four of these plots were logged, and four remained forested. These plots contained some plant species which were not found anywhere else in the Atleo River Valley. This is illustrated in the species lists for both the forested and logged river riparian areas (Tables 5.11 and 5.12 respectively). Riparian areas tend to have a very high species diversity, and many specialist plants, i.e. plants which have developed characteristics which adapt them to a particular habitat type. Riparian plants must be suited to the high moisture content of riparian areas, and the frequent disturbances (such as flooding) which characterize riparian zones. The

Ahousaht have traditionally recognized, and utilized this high species diversity in riparian areas. Many special plants, including those with medicinal properties, are found in this habitat type. For example, Arlene Paul (1996) told us that,

> The plants they needed [for medicine] was always in the forest, where the streams were especially. Like I was saying about that well [in Ahousaht], they covered it, it used to be full of stuff there, and the potent things they needed. . . that's gone, it used to be down there. . . now it's been cut away and there's no shelter, no protection for the plants at all.

The effect of logging on this crucial habitat type is of great concern to some people in Ahousaht, and especially its impact on the health and availability of medicinal plants. Murray John (1996) explained:

> 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 drugstore no 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, there'll be no more medicine for the First Nation.

In addition to providing habitat for medicinal plants, the vegetation adjacent to the river has an important relationship to the health of the river system. This, in turn, is directly linked to the health of the fish stocks. As mentioned in Chapter 4, the Atleo River has been an extremely important fishery location for the people of Ahousaht since they gained control of the territory through warfare with the Otsosat in the 19th century.

To reach the first two forested riparian plots on the south side of Atleo River, we walked down from the logging road and followed the river edge a randomly chosen distance. The walk was quite easy, since the understorey was fairly open and overlain with animal trails. On our way to the plots, we climbed over large fallen trees and passed by large patches of sword fern (*Polystichum munitum*). In these plots, the canopy was fairly closed, being estimated at 50% to 80% canopy closure. There were, however, some open patches where sunlight reached the forest floor. These plots contained trees of many different age and height classes, as well as large quantities of coarse woody debris in various stages of decay on the forest floor. The forest floor was quite open, being covered with moss, organic litter, and small clusters of mushrooms. The soil at these plots was a dark, rich loam. The forest showed some signs of disturbance in the form of blowdown, and the presence of species such as red alder (*Alnus rubra*) which are associated with disturbed sites.

The two forested riparian plots surveyed on the north side of the river displayed many similar characteristics as the southern river plots including: high species diversity, the presence of different age and height class of trees, and evidence of disturbance. The latter was particularly pronounced in the two northern river plots, possibly due to the close proximity of logged areas (directly across the river). The walk to these sites was relatively easy. We travelled along animal paths down the slope from the logging road. We passed over small streams and through swampy areas which were populated by skunk cabbage (*Lysichiton americanum*) and tall stands of devil's club (*Oplopanax horridus*). The conditions at these sites were slightly more open, with a dry gravel bed running from the forest to the river. In contrast, the southern sites had a steep cutbank of moist dark soil, dotted with patches of maidenhair fern (*Adiantum pedatum*), sword fern (*Polystichum munitum*), false lily of the valley (*Maianthemum dilatatum*), and twisted stalk (*Streptopus amplexifolius*).

The dominant tree species in the southern river plots was western hemlock (*Tsuga heterophylla*) and amabilis fir (*Abies amabilis*). These two species made up approximately 50% and 30% of the tree cover respectively at the first plot, and 40% and 10% of the tree cover at the second plot. Both species were represented by many large individual trees, with lots of new growth, as well as younger seedlings. The bases and trunks of the larger trees were carpeted in moss. In addition to these two species, there were also smaller proportions of red alder (*Alnus rubra*) and western red-cedar (*Thuja plicata*). The alder tended to grow right at the river's edge, and the cedar was only represented by a few very small seedlings. Across the river from our second plot, we measured the circumference of a single Sitka spruce (*Picea sitchensis*) at 8.2m. The tree itself was over 50m tall. At both of the southern river plots, there were many snags (standing dead trees) and nurse logs (down trees which are decaying and providing habitat for young plants).

The forest surrounding the northern river plots was also dominated by western hemlock and amabilis fir; however, within the plots themselves the dominant tree species by far was the red alder which formed an almost closed canopy over the river. There were also a few Sitka spruce and western hemlock in these plots. The two tree species which were found in all four of the plots surveyed were western hemlock and red alder; however, these were not necessarily the dominant species at the sites at which they were present.

The shrub layer in the southern river plots consisted primarily of *Vaccinium* species: red huckleberry (*Vaccinium parvifolium*) and blueberry (*Vaccinium alaskense and V. ovalifolium*). There were some red huckleberry growing up to 3m in height, while other were small plants growing out of mossy nurse logs. There were also small clumps of salmonberry (*Rubus spectabilis*) and salal (*Gaultheria shallon*). In contrast, salmonberry was found to be the predominant species at both of the northern river plots; in one plot, salmonberry accounted for about 70% of the shrub cover. The northern plots also contained thimbleberry, stink currant, and salal in the shrub layer.

There were many plants of interest in the herb layers of the forested river riparian plots. As mentioned above, riparian areas tend to have extremely diverse plant communities. This was expressed in very different ways at the southern and northern plots. The southern plots contained plants that favour shady, moist forest conditions; and which are often found near rivers or streams. Some of these species include: plants from the *Liliaceae* such as false lily of the valley (*Maianthemum dilatatum*), clasping twisted stalk (*Streptopus amplexifolius*), and sticky false asphodel (*Tofieldia glutinosa*); Siberian miner's lettuce (*Claytonia sibirica*); false bugbane (*Trautvetteria caroliniensis*); single delight (*Moneses uniflora*); and maidenhair fern (*Adiantum pedatum*). In addition, we came across one particularly interesting species: striped coral root (*Corallorhiza striata*). This small orchid (about 20cm tall) was found growing at the mossy base of a large conifer. This plant is unusual in that it is saprophytic: in other words, it lives off dead organic matter instead of making its own food through photosynthesis. In fact, the coralroot does not contain chlorophyll which is necessary for the photosynthesis process. It would be very unlikely that this species would be found in a logged site, since it requires the rich humus of old-growth forests. In addition, orchids often establish an intimate relationship between their roots and particular soil fungi (Pojar and MacKinnon 1994), making them especially difficult to transplant and re-establish.

In contrast, the northern river riparian plots contained a plethora of interesting species adapted to more open riparian conditions. Among these were: red columbine (*Aquilegia formosa*), kneeling angelica (*Angelica genuflexa*), self-heal (*Prunella vulgaris*), Cooley's hedge-nettle (*Stachys cooleyae*), and western rattle-snake root (*Prenanthes alata*). Other species at this site reflected the disturbed conditions which can be attributed to the close proximity of logging activities which continued right down to the water's edge on the opposite side of the river, with no evidence of a buffer zone. Some of the species found in these plots which are typical of open, disturbed sites include: broad-leaved dock (*Rumex obtusifolius*), little buttercup (*Ranunculus uncinatus*), purple-leaved willow herb (*Epilobium ciliatum*), and pearly everlasting (*Anaphalis margaritacea*). The last two, in particular, were found at many of the clearcut areas we surveyed during the course of our fieldwork. Many of these species were also found on the other side of the river where the logging had occurred.

Table 5.11: Species found in forested river riparian areas.

Common name	Latin name	Nuu-Chah-Nulth name
western red-cedar	*Thuja plicata*	*tlaasmapt*
[redacted]		
big-leaf maple	*Acer macrophyllum*	*ʕamits'aqmapt*
[redacted]		
red elderberry	*Sambucus racemosa*	*ts'iwiipt*
[redacted]		
thimbleberry	*Rubus parviflorus*	*tl'ach7alhmapt*
[redacted]		
Sitka willow	*Salix sitchensis*	NA
twisted stalk	*Streptopus amplexifolius*	*muwach ha7um7ak*

Common name	Latin name	Nuu-Chah-Nulth name
sticky false asphodel	*Tofieldia glutinosa*	NA
false hellebore	*Veratrum viride*	*haw'ah*
striped coral root	*Corallorhiza striata*	NA
broadleaved dock	*Rumex obtusifolius*	NA
streambank springbeauty	*Montia parvifolia*	NA
Siberian miner's lettuce	*Claytonia sibirica*	*fl fanm'i7aqtl*
youth-on-age	*Tolmiea menziesii*	NA
coast boykinia	*Boykinia elata*	NA
fringecup	*Tellima grandiflora*	*hahaptspaa*
little buttercup	*Ranunculus uncinatus*	*k'ahk'ahshsmapt*
red columbine	*Aquilegia formosa*	NA
purple-leaved willowherb	*Epilobium ciliatum*	NA
kneeling angelica	*Angelica genuflexa*	NA
self-heal	*Prunella vulgaris*	NA
Cooley's hedge-nettle	*Stachys cooleyae*	*tushksmaqk'uk*
single delight	*Moneses uniflora*	NA
western rattlesnake-root	*Prenanthes alata*	NA
pearly everlasting	*Anaphalis margaritacea*	NA
pathfinder	*Adenocaulon bicolor*	NA
wall lettuce	*Lactuca muralis*	NA
common plantain	*Plantago major*	*titimatk'uk*

Common name	Latin name	Nuu-Chah-Nulth name
[redacted]		
nodding trisetum	*Trisetum cernuum*	NA
spike bentgrass	*Agrostis exarata*	NA
Merten's sedge	*Carex mertensii*	NA
dagger-leaved rush	*Juncus ensifolius*	NA
[redacted]		
bracken fern	*Pteridium aquilinum*	*shitlmapt*
[redacted]		
spiny wood fern	*Dryopteris expansa*	*shishitlmaptk'uk*
[redacted]		

Legend and Table Summary	
Species found in one of four plots surveyed	16
Species found in two of four plots surveyed	17
[redacted]	12
	6
Total number of species	**51**

For the four logged river riparian plots surveyed during the course of the fieldwork, we tried to choose areas which would offer good comparison data with the forested areas. We also divided our plots into north and south areas, two in each. Because of the particular pattern in which the river area was logged (alternating logging and not logging on opposite sides of the river), we were able to survey logged plots in close proximity to the forest plots. In the upper

Atleo Valley, which was not included in our study, slopes leading down to the river were clearcut on both sides. It would be interesting to survey these areas to see how the vegetation and hydrological systems have been impacted in comparison with the lower Atleo River Valley.

To reach the two plots in logged areas on the north side of the river, we made our way through dense shrubs down from the logging road until we reached the river bed. We then continued along the river a randomly chosen distance to our plots. The riverbed was open and rocky, fringed by a stand of tall red alders. Dense patches of shrubs (primarily salmonberry) mixed with thin, young conifers were found immediately behind the red alders. The sandy soil was a salt-and-pepper colour, becoming mixed with gravel and rocks further into the river bed. We experienced some confusion in locating our second plot on the north side of the river. Our difficulties lay in the fact that the river was no longer running in the same place it had been in 1991 - the year that the aerial photograph we were using as a reference had been taken. We surmised that the altered course could be attributed to the massive log jam which completely blocked the flow of the river. Beyond this log jam, which spanned the width of the river, there was a dry gravel bed where the river used to run. This particular site will be discussed further in Chapter 6.

The two plots we surveyed in the logged area on the south side of the Atleo River were directly opposite the forested plots. Like their forested counterparts, these plots were quite exposed, with a flat gravel bed running to the river. A thin band of red alder trees mixed with some tall western hemlocks and a few mid-sized cedar seedlings edged the river bed. The second southern plot was distinctive in that it contained some remnant structure from the forest which had existed prior to logging. Of particular note was a large downed tree which had been left to decay just inside the riparian vegetation zone. There was also a depression about 10m in from the river bed which was quite moist, and was possibly a former tributary or stream of the river. Both the rotting nurse log and moist depression provided habitat for a number of young plants of various species. As indicated in the species present list (Table 5.12) there was a large number of plant species identified in the logged riparian areas. Although the numbers of species were similar in the forested and logged riparian river plots, it is important to look at the type of species found in the different habitat types. This gives some information on the process of vegetation recovery and recolonization following disturbance.

In all four of the logged river riparian plots, red alder was the dominant tree species, comprising between 50% and 90% of the total tree cover in the different plots. The individual alder trees ranged anywhere from 5m to 25m in height. Red alder is one of the first species to colonize sites following disturbances. Often described as a "weed" tree, alder is in fact extremely important in facilitating the recovery process of disturbed sites. Red alder, through bacterial root nodules, is able to fix nitrogen in the soil to make it available for plant use. Lack of nitrogen is one of the most serious limiting factors to plant growth on the west coast of Vancouver Island. Despite this valuable ecological service, red alders are often subject to brush control (girdling or herbicide application) to allow the more commercially valued conifer species to grow.

In addition to this ecological significance, red alder is also a culturally important species to the traditional inhabitants of the area. As mentioned in Chapter 4, alder is the preferred wood for smoking fish, and is still used in the smokehouses of Ahousaht. In addition, the red alder is an important ecological indicator. Many of the people we spoke with observed that the presence of red alder by a river or stream indicates that water is safe to drink. For example, Trudy Frank (1996) told us that,

> They used to tell us certain kind of places, like 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.

Similarly, Stanley Sam (1996) noted that,

> My father said, " Don't ever drink when there's no alder trees. Alder tree doesn't grow when there's a poison in the river."

This type of ecological observation illustrates the sophisticated nature of knowledge gained through generations of experience and observation.

In the two northern plots, salmonberry was by far the dominant shrub species, forming tall, almost uniform stands. Also in significant amount was stink currant (*Ribes bracteosum*), which tended to grow mostly at the edge of the other vegetation. Small patches of thimbleberry (*Rubus parviflorus*) and a few individual red huckleberry plants growing on a fallen log were also present. Mixed in with the shrubs were some young Sitka spruce (*Picea sitchensis*). These had very thin stems, and some of them were unhealthy or dead. We found similar patterns in the shrub layers at the two southern sites. In these plots, the most abundant shrub was unquestionably salmonberry, followed by the stink currant. As in the previous two plots, the salmonberry was growing quite tall - up to 2m in height - and the stink currant was found at the edge of the other vegetation. Further back from the river's edge, salmonberry formed extremely dense and uniform stands in the logged area. A few small red huckleberry plants were once again found growing on a fallen log. The presence of devil's club (*Oplopanax horridus*) in one of the southern plots was very distinctive. We had passed by stands of devil's club on our way to this site; this species is commonly found along side streams in wet, well-drained sites.

