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Maximizing ecosystem representation in managed forest landscapes

Highlights

- Ecosystem representation can provide the building blocks of a coarse filter approach to biodiversity conservation.
- Non-harvestable areas are areas excluded from timber harvesting based on a variety of criteria.
- Since non-harvestable areas can often occupy large areas within managed forests, they can significantly contribute to conservation and ecosystem representation targets.
- A network of representative ecosystems can be identified through a landscape-level analysis of the harvestable and non-harvestable landbase.
- Forest managers should consider how much area is contained within non-harvestable areas in addition to assessing whether or not all ecosystem types in the landscape are represented in these areas.
- An ecological inventory can be used to assess the contribution of non-harvestable areas as part of a conservation strategy.

What are non-harvestable areas?

Non-harvestable areas include any forested or non-forested areas that are excluded from timber harvest activities within a managed forest landbase. These can include both terrestrial and aquatic aspects of the landbase such as parks, riparian zones, wetlands, wildlife reserves and visual corridors. Non-harvestable areas also occur within commercial forest types because of operational constraints such as variable retention strategies, sensitive soils, inoperable terrain and economic feasibility. Generally, they are any patch of forest excluded from harvest activities for any reason. Exclusions and harvest restraints such as these can result in a substantial portion of the managed land base being left unharvested, sometimes even more than that required by protected areas strategies. Managers should consider how these non-harvestable areas can contribute to achieving conservation and other ecological objectives in managed forests. In some cases, a system of representative non-harvested areas can be the primary method for maintaining biodiversity objectives in a managed forest and promote the development of a coarse filter biodiversity approach.

How much non-harvestable area do we need? Is it representative?

Conservation recommendations for amounts of forests left unharvested (e.g., retention objectives and/or protected areas) can vary widely from 10% to 50% or more of a given land area, depending on the objectives and context. In managed forests, the area of non-harvestable forest can be quite extensive, and often exceeds most conservation recommendations. However, ecological representation is also a key



ingredient to any conservation strategy. Forest managers should consider whether the non-harvestable areas are representative of the ecological diversity in the landscape. For example, if the non-harvestable areas in the landscape are substantial, but contain only a narrow selection of ecosystem types, they will not be representative of all the ecosystems in a landscape. This may have implications for meeting biodiversity objectives such as species and habitat conservation.

Assessing ecological representation of non-harvestable areas

A preliminary or baseline conservation goal for ecological representation could be to ensure there are non-harvestable areas of all ecosystem types in proportion to their occurrence across the landbase. Ecosystem types in this case will usually be based on some kind of standardized ecological or forest classification system. A wetland classification can provide additional value if available. In some cases, representing greater proportions of rare, endangered, or regionally important ecosystem types may also be desirable. Dr. David Huggard and colleagues have developed an approach to assess whether

Box 1: Assessing non-harvestable forests in managed landscapes

1. **Use or develop an ecosystem classification map.** Add special ecosystem types if necessary; include both terrestrial and aquatic ecosystems; distinguish between levels of productivity (e.g., site index).
2. **Map the regulatory or operationally constrained areas that produce non-harvestable areas** (e.g., parks, riparian reserves, wildlife reserves, wetlands, visual corridors, sensitive soils, inoperable terrain, etc.).
3. **Determine the proportional representation of ecosystem types in non-harvestable areas.**
4. **Evaluate whether the conservation objectives for that landbase have been achieved.**
5. **Monitor non-harvestable patches to ensure they continue to meet conservation objectives.** This could include monitoring: size distribution, geographic distribution, edge/interior ratios, current age distribution, and other relevant spatial features.
6. **Monitor non-forestry activities that can affect ecological contributions of non-harvestable areas** (e.g., oil and gas exploration, salvage logging, fire, cattle grazing).

