



BIG MARSH
LATE SUCCESSIONAL
RESERVES

October 1997

Deschutes National Forest
Crescent Ranger District




REGIONAL ECOSYSTEM OFFICE

333 SW 1st
P.O. Box 3623
Portland, Oregon 97208-3623
Phone: 503-808-2165 FAX: 503-808-2163

MEMORANDUM

DATE: December 3, 1999

TO: Nancy Graybeal, Acting Regional Forester, Region 6

FROM: Curtis A. Loop, Acting Executive Director 

SUBJECT: Regional Ecosystem Office Review of Big Marsh Late-Successional Reserve Assessment (LSRA), Deschutes National Forest

Summary

The Regional Ecosystem Office (REO) and the interagency Late-Successional Reserve Work Group have reviewed the Big Marsh Late-Successional Reserve Assessment on the Deschutes National Forest. The assessment addresses three LSRs within the Big Marsh watershed: Crescent, Lower Big Marsh, and Upper Big Marsh. The REO finds that the LSRA provides sufficient framework and context for future projects and activities within the LSR. Except as noted below, future silvicultural activities described in the LSRA that meet its criteria and objectives and are also consistent with the Standards and Guidelines (S&Gs) of the Northwest Forest Plan (NFP) are exempt from further project-level REO review. This review also serves as the REO review of the site-specific forest plan amendments that would be needed for non-risk thinning in stands greater than 80 years of age, as described in the assessment. Also, see the Conclusions section of this memo for more details on REO findings related to this assessment.

Basis for the Review

Under the S&Gs for the NFP, a management assessment should be prepared for each large LSR (or group of smaller LSRs) before habitat manipulation activities are designed and implemented. As stated in the S&Gs, these assessments are subject to REO review. The REO review focuses on the following:

1. The first focus of the review considers whether the assessment contains sufficient information and analysis to provide a framework and context for making future decisions on projects and activities. The eight subject areas that an assessment should generally include are found in the NFP Record of Decision (S&Gs, page C-11). The REO may find that the assessment contains sufficient information or may identify topics or areas for which additional information, detail, or clarity is needed. The findings of the review are provided to the agency or agencies submitting the assessment.
2. The review also considers treatment criteria and potential treatment areas for silvicultural, risk-reduction, and salvage activities, if these activities are addressed in the LSRA. When the treatment criteria are clearly described and their relationship to achieving desired late-successional conditions are also clear, subsequent projects and activities within the LSR(s) may be exempted from the REO review, provided they are consistent with the LSRA criteria and the NFP S&Gs. The REO authority for developing criteria to exempt these actions if found in the S&Gs (pages C-12, C-13 and C-18). If such activities are not described in the LSRA and exempted from further review in this memo, they remain subject to future REO review.

The basis for the review is the Big Marsh LSRA dated October, 1997 as supplemented by additional information provided by the Forest on August, 4 1999 and the June 1997 Big Marsh Watershed Analysis.

Scope of the Assessment and Description of the Assessment Area

The assessment addresses three LSRs, all contained within the Big Marsh Watershed. The three LSRs (Crescent, Lower Big Marsh, and Upper Big Marsh), total 5,051 acres and are comprised of seven plant association groups (dry lodgepole pine, wet lodgepole pine, mixed conifer dry, mixed conifer wet, mountain hemlock, riparian, and rock). While there are substantial differences among the LSRs in terms of the forest vegetation they support, all three provide habitat for late-successional and old-growth dependent species. One hundred-forty-five acres (approximately 1/3) of the Crescent LSR is also a bald eagle management area (BEMA).

Review of the Assessment

The REO reviewed the LSRA in light of the eight subject areas identified in the S&Gs (page C-11) and sought additional information regarding these subject areas when necessary. The assessment addresses characteristics of, and differences among, the LSRs. Desired conditions and treatment criteria reflect historic disturbance regimes, results of past management activities and the exclusion of fire. The assessment recognizes the need to maintain high levels of late-successional habitat within the reserves, while balancing this need against the risk of large-scale loss to wildfire and disease.

