

# ***HUPACASATH LAND USE PLAN***

## **PHASE 2**

Prepared by:

Tom Whitfield, RPF  
TWs Forest Planning  
#7-240 Higson Crescent  
Qualicum Beach, BC. V9K 2B4  
[twforest@shaw.ca](mailto:twforest@shaw.ca)

and

Tawney Lem  
4181 Craig Road  
Port Alberni, BC. V9Y 5Y4  
[tawneylem@telus.net](mailto:tawneylem@telus.net)

Prepared for:

**Hupacasath First Nation**  
Box 211, 5500 Ahahswinis Drive  
Port Alberni, BC. V9Y 7M7

# SECTION 1: INTRODUCTION

## **1(1) Introduction**

In 2003, the Hupacasath First Nation announced the completion of Phase 1 of their Land Use Plan. The key components to this plan include:

- Identification of the range of values important to Hupacasath;
- Summaries of which values are present in each Hupacasath Use Area
- Land use designations describing the level of development or protection appropriate in each Hupacasath Use Area; and
- Broad objectives highlighting management priorities (e.g. protection of fisheries, wildlife or water quality).

Phase 1 of the plan serves to make third parties aware, at the earliest stages of planning, of Hupacasath's interests in the territory. Building upon this framework, Phase 2 of the plan defines how the broad objectives can be met in a measurable way. The main components of this phase include:

1. Identifying cultural and ecological netdowns; and
2. Providing management standards for key indicators

When implemented together, these components will contribute to sustainable development in the territory and protection of the values outlined in Phase 1.

Phase 2 includes three types of standards:

1. Overarching – apply to territory as a whole
2. Special Management Area – apply to SMA designated planning units
3. Specific Area – apply to specific areas of the territory, in addition to the overarching and SMA standards.

The standards include:

- Background material - the context and rationale for the standard;
- Hupacasath standard – provisions requiring mandatory implementation; and

Phase 2 of the Land Use Plan is not a stand alone document and must be utilized and referenced in conjunction with Phase 1.

## 1(2) Plan Context

### 1(2)(i) Hupacasath Approach

The Hupacasath First Nation will implement this Land Use Plan with the cooperation of those who share their vision for holistic and sustainable development of lands and resources.<sup>1</sup>

The Hupacasath First Nation (HFN) request stewardship and resource management that ensures Hupacasath cultural, ecological and resource values are protected in a sustainable manner. Decision-making should be guided by principles whereby cultural and environmental responsibility along with balanced use takes precedent over development.<sup>2</sup>

Holistic timber harvesting requires that sustainable harvest levels are conducted in an ecologically sensitive manner. It also takes into account other values attributed to cultural heritage and traditional uses of lands and resources. The recommendations in this Land Use Plan are led by the interest of promoting sustainability in the territory. These recommendations take the economic uses of the natural resources into consideration, but not in isolation from social and environmental considerations.

### 1(2)(ii) Basis for the Hupacasath Standards

Some may view this Land Use Plan as being overly prescriptive at a time of increased flexibility brought about by the new Forest and Range Practices Act. As planning will be undertaken on a cost-competitive basis under BCTS, professionals may find it quite acceptable and even desirable to have best management practice guidelines in place. Innovative approaches offered in this Land Use Plan are based on the best available information. Sustainable forest management based on principles of sound science and ecological principles have been the underlying direction taken in formulating this plan.

Unique Hupacasath standards have been developed with this plan. Some standards are overarching and apply to all zones appropriate for development. Other standards are to be applied specifically on lands designated as Special Management Areas. Additional standards have been developed specifically for lands adjacent to the Somass River Estuary as well as for waterways that are especially important to the fishery.

The development of management strategies and standards in the Land Use Plan adhere to the *precautionary principle* whereby, if there is a 'lack of full scientific certainty' about current results, and harm to a resource is possible, then a higher standard and/or alternative to the potentially harmful practice should be adopted.<sup>3</sup>

Innovative approaches offered in this land use plan are based on the best available information. Sustainable forest management based on principles of sound science and ecological principles have been the underlying direction taken in formulating this plan. The standards established in this land use plan are based in part on the knowledge and recommendations made by the expert Scientific Panel in their annual critique of Weyerhaeuser's Coastal Forest Strategy over the 5-

---

<sup>1</sup> "Sustainable development" means development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

<sup>2</sup> "Stewardship" is defined as simply caring of the land and people who live on it.

<sup>3</sup> Modified from the Environment Canada discussion paper on critical habitat for the species at risk recovery program (2004) and the Species at Risk Act (SARA).

**Hupacasath First Nation  
TERRITORY LAND USE PLAN – PHASE 2**

---

year phase-in period of variable retention harvesting during 1999 to 2003.<sup>4</sup> Other scientific reports, guidelines and reviews prepared by various experts that pertain specifically to coastal BC harvesting practices were also consulted and drawn from in the preparation of this land use plan.

In summary, Hupacasath standards established by this land use plan are based on recent research findings, the expert opinion of members of the forestry scientific community and local knowledge.

In any resource development initiative, it should be recognized that of utmost importance to the Hupacasath is the need to protect, enhance and restore salmon runs, water quality, fish and wildlife habitat, cedar (both old growth and second growth) and cultural heritage resources. These objectives derive from Hupacasath's stewardship role over their territory, and their need to be able to exercise their aboriginal rights to the fullest extent. These objectives guide resource development planning and decision making and are used in formulating management standards for this land use plan. To this end, it is recognized that ecological restoration of fish habitat is required. Also, higher resource management standards than those already established by government, may be appropriate.

---

<sup>4</sup> The term "standards" used in this HFN LUP refers to recommended management practices.

## **1(3) Land Use Zoning**

Driven by the need for balanced use through consideration that cultural and ecological responsibility takes precedent over economic development, Phase 1 of the Hupacasath Land Use Plan applied zoning as a technique to identify acceptable levels of resource development within the territory.

### **1(3)(i) Protection Areas (PAs)**

Lands in this zone require protection from resource development that includes, but is not limited to timber harvesting, mining, large-scale tourism, hydro development and urbanization. Limited, sensitive development may only be acceptable in order to assist with the maintenance, protection, enhancement and traditional use of cultural heritage sites, traditional resource uses, fish, wildlife, water quality and old growth cedar. Any development of lands and resources in this zone requires Hupacasath consent.

Hupacasath Use Areas in this designation include:

- Doran
- Drinkwater / Della
- Grassy
- Maber / McBride
- Thunder

There are also several, smaller areas within the other Hupacasath Use Areas that require protection. Maps showing these areas will be shared only on a strictly confidential basis.

### **1(3)(ii) Special Management Areas (SMAs)**

Resource development can occur in this zone, but only if HFN standards are applied. Higher standards than those currently set by government through legislation have been formulated and are to be applied, in addition to that required by legislation. Hupacasath standards have been developed to protect the values in this zone, and such standards take into account that cultural and environmental responsibility take precedent over economic uses and industrial development.

Hupacasath Use Areas in this designation include:

- Arbutus Summit
- Ash
- Beaufort
- Great Central Lake
- Hywatches
- McCoy / Devils Den
- Nahmint
- Oshinow
- Shoemaker
- Sproat Lake
- Taylor
- Barkley Sound & Offshore

### **1(3)(iii) Resource Development Areas (RDAs)**

Resource development that includes timber harvesting, mining, large-scale tourism, hydro development and urbanization can take place in this zone while respecting Hupacasath rights and title. Such industrial activities must adhere to relevant legislation, be sensitive to fish, wildlife, cultural and other environmental values.

Hupacasath Use Areas in this designation include:

- Cameron
- China
- Chuchakacook
- Coleman
- Corrigan Creek
- Cous
- Handy Creek
- Lowry
- Mactush Creek
- Museum
- Pocahontas Point
- Roger Creek

## **SECTION 2: OVERARCHING STANDARDS**

## 2(1) Overarching Standards

Overarching standards apply to those areas of the territory suitable for development: the special management (SMAs) and resource development areas (RDAs). Overarching standards contribute to the larger goal of sustainable development in the territory and include:

- Cultural Responsibility
- Consultation and Accommodation
- Planning
- Economic Sustainability
- Culturally Modified Trees
- Sustained Yield Timber Harvest Planning
- Red- and Blue-Listed Species
- Sensitive Ecosystems
- Herbicides

## 2(2) Cultural Responsibility

### Background Information

Hupacasath's culture and very identity is tied to the land and resources in their territory. Sustenance, economic activity and sacred and spiritual practices all depend on the state of the territory and health of the resources. Therefore, the maintenance and respect of Hupacasath culture is largely dependent on the maintenance and respect of the territory.

Hupacasath culture is expressed through the land base in two ways:

1. Traditional Use – this includes, but is not limited to, the exercise of aboriginal rights (hunting, fishing, trapping, gathering, sacred and spiritual practices, self-government and economic use). Traditional uses may, or may not leave a physical expression on the land base.
2. Archaeological Sites – these are physical sites that include, but are not limited to, villages, camps, lithics and other artifacts, petroglyphs, cultural modified trees and burials.

The end goal is Hupacasath's continuance of their way of life, exemplified through the use of the lands and resources. This will require cultural responsibility from all resources users in the territory.

Demonstrating cultural responsibility includes: the identification of interests, uses and sites; management and access strategies; and where necessary, long-term protection.



*Hupacasath Standards*

Regarding the identification of interests, uses and sites:

- Resources are made available for Hupacasath to review all development plans in the context of identifying their interests and where additional investigation may be required.
- Use of trained Hupacasath crews for cultural heritage surveys and investigations.
- Use of RIC 3 inventory standards for cultural modified tree and archaeological inventories.
- Joint selection of professionals (e.g. archaeologists, ethnographers, researchers) working in the territory.
- Timber development plans (forest development plan amendments, forest stewardship plans, silvicultural prescription amendments and site plans) should recognize, accommodate and protect confidential Hupacasath cultural information. This may be through the adherence to negotiated information sharing agreements.
- Compensation, at a rate mutually agreed to, for the use of Hupacasath traditional and cultural knowledge.