(Refer to Huggard 2004 for details on this approach)

or not non-harvestable areas contain representative amounts from all ecosystem types (see Box 1). This approach requires an ecological inventory of the landbase. The non-harvestable areas are mapped and superimposed on the ecosystem-mapping framework. This provides a means to quantify the area of each ecosystem type over the entire landbase and how much non-harvestable area is in each ecosystem type. The proportional amounts of each ecosystem type within the entire landbase and the non-harvestable areas provide an assessment of the ecological representation within the non-harvestable areas.

Example calculation:

- 1000 hectares of spruce-leading mixedwood ecotype over the landbase
 - 100 hectares of non-harvestable area in the spruce-leading mixedwood ecotype
- = 10% of the ecotype is conserved by the non-harvested areas.

Other considerations

Representation of ecosystem types is the primary concern when assessing the ecological contribution of non-harvestable areas, but other characteristics may be important and should be monitored. These include: patch size distribution, geographic distribution, edge/interior proportions, age distribution, and other

related spatial aspects. Other considerations include whether or not all representative areas are static in terms of location, or if there is an option to have roving areas of representation across the landbase



through time. Monitoring these features can provide feedback to managers and may be useful in developing retention strategies.

Representative wetlands and riparian areas can be used as anchors in a landscape design approach around which travel corridors or larger patches of interior and contiguous patches of non-harvestable forest can be identified.

What if the non-harvestable areas are not ecologically representative?

If sufficient ecological representation exists within the non-harvestable areas, many conservation goals can be achieved. However, if there is insufficient ecological representation, additional areas from the harvestable landbase may need to be considered to achieve conservation targets. For example, if a particularly important ecosystem type that supports a key species is not represented within the non-harvestable areas, additional conservation areas may be required.

Using the assessment approach outlined in this research note will assist managers in identifying ecosystems of concern and support the development of alternate management strategies.

Further reading

D'Eon, R.G., Hebert, D. and S. Vizslai. 2004. *An ecological rationale for sustainable forest management concepts at Riverside Forest Products, south-central British Columbia*. For. Chron. 80: 341-348.

Huggard, D. 2004. *Establishing representative ecosystems within a managed landscape: an approach to assessment of non-harvestable areas*. Sustainable Forest Management Network, University of Alberta, Edmonton, Canada. On-line: www.sfmnetwork.ca

Huggard, D.J., G.B. Dunsworth, J.R. Herbers, W. Klenner, L.L. Kremsater and R. Serrouya. 2006. *Monitoring ecological representation in currently non-harvestable areas: Four British Columbia case studies*. For. Chron. 82: 383-394.

Wells, R.W., Bunnell, F.L., Haag, D. and G. Sutherland. 2003. *Evaluating ecological representation within differing planning objectives for the central coast of British Columbia*. Can. J. For. Res. 33: 2141-2150.

Tree Farm License 49 – an example application

Tree Farm License (TFL) 49 is a 145,000 ha forest tenure held by Tolko Industries Ltd. in south-central British Columbia. The approach described in this research note was used to assess ecological representation of the non-harvestable landbase within TFL 49. The ecological inventory used was the British Columbia Biogeoclimatic Classification System. Site series groupings were used as the base ecological unit for the assessment.

The amount of fully-constrained area (no logging permitted for legal and/or regulatory reasons) was 10.2% of TFL 49. Another 43% of TFL 49 was within partially- and lightly-constrained areas (reduced logging levels permitted). As a result, a relatively large portion of TFL 49 contained non-harvestable areas even before consideration of other reserve or retention strategies.

All 23 ecological site series groupings in the assessment had more than 10% of their area within fully-constrained areas, therefore meeting a 10% retention target across all ecosystem types. All but three ecological groupings met a 20% retention target. In this case, if a 10% retention target was desirable, it could be met entirely within the non-harvestable areas. However, if a 20% retention target was desirable, additional retention would have to be secured from within harvestable areas for the three identified site series groupings. This logic provides an example of the way a representation assessment can be used to achieve conservation targets using non-harvestable areas.



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