As with the forested river riparian areas, the herb layer showed a high diversity of species. Many of them were the same as their forested counterparts, with a few notable exceptions. Missing from the herb layer of the logged sites were species such as coralroot, single delight, and clasping twisted stalk. Many species of herbaceous plants which are commonly associated with disturbed sites were found at these plots: pearly everlasting (*Anaphalis margaritacea*), wall lettuce (*Lactuca muralis*), thistles (*Cirsium* sp.), and orchard grass (*Dactylis glomerata*).

Table 5.12: Species found in logged river riparian areas.

Common name	Latin name	Nuu-Chah-Nulth name
[redacted]		
amabilis fir	*Abies amabilis*	*w'ihmapt*
[redacted]		
salal	*Gaultheria shallon*	*y'am'apt*
oval-leaved blueberry	*Vaccinium ovalifolium*	*tl'itsxwaanushmapt*
[redacted]		
Pacific ninebark	*Physocarpus capitatus*	*pipits'k'uk*
[redacted]		
devil's club	*Oplopanax horridus*	*n'aap'aalhmapt*
[redacted]		
sticky false asphodel	*Tofieldia glutinosa*	NA
false hellebore	*Veratrum viride*	*haw'ah*

Common name	Latin name	Nuu-Chah-Nulth name
streambank springbeauty	*Montia parvifolia*	NA
[redacted]		
youth-on-age	*Tolmiea menziesii*	NA
[redacted]		
wood saxifrage	*Saxifraga mertensiana*	NA
fringecup	*Tellima grandiflora*	*hahaptspaa*
[redacted]		
little buttercup	***Ranunculus uncinatus***	***k'ahk'ahshsmapt***
red columbine	***Aquilegia formosa***	**NA**
[redacted]		
fireweed	*Epilobium angustifolium*	*7a7adakqii*
Pacific water-parsley	*Oenanthe sarmentosa*	*wa7uu*
self-heal	*Prunella vulgaris*	NA
Cooley's hedge-nettle	***Stachys cooleyae***	***tushksmaqk'uk***
[redacted]		
pearly everlasting	***Anaphalis margaritacea***	**NA**
pathfinder	*Adenocaulon bicolor*	NA
thistle	*Cirsium sp.*	NA
[redacted]		
Pacific bleeding heart	*Dicentra formosa*	NA
[redacted]		
spike bentgrass	*Agrostis exarata*	NA
Orchard grass	*Dactylis glomerata*	NA
Alaska oniongrass	*Melica subulata*	NA

Common name	Latin name	Nuu-Chah-Nulth name
[redacted]		
deer fern	*Blechnum spicant*	*kaatskuuxsmapt*
licorice fern	*Polypodium glycyrrhiza*	*h̲ih̲it'aqtimapt*
maidenhair fern	*Adiantum pedatum*	*yumapt*
[redacted]		
common horsetail	*Equisetum arvense*	*q̱waq̱tl*

Legend and Table Summary	
Species found in one of four plots surveyed	21
Species found in two of four plots surveyed	7
[redacted]	10
	10
Total number of species	**48**

Table 5.13: Comparison of plant life form distribution in forested and logged riparian plots adjacent to Atleo River.

	Forested Plots	**Logged Plots**
Trees	6 (12%)	5 (10%)
Shrubs	8 (16%)	9 (18%)
Flowering non-woody plants	27 (53%)	24 (50%
Grasses, sedges, and rushes	4 (8%)	4 (8%)
Ferns and fern allies	6 (12%)	6 (13%)
Total	**51 (101%)**	**48 (99%)**

Estuaries

During the course of our fieldwork, we surveyed estuaries at both the mouth of the Atleo River, and at Bedingfield Bay. The latter does not fall strictly within the watershed of the Atleo River Valley; however, it is in very close proximity and provides useful replicate data for the river mouth plots. We surveyed two plots in each of the estuarine areas. Estuaries are unique ecological areas; the interface of marine and forest ecosystems creates distinctive habitats and ecological communities. Many of the plant species we discovered in the estuary plots were not found anywhere else in the valley. We saw abundant wildlife in both estuaries, notably, blackbears and bald eagles.

The estuary was surrounded by patches of forest at different successional stages. A patch of forest with old growth characteristics (although small in area) was present on the north side of the estuary.[6] The surrounding hills had been clearcut, mostly in the last seventeen years. There appeared to be little disturbance to the estuary itself, although impacts from logging upstream may have increased debris and sediment accumulation in the estuary. In addition, the flow of the river may have been altered as a result of log jams and changes to the structure of the stream. The substrate in the estuary was a mix of rocky gravel and wet loam. There was a wildlife tree in the approximate centre of the estuary, and several bald eagles were spotted in the vicinity. The species that we identified in the plots we surveyed, as well as in nearby areas, are listed in Table 5.14.

The estuary at the mouth of the Atleo River forms part of the Seektukis Indian Reserve.

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[6]This is the forest that was harvested by Aero Timber Products in 1943. It appears to have been selectively logged, i.e. only the merchantable timber was removed. We found large stumps of western red-cedar in this small patch of forest.

As noted in Chapter 4, this area was formerly the site of a fall fishing village used by the Otsosat and later Ahousaht people. With this history of occupation, it is likely that the plant resources at the river mouth were used in conjunction with the fish resources. We found significant populations of two culturally important root foods in this area: Pacific silverweed (*Potentilla pacifica*) and springbank clover (*Trifolium wormskjoldii*). The roots and rhizomes of these species were formerly harvested for consumption. They are best harvested in the fall, thus coinciding with the fishing season. Both Trudy Frank and Lena Jumbo remembered eating these roots. Lena Jumbo (1996) remembered the Ahousaht name for the wild clover roots, and recognized the herbarium specimen we had pressed:

> [Carl Jumbo's] mom used to talk about [plants], she used to name them by name. . . what they used to eat, roots. I just remember *ʔaʔiits'u* [wild clover roots]. . . we used to eat that.

In addition, Trudy Frank told us that her grandmother used to gather root foods at the mouth of the Atleo River, where they had a fall smokehouse. It was probably from these very patches that she gathered the roots. Trudy Frank remembers trying the root foods, and described them as being very tasty.

As mentioned in Chapter 3, the process of harvesting the roots of plants like the Pacific silverweed could be considered a form of cultivation, where the soil is tilled by digging sticks and the seeds dispersed through human activity. The silverweed present at the estuary plots was in very dense patches in some locations. Formerly, silverweed patches were owned and cared for by certain families. Stanley Sam (1996) described beaches as being "privately owned" and part of *h̲ah̲uulthi* areas. It is possible that the women who harvested the roots would weed the patches of other species. This would facilitate the process of harvesting in the following year, since the patches would be more uniform. At the end of our summer field season, we tried harvesting the roots and rhizomes of these two species. Using small spades and garden shovels, we pried the roots loose from the rocky soil. It was a difficult task to extract the entire roots, and took some time to harvest a sizeable portion. This exercise left me with a deep appreciation for the work that women would do to collect the roots, berries, and other plant foods which were part of the traditional diet.

We also found populations of these root foods at the Bedingfield Bay estuary. The conditions at this estuary were much the same as at the Atleo river mouth site. Surrounding the estuary was old-growth forest on the eastern side, and fragmented forest on the western side where the estuary borders on the edge of the Bedingfield logging camp. We discovered one culturally modified tree in the forest to the east of the estuary, suggesting that this site has been used in the past for resource harvesting. There was evidence of abundant wildlife in the estuarine area, and there were several wildlife trees present. Wildlife sighted include: butterflies, crows, swallows, hummingbirds, garter snakes, and a young blackbear. The substrate at this site was less rocky, with more wet loam.

Several of the species located in this estuary are the same as those at the river mouth, with a few significant additions. The two additional plants found at the Bedingfield site with documented traditional uses were northern rice root (*Fritillaria camschatcensis*) and yarrow (*Achillea millefolium*). The bulb of northern rice root was traditionally prepared in much the same way as the silverweed and clover. This beautiful plant from the lily family (Liliaceae) has chocolate brown petals, and a bulb which looks like clumps of white rice. We collected one sample of this plant, which came free from the soil with a gentle pull (it was much less work than the silverweed or clover!). We did not speak with anybody in Ahousaht who remembered this specific plant; however, its use by various Nuu-Chah-Nulth peoples in Clayoquot Sound has been documented elsewhere (Turner and Efrat 1982; Scientific Panel 1995b).

Information has also been published about the medicinal properties of yarrow (Turner and Efrat 1982, Scientific Panel 1995b), and several people in Ahousaht spoke to us of this plant. As discussed in Chapter 2, however, we did not attempt to gather specific information on medicinal plants as part of our study. Both the yarrow and the northern rice root were growing together in patches with springbank clover and Pacific silverweed. This estuary would be an extremely valuable area for gathering root foods.

Estuaries also provide habitat for another important basket-making material: three-cornered grass (*Scirpus americanus*). We did not come across this species in our fieldwork; apparently, it is only found in certain locations in Clayoquot Sound. According to Lena Jumbo (1996),

> [Three-cornered grass] grows on the beach. Not everywhere, certain areas it grows. You get that from Vargas next beach to Keltsmaht. . . 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.

The three-cornered grass is used in conjunction with the other basket making materials described above. Trudy Frank (1996) described the way in which this particular material is used:

> The other kind [three-cornered grass], we call it the reed grass, like it's got foam inside. It's almost like the swampgrass [basket sedge], but you get it down where the salt water comes in. . . 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*. . . other people call it *t'uxt'ux* for short.[7]

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[7]The name *t'uxt'ux* echoes the sound it makes when pulled up (Dr. Nancy Turner, pers. comm.).

Table 5.14: Species found in estuaries at the mouth of the Atleo River and Bedingfield Bay.

Common name	Latin name	Nuu-Chah-Nulth name
northern rice root	*Fritillaria camschatcensis*	*kuuxwapiihmapt*
[redacted]		
yarrow	*Achillea millefolium*	*shashaaxtan'uuh*
Douglas aster	*Aster subspicatus*	NA
[redacted]		
Alaska plantain	*Plantago macrocarpa*	NA
common plantain	*Plantago major*	*titimatk'uk*
[redacted]		
dunegrass	*Elymus mollis*	NA
[redacted]		

Legend and Table Summary	
Species present only at Bedingfield Bay estuary	3
Species present only at Atleo River mouth estuary	3
[redacted]	8
Total number of species present	14

Summary

In this chapter, I have described the plants and ecological conditions of the various habitat types of the Atleo River Valley. These include: old-growth forest (cedar-hemlock and hemlock-amabilis), logged areas (1991-1994 clearcuts, 1985-1986 clearcuts, and 1979-1981 clearcuts), and riparian areas (lake edge, river edge, and estuaries). Each habitat type contains particular plant communities, and each has been differentially affected by logging activities. Similarly, there are specific kinds of plant use and management associated with these habitat types. The culturally significant plants found in each habitat type have been, and are being used by the Ahousaht First Nation. This knowledge of the forest, along with the forest itself, is continually evolving. It is difficult to predict how the forests of Clayoquot Sound will be used in the future by either Aboriginal or non-Aboriginal inhabitants. This will depend, to a great extent, on the political and economic milieu as new policies and practices are put in place.

One thing, however, is certain: the process of repairing the damage that has been caused to forest ecosystems in Clayoquot Sound by industrial logging and other activities will be of vital importance in the near future. Restoration, both passive and active, will need to be guided by explicit goals and values. In the following chapter, I will explore some options for ecological restoration in the Atleo River Valley, taking into account the historical, ecological, and cultural information which has been discussed in this thesis.

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Chapter 6
Ecocultural Restoration in the Atleo River Valley:
"It's all connected."

"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 happening today." Archie Frank (1996)

"Forest Renewal BC, well, what does that mean?. . . Does it mean forest renewal for harvesting? Or does it mean real forest renewal? Is it a shade of it or is it all of it? And we say it should be all of it. And you are not going to get that unless you have the involvement of people with traditional knowledge and information." Clifford Atleo (1996)

Introduction

When Aboriginal title to traditional lands is formally recognized through the treaty process, First Nations in Clayoquot Sound will inherit the consequences of a century of industrial logging activities. Ancestral lands that have been logged will have to be restored. The responsibility for this restoration has yet to be determined; however, the involvement of Aboriginal peoples as practitioners and leaders of restoration efforts will be crucial to the long-term and meaningful success of these activities. Restorationists have much to learn from the traditional inhabitants of the land, whose activities and occupation helped shape the ecosystems of that land. As described in this thesis, the land itself is infused with historical, cultural, and spiritual significance to the people of Ahousaht.

Traditional philosophies of respectful interaction with the forest, the idea of the interconnectedness of all living things expressed in the phrase ***hishuk ish ts'awalk*** (all things are one), strategies for sustainable forest use based on selective harvesting of diverse forest products, and cultural institutions such as the concept of *hahuulhi* which traditionally regulated the use of resources, can provide a culturally and ecologically appropriate foundation for the process of restoration. Hopefully, some of the ideas and strategies for restoration outlined in this chapter will be consistent with these traditional values and practices. Before discussing ecological restoration strategies for the Atleo River Valley, I will begin by considering restoration theory and practice, its role in ecologically responsible forest use, and its relationship to traditional ecological knowledge.

Restoration: Theory and Practice

Ecological restoration represents a relatively new field of study for which there is a growing body of literature (for example, see Jordan 1987, 1994; Baldwin *et al.* 1994; Cairns 1988; Wali 1992; Stevens 1995; Berger 1990). According to Jackson *et al.* (1995:71) the definition of ecological restoration as adopted by the Society for Ecological Restoration is, "the process of repairing damage caused by humans to the diversity and dynamics of indigenous ecosystems." This definition recognizes the importance of considering both the structures and functions of ecosystems in undertaking restoration. In other words, restoration work must restore both the processes of ecosystems (such as plant succession, mutualistic associations, and nutrient cycling) and the products of those systems (for example, ancient trees and small, rare plants).

