E103:
Ecological Baseline Assessment

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FINAL REPORT: October 31st, 2008.

Disclaimer

This report was commissioned by the Ecosystem-Based Management Working Group (EBM WG) to provide information to support full implementation of EBM. The conclusions and recommendations in this report are exclusively the authors', and may not reflect the values and opinions of EBM WG members.

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Executive Summary

This project is intended to provide an up-to-date analysis of the conservation status of the coast planning region. It was intended to include an analysis of both coarse filter risk – based on site series surrogates, and of habitat condition for a suite of focal species. However, due to on-going model refinements, it was decided that this report should focus on the coarse filter, and that the species analysis may be included at a later date.

The analyses are based on a 'coast-wide' database provided by CFCI (Feb 2008) and a timber supply analysis output (A. Fall 2008) based on similar data.

The analysis includes three scenarios –

- **Spatial Basecase** – which represents the latest timber supply analyses and management legislation and policies, prior to the agreement to implement EBM on the coast;
- **Current SLUO** (3b) – which represents the currently existing agreements on Protected Areas, and legal objectives as of June 2008;
- **Full EBM** (Risk_managed_4d) – which represents a model of the risk-managed EBM targets of 70% regional targets for all SSS implemented across the entire coast.

Methods

Data Sources. This analysis was intended to be based on the most up-to-date and universally agreed upon dataset. A dataset was provided by CFCI (via C. Rumsey; Feb 2008) which included up-to-date depletions and was considered 'clean'. This dataset was used for the current condition analysis for representation in Protected Areas. Secondly, output from the landscape model (SELES; A. Fall pers. comm.) allowed an analysis of trends through time for the condition of ecosystems.

There are a number of data and approach inconsistencies that make analyses such as this more difficult than necessary, including:

- the lack of a definitive list of site series surrogates that meshes between all datasets and SLUOs,
- inconsistencies between land use objective RONV used to set targets, and best available science information for RONV,
- the lack of age data that are generally accepted to be reasonable for all SSS on the coast,
- datasets (prototable versus timber supply data) that do not include exactly the same physical area.

The scope of each of these issues has been examined in this paper, and where possible, recommendations for action are made. In other cases, questions are raised that need to be examined further in order to solve inconsistencies. In many cases (except for age issue) the area impact of the inconsistencies is usually small and so has typically therefore been ignored, however these small inconsistencies constantly cause questions to be raised about the data, and result in additional effort being required every time a new analysis is needed. In order that automated routines can be used to output information about scenarios, a consistent set of information is needed.

Risk is defined in terms of the probability that ecological integrity will not be maintained, and is assumed to increase with a change in state from the natural forest condition. Assessing risks to ecosystems and ecosystem processes is considerably more complex than for single species, however, it is a key measure by which EBM is judged (CIT 2004). Background documents that discuss risk to ecosystems, ecological integrity and thresholds are available (CIT 2004; Holt 2005; Price et al. 2007).

Uncertainties. In any analysis of this kind, there are many different kinds of uncertainties. There are uncertainties embodied within the modeling (e.g. the timber supply modeling makes assumptions about how harvesting will occur within the ruleset, or how well trees will grow in the future etc). There are uncertainties in the interpretation of the information (e.g. how well do the site series surrogates reflect 'real' ecosystems, or how well do we understand risks to ecological integrity based on these indicators). There are also 'operational' uncertainties which point to our inability to know in advance how any

particular scenario will play out on the ground. Although the scenario rules are assumed to have some influence on the future, many unforeseen events could significantly alter the actual outcomes. Although some of these uncertainties are intertwined, they are separated out in the commentary below as far as is possible.

Results

The results are organised in order to compare the three land use scenarios in sequence. In each comparison, the protected areas analysis and old forest trends indicators are summarised. In addition, for ease of reading, relevant key uncertainties are also summarised within each indicator section. Additionally, a final summary of uncertainties is presented that includes 'general uncertainties' that influence general interpretation of the results. This split is made in order to reduce repetition within the report.

The Current SLUO significantly reduces risk to ecological integrity over Basecase scenario. The lowered risk comes from a variety of sources and has different levels of certainty.

- **Protected Area**: the percent of the total landbase protected has increased significantly, from 7% over the region to almost 32% over the region. This increase should provide a substantive reduction in risk to biodiversity values in general. The protected areas also generally provide a high level of certainty of protection, adding to their utility as the core of a conservation plan for the region.
- **Distribution of Protected Areas**: generally the protected area network consists of large geographic areas (typically numbers of adjacent watersheds) which are well distributed across the region, resulting in an assumed increase in functional protection from these areas. Ecosystem representation has increased significantly over Basecase which has significantly lowered risk; however, there remain some ecosystems (as defined by SSS) that remain under-represented in the protected areas, including 99 of 212 SSS that have less than 20% protection. This under-representation has the potential to undermine the long-term effectiveness of the core protected areas strategy (Noss and Harris 1986; Noss and Cooperrider 1994; Pressey 1994) by failing to provide core protection for a significant number of ecosystems (SSS). Some of the most southern biogeoclimatic variants (e.g. CWHxm2 and CWHdm) have additional concerns because they also have very low representation in Protected Areas in the neighbouring region to the south (A. MacKinnon pers. comm.).
- **Old Growth Forest:** Compared with the Basecase scenario, the Current SLUO scenario results in additional old forest remaining on the landbase through time. After 250 years, a total additional area of 137,351ha of old forest remains that would not have been present prior to implementation of EBM. The additional old forest maintained is partly in protected areas, and partly as a result of old forest and other retention targets.
- **Ecosystems at high risk:** The number and area of ecosystems at high or high-moderate risk through time is lower under the Current SLUO, compared with Basecase. Currently, 45 of 167 SSS (covering 223,490 ha) are at high risk (see Fig. 1 for locations by landscape unit), and of these 25 (representing 60,000ha) have less than 10% of natural levels of old growth remaining. Ecosystems at high risk today tend to be higher productivity ecosystems that are associated with a disproportionate amount of the biodiversity values on the coast. The number at high risk was predicted to increase under the Basecase until 100 years out and then to decline to 34 SSS (82,455 ha) remaining at high risk after 250 years. Under the Current SLUO, the number of SSS at high risk declines slightly in the short-term, and declines significantly to 11 of 167 after 250 years (representing 33,733 ha remaining at high risk). The number at high and high-moderate risk however, remains relatively high into the future, with 43 SSS remaining in this higher risk category after 250 years.
- **Locations of ecosystems at high risk today:** the distribution of ecosystems and risk across the landscape is not random. First, some landscape units have high SSS diversity (maximum of 53 SSS in a single LU), compared with others with less than 10 SSS. Areas of high diversity tend to have high biodiversity values overall, and are also often particularly important in terms of functional diversity. The following Landscape Units have more than 10 SSS at high risk, covering areas up to 30,000ha

within a unit: Thurlow, Franklin, Estero, Dean, Gray, Fulmore, LowerKlinaklini, Saloornpt, Owikeno, MiddleKlinaklini, BellaCoola, KnightEast and Phillips (See Fig. 1 for locations of high risk SSS today, and a full list of SSS risk through time in Table 7. Note that this figure shows SSS at high risk – but does not reflect individual condition; i.e. the SSS is at high risk from a coastwide perspective, but in any particular LU may be in good (i.e. old growth) condition.

- The SLUO scenario reflects a single scenario based on specific requirements of the SLUO today. However, operational implementation and individual DSPs have the potential to alter the specific outcomes associated with this scenario. Operational uncertainty regarding the specifics of implementation remains significant at this time, and could result in either an increase or a decrease in risks to ecological integrity.

The Full EBM scenario results in additional lowering of risk compared to the Current SLUO. Again, the lowered risk comes from various sources, and has different levels of certainty:

- **Protected Areas:** these remain the same for the Current SLUO and the Full EBM scenario and as such, they continue to lower risks to ecological integrity under Full EBM.
- **Old Growth Forest:** Full EBM results in an almost doubling of additional old forest remaining on the landbase over the Current SLUO, from a total of 137,000ha of additional old growth to a total of 214,000ha of old growth over 250 years under Full EBM.
- **Number and area of ecosystems at risk:** the number of ecosystems at high and high–moderate risk is lower under Full EBM compared with the Current SLUO. After 250 years, with Full EBM half the area remains at high risk compared with the current SLUO (17,000ha compared with 33,773ha). Note that some of this area remains at high risk as an artefact of the modeling (5 of the 8 remaining ecosystems). The relative comparison holds however, with full EBM resulting in lower risk overall.
- Additionally, the **rate** at which ecosystems move to a lower risk status increases under Full EBM. Under the current SLUO a number of ecosystems continue to increase in risk for many decades before a long-term retention strategy finally lowers risk. Under Full EBM most ecosystems move much more rapidly into a lower risk status.
- **Certainty**: As with the SLUO model results, there remain large uncertainties about how Full EBM would be operationalised. As with any scenario, operational uncertainties remain and may increase or decrease risks to ecological values depending on how the scenario is implemented. However, the assumed level of certainty for the risk results is higher for the Full EBM scenario than for the Current SLUO scenario because the required protection levels are higher and so the outcomes are less dependent on *defacto* protection from the 'inoperable' landbase, or on discretionary differences of implementation approach.

Assessment of Long-Term Ecological Integrity

Based on the modelled implementation of the scenarios, the Current SLUO significantly reduces future ecological risk compared with the Basecase as outlined above. There remain potential gaps however, and these tend to be more significant under the current legal objectives compared with the full EBM scenario.

- **Under-represented Ecosystems** – overall protection is high under the Current SLUO, yet there remain a significant number of ecosystems that are under-represented in Protected Areas. Of most concern are drier southern ecosystems where little old-growth remains and where old growth retention targets tend to be lowest. Lack of core protection for ecosystems is a key issue because this type of protection has the greatest certainty of effectiveness for maintaining functioning ecosystems in general, and, because representation that is part of a larger area (i.e. a protected area, rather than small patches of retention) may be crucial to species' adaptations to climate change into the future.
- **Effectiveness of Protected Areas and retention areas** – The suite of protected areas under the current SLUO covers a substantive area and appears to include large functional areas, and so in

general is likely to significantly reduce risk to ecological integrity. However, there are proposals to undertake developments within some of these (IPPs, transmission lines and access) which may or may not occur, and which may influence the long-term ecological integrity of some core reserves. The potential extent of this operational uncertainty remains unknown at this time. With regard to old forest protected in the broader landscape under different objectives, overall effectiveness of the old forest retention will depend on the extent to which conservation biology principles are employed during operational implementation.

- **Ecosystems at high risk –** today, many of the highest productivity ecosystems are at high or high-moderate risk due to past harvesting. Under the Current SLUO some of these remain at high or high-moderate risk for many hundreds of years into the future, even with the new protected areas and old growth targets. Full EBM tends to result in ecosystems moving to lower risk classes more rapidly, and so has a more short-term influence on landscape condition and risk levels. The temperate rainforest on the BC coast is dominated by a few very large ecosystems, and very many smaller ecosystems. The Current SLUO objectives result in the vast majority of the coastal forest area receiving a low old-growth target allowing these to move to higher risk over time. This includes both relatively large areas of moderate productivity ecosystems, and a large number of small higher productivity ecosystems. The higher productivity ecosystems include a very small percentage of the total area on the coast, but are often unique and represent some of the highest biodiversity values on the coast.
- **Inoperable Areas and Protection Certainty** – Areas that are inoperable today are assumed in the timber supply model to remain unlogged in future. However, if some of those areas were to be logged, risk levels could increase. This is particularly relevant for some moderate productivity, mid-sized ecosystems that have low old-growth targets but are assumed (in the model) to be 'protected' from harvest largely due to inoperability. This is one difference between the SLUO scenario and Full EBM scenario in which, even if a modelled risk level is similar, the certainty under Full EBM is higher[1].
- **Stand Level Retention** – The timber supply models reported on here assumes an average stand level retention of 15%, the lowest level of the Coast Information Team's recommended 15% - 70% range (CIT 2004a,b; A. Fall pers. comm.). If implemented in this way, this level would compromise the potential future benefits of "variable retention" and may add to risk levels where high levels of past harvesting is combined with high risk targets (typically in the southern areas of the coast in drier ecosystems). However, an analysis of stand level retention occurring recently on the coast has shown higher levels of retention occurring operationally than modelled in the timber supply analysis (D. Cardinall pers. comm. – an average of around 26% rather than 15%). This discrepancy between operational reality and modelled stand level retention may result in actual risk levels being lower than suggested in the analysis[2].
- **Alternate land use not reflected in any scenario –** Detailed Strategic Plans (DSPs) are under development currently. These plans can and may include many additional factors that may result in changes to risk to ecological values compared with what is reported here (for example, cultural protection areas – D. Cardinall pers. comm.). Since the details of the DSPs remain uncertain / unknown at this time they cannot be quantitatively factored into this analysis, however the potential to influence long-term ecological integrity both positively and negatively compared with the results outlined here remains.

Additional Uncertainties

There are also additional uncertainties that are relevant to interpretation of the results:

- **Risk Thresholds.** The original CIT report (CIT 2004) identified an example model for interpreting risk to ecological integrity. Since that time, additional work on risk thresholds has attempted to provide further clarify on how changes from a natural landscape may influence risk to ecological

[1] An analysis of a subset of existing development plans today shows in the order of 37% of current harvest to be ongoing in areas outside the official THLB (D. Leversee pers. comm.).

[2] The effectiveness of stand level retention in meeting 'landscape level' retention goals remains unknown (Price et al. in prep.).

integrity (EBM WG Workshop 2007; Price et al. 2007). This framework is reflected in a number of ERAs for the coast, undertaken over the last number of years (Holt 2003; Holt 2005; Holt and MacKinnon 2007a and 2007b). This approach identifies two key risk thresholds, based on a percentage of natural old forest conditions that are used in this report – less than 30% of natural old growth (high risk), and more than 70% of natural old growth (low risk). Two specific areas of uncertainty have been raised around these:

- Low risk threshold – it has been recognised that the *intention* of the 70% of natural target for forests >250 (or 180) years is to maintain a natural distribution of all older forest types (i.e. 250 – 500; 500 – 1000, 1000 – 2000 years etc; Holt et al. 2008). Under some circumstances this can be assumed to occur (e.g. with large areas of unmanaged forest), but for other smaller units or where the majority of the SSS is in the THLB, specific management direction may be needed to ensure that the full range of original old-aged forests are adequately maintained.
- High risk threshold – additional literature review, discussed at an EBM WG workshop (2007) has recommended that the original CIT '30% of *natural*' high risk threshold be raised to a '30% of *total habitat*' threshold. This recommendation results from studies where negative population trends were observed as habitat was reduced to below 30% of total (Price et al. 2007). All the analyses in this document used the original CIT (CIT 2004) threshold, which results in targets as low as 12% total habitat on the south coast. It is possible then that 'high risk' is reached at higher levels of old forest than assumed here, and if so would result in a significant increase in the numbers of ecosystems at high risk in all scenarios.
- Additionally, there are 16 SSS (primarily low productivity types) for which the RONV used to generate targets appears to be significantly lower than that identified by science (see methods). This issue should be clarified to ensure targets are calculated from best available information.

- **Defining Ecosystems –** this analysis uses site series surrogates to define ecosystems, as the best available fine-scaled descriptor available for the entire coast. Implementation of EBM however was intended to occur however using site series (CIT 2004a). However, policy targets in the Land Use Objectives refer to SSS, leaving a potentially significant gap between SSS and maintaining ecosystems as defined by site series. A preliminary analysis of the potential implications suggests SSS may fail to well represent site series and this implementation issue requires additional consideration (Price 2008).
- **Climate change -** Climate change represents a very significant uncertainty to many aspects of this analysis. The extent of future changes remains unknown, but at minimum they are likely to result in less ecological stability for the coastal rainforest due to changes in temperatures, stream flows, and more frequent and severe storms. Key uncertainties may include timber supply assumptions such as growth rates of future trees, and assumptions within this ERA around ecological integrity and risk levels. The broad effect of climate change is as an additional stressor to ecosystems that would exacerbate stresses incurred through harvesting or other developments.

Recommendations

A number of recommendations are made in this report that relate primarily to managing of information and datasets (see Appendix 4 and 5).

Recommendations relating to information management:

- Data Sets: A concerted effort is needed to create a single dataset that is used by all parties for all coastal analysis. A start has been made in the CFCI dataset (prototable – May 2008), but there remain inconsistencies in this dataset, and it is currently not used in the timber supply modeling that is on-going. Updating forest cover information for the whole coast so that no 'fixes' are required should be a high priority.

- SSS list: In the short term, create a comprehensive and definitive list of SSS. If this excludes small areas of 'apparent' SSS, provide guidance as to how to practically deal with mapped site series surrogates that don't exist in the SLUO targets tables. Align the list of SSS so that there is clear criteria for inclusion / exclusion within the SLUOs, based on the definitive list created above. However, as outlined by the EBM Handbook, and now confirmed by recent work (Andy Mackinnon pers. comm.), site series surrogates are extremely poor surrogates for ecosystems. **Where TEM / PEM are available, these should be used immediately in both target-setting and implementation of EBM.** Where site series information is unavailable, prioritise development of these data.
- RONV: Provide rationale or fix for the 16 SSS which appear to have very low RONV information used to generate targets. A 'final' RONV list should be generated and posted on the web as a resource to all parties undertaking coastal analysis.
- Rationale for rarity rankings: Provide rationale and check for how the 'commonness' categories are assigned in each region. There appear to be discrepancies in the LUOs.
- Reassess the integrity of an approach that assigns rarity categories to SSS based on a number distribution when many units are included that are not being directly managed for old seral forest (e.g. deciduous units), may be largely non-forest (At), and cover areas of land inappropriate for management at this scale (e.g. SSS that cover tiny numbers of hectares – 17 SSS with targets in the SLUOs cover less than 100ha on the entire coast).

There are also a number of recommendations that relate to classification of old forest on the coast. These recommendations are made to deal with known or suspected incorrect age-class designations (see Appendix 4).

- For ERA and Timber Supply: For units primarily NOT in the THLB (S_P_Low, Cw_Low and HB_low) continue to shift the AC8 up to AC9. These units are clearly at low risk and unconstrained for timber (as currently occurs);
- For ERA: For other units with slightly skewed age-class distribution (C_M; HB_Medium and Good, S_M), , assume AC8 + 9 represents the forest >140 years, but don't assume further knowledge about the age-class distribution. Use the predicted target >140 years for comparison in ERA (approach employed in this document).
- For timber supply: shifting the entire AC8 for any SSS into AC9 creates an unreal 'gap' in the age-class distribution. Where there is very little "old seral" remaining this may 'free up' timber that is actually required to meet old seral targets. The most appropriate solution is to attempt to 'correct' the distribution rather than shifting the whole age-class. Shifting the whole age-class in many cases exacerbates the problem rather than fixing it. Alternatively, leave the data as they are currently (particularly where the existing skew is minor – e.g. or hemlock_balsam medium and high and cedar medium, plus for Spruce_medium where the skew likely represents the natural distribution).
- If a 'fix' is used to increase the age-class, sensitivity analyses should be undertaken to ensure additional risk is not being placed on these ecosystems as a result. Don't apply one-off fixes to the data for any analysis without clear ecological rationale.
- In addition, the standard FC age-class9 should be separated into AC9a and AC9b to reflect 'original' old forest, and forests of known age greater than 250 years that regrow after harvest or known disturbance.

Acknowledgements

This work was significantly aided by data and support from Andrew Fall and Jim Brown who tried to smooth the process of understanding the different data sources and background information pieces. Helpful comments have been received and incorporated from Dan Cardinall, Dennis Crockford, Wally Eamer and Jody Holmes. Ian McLachlan deserves a mention for his previous efforts to work on a similar project.

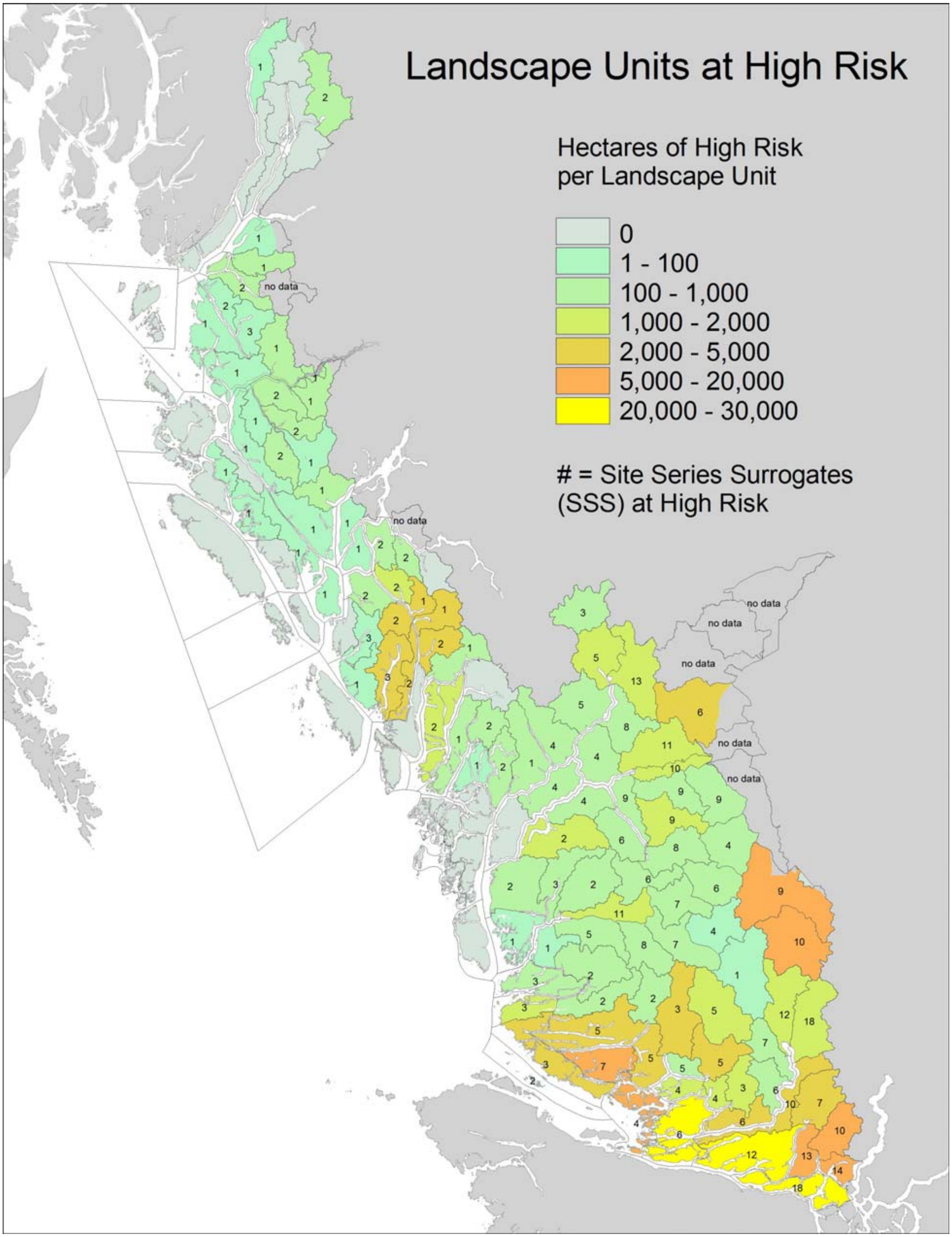


Figure 1. Area and number of Site Series Surrogates at high risk by landscape unit for the north, central and south coast areas of the B.C. Coastal Temperate Rainforest. AWAITING A NEW TITLE

Project objectives

The details of implementing ecosystem based management on much of BC's coastal temperate rainforest is on-going. This process is being overseen by the EBM Working Group who contracted this work. Over the history of development of EBM, various similar products have been produced for sub-sections of the coastal planning area, using various different datasets and scenario assumptions (e.g. Holt and MacKinnon 2006a and b). The objective in this case is to undertake analysis for the whole coast (North and Central) simultaneously, and to use a dataset that is as updated as possible.

Specific objectives of the project are:

1) provide an up-to-date analysis of current condition and threats for key indicators, including ecosystems (defined by site series surrogates). In addition, the original terms of reference included focal species however, due to on-going work to update individual habitat models, this report focuses only on the former at this time;
2) provide sub-regional context relating to the distribution and condition of key ecosystem level indicators for the coast planning area.

This report provides the methods and results for the conservation status assessment (1). The distribution and condition reporting for individual indicators is provided in an excel database (2).

The analysis includes assessment of three alternate land use scenarios:

- Spatial **Basecase** – which reflects the latest TSR for each management unit within the coastal region;
- **Current SLUO (3b)** – which reflects the implications from the current Strategic Land Use Objectives (July 2008) which are the legal agreements currently in place;
- **Full EBM Risk management (4d)** – which is the 'risk managed' version of EBM. Note this is not the same as 'full EBM' as outlined by the Coast Information Team (CIT 2004a; see Methods).

Scope

Ideally, a condition analysis includes both coarse filter and fine filter indicators.

Coarse filter indicators typically provide an assessment of the extent to which 'ecosystems' are represented and maintained across the landscape. The coarse filter is the central piece of a conservation planning framework because we assume they provide habitat and conditions for the vast majority of known and unknown species and ecosystem processes and functions. In this analysis the coarse filter indicator being used are 'site series surrogates' (SSS) defined by analysis units and biogeoclimatic variants. These units are used within the Strategic Land Use Objectives to set targets, and are the most fine-scaled unit available across the whole coast region.

There are a number of technical issues that are raised when undertaking the coarse filter analysis that are considered in this report:

- Site series surrogates are not widely used in forestry in BC for the kind of detailed analysis and target-setting being undertaken here. As a result, there are a number of issues associated with their use, including not having a 'definitive list' of SSS that all users agree to (see Appendix 5).
- Forest Cover age data have known deficiencies that can influence a strategic understanding of whether land use old-growth targets can be met for different SSS. These 'deficiencies' differ in magnitude for different SSS, and can be dealt with in different ways (see Appendix 4).

To complement the coarse filter analysis, it was intended to include a summary of outcomes for individual focal species within this project. However, a number of other EBM WG projects are tackling the focal species issues in detail, and are currently upgrading various habitat models. As a result, it was determined that focal species results should not be included at this time.

Methods and Assumptions

Methods - Scenarios

This report provides results of a coarse filter environmental risk assessment (ERA) based on timber supply analysis by Gowlland Technologies Ltd. (Spring 2008). The ERA compares predicted conditions under three scenarios:

- Spatial Basecase (SBC) – the scenario that reflects TSR2 for each management unit;
- Current SLUO (3b): This reflects the Ministerial Order “risk-managed” interpretation which includes the current legal obligations in each of the regions of the coast,
- Full EBM (4d): EBM with 70% target overall but no landscape level target which reflects a risk managed implementation of full EBM (with 70% of natural old growth targets for all SSS). This risk management approach does not include the full set of EBM recommendations as made by the CIT (2004).

Methods - Characterising Environmental Condition

Approaches to characterising environmental condition (or Environmental Risk Assessment) have been outlined (BC MoE 2000; Holt 2007). The intention is to identify the potential implications of a decision-set to a range of environmental values.

The process of ERA generally consists of:

- Identifying appropriate environmental indicators
- Characterising trends in those indicators through time
- Establishing benchmarks against which to understand the significance of the trends through time, and where possible identifying low and high risk thresholds to categorise the significance of changes
- Presenting results and identifying key assumptions and uncertainties so a) decisions can be made with full knowledge of the potential environmental implications and b) adaptive management processes can test the hypotheses being generated.

Methods - Indicators

Ideally ERAs examine trends for a comprehensive and complementary suite of ecological indicators. In this analysis, we focus only on coarse filter indicators (see below for brief summary on potential focal species / fine filter indicators).

The coarse filter analysis acknowledges a) that the vast majority of species are unknown in these ecosystems (particularly non-vertebrate animals, non-vascular plants, fungi, lichens and microbes), b) where they are known, detailed habitat requirements are often unknown, c) that ecosystems and not just species are important elements of biodiversity in their own right. For example, ecosystem processes are a function of the combination of biotic and abiotic elements present (the ecosystem) and failing to maintain all these combinations may have significant unforeseen consequences for overall biodiversity and functioning.

Additionally, within the coarse filter a variety of spatial scales should be considered. For example, the coarse filter approach of maintaining old forests should require consideration of both the abundance and distribution of old forest landscapes, and of old forest stand structural elements within stands. The spatial scale of the modelling for the two coast regions was inappropriate to assess the biological values arising from the different stand level recommendations. This factor is discussed in the risk assessment summary for each area.

Here the ‘coarse filter’ ecological risk analysis using four indicators:

- **Amount of protected area** (or partially protected area) – protected areas provide a core for maintaining ecological values. Typically the certainty of protection is higher than other forms of retention and the probability of full functioning is higher due to large complexes being protected and lower disturbance from a variety of potential sources.

- **Amount and trends in old forest abundance and distribution for individual ecosystems** – this reports on the composite effect of protected areas and all other required retention, plus distribution of ecosystems in the 'inoperable' forest landbase.
- **Number of ecosystems in one of four risk classes** – assessing the amount of old forest in relation to the level expected naturally provides an ecological interpretation of the level of old forest in different ecosystems.
- **Area of ecosystems in one of four risk classes –** the areal extent of different ecosystems on the coast differs widely. Area in each risk class provides an alternate interpretation of the number of ecosystems in each risk class.