*Hupacasath Standards*

Regarding management and access:

- Maintain natural resources to a level that Hupacasath is able to fully exercise their aboriginal rights and meet food, social and ceremonial needs, with priority second only to conservation.
- Allow unrestricted access to lands for resource use, with exceptions only for public safety and conservation.
- Provide consultation, joint decision-making and accommodation for all decisions related to and affecting cultural heritage resources, in a way that ensures their appropriate management and/or mitigation. In some case, consent will be required (see section 2(3) Consultation).
- Timber development plans (forest development plan amendments, forest stewardship plans, silvicultural prescription amendments and site plans) identify and make available old growth cedar trees suitable for canoes, carvings such as welcome figures, and housing, and second growth for cedar bark and carving in volumes that meet Hupacasath's annual needs (refer to Hupacasath First Nation Cedar Strategy, 2004).
- Regulate commercial use of traditional plants.
- In order to ensure a future supply exists of culturally significant tree species, timber development plans (forest development plan amendments, forest stewardship plans, silvicultural prescription amendments and site plans) include the requirement that where ecologically suitable, red and yellow cedar will be reforested to a level that will comprise a minor if not preferably a major stocking component of young plantations.

- Timber development plans (forest development plan amendments, forest stewardship plans, silvicultural prescription amendments and site plans) recognize the need for Hupacasath traditional uses to take place during road building and timber harvesting.

*Hupacasath Standards*

Regarding protection:

- Protect cultural heritage resources (e.g. sacred spiritual areas, trails, archaeological sites and culturally modified trees) in a way that maintains both the resource as well as the context in which it exists.
- Significant sites, as defined by Hupacasath, are taken out of the timber harvesting land base.
- Archaeological sites are protected as per the recommendations of a professional archaeologist. These recommendations take into consideration Hupacasath's cultural significance assessment.
- Any creek having "Sacred Significance" will receive a 100 meter buffer on both sides of the creek

## **2(3) Consultation and Accommodation**

*Background Information*

Consultation is a good faith, reasonable information disclosure between the Hupacasath and the development proponent. Consultation is the key process that will engage Hupacasath with the development proponent to identify aboriginal interests and address mitigation and/or accommodation in the event that infringement takes place.

The B.C. government has a consultation policy that was last updated January 2003. It is the interpretation of many First Nations that this policy is inadequate for many reasons, the main ones including that it:

- Was developed in the absence of any First Nation consultation;
- Takes a narrow interpretation of case law;
- Provides line Ministries with the ability to assess the 'soundness' of a First Nation's claim; which only the courts should be able to do;
- Imposes timelines within which adequate consultation can not always take place; and
- Does not acknowledge that there is a cost to the First Nation to participate in consultation.

The duty to consult rests with the government. Many third parties have chosen to rely on the government to lead the consultation process with First Nations. However, an increasing number of development proponents are demonstrating proactive and innovative efforts to consult with First Nations. Third parties are showing the ability and willingness to bridge the gap between what government offers for consultation and what First Nations expect.

Accommodation is required when a proposed action will infringe upon Hupacasath's aboriginal rights.

The standards developed for consultation and accommodation are based on best practices and the pragmatic, but full, interpretation of relevant case law.

*Hupacasath Standards*

In regards to consultation:

- Consultation takes place for all issues, including but not limited to, management of land and resources, decisions about resource use and allocation, regulation and conservation of resources, strategic and operational issues, amendments, all levels of planning, rates of harvest and development, and distribution of development.
- Examination is made of Hupacasath information such as traditional use studies and the Land Use Plan, but the review of such information does not constitute full consultation in itself.
- Mutually acceptable arrangements are made to compensate Hupacasath for their costs associated with participating in the consultation process (e.g. staff or legal resources, mapping, community input).
- Mutually acceptable timeframes are established.
- Capacity gaps should be discussed, with creative methods discussed to address any capacity requirements so full participation in the consultation process is achieved.
- All parties and persons authorized to engage in consultation are identified, and their participation is maintained through the consultation process.
- To save time and financial resources, consultation is initiated when the proposed development is in the conceptual stage and before decisions have been made, versus when approvals are being sought
- A joint consultation process will be developed that takes into consideration the scope and level of potential impact that the proposed development may have, and incorporates the following legal components into the process:
  - Is conducted in good faith (*Delgamuuk'w*)
  - Has a full disclosure of information on a timely and continuous basis so the First Nation can make an informed decision (*Jack, John and John, Halfway, Sampson*)
  - Is meaningful (*Delgamuuk'w, Halfway, Taku*)
  - Has the purpose of substantially addressing the First Nation interest at stake (*Delgamuuk'w, Taku*)
  - Varies with the circumstances of each situation (*Sparrow, Sampson, Delgamuuk'w, Nikal*)
  - Occasionally may require, at the end, consent (*Delgamuuk'w*)

**Hupacasath First Nation  
TERRITORY LAND USE PLAN – PHASE 2**

---

- Has the duty to arise before legislation is enacted or measure taken (*Halfway, Jack, John and John, Sampson*)
- Includes the proponent informing itself of the First Nation's perspective, practices and rights (*Jack, John and John, Halfway*)
- Is proactive versus waiting for the First Nation to approach the proponent (*Sampson*)  
Is separate and distinct from any public consultation process (*Mikisew*)
- Takes the claims of the First Nation seriously (*Alphonse*)
- Is conducted to the best ability of the parties (*Blueberry*)
- Endeavors to seek workable accommodations of the cultural and economic interests of both the aboriginal and non-aboriginal parties (*Haida, Taku*)
- Is a two-way street with an obligation on the First Nation to also participate in good faith (*Cheslatta, Ryan*)

*Hupacasath Standards*

In regards to accommodation:

- When determining appropriate accommodation, the priority interests of the Hupacasath over other users, based on Hupacasath's constitutional status, will be reflected (*Gladstone, Mikisew*).
- Accommodation will include both the cultural and economic interests of the First Nation (*Haida*).
- The substance of Hupacasath's concerns will be addressed (e.g. conditions of development).
- The form of accommodation will be mutually acceptable.

*Standards Guidance*

Possible means of accommodation include, but are not limited to:

- Alternative courses of action or amendments to the terms of development to address aboriginal interests.
- Revenue sharing
- Heritage fund arrangements
- Economic development opportunities (e.g. harvesting, employment, contracts)
- Providing access to resources for community needs

- Capacity building
- Acknowledgment and use of the Hupacasath Land Use Plan

## **2(4) Planning**

### **2(4)(i) Meaningful Involvement in Planning Processes**

#### *Background Information*

The Hupacasath Land Use Plan (Phases 1 and 2) were developed in part so that the First Nation could actively participate in planning processes from the earliest stages possible. This is necessary so that Hupacasath's values and interests can be accommodated before resources are unnecessarily spent and decisions already made. At least in the early stages of implementation of the land use plan, third parties can not just independently consult the land use plan during their planning processes. Instead, Hupacasath must be actively involved to ensure proper interpretation of the plans and to provide additional access to internal First Nation information. Fulfilling this requirement will reduce potential infringements on Hupacasath's aboriginal rights and increase the efficiency in which the First Nation can support proposed developments with a 'green letter.'

#### *Hupacasath Standards*

- The nature of planning processes that Hupacasath will be involved in and the scope to which they are involved will be guided by the Hupacasath Consultation Policy and any specific consultation protocols negotiated.

## **2(5) Economic Sustainability**

#### *Background Information*

For thousands of years, Hupacasath have utilized the territory for sustenance needs. Sustenance includes not only direct use of the resources in the territory, but also trading with others for resources not found in the territory. This long standing practice of trade is one of the foundations for aboriginal rights having an economic component.

As the owners and stewards of the territory, there is an inherent right to derive benefit from the land and resources within the territory. Since the time of European contact, there has been extensive use of the resources by third parties, but little if any benefit flowing back to Hupacasath.

The Government of Canada, through the Indian Act, has created a situation of First Nations' dependence on government assistance. However, Hupacasath have worked diligently to reduce this dependence through the creation of own source revenue. Both existing and future development needs to acknowledge Hupacasath's right to long-term economic sustainability derived from the territory.

#### *Hupacasath Standards*

To achieve long-term economic sustainability:

- Resource tenures and/or ownership opportunities and economic development opportunities are established.
- Management of the lands and resources are consistent with the goal of encouraging eco-tourism opportunities.
- Stable, consistent employment opportunities with reasonable pay are available for all able community members.
- Revenue sharing from resources used by others in the territory, at a level that acknowledges Hupacasath's aboriginal rights and title, is established.
- Resource planning provides access to logs for value-added initiatives.

## **2(6) Culturally Modified Trees**

### Background Information

Based on Hupacasath's assessment of the cultural significance of Culturally Modified Trees (CMTs), CMTs may require protection. Efforts should be made to provide protection for CMTs and to attempt to ensure that CMTs do not become windthrown during or after logging. An assessment of windthrow hazard should include acceptance of CMTs as non-renewable resource features requiring protection. There are high social consequences, and potentially financial and/or legal consequences, should CMTs be impacted through logging practices.

### Hupacasath Standards

- In order to avoid leaving CMTs along forested edges assessed as having a high windthrow hazard, locate cutblock boundaries and road right-of-ways with a 20 to 30 meter buffer. Moving falling boundaries to an edge consisting of open, small crowned trees is another option.
- Clusters of 3 or more CMTs (or single trees with high significance) require placement in long-term retention patches with a 20 to 30 meter buffer established along windward and windward diagonal edges.
- In areas of high windthrow hazard along edges with CMTs, edge windfirming (feathering, pruning or topping) may be appropriate. Another option is to carefully position long term retention patch(s) in order to reduce fetch distance and thereby reduce windthrow hazard.
- After careful consideration of all options, it may be necessary to harvest the CMTs in accordance with the Heritage Conservation Act and any special arrangements made during First Nation consultation. Hupacasath consent is required for the harvesting of CMTs, and the First Nation has the right of first refusal to access harvested CMTs for traditional purposes.