Current thinking in the ecological sciences is moving away from the idea of the "balance of nature" to the notion of "nature in flux" (Pickett and Parker 1994; Botkin 1990; Kay and Schneider 1994). This has significant implications for the way in which restoration is undertaken. The idea of nature in flux suggests that ecosystems are dynamic, open, and to some degree unpredictable. This offers certain challenges for undertaking restoration by calling into question the possibility of achieving an "end product" in the form of a predetermined landscape or plant community.[1] Instead, the focus becomes the restoration of those structures and processes which allow ecosystems to both persist and evolve over time. As Jordan (1994:20) puts it, "[Ecological restoration] means not just setting the system up, like a diorama, but actually setting it in motion."

In old growth forest ecosystems the structures may include: the presence of diverse ages, heights, and species of trees; nurse logs; snags; coarse woody debris in various stages of decay; gaps in the canopy cover; and healthy middle and understorey plant communities. The processes may include: the role of decay and nutrient cycling; interspecies interactions involving plants, animals, and detritivores; natural disturbances; coevolution of species; and functioning food webs. Another factor which is gaining increasing importance and recognition in restoration activities is the role of humans in shaping these ecosystems. Traditional activities such as burning, selective harvesting, cultivation, and dispersal of plants (intentionally or unintentionally) have the potential to impact both the structures and functions of ecosystems. Jackson *et al.* (1995:72-3) suggest that where these activities have played a role in shaping ecosystems, they should be reintroduced as part of the process of restoration so that, "as we begin to discover and acknowledge the historical impacts of indigenous cultures on an increasing number of seemingly 'untouched' ecosystems, restoration of indigenous human cultural

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[1] While recognizing the importance of change and dynamics in forest ecosystems, it may also prove valuable to establish what Aronson *et al.* (1993) refer to as an "ecosystem of reference." This is a comparable and preferably local ecosystem which demonstrates some features and functions which are to be restored in the damaged system. Choosing such an ecosystem will help with the project design and provide a yardstick for evaluation. It can also provide some much needed inspiration. One possible ecosystem of reference for the Atleo River Valley is the Shark Creek Watershed which is immediately north of the Atleo River on the mainland of Vancouver Island. Shark Creek is under the traditional jurisdiction of Chief Earl Maquinna George of Ahousaht.

relationships with the land will become the rule, rather than the exception, in ecological restoration." Thus, humans, particularly the traditional inhabitants of the land, have an important role to play in the restoration process.

Restoration and Ecologically Responsible Forest Use

In undertaking restoration, it is essential to recognize the connections between the area being restored and adjacent landscape ecosystems. The landscapes of Clayoquot Sound and Vancouver Island are highly fragmented as a result of industrial logging activities. This is clearly evident in the high level aerial photograph (Figure 4.3) taken in 1987, which shows the extent of logging activities in the area surrounding the Atleo River valley. While restoration activities take place at specific sites, these sites are embedded in the structures and processes of the surrounding landscape. In order to provide continuity with the larger landscape, while restoration is occurring in already damaged areas, healthy functioning ecosystems need to be maintained through conservation efforts and responsible forest use. These intact ecosystems provide the biological foundation for restoration efforts (Handel *et al.* 1994). In this way, restoration becomes an integral part of larger strategies for ecological conservation and responsible forest use.

The purpose of restoration is to begin the process of healing the damage which has already occurred to ecological systems; it should not be used as an excuse to continue ecologically destructive practices (Berger 1990). In this chapter, I will be discussing restoration as applied to areas which have been subject to intensive clearcutting silvicultural systems. Contrary to claims by logging companies, clearcut logging does not imitate natural disturbance regimes in the coastal temperate rainforest. As described in Chapter 5, on the West Coast the natural disturbance regime is dominated by the action of wind which takes down individual trees, and small patches of trees. The element of fire is much less widespread due to the high precipitation and moisture conditions year round. If, however, a large forest fire or even outbreak of disease or pest were to affect large stands of trees, there would still be some remnant structure left to provide the foundation of the new forest. These residual plants, in combination with migrant plants, work together to form the new forest community (MacMahon 1987; Franklin 1994). Clearcutting does not provide what Franklin (1994) refers to as "biological legacies," the remnant structures which give new forest communities a head start on species richness and structural diversity.

One of the major recommendations of the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound is to phase out conventional (i.e. clearcutting) silvicultural systems and replace them with some form of variable retention silvicultural system (Scientific Panel 1995d). This type of system, often referred to as a selection silvicultural system [2] is designed to maintain as many of the original forest characteristics as possible. This may involve leaving some remnant structure of the original forest (such as snags, large trees, groups of trees, and downed wood). This remnant structure can provide the foundation for the new forest community, maintain some of the essential processes and functions of natural forest ecosystems, and contribute to greater connectivity with adjacent forested areas. If selection logging were to

[2] A selection silvicultural system, which removes mature timber in the form of scattered individuals or small groups of trees, relies primarily on natural regeneration and maintains an uneven-aged stand of trees of diverse heights. It is important not to confuse this system with "selective logging," which involves the removal of the best trees from the stand and is analogous to high-grading (taking the best and leaving the rest). It also has important differences with the shelterwood silvicultural system, which removes stands of trees in a series of cuttings, eventually establishing an new even-aged stand under the shelter of the old stand which is then removed.

replace clearcutting methods, the process of restoration described in this chapter would be greatly facilitated, and perhaps made unnecessary, in the future.

In the summer of 1995, members of the various Nuu-Chah-Nulth First Nations (including representatives from Ahousaht) visited two reservations in the United States where selection forestry is currently being practiced (Dunn 1995). Both Clifford Atleo and Murray John of Ahousaht spoke positively of their visits to the Yakama Nation in Washington, and Menominee reservation in Wisconsin. Traditional knowledge of tribal elders has been a key component of the Yakama forest plans; while in Menominee, a stable volume of trees on their forested reserve lands has been maintained for over a century. Many of the people we spoke with in Ahousaht who have had experience in forestry expressed some interest in selection logging practices. For example, Chief Earl Maquinna George (1996) noted,

> Fifty years ago when there was still good solid wood up in the mountains - up over here where you see the bare spots - if they had done more in the sense of select logging or no logging at all, we'd still have the face of the earth the way it was during early time.

It is important to note that selection logging methods are much more consistent with traditional patterns of forest use, which involve selective and conservative harvesting methods. During the course of our interviews with knowledgeable people in Ahousaht, one of the most commonly expressed sentiments was that in harvesting resources you "only take what you need" and that you should "not be wasteful." In contrast, clearcut logging is the epitome of wasteful practices, involving the removal of all elements of the forest web to obtain the one or two species of commercially viable trees. The adoption of more responsible forestry practices, such as variable retention, or selection logging systems, must go hand in hand with the practice of restoration.

The Relationship Between Traditional Ecological Knowledge and Ecosystem Restoration

According to Schwalen and Nelson (1996), "Native Restorationists are reframing restoration to include the social and cultural concerns of indigenous peoples." Dennis Martinez, a mixed-blood American Indian restorationist, has been a strong proponent of this position. Martinez is part of the Indigenous Peoples' Restoration Network (IRPN) established through the Society for Ecological Restoration in 1995. The goals of the IPRN are to undertake ecological restoration in such a way that it facilitates the survival of Aboriginal peoples and cultures, and incorporates the traditional knowledge of Aboriginal people into ecosystem management strategies (SER 1995). Martinez (1993:9) suggests that, "Putting Culture back into Nature in this land will require both a working knowledge of indigenous resource utilization and of indigenous environmental regulations and safeguards. . . Native land knowledge cannot be separated from native ecosystem preservation/management and restoration."

Martinez (1994) outlines a number of general ways in which Native peoples have shaped the land through traditional practices. These include: dispersing plants and seeds (intentionally through transplanting, or unintentionally through harvesting activities), modifying plant habitats (for example, by burning or pruning areas to facilitate new growth), and genetic modification through selective harvesting activities. Some examples of these activities in Ahousaht traditional territory were described in Chapter 5; notably dispersing seeds through harvesting and transporting berries, and pruning areas of basket making materials to provide room for new growth. One particularly interesting story shared with us by Arlene Paul gives an indication of the ways in which the Ahousaht people have shaped their environment in the past. Arlene Paul (1996) described to us how her great-grandmother (Mamie Tom) tried replanting cranberries from a site near Ahousaht village on Flores Island, to a site on nearby Vargas Island:

> They tried transplanting some stuff from the school, old place out here, out to Vargas, a mossy place as well. It never worked. . . even cranberries. . . 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. . . 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.

This suggests a tradition of interest in experimentation with transplanting and the intentional dispersal of plant species. This is not surprising, given the variable availability of culturally significant plants in Ahousaht traditional territory. What is found on one island, or in one river valley, might not be found in another. This story also reflects an understanding of ecological associations, and the relationship between individual plant species and their habitats.

In addition to specific practices, there are also conceptual and philosophical ways in which the people of Ahousaht have traditionally encouraged sustainable use of forest resources: placing emphasis on not taking more than you need, discouraging over-exploitation and wasteful use, and fostering a respectful relationship with the forest. As Chief Umeek (1996) explained to us, knowledge and practices for resource use might vary between individuals and families, but the underlying principle would be respect for the living beings which make up the forest community:

> 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 like a living being, right. They would all treat the tree as a living being, but they might have different words with which they approach the tree. . . 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 dos and don'ts, you know. And they would be specific to families, right, and it would pass from one generation to the next. 'This is how we do things. This is how we do it.'

This principle of respecting all life forms in the forest as living beings provides the basis for all interactions with the forest, and is a good foundation on which to begin the process of restoration. The traditional concept of *hahuulhi* (see Chapters 3) also may provide a context through which restoration activities might take place. In undertaking restoration activities, these traditional boundaries and patterns of resource ownership should be respected. Permission should be sought from the traditional owners of the areas in which restoration is taking place. As discussed in Chapter 3, the concept of *hahuulhi*, also confers some elements of responsibility, as well as rights, on the part of the owner. Depending on time and interest, the traditional *hahuulhi* owners might wish to guide the restoration process in their territories, and ensure that traditional protocols are respected.

Restoration of the Atleo River Valley: Principles and Practices

The Cultural Conservancy (TCC), a Native non-profit organization which seeks to protect Aboriginal cultures and ancestral lands, is founded on the principle of recognizing the important links between traditional knowledge and practices, and the process of restoration and land management. This chapter, which is devoted to an exploration of options for restoration in the Atleo River Valley, is also based on this principle. My approach will be one of "ecocultural restoration,"[3] recognizing that restoration must take into account social and cultural, as well as ecological factors. Too often, restoration is approached from a narrowly construed scientific viewpoint, detached from cultural and social contexts (Higgs 1994). Traditional knowledge holders should be included as experts in the restoration process. Restoration of forest ecosystems

[3] I am borrowing this term from The Cultural Conservancy's (1995) publication entitled the "Ecocultural Restoration Reader." This is a collection of articles and reports focusing on the role of indigenous peoples in restoration activities.

is not merely an act of planting trees; it is an affirmation of the commitment to restore healthy relationships between humans and the land.

The process of restoring an area must begin with first learning about that area and developing a respectful relationship with it. Both Aboriginal and non-Aboriginal people involved in restoration efforts could be educated about the histories of the areas in which they are working. This might help foster a greater understanding of and respect for the land which could enrich the experience of restoration, as well as the end results.[4] This is one venue through which Ahousaht Elders (depending on their time and interest) might be involved in the process of restoration - in leading educational walks through traditional territories such as the Atleo River Valley which are to be restored. As part of the work of the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound, Ahousaht Elder Stanley Sam conducted a guided helicopter tour of the areas of Clayoquot Sound, telling the other panel members about the histories of the area so that they could better appreciate the significance of these lands to the First Nations of Clayoquot Sound. A similar process could take place when restoration efforts are initiated in traditional territories. Elders could be hired as expert consultants by the parties responsible for restoration, which at this time are the logging companies and the BC Ministry of Forests. It is important to note that many sites in Ahousaht traditional territory have spiritual or sacred associations, and knowledge concerning these sites might be private.

Native restorationist Dennis Martinez (1994:307) suggests that, "above all we need to seek guidance from the Creator in our restoration efforts. . . we must use as best we can the

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[4]This is the rationale behind the significant historical component to this thesis (see Chapters 3 and 4).

newer management tools of Euro-America, which are appropriate to the new destruction - the scale of which no indigenous people has had to deal with before modern times." This statement emphasizes the way in which traditional knowledge and Western scientific knowledge both have important roles to play in the restoration process. As part of our research project in the summer of 1996, we attempted to incorporate both of these perspectives in our learning process. One aspect of the process was talking with Elders and other knowledgeable people in Ahousaht about the histories of the area, and traditional patterns of forest use. The other major component of the research was in learning about the forest ecosystems in the Atleo River valley through close observation and fieldwork (see Chapters 2 and 5).

During our fieldwork in the summer of 1996, we surveyed a total of twelve plots in old-growth (i.e. unlogged) forest ecosystems. This included six plots in hemlock-amabilis, and six plots in cedar-hemlock dominated forest. The information obtained from these plots provides base-line data for the Atleo River Valley which can be used to measure the extent of damage in logged areas, and to guide restoration efforts. It proved difficult to find large, contiguous plots of old-growth forest in the Atleo River Valley, due to the extensive logging activities which have taken place there. As a result, much of the forest we did survey showed signs of fragmentation and the edge effect in the form of large quantities of blowdown, unhealthy individual plants, and the invasion of some exotic species or species endemic to disturbed sites. Nevertheless, these areas may provide many valuable insights into the structure and function of local old-growth ecosystems, and offer some guidelines and goals for restoration efforts. As such, these areas form the ecosystem of reference for restoration in the area (Aronson *et al.* 1993).[5]

The old-growth forest ecosystems in the Atleo River valley are described in detail in Chapter 5, along with some of the traditional activities which took place in these forests. Here, I will just highlight some of the key features of these ecosystems which can guide restoration activities. The most obvious feature of the old-growth forests in the Atleo River valley was the presence of large, ancient trees. The impressive standing biomass of these trees represents centuries of growth and accumulation. The old-growth forests surveyed during the course of our fieldwork were characterized by structural diversity. In other words, trees were of many different species, ages, and heights; and the other strata of the forest (the shrub and herb layers) were also well developed. The development of the understorey was facilitated by the presence of gaps in the canopy created by windthrow and subsequent open patches where sunlight reached the forest floor. The advanced regeneration of the tree seedlings and shrubs in these open patches will ensure that the forest continues to persist and evolve through new generations. These ecosystems were also characterized by the presence of abundant coarse woody debris on the forest floor, and many epiphytic plants. The well developed populations of mosses, as well as the presence of species such as single delight (*Moneses uniflora*) and plants in the Lily family which favour moist rich soils, indicate healthy processes of decomposition and nutrient cycling.

