



The Teal-Jones Group

Fraser Public Advisory Group
(Fraser PAG)

Ecosystem Condition and Productivity

Forest License A19201 & Timber
License T0822

Sustainable Forest Management



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Introduction

This document has been created to give members of the Fraser Public Advisory Group (Fraser PAG) relevant background information to participate in identifying and selecting local Values, Objectives, Targets and Indicators for ecosystem condition and productivity.

The goal of this meeting is to identify values, objectives, indicators and targets for Ecosystem condition and productivity, considering:

- Forest Ecosystem Resilience
- Forest Ecosystem Productivity

In order to aid members and their respective groups, the following information is provided in this document.

- Overview of Ecosystem Condition and Productivity
- Forest License A19201 & Timber License T0822 (the **Defined Forest Area** or **DFA**) and ecosystem condition and productivity (including a brief description of mandatory indicators that Teal must measure for other commitments or processes e.g., legislative requirements, government policy, etc.)
- Reference set of indicators from the Canadian Council of Forest Minister
- Examples of indicators used by other forest companies on the coast in their Sustainable Forest Management Plans

Ideally members will review this package prior to the meeting. This will enable members to:

- Educate themselves (and their group where applicable) on ecosystem condition and productivity
- Bring forth informed ideas and opinions to the meeting
- Participate effectively and efficiently to maximize valuable discussion time at meetings

Please feel free to contact us if you have any questions on this material, or bring your questions to the meeting!



Overview of Ecosystem Condition and Productivity

Ecosystem Condition and Productivity is the health, vitality and rates of biological production in forest ecosystems

In order for resource development to operate sustainably, ecosystems must be functioning normally over the long term. Normal functioning requires appropriate levels of health, vitality and productivity of its components. Ecosystem functioning is measured by forest condition. Forest condition is a measure of relative freedom from stress (health) and relative level of physical/biological energy (vitality) within a forest ecosystem.

Forest Ecosystem Resilience

Forest Ecosystem Resilience is ability of forest ecosystem processes and conditions to recover from or adapt to disturbances

Ecosystem resilience reflects the persistence of ecosystems and their capacity to absorb change and disturbance while maintaining the same productivity and the same relationships among populations. The focus is on the potential for populations to recover from very low levels by having adequate regenerative capacity and a balanced distribution of forest types and age classes.

Forest Ecosystem Productivity

Forest Productivity is the rate of flora and fauna production.

Forest productivity refers to rates of flora and fauna production, which depend on the degree to which nutrients, water and solar energy are absorbed and transferred within the ecosystem. Sustainable productivity within a forest ecosystem is dependent upon the ability of the ecosystem's components and their populations to recover from or adapt to disturbances.

Forest Productivity refers to the condition of the forest in terms of biomass production of all species and types and includes the ability of ecosystems to support rarer species.¹

¹ Canadian Council of Forest Ministers Criteria & Indicators (2003) www.ccfm.org



The Defined Forest Area: Ecosystem Condition and Productivity

The combination of topography, soils and climate have resulted in a full range of growing sites for commercial tree species, however the majority of the DFA is situated on medium quality growing sites. The dominant tree species are hemlock and amabilis fir on the coast, with lesser amounts of Douglas fir, western red cedar, yellow cedar, and minor amounts of spruce, pine and alder. In the interior

The following information describes some of the management challenges to ensure ecosystem condition and productivity are maintained, and actions Teal undertakes to achieve this goal.

Forest Regeneration

A combination of activities are implemented in order to establish and maintain a new forest following harvesting and/ or other disturbances. These activities are referred to as Basic silviculture, and may include planting (reforestation), brushing or site preparation. Basic silviculture is focused on insuring that all harvested areas are regenerated and reach a "free-growing²" state, it is a legal obligation and is undertaken at Teal's expense.

Reforestation

Where planting is required, high quality seedlings are planted to maintain physiological vigour. Currently, about 95% of reforested areas are planted and the balance utilizes natural regeneration. The major species planted have been Douglas fir, western red cedar, western hemlock, amabilis fir, grand fir and yellow cedar and Sitka spruce, mountain hemlock, alder and noble fir. Generally, planting occurs within one to two years following harvesting. Planting is carried out as necessary to meet stocking requirements or to favour rapid early growth so that visual quality, hydrologic recovery and wildlife objectives are met.