## 2(7) Sustained Yield Timber Harvest Planning

Sustained yield timber harvest planning determines the appropriate level of harvest to ensure long-term sustainability of both economic timber values as well as social and environmental values. As an overarching standard, the plan promotes sustained yield timber harvest planning. To achieve this, several factors are incorporated.

### 2(7)(i) Red and Yellow Cedar Forest

#### Background Information

Only a minor extent of unharvested forest in the territory is dominated by red and yellow cedar (2%, 1.2% respectively according to the Hupacasath Cedar Strategy). This highlights the need to conserve these species for Hupacasath cultural needs (e.g. canoe and construction logs) as well as to establish cedar in reforestation efforts (see section 2(2) Cultural Responsibility).

#### Hupacasath Standards

For red and yellow cedar, both second growth and old growth:

- The Hupacasath Cedar Strategy (2004) will guide management decisions for red and yellow cedar to ensure that there are adequate resources to meet Hupacasath's aboriginal rights.

### 2(7)(ii) Deletions of Forest Area from the Timber Harvest Land Base

#### Background Information

Hupacasath have identified areas within their territory as having highly significant cultural value. These are to be removed from the area to be managed for timber harvesting based on the view that these cultural features take precedent over development. Deletions from the working forest or timber harvest land base (THLB) should be undertaken in all designated land use zones (e.g. protected, special management and resource development areas).

#### Hupacasath Standards

Regarding the timber harvest land base:

- Areas that Hupacasath have identified as having significant cultural value will be respected by removing these areas from the timber harvesting land base.
- Maps showing areas to be deleted from the timber harvesting land base will be shared only on a strictly confidential basis.

## 2(7)(iii) Allowable Annual Cut Determination for TFL 44 and Arrowsmith TSA

### Background Information

In his 2003 Allowable Annual Cut (AAC) Rationale for TFL 44, Deputy Chief Forester Ken Baker stated that *“there is no need at this time to partition by species to protect cedar from being over-harvested relative to its presence on the land base.”* He also stated that he would *“examine this matter closely at the time of the next AAC determination.”* Also that, *“if additional significant new information is made available to me in respect of the management assumptions upon which I have predicated this decision, or First Nations’ interests, then I am prepared to revisit this determination sooner than the five years required by legislation.”*

Adjustments to the management assumptions used by the Deputy Chief Forester may now be forthcoming for two key reasons. Importantly, tenure on the land base has changed significantly since the current AAC determination for TFL 44. This is due to government “takeback” of Crown lands as well as privately-owned lands being removed from the TFL 44 land base. Also, based on recommendations made in this Hupacasath Land Use Plan, revision of the original inputs and assumptions used in the timber supply analysis may now be necessary. Specifically, sacred areas currently zoned as Protection Areas in the Land Use Plan should be removed from the THLB. Additionally, standards identified in the plan may affect netdowns previously used in the timber supply analysis. Therefore, base case modeling used in the AAC determination may not adequately reflect the Hupacasath’s interests with respect to their territory. For these reasons, the THLB may be over-estimated with respect to timber supply and likely should be re-examined. Due to a transfer of tenured lands, such factors should also be taken into account in an ACC determination for the Arrowsmith TSA.

The Hupacasath make recommendation in this Land Use Plan for careful and judicious use of standing stem helicopter harvesting under the retention silvicultural system employing modified variable retention standards. Certainly, harvesting timber from areas not typically harvested in the past requires adherence to forest practices constraints. Use of this form of non-conventional harvesting in previously constrained areas may at least partially offset the effect of implementing HFN standards established in this higher level plan.

First Nations have made recommendations to decrease the rate of harvest of old growth red and yellow cedar to ensure sustainable traditional and cultural use of this species. It may be timely to review documentation of the volume of cedar harvested relative to the volume of cedar in the inventory profile. Strategies should be developed to ensure both short and long-term supplies of cedar are adequate and sustainable to meet an expanding First Nation population.

### Hupacasath Standards

In relation to the AAC determination:

- The Hupacasath Phase 1 and 2 Land Use Plans, and Cedar Access Strategy will be reviewed by the Chief Forester for the purposes of assessing the availability of cedar for Hupacasath needs, and removing identified areas from the timber harvesting land base. The AAC will appropriately reflect these two factors.



## 2(8) Red- and Blue-Listed Species

### Background Information

The decline in the population of a species can often be explained by a loss of habitat. It is therefore essential to identify habitat that is critical to a species' survival and to protect it. The federal Species at Risk Act (SARA, 2002) is now fully implemented with identification of species at risk provided by COSEWIC (Committee on the Status of Endangered Wildlife in Canada). When critical habitat is located on private or provincial lands, it is to be protected through other agreements, higher level land use plans or other provincial laws.

Provincially, the Ministry of Water, Land and Air Protection (MWLAP) has established the list of 'Species at Risk' "that may be affected by forest or range management on Crown land and require protection in addition to that provided by other mechanisms." 'Regionally Important Wildlife' has also been identified by MWLAP. Habitat requirements and recommendations for management called 'Accounts and Measures' have been developed by MWLAP and must be utilized when developing specific strategies for habitats of species collectively named 'Identified Wildlife' (Species at Risk and Regionally Important Wildlife). Some of these species are found within the Hupacasath territory.

Landscape level planning should establish habitat provisions for 'Identified Wildlife'. For instance, if ecologically suitable, Marbled Murrelet (*Brachyramphus marmoratus*) habitat may be designated as wildlife habitat areas (WHAs) within Hupacasath Protection Areas (PAs). This should only be done if suitable habitat is located within the Hupacasath PAs. At the cutblock level, habitat for Red-legged Frogs (*Rana aurora aurora*) may be benefited by placing long-term retention patches on small wetlands not otherwise protected under legislation. The interspersions of forested and wetland habitats has been shown to be particularly important for this species. Weyerhaeuser (2001) found that at least 50% of red-legged frogs remained in larger retention patches of 0.3 hectares. Another example of a listed species found within the Hupacasath territory is the 'Queen Charlotte' goshawk (*Accipiter gentilis laingi*).

#### *Hupacasath Standards*

- Refer to the federal Species at Risk Act (SARA, 2002) and MWLAP 'Identified Wildlife' to identify all species requiring long-term habitat provisions.
- Utilize MWLAP 'Accounts and Measures' when formulating innovative recovery strategies for habitat management and conservation.
- Manage for species at risk with the aim of recovering or adequately protecting these species at a level where they are no longer at risk.
- Utilize long-term retention patches for Red-legged Frogs of at least 0.3 hectares in size when applied to riparian habitats not otherwise protected by legislation. A 30 meter buffer on small wetlands is preferable.

## 2(9) Sensitive Ecosystems

### Background Information

Ecosystems identified in a Sensitive Ecosystems Inventory (SEI) are often remnant, rare and fragile ecosystems and may provide critical habitat for both species and ecosystems at risk. In TFL 44, Terrestrial Ecosystem Mapping (TEM), forest cover inventory and other relevant data have been used by Weyerhaeuser to create a Sensitive Ecosystems Inventory (SEI). SEI is a valuable tool that can be used in identifying sites of high biological value. The BC Conservation Data Center has prepared red lists for species and plant communities identified as being extirpated, endangered or threatened in BC and blue lists for those identified as being of special concern.

### Hupacasath Standards

- Utilize the Sensitive Ecosystem Inventory prepared by Weyerhaeuser for TFL 44 to identify areas requiring protection in timber harvest planning.
- Harvest planning standard units containing red or blue-listed plants and/or overlap with plant communities as described by the BC Conservation Data Center, should be largely positioned within cutblock reserves (e.g. retention patches, riparian reserves, WTPs or others as required by legislation).

## 2(10) Herbicide Use

### Background Information

Brush problems can be overstated and at times young tree seedlings require only a 'slight edge' in order to grow through competing brush. At other times, a 'wait and see approach' can be successful in allowing coniferous leaders sufficient time to 'break free' of competing vegetation. Sometimes though, competing vegetation is present in sufficient coverage before logging that once overstory trees are removed thereby facilitating full sunlight, a competing brush species like salmonberry (*Rubus spectabilis*) on an old floodplain or on an upland moisture-receiving site will readily invade and take over productive sites where reforestation of conifers is intended. Bigleaf maple (*Acer macrophyllum*) regenerates aggressively from stumps in the form of coppice sprouting and can quite quickly become a major competitor in young plantations. Neither salmonberry nor maple are effectively controlled through manual means but are controlled quite well with Vision® (spray application) and Garlon® (thinline basal spray application), respectively.

Depending on site conditions and species involved, manual treatments may be a viable alternative to herbicide use. This works reasonably well for a dry-site species such as bracken fern (*Pteridium aquilinum*), although repeated treatments are usually necessary. Girdling competing red alder (*Alnus rubra*) works very well once stems are large enough in diameter for girdling without breaking stems off completely thereby causing stem sprouting. Small red alder can be pulled from the soil if still quite young and roots are not extensive. Even fireweed (*Epilobium angustifolium*) can be problematic by smothering regenerating conifers over winter, but such dense colonies usually aren't a concern on the coast. Competing salal (*Gaultheria shallon*) is generally disturbed enough through logging such that adequate plantable area is available for reforestation, although not always.

Prescribed burning was an effective tool for reducing extensive salal competition, but with leaving extensive forested retention patches through variable retention logging, the burning option has become much less viable. Also too, concerns about smoke at a time of increased public awareness about carbon emissions in relation to global warming has reduced the acceptability of broadcast burning as a vegetation management tool.

Prompt planting (e.g. first spring or fall season after prime harvest completion) and not waiting for naturals to become established on sites prone to competing brush is the best strategy. Modifying free-growing stocking standards is sometimes required in meeting long-term silvicultural objectives on brushy sites. Reduced inter-tree spacing when planting along with longer free-growing time periods may be required. A postharvest assessment by a qualified professional should determine where waiting for naturals is appropriate and where planting must occur in the next spring or fall season in order to gain a foothold prior to brush becoming well established.

