Summary of Public Comments and Responses

From September 29, 2017 to November 9, 2017, we invited input from interested and affected parties and the general public on the draft Marbled Murrelet status review. We received several thousand emails containing comments during this period, many of which were form letter responses. Comments came from conservation organizations, science or research institutions, industry, state and local governments, and individuals. All comments submitted are provided in Appendix II.

The most substantive comments on the draft, along with ODFW responses, are summarized below by topic area. ODFW grouped similar comments together and often paraphrased or took key excerpts from original comments to convey content in a more condensed format. Sometimes, when commenters expressed opposite viewpoints on the very same topic, ODFW responded collectively to comments on both sides of the issue. References noted in comment responses are provided in the Literature Cited section of the status review, with the few exceptions listed in full below.

Comment Summaries by Topic Area

1. Population Size and Trend

1.1. Comment Summary: Some commenters emphasized that the Oregon Marbled Murrelet population is stable or increasing, whereas others emphasized that the population is declining.

In this revision, we added the peer-reviewed criteria used by the Northwest Forest Plan's (NWFP) Effectiveness Monitoring Program for evaluating Marbled Murrelet population trend results (Falxa et al. 2016, p. 8):

> For the purposes of evaluating the evidence for a linear trend, we considered: (1) the magnitude of the annual trend estimate, particularly in relation to zero, where zero represents a stable population, and (2) the width and location of the 95 percent confidence intervals surrounding that trend estimate, also in relation to zero. The evidence for a population trend, versus a stable population, is stronger when the trend estimate and its 95 percent confidence interval do not overlap zero, and when the trend estimate is farther from zero. When the confidence interval of a trend estimate is tight around zero, then we would conclude that there is no evidence of a trend. Finally, when the confidence interval of a trend estimate broadly overlaps zero and the trend estimate is not close to zero, this indicates evidence that is not conclusive for or against a non-zero trend. Confidence intervals that are mainly above or below zero, but slightly overlap zero, can provide some evidence of a trend.

We also updated text throughout our review for consistency with these criteria. In applying these criteria, the population trend estimate for Oregon presented in Lynch et al. (2017) is positive (1.7% per year), with 95% confidence intervals (-0.3, 3.7) that are mainly above but narrowly overlap zero. This suggests a stable population with some evidence of a positive trend during the 2000-2015 period, but is not conclusive. The same approach would suggest that the evidence is not conclusive for or against a non-zero trend from 2001-2015 for the entire NWFP area (Washington, Oregon, and northern California combined). In addition, we outline sources of uncertainty associated with these at-sea surveys, including complications that extensive bird movement during the breeding season may present.

1.2. Comment Summary: Some commenters emphasized that the California Marbled Murrelet population is increasing, whereas others emphasized that the perceived increase is an artefact of bird movement and the sampling design of at-sea surveys.

As discussed in 1.1, we use the NWFP's peer-reviewed criteria for evaluating Marbled Murrelet population trend results from at-sea surveys and describe sources of uncertainty that could affect conclusions based on those results. We also note that NWFP at-sea surveys cover only northern California (Conservation Zones 4 and 5); Conservation Zone 6 in central California is sampled independently of the NWFP Program and has supported a small population in recent years (Henry 2017).

In the status review, we indicate that it is unclear to what degree dispersing birds may be affecting at-sea densities (p. 36):

> …Genetics research in central California has shown that murrelets moving from the north can mask declines in the resident population. Peery et al. (2010) found that dispersing birds in Conservation Zone 6 were not true immigrants but rather "visitors" as few nested or contributed offspring to the resident population. Birds may be moving following early nest failures elsewhere or to more productive winter foraging areas; this idea is supported by preliminary results from an ongoing Oregon State University telemetry study. In 2017, researchers found that marked murrelets from Zone 3 in Oregon moved long distances within the breeding season into Zones 4 and 5 (in California), likely due to poor ocean conditions that reduced prey availability in Northwest waters (S. K. Nelson, pers. comm.). These murrelets were failed breeders or non-breeders that will presumably return to nest in Oregon in future years, but they would have been counted in at-sea surveys as part of the California population. If such movements are representative, these results suggest that temporary shifts in murrelet distribution during the breeding season could complicate conclusions about population size or trend from at-sea surveys, at least in some years. This is clearly an area in need of further investigation.

This Oregon status review necessarily focuses on Oregon's Marbled Murrelet population but brings in information from other parts of the range where it may be biologically or genetically relevant to the species' status in Oregon. In addition, before deciding not to list or reclassify a species under the Oregon Endangered Species Act that would otherwise qualify for such legal status, the Oregon Fish and Wildlife Commission must consider the security of the species outside the state (OAR 635-100-0105(7)).

1.3. Comment Summary: Only Zone 1 (in Washington State) shows evidence of a significant murrelet decline, but high variability in Zone 1 estimates suggests it may not be a closed population. The perceived decline may not be reliable due to movement of birds to Canada.

Falxa et al. (2016, p. 30) addressed the possibility that a northward shift in murrelet distribution could mimic a decline in Zone 1. At the time, they felt it was unlikely, explaining:

> A northward shift of the murrelet's distribution from Washington into Canada could mimic the decline observed in Conservation Zone 1 (Puget Sound and Strait of Juan de Fuca) and could also affect trends in coastal Washington, Conservation Zone 2. However, we know of no evidence or causal mechanism for such a shift from 2001 to 2013, and the available data indicate that such a shift is unlikely. The murrelet's distribution at sea during the breeding season generally coincides with the distribution of potential nesting habitat directly inland (Burger 2002; Meyer et al. 2002; Miller et al. 2002; Raphael 2006; Raphael et al. 2002, 2015), suggesting that most murrelets observed on the water represent local breeding populations. A large northward population shift would suggest that breeding individuals are shifting nest locations, which is not supported by the limited information on nest-site fidelity. Nest-site fidelity is common in other alcids (Divoky and Horton 1995), and individual Marbled Murrelets have been observed re-nesting in the same stands and trees in successive years, suggesting some fidelity to nest areas (Hébert et al. 2003, Piatt et al. 2007). Also, population-trend data from British Columbia from the 1990s to 2006 do not support a shift from Washington waters to British Columbia, where there is some evidence for a decline during this period (Piatt et al. 2007). When examining the

previously mentioned yearly monitoring by Zharikov on the southwest coast of Vancouver Island in British Columbia, there is no evidence that murrelets are shifting between Conservation Zone 1 and southwest Vancouver Island during the monitoring period. A recent analysis of British Columbia murrelet population trends during 1996 through 2013, based on a radar-based monitoring program, found negative annual trends for two of the three sampling regions adjacent to Washington (East Vancouver Island and South Mainland Coast), and no trend in the third region (West and North Vancouver Island) (Bertram et al. 2015). Finally, Piatt et al. (2007) reported a substantial and continuing loss of likely murrelet nesting habitat on Vancouver Island and Haida Gwaii since the 1970s.

More recently, in the NWFP's draft Science Synthesis, Raphael et al. (2016c) expanded upon the open population hypothesis. They concluded that "it is not known if, north of California, movements of murrelets are sufficient to affect population estimates and trends within the NWFP area" (Raphael et al. 2016c, p. 39). In this Oregon status review, we discuss these uncertainties and acknowledge complications that extensive bird movement during the breeding season (both within and beyond the NWFP area) could have for interpretation of at-sea survey results. We necessarily focus on the Oregon population, but we bring in additional information from other parts of the range where it may be biologically or genetically relevant to Oregon's murrelets, or where it pertains to the security of the species outside the state (OAR 635-100-0105(7)).

1.4. Comment Summary: The review should use the most recent NWFP Effectiveness Monitoring Program at-sea survey results from 2016 and 2017.

We have incorporated all NWFP Effectiveness Monitoring Program Marbled Murrelet at-sea survey results available to us at this time. The 2017 results have not yet been released by the program, and since 2014, the program has switched to a reduced-effort sampling scheme. This means that most Conservation Zones, including those in Oregon waters, are sampled in alternate years, so it now takes 2 years to survey all zones in Oregon and generate state-scale estimates; state-scale estimates are provided through 2015 only (see Lynch et al. 2017 for details).

1.5. Comment Summary: Demographic data presented are in conflict with long-term NWFP monitoring data, which indicate a relatively stable population in Oregon. The review should de-emphasize outdated demographic models.

We recognize the apparent contradiction between predictions of demographic models by McShane et al. (2004) and the most recent (2000-2015) at-sea survey results produced by the NWFP Effectiveness Monitoring Program (Lynch et al. 2017). Given the difficulties of monitoring this species, there are merits to both approaches, and we include both in our report to provide a holistic review of best available information relevant to the status of the species in Oregon. As summarized by Raphael et al. (2016c), major sources of uncertainty include uncertainty in estimating survivorship and fecundity (reproductive output) in the demographic models and uncertainty about whether the murrelet populations being monitored are closed or open to immigration.

1.6. Comment Summary: 2-sided p-values for population trend estimates were erroneously reported in Lynch et al. (2017) for a 1-sided test of population decline.

The NWFP Marbled Murrelet Effectiveness Monitoring Program team re-examined the trend results in Lynch et al. (2017) and confirmed to ODFW in December 2017 that they are, in fact, from 2-tailed tests (D. Lynch, pers. comm.). We corrected the header for Table 7 of the status review accordingly.

1.7. Comment Summary: Discussion of the power analysis by Falxa and Raphael (2016) should also include ability to detect a lack of decline.

Falxa and Raphael (2016) discussed statistical power needed to detect various percentages of annual decrease in the NWFP Marbled Murrelet population, so for consistency, we also frame our discussion of their work in this way.

1.8. Comment Summary: Key details, such as the hypothesis test used, test statistic, and Type 1 error rate, were omitted from the power analysis in Falxa and Raphael (2016), making it difficult for readers to assess the validity of their analysis.

The Falxa and Raphael (2016) power analysis is part of a peer-reviewed document produced by the U.S. Forest Service's Pacific Northwest Research Station. Readers seeking further details about their methodology may wish to contact the authors directly.

1.9. Comment Summary: Ralph (1994) compiled anecdotal data on historical abundance. This type of data has high uncertainty. In addition, population reductions that happened 100 years ago are not informative about recent/current trends and are usually not a basis for status determinations (e.g., in the IUCN red list process), which usually use several generations or 30 years as a time-frame.