The REO finds the LSRA provides a sufficient framework and context for designing future actions. The assessment provides specific objectives, criteria and identifies possible treatments to achieve and maintain desired conditions. The descriptions of current conditions (forest structure, composition, vegetation patterns and fire-caused mortality projections) provide a framework for identification, design and prioritization of treatments.

While the assessment provides for possible management actions in any of the three LSRs, actions are only proposed within the Crescent LSR at this time. Except as discussed below, the REO finds the proposed treatments to be consistent with NFP S&Gs.

Thinning in stands greater than 80 years of age

Commercial thinning of stands greater than 80 years of age is proposed within the LSRA for the purpose of enhancing development of late-successional character. These treatments do not meet the "Guidelines to Reduce Risk of Large-Scale Disturbance" (S&Gs, page C-12-13). The REO has previously stated that the S&Gs for non-risk thinning projects (S&Gs, C-12) apply to all provinces (REO memo 7/15/97, *REO Review of Siskiyou Habitat Improvement Project....Smith River NRA*). The LSRA identified a need to thin in stands greater than 80 years of age (LSRA, page 3-25) and this is further discussed in the August 4, 1999 letter from the Forest. The LSR Work Group focused its review on whether stand selection criteria, other than age, were sufficient to meet NFP objectives and intent. It also examined whether the stand-specific treatment criteria were appropriate.

The Forest proposes to thin stands older than 80 years old where the objective is to achieve fire-climax habitats, and in particular to enhance habitat development for bald eagle and white-headed woodpecker. The Forest states (August 4 letter) that "Managing for open fire climax stands would not require removal of a large number of trees older than 80 years of age, yet such an option might be essential in some stands in order to manage for these objectives." Although there may be instances where this may occur, treatments in these stands will normally emphasize removals in the smaller diameter classes.

The REO finds the goals and objectives of the proposed thinning in stands greater than 80 years of age to be consistent with the NFP goals and objectives, while recognizing that appropriate analysis and documentation under the National Environmental Policy Act, including a forest plan amendment, will be needed before thinning in these stands may proceed. No additional REO review of these proposals or amendments will be required, except that the Forest is asked to notify REO when thinning of the first over-80 units is completed so that a field trip by the work group may be scheduled. The REO retains the option of modifying this exemption from review as a result of that visit.

Firewood cutting within the LSRs

The NFP S&Gs (page C-16) allow fuelwood to be gathered in existing cull decks, where green trees are marked by silviculturists to thin (consistent with standards and guidelines), to remove blowdown blocking roads, and in recently harvested timber sale units where down material will impede scheduled post-sale activities or pose an unacceptable risk of future large-scale disturbances. The REO has also interpreted the S&Gs to allow removal, for fuelwood, of trees felled for safety purposes in excess of coarse woody debris requirements (page C-16) and to allow fuelwood removal as a part of a fire risk reduction strategy consistent with "Guidelines to Reduce Risk of Large-Scale Disturbance", (S&Gs, pages C-12 and 13). Fuelwood cutting in other circumstances, or for other purposes, would require a Forest Plan amendment to include REO review (S&Gs, page E-18). Initially, the LSRA contained wording (page 3-26) implying that firewood cutting might occur other than described above. The August 4 letter stated that this section of the LSRA will be deleted.

Harvesting large-diameter trees

Late- and old-structured stand (LOS) protection strategies related to large trees (LSRA, page 3-18) recognize a need in some risk reduction thinning to cut trees larger than 21 inches in diameter. The REO recommends that cut trees larger than 21 inches in diameter be retained as coarse woody debris, unless doing so would result in excessive fuel loadings. Proposed projects where stand protection requires cutting of trees larger than 24 inches in diameter remain subject to REO review.

