A Systematic Ecological Restoration Assessment in the Forest Regions of British Columbia

The Results of Six Workshops

Summary: Ecological Restoration Priorities by Region

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Executive Summary

Forest Renewal BC and Ministry of Environment Habitat Branch have initiated a new FRBC program – the Terrestrial Ecosystem Restoration Program (TERP). In order to provide a strong ecological foundation for this new program, a need for an assessment of Provincial strategic restoration priorities was determined. The purpose of a strategic assessment was threefold: a) to identify the most 'degraded' ecosystems in each region, b) to identify causal factors of degradation where possible and c) to summarise these data to guide investments in the TERP. To achieve this goal, a series of six regional workshops were organised for October and November, 2000. The results of the workshops are available in six reports, one for each Forest Region. This report summarises the priority ecosystems identified at each workshop as those with the highest ecological need for restoration.

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Introduction

Forest Renewal British Columbia (FRBC) has a mandate to support the restoration of forest resources damaged by logging and logging-related activities. Since 1994, this mandate has been met primarily by activities of the Watershed Restoration Program. Recognising that the Watershed Restoration Program does not meet the full range of restoration priorities, FRBC started to explore development of a Terrestrial Ecosystem Restoration Program in 1995. Since this time, some seed funding has been allocated to projects throughout the Province. However, in order to efficiently guide future terrestrial restoration efforts, the need for strategic direction has been recognised. Pandion Ecological Research Ltd. (technical) and Salasan Associates (organisational) were contracted in October and November 2000 by Habitat Branch MoELP and Forest Renewal BC to organise a series of regional workshops to assess ecological restoration needs across the province. Ecologists, foresters, biologists and restoration experts familiar with each region were invited and asked to systematically assess ecosystems in their region for the extent and causes and indicators of ecological degradation and to highlight ecosystems, habitats or ecosystem components most in need of restoration from an ecological perspective.

Objective

To produce a science-based strategic assessment of terrestrial ecosystem restoration needs regionally. Potential restoration needs were assessed based on ecological units primarily by Biogeoclimatic Ecosystem Units (BEC) subzones, and then specified to variant or individual areas where appropriate. Broad habitat types such as grasslands, wetlands were also identified where specific impacts are seen.

Participants were specifically asked:

1. What are the main agents / issues creating a need for restoration in this Forest Region? (degrading agents)
2. What are the indicators used to determine an ecological problem? (i.e. what is the evidence of an ecological problem)
3. What are highest priority impacts in each ecological unit in the Region?

Scope

The workshops focused on determining the ecological need for restoration in all terrestrial ecosystems and their interface with riparian systems, including non-forest land, private land, crown forest, rangeland, grasslands, small wetlands and urban areas. The workshop did not set out to address whether it is politically or socially possible to restore systems, but rather to simply address whether there is an ecological need for restoration. An effort was made to identify all major factors causing ecological degradation in order to identify potential cumulative impacts between agents.

Participants

The intent of the workshops was to gather ecological information pertinent to each region. We therefore invited technical experts familiar with local ecosystems, their historical extent and form and their current status. Participants with a broad background in ecology, forestry, range, wildlife, conservation and restoration, plus specialists familiar with local restoration projects, non-native species, endangered species etc were encouraged to attend. An attempt was made to include a diverse range of expertise, and invite technical experts from Ministries, industry and consultants where expertise was known to be available.

Approach
In 1993, the Forest Ecosystem Management Team (FEMAT) working in the Pacific Northwest USA recommended that ecosystem restoration should be grounded in ecological theory, but must also take a pragmatic approach that would start by:

> "determining all ecosystem restoration needs, then sifting these for the most important processes of concern, "treatability", cost-effectiveness, funding expectations, management situations, and institutional and socio-political considerations to arrive at the best implementable program"

These Regional TERP workshops were intended to fulfill the primary function of 'determining all ecosystem restoration needs' at the strategic level.

Participants were specifically asked to avoid addressing questions other than those relevant to ecological impacts (i.e. avoiding political debate, or consideration of whether a problem was 'fixable' or not).

Limitations of the Process
The information presented in this series of reports is limited to that presented by participants at the workshops. We do not believe this constitutes is a failing of the reports because the invited participants include many of the most knowledgeable professional ecologists, foresters and other ecosystem practitioners in the Province.

Participants were asked to detail ecosystem degradation in their region. Due to the nature of the workshop and the time available, it was often not possible to provide quantification, but only qualitative comments on the level of ecosystem degradation. Participants were asked to prioritise ecosystems and types of degradation for their region using a crude ranking system. We note that across the different regions, there tended to be repeatability of the types of systems and agents causing highest degradation. However, also note that the approach does not allow comparisons between different regions, only within individual regions.

Ecological significance of ecosystem changes

Determining whether an ecosystem is degraded (or 'broken') is one of the key features of a restoration program. There is controversy over the details of how to assess ecosystem degradation, however, there is generally little disagreement that directional changes in pattern, distribution and abundance of ecosystem components away from natural patterns increases the risk to biodiversity values (Province of BC 1995). A system can be considered to be degraded (i.e. that the change is ecologically significant) when ecosystem component (s) are lost from the system, or changed in abundance or distribution sufficiently to impact the interconnecting components and species dependent upon them (Perry 1994). The ecological importance of many of the ecosystem components referred to in this report has been well documented and will not be reviewed in depth here, however as examples:

- Absolute area of habitat, relevant particularly to older/ mature forest in BC is documented to impact population demography and ability to support many species (Maser 1990; Noss 1996)
- Old-growth forests are known to support unique communities of flora and fauna (Goward 1993; MacKinnon 1998; Schowalter 1995; Winchester 1997), and are therefore important for maintaining biodiversity.

- Fire suppression is known to change the course of succession in NDT 4 ecosystems, and radically alter habitat availability for a large number of red and blue-listed species (Tiedmann et al. 2000)
- Large-sized and sufficiently abundant wildlife trees and coarse woody debris are known to be required to support many cavity-nesting species (Machmer and Steeger 1995; Franklin et al. 2000).
- Road density, and particular those with high levels of use are known to significantly impact habitat quality and use by many species, and increase mortality patterns in other species (Forman and Alexander 1998; deMaynadier and Hunter 2000; Trombulak and Frissell 2000).

More controversial are questions, for example, regarding how fragmentation of mature/ old forest landscapes impacts the ability of the ecosystem to function (Harrison and Voller 1998). There are data that demonstrate certain species are impacted by forest fragmentation in a forested landscape (C. Kyle pers. comm.; Debinski and Holt 2000; Smith et al. 2000), however others maintain that fragmentation is not a concern for biodiversity in a mostly forested landscape (Bunnell 1999).