Methods - Focal Species

To supplement assessments on coarse filter ecological condition, this project proposed a similar evaluation for a suite of focal animal species. In the context of ongoing planning and research on the Central and North Coast of B.C., marbled murrelet, northern goshawk, grizzly bear, tailed frog and mountain goat have been identified by the current legal order for the purposes of maintaining ecological integrity in the region. Two other species, black bear and black-tailed deer have also been modeled and assessed in the past, since their inclusion further widens the range of measurable habitat types.

While a number of models have been developed for these species through the North and Central Coast LRMPs, as well as the Coast Information Team, the EBMWG has specifically created the EI02 project to oversee the development, collation, and peer review of updated models and mapping for these species. There appears to be little advantage in developing a baseline and risk assessment based on data that is shortly planned to be substantially improved and updated. As such, the EI03 project has chosen to delay assessment work on these species until the EI02 project is complete.

Once the appropriate data is in hand, a full assessment of the current land status of high value habitats will be conducted. In order to assess potential future condition, it may also be possible to take advantage of time series evaluations of focal species habitat being conducted for a third EBMWG project, DS04.

Meanwhile the EI02 project has provided the following progress update for the species in question:

Marbled Murrelet: Contractors for the Ministry of Environment (MoE) are completing air photo interpretation of all landscape units starting with the South Coast sub-region and working north. As of August 2008 all of the South Coast landscape units are complete and contractors are currently working on the Mid Coast.

Northern Goshawk: Currently known nest occurrences buffered by 200ha, are being made available by the Northern Goshawk Recovery Team.

Grizzly bear: Air photo mapping for grizzly bear has been completed for Mid and South Coasts and will be completed for North Coast by end of September 2008.

Black bear: EI02 domain experts have determined that the existing black bear models developed for LRMPs are insufficiently accurate to support EBMWG analysis but acknowledge instead that the combined EBM package is adequate to address the habitat needs of this species.

Mountain goat: In addition to legislated Ungulate Winter Range areas, MoE has made available biological habitat layers for goat winter range in the North and Mid Central Coasts. MoE is also preparing a similar goat habitat layer for the South Coast to be made available for September 2008.

Coastal blacktailed deer: MoE is creating coast-wide habitat suitability mapping for coastal deer to replace the former layer which EI02 peer reviewers deemed too coarse for planning needs. This model layer should be available in September 2008.

Tailed frog: Habitat mapping prepared by the CIT is currently available, and Domain Experts for EI02 have noted that the CIT layer has proven quite accurate at predicting tailed frog occurrences. However, they also predict that the existing model only captures about 5% of tailed frog streams. To improve the mapping the tailed frog team has assembled known occurrences for the three coastal sub-regions and is currently discussing cost-effective ways to make improvements by the end of September 2008.

Additional species: Based on input by EI02 domain experts, habitat information for elk and moose have been made available for the Mid and North Coasts.

Methods - Data Sources

The coarse filter analysis is based on two datasets –

i) Trends analysis data are output from the timber supply analysis undertaken for the EBMWG using SELES by Andrew Fall at Gowlland Technologies. Supplied by the B.C. Ministry of Forests, SELES data was drawn from the Coastal Detailed Strategic Planning (DSP) Decision-Support project (Gowlland Technologies Ltd). The Coastal DSP process is making use of the SELES spatial timber supply model (STSM - see Fall and Crockford 2006) using data based on the most recent timber supply review analyses. As it currently stands, these DSP forest representation outputs serve as the only readily available source for indicators of potential *future* forest condition. Since an assessment of future condition is essential to this analysis, the DSP data has been adopted in its entirety.

ii) Protected area data are taken from the CFCI 2008 dataset. These data are from an updated version of forest cover (made available to B.C.'s Integrated Land Management Bureau (ILMB) through the Coastal Forest Conservation Initiative (CFCI)). These data, which became available February of 2008, now represent the most up-to-date database available with respect to *current* Site Series Surrogate distribution and forest age on the North and Central Coast.

Unfortunately, at the time of this report, there has been no opportunity to use this information in SELES to provide an updated future condition analysis. Nonetheless, it is recommended that in the future, any updated baseline and ecological risk assessment make use of the February 2008 database, and any available harvest updates that are available at the time.

There are discrepancies between these two datasets, in terms of the site series surrogates present on the coast. Appendix 5 examines these discrepancies.

As outlined below, stand age is used as the definition for old growth in these ecosystems. However, there are some known issues with the forest cover data (see Appendix 4 for details). In some cases, known data problems are 'fixed' within the original data prior to it being incorporated in timber supply analysis (A. Fall pers. comm.), and in other cases data were examined to determine to what extent apparent data errors were causing erroneous results. Appendix 4 examines this issue and provides some general recommendations relating to both ERA and timber supply analysis using the base data sets.

Methods - Defining ecosystems

Site series are the most ecologically appropriate description of ecosystems for BC. Site series are used operationally in forest management in BC but reliable site series mapping is not yet available for the entire coastal ecosystem. As a surrogate ,in these analyses and in policy, ecosystems are defined on the basis of Analysis Units located within Biogeoclimatic units – or Site Series Surrogates (SSS). In the report I will use 'SSS' and 'ecosystems' synonymously, even though SSS do not thoroughly reflect an ecological description of ecosystems.

Analysis units are defined based on the productivity of the site (good, moderate or low) and the leading tree species. Note that 'leading species' simply describes the most prevalent species in the stand, but does not imply that only that species is present (e.g. a cedar-leading stand can have 40% cedar and 20% each of hemlock, spruce and deciduous trees[3]).

[3] Analysis Units use common and oftentimes confusing names for tree species. On this part of the coast, "cedar" means western redcedar (*Thuja plicata*) and/or yellow-cedar (*Chamaecyparis nootkatensis*), "hemlock" means western hemlock (*Tsuga heterophylla*) and/or mountain hemlock (*T. mertensiana*), "spruce" can mean Sitka spruce (*Picea sitchensis*) or Engelmann or white spruce (Picea engelmannii or P. glauca or hybrids thereof) in the interior zones, "fir" means coastal Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*), "balsam" means amabilis fir (*Abies amabilis*), and "pine" means shore pine (*Pinus contorta* var. *contorta*).

Analysis units have only a limited use for defining ecosystems because the description is not linked to site potential. For example, AU description changes when the site is logged and replanted with a different species, unlike site series which reflects site potential. In addition, similar sites could be identified by apparently very different labels because of the use of leading species[4]. However, it is the best description available for these analyses at this present time (A. Banner pers. comm.), and is preferable to simply using biogeoclimatic variant level representation.

Figure 2 and Fig. 3 shows the distribution of Analysis Units and Biogeoclimatic variants on the whole coast. The most abundant analysis units are cedar-leading low productivity types, and hemlock_balsam moderate and low productivity types. The predominant BEC variants are CWHvh2, CWHvm1 and vm2 and MHmm1. The other half of the forested landbase consists of a large number of other types, including the higher productivity types which tend to be limited to small portions of the landbase.

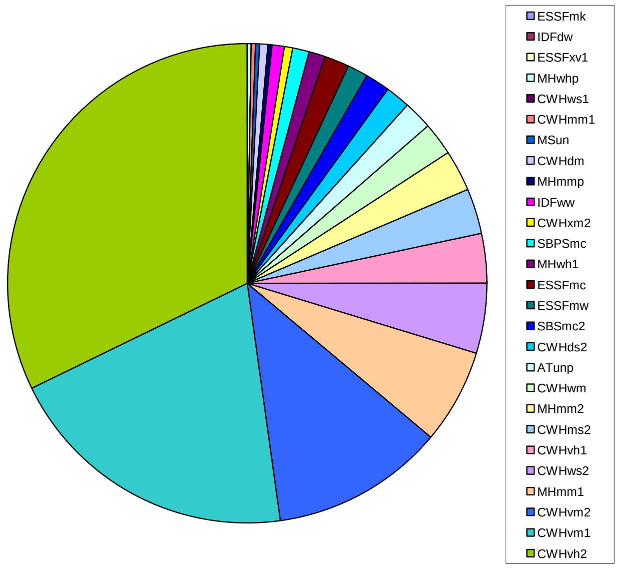


Figure 2. Distribution of biogeoclimatic variants for the whole coast. The region is dominated by the CHWvh2, the CWHvm1 and the CWHvm2 (smallest unit is at the top in the legend, increasing through the list).

[4] Although additional species information is available within forest cover, tracking additional species through time is complex and so is not undertaken as part of timber supply analysis/ landscape modeling.

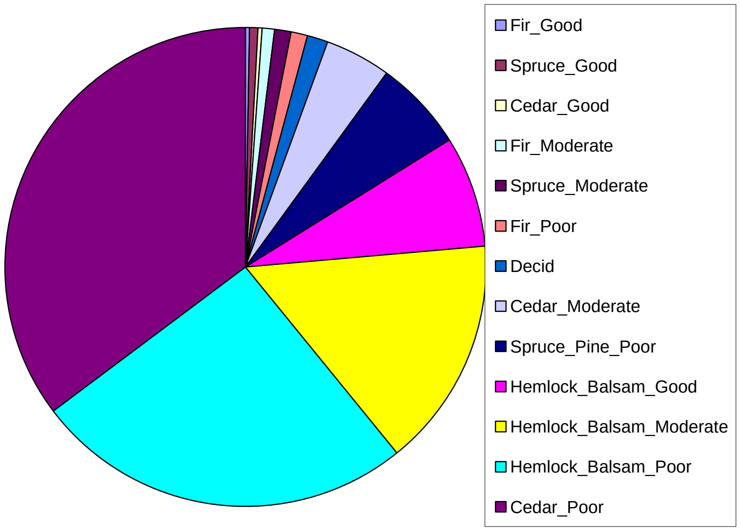


Figure 3. Areal distribution of analysis units. The region is dominated by cedar_poor and hemlock_Balsam poor sites (62% of the total area) and hemlock_balsam moderate sites.

There are various potential sources for generating a list of SSS relevant to the coast, including the SLUOs which list a series of SSS and associated targets, the CFCI dataset from which a list of SSS can be generated and the dataset used by Andrew Fall as part of the timber supply analysis. None of these three sources come up with exactly the same list of SSS. Background information on these issues is outlined in Appendix 5.

Methods – Defining Old Growth Forests and Recovery

An analysis of representation of 'old growth forest' provides a primary coarse filter indicator. This is because old growth forest was historically the prevalent stage of forests present on the landscape and because old growth provides the habitat for many other species and functions in coastal temperate rainforest.

Old growth forest is defined for the purposes of this analysis as 'those forests that are at least 250 years old' – as defined for individual biogeoclimatic zones by the Biodiversity Guidebook (1995). In the southern sections of the Central Coast (KMT - Kwagiulth - Musgamagw Tsawataineuk/ Nuxalk areas) the age cut-off for old growth was reduced from 250 to 180 years in the SLUOs. In the ERA, we continue to use the standard age cut-off of 250 years to assess risks to ecosystems, irrespective of this policy change.

We know that many of the natural old forests in coastal ecosystems are considerably older than 250 years, but we do not know their exact age. When setting targets for forests >250 years old, the *intention* is to represent the full age range of forests (i.e. those 250 – 500 years, 500 – 1000, 1000 – 1500 years etc, and there are circumstances when this is more or less likely and there are occasions when a more complex analysis may be required – see Holt et al. 2008 for discussion).

However, we continue to use the simple age cut-off at this time because we know that any forests with a minimum age of 250 years were established naturally (i.e. there is no industrial harvesting from that long ago), and so these forests represent true 'natural' old forests. This age was also chosen because forests less than 250 years old often lack the complex structure characteristic of old-growth forests. An older age cut-off was not used because available data (forest cover) does not adequately distinguish forests past the 250 year old cut-off. See Appendix 4 for a more detailed description of the use of forest cover age data to define old forests.

Clearly, the functions of old forests after harvest or natural disturbance are restored at different rates and simply using forests >250 years to define risk is arbitrary: some functions of old-growth forest can be restored much sooner than 250 years, while others may take considerably longer. Work is underway to quantify recovery rates of different attributes (A. Banner and A. Mackinnon pers. comm.), but this work is in its infancy. In addition, work is underway to define when it may be appropriate, within an ecosystem-based management context, to 'count' younger forests towards old-growth targets (Holt et al. 2008). Until this work is finalised, we continue to use the threshold of 250 years as a reasonable recovery period for some attributes such as larger structural attributes and coarse woody debris. Some functions may be fully recovered sooner (e.g. hydrologic functions), or much later (e.g. fully developed multi-aged canopy and gap dynamics, or populations of rare species) than 250 years.

Methods – Defining range of natural variability for SSS

Defining RONV

The identified targets for retention of old forest in these ecosystems is defined by a percentage of the expected natural level of old forest (termed range of natural variability for old – or RONV). This RONV number is bound up in the SLUO appendices that identify target percentages, and since there remains some confusion about this number, the SLUOs were unravelled in order to understand what RONV numbers were used in the targets. This is outlined in Appendix 5.

The vast majority of the target numbers used closely agree with RONV numbers developed by Price and Daust (2003), however some RONV numbers appear to fall significantly outside what was scientifically recommended. Table 1 identifies those SSS for which the RONV number (or the target percentage) used *appears* to be incorrect.

Table 1. SSS where the RONV used on the south coast appears to contradict[1] other information (see Appendix 5 for further discussion).

AU	BEC	NC_CC Category	Target NCCC	Target SC	SC Category	Relevant Area	Area	RONV used NC	RONV used SC	Price RONV
Fir_Moderate	MHmm2			29	V_R	SC only	52		0.41	0.70
Spruce_Pine_Poor	CWHdm	V_R	60	13	C	AllCoast	87	0.86	0.43	0.86
Spruce_Pine_Poor	MHmm1	Rare	65	29	V_R	AllCoast	506	0.93	0.41	0.93
Spruce_Pine_Poor	MHmm2	Rare	65	29	M	AllCoast	633	0.93	0.41	0.93
HemBal_Poor	CWHvh1	M	68	29	M	AllCoast	1,230	0.97	0.41	0.97
Spruce_Pine_Poor	CWHms2	M	60	12	C	AllCoast	2,321	0.86	0.40	0.86
Spruce_Pine_Poor	CWHvh1	C	29	12	C	AllCoast	4,688	0.97	0.40	0.97
Spruce_Pine_Poor	CWHws2	C	29	12	C	AllCoast	4,967	0.97	0.40	0.98
Fir_Poor	CWHws2	C	22	22	M	AllCoast	7,056	0.73	0.31	0.72
Spruce_Pine_Poor	ESSFmw	C	29	29	M	AllCoast	7,708	0.97	0.41	0.98
Spruce_Pine_Poor	CWHvm2	C	28	29	M	AllCoast	8,523	0.93	0.41	0.93
Spruce_Pine_Poor	CWHds2	C	29	12	V_C	AllCoast	12,041	0.97	0.40	0.98
Spruce_Pine_Poor	IDFww	C	29	12	C	AllCoast	12,572	0.97	0.40	0.98
Spruce_Pine_Poor	CWHvm1	V_C	28	12	C	AllCoast	13,297	0.93	0.40	0.93
Spruce_Pine_Poor	CWHvh2	V_C	29	12	C	AllCoast	43,261	0.97	0.40	0.97
Spruce_Moderate	CWHvh1			25	M	SC only			0.36 ?	

1: Note that a significant amount of work goes into simply understanding where the target percentages came from, and this in itself is a barrier to implementation and updating information. Hence leading to a recommendation that clear and transparent information on RONV and targets etc should be freely available.

Using appropriate age data

Appendix y outlines in detail how the forest cover age data incorrectly classifies age for certain sites on the coast. This is a very significant issue for the ERA (and for timber analysis that is based on age related constraints) because a key indicator is the amount of old forest on the landscape for each SSS – where real 'old' forest is mistyped as younger forest the data would give the impression that there is high risk for that SSS when in fact the data are incorrect, and *vice versa*.

For some of the known or suspected areas of concern, various options were available to attempt to identify and then avoid these issues (see detail in Appendix 4). For some areas and SSS, the data in the dataset have been altered in the base data (A. Fall pers. comm.) (i.e. for low productivity types where the change has little timber supply impacts), for others there remain areas where there appear to be discrepancies. Some data have been changed in some datasets or analyses (e.g. all AC 8 was shifted to AC9 for the midcoast TSA and a TFL within a Cortex TS analysis; A. Fall pers. comm.).

For other areas or SSS, there are potential 'fixes' that could be made in the data but since datasets are not yet updated, an alternative approach was used in the ERA that avoids making 'guesses' about the distribution of ages. In this analysis I assumed instead that all the forest in AC 8 and 9 are over 140 years in age, but no additional assumptions are made about age. In the risk analysis then, for these types only, the 'risk' test was performed on the amount of forest expected greater than 140 years and compared to the total AC8 plus 9. This is likely the most accurate approach since it makes no further assumptions about age only that AC8 and 9 are greater than 140 years in old, and it does not create the 'holes' in the age class distribution as occurs when an entire age class is 'shifted' into the higher bracket.

Appendix 4 provides a rationale for this and other recommended changes associated with forest cover old age issues.

Methods – Protected Areas Analysis

Assessing the adequacy of a Protected Areas network is an important component of the coarse filter assessment. However, there is no simple number to describe how large a protected area needs to be, or what percentage of area must be protected, to achieve stated goals. To properly assess 'adequacy' requires a clear definition of goals and objectives for the protected area network, and a monitoring program to assess whether those goals and objectives are being achieved. Accordingly, this assessment of 'adequacy' of protected areas is restricted to a comparison of the percent protected for individual site series surrogates compared with the overall percent protected. Ensuring all ecosystems are well represented within the protected areas is known to be an important element for an effective protected areas strategy.

Representation of SSS in the newly agreed-to Protected Areas and Biodiversity Areas[5] (from Feb 2007) provides an assessment of the representation of each ecosystem type within areas primarily managed for biodiversity (data used are the CFCI 2008 dataset). This analysis shows ecosystems that are 'under' or 'over' represented compared to the average level of representation. Preferably this analysis would be at the level of site series, however these data were unavailable.

The potential ecological benefits of large Protected Areas are well known, and include lack of disturbance, minimised roadways, and areas large enough to allow natural disturbance processes to continue. There are no specific thresholds that identify how much protected area is enough (in isolation from the total amount of the landbase with low footprint, i.e. in a combination of protected areas and other reserves). In some cases, the certainty of protection within the identified Protected Areas is unclear – for example, a significant number of developments, including Independent Power Projects (wind and 'run-of-river' hydro developments) are proposed in or directly adjacent to protected areas – the potential impacts are unknown at this time but have a significant potential to reduce the ecological protection assumed to be afforded by large protected areas.

[5] Biodiversity areas are intended to maintain ecological diversity and function while allowing some level of development: Commercial forestry and major hydro-electric activities are not permitted in these zones, while all other land uses, including mining and tourism activities, are allowed. The CC LRMP states: "The primary role of the EBM Biodiversity Areas is conservation and the contribution to the maintenance of species, ecosystems and seral stage diversity and ecosystem function."

Methods - Characterising Forest Trends

The Ecosystem Risk Assessment also uses output from timber supply analyses to provide trends through time for ecosystems on the forested landscape, under three different land use scenarios.

The landscape / timber supply model SELES was run by Andrew Fall to produce timber supply outputs for multiple land use scenarios, and this output was also provided for the ERA.

Three land use scenarios are analysed in this analysis (Table 2).

Table 2. Land Use Scenarios analysed in this report.

Land Use Scenario	Key Elements
Basecase	Spatial basecase as per TSR2 for each management unit, with updated depletions (2008?). This reflects typical management prior to implementation of EBM rules for the coast.
Scenario 3b	Interim management objectives reflecting "Blended Risk" targets: risk-managed thresholds applied to KNT/ Nuxault and low-risk thresholds applied in Turning Point. Includes updated landbase depletions to 2008? Old forest targets applied as per Objective 14 in the ministerial order. No subregional targets are applied. Where SSS could not meet old growth targets, stands were recruited from NC stands and then from old growth in THLB.
Scenario 4b	Risk Managed Full EBM. Subregional target of 70% of RONV for each SSS applied by Management Unit (TSA / TFL Block). In deficient SSS, stands were recruited first from NC stands and then from old growth in THLB.

Protection levels: known and assumed

When interpreting the results of the environmental risk assessment, the reported risk levels result from a combination of factors: the amount of an ecosystem protected in Protected Areas, the additional amount protected by the suite of ERA protection (old forest targets, hydroriparian, grizzly bear reserves), and the amount of forest that is not harvested in the model because it is deemed (on a map) to be inoperable today. This 'defacto' protected area represents a significant uncertainty for the retention level of old forest ecosystems (although difficult to pinpoint exactly, more than 85% of North Coast and more than 65% of the Central Coast are considered economically inoperable under Basecase management). The potential implications of this are considered in the Discussion.

Table 3 shows the land status of the broad site series surrogate groups. This highlights the variability in types of 'known' versus 'defacto' protection afforded by land status. Looking at the cedar_good productivity type, a total of 19% of the cedar_good analysis unit is 'defacto' protected by being in the non-contributing but unprotected landbase (i.e. the model will not harvest it, even if it is not required to meet an old forest target). In the cedar-moderate, a much larger SSS, 32% is defacto protected in the model, but not necessarily in reality. An (incomplete) analysis of forest development plans in relation to the THLB shows even without full FDP information, around 37% of ongoing harvesting occurring in this 'defacto' protection area (D. Leversee pers. comm.).

Table 3. Landstatus for the general Analysis Unit groups.

AUClass	NC netdown	NC unprotected	NC wha	Protected Area	Timber Harvesting Landbase	Total Area	Percent NC Unprotected
Cedar Good	941	2,857	275	728	10,362	15,164	19
Cedar_Moderate	8,267	49,664	1,888	29,714	64,186	153,720	32
Cedar_Poor	14,749	608,465	2,341	237,492	80,425	943,472	64
Deciduous	2,500	31,617	222	7,371	12,921	54,631	58
Fir_Good	638	2,345	54	323	8,597	11,957	20
Fir_Moderate	2,150	7,541	443	6,077	15,210	31,420	24

AUClass	NC netdown	NC unprotected	NC wha	Protected Area	Timber Harvesting Landbase	Total Area	Percent NC Unprotected
Fir_Poor	983	15,448	398	10,895	5,282	33,006	47
Hemlock_Good	10,818	37,354	2,356	27,630	113,687	191,845	19
Hemlock_Moderate	24,784	209,876	5,518	108,578	186,180	534,936	39
Hemlock_Poor	9,969	383,802	656	126,228	30,225	550,880	70
Spruce_Good	2,918	3,263	1,833	4,442	2,807	15,264	21
Spruce_Moderate	1,865	3,083	404	3,437	3,479	12,268	25
Spruce_Poor_Pine	1,601	21,914	112	30,242	3,148	57,017	38
Grand Total	82,184	1,377,229	16,500	593,157	536,510	2,605,580	53

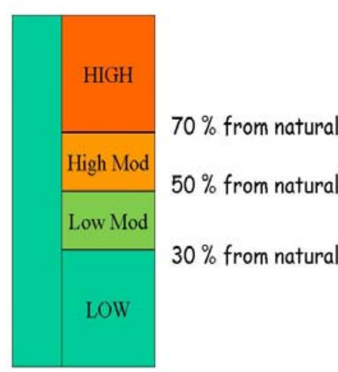
Natural Disturbance Modeling

Including natural disturbances within timber supply modeling requires a number of assumptions to be made. Historically, TS models allowed all the forest in the landscape to 'age' forever, thereby allowing any areas that were not harvested to become old. This is unrealistic in all landscapes because natural disturbances occur and reset the age of some proportion of the forest through time. In order to reduce this effect, the SELES landscape model 'fixed' the age class distribution in the non-contributing landbase to the pattern seen in year zero. This approach assumes that the area has reached equilibrium in terms of age-class structure, an assumption less likely to hold for small areas and less likely to hold in areas with higher frequency of disturbance. As a result, a number of smaller areas which have the significant majority of their area in the non-contributing landbase appear at 'high risk' after 250 years because the frozen age-class distribution included a high percent of young forest. These areas are highlighted in the results as anomalies of the modeling.

Methods - Establishing Benchmarks and Risk Thresholds

Historic conditions and predicted future conditions provide a context within which to understand the current state of the environment, and so provide a broad context for understanding the implications of land use choices and management decisions (Landres et al., BC MoE 2000, Holt 2005).

Comparing against a benchmark defined by natural processes is a widely used approach to setting an ecologically appropriate benchmark (Morgan et al. 1994; Province of BC 1995; Haynes et al. 1996; Cissel et al. 1998; Landres et al. 1999; Swetnam et al. 1999). The approach assumes that species have adapted to the range of habitat patterns resulting from historical disturbance events and that the probability of survival declines as habitat elements and patterns move beyond this range (Jensen and Bourgeron 1994; Bunnell 1995; Cissel et al. 1998).



For example, identifying how much old forest was present under natural conditions can be used to assess risks associated with the current and projected future amount of old forest on the landscape. It is assumed in this methodology that the higher the natural amount of old forest there is in a landscape, the higher the amount required to maintain fully functioning ecosystems. However, ecosystems are not static over time – they change at different rates and at different scales. This Range of Natural Variability (RONV) more fully describes the natural state of the environment, but identifying the parameters of RONV can be difficult (e.g. Price and Daust 2003). As a surrogate we use an estimate of 'mean range of natural variability' as a benchmark for the amount of natural old forests in this report.

Determining important 'thresholds' in the trends of an indicator is an important part of undertaking Environmental Risk Assessments. 'Thresholds' can signify a) a point at which the rate of change suddenly changes (e.g. ecosystem functioning 'collapses', or populations cease to be viable), or b) a place along a linear trend where some level of functioning no longer occurs.

For the 'coarse filter' old forest ecosystem representation the Coast Information Team (2004a,b) made preliminary suggestions for a risk function, which was later refined by additional more detailed literature review (Price et al. 2007; EBMWG Old Growth workshop 2007). Based on this work, and previous ERAs (Holt 2003; Holt 2005; Holt and MacKinnon 2007a and 2007b) a high risk threshold of 30% of natural and a low risk threshold of 70% deviation from natural are used to define risk classes. In addition, in this coarse filter assessment we add a middle category that separates the 'moderate' level of risk into 'high' moderate (50-70%) and 'low' moderate (30-50% of natural) (adjacent figure). This provides additional resolution for the results.

The more recent review of the literature identified a new potential high risk threshold - 30% of the total amount of old-growth (Price et al. 2007). This increased level for high risk was identified because this level was identified as resulting in significant population impacts (Price et al. 2007), and is a departure from the implementation approach for coastal EBM (e.g. the SLUOs use 30% of RONV as their minimum level). **We continue to use 30% of RONV in this analysis as the 'high risk' threshold, however the Price et al. paper has implications that should be considered. See discussion.**

Another area of uncertainty is the definition of 'natural levels of old forest'. Typically, the negative exponential equation has been used to predict the age class structure of different ecosystems, based on assumptions about the disturbance frequency, which assumes a Poisson process as the underlying statistical model, and is very sensitive to inadequately knowing information about the 'tail' of the distribution (i.e. the ages, or area of older forests; Lertzman et al. 2002). Detailed field research into fire history of the coastal temperate rainforest in BC and Alaska (Gavin et al. 2003, Lertzman et al. 2002), shows that the actual pattern of disturbance in many areas suggests a considerably longer 'tail' on the distribution curve – with many areas not undergoing a fire event over the last 6000 years, and many other areas only seeing one or two fires within this same long period (Lertzman et al. 2002). The implication of this for EBM is that the actual predicted natural amounts of old forest is likely higher in many ecosystems than is being used as the basis for targets with a foundation on inferred disturbance frequencies and the negative exponential equation (K. Lertzman pers. comm.)[6]. This uncertainty should be considered when interpreting the results of this analysis.

There is on-going discussion around the terminology of the risk classes: for example it has been suggested that instead of 'low risk' for 70% of natural, an alternative phrase "certainty that integrity is maintained" be used. And conversely, that 30% of natural refers to 'damage to integrity' not 'high risk' (W. Eamer pers. comm.). We suggest that this terminology is indeed interchangeable in this way – that high risk does refer to a high certainty that ecological integrity will not be maintained, and that low risk refers to a high certainty that no damage to ecological integrity will occur. However, it is our understanding that there is no place on the risk curve (0-100%) that has 'no risk', and that risk gradually increases between the 'high certainty that integrity will be maintained (from 100% of natural)' and 'high certainty of damage' (0% of natural). In the results we provide the reader with the designated 'risk level' determined using the figure above, and in addition we also provide all the raw data (usually in appendices) in case new science on risk thresholds comes forward, or if the reader wishes to apply their own thresholds to the data.

Science cannot provide generic answers to the question of 'how much is enough?' to maintain biological values. Science can however provide guidance as to the probability of survival, or probability of maintaining ecosystem functions. The probability of maintaining something can also be termed as the

[6] This paper is not focused on fine-tuning appropriate the range of natural variability (RONV) for different ecosystems. Compiling and further investigating how disturbances play out at smaller scales in different ecosystems may be an important component of an adaptive management program for EBM implementation.