We consider evidence for Marbled Murrelet population trends across various timescales but emphasize changes since the 1990s. Our review acknowledges the largely anecdotal nature of historical abundance data. However, it is our view that even limited historical information about population size, habitat conditions, marine forage availability, genetics, etc. can provide valuable context for contemporary status and help us to better understand and identify threats, stressors, and conservation needs. The Marbled Murrelet Recovery Implementation Team (RIT 2012) explained that there may be "legacy effects" of past declines that could alter contemporary population dynamics and population resiliency. Since this is an ODFW status review examining reclassification of a species under the Oregon Endangered Species Act, we cannot speak to the process and criteria used by other entities for their status determinations.

1.10. Comment Summary: The suggestion that the Oregon Marbled Murrelet population is hovering around a new, lower baseline is not based on sound historical information.

There is widespread agreement that Marbled Murrelet populations in Washington, Oregon, and California have undergone considerable declines since European settlement (Ralph 1994, McShane et al. 2004). While early history levels may be largely anecdotal, there is strong evidence of large-scale loss of

old-growth and late-successional forest nesting habitat since the early 1900s (e.g., Teensma et al. 1991, Bolsinger and Waddell 1993, Perry 1995, Wimberly et al. 2000, Wimberly and Ohmann 2004, Strittholt et al. 2006, Ohmann et al. 2007, Davis et al. 2015), with further losses since the 1990s (Raphael et al. 2016a). At the time of federal ESA and multiple state ESA listings in the 1990s, the primary factor driving murrelet population size and trend was believed to be terrestrial habitat conditions, and this remains the prevailing hypothesis from monitoring and research by the NWFP Effectiveness Monitoring Program that now spans more than 20 years (see Raphael et al. 2016b). Population monitoring from at-sea surveys indicates a variable but non-declining population in Oregon during the 2000-2015 period (see 1.1 above).

1.11. Comment Summary: The at-sea survey results from Strong (2003) were overemphasized. There are many potential flaws with those estimates, and ultimately, they may not be comparable to current NWFP at-sea surveys.

Due to differences in survey methods, we recognize that results from Strong (2003) from the 1990s may not be directly comparable to NWFP Effectiveness Monitoring Program survey results. They nonetheless represent standardized Marbled Murrelet at-sea surveys conducted during a relevant time period for this review (1992-1999). In this revision, we added that sampling effort (as well as potentially poor marine conditions, see next comment below in 1.12) could also explain the abrupt decline reported by Strong (2003) in 1996 on the central coast of Oregon (p. 37).

1.12. Comment Summary: The hypothesis referenced from Strong (2003) that heavy logging in the Siuslaw National Forest caused the Marbled Murrelet "decline" observed in 1996 is not supported and is contradicted by data presented later in the review on older forest increases in the Siuslaw National Forest.

In this revision, we reference the Strong (2003) hypothesis about logging on the Siuslaw but add that sampling effort and potentially poor marine conditions in 1996-1997 are other possible explanations for the abrupt rather than steady decline he reported.

1.13. Comment Summary: The comparison of linear range from Alaska to California relative to population proportions (and implication that the WA/OR/CA population should represent 18% of the total North American population) is not well supported.

The estimate that the 3-state population represents about 18% of the species' linear breeding range is from a U.S. Fish and Wildlife Service 5-year Marbled Murrelet status review (McShane et al. 2004). Even if this estimate is imprecise, there is other evidence to suggest that Washington, Oregon, and California combined historically supported larger Marbled Murrelet populations; much of this evidence served as the basis for federal ESA and multiple state ESA listings in the 1990s (CDFG 1994, ODFW 1995, Desimone 2016, USFWS 1997, 57 FR 45328).

1.14. Comment Summary: Please use the number of individual Marbled Murrelet populations in Oregon that reflect endangered status instead of adding Alaska's population where fortunately the populations are stable, to classify their status.

Part of this comment reflects a policy position on state legal status. We again note that this status review focuses on Oregon's Marbled Murrelet population but brings in information from other parts of the range where it may be biologically or genetically relevant to the species' status in Oregon. In addition, before deciding not to list or reclassify a species under the Oregon Endangered Species Act that would otherwise qualify for such legal status, the Oregon Fish and Wildlife Commission must consider the security of the species outside the state (OAR 635-100-0105(7)).

2. Geographic Range and Distribution

2.1. Comment Summary: The review does not distinguish between the historical vs. current distribution of the species in Figures 1-3.

Our review presents best available information on contemporary murrelet distribution in these figures. As discussed elsewhere in the review, data on historical distribution are limited and largely anecdotal but suggest that the species once inhabited coastal old-growth forests throughout the Pacific Northwest and northwestern California (USFWS 1997, McShane et al. 2004). In this revision, we added text that better conveys habitat change from historical levels across the landscape within Oregon (see the Historical Summary section in Habitat in Oregon). We also note that there is still some uncertainty in inland nesting distance and how that varies throughout the range (see Raphael et al. 2016c).

2.2. Comment Summary: It would be useful to highlight the areas where "large habitat gaps" occur on Figures 2 or 3 and to provide some data on percent or approximate size of these areas, percent of total range in Oregon affected, percent of total potential habitat affected (i.e., after taking into account land use).

Some of these large habitat gaps are found outside of Oregon (e.g., southwest Washington, central California) (Ralph et al. 1995a, USFWS 1997, RIT 2012). Based on models by Raphael et al. (2016a) and federal and state land ownership data, Fig. 2 shows where core areas of higher-suitability habitat are thought to remain in Oregon. These results are consistent with the characterization by the Marbled Murrelet Recovery Implementation Team (RIT 2012) that large gaps occur in northwestern Oregon and in the coastal strip between Reedsport and the Siskiyou Mountains. Similarly, Fig. 1 in Davis et al. (2015, p. 4) provides a map showing historical (1930s-1940s) vs. current (2012) older forest within the NWFP area, which also helps to illustrate broad changes or "gaps" in forest cover.

In this revision, we added estimates of forest cover change in the Oregon Coast Range over time, all of which indicate substantial loss of older forests relative to historical levels, with further losses since the 1990s (see p. 20):

> Wimberly et al. (2000) quantified the range of historical variability in the amount of old forests in the Oregon Coast Range and estimated that late-successional forests covered 52-85% of the landscape over the 1,000 years prior to Euro-American settlement. Wimberly and Ohmann (2004) subsequently found that large-conifer forests decreased from 42% of the landscape in 1936 to 17% in 1996, while small-conifer forests increased from 21% of the landscape in 1936 to

39% in 1996. The change in large-conifer forests represented a loss of 6,206 km^2 [1,533,536 ac], or 58% of the total area of large-conifer forests in 1996.

2.3. Comment Summary: The review states that "most breeding behaviors indicative of occupancy/nesting have been recorded within 65 km [40 mi] of salt water". This is not supported since Marbled Murrelets have been documented up to 47 mi inland and systematic surveys have not been done outside the Siskiyou region to document the extent of their inland habitat range.

We are unsure of the source or details of the 47 mi record referenced by the commenter. Our statement in the draft that "most breeding behaviors indicative of occupancy have been recorded within 40 mi of the coast" is consistent with the inland survey data shown in Fig. 3 and provided to us in databases from the Bureau of Land Management (BLM), Oregon Department of Forestry (ODF), and Oregon State University (OSU) in 2017. However, we recognize that it is possible that some records may not be captured in these databases or in publications, and that there is still some uncertainty associated with inland nesting distance (Raphael et al. 2016c). In this revision, we added the following footnote (p. 7):

> In recent consultations concerning Marbled Murrelets, the USFWS considered "a tree with potential nesting structure" that "occurs within 50 mi [81 km] of the coast (USFWS 1997, p. 32)" as one of the typical characteristics of suitable habitat in Oregon (excerpt of biological opinion text provided to ODFW by R. Bown, USFWS, in March 2017).

3. Migration and Movement

3.1. Comment Summary: Add new 2017 results from OSU's telemetry study documenting Marbled Murrelet movements from Oregon during the breeding season.

We added some preliminary results from telemetry work by OSU provided by S. K. Nelson (see the Oregon and NWFP Populations section, p. 36). These data indicate extensive bird movement during the breeding season in 2017 from Oregon to California, likely due to ocean conditions and poor prey availability in Northwest waters.

4. Fledging

4.1. Comment Summary: The assertion that "many recently-fledged Marbled Murrelets do not make it to the ocean" is not supported by the data in Nelson and Hamer (1995a).

We added two more relevant citations (Hamer and Nelson 1995a, Halbert and Singer 2017) to strengthen this statement. Both include tables with records of grounded chicks or fledglings.

4.2. Comment Summary: The effect of juvenile mortality during dispersal on recruitment is unknown, as is whether dispersal and survival differ in managed vs. unmanaged landscapes. This data gap should be emphasized in discussions of population modeling.

We added statements throughout the status review indicating that there is uncertainty surrounding measures of reproductive output used in demographic models (see Raphael et al. 2016c).

5. Breeding Site Fidelity

5.1. Comment Summary: Some commenters felt that the status review overstated evidence for breeding site fidelity. They noted limited sample sizes, anecdotal observations, and reliance on information from other alcids that may not be applicable to Marbled Murrelets. They recommended that we focus on the findings of Plissner et al. (2015). However, other commenters felt that the status review downplayed the significance of nest site fidelity, given that murrelets have been documented reusing nesting areas year after year for decades, as long as those areas remain intact.

Our status review conveys uncertainties about breeding site fidelity (i.e., few data from marked birds, need for additional research) and relies heavily on the review by Plissner et al. (2015) (see pp. 12-13). In this revision, we provided some additional content, including evidence of reuse of the same nesting stands year after year from inland surveys (Divoky and Horton 1995) and examples of reuse of nest sites or individual platforms, even after failure (e.g., Hebert et al. 2003, Golightly and Schneider 2011).

6. Social Behavior

6.1. Comment Summary: The review claims that murrelets are relatively isolated breeders and implies that the species does not use the nest site for social activities. It also claims that nests are often isolated, but given a lack of programmatic surveys, this cannot be claimed.

We characterized Marbled Murrelets as solitary or semi-colonial breeders, which is consistent with how others have broadly described their nesting behavior (see Simons 1980, Divoky and Horton 1995, Nelson 1997). In this revision, we qualified the statement about solitary nests by noting that "solitary nests are likely grouped within suitable habitat" (p. 13). We also added some details further describing murrelet social behavior around nesting areas (p. 13).

7. Nesting Habitat Characteristics

7.1. Comment Summary: The status review is flawed. An example is the outdated data used such as the S. K. Nelson data on p. 17 [Table 1] of the review.

Table 1 provides summarized data on nest tree and nest characteristics for all 75 Marbled Murrelet nests found in Oregon since 1990. These data were obtained from OSU in 2017, and we are not aware of more current data.