Conclusion

This LSRA addresses three LSRs located on the Deschutes National Forest. Based on review of the documentation and discussions with Forest staff, the REO finds that the LSRA provides sufficient framework and context for decision makers to proceed with project development and analysis. Except as discussed above, strategies for protection and enhancement of late-successional values addressed in the LSRA are exempted from subsequent, project-level REO review.

cc:

Lisa Freedman, FS
LSR work group
RIEC
Deschutes NF

1453/ly



File Code: 1920/2470

Date:

AUG 4 1999

Route To:

Subject: Big Marsh Late Successional Reserve Assessment

To: Regional Forester, R-6

This letter provides a response to questions and requests for clarification that arose during the REO review of the Big Marsh Late Successional Reserve Assessment.

1. Does the down wood requirement in lodgepole refer to whole trees or logs (pieces) (Page 3-7)?

In the lodgepole section of Table 3-7, under down wood, the intent is to leave 100% of the trees greater than 11 inches dbh (e.g. blown down trees), as well as any logs (pieces) that might be greater than 11 inches in diameter at the large end.

2. Suggest that a provision be included to have REO review instances when trees greater than 21 inches are proposed for removal (Pages 3-18 and 3-24).

The instances where cutting larger trees (>21 inches) were considered necessary were defined in this section of the Big Marsh LSR. These instances were developed to be consistent with similar criteria found in the Davis LSR Assessment (Davis LSR 3-28), which allows for removing trees greater than 21" DBH in spotted owl nesting/roosting/foraging habitat with the review and approval of the District Ranger. Since the Davis LSR includes a spotted owl critical habitat unit--which the Big Marsh LSR does not--we had not considered a Ranger review requirement necessary. However, in order to respond to this concern, we can add a provision for such a ranger review and approval. We do not believe that REO review would be necessary.

3. More clearly state the need to include selective thinning of trees older than 80 years as an LOS enhancement. This strategy is sound for younger stands because of the benefits to growth and quickening achievement of LOS stands, but is not justified in older trees (page 3-25)..

The intent of leaving the option open for thinning as an LSR enhancement lies with the need to establish both climatic-climax and fire-climax LOS habitats within the LSRs. Where the objective is climatic-climax in mixed conifer dry plant association groups, we agree that thinning in trees older than 80 years should not be considered an enhancement action. But where the objective leads toward fire-climax habitats, thinning should be considered enhancement for species such as bald eagle and white-headed woodpecker (for bald eagle, see Table 3-7 at page 3-12).

Managing for more open fire climax stands would not require removal of a large number of trees over 80 years in age, yet such an option might be essential in some stands in order to manage for these objectives. Leaving this paragraph out of this section would result in avoiding treatments in stands that are not at risk, even when they would benefit from treatments needed to reach single story structure objectives. Therefore, the practical effect of removing this statement is that once the Crescent Lake LSR reaches a lower risk condition (lower imminent susceptibility), future treatments to maintain open condition would be hard to justify. An example can be found in the Crescent LSR, which overlays partially a Bald



(lower imminent susceptibility), future treatments to maintain open condition would be hard to justify. An example can be found in the Crescent LSR, which overlays partially a Bald Eagle Management Area. Initial entry into this area would meet the risk reduction criteria, but once that risk reduction occurs, long-term maintenance of the bald eagle, fire-climax type of stand would require periodic treatment. At that point in the future, the risk reduction would not be the main purpose of such treatments. Rather, the treatments would enhance the LS condition by promoting the more open stand structure. Without LSRA sanction, these treatments would not be permissible until a risk-reduction condition developed in the stand.

4. The need to include firewood/salvage as an LOS enhancement strategy is not well explained (page 3-26).

This section will be deleted from the LSRA. This firewood/salvage strategy was originally proposed in tandem with black-backed woodpecker habitat enhancement strategies in the Big Marsh North LSR. Final LSRA recommendations were to minimize vegetation management during the short-term and long-term, whether as protection or enhancement. Removing firewood/salvaging as an enhancement strategy would result in no changes in the LSRA recommendations (4-18).

5. What is the recreation emphasis for the north side of Crescent Lake, which includes the LSR? The LSRA notes a projected increase in recreational use, but it does not make any recommendations for how that use should be managed to minimize impacts to the LSR.