'risk' to a species or function and can be outlined in scientific terms. However, deciding what level of risk is acceptable is a social decision and cannot be answered by science.

Methods - Assessment Units

The primary purpose of this analysis was to provide results for the entire coast region, as a whole. The results within the body of this report do that.

It is important to remember however, that the analysis itself meets targets at the level of management units, not at a regional scale.

In order to provide more detailed information, the Results and in Appendix 2 summarises the distribution of SSS at high risk, by landscape unit. Note that this summary reflects only the *location* of SSS that are regionally at high risk. It doesn't reflect the current condition of individual SSS.

Results

Representation: Protected Areas Analysis

The amount of the total landbase that is protected is shown in Table 4. Protected Areas only differ across two scenarios – the Basecase (which summarises the existing protected areas prior to 2006), and new biodiversity areas and conservancies which apply in both the 3b and 4d scenarios.

Under the Basecase, a total of 7.5% was protected on the whole coast. Under the two scenarios, this increases to a total of 31.3% protected overall (CFCI dataset 2008). Table 4 shows the representation of protection separately for biogeoclimatic variants, and for analysis units (Appendix 1 summarises the total data for SSS).

Within the table, the results are sorted based on the percent protected (highest to lowest). There is high variability in the level of protection for different units, with a number of biogeoclimatic variants having very high levels of protection, and others having very low levels. Of particular concern, there remain a number of low elevation biogeoclimatic variants that are poorly represented in protected areas, in particular the CWHxm2 and CWHdm. In addition, some more common units are also under-represented (CWHms2, CWHws2, CWHvm1).

Looking at analysis units only, fir_good and fir_moderate, cedar_good and cedar_moderate remain significantly under-represented in the protected areas (Table 4).

Looking at individual SSS, (Appendix 1), of the 212 SSS in the CFCI dataset (including deciduous units), 99 have less than 20% protected. Conversely, 37 have more than 80% protected, 20 have between 40-80% protected.

Table 4. Protected Areas representation for BEC variants and Analysis Units. Shows existing Protected Areas (under Basecase), and new Biodiversity Areas and Conservancy Areas. Ordered in terms of percent protected (high to low).

Units	Area	% Existing PA	% New Biodiversity Area	% New Conservancy Area	% Not Protected (3b/4d)	Not protected category (3b/4d)
BEC						
ESSFxv1	1,990	100.0	-	-	-	0-20
Msun	7,846	100.0	-	-	-	0-20
SBPSmc	37,777	100.0	-	-	-	0-20
SBSmc2	62,298	100.0	-	-	-	0-20
ESSFmc	56,092	95.5	-	4.5	0.1	0-20
IDFww	24,904	60.2	-	34.2	5.6	0-20

Units	Area	% Existing PA	% New Biodiversity Area	% New Conservancy Area	% Not Protected (3b/4d)	Not protected category (3b/4d)
ESSFmw	59,214	74.3	-	5.9	19.8	0-20
IDFdw	315	-	-	63.2	36.8	20-40
CWHds2	67,527	21.9	-	33.9	44.2	40-60
MHmmp	19,647	6.6	15.6	20.2	57.5	40-60
CWHwm	79,832	9.1	19.1	5.8	66.1	60-80
Atunp	71,336	22.9	1.4	9.1	66.6	60-80
CWHvh2	1,222,096	0.7	5.1	26.3	67.9	60-80
CWHvm2	439,180	0.5	3.3	23.0	73.2	60-80
CWHvh1	122,149	0.0	17.1	8.6	74.2	60-80
MHmm1	244,303	1.4	5.5	18.0	75.1	60-80
CWHvm1	755,000	0.6	2.2	19.6	77.7	60-80
MHwh1	45,650	0.8	1.2	17.8	80.2	80-100
CWHms2	111,511	-	2.7	15.8	81.5	80-100
CWHws2	184,881	0.7	1.5	16.1	81.7	80-100
MHwhp	4,587	0.6	-	17.1	82.3	80-100
CWHws1	6,412	-	12.6	-	87.4	80-100
MHmm2	111,250	0.1	1.7	9.6	88.6	80-100
CWHdm	19,304	-	-	6.4	93.6	80-100
CWHxm2	25,402	1.1	-	1.0	97.9	80-100
CWHmm1	7,709	-	-	-	100.0	80-100
ESSFmk	288	-	-	-	100.0	80-100
Analysis Units						
Spruce_Pine_Poor	231,484	58.7	1.2	24.0	16.1	0-20
Spruce_Moderate	36,042	58.3	2.0	11.2	28.5	20-40
Fir_Poor	41,605	9.0	0.3	31.3	59.4	40-60
Cedar_Poor	1,335,594	0.6	6.1	22.3	71.1	60-80
Hemlock_Balsam_Poor	966,739	9.9	4.8	17.2	68.2	60-80
Hemlock_Balsam_Moderate	588,567	1.0	2.6	17.5	78.9	60-80
Hemlock_Balsam_Good	274,455	0.9	1.7	22.0	75.5	60-80
Decid	59,012	12.8	2.5	8.1	76.6	60-80
Spruce_Good	14,384	4.1	2.6	27.3	66.0	60-80
Cedar_Moderate	168,884	0.5	1.7	17.3	80.5	80-100
Fir_Moderate	32,579	0.6	1.6	17.2	80.6	80-100
Cedar_Good	17,415	0.5	0.8	6.8	91.9	80-100
Fir_Good	12,455	0.3	-	2.7	97.0	80-100
Grand Total	3,788,712	7.5	4.1	19.7	68.7	60-80

The effectiveness of protected areas varies depending on a number of paramenters. Size is a primary factor – and the vast majority of the existing and new protected areas are large and encompass entire series of watersheds. This will contribute significantly to the functionning of the protected areas. However, there remain some significant unknown factors relating to long-term future functionning, including the permitted development of independent power projects (IPPs) that have the potential for a significant negative impact depending on the scale and scope of the development that occurs.

Trends in Old Forest

The following results are generated from the landscape model SELES that is intended to reflect how forest management rule sets will 'play out' on the ground. The landscape modelling results are a function of a) land use decisions (amount of protected areas / conservancies), b), operability levels (i.e. defacto protection levels), and c) the composite retention resulting from the combination of rules including old forest targets, single species targets, riparian targets etc. Three indicators are reported on:

- number of site series surrogates at risk, through time
- area of site series surrogates in each risk category over time
- total area of additional old forest existing on the landbase, in relation to the Basecase Scenario.

Coarse Filter: Number of SSS at risk, through time

The three scenarios result in different trends in ecosystems at risk through time (Table 5). Under the Basecase, the number of SSS at high risk continues to increase into the future, and declines again over 250 years. Under Current SLUO, the number of SSS at high risk declines slowly after about 100 years, but with 11 remaining at high risk into the future, and under Full EBM the number at high risk declines more rapidly at to a lower level in 250 years. However after 250 years, there remain 5 SSS apparently at high risk[7] (Figure 4) for which we suggest the modeling does not reflect the real trend for these low productivity SSS.

Table 5. Number of ecosystems in each risk category, through time, for three scenarios.

Scenario	Deviation from natural OG	Risk Category	Year 0	Year 20	Year 50	Year 100	Year 150	Year 200	Year 250
SBC	>70	H	45	52	55	46	43	44	34
SBC	50-70	HM	23	26	31	45	47	43	50
SBC	30-50	LM	35	35	33	37	39	40	41
SBC	<30	L	64	54	48	39	38	40	42
SLUO	>70	H	45	43	45	38	31	23	11
SLUO	50-70	HM	23	26	27	31	30	31	32
SLUO	30-50	LM	35	42	40	44	42	44	51
SLUO	<30	L	64	56	55	54	64	69	73
Full EBM	>70	H	45	42	42	33	25	15	8

[7] Detailed examination of these results show for 5 poor productivity ecosystems (S_Poor_Pl in IDFww; Cedar_Poor in IDFww; S_Poor_Pl in CWHdm, S_Poor_Pl in CWHds2, S_Poor_Pl in MHmm2), the timber supply results likely do not reflect a true picture of the trends. The model SELES holds the age-class distribution steady in the non-contributing landbase, assuming that this part of the landbase is in equilibrium with long-term natural disturbance events. In cases where the area is small, or a large disturbance occurred, this assumption would not hold. If the vast majority of the SSS is located in the non-contributing landbase this approach can result in an unreal suggestion of risk. See Methods – Characteristinc Trends. Since these results compare scenarios, and a similar artefact occurs in each scenario, we present the results as SELES produces them. For an additional three SSS (hembal_poor in ESSFmc, S_Poor_Pl in ESSFmc and S_Poor_Pl in ESSFmw) the 'high risk' was caused by an abundance of 140 year old forest, but not 250 year old forest. For these SSS, the risk level was reassessed based on the percent expected greater than 140 years, which reduces the error associated with both natural disturbance rates in 'interior' zones and forest cover age class.

Scenario	Deviation from natural OG	Risk Category	Year 0	Year 20	Year 50	Year 100	Year 150	Year 200	Year 250
Full EBM	50-70	HM	23	26	26	26	26	20	12
Full EBM	30-50	LM	35	41	43	50	47	58	66
Full EBM	<30	L	64	58	56	58	69	74	81

SBC – spatial basecase; SLUO = strategic land use objectives; Full EBM = risk management full EBM. Risk categories: H = high, HM = highmoderate, LM = lowmoderate, L = low.

The number of ecosystems at high risk is shown in Figure 4 for the three scenarios. From the starting point today, 45 of 167 ecosystems are at high risk. This increases under the Basecase and doesn't decline until 100 years from now. For the Current SLUO (3b) and Full EBM (4d) scenarios, the number at high risk declines only slightly in the short-term which is a result of a) the length of time it takes to 'recover' old growth forests that are already harvested and b) reflects the ability to continue to harvest some high risk ecosystems in the short-term particularly under the Current SLUO (3b) scenario. However, after 50 years, the number at high risk declines more rapidly under Full EBM.

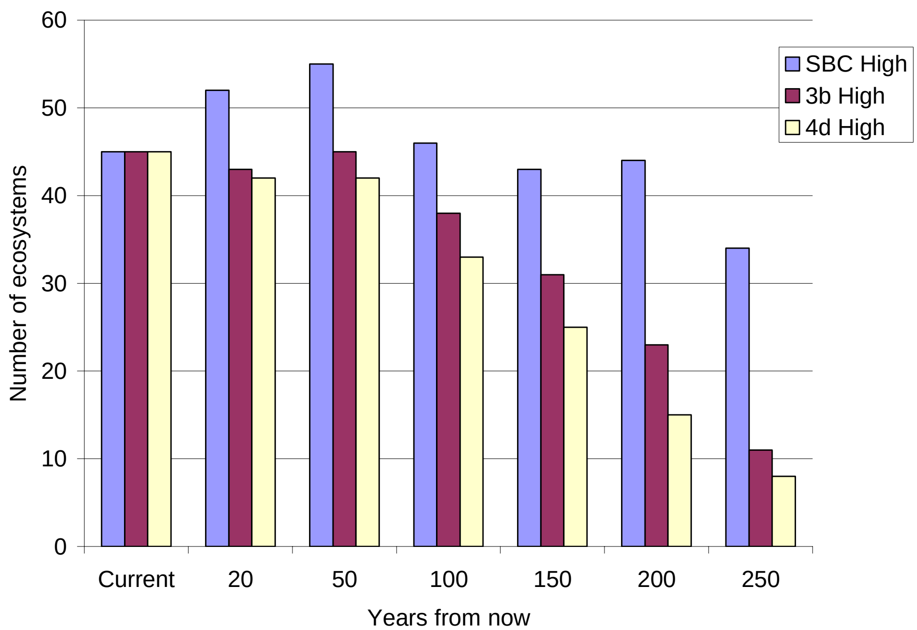


Figure 4. <u>Number of site series surrogates at high risk</u> – from current to 250 years into the future. Under three scenarios (Spatial Basecase, Current SLUO (3b) and Full EBM (4d).

After 100 years, the number of SSS at high risk declines steadily under both Current SLUO (3b) and Full EBM (4d) scenarios. Eight SSS remain at high risk even under 4d: 5 of which become almost low risk but don't quite reach the threshold, and 3 of which are located primarily in the non-contributing landbase. For these latter SSS the high risk description is an artefact of the model and likely does not represent a true description of the future state for these types (see Methods – Characterising Trends).

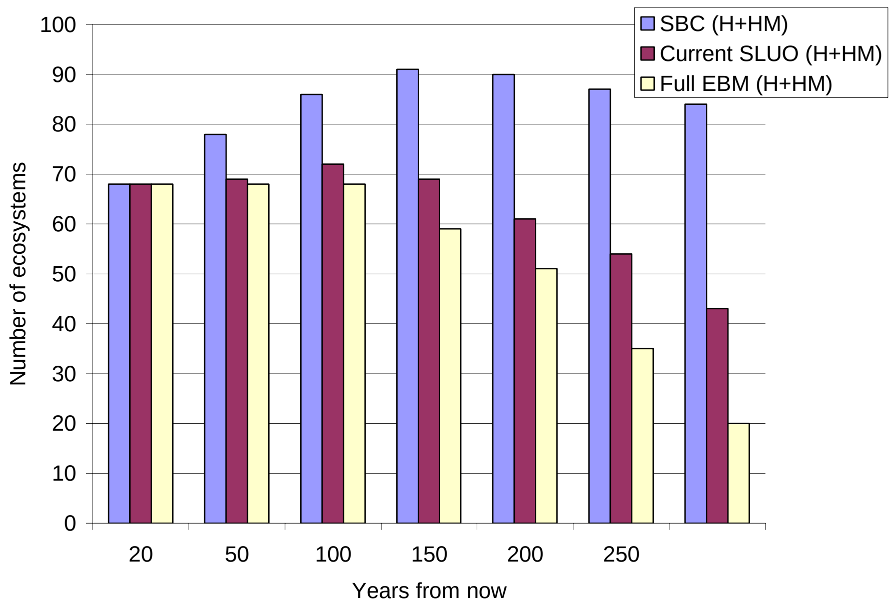


Figure 5. Number of site series surrogates at high plus high-moderate risk – from current to 250 years into the future. Under three scenarios (Spatial Basecase, Current SLUO (3b) and Full EBM (4d).

Differences between the scenarios are increasingly visible when looking at a combination of SSS that are at high plus high-moderate risk (Figure 5). Here the Basecase scenario shows an increasing number for ecosystems at risk up to 150 years into the future, and then a slow decline in this number, but with 84 of 167 SSS at risk 250 years into the future. The Current SLUO scenario results in a continued increase in the number of SSS at risk up to 100 years from now (to a maximum of 72 of 167; 43% of the total number), though the rate and extent of increase is much lower than under Basecase. The Full EBM Scenario does not allow any continued increase in risk for SSS, and the number of SSS in this category stays steady at 68 of 167 for 100 years, and then begins to steadily decline to 20 / 167 (12%) after 250 years.

Which ecosystems are at risk?

The pattern of ecosystems at risk today, and into the future, is non-random. Today, a preponderance of the SSS at high, or high-moderate risk are higher productivity types. Table 6 shows the number of ecosystems at high risk and at high-moderate risk, in three productivity categories (good, moderate and poor productivity), and for the three scenarios (Spatial basecase, Current SLUO (3b) and Full EBM 4d), plus three time periods (current, 50 years and in 250 years).

Of 42 good productivity ecosystems, 26 are currently at high risk. Under all scenarios this changes very little in 50 years (very little old growth can be created during this time period because harvested stands are relatively young and take time to develop old age and old attributes). Over the long term (250 years) this declines to 15 of 42 for the Basecase to 2 ecosystems under the current SLUO (3b) and to none at high risk under Full EBM (4d).

In contrast, of 70 poor productivity ecosystems, 14 are currently at high risk. This increases in the short-term (50 years) under the Basecase and remains about the same in the longterm under the Basecase. Under the SLUO (3b) and Full EBM (4d) a number of poor ecosystems remain at high risk into the long-term (see Footnote 7 above).

Examining ecosystems that are at high combined with those at high-moderate risk, the patterns of trends across scenarios and through time stays very similar to that looking at the high-risk SSS only. However the spread between scenarios increases. In particular, for the good productivity ecosystems the full EBM scenario results in no SSS in this higher risk zone, compared with 17 under the Current SLUO and 32 under Basecase.

Table 6. Number of ecosystems at high and high-moderate risk in three scenarios, and at three time periods.

	Risk Level	Total #	Current	SBC	SLUO	Full EBM	SBC	SLUO	Full EBM
Time period			Year 0	Year 50			Year 250		
Good Productivity	High	42	26	26	26	24	15	2	0
Mod Productivity	High	55	5	12	5	4	6	0	0
Poor Productivity	High	70	14	17	14	14	13	9	8
Good Productivity	High + High-Mod	42	28	32	30	28	32	17	0
Mod Productivity	High + High-Mod	55	11	20	13	11	22	7	0
Poor Productivity	High + High-Mod	70	29	34	29	29	30	19	20

A full table showing deviation from natural old growth for all ecosystems, through time, is shown in Table 7. The numbers in each cell show the extent of deviation from the predicted mean natural level of old forest (e.g. 20 means 20% deviation from natural, and 80 means 80% deviation from natural). The cells are also colour-coded to show the risk categories (see table legend).

Overall, currently, good productivity sites tend to be at higher risk today, due to focused harvesting on accessible and higher productivity sites which tend to have larger trees on them. All fir-leading SSS also tend to be at higher risk. A number of significant SSS (e.g. hemlock_balsam_high in the CWHvm1 which covers a significant area on the coast, plus a significant number of cedar-leading, fir-leading and hemlock-leading higher productivity units) remain at high or high-moderate risk even after 250 years under the current SLUO (3b) due to the combination of representation in Protected Areas and the old forest targets. Spruce higher productivity units tend to move more rapidly, or remain in, lower risk categories, which is likely a result of additional protection in the riparian zone.

Table 7. Summary table of risk to ecosystems through time, under the Spatial Basecase, Scenario 3b (current legal objectives) and full implementation of EBM (4d). Numbers are 'deviation from natural', with four colour codes (red / high risk / >70% deviation), orange (H-M risk / 50-70), green (L-M risk / 30-50), white (low risk/ <30%). In this summary table only three time periods are shown (Years 0, 50 and 250). The table is organised by leading species groups.

AU	BEC	Total Area	All Current Condition	SBC	SLUO	Full EBM	SBC	SLUO	Full EBM
				50 years			250 years		
Cedar_Good	CWHdm	320	60	89	69	60	80	49	34
Cedar_Good	CWHds2	179	95	97	95	95	62	6	2
Cedar_Good	CWHms2	756	82	89	71	67	67	26	32
Cedar_Good	CWHvh1	2,675	100	100	100	100	80	68	30
Cedar_Good	CWHvh2	1,712	87	89	90	86	84	50	47
Cedar_Good	CWHvm1	8,216	91	95	94	91	69	61	31
Cedar_Good	CWHvm2	848	31	60	51	34	55	40	29
Cedar_Good	CWHws2	86	97	66	84	63	78	66	50
Cedar_Good	CWHxm2	258	100	100	100	100	71	67	30
Cedar_Good	MHmm1	60	29	68	58	52	60	54	44
Cedar_Moderate	CWHdm	733	23	55	44	35	66	51	36
Cedar_Moderate	CWHds2	1,524	43	61	45	43	49	28	28
Cedar_Moderate	CWHmm1	209	26	89	47	37	87	42	37

AU	BEC	Total Area	All Current Condition	SBC 50 years	SLUO 50 years	Full EBM 50 years	SBC 250 years	SLUO 250 years	Full EBM 250 years
Cedar_Moderate	CWHms2	6,000	25	49	40	37	57	35	32
Cedar_Moderate	CWHvh1	8,846	42	76	61	45	70	56	29
Cedar_Moderate	CWHvh2	44,574	7	33	35	31	46	40	31
Cedar_Moderate	CWHvm1	74,814	22	50	43	30	53	43	31
Cedar_Moderate	CWHvm2	12,202	7	29	27	26	35	31	29
Cedar_Moderate	CWHvm3	1,363	2	10	19	15	39	23	33
Cedar_Moderate	CWHwm	155	2	34	21	24	36	17	21
Cedar_Moderate	CWHws2	1,234	9	28	21	24	25	15	18
Cedar_Moderate	CWHxm2	325	55	72	64	56	71	43	35
Cedar_Moderate	IDFww	217	-21	-21	-21	-21	-21	-21	-21
Cedar_Moderate	MHmm1	885	0	26	17	22	30	17	26
Cedar_Moderate	MHwh1	455	3	19	14	15	37	25	25
Cedar_Poor	CMAunp	1,949	1	1	1	1	1	1	1
Cedar_Poor	CWHdm	777	30	55	46	46	65	47	47
Cedar_Poor	CWHds2	584	72	75	72	72	70	67	68
Cedar_Poor	CWHmm1	482	-5	86	21	21	85	20	20
Cedar_Poor	CWHms2	4,189	43	52	49	50	52	48	48
Cedar_Poor	CWHvh1	82,406	12	25	24	24	25	23	24
Cedar_Poor	CWHvh2	515,043	35	36	36	36	40	38	38
Cedar_Poor	CWHvm1	167,567	15	26	25	25	30	26	26
Cedar_Poor	CWHvm2	111,874	7	11	11	10	12	11	11
Cedar_Poor	CWHvm3	2,021	25	25	25	25	27	26	26
Cedar_Poor	CWHwm	3,011	32	36	36	35	14	12	13
Cedar_Poor	CWHws2	915	43	49	49	49	52	49	51
Cedar_Poor	CWHxm2	471	0	11	31	31	84	30	30
Cedar_Poor *	IDFww	95	100	100	100	100	100	100	100
Cedar_Poor	MHmm1	26,173	11	11	11	11	11	11	11
Cedar_Poor	MHmm2	311	6	6	6	6	6	6	6
Cedar_Poor	MHwh1	17,044	29	29	29	29	32	31	31
Fir_Good	CWHdm	1,903	99	100	99	99	70	61	32
Fir_Good	CWHds2	848	100	100	97	97	68	33	37
Fir_Good	CWHmm1	263	100	100	100	100	76	67	28
Fir_Good	CWHms2	1,656	78	92	74	74	80	55	33
Fir_Good	CWHvm1	4,413	98	100	98	97	74	64	31
Fir_Good	CWHvm2	141	100	100	100	100	31	18	31
Fir_Good	CWHvm3	51	97	97	97	97	27	27	27
Fir_Good	CWHws2	55	97	97	97	97	58	33	31
Fir_Good	CWHxm2	2,627	100	100	100	100	71	67	32
Fir_Moderate	CWHdm	1,586	88	87	89	88	51	38	34
Fir_Moderate	CWHds2	4,863	66	79	58	58	74	34	34

AU	BEC	Total Area	All Current Condition	SBC 50 years	SLUO 50 years	Full EBM 50 years	SBC 250 years	SLUO 250 years	Full EBM 250 years
Fir_Moderate	CWHmm1	197	58	90	66	58	51	34	31
Fir_Moderate	CWHms2	9,985	35	65	49	48	52	30	24
Fir_Moderate	CWHvm1	7,772	84	89	85	84	56	44	30
Fir_Moderate	CWHvm2	308	83	87	82	80	62	31	41
Fir_Moderate	CWHvm3	309	-3	23	21	20	29	17	16
Fir_Moderate	CWHws2	2,276	46	54	50	55	50	43	47
Fir_Moderate	CWHxm2	3,269	87	91	87	87	65	58	27
Fir_Moderate	IDFww	748	29	29	29	29	29	29	29
Fir_Poor	CWHdm	662	74	83	76	74	45	37	32
Fir_Poor	CWHds2	8,688	52	61	57	57	60	54	54
Fir_Poor	CWHmm1	500	31	87	39	38	84	36	36
Fir_Poor	CWHms2	8,334	40	49	42	43	48	40	40
Fir_Poor	CWHvm1	3,229	74	81	77	73	53	48	39
Fir_Poor	CWHvm2	345	51	62	59	56	34	30	27
Fir_Poor	CWHvm3	479	41	42	42	44	40	39	40
Fir_Poor	CWHws2	5,028	50	52	52	51	46	46	46
Fir_Poor	CWHxm2	1,643	60	64	70	60	65	42	26
Fir_Poor **	ESSFmw	284	78	78	78	78	78	78	78
Fir_Poor	IDFww	3,084	-8	-8	-8	-8	-8	-8	-8
Fir_Poor	MHmm1	135	54	74	66	54	28	26	11
Fir_Poor	MHmm2	555	63	63	63	63	10	10	10
HemBal_Good	CWHdm	7,566	97	89	92	89	78	66	38
HemBal_Good	CWHds2	868	91	93	91	91	77	33	36
HemBal_Good	CWHmm1	2,892	99	96	96	96	85	72	37
HemBal_Good	CWHms2	6,736	87	84	79	77	69	52	37
HemBal_Good	CWHvh1	4,724	100	97	100	100	76	65	34
HemBal_Good	CWHvh2	22,432	13	40	40	39	58	40	36
HemBal_Good	CWHvm1	116,731	75	78	76	76	68	53	32
HemBal_Good	CWHvm2	13,161	30	37	38	35	38	29	20
HemBal_Good	CWHvm3	421	82	74	75	72	59	28	35
HemBal_Good	CWHwm	514	24	50	27	29	43	6	6
HemBal_Good	CWHws1	574	22	43	28	26	50	29	29
HemBal_Good	CWHws2	2,618	74	81	79	76	70	42	35
HemBal_Good	CWHxm2	11,382	99	90	90	86	77	70	38
HemBal_Good	MHmm1	759	17	35	25	18	31	17	14
HemBal_Good	MHmm2	131	40	55	55	48	54	32	29
HemBal_Good	MHwh1	230	35	42	37	37	37	16	19
HemBal_Moderate	CMAunp	543	26	26	27	26	16	13	22
HemBal_Moderate	CWHdm	2,658	71	67	66	57	69	57	38
HemBal_Moderate	CWHds2	7,796	25	30	26	26	29	19	19

AU	BEC	Total Area	All Current Condition	SBC	SLUO	Full EBM	SBC	SLUO	Full EBM
				50 years			250 years		
HemBal_Moderate	CWHmm1	2,507	61	96	72	59	85	60	38
HemBal_Moderate	CWHms2	56,455	20	43	39	34	54	41	36
HemBal_Moderate	CWHvh1	3,737	61	77	66	61	65	53	31
HemBal_Moderate	CWHvh2	70,131	18	38	36	30	43	34	30
HemBal_Moderate	CWHvm1	174,895	32	48	43	37	50	38	32
HemBal_Moderate	CWHvm2	80,284	5	18	18	17	24	20	20
HemBal_Moderate	CWHvm3	20,170	0	10	13	10	27	20	20
HemBal_Moderate	CWHwm	14,061	31	43	41	32	30	19	24
HemBal_Moderate	CWHws1	2,904	42	67	35	35	70	33	34
HemBal_Moderate	CWHws2	55,278	5	25	25	21	34	30	28
HemBal_Moderate	CWHxm2	2,842	60	65	64	49	71	53	36
HemBal_Moderate	ESSFmc	379	-4	-4	-4	-4	-4	-4	-4
HemBal_Moderate	ESSFmk	82	16	16	16	16	16	16	16
HemBal_Moderate	ESSFmw	1,628	5	5	5	5	0	4	4
HemBal_Moderate	IDFww	251	40	40	40	40	40	40	40
HemBal_Moderate	MHmm1	17,314	-1	9	10	9	13	12	12
HemBal_Moderate	MHmm2	16,591	-1	5	6	5	8	8	7
HemBal_Moderate	MHwh1	3,730	9	24	21	22	26	20	21
HemBal_Poor	ATp	515	61	7	7	7	4	-2	-2
HemBal_Poor	BAFAunp	507	63	63	63	63	63	63	63
HemBal_Poor	CMAunp	7,732	61	61	61	61	38	38	38
HemBal_Poor	CWHdm	240	59	67	66	59	50	48	40
HemBal_Poor	CWHds2	4,048	65	65	65	65	66	66	65
HemBal_Poor	CWHmm1	541	0	9	0	0	10	-1	-1
HemBal_Poor	CWHms2	13,213	42	50	47	47	52	47	47
HemBal_Poor	CWHvh1	1,524	40	40	40	40	42	42	40
HemBal_Poor	CWHvh2	102,509	25	27	28	27	33	31	31
HemBal_Poor	CWHvm1	59,266	20	27	25	24	34	27	27
HemBal_Poor	CWHvm2	98,557	16	18	18	18	21	19	19
HemBal_Poor	CWHvm3	13,824	19	20	20	20	22	22	22
HemBal_Poor	CWHwm	45,419	42	32	32	32	9	8	8
HemBal_Poor	CWHws1	1,685	61	55	60	53	68	61	61
HemBal_Poor	CWHws2	41,625	33	37	38	37	42	41	41
HemBal_Poor	CWHxm2	293	27	27	27	27	27	27	27
HemBal_Poor	ESSFmc	126	-9	-9	-9	-9	-9	-9	-9
HemBal_Poor	ESSFmk	56	-16	-16	-16	-16	-16	-16	-16
HemBal_Poor **	ESSFmw	4,590	70	70	70	70	70	70	70
HemBal_Poor	IDFww	292	57	57	57	57	57	57	57
HemBal_Poor	MHmm1	79,546	28	25	25	25	23	23	23
HemBal_Poor	MHmm2	51,198	21	24	24	24	24	24	24

AU	BEC	Total Area	All Current Condition	SBC	SLUO	Full EBM	SBC	SLUO	Full EBM
					50 years			250 years	
HemBal_Poor	MHwh1	21,536	23	24	25	24	27	26	26
S_Good	CWHds2	53	100	100	100	100	88	29	29
S_Good	CWHms2	1,555	40	43	28	28	36	9	9
S_Good	CWHvh2	2,504	41	56	31	31	62	18	23
S_Good	CWHvm1	9,786	45	55	43	42	55	25	25
S_Good	CWHvm2	510	8	19	16	17	44	4	9
S_Good	CWHwm	204	59	23	16	16	43	-5	-5
S_Good	CWHws2	546	49	47	37	35	51	32	32
S_Moderate	CWHds2	74	35	81	35	35	79	21	21
S_Moderate	CWHms2	901	22	45	22	22	44	11	11
S_Moderate	CWHvh2	2,278	37	58	43	39	56	23	25
S_Moderate	CWHvm1	6,735	28	49	35	32	54	28	28
S_Moderate	CWHvm2	967	8	23	14	15	36	13	16
S_Moderate	CWHvm3	126	-10	-8	-9	-9	9	5	5
S_Moderate	CWHwm	286	5	7	6	5	24	0	0
S_Moderate	CWHws2	661	13	29	23	22	28	14	13
S_Moderate	IDFww	78	-9	-9	-9	-9	-9	-9	-9
S_Poor_Pl *	CWHdm	74	100	100	100	100	100	100	100
S_Poor_Pl *	CWHds2	5,977	99	99	99	99	96	96	96
S_Poor_Pl	CWHms2	2,092	83	91	86	84	78	72	70
S_Poor_Pl *	CWHvh1	3,013	71	72	72	72	71	71	71
S_Poor_Pl	CWHvh2	24,625	59	61	60	60	62	60	60
S_Poor_Pl	CWHvm1	7,156	43	46	42	41	60	42	42
S_Poor_Pl	CWHvm2	2,137	39	40	38	37	47	35	35
S_Poor_Pl	CWHvm3	118	44	44	44	44	38	33	33
S_Poor_Pl	CWHwm	701	70	59	56	56	34	20	23
S_Poor_Pl	CWHws2	3,666	84	86	85	85	71	69	68
S_Poor_Pl	CWHxm2	427	98	98	98	98	67	67	67
S_Poor_Pl	ESSFmc	1,240	14	14	14	14	14	14	14
S_Poor_Pl	ESSFmw	1,246	62	62	62	62	62	62	62
S_Poor_Pl *	IDFww	2,782	100	100	100	100	100	100	100
S_Poor_Pl	MHmm1	279	38	33	31	31	19	18	18
S_Poor_Pl *	MHmm2	592	94	94	94	94	89	89	89
S_Poor_Pl	MHwh1	532	47	46	44	44	47	44	47

* indicates the SSS where the continued high risk ranking is a result of the approach to modeling the inoperable in SELES.
** indicates where the SSS is primarily in the inoperable, and the age-class is dominated by AC8, rather than AC9.

