Deciduous Ecosystem Representation

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For the EBM Working Group

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.

Preamble

Due to the limited time available to complete this project, I have worked with existing databases and have not attempted to incorporate new data. Similarly, the information contained within this report relies upon background work completed previously for the Coast Information Team and EBM Working Group and does not include information derived from a new literature review.

EBM Implementation Problem

EBM recommendations for the Central and North BC coast include a strategy to maintain ecological integrity that defines targets for ecosystem representation. Theoretically, these targets are intended to apply to all ages of all ecosystems as defined by biogeoclimatic site series (or an ecologically-appropriate grouping of these site series) [1]. Two limitations have prevented this approach. First, a focus on old forest as the most prevalent natural seral stage, and as the seral stage most at-risk on the coast, means that targets have been set only for old forest (over 250 years in the Central and North Coast; over 180 years in the South Central Coast). Second, lack of terrestrial ecosystem mapping means that ecosystems have been defined by ecologically-inappropriate groups based on timber analysis units. These limitations have led to several problems. One is that timber analysis units, described by leading species rather than the ecological potential of a site, set out a class of "deciduous" ecosystems. There are no representation targets for these deciduous-leading ecosystems, that frequently do not reach the age required for old forest representation.

Questions Asked by the EBM Working Group

1. Should there be an old forest representation target for any deciduous-leading ecosystems?
2. If so, how do we assign targets?

This report provides background information in the form of a brief listing of ecological values of deciduous ecosystems, and a context for representation based on the natural distribution of deciduous ecosystems and on changes arising from logging. It then presents recommendations.

Background Information

Ecological Value of Deciduous Stands

Deciduous stands provide a disproportionately high contribution to biodiversity on the coast. Annual litter fall provides a rich and easily broken down nutrient source to stream systems. Tree form and chemical composition of some species allow development of a rich assemblage of epiphytic lichens and bryophytes that in turn house abundant invertebrates. More susceptible to decay than conifers, deciduous trees provide structure—particularly snags and easily excavated

[1] For rationale, see Holt R, Price K, Kremsater L, MacKinnon A, Lertzman K. 2008. Defining old growth and recovering old growth on the coast: discussion of options. Background paper for EBMWG.

standing and downed wood—early in stand development. In riparian areas, many vertebrates are associated with deciduous stands[2].

Not all deciduous stands are ecologically equivalent. In particular, on the coast, riparian cottonwood stands are rich and productive, providing habitat for a wide variety of organisms. These cottonwood ecosystems are additionally ecologically valuable—and sensitive—due to their rarity: most are red- or blue-listed by the Conservation Data Centre.

Natural Distribution of Deciduous Ecosystems on the Coast

Under natural conditions, many coastal ecosystems pass through a deciduous stage following stand-replacing disturbance. Most ecosystems return to a conifer-dominated stage as succession proceeds. Due to their topographical location, some ecosystems persist in a deciduous stage due to repeated disturbances. These ecosystems include geomorphically-disturbed slide and avalanche tracks and flood-disturbed hydroriparian ecosystems.

Deciduous-leading analysis units account for about 2% of forested area on the coast (about 69,000 hectares)[3]. About 37,00 hectares of this area have been initiated by logging. This section analyses the 32,000 hectares of unlogged deciduous ecosystems to investigate their natural extent and age-class distribution. Over the north and central coast, naturally-initiated deciduous ecosystems are dominated by either red alder, black cottonwood or trembling aspen, while birch and maple cover less than 300 ha each (Figure 1).