The watershed analysis defines the Crescent Lake area as one landscape area. Landscape Area B (LA B) identifies a "yellow" trend in the growing recreational use of Crescent Lake and its vicinity (Trend 10, page 3-6). The trend is described (pages 4-51 and -52) and objectives are outlined (pages 5-4 and -5). Opportunities are also described in the where Management Options for Access and Infrastructure recommend

"[seeking] opportunities to mitigate the impacts of existing non-neutral, non-beneficial infrastructures and humans uses. For instance, delineate access and parking within the summer home area to reduce compaction and damage to vegetation, especially large trees, from vehicles." (LSRA pages 4-10 and -11)

Other than specifically calling for managing the LSR for LOS habitat, it is fair to say no other measures are included for managing recreation use within the Crescent Lake LSR. However, the assessment describes how existing information and direction was used in order to avoid duplication. This direction includes the Watershed Analysis recommendations and the Northwest Forest Plan ROD direction.

The watershed analysis responses to this trend by defining the following objectives for Landscape Area B (see page 5-5):

- L. Focus commercial use at the Crescent Lake Resort and Camp Makualla.
- N. Improve the quality and function of existing recreation sites before constructing new ones.
- O. Identify the desired outdoor settings which range from semi-primitive to developed, and the appropriate linkages between them, to attain the desired use. Delineate settings to minimize conflicts among users and between users and wildlife.
- P. Enhance education opportunities via Crescent Lake Lodge, campground concessionaires, Willamette Pass Visitor Center, local schools, and Central Oregon Community College.

- Q. Develop a fuel reduction strategy, especially near summer homes along Crescent Lake and the boy scout camp.
- R. Maximize educational opportunities and participation with rural planning groups and private forest users.

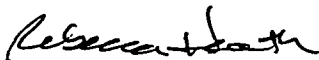
In addition, the ROD (C-17) describes general criteria for allowing new development within LSRs:

Developments of new facilities that may adversely affect Late-Successional Reserves should not be permitted. New development proposals that address public needs or provide significant public benefits, such as powerlines, pipelines. . . will be reviewed on a case-by-case basis and may be approved when adverse effects can be minimized and mitigated. These will be planned to have the least possible adverse impact on Late-Successional Reserves. Developments will be located to avoid degradation of habitat and adverse effects on identified late-successional species.

The objectives set out in the watershed analysis and the standard from the ROD provide a means of evaluating potential conflicting activities that may be proposed in the future. We do not believe that additional recommendations are necessary to protect the LSR from this trend of increased use. To illustrate how we would interpret the meaning of these criteria in practical terms, the following examples may be helpful:

- ◆ New recreation facilities (new campgrounds, new access roads, and new summer home construction) would not be permitted, unless a compelling public benefit could be demonstrated and the project could be designed to have minimal adverse impacts to the LSR. This would include new outbuildings at existing summer homes.
- ◆ Maintenance of current summer homes and access roads would be permissible. This would include reroofing existing buildings. It would also include replacing existing outbuildings/support facilities, such as wells and septic systems so long as the scale of the replacement facilities was comparable to the original. The LSRA specifically notes that hazard tree felling along utility rights-of-way would be appropriate.
- ◆ Trail maintenance would be permissible. New trail construction would also be permissible if the location could be demonstrated to be neutral or beneficial to the LSR (e.g. a trail is relocated to route foot traffic away from sensitive locations).

I hope this information proves helpful in your review of the Big Marsh LSR Assessment. If you have any questions, please contact Shane Jeffries at (541) 383-5465.



REBECCA HEATH
Acting Forest Supervisor

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CHAPTER 1

BACKGROUND INFORMATION

WHAT IS A LATE-SUCCESSIONAL RESERVE ASSESSMENT?