Brushing

The basic silvicultural program strives to prevent the suppression of potential crop-trees by competing vegetation typically by planting shortly after harvesting. However, if situations develop whereby crop-tree growth and survival is significantly threatened by competition, action is taken to release the trees by manual (powersaws) and/or chemical methods. Experienced staff will determine treatment needs after having considered environmental and worker protection, probability of treatment success, and expected benefits. No chemical herbicides are used in the Pitt River area of the DFA.

² Free Growing is defined as a stand of healthy trees of a commercially valuable species, the growth of which is not impeded by competition from plants, shrubs or other trees



Chemical treatment procedures follow applicable legislative requirements and are detailed within a Pest Management Plan (PMP). They may include aerial or backpack spraying techniques. All chemical applications are applied by or under the direct supervision of a Certified Pesticide Applicator according to the terms of the PMP. The primary brush species are bigleaf maple, red alder near the coast and sitka alder, vine maple and Douglas maple, hazelnut, birch and Ceonothus in the interior. Cottonwood is occasionally brushed in both areas.

Site Preparation

In some cases, site preparation is carried out to facilitate reforestation and may involve a combination of prescribed burning, mechanical or chemical site preparation techniques. During recent years, the number of hectares that have been broadcast burned has declined dramatically due to public concerns over air quality and the high cost of treatment. Most of the prescribed burns were conducted in the mid to late 1980's. No broadcast burning is conducted presently and is not anticipated to be used in the foreseeable future.

Chemical site preparation (clearing brush for planting) is not generally used in the DFA as prompt reforestation is a more effective and cost effective technique. Mechanical site preparation to disperse logging slash to improve plantability is most commonly used to reduce roadside accumulations of logging debris (non-merchantable wood that has accumulated during yarding). Debris is typically either piled or dispersed. Roadside piles are then burned in the fall.

Incremental Silviculture

Incremental silviculture is applied to free growing stands to increase the yields of merchantable volume and/ or wood quality, to reduce the time to future harvest, to increase wildlife capability or in some cases to increase employment in high unemployment areas. On crown lands, incremental silviculture is not a legislated requirement; however, funding may be available.

Commercial Thinning

Commercial thinning involves removing smaller trees for pulp logs and small saw logs while maintaining a healthy, large crop trees. The retained crop trees benefit from the decreased competition and grow faster in diameter. The harvested trees are often trees that are growing the slowest or have the greatest risk of being shaded out and dieing. Commercial thinning is often not included as an 'incremental activity' since it involves commercial harvesting. This activity is highly dependent on prices for small logs as it is often more costly than more intensive harvesting.

Juvenile Spacing

Juvenile spacing is applied to stands that can most benefit from stocking control or a tree species shift. Spacing can also be a tool to enhance spring forage adjacent to designated deer winter ranges. Research trials have shown that investments made on juvenile spacing provide a poor return and that densely stocked stands, on most coastal sites, differentiate in height and diameter adequately without treatment. However, if government funding is provided for employment and community stability purposes, Teal will consider undertaking spacing projects provided that such treatments do not adversely affect the future physical quality of treated stands.



Fertilization

Fertilizer may be broadcast aerially or by hand on the ground to individual trees in order to accelerate growth. In either application, care must be taken to not place fertilizer into fish streams. Aerial fertilization of suitable Douglas-fir leading stands (on moderate or good quality sites) is considered to accelerate green-up and hydrologic recovery. Where fisheries resources are of concern, appropriate government industries are consulted.

Tree Improvement

Improved seed from controlled pollination of selected superior seed orchard trees will result in gains in both timber volume and wood quality. Where available, it is a legal requirement to use seedlings grown from improved seed to plant harvested areas.

Pruning

Pruning projects can be undertaken to improve wood quality (knot free timber) or, in some cases manage forest health issues (e.g., white pine blister rust). However, pruning is ranked below juvenile spacing as an investment due to the high initial cost of treatment, the need to prune twice or more in order to not reduce too many branches (the trees' food factories) at once and the long time it takes to see a return on the investment.