The remaining old-growth forest ecosystems in the Atleo River Valley form the biological reservoir from which restoration activities in the area can draw. Some of the key

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[5]It would be useful to conduct inventories and surveys in adjacent watersheds which are less disturbed by logging activities. For example, the lower Shark Creek watershed which is immediately north of the Atleo River Valley has not been impacted by industrial logging activities and would provide valuable comparative data. As mentioned, this could provide an ecosystem of reference for the Atleo River Valley.

elements of these ecosystems which restorationists can make use of include: seed sources which are ecologically adapted to local conditions; genotypic variation within species which can contribute to the successful survival of colonizing plants; and the presence of mutualists such as pollinators, seed dispersers (birds and wildlife), nitrogen fixing bacteria in the soil, and mycorrhizal fungi. These elements provided by remnant natural communities may be vital to the success and integration of restored ecosystems into the broader landscape (Handel *et al.* 1994).

One of the most valuable lessons to learn from these old-growth forest ecosystems is the importance of time. The structures and functions of old-growth forest ecosystems were established over hundreds of years of co-evolution and adaptation. It will not be possible to re-establish these processes in a single "rotation" of 80 years. If the purpose of restoration is truly to restore forest ecosystems, and not just crops of trees, it will be necessary to take a long-term approach to the process of restoration. This approach will include time for natural healing and regeneration, and take into consideration all aspects of the forest web, not just the commercially valuable trees. In addition, the knowledge and activities which traditionally helped to shape these forests, and the relationships between humans and the forest, will provide the foundation for restoration activities.

Establishing Goals and Priorities

When developing a plan for restoration activities, it is important to establish goals and priorities. These will have to be determined specifically by those actually carrying out the restoration, which for the Atleo River Valley might include the Ahousaht First Nation, BC Ministry of Forests, and logging companies which have operated in the area (MacMillan Bloedel and Interfor). For the purposes of this discussion, however, I will identify three goals which I believe are critical in guiding restoration efforts:

- Achieving as closely as possible some of the key structures and functions of the ecosystem of reference (late successional old-growth forest ecosystems).
- Maintaining and restoring biological diversity.
- Designing ecological restoration strategies which are consistent with and informed by traditional ecological knowledge.

The suggestions for restoration offered in this chapter will be directed towards these goals.

Canada has specific obligations to protect biodiversity under the United Nations Convention on Biodiversity which was signed and ratified by Canada in 1992 (Scientific Panel 1995c). According to Noss and Cooperrider (1994:5) biological diversity may be defined as "the variety of life and its processes. It includes the variety of living organisms, the genetic differences among them, the communities and ecosystems in which they occur, and the ecological and evolutionary processes that keep them functioning, yet ever changing and adapting." Thus, biological diversity is expressed on at least four different levels: genetic, species, ecosystem, and landscape. On each of these levels, there is variation in composition, structure, and function. Maintaining and restoring diversity must also take into account these different levels. For example, attention should be given to restoration of genetic diversity within species (avoiding clonal monocultures), diversity between species, and also the diversity of the habitats and landscapes of which they are a part.

In this thesis, I am focusing on the restoration of forest plant communities; however, this restoration of habitat is closely linked to the health and survival of wildlife in the area. Chief Earl Maquinna George (1996) noted that the people of Ahousaht have traditionally recognized and respected the importance of habitat to individual plant and animal species:

> Forest lands were sacred, were the place for other animals. . . I think more or less it wasn't our people that saved the forest and land. I think it was more with respect for the habitat.

One of the primary ways of protecting biological diversity is to protect, conserve, and restore populations of native (indigenous) species of flora and fauna, and to control the spread of non-indigenous (exotic) species. The invasion and propagation of exotic species is one of the leading contributors to the process of biological homogenization on both global and local levels, leading to a decrease in biological diversity (Noss and Cooperrider1994; Crosby 1986). As Crosby (1986) points out, there is an important parallel to be drawn between the invasion of European peoples in North America (and elsewhere), and the invasion of exotic plant species. Crosby contends that European imperialism had biological and ecological dimensions. As peoples from Europe migrated to other continents, they brought with them a host of plants, animals, and pathogens from their own countries. This took place through both intentional and unintentional mechanisms. Regardless of the intentions, these introduced plants and animals had a profound and far-reaching impact on the indigenous flora and fauna; just as the introduced people (and the pathogens they brought with them) had significant impacts on the indigenous human populations.

An example which might serve as a useful illustration of this process is the introduction of Scotch Broom (*Cytisus scoparious*) to Vancouver Island. This shrub is notorious on the Island for its ability to colonize an area quickly and extensively, often out-competing the native vegetation. This is particularly pronounced on southern Vancouver Island, in the relatively dry rain-shadow area. We came across this species in the Atleo River Valley during the course of our fieldwork. The history of this species, and the route by which it reached Vancouver Island, is relatively well documented. Captain Walter Colquhoun Grant (1822-1861), an immigrant from Scotland, introduced the species in 1850. The original seeds were obtained by Captain Grant from Mr. Wylie, the British Consul in the Sandwich Islands (Hawaii). He planted the seeds on his farm in Sooke (southern Vancouver Island), and achieved the successful germination of three plants. The extensive colonies of Scotch Broom on the Island today are descended from these original progenitors (Pojar and MacKinnon 1994). Certain types of habitats are more susceptible than others to invasion by exotic species. These include: roadsides, riparian areas, and disturbed open sites in general. Controlling invading exotic species is one of the most important issues facing restoration projects (Cairns 1990; Hamilton 1990; Handel *et al.* 1994; Berger 1993).

With these general principles of restoring biological diversity and the key structures and functions of old-growth forest ecosystems, I will now go on to discuss some of the potential ways in which restoration might proceed in the Atleo River Valley. I will focus my discussion on three main areas of priority, following the recommendations of the Scientific Panel (1995d):

- Restoring areas where soil erosion has occurred, or is likely to occur.
- Restoring areas which have been clearcut in the past without retaining remnant forest structures.
- Restoring hydroriparian areas.

As an overarching principle, areas of cultural significance (for example: former village sites, important resource harvesting or gathering areas, or spiritual sites) should be given top priority.

Restoring Areas Subject to Soil Erosion

As a result of the recent history of glacial activity in BC (see Chapter 3) the soils on the west coast of Vancouver Island tend to be quite shallow, with most of the available nutrients being located in the forest floor and upper mineral layers. Loss of this organic matter through the forces of erosion is extremely detrimental to the future survival and re-establishment of plant communities. In addition to soil stability, the texture and moisture content of the soil may be negatively impacted by the removal of forest cover. Exposed soil is subject to compaction by mechanical equipment used in road building and preparation. Compacted soil is less able to absorb and retain moisture. Run-off from the slopes may lead to flooding and sedimentation in adjacent rivers and streams. For these reasons, restoration of areas where soil erosion has occurred, or is likely to occur, is a high priority. Recommendation 5.5 of the Scientific Panel (1995d) suggests that all disturbed roadside areas, as well as all denuded mineral soil surfaces (including cutslopes, fillslopes, borrow pits, and waste disposal sites), be revegetated as quickly as possible using non-invasive indigenous species.

On slopes with steep gradients, soil erosion can be a significant problem, particularly when this erosion affects hydrological systems in the area. Erosion occurs when the root structure provided by vegetation cover is removed through logging activities, and soil becomes directly exposed to the forces of wind and precipitation. The process of surface erosion goes through a number of different stages: from splash erosion where the soil particles are loosened with the impact of precipitation, through sheet erosion where layers of soil are removed through surface run-off, to rill and gully erosion, where deep channels are formed through accumulation and movement of large quantities of water (Lousier 1990). In contrast to surface erosion, land slides are primarily caused by the force of gravity, through the mass movement of the soil and surface materials. This often occurs when they are saturated with water.

Weather patterns in Clayoquot Sound are such that violent rainstorms are a frequent occurrence in winter months. On exposed steep slopes, this can trigger large scale landslides which are extremely difficult to repair, particularly where logging roads have been poorly located or constructed (Beese *et al.* 1994). Carl and Lena Jumbo, two Ahousaht Elders, spoke of the increasing occurrence of landslides in Clayoquot Sound. For example, Carl Jumbo noted:

> You know, there's all these logged out areas now, today. A lot of slides and that. It wasn't like that before in the earlier days. If you'd have a tremor, a small tremor, sometimes you'd see the slide, but today it's every place you look at, every mountain. . . where the logging roads are, there's a lot of slides there. . . when we flew up to Gold River, first week of January, boy we noticed all the slides. Lot of roads you know, logging roads on the mountains back there, behind Hesquiaht. . . tremendous amounts of slides.

Stanley Sam (1996), another Ahousaht Elder, noted that some kinds of logging are less likely to result in landslide activity. He also pointed out that landslides and erosion can negatively impact the rivers and fish populations:

> There's all kinds of logging, it's not just one kind. So we seen helicopter logging. That was cleanest. Boy it's clean! Because they don't make truck roads up the hill. . . I was telling the scientists, I 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 comes out of the rocks [it] seeps into the river and kills the fish.

The negative consequences of erosion, and the potential for serious landslide activity can be ameliorated through the reestablishment of vegetation on slopes; and the proper construction, location, and decommissioning of logging roads.

The main areas in which non-native species are being deliberately planted are at roadsides and on slopes for purposes of soil stabilization. According to Bill Perry of MacMillan Bloedel, there are currently no mixes of native grass species available for use in replanting. Therefore, exotic grass and legume species are often being used to provide vegetation cover and soil stabilization. This function could probably be achieved by using native species, and would contribute to maintaining the endemic genetic and species composition of the area.

During the course of our field work, we came across a number of indigenous species in the grass family (Poaceae). Some of these could be considered for grass-legume mixes for reseeding slopes and roadsides. For example, bluejoint (*Calamagrostis canadensis*) was found growing in both the 1979/81 clearcut sites, and in the Seektukis Indian Reserve at the mouth of the Atleo River. This species is a perennial with creeping rhizomes, which may be advantageous in creating soil stability. It also is an aggressive colonizer of disturbed sites (Pojar and MacKinnon 1994). Other grasses which we came across include: red fescue (*Festuca rubra*), spike bentgrass (*Agrostis exarata*), Alaska oniongrass (*Melica subulata*), and nodding trisetum (*Trisetum cernuum*). Nodding trisetum was particularly widespread in the valley, showing up in a number of habitat types including: forested and logged river riparian areas, old-growth hemlock-amabilis forest, and 1979/81 clearcuts. This adaptability to a wide range of conditions might make it a desirable seed species. Red fescue is already used in grass-seeding mixtures for erosion control. The area where we found this species was a disturbed slope where some soil erosion was evident. It was found in conjunction with orchard grass (*Dactylis glomerata*) and English ryegrass (*Lolium perenne*), two introduced species which are also commonly used in grass-seeding mixes to provide quick cover, and which are most often found in settled and disturbed areas in the southern region of coastal BC.

Some species of legume are often mixed in with grass for seeding slopes and roadsides. Legumes provide an important nitrogen-fixing service for the disturbed area, which facilitates the ability of other plant species to colonize a site. The loss of nutrients, particularly nitrogen, through deforestation and erosion may be a significantly limiting factor in the recovery of plant communities on the site. The legume species most commonly used in these mixes in the study area is white clover (*Trifolium repens*). This species is an introduced perennial herb which spreads through clonal rhizomatous growth, a feature which makes it a very rapidly colonizing species (Handel *et al.* 1994). As such, it poses a threat to the survival of the native clover (*Trifolium wormskjoldii*) which tends to grow in wet, open areas - particularly saltmarshes and estuaries. It is difficult to know if the native clover would be successful in colonizing dry, disturbed sites; however, it might be tried as an alternative to the introduced clover. Experimentation with the native clover, and with other native legume species, should be an important component of slope revegetation.

In addition to grass-legume mixtures, some native woody shrubs and hardwoods have been found to be effective in rehabilitating sites and controlling soil erosion. These include: red alder (*Alnus rubra*), willow species (*Salix* spp.), salmonberry (*Rubus spectabilis*), thimbleberry (*Rubus parviflorus*) and hardhack (*Spiraea douglasii*); all of which were commonly found in the Atleo River valley (Beese *et al.* 1994). Notably, salmonberry has been successfully established in landslide areas. Given its abundance in Ahousaht traditional territory, and the frequency of landslide activity in the winter months, salmonberry may be an important species for restoration. Although many of these species will colonize naturally from adjacent areas, they could be intentionally planted in sites with severe damage and erosion problems in order to speed the recovery process. Aside from these species, deer fern (*Blechnum spicant*) might also be utilized for slope restoration. Deer fern was one of the few species which we found thriving in both open, disturbed areas; and in old-growth forest. Above all, it is important to experiment with the use of native species - including grasses, shrubs, and trees - in restoration activities, as little has been done in this area (Beese *et al.* 1994).

Prior to seeding and planting, areas should be prepared by removing some of the accumulated slash, decompacting soil, and tilling under the ash layer (Beese *et al.* 1994). The practise of "preparing" a site through broadcast burning of slash following clearcutting is not recommended. This practice may result in long-term negative consequences such as the loss of soil nutrients either during the burn, or as a result of subsequent erosion of the exposed soil; impairment of nutrient cycling, and disturbance to natural hydrological regimes. High impact fires can destroy the organic matter on forest floors, and lead to a long-term nutrient impoverishment of the soils (Pilarski 1994). The nutrients which are made available through burning are easily leached from the soil through erosion and increased impact of precipitation on exposed areas (Beese *et al.* 1994). As noted in the habitat type descriptions in Chapter 5, many of the clearcut sites in the Atleo River Valley contained large accumulations of burned slash which did not show signs of decay. These large, clearcut areas form another important priority for restoration efforts.

Strategies for Restoring Clearcut Areas

In the Atleo River valley, as with most logged areas on the west coast of Vancouver Island, the main "restoration" activity taking place is tree planting. This is geared towards the re-establishment of the commercially valuable tree species which are earmarked for harvesting in the next rotation. This is accomplished by a dense, uniform tree planting strategy designed to meet MOF restocking requirements. The results of this strategy are reflected in the habitat descriptions for logged areas in Chapter 5. These areas are dominated by two or three species of coniferous trees. The seedlings are generally even aged, the same height, closely spaced and thin-stemmed.

