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Baseline Datasets for Evaluating Wildlife Tree Patches

Introduction

In November 2003, the FRPA Resource Evaluation Working Group contracted researcher David Huggard to compile datasets on tree and snag densities in unmanaged CWH, ESSF and ICH forests to provide baseline comparisons with wildlife tree patch data collected by the Ministry of Forests during a comprehensive wildlife tree retention study (see *Evaluation of Wildlife Tree Retention for Cutblocks Harvested Between 1996–2001 Under the Forest Practices Code* at: (http://www.for.gov.bc.ca/hfp/frep/6_evaluation_reports.html).

The goal of the project was to answer the following evaluation question: "How much do levels of various structures retained in wildlife tree patches differ from unmanaged stands?" Comparing available baseline information with data collected during effectiveness monitoring/evaluations is an effective method for determining if the full range of natural variation is being maintained within wildlife tree retention areas in managed stands. Ideally, the best baseline data would be derived from pre- and post-harvest data collected from the same site; however, this type of information is rarely available.

Baseline comparisons are also valuable for identifying the "weak points" in retention (i.e., habitat structures that are at the lowest levels relative to unmanaged stands). These weak points can be used to focus improvements to management practices and guide subsequent effectiveness monitoring/evaluations.

The three main objectives of the project were to:

- Collect existing baseline datasets for snags and trees in unmanaged forests in the three main biogeoclimatic (BEC) zones sampled in the 1996–2001 MOF WTR study – CWH, ESSF and ICH.
- Compile the baseline datasets into a consistent format to allow comparisons with the 1996–2001 MOF WTR data.
- Conduct initial comparisons and interpretations of the baseline data versus the 1996–2001 MOF WTR data.

The FRPA Evaluator is a regular publication of the FRPA Resource Evaluation Program designed to inform stakeholders on program development and implementation, and report on the results of evaluation projects.

The objective of the FRPA Resource Evaluation Program is to determine if forest and range policies and practices in British Columbia are achieving government's objectives for the resource values identified in FRPA, with a priority on environmental outcomes and consideration for social and economic parameters, where appropriate.

Methods

Baseline datasets were obtained from a variety of sources across British Columbia (MOF, MWLAP, UBC, licensees, consultants), representing approximately 1175 sites. The baseline datasets (and associated BEC zones) used in the project were:

- Vegetation Resources Inventory (VRI) – CWH, ESSF, ICH
- Provincial Ecology Program (PEP) – CWH, ESSF, ICH
- Weyerhaeuser Coastal B.C. Habitat Structural Monitoring – CWH
- MWLAP/UBC Benchmark Project on Vancouver Island – CWH
- Sicamous Creek – ESSF
- Monashee Spruce Grouse Surveys – ESSF
- Old-growth Structure in Nelson Region – ICH and ESSF
- Trial on Partial Cutting for Root Disease – ICH
- Arrow IFPA – ICH and ESSF
- Robson Valley EFMPP Stand Structure – ICH and ESSF
- Date Creek – ICH
- Northern Wetbelt Silvicultural Systems Projects – ICH.

The baseline datasets were summarized in Excel files by BEC variants or subzones, and mature versus old-age class for each main species group (Douglas-fir, cedar, hemlock and true fir, spruce, pine, and deciduous species), as well as all species combined. Mean densities and between-site standard deviations were calculated by height class (>10 m tall, >5 m tall, all), diameter class (12.5–20 cm, 20–30 cm, 30–50 cm, 50–70 cm, >70 cm) and various overlapping combinations of wildlife tree classes (live, classes 3+4, 5+6, 7+8, 3 to 5, 6 to 8, all snags, and all stems). Live and dead stems with broken tops were also summarized. The format of the baseline database is intended to be flexible enough to allow a variety of users to manipulate and utilize the data for other studies or comparisons.

The 1996–2001 MOF WTR data were summarized by eight groupings of subzones (CWHxm, CWHmm/ms/dm/ds, CWHvh/vm/ws, ESSFdc/mv/mw, ESSFwc/wk/wm, ICHmk/mw, ICHvk/wk and ICHmc). This was done separately for reserves and dispersed retention.