Establishing and growing red alder as a commercial species on select sites may be desirable. These richer sites often have a brush component though, frequently comprised of salmonberry. Even if alder is a preferred species, natural regeneration of alder is not desirable. Harvesting alder when stored carbohydrate reserves in the root systems are at their lowest level due to leaf growth (e.g.  $\frac{3}{4}$  to full leaf) helps control the extent of alder stump sprouting. Careful logging that minimizes soil exposure also helps prevent dense re-establishment of alder which reproduces readily from seed. Even after taking these precautions, a pre-planting herbicide application may be necessary for successful establishment of alder seedlings due to competing brush.

At times, control of dense vegetation may be necessary to ensure adequate water, light and nutrients facilitate seedling survival and growth. Knowledge of how competing vegetation reproduce and respond to treatment are integral components of a successful vegetation management program (Coates, Haeussler and Mather, 1990).

Judicious use of herbicides may be the only viable option if certain sites are to be harvested. Applying minimal rates can be quite effective in achieving partial kill of select vegetation yet provide enough relief to allow conifers to grow through the brush. A complete kill of competing vegetation is seldom necessary or desirable. Timing of application should be when the target vegetation is in its most vulnerable state. Foliar treatment timing should coincide with optimal translocation of the active ingredient (e.g. active growing season with full leaf) but also when conifers have hardened off and are less susceptible to herbicide damage (e.g. late summer to early fall). Species such as maple, sprouts readily and is best controlled with a stem treatment timed to coincide with slow growth or applied in the dormant season. Site-specific prescriptions should be applied to small, stratified portions of the plantation that have been assessed as being highly unlikely to survive the effects of competing brush. Only these areas should be considered for treatment.

Qualified professionals must also rely on their own judgment and local experience when evaluating the need for chemical control in vegetation management. Early assessment of the problem may allow less area to be treated and at reduced rates if applied before competing vegetation becomes well established. Post application follow-up should be undertaken to assess effectiveness, to refine application prescriptions and to determine whether silvicultural objectives have been met.

Herbicides should not be relied upon as a 'quick fix' or as a panacea to poor forest management. Prompt reforestation using larger, fast-growing seedlings on brushy sites is a good approach that reduces the number of times vegetation becomes a competition problem. Herbicides should only be used sparingly and as infrequently as possible and only when all alternatives have been explored. Judicious use requires that only a minimal amount of chemical is applied at the proper time, to produce sufficient control rates that allow conifers to overtop competing vegetation and become free growing.

*Hupacasath Standards*

Concerning vegetation management approaches:

- Where applicable, qualified professionals develop harvest plans that incorporate proactive vegetation management strategies such as harvesting in such a way that subsequent competing vegetation is minimized. Such plans must then be implemented.
- On brush-prone sites, carry out prompt reforestation (e.g. first spring or fall season after prime harvest completion – see section 3(11) NSR) using larger, fast-growing seedlings.
- Manual methods of vegetation management are employed wherever possible.
- Ongoing and early assessment of brushy sites are stratified on the basis of:
  - Most likely to grow out of competing brush (e.g. within 80 to 100% of brush height);
  - May require brush control (e.g. within 50 to 80% of brush height);
  - Likely requires brush control for seedling survival (e.g. below 50% of brush height).

Regarding herbicide prescriptions:

- After proactive steps as described above are taken, judicious use of herbicides may be acceptable for sites which are absolutely in need of treatment if it is clear that young seedlings will not survive. Reductions in growth rates are not a primary concern of the Hupacasath.
- Herbicides should only be used sparingly and as infrequently as possible and only when all alternatives have been explored.
- Site-specific prescriptions should be applied to small, stratified portions of the plantation that have been assessed and conifers are deemed unlikely to survive.
- All fish bearing streams will have a 50 Meter buffer on both sides and all non-fish bearing streams will have a 30 meter buffer on either side. Herbicides will not be used within these riparian buffers.
- Apply only minimal rates to achieve sufficient partial kill of target vegetation and not damage the current year's growth of young conifers.
- Application should be timed to occur only when the target vegetation is in its most vulnerable state and when conifers have hardened off and are less susceptible to herbicide damage.
- Herbicides will not be used within buffers established on Sacred Creeks. Only manual vegetation management approaches will be accepted.

## **SECTION 3: SPECIAL MANAGEMENT AREA STANDARDS**

### 3(1) Special Management Area Standards

The following standards apply to lands within the territory designated as Special Management Areas (SMAs). Special Management Area standards contribute to the larger goal of sustainable development in the territory and include:

- Water Quality
- Roads
- Riparian Buffers
- Landslide Hazard
- Terrain stability Field Assessments (TSFAs)
- Variable Retention Timber Harvesting
- Windthrow Management
- Salvage of Windthrown Timber
- Standing Stem Helicopter Harvesting
- Forest Health
- Not Satisfactorily Restocked (NSR) Area

### 3(2) Water Quality

#### Background Information

Water quality objectives (WQOs) for community watersheds have been required under the Forest Practices Code (FPC) in effort to prevent possible negative impacts to water quality from timber harvesting and related practices. Among other things, the FPC also required terrain mapping, terrain stability field assessments, watershed and erosion assessments and it provided for riparian buffer zones during harvest and other forest practice rules related to water quality. Under the new results-based Forest and Range Practices Act (FRPA), objectives are to be set within each community watershed.

WQOs can include benchmarks or acceptable levels for such criteria as turbidity levels, temperature, stream flow, organic matter, levels of fecal coliform, nitrate/nitrite concentration and pesticides. Forestry can increase turbidity, nutrients and raise water temperature yet natural processes can have a similar effect. Usually, pre-disturbance data is lacking against which forestry impacts can be compared. Specifying the natural variation of water quality may be difficult or even impossible to achieve and requires long term monitoring. An event such as a landslide may cause a brief but quantifiable spike in substandard water quality, but pre-slide data needs to exist in order to determine the impact. It has been estimated that costly water sampling should take place over a three year period in order to establish baseline information. Therefore, WQO standards may not be enforceable in forestry because of the practical difficulties of: 1) proving that a particular forest practice exceeded natural variability or normal levels for parameters being

tested, 2) the high cost and at times unreliable accuracy of testing, and 3) the long time required for some impacts to appear also makes assigning responsibility difficult. Measuring results after something potentially damaging has occurred does not prevent damage from occurring. WQOs may indicate specific goals or results to be accomplished but they don't prescribe how to accomplish the end result (Forest Practices Board, 2003).

A better approach is to establish standards for assessing hazards and for best management practices that attempt to prevent damage to water quality. It is much more practical to set standards for road building and timber harvesting related to: 1) an acceptable amount of soil disturbance, 2) limitations on the amount of area taken up by permanent roads, 3) construction of temporary or permanent stream crossings, 4) prohibition against introducing excessive sediment or logging debris into streams, 5) use of riparian buffers, 6) requirements for terrain and hazard assessments, and 7) logging and site plans being required to incorporate terrain stability and erosion potential assessment results (Forest Practices Board, 2003).

*Hupacasath Standards*

- In the absence of baseline water quality information for each watershed within the Hupacasath territory, WQOs cannot be established for this LUP. However, standards relating to road construction, timber harvesting and planning that serve to prevent or reduce the impact of forestry operations on water quality are given in this LUP. These standards may be used effectively when monitoring forestry operations in relation to potential impacts on water quality.

### **3(3) Roads**

*Background Information*

Roads and stream crossings influence sedimentation which in turn influences water quality, salmon and other fish. Roads are probably the single most destructive element in terrestrial landscapes worldwide that have been altered by human activity (Noss 2003). In coastal BC, the Coastal Watershed Assessment Procedure (CWAP) primarily considers road densities (km of road per km<sup>2</sup> of watershed) and number of stream crossings to indicate watershed condition. Since not all road and/or stream crossings are built to the same standard, this measure of watershed health may be used with some degree of caution. Erosion from the cutbank-ditch has been shown to be the largest contributor of sediment followed by the road surface. Extremely high levels of erosion are frequently associated the scour of the ditch. The key factor in controlling erosion is the road drainage system itself (Carson, 2002).

In coastal conditions having heavy rainfall, particular attention should be given to establishing high standards of road design, construction and maintenance in order to control road-related soil erosion.

*Hupacasath Standards*

In relation to roads and to help ensure water quality and fish values are maintained:

- Utilize temporary, rather than permanent roads, wherever possible.

- Minimize road width.
- Minimize the damming effect of the road prism by dispersing ditch and surface water rather than concentrating it.
- Utilize cross ditches and drainage culverts frequently (e.g. placing culverts or ditch blocks uphill from stream crossings to move sediment onto the forest floor for absorption).
- Keep spoil material out of riparian management areas.
- Minimize right-of-way width at stream crossings, maintaining natural drainage patterns of watercourses.
- Maintain rough surfaces on cutslopes.
- Create ditches and fill slopes that facilitate revegetation.
- Recognize sediment liabilities of old roads and drainage structures.
- Ensure that concentrated flow is not diverted onto erodible slopes.
- Construct cutbanks at a stable angle to prevent bank failure.
- Observe roads and drainage structures during heavy rains in order to identify further soil conservation modifications.
- Recognize that speed of revegetation and resulting vigor of vegetation cover are very important in controlling sediment movement along cut and fill slopes and through ditches.
- Complete direct seeding or hydroseeding with fertilization of disturbed ground immediately following road construction or deactivation.
- Limit the amount of land taken up by permanent access structures (PAS) to a maximum of 7%, to be calculated on a cutblock basis. Where not possible, document a sound rationale. Utilize temporary access structures (TAS) to make up the balance of roads required for timber development or use non-conventional harvesting methods in order to keep the amount of area taken up by roads to a minimum.
- Deactivate TAS roads immediately after harvesting is complete (e.g. cutblock logging residue has been assessed).
- Implement CWAP report recommendations as per approved Forest Development Plans.
- Identify steps through conducting a Watershed Assessment Procedure (WAP) process to restore and ensure the health of watersheds specifically in relation to water quality and fish. Include not only the requirements for road-related activities (e.g. deactivation) but also the identification of areas in need of in-stream rehabilitation and the restoration of fish habitats.
- Assess road surface soil erosion hazard during road planning, construction, maintenance and decommissioning to identify areas where management steps must be taken to maintain water quality and avoid high levels of sediment introduction to streams. In areas of high to very high erosion hazard, special measures may be required to control erosion from the road surface, cutbank and ditch. Document mitigation strategies and incorporate them into the road design.