7.2. Comment Summary: The review overplays the significance of stand structure as compared to stand age.

In the Stand Age and Tree Density section (p. 15), we qualified the statement that "These and other studies support the idea that stand structure is more important in determining use by murrelets than stand age or size" by following it with "but further research is needed to fully investigate the combination of physical conditions that constitute an optimal nest site (Halbert and Singer 2017)".

7.3. Comment Summary: The review makes generalizations about elevation restrictions on murrelet habitat, but no programmatic surveys have been conducted for the species in the state, and therefore, these generalizations are unfounded.

Consistent with other reviews of the species (e.g., Burger 2002), we summarized elevational data from known nest sites. We revised this section as follows (p. 16):

> …All nests found in Oregon have been located at 617 m [2,024 ft] or less (Table 1a), though murrelets have been recorded up to 4,200 ft in the Klamath Mountains (see Nelson et al. 2006). The use of mostly low-elevation, moist forests by murrelets in Washington, Oregon, and California could be because high elevations are not present throughout much of the southern range, and where they occur, suitable habitat is lacking (Hamer and Nelson 1995b, McShane et al. 2004, Nelson et al. 2006).

7.4. Comment Summary: This section [Tree Size and Age] seems to frame suitable nest trees too definitively as >80 years based on limited sample sizes. We regularly survey and have delineated many occupied sites in younger forests where few of the suitable habitat trees are 80 or older.

Since this section focuses on nest tree size and age in Oregon, we present best available information on those attributes for nests found to date in Oregon. Although sample sizes for actual nests found are very limited due to the difficulty of monitoring this species, the majority of nests have been found in trees 80 years or older. We also report here (p. 14) and in several other places throughout the review that nesting has been documented in younger and mature trees with structural elements (deformities or dwarf mistletoe infestations) characteristic of older trees:

> Nelson and Wilson (2002) … found 37 nests on state lands in Oregon, 25 of which were in mature (80-165 years old) trees; a single nest was also located in a young (66 years old) western hemlock on the Tillamook State Forest….

8. Reproductive Success

8.1. Comment Summary: This section should mention fledgling dispersal, recruitment, and survival.

Demographic data for Oregon are sparse, and we are not aware of data on Marbled Murrelet fledgling dispersal (with the exception of opportunistic records of grounded fledglings; see Hamer and Nelson 1995a, Nelson and Hamer 1995a, Halbert and Singer 2017) or fledgling survival rates. We include juvenile:adult at-sea ratios, an index of productivity that incorporates early post-fledging mortality, in Table 9. The reliability of these ratios has long been debated, however (Ralph and Long 1995, Kuletz and Kendall 1998, Lougheed et al. 2002). We note that demographic model projections by McShane et al. (2004) were "especially sensitive to immigration rates and fecundity" (p. 39) and underscore elsewhere that there is uncertainty in the estimates of reproductive output used in demographic models (p. 53).

8.2. Comment Summary: It would be useful to discuss nest success estimates for murrelets within the context of other bird species that nest in similar habitat.

Marbled Murrelets have a rather unique life history and their nest success is likely affected by a combination of terrestrial and marine factors (McShane et al. 2004). We caution that that could complicate comparisons with other forest-nesting bird species, so we do not discuss murrelet nest success in this context.

8.3. Comment Summary: In the middle of page 53 you state, "However, murrelets may not be able to compensate for long periods of unfavorable [ocean] conditions...." I agree with this statement, but I think you could be clearer about the severity of this effect. If individuals with an already low yearly reproductive success rate cannot breed in 2-3 years out of every ENSO [El Niño Southern Oscillation] cycle, rather than missing only 1 year per ENSO cycle, for instance, then population declines could be even greater than those predicted by current population survival models (which you also discuss on pages 35, 48, and 65).

Based on recent murrelet field studies (e.g., Peery et al. 2004; Beissinger and Peery 2007; CCR 2008, 2013; Lorenz et al. 2017), emerging data from Oregon telemetry research initiated in 2017, and evidence from other alcids (e.g., Sydeman et al. 2006; Ronconi and Burger 2008; Piatt et al., in prep.), we agree that prolonged unfavorable ocean conditions could have serious consequences for the viability of Marbled Murrelet populations. McShane et al. (2004, p. 3-34) explained that their model projections may represent "an optimistic scenario if extensive loss of old-growth forest habitat occurs due to logging or natural events, or if reproductive rates are depressed for decades by marine conditions within the time periods modeled". They made some assumptions about the impacts of severe El Niño events on reproductive output and the effects of ocean conditions on these parameters. For example, they assumed that 90% of adults breed in most years, and reduced this to 50% in "severe El Niños" modeled to occur in 3 of every 25 years. They also assumed that breeding success of those birds that do breed was not changed by El Niño conditions, due to insufficient information on those effects. Since this species is very difficult to monitor, further research is needed to verify model assumptions and refine fecundity estimates (McShane et al. 2004). Given these uncertainties, we do not further clarify the magnitude of prolonged El Niño or similar ocean conditions on murrelet populations.

9. Amount of Nesting Habitat and Habitat Change

9.1. Comment Summary: Historical habitat estimates referenced from Ripple (1994) and Teensma et al. (1991) don't seem to add up, and no acreage is provided for comparison of early estimates to current habitat. The estimate that 89% of the old forest in the Coast Range was spatially connected as one patch is not defined.

These values may not add up (to 100%) since they represent proportions of older forest types on the landscape at different time periods. The estimate that 89% of the old forest in the Coast Range was spatially connected as one patch in the early 1900s is from Ripple (1994). We provide an excerpt from Ripple (1994, p. 47) below, which offers more details on that estimate, and we note that the original article contains a map (Fig. 1) showing the distribution of older forests in western Oregon:

> Researchers used GIS to illustrate the forest-type patch distributions in western Oregon (Fig. 1). At this regional scale, 89% of the forest area in the large-size class was in one large connected

> patch extending throughout most of western Oregon forest land with the exception of the North Coast….

Please see our responses in 9.2, 9.3, and 9.10 for further discussion of habitat change from historical levels.

9.2. Comment Summary: Assumptions with regard to past 150 to 200 year-old old-growth forest (see p. 25 of the draft) and Marbled Murrelet habitat overlooked the reality that 150 to 200 years ago, the old-growth forests were continuously consumed by fire.

The commenter appears to be referencing the following statement from p. 25 of the draft:

> Major changes have occurred in forested lands over the last 150-200 years, including considerable loss of late-successional forest and fragmentation of remaining forest into smaller or more isolated patches (Harris 1984).

While we agree that fire disturbance and historical variability in the amount of older forest on the landscape should be considered when assessing habitat change on the landscape today, we disagree that the status review overlooks this factor. We discuss the role of fire in landscape dynamics and in shaping many public forest lands that now provide murrelet habitat. In this revision, we added content that better conveys habitat change over time in the Oregon Coast Range. For example, Wimberly et al. (2000) quantified the range of historical variability in the amount of old forests in this region (see p. 20). They estimated that late-successional forests covered 52-85% of the landscape over the 1,000 years prior to Euro-American settlement. Subsequent analyses by Wimberly and Ohmann (2004) found that large-conifer forests decreased from 42% of the landscape in 1936 to 17% in 1996. These and other studies indicate that older forests have declined substantially from historical levels.

9.3. Comment Summary: It would be helpful to compare estimates of historical habitat acreage to contemporary habitat acreage, perhaps in a table.

We do not add a table to this effect since we do not want to encourage direct comparison of acreages obtained from different time periods with inconsistent study areas, methods, or definitions of habitat. However, we do present additional information from the Oregon Coast Range, where surveys and simulations are more consistent.

9.4. Comment Summary: Some commenters were critical of the habitat change analysis by Raphael et al. (2016a) referenced in the status review. They indicated that these models may be unreliable due to highly uncertain underlying gradient nearest neighbor (GNN) data, the small and potentially biased set of training data, the large number of variables included in the models and possibility of overfitting, and the authors' use of area under the curve statistics (AUC) to evaluate the model's discrimination abilities.

The analysis by Raphael et al. (2016a) has undergone peer review, and we believe that it provides the best available assessment of Marbled Murrelet habitat change since the 1990s in Oregon. Raphael et al.

(2016a) discussed sources of uncertainty in their modeling approach in detail, including those associated with vegetation mapping, murrelet locations, and model uncertainty. They concluded (p. 85):

> …The sources of uncertainty we mention should predispose the models to perform worse – not better. Nonetheless, even with the "deck stacked against" good models, good models were generated.

They caution, however, that their habitat-suitability data are best applied at large (landscape, province, watershed, etc.) scales and are not appropriate for site-level inference without ground-truthing or other verification methods. Raphael et al. (2016c) expanded upon this discussion, explaining that a more reliable modeling solution would require intensive research across the NWFP area to identify more known nest sites and enlarge the training data set used to build the models.

9.5. Comment Summary: The review should emphasize that habitat estimates from Raphael et al. (2016a) are modeled habitat.

We provide background on the habitat change analysis conducted by Raphael et al. (2016a) using Maxent models. For further clarity, we added more references to these "habitat suitability models" and estimates of "potential" habitat generated from them.

9.6. Comment Summary: The review should be clear that 21% and 3.4% estimates of habitat loss on nonfederal and federal lands, respectively, refer to percentages on those lands, not habitat overall.

When discussing habitat change results from Raphael et al. (2016a), we provide both acreages and percentages in several locations to help with interpretation. We also include a figure (Fig. 4) to convey this information in a more visual format.

9.7. Comment Summary: Why is there a discrepancy in total acres between Tables 2 and 3? Were some acreage losses not attributable?

Tables 2 and 3 reproduce results from Raphael et al. (2016a). It is our understanding that differences in acreage lost between the tables reflect the fact that some losses could not be attributed to one of the four disturbance categories. Raphael et al. (2016a, p. 49) explained their methods for quantifying habitat change and attribution of losses by LandTrendr change detection:

> …We considered bookend losses that overlapped one of the four disturbance classes as "verified" by LandTrendr. If both the bookend analyses indicated a loss of suitable habitat for that pixel and the LandTrendr data also indicated a disturbance, it was assigned a particular disturbance type.
>
> Differences between these two methods of estimating habitat change are as follows: (1) for the "bookend approach," we used the net change in habitat as a result of gains and losses, while the "LandTrendr-verified approach" estimated only losses, and (2) the latter method used

> information from two sources (the Maxent models and LandTrendr) to estimate losses, and provided data on cause of habitat loss….

They also noted some data gaps that precluded capturing all disturbances that occurred in the final year of their analysis (2012).