In this exercise, a decision was made to not debate these complex questions directly, but rather to use a combination of expert opinion and evidence on the extent of changes from natural patterns to provide strategic guidance as to which ecosystems are most degraded. In general, it is agreed that a combination of the following can be used to help determine which ecosystems have highest ecological degradation:

- *severity and extent of change from natural patterns:* increased change = increased degradation of the ecosystem
- *scale of impact:*: are ecological processes, habitats or species impacted? As a general rule, processes have higher ecological significance because of cascading effects down onto habitat and species, but not necessarily in reverse
- *ecological function*: does the ecosystem component impacted have a key ecological function? e.g. keystone species may have higher ecological impacts than other species
- *geographic extent*: a large scale impact is likely more significant than small geographic extent
- *ecological resilience*: systems with low ecological resilience will be impacted more heavily by equal disturbances than highly resilient systems
- *extent of representation in protected areas*: high levels of protection may decrease the significance of high levels of impacts elsewhere
- *component rarity*: rare ecosystems or components may be heavily impacted by relatively small changes
- *cumulative impacts*: many small impacts may result in significant overall degradation.

Experts were asked to focus only on issues they considered to be ecologically significant in each area of their region. Two levels of priority setting were used in each variant grouping: a) which ecosystems are the most significantly degraded within each variant group and b) which ecosystems are the most significantly degraded overall for the region. This second priority setting allowed variants whose low priority issues are more ecologically significant than other variants' high priority issues to be identified.

The results of each workshop are summarised in six reports which are formatted in three sections, with increasing levels of detail:

Section I: Summary of Regional Priorities: tabulates the ecological zones noted as having the highest levels of ecological degradation in that region. For each ecological zone, the most important agents of degradation are specified.
Section II: Summary Tables for All Ecosystems: tabulates information for each ecosystem discussed during the workshop, including background information (biogeoclimatic variants, numbers of listed species, percent of area in protected areas), and the highest priority areas of concern within that ecosystem.
Section III: Detailed Information for All Ecosystems: tabulates all information collated for all ecosystems discussed during the workshop, organised by types of ecological impacts.

Note that the intention of these limited workshops was, as a first step, to assess the ecological need for restoration, and participants were asked to focus their comments on what they considered to be *ecologically significant* degradation issues. They were also asked not to prioritise their comments based on the feasibility of restoration, but rather to focus solely on ecological need. It is therefore likely that in some instances, apparently lower priority degraded ecosystems (e.g. those highlighted in section III) may provide the best investment for FRBC in this program.

This report provides an overall summary of Regional Priorities presented at each Region. We consider that the information provided by experts, interpreted in light of additional indicator information, provides adequate data to guide strategic restoration priorities for the Terrestrial Ecosystem Restoration Program.

Summary of Regional Priorities

Workshop participants were asked to prioritise which zones most urgently required restoration in their region, and this is summarised in the tables below. Note that in general, participants were willing to identify only “high” and “low” priorities (due to the coarseness and limited time available for ranking). In which case all “high” priorities are presented in Table 1, and all other “low” priorities are presented in Sections II and III., Within the highest priorities a crude ranking system was used to determine variation between restoration needs. For each ecosystem identified, a brief rationale for the ecological significance of the high ranking is provided. Further background rationale is provided in the individual reports from each Region.

Note that each region determined its own ranking procedure – in particular, they determined the maximum number of ‘stars’ to be attributed to each item. These ranks are therefore relative ranks comparable within regions only, and cannot be used to distinguish between regions.

Cariboo Forest Region

Rank	Ecological zones
*** *** *** **	Bunchgrass zone ➢ Cattle ranching and associated impacts: i) trampling of riparian and rare communities, ii) almost complete loss of climax grassland communities ➢ Access (ranching/ roads) result in: increased distribution and abundance of non-native (agronomic and other) plant species; ➢ Fire suppression: encroachment of forest onto previously grassland habitat (most relevant on north aspects) and change in plant communities Rationale for rating: ➢ Very small percent of the region (0.1%) but high biodiversity values: high absolute number of listed species, and high density per unit area ➢ 21% of zone in protected areas, but these areas are negatively impacted by fire suppression and grazing pressure and so fail to protect ecosystem processes, or provide reference ecosystems ➢ Cattle grazing and fire suppression in combination are extensive in their impacts, and have cumulative impacts affecting all areas of the zone ➢ Encroachment is slightly lower priority, largely because it impacts only the 'interface' with forested zones ➢ Have lost/ or almost lost all reference ecosystems in these ecosystems ➢ Ecosystems not resilient to changes in ecosystem processes (e.g. suppression of fire results in forest ingrowth and so causes change in grassland ecosystems) ➢ Ecosystems potentially not resilient because they are at the northern end of their ranges, and susceptible to natural/ human-induced changes in climate ➢ Human population density increasing; and will continue to expand rapidly in this zone Comments ➢ Ecologically feasible to restore/ reduce impacts of ranching, however, requires extensive social involvement to provide willingness for change. ➢ Need to overcome social concern regarding reintroduction of fire
*** *** ***	Interior Douglas Fir ➢ Fire suppression resulting in forest ingrowth of historically open forest stands resulting in low economic value and low biodiversity value stands. Associated loss of large fire-maintained trees plus change in understory compositions. ➢ Forest encroachment onto existing open forest areas, resulting in loss of open forest and loss of associated plant communities ➢ Cattle ranching + associated impacts (in dry IDF only): i) trampling of riparian and rare communities, ii) increased introduction and movement of non-native plant species; iii) almost complete loss of climax grassland communities Rationale for ranking ➢ This BEC zone supports the highest absolute number of listed species and communities in Province (though note that not all species occur in this Region) ➢ IDF covers 20% of region, but only 5% represented in Protected Areas (with only 1% of some of largest variants) ➢ Protected areas still impacted by fire suppression and grazing – therefore fail to protected ecosystem processes, or provide reference ecosystems ➢ Fire suppression + forest management approaches have resulted in radical

Rank	Ecological zones
	change from natural disturbances patterns on the landscape, particularly with loss of large/ old Douglas Fir through zone, which has high biodiversity value and was historically extensively distributed through the zone. ➢ Combination of major degrading agents (ranching + fire suppression etc.), lead to exacerbated cumulative impacts ➢ almost all zone is 'managed forest' due to very low level of inoperable forest – therefore extensive cumulative impacts over a large area <u>Comments</u> ➢ Restoration is ecologically feasible with currently available techniques, ➢ however, success potentially limited by Douglas Fir Beetle, and Workers Compensation Board Regulations. ➢ Need to overcome social concern regarding reintroduction of fire ➢ Ecologically feasible to restore/ reduce impacts of ranching. But requires extensive social involvement to provide willingness for change.
*** *** *** **	<u>Interior Cedar Hemlock</u> ➢ Forest harvesting resulting in loss of historically abundant old growth attributes at both stand and landscape levels: i) Loss of old growth – dramatic reversal in seral stage distribution (predominantly old to predominantly young) ii) Remaining low elevation old growth highly fragmented by young seral forest and roads iii) Harvesting + short rotation forestry results in systematic loss of large-sized structures (live and dead) throughout zone. This will increase through time as percent managed forest increases iv) Silviculture approach: species conversion from western red cedar / western hemlock to younger seral species <u>Rationale for ranking</u> ➢ BEC zone covers 4% of Region ➢ Significant change from natural (recent historic) abundance and distribution of mature and old forest, particularly on valley bottoms and lower sloped plateaus ➢ Loss of 'connectivity' across valleys and plateaus may significantly decrease remaining habitat value for some species dependent on undisturbed or connected old growth (e.g. caribou; lichen population dispersal). ➢ Difficult to recreate large-sized / ancient attributes due to long time frame required. Important for numerous species, including red-listed mountain caribou/ ancient forest associated lichen species etc. Current stand level policy considered insufficient to maintain veteran trees throughout the managed forest into the future, ➢ Current policy considers all forest >250 years to be equally old and therefore fails to identify and manage for rare 'ancient' forests (>600 years or more) historically present in this system ➢ Concern at the table regarding 'unknown effects' on biodiversity of such significant stand and landscape level changes – consideration that current policy may foreclose options for the future <u>Comments</u> ➢ Prevention of further fragmentation and/ or loss of stand attributes is most pragmatic approach, due to very long timeframes involved. ➢ Plateau area is currently more degraded than mountainous ICH, therefore maybe focus efforts on remaining areas? ➢ Potential difficulties regarding conflicts with current policy