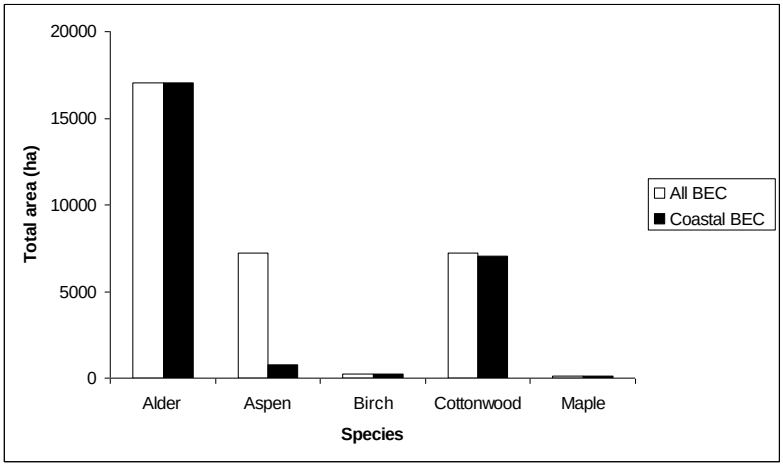

Figure 1. Area of each deciduous ecosystem in unlogged portions of the North and Central coast. "Coastal BEC" excludes interior SBSmc2 or SBPS biogeoclimatic subzones/variants; "All BEC" includes all subzones/variants.

[2] For more information, see Price K and McLennan D (2001) Hydroriparian ecosystems of the North Coast. Report to the NC LRMP, Bunnell FL, Sutherland GD and Wahbe TR (2001) Vertebrates associated with riparian habitats on British Columbia's mainland coast. Hydroriparian Planning Guide Technical Report 5, and Price K and McLennan D (2002) Impacts of forest harvesting on terrestrial riparian ecosystems of the Pacific Northwest. Hydroriparian Planning Guide Technical Report 7.

[3] Database of the Central Coast and North Coast LRMP areas compiled by Dave Leversee in April 2008 including area of deciduous-leading analysis units by leading species, BEC subzone/variant, stand age, and hydroriparian reserves estimated from draft land-use objectives. The boundary between North and Central Coast and South Central Coast Ministerial Orders was not available at the time.

Birch and maple cover insufficient area for further analysis. Most (90%) trembling aspen ecosystems are in interior biogeoclimatic subzones (SBSmc2, SBPS) that experience very different disturbance regimes and ecosystem dynamics. These stands are dominated by a single vast stand (about 5,000 ha) in one age class, likely initiated by fire. Analysis of aspen stands based on these data would be unreliable; future analyses should be based on a larger area focussing on interior biogeoclimatic subzones. Age-class analysis focuses on alder and cottonwood stands as these are important coastal ecosystems with sufficient area for further investigation.

Under natural disturbance conditions, red alder and cottonwood stands follow very different age-class distributions (Figure 2). Most alder stands are 40 – 80 years old, with less than 5% of the area over 120 years. Conversely, 50% of cottonwood stands are over 120 years old (and 40% are over 140 years). These mature cottonwood stands are likely dominated by large trees and have many of the ecological values described above. This analysis suggests that alder and cottonwood stands should be considered separately in designing targets.

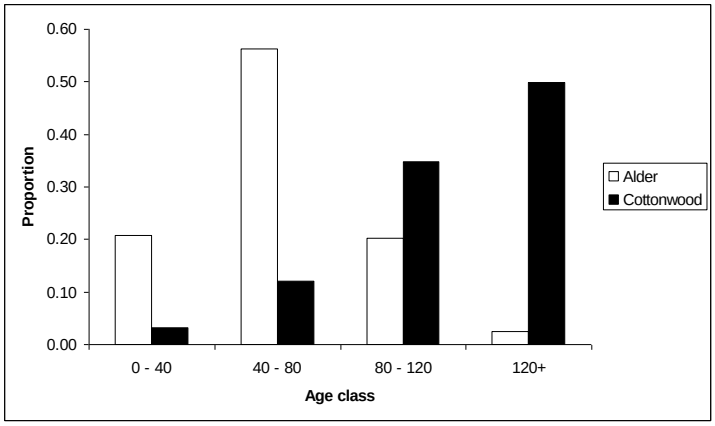

Figure 2. Age-class distribution of alder- and cottonwood-leading ecosystems.

Influence of Harvest on Deciduous Ecosystems

As with natural stand-replacing disturbance, logging is also often followed by a deciduous seral stage, usually dominated by alder. In some cases, particularly on old roadways, dense alder stands persist after logging for much longer than would be expected following natural disturbance. In essence, these stands have been converted from one ecosystem to another.