In Summary: The Current SLUO (3b) scenario results in a significantly lower number of SSS at high risk compared with the Spatial Basecase. However, additional lowering of risk is possible with Full EBM (4d). It is primarily the high productivity SSS that are at high risk today, as a result of harvesting focusing on higher productivity (which tend to be the larger structural and lower elevation stands) to date.

Both the Basecase and the Current SLUO continue to result in a significant number of SSS at high or high-moderate risk into the short-term and long-term future. Under Full EBM, the rate of reduction in risk is faster, and none of the Good and Moderate productivity SSS remain at high or high-moderate risk in the long-term.

What area of ecosystems is at risk through time?

SSS cover significantly different orders of magnitude of area on the coast. Table 8 summarises the area in each risk category under the three scenarios, and for the current, mid-term (50 years) and long-term (250 years).

Currently, a significant area is at low or low-moderate risk and under the Basecase scenario this area is reduced by 50% after 250 years. Both the 3b and 4d scenarios also have a decline in area, though less significantly than under Basecase; with reductions of 28% and 20% respectively of area at low risk after 250 years.

The area at high plus high-moderate risk currently is around 300,000ha. This increases under the Basecase, but in total remains similar under 3b and 4d over 50 years. In the longer term, the total area at high and high-moderate risk doubles in the Basecase. Under Scenario 3b, the area of ecosystems at high risk is reduced significantly, although the area at high-moderate risk increases. Under Scenario 4d, the area at both high and high-moderate risk declines significantly after 250 years.

Table 8. Area of ecosystems in each risk category for 3 scenarios, and after 50 and 250 years.

Scenario		Spatial Basecase	3b	4d	Spatial basecase	3b	4d
Year	Current	Year 50			Year 250		
Low	1,351,733	1,058,351	1,070,616	1,140,747	696,876	986,108	1,084,267
Low-Mod	895,357	1,123,111	1,160,004	1,102,540	1,325,936	1,288,665	1,388,083
High-Mod	67,952	114,129	84,573	75,255	433,265	229,986	48,775
High	223,490	242,941	223,339	219,990	82,455	33,773	17,407

The areas involved in the different categories likely masks the potential ecological implications associated with the different risk categories. Overall, a significant area of the coast remains at low risk now and into the future under all the scenarios. However, as outlined above, it is the higher productivity ecosystems that are at high risk today and remain at high risk in the future under the Current SLUO. These sites only cover a small percentage of the total coast, but include systems such as fans, floodplains and colluvial slopes, and incorporate the richest, most diverse sites providing the most diverse structure and vegetation present on the coast (Mittelbach et al. 2001; Sabo et al. 2005). Spatial and structural heterogeneity, created by productivity, flooding, debris flows, lateral river migration, massive woody debris etc, creates a large number of niches so allowing a large number of species to co-exist (Pollock et al. 1998). In addition, the low elevation areas are important for maintaining ecosystem processes such as hydrology and nutrient cycling (e.g. salmon/ grizzly bear / ecosystem nutrient transfer). Maintaining this relatively small area of ecosystems in high risk therefore has a disproportionate impact on providing basic ecosystem services and in maintaining sufficient resilience to respond to expected climate change impacts.

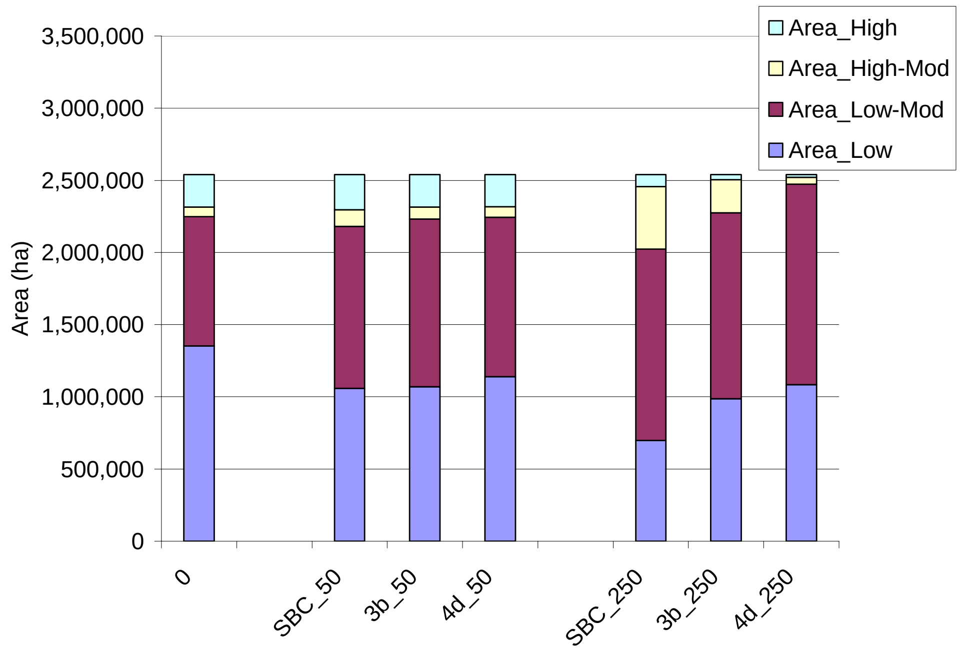


Figure 6. Area of ecosystems at risk, in three scenarios (basecase, 3b and 4d), at three time periods (current, 50 years and 250 years).

Area of old growth on the landscape.

The three scenarios result in different levels of old growth forest being maintained on the landscape, in different SSS, over time. Under the Basecase scenario, currently approximately 60,000ha of Good productivity and 400,000ha of moderate productivity SSS remain as old growth. Over time, these numbers decline significantly, as forest is harvested and then increases (for good productivity) as the forest regrows into 250 year old stands. This includes all the forest captured within protected areas, under old growth targets and in other retention such as marbled murrelet or grizzly bear wildlife habitat areas.

Both the Current SLUO (3b) and Full EBM (4d) result in maintaining additional old growth over time, compared with the Basecase scenario. Table 9 shows how much additional forest aged >250 years is maintained through time, in the good, moderate and poor productivity classes. After 20 years, the two scenarios result in about 4,000ha of good productivity old growth that would have been harvested under the Basecase scenario. Through time this increases, with an additional 32,000 (under Current SLUO) and 71,000ha (under Full EBM) in the good productivity class. Similar patterns are observed for moderate productivity SSS, with an additional 74,000 and 111,000ha of old forest being maintained over Basecase under Current SLUO and Full EBM respectively. The apparent gains are not so dramatic for the poor productivity SSS, but this is because considerably less harvesting was planned to occur in these types under the Basecase. That is, even though there is also a high level of additional protection for these SSS types, the apparent gains are lower because there was a high level of *'defacto'* protection occurring for units that had low economic value and operability.

Table 9. Area of old growth maintained under the Basecase, and <u>additional</u> old growth maintained under Current LUO (3b) and Eull EBM scenario (4d).

	Year	0	20	50	100	150	200	250
Good	SBC	60,138	53,364	42,767	39,930	48,690	55,033	66,675
	3b	0	4,105	8,650	10,486	6,488	24,245	32,635
	4d	0	4,745	9,867	12,955	9,784	54,780	71,214
Moderate	SBC	425,764	385,463	328,766	283,478	269,376	269,970	283,820

	Year	0	20	50	100	150	200	250
	3b	0	11,698	23,692	47,137	57,322	65,052	74,090
	4d	0	29,565	56,004	89,041	100,576	107,169	111,903
Poor	SBC	1,046,810	1,028,437	997,543	961,800	955,653	964,880	967,982
	3b	0	2,546	5,155	19,022	26,256	29,723	30,626
	4d	0	3,046	10,862	19,956	26,761	30,082	31,026
Total additional	3b	0	18,350	37,496	76,645	90,066	119,021	137,351
Total additional	4d	0	37,355	76,733	131,953	137,122	192,031	214,143

Similar information is shown in Figures 7 - 9, but as a percentage of the total area in each productivity class. Note that for the good productivity units, overall, the total old growth is today less than 30% of total habitat (averaged across all good productivity units) and under all scenarios this average drops even further to an average of around 22%, even under the full implementation of EBM. This is because the high risk targets are based on 30% of 'natural' old forest (which for many drier types result in a target percentage of around 17%). However, it has been recently highlighted that in fact the high risk threshold may be higher at 30% of total habitat (Price et al. 2007; EBM WG Workshop Proceedings 2007). This has potentially significantly implications for interpreting this analysis, and should be considered a significant area of uncertainty around future ecological integrity, if significant numbers of higher productivity ecosystems are managed to a '30% of natural' target.

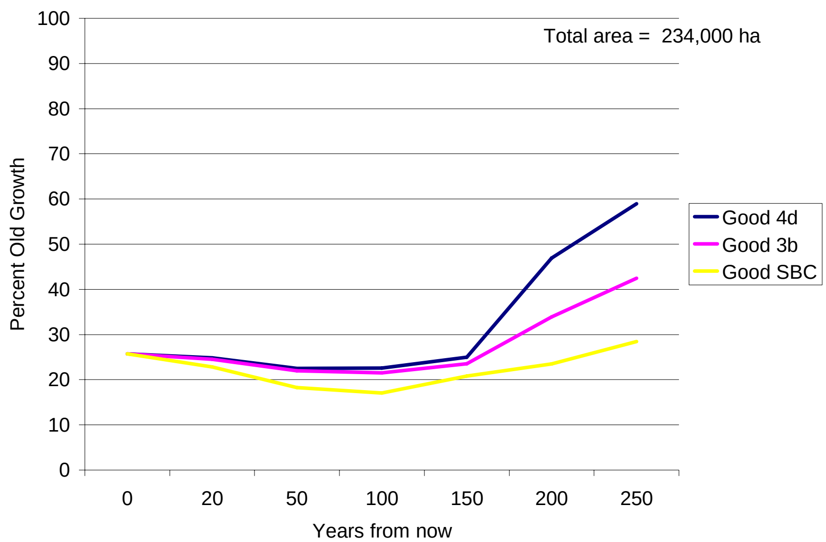


Figure 7. Percent old growth over time for good productivity SSS, under three scenarios (SBC, Current SLUO (3b) and Full EBM (4d)).

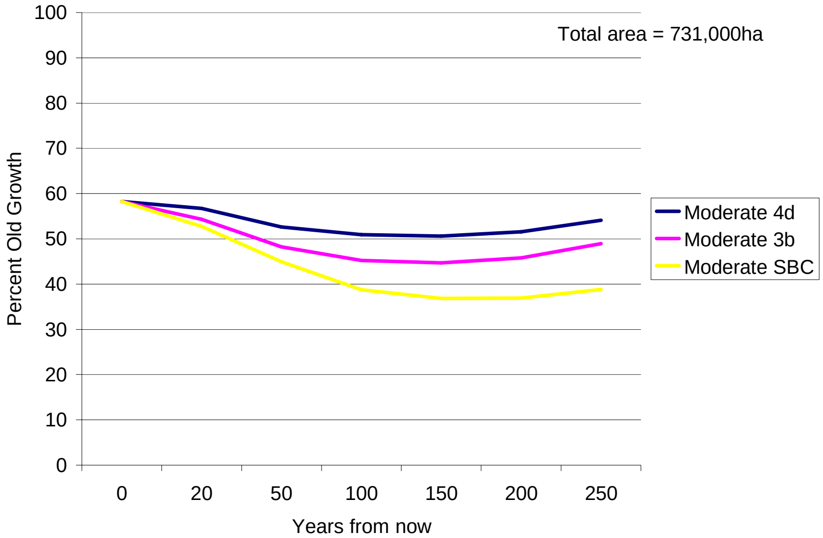


Figure 8. Percent old growth over time for moderate productivity SSS, under three scenarios (SBC, 3b and 4d).

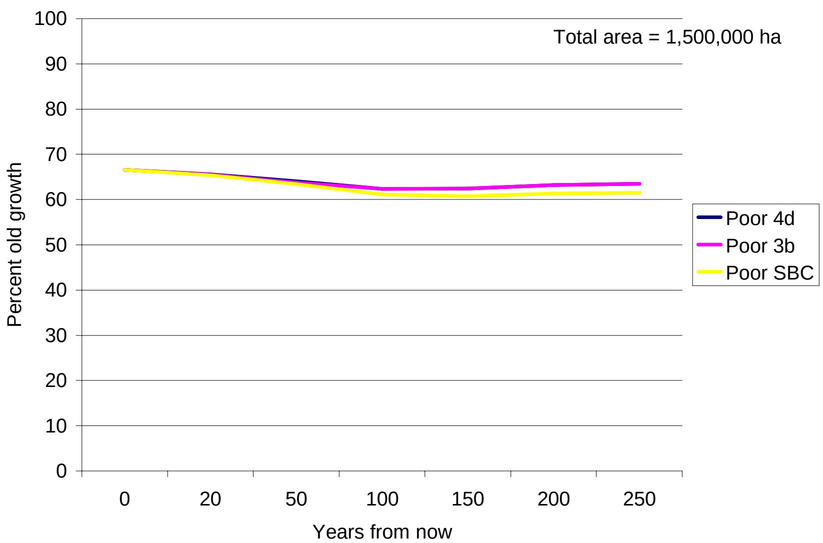


Figure 9. Percent old growth over time for poor productivity SSS, under three scenarios (SBC, Current SLUO (3b) and Full EBM (4d)).

Summary: The Current SLUO results in a total of 137,000ha of old growth after 250 years, compared with the Basecase. Full EBM has a significant increase over the Current SLUO, with an additional 214,000ha of old growth remaining after 250 years. Both alternate land use scenarios have the most significant impact on the good productivity SSS, with full implementation of EBM (4d) having the potential for the largest relative increase in old forest present over time. Additionally, there is identified uncertainty around the high risk target, with newer analysis suggesting that 30% of total habitat, rather than 30% of natural old forest represents a more ecological relevant high risk threshold (Price et al. 2007; EBM WG Workshop 2007).

In what landscape units are the ecosystems at risk located?

There are a total of 142 landscape units (large planning units) on the north/ central/ south coast. These landscape units are highly variable with respect to the diversity of SSS that they contain (i.e. landscape units contain between 3 and 53 different SSS, and in area (4,000 to 65,000ha). This difference in SSS diversity likely reflects real differences in both biological and functional diversity in these different areas.

Landscape Unit also differ with respect to the location of high and high-moderate risk SSS. Table 10 shows the 20 landscape units with highest area and number of SSS at risk. A full table of all landscape units is available in Appendix Y. This information is also shown in mapform (Figure 1).

Table 10. Top 20 Landscape Units with number and area of SSS at high risk.

	Number of SSS at risk					Area of SSS at risk				
LU	L	LM	HM	H	Total	L	LM	HM	H	Total Area
Thurlow	11	4	6	18	39	2,249	1,211	7,517	27,039	38,016
Franklin	19	12	4	18	53	7,346	2,099	278	1,207	10,930
Estero	14	4	5	14	37	7,514	922	296	5,554	14,286
Dean	10	12	6	13	41	10,392	2,744	3,622	1,763	18,521
Gray	14	4	3	13	34	7,684	4,737	97	9,627	22,145
Fulmore	13	7	5	12	37	20,892	14,577	157	29,365	64,991
LowerKlinaklini	14	13	3	12	42	13,308	8,446	498	1,553	23,805
Saloompt	14	10	5	11	40	9,776	4,381	408	1,643	16,208
Owikeno	21	8	3	11	43	10,051	4,320	157	1,581	16,109
MiddleKlinaklini	10	9	7	10	36	5,056	4,900	3,488	5,914	19,358
BellaCoola	8	9	5	10	32	2,272	1,461	2,019	1,241	6,993
KnightEast	13	7	3	10	33	17,314	4,459	676	3,405	25,854
Phillips	17	5	2	10	34	5,699	3,546	64	6,198	15,507
UpperKlinaklini	11	7	7	9	34	6,158	2,895	3,988	6,727	19,768
TalchakoGyllenspetz	6	4	5	9	24	2,566	1,087	3,901	548	8,102
Nusatsum	9	10	4	9	32	9,201	1,754	159	935	12,049
Clayton	17	9	2	9	37	8,678	2,732	46	846	12,302
SmitleyNoeick	8	9	1	9	27	8,621	2,604	36	1,080	12,341
TaleomeyAsseek	14	9	2	8	33	8,594	4,267	128	671	13,660
Neechanz	17	8	1	8	34	17,721	1,247	229	743	19,940
JumpAcross	11	10		8	29	8,447	2,038		705	11,190

It is interesting to note (particularly in the full table Appendix 2) that although there is a general agreement between the area and the number of SSS at high risk in any particular LU. However, this is not a 1 to 1 relationship. For example, Thurlow LU has a large area at high risk (23,000ha) reflecting 6 SSS at high risk. Thurlow on the other hand has 27,000ha at high risk, but reflecting a much higher diversity of ecosystems (18 SSS at high risk).

In what tenures are the ecosystems at risk located?

SSS are not located randomly across the coastal area and its tenures. For the 223,000ha of SSS at high risk today, the majority are located within Kingcome TSA and midcoast TSA (Table 11). Additional information on locations of specific SSS is shown in Appendix 3.

Table 11. For high risk ecosystems only, total area and percent of <u>all seral</u> in each management unit is shown.

BEC	Area	KingcomeTSA	MidcoastTSA	NorthCoastTSA	StrathconaTSA	TFL25_blk5	TFL25blk2	TFL39_blk7	TFL39blk3	TFL39blk5	TFL45	TFL47
Total area	223,490	68,016	29,123	4,441	18,800	24,541	5,892	642	9,315	5,693	8,009	49,018
% of all high risk SSS on tenure		30.4	13.0	1.9	8.4	11.0	2.6	0.3	4.1	2.5	3.6	22.0
High risk SSS OG area	45,231	7,269	9,407	1,070	1,616	22,595	101	0	46	1,436	532	1532
Percent total High risk OG		16.0	20.8	2.3	3.5	50.0	0.2	0	0.1	3.2	1.2	3.4

Summary: The majority of the SSS at high risk are located in Kingcome TSA and TFL47, with intermediate amounts in the Midcoast TSA, TFL_25_Block5 and TFL39_Block3. Of these areas, the largest amounts of old forest for these SSS are remain in TFL25_block5, Kingcome TSA and the Midcoast TSA. The remaining areas have small percentages of the total SSS at high risk, and therefore little opportunity to change these risk levels into the future.

Summary of Results

The results provide some general patterns of outcomes which can be summarised as:

- **The Current SLUO significantly reduces risk to ecological integrity, compared with the intended Basecase management framework that was in place prior to the adoption of an EBM framework for the coast in 2006.** The reduced risk stems from a combination of a significant increase in protected areas, old forest targets, and retention for other values (riparian / grizzly bear etc) that were not previously in place. Some areas where risk is apparently reduced, in particular protection of some biodiversity / protected areas, plus protection levels for some ecosystems remain somewhat uncertain. This uncertainty stems from a number of sources, including proposed developments of unknown extent within Biodiversity Areas, and the future status of the 'inoperable' landbase. Today a significant amount of harvest occurs in this 'inoperable' area, which the timber supply model assumes to be defacto protected in these analyses.
- **Full EBM results in further reductions in risk over the Current SLUO resulting from additional protection of primarily high and moderate productivity ecosystems**, which tend to represent a disproportionate amount of coastal biodiversity. Additionally, the rate at which ecosystems are allowed to move into lower risk categories increases with Full EBM. The certainty of protection increases because higher targets are demanded, and so the outcomes are more fixed, irrespective of future changes in operability. The uncertainty associated with future ecological integrity in biodiversity areas remains.
- Significant external uncertainties that should be considered when interpretating the results include the unknown influences of additional planning (e.g. DSPs), assumptions around future operability levels, and climate change which adds a significant additional stressor to these ecosystems.

The Executive Summary of this report provides a detailed summary of results and discussion of uncertainties.

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Appendix 1. Protected Areas Representation by SSS.

Table 12 summarises the level of each SSS captured within Protected and Biodiversity Areas. The SSS are categorised by percent unprotected (last column), and within this group are arranged by size. A total of 99 SSS (over 867,102 ha) have less than 20% protected in the core protected areas.

Table 12. Table of Protected Area representation by SSS.

AU_text	BEC	Area	Percent existing	Percent New Bio	Percent New cons	% Not Prot	% not protected Category
HemBal_Good	CWHvm1	132,611	0.5	0.8	14.6	84.2	80-100
HemBal_Poor	MHmm2	91,841	0.2	1.7	8.0	90.1	80-100
Cedar_Moderate	CWHvm1	81,884	0.3	0.6	17.3	81.8	80-100
HemBal_Mod	CWHws2	80,121	0.0	1.1	14.3	84.5	80-100
HemBal_Poor	CWHws2	77,355	1.7	2.1	15.2	80.9	80-100
HemBal_Mod	CWHms2	55,818	0.0	2.6	15.5	81.9	80-100
Cedar_Poor	MHmm1	54,555	0.1	3.0	16.4	80.5	80-100
Decid	CWHvm1	34,372	0.7	1.6	8.4	89.3	80-100
HemBal_Poor	MHwh1	23,288	0.3	0.4	16.0	83.3	80-100
HemBal_Mod	MHmm1	20,223	0.5	4.3	13.0	82.2	80-100
HemBal_Mod	MHmm2	17,034	0.0	1.8	17.7	80.6	80-100
Cedar_Moderate	CWHvm2	13,891	0.0	0.6	15.5	83.9	80-100
HemBal_Good	CWHxm2	11,938	1.1	0.0	1.1	97.8	80-100
Fir_Moderate	CWHvm1	10,205	0.0	0.6	6.0	93.4	80-100
Cedar_Moderate	CWHvh1	10,177	0.0	8.7	5.1	86.1	80-100
Cedar_Poor	ATunp	9,573	0.0	6.0	11.1	82.8	80-100
Cedar_Good	CWHvm1	9,064	0.8	0.6	4.0	94.6	80-100
HemBal_Good	CWHdm	7,593	0.0	0.0	6.1	93.9	80-100
Fir_Poor	CWHms2	7,435	0.0	1.4	9.5	89.1	80-100
Decid	CWHms2	6,851	0.0	1.6	11.1	87.3	80-100
Fir_Moderate	CWHms2	6,586	0.0	7.0	8.0	85.0	80-100
HemBal_Good	CWHms2	6,409	0.0	3.5	8.7	87.8	80-100
HemBal_Good	CWHvh1	5,422	0.0	0.5	1.1	98.4	80-100
Fir_Good	CWHvm1	5,202	0.0	0.0	1.8	98.2	80-100
Decid	CWHvh2	5,166	1.1	3.0	15.1	80.8	80-100
Fir_Poor	CWHvm1	4,931	0.5	0.1	14.2	85.3	80-100
HemBal_Mod	CWHvh1	4,312	0.2	8.0	7.6	84.2	80-100
Cedar_Good	CWHvh1	3,698	0.0	1.6	0.0	98.4	80-100
Fir_Moderate	CWHxm2	3,542	2.0	0.0	1.0	97.0	80-100
HemBal_Mod	CWHws1	3,339	0.0	7.2	0.0	92.8	80-100
HemBal_Mod	CWHdm	3,181	0.0	0.0	7.6	92.4	80-100
HemBal_Good	CWHws2	3,157	0.0	0.3	5.7	94.0	80-100
HemBal_Poor	MHwhp	3,143	0.1	0.0	14.7	85.2	80-100

AU_text	BEC	Area	Percent existing	Percent New Bio	Percent New cons	% Not Prot	% not protected Category
Cedar_Poor	CWHwm	3,089	2.9	12.1	3.7	81.3	80-100
HemBal_Good	CWHmm1	2,951	0.0	0.0	0.0	100.0	80-100
Cedar_Moderate	CWHws2	2,865	0.0	1.5	13.4	85.1	80-100
HemBal_Mod	CWHxm2	2,807	1.9	0.0	0.7	97.5	80-100
Fir_Good	CWHxm2	2,685	0.0	0.0	1.1	98.8	80-100
HemBal_Mod	CWHmm1	2,496	0.0	0.0	0.0	100.0	80-100
Spruce_Poor_Pl	CWHms2	2,321	0.0	0.0	13.1	86.9	80-100
Cedar_Moderate	CWHds2	2,059	2.6	0.0	14.6	82.8	80-100
Fir_Good	CWHdm	2,020	0.0	0.0	1.4	98.6	80-100
Fir_Moderate	CWHdm	1,890	0.0	0.0	2.7	97.3	80-100
Decid	CWHvh1	1,695	0.0	0.0	1.0	99.0	80-100
Fir_Poor	CWHxm2	1,679	1.0	0.0	1.0	98.0	80-100
HemBal_Poor	CWHws1	1,645	0.0	10.9	0.0	89.1	80-100
Decid	CWHdm	1,536	0.0	0.0	8.3	91.7	80-100
Decid	CWHws2	1,287	0.0	0.1	13.0	86.9	80-100
Decid	CWHvm2	1,251	0.0	4.6	8.8	86.6	80-100
Decid	CWHxm2	1,088	0.5	0.0	0.2	99.3	80-100
Fir_Good	CWHms2	1,081	0.0	0.0	3.0	97.0	80-100
HemBal_Mod	ATunp	1,073	0.0	0.0	12.4	87.6	80-100
HemBal_Mod	MHwh1	1,001	0.0	0.9	7.0	92.0	80-100
Fir_Good	CWHds2	960	3.4	0.0	16.5	80.2	80-100
Cedar_Moderate	MHmm1	941	0.0	0.1	8.7	91.2	80-100
Spruce_Moderate	CWHws2	924	0.0	0.0	15.9	84.1	80-100
Cedar_Good	CWHvm2	854	0.0	0.6	0.5	98.9	80-100
Fir_Poor	MHmm2	829	0.0	0.0	4.4	95.6	80-100
HemBal_Good	CWHws1	817	0.0	8.9	0.0	91.1	80-100
Fir_Poor	CWHdm	816	0.0	0.0	0.1	99.9	80-100
Cedar_Moderate	CWHdm	771	0.0	0.0	14.9	85.1	80-100
Cedar_Poor	MHmm2	615	0.0	0.0	0.7	99.3	80-100
HemBal_Poor	CWHmm1	545	0.0	0.0	0.0	100.0	80-100
Fir_Poor	CWHmm1	496	0.0	0.0	0.0	100.0	80-100
Cedar_Poor	CWHmm1	493	0.0	0.0	0.0	100.0	80-100
Spruce_Poor_Pl	CWHxm2	438	2.7	0.0	0.0	97.3	80-100
Cedar_Poor	CWHxm2	424	0.0	0.0	0.0	100.0	80-100
Fir_Poor	CWHvm2	420	0.0	0.0	19.0	81.0	80-100
Cedar_Good	CWHdm	382	0.0	0.0	0.7	99.3	80-100
Cedar_Moderate	CWHxm2	370	0.0	0.0	2.1	97.9	80-100
Fir_Moderate	CWHvm2	339	0.0	0.4	8.2	91.4	80-100
Cedar_Moderate	CWHwm	313	15.4	4.3	0.0	80.2	80-100

