

# Appendix K

## Marbled Murrelet Habitat Rating Key

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This key will be used to rate sites as either high, medium, or low quality nesting habitat for marbled murrelets. It will be used as part of the decision steps outlined in Section IV of the Habitat Conservation Plan, under the heading “Marbled Murrelet Habitat Ranking Process.” This key will be used as part of “Step 2: Implementation — Timber Harvesting Decisions.” A validation of the key will be conducted, beginning within 3 months after signing of the HCP, to determine how the key rates known occupied stands and stands with probable absence. This analysis will be completed before the key is used, for sales after January 1, 1996. Research and monitoring projects will allow ODF to calibrate the rating key over the course of the 6 year incidental take permit. The validation plan is described below, after the key, followed by the biological rationale for the process.

Field surveys of sites will collect information on the following stand characteristics: live crown ratio, canopy closure, and evidence of potential nesting platforms higher than 50 feet above the ground. To rate these stand characteristics as high, medium, or low quality nesting habitat for murrelets, surveyors will use the key on the next page.

Survey work will be conducted by trained field crews. The entire site will be evaluated unless specified differently in the key. Aerial photos or air reconnaissance will be used to assist with identification of specific elements where possible. Field verification will be used to corroborate all air surveys.

# Marbled Murrelet Habitat Rating Key

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|----|--|---------------|
| 1. | Multi-storied canopies <sup>1</sup>                                    | YES — go to 4 |
| 1. | Multi-storied canopies   | NO — go to 2  |
| 2. | Remnant trees <sup>2</sup>   | YES — go to 4 |
| 2. | Remnant trees  | NO — go to 3  |
| 3. | Deformed trees <sup>3</sup> or trees<br>with greater than 5-inch limbs | YES — go to 4 |
| 3. | Deformed trees or trees<br>with greater than 5-inch limbs              | NO — go to 7  |
| 4. | 0-1 potential nesting platforms <sup>4</sup>                           | YES — go to 7 |
| 4. | 2-6 potential nesting platforms  | YES — go to 5 |
| 4. | Greater than 6 potential nesting platforms                             | YES — go to 9 |
| 5. | Live crown ratio <sup>5</sup> greater than 40%                         | YES — go to 6 |
| 5. | Live crown ratio less than 40%   | YES — go to 8 |
| 6. | Gaps <sup>6</sup> in the stand   | YES — go to 9 |
| 6. | Gaps in the stand  | NO — go to 8  |
- 7. Low quality habitat**
- 8. Medium quality habitat**
- 9. High quality habitat**

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Footnotes for marbled murrelet habitat rating key:

1. Any portion of the stand that has more than one tree canopy layer. This may be exhibited when a single tree is above the rest of the canopy.
2. Larger trees within a stand resulting from past management activities or natural disturbance events.
3. Trees with disease history or unique growing conditions that have resulted in a growth pattern that is atypical for the stand in general. Characteristics include non-pyramidal tops, larger limbs, crooks, cavities, etc.
4. Flat nest sites constructed on a supporting structure such as a branch. Acceptable platforms may take the form of aggregations of litter, duff, crooks in limbs, witch's brooms, mistletoe, etc. Suitable platforms will be 15 meters or higher above the ground and located on side limbs 12 centimeters or greater in diameter.
5. Crown ratio measured in a 50 meter diameter circle surrounding potential nest tree or trees at a minimum of 5 separate locations.
6. Pockets of low structured vegetation resulting from past management or disturbance, including blow-down, selective harvest, root disease, etc.

# **Validation and Adaptive Management Plan for the Marbled Murrelet Habitat Rating Key**

## **Validation**

The Oregon Department of Forestry will conduct a retrospective analysis of the “Marbled Murrelet Habitat Rating Key” to determine how the key rates known occupied stands and stands with probable absence. This analysis will commence within 3 months after signing of the HCP.

Forty stands with past murrelet surveys will be identified randomly from all of the stands surveyed on the Elliott State Forest. Twenty of these stands will be confirmed occupied stands, and twenty stands will have been surveyed to protocol with no indications of murrelet occupancy. Using the murrelet habitat rating key, at least two evaluators (biologists or foresters with knowledge of marbled murrelet habitat) will separately rate the 40 stands for marbled murrelet suitability, without prior knowledge of the stands’ occupancy determination. The Service may provide additional qualified personnel to assist in the validation.