The presence of many species associated with disturbed sites, such as fireweed, pearly everlasting, and red alder, is pronounced to different degrees in the logged areas. Some areas have been colonized by exotic species, such as Scotch broom (*Cytisus scoparius*) and Himalayan blackberry (*Rubus discolor*) which pose some threat to the native plant communities. In most areas, none or little of the structure of the previous forest ecosystem was left in place following logging. Generally, clearcut logging involves the total removal of all major vegetation from a site, which is then burned and prepared for replanting.

The importance of remnant structure (which should be more extensive than one wildlife tree left in the middle of a clearcut) is clearly demonstrated in the habitat descriptions of the few plots retaining some of the biological legacies of the forest communities. For example, in one of the logged river riparian sites, a fallen log had been left to decay just inside the vegetation zone. This plot had high moisture levels, as evidenced by the presence of species such as false lily-of the valley, foamflower, false bugbane, and Siberian miner's lettuce. As a nurse log, the tree was providing important habitat for young plants such as a Sitka spruce seedling, young salal and salmonberry, coast boykinia, sweet-scented bedstraw, and deer fern. In a different plot, one in an area logged in 1981 on the north side of the valley, quantities of downed wood had been left to rot instead of being burned. This is not analogous to burned piles of slash where the charred bark remains intact and there are few signs of decay. In this area, the young tree seedlings were growing quite well relative to other clearcut sites surveyed. In addition, the area at the mouth of the river (the Seektukis Indian Reserve) had apparently been selectively logged in the 1940's (see

Chapter 4), leaving behind much of the original forest structure. This area showed many of the characteristics of old-growth forest ecosystems, and was one of the healthier-looking forested areas we encountered in the course of our fieldwork.

Remnant structure is important not only for providing a basis for recreating the structures of old-growth forest ecosystems, but also for maintaining some of the functions which allow these systems to persist and evolve over time. For example, the processes of nutrient cycling, decomposition, and species interaction can all be facilitated by the presence of remnant structure. As already mentioned, there are few logged areas in the Atleo River valley which retain some remnant structure from the previous forests. It might, however, be possible to take advantage of the forest structures which are left. One way to do this is to begin restoration in those areas which are immediately adjacent to remaining patches of old-growth forest. In this way, wildlife and birds which act as seed dispersers may come in from forested areas to provide mutualistic associations. In addition, this will facilitate the colonization of the area by plant species which are adapted to that particular location. This exchange of biological material will create a greater genetic and species continuity in the landscape (Ashby 1987; Handel *et al.* 1994).

However, where natural colonization and migrations do not occur, or where the damage is particularly severe, it may be necessary to engage in more active restoration activities. One possibility for active restoration is actually bringing in small quantities of soil from adjacent forested areas, and even some decaying logs to act as nurse logs for young plants. It should be emphasized, however, that this method should be approached with caution. Care must be taken not to debilitate the donor forest ecosystem; restoration of one system should not take place at the expense of another. Used with discretion, however, this method may have some beneficial results. The soil may contain the vital mutualistic fungi, bacteria, and soil organisms which contribute to processes of nutrient cycling and decomposition. Of course, it is also possible that unwanted pathogens may also be brought in, so there are some potential drawbacks to this method (Perry and Amaranthus 1990; St. John 1990). Nurse logs can provide habitat for young plants, and contribute to the accumulation of nutrients and the moisture retaining properties in the soil as they decays. This has been tried in Germany, where rotting logs have been introduced to restoration sites in order to increase the presence of useful fungi in the soil (Handel *et al.* 1994). This will create a more favourable environment for young plants to grow and flourish. This might be one way through which favourable conditions for the more sensitive moisture-demanding species (for example many of the *Liliaceae*) can be restored. Another active method of restoration might involve pounding wooden stakes into the soil, particularly where exposed soil has been compacted by logging equipment or heavy precipitation. These stakes will decompose and create major channels in the soil, thus facilitating the movement of water through the sub-surface (Ashby 1987).

Active restoration, in contrast with passive restoration, is concerned with speeding up or facilitating those changes and processes of recovery which would naturally occur over time. Replanting is one of the activities involved in active restoration. Both the pattern and species composition of replanting should imitate, as closely as possible, the natural processes of succession. According to Gross (1987) the three main principles operating in succession are: facilitation, tolerance, and inhibition. Facilitation is the process whereby early colonizers create conditions which are favourable to subsequent plant colonization. Tolerance is the ability of plant species to persist under changing ecological conditions. Inhibition is the means by which later successional species impede the growth of other species (for example by creating shady conditions which some species can not tolerate). Restoration should take place in stages, following these naturally occurring processes and principles of succession (Ashby 1987). Thus, the first species which should be planted at a site are the colonizers, or pioneer species. These species are generally fast growing, short lived, low nutrient demanding or nitrogen fixing, and suited to open conditions (Gross 1987). These species, particularly red alder (*Alnus rubra*), are often subject to brush control, based on the belief that they will suppress the growth of coniferous trees (Horowitz 1990). Instead, they should be encouraged and respected as important members of the forest community which benefit soil fertility. Restoration of forest ecosystems must be based on respect for all life forms in the forest, not just the commercially valuable ones.

The planting of coniferous, late successional species plays an important role in restoration; however, as I have attempted to emphasize in this chapter, it is not the only aspect of restoration. The tree seedlings will eventually provide the main structure of the forest ecosystem. Currently, seedlings are planted in dense, uniform stands in order to satisfactorily restock an area. As described in Chapter 5, in the 1979/81 clearcuts which were replanted, the young trees are close together with very thin stems, and the development of understorey layers (shrubs and herbs) is inhibited by the crowding and lack of available light and nutrients. According to Horowitz (1990), this "narrowly conceived and short-sighted" approach to reforestation is designed to create a "uniform green blanket" of tightly spaced trees, preferably at a density of 1,000 to 1,500 trees per hectare. Generally, these trees will require thinning in order to alleviate overcrowding.

An alternative approach to replanting trees which more closely imitates the structures of old-growth systems might be to plant seedlings in patches or clumps, and to space them more widely apart (Handel *et al.* 1994; MacMahon 1987; Horowitz 1990). This will allow more room for the young trees to grow, as well as creating gaps where shrubs and herbaceous plants might regenerate. As already discussed, openings are a naturally occurring feature of old-growth forest ecosystems, and they can facilitate the growth and development of new generations of plants. In addition, the planting of smaller numbers of seedlings in combination with more careful site selection might alleviate the necessity for thinning. Once the goal is shifted from creating a new crop of trees to be harvested sometime in the not-so-distant future, to restoring a functioning forest ecosystem, new priorities emerge. This may take more time, and have less immediate results than restocking methods, but I believe it may have long-term benefits in creating a more diverse and healthy forest ecosystem.

This pattern of replanting might be tried in the recent clearcuts (1991-1994) which have not yet been replanted, or which have not had much opportunity to regenerate. In the areas which have already been replanted (for example, the 1985/86 and 1979/81 clearcuts) it might be possible to imitate more closely the natural forest structure by removing small patches of trees, in addition to the thinning activities which are already taking place. More emphasis could be placed on individual brush pulling, instead of uniformly "controlling" all unwanted vegetation at a site. Deciduous trees, particularly red alder with its nitrogen-fixing capabilities, have an important role to play in the process of succession and the development of a diverse forest community (Horowitz 1990; Pilarski 1994).

In addition to the issues of which species to plant, and when and where to plant them; there is the question of where to obtain the seeds or seedlings. Seeds and seedlings may be obtained from nurseries or from local wild seed sources. MacMillan Bloedel currently obtains most of its seed stock from its own nursery at Yellow Point and in Campbell River, both of which are on Vancouver Island. These nurseries collect their stock from broad seed zones in the province of BC. It may be preferable, however, to collect wild seed from local sources for specific restoration sites; provided that precautions are taken not to negatively impact the health and reproduction of the donor plants (Pilarski 1994; Handel *et al.* 1994; Lippitt *et al* 1994). Using local seed sources has the advantage of using genotypes which have successfully adapted to the local microclimate. This may improve the chances of successful recolonization on disturbed sites. In addition, there is a greater genotypic variety in natural seed sources, which offers a wider range of survival mechanisms. Both collecting and planting wild seeds is very labour intensive. This, however, is not necessarily a bad thing, as it could become a major source of local employment in an area with high unemployment, particularly First Nations communities. A native seed collection could be established and maintained in the community of Ahousaht. This would provide easy availability and access to seeds and seedlings as they are required.

Lippitt *et al.* (1994) offer some useful guidelines for collecting wild seeds and establishing a local native seed collection. Wild seeds are best collected by hand directly from the plant. It is advantageous to harvest seeds from a variety of plants in different local habitats. This reduces the risk to the donor population, and ensures a wider range of genetic variability. Small seeds or fruits from shrubs may be harvested directly into a container carried by the harvester. By holding the bag underneath a stretched out branch, and raking the branch by hand or stick, the seeds or fruits fall into the basket. Traditional methods of harvesting huckleberries and blueberries, for example as described by Irene Thomas and Trudy Frank, could be adapted to serve as dry fruit or seed collection methods. Irene Thomas (1996) describes the traditional method of harvesting berries:

> There was real lot of berries up there [at Bear River] too, in July. Oh, it was plentiful, the blueberries and the red huckleberries. We used to just get branches and just shake it off... we used to just pull it down like that and just use our hands to do it, go on the mat, then put it into buckets.

Traditional methods of cleaning berries could also be adapted for processing the seeds and prepare them for storage. Trudy Frank (1996) described the method by which unwanted leaves and stems were separated from the berries:

> We used to have these big huge baskets. . . and the way they used to have us pick it, 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!

Following the initial cleaning, screens of various sizes could be used to further sort and clean the seeds.

Another important aspect of restoring these forest ecosystems is restoring some of the human activities which helped to shape them at various times in the past. Obviously, newly logged areas are not going to be a very good location for harvesting cedar bark, but advantage could be taken of those species which are doing well in the open conditions. Some fruit-bearing shrubs, such as salal and red huckleberry, do well in logged areas, particularly those that have been recently burned (Turner 1994). Many of the people we spoke with in Ahousaht recognized this pattern. For example, Arlene Paul (1996) noted that,

> *Y'ama*, salal, they come out really good when they first log a place out and it comes up, it's always really good stuff. . . it produces really good berries when you get a logged out place.

As mentioned in Chapter 5, the process of picking berries might provide an important seed dispersal service. Even though people are tending to pick berries locally, it is possible that some might be interested in going farther afield to gather. These berries might be used domestically, or sold to the growing market for wild food products, such as berries, jams, and jellies. Obviously, there is considerable experience and skill in Ahousaht in making jams and jellies from these wild fruits. In addition, non-traditional products such as materials for sale to florist shops might also be harvested from logged areas. Florist shops currently purchase stems of salal and sword fern for sale in floral arrangements (Scientific Panel 1995a).

As noted by Lena Jumbo, harvesting basket making materials such as basket sedge (*Carex obnupta*) actually improves their growth by pruning them and allowing space for the new plants. The primary basket making material we came across in the Atleo River Valley (aside from cedar bark) was basket sedge in wet areas and particularly around Barra Lake. There was one plot near the river mouth, however, where cattail was also growing. In areas such as this, walkable paths might be cut into the clearcut areas to provide easier access, particularly for Elders. This might be one case in which the logging roads, which can cause significant ecological damage by disrupting hydrological systems and initiating landslides, might have some positive use in facilitating access. Some logging roads need to be maintained to provide access to replanted areas. These could also serve as access routes for harvesting products, or for collecting wild seeds as described above.

Special Considerations for Riparian Areas

Riparian forest ecosystems have characteristics which require special consideration in restoration activities. During the course of our fieldwork, we noted considerable disturbance to the hydrological systems in the Atleo River Valley as a result of logging activities. For example, large accumulations of woody debris in the water (log jams) altered the course and structure of rivers and streams, and the removal of protective vegetation from the river's edge left the river more exposed to precipitation and the sun. These impacts affect not only the plant communities, but the fish stocks in the river as well (Scientific Panel 1995d; Hartman and Scrivener 1990; Sierra Legal Defence Fund 1994). The extreme importance of fish species, especially salmonids, to the people of Ahousaht, both culturally and economically, means that the forest ecosystems to which they are linked should be given special consideration.

In Carnation Creek on the west coast of Vancouver Island near Barkley Sound, a seventeen year study was undertaken to explore and monitor the impacts of streamside logging on the stream ecosystem (Hartman and Scrivener 1990). The findings from this study might prove useful in guiding restoration efforts in the Atleo River Valley and other areas in Ahousaht traditional territory. In this study, it was found that streamside logging decreased the stability of the stream channel and the large organic debris (LOD) in that channel. LOD in the form of large fallen trees and small debris accumulations plays an important role in unlogged stream ecosystems in coastal temperate rainforests. It creates a structure in the stream channel which mediates the course and flow of water. In addition, it provides crucial habitat for young salmon in the stream by creating deep pools and back eddies with gravel bottoms. The vegetation at the side of the stream is important in providing this LOD, and in regulating stream temperature through shading. Organic debris, mostly in the form of leaf litter from streamside vegetation, provides an important energy source for these streams.

In the Carnation Creek study, logging was found to negatively impact these features of stream ecosystems. Removing streamside forest vegetation reduced the organic litter entering the stream, and increased the stream temperature by exposing the water to direct light. In addition, the erosion of streamside soil increased the sediment accumulation in the stream. Loss and destabilization of LOD changed the stream structure, and removed important winter habitat for young salmon. There were some short term positive impacts of the increased temperature and nutrient availability, facilitating faster and more growth of salmon fry; however, in the long term, the survival and reproduction of adult salmon populations was negatively impacted. The authors of this report suggest that large, stable debris in the stream, and prelogging patterns of gravel movement must be re-established in order to ameliorate these negative impacts. In a coastal temperate rainforest ecosystem, this could take a century or more, and will not occur if the logging rotation is only eighty years.

Due to this close link between riparian forest ecosystems and the health of salmon populations, the restoration of riparian forest ecosystems in the Atleo River Valley (an important traditional fishery) is extremely important. According to Kauffman *et al.* (1995), riparian zones are subject to frequent natural disturbances. As a result, riparian vegetation tends to be highly resilient and capable of recovering from these disturbances. Vegetation in such ecosystems is highly diverse in community composition and successional stage. Both of these characteristics (species diversity and resilience) were evident in the river riparian plots we surveyed. These contained numerous plant species on both the logged and unlogged sites. The high diversity in the logged riparian areas is possibly an indication of this resilience.