9.8. Comment Summary: The review should drill deeper into nonfederal lands and split out habitat on state and private ownerships since state lands are most directly affected by the Oregon Endangered Species Act.

Raphael et al. (2016a) modeled habitat suitability across the NWFP area, which includes Oregon. However, their habitat change analysis did not split out ownership types within the "nonfederal lands" category, so we lack estimates of habitat change from 1993 to 2012 for state vs. private lands. Based on available forest inventory and harvest data, we assume that little Marbled Murrelet habitat remains on private lands in Oregon (see Private Lands on p. 26).

9.9. Comment Summary: Provide methods used to generate ODFW estimates of suitable habitat by ownership type.

We added a footnote with more details on these methods (p. 20):

> The process for generating these estimates was completed using Esri ArcGIS Desktop 10.3.1, using all publicly available data. Ownership/management was represented by the U.S. Geological Survey's Protected Areas Database, providing a boundary dataset for land ownership/management within the range of the Marbled Murrelet. NWFP habitat suitability classes produced by Raphael et al. (2016a) [for 2012] were then overlaid on the ownership/management boundaries, and the ArcGIS Spatial Analyst tool "Zonal Histogram" was used to calculate the area of each habitat suitability class within each agency's ownership/management boundaries. ODFW notes that recent (post-2012) land ownership/management or habitat changes are not captured by these estimates.

9.10. Comment Summary: The review emphasizes habitat losses over gains. It should provide projections of future habitat conditions predicted by the NWFP, BLM Western Oregon Resource Management Plan (RMP), Oregon state forest management plans, etc.

There is strong evidence of large-scale loss of older forests since European settlement within the Marbled Murrelet range in the Pacific Northwest and northwestern California (e.g., Booth 1991, Teensma et al. 1991, Bolsinger and Waddell 1993, Ripple 1994, Perry 1995, USFWS 1997, Wimberly et al. 2000, McShane et al. 2004, Strittholt et al. 2006, Ohmann et al. 2007, Davis et al. 2015). In the Oregon Coast Range, Wimberly and Ohmann (2004) estimated that large-conifer forests declined by 58% between 1936 and 1996, with corresponding increases in small-conifer forests during this period. Habitat loss and degradation were primary factors in the initial federal and state listings of the Marbled Murrelet (CDFG 1994, ODFW 1995, Desimone 2016, USFWS 1997, 57 FR 45328). The habitat change results from Raphael et al. (2016a) also showed net losses of higher-suitability habitat from 1993 to

2012, despite gains in some areas, on both federal and nonfederal forest lands, so our conclusions focus on overall habitat loss. However, we do show gains along with losses in Table 2 and note that the Siuslaw National Forest is one example of a particular site where older forests have been largely restored or maintained since the 1990s (USFS 2014). We also indicate that habitat gains are anticipated over the long-term under the NWFP and BLM Western Oregon RMP, and have added a statement to this effect for the Northwest Oregon State Forests Management Plan (p. 85); we note that many of these gains are expected well into the future, however, and are based on certain assumptions. Economic factors, policy decisions, and climate change effects are among sources of uncertainty for future forest conditions and management.

9.11. Comment Summary: Tables 2 and 3 provide the negatives associated with nonfederal lands but do not show the federal lands which are positively contributing to habitat gains. Inclusion of federal lands would help to better illustrate to the reader the contribution of the various ownerships.

Tables 2 and 3 of our status review reproduce Oregon results from Tables 2-10 and 2-13 in Raphael et al. (2016a). These tables focus on nonfederal lands as well as all land ownership types (nonfederal and federal lands combined). Overall, despite gains in some areas, there were net losses in higher-suitability potential habitat across federal, nonfederal, and all land ownership combined categories. This finding is clearly portrayed in Fig. 4, which splits out ownership types into nonfederal, federal, and all land ownerships categories, and elsewhere in the text of the review. We believe that adding data from Tables 2-9 and 2-12 in Raphael et al. (2016a) on federal reserved and federal nonreserved land classifications would be confusing since differences in federal nonreserved and federal reserved lands are not a primary focus of this review.

9.12. Comment Summary: The timescale reported for development of suitable nesting habitat (many decades or centuries) does not seem appropriate given that many decades are likely too short and habitat can become suitable before many centuries have elapsed. It only applies to young or newly cut/destroyed forest.

We believe that our characterization of the timescale is consistent with that reported by others (e.g., USFWS 1997, Raphael et al. 2016a). It also encompasses the range of tree ages recorded for nests found in Oregon (see Tree Size and Age). We agree that, under most conditions, many decades are likely too short to develop suitable habitat. We added the following to the status review, which underscores that habitat most likely to support murrelet nesting, based on habitat suitability models by Raphael et al. (2016a), can take centuries to develop (p. 50):

> For example, they [Raphael et al. (2016a)] explained that "it can take more than 100 years for Class 2 habitat to become Class 3 and more than 200 years to become Class 4" (Raphael et al. 2016a, p. 86).

However, we also know that within the Sitka spruce/western hemlock forest type in Oregon, some nests have been found in younger or mature trees, where platforms suitable for nesting were created by deformities and dwarf mistletoe infestations on shorter timescales (Nelson and Wilson 2002, Nelson et al. 2006); we include this information in our review as well (e.g., p. 14).

9.13. Comment Summary: Extra attention should be paid to losses of the oldest high quality nesting habitat. Those losses should not be considered exactly offset by stands aging into the youngest classes of suitable habitat. Specifically, in Table 2 on page 21, even within "higher-suitability" classes, do the acres reported as gained functionally replace the losses?

Comment noted. Raphael et al. (2016a, p. 86) provide some insights into this question:

> We found that the highest suitability habitat (Class 4) comprised a relatively small proportion (about 20 percent [within the NWFP area]) of all higher suitability nesting habitat (Classes 3 plus 4). Class 4 includes areas with suitability scores equaling or exceeding the average condition for the murrelet presence sites used to train our models. To the extent which murrelets might preferentially nest in this highest suitability habitat, our estimates of the total amount of suitable habitat available to murrelets, as represented by Classes 3 plus 4, may be optimistic.

They further explain (p. 86) that much of the young forest currently in federally reserved lands has potential to develop into suitable nesting habitat, depending on site conditions, future management, and various other factors, but that it is important to consider "that losses of our highest suitability habitat (Class 4) would not be balanced by gains in lower classes of suitability represented by acres that just cross over the habitat suitability threshold".

10. Federal Lands

10.1 Comment Summary: Add new information from the U.S. Forest Service on habitat impacts of the Chetco Bar Fire in southern Oregon in 2017.

We added some information from Vaughn (2017), which describes the U.S. Forest Service's assessment of impacts to Marbled Murrelet habitat from the Chetco Bar Fire.

10.2. Comment Summary: On page 24, it says we went from 211,000 ac >200 OGSI to 244,000 ac in just 20 years [on the Siuslaw National Forest]. Was there really that much forest that just happened to be 180-200 years old 20 years ago? (Are these numbers correct?)

These estimates are from a U.S. Forest Service report on the Siuslaw National Forest (USFS 2014, p. 46). The authors attributed most of these gains in the OGSI 200 [old-growth structure index threshold of ≥200 years average stand age, a measure of forest structural elements] category to natural regeneration of areas burned by large, stand-replacing wildfires in the mid-1800s.

10.3. Comment Summary: Provide more information on the importance of BLM lands… [to murrelets].

We discuss BLM lands in greater detail elsewhere in the status review. We provide background on BLM's Western Oregon RMP in the Adequacy of State and Federal Programs or Regulations section.

11. State Lands

11.1 Comment Summary: ODF no longer manages the Elliott State Forest, so affected acreage and Marbled Murrelet Management Area (MMMA) estimates and federal Habitat Conservation Plan (HCP) planning references in this review should be updated accordingly.

In this revision, we included updated acreage estimates for ODF-managed forest lands within the range of the Marbled Murrelet and for MMMAs. Revised estimates were provided by ODF in December 2017. We also updated HCP references to reflect this management change.

11.2. Comment Summary: Include State Parks in this section and to a greater extent throughout the document.

We added some Marbled Murrelet habitat estimates from the Oregon Parks and Recreation Department to the status review (p. 25).

11.3. Comment Summary: The biological and conservation contribution of ODF-managed forests in the West Oregon District have been largely ignored or underestimated in this review.

We added data from ODF that provide a breakout of the number and size of all MMMAs by county on ODF-managed forest lands (see revised Table 5).

11.4. Comment Summary: The review downplays the significance of habitat in the Tillamook and Clatsop State Forests by underscoring the average age of forest stands on these state lands, but murrelets have been extensively documented on these forests….

We added some information on the types of habitat that murrelets use in these forests.

11.5. Comment Summary: Your review states that there are 10,589 acres of MMMAs in the Elliott, but based on the GIS data we received from ODF, the Elliott contains 17,077.9 acres of MMMAs, and 28,528.48 acres including prior boundaries and buffers. During this nesting season alone, 814 acres of previously unidentified occupied habitat was found by Coast Range Forest Watch surveyors (map attached).

As discussed in 11.1, ODF informed us that they no longer manage Common School Fund lands in the Elliott State Forest, so we present revised estimates of MMMA acreage (including buffers) in this review (Table 5). These estimates were obtained directly from ODF on December 18, 2017. They reflect MMMAs in various stages of alignment with current ODF policy, as well as "draft" MMMAs still pending approval.

As for the Elliott State Forest MMMA estimates referenced by the commenter, we note that data obtained from ODF at another time period will likely differ in acreage from the estimates we provided in our draft status review since MMMA boundaries are not static; ODF is in the midst of an ongoing process to bring MMMAs created prior to 2013 into alignment with their current policy (N. Palazzotto,

pers. comm.). Differences will also be due to methods and criteria used to summarize MMMA GIS data. Our estimates in the draft status review did not include prior MMMA boundaries and buffers, nor did they include draft MMMAs pending approval – they considered only the then-current (obtained from ODF May 23, 2017) MMMA boundaries and buffers. We recommend contacting ODF and the Department of State Lands (DSL) directly if seeking new GIS data or further clarification on MMMA acreages and management in the Elliott State Forest.

11.6. Comment Summary: The review claims that since less than 2% of Oregon's land base is state-owned, the burden of recovering threatened and endangered species is primarily on the federal government in Oregon. This statement should be qualified by stressing that state and private lands make up a substantial percentage (~40%) of highly suitable murrelet habitat in Oregon, and so in the case of the Marbled Murrelet, the burden of recovering this species includes state land as well.