Access Structures

To facilitate forest management, part of the forest land base must be occupied by roads and other structures that provide access to the forest. Minimizing the amount of productive forest land occupied by these structures is an important objective of forest management.³

The area of occupancy of permanent and temporary access structures is minimized and temporary access structures are rehabilitated where appropriate.

Site degradation limits are specified for each cutblock, as appropriate (e.g., limits depend on the soil sensitivity and harvesting system utilized).

Forest Health

Although there are no significant risks to the health of forest resources in the DFA, there are factors, which may affect forest health and must be recognized and managed in order to limit the potential for a widespread infestation. Commonly the management objective for these forest health factors is to conduct site specific assessments and prescribe activities to mitigate their impact and control their proliferation. Current health factors are discussed below:

³ Forest Practice Code Soil Conservation Guidebook May 2001



Mountain Pine Beetle

Mountain pine beetles attack lodgepole pine trees and feed on the bark which weakens and kills the tree. Currently, a mountain pine beetle outbreak is devastating the north central interior of BC. Within the DFA, there is a limited amount of the host pine. There are other species of beetles that each specialize in attacking certain species of conifers in a similar fashion such as the Spruce bark beetle and the Douglas Fir Beetle. .

Root diseases

In the forest, fungal root diseases can kill individual trees or cause large centers of mortality up to approximately age 25. The main root rot diseases in the DFA are caused by *Phellinus* and *Armillaria*. It primarily affects Douglas fir. It spreads primarily from an infected tree via root contact with a tree with uninfected roots. The probability of infection is influenced by host species, age and vigour of host, site factors and presence of the fungus. Douglas fir and hemlock are particularly susceptible to root diseases. Measures include planting less susceptible species or reducing the probability of root contact (by pulling out infected stumps or 'stumping').

Ungulate browse

Forage by ungulates (deer, elk, and mountain goat) on tree seedlings can reduce the growing capacity of a site. Generally, where browse is a problem, the area is managed for wildlife and biodiversity values, resulting in diverse, ecologically rich stands beneficial to ungulates and other species of wildlife.

Pika

Pikas (also known as rock rabbits) are small rodents that live in areas with rocky slopes. They feed on young tree seedlings present in their territory. As rodents, they often go through wild population spikes and can cause significant seedling mortality where they are present.

Dwarf Mistletoe

Dwarf Mistletoe is widespread throughout the range of coastal western hemlock. Heavily infected trees suffer reduced lumber recovery, reduced height and diameter growth, and occasional mortality. Measures include cutting infected stems to avoid spread and preference of alternate tree species where infected stands exist.

Spruce Weevil

Spruce Weevils lay eggs in holes they drill into the bark of the leaders (the very top of the tree) of spruce trees. As the eggs hatch and the larvae feed it leads to wilting and death of the leader. Because the leader dies, the tree grows a new leader or a branch grows into a leader resulting in a crooked or forked top. Repeated attack may result in a tree that is nothing more than a large shrub. Measures generally include avoiding planting of spruce where there is potential for weevil



infestation⁴. There is also a vigorous tree breeding program targeted at developing more resistance to this pest.

Windthrow

Periodic exposure to high winds can greatly reduce crown and stem quality and height growth. Tree mortality occurs when a tree is toppled. Toppled trees can turn over significant amounts of soil which may lead to impacts to streams. Measures to reduce the impact of windthrow are prescribed where windthrow risk is judged to be 'high' or 'very high'. Measures may include cutblock design or treatments to timber edges (e.g., topping and pruning).

Fire

Although not recently a significant issue related to the management of the DFA, some timber losses have occurred due to fire-related damage. The threat of wildfire occurrence is always present and must be managed, particularly during the dry summer months. Teal has various responsibilities in fire prevention, monitoring, and protection. For example, a Wildfire Preparedness plan is updated each year, daily weather is recorded in order to calculate the fire danger hazard, crew are trained in initial fire response techniques and fire equipment is readily available on equipment and in central storage areas.