AU_text	BEC	Area	Percent existing	Percent New Bio	Percent New cons	% Not Prot	% not protected Category
Cedar_Moderate	MHwh1	282	0.0	0.0	18.7	81.3	80-100
HemBal_Poor	CWHxm2	279	0.0	0.0	0.0	100.0	80-100
Fir_Good	CWHmm1	259	0.0	0.0	0.0	100.0	80-100
HemBal_Poor	CWHdm	255	0.0	0.0	13.7	86.3	80-100
Cedar_Moderate	CWHmm1	203	0.0	0.0	0.0	100.0	80-100
Fir_Moderate	CWHmm1	197	0.0	0.0	0.0	100.0	80-100
HemBal_Poor	ESSFmk	155	0.0	0.0	0.0	100.0	80-100
Cedar_Good	CWHws2	155	0.0	1.0	0.3	98.7	80-100
Cedar_Good	CWHxm2	153	0.0	0.0	0.7	99.3	80-100
Cedar_Moderate	ATunp	148	0.0	0.0	10.3	89.7	80-100
HemBal_Mod	ESSFmk	134	0.0	0.0	0.0	100.0	80-100
Fir_Good	CWHvm2	132	0.0	0.0	0.0	100.0	80-100
Decid	MHmm1	119	7.3	0.8	11.1	80.7	80-100
Fir_Good	CWHws2	116	0.0	0.0	0.0	100.0	80-100
Spruce_Poor_Pl	CWHdm	87	0.0	0.0	6.3	93.7	80-100
Cedar_Good	MHmm1	86	0.0	0.0	0.0	100.0	80-100
Spruce_Poor_Pl	CWHmm1	35	0.0	0.0	0.0	100.0	80-100
Cedar_Good	CWHmm1	22	0.0	0.0	0.0	100.0	80-100
Spruce_Moderate	MHwh1	22	0.0	0.0	0.0	100.0	80-100
Spruce_Moderate	CWHdm	19	0.0	0.0	5.2	94.8	80-100
Decid	CWHmm1	13	0.0	0.0	0.0	100.0	80-100
Cedar_Good	MHwh1	12	0.0	0.0	0.0	100.0	80-100
HemBal_Good	MHmm2	12	0.0	0.0	0.0	100.0	80-100
HemBal_Mod	MHwhp	8	0.0	0.0	16.1	83.9	80-100
Decid	MHmm2	7	0.0	0.0	0.0	100.0	80-100
Decid	MHwh1	7	0.0	0.0	0.0	100.0	80-100
Cedar_Good	MHmmp	3	0.0	0.0	0.0	100.0	80-100
Cedar_Poor	CWHvh2	810,414	0.8	6.3	25.0	68.0	60-80
HemBal_Mod	CWHvm1	187,912	0.7	2.1	17.8	79.4	60-80
Cedar_Poor	CWHvm1	181,127	0.4	2.8	21.4	75.4	60-80
HemBal_Poor	MHmm1	167,061	1.9	6.5	19.1	72.4	60-80
Cedar_Poor	CWHvm2	153,333	0.1	2.1	20.1	77.7	60-80
HemBal_Poor	CWHvm2	152,141	0.9	6.5	25.7	66.9	60-80
HemBal_Poor	CWHvh2	140,418	0.5	3.2	19.6	76.7	60-80
HemBal_Mod	CWHvm2	91,315	0.5	1.1	19.9	78.4	60-80
Cedar_Poor	CWHvh1	90,928	0.0	20.7	9.3	70.1	60-80
HemBal_Mod	CWHvh2	82,185	0.4	2.1	20.0	77.5	60-80
HemBal_Poor	CWHvm1	76,559	0.7	4.8	33.9	60.6	60-80
HemBal_Poor	ATun	59,403	27.4	0.9	7.9	63.8	60-80

AU_text	BEC	Area	Percent existing	Percent New Bio	Percent New cons	% Not Prot	% not protected Category
HemBal_Poor	CWHwm	53,562	7.2	17.7	4.6	70.5	60-80
Cedar_Moderate	CWHvh2	49,272	0.9	2.5	20.6	76.0	60-80
Cedar_Poor	MHwh1	19,720	1.4	2.1	18.8	77.6	60-80
HemBal_Good	CWHvm2	15,292	0.0	0.0	27.6	72.4	60-80
HemBal_Poor	CWHms2	12,465	0.0	2.6	25.1	72.3	60-80
HemBal_Mod	CWHds2	11,973	3.1	0.0	35.7	61.2	60-80
Spruce_Good	CWHvm1	9,586	2.1	2.4	28.3	67.3	60-80
Spruce_Moderate	CWHvm1	8,206	1.5	4.2	25.1	69.2	60-80
Fir_Poor	CWHws2	7,044	0.2	0.0	31.0	68.7	60-80
Decid	CWHds2	5,804	11.2	0.0	19.0	69.8	60-80
Cedar_Moderate	CWHms2	5,447	0.0	3.3	17.8	79.0	60-80
Spruce_Poor_Pl	CWHws2	4,967	0.3	0.2	34.7	64.8	60-80
Spruce_Poor_Pl	CWHvh1	4,688	0.5	15.8	18.9	64.7	60-80
Cedar_Poor	CWHms2	4,377	0.0	0.5	31.0	68.5	60-80
Cedar_Poor	CWHws2	3,684	0.0	1.7	23.1	75.2	60-80
Spruce_Moderate	CWHvh2	3,157	0.1	2.1	24.6	73.2	60-80
Fir_Moderate	CWHws2	2,853	0.0	0.1	26.5	73.5	60-80
Spruce_Good	CWHvh2	2,329	0.8	0.5	22.2	76.5	60-80
Cedar_Good	CWHvh2	2,029	1.1	0.6	26.4	71.9	60-80
Cedar_Poor	MHwhp	1,429	1.8	0.0	22.1	76.1	60-80
Spruce_Good	CWHms2	1,244	0.0	4.7	25.8	69.5	60-80
HemBal_Poor	CWHvh1	1,230	1.6	5.9	23.5	69.1	60-80
Sub	Sub	1,100	0.0	1.2	35.6	63.2	60-80
Cedar_Poor	CWHdm	768	0.0	0.0	21.7	78.3	60-80
Cedar_Good	CWHms2	752	0.0	1.5	23.2	75.3	60-80
Spruce_Moderate	CWHms2	729	0.0	4.1	18.9	77.0	60-80
HemBal_Good	MHmm1	654	0.0	1.6	23.9	74.4	60-80
Spruce_Poor_Pl	MHmm2	633	0.0	0.7	32.5	66.9	60-80
Spruce_Good	CWHws2	347	0.0	0.0	34.3	65.7	60-80
Cedar_Poor	MHmmp	281	0.4	1.0	36.0	62.6	60-80
HemBal_Good	MHwh1	234	0.0	0.0	28.3	71.7	60-80
HemBal_Mod	MHmmp	134	12.3	6.0	20.2	61.5	60-80
AT_Misc	AT	101	1.5	0.0	29.6	68.9	60-80
Cedar_Moderate	MHmm2	42	0.0	0.0	20.1	79.9	60-80
Spruce_Moderate	MHmm1	18	24.3	0.0	0.0	75.7	60-80
HemBal_Good	CWHvh2	83,905	0.2	3.6	41.4	54.9	40-60
HemBal_Poor	MHmmp	19,223	6.7	15.9	20.0	57.4	40-60
HemBal_Mod	CWHwm	18,700	10.4	23.0	8.1	58.5	40-60
Spruce_Poor_Pl	CWHvm1	13,297	1.2	6.2	49.5	43.1	40-60

AU_text	BEC	Area	Percent existing	Percent New Bio	Percent New cons	% Not Prot	% not protected Category
HemBal_Poor	CWHds2	12,195	37.8	0.0	14.7	47.5	40-60
Fir_Moderate	CWHds2	6,110	2.2	0.0	45.3	52.5	40-60
Spruce_Moderate	CWHvm2	1,419	3.7	5.6	48.1	42.5	40-60
Spruce_Poor_Pl	ATunp	1,246	7.0	0.0	48.4	44.6	40-60
Decid	CWHwm	1,133	11.8	32.0	10.1	46.1	40-60
HemBal_Good	CWHwm	770	5.4	28.9	17.6	48.1	40-60
Fir_Poor	ESSFmw	711	39.6	0.0	9.3	51.1	40-60
Cedar_Poor	CWHds2	676	0.0	0.0	40.9	59.1	40-60
Decid	CWHws1	537	0.0	50.4	0.0	49.6	40-60
Spruce_Poor_Pl	MHmm1	506	10.4	4.6	34.8	50.2	40-60
Spruce_Good	CWHvm2	270	1.3	0.0	49.9	48.8	40-60
Spruce_Poor_Pl	IDFdw	222	0.0	0.0	59.7	40.3	40-60
Cedar_Good	CWHds2	204	0.0	0.0	45.2	54.8	40-60
Spruce_Moderate	CWHws1	37	0.0	43.0	0.0	57.0	40-60
Spruce_Good	CWHws1	16	0.0	47.7	0.0	52.3	40-60
Spruce_Poor_Pl	CWHvh2	43,261	0.3	1.6	64.8	33.3	20-40
Fir_Poor	CWHds2	12,018	17.2	0.0	48.7	34.2	20-40
Spruce_Poor_Pl	CWHvm2	8,523	1.0	1.5	65.6	31.9	20-40
Spruce_Poor_Pl	ESSFmw	7,708	72.4	0.0	4.9	22.7	20-40
HemBal_Good	CWHds2	2,423	58.9	0.0	6.9	34.2	20-40
HemBal_Mod	ESSFmw	2,173	3.4	0.0	72.1	24.4	20-40
Spruce_Poor_Pl	CWHwm	902	39.7	26.7	9.7	23.9	20-40
Spruce_Poor_Pl	MHwh1	368	0.0	0.8	60.5	38.7	20-40
HemBal_Mod	IDFww	342	6.4	0.0	64.6	28.9	20-40
Fir_Poor	IDFdw	78	0.0	0.0	74.6	25.4	20-40
HemBal_Poor	ESSFmw	48,622	78.3	0.0	3.0	18.7	0-20
Spruce_Poor_Pl	SBSmc2	46,614	100.0	0.0	0.0	0.0	0-20
Spruce_Poor_Pl	SBPSmc	37,158	100.0	0.0	0.0	0.0	0-20
Spruce_Poor_Pl	ESSFmc	25,755	92.5	0.0	7.4	0.1	0-20
HemBal_Poor	ESSFmc	18,449	99.2	0.0	0.8	0.1	0-20
Spruce_Poor_Pl	IDFww	12,572	73.1	0.0	21.6	5.3	0-20
Spruce_Poor_Pl	CWHds2	12,041	37.8	0.0	50.4	11.8	0-20
Spruce_Moderate	ESSFmc	10,238	100.0	0.0	0.0	0.0	0-20
Spruce_Moderate	SBSmc2	7,775	100.0	0.0	0.0	0.0	0-20
Spruce_Poor_Pl	MSun	7,321	100.0	0.0	0.0	0.0	0-20
Decid	SBSmc2	6,393	100.0	0.0	0.0	0.0	0-20
Fir_Poor	IDFww	4,965	27.3	0.0	66.3	6.4	0-20
HemBal_Poor	IDFww	3,986	82.6	0.0	9.3	8.1	0-20
HemBal_Mod	ESSFmc	1,650	71.8	0.0	27.9	0.2	0-20

AU_text	BEC	Area	Percent existing	Percent New Bio	Percent New cons	% Not Prot	% not protected Category
HemBal_Poor	SBSmc2	1,517	100.0	0.0	0.0	0.0	0-20
Spruce_Moderate	CWHds2	1,062	83.6	0.0	6.9	9.5	0-20
Decid	IDFww	985	28.6	0.0	71.4	0.0	0-20
Spruce_Moderate	IDFww	919	91.5	0.0	8.5	0.0	0-20
Fir_Moderate	IDFww	805	0.0	0.0	99.8	0.2	0-20
Spruce_Poor_Pl	ESSFxv1	800	100.0	0.0	0.0	0.0	0-20
Spruce_Moderate	CWHwm	772	53.7	24.2	7.8	14.3	0-20
HemBal_Poor	ESSFxv1	732	100.0	0.0	0.0	0.0	0-20
Spruce_Good	CWHwm	592	63.4	12.0	20.4	4.2	0-20
HemBal_Poor	MSun	525	100.0	0.0	0.0	0.0	0-20
Spruce_Moderate	ESSFxv1	458	100.0	0.0	0.0	0.0	0-20
Decid	SBPSmc	258	100.0	0.0	0.0	0.0	0-20
Spruce_Moderate	SBPSmc	222	100.0	0.0	0.0	0.0	0-20
Cedar_Moderate	IDFww	222	0.0	0.0	100.0	0.0	0-20
Int_Misc	Int	145	95.3	0.0	0.0	4.7	0-20
Cedar_Poor	IDFww	109	0.0	0.0	100.0	0.0	0-20
Spruce_Poor_Pl	CWHws1	21	0.0	95.2	0.0	4.8	0-20
Fir_Poor	CWHw2	13	0.0	0.0	98.0	2.0	0-20
Decid	IDFdw	8	0.0	0.0	100.0	0.0	0-20
Spruce_Poor_Pl	MHmmp	3	100.0	0.0	0.0	0.0	0-20
HemBal_Good	MHmmp	2	0.0	0.0	100.0	0.0	0-20
HemBal_Poor	CWHvm	1	0.0	0.0	100.0	0.0	0-20
Spruce_Poor_Pl	MHwhp	1	0.0	0.0	100.0	0.0	0-20
	Grand Total	3,788,712	7.5	4.1	19.7	68.7	

Appendix 2. Landscape Units – number and area of SSS in different risk classes (ordered in decreasing number of SSS at high risk).

	Number of SSS at risk				#SSS	Area of SSS at risk				
LU	L	LM	HM	H	Total	L	LM	HM	H	Total Area
Thurlow	11	4	6	18	39	2,249	1,211	7,517	27,039	38,016
Franklin	19	12	4	18	53	7,346	2,099	278	1,207	10,930
Estero	14	4	5	14	37	7,514	922	296	5,554	14,286
Dean	10	12	6	13	41	10,392	2,744	3,622	1,763	18,521
Gray	14	4	3	13	34	7,684	4,737	97	9,627	22,145
Fulmore	13	7	5	12	37	20,892	14,577	157	29,365	64,991
LowerKlinaklini	14	13	3	12	42	13,308	8,446	498	1,553	23,805
Saloompt	14	10	5	11	40	9,776	4,381	408	1,643	16,208
Owikeno	21	8	3	11	43	10,051	4,320	157	1,581	16,109
MiddleKlinaklini	10	9	7	10	36	5,056	4,900	3,488	5,914	19,358
BellaCoola	8	9	5	10	32	2,272	1,461	2,019	1,241	6,993
KnightEast	13	7	3	10	33	17,314	4,459	676	3,405	25,854
Phillips	17	5	2	10	34	5,699	3,546	64	6,198	15,507
UpperKlinaklini	11	7	7	9	34	6,158	2,895	3,988	6,727	19,768
TalchakoGyllenspetz	6	4	5	9	24	2,566	1,087	3,901	548	8,102
Nusatsum	9	10	4	9	32	9,201	1,754	159	935	12,049
Clayton	17	9	2	9	37	8,678	2,732	46	846	12,302
SmitleyNoeick	8	9	1	9	27	8,621	2,604	36	1,080	12,341
TaleomeyAsseek	14	9	2	8	33	8,594	4,267	128	671	13,660
Neechanz	17	8	1	8	34	17,721	1,247	229	743	19,940
JumpAcross	11	10		8	29	8,447	2,038		705	11,190
Sim	17	7	3	7	34	5,399	2,007	52	790	8,248
Machmell	18	11	2	7	38	12,599	3,659	519	747	17,524
Sheemahant	17	10	2	7	36	11,088	6,170	301	882	18,441
Stafford	16	5	2	7	30	15,848	3,081	327	3,085	22,341
Huaskin	11	6	1	7	25	24,882	4,262	1,309	6,192	36,645
Crag	10	4	6	6	26	7,263	682	2,286	2,077	12,308
Ahnuhati_kwalate	15	4	2	6	27	8,281	4,005	76	868	13,230
SouthBentinck	11	10	2	6	29	5,579	3,016	27	326	8,948
Washwash	12	6	2	6	26	10,692	1,314	73	706	12,785
Gilford	13	7	1	6	27	20,962	11,273	12	23,094	55,341
Lull_Sallie	15	7	1	6	29	13,828	4,448	182	4,278	22,736
Sumquolt	8	10	1	6	25	7,828	2,524	176	524	11,052
Belize	19	9	2	5	35	57,462	5,585	570	2,706	66,323

	Number of SSS at risk				#SSS	Area of SSS at risk				
LU	L	LM	HM	H	Total	L	LM	HM	H	Total Area
Charles	13	4	2	5	24	7,216	1,006	87	838	9,147
LowerKimsquit	9	10	2	5	26	8,980	5,355	79	1,576	15,990
UpperKingcome	14	4	2	5	25	13,344	5,433	1,408	1,093	21,278
DoosDallery	18	8	1	5	32	12,299	5,573	18	327	18,217
LowerKingcome	14	5	1	5	25	14,411	4,598	948	2,301	22,258
Snowdrift	15	5	1	5	26	23,073	4,180	16	3,363	30,632
SutslemSkowquiltz	14	7	1	5	27	9,183	3,688	1	253	13,125
Ape	4	1	4	4	13	2,142	85	423	207	2,857
KingIsland	20	7	3	4	34	17,188	6,115	28	551	23,882
Ahta	12	5	2	4	23	8,944	1,523	16	1,071	11,554
Kilippi	8	5	1	4	18	8,217	1,408	260	79	9,964
Miriam	11	6	1	4	22	13,536	1,715	8	1,752	17,011
Twin	18	8	1	4	31	10,522	3,235	40	354	14,151
Broughton	4	2		4	10	13,740	3,831		8,479	26,050
Labouchere	13	5		4	22	12,500	2,465		645	15,610
Nascall	18	4		4	26	3,850	3,120		149	7,119
Clyak	19	9	2	3	33	14,246	7,395	35	797	22,473
Quottoon	24	10	2	3	39	10,274	2,333	105	82	12,794
UpperKimsquit	8	6	2	3	19	9,044	3,952	105	956	14,057
Allison	1	2	1	3	7	44,441	3,973	910	3,963	53,287
Draney	19	6	1	3	29	17,218	20,381	2	577	38,178
Kakweiken	15	5	1	3	24	13,440	3,160	175	1,664	18,439
Laredo	21	8	1	3	33	13,769	15,271	9	4,705	33,754
SmithSound	3	4	1	3	11	14,353	2,470	885	1,645	19,353
Surf	18	5	1	3	27	7,892	12,859	153	4	20,908
Wakeman	14	4	1	3	22	21,991	5,157	395	2,082	29,625
Johnston	21	9	2	2	34	21,125	10,665	33	135	31,958
Kitsault	10	6	2	2	20	16,768	9,642	1,570	307	28,287
Nekite	20	8	2	2	32	23,031	7,334	87	348	30,800
NootumKoeye	21	7	2	2	32	24,056	17,057	130	773	42,016
Roscoe	16	6	2	2	26	12,961	8,022	117	103	21,203
Smokehouse	14	5	2	2	23	17,743	2,711	10	183	20,647
Somerville	17	7	2	2	28	15,243	4,366	54	455	20,118
Union	20	9	2	2	33	9,320	5,049	227	8	14,604
Big_Falls	13	7	1	2	23	9,647	2,540	17	706	12,910
Bishop	16	8	1	2	27	11,954	4,690	10	466	17,120
KilbellaChuckwalla	17	8	1	2	28	16,318	7,918	50	961	25,247
KwatnaQuatlena	20	5	1	2	28	16,928	9,440	1	1,827	28,196
Seymour	14	5	1	2	22	14,264	2,448	117	480	17,309

	Number of SSS at risk				#SSS	Area of SSS at risk				
LU	L	LM	HM	H	Total	L	LM	HM	H	Total Area
Sparkling	16	7	1	2	26	7,064	1,240	2	186	8,492
Tolmie	16	7	1	2	26	6,517	5,472	44	2,845	14,878
Walker	1	2	1	2	6	639	97	263	53	1,052
Whalen	20	9	1	2	32	13,326	6,307	93	555	20,281
Butedale	14	3		2	19	4,332	1,312		4,195	9,839
Ellerslie	15	4		2	21	8,947	3,651		112	12,710
Green	13	5		2	20	6,303	3,516		4,564	14,383
Klekane	13	5		2	20	5,181	1,028		1,745	7,954
Roderick	14	6		2	22	22,735	13,689		1,704	38,128
Scotia	17	7		2	26	11,973	4,434		418	16,825
Triumph	13	4		2	19	6,675	2,713		145	9,533
Marmot	8	4	3	1	16	4,119	10,164	275	1	14,559
Hevenor	8	4	2	1	15	9,411	16,477	553	8	26,449
KlinakliniGlacier	6	8	2	1	17	3,810	1,124	203	2	5,139
Kumealon	15	8	2	1	26	12,119	11,649	716	26	24,510
Brown	17	6	1	1	25	7,948	1,416	22	99	9,485
Captain	7	3	1	1	12	6,122	7,955	76	3	14,156
Chambers	18	7	1	1	27	16,270	2,634	16	61	18,981
DonPeninsula	12	6	1	1	20	13,784	9,202	155	113	23,254
FishEgg	6	3	1	1	11	5,561	28,861	19	36	34,477
Gil	7	3	1	1	12	5,833	11,832	1,165	1	18,831
Gribbell	8	5	1	1	15	5,177	6,053	68	10	11,308
Hartley	8	4	1	1	14	12,125	17,988	356	3	30,472
Hawkes_South	7	4	1	1	13	5,040	4,092	201	3	9,336
Helmcken	12	3	1	1	17	1,975	20,147	68	1	22,191
Kaien	19	9	1	1	30	12,145	14,224	1,132	8	27,509
Khyex	13	6	1	1	21	10,138	2,339	9	112	12,598
Kitkiata	16	6	1	1	24	11,390	3,065	2	260	14,717
Kwinamass	13	6	1	1	21	12,880	3,063	1	194	16,138
Red_Bluff	7	4	1	1	13	7,774	12,476	289	1	20,540
Tuck	8	4	1	1	14	9,223	7,806	638	3	17,670
Yeo	9	3	1	1	14	10,408	9,830	17	70	20,325
Aaltanhash	11	3		1	15	3,339	1,155		2,144	6,638
Braden	12	4		1	17	10,752	5,863		127	16,742
Khtada	13	5		1	19	5,732	2,462		120	8,314
Khutze	13	3		1	17	3,247	1,414		2,461	7,122
SheepPassage	10	3		1	14	8,030	2,602		112	10,744
Skeena_Islands	9	5		1	15	1,419	853		104	2,376
Stagoo	7	6	4		17	3,870	12,247	799		16,916

	Number of SSS at risk				#SSS	Area of SSS at risk				
LU	L	LM	HM	H	Total	L	LM	HM	H	Total Area
Kshwan	5	3	3		11	1,066	2,840	112		4,018
Observatory_West	9	4	3		16	3,857	6,459	34		10,350
Belle_Bay	12	4	2		18	6,999	10,033	98		17,130
Evans	16	4	2		22	9,316	19,113	383		28,812
Nass	2	2	2		6	4	50	26		80
Olh	8	5	2		15	1,146	6,999	42		8,187
Anyox	4	3	1		8	581	6,971	48		7,600
Aristazabal	3	1	1		5	626	14,958	1,245		16,829
Banks	5	2	1		8	4,879	41,494	1,717		48,090
Calvert	6	3	1		10	1,136	19,332	434		20,902
Campania	4	2	1		7	782	3,180	2,372		6,334
Chapple	7	4	1		12	5,817	9,250	914		15,981
Denny	4	1	1		6	4,248	10,386	306		14,940
Dundas	3	2	1		6	1,203	8,206	4,308		13,717
Greenville			1		1			2		2
Hunter	5	2	1		8	1,279	8,240	530		10,049
McCauley	3	1	1		5	2,576	12,824	209		15,609
Monckton	7	2	1		10	5,379	15,368	926		21,673
Observatory_East	4	3	1		8	820	7,572	62		8,454
OuterCoastIslands	2	1	1		4	157	6,501	886		7,544
Pa_aat	6	2	1		9	5,069	5,783	25		10,877
Pearse	8	4	1		13	11,677	11,029	770		23,476
Porcher	8	5	1		14	11,491	20,814	1,072		33,377
Stephens	1	1	1		3	372	3,761	1,730		5,863
Trutch	2	1	1		4	149	4,340	316		4,805
Iknouk	1	1			2	4	1			5
Kiltuish	5	2			7	380	134			514
Kynoch	11	4			15	5,126	2,430			7,556
Price	4	1			5	449	5,295			5,744
Swindle	7	1			8	5,391	8,926			14,317
Grand Total	1632	766	229	489	3116	1,351,733	895,357	67,952	223,490	2,538,532

Appendix 3. Location of SSS at risk, by management unit.

The three tables below show i) a totaled sum of old growth for high risk ecosystems, by tenure (Table 13), ii) location of individual high risk SSS (all seral) by tenure (Table 14), and location of old growth by high risk SSS by tenure (Table 15).

These tables together provide i) an overview of location of high risk SSS, ii) a more detailed breakdown of SSS at high risk locations showing retention and recovery potential by tenure and iii) remaining old growth locations for high risk SSS.

Table 13. For high risk ecosystems only, total area and percent of all seral in each management unit is shown.

BEC	Area	KingcomeTSA	MidcoastTSA	NorthCoastTSA	StrathconaTSA	TFL25_blk5	TFL25blk2	TFL39_blk7	TFL39blk3	TFL39blk5	TFL45	TFL47
Total area	223,490	68,016	29,123	4,441	18,800	24,541	5,892	642	9,315	5,693	8,009	49,018
% of all high risk SSS on tenure		30.4	13.0	1.9	8.4	11.0	2.6	0.3	4.1	2.5	3.6	22.0
High risk SSS OG area	45,231	7,269	9,407	1,070	1,616	22,595	101	0	46	1,436	532	1532
Percent total High risk OG		16.0	20.8	2.3	3.5	50.0	0.2	0	0.1	3.2	1.2	3.4

For more detailed information, looking only at high risk ecosystems today, Table 14 summarises the percent of each SSS located in each tenure area. This includes all seral stages, not just old forest, and shows the opportunity for recovery of the SSS at high risk today.

Table 14. Location of high risk ecosystems today. Total area potential in each management unit (all seral stages).

AU	BEC	Risk cat	Total Area	KingcomeTSA	MidcoastTSA	NorthCoastTSA	StrathconaTSA	TFL25_blk5	TFL25blk2	TFL39_blk7	TFL39blk3	TFL39blk5	TFL45	TFL47
HemBal_Poor	ESSFmw	H	4590	3146	1444									
HemBal_Moderate	CWHdm	H	2658	46			1371					23	581	637
S_Poor_Pl	CWHvh1	H	3013	1675	1338									
Cedar_Poor	CWHds2	H	584	317	267									
Fir_Poor	CWHdm	H	662	69			333						35	225
HemBal_Good	CWHws2	H	2618		2103	281							234	
Fir_Poor	CWHvm1	H	3229	854	262		897		1		37	13	105	1060
HemBal_Good	CWHvm1	H	116731	40430	5302	3913	7044	24213	5235		8073	3536	2218	16767
Fir_Good	CWHms2	H	1656		1104								552	
Fir_Poor	ESSFmw	H	284	284										

AU	BEC	Risk cat	Total Area	KingcomeTSA	MidcoastTSA	NorthCoastTSA	StrathconaTSA	TFL25_blk5	TFL25blk2	TFL39_blk7	TFL39blk3	TFL39blk5	TFL45	TFL47
HemBal_Good	CWHvm3	H	421		421									
Cedar_Good	CWHms2	H	756		668								88	
Fir_Moderate	CWHvm2	H	308	73	38		76		12			23	28	58
S_Poor_Pl	CWHms2	H	2092		1775								317	
Fir_Moderate	CWHvm1	H	7772	1372	527		1944		30		24	335	219	3321
S_Poor_Pl	CWHws2	H	3666	1808	1795	26							37	
Cedar_Good	CWHvh2	H	1712		688	81		301		642				
Fir_Moderate	CWHxm2	H	3269				501						86	2682
HemBal_Good	CWHms2	H	6736		5999								737	
Fir_Moderate	CWHdm	H	1586	156			674					86	25	645
Cedar_Good	CWHvm1	H	8216	2860	441	139	747	27	497		1150	1302	111	942
HemBal_Good	CWHds2	H	868	29	839									
S_Poor_Pl	MHmm2	H	592	173	418	1								
Cedar_Good	CWHds2	H	179		179									
Cedar_Good	CWHws2	H	86		84								2	
Fir_Good	CWHws2	H	55		55									
Fir_Good	CWHvm3	H	51		51									
HemBal_Good	CWHdm	H	7566	98			1772					361	1305	4030
Fir_Good	CWHvm1	H	4413	252	145		592		114		31	14	146	3119
S_Poor_Pl	CWHxm2	H	427				72							355
Fir_Good	CWHdm	H	1903	256			239						144	1264
HemBal_Good	CWHxm2	H	11382				1421						569	9392
HemBal_Good	CWHmm1	H	2892				244						438	2210
S_Poor_Pl	CWHds2	H	5977	3950	2027									
Cedar_Good	CWHvh1	H	2675	2565	110									
Cedar_Good	CWHxm2	H	258				152						10	96
Cedar_Poor	IDFww	H	95	95										
Fir_Good	CWHds2	H	848	38	810									
Fir_Good	CWHmm1	H	263				209						5	49
Fir_Good	CWHvm2	H	141	123	2				3				12	1
Fir_Good	CWHxm2	H	2627				500						5	2122
HemBal_Good	CWHvh1	H	4724	4527	197									
S_Good	CWHds2	H	53	19	34									
S_Poor_Pl	CWHdm	H	74	19			12							43
S_Poor_Pl	IDFww	H	2782	2782										

In order to assess where the opportunities are to reduce risk in the short-term for these high risk SSS, Table 15 identifies the locations of remaining older forest (>140 years) within in management unit.