We added estimated percentages of Marbled Murrelet habitat on state lands using 2012 habitat suitability data produced by Raphael et al. (2016a) and adapted by ODFW to account for land ownership/management type. The Oregon Endangered Species Act most directly affects state-owned, managed, or leased lands. We also included the following statement (p. 83), recognizing that all lands play a role in the conservation of the Marbled Murrelet:

> Moreover, silvicultural practices and other land management activities on nonfederal forest lands can affect the viability of murrelets on federal lands (see Raphael et al. 2016c).

12. Private Lands

12.1. Comment Summary: Why is there a discrepancy between habitat estimates by McShane et al. (2004) and Raphael et al. (2016a)?

The authors used different methods and data sources to obtain estimates of forest lands within the range of the Marbled Murrelet. Both approaches indicate that there is a large amount of private forest within the range of the Marbled Murrelet. They also suggest to ODFW, when considered with forest inventory and harvest data (see Greber et al. 1990, Ohmann et al. 2007), that little suitable murrelet habitat remains on private lands in Oregon.

McShane et al. (2004, p. 4-4) described their methods as follows:

> …the Service completed a geographic information system (GIS) analysis of total acreage in private commercial forest land ownership in Oregon within 50 miles (80 km) from the coast. The data layer used was Forest Ownership Western Oregon–Western Oregon Industrial Land Ownership…. Based on these data, it appears that there are 2,709,516 acres (1,096,507 ha) of commercial forest lands within the range of the murrelet in Oregon (50 miles [80 km] inland from the coast). The vast majority of that ownership (87%) occurs within 35 miles (56 km) of the coast, which coincides with most known murrelet sites in Oregon. Thus, a relatively large amount of land within the murrelet's range in Oregon is in private ownership. The Service is aware of some occupied habitat on private lands in Oregon, but for the most part, the amount

> of suitable habitat on these lands is unknown. Due to the lack of State regulation of harvesting in murrelet habitat on private lands in Oregon and the failure to require pre-project surveys, it is likely that most suitable habitat has been lost from these lands over the 11 years since listing.

Raphael et al. (2016a, p. 39) described their study area as follows:

> …"Habitat-capable" lands were defined as lands capable of supporting forest, and delineated for all of our map-based analyses by a 30-m resolution raster map that represents areas within the NWFP boundary that are capable of developing into forests. This map was created for the 15-year monitoring reports (Davis et al. 2011, Raphael et al. 2011) and was not updated for this report. It was largely based on the U.S. Geological Survey (USGS) Gap Analysis Program (GAP) and the "impervious layer" from National Land Cover Database (Herold et al. 2003, Vogelmann et al. 2001). It excluded urbanized areas, major roads, agricultural areas, water, lands above tree line, snow, rock, and other nonforested features….

Raphael et al. (2016a) used maximum entropy models (Maxent) to model habitat suitability across all lands within the "habitat-capable" area. Our examination of the 2012 habitat data produced by Raphael et al. (2016a) indicates that there are about 3.4 million ac of private lands capable of supporting forests and nesting habitat (Classes 1, 2, 3, and 4 combined, where Class 1 is lowest-suitability and Class 4 is highest-suitability) in Oregon, less than 3% of which is higher-suitability (Classes 3 and 4) habitat.

12.2. Comment Summary: Clarify the Ohmann et al. (2007) estimates and how they relate to Marbled Murrelet habitat.

We removed the original statement and replaced it with the following (p. 26):

> More recently, in the Oregon Coast Range, Ohmann et al. (2007, Fig. 5, p. 26) estimated that private forest lands (industrial and non-industrial ownerships combined) represented about 6% of old-growth and about 12% of very large tree structural conditions found on the landscape.

13. State Forest Plans

13.1. Comment Summary: State forest management plans also call for a long-term net increase in total area and amount of murrelet habitat during the life of the plan. For example, the Northwest Oregon State Forests Management Plan calls for a desired future condition of 30-50% complex forest within the life of the plan (50 years) with targets at intervals between (e.g., 20% complex in 20 years)….

Comment noted. We added a statement to this effect in this section (p. 85). We also note that a multi-year project is currently underway to consider revisions to the Northwest Oregon State Forests Management Plan (L. Dent, pers. comm.).

13.2. Comment Summary: The Elliott State Forest Management Plan is not guided by "greatest permanent value" concepts, which only apply to Board of Forestry Lands, nor does structure-based management as described in this review.

Comment noted. In this revision, we removed references to these concepts for the Elliott State Forest Management Plan.

13.3. Comment Summary: Page 78 of your review describes state policies: "The state forests management plan allows short-term loss of suitable habitat in as much as areas deemed suitable habitat and for which Marbled Murrelet occupancy has not yet been determined can be logged." The meaning of this statement is unclear; however it seems to allude to the fact that suitable Marbled Murrelet habitat is also deemed suitable for logging by state agencies.

We revised this section to better clarify ODF policies (p. 85):

> These policies provide a process for avoiding "take" and protecting suitable habitat around identified occupied sites. The ODF plans timber sales only after surveys for Marbled Murrelets have been conducted in potentially suitable habitat according to protocols established by the Pacific Seabird Group (Evans Mack et al. 2003), and the survey area was classified as unoccupied by nesting murrelets (presumed absence or presence only).

13.4. Comment Summary: The review implies that ODF harvests suitable habitat without conducting surveys first. However, ODF only harvests suitable habitat if surveys have been conducted to protocol following PSG (2003) and the survey area was classified as presumed absence or presence only.

Comment noted. See above response in 13.3.

14. Oregon Forest Practices Act

14.1. Comment Summary: This section appears to have been largely extracted from the ODF March 2017 report to the Board of Forestry and should be appropriately quoted and cited.

Thank you for drawing this oversight to our attention. We have cited the material appropriately in this revision.

15. Habitat Fragmentation and Predation

15.1. Comment Summary: Higher predator densities or predation rates are largely untested assumptions. What are the mechanisms? Are there population-level or landscape-level models that predict this increase? Many predation studies referenced in the review relied on artificial nests. Consider adding more relevant citations, and emphasizing data gaps and uncertainties.

The Marbled Murrelet Recovery Implementation Team (RIT 2012, p. 10) outlined mechanisms that could contribute to Marbled Murrelet population declines. Their rationale included the following:

Nest Predation (Eggs and Chicks)

- There are documented increases in populations of corvids (crows, ravens, and jays).

- Human activity both within and around habitat patches (recreation sites, roads, landfills/dumps, agriculture, rural development) contributes to increased predator populations.
- Habitat fragmentation and degradation contributes to increased predation due to increased forest edges and increased predator access to nests (e.g., by corvids).
- Energetic stress on individual birds is also a factor in chick mortality.
    - chicks: increased likelihood of being preyed upon, for example, reduced chick vigor due to reduced prey delivery and lowered ability to defend themselves
    - adults: attendance at nest could be affected by foraging conditions, which in turn could affect predation risk for eggs and chicks

Post-fledging Mortality

- Increasing abundance of known predators may be resulting in increased predation on murrelets
    - Bald Eagle and Peregrine Falcon populations have recovered to the degree that both of these species were removed from the Endangered Species List
    - Reintroduction (e.g., hack sites) of Peregrine Falcons is a recent activity, therefore data are limited regarding adult and subadult predation. However, extrapolations of effects on other seabirds and shorebirds can be made to suggest increasing predation events on murrelets….

Many known or potential murrelet nest predators have seen significant increases in abundance in recent decades (see Burger 2002, Piatt et al. 2007, Halbert and Singer 2017). While some studies examining murrelet-predator dynamics have relied on artificial nests, evidence throughout the range from both real and artificial nests indicates that predation is a leading cause of nest failure (Nelson and Hamer 1995b, USFWS 1997, McShane et al. 2004, USFWS 2009), that corvids have the greatest impact (USFWS 2009), and that predation is likely limiting contemporary murrelet nest success (Nelson and Hamer 1995b, McShane et al. 2004, Peery and Henry 2004, Peery et al. 2004, Peery et al. 2006a, Piatt et al. 2007). In this revision, we added more references to recent research investigating the influence of anthropogenic foods on predator behavior and space use, with implications for murrelet predation risk (e.g., Scarpignato and George 2003, Neatherlin and Marzluff 2004, Vigallon and Marzluff 2005, Golightly and Schneider 2011, Goldenberg et al. 2016, West and Peery 2017).

15.2. Comment Summary: A study published in The Condor [by Goldenberg et al. 2016] found that Marbled Murrelets nesting within campgrounds are at greater risk of predation, due to an increased concentration of predators such as Steller's Jay that benefit from the bounty of food left by humans. This harmful effect of increased nest and chick predation could extend outward from the campground for up to 1 km (.62 mi).

Comment noted. We added this reference to our discussions of edge effects, predation, and anthropogenic food sources (pp. 29 and 74).

15.3. Comment Summary: In relation to edge effects, the review appears to conclude in numerous places that the only impacts to murrelet habitat result from clearcutting. Commercial thinning can also create edge effects and impact adjacent and occupied suitable habitat.

We added commercial thinning as a potential stressor. While thinning can, over the long-term, speed development of forest conditions suitable for murrelet nesting, it may also have negative impacts in the short-term (Raphael et al. 2016b).

15.4. Comment Summary: The Draft Status Review should recognize that alarming rates of habitat loss on nonfederal lands reduce the quality of habitat remaining on federal lands, which experience more edge exposure owing to clearcuts in inholdings and adjacent private and state lands.

ODFW agrees that fragmentation and associated edge effects can impact the quality of remaining Marbled Murrelet habitat. The status review discusses these issues in several places (e.g., Fragmentation of Habitat, Predation, Forest Habitat Alteration). It also describes how remaining higher-suitability habitat on both federal and nonfederal lands is highly fragmented. For example, Raphael et al. (2016a) classified nearly 90% of potential habitat on nonfederal lands as "edge", whereas federal lands had lower (>70-80%) but still high proportions of edge. In this revision, we added that lack of buffers and heavy thinning adjacent to murrelet habitat can contribute to habitat loss and degradation on all lands (p. 50), and noted that silvicultural practices and other land management activities on nonfederal forest lands can affect the viability of murrelets on federal lands (p. 83).

16. Energy Development - Transmission Lines

16.1. Comment Summary: The review indicates that murrelet habitat is unlikely to be impacted [by a transmission line proposed from Tillamook to Oceanside] since the lines will go through "mostly second-to-third growth timber production areas not likely to be used by nesting murrelets". What is the basis for this assumption? Many ODF-managed lands in that region might be described as second-to-third growth but may contain suitable structures for nesting.