Rank	Ecological zones
***	Sub-Boreal Pine-Spruce ➢ Forestry activity results in a) very few large-sized patches of old/ mature forest remaining on entire landscape b) harvesting does not retain fire refugia and older stand structures (the variation in natural disturbances is not mimicked) c) changes in successional stage frequencies: loss of early shrub habitat and old forest due to truncation of succession at early and late seral stages, d) extensive roading – high operable Rationale for ranking ➢ covers 25% of the region, with relatively low density of listed species per unit area ➢ however, only 3% represented in protected areas ➢ although the change from natural disturbance patterns is overall less severe than in some other ecosystems (due to naturally large scale disturbances), considered to be still significant differences between forest management and natural disturbance patterns. Biodiversity values may be highly impacted because the changes are at the early and late successional stages which tend to have highest ecological diversity. ➢ extensive impacts on ecosystem because it is highly accessible, and operable, therefore almost entirely managed forest. ➢ Due to difficulties of changing existing landscape patterns once they are on the landscape, it will be difficult to manage to large patches of mature forest in future, unless this is incorporated into planning at the present time. Current policy does not plan for adequately large areas of mature forest. Comments ➢ Ecologically feasible in near future. However will be difficult in future to change the patterns created at the landscape level. ➢ Potential difficulties regarding conflicts with current policy
***	Generic Comments (all zones) ➢ Access: throughout all zones, increasing road density was considered a major agent of degradation. Highlighted in areas where road-sensitive or hunted species were present. However, the general impacts of roads on habitat quality and use by many species was a concern throughout. Access management in the dry / flat zones is a particular issues since roads are not necessary to allow mechanised access.
**	➢ Future ecosystems of concern: Two BEC zones, montane spruce and Engelmann spruce/ subalpine fir – particularly the wet variants (each approximately 12% of region) were noted as having currently low levels of degradation. However, it was also noted that harvesting history in these systems is recent, and that current management policies will not provide for adequate ecological protection in these systems as harvesting increases, leading to degradation as observed in other areas. Lower concern is related to the lack of immediacy in these systems

Kamloops Forest Region

Rank	Ecological zones
**** ***	Bunchgrass zone + other grasslands ➢ A combination of urban/ agricultural development and fire suppression resulting in: i) direct loss of majority of grassland to other uses ii) almost complete loss of 'old growth' grassland ecosystems iii) high abundance and extent of invasive species (plus increasing at a rapid rate) leads to serious degradation of remaining grassland (health of grasslands considered very low) ➢ extensive access to all grassland areas – due to high road density, plus road access not necessary for motorised access throughout the zone Rationale for rating: ➢ 3% of region – very high density of listed species per unit area ➢ very low percent in protected areas (5) – and protected areas also impacted by invasive species – so fail to provide area for natural processes and plant communities, or reference ecosystems. ➢ Combination of major degrading agents lead to exacerbated cumulative impacts ➢ almost all zone is degraded, including protected areas (highly managed/ settled landscape) ➢ Human development will continue to increases in these zones Comments ➢ Considered difficult to deal with due to lack of buy-in from public. ➢ education required ➢ Coordinated efforts between multiple agencies and the private land owners are needed to address restoration here
***	Ponderosa pine and dry Interior Douglas Fir ➢ Fire suppression leading to: i) extensive forest ingrowth – resulting in low economic value and low biodiversity value stands. ii) Associated loss of large fire-maintained attributes iii) changes in understory composition. Rationale for ranking ➢ small percent of region (3%), with very high number of listed species per unit area ➢ loss of large stand attributes are key to maintaining much of the biodiversity values, and listed species ➢ high density stands have low biodiversity value plus low economic value – therefore there is little incentive to solve this problem ➢ increase fuel loadings result in higher risk of catastrophic fire in future ➢ Fire suppression + forest management approaches have resulted in radical change from natural disturbances patterns on the landscape, particularly with loss of large/ old Douglas Fir through zone, which has high biodiversity value and was historically extensively distributed through the zone. ➢ Combination of major degrading agents (ranching + fire suppression etc.), lead to exacerbated cumulative impacts ➢ almost all zone is 'managed forest' due to very low level of inoperable forest – therefore extensive impacts over a large area Comments ➢ concern from some participants regarding how to restore these systems without exacerbating other factors (e.g. invasive species).

Rank	Ecological zones
	➢ Also, concern regarding lack of knowledge on suitable goals for restoration (i.e. what is natural?)
*** *** **	Interior Cedar Hemlock ➢ Forest harvesting resulting in loss of historically abundant old growth attributes at both stand and landscape levels: i) Loss of old growth – dramatic reversal in seral stage distribution (predominantly old to predominantly young) ii) Harvesting + short rotation forestry results in systematic loss of large-sized structures (live and dead) throughout zone. This will increase through time as percent managed forest increases iii) Remaining low elevation old growth highly fragmented by young seral forest and roads Rationale for ranking ➢ relatively large percent of region (15%), with moderate number of listed species. Also provides habitat for a number of sensitive large species ➢ highly diverse ecosystem, with high biodiversity values ➢ extent of change from natural processes to managed forest is large – therefore risk to biodiversity is likely to be high ➢ Difficult to recreate large-sized / ancient attributes due to long time frame required. Important for numerous species, including red-listed mountain caribou/ ancient forest associated lichen species etc. Current stand level policy considered insufficient to maintain veteran trees throughout the managed forest into the future, ➢ Current policy considers all forest >250 years to be equally old and therefore fails to identify and manage for rare 'ancient' forests (>600 years or more) historically present in this system Comments ➢ Prevention of further fragmentation and/ or loss of stand attributes is most pragmatic approach, due to very long timeframes involved.
**	Engelmann Spruce-Subalpine Fir ➢ Forest harvesting resulting in loss of historically abundant old growth attributes at both stand and landscape levels: i) Loss of old growth – dramatic reversal in seral stage distribution (predominantly old to predominantly young) ii) Remaining low elevation old growth highly fragmented by young seral forest and roads iii) Harvesting + short rotation forestry results in systematic loss of large-sized structures (live and dead) throughout zone. This will increase through time as percent managed forest increases Rationale for ranking: ➢ large percent of region (23%), with relatively low number of listed species, however provides habitat for a number of sensitive large species (e.g. mountain caribou) ➢ extent of change from natural processes to managed forest is large – therefore risk to biodiversity is likely to be high ➢ policy does not recognise differences between forests >250 years old – therefore older forest is not managed for and may be lost from operable landbase Comments ➢ Prevention of further fragmentation and/ or loss of stand attributes is most pragmatic approach, due to very long timeframes involved.
**	Montane Spruce (Merritt District) ➢ Forestry operations guided by mountain pine beetle salvage result in: i) very high rate of harvest, high impact on landscape pattern – many very large cutblocks