Using contingency table analysis, ODF will test whether the habitat ranking key rates occupied stands and stands with probable absence differently than expected by chance. The null hypothesis, then, is there is no statistical difference in the number of occupied and unoccupied stands rated as high, medium, and low. ODF will solicit input from ODFW and USFWS during data analysis and interpretation. If this analysis demonstrates that the habitat rating key does an inadequate job of rating occupied sites higher than non-occupied sites, ODF will modify the rating key and re-test it.

As discussed on page IV-37 of this document, in the event of disagreement between ODF and USFWS regarding results of validation tests of the key or questions of murrelet habitat or biology, the situation will be reviewed by a group of independent experts agreeable to both agencies, who will prepare recommendations for approval.

Before collecting the field data ODF, in consultation with ODFW, USFWS and other research organizations, will develop guidelines and definitions for implementing the habitat rating to assure that the rating will be conducted uniformly by observers. ODF will compare uniformity in application of the rating key by comparing the ratings of individual sites between observers. If the observers fail to rank at least 85% of the examined stands consistently, ODF will modify the implementation guidelines to assure greater consistency, and will conduct a test to assure that habitat ratings are similar among observers. In addition, at various times during collection of field data, habitat ratings among observers will be checked and recalibrated to ensure that consistency continues to be maintained.

## **Research and Adaptive Management**

ODF is involved in research and monitoring projects that ultimately will better define the key components that contribute to marbled murrelet habitat. A comprehensive research program will be developed in cooperation with USFWS, ODFW, OSU and other research

organizations. The Department of Forestry will obtain the concurrence of the Service on the research program and on any changes to the habitat ranking key prior to implementation.

This section will describe two on-going projects that will allow ODF to calibrate the marbled murrelet habitat rating key over the course of the 6 year incidental take permit.

1. **Habitat Structure of Occupied Sites.** ODF has an ongoing contract with a private consulting company to measure structural habitat components at known occupied and unoccupied sites within the Elliott State Forest. This project measures an array of habitat variables at a point within the occupied stand thought to be the most likely nesting location. The contractor is taking the same measurements within the best-looking habitat patch within unoccupied sites (Attachment A of ODF Contract # 95001). The ultimate goal of this work is to use a technique such as multiple regression to determine the key variables that will allow prediction of occupancy at a site. The results of this work may be directly applied to recalibration of the habitat rating key.
2. **Nest Location through Tree Climbing.** A key assumption in the analysis described in the previous section is that murrelets are nesting within the plots where habitat measurements are made. ODF is working with Kim Nelson and Tom Hamer (Nelson, Anthony and Hamer 1995) to locate murrelet nests by means of tree climbing. The researchers will locate one tree-climbing plot within the same plots that the habitat structure variables are measured. They also will establish a second, random location plot within the same stand, to test whether the criteria that ODF used to locate the habitat structure plots (observed murrelet behavior, crown ratio, canopy gaps, and platforms) are predictive of murrelet nesting sites within a stand.

## Biological Rationale for the Marbled Murrelet Habitat Rating Key

The Elliott State Forest is located within the recognized inland range, 38 miles in Oregon (Nelson 1990) of the marbled murrelet. The birds are not typically found in the type of conifer stands (second growth Douglas-fir) that dominate the Elliott, unless deformations or other structures suitable for nesting are available. Sufficient research data are not available to justify a universally adopted definition of marbled murrelet habitat, especially for forest conditions other than old-growth. This habitat rating key is designed to rank conifer stands on the Elliott State Forest relative to suitability as murrelet nesting habitat, with the intent of minimizing incidental take of murrelets. The elements in the key identify features that are correlated with occupied stands, based upon marbled murrelet research in the Pacific Northwest and direct experience by ODF as part of extensive survey efforts since 1992. The habitat quality ranking (High, Medium, Low) resulting from this key is intended to describe the relative quality of habitat on the Elliott State Forest, and may not be applicable to other physiographic regions.