Silviculture Systems

The selection of an appropriate silviculture system for each harvest proposal in the DFA is a critical element in achieving the objectives for other forest and non-forest resources within the DFA.

Much of the harvest proposals within the DFA are clearcut silviculture systems, meaning that the stand is completely harvested. Increasingly, variations or alternatives to the clearcut silviculture system are applied. A variation to the clearcut system is the clearcut with reserves where groups of trees are left standing within the block for wildlife, fisheries, or visual aesthetics. Partial Cut systems include various silviculture and harvesting systems such as individual tree selection, group retention, strip selection, shelterwood and retention systems and requires that over 50% of the harvested area must remain under forest influence from the adjacent stands or retained patches. Forest influence is defined as the area within one tree height of the stand edge or tree. The size and distribution of the retained areas depends on site-specific conditions. An effort is made to retain both unique ecological characteristics as well as representative samples of the existing stand.

It is important to note that Partial Cut silviculture systems are relatively new to forest management. Teal will monitor, and participate in where appropriate, on-going scientific studies on Partial Cut systems.

⁴ Field Guide to Forest Damage in British Columbia March 2001



Seral Stage Representation

Seral Stage representation is the pattern and timing of forest harvesting operations. Due to past harvesting practices, old growth seral stage is underrepresented for some ecosystem variants within the DFA. Seral stage representation is achieved through the 'Landscape Unit Planning' process, which is only recently been completed for the DFA.

Landscape Unit Planning establishes Old Growth Management Areas, areas that currently meet, or will meet in the future, old growth retention and representation objectives. Old growth management areas are managed for specific structural old growth attributes and ecosystem functions, such as, landscape connectivity, interior forest habitat, or special wildlife habitat features⁵

⁵ Forest Practices Code Biodiversity Guidebook September 1995



General Guidelines for Choosing Local Values, Objectives, Indicators and Targets

The following is a summary of the CCFM Criteria and CSA Elements, which will serve as a starting point for organizing DFA values and objectives. Where local level values and objectives do not fit into CSA Elements, new elements may be developed.

CCFM SFM Criteria 2: Ecosystem Condition and Productivity

Conserve forest ecosystem condition and productivity by maintaining the health, vitality, and rates of biological production.

CSA SFM Element 2.1 Forest Ecosystem Resilience

Conserve ecosystem resilience by maintaining both ecosystem processes and ecosystem conditions.

CSA SFM Element 2.2 Forest Ecosystem Productivity

Conserve forest ecosystem productivity and productive capacity by maintaining ecosystem conditions that are capable of supporting naturally occurring species.



Canadian Council of Forest Ministers

Indicators

Incidence of disturbance and stress (biotic and abiotic)

- 2.1.1 Area and severity of insect attack
- 2.1.2 Area and severity of disease infestation
- 2.1.3 Area and severity of fire damage
- 2.1.4 Rates of pollutant deposition
- 2.1.5 Ozone concentrations in forested regions
- 2.1.6 Crown transparency in percentage by class
- 2.1.7 Area and severity of occurrence of exotic species detrimental to forest condition
- 2.1.8 Climate change as measured by temperature sums

Ecosystem resilience

- 2.2.1 Percentage and extent of area by forest type and age class (ref. 1.1.2)
- 2.2.2 Percentage of area successfully naturally regenerated and artificially regenerated

Extant biomass (biota)

- 2.3.1 Mean annual increment by forest type and age class
- 2.3.2 Frequency of occurrence within selected indicator species (vegetation, birds, mammals, fish).



Example Indicators - Other Forest Companies

CCFM Criterion 2 -Ecosystem Condition & Productivity

CSA SFM Element 2.1 Forest Ecosystem Resilience					
Company	Operation	Value	Objective	Indicator	Target
Teal Cedar Products Ltd. (Teal Jones Group)	Southwest Island Timberlands (TFL 46, TL T0910andFL A52027)	Ecosystem recovery from disturbance & stress	Forest management activities do not compromise the ability of the ecosystem to recover from disturbance and stress.	Successful regeneration (average time required to reforest a cutblock)	Full compliance with regeneration delay requirements in approved stocking standards
				Successful establishment of stands (cutblocks meet free growing criteria)	Full compliance with free growing requirements in approved stocking standards
	Healthy Forests		Minimize stress associated with Harvesting activities	Number of industrial caused fires	Zero accidental industrial caused fires.
			Minimize impacts due to windthrow	Catastrophic Windthrow Events within Riparian Reserve Zones as a result of harvesting activities	Zero Catastrophic Windthrow Events within Riparian Reserve Zones as a result of harvesting activities