### 3(4) Riparian Buffers

#### 3(4)(i) Small Streams

##### Background Information

Small headwater streams may be important for maintaining the productive capacity of downstream fish habitat through import of nutrients, insects and organic matter (Weyerhaeuser, 2003). Additionally, high summertime water temperatures can be a problem for downstream fish. Logging can increase the summertime temperature of a forest stream by removing vegetation that shades the water's surface (Teti, 2003). Denny Maynard (Maynard/Golder and Associates, 2003) did an analysis of local landform types to determine those with the highest rates of landslide activity. Several landform features associated with streams were found to have the highest probability of landslide occurrence. A description of appropriate riparian management is described in section 3(5) entitled Landslide Hazard.

There are no required guidelines or regulations for managing the effects of forest practices on stream temperature under either the Forest Practices Code of British Columbia Act (FPC) or under the recently approved Forest and Range Practices Act (FRPA). The retention of trees for stream temperature protection in riparian areas of S4, S5 and S6 streams is identified as a best management practice in the Riparian Management Area Guidebook (Province of British Columbia, 1995), but riparian reserves are not mandatory on those stream classes. Reserves are required under both sets of legislation for streams classed as S1, S2, and S3 and for smaller streams in community watersheds. Under FRPA, streams designated as temperature sensitive must not have an increase in stream temperature that causes an "adverse impact on fish."

##### Hupacasath Standards

In relation to the buffering of small streams classed as S4 and those having moderate to high or high debris transport potential and classed as S5 and S6:

- Riparian reserve buffers for those small streams a minimum of 30 meter width on both sides of small streams.

#### 3(4)(ii) Fisheries-Sensitive Zones

##### Background Information

Fisheries sensitive zones (FSZs) are an important part of the drainage basin that do not meet the legislated definition of a stream, lake or wetland, but are occupied at least part of the year by fish. These small channels are most often located within a floodplain but are also found at the headwaters of drainages. In coastal watersheds, off-channel areas are frequently important as over-winter habitat for Coho salmon and Cutthroat trout juveniles and can contribute substantially to overall survival. The importance of these small features to fish populations should not be underestimated (Province of British Columbia, 1995).

Legislation does not require tree retention or that these features be mapped unless large enough to be identifiable on a 1:20,000 scale map. Best management practices in the Riparian Management Area Guidebook (Province of British Columbia, 1995), suggest falling and yarding away, to avoid constructing road through them, to maintain a 5 m machine free zone, to retain non-merchantable trees and understory vegetation within 5 m where practical, to avoid introduction of sediment and debris and to avoid restrictions to water flow and fish. These are all advisable and good practices, but because there are few guarantees about fish use, it may be wise to apply an added measure of caution when avoiding all unnecessary damage to fish habitat. Application of riparian buffers may therefore be prudent. Also, mapping of FSZs is advisable as it will help harvest operators and others when carrying out careful logging practices adjacent FSZs.

*Hupacasath Standards*

In relation to FSZs:

- Riparian reserve buffers should be a minimum of 50 meters wide.
- Where there is a high hazard of windthrow damaging or destabilizing the integrity of the FSZ as fish habitat, exemptions are acceptable but should be well documented.
- FSZs should be mapped along with other watercourses.

### **3(5) Landslide Hazard**

*Background Information*

A landslide inventory for the Nahmint and Upper Kennedy watersheds as well as the Mactush and Cook Creek watersheds has been carried out by Denny Maynard (Maynard/Golder and Associates, 2003). For this, he used five sets of air photos dating back to 1970 and integrated this with existing terrain maps in order to supplement the existing five-class terrain stability mapping that is currently used. Additionally, he did an analysis of landform types to determine those with the highest rates of landslide activity. He determined that on steep terrain (e.g. > 55% slope), inner gorge or stream escarpments, gully headwalls or sidewalls and concave headwater basins had the highest likelihood of landslide delivery to streams (e.g. up to 92% probability).

Recent changes to legislation include a provision in section 37 of the FRPA that:  
*“An authorized person who carries out a primary forest activity must ensure that the primary forest activity does not cause a landslide that has a material, adverse effect on a matter referred to in section 149(1) of the Act.”*

However, guidance is not given as to what constitutes a landslide or a material adverse effect. In the absence of clarity on these issues, it seems advisable to make every effort to avoid causing landslides through timber harvesting activities that may impact upon other resources. In timber harvest planning, informed decisions are based on assessments of site conditions. Cutblock and road layout should utilize knowledge of those landform types most likely associated with landslides and to take steps to reduce the level of hazard. A reasonable approach is to establish riparian buffers along susceptible landforms.

Another issue for consideration is windthrow hazard. Trees left standing along riparian areas may experience some degree of windthrow thereby potentially impacting downstream fish resources through the introduction of sediment and/or debris. Tree left standing provide long-term bank stability, provide wildlife habitat and serve to protect water quality. On steep slopes with landforms susceptible to landslides, reasonably wide buffers may be appropriate.

*Hupacasath Standards*

In effort to reduce landslide hazard associated with timber harvesting and to protect other resources:

- Buffers are to be established on steep terrain (>55% slope) with landforms most likely to initiate landslides, including inner gorge or stream escarpments, gully headwalls and/or gully sidewalls or concave headwater basins.
- Riparian reserve buffers should be a minimum of 30 meters wide.
- Reducing high windthrow hazard through crown modification and/or selective tree removal (feathering) may be advisable with emphasis placed on creating a more windfirm and stable forested edge.

### **3(6) Terrain Stability Field Assessments**

*Background Information*

Terrain Stability Field Assessments (TSFAs) as outlined in the Mapping and Assessing Terrain Stability FPC guidebook (1995) are expected in moderate to high hazard areas to ascertain the likelihood of landslide occurrence that may result in a "material adverse effect" to watercourses supporting fish or overall water quality, or other forest resources. In order to adequately manage and conserve resources, TSFAs are required for timber harvest planning where proposed cutblocks and/or roads are within or adjacent to landforms and terrain that have a moderate to high likelihood of landslide occurrence. In areas where very high value resources are at risk, it may be appropriate to evaluate lower hazard areas as well.

*Hupacasath Standards*

TSFAs are required for lands within and adjacent to proposed cutblocks and/or roads:

- In the Nahmint watershed where recent terrain and landslide hazard mapping (Denny Maynard and Associates Ltd. /Golder Associates Ltd., 2004) indicates a likelihood of >2 landslides per 100 hectares.
- For lands within other watersheds in the Hupacasath territory that contain:
  - >55% slopes and inner gorge or stream escarpments, gully headwalls and/or gully sidewalls or concave headwater basins.
  - >55% slopes or class IV or V terrain, or areas mapped as potentially unstable or unstable terrain.
  - Historic instability or areas with field indicators of present or past slope movement.
  - Fans that could be destabilized by a landslide or forest harvesting.

*Hupacasath Standards*

In relation to the content of TSFAs:

- TSFA traverses along falling boundaries must describe the terrain inside and outside (+/-50 m) the falling boundary.
- Traverses along road alignments must describe the terrain immediately upslope and downslope of the centerline.
- Additional traverses within the proposed cutblock area may be necessary to fully evaluate and describe terrain conditions.
- In cases where a definitive map or air photo determination can not be made, areas which are sometimes a considerable distance below the cutblock or road will need to be evaluated on the ground to adequately assess and identify potential landslide runout zones and resources at risk.
- Include an assessment of landslide likelihood, runout distances and potential damage to resources. TSFA reports should discuss the likelihood of landslide initiation (from roads, harvesting or windthrow) as well as likely runout distances, expected landslide size ranges and any environmental effects that are likely to occur as a result of landslide activity (including but not exclusive to effects on streams, lakes, standing timber and soils). Sound rationales and/or the data supporting these interpretations must be provided.
- An indication of windthrow hazard adjacent to unstable terrain and forest resources should be included, or the TSFA should specify those areas where windthrow could be a concern and recommend that a windthrow hazard assessment be done.

### 3(7) Variable Retention Timber Harvesting

#### Background Information

Forest management that attempts to sustain biodiversity through the use of variable retention timber harvesting will better serve values held by the Hupacasath than would clearcutting. The scientific community has expressed ecological concerns about clearcutting based on the simplification of forest structure and the resulting impact on biological diversity. There is concern that even-aged forest management practices such as clearcutting do not adequately protect forest structural elements or leave biological legacies (e.g. snags, downed logs, large old trees) to meet the needs of wildlife following timber harvest. Retention of valuable biological structural elements does much to achieve ecological objectives.

Variable retention refers to the overall harvesting approach whereas the retention system refers to a specific silvicultural system. The key element of variable retention systems is to leave portions of the existing stand unharvested. Leaving both dispersed trees and grouped forest patches provide biological legacies as “lifeboats” for species and processes after logging and before forest cover is reestablished and provide better “connectivity” between larger reserves. Remnants contribute to continuous landscape cover and provide pathways for functional habitat needs such as migration and foraging. These structures provide habitat for many species including those that utilize old-growth forests. Variable retention harvesting follows nature’s model by retaining part of the forest after harvest. A wider array of forest management goals are met through use of the retention system than by clearcutting.

#### Hupacasath Standards

In relation to preferred silvicultural systems to be used in timber harvesting:

- All timber harvesting be done so in accordance with retention system standards.

#### Hupacasath Standards

Concerning retention levels:

- Long-term retention targets are required to be at minimum, 30% of total harvestable area. This target includes areas required by legislation (e.g. wildlife tree patches and riparian reserves) as well as additional areas left as a biological legacy.
- Both the level of retention and amount of forest influence are to be recorded to ensure due diligence with regard to maintaining more than 50% of the cutblock under forest edge influence.