Rank	Ecological zones
	throughout landscape ii) loss of stand level attributes due to type of management encouraged by beetle salvage iii) Even though forest activities here are relatively new, there are options for adequate planning, however current salvage are removing these options. <u>Rationale for ranking</u> ➢ Although this zone does not have specific very high biodiversity values, concerns were raised regarding the massive impact of forestry activities based on beetle salvage. It was also noted that there are significant biodiversity issues in this zone, although it is *generally* not considered as a highly biologically diverse (and therefore valuable) ecosystem.
*** ***	<u>Generic (all zones)</u> ➢ Degradation caused by access is a large problem throughout the Region: but particularly in the alpine, bunchgrass and interior Douglas fir zones. ➢ Invasive species are a ubiquitous problem across the Region

Nelson Forest Region

Rank	Ecological Zones and Priorities
	Interior Douglas Fir and Ponderosa Pine (***) Montane Spruce (**)
***	➢ Fire exclusion combined with harvesting practices leading to: i) extensive ingrowth of historically open forest stands, resulting in low biodiversity and economic value ii) loss of open forest stand attributes (large snags and live trees), iii) changes in plant communities iv) increase in forest health issues
***	➢ Combination of cattle ranching, fire exclusion, settlement and increases in road density and recreation result in i) rapid increase in the abundance and geographic extent of non-native species (noxious and non-noxious): ii) heavy pressure on any remaining native grassland plant communities
***	➢ Cumulative impacts of high urban and agricultural development increasing direct habitat loss
	Rationale for ranking ➢ 6% of Region (IDF), with highest absolute number of listed species in Province ➢ 1% of Region (PP) with very high number of listed species per unit area ➢ 7% of Region (MS) with high number of listed species per unit area ➢ Highly under-represented in Protected Areas Strategy (PP: 0.2%; IDF: 1%; No IDF protected in Boundary District; MS 7%) ➢ Have lost/ or almost lost all reference ecosystems in these ecosystems ➢ Ecosystems not resilient to changes in ecosystem processes (e.g. removal of fire and forest ingrowth results in change to different ecosystem) ➢ Ecosystems potentially not resilient because they are at the northern end of their ranges, and susceptible to natural/ human-induced changes in climate ➢ almost all of the zone is 'managed forest' or private land due to high operability and low protected areas
	Comments ➢ The East Kootenay Trench Restoration Plan provides a model for other restoration strategies. Extensive networking has allowed ranching and urban community to understand and participate in reintroduction of fire. In many areas of the Province, it was thought that this level of agreement would be difficult to attain. ➢ May be difficult to initiate a similar process in the western/ Boundary district ➢ However, there is a large concern that restoration of the dry ecosystems will fail unless there is high regard for the potential negative impacts of invasive species. They must be adequately managed, otherwise the supposed ecosystem benefits will not be achieved. Once established, many of these species (e.g. Leafy Spurge and Knapweed) will disperse into undisturbed habitats, irrespective of the levels of disturbance. ➢ Natural (recent historic) fire disturbance rates in dry ICH are difficult to determine due to extensive settlement burning at the turn of the century ➢ Appropriate stand level management hindered by Workman's Compensation Board and firewood cutting
	Dry Interior Cedar Hemlock (ICHxw/ ICHdw)
****	➢ Dam building (to create reservoirs) on major river systems, plus high historic urbanisation result in extensive loss of these ecosystems. Particularly, loss of high percent of riparian/ wetland systems and associated biodiversity

Rank	Ecological Zones and Priorities
***	➢ Fire exclusion resulting in ingrowth, exacerbating forest health issues (less dramatic than in IDF and PP)
***	➢ Forestry activities result in: i) Loss of large sized/ fire maintained attributes (large Fd/ Py) through historic clearcut harvesting (inappropriate to the natural disturbance type) ii) Almost 100% loss of NDT1/ NDT2 old growth in ICHdw (i.e. riparian Cw/ Hw old growth) iii) Loss of larger old growth patches, plus changes in patterns and distribution of retained old growth <u>Rationale for ranking</u> ➢ ICH is a large zone (25% of Region), but the dry variants constitute a relatively low percentage of the total (ICHdw 16% of ICH; ICHxw 2% of ICH) ➢ High under-representation in protected areas: ICHdw (6%); ICHxw (0%) ➢ Relatively large number of listed species; with high number of listed species per unit area ➢ Highly diverse forest ecosystems – high inherent ecological values ➢ Cumulative impacts of habitat loss and degradation extensive throughout the zone ➢ Current policy not considered adequate to maintain adequate old growth, particularly since it does not allow representation below variant level. ➢ Current policy not considered adequate to maintain stand level veteran attributes into the future of managed forests <u>Comments</u> ➢ Natural (recent historic) fire disturbance rates in dry ICH are difficult to determine due to extensive settlement burning at the turn of the century ➢ Appropriate stand level management hindered by Workman's Compensation Board and firewood cutting
***	<u>Interior Cedar Hemlock (all variants)</u> ➢ Forestry operations have resulted in dramatic changes to natural ecosystem patterns at both stand and landscape levels, resulting in
***	➢ Loss of old forest attributes throughout zones (e.g. large sized structures - live, dead and coarse woody debris)
***	➢ Loss of old forest, with dramatic losses at low elevations. The extent of pattern change currently most excessive in drier subzone/ variants due to historic settlement patterns. In future, extent of change will be most dramatic in wet subzones due to historically high levels of old growth.
**	➢ Increased fragmentation of remaining mature/ old forest landscape by younger seral forest and roads. Dramatic changes in patch sizes of remaining old forest.
****	➢ Dam building (to create reservoirs) at low elevation in northern / wet variants resulted in loss of locally rare areas of highly diverse valley bottom habitat. Significantly changed habitat for many terrestrial and aquatic species, plus ecosystem processes (including associated marshes/ wetlands etc – now very rare ecosystems)
***	➢ Invasive species: the ICH (particularly on some drier sites, but throughout the zone) provides highly productive sites for a large number of invasive species. There are relatively few plant communities (particularly on some sites) that have not been impacted. <u>Rationale for ranking</u> ➢ High variation in numbers of listed species: highest numbers in south and at low elevation. ➢ Poor representation of whole ICH in protected areas, with extremely low representation in southern/ dry/ low elevation variants (e.g. 7% overall; 0% in ICHxw) ➢ BEC zone has highest tree species diversity in Province. High inherent ecological values. ➢ Extensive loss in large-sized stand level attributes (from forestry, firewood cutting, fire suppression, settlement) known to be important for maintaining a large number of species ➢ Specific old-growth dependent/ disturbance intolerant species (e.g. mountain caribou)