Table 15. Percent of remaining older forest (>140 years) remaining in each management unit, for current high risk ecosystems only.

AU	BEC	Risk cat	Area	KingcomeTSA	MidcoastTSA	NorthCoastTSA	StrathconaTSA	TFL25_blk5	TFL25blk2	TFL39_blk7	TFL39blk3	TFL39blk5	TFL45	TFL47
HemBal_Poor	ESSFmw	H	4590	69	31	0	0	0	0	0	0	0	0	0
HemBal_Moderate	CWHdm	H	2658	1	0	0	48	0	0	0	0	0	26	25
S_Poor_Pl	CWHvh1	H	3013	56	44	0	0	0	0	0	0	0	0	0
Cedar_Poor	CWHds2	H	584	70	30	0	0	0	0	0	0	0	0	0
Fir_Poor	CWHdm	H	662	0	0	0	42	0	0	0	0	0	23	35
HemBal_Good	CWHws2	H	2618	0	55	45	0	0	0	0	0	0	0	0
Fir_Poor	CWHvm1	H	3229	29	12	0	23	0	0	0	2	0	7	26
HemBal_Good	CWHvm1	H	116731	2	3	3	1	86	0	0	0	3	0	1
Fir_Good	CWHms2	H	1656	0	100	0	0	0	0	0	0	0	0	0
Fir_Poor	ESSFmw	H	284	100	0	0	0	0	0	0	0	0	0	0
HemBal_Good	CWHvm3	H	421	0	100	0	0	0	0	0	0	0	0	0
Cedar_Good	CWHms2	H	756	0	100	0	0	0	0	0	0	0	0	0
Fir_Moderate	CWHvm2	H	308	51	27	0	0	0	0	0	0	4	9	9
S_Poor_Pl	CWHms2	H	2092	0	86	0	0	0	0	0	0	0	14	0
Fir_Moderate	CWHvm1	H	7772	28	24	0	24	0	0	0	0	4	6	14
S_Poor_Pl	CWHws2	H	3666	12	84	2	0	0	0	0	0	0	2	0
Cedar_Good	CWHvh2	H	1712	0	11	18	0	72	0	0	0	0	0	0
Fir_Moderate	CWHxm2	H	3269	0	0	0	33	0	0	0	0	0	2	65
HemBal_Good	CWHms2	H	6736	0	100	0	0	0	0	0	0	0	0	0
Fir_Moderate	CWHdm	H	1586	14	0	0	66	0	0	0	0	0	3	17
Cedar_Good	CWHvm1	H	8216	1	0	7	5	1	2	0	0	76	0	8
HemBal_Good	CWHds2	H	868	0	100	0	0	0	0	0	0	0	0	0
S_Poor_Pl	MHmm2	H	592	9	91	0	0	0	0	0	0	0	0	0
Cedar_Good	CWHds2	H	179	0	100	0	0	0	0	0	0	0	0	0
Cedar_Good	CWHws2	H	86	0	100	0	0	0	0	0	0	0	0	0
Fir_Good	CWHws2	H	55	0	100	0	0	0	0	0	0	0	0	0
Fir_Good	CWHvm3	H	51	0	100	0	0	0	0	0	0	0	0	0
HemBal_Good	CWHdm	H	7566	0	0	0	37	0	0	0	0	6	0	57
Fir_Good	CWHvm1	H	4413	9	47	0	30	0	0	0	8	5	0	0
S_Poor_Pl	CWHxm2	H	427	0	0	0	0	0	0	0	0	0	0	100
Fir_Good	CWHdm	H	1903	0	0	0	0	0	0	0	0	0	0	100

AU	BEC	Risk cat	Area	KingcomeTSA	MidcoastTSA	NorthCoastTSA	StrathconaTSA	TFL25_blk5	TFL25blk2	TFL39_blk7	TFL39blk3	TFL39blk5	TFL45	TFL47
HemBal_Good	CWHxm2	H	11382	0	0	0	47	0	0	0	0	0	0	53
HemBal_Good	CWHmm1	H	2892	0	0	0	0	0	0	0	0	0	0	100
S_Poor_Pl	CWHds2	H	5977	14	86	0	0	0	0	0	0	0	0	0
Cedar_Good	CWHvh1	H	2675											
Cedar_Good	CWHxm2	H	258	0	0	0	0	0	0	0	0	0	0	100
Cedar_Poor	IDFww	H	95	100	0	0	0	0	0	0	0	0	0	0
Fir_Good	CWHds2	H	848	0	100	0	0	0	0	0	0	0	0	0
Fir_Good	CWHmm1	H	263											
Fir_Good	CWHvm2	H	141											
Fir_Good	CWHxm2	H	2627	0	0	0	0	0	0	0	0	0	0	100
HemBal_Good	CWHvh1	H	4724											
S_Good	CWHds2	H	53											
S_Poor_Pl	CWHdm	H	74	0	0	0	42	0	0	0	0	0	0	58
S_Poor_Pl	IDFww	H	2782	100	0	0	0	0	0	0	0	0	0	0

Appendix 4. Forest Cover Typing and Seral Stage Definitions.

Based on CFCI coastal data, provided Feb 2008 to C. Rumsey.

Issue: Forest Cover data does not accurately reflect the true age of older stands. Forest Cover uses wide age ranges in the higher age categories to partly deal with this issue (e.g. AC 8 = 140 – 250; AC 9 = 250+). The assignment of ages to older stands has not been a focus for MoFR, however, in ERA, when comparing the amount of 'older forest' against a predicted natural baseline, it is important that the age is relatively accurately expressed. It is also important during timber supply analyses, since age is used to constrain harvesting where age-based targets are not met.

During the North Coast ERA process (Holt 2002) some obvious discrepancies were noted in the FC age data. In particular, low and some medium productivity stands were identified primarily as being between 120 and 250 years in age (AC 7 and 8) yet were clearly primarily stands that had not seen a stand disturbing event for many hundreds or thousands of years (A. Banner / J. Pojar pers. comm.). The age data for these stands were 'fixed' at that time during that process by arbitrarily making all stands in those groups 'old' (i.e. >250 years; Fig. 10.).

AU	Data Solution	Rationale
Cedar / hemlock – high Hemlock/ balsam – high	No data lumping	Large structured stands, usually in the THLB. Good inventory, plus easy to photo-interpret.
All Spruce All cottonwood	No data lumping	Disturbance regimes relatively frequent, so current canopy tree age most closely represents actual stand age
Cedar/ hemlock – medium Hemlock/ balsam – medium Hemlock/ balsam – low	Lump AC 8 and 9 as 9	Intermediate productivity stands: Some units have much higher apparent AC8 and lower AC9 than predicted. Difficult to photo-interpret among these age classes.
Cedar/ hemlock – low Pine	Lump AC 7, 8 , 9 as 9	Very unproductive stands. Very difficult to photo-interpret; tends to be outside THLB (so low effort)

Figure 10. Original 'fix' used in North Coast (from Holt 2002).

Various other 'fixes' have been used during the various coastal modeling processes. For example, Cortex in their timber supply modeling work, changed the age of stands in the TFL25 and the midcoast TSA from 201-250 to greater than 250 (A. Fall pers. comm.).

This approach however, fixes one problem and creates another, by 'skewing' the data and creating a hole in the age class distribution.

Using the exponential equation[8], the percent of forest in different age categories can be predicted. Table 16 shows a range of predictions, based on a range of stand disturbing return intervals (250 – 1500 years).

Table 16. Range of predicted percentages in each age group, based on 250 – 1500 SDRI. (note, not looking at the fir-leading types).

[8] Note it has been raised that the exponential equation may fail to adequately reflect the high distribution of oldest forests in these landscapes (Lertzman 2002; Lertzman pers. comm.), and it is hypothesised that a higher percentage of forest would be found in the older age classes than suggested by the negative exponential equation. However, we continue to use it here due to lack of an available alternative.

Age	250-1500 SRDI
120-140	1-5%
140-200	4-12%
200-250	3-8%
250+	37-85%

Approach: The extent of the problem is examined, using age data in categories, to examine the distribution of the age data compared with what is predicted to occur naturally under a range of conditions.

a) Seral Stage Distribution.

In order to examine which parts of the forest cover may not accurately reflect real age of the stands, the distribution of forest in each age class for each AU, was compared to the range of predicted ages based in Table 16.

Table 17. FC data showing age-class distribution (percent) for each AU. Coloured cells show a deviation from a range of predicted values (shown in Table 16). Red is highest and yellow lowest deviation.

AU_text	Total Area	1-40	41-80	81-120	121-140	141-200	201-250	251+
Fir_Good	12,455	37	41	17	2	1	1	1
Fir_Moderate	32,579	44	11	13	3	6	8	15
Fir_Poor	41,605	7	7	16	8	12	29	23
Cedar_Good	17,415	66	16	2	0	1	5	9
Cedar_Moderate	168,884	18	4	1	0	2	10	65
Cedar_Poor	1,335,594	1	0	1	0	8	23	65
Hemlock_Balsam_Good	274,455	24	24	7	1	10	10	24
Hemlock_Balsam_Moderate	588,567	16	4	4	2	5	13	55
Hemlock_Balsam_Poor	966,739	0	3	5	2	7	19	64
Spruce_Good	14,384	26	5	4	1	4	12	47
Spruce_Moderate	36,042	11	0	6	3	53	4	23
Spruce_Pine_Poor	231,484	1	5	12	10	22	15	35
Decid	59,012	26	48	24	1	1	0	0
S_Low (only)	57,914	1	1	2	2	18	21	56
Grand Total	3,788,712	7	5	5	2	8	18	55

Spruce-Low is not a typical coastal AU, but was examined separately here, because 'spruce_pine_low' is located partly in the interior (SBS and SBPS) and partly in the CWHvh2 and CWHvm1.

Note that the older age classes can have less old forest than predicted because it has been harvested (see cedar_good or hemlock_good for example). We therefore focused the analysis on the remainder of the distribution. Colour coding shows slightly outside the range (yellow), further outside the range (orange) and considerably outside the range (red).

Discrepancies:

- Discrepancies are largely found in the age range 200-250, with differences here primarily in cedar_poor; cedar-medium; HB_good; HB_medium and HB_poor.
- Spruce_medium has a large discrepancy in the 141-200 age range;
- Spruce_pine_poor has discrepancies in all three – 121-140; 141-200; 201-250.

Potential Solutions[9]**:** There are a number of potential solutions, which may be relevant for different pieces of the data, and for different tools. (Solution 1, 2a and 2b below).

1. For age class data for areas where it is outside the expected range, and we have no reasonable explanation, force the ages of the forest in each class to mirror the expected distribution. This could be done randomly to the original FC data file to ensure random changes across the physical landscape. This would be the 'best' solution, and could reflect the kind of range outlined in Table 1 above to allow for some 'variability'. For timber supply modeling in particular this would be a 'best solution' since it prevents unrealistic bumps and holes being created in the age class data. However, it would require additional ecological input to 'reasonably' assign these ages geographically. For example, we know there is physiographic variability in location of different aged forests (e.g. Lertzman et al. 2002).

2. Focusing on a solution for the ERA alone, since the ERA looks at broad categories of forest (e.g. forest >250 years, or forest >140 years etc), 'holes' in the age class distribution are less relevant. Where the distribution is outside the expected range, and we have no reasonable explanation, bump up age classes (e.g. all forest in the 201 – 250 range for hemlock poor could be made into forest >250years) and then make one of two assumptions:

2a. That all that forest really is >250 years in which case we compare it to the naturally predicted level >250 (as done for NC – Holt 2005),

2b. Or we assume that some percentage of it is actually 201+, and compare it to the naturally predicted level >201 (or 140 as is convenient in the data).

Consideration of individual analysis units

i. Spruce_Pine_Low (AU12).

The SP_Low class is a mixture of ecosystems – significant areas of interior Pl and low productivity spruce (e.g. in the SBSmc2 of the Nechako, or the MS of Atnarko) combined with coastal 'shorepine' also Pl such as on Banks island which are truly low productivity pine sites in the CWHvh2. This creates a difficulty in dealing with this unit for the whole coast region because these two areas are dominated by significantly different disturbance regimes.
The distribution of age-classes for the interior type mirrors the predicted types relatively well because of the much higher disturbance rates for these stands (Table 18). There are also potentially different trajectories for these two very different ecological units, in terms of harvesting and / or mountain pine beetle, however the THLB layer shows they have very similar and very low operability.

Table 18. AU12 (S_P_Low). Separated into interior and coastal pine.

	1-40	41-80	81-120	121-140	141-200	201-250	251+
PINE INTERIOR ONLY (IDF/ MS/ ESSF)							
	0	8	14	13	31	10	23
PINE COASTAL ONLY (CWH / MH)							
	1	1	9	6	10	22	52

In Summary:

Ecologically it may be most appropriate to split this AU and treat them differently, with the interior units reflecting a different disturbance regime than that for coastal units. However, because neither unit is within the timber harvesting landbase (so risks are low), and because they are treated as the same unit within the Site Series Surrogates,

[9] There are two issues – a general 'fix' in the whole dataset, and ERA-specific fixes that were used in this analysis.

Recommend Solution 2a. Rationale – simplicity, with no apparent impacts for either timber supply or ERA.

Figure 11. Spruce_Pine_Low (AU12) highlighted in yellow.

ii. Cedar_Low (AU6)

Cw_Low class – is located primarily along the coastal fringes, islands and fjords, and has very low inclusion in the THLB

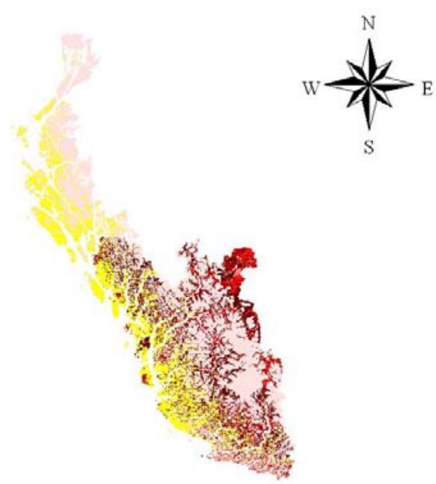

Figure 12. Cedar_Low highlighted in yellow.

Recommend Solution 2a. Rationale – simplicity, with no apparently disadvantage for either timber supply or ERA.

iii. Hemlock_Balsam_Low

H_B_Low sites are located throughout the region, including areas of the outer coast (north coast), the backs of valleys (central coast), and at the heights of land in the MH and more interior or transitional ESSF zones. These sites are therefore quite variable, and may naturally be dominated by quite different disturbance regimes. However, the zone is primarily outside the THLB (6% of the total area of H_B_Low is THLB).

Recommend Solution 2a. Rationale – simplicity, with no apparent disadvantage for either timber supply or ERA.

Figure 13. Hemlock_balsam_low sites highlighted in yellow.

iv. Cedar_Medium

For the cedar_medium sites – similarly, they are only slightly outside the expected range in the 201-250 range.

Recommend: Leaving data as is in FC for both ERA and TS. Rationale: Not sufficiently outside the range to alter data.

v. Spruce_Medium

Spruce_medium sites are primarily scattered across the coast, in very small pockets (highlighted in yellow, but largely invisible on the figure below). On the coastal side, these are likely primarily riparian sites. However, a significant portion of the total is located on the east side of the coast mountains in the ESSFmc and SBSmc (a total of 50% of the total area). These forests are dominated by completely different disturbance regimes (large stand-replacing fire events) than the small pockets of spruce along the coast which are likely dominated by a combination of stand dynamics and higher disturbance related with flooding events.

Table 19. Spruce_medium analysis units, showing area and percent location by BEC.

AU	BEC	Area	Percent of total
AU11	ESSFmc	105,017,938	29
AU11	SBSmc2	77,769,322	21

AU11	CWHvm1	53,892,534	15
AU11	CWHds2	10,615,858	3
AU11	CWHvh2	11,809,814	3
AU11	IDFww	9,188,381	3
AU11	CWHms2	7,311,834	2
AU11	CWHws2	8,899,594	2
AU11	CWHvm2	2,270,722	1
AU11	ESSFxv1	4,565,971	1
AU11	SBPSmc	2,234,883	1
AU11	CWHdm	206,316	0
AU11	MHmm2	703,991	0
AU11	MHwh1	11,324	0
AU11	(blank)	68,926,769	19

From FC (Table 17) spruce_medium sites have a significant area in the 140 – 200 year old age class (53%). This may reflect a real ecological situation, rather than an error in typing, resulting from the combination of completely different ecosystems and disturbances as outlined above. Or it could be combination of FC typing and the increased disturbances in this group.

Figure 14. Spruce_pine_low sites, highlighted in yellow.

<u>Recommendation: Employ Solution 2b for ERA. Ensure that this group is not lumped and moved into AC9 for timber supply, for any area of the region.</u> Rationale: the data may reflect a real situation of higher disturbance events for these SSS.

vi. Hemlock_Balsam_moderate and Good

For hemlock_balsam_medium + H_B_Good productivity sites, which represent a considerably larger area over the whole coast than they did just for North Coast (800,000ha of which approx. 60% is within the THLB), the amount of forest in the lower age-classes is outside the predicted range in the 201-250 group, but only marginally. For these sites, bumping the entire category (as was done on NC) up into 250+ would make the 210-250 category further from the predicted than it is now.

Recommendation: Employ Solution 2b for ERA. This could occur for the subgroup (201-250), or for the whole of AC 8 – i.e. 140 plus, and the latter is recommended as is it does not require an additional age-class breakdown in the dataset.

For timber supply analysis, recommend either leaving the data as they are, or undertaking Solution 1 for timber supply, otherwise the problem is magnified by pushing all the AC8 into AC9.

Summary:

For ERA and Timber Supply: For units primarily NOT in the THLB (S_P_Low, Cw_Low and HB_low) continue to shift the AC8 up to AC9. These units are clearly at low risk and unconstrained for timber. (Solution 2a)

For ERA: For other units with slightly skewed age-class distribution (C_M; HB_Medium and Good, S_M), , assume AC8 + 9 represents the forest >140 years, but don't assume further knowledge about the age-class distribution. Use the predicted target >140 years for comparison in ERA. (Solution 2b).

For timber supply: shifting the entire AC8 into AC9 creates an unreal 'gap' in the age-class distribution. Where there is very little "old seral" remaining this may 'free up' timber that is actually required to meet old seral targets. The appropriate solution here would be to undertake solution 1 for the units of concern –ie. Attempting to 'correct' the distribution rather than shifting the whole age-class. Shifting the whole age-class in many cases exacerbates the problem rather than fixing it.

Alternatively, leave the data as they are currently (particularly where the existing skew is minor – e.g. or hemlock_balsam medium and high and cedar medium, plus for Spruce_medium where the skew likely represents the natural distribution.

If a 'fix' is used to increase the age-class, sensitivity analyses should be undertaken to ensure additional risk is not being placed on these ecosystems.

Additional Points:

1. Data Cleaning

Table 2 shows the seral stage column from CFCI data. Although in general, it applies the usual age class / seral rules, there are however some discrepancies that cannot be explained.

Recommendation: To help in 'cleaning up' the data, this column should be removed and a basic seral stage definition recreated from age in this dataset. Seral 'Fixes' should be identified separately to avoid future confusion when using the dataset. Also clean up use of alternate terms (e.g. early and young).

Table 20. The seral stage column from original CFCI data. The terms do not always reflect the typical age ranges associated with each seral stage. For example, 1749ha of forest between 41 – 80 years are aged as mature. Similarly, some of the 181,000ha of forest 141-200 years in age that are typed as 'old' is not explained by 'known' FC fixes'.

Sum of Area_ha	Age_text_new							
SER_STAGE	1-40	41-80	81-120	121-140	141-200	201-250	251+	Grand Total
Early	231,034							231,034
Young	34,455							34,455
Mid	3,027	188,985						192,012
Mature		1,749	173,571	64,808	140,728	315,639		696,494
Old				4,487	181,180	358,028	2,113,337	2,657,032
Grand Total	268,516	190,734	173,571	69,294	321,907	673,667	2,113,337	3,811,027

2. Re the Cortex seral fix rules for midcoast:
I don't have management unit data in this data set, so can't check for discrepancies that would suggest bumping all 201-250 into the >250 class would be appropriate. I can't think of any ecological reason why it would be an ecologically appropriate approach. It will likely result in higher risk being applied in any areas where there is a short-fall of old forest.
Recommendation: Apply a standard fix coast-wide for analysis units. Don't apply management unit level fixes unless a rationale is provided.

Appendix 5. RONV and Site Series Surrogates

Issue: The old forest targets in the SLUO[10] are based on two pieces of information – a list of site series surrogates (SSS), and targets that are based on a percentage of RONV for each SSS. There remains some confusion about both pieces of information. This appendix aims to identify these issues.

a) Is there a single comprehensive list of SSS that are in use? There are a total of (approximately) 230 AU/ BEC combinations for the combined North / Central Coast dataset[11].

b) Which ecosystems are included in the SLUO targets, and what RONV information was used to create the targets?

c) Should the full list of ecosystems be included in a coarse filter ERA?

Approach:

1a. Is there a definitive list of site series surrogates? (SSS)

Although there have been extensive efforts to create a single definitive list of SSS, there remains confusion in the datasets in use, and between the SLUOs. This lack of a comprehensive single list used by everyone causes various problems including:

- Creating difficulties in producing automated / transparant analysis;
- implementation issues associated with not having targets for ecosystems that are apparently present on maps or in datasets.

Using the AU x BEC combinations, there are approximately 230 SSS in the CFCI dataset, and 235 using the SELES model dataset. In addition, these datasets identify a combined SSS column, but which does not necessarily appear to agree with the AU x BEC information from which it should have been derived.

Table 21 shows SSS from both CFCI data and data used in the SELES timber supply analysis. The SELES data includes only SSS in the productive landbase (hence the large area difference), however there remain many SSS present in one set but not in the other (see blank lines), there are many many small area differences between existing SSS, and there are some labeled SSS (in the CFCI dataset) appear to be in contradiction with the original data. These may be simple typing errors, or sorting errors within these datasets. Note that all the apparent errors relate to very small areas, but create confusion when SSS are created and implemented.

Some of the smaller units have been grouped in the SLUOs into 'alpine-SSS' and 'interior-SSS'. The rationale and process for this remains unclear and is confusing because it is unclear to many people working on the project what AU x BEC units this label applies to. Although this information *is* available, it should be made available in a central location and clearly linked to the target and SSS list in the SLUOs.

Although much work has gone into identifying SSS that may not be 'real' (primarily by A. MacKinnon and A. Banner), there remain some SSS that may be questionable (see Table 22 below). In Table 22 Column I (A. MacKinnon pers. comm.) a list of potential 'not real' ecosystems are noted (19 SSS ranging in labeled size from 2ha up to almost 60,000ha), which remain in one or other of the working datasets.

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[10] The Sched4 for NC and CC is available :

http://ilmbwww.gov.bc.ca/slrp/lrmp/nanaimo/cencoast/plan/objectives/index.html

Sched3 for South Coast is available at the same link above:

[11] Based on the CFCI Prototable; 235 based on Andrew's dataset, excluding zeros.

Recommendation 1: create a comprehensive and definitive list of SSS. If this excludes small areas of 'apparent' SSS, provide guidance as to how to practically deal with mapped site series surrogates that don't exist in the SLUO targets tables.

Table 21. Comparison of CFCI SSS and SELES data SSS. Highlighted Red rows appear disconnected from their original information.