Within each main species (and for all species combined) in each of the eight subzone groupings, baseline results were combined to produce overall means and standard deviations of densities for the combinations of height classes, diameter classes, and wildlife tree classes.

The MOF results were compared to the combined baseline data within each main species (and for all species combined) in each of the eight subzone groupings. Comparisons included values in MOF reserves or dispersed retention expressed as a percentage of the baseline values, as well as the difference between MOF values and the baselines divided by the baseline standard deviation (potentially useful for comparing the range of natural variability). Crude indicators of confidence intervals were estimated for all of the comparison values.

Results and Interpretations

The report discusses a number of results and interpretations of the MOF versus baseline data comparisons.

All stems, all snags, and snags >10 m tall

The total density of all stems (live and dead) in the MOF WTR reserves were very similar to baseline values in four of the eight subzone groupings – CWHmm/ms/dm/ds, CWHvh/vm/ws, ESSFwc/wk/wm, and ICHmk/mw. The reserves were considerably denser in the drier subzones of CWHxm and ESSFdc/mv/mw, and in the ICHvk/wk. Data on retention by size class suggests that the higher densities of stems in the reserves may be attributed to retention occurring on poorer sites where the trees would be smaller than baseline sites. The ICHmc showed lower relative stem densities than baseline values, but this grouping had the least amount of available data, and results may have been influenced by sampling error or differences in forest types.

Densities of snags in the reserves are more variable than total stems, but are similar to baseline studies in five of the eight subzone groupings. In the ICHvk/vw, average snag retention was considerably higher than in baseline sites, but highly variable. Lower overall snag densities occurred in reserves in the wetter subzones of the CWH and ESSF – CWHvh/vm/ws and ESSFwc/wk/wm. This may be related to falling snags around the edges of reserves in these two subzones for safety reasons.

The densities of tall snags (>10 m tall) show the same pattern relative to baseline values for all snags, except in the ICH. These results suggest that the retention of tall snags is not any more of a management concern than the retention of overall snags. In the ICH, densities of tall snags are considerably higher in the reserves. This may be due to a lower percentage of tall snags in the stand types included in the baseline sites.

Note: The appendix of the report contains boxplots of the MOF data and baseline values for several habitat elements by BEC unit. The boxplots allow for more direct comparisons between the MOF data and the baselines; however, due to different levels of effort associated with the different sites, the data could not be accurately weighted and the visual comparisons have no confidence intervals. Conclusions drawn from the box-plots should therefore be made cautiously, particularly where sample sizes are small.

All stems and snags by size class and wildlife tree class

In the CWHxm, small and moderately large diameter stems were at similar densities in the MOF WTR reserves and baselines sites, mid-sized stems were much more common in the reserves, and very large stems were rare in the reserves. This may be attributed to the location of the reserves (poorer sites) or due to the fact that much of the harvesting in the CWHxm is in mature second growth, whereas many of the baseline sites were in old growth. In contrast to the overall stems, large diameter snags were not at lower densities in the reserves. There was no apparent difference in the density of hard snags (wildlife tree class 3–5) versus soft snags (classes 6+) between the reserves and baselines.

In the CWHmm/ms/dm/ds, stems and snags in the largest size class were lower in the reserves than baseline sites. This under-representation of the largest stems in the CWH is a concern for longer-term recruitment of large snags and coarse woody debris (CWD).

Compared to baseline sites, reserves in the ESSF subzones showed a continuous decrease in the retention of stems with increasing size, while snags showed a more comparable size distribution in the reserves and baselines. Hard versus soft snags were retained at similar relative densities in the reserves and baselines. Encouraging the retention of more moderately large stems in the ESSF would assist with long-term snag and CWD recruitment. In the wetter ESSF, greater retention of moderate to large snags would also be beneficial.

In the ICHmk/mw, retention densities of both stems and snags in the reserves were either similar to or above baseline levels. Hard and soft snag densities were also at baseline levels. However, this subzone grouping had the lowest overall retention level, and further improvement could come simply from retaining more area.

In the ICHvk/wk, densities of stems and snags in the first four size classes in the reserves are at or considerably above baseline levels; however, stems and snags in the largest size class are much less common in the reserves. This may reflect a difference in the age class between the reserves and baselines, or may be due to selecting reserves that do not contain large trees or snags.