CCFM Criterion 2 –Ecosystem Condition & Productivity

CSA SFM Element 2.1 Forest Ecosystem Resilience					
Company	Operation	Value	Objective	Indicator	Target
Teal Cedar Products Ltd. (Teal Jones Group)	Southwest Island Timberlands (TFL 46, TL T0910 and FL A52027)	Healthy Forests	Minimize impacts due to windthrow	Landslides caused by windthrow induced instability as a result of harvesting activities.	All areas, as specified within site level plans, where windthrow may induce instability have edge treatments to avoid windthrow.
Weyerhaeuser	West Island Timberlands	Ecosystem recovery from disturbance & stress	<p>Forest management activities do not compromise the ability of the ecosystem to recover.</p> <p>Access structures are built and maintained for long term uses to support forest maintenance/silviculture, fire protection, recreation while also protecting the soil resource.</p> <p>Rare, endangered or otherwise significant features are identified and their important qualities are protected.</p>	Area out of conformance with Free-to-Grow objectives	Identify and reduce the non-conformance area to below 50 hectares
				Equivalent years of Not Sufficiently Reforested (NSR) (as 5 year rolling average)	Maintain NSR equivalency at < 3 years harvest area
				Area out of conformance with regeneration delay obligations	Less than 20 Hectares non-conformance annually with regeneration delay in the DFA
				Stand level retention in all cutblocks as percent of total cutblock area	Average \geq 15% in-stand retention in 2000 (focusing on riparian areas, structure, wind firmness, distribution and key ecological attributes)



CSA SFM Element 2.1 Forest Ecosystem Resilience					
Company	Operation	Value	Objective	Indicator	Target
Western Forest Products Inc.	North Vancouver Island Region	Resilient forest ecosystems	Maintain distribution of species and age classes (e.g., seral stages)	Seral Stage distribution (on a 5 year basis)	Seral Stage distribution (on a 5 year basis)
Western Forest Products Inc.	North Vancouver Island Region	Resilient forest ecosystems	Maintain and restore critical habitat	Annual ha's attributed to stand and landscape level retention initiatives (by classification) vs. ha's harvested	Annual ha's attributed to stand and landscape level retention initiatives (by classification) vs. ha's harvested
				Km of fish habitat created, restored, or maintained	Cooperate in 100% of WFSPs; site maintenance; report progress
				Ha of new riparian restoration, or maintenance	15 hectares
Western Forest Products Inc.	North Vancouver Island Region	Resilient forest ecosystems	Enhance ecosystem recovery conditions	Percent NAR that meets FG commitments	100%
				Average time to reforestation	Reforest 100% of the harvested area within 3 years on average from time of harvest
				Km of road permanently de-built	To report the total distance of road de-built each year
			Maintain ecological suitability of reforested species to site	Implementation Monitoring	Zero Administrative Penalties



CSA SFM Element 2.1 Forest Ecosystem Resilience					
Company	Operation	Value	Objective	Indicator	Target
Western Forest Products Inc.	North Vancouver Island Region	Resilient forest ecosystems	Maintain ecological suitability of reforested species to site	Conformance with Seed Transfer Guidelines	Zero Administrative Penalties
Western Forest Products Inc.	North Vancouver Island Region	Resilient forest ecosystems	Maintain ecological suitability of reforested species to site	Percent of Seed Orchard seedlings planted	70%
			Maintain ecological suitability of reforested species to site	Number of ha's fertilized at time of planning (in cedar salal sites)	To fertilize 100% of unburned cedar / salal sites at time of planting
		Healthy Forests	Minimize stresses associated with harvesting	Average annual percent in permanent access for DFA	6%
			Minimize stresses associated with harvesting	Percent NAR that meets FG commitments	Percent NAR that meets FG commitments
			Minimize impact on forest due to uncontrolled disease and pests	Percent weevil resistant Spruce vs. total planted in high hazard weevil areas	To plant 100% spruce weevil resistant seedlings trees in high hazard areas
			Minimize impact on forest due to uncontrolled fires	Number of industrial caused fires	Zero accidental operationally caused fires
			Minimize impact on forest due to uncontrolled fires	Average time to control accidental or industrial fires	To control all fires within 24 hours from detection
Minimize impact on forest due to wind throw losses	Percentage of high wind fall risk edges treated	Treat 100% of all "high risk edges"			