These are privately-owned second-to-third growth timber production areas (Tillamook PUD 2016). CH2M's evaluation of biological resources within the project vicinity did not identify potentially suitable habitat for Marbled Murrelets in the study area (see permit applications for the Tillamook to Oceanside Transmission Line Project available at: https://www.tpud.org/news-community/tillamook-to-oceanside-transmission-line-project/).

Tillamook People's Utility District (PUD). 2016. Tillamook to Oceanside transmission line route recommendation. Prepared by Engineering Department, Tillamook, Oregon.

17. Marine vs. Terrestrial Limiting Factors

17.1. Comment Summary: Trends for Zones 2-4 show no evidence of decline, despite reported habitat loss. These and other findings suggest that habitat is not limiting.

Marbled Murrelets are habitat specialists that depend upon older forests with certain characteristics to successfully reproduce in Oregon (see Chapter 2 of the status review). Recent research has shown that murrelet distribution at-sea during the breeding season is positively associated with the amount of unfragmented nesting habitat directly inland (Raphael et al. 2015, Raphael et al. 2016b, Lorenz et al. 2016). While it is likely that a combination of terrestrial and marine factors is important to the continued viability of Marbled Murrelet populations, Halbert and Singer (2017, p. 7) explained that determining whether nesting habitat is limiting, even where older forest is still abundant, is challenging given that habitat can be defined at various scales:

> The combination of physical conditions that make for an optimal nest site have not been fully investigated. These may include close-in vertical cover, position close to the trunk or a vertical branch (Nelson and Hammer 1995), and a horizontal open area next to the landing pad. The juxtaposition of all three conditions on the same branch, along with suitable platform size, may be unusual enough to make high-quality nest sites a limited resource and thus be responsible for the apparent high fidelity shown by murrelets to their nesting platforms (Hébert and Golightly 2006).

17.2. Comment Summary: In Table 3-3 in Falxa and Raphael (2016) [Raphael et al. (2016b) in the status review], Spearman correlations between abundance of Marbled Murrelets and covariates, including oceanic conditions and nesting habitat (from Maxent), are shown. The correlations between abundance and nesting habitat are 0.350 in Zone 1, 0.915 in Zone 2, 0.071 in Zone 3, 0.082 in Zone 4, and -0.167 in Zone 5. The Status Review concludes that murrelet nesting habitat decline is an important cause of their population decline. However, the low correlations in four of the five zones do not support that proposition.

As discussed above in 17.1, several recent studies have found that the distribution of murrelets at sea during the breeding season is most closely related to the amount and cohesion of suitable nesting habitat directly inland (e.g., Raphael et al. 2015, Raphael et al. 2016b, Lorenz et al. 2016). It is likely that a combination of marine and terrestrial factors is ultimately responsible for explaining murrelet distribution at sea, so a weak univariate correlation between at-sea murrelet densities and inland nesting habitat does not imply to us that nesting habitat is unimportant. The multivariate analyses and overall findings of Raphael et al. (2016b) also support this idea. For example, Fig. 3-9 in Raphael et al. (2016b) indicates that nearly 60% of the influence on murrelet at-sea abundance during the breeding season was explained by terrestrial covariates (nesting habitat cohesion, terrestrial human footprint, and amount of nesting habitat) in Zones 2-5, which include Oregon. Overall, the authors summarized their findings as follows (Raphael et al. 2016b, p. 95):

> …To assess the relative contributions of terrestrial and marine factors on murrelet population abundance and distribution, we synthesized data on the status and trend of murrelet populations, status and trend of inland nesting habitat, and status and trend of marine factors. Specifically, we initially examined the spatial and temporal correlations of marine and terrestrial factors with the spatial distribution and trend of murrelets. We then used a boosted regression tree analysis to investigate the contributions of a suite of marine and terrestrial factors to at-sea murrelet abundance. In both analyses, we found that numbers of murrelets are strongly

> correlated with amounts and pattern (large contiguous patches) of suitable nesting habitat, and population trend is most strongly correlated with trend in nesting habitat, although marine factors may also contribute to this trend. Model results suggest that conservation of suitable nesting habitat is key to murrelet conservation. Conservation of habitat within reserves, as well as management actions that are designed to minimize loss of suitable habitat or improve quality of nesting habitat, will likely contribute to murrelet conservation and recovery.

Other studies examining these associations have similarly concluded that terrestrial factors appear to be more important, though variables used to date as proxies for marine productivity may not fully capture the complex relationships between murrelets and their prey (Raphael et al. 2015, Lorenz et al. 2016, Raphael et al. 2016b). While correlations do not equate to causation, they nevertheless support the hypothesis that nesting habitat appears to be the primary factor driving murrelet population size and trend. It is our view that conservation of the Marbled Murrelet will depend upon protection of both nesting and foraging habitat.

17.3. Comment Summary: The review should do more to recognize increasingly deteriorating ocean conditions for the murrelet. For example, surface marine conditions in the North Pacific (including off of Oregon) have consistently been unusually warm in recent years, limiting productivity of forage fish, which are a vital food source for murrelets. These conditions are believed to have led to some recent massive seabird mortality events (some events documenting tens of thousands of mortalities) including in Oregon.

We agree that poor oceanic conditions may be reducing forage fish availability for Marbled Murrelets, but there are few studies that have examined this relationship. In the section on Climate Effects on Terrestrial and Marine Habitat, we added several sentences that discuss seabird mortalities associated with recent warm-water events (pp. 61-62):

> …A number of forage fish species declined in abundance in 2013-2016, and a mass starvation of Common Murres was observed from southern California to the Aleutian Islands. Murre breeding success was also diminished off California and Oregon, and murres failed altogether in Alaska at many colonies in 2015 and 2016. Several other species of seabirds and marine mammals suffered starvation or breeding failures from southern California to the Bering Sea of Alaska during this period (J. F. Piatt et al., in prep.).

17.4. Comment Summary: For the upwelling paragraph on page 55-56, I thought I had read somewhere that this year, 2017, had a spring transition (start of upwelling) much later than average. This may have even extended the lack of primary productivity and forage fish for murrelets that you list as spanning 2014-2016 in the next paragraph.

As discussed above in 8.3 and 17.3, it is likely that adverse oceanic conditions have affected prey availability for murrelets in recent years. The National Oceanic and Atmospheric Administration and others routinely record spring transition dates and track ocean productivity-related data, so this may be something to examine more closely in the future. In general, more research is needed on direct measures of murrelet prey resources and their effects on recruitment.

18. Small Population Size

18.1. Comment Summary: "The combined effects of these risks has been likened to a vortex that tends to drive small populations to extinction (Gilpin and Soule 1986)." This statement seems unnecessary in a scientific review document and more like a scare tactic.

We mention extinction vortices as a key concept in conservation biology and do not intend the statement as a scare tactic. Allee effects and other problems that can arise in small or sparse populations are regularly discussed in the scientific literature.

19. Assessment of Influencing Factors

19.1. Comment Summary: In Table 10, the review claims that habitat loss from logging and fires is similar to the degree of that threat in 1992, but this is untrue since habitat loss has increased and there is evidence that climate change will increase habitat loss from fires.

Table 10 represents a summary of threats and threat levels as assessed by the U.S. Fish and Wildlife Service in their past 5-year status reviews. It is true that some threats and threat levels may have changed since their last (2009) review, but this table is provided as a reference for how that agency has documented changing threats to the species over time. A new USFWS 5-year status review is underway but not yet completed (82 FR 18665). Elsewhere in this status review (e.g., p. 60), we provide additional information on habitat loss and anticipated effects of climate change, including increasing risk of severe wildfire.

19.2. Comment Summary: "Key threats identified in 1995, including forest habitat alteration, large-scale disturbances, small population size, predation, changes in prey quality and availability, and oil spills, have not improved or have worsened since state listing (i.e., they remain high), and many new threats have been identified, particularly in the marine environment." This statement seems in contrast to Table 10, which indicated reduced rates of habitat loss and improved regulatory mechanisms….

We do not view these as contradictory statements. We agree that Table 10 indicates reduced annual rates of habitat loss due to improved regulatory mechanisms. These findings are consistent with the conclusion that the NWFP slowed loss of habitat due to timber harvest on federal lands since its implementation (see Raphael et al. 2016b). However, we also note that existing state and federal programs and regulations have not prevented continued high rates of habitat loss due to timber harvest on nonfederal lands in Oregon during this period, nor have they prevented habitat losses due to large wildfires on federal lands (e.g., 2002 Biscuit Fire, 2017 Chetco Bar Fire) (McShane et al. 2004, Raphael et al. 2016a, Vaughn 2017). Since both past and present (cumulative) habitat loss has potential to affect the viability of a species, we continue to consider the threat of habitat loss as high for the Marbled Murrelet in Oregon. This threat may increase in the future, given climate models that project greater risk of severe wildfire, insect infestations, disease outbreaks, severe storms, and changes in temperature, moisture, or other conditions that affect vegetation composition and epiphyte growth (COSEWIC 2012, Dalton et al. 2017); the magnitude of these effects is uncertain at this time, however.

20. Overall Assessment of Reclassification Criteria

20.1. Comment Summary: Some commenters felt that the status review draws contradictory conclusions pertaining to threats and the adequacy of regulatory mechanisms. Examples of specific comments included:

> *The review should reconcile the conclusion that key threats to the species have continued unabated or increased since state listing (p. 63) with the conclusion in Chapter 4 that the threat from inadequate state and federal programs and regulations has decreased since state listing (p. 82). Without reconciliation of these conclusions, additional protections seem unlikely to effectively address the reasons for the continued or increased threats to the species.*
>
> *The review finds that "management programs, plans, and regulations have slowed but not halted further nesting habitat loss and degradation since the 1990s" (p. 65). The review also finds that "(s)ince state listing in 1995, several key threats and stressors have continued unabated or increased…" (p. 63), and identifies forested nesting habitat alteration as one of the key threats to the species, the threat most closely tied to murrelet status and distribution trends. However, "slowed but not halted" is not the same as "continued unabated or increased" and should be reconciled for a clear picture of the trends affecting this key threat.*

Overall, our review found that, despite some habitat gains in certain areas and improved regulatory mechanisms, there have still been net losses in murrelet nesting habitat since the 1990s, and that habitat is continuing to be lost or degraded even in some protected areas due to wildfire, forest fragmentation and edge effects, etc. Moreover, as discussed in response to the prior comment in 19.2, climate change is expected to increase potential for habitat loss from catastrophic wildfires, insect infestations, disease outbreaks, and severe storms. We do not view these as mutually exclusive or contradictory conclusions.

20.2. Comment Summary: The review stops short of assessing whether the reclassification criteria have been met and incompletely analyzes several criteria. Many of the review's conclusions pertaining to habitat loss and population effects are inconsistent. The review's evaluation of OAR 635-100-0105(3)(b), which addresses risk of extinction, is inconclusive.