From CFCI Prototable Feb 08			3,788,712	SELES_April 08		2,605,580	
AU_text	BEC	SSS	Area	AU	BEC	Area	Current Deviation from natural**
Cedar_Good	CWHdm	CWHdm_SAU4	382	Cedar_Good	CWHdm	320	60
Cedar_Good	CWHds2	CWHds2_SAU4	204	Cedar_Good	CWHds2	179	95
Cedar_Good	CWHmm1	CWHmm1_SAU4	22	Cedar_Good	CWHmm1	26	
Cedar_Good	CWHms2	CWHms2_SAU4	752	Cedar_Good	CWHms2	756	82
Cedar_Good	CWHvh1	CWHvh1_SAU4	3,698	Cedar_Good	CWHvh1	2,675	100
Cedar_Good	CWHvh2	CWHvh2_SAU4	2,029	Cedar_Good	CWHvh2	1,712	87
Cedar_Good	CWHvm1	CWHvm1_SAU4	9,064	Cedar_Good	CWHvm1	8,216	91
Cedar_Good	CWHvm2	CWHvm2_SAU4	854	Cedar_Good	CWHvm2	848	31
				Cedar_Good	CWHvm3	22	
				Cedar_Good	CWHwm	2	
Cedar_Good	CWHws2	CWHws2_SAU4	155	Cedar_Good	CWHws2	86	97
Cedar_Good	CWHxm2	CWHxm2_SAU4	153	Cedar_Good	CWHxm2	258	100
Cedar_Good	MHmm1	MHmm1_SAU4	86	Cedar_Good	MHmm1	60	29
Cedar_Good	MHmmp	MHmmp_SAU4	3				
Cedar_Good	MHwh1	MHwh1_SAU4	12				
				Cedar_Good	Undefined	4	
Cedar_Moderate	ATunp	ATunp_SAU5	148	Cedar_Moderate	CMAunp	47	
Cedar_Moderate	CWHdm	CWHdm_SAU5	771	Cedar_Moderate	CWHdm	733	23
Cedar_Moderate	CWHds2	CWHds2_SAU5	2,059	Cedar_Moderate	CWHds2	1,524	43
Cedar_Moderate	CWHmm1	CWHmm1_SAU5	203	Cedar_Moderate	CWHmm1	209	26
Cedar_Moderate	CWHms2	CWHms2_SAU5	5,447	Cedar_Moderate	CWHms2	6,000	25
Cedar_Moderate	CWHvh1	CWHvh1_SAU5	10,177	Cedar_Moderate	CWHvh1	8,846	42
Cedar_Moderate	CWHvh2	CWHvh2_SAU5	49,233	Cedar_Moderate	CWHvh2	44,574	7
Cedar_Moderate	CWHvm1	CWHvh2_SAU5	39	Cedar_Moderate	CWHvm1	74,814	22
Cedar_Moderate	CWHvm2	CWHvm2_SAU5	13,891	Cedar_Moderate	CWHvm2	12,202	7
				Cedar_Moderate	CWHvm3	1,363	2
Cedar_Moderate	CWHwm	CWHwm_SAU5	313	Cedar_Moderate	CWHwm	155	2
Cedar_Moderate	CWHws2	CWHws2_SAU5	2,865	Cedar_Moderate	CWHws2	1,234	9
Cedar_Moderate	CWHxm2	CWHxm2_SAU5	370	Cedar_Moderate	CWHxm2	325	55
Cedar_Moderate	IDFww	IDFww_SAU5	222	Cedar_Moderate	IDFww	217	-21
Cedar_Moderate	MHmm1	MHmm1_SAU5	941	Cedar_Moderate	MHmm1	885	0
Cedar_Moderate	MHmm2	MHmm2_SAU5	42	Cedar_Moderate	MHmm2	34	

From CFCI Prototable Feb 08			3,788,712	SELES_April 08		2,605,580	
AU_text	BEC	SSS	Area	AU	BEC	Area	Current Deviation from natural**
				Cedar_Moderate	MHmmp	1	
Cedar_Moderate	MHwh1	MHwh1_SAU5	282	Cedar_Moderate	MHwh1	455	3
Cedar_Moderate	MHwh1	CWHvm1_SAU5	81,884				
				Cedar_Moderate	Undefined	102	
Cedar_Poor	(blank)	CWHvm2_SAU6	2	Cedar_Poor	ATp	3	
Cedar_Poor	ATunp	ATunp_SAU6	9,573	Cedar_Poor	CMAunp	1,949	1
Cedar_Poor	CWHdm	CWHdm_SAU6	768	Cedar_Poor	CWHdm	777	30
Cedar_Poor	CWHds2	CWHds2_SAU6	676	Cedar_Poor	CWHds2	584	72
Cedar_Poor	CWHmm1	CWHmm1_SAU6	493	Cedar_Poor	CWHmm1	482	-5
Cedar_Poor	CWHms2	CWHms2_SAU6	4,377	Cedar_Poor	CWHms2	4,189	43
Cedar_Poor	CWHvh1	CWHvh1_SAU6	90,928	Cedar_Poor	CWHvh1	82,406	12
Cedar_Poor	CWHvh2	CWHvh2_SAU6	810,414	Cedar_Poor	CWHvh2	515,043	35
Cedar_Poor	CWHvm1	CWHvm1_SAU6	181,127	Cedar_Poor	CWHvm1	167,567	15
Cedar_Poor	CWHvm2	CWHvm2_SAU6	153,331	Cedar_Poor	CWHvm2	111,874	7
				Cedar_Poor	CWHvm3	2,021	25
Cedar_Poor	CWHwm	CWHwm_SAU6	3,089	Cedar_Poor	CWHwm	3,011	32
Cedar_Poor	CWHws2	CWHws2_SAU6	3,684	Cedar_Poor	CWHws2	915	43
Cedar_Poor	CWHxm2	CWHxm2_SAU6	424	Cedar_Poor	CWHxm2	471	0
Cedar_Poor	IDFww	IDFww_SAU6	109	Cedar_Poor	IDFww	95	100
Cedar_Poor	MHmm1	MHmm1_SAU6	54,555	Cedar_Poor	MHmm1	26,173	11
Cedar_Poor	MHmm2	MHmm2_SAU6	615	Cedar_Poor	MHmm2	311	6
Cedar_Poor	MHmmp	MHmmp_SAU6	281	Cedar_Poor	MHmmp	6	
Cedar_Poor	MHwh1	MHwh1_SAU6	19,720	Cedar_Poor	MHwh1	17,044	29
Cedar_Poor	MHwhp	MHwhp_SAU6	1,429	Cedar_Poor	MHwhp	7	
				Cedar_Poor	Undefined	8,544	
				Decid	CMAunp	28	
Decid	CWHdm	CWHdm_SAU13	1,536	Decid	CWHdm	1,241	
Decid	CWHds2	CWHds2_SAU13	2,247	Decid	CWHds2	2,635	
Decid	CWHmm1	CWHmm1_SAU13	13	Decid	CWHmm1	11	
Decid	CWHms2	CWHms2_SAU13	5,211	Decid	CWHms2	7,944	
Decid	CWHvh1	CWHvh1_SAU13	1,617	Decid	CWHvh1	1,200	
Decid	CWHvh2	CWHvh2_SAU13	5,166	Decid	CWHvh2	4,073	
Decid	CWHvm1	CWHvm1_SAU13	31,806	Decid	CWHvm1	31,102	
Decid	CWHvm2	CWHvm2_SAU13	1,240	Decid	CWHvm2	1,481	
				Decid	CWHvm3	3	
Decid	CWHwm	CWHwm_SAU13	1,133	Decid	CWHwm	906	
Decid	CWHws1	CWHws1_SAU13	537	Decid	CWHws1	375	

From CFCI Prototable Feb 08			3,788,712	SELES_April 08		2,605,580	
AU_text	BEC	SSS	Area	AU	BEC	Area	Current Deviation from natural**
Decid	CWHws2	CWHws2_SAU13	619	Decid	CWHws2	1,523	
Decid	CWHxm2	CWHxm2_SAU13	1,088	Decid	CWHxm2	807	
Decid	IDFdw	IDFdw_SAU13	7				
Decid	IDFww	IDFww_SAU13	185	Decid	IDFww	624	
Decid	MHmm1	MHmm1_SAU13	119	Decid	MHmm1	169	
Decid	MHmm2	Sub_Misc	1	Decid	MHmm2	387	
Decid	MHwh1	MHwh1_SAU13	7	Decid	MHwh1	34	
Decid	SBPSmc	SBPSmc_SAU13	229				
Decid	SBSmc2	SBSmc2_SAU13	6,252				
				Decid	Undefined	88	
Fir_Good	CWHdm	CWHdm_SAU1	2,020	Fir_Good	CWHdm	1,903	99
Fir_Good	CWHds2	CWHds2_SAU1	960	Fir_Good	CWHds2	848	100
Fir_Good	CWHmm1	CWHmm1_SAU1	259	Fir_Good	CWHmm1	263	100
Fir_Good	CWHms2	CWHms2_SAU1	1,081	Fir_Good	CWHms2	1,656	78
Fir_Good	CWHvm1	CWHvm1_SAU1	5,202	Fir_Good	CWHvm1	4,413	98
Fir_Good	CWHvm2	CWHvm2_SAU1	132	Fir_Good	CWHvm2	141	100
				Fir_Good	CWHvm3	51	97
Fir_Good	CWHws2	CWHws2_SAU1	116	Fir_Good	CWHws2	55	97
Fir_Good	CWHxm2	CWHxm2_SAU1	2,685	Fir_Good	CWHxm2	2,627	100
Fir_Moderate	CWHdm	CWHdm_SAU2	1,890	Fir_Moderate	CWHdm	1,586	88
Fir_Moderate	CWHds2	CWHds2_SAU2	6,110	Fir_Moderate	CWHds2	4,863	66
Fir_Moderate	CWHds2	CWHms2_SAU2	3				
Fir_Moderate	CWHmm1	CWHmm1_SAU2	197	Fir_Moderate	CWHmm1	197	58
Fir_Moderate	CWHms2	CWHms2_SAU2	6,581	Fir_Moderate	CWHms2	9,985	35
				Fir_Moderate	CWHvh2	1	
Fir_Moderate	CWHvm1	CWHvm1_SAU2	10,205	Fir_Moderate	CWHvm1	7,772	84
Fir_Moderate	CWHvm2	CWHvm2_SAU2	339	Fir_Moderate	CWHvm2	308	83
				Fir_Moderate	CWHvm3	309	-3
Fir_Moderate	CWHws2	CWHws2_SAU2	2,853	Fir_Moderate	CWHws2	2,276	46
Fir_Moderate	CWHws2	CWHms2_SAU2	3				
Fir_Moderate	CWHxm2	CWHxm2_SAU2	3,542	Fir_Moderate	CWHxm2	3,269	87
				Fir_Moderate	ESSFmc	35	
				Fir_Moderate	ESSFmw	2	
Fir_Moderate	IDFww	IDFww_SAU2	805	Fir_Moderate	IDFww	748	29
Fir_Moderate	MHmm2	Sub_Misc	52	Fir_Moderate	MHmm2	69	
Fir_Poor	ATunp	AT_Misc	31				
				Fir_Poor	BAFAunp	7	

From CFCI Prototable Feb 08			3,788,712	SELES_April 08		2,605,580	
AU_text	BEC	SSS	Area	AU	BEC	Area	Current Deviation from natural**
				Fir_Poor	CMAunp	19	
Fir_Poor	CWHdm	CWHdm_SAU3	816	Fir_Poor	CWHdm	662	74
Fir_Poor	CWHds2	CWHds2_SAU3	12,018	Fir_Poor	CWHds2	8,688	52
Fir_Poor	CWHmm1	CWHmm1_SAU3	496	Fir_Poor	CWHmm1	500	31
Fir_Poor	CWHms2	CWHms2_SAU3	7,435	Fir_Poor	CWHms2	8,334	40
				Fir_Poor	CWHvh1	3	
				Fir_Poor	CWHvh2	11	
Fir_Poor	CWHvm1	CWHvm1_SAU3	4,926	Fir_Poor	CWHvm1	3,229	74
Fir_Poor	CWHvm2	CWHvm1_SAU3	5				
				Fir_Poor	CWHvm2	345	51
				Fir_Poor	CWHvm3	479	41
Fir_Poor	CWHws2	CWHw2_SAU3	13	Fir_Poor	CWHws2	5,028	50
Fir_Poor	CWHxm2	CWHxm2_SAU3	1,679	Fir_Poor	CWHxm2	1,643	60
Fir_Poor	ESSFmw	ESSFmw_SAU3	711	Fir_Poor	ESSFmw	284	78
Fir_Poor	IDFdw	IDFdw_SAU3	78				
Fir_Poor	IDFww	IDFww_SAU3	4,965	Fir_Poor	IDFww	3,084	-8
Fir_Poor	MHmm1	Sub_Misc	142	Fir_Poor	MHmm1	135	54
Fir_Poor	MHmm2	MHmm2_SAU3	829	Fir_Poor	MHmm2	555	63
Fir_Poor	CWHvm2	CWHvm2_SAU3	420				
Fir_Poor	CWHws2	CWHws2_SAU3	7,044				
Hemlock_Balsam_Good	ATunp	AT_Misc	69	HemBal_Good	CMAunp	46	
Hemlock_Balsam_Good	CWHdm	CWHdm_SAU7	7,570	HemBal_Good	CWHdm	7,566	97
Hemlock_Balsam_Good	CWHds2	CWHds2_SAU7	2,423	HemBal_Good	CWHds2	868	91
Hemlock_Balsam_Good	CWHmm1	CWHmm1_SAU7	2,951	HemBal_Good	CWHmm1	2,892	99
Hemlock_Balsam_Good	CWHms2	CWHms2_SAU7	6,398	HemBal_Good	CWHms2	6,736	87
Hemlock_Balsam_Good	CWHvh1	CWHvh1_SAU7	5,422	HemBal_Good	CWHvh1	4,724	100
Hemlock_Balsam_Good	CWHvh2	CWHvh2_SAU7	83,905	HemBal_Good	CWHvh2	22,432	13
Hemlock_Balsam_Good	CWHvm1	CWHvm1_SAU7	132,611	HemBal_Good	CWHvm1	116,731	75
Hemlock_Balsam_Good	CWHvm2	CWHvm2_SAU7	15,292	HemBal_Good	CWHvm2	13,161	30
				HemBal_Good	CWHvm3	421	82
Hemlock_Balsam_Good	CWHwm	CWHwm_SAU7	770	HemBal_Good	CWHwm	514	24
Hemlock_Balsam_Good	CWHws1	CWHws1_SAU7	817	HemBal_Good	CWHws1	574	22
Hemlock_Balsam_Good	CWHws2	CWHws2_SAU7	3,157	HemBal_Good	CWHws2	2,618	74
Hemlock_Balsam_Good	CWHws2	CWHms2_SAU7	12				
Hemlock_Balsam_Good	CWHxm2	CWHxm2_SAU7	11,938	HemBal_Good	CWHxm2	11,382	99
Hemlock_Balsam_Good	MHmm1	MHmm1_SAU7	654	HemBal_Good	MHmm1	759	17
Hemlock_Balsam_Good	MHmm2	MHmm2_SAU7	12	HemBal_Good	MHmm2	131	40

From CFCI Prototable Feb 08			3,788,712	SELES_April 08		2,605,580	
AU_text	BEC	SSS	Area	AU	BEC	Area	Current Deviation from natural**
Hemlock_Balsam_Good	MHmmp	MHmmp_SAU7	2	HemBal_Good	MHmmp	4	
Hemlock_Balsam_Good	MHwh1	MHwh1_SAU7	234	HemBal_Good	MHwh1	230	35
Hemlock_Balsam_Good	MHwhp	Sub_Misc	2	HemBal_Good	MHwhp	1	
Hemlock_Balsam_Good		Sub_Misc	113				
Hemlock_Balsam_Good		Sub_Misc	108				
Hemlock_Balsam_Moderate	ATunp	ATunp_SAU8	1,073	HemBal_Good	Undefined	55	
				HemBal_Moderate	ATp	15	
				HemBal_Moderate	BAFAunp	4	
				HemBal_Moderate	CMAunp	543	26
Hemlock_Balsam_Moderate	CWHdm	CWHdm_SAU8	3,181	HemBal_Moderate	CWHdm	2,658	71
Hemlock_Balsam_Moderate	CWHdm	CWHdm_SAU7	10				
Hemlock_Balsam_Moderate	CWHds2	CWHds2_SAU8	11,973	HemBal_Moderate	CWHds2	7,796	25
Hemlock_Balsam_Moderate	CWHmm1	CWHmm1_SAU8	2,496	HemBal_Moderate	CWHmm1	2,507	61
Hemlock_Balsam_Moderate	CWHms2	CWHms2_SAU8	55,803	HemBal_Moderate	CWHms2	56,455	20
Hemlock_Balsam_Moderate	CWHvh1	CWHvh1_SAU8	4,312	HemBal_Moderate	CWHvh1	3,737	61
Hemlock_Balsam_Moderate	CWHvh2	CWHvh2_SAU8	82,185	HemBal_Moderate	CWHvh2	70,131	18
Hemlock_Balsam_Moderate	CWHvm1	CWHdm_SAU7	12				
Hemlock_Balsam_Moderate	CWHvm2	CWHdm_SAU7	2				
Hemlock_Balsam_Moderate	CWHvm1	CWHvm1_SAU8	187,907	HemBal_Moderate	CWHvm1	174,895	32
Hemlock_Balsam_Moderate	CWHvm1	CWHvm2_SAU8	3				
Hemlock_Balsam_Moderate	CWHvm2	CWHvm1_SAU8	5				
Hemlock_Balsam_Moderate	CWHvm2	CWHvm2_SAU8	91,312	HemBal_Moderate	CWHvm2	80,284	5
				HemBal_Moderate	CWHvm3	20,170	0
Hemlock_Balsam_Moderate	CWHwm	CWHwm_SAU8	18,700	HemBal_Moderate	CWHwm	14,061	31
Hemlock_Balsam_Moderate	CWHws1	CWHws1_SAU8	3,339	HemBal_Moderate	CWHws1	2,904	42
Hemlock_Balsam_Moderate	CWHws2	CWHws2_SAU8	80,121	HemBal_Moderate	CWHws2	55,278	5
Hemlock_Balsam_Moderate	CWHws2	CWHms2_SAU8	8				
Hemlock_Balsam_Moderate	CWHxm2	CWHxm2_SAU8	2,807	HemBal_Moderate	CWHxm2	2,842	60
Hemlock_Balsam_Moderate	ESSFmc	ESSFmc_SAU8	1,650	HemBal_Moderate	ESSFmc	379	-4
Hemlock_Balsam_Moderate	ESSFmk	ESSFmk_SAU8	134	HemBal_Moderate	ESSFmk	82	16
Hemlock_Balsam_Moderate	ESSFmw	ESSFmw_SAU8	2,173	HemBal_Moderate	ESSFmw	1,628	5
Hemlock_Balsam_Moderate	IDFww	IDFww_SAU8	342	HemBal_Moderate	IDFww	251	40
Hemlock_Balsam_Moderate	MHmm1	MHmm1_SAU8	20,223	HemBal_Moderate	MHmm1	17,314	-1
Hemlock_Balsam_Moderate	MHmm2	CWHms2_SAU8	7	HemBal_Moderate	MHmm2	16,591	-1
Hemlock_Balsam_Moderate	MHmmp	MHmmp_SAU8	134	HemBal_Moderate	MHmmp	8	
Hemlock_Balsam_Moderate	MHwh1	MHwh1_SAU8	1,001	HemBal_Moderate	MHwh1	3,730	9
Hemlock_Balsam_Moderate	MHwhp	MHwhp_SAU8	8	HemBal_Moderate	MHwhp	1	

From CFCI Prototable Feb 08			3,788,712	SELES_April 08		2,605,580	
AU_text	BEC	SSS	Area	AU	BEC	Area	Current Deviation from natural**
				HemBal_Moderate	Undefined	672	
Hemlock_Balsam_Moderate	MHmm2	MHmm2_SAU8	17,034				
Hemlock_Balsam_Moderate		Sub_Misc	1				
Hemlock_Balsam_Moderate		Sub_Misc	610				
Hemlock_Balsam_Moderate		Sub_Misc	6				
Hemlock_Balsam_Poor	(blank)	CWHvm2_SAU9	5				
Hemlock_Balsam_Poor	ATun	ATun_SAU9	208	HemBal_Poor	ATp	515	61
Hemlock_Balsam_Poor	ATunp	ATun_SAU9	59,195	HemBal_Poor	BAFAunp	507	63
				HemBal_Poor	CMAunp	7,732	61
Hemlock_Balsam_Poor	CWHdm	CWHdm_SAU9	255	HemBal_Poor	CWHdm	240	59
Hemlock_Balsam_Poor	CWHds2	CWHds2_SAU9	12,195	HemBal_Poor	CWHds2	4,048	65
Hemlock_Balsam_Poor	CWHmm1	CWHmm1_SAU9	545	HemBal_Poor	CWHmm1	541	0
Hemlock_Balsam_Poor	CWHms2	CWHms2_SAU9	12,431	HemBal_Poor	CWHms2	13,213	42
Hemlock_Balsam_Poor	CWHvh1	CWHvh1_SAU9	1,230	HemBal_Poor	CWHvh1	1,524	40
Hemlock_Balsam_Poor	CWHvh2	CWHvh2_SAU9	140,418	HemBal_Poor	CWHvh2	102,509	25
Hemlock_Balsam_Poor	CWHvm	CWHvm_SAU9	1				
Hemlock_Balsam_Poor	CWHvm1	CWHvm1_SAU9	76,559	HemBal_Poor	CWHvm1	59,266	20
Hemlock_Balsam_Poor	CWHvm2	CWHvm2_SAU9	152,136	HemBal_Poor	CWHvm2	98,557	16
				HemBal_Poor	CWHvm3	13,824	19
Hemlock_Balsam_Poor	CWHwm	CWHwm_SAU9	53,562	HemBal_Poor	CWHwm	45,419	42
Hemlock_Balsam_Poor	CWHws1	CWHws1_SAU9	1,645	HemBal_Poor	CWHws1	1,685	61
Hemlock_Balsam_Poor	CWHws2	CWHms2_SAU9	35	HemBal_Poor	CWHws2	41,625	33
Hemlock_Balsam_Poor	CWHxm2	CWHxm2_SAU9	279	HemBal_Poor	CWHxm2	293	27
Hemlock_Balsam_Poor	ESSFmc	ESSFmc_SAU9	18,449	HemBal_Poor	ESSFmc	126	-9
Hemlock_Balsam_Poor	ESSFmk	ESSFmk_SAU9	155	HemBal_Poor	ESSFmk	56	-16
Hemlock_Balsam_Poor	ESSFmw	ESSFmw_SAU9	48,622	HemBal_Poor	ESSFmw	4,590	70
Hemlock_Balsam_Poor	ESSFxv1	ESSFxv1_SAU9	732				
Hemlock_Balsam_Poor	IDFdw	Int_Misc	7				
Hemlock_Balsam_Poor	IDFww	IDFww_SAU9	3,986	HemBal_Poor	IDFww	292	57
				HemBal_Poor	IMAunp	110	
Hemlock_Balsam_Poor	MHmm1	MHmm1_SAU9	167,060	HemBal_Poor	MHmm1	79,546	28
Hemlock_Balsam_Poor	MHmm2	MHmm2_SAU9	91,841	HemBal_Poor	MHmm2	51,198	21
Hemlock_Balsam_Poor	MHmmp	MHmmp_SAU9	19,223	HemBal_Poor	MHmmp	15	
Hemlock_Balsam_Poor	MHwh1	MHwh1_SAU9	23,288	HemBal_Poor	MHwh1	21,536	23
Hemlock_Balsam_Poor	MHwhp	MHwhp_SAU9	3,143	HemBal_Poor	MHwhp	3	
Hemlock_Balsam_Poor	MSun	MSun_SAU9	525				
Hemlock_Balsam_Poor	SBPSmc	Int_Misc	138				

From CFCI Prototable Feb 08			3,788,712	SELES_April 08		2,605,580	
AU_text	BEC	SSS	Area	AU	BEC	Area	Current Deviation from natural**
Hemlock_Balsam_Poor	SBSmc2	SBSmc2_SAU9	1,517				
Hemlock_Balsam_Poor	CHWms2	CWHws2_SAU9	63				
Hemlock_Balsam_Poor	CWHws2	CWHws2_SAU9	77,292				
Hemlock_Balsam_Poor	(blank)	MHmm1_SAU9	1				
				HemBal_Poor	Undefined	1,910	
				S_Good	CWHdm	1	
				S_Good	CWHds2	53	100
Spruce_Good	CWHms2	CWHms2_SAU10	1,244	S_Good	CWHms2	1,555	40
				S_Good	CWHvh1	11	
Spruce_Good	CWHvh2	CWHvh2_SAU10	2,329	S_Good	CWHvh2	2,504	41
Spruce_Good	CWHvm1	CWHvm1_SAU10	9,586	S_Good	CWHvm1	9,786	45
Spruce_Good	CWHvm2	CWHvm2_SAU10	270	S_Good	CWHvm2	510	8
				S_Good	CWHvm3	15	
Spruce_Good	CWHwm	CWHwm_SAU10	592	S_Good	CWHwm	204	59
Spruce_Good	CWHws1	CWHws1_SAU10	16	S_Good	CWHws1	17	
Spruce_Good	CWHws2	CWHws2_SAU10	347	S_Good	CWHws2	546	49
				S_Good	CWHxm2	4	
				S_Good	MHmm1	12	
				S_Good	MHmm2	4	
				S_Good	MHwh1	19	
				S_Good	Undefined	23	
Spruce_Moderate	CWHdm	CWHdm_SAU11	19				
Spruce_Moderate	CWHds2	CWHds2_SAU11	1,062	S_Moderate	CWHds2	74	35
Spruce_Moderate	CWHms2	CWHms2_SAU11	729	S_Moderate	CWHms2	901	22
				S_Moderate	CWHvh1	15	
Spruce_Moderate	CWHvh2	CWHvh2_SAU11	3,157	S_Moderate	CWHvh2	2,278	37
Spruce_Moderate	CWHvm1	CWHvm1_SAU11	8,206	S_Moderate	CWHvm1	6,735	28
Spruce_Moderate	CWHvm2	CWHvm2_SAU11	1,419	S_Moderate	CWHvm2	967	8
				S_Moderate	CWHvm3	126	-10
Spruce_Moderate	CWHwm	CWHwm_SAU11	772	S_Moderate	CWHwm	286	5
Spruce_Moderate	CWHws1	CWHws1_SAU11	37	S_Moderate	CWHws1	23	
Spruce_Moderate	CWHws2	CWHws2_SAU11	924	S_Moderate	CWHws2	661	13
Spruce_Moderate	ESSFmc	ESSFmc_SAU11	10,238				
Spruce_Moderate	ESSFxv1	ESSFxv1_SAU11	458				
Spruce_Moderate	IDFww	IDFww_SAU11	919	S_Moderate	IDFww	78	-9
Spruce_Moderate	MHmm1	MHmm1_SAU11	18	S_Moderate	MHmm1	23	
Spruce_Moderate	MHmm2	Sub_Misc	67	S_Moderate	MHmm2	66	

From CFCI Prototable Feb 08			3,788,712	SELES_April 08		2,605,580	
AU_text	BEC	SSS	Area	AU	BEC	Area	Current Deviation from natural**
Spruce_Moderate	MHwh1	MHwh1_SAU11	22	S_Moderate	MHwh1	14	
Spruce_Moderate	SBPSmc	SBPSmc_SAU11	222				
Spruce_Moderate	SBSmc2	SBSmc2_SAU11	7,775				
				S_Moderate	Undefined	21	
Spruce_Pine_Poor	ATunp	ATunp_SAU12	1,246	S_Poor_Pl	BAFAunp	15	
				S_Poor_Pl	CMAunp	9	
Spruce_Pine_Poor	CWHdm	CWHdm_SAU12	87	S_Poor_Pl	CWHdm	74	100
Spruce_Pine_Poor	CWHds2	CWHds2_SAU12	12,041	S_Poor_Pl	CWHds2	5,977	99
Spruce_Pine_Poor	CWHmm1	CWHmm1_SAU12	35	S_Poor_Pl	CWHmm1	40	
Spruce_Pine_Poor	CWHms2	CWHms2_SAU12	2,321	S_Poor_Pl	CWHms2	2,092	83
Spruce_Pine_Poor	CWHvh1	CWHvh1_SAU12	4,688	S_Poor_Pl	CWHvh1	3,013	71
Spruce_Pine_Poor	CWHvh2	CWHvh2_SAU12	43,261	S_Poor_Pl	CWHvh2	24,625	59
Spruce_Pine_Poor	CWHvm1	CWHvm1_SAU12	13,297	S_Poor_Pl	CWHvm1	7,156	43
Spruce_Pine_Poor	CWHvm2	CWHvm2_SAU12	8,523	S_Poor_Pl	CWHvm2	2,137	39
				S_Poor_Pl	CWHvm3	118	44
Spruce_Pine_Poor	CWHwm	CWHwm_SAU12	902	S_Poor_Pl	CWHwm	701	70
Spruce_Pine_Poor	CWHws1	CWHws1_SAU12	21	S_Poor_Pl	CWHws1	37	
Spruce_Pine_Poor	CWHws2	CWHws2_SAU12	4,967	S_Poor_Pl	CWHws2	3,666	84
Spruce_Pine_Poor	CWHxm2	CWHxm2_SAU12	438	S_Poor_Pl	CWHxm2	427	98
Spruce_Pine_Poor	ESSFmc	ESSFmc_SAU12	25,755	S_Poor_Pl	ESSFmc	1,240	14
				S_Poor_Pl	ESSFmk	3	
Spruce_Pine_Poor	ESSFmw	ESSFmw_SAU12	7,708	S_Poor_Pl	ESSFmw	1,246	62
Spruce_Pine_Poor	ESSFxv1	ESSFxv1_SAU12	800				
Spruce_Pine_Poor	IDFdw	IDFdw_SAU12	222				
Spruce_Pine_Poor	IDFww	IDFww_SAU12	12,572	S_Poor_Pl	IDFww	2,782	100
				S_Poor_Pl	IMAunp	1	
Spruce_Pine_Poor	MHmm1	MHmm1_SAU12	506	S_Poor_Pl	MHmm1	279	38
Spruce_Pine_Poor	MHmm2	MHmm2_SAU12	633	S_Poor_Pl	MHmm2	592	94
Spruce_Pine_Poor	MHmmp	MHmmp_SAU12	3				
Spruce_Pine_Poor	MHwh1	MHwh1_SAU12	368	S_Poor_Pl	MHwh1	532	47
Spruce_Pine_Poor	MHwhp	MHwhp_SAU12	1				
Spruce_Pine_Poor	MSun	MSun_SAU12	7,321				
Spruce_Pine_Poor	SBPSmc	SBPSmc_SAU12	37,158				
Spruce_Pine_Poor	SBSmc2	SBSmc2_SAU12	46,614				
				S_Poor_Pl	Undefined	255	
SAU14	CWHds2	CWHds2_SAU13	3,556				
SAU14	CWHms2	CWHms2_SAU13	1,640				

From CFCI Prototable Feb 08			3,788,712	SELES_April 08		2,605,580	
AU_text	BEC	SSS	Area	AU	BEC	Area	Current Deviation from natural**
SAU14	CWHvh1	CWHvh1_SAU13	79				
SAU14	CWHvm1	CWHvm1_SAU13	2,566				
SAU14	CWHvm2	CWHvm2_SAU13	10				
SAU14	CWHws2	CWHws2_SAU13	668				
SAU14	IDFdw	IDFdw_SAU13	1				
SAU14	IDFww	IDFww_SAU13	800				
SAU14	MHmm2	MHmm2_SAU13	7				
SAU14	SBPSmc	SBPSmc_SAU13	29				
SAU14	SBSmc2	SBSmc2_SAU13	141				

Assuming SAU14 is combined with AU13 for deciduous, but left them separate here to know what is included.

** Deviation from natural : >70 = high risk; 50 – 70 = high_moderate risk; 30-50 = low_moderate risk; <30 = low risk.

2. Which ecosystems are included in the Sched4 (NC/ CC) and Sched3 (SC) SLUOs and what RONV numbers were used to create the targets?

Table 22 (in black) shows the list of SSS listed in the Sched4 and Sched3 of the Strategic Land Use Objectives (SLUO) for north/ central coast and south coast respectively.

The area of each combination is shown (generated using the CFCI prototable dataset). There are also some inconsistencies in terms of inclusion, and intermittent overlap with the list of potentially 'not real' SSS as identified by A. MacKinnon (Column I).

There are also quite a number of ecosystems that may be potentially 'real', but which are of sufficiently tiny size to be largely meaningless from a management perspective at this scale. For example, there are 7 SSS in the V_R category have less than 30 ha total on the entire coast, and a total of 17 SSS with less than 100ha on the entire coast. In addition, of these, a number are deciduous units, which are listed in the SLUO (and used in the calculation for commoness) but are given no targets. Of themselves, these issues may not be problematic, but when combined with the approach to designating old growth targets, it raises questions around the validity of the approach.

The targets in the SLUO based on RONV[12]. However, because of the way the SLUO Sched4 and Sched3 are written (i.e. a combination of a percentage of RONV) makes it very difficult to determine what specific RONV numbers were used in each case to create the target.