#### Hupacasath Standards

In order to ensure that retention is dispersed within the cutblock:

- At least 30% of retention should be visual within cutblock retention as opposed to perimeter or outer edge cutblock retention.

*Hupacasath Standards*

Related to cutblock planning and layout for variable retention timber harvesting:

- Attempt to include dispersed retention along with group or other retention patterns in order to provide a mix of structure and a greater range of conditions for wildlife. Instead of leaving single, dispersed trees, a better option is to leave a small clump of trees along with saplings and intact vegetation.
- Narrow riparian bands of timber (e.g. 5-10 meters) left along small streams are highly vulnerable to windthrow. If retention groups are established along S4, S5 and S6 streams, they should be a minimum of 20 meters wide along either or both sides of streams. In order to further help trap sediment, wider retention should be established at the juncture of road and stream crossings upstream from fish streams.
- The leading windward edge of riparian retention should be located on well-drained soil. Wet soils limit root growth and increase the risk to windthrow. Highly productive riparian areas generally produce larger crowns that are more susceptible to windthrow. Edge windfirming may be required in areas of high windthrow hazard.
- Make “lifeboating” on biological anchors the priority in retention placement. Center retention patches on biological anchors that include but are not limited to: snags, old coarse clumps or other late seral conditions, wildlife trees, riparian areas including small wetlands or depressions including fisheries sensitive zones, deciduous trees, rare or endangered ecosystems, unique plant assemblages, areas with extensive moss cover, rock outcrops, scrubby timber and windthrow patches.
- In an attempt to maintain use of bear dens, it is preferable to establish a clump of leave trees in addition to retaining both saplings and vegetation for at least 20 meters adjacent the entranceway.
- Retention on small wetlands should be large enough to accommodate some windthrow due to wet soils (see section 2(8) Red and Blue-listed Species).
- On steep terrain (>55% slope) landform features most likely to initiate landslides should be buffered (e.g. 20 to 30 meter wide) with use of group retention (see section 3(5) Landslide Hazard).
- Clusters of 3 or more CMTs (or single trees with high significance) require placement in long-term retention patches with a 20 to 30 meter buffer on windward and windward diagonal edges (see section 2(6) Culturally Modified Trees).
- Where substantial windthrow is anticipated in areas of high windthrow hazard, fewer but larger retention groups may be a better option.

### 3(8) Windthrow Management

#### Background Information

In wet, cool, coastal ecosystems, it is recognized that forests are impacted by wind which is a major agent of natural disturbance. Wind may replace whole stands or create small gaps and windthrow occurrence is often random. Occasionally catastrophic windthrow occurs whereby larger areas are impacted. What follows is pertinent to the management of endemic windthrow in an attempt to minimize timber harvest-related windthrow and its potential impact on natural resources.

It is understood that due to the random nature of climatic variables (wind, rain) and the complex nature of site and stand factors, there is uncertainty concerning treatment outcomes. Windfirming treatments are expected to reduce the incidence and severity of windthrow but are not expected to prevent the occurrence of windthrow altogether. Some level of windthrow may occur even after edge stabilization treatments are undertaken. Windthrow along harvested forest edges can be considered to be within the range of natural variation when extended across the landscape. Some extent of windthrow may actually contribute towards biodiversity and may reduce overall susceptibility to an unexpected larger catastrophic windthrow event.

Windthrow may have a negative impact when the damage interferes with the achievement of management objectives. Windthrow hazard assessment is to be undertaken for any cutblock forest edge that, if windthrow were to occur, it may result in a potentially significant negative impact to water quality, fish, or fish and wildlife habitat, cultural resources or that may cause a landslide. Assessment of windthrow hazard should include recommendations for mitigating the extent of windthrow where resources may be at risk. Locally, the average distance of endemic windthrow penetration extends up to about 20 meters into standing timber with a maximum distance of about 40 meters (Weyerhaeuser, 2003).

#### Hupacasath Standards

Pertaining to overall windthrow management and harvest planning:

- This plan makes the recommendation that long-term retention levels should be at least 30% of the harvest area. This level of retention should be maintained if salvaging of windthrown timber is undertaken.
- Professional geoscientists complete Terrain Stability Field Assessments (TSFAs) and TSFA reports prepared by them should state that if timber harvest-related windthrow were to occur, what the likelihood of landslide initiation is. If there is the potential for landslides, the TSFA report should offer recommendations for modifications to cutblock layout and/or windfirming to reduce the level of windthrow hazard.
- Available windthrow management tools such as windthrow probability and hazard mapping (Mitchell, 2003) and mapping showing localized actual or known prevailing wind directions should be consulted when developing plans for cutblock layout.
- Field assessment of windthrow hazard should determine historic windthrow orientation as evidence of prevailing wind directions in order to identify critical edge boundaries.
- Windthrow hazard assessment is to be undertaken for any cutblock forest edge that, if windthrow were to occur, it may result in significant impacts to water quality, fish, and fish or wildlife habitat, cultural resources or may cause a landslide.

- Hazard assessment findings should indicate the level of concern or management effort required to achieve a windthrow management outcome. Recommendations should be made for mitigating the extent of windthrow where resources may be at risk.
- Modifications to cutblock design should be well documented to demonstrate due diligence in planning strategies for sound windthrow management.
- Windfirming techniques, whether edge feathering or crown modification through pruning or topping, should be carried out as soon as possible after an edge is exposed. Once tree felling exceeds about 2 tree lengths from a standing edge, resources may be at risk. Windfirming should be completed well before the onset of strong winter winds.

*Hupacasath Standards*

Related to cutblock layout:

- Incorporate wide 20 to 30 meter buffers in high risk environments such as windward boundaries on fish-bearing streams and along landforms most likely to initiate landslides such as on steep terrain (>55% slope) including inner gorge or stream escarpments, gully headwalls, gully sidewalls or concave headwater basins. Stream channels on fans at the base of gullies tend to be vulnerable to destabilization so incorporate wide buffers on fans as well.
- Minimize windward boundaries on south facing, tall or large crowned timber, especially on upper slopes and ridgetops as these are highly prone to windthrow.
- In high hazard areas use larger retention patches rather than more vulnerable smaller patches. Position larger retention patches to the leeward side of the cutblock if possible to reduce risk.
- Where steep or possibly unstable terrain lies adjacent to a windward boundary, move the falling boundary 20 to 30 meters back from the deflection break to reduce the potential for windthrow to extend into unstable terrain thereby possibly initiating a landslide.
- Establishing boundaries well back from the deflection break in combination with edge feathering and/or windfirming may be warranted along high risk boundaries.
- Where crown modification treatments (e.g. pruning or topping) are applied, these should extend for 25 to 30 meters into standing timber as average windthrow penetration distance has been found to be about 20 meters.
- If non-replaceable features such as CMTs or bear dens are placed within retention patches in high hazard areas, then situate them such that standing timber on the windward side is wide enough (e.g. 20 to 30 meters) to absorb windthrow without resources being significantly affected.
- Reducing fetch distance can also be effective in reducing windthrow hazard. A high risk boundary can be protected by installing retention patches (bigger is better) in front of the forested edge.



- Retain trees that have been acclimated to winds where possible. Superdominant vets along a feathered edge or adjacent to established second growth may be quite windfirm and additionally provide unique wildlife habitat.

### 3(9) Salvage of Windthrown Timber

#### Background Information

Some windthrow is to be expected especially with leaving increased amounts of forest edge associated with variable retention timber harvesting. However, old growth attributes in riparian areas may actually be accelerated by windthrow as structural variability in riparian areas is increased with windthrown timber. It has been recommended by some (Franklin, 2003) to avoid salvage in riparian habitats as quite a few species of wildlife utilize clumps of snags and patches of downed wood (Marcot, 2003). Science supports the notion that it is ecologically beneficial to keep downed wood on the ground (Perry, 2003) in terms of the unique role of dead wood in natural ecological functions. Additional soil disturbance may also occur when windthrown trees are yarded from riparian areas and this may impact water quality and downstream fish.

Legislation stipulates that trees not be removed from designated wildlife tree patches (WTPs) or from riparian reserve zones (RRZs) unless prior approval is granted. If economic, windthrown trees have been salvaged locally from areas other than WTPs and RRZs if the windthrown area is in excess of long-term retention level targets as defined by Weyerhaeuser's Stewardship Zone requirements (e.g. 10%, 15% and 20% retention).

This LUP has established a higher standard (see section 3(7) Variable Retention) whereby 30% is the minimum requirement for long-term retention, while 30% of that is to be positioned within the cutblock. This retention should be set aside as "hard" retention (as is WTP and RRZ) and is not to be salvaged if windthrown. In addition, riparian salvage should be avoided if there is a likelihood of introducing sediment into streams through increased soil disturbance either during the salvage operation or later on during subsequent heavy rainfall. As suggested by specialists, it may be preferable for windthrow to remain as part of the natural ecosystem process in riparian areas. Water quality may be better maintained, old growth structure and habitat enhanced and ecosystem processes better served by not salvaging windthrown trees in riparian areas.

#### Hupacasath Standard

In relation to log salvage:

It is preferable that windthrown timber in riparian management areas (RMAs as established by legislation), including CMTs, be left unharvested except where:

Salvage can occur if water quality and downstream fish will not be affected.

Salvage can occur if windthrown trees are in excess of the Hupacasath minimum long-term retention standard of 30%.

### 3(10) Forest Health

Hupacasath Standards

In order help ensure sustainability of future forests:

**3(10)(i) Hemlock Dwarf Mistletoe**

- The Hawksworth dwarf mistletoe rating system should be used by professionals when developing harvest prescriptions in order to identify areas having a high incidence of infection requiring control measures.
- Plant immune species such Western red cedar or Cypress for 15 meters or more adjacent infected trees to control the spread.
- Fell heavily infected trees along the cutblock perimeter at the time of harvest.
- Fell heavily infected saplings within the cutblock (e.g. 3 meter knockdown).
- If left unharvested, heavily infected trees should be positioned well within retention patches.