Species densities

The densities of different species in the MOF WTR reserves relative to baselines showed widely varying patterns across the eight subzone groupings. In addition, the confidence intervals for individual species were extremely wide owing to the high variability in species composition between stands during sampling. Comparisons of stands matched by leading species would reduce this concern, and pre- versus post-harvest measurements would be optimal.

In the CWHvh/vm/ws, deciduous stems and snags were retained in the reserves at densities far higher than those found in the baselines. Retention could be improved in this subzone by retaining more conifer snags, especially cedar for its longevity, but also shorter-lived hemlock and true firs.

The ESSFdc/mv/mw showed only pine snags as being under-represented in the reserves compared to the baselines. ICHmk/mw showed an emphasis on retaining hemlock, true firs and pines, and some under-representation of deciduous stems. Numerous hemlock, few cedar, and no deciduous snags were retained in the ICHmk/mw. Improving the retention of cedar snags would be a useful goal.

Patch versus dispersed retention

The comparison between patch and dispersed retention is limited in that dispersed retention was not the main form of retention in many of the blocks surveyed in the MOF WTR study. A more balanced comparison would be to compare patch retention blocks with blocks that only contained dispersed retention, matched by forest type.

Dispersed retention sampled in the CWH, drier ESSF and ICHmc contained far lower densities of stems than patch retention and only a negligible density of trees compared to baselines. In contrast, in the wetter ESSF, and the ICHmk/mw and ICHvk/vw, dispersed retention had very similar densities to patch retention.

Snags and tall snags (>10 m tall) were also less common in dispersed retention compared to patch retention, except in the ICHmk/mw and ICHvk/vw.

Summary of weak points in retention

The report identifies the following "weak points" in current wildlife tree retention based on comparisons between the MOF WTR reserves and the baseline sites:

- CWHxm – low densities of the largest trees (>70 cm dbh)
- CWHmm/ms/dm/ds – few trees or snags >70 cm dbh
- CWHvh/vm/ws – relatively low overall densities of snags, including conifers
- ESSFdc/mv/mw – few moderately large trees
- ESSFwc/wk/wm – low densities of tall snags (generally low snag densities overall), as well as few moderately large and soft snags
- ICHmk/mw – only cedar snags and deciduous stems relatively under-represented in reserves, but lowest overall amount of area retained of the eight subzone groupings
- ICHvk/wk – stems >70 cm dbh at very low densities in reserves (assuming they are present in pre-harvest stands)
- ICHmc – low overall live tree densities (but limited data suggests this may be because particularly large trees are being retained).

Limitations and Suggestions

One of the main assumptions underlying the retention/baseline comparisons is that the baseline sites are representative of pre-harvest conditions in the blocks that were surveyed in the MOF WTR study. However, the wide variety of studies used to produce the baseline dataset casts some doubt on this assumption. Potential differences between sites can include different geographical areas, different forest types within a BEC subzone, different age classes, and different disturbance histories. Carefully matching monitoring sites with local baseline sites in similar forest types and age classes would help reduce this concern. Supplementing baseline data with pre- and post-harvest measurements would further increase the representativeness of baseline data. One potential source of pre-harvest information may be cruise plots, provided they are suitably modified to collect the appropriate information.

One of the main values of wildlife tree retention is providing a source of future recruitment of snags and other habitat attributes. To ensure retention is providing a good source of future snags, it may be a good idea to project snag levels through the entire harvest rotation and compare them with baseline values or stands undergoing succession after natural disturbances. These snag projections would require data on the snags retained, as well as information on retained live trees, tree mortality rates, snag decay levels, and snag fall rates.

The compiling of existing baseline datasets to make comparisons with the MOF WTR data was a relatively efficient and cost-effective process compared to conducting field surveys of comparable baseline sites. Efforts to expand this baseline data into a centralized provincial database should be a priority in order to facilitate future studies. The provincial database should optimally be based on raw plot data to allow users more flexibility in creating different summary variables to address a variety of evaluation questions.

More Information

For additional information on FREP, or to view a copy of the full report, please refer to our website at: http://www.for.gov.bc.ca/hfp/frep, or contact any member of the FRPA Resource Evaluation Working Group:

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