Overall, forest harvesting likely reduces the amount of cottonwood stands and increases the amount of alder. Over the central and north coast, two-thirds of alder stands were initiated by logging as were three-quarters of birch stands and about a third of cottonwood and maple stands. I was unable to assess the pre-disturbance condition of stands from the available database. Such analysis would require examination of all forested ecosystems. Ideally, analysis would look at age-class distribution of stands organised by site series (or groups of site series—e.g. floodplain ecosystems with a cottonwood seral stage).

Again focussing on alder and cottonwood, harvesting skews the age-class distribution of deciduous ecosystems to younger stands (Figure 3). The distribution for alder is slightly shifted, but not qualitatively different from the natural stands. The distribution for cottonwood, however, is vastly altered, and the ecologically valuable ‘mature to old’ stands that dominate natural ecosystems make up the smallest area of harvested ecosystems. This difference between natural

and harvested distributions implies that a target for ‘mature to old’ cottonwood stands is necessary to ensure representation of these ecosystems.

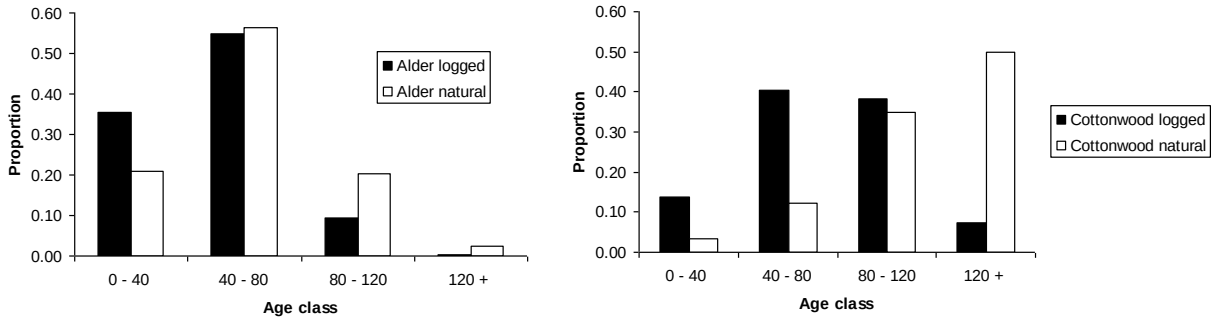

Figure 3. Age-class distribution of natural and logged alder and cottonwood stands in the North and Central Coast.

Existing Protection of Deciduous Ecosystems

Because many deciduous-leading analysis units are hydroriparian ecosystems, it is worth considering whether existing strategies will protect these ecosystems sufficiently. Alder stands on slides and avalanche chutes are not at risk from harvesting and do not need further protection. I investigated whether legal strategies to protect hydroriparian ecosystems include all floodplain cottonwood and alder ecosystems.

I compiled the area of deciduous-leading stands protected by the best estimated draft legal hydroriparian objectives from the available database. Because fluvial units are buffered in the North and Central Coast but not in the South Central Coast, I separated this buffer out for analysis. It will be protected in the North and Central Coast (with 10% harvest allowed) but not in the South Central coast.

Of deciduous ecosystems initiated by natural disturbance (so that converted alder stands are excluded), about half of the cottonwood, and one third of alder, ecosystems are within hydroriparian reserves (Figure 4). In the portion of the Central Coast included in the northern ministerial order, the proportion falling under existing reserves would increase by 6% for alder and 14% for cottonwood.