Rank	Ecological Zones and Priorities
	remnant populations in south of this zone – exhibiting considerable population declines in recent past and on-going. ➢ Difficult to recreate large-sized / ancient attributes due to long time frame required. Important for numerous species, including red-listed mountain caribou/ ancient forest associated lichen species etc. Current stand level policy considered insufficient to maintain veteran trees throughout the managed forest into the future, ➢ Current policy considers all forest >250 years to be equally old and therefore fails to identify and manage for rare 'ancient' forests (>600 years or more) historically present in this system ➢ Current policy not considered adequate to maintain stand level veteran attributes into the future of managed forests (large Fd/ Py in drier variants/ large Cw/ Hw in wetter variants) ➢ Current policy not considered adequate to maintain adequate old growth, particularly because it does not allow representation below variant level, and because extent of change from natural abundance and patterns is dramatic (particularly in moist and wet variants) . Comments ➢ a rate of harvest considerably higher than natural forest turnover rates. Considered the most fundamental degrading factor. ➢ Appropriate stand level management hindered by Workman's Compensation Board and firewood cutting ➢ Some disagreement regarding the ecological importance of fragmentation in these landscapes ➢ Prevention of further fragmentation and/ or loss of stand attributes is most pragmatic approach, due to very long timeframes involved.
** **	Engelmann Spruce Subalpine Fir Alpine Tundra ➢ backcountry tenures + general recreation access (especially, but not exclusively motorised) increasing at a rapid rate. Potential disturbance to alpine mammals/ trampling of plant communities. Insufficient control over expansion of these areas. ➢ Whitebark pine being lost from ecosystem (in ESSF), due predominantly to white pine blister rust, and possibly exacerbated by fire exclusion Rationale for Ranking ➢ Critical habitat for sensitive species (mountain caribou and goats) ➢ Fairly high numbers of listed species (though low per area number) ➢ Low resiliency in these ecosystems – at the edge of ecological limits for growth. Systems will be slow to recover from degradation. ➢ Whitebark pine appears to be a keystone species, linking multiple species throughout the ecosystem ➢ Slightly lower ranking due to relatively high representation in protected areas> however, concern that populations of sensitive and/ or large-ranging species will not be maintained by protected areas (e.g. grizzly bear/ caribou). ➢ No consideration of the cumulative impacts of recreation and forestry operations (i.e. no agency overseeing this). Comments ➢ Lack of inventory prevents adequate assessment of impacts
***	Generic Comments (all zones) ➢ Concern regarding current approach to forest management which requires high density and continually accessed roads. Many species sensitive to disturbance and/ or increased mortality resulting from roads. Plus likely reduced value of retained habitat in highly roaded landscapes. In the Nelson Forest Region, there are 59,000 km of roads (calculated using

Rank	Ecological Zones and Priorities
	1990 data). There are 8000ha of mainline roads in the Arrow District alone, many of which are in low elevation areas that were historically highly productive. ➢ Large information gaps relating to inventory and research (particularly in relation to significance of natural disturbance patterns at stand and landscape level ➢ Education and creative partnering (e.g. with local stewardship groups) were listed as ways to increase the effectiveness of restoration projects.
***	➢ Reference areas should be identified for ecosystems such as the grasslands, ICHdw/xw old growth, and Pa communities where "natural" conditions are rare.
**	➢ There is a lack of knowledge regarding species/ habitat relationships and impacts of landscape pattern on population viability and species distribution. Is it total pattern or habitat loss that is impacting wildlife populations? There is poor inventory data and poor understanding of species life histories, etc. ➢ Species diversity is not monitored well; Assumptions are made that habitat conservation will address species, but there is little evidence to be confident about this. ➢ Concern regarding continuing degradation outpacing any possible restoration program

Prince George Forest Region

Rank	Ecological zones
**(*)	ESSF moist/ wet and alpine Tundra ➢ backcountry tenures + general recreation access (especially, but not exclusively motorised) increasing at a rapid rate. Potential disturbance to alpine mammals/ trampling of plant communities. Insufficient control over expansion of these areas. ➢ No consideration of the cumulative impacts of recreation and forestry operations (i.e. no agency overseeing this). Rationale for Rating: ➢ large percent of the Region (31%) – with high percent protected areas (approximately 14% overall). However, concern that there will be extensive degradation throughout this large area – impacting populations of large mammals, plus impacting plant communities Comments ➢ look at US approach – pollution from 2-stroke engines worse than cars in Yellowstone ➢ Need education: brochure/web on impacts and pollutants
**(*)	Engelmann Spruce Subalpine Fir – wet ➢ Invasive species: particularly new invasion by marsh plume thistle – rapid and extensive growth of this species to exclusion of all other species. Exacerbated by clearcutting, especially around riparian areas. ➢ Forestry results in: i) loss of old growth – radical change in seral stage distribution ii) fragmentation of remaining old growth in THLB iii) change in natural disturbance processes – gap dynamics to clearcut. ➢ Slightly lower priority due to relatively small percent of THLB ➢ Access: see ESSF/ AT above Rationale for Rating ➢ Large area of Region (15%) – with under-representation in protected areas (8%). ➢ Although relatively little harvesting to date, the extent of change from natural will be very high – and will be concentrated in THLB. Linked to potentially sensitive species so issue will increase as management increases.
****	Boreal White and Black Spruce mw1 ➢ Agricultural/ private land clearing resulting in extensive habitat loss – particularly loss of grassland plant communities. ➢ Fire suppression resulting in: loss of grasslands, especially along the Peace River. Shift from fire-maintained grasslands to aspen forest. ➢ Oil / gas exploration + private land resulting in extensive roading. Whole zone is accessible – extensive impacts. Impacts wildlife use of available habitat, and encourages the spread of non-native plant species. ➢ Invasive Species: concomitant with high access levels, and agriculture – have high negative impacts of invasive species (Canada thistle in particular), plus the non-native forage species, which negatively impact native grassland plant communities (a locally rare ecosystem type). ➢ Higher rating in mw1 because its more extensive than mw2 (not because impacts are greater) Rationale for Rating ➢ 11% of region (25% of BWBS), with highest number listed species by variant in the Region. ➢ Highly under-represented in Protected Areas (1% by variant)(note this does not include Muskwa-Kechika PA)