Table 22 identifies the Commoness category as identified in each SLUO and the associated old forest target for the two areas. These differ for the two regions (North/ Central Coast and South Coast). Using the ruleset of 70% of RONV applied to very rare, rare and modal units, and 30% of RONV applied to C and very C, with the exception of the three dry units in the south coast (CWHmm1, CWHdm, and CWHxm) for which 30% of RONV was applied irrespective of area (A. Roburn pers. comm. quoting L. Jones ILMB pers. comm.), the assumed RONV is shown for each region and SSS.

[12] RONV = Range of natural variability, and here refers to the predicted amount of old forest expected under a single estimate of disturbance frequency for each ecosystem.

The Price RONV numbers are shown as comparison (Price and Daust 2003). There are is largely very good agreement between the used and the expected RONV. However, there are a number of notable exceptions (highlighted in Yellow) where the RONV used on SC is apparently considerably less than that for the same ecosystem on NC and from the Price RONV. This applies to 16 SSS (totaling approximately 120,000ha).

Recommendation 2:

- Align the list of SSS so that there is clear criteria for inclusion / exclusion within the SLUOs, based on the definitive list created above.
- Provide rationale and check for how the 'commonness' categories are assigned in each region.
- Provide rationale or fix for the 16 SSS which appear to have very low RONV information used to generate targets (highlighted in yellow).
- Reassess the integrity of an approach that assigns rarity categories to SSS based on a number distribution when many units are included that are not being directly managed for old seral foerst (deciduous units), may be largely non-forest (At), and cover areas of land inappropriate for management at this scale (e.g. SSS that cover tiny numbers of hectares).

Table 22. Summary of Schedule 4 of North/ Central Coast SLUO and Schedule 3 of South coast SLUO, showing relevant ecosystems (SSS based on AU and BEC), commonness category for NC/ CC (Col A) and South Coast (Col D), old forest targets for NC / CC (Col B) and South (Col C), and associated RONV used to generate targets in each region (Col G and H). In addition the area from the CFCI Prototable dataset is shown (Col F) and the RONV generated by Price (I). A comment as to whether the ecosystem is likely to be 'real' or not is shown in Col J (A. MacKinnon pers. comm.).

		A	B	C	D	E	F	G	H	I	J
AU	BEC	NC_ CC Category	Target NCCC	Target SC	SC Category	Relevant Area	Area	RONV used NC	RONV used SC	Price RONV	Real ? Mackinnon
Decid	MHmm2	V_R	0			CCNC_Only	1	0.00			N
Decid	MHwh1	V_R	0			CCNC_Only	7	0.00			
Cedar_Good	MHwh1	V_R	63			CCNC_Only	12	0.90			
Decid	CWHmm1	V_R	0			CCNC_Only	13	0.00			
Spruce_Good	CWHws1	V_R	59			CCNC_Only	16	0.84			
Spruce_Moderate	MHmm1			59	V_R	SC only	18		0.84	0.84	
Spruce_Moderate	CWHdm	V_R	61			CCNC_Only	19	0.87		0.87	
Spruce_Pine_Poor	CWHws1						21				
Spruce_Moderate	MHwh1	V_R	59			CCNC_Only	22	0.84			
Cedar_Good	CWHmm1	V_R	53	23	C	AllCoast	22	0.76	0.77	0.76	
Spruce_Pine_Poor	CWHmm1	V_R	60	26	C	AllCoast	35	0.86	0.87	0.86	
Spruce_Moderate	CWHws1	V_R	59			CCNC_Only	37	0.84			
Cedar_Moderate	MHmm2			65	V_R	SC only	42		0.93	0.93	
Fir_Moderate	MHmm2			29	V_R	SC only	52		0.41	0.70	N
Spruce_Moderate	MHmm2						67				
Cedar_Good	MHmm1	V_R	59	59	V_R	AllCoast	86	0.84	0.84	0.84	
Spruce_Pine_Poor	CWHdm	V_R	60	13	C	AllCoast	87	0.86	0.43	0.86	
Cedar_Poor	IDFww	V_R	60	60	V_R	AllCoast	109	0.86	0.86	0.86	
Fir_Good	CWHws2	V_R	42			CCNC_Only	116	0.60		0.60	
Decid	MHmm1	V_R	0			CCNC_Only	119	0.00			

AU	BEC	A NC_CC Category	B Target NCCC	C Target SC	D SC Category	E Relevant Area	F Area	G RONV used NC	H RONV used SC	I Price RONV	J Real? Mackinnon
HemBal_Good	MHmm2			59	Rare	SC only	125	0.00	0.84		
Fir_Good	CWHvm2	V_R	49	49	Rare	AllCoast	132	0.70	0.70	0.70	N
HemBal_Moderate	ESSFmk						134				
HemBal_Moderate	MHmmp			59	V_R	SC only	135		0.84	0.84	N
HemBal_Poor	SBPSmc						138				
Fir_Poor	MHmm1			49	Rare	SC only	142	0.00	0.70		N
Cedar_Moderate	AT	V_R	60			CCNC_Only	148	0.86		0.86	N
Cedar_Good	CWHxm2	V_R	53	23	C	AllCoast	153	0.76	0.77	0.76	
Cedar_Good	CWHws2	V_R	50			CCNC_Only	155	0.71		0.72	
HemBal_Poor	ESSFmk						155				
Decid	IDFww	Rare	0			CCNC_Only	185	0.00			
Fir_Moderate	CWHmm1	V_R	41	18	C	AllCoast	197	0.59	0.60	0.58	
Cedar_Moderate	CWHmm1	V_R	53	23	C	AllCoast	203	0.76	0.77	0.76	
Cedar_Good	CWHds2	V_R	50			CCNC_Only	204	0.71		0.72	
HemBal_Poor	AT	V_R	60			CCNC_Only	208	0.86		0.86	N
Cedar_Moderate	IDFww	V_R	50	50	Rare	AllCoast	222	0.71	0.71	0.72	
Spruce_Moderate	SBPSmc						222				
Decid	SBPSmc	V_R	0			CCNC_Only	229	0.00			
HemBal_Poor	CWHdm	V_R	53	23	C	AllCoast	255	0.76	0.77	0.76	
Fir_Good	CWHmm1	V_R	53	23	C	AllCoast	259	0.76	0.77	0.76	
Spruce_Good	CWHvm2	V_R	59	59	V_R	AllCoast	270	0.84	0.84	0.84	
HemBal_Poor	CWHxm2	V_R	53	23	C	AllCoast	279	0.76	0.77	0.76	
Cedar_Poor	MHmmp	V_R	68			CCNC_Only	281	0.97			
Cedar_Moderate	MHwh1	V_R	68	68	V_R	AllCoast	282	0.97	0.97	0.97	
Cedar_Moderate	CWHwm	V_R	65			CCNC_Only	313	0.93			
Fir_Moderate	CWHvm2	V_R	49	49	Rare	AllCoast	339	0.70	0.70	0.70	
HemBal_Good	MHwh1						342				
HemBal_Moderate	IDFww	Rare	60	60	M	AllCoast	342	0.86	0.86	0.86	
Spruce_Good	CWHws2	V_R	60			CCNC_Only	347	0.86		0.85	
Spruce_Pine_Poor	MHwh1	Rare	68			CCNC_Only	368	0.97			
Cedar_Moderate	CWHxm2	V_R	53	23	C	AllCoast	370	0.76	0.77	0.76	
Cedar_Good	CWHdm	Rare	53	23	C	AllCoast	382	0.76	0.77	0.76	
Cedar_Poor	CWHxm2	Rare	61	26	V_C	AllCoast	424	0.87	0.87	0.87	
Fir_Poor	CWHvm2	Rare	49	49	Rare	AllCoast	425	0.70	0.70	0.70	
Spruce_Pine_Poor	CWHxm2	Rare	60	26	C	AllCoast	438	0.86	0.87	0.86	
Spruce_Moderate	ESSFxv1	Rare	60			CCNC_Only	458	0.86			
Cedar_Poor	CWHmm1	Rare	61	26	V_C	AllCoast	493	0.87	0.87	0.87	
Fir_Poor	CWHmm1	Rare	41	17	V_C	AllCoast	496	0.59	0.57	0.58	
Spruce_Pine_Poor	MHmm1	Rare	65	29	V_R	AllCoast	506	0.93	0.41	0.93	
HemBal_Poor	Msun	V_R	60			CCNC_Only	525	0.86			
Decid	CWHws1	V_R	0			CCNC_Only	537	0.00			
HemBal_Poor	CWHmm1	Rare	53	23	V_C	AllCoast	545	0.76	0.77	0.76	
Spruce_Good	CWHwm	Rare	59			CCNC_Only	592	0.84			
Cedar_Poor	MHmm2	Rare	65	65	Rare	AllCoast	615	0.93	0.93	0.93	
Decid	CWHws2	M	0			CCNC_Only	619	0.00			
Spruce_Pine_Poor	MHmm2	Rare	65	29	M	AllCoast	633	0.93	0.41	0.93	

AU	BEC	A NC_CC Category	B Target NCCC	C Target SC	D SC Category	E Relevant Area	F Area	G RONV used NC	H RONV used SC	I Price RONV	J Real? Mackinnon
HemBal_Good	MHmm1	Rare	59	59	M	AllCoast	654	0.84	0.84	0.84	
Cedar_Poor	CWHds2	Rare	60	60	Rare	AllCoast	676	0.86	0.86	0.86	
Fir_Poor	ESSFmw	Rare	50	50	Rare	AllCoast	711	0.71	0.71	0.72	
Spruce_Moderate	CWHms2	Rare	61	61	M	AllCoast	729	0.87	0.87	0.87	
HemBal_Poor	ESSFxv1	Rare	60			CCNC_Only	732	0.86			
Cedar_Good	CWHms2	Rare	53	53	M	AllCoast	752	0.76	0.76	0.76	
Cedar_Poor	CWHdm	Rare	61	26	C	AllCoast	768	0.87	0.87	0.87	
HemBal_Good	CWHwm	Rare	59			CCNC_Only	770	0.84			
Cedar_Moderate	CWHdm	Rare	53	23	C	AllCoast	771	0.76	0.77	0.76	
Spruce_Moderate	CWHwm	Rare	59			CCNC_Only	772	0.84			
Spruce_Pine_Poor	ESSFxv1	Rare	69			CCNC_Only	800	0.99			
Fir_Moderate	IDFww	Rare	42	42	M	AllCoast	805	0.60	0.60	0.60	
Fir_Poor	CWHdm	Rare	41	18	C	AllCoast	816	0.59	0.60	0.58	
HemBal_Good	CWHws1	V_R	59			CCNC_Only	817	0.84			
Fir_Poor	MHmm2	Rare	49	49	Rare	AllCoast	829	0.70	0.70	0.70	N
Cedar_Good	CWHvm2	Rare	59	59	M	AllCoast	854	0.84	0.84	0.84	
Spruce_Pine_Poor	CWHwm	M	68			CCNC_Only	902	0.97			
Spruce_Moderate	IDFww	Rare	60	60	rare	AllCoast	919	0.86	0.86	0.86	
Spruce_Moderate	CWHws2	Rare	60	60	M	AllCoast	924	0.86	0.86	0.86	
Cedar_Moderate	MHmm1	Rare	65	65	M	AllCoast	941	0.93	0.93	0.93	
Fir_Good	CWHds2	Rare	42	42	M	AllCoast	960	0.60	0.60	0.60	
Spruce_Moderate	CWHds2	M	60	60	V_R	AllCoast	1,062	0.86	0.86	0.86	
HemBal_Moderate	AT	M	60			CCNC_Only	1,073	0.86		0.86	
Fir_Good	CWHms2	M	53	23	C	AllCoast	1,081	0.76	0.77	0.76	
Decid	CWHxm2	Rare	0			CCNC_Only	1,088	0.00			
Decid	CWHwm	M	0			CCNC_Only	1,133	0.00			
HemBal_Poor	CWHvh1	M	68	29	M	AllCoast	1,230	0.97	0.41	0.97	
Decid	CWHvm2	M	0			CCNC_Only	1,240	0.00			
Spruce_Good	CWHms2	M	61	61	M	AllCoast	1,244	0.87	0.87	0.87	
Spruce_Pine_Poor	AT	M	60			CCNC_Only	1,246	0.86		0.86	
Spruce_Moderate	CWHvm2	M	59	59	M	AllCoast	1,419	0.84	0.84	0.84	
Cedar_Poor	MHwhp	M	68			CCNC_Only	1,429	0.97			
HemBal_Poor	SBSmc2	M	0			CCNC_Only	1,517	0.00			
Decid	CWHdm	M	0			CCNC_Only	1,536	0.00			
HemBal_Moderate	MHwh1	M	68	68	Rare	AllCoast	1,611	0.97	0.97	0.97	
Decid	CWHvh1	M	0			CCNC_Only	1,617	0.00			
HemBal_Poor	CWHws1	Rare	60			CCNC_Only	1,645	0.86			
HemBal_Moderate	ESSFmc	M	60			CCNC_Only	1,650	0.86		0.86	
Fir_Poor	CWHxm2	M	41	17	C	AllCoast	1,679	0.59	0.57	0.58	
Fir_Moderate	CWHdm	M	41	17	C	AllCoast	1,890	0.59	0.57	0.58	
Fir_Good	CWHdm	M	53	23	C	AllCoast	2,020	0.76	0.77	0.76	
Cedar_Good	CWHvh2	M	63	63	M	AllCoast	2,029	0.90	0.90	0.90	
Cedar_Moderate	CWHds2	M	50	22	C	AllCoast	2,059	0.71	0.73	0.72	
HemBal_Moderate	ESSFmw	M	60	26	C	AllCoast	2,173	0.86	0.87	0.86	
Decid	CWHds2	C	0			CCNC_Only	2,247	0.00			
Spruce_Pine_Poor	CWHms2	M	60	12	C	AllCoast	2,321	0.86	0.40	0.86	

		A	B	C	D	E	F	G	H	I	J
AU	BEC	NC_ CC Cate gory	Target NCCC	Targ et SC	SC Cate gory	Relevant Area	Area	RONV used NC	RONV used SC	Price RONV	Real ? Mac kinn on
Spruce_Good	CWHvh2	M	59	25	C	AllCoast	2,329	0.84	0.83	0.84	
HemBal_Good	CWHds2	M	60	60	M	AllCoast	2,423	0.86	0.86	0.86	
HemBal_Moderate	CWHmm1	M	53	23	C	AllCoast	2,496	0.76	0.77	0.76	
Fir_Good	CWHxm2	M	53	23	C	AllCoast	2,685	0.76	0.77	0.76	
HemBal_Moderate	CWHxm2	M	53	23	C	AllCoast	2,807	0.76	0.77	0.76	
Fir_Moderate	CWHws2	M	42	18	C	AllCoast	2,856	0.60	0.60	0.60	
Cedar_Moderate	CWHws2	M	50	50	M	AllCoast	2,865	0.71	0.71	0.72	
HemBal_Good	CWHmm1	M	53	23	C	AllCoast	2,951	0.76	0.77	0.76	
Cedar_Poor	CWHwm	M	65			CCNC_Only	3,089	0.93			
HemBal_Poor	MHwhp	M	68			CCNC_Only	3,143	0.97			N
Spruce_Moderate	CWHvh2	M	59	59	M	AllCoast	3,157	0.84	0.84	0.84	
HemBal_Good	CWHws2	M	60	26	C	AllCoast	3,168	0.86	0.87	0.86	
HemBal_Moderate	CWHdm	M	53	23	C	AllCoast	3,190	0.76	0.77	0.76	
HemBal_Moderate	CWHws1	Rare	59			CCNC_Only	3,339	0.84			
Fir_Moderate	CWHxm2	C	17	17	C	AllCoast	3,542	0.57	0.57	0.58	
Cedar_Poor	CWHws2	M	60	60	M	AllCoast	3,684	0.86	0.86	0.86	
Cedar_Good	CWHvh1	M	63	27	C	AllCoast	3,698	0.90	0.90	0.90	
HemBal_Poor	IDFww	C	26	60	rare	AllCoast	3,986	0.87	0.86	0.86	
HemBal_Moderate	CWHvh1	C	29	29	C	AllCoast	4,312	0.97	0.97	0.97	
Cedar_Poor	CWHms2	C	26	26	C	AllCoast	4,377	0.87	0.87	0.87	
Spruce_Pine_Poor	CWHvh1	C	29	12	C	AllCoast	4,688	0.97	0.40	0.97	
Fir_Poor	CWHvm1	C	21	21	C	AllCoast	4,926	0.70	0.70	0.70	
Fir_Poor	IDFww	C	22	22	C	AllCoast	4,965	0.73	0.73	0.72	
Spruce_Pine_Poor	CWHws2	C	29	12	C	AllCoast	4,967	0.97	0.40	0.98	
Decid	CWHvh2	C	0			CCNC_Only	5,166	0.00			
Fir_Good	CWHvm1	C	21	21	C	AllCoast	5,202	0.70	0.70	0.70	
Decid	CWHms2	C	0			CCNC_Only	5,211	0.00			
HemBal_Good	CWHvh1	C	25	25	C	AllCoast	5,422	0.83	0.83	0.84	
Cedar_Moderate	CWHms2	C	23	23	V_C	AllCoast	5,447	0.77	0.77	0.76	
Fir_Moderate	CWHds2	C	18	18	V_C	AllCoast	6,113	0.60	0.60	0.60	
Decid	SBSmc2	C	0			CCNC_Only	6,252	0.00			
HemBal_Good	CWHms2	C	23	23	V_C	AllCoast	6,398	0.77	0.77	0.76	
Fir_Moderate	CWHms2	C	17	17	V_C	AllCoast	6,581	0.57	0.57	0.58	
Fir_Poor	CWHws2	C	22	22	M	AllCoast	7,056	0.73	0.31	0.72	
Spruce_Pine_Poor	Msun	C	29			CCNC_Only	7,321	0.97			
Fir_Poor	CWHms2	C	17	17	V_C	AllCoast	7,435	0.57	0.57	0.58	
HemBal_Good	CWHdm	C	23	23	V_C	AllCoast	7,570	0.77	0.77	0.76	
Spruce_Pine_Poor	ESSFmw	C	29	29	M	AllCoast	7,708	0.97	0.41	0.98	
Spruce_Moderate	SBSmc2	C	0			CCNC_Only	7,775	0.00			
Spruce_Moderate	CWHvm1	C	25	25	V_C	AllCoast	8,206	0.83	0.83	0.84	
Spruce_Pine_Poor	CWHvm2	C	28	29	M	AllCoast	8,523	0.93	0.41	0.93	
Cedar_Good	CWHvm1	C	25	25	V_C	AllCoast	9,064	0.83	0.83	0.84	
Cedar_Poor	AT	C	26			CCNC_Only	9,573	0.87		0.86	N
Spruce_Good	CWHvm1	C	25	25	V_C	AllCoast	9,586	0.83	0.83	0.84	
Cedar_Moderate	CWHvh1	C	29	29	V_C	AllCoast	10,177	0.97	0.97	0.97	
Fir_Moderate	CWHvm1	C	21	21	V_C	AllCoast	10,205	0.70	0.70	0.70	

		A	B	C	D	E	F	G	H	I	J
AU	BEC	NC_CC Category	Target NCCC	Target SC	SC Category	Relevant Area	Area	RONV used NC	RONV used SC	Price RONV	Real? Mackinnon
Spruce_Moderate	ESSFmc	C	26			CCNC_Only	10,238	0.87			
HemBal_Good	CWHxm2	C	23	23	V_C	AllCoast	11,938	0.77	0.77	0.76	
HemBal_Moderate	CWHds2	C	26	26	V_C	AllCoast	11,973	0.87	0.87	0.86	
Fir_Poor	CWHds2	C	22	22	V_C	AllCoast	12,018	0.73	0.73	0.72	
Spruce_Pine_Poor	CWHds2	C	29	12	V_C	AllCoast	12,041	0.97	0.40	0.98	
HemBal_Poor	CWHds2	C	26	26	C	AllCoast	12,195	0.87	0.87	0.86	
HemBal_Poor	CWHms2	C	23	23	V_C	AllCoast	12,493	0.77	0.77	0.76	
Spruce_Pine_Poor	IDFww	C	29	12	C	AllCoast	12,572	0.97	0.40	0.98	
Spruce_Pine_Poor	CWHvm1	V_C	28	12	C	AllCoast	13,297	0.93	0.40	0.93	
Cedar_Moderate	CWHvm2	V_C	28	28	V_C	AllCoast	13,891	0.93	0.93	0.93	
HemBal_Good	CWHvm2	V_C	25	25	V_C	AllCoast	15,292	0.83	0.83	0.84	
HemBal_Moderate	MHmm2	V_C	25	25	V_C	AllCoast	17,041	0.83	0.83	0.84	
HemBal_Poor	ESSFmc	V_C	26			CCNC_Only	18,449	0.87		0.86	
HemBal_Moderate	CWHwm	V_C	25			CCNC_Only	18,700	0.83			
HemBal_Poor	MHmmp	V_C	25	59	V_R	AllCoast	19,223	0.83	0.84	0.84	
Cedar_Poor	MHwh1	V_C	29	29	C	AllCoast	19,720	0.97	0.97	0.97	
HemBal_Moderate	MHmm1	V_C	25	25	V_C	AllCoast	20,223	0.83	0.83	0.84	
HemBal_Poor	MHwh1	V_C	29	68	M	AllCoast	23,288	0.97	0.97	0.97	
Spruce_Pine_Poor	ESSFmc	V_C	29			CCNC_Only	25,755	0.97		0.98	
Decid	CWHvm1	V_C	0			CCNC_Only	31,806	0.00			
Spruce_Pine_Poor	SBPSmc	V_C	0			CCNC_Only	37,158	0.00			
Spruce_Pine_Poor	CWHvh2	V_C	29	12	C	AllCoast	43,261	0.97	0.40	0.97	
Spruce_Pine_Poor	SBSmc2	V_C	0			CCNC_Only	46,614	0.00			
HemBal_Poor	ESSFmw	V_C	26	26	C	AllCoast	48,622	0.87	0.87	0.86	
Cedar_Moderate	CWHvh2	V_C	29	29	V_C	AllCoast	49,233	0.97	0.97	0.97	
HemBal_Poor	CWHwm	V_C	25			CCNC_Only	53,562	0.83			
Cedar_Poor	MHmm1	V_C	28	28	V_C	AllCoast	54,555	0.93	0.93	0.93	
HemBal_Moderate	CWHms2	V_C	23	23	V_C	AllCoast	55,803	0.77	0.77	0.76	
HemBal_Poor	Atunp	V_C	26			CCNC_Only	59,159	0.87			N
HemBal_Poor	CWHvm1	V_C	25	25	V_C	AllCoast	76,559	0.83	0.83	0.84	
HemBal_Poor	CWHws2	V_C	26	26	V_C	AllCoast	77,327	0.87	0.87	0.86	
HemBal_Moderate	CWHws2	V_C	26	26	V_C	AllCoast	80,129	0.87	0.87	0.86	
Cedar_Moderate	CWHvm1	V_C	28	28	V_C	AllCoast	81,923	0.93	0.93	0.93	
HemBal_Moderate	CWHvh2	V_C	29	29	V_C	AllCoast	82,185	0.97	0.97	0.97	
HemBal_Good	CWHvh2	V_C	25	25	V_C	AllCoast	83,905	0.83	0.83	0.84	
Cedar_Poor	CWHvh1	V_C	29	29	V_C	AllCoast	90,928	0.97	0.97	0.97	
HemBal_Moderate	CWHvm2	V_C	25	25	V_C	AllCoast	91,319	0.83	0.83	0.84	
HemBal_Poor	MHmm2	V_C	25	25	V_C	AllCoast	91,841	0.83	0.83	0.84	
HemBal_Good	CWHvm1	V_C	25	25	V_C	AllCoast	132,611	0.83	0.83	0.84	
HemBal_Poor	CWHvh2	V_C	29	29	V_C	AllCoast	140,418	0.97	0.97	0.97	
HemBal_Poor	CWHvm2	V_C	25	25	V_C	AllCoast	152,136	0.83	0.83	0.84	
Cedar_Poor	CWHvm2	V_C	28	28	V_C	AllCoast	153,331	0.93	0.93	0.93	
HemBal_Poor	MHmm1	V_C	25	25	V_C	AllCoast	167,060	0.83	0.83	0.84	
Cedar_Poor	CWHvm1	V_C	28	28	V_C	AllCoast	181,127	0.93	0.93	0.93	
HemBal_Moderate	CWHvm1	V_C	25	25	V_C	AllCoast	187,922	0.83	0.83	0.84	
Cedar_Poor	CWHvh2	V_C	29	29	V_C	AllCoast	810,414	0.97	0.97	0.97	

		A	B	C	D	E	F	G	H	I	J
AU	BEC	NC_ CC Cate gory	Target NCCC	Targ et SC	SC Cate gory	Relevant Area	Area	RONV used NC	RONV used SC	Price RONV	Real ? Mac kinn on
Fir_Moderate	CWHvh1			63	rare	SC only		0.00	0.90		
HemBal_Poor	MHmm2e			59	rare	SC only		0.00	0.84		
Spruce_Good	CWHxm2			26	C	SC only			0.87		
Spruce_Moderate	CWHvh1			25	M	SC only			0.36 ?		
	Interior	Rare	0			CCNC_Only		0.00			
Fir_Moderate	MHmm1			49	V_R	SC only			0.70	0.70	
Fir_Poor	MHmm2e			49	V_R	SC only			0.70		
HemBal_Good	IDFww			60	V_R	SC only			0.86	0.86	
HemBal_Moderate	ESSFmwh			60	V_R	SC only			0.86		
HemBal_Poor	CWHvm3			25	V_C	SC only			0.83		
HemBal_Poor	ESSFmwh			60	V_R	SC only			0.86		
Spruce_Good	CWHds2			60	V_R	SC only			0.86	0.85	
Spruce_Pine_Poor	CWHws	V_ R	65			CCNC_Only		0.93		0.98	
Spruce_Pine_Poor	ESSFmwh			29	V_R	SC only			0.41		
Spruce_Pine_Poor	MHmm2e			29	V_R	SC only			0.41		
	Alpine	Rar e	60			CCNC_Only		0.86			

3. Which ecosystems should be considered within the ERA?

Theoretically, the ERA approach using a comparison of current condition compared with a predicted natural condition based on natural disturbance events, requires that the natural disturbances generating the landscape pattern are occurring randomly and that the area under consideration is large enough area that the forest is in 'equilibrium'.

In particular, if a single event can change the condition of the whole ecosystem then the assumptions do not hold. Applying the ERA analysis approach to tiny ecosystems breaks these assumptions. However, the current management approach includes all the tiny ecosystems as important (which they may be ecologically) so it is also important to understand patterns and trends for each of these.

Ecosystems of different productivity ranks (good / medium/ poor) are distributed in different size class distributions across the coast (Fig. 15); low productivity ecosystems tend to be much larger on average, and good productivity types are much smaller.

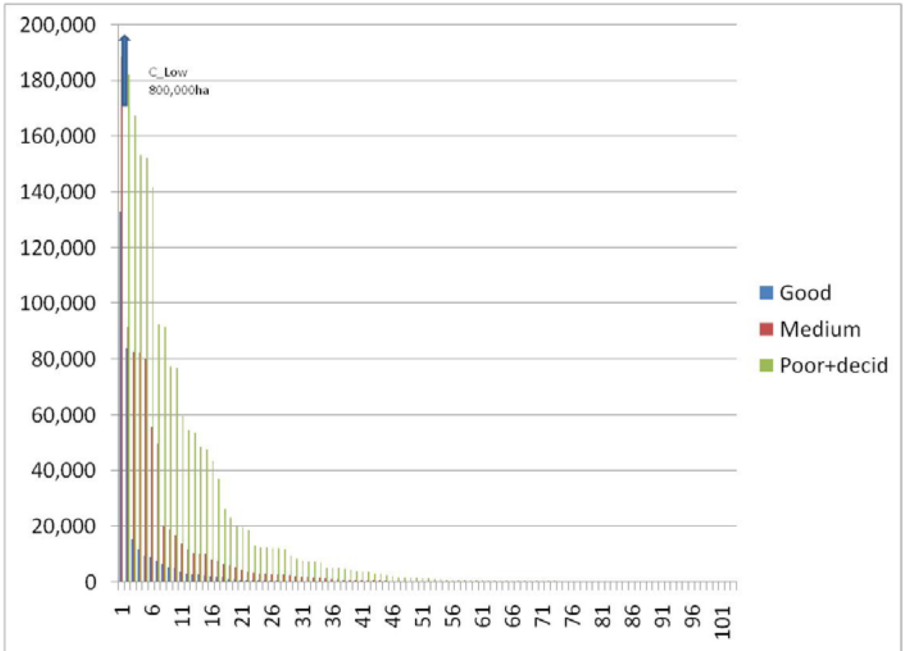

Figure 15. Number of SSS in different area classes, separated by productivity class.

This suggests that any minimum size cut-off should be stratified by productivity class.

Taking this approach balances the trade-off between being 'reasonable' and trying not to lose ecological variability (i.e. have a lower than optimum size for the ERA in the higher productivity sites, simply to ensure that real ecological variability is not lost).

Recommendation 3:

For the ERA,

- all SSS under 50 ha were not included in the analysis
- SSS <100ha were included only if they were either low elevation or high productivity units.