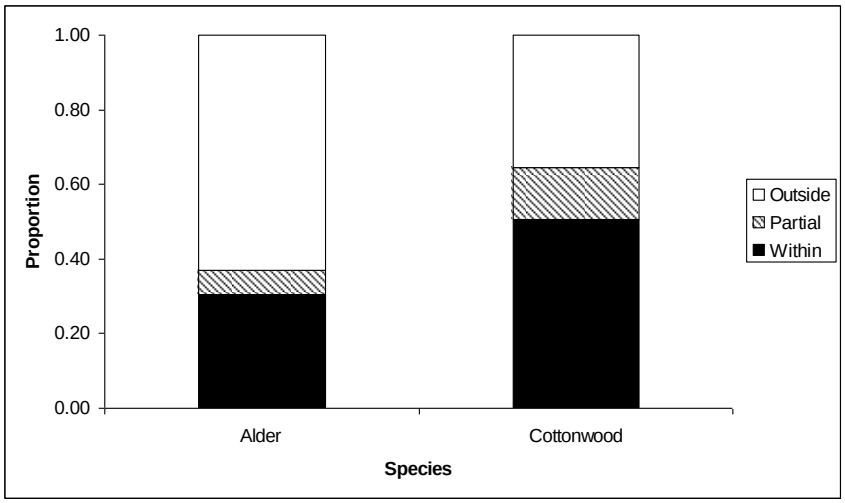

Figure 4. Proportion of alder and cottonwood ecosystems within draft hydroriparian reserves. "Within" = within high-value fish habitat, floodplain and buffers in North Coast LRMP area; "partial" = floodplain buffers in Central Coast LRMP area; "outside" = outside hydroriparian reserves.

Limitations of Analysis

Unfortunately, any analysis performed by ecologically inappropriate site series surrogates such as timber analysis units will not be able to answer all questions. Rather than classifying deciduous stands as seral stages of particular ecosystems (sometimes persisting due to repeated disturbances), analysis units classify them as separate ecosystems, making analysis of conversion and succession very difficult—if not impossible. Complete analysis and planning requires knowing pre-disturbance species composition and trajectory over time via succession and/or subsequent disturbances. Basing analyses on site series would solve much of this issue.

The age-class analysis is a snapshot in time rather than an estimate of disturbance frequency. A complete analysis of disturbance frequency was not possible within the timeframe of this project.

The hydroriparian reserves were estimated based on draft legal objectives. Lack of ministerial order boundary coverage prevented complete analysis.

Recommendations

It is important to recognise that there are site series specifically described for the cottonwood units considered in this document. It is also important to recognise that old forest targets are inappropriate for ecosystems described in part by their flooding frequency.

Recommendation 1: All deciduous-leading stands should be classified by site series.

Rationale:

- Targets could be applied as intended without complex additional calculations and considerations.
- Analysis could separate seral from persistent deciduous stands.
- Analysis could account for pre-harvest species composition.

Recommendation 2: Cottonwood sites have highest priority for terrestrial ecosystem mapping.

Rationale:

- These sites are easily classified by site series.
- Many cottonwood site series are listed as rare and should be treated as such.
- Further rationale under Recommendation 3.

Question 1: Should there be an old forest representation target for any deciduous-leading ecosystems?

Recommendation 3: There should be a target for cottonwood stands over 120 years.

Rationale:

- Most cottonwood-leading stands are mature – old under natural disturbance regimes.
- These stands provide disproportionately valuable, and rare, habitat elements over the coast.
- Logging changes the age-class distribution.
- Not all stands are covered by hydroriparian reserves (e.g. high-bench floodplain).

Recommendation 4: Targets are not a priority for other deciduous stand types, although maple and birch-leading ecosystems should not be logged when they are found, and aspen-leading stands could be considered in planning along with interior regions.

Rationale:

- Alder stands initiated by natural disturbance (low-bench floodplain or on slides and avalanche chutes) are not at risk from logging.
- Logging does not change the age-class distribution of alder very much.
- Birch and maple cover too small an area for a target to be appropriate (small changes in disturbances would vastly change the area).
- Aspen stands should be considered with interior ecosystems.

Question 2: How do we assign targets?

Recommendation 5: Red-listed cottonwood site series: 100% should be reserved regardless of their current age.

Rationale:

- This target is consistent with other red-listed site series.
- These site series are rare partially due to past logging. Stands younger than 120 years will recruit to the listed structural condition over time.

Recommendation 6: Blue-listed cottonwood site series: 70% should be reserved regardless of their current age.

Rationale:

- This target is consistent with other blue-listed site series.
- These site series are rare partially due to past logging. Stands younger than 120 years will recruit to the listed structural condition over time.

Recommendation 7: Other cottonwood site series: 70% of the natural proportion over 120 years should be reserved (as an initial estimate, reserve 35% of the total area of these site series over 120 years).

Rationale:

- This target is consistent with low-risk targets for other site series.
- Low-risk targets are particularly important for such ecologically valuable stands.