CSA SFM Element 2.1 Forest Ecosystem Resilience					
Company	Operation	Value	Objective	Indicator	Target
Canadian Forest Products Ltd.	Englewood Division	A resilient forest ecosystem	Maintain resilient forest ecosystems	Seral stage representation by LU and BEC variant	Achieve seral stage representation objectives ($\pm 10\%$) by LU and BEC variant as detailed in the SFM plan, within three rotations, with focus on old seral until January 2004. Review every 5 years
			Minimize forest regeneration failure	Percent of successfully regenerated cutblocks	Regeneration success on $\geq 95\%$ ($\pm 5\%$) of cutblocks. Ongoing evaluations.
				Percent of cutblocks that achieve free growing status as specified in SP's.	100% cutblocks will achieve free growing status within the free growing assessment period specified in SP's.



CSA SFM Element 2.2 Forest Ecosystem Productivity					
Company	Operation	Value	Objective	Indicator	Target
Teal Cedar Products Ltd. (Teal Jones Group)	Southwest Island Timberlands (TFL 46, TLT0910 and FLA52027)	Productive forest ecosystem	Conserve productivity of forests by minimizing disturbance due to harvesting activities	Compliance with soil conservation limitations (permanent access structures and soil disturbance)	Full compliance with permanent access and site disturbance limitations as specified within operational plans (or within legislation where not specified within the operational plan)
Western Forest Products Inc.	North Vancouver Island Region	Productive forest ecosystems	Maintain natural biological diversity	Seral Stage distribution (on a 5 year basis)	Seral Stage distribution (on a 5 year basis)
			Maintain natural biological diversity	Annual ha's attributed to stand and landscape level retention initiatives (by classification) vs. ha's harvested	Annual ha's attributed to stand and landscape level retention initiatives (by classification) vs. ha's harvested
			Maintain natural biological diversity	Number of known species classified as threatened or endangered (COSEWIC & CDC)	Number of known species classified as threatened or endangered (COSEWIC & CDC)
			Maintain natural biological diversity	Number of fry released annually	1,000,000
			Maintain productivity through appropriate harvesting systems	Implementation Monitoring	Implementation Monitoring



CSA SFM Element 2.2 Forest Ecosystem Productivity					
Company	Operation	Value	Objective	Indicator	Target
Western Forest Products Inc.	North Vancouver Island Region	Productive forest ecosystems	Enhance growth of forest through enhanced silviculture	Number of ha's broadcast fertilized	Number of ha's broadcast fertilized
			Enhanced Silviculture on suitable sites	Dollars invested in enhanced forestry	To maintain investment in enhanced forestry activities at \$1,000,000 per year (Year 2000 level)
Canadian Forest Products Ltd.	Englewood Division	A productive forest ecosystem	Conserve the productivity of forest ecosystems by using appropriate harvesting systems for the site	Percent of cutblocks at or below site degradation specifications identified in SP's	100% ($\pm 1\%$) of cutblocks in compliance with site degradation objectives specified in SP's
			Conserve the productivity of forest ecosystems including their ability to support Identified Wildlife and federally listed endangered or threatened species	Seral stage representation by LU and BEC variant	Achieve seral stage representation objectives ($\pm 10\%$) by LU and BEC variant as detailed in the SFM plan, within three rotations, with focus on old seral until January 2004. Review every 5 years
				Areas set aside for special management associated with known habitat features as they are discovered	Establish management zones around special habitat features, as they are located, and where worker safety will not be compromised