The commenter is correct that the status review does not provide a staff recommendation on state legal status, nor does it state definitively whether a particular legal reclassification criterion has been met or not. The Oregon Fish and Wildlife Commission will make those determinations. Please see our response above in 19.2 for a discussion of conclusions pertaining to terrestrial habitat loss and population effects; we do not view our conclusions as inconsistent and clarify that the threat of habitat loss remains high due to a combination of factors, including severe wildfire and climate-related effects.

20.3. Comment Summary: The review does not explicitly address OAR 635-100-0105(6), which requires that the Commission find that the natural reproductive potential of the species is in danger of failure due to one or more specified natural or human causes, and assess the relative impact of human actions.

The status review revisits those influencing factors (natural and human-induced factors that could affect the species' "natural reproductive potential" and continued existence in Oregon) identified in 1995 at the time the species was listed as state-threatened (ODFW 1995) and provides new or updated information whenever possible (see Chapter 3).

20.4. Comment Summary: Although the geographic area used by the murrelet in Oregon is discussed in detail, this review does not consider the "portion thereof in which the species is or is likely within the foreseeable future to become in danger of extinction" per OAR 635-100-0105(5)(a). To meet the OAR requirements of information the Commission shall consider in reclassification of a species, the review's analysis should be expanded to include this assessment.

Extinction probabilities derived from demographic models by McShane et al. (2004) were provided elsewhere in the status review and were developed at the Conservation Zone scale. Under the assumptions used, these models indicate that extinction probability for Marbled Murrelets is high in this century in both zones that include Oregon; finer-scale assessments are not available. A source of uncertainty in these models is in estimating survivorship and reproductive output (Raphael et al. 2016c).

20.5. Comment Summary: [Regarding the Chapter 4 Summary] Seems that some important summary points are lacking. OAR 635-100-0111(1)…. First and foremost, there is no reference to the population monitoring results (Lynch et al. 2017) that provide strong support for a stable population in Oregon. Instead, the leading summary bullet references only a reduced population baseline, and 13-year old demographic models of extinction risk that are in conflict with the long-term monitoring data…. Reference to Raphael et al. (2016) statement that nonfederal lands are important should be caveated… with references to improvements in habitat condition already being seen on federal lands, which provide much more potential (in terms of acres) for suitable habitat than nonfederal lands.

We revised the first bullet point to the following (p. 94):

- Best available information indicates that Oregon's Marbled Murrelet population is considerably smaller than it was historically. There is some uncertainty regarding current population trends in Oregon, as the limited data on recent breeding success suggest that recruitment is too low to sustain the population, while population monitoring from at-sea surveys indicates a variable but non-declining population during the 2000-2015 period.

In addition, we added several bullet points that summarize pertinent programs, policies, or projects specific to state land-owning or managing agencies (p. 95):

- Since the 1990s, ODF has adopted a take avoidance policy that requires Marbled Murrelet surveys prior to harvest of suitable habitat and is designed to protect known occupied sites in designated areas, or MMMAs….
- The State Land Board and DSL are moving forward to implement the Elliott Public Ownership Project.
- The Board of Forestry has initiated a rulemaking process to address protection of Marbled Murrelet resource sites on nonfederal lands regulated by the FPA….

The commenter also references the below bullet point and recommends changes:

- Raphael et al. (2016a,b) concluded that protection of suitable habitat on nonfederal lands is important to the viability of the species. Marbled Murrelets in Oregon have continued to experience deterioration of their forest nesting habitat, especially on nonfederal lands, since the 1990s.

Please see our responses above in 9.10 and 9.11 pertaining to emphasis on habitat gains vs. losses. Despite gains in some areas, there have been net losses in higher-suitability potential habitat on federal lands since the 1990s, mostly due to wildfire (Raphael et al. 2016a). As explained by Raphael et al. (2016a, p. 87) and included in our review (p. 68):

> Over the long run, it is not unreasonable to expect to see some net increase in total amount of higher-suitability habitat; however in the short-term, conservation of the higher-suitability habitat (Classes 3 and 4) is essential. If losses of suitable habitat are reduced, old forest suitable for nesting is allowed to develop, and fragmentation of older forest is reduced throughout the reserved federal lands, then meeting murrelet population objectives will be more certain. Given declining murrelet population trends as well as habitat losses, in many areas, it is uncertain whether their populations will persist to benefit from potential future increases in habitat suitability. This underscores the need to arrest the loss of suitable habitat on all lands, especially on nonfederal lands and in the relatively near term (3 to 5 decades).

For these reasons, we do not modify this summary to highlight "improvements in habitat condition already being seen on federal lands".

21. Adequacy of State and Federal Programs and Regulations

21.1. Comment Summary: The review's conclusion that HCPs must contribute to species recovery is not accurate.

We revised applicable statements in the review pertaining to HCPs (pp. 76 and 95) as follows:

> …To obtain a permit, the applicant must first develop a Habitat Conservation Plan (HCP) demonstrating that the activities will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. The HCP must include measures to minimize and mitigate the effects of incidental take to the maximum extent practicable (16 USC 1539(a)(1)(B) [Section 10(a)(1)(B)]; *endangered wildlife species: 50 CFR 17.22; threatened wildlife species: 50 CFR 17.32*)….
>
> …HCPs are under development for the Elliott State Forest and Northwest Oregon state forests. If approved, some areas of suitable habitat would be logged, while other areas would be protected and managed for future habitat. Over the long-term, these plans could potentially contribute to the recovery of the species while also providing more regulatory certainty for forest managers….

21.2. Comment Summary: The review provides a lengthy discussion of state and federal programs and regulations but does not analyze the effectiveness of these protections.

We appreciate the opportunity to clarify our approach. As a starting point, we identified key state and federal programs and regulations relevant to the status of the Marbled Murrelet in Oregon. These were programs or regulations that could affect major threats to the species, either positively or negatively. In the terrestrial environment, we focused on programs and regulations pertaining to forest practices and land use since nesting habitat loss and degradation were considered major threats. In the marine environment, we focused on programs and regulations pertaining to forage fish and oil pollution since issues of prey quality and availability and impacts from oil spills and energy infrastructure were considered major threats. Our overall assessment of the effectiveness of these protections centered on how well programs and regulations contributed to the elimination or reduction of major threats and when they were expected to produce benefits for the species. Our conclusions indicate that the threat of inadequate regulatory mechanisms has been reduced, but not eliminated, since state listing in 1995 and federal listing in 1992. In particular, continued loss of habitat due to timber harvest on nonfederal lands suggests that improvements are still needed.

21.3. Comment Summary: The conclusion associated with "adequacy of federal protections" should reference more than just nonfederal lands. Protections have also impacted federal lands.

We have broadened this conclusion to the following (p. 94), which addresses all lands: "Existing federal protections have slowed but not halted habitat loss on both federal and nonfederal lands in Oregon."

21.4. Comment Summary: The conclusion associated with "adequacy of state and federal programs and regulations" should include that since the 1990s, ODF has adopted and implemented forest management plans that call for restoration of 30-50% of the forests into mature and old-growth structural conditions and enacted a policy for take avoidance that requires surveys of suitable habitat and protects occupied sites.

In this revision, we added information on the long-term vision provided by the Northwest Oregon Forests Management Plan (ODF 2010) and indicate that ODF has adopted a policy for Marbled Murrelet take avoidance. We also added a summary point on ODF's take avoidance policy in the Summary of Information Pertaining to Reclassification Criteria (p. 95). However, we do not highlight these topics in our conclusion associated with the adequacy of state and federal programs and regulations given that state forest management plans and policies have undergone multiple changes since the 1990s, and a new effort is underway to revise the Northwest Oregon State Forests Management Plan again (L. Dent, pers. comm.). Altogether, these frequent changes present a source of uncertainty for our status review.

21.5. Comment Summary: It is important to recognize that the NWFP is a 100-year plan only in its early years, and many habitat gains associated with this plan are not anticipated until mid-century given the time needed for younger forests to grow and mature into suitable habitat.

Comment noted. In the NWFP section (p. 79), we added:

> The expectation of the NWFP was that it would take at least 50 to 100 years to restore the amount of older forests on federal lands to levels more typical of previous centuries (prior to logging and extensive fire suppression) (reviewed in Davis et al. 2015).

21.6. Comment Summary: The review in numerous places seems to imply that the reserves on federal forest lands all provide suitable Marbled Murrelet nesting habitat. However, many of these are younger forests that may be logged, which can impact adjacent mature murrelet habitat. It is misleading to characterize these younger reserves as current murrelet habitat.

We are unsure of which sections the commenter is referring to. We note that many federally reserved lands are younger stands that may not become suitable habitat until well into the future (pp. 50 and 68). In this revision, we also added that logging/thinning adjacent to occupied sites can lead to adverse edge effects (p. 50).

21.7. Comment Summary: The review reiterates claims by the BLM that the Western Oregon RMP will amount to increases in murrelet habitat. Since the RMP eliminates survey requirements in areas >40 mi from the coast and allows logging for forest health reasons, murrelet habitat will be lost.

The status review states (pp. 80-81):

> …The RMP will require pre-project surveys for Marbled Murrelets and protection of occupied sites in Zone 1 (from the coast to approximately 35 mi inland) and in the Late-Successional Reserve and Riparian Reserve in Zone 2 (from the eastern boundary of Zone 1 to approximately 50 mi inland from the coast), but not in the Harvest Land Base in Zone 2….

We summarize the BLM's analysis in the Proposed RMP/Final EIS, which under their assumptions, showed near-term loss of Marbled Murrelet high-quality nesting habitat but gains beginning in the second decade of the plan. We recognize that there is still some uncertainty in inland nesting distances by Marbled Murrelets in Oregon (Raphael et al. 2016c).

21.8. Comment Summary: We recommend qualifying the conclusion at the top of p. 82 by stating that while new fishery plans provide new regulations beneficial to protecting murrelet food, ocean conditions in general off of Oregon have been bad for murrelets in recent years.

Comment noted. We summarize what we know about ocean conditions and murrelet and other seabird prey resources elsewhere in the status review. In our evaluation of (a) Deterioration of Range or Habitat, we state (p. 73):

> Variability in ocean conditions and anthropogenic threats and stressors are also affecting marine habitat off of Oregon's coast. Marbled Murrelets use marine waters for foraging, loafing, courtship, molting, and preening. They require sufficient prey resources for survival and successful reproduction. While some recent government programs and regulations (e.g., establishment of marine reserves and marine protected areas, additional oversight of forage fish take) may help to protect certain marine areas and forage species, it is too soon to know their

effectiveness; critical habitat in the marine environment has not been established for the Marbled Murrelet. Climate change is expected to exacerbate conditions unfavorable to murrelets in both the marine and terrestrial environments.