**3(10)(ii) Root Disease and Rot**

- Where trees planned for harvest contain obvious signs of infection, a preharvest walkthrough assessment by a qualified person should be done in order to stratify low, medium or high incidence of infection. A systematic root rot survey should be undertaken to stratify medium incidence of infection to define specific areas in need of management such as stumping with reforestation of less susceptible species.
- Plant immune species such Western red cedar or Cypress for 15 meters or more adjacent infected forest edge and/or infected pockets within the cutblock to control the spread.
- Carry out stump excavation in areas of the cutblock that are highly infected.

## **3(11) Not Satisfactorily Restocked Area**

Background Information

Standards for maximum size of not satisfactorily restocked (NSR) area do not currently exist in legislation. In effort to provide clarity to silviculturalists and others concerned with free-growing requirements and in order to better ensure the establishment and sustainability of the forests, it may be advisable to establish such standards.

Hupacasath Standards

Concerning NSR and reforestation:

- For the non-roadside portion (setting), an area constitutes NSR if a minimum of 1.0 ha or patches of 0.25 ha adding up to 2.0 ha of continuous productive area has achieved less than minimum stocking standards.

- For roadside areas, an area constitutes NSR if a minimum of 0.3 ha of continuous productive area has achieved less than minimum stocking standards.
- It is expected that reforestation efforts will not be directed towards meeting only minimum stocking standards.
- If planting, require doing so within 2 growing seasons since prime harvest completion.
- Prime harvest completion is defined as 'logs yarded or flown to the landing or roadside.'

### 3(12) Standing Stem Helicopter Harvesting

#### Background Information

'Standing stem' is a relatively new term used to describe a harvest method (Weyerhaeuser 2003). Individual trees are harvested by helicopter while they are still standing. The term applies regardless of the number of trees removed and whether removed singly or in groups. The retention silvicultural system is most often employed with the standing stem method but other systems have also been used. This technique allows timber to be harvested from previously inoperable terrain where conventional cable or ground-based yarding would not be possible. Furthermore, if trees were conventionally felled in some of these areas, breakage due to rocky terrain would greatly reduce log quality and value. High retention levels are maintained and other values can be protected using this harvest method.

If done properly, this roadless method of logging is preferable as it can result in the least overall impact to the environment. Logged areas may also mimic natural disturbance patterns reasonably well. Specific objectives can be met while extracting high value timber from previously constrained or inoperable areas (e.g. Es1 and class V terrain) while maintaining non-timber values. The economic benefits include added employment, additional spin-offs to the local community and increased provincial stumpage revenues. While vertical helicopter yarding minimizes log breakage and maintains the value of high quality logs, specialized care must be taken to ensure that forests are not "highgraded" thereby jeopardizing future forest sustainability.<sup>1</sup>

In terms of managing for non-timber values, standing stem harvesting may produce some additional benefits. Single tree or small patch removal may provide additional light to increase spring forage. Biodiversity may be increased through increased diversification of ground vegetation. Removal of some large crowned trees in riparian areas can reduce overall susceptibility to windthrow and thereby provide an added measure of protection for water quality. In planning for the standing stem harvest method, one must initially identify the critical resource values to be protected, determine what is needed to protect those values, and finally, to make a decision as to whether there is any opportunity for timber harvesting.

Concerns with standing stem helicopter logging usually center on:

- How much of the forest is removed and subsequently left standing.
- Whether harvesting is focused on only one or two species (usually cedar and fir).
- How other non-timber values may be impacted.
- The amount of residue left from logging.
- Silvicultural concerns related to small gaps, shading and forest health.
- Whether conventional harvesting could be employed instead.

### 3(12)(i) Diameter Limitations for Tree Removal

#### Background Information

One way to help ensure that “highgrading” issues do not arise is to limit the harvest removal to stems within a range of diameter classes. Both smaller and larger stems are then left standing. As an example, for a given site the weight per m<sup>3</sup> associated with cedar and Douglas fir in relation to the corresponding maximum lift capacity of the helicopter, may dictate that cedar can be harvested if within 60 to 110 cm dbh and fir if within 60 to 90 cm dbh. Smaller trees are uneconomic to harvest vertically using an expensive helicopter and so are left to grow and replace the larger diameter classes scheduled for removal. Conversely, larger trees are too heavy so are left unharvested as well. Remaining very large trees provide old growth attributes for wildlife habitat and forest structure. Within the species and diameter ranges selected for harvesting (based on local weight factors), not all trees are taken. As this form of logging is quite expensive, only those trees free of defect and of the best form are harvested. This leaves a large percentage unharvested even within the diameter range selected for removal. If done properly, other forest values like biodiversity, old growth attributes and terrain stability, should be maintained as so few trees are removed (usually about 20 to 30%) using this specialized method of vertical felling with helicopter yarding.

<sup>1</sup> Highgrading has been defined as: the removal of only the best trees from a stand, often resulting in a residual stand of poor quality trees (BC Forest Service glossary). the larger diameter classes scheduled for removal. Conversely, larger trees are too heavy so are left unharvested as well. Remaining very large trees provide old growth attributes for wildlife habitat and forest structure. Within the species and diameter ranges selected for harvesting (based on local weight factors), not all trees are taken. As this form of logging is quite expensive, only those trees free of defect and of the best form are harvested. This leaves a large percentage unharvested even within the diameter range selected for removal. If done properly, other forest values like biodiversity and terrain stability should be maintained as so few trees are removed (usually about 20 to 30%) using this specialized method of vertical felling with helicopter yarding.

#### Hupacasath Standards

Regarding tree removal based on diameter limits:

- Harvest planning determines a specific mid range of diameters available for removal. Smaller trees are to be left to grow into the partially-harvested diameter range along with unharvested larger trees left standing to satisfy a range of resource values.

### 3(12)(ii) Log the Profile

#### Background Information

The majority of trees marked for removal by the standing stem harvest method are high value fir, cedar or cypress. Lower value hemlock and especially balsam are not marked for removal although top quality hemlock is sometimes economic to harvest when combined with other species. In order to ensure that single species are not “highgraded”, a standard to “log the profile” is established. Recent timber cruise data offers actual stand species composition.

Hupacasath Standards

Concerning tree removal based on the stand species profile:

- The proportion of the existing stand that represents any species to be harvested, establishes the proportion eligible for harvest removal, including up to a 40% tolerance limit.

**3(12)(iii) Logging on Previously Inoperable Terrain**

Hupacasath Standards

Concerning helicopter logging previously inoperable terrain:

- A qualified geoscientist must assess the stability of areas proposed for standing stem harvesting and make recommendations pertaining to the suitability and level of tree removal based on any concerns regarding slope stability.

**3(12)(iv) Harvest Gap Size**

Background Information

BC Ministry of Forests model results as described in the Coastal Watershed Assessment Procedure Guidebook, have shown that a one tree height opening on flat ground receives less than 10% of the incident light that a full opening would receive. Modeling results have also shown that a two tree height opening on flat ground receives about 30% of the incident light that a full opening would receive (Province of British Columbia, 1999).

Light in openings less than one tree height would no doubt be a limiting factor to reasonable tree growth. However, light in somewhat larger openings may not be a limiting factor to reasonable tree growth. In terms of how large an opening should be in order to provide adequate light, it has been shown that Douglas fir requires an opening of at least 0.5 hectare in size to support reasonable tree growth (de Montigny, 2003).

Hupacasath Standard

Concerning harvest gap size:

- Small harvested openings less than 1 tree height in size may not be considered NSR.
- Larger openings of 2 tree lengths or more in size should be considered NSR and reforested either naturally or artificially in accordance with approved free-growing stocking standards.
- Tree heights used in this calculation should not be based on cruised stand averages but should be based on the actual height of remaining edge trees. Opening sizes can be measured from tree dripline to dripline along the gap perimeter.

**3(12)(v) Other Silvicultural Considerations**

*Hupacasath Standards*

Regarding maintenance of desirable species and forest health:

- Professionals developing prescriptions for standing stem harvesting should ensure that undesirable shifts in species composition do not occur such as offsite hemlock becoming established where Douglas fir is preferred.
- In areas heavily infected with hemlock dwarf mistletoe, standing stem harvesting of small openings may not be deemed appropriate without additional control measures.

## **SECTION 4: SPECIFIC AREA STANDARDS**

## 4(1) Specific Area Standards

The following standards apply to specific lands within the territory. Specific area standards contribute to the larger goal of sustainable development in the territory and include:

- Somass Estuary Management Plan
- Fish Habitat Conservation Units

## 4(2) Somass Estuary Management Plan

### Background Information

The Somass River Estuary lies at the mouth of the Somass River, the second largest river on Vancouver Island. The intertidal, marine and river portions of the estuary together are of major importance for fisheries, waterfowl and botanical values.

The Somass Estuary is currently a highly disturbed and degraded environment. Resource management practices taking place adjacent the estuary should not add to the problem. Privately-owned areas with resources important to the functioning of the estuary are termed Key Adjacent Properties in the Somass Estuary Management Plan or SEMP (Catherine Berris Associates Inc., 2004). The plan states that *“certainly, by far the largest impacts have resulted from industrial development along the City’s waterfront, from dyking, and from the location of sewage and effluent lagoons on the tidal flats.”* In the past, the situation was so serious regarding pulp mill effluent, that special legislation was enacted in 1992, under the federal Fisheries Act. The Port Alberni Pulp and Paper Effluent Regulations were formulated to *“protect the sensitive ecosystem of Alberni Inlet and to mitigate the impact of the mill on migrating Sockeye and Chinook salmon.”* Due to the highly sensitive and important nature of Alberni Inlet to salmon, more stringent discharge limits were needed.

In terms of impacts to Alberni Inlet related to the adjacent terrestrial environment, SEMP also states that one of the past activities within the surrounding watershed that has had a major impact on the estuary included the removal of the forest.

Two ‘Key Adjacent Properties’ were identified in SEMP. These include a poplar plantation owned by NorskeCanada along the southern shore of the Somass River as well as forested patches and a forestry shop complex owned by Weyerhaeuser and a works yard owned by Coulson to the north of Shoemaker Bay. Weyerhaeuser also owns land along the western shores of the estuary at the head of Alberni Inlet. These private lands are also identified as being within the Shoemaker and Arbutus Special Management Areas as described in Land Use Plan Phase 1.