Rank	Ecological zones
	➢ High number of cumulative impacts exacerbates individual impacts Comments ➢ Difficult to remedy due to social concern regarding fire, especially adjacent to private land areas. ➢ Seismic issues are considered unassailable – though repeatedly occur as high priority
****	Boreal White and Black Spruce mw2 ➢ Forestry has resulted in: i) extensive loss of larger-sized bottom-land riparian habitat along major river systems, particularly high bench spruce ecosystems and low bench cottonwood. ii) This has been exacerbated by combination of dam building and lack of reserves for very large river systems iii) associated changes in plant communities ➢ Oil and gas exploration and development (mostly seismic) – impacts approximately 1500 hectares annually. Reforestation is not required, and natural regeneration is very slow. Impact of clearing these areas is therefore substantial and cumulative impacts significant over time. ➢ Access: extensive roading and seismic lines due to combination of oil/ gas exploration and development (with little adequate regulation of impacts), in combination with general road systems – generally fully accessible area. Likely impacts wildlife use of available habitat, and encourages the spread of non-native plant species. Extensive use of snowmobiles and ATVs on existing road system - high disturbance of wildlife species likely impacts habitat use by these species Rationale for rating ➢ 21% of Region (50% of BWBS): highly under-represented in protected areas (2%)(this does not include new Muskwa Kechika) ➢ riparian habitat provides very high biodiversity values (rare warblers/ mammals etc/ plus rare plant communities) ➢ high and multiple impacts have cumulative impacts Comments ➢ Seismic issues are considered unassailable – though repeatedly occur as high priority
***	Interior Cedar Hemlock ➢ Forestry impacts (particularly in wetter variants): i) radical change in seral stage distribution – loss of old growth forest (particularly antique forests) ii) loss of large-sized stand structures – particularly around riparian areas iii) fragmentation of remaining old growth in THLB
****	➢ Marsh plume thistle is invading newly clearcut areas, exacerbating regeneration problems, and radically changing plant communities in early seral (particularly problematic in moist variants). Rationale for Rating ➢ Less than 1% of region, but high number of listed species per unit area, plus provides habitat for some sensitive species (e.g. caribou) ➢ Under-represented in protected areas (9%) ➢ Extent of change from natural patterns (at landscape and stand level) is extreme ➢ Current policy considers all forest >250 years to be equally old and therefore fails to identify and manage for rare 'ancient' forests (>600 years or more) historically present in this system Comments ➢ potential for future impacts of marsh plume thistle to be massive

Rank	Ecological zones
***	SBSvk /wk1-3 ➢ Extensive harvesting resulted in: i) loss of older forest – harvesting does not mimic variation in natural disturbance regimes ii) highest percent of logged ecosections in region (e.g. Bowron Clearcut) iii) loss of large-sized structures at stand level – management not resulting in veteran trees remaining throughout landscape ➢ Agriculture: limited geographic extent (Willow River), but habitat loss where it has occurred ➢ Invasive species: marsh plume thistle increasing most aggressively in this region. Establishing extensively in clearcuts, and changing plant communities, especially in riparian areas Rationale for Rating ➢ 6% of region – under-represented in protected areas (3%) ➢ extensive impacts due to high percent THLB – and few protected areas
****	SBSdh ➢ High percent private land resulting in: high loss of habitat (80%) in valley bottom, particularly resulting from deforestation ➢ Loss of historically abundant wetland/ riparian habitats in this valley bottom (high value for biodiversity) – due to private land logging and clearing + agriculture ➢ Invasion by marsh plume thistle. Currently, small population, but rapidly expanding. Will likely have a high impact on riparian areas in future Rationale for rating ➢ Small percentage of Region (1% of SBS zone), but highly productive valley bottom sites. Very high historic biodiversity values in this steep-sided valley – for summer breeding populations and wintering populations. ➢ Very high percent of this zone is highly impacted. Comments ➢ difficult to mitigate due to private ownership

Prince Rupert Forest Region

Rank	Ecological zones
****	Haida Gwaii/ Queen Charlotte Islands ➢ Forest Harvesting results in loss of historically abundant old growth attributes at both stand and landscape levels: i) Loss of old growth forest – radical reversal of seral stage distribution. ii) Remaining low elevation old growth highly fragmented by young seral forest and roads iii) Harvesting + short rotation forestry results in systematic loss of large-sized structures (live and dead) throughout zone. This will increase through time as percent managed forest increases iv)) rate of harvest designed to sustain timber volume, not biological values; effect exacerbated by small area of operable forest – in valley bottoms. Results in almost complete loss of old growth in valleys. Rate of harvest exacerbated by low harvest in Hecate lowland v) high impacts on rare ecosystems due to lack of inventory, and lack of inclusion in policy. Particular issue regarding riparian ecosystems – particularly Sitka Spruce which have been targeted due to high timber value – some are considered globally imperiled. vi) extent of change from natural disturbance regimes is very high - at both stand and landscape levels (processes and patterns of disturbance)
****	➢ Invasive species: i) large number of invasive species, impact biodiversity at all scales (deer/ small mammals/ plants etc). ii) Exacerbates impacts from forestry activities by changing regeneration patterns in clearcuts. iii) changes natural plant and animal communities radically. Rationale for ranking ➢ Haida Gwaii represents unique island community – island glacial refuge leading to high endemic species values, plus very high biodiversity values in highly productive and ancient forests ➢ Highly significant change from natural (recent historic) abundance and distribution of mature and old forest, highlighted particularly on most productive valley bottoms ➢ Loss of natural processes from the landscape- gap dynamics to large scale stand replacement – may be difficult, or impossible to recover these forests ➢ Loss of 'connectivity' across valleys and plateaus may significantly decrease remaining habitat value for some species dependent on undisturbed or connected old growth in large patches. ➢ Difficult to recreate large-sized / ancient attributes due to long time frame required. Current policy considered insufficient to maintain veteran trees throughout the managed forest into the future, ➢ Current policy considers all forest >250 years to be equally old and therefore fails to identify rare 'ancient' forests (>600 years or more) ➢ Concern at the table regarding 'unknown effects' on biodiversity of such significant stand and landscape level changes – consideration that current policy may foreclose options for the future ➢ Highest ranking given in this region due to combination of high biodiversity values, plus rate and extent of current degradation Comments ➢ Difficult to deal with combination of agents (forestry + invasive species) in social