Within 3 months after the HCP is signed, ODF will develop guidelines for implementing the habitat rating to assure that the rating will be conducted uniformly by observers. ODF plans to implement a validation plan (described in the previous section) to determine how this key rates known occupied stands and stands with probable absence. ODF will yearly analyze the results of ODF-sponsored and other relevant research (soliciting input from ODFW and USFWS) to determine whether or not improvement of the habitat rating key is necessary.

### **Habitat Components Addressed by the Key**

1. **Multi-storied Canopies.** All nest stands analyzed for this variable by Hamer and Nelson (1995) were reported to have 2 to 4 tree canopy layers. They hypothesized that multi-layered canopies, in addition to other factors, may provide cover to the nest, which may help reduce predation. In Oregon, Grenier and Nelson (1995) found that “nest stands generally consisted of 2 to 3 canopy layers.” The purpose of including this criterion is to index a habitat component that may provide some degree of cover to protect nesting birds and nestlings from predation. Therefore, when implementing this key, tree seedlings or saplings well below the level of the main canopy are not considered a canopy layer.
2. **Remnant Trees.** Remnant trees are defined as larger trees (older age cohort) within a stand resulting from past management activities or natural disturbance events. Grenier and Nelson (1994) found that “occupied sites on ODF lands include sites with large trees and large remnant trees, at least 1/acre.” Using ODF data in a stepwise logistic regression model, Grenier and Nelson (1995) found that large remnant tree density was a significant predictor of murrelet habitat. Therefore, in developing this rating key, ODF assumed that if any remnant trees were present, the need for large trees was satisfied, and the stand was eligible for rating as medium or high.
3. **Deformed Trees / Limb Diameter Greater than Five Inches.** Murrelets nest in forests with deformations that provide surfaces for nesting (Ralph, et al., 1993). Specifically, Hamer and others (In prep.) found that nest platforms were on structures greater than 7” in diameter. Further, Naslund and Hamer (1994) found that branch diameters averaged 14” in diameter at the nest, with a minimum diameter of 4.5”. Therefore, the rating key assumes any limb or structure greater than 5” in diameter is a potential nesting platform.
4. **Number of Platforms Per Acre.** Cummins, et al., (1993) stated that frequency of nesting platforms is the most important within-stand structural feature associated with marbled murrelet use. They recommended that stands considered to be suitable habitat should have at least 2 nesting platforms per acre. Hamer, et al., (In prep.) found that occupied sites in Washington have large numbers of potential nest platforms. Grenier and Nelson (1994) recommended that tree diameter, forest structure, and number and size of platforms should be used to determine suitable habitat.
5. **Live Crown Ratio.** Greater than 70% vertical cover above the nest cup and the level of horizontal cover is also an important structural component (Grenier and Nelson 1994). Foliage from the surrounding crown provides at least partial cover from the sun and weather, and reduces detection by predators (Naslund and Hamer 1994). Finally, trees with high crown ratio tend to have larger limbs. Therefore, in addition to providing an

index of potential cover from predators, this measurement provides another index of the probability that a stand has suitable nest platforms.

6. **Gaps in the Stand.** Gaps are defined as small openings in the canopy that would contribute to flight accessibility for murrelets flying into, out of, or through the forest canopy. Naslund and Hamer (1994) stated that accessibility for landing and departing from nesting sites may be provided by openings or small gaps in the canopy. Hamer and Nelson (1995) found that mean canopy closure for murrelet nest stands in the Pacific Northwest was 49 percent, compared to canopy closure for a typical old-growth stand in Washington, which averaged 80 percent. They stated that these results suggested murrelets use canopy openings for access to nest platforms.

### **Habitat Quality Rankings in the Key**

**Low** - The stands identified to be of this quality would average less than 2 platforms per acre and would likely include single layer stands that are common on the Elliott. The lack of platforms would also relate to predation rates, given consideration to the theory that predators would need to search more of the stand if the murrelet nesting opportunities were numerous and widely dispersed.

**Medium** - The stands identified to be of this quality would generally have the minimums of suitable habitat characteristics.

**High** - The stands identified to be of this quality would generally have at least some of the characteristics that have been documented by research at known murrelet nest sites.

Literature cited can be found in Appendix B.