SEMP did not include specific recommendations for privately owned lands lying adjacent to the estuary but recognized that *“activities throughout the watershed (particularly those involving water quality and maintenance of stream flow) have significant impacts on the estuary and must be taken into account in the management plan.”* The plan goes on to say that *“analysis and recommendations in this plan address that larger area of influence at a broader level (e.g. upstream water resources, adjacent riparian areas, surrounding land uses).”* Also to *“work with the existing owner of the upland and riparian forested areas in the Key Adjacent Properties and secure or manage the land to protect its existing fish, wildlife and vegetation values.”* Additionally, if this is accomplished, to *“implement the relevant management strategies.”* Management strategies in SEMP deal with issues related to fish and wildlife, vegetation, culture and heritage, industry and other land uses as well as recreation and access.



Hupacasath Standards

Related to protecting the Somass River Estuary:

- Relevant management strategies given in the Somass Estuary Management Plan should be implemented to lands described as 'Key Adjacent Properties' in the plan.
- It is preferable to not harvest timber described as forested patches in 'Key Adjacent Properties'.
- Timber harvesting within the Somass watershed should be conducted in accordance with standards developed by the Hupacasath for Special Management Areas in this plan.

### **4(3) Fish Habitat Conservation Units**

Background Information

Fish habitat conservation and restoration efforts can be prioritized according to important fish habitat conservation units. The most important waterways (including their tributaries) for fisheries resources in the Hupacasath territory include the following:

- Somass River
- Stamp River
- Great Central Lake
- Sproat Lake
- Nahmint Lake and Nahmint River
- Gracie Lake and Gracie River
- Taylor River
- Franklin River
- Corrigan Creek (lower end)
- Franklin River
- Mactush Creek
- China Creek (below falls)
- Cook Creek
- Coleman Creek
- Cous Creek
- Doran Creek

Over time, Hupacasath have observed that rivers and streams have become wider and shallower, causing the loss of valuable fish habitat (Hupacasath Fisheries Department, 2004). This is likely due to an increase in stream velocity thereby enabling materials to move downstream. Removal of adjacent forest cover through logging and road building may have also resulted in at least short-term increases in water temperature, also negatively impacting water quality and fish habitat. The control of water quality and temperature is important for returning adult salmonids on their upstream migration (Catherine Berris Associates Inc., 2004).

The importance of these watercourses to the fisheries resource cannot be overstated. For instance, the Somass River system supports one of the most productive fisheries on Vancouver Island. It is estimated that the Somass River system accounts for close to 90% of the salmon escapement for Barkley Sound and is of major importance to the commercial, recreational and First Nations salmon fishery. The Stamp River is one of the most heavily fished Steelhead

streams in BC and has the largest run of summer Steelhead on Vancouver Island (Catherine Berris Associates Inc., 2004).

*Hupacasath Standards*

- The waterways listed above, are designated as fish habitat conservation units.
- In effort to support and nurture future salmon populations, these waterways should be prioritized for stream restoration, conservation and enhancement of fish habitat, where suitable. Constructed stream side channels may enhance refuge and feeding habitat for juvenile salmonids.
- A detailed habitat and restoration plan should be developed that focuses on providing fish habitats in degraded aquatic ecosystems. Potential projects should be prioritized based on environmental benefits and costs associated with planning and construction. The new Watershed Assessment Process (WAP) would be a useful tool to use in identifying restoration areas and in setting priorities.

## **References**

Bancroft, B. and K. Zielke. 2003. Evaluation of Variable Retention Cutblocks – Company Report – All Timberlands Weyerhaeuser BC Coastal Group. Prepared by Symmetree Consulting Group Limited for Weyerhaeuser Company Limited, BC Coastal Group, Nanaimo Timberlands Services, Nanaimo, B.C.

Catherine Berris Associates Inc., 2004. Somass Estuary Management Plan. Prepared for the Somass Estuary Management Committee, Port Alberni, B.C.

Carson, B. 2002. Assessing Soil Erosion from Roads and Mitigating its Potential to Degrade Water Quality in Coastal British Columbia. FRBC report for Ministry of Water, Land and Air Protection.

Coates, D., S. Haeussler and J. Mather. 1990. A Guide to the Response of Common Plants in British Columbia to Management Treatments. FRDA handbook, ISSN 0835-1929: 008. BC Ministry of Forests, Victoria, B.C.

de Montigny, L. 2003. Personal communication. The Ecology and Silviculture of Variable Retention in BC Coastal Forests. Malaspina College presentation held on April 25, 2003.

Denny Maynard and Associates Ltd. /Golder Associates Ltd. 2003. Nahmint - Upper Kennedy Landslide Inventory. Report and maps prepared for Weyerhaeuser Company Ltd., BC Coastal Group, Nanaimo Timberlands Services, Nanaimo, B.C.

Denny Maynard and Associates Ltd./Golder Associates Ltd., 2004. Nahmint-Kennedy-Mactush Terrain and Landslide Hazard Mapping Project. Report and maps prepared for Weyerhaeuser Company Ltd., BC Coastal Group, Nanaimo Timberlands Services. Nanaimo, B.C.

Forest Practices Board, 2003. A Special Report on the Use of Water Quality Objectives Under Forest Practices Legislation – Lessons for the Future. FPB/SR/14.

Franklin, J. in Weyerhaeuser Company Limited, 2003. Summary of the Fifth Year Critique Workshop on the Weyerhaeuser BC Coastal Forest Project (Coast Forest Strategy) July 7-9, 2003. Weyerhaeuser Company Ltd., BC Coastal Group, Nanaimo Timberlands Services. Nanaimo, B.C.

Hupacasath First Nation. 2004. Hupacasath First Nation Cedar Strategy. Port Alberni, BC.

Hupacasath Fisheries Department. 2004. Personal communication. Conversation held on June 22, 2004 at the Hupacasath office in Port Alberni, B.C.

Marcot, B. in Weyerhaeuser Company Limited, 2003. Summary of the Fifth Year Critique Workshop on the Weyerhaeuser BC Coastal Forest Project (Coast Forest Strategy) July 7-9, 2003. Weyerhaeuser Company Ltd., BC Coastal Group, Nanaimo Timberlands Services. Nanaimo, B.C.

Mitchell, S. 2003. Windthrow Hazard Mapping Using GIS, Weyerhaeuser West Island Timberlands. Prepared for Weyerhaeuser Company Ltd., Nanaimo, B.C. at the Faculty of Forestry, University of British Columbia, Vancouver, B.C.

Noss, R. in Weyerhaeuser Company Limited, 2003. Summary of the Fifth Year Critique Workshop on the Weyerhaeuser BC Coastal Forest Project (Coast Forest Strategy) July 7-9, 2003. Weyerhaeuser Company Ltd., BC Coastal Group, Nanaimo Timberlands Services. Nanaimo, B.C.

**Hupacasath First Nation**  
**TERRITORY LAND USE PLAN – PHASE 2**

---

Port Alberni Pulp and Paper Effluent Regulations. 1992. SOR/92-638 under the Fisheries Act.

Perry D. in Weyerhaeuser Company Limited, 2003. Summary of the Fifth Year Critique Workshop on the Weyerhaeuser BC Coastal Forest Project (Coast Forest Strategy) July 7-9, 2003. Weyerhaeuser Company Ltd., BC Coastal Group, Nanaimo Timberlands Services. Nanaimo, B.C.

Province of British Columbia. 1995. Coastal Watershed Assessment Procedure Guidebook (Forest Practices Code of BC). BC Ministry of Forests and BC Environment, Victoria, B.C.

Province of British Columbia. 1995. Fish-Stream Identification Guidebook (Forest Practices Code of BC). BC Ministry of Forests and BC Environment, Victoria, B.C.

Province of British Columbia. 1995. Mapping and Assessing Terrain Stability Guidebook (Forest Practices Code of BC). BC Ministry of Forests and BC Environment, Victoria, B.C.

Province of British Columbia. 1995. Riparian Management Area Guidebook (Forest Practices Code of BC). BC Ministry of Forests and BC Environment, Victoria, B.C.

Teti, P. 2003. Shade and Stream Temperature in Streamline Watershed Management Bulletin. Volume 7, Number 4 Winter 2003/04.

Weyerhaeuser Company Limited, 2001. Summary of the Third-Year Critique Workshop on the Weyerhaeuser BC Coastal Forest Project (Coast Forest Project). Weyerhaeuser Company Ltd., BC Coastal Group, Nanaimo Timberlands Services. Nanaimo, B.C.

Weyerhaeuser Company Limited, 2002. Timber Supply Analysis Information Package for Tree farm License 44 – Management Plan No. 4. Weyerhaeuser Company Ltd., BC Coastal Group, Nanaimo Timberlands Services. Nanaimo, B.C.

Weyerhaeuser Company Limited, 2003. Summary Report – West Island Variable Retention Windthrow Monitoring Pilot Project – 2001 to 2003. Weyerhaeuser Company Ltd., BC Coastal Group, Nanaimo Timberlands Services. Nanaimo, B.C.

Weyerhaeuser Company Limited, 2003. Summary of the Fifth-Year Critique Workshop on the Weyerhaeuser BC Coastal Forest Project (Coast Forest Strategy) July 7-9, 2003. Weyerhaeuser Company Ltd., BC Coastal Group, Nanaimo Timberlands Services. Nanaimo, B.C.

Weyerhaeuser Coastal Timberlands, Standing Stem Working Group. 2003. Standing Stem Harvesting Guidelines. Weyerhaeuser Company Ltd., BC Coastal Group, Nanaimo Timberlands Services. Nanaimo, B.C.

Zielke, K., B. Beese. 2004. SPs for VR Guidelines for Designing Variable Retention – Layout and Silvicultural Prescriptions. Weyerhaeuser Company Ltd., BC Coastal Group, Nanaimo Timberlands Services. Nanaimo, B.C.