Rank	Ecological zones
	context (e.g. deer removal is ecologically appropriate but socially controversial)
**	Coastal western hemlock mainland (all variants except vh2) ➢ Forest Harvesting results in loss of appropriate old growth attributes at both stand and landscape levels: a) Loss of old growth forest – reversal of seral stages extensive. Remaining low elevation old growth highly fragmented by young seral forest and roads b) Harvesting + short rotation forestry results in systematic loss of large-sized structures (live and dead) throughout zone. This will increase through time as percent managed forest increases c) rate of harvest designed to sustain timber volume, not biological values; effect exacerbated by small area of operable forest – in valley bottoms. Results in almost complete loss of old growth in valleys. d) high impacts on rare ecosystems due to lack of inventory, and lack of inclusion in policy. Particular issue regarding riparian ecosystems – particularly Sitka Spruce and estuarine ecosystems which have been targeted due to high timber value – some are considered globally imperiled. e) extent of change from natural disturbance regimes is very high - at both stand and landscape levels (processes and patterns of disturbance) Rationale for Ranking ➢ Coastal temperate rainforests globally rare ecosystems with few intact valleys remaining globally. Harvest history is relatively new – however, in some areas, 80% of valley bottom has been logged in past 50 years. Rate and scale of change in natural disturbance processes extreme. ➢ Extremely high biodiversity values – rare ecosystems/ ancient forests/ populations of grizzly bears etc. ➢ Rare old growth ecosystems continue to be harvested due to lack of inventory and current biodiversity policy ➢ Difficult to recreate large-sized / ancient attributes due to long time frame required. Important for numerous species. Current stand level policy considered insufficient to maintain veteran trees throughout the managed forest into the future, ➢ Current policy considers all forest >250 years to be equally old and therefore fails to identify and manage for rare 'ancient' forests (>600 years or more) historically present in this system ➢ rank is relatively low due to relatively recent development in this ecosystem, plus very large geographic size of system. However, high concern that current policies will not prevent further degradation throughout the ecosystem.
***	Sub Boreal Spruce (dk) ➢ Fire suppression has resulting in: i) ingrowth of stands resulting in higher density, stressed stands. This encourages an increase in beetle populations and increasing potential for catastrophic fire/ beetle outbreaks. ii) Specific impacts on rare ecosystems: particularly dry juniper systems – impacted by fire suppression, and now being grazed heavily by high (unnaturally high?) deer populations
***	➢ Forest management directed by salvage: i) exacerbates high rate of harvest – does not consider natural variation in disturbance – high loss of old growth riparian habitat; old growth pine virtually eliminated from landscape ii) concern that beetles will increase through time in second growth
***	➢ High percentage of private land results in: i) loss of natural forests and grassland areas due conversion

Rank	Ecological zones
	ii) inability to manage landscape e.g. difficulty involved in reintroduction of fire. Rationale for Ranking ➢ 3% of Region – with under-representation in protected areas (5%) ➢ this variant has the highest number of cumulative impacts degrading it (forestry + settlement + agriculture) ➢ important low elevation variant for many species Comments ➢ Due to percentage of private land needs to be an incentive to private land owners to maintain habitat. Farm tax status can't be maintained by habitat maintenance ➢ Need to overcome social concern regarding reintroduction of fire ➢ Ecologically feasible, but necessary to create willingness for land use change
**	Sub Boreal Spruce (except dk) Fire suppression + harvesting has resulted in: i) no 'natural' young forests – no early seral benchmarks remain ii) largely zoned as intensive forestry areas: concern the biodiversity provisions (core reserves and corridors) will need restoration since they have already been impacted by previous harvesting iii) harvesting dominated by beetle salvage – resulting in loss of critical stand level attributes – extent unknown Rationale for Ranking ➢ 7 % of region – approximately 8% in Protected Areas ➢ intensive forest management – will result in all of this ecosystem as managed forest – unknown biodiversity impacts over long term
**	Interior Cedar Hemlock ➢ Forest harvesting resulting in loss of historically abundant old growth attributes at both stand and landscape levels: i) Loss of old growth – dramatic reversal in seral stage distribution (predominantly old to predominantly young) ii) Remaining low elevation old growth highly fragmented by young seral forest and roads iii) Harvesting + short rotation forestry results in systematic loss of large-sized structures (live and dead) throughout zone. Particularly impacts riparian. This will increase through time as percent managed forest increases Rationale for ranking ➢ 4% of area, with relative high number of listed species per area ➢ highly under-represented in protected areas (4.4%) ➢ significant change from natural (recent historic) abundance and distribution of mature and old forest, particularly on valley bottoms
*	All other variants (AT/ CWHvh2/ SBPS/ ESSF/ BWBS + SWB) ➢ due to relatively short development history, and large size of Region, some ecosystems have seen little development currently. However, participants expressed concern that about the ability of current policy to prevent degradation occurring in theses systems as development occurs – see generic comments regarding factors of concern Comments ➢ potential for future degradation considered high on basis of current policy.
	Generic ➢ lack of planning resulting in continued degradation of ecosystems

Rank	Ecological zones
***	➢ access throughout ecosystems results in numerous cumulative impacts – will continue to increase, and is not managed by any agencies in a comprehensive manner
***	➢ implementation of biodiversity policy based on timber impacts, not original intent – therefore failing to protect the values originally identified as important ➢ policy implementation results in 'suggestion' that there is a large area of old growth remaining – however, it is ignoring biological realities that low elevation old growth is rapidly disappearing
***	➢ lack of inventory is particularly a problem in the north and in the complex coastal forests – difficult to obtain money for biological inventory here
***	➢ rate of harvest – throughout the zone – aims to sustain timber, not ecological values. Is set 'top down' due to rules of maintaining flow etc, not based on biology of the system. This is exacerbated in areas with beetle salvage – and will continue into future as second growth stands are also susceptible to beetles.

Vancouver Forest Region

Rank	Ecological Zones
**** **** *** **	Coastal Douglas Fir ➢ A combination of historic and current forestry operations, plus extensive urban and agricultural development resulting in: ➢ Almost complete loss of mature/old forest. No large patches of old growth forest remaining currently. Retention of existing small areas of old growth combined with recruitment from surrounding second growth stands is the highest priority for conservation/ restoration. Careful planning is necessary in this procedure to maximise stand and landscape level benefits – e.g. distribute stands across the region, and ensure adequate patch sizes. ➢ Garry oak ecosystems have been almost entirely lost through urban and agricultural development. The remaining areas are all highly impacted by a number of factors. This is one of the most endangered ecosystems in Canada. Requires protection of any existing areas, then restoration of degraded areas ➢ Abundant and extensive invasive species, particularly in the Garry oak ecosystem (though it will likely become a huge problem in the rest of the CDF). ➢ Loss of riparian/ wetland systems throughout this zone – many small systems have been eradicated due to agricultural and urban development – and these areas tend to have the highest diversity, and are often associated with rare ecosystems and species ➢ Nutrient cycling is not urgent yet, but could become so on a long-term basis. Need to address on an ongoing basis before it becomes a crisis. Rationale for rating: ➢ 1.5% of Region – and contains highest number of listed species in the Province + plus many endemic species due to refugia from ice age ➢ Highly under-represented in protected areas – 1.6% ➢ Highly impacted by large and cumulative degrading agents – long harvesting history plus long settlement history ➢ Area is still under-going considerable and increasing development pressures with insufficient municipal protection for rare ecosystems Comments ➢ Planning across agencies and different levels of government (municipal and provincial) will be required. ➢ General education regarding rare ecosystems crucial in this highly populated zone ➢ Insufficient data on frequency and patterns of natural disturbance in CDF ➢ Reference ecosystems in short supply
***	Coastal Western Hemlock – dry and very dry (xm and dm) ➢ A combination of historic and current forestry operations, plus more limited (than in CDF) urban development resulting in: i) Almost complete loss of mature/old forest. Very few large patches of old growth forest remaining in THLB (majority of zone). Retention of existing small areas of old growth combined with recruitment from surrounding second growth stands is very high priority for conservation/ restoration. ii) Remaining low elevation old growth highly fragmented by young seral forest and roads iii) Harvesting + short rotation forestry results in systematic loss of large-sized structures (live and dead) throughout zone , (which are required by many species, and functionally as woody debris in streams). This will increase through time as percent managed forest increases iv) long-term impacts on riparian ecosystems in particular