Kauffman *et al.* (1995) describe two types of restoration activities for riparian areas: passive and active. Passive restoration involves the cessation of activities which damage riparian ecosystems and which impede their subsequent recovery. In the case of the Atleo River Valley, these activities consist primarily of intensive logging on slopes adjacent to the river. As seen in the aerial photographs, logging has in some cases proceeded to the very edge of the river with totally inadequate, and in some cases non-existent, forest buffer zones. This has resulted in large accumulations of debris and sediment in the river, creating log jams and altering the natural hydrological systems in the area. The removal of vegetation from the river-edge leaves the water exposed. This can increase the temperature of the water, as well as causing a decline in the amount of organic matter entering the stream system, as demonstrated by the Carnation Creek study.

In addition to impacts on fish populations, logging in riparian zones may negatively impact the populations of culturally significant plants. As mentioned in Chapter 5, a large number of significant plants, especially medicinal plants, are found in riparian areas. Many of the plants are restricted to the high moisture conditions of riparian areas, and require the protection of the forest cover. Arlene Paul (1996) recounted an incident where an important medicinal plant vanished as a result of changes to its riparian habitat:

> There was a time they were clearing rocks and stuff away by the river, only for that plant to vanish within the next two years, it never came back. I thought it must have a purpose, to grow where it was at. . . whatever changes was made, not directly with the plant itself, but like I was saying, the purpose of it. The rocks were taken away from that area, and there must have been a purpose, why the plant was there. . . just like having a roof over your head or something, you can't live without that!

This statement reflects an astute understanding of the important relationship between plants and their habitats, and the special considerations which are necessary in riparian areas. In addition to being the locale for populations of culturally important plants, rivers and streams were often the locations of sacred sites, or prayer pools. These have also been negatively impacted by logging in riparian areas, as described by Murray John (1996):

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

Stanley Sam (1996) also noted the damage to sacred places and prayer pools as a result of logging activities:

> That forest of ours is destroyed, mostly by logging. Because where our people had sacred pools upon the hillsides and where they asked for power to the Creator, are no longer there because it's all destroyed by all the roads and the truck loads what they put through in logging.

For these reasons, the restoration of riparian areas takes on an added significance.

Kauffman *et al.* (1995) suggest that passive restoration, which relies on natural mechanisms and processes for recovery, is the first and most important step in the restoration of riparian ecosystems. In riparian ecosystems, one such mechanism is the rapid colonization and dispersal of diverse vegetation. If, however, the ecosystem has been impacted to the extent that these mechanisms can no longer function, then active restoration may be undertaken. This could involve re-establishing streamside vegetation, particularly on streamside slopes with steep gradients where logging activities have continued right down to the water, or where an inadequate leavestrip or buffer zone has been left (Kauffman *et al.* 1995). As indicated in the habitat descriptions for logged river riparian areas in Chapter 5, red alder (*Alnus rubra*) appears to be re-establishing successfully in logged river riparian areas. Willow species might also be used to facilitate the recovery of riverside vegetation. Sitka Willow (*Salix sitchensis*), for example, was already present in areas adjacent to the Atleo River, and in the vicinity of small streams. The restoration and revegetation of slopes surrounding riparian areas should also have a positive impact on the health of stream and river ecosystems. As mentioned in the previous section, the process of erosion and debris slides on logged slopes can be very detrimental to hydrological systems, resulting in increased sedimentation and accumulation of debris in the stream.

One important aspect of active restoration in riparian areas is the removal of accumulated debris and slash. One obvious place where this might be done is the large log jam described in Chapter 5 which we encountered *en route* to one of the riparian plots. As mentioned in Chapter 5, the river has completely changed course to circumvent the log jam in this location. It is difficult to know if the river can be restored to its original route by removing this accumulation of wood; however, some efforts should be made. In other areas, we came across streams which were choked with debris. In one case, we reached our plot by travelling up the remains of a stream which was filled in with slash. This stream ran right down to the logging road where it stopped. On the other side of the logging road there was evidence of a dried up stream. This demonstrates the importance of properly constructing and locating logging roads in the first place, and of decommissioning roads, including the removal of culverts, once logging activities are finished.

Estuaries form a special category of riparian habitat. Estuaries provide important links between the ecosystems of land and sea. As noted in Chapter 5, the estuaries of the Atleo River Valley (at the river mouth and near Bedingfield Bay) contain substantial populations of traditional root foods. In addition, many important seafood resources are found in or near estuaries. These include: herring which often spawn in estuarine areas, geoduck populations, and clam beds (Scientific Panel 1995d). These resources, which are of vital importance to the people of Ahousaht, may be negatively impacted by industrial activities, such as log dumping, which take place in these areas. As the access points to major watersheds in Clayoquot Sound, estuaries are often used as areas for dumping logs to be transported. This was clearly evident in the sheltered marine area of Bedingfield Bay, where logs were often seen drifting in the water. In addition, logging activities upstream may result in sediment and debris accumulation in the estuaries as they are transported downstream. The main form of restoration in these areas is passive; in other words, removing the factors which are causing damage. This involves the cessation of log dumping and sorting in sensitive areas such as estuaries, as recommended by the Scientific Panel (1995d). More active restoration activities might take place upstream in restoring logged slopes adjacent to river and stream systems. In addition, as discussed previously, the reintroduction of human activities, including digging for root foods and collecting basket materials, might also have a beneficial impact on the populations and habitats of culturally significant plants.

First Nations Involvement

The Scientific Panel Report on First Nations' Perspectives Relating to Forest Practices Standards in Clayoquot Sound (1995a) makes two recommendations which specifically address the process of restoration of damaged areas in Clayoquot Sound, and the importance of First Nations' involvement in this process.

- Where damage to ecosystems, culturally important areas, and traditional resources due to forestry activities is found, restoration must be undertaken.
- All phases of restoration activities in damaged Clayoquot Sound ecosystems must be undertaken in full consultation and with active participation of the Nuu-Chah-Nulth of Clayoquot Sound.

There are a number of other ways in which the people of Ahousaht could be involved in the process of restoring their traditional territories. One of the most obvious and immediate capacities is through employment in forestry crews or on research projects. Clifford Atleo (1996) affirmed the determination of the people of Ahousaht to be involved in all aspects of forest use and management:

> We want to see our own people involved. We want to develop our own managers, our own foresters, our own silviculture experts.

Due to the extensive and intensive impacts of industrial logging activities in Ahousaht traditional territory, ecosystem restoration might be one venue for First Nations involvement in the forest industry in the years to come. For example, as described earlier, the establishment of a native seed and cutting collection and nursery could be a major source of local employment. Collecting, processing, storing, and propagating seeds and cuttings could all be carried out in local communities such as Ahousaht.

Involvement in restoration activities may have implications beyond the economic realm. Just as restoration efforts can benefit from the involvement of First Nations, First Nations might also benefit from involvement in the restoration process. In answer to the question "what do we want to restore?" Native American restorationist Dennis Martinez (1994:308) answers:

> We want to restore life. We want to restore the living and sacred relationship between people and the earth. We want to restore our spirits as we restore the land. We want to restore our culture, our songs, our myths and stories, and the Indian names for creeks and springs.

This statement points to the many ways in which the process of ecological restoration can reverberate in the cultural sphere.

One way in which to facilitate First Nations' involvement in restoration is through education, particularly for young people. As pointed out by Chief Umeek, the current generation of Ahousaht people have much less direct experience with their traditional territories than their ancestors. Groups of school children could be taken to both forested and logged sites in Ahousaht traditional territory in order to learn about ecology, and traditional forest uses. As part of our summer research project, we created a herbarium collection of culturally significant plants which was left at the school in Ahousaht. This type of educational material could be utilized in school programs, in conjunction with traditional methods of teaching and communication. Also, last summer we attended a rediscovery camp organized by Arlene Paul. This was a multi-day camping trip to Keltsmaht Beach on Vargas Island which brought together young people and Elders from Ahousaht. The camp involved storytelling, and lessons in language and traditional skills such as carving. Learning about Ahousaht plant names and uses could easily be incorporated in these sessions, as well as walks through logged areas to explore the processes of succession and natural recovery. This method of experiential and oral learning is consistent with traditional approaches to education and communication (Colorado 1988), and could help ensure the involvement of First Nations in forest management and restoration in generations to come. The process of restoration itself is a way of learning about ecological systems experientially (Jordan 1987).

It is also important to note that education flows in many directions, and at this point in time, there needs to be an intensive education process for non-Aboriginal people, particularly those working in the forest industry, in learning to respect and appreciate the traditional systems of resource use and relationships with the land.

Summary

In this chapter, I have explored a number of options for restoration activities in the Atleo River Valley. These suggestions are based on the recognition that traditional knowledge - including historical information, traditional plant uses and management strategies, as well as the philosophical context through which these practices are carried out - has an important role to play in the restoration process. The goal of these restoration activities is the restoration of healthy, functioning, and diverse forest ecosystems, rather than a crop of commercially valuable trees. The following is a brief summary of some of the options which were explored in this chapter:

- **Restoration activities should occur in conjunction with shifts towards more ecologically responsible forest practices, as suggested by the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound.**

- **First Nations should be involved as both practitioners and leaders of restoration activities in traditional territories.**

- **First Nations Elders could conduct educational walks through areas in traditional territories which are to be restored, in order to educate both Aboriginal and non-Aboriginal practitioners of restoration.**

- **Restoration activities should be guided by specific goals and priorities. These might include the maintenance and restoration of biological diversity, and of the key structures and functions of old-growth forest ecosystems.**

- **Priority areas for restoration include: areas subject to soil erosion, clearcut areas where no remnant forest structure has been retained, riparian forest ecosystems, and culturally important areas.**

- **Native plant species should be used whenever possible for restoration activities; particularly in reseeding slopes and roadsides. Examples of native grass and legume species which might be appropriate include: *Calamagrostis canadensis, Trisetum cernuum, Festuca rubra, and Trifolium wormskjoldii.***

- **Restoration should involve experimentation with native shrubs and trees (such as *Rubus spectabilis*, *Rubus parviflorus*, *Salix* spp., and *Alnus rubra*) for soil stabilization.**

- **Limit or ban broadcast burning of slash following logging; instead, the natural colonization and succession of species, as well as the retention of remnant forest structures, should be encouraged.**

- **Begin restoration in areas adjacent to unlogged forested areas in order to facilitate the migration and colonization of species, and to encourage greater landscape connectivity.**

- **Experiment with bringing in small quantities of donor soil and rotting logs from adjacent forested areas (care must be taken not to debilitate the donor ecosystems).**

- **Develop a program for collecting local, wild seed and cuttings, and establish a local native seed collection and storage facility (Forest Renewal BC is a potential funding source) . This could be done in First Nations communities such as Ahousaht.**

- **Tree seedlings could be planted in clumps or patches (leaving gaps for understorey development), and in a more widely spaced pattern than is currently used.**

- **In areas which have already been planted, gaps could be created by removing small patches of trees, in addition to thinning activities, in order to facilitate late-succession characteristics.**

- **Traditional activities (such as berry picking, digging for root foods, and collecting materials for basket making) which in the past have helped to shape the forest ecosystems of Ahousaht traditional territory could be reintroduced in areas such as the Atleo River valley.**

- **Removal of log jams, deactivating roads and culverts, and revegetating streamside slopes could aid in riparian restoration.**

- **The involvement of First Nations in restoration activities could be facilitated by education programs directed at both Aboriginal people (particularly youth), and non-Aboriginal people (particularly those currently involved in forest management and restoration).**

Ultimately, the role of First Nations in forestry activities will be determined by themselves and negotiated with the other parties involved: the logging companies and the government of British Columbia. This process will unfold in conjunction with treaties and land claims, as the ownership and rights of Ahousaht people to their traditional territories are recognized. It is most likely that as this process evolves, so will the involvement of First Nations in all aspects of resource management. Due to the impacts of past logging activities in Clayoquot Sound, one of the most important activities in the years to come will be that of restoration. Hopefully, some of the information and suggestions in this thesis can contribute to designing plans for restoration which are consistent with and informed by the traditional values and activities which have shaped the land.

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Conclusion:
"The answer is to learn to respect and conserve."

"The only way you can get conservation is if you start respecting, it can't happen with trying to have cut-backs on logging, cut-backs on fisheries. That's not the answer. The answer is to learn to respect and conserve. . . it will provide for you as long as you take what you need. That's our teaching, take what you need, don't take anymore, because every year it will be there for you. . . Take what you need for this year, because next year it will still be there for you, and that's very important in our lives." Archie Frank (1996)

In this thesis, I have explored the relationship between traditional ecological knowledge and forest practices in Ahousaht traditional territory, Clayoquot Sound, BC. In doing so, I have drawn attention to the ways in which history, culture, and ecology have interacted to create place-specific and continually evolving relationships between humans and forest ecosystems. The primary research for this thesis took place in the summer of 1996 as part of a research project funded by the Long Beach Model Forest. Fieldwork was conducted by myself, a graduate student at Trent University; Juliet Craig, a graduate student at the University of Victoria; and four Ahousaht research assistants (Travis Thomas, Daphne Frank, Greg Hayes, and Paul Frank Junior). The summer research project was supervised by Dr. Richard Atleo (Chief Umeek), Dr. Nancy Turner, and Dr. John Wadland. Here, I will highlight some of the important points from each chapter, and draw attention to some of the key relationships both within and between chapters. Finally, I will offer some suggestions for further research, and some concluding thoughts.

Retrospective

In my introductory chapter, I outlined the broader political and social contexts which frame the information presented in later chapters. Clayoquot Sound has been the site of much controversy and conflict in recent years. This controversy has centred primarily on logging activities in one of the few remaining areas of temperate coastal rainforest, an area which also happens to be the traditional territory of five of the fourteen Nuu-Chah-Nulth First Nations on the west coast of Vancouver Island. I provided a thumbnail sketch of events in Clayoquot Sound leading up to the creation of the Scientific Panel for Scientific Forest Practices in Clayoquot Sound. The work of the Scientific Panel, on which both Dr. Nancy Turner and Chief Umeek served, was both the impetus and the inspiration for this thesis research. I also discussed political events, such as ongoing treaty negotiations between the Nuu-Chah-Nulth First Nations, and the Interim Measures Agreements of 1994 and 1996; and new directions in resource management such as the creation of the Central Region Board to facilitate co-management of resources in Clayoquot Sound. I also discussed traditional ecological knowledge, and its relationship with western science, as one of the key issues around which this thesis revolves.