The conclusion referenced by the commenter focuses on the threat posed by inadequate regulatory mechanisms; we currently have insufficient information to separate out the roles of fishing pressures, changing ocean conditions, and other factors in murrelet diet.

21.9. Comment Summary: The review positively summarizes the adequacy of state and federal programs and regulations (page 82), highlighting the areas in which regulations have improved. While regulations and protections were improved in the 1990s, this conclusion discounts the areas that still fall short of protecting the species. The research quoted on page 82 states that "protection of suitable habitat on nonfederal lands is important for the viability of the species," yet there are currently minimal to no regulatory protections on private lands. Improvements to the Oregon Forest Practices Act (FPA) are necessary, especially pertaining to the Marbled Murrelet.

The Board of Forestry is currently undergoing a Marbled Murrelet rulemaking process, which has implications for protection of murrelet resource sites under the Oregon Forest Practices Act, but that process is still in its early stages. We have added some information on forest practices on private lands, including the lack of a state regulation requiring pre-project Marbled Murrelet surveys (pp. 26 and 87-88). We also note that Marbled Murrelet protections under the federal Endangered Species Act currently extend to all lands (state, federal, private, other), although enforcement may be difficult (see next response below in 21.10).

21.10. Comment Summary: Under the 9th bullet on p. 86, [this statement] should include "On private lands, "take" avoidance is required by the OESA and federal ESA ***although enforcement is difficult****; the FPA…."*

We added the suggested qualifier (p. 95). The status review discusses the current regulatory framework, including enforcement challenges.

21.11. Comment Summary: …the City of Corvallis owns and manages approximately 2,300 acres of the 10,000 acre Corvallis Watershed property. [Most of] the balance of that acreage is managed as Late Successional Reserve (LSR) by the Siuslaw National Forest. Several listed bird species have been known to nest on city ownership, including Northern Spotted Owl, Marbled Murrelet, and the formerly state-listed Bald Eagle. Under their "Corvallis Forest Stewardship Plan", these and other species habitats are to be conserved and enhanced, but to date no species management plans have been developed or presented for review under the requirements of Oregon's State Endangered Species Act, as required of any state agency. ORS 496.012

If we are interpreting this comment as intended, it seems to refer to the lack of an Oregon management plan for the Marbled Murrelet and several other species. ORS 496.012 is referenced, and this is the broader wildlife policy of the State of Oregon, which states, in part, "that wildlife shall be managed to prevent serious depletion of any indigenous species". Other species and specific management issues or

recommendations are beyond the scope of this status review, so we focus our response on Marbled Murrelets and the Oregon Endangered Species Act. City-owned lands containing Marbled Murrelet habitat would not be directly affected by the Oregon Endangered Species Act, except for the prohibition of take (to kill or obtain possession or control of) of listed species that applies to all lands, and through any applicable provisions of the Oregon Forest Practices Act pertaining to state and federally listed species. In the event of an uplisting decision by the Commission to change the state status of the Marbled Murrelet, survival guidelines and endangered species management plans would apply only to state-owned, managed, or leased lands. We note that the federal ESA already applies to all land ownerships, and the federal definition of take is much broader and includes harm caused by significant habitat modification or degradation. ODFW was involved in the development of the federal recovery plan for the Marbled Murrelet, which covers the federally-listed populations in Washington, Oregon, and California (USFWS 1997). Recovery plans are not regulatory documents.

21.12. Comment Summary: Although murrelets have high site fidelity, nesting sites that occur further inland are less often used in years with lower nesting activity, even while inland pre-sale survey requirements are no different than those surveys required very close to the ocean. This creates the very real possibility that a recently occupied habitat can be missed with only a two year pre-sale survey window that would falsely confirm an absence of stand occupancy. ORS 496.176(3)(c)

We do not have sufficient data on frequency of use of nesting sites further inland compared to more coastal areas. Systematic surveys have not been conducted in many areas, and there is still some uncertainty in inland nesting distance and how that varies throughout the murrelet range (Raphael et al. 2016c). We recognize that the difficulties associated with surveying this cryptic species in forest habitat could result in some error and associated loss of occupied sites. The Pacific Seabird Group is currently undertaking revisions to its protocol, which may help to address some survey error (S. K. Nelson, pers. comm.).

21.13. Comment Summary: While the current implementation of the federal Northwest Forest Plan (p. 73) may be adequate, there is currently a bill, HR 2936, the "Resilient Forests Act", that has just passed the U.S. House. If made law, that act could drastically reduce protections for Marbled Murrelets on all National Forest and BLM lands. Because those lands account for the majority of murrelet nesting habitat, any change in federal policy would dramatically impact survival calculations and should trigger an immediate review of state-level policy to compensate.

We recognize that future changes to the NWFP or to other federal programs or regulations could have implications for Marbled Murrelet protections and this review's analysis of the adequacy of those protections. However, we are unable to predict what those effects might be at this time.

21.14. Comment Summary: The review does not identify what protections are lacking in the species' threatened status or what protections would be improved under an endangered status.

Our review identifies loss of forest nesting habitat as a major threat to the continued viability of the Marbled Murrelet in Oregon, suggesting that a mechanism is still needed to reduce this continued habitat loss and degradation.

If the species were to be uplisted, affected state land-owning and managing agencies would be required to follow survival guidelines. Survival guidelines are quantifiable and measurable guidelines necessary to ensure the survival of individual members of the species (OAR 635-100-0100(13)). They may include take avoidance and protecting resource sites such as nest sites or other sites critical to the survival of individual members of the species. Survival guidelines would serve as interim protection until endangered species management plans were developed and approved by applicable state agencies (required within 18 months of uplisting) and reviewed and approved by the Commission (required within 24 months of uplisting) (ORS 496.182(8)(a)(C), (D)). The degree to which these new mechanisms would result in increased protections for the species would depend largely upon the role defined for state lands in the conservation of the species. As discussed in the status review (pp. 83-84):

> …within 4 months of listing an endangered species, the Commission must determine whether state land can play a role in the conservation of that species. If so, the land-owning or managing agency must determine (in consultation with ODFW) what role its lands will play in the conservation of the endangered species. To do so, the agency must consider the survival guidelines adopted by the Commission, additional information provided by the Department on the conservation needs of the endangered species, the social and economic impacts of implementing needed conservation measures, and the agency's statutory obligations. The agency must then develop an endangered species management plan and submit it to the Oregon Fish and Wildlife Commission for approval. Commission approval is based on whether the plan achieves the role defined by the agency. Based on the biological needs of the species, and in consultation with state agencies, the Commission may modify the endangered species management plan to make it consistent with the agency's role. In any case, the Commission must approve the endangered species management plan within 24 months of listing the species as endangered….

22. Overutilization

22.1. Comment Summary: The review concludes that overutilization is occurring but does not provide an explanation of what level would constitute overutilization.

Habitat loss due to industrial logging was a primary factor contributing to initial multi-state and federal listings of the Marbled Murrelet (CDFG 1994, ODFW 1995, Desimone 2016, USFWS 1997, 57 FR 45328), and further habitat loss has occurred since the 1990s (Raphael et al. 2016a), so our conclusion of overutilization is based on these considerations.

23. Commercial Significance

23.1. Comment Summary: The review fails to recognize commercial significance of the Marbled Murrelet. Portland Audubon's annual Marbled Murrelet community science survey in the Yachats area attracts over 150 participants, many of whom stay in hotels, spend money on food, etc. More broadly, an ODFW-funded study from 2009 found that over 170 million dollars in 2008 was spent on travel generated/local recreation expenditures on Oregon's coast related to wildlife viewing.

We revised this section to add more information on the economic contributions of wildlife viewing and note that Marbled Murrelets are a sought-after species for birders (p. 93).

24. Economic Impacts of Uplisting

24.1. Comment Summary: Some commenters expressed concerns about economic impacts that could result from a state-level Marbled Murrelet uplisting decision by the Commission.

These comments are beyond the scope of this status review, which does not examine economic implications of a potential uplisting decision. If, however, the Commission decides to uplist the species, an economic analysis will be prepared to examine impacts of the proposed rule changes. Economic considerations could also enter into future implementation of survival guidelines and development of endangered species management plans by applicable state land-owning or managing agencies (see the section on the Oregon Endangered Species Act and "Protected" Species in State Programs and Regulations for more information).

25. New Research Underway

25.1. Comment Summary: Any change in status of the Marbled Murrelet should wait for completion of OSU's Marbled Murrelet research study, which is only in its second year.

This comment reflects a policy recommendation directed to the Oregon Fish and Wildlife Commission. With regard to this uplisting petition, and pursuant to OAR 635-100-0111(1) and OAR 635-100-0110(8), the Commission is required to make a final determination on whether Marbled Murrelet reclassification is warranted by June 21, 2018. The Commission can take ongoing research under consideration.

26. Oregon-Specific Data

26.1. Comment Summary: The decision on whether to uplist the Marbled Murrelet should rely solely on Oregon-specific data.

The status review outlines the legal reclassification criteria and other factors that the Commission must consider in their decision process. Some information from other states or Canada is provided where it may be biologically or genetically relevant to the species' status in Oregon. We note that before deciding not to list or reclassify a species under the Oregon Endangered Species that would otherwise qualify for such legal status, the Oregon Fish and Wildlife Commission must consider the security of the species outside the state (OAR 635-100-0105(7)).

27. Forestry Rotations

27.1. Comment Summary: In several places, it is mentioned that commercial forestry uses 30-60 year rotations. We are unaware of commercial operations in this region with rotations as short as 30 years.

It is difficult to find technical reports or publications that have examined this topic in a systematic way. The above-referenced estimate of forestry rotations in the Oregon Coast Range is derived from Wimberly et al. (2000, p. 177):

> On private industrial lands, the historical fire regime has been replaced by regularly timed timber harvests at 30- to 60-year rotations.

FEMAT (1993, p. IV-110) noted a similar range of 30-70 years for rotations on private forest lands within the NWFP area. More recently, Briggs (2007, p. 10) reported that rotation age is generally under 50 years on most industrial forest land for conifers. Anecdotally, we have heard of rotations at least as short as 35 years.

Briggs, D. 2007. Management practices on Pacific Northwest west-side industrial forest lands, 1991-2005: with projections to 2010. Stand Management Cooperative, SMC Working Paper Number 6. College of Forest Resources, University of Washington, Seattle, Washington.