Rank	Ecological Zones
	Rationale for Rating ➢ 25 % of Region – relatively high number of listed species ➢ Highly under-represented in protected areas (3%) ➢ Almost all of both ecosystems are located at low elevation, and have been harvested almost completely. Extent of change from natural levels of old growth is dramatic for these systems because there is little inoperable forest. ➢ Current policy does not prevent continued harvest of red-listed (or otherwise rare) ecosystems Comments ➢ Planning across agencies and different levels of government (municipal and provincial) will be required.
***	Coastal Western Hemlock (general) – ms/ vm in particular ➢ Forestry operations have resulted in: i) loss of old growth at low elevations throughout these variants. Significant change from natural disturbance patterns. High impact on important low elevation riparian areas. ii) high fragmentation in remaining old growth patches (by young seral and roads) iii) loss of old growth attributes at the stand level throughout the low elevation forests – exacerbated due to long harvesting history ➢ Harvesting high productive sites first resulted in very high percentage loss of particular ecosystems, particularly old growth Sitka Spruce riparian ecosystems – (some of which are considered globally imperiled) ➢ Short rotation forestry practices result in lack of recruitment of importance stand structural attributes through time Rationale for Rating ➢ An extensive zone, covering much of the coast – high variation in amount and distribution of protected areas – mid-coast protected areas are currently under negotiation. ➢ Relatively low red and blue listed species per unit area, however research continually finds new species (e.g. in canopy etc), or rare communities ➢ Most valleys, particularly on Vancouver Island/ Sunshine Coast and some in Mid Coast have been heavily harvested, leaving little or no old growth on low slope sites. Old growth forest still remains abundant on inoperable areas, however there are concerns regarding its' distribution and how distribution affects its' functioning. ➢ Natural ecosystem processes have been eradicated throughout valley bottoms (from gap dynamic systems with rare stand replacing events to frequent stand replacement) ➢ Natural forest stands are many times older than acknowledged in policy (1000+ years compared with 250 years). Attributes associated with these ancient forests may therefore be eradicated from the managed forest landscape
***	Transition Zones (e.g. IDFww / ESSFmw /CWHds1) ➢ Fire suppression has been extensive in these localised geographic areas (e.g. around Lillooet etc) where an NDT4 ecosystem complex (IDF/ CWHds1/ ESSF) has been historically impacted by burning. Current ingrowth in these ecosystems changing plant communities and faunal species. ➢ Ingrowth and loss of open forest types has had negative impacts on distribution of Py and Pa. Fire regime: Changed from 2-7 yr FRI to 100 yr exclusion. Increasing density of Mountain pine beetle, Phelinus, spruce beetle. ➢ Heavy fuel accumulation –increasing risk of catastrophic fire. Rationale for Rating

Rank	Ecological Zones
	➢ These ecosystems fluctuate widely between moist and dry conditions and contain very high levels of flora and fauna diversity ➢ They are key migratory systems between true maritime and continental conditions. ➢ Detailed information on historic disturbance regimes is available from Squamish Forest District (Robert Gray pers. comm.). ➢ There is considered to be a limited timeframe where meaningful restoration will be possible here – e.g. Covington *et al*. (1994). Historical and anticipated changes in forest ecosystems of the Inland West of the United States. *Jor. Sus. For*. 2(1/2):13-63.
	<u>Generic Issues (all zones)</u>
***	➢ Loss of old growth throughout the zone – although there is variation across the BEC zones, the extent and general systematic loss of old growth forest from all zones was considered a major ecological degradation. Particular concern was raised throughout the region concerning loss of valley bottom/ high productivity sites.
***	➢ Loss of old growth associated stand structures throughout the managed landscape – known to be important for a large number of species, and current abundance considerably lower than naturally.
***	➢ Loss of riparian ecosystems throughout the zone. In drier subzones this includes total loss of small stream and wetlands in development, exacerbated by forestry. In wetter subzones, includes loss of large-sized attributes and rare old growth ecosystems historically present.
***	➢ Impact on rare ecosystems – known and unknown – throughout the zone. Although this is a particular issue in the highly diverse, highly impacted CDF and dry CWH, it is a potential concern throughout the zone due to the lack of inventory (particular for invertebrates and plant communities).

Summary and Common Themes

After completion of the Strategic Ecological Restoration Assessments, a number of patterns and common themes were evident from all the workshops. These are highlighted in the Table below.

Theme	Issue	Priority ecosystems / areas
Forest policy	➢ Rate of harvest ➢ Stand and landscape retention levels ➢ Implementation rules ➢ Extent of difference from natural ➢ Ability of non-contributing landbase to meet objectives of policy	➢ NDT1/ NDT2 ➢ Some NDT 3
Forestry practices	➢ Species conversions ➢ Beetle management strategies ➢ Silviculture approaches ➢ Succession truncation ➢ Appropriate stand structure retention	➢ NDT4 ➢ Interior Cedar-Hemlock ➢ Areas with beetle infestations
Access	➢ Road density ➢ Hunting pressure ➢ Disturbance pressure ➢ Invasive species ➢ Seismic lines	➢ Ubiquitous ➢ Dry / low elevation systems ➢ sensitive spp. ➢ northern BC (seismic lines) ➢ no agency in control
Riparian	➢ Loss of unique structures ➢ Terrestrial interface-plant community changes ➢ No overlap with WRP	➢ Systems with long development histories ➢ Ranching impacts ➢ CWH/ ICH
Invasive species	➢ Ubiquitous ➢ Many populations already established ➢ New species offer possibilities of prevention of further outbreaks	➢ Grassland ecosystems ➢ Concentrate on threats of future ➢ Relevant to many other restoration activities (e.g. NDT4 restoration)
Backcountry tenure + recreation	➢ Rapidly expanding ➢ Motorised travel ➢ Remote lodges in high elevation areas ➢ Cumulative impacts with forestry	➢ ESSF / AT ➢ Coastal (mid/ north), especially Islands ➢ Adjacency to US/ Alberta
Reference ecosystems	➢ Losing reference ecosystems in some areas ➢ Losing some essential components (e.g. Whitebark pine, ICHdw riparian)	➢ Grassland ecosystems ➢ Low elevation / impacted protected areas
Cumulative impacts	➢ Can't consider forestry impacts in isolation of other impacts	➢ Need to consider partnerships with landowners
Other comments	➢ Social license is needed for many restoration projects ➢ Education on many subjects is needed	

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