This introductory chapter was important in setting out the broad parameters in which the research for this thesis took place. My purpose was to ensure that the information in the main body of the thesis was read within a contextual framework. I devoted Chapter 2 to a discussion of the process and methods through which the research for this thesis was developed and carried out. This chapter also included a discussion of the ethical issues involved in undertaking research on traditional ecological knowledge. Much of what I learned in researching and writing this thesis was about the process and experience of undertaking community-based and community-responsible research. In addition, many of the issues that I and my co-researchers grappled with centred around ethics and questions of process. This chapter outlines how we resolved these issues, and their implications for our research. As such, Chapter 2 answers the important questions of what we did, how we did it, and why. This might be of particular interest to people interested in undertaking similar research projects.

Essential to understanding recent events, and the current status of forest ecosystems in Clayoquot, is an understanding of the histories of the area. Chapters 3 and 4 are historical in nature; the former explores historical patterns of environmental and social change in the Clayoquot Sound region, while the later takes a more focussed look at the histories of the Atleo River Valley which was the site of our primary fieldwork in the summer of 1996. Both chapters involve the integration of many different sources of information, and bring together a variety of different perspectives on historical processes. An important contrast, and one which runs throughout the entire thesis, can be found between the oral histories of Ahousaht knowledge holders, and the archival and published record of Euro-Canadians. These illustrate the differing ways in which people have interacted with and perceived the forest ecosystems of Clayoquot Sound, and the ways in which these ecosystems have both shaped and been shaped by the human inhabitants of the area.

It is important to stop for a moment and reflect on some of the patterns which emerged from this historical information. First are the intimate links between the development of human socio-cultural systems and the evolution of natural ecosystems in the area. In Chapter 3, palaeobotanical studies were used to chart the changing composition of plant communities in coastal BC. These show the increasing abundance of coniferous trees such as western hemlock (*Taxus brevifolia*) and in particular, western red-cedar (*Thuja plicata*), reaching a peak sometime between 6,000 and 2,500 BP. Archaeological evidence shows that it was during this time period that complex woodworking technologies, based largely around the western red-cedar, were developed by First Nations in the area. In addition, patterns of resource use and land management were successfully developed by early inhabitants to take advantage of the particular patterns of resource availability and abundance in the Clayoquot Sound area.

Another important pattern emerging from historical information is found in the differing perceptions of forest ecosystems, and the relationship between humans and these ecosystems. The quotes taken from the published accounts of early European explorers and colonists reflect a particular cultural response to the land. Cultivation of the land is given primacy over other forms of land use such as gathering wild plants, hunting, and fishing; its "introduction" to Aboriginal peoples is seen as an integral part of the imperialist project of "civilization." Ironically, early Euro-Canadians did not recognize the ways in which First Nations in the area *did* shape and manage the land; for example, by selectively harvesting diverse resources, by facilitating the propagation of culturally important plants, and by developing cultural institutions such as the concept of *ha̲huulhi* which traditionally regulated resource use and ownership.

The tangible evidence of these differing perceptions of the land and philosophies of land use is reflected in the present status of forest ecosystems in Ahousaht traditional territory. This was the subject of Chapter 5, which combined field data gathered during the course of our research with the observations and knowledge of Ahousaht knowledge holders. Through vegetation surveys in different habitat types in the Atleo River Valley, we were able to learn about the distribution and abundance of culturally significant plants (see Craig's thesis, in progress), as well as the ways in which these plants have been impacted by industrial logging activities. Through our conversations with Elders and other knowledgeable people in Ahousaht, we were able to gain a clearer understanding of the histories of the land, the cultural importance of specific plants and habitats, and perspectives on forest use - past, present and future.

This information provided the foundation for Chapter 6, which discussed the potential for ecological restoration in Ahousaht traditional territory. In Chapter 6, I drew on the rapidly growing literature on ecological restoration, field observations and data, and interview materials. Important links were suggested between ecological restoration, traditional ecological knowledge, and responsible forest use. I approached the topic from an "ecocultural" perspective, with the goal of offering suggestions for restoration which were consistent with and guided by Ahousaht traditional knowledge. This included taking into account both the historical significance and occupation of traditional territories (see Chapter 4), and the view that all life forms in the forest are inherently connected and important. Thus, the focus was on restoring forest ecosystems, not just crops of merchantable timber, using native plant species and following natural patterns of succession and disturbance (as described in Chapters 3 and 5). This Chapter offers a perspective on the future, since the restoration of damaged forest ecosystems will take on added significance and urgency in the years to come.

Suggestions for Further Research

Before offering some suggestions for further research, it is important to again point out that this thesis is a companion to the M.Sc. thesis written by Juliet Craig (in progress) at the University of Victoria. Craig's work provides more quantitative analyses of the information gained through fieldwork in the Atleo River Valley, as well as further insights into the historical and cultural dimensions of resource use in Ahousaht traditional territory. It is strongly recommended that Craig's work be read in conjunction with this thesis.

My suggestions for future research will be minimal, since the direction of such research should be determined by the interests and goals of the people of Ahousaht. Ideally, future research will be carried out by the community itself, or through other co-operative projects which involve the direct participation of and consultation with community members. Based on my own experience, I can offer some thoughts on research areas which might be further developed. I will focus mostly on restoration research, since in my view this will have the greatest urgency in years to come. First and foremost, there needs to be more communication between restorationists and indigenous knowledge holders. This will likely develop in conjunction with the growing recognition and appreciation of traditional ecological knowledge on the part of western scientists. Hopefully, this will also involve the recognition of the links between Aboriginal rights and resource management.

In my research, I noted a dearth of studies on the successful propagation of native plant species for the purposes of restoration. Some work has been done with shrubs and hardwoods; however, there needs to be more work with grasses, ferns and legume species for erosion control and site rehabilitation, since this is the context in which most exotic species are being used. In particular, some of the species suggested in Chapter 6 could be planted and monitored in the different habitat types. Deer fern (*Blechnum spicant*), for example, was a widely distributed and abundant species, found in clearcuts and old-growth forests alike. Versatile species such as this could provide the linkages between different seral stages of the restoration process, and should feature prominently in experimentation with native plants in restoration.

Comparative studies might also provide fruitful results. Projects ongoing in other First Nations' communities, either locally such as the *Management for a Living Hesquiaht Harbour* in

Hesquiaht First Nation, Clayoquot Sound; or farther afield, such as the *Sinkyone Intertribal Park Project* in the United States, as described by Dennis Rogers-Martinez, could provide both insights and inspiration. For example, in the San Francisco Bay area coalitions have been formed between members of the California Indian Basketweavers Association (CIBA) and restorationists to share knowledge on how to restore and maintain populations of willow, an important basket material which also serves restoration purposes by propagating quickly in riparian areas. A similar thing might be done in Ahousaht traditional territory in the case of basket sedge (*Carex obnupta*). Lena Jumbo, an Ahousaht weaver, told us of the importance of gathering and tending stands of basket sedge in order to ensure a healthy population the following year (see Chapter 5). Basket sedge is a culturally significant plant which could play a role in restoration of riparian areas; lake-edges in particular.

Traditional ecological knowledge and ecological restoration are both inherently site-specific, flowing from the unique co-evolution of cultural and natural systems. Even so, broad principles and patterns might emerge from comparative studies. This process can be greatly facilitated by organizations such as the Indigenous Peoples' Restoration Network (IPRN) and The Cultural Conservancy. Comparative studies *within* the Ahousaht First Nation are equally important. As mentioned in Chapter 6, choosing ecosystems of reference to guide restoration efforts is an important process. In Ahousaht traditional territory, the few remaining unlogged watersheds, for example lower Shark Creek, can act as ecosystems of reference. By observing the structures and processes of functioning, healthy ecosystems; it may be possible to set goals and criteria for the restoration process. In doing so, however, it is important not to turn a "reference" into a "template." The ecosystem of reference acts as a flexible guide, not a static blueprint. Studies and observations of these ecosystems must therefore be ongoing in conjunction with restoration projects.

Long-term monitoring is vital to the success of restoration projects. It is logical that the original inhabitants of an area will be best suited and able to undertake such long-term projects. The field data and observations described in Chapter 5, and in Craig's thesis, represent a synchronic view of forest ecosystems and their evolution, given some depth by the historical knowledge of the Ahousaht. Patterns will change and emerge in the next few years, and indeed, far beyond a single human life-span. An intergenerational approach needs to be taken in restoration work, as in all interactions with natural systems.

Concluding Thoughts

At the beginning of this thesis, I suggested that Ahousaht traditional ecological knowledge could provide the foundation for sustainable forest practices in general, and specifically for ecological restoration of damaged forest ecosystems. Traditional interactions with forest ecosystems were based on the respect for all life forms, and guided by the belief that the gifts of the forest should be used with discretion and appreciation. It is clear from the field data presented in Chapter 5, that there has been significant damage done to the forest ecosystems in the Atleo River Valley through the imposition of industrial forest activities on lands where traditional systems of forest use and management had been in effect for countless generations of Ahousaht people.

It is also clear, however, that at this particular point in time, and in this specific place - the traditional territory of the Ahousaht First Nation - there is an unprecedented opportunity to begin the process of healing some of the damage, both ecological and cultural, which has occurred in the past. Initiatives such as the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound, the signing of the *Interim Measures Agreement*, the creation of the Central Region Board, and the ongoing treaty negotiations strongly suggest that this process is already underway. Indeed, this is not a localized phenomenon, but part of a larger global trend of growing appreciation and respect for the considerable knowledge held by Indigenous peoples, and the realization that this knowledge can lead the way towards rebuilding healthy relationships between people and the ecosystems of which they are a part. Hopefully, this thesis will also contribute to the process of building mutual understanding and respect.

As Archie Frank eloquently states, "The only way you can get conservation is if you start respecting." I believe this advice concerning the importance of respect has far-reaching implications. Our understanding of forest ecosystems is vastly enriched by respecting and learning from a variety of perspectives and sources of knowledge. This includes taking into account historical information, both written and oral, and knowledge of ecological processes, both traditional and scientific. Similarly, the key to combining traditional and scientific knowledge lies in having respect for the experiences and perspectives inherent in each knowledge system. Finally, in order to develop a positive relationship with forest ecosystems, it is important to respect all the life forms in those systems, as well as the systems themselves as a whole. The Nuu-Chah-Nulth phrase ***hishuk ish ts'awalk*** - all things are one - eloquently embodies this sentiment of respect and mutual interdependence which should guide our future interactions with the forests, and with each other.

Appendix A

Research Participants

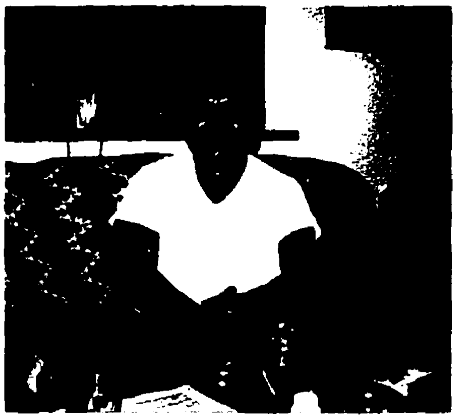
Clifford Atleo
Cliff Atleo is the Chief Treaty Negotiator for the Ahousaht First Nation. He works and lives in Port Alberni, BC.

Florence (Flossie) Atleo
Flossie is an Elder living in Ahousaht. Flossie's grandparents had a smokehouse at the Atleo River, where they went to smoke fish in the fall.

Luke Atleo
Luke lives in Ahousaht where he worked as a teacher at the school for many years. Luke gave us advice on the educational component of our summer research project, as well as sharing with us some of his memories and knowledge.

Archie Frank and grandson Paul Frank Jr.
Archie Frank is an Elder in Ahousaht where he has lived most of his life. He spent twenty years working in Aboriginal politics. He now runs a water-taxi business out of Ahousaht with his sons.

Gertrude (Trudy) Frank and grandson Greg Hayes
Trudy was born at Keltsmaht on Vargas Island, but she has lived in Ahousaht most of her life. Trudy is granddaughter of the late *Kiista*. Trudy has been a community health representative (CHR) at the Ahousaht Health Clinic for the past 24 years (under various titles!). She is also an active member of the National CHR association.



Murray John
Murray John in the brother of Rosie Swan and Greta Charlie. He has lived in Ahousaht most of his life, where he has worked as a logger and a fisher. Murray is currently involved with the Ahousaht Band Council Forestry Committe.

Lena and Carl Jumbo
Lena and Carl are both Elders living in Ahousaht. Carl has spent time trapping with his brother, and worked for a number of years as a logger, starting in 1943. Lena is a highly skilled weaver, and makes beautiful Maquinna hats.

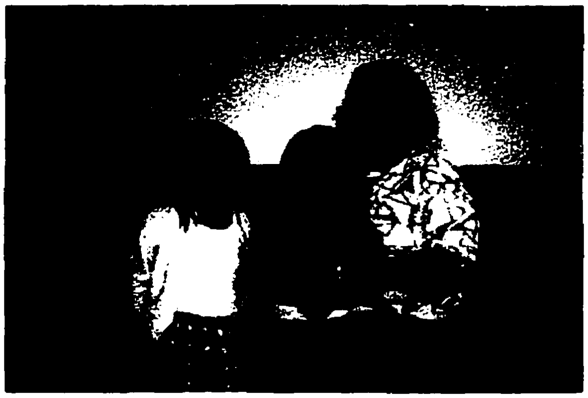
Arlene Paul
Arlene has been a community health representative (CHR)at the Ahousaht Health Clinic since 1980. Before that, she taught at the school in Ahousaht. Arlene has lived in Ahousaht for the last 38 years. As a child she lived with her family at Keltsmaht on Vargas Island.

Greta Charlie (left) and Rosie Swan (right)
Greta and Rosie are sisters who both live in Ahousaht. Their parents were originally from Keltsmaht on Vargas Island. Rosie and Greta remember travelling with their parents around Clayoquot Sound - they have spent time at Ahous Bay, Hot Springs Cove, the Megin River, and Sydney Inlet.

Morris Sutherland
Morris is originally from Ahousaht, and is now living and working in Port Alberni, BC where he is the Aboriginal Liaison Officer for the Ministry of Forests.

Chief Earl Maquinna George (no picture)
Earl George is an Ahousaht hereditary chief. Chief Earl Maquinna George is currently working on his M.A. at the University of Victoria, where he recently finished his undergraduate degree. Earl George is also a member of the Central Region Board.

Stanley Sam
Stanley is an Elder in Ahousaht. His mother was Tla-o-qui-aht, and his father was Ahousaht. Stanley is knowledgeable about the histories of both these First Nations. He was chosen to be one of the Nuu-Chah-Nulth experts on the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound.



Irene Thomas with grandchildren
Irene lives in Ahousaht; however, she has also spent a lot of time at the Megin River, which is the territory traditionally utilized by the Thomas family.

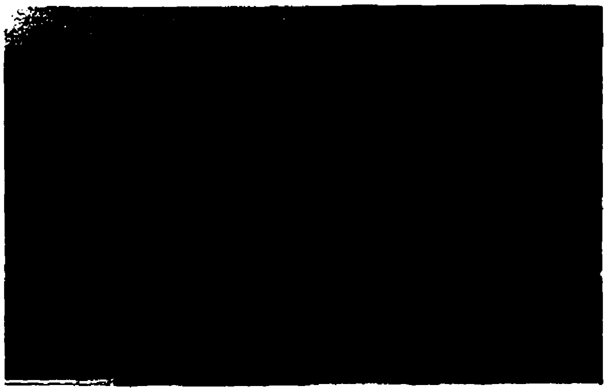
Sidney Sam Sr.
Sid Sam began his term as elected Chief Councillor of the Ahousaht First Nation Band Council on April 22, 1996. He has lived in Ahousaht most of his life, and spent time in Opitsat and Herbert Arm when he was young.

Robert Thomas
Robert Thomas is an Elder living in Ahousaht, although he also spends time in Port Alberni. Robert used to stay at the Megin River, in the area traditionally utilized by the Thomas family. He also spent four years working for MacMillan Bloedel. Robert knows many songs and stories which were taught to him by his grandparents.

Dr. Richard Atleo and Dr. Nancy Turner

Dr. Richard Atleo (Chief Umeek) kindly gave us permission to work in his *hahuulhi,* the Atleo River Valley, and was a co-supervisor of the summer research project. Dr. Atleo is a professor at Malaspina University-College (Nanaimo, BC) in the First Nations program. Dr. Atleo was co-chair of the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound.

Dr. Nancy Turner is a professor in Environmental Studies at the University of Victoria. She is an ethnobotanist with much experience working with First Nations in BC. Dr. Turner co-supervised the summer research project, and is a member of Robin Smith and Juliet Craig's theses committees. She also served on the Scientific Panel.



Summer Research Team

Greg Hayes, Paul Frank Jr., Daphne Frank, and Travis Thomas (top row left to right) were research assistants hired through Long Beach Model Forest to work on the summer project. Robin Smith and Juliet Craig (bottom row left to right) are graduate students at Trent University and the University of Victoria respectively. Juliet and Robin were co-researchers on the summer project.

Professors John Wadland Stephen Bocking

Dr. Wadland was Robin Smith's thesis supervisor at Trent University where he has taught in the Canadian Studies Department for over twenty years. He is currently Director of the Frost Centre for Canadian Heritage and Development Studies, an interdisciplinary graduate program at Trent.

Dr. Stephen Bocking was also a member of Robin Smith's thesis committee at Trent. He is a professor in Environmental and Resource Studies at Trent, and has interests in environmental history, and the history of science.

Appendix B

Interviews Conducted

During our time in Ahousaht, we were fortunate in being able to speak with many knowledgable people in the community. We greatly appreciate them sharing their time, knowledge, and memories with us. We learned a great deal from the people of Ahousaht, and our understanding of the forest and forest use (past, present, and future) has been deepened and enriched as a result of these conversations. The following is a list of some of the people we spoke with, in chronological order. Whenever possible, interviews were conducted by either Juliet Craig or Robin Smith, and one of the summer research assistants.

Date of Interview	Person Interviewed	Interview conducted by:
July 17, 1996	Gertrude Frank	Robin Smith and Greg Hayes
July 23, 1996	Stanley Sam	Juliet Craig and Robin Smith
July 24, 1996	Stanley Sam	Juliet Craig and Robin Smith
July 25, 1996	Arlene Paul	Robin Smith and Juliet Craig
August 12, 1996	Morris Sutherland	Robin Smith and Greg Hayes
August 12, 1996	Bill Perry	Juliet Craig and Travis Thomas
August 13, 1996	Arlene Paul	Robin Smith and Daphne Frank
August 14, 1996	Lena Jumbo	Robin Smith and Daphne Frank
August 14, 1996	Rosie Swan & Greta Charlie	Robin Smith and Daphne Frank
August 15, 1996	Sidney Sam Sr.	Robin Smith and Travis Thomas
August 20, 1996	Irene Thomas	Robin Smith and Travis Thomas
August 20, 1996	Chief Earl George	Juliet Craig
August 22, 1996	Carl Jumbo	Robin Smith and Daphne Frank
August 26, 1996	Robert Thomas	Juliet Craig and Greg Hayes
August 26, 1996	Archie Frank	Robin Smith and Paul Frank Jr.
September 4, 1996	Murray John	Juliet Craig and Robin Smith
September 4, 1996	Rosie Swan	Juliet Craig and Robin Smith
September 5, 1996	Clifford Atleo	Juliet Craig and Robin Smith
November 4, 1996	Richard Atleo (Chief Umeek)	Juliet Craig
November 10, 1996	Robert Thomas	Juliet Craig
November 11, 1996	Luke Atleo	Juliet Craig

In addition to formal interviews, we also learned a great deal by talking informally with many of the people in the community, such as Peter Charlie, Flossie Atleo, Darrell Campbell, Larry Swan, and Roman Frank.

Appendix C

Sample Data Form

ETHNOBOTANY AND RESTORATION OF THE ATLEO RIVER VALLEY

Names:				Forest Cover Map info:	
Date:		Plot#:			
Mapsheet #:		Photo#:			
Location:					
Position:	apex	upper slope	middle slope	lower slope	valley floor
Accessibility (min. from river mouth):					
Travel Description:					
Habitat type:	clearcut	tree age: _______	old growth	wetland	
Substrate:	rock	gravel sand	loam	clay	
comment:					
Slope:		Aspect:	Elevation::		
Moisture:	dry	mesic moist	wet	aquatic	

COMMENTS: (Evidence of disturbance; animal signs; restoration comments)

SPECIES PRESENT IN AREA

Other comments about area and/or surrounding area:

TREES (20m x 20m)

<u>% Cover</u>		<u>Vigour</u>	
81-100%	5	Dead	0
61-80%	4	Poor	1
41-60%	3	Good	2
21-40%	2		
1-20%	1		
<1%	0		

Tree species	% Cover	Vigour	Comments

Culturally Modified Trees in area (numbers):

Abundance of wood (individual trees)

Species	circum.	height	Comments (e.g. bark collecting)

Dead and down comments:

SHRUBS (10m x 10m)

% Cover		Vigour	
81-100%	5	Dead	0
61-80%	4	Poor	1
41-60%	3	Good	2
21-40%	2	Excellent	3
1-20%	1		
<1%	0		

Shrub Species	% Cover	vigour	stage	Comments

SHOOTS:

Salmonberry shoots:
mean length: _______
mean diameter: _______
Comments:

Salmonberry shoots:
mean length: _______
mean diameter: _______
Comments:

BERRIES:

berries/bush: blueberry; huckleberry; salmonberry; thimbleberry; saskatoon; pacific crabapple; elderberry
pods/bush: wild currant; gooseberries
berries/m2: salal; bunchberries; wild strawberry; bog cranberry; trailing blackberry

Species: ______________________
shoots/m2: ____________ berries/bush or m2: ________________
time to pick 500ml: ____________
comments:

Species: ______________________
shoots/m2: ____________ berries/bush or m2: ________________
time to pick 500ml: ____________
comments:

Species: ______________________
shoots/m2: ____________ berries/bush or m2: ________________
time to pick 500ml: ____________
comments:

Species: ______________________
shoots/m2: ____________ berries/bush or m2: ________________
time to pick 500ml: ____________
comments:

Species: ______________________
shoots/m2: ____________ berries/bush or m2: ________________
time to pick 500ml: ____________
comments:

TEA (labrador tea; rose leaves/hips; blackberry leaves)

plants/ m2: ____________________
average # leaves/plant: ______________
comments:

plants/ m2: ____________________
average # leaves/plant: ______________
comments:

FLORAL PLANTS (huckleberry; salal; falsebox; sword fern)

species: _____________________
stems/m2 _________________
height (mean); __________
comments:

species: _____________________
stems/m2 _________________
height (mean); __________
comments:

species: _____________________
stems/m2 _________________
height (mean); __________
comments:

HERBS (1m x 1m)

	Plot I			Plot II			Plot III			Plot IV		
Species	% cover	vigour	stage	% cover	vigour	stage	% cover	vigour	stage	% cover	vigour	stage

Comments (mushrooms, moss, etc.):

ROOTS/RHIZOMES: (wild clover; pacific silverweed)

species: ___________________________
stems/m2: _____/_____/_____/_______ average: ________
% cover: _____/_____/_____/_______ average: ________
time to collect 250ml: _________________
comments:

species: ___________________________
stems/m2: _____/_____/_____/_______ average: ________
% cover: _____/_____/_____/_______ average: ________
time to collect 250ml: _________________
comments:

FIBROUS MATERIALS: (tall basket sedge; american bullrush; cattail; tule; stinging nettle)

Species: _______________________________
stems/m2: ______/______/______/______ average: ________
average height: ______/_______/_____/_____ average: ________

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*Note: The primary sources for this thesis were collected from the National Archives of Canada in Ottawa, Ontario; and the British Columbia Provincial Archives in Victoria, British Columbia.

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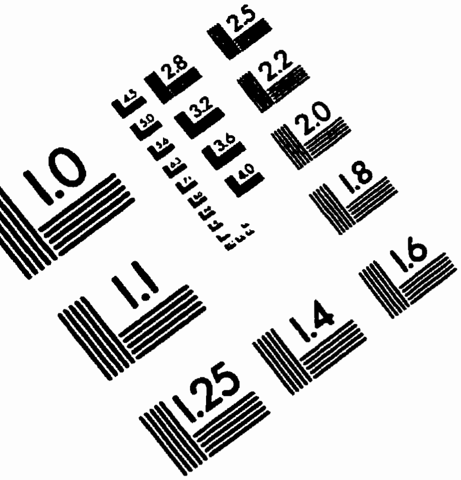
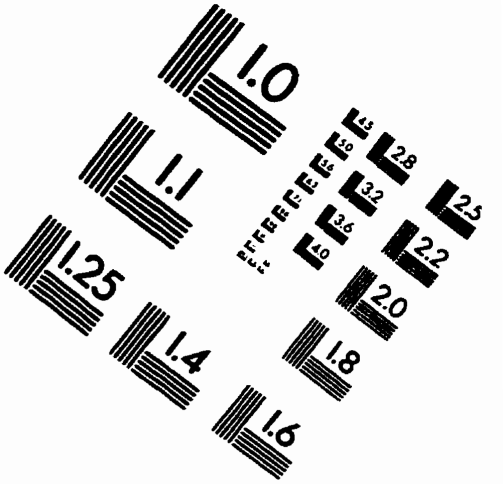
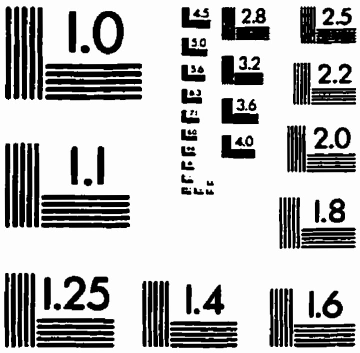
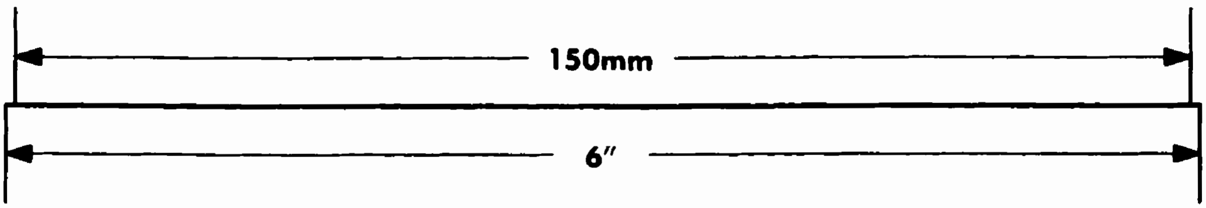
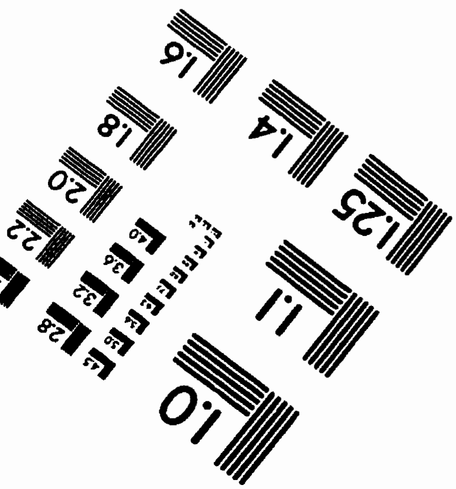
IMAGE EVALUATION TEST TARGET (QA-3)

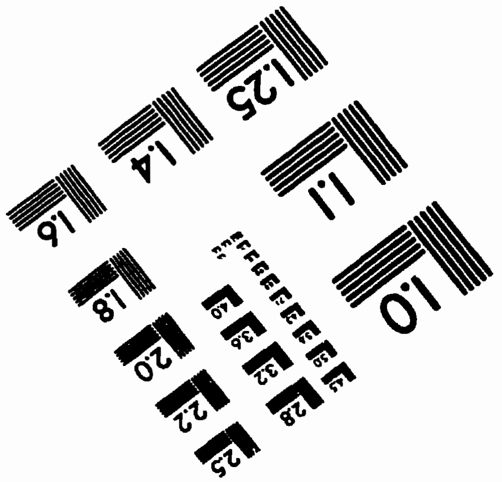












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