The 1994 Northwest Forest Plan allocated areas within National Forests of the Pacific Northwest to be managed as part of an interacting network of late-successional and old-growth forest ecosystems, which will serve as habitat for late-successional and old-growth related species such as the northern spotted owl. As directed by the Northwest Forest Plan, management assessments are to be prepared for each designated LSR before habitat manipulation activities are designed and implemented. These assessments should generally include the following eight elements:

- 1) A history and inventory of overall vegetative conditions within the reserve;
- 2) A list of identified late-successional associated species known to exist within the Late-Successional Reserves and information on their locations;
- 3) A history and description of current land uses within the reserve;
- 4) A fire management plan;
- 5) Criteria for developing appropriate treatments;
- 6) Identification of specific areas that could be treated under those criteria;
- 7) A proposed implementation schedule tiered to higher order plans; and
- 8) Proposed monitoring and evaluation components to help evaluate if future activities are carried out as intended and achieve desired results.

To some extent, the eight elements listed above have all been addressed in one or more of the following documents: the 1994 Northwest Forest Plan, the 1997 Big Marsh Watershed Analysis, the 1995 Deschutes National Forest Late-Successional Reserve Overview, the 1990 Deschutes National Forest Land and Resource Management Plan (LRMP), and this document - the Big Marsh Watershed Late-Successional Reserves Assessment. The following is a brief summary of each of these documents as they pertain to the eight elements.

1994 Northwest Forest Plan

The 1994 Northwest Forest Plan provides the objectives for this LSR assessment. The following objective was used to develop the team's key questions and focus the assessment:

"Late-Successional Reserves are to be managed to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for late-successional and old-growth related species including the northern spotted owl. These reserves are designed to maintain a functional, interacting, late-successional and old-growth forest ecosystem." (C-11)

Other objectives include:

"...provide a distribution, quantity, and quality of old-growth forest habitat sufficient to avoid foreclosure of further management options...provide habitat for populations of species that are associated with late-successional forest...and help ensure that late-successional species diversity will be conserved." (B-4, 5)

As stated above, "protect and enhance conditions of late-successional and old growth forest ecosystems" is the main objective for this LSR Assessment. The Northwest Forest Plan allows management strategies and activities to be developed that "protect and enhance" conditions which inherently exist on the east or west sides of the Cascade Mountains.

The Northwest Forest Plan recognizes that LSRs east of the Cascades have an increased risk of fire due to lower moisture conditions and the large accumulations of fuels following insect outbreaks and drought, therefore, the Northwest Forest Plan allows additional protection oriented activities to occur in these LSRs.

The ROD Standards and Guidelines state that risk management activities may reduce the probability of major stand-replacing events and are encouraged. Specific guidelines for salvage and multiple-use activities other than silviculture are provided in the Northwest Forest Plan. (C-11 through C-21)

Deschutes National Forest LSR Overview

In February 1995, the entire network of Late-Successional Reserves designated on the Deschutes National Forest was assessed to provide a larger context for each of the site-specific LSR assessments (See Figure 1). A Forest-wide overview document was prepared to provide LSR teams with the following information: 1) a general description of the vegetative series and related floral and fauna species for each specific LSR; 2) a discussion of the processes that sculpted the Forest landscape and potential future risks; 3) a description of forest pattern and structure; and 4) a discussion of forest function across the landscape with regard to habitat and habitat connectivity.

This Assessment will look at the three LSRs in the Big Marsh Watershed: Crescent, (604 acres), Upper Big Marsh (3250 acres), and Lower Big Marsh (1197 acres).

Crescent LSR

This LSR is located south and west of the Davis LSR. It is a narrow strip bordering the Diamond Peak Wilderness Area. Dry mixed conifer and lodgepole pine characterize the vegetative communities. Late-successional and old growth related species include the northern spotted owl and *Allotropa virgata*.

Lower Big Marsh LSR

This LSR is small in size and is located several miles south of the Crescent LSR. The vegetative community is primarily comprised of lodgepole pine. Late-successional and old growth related species include the northern goshawk, black-backed woodpecker, and spotted frog.

Upper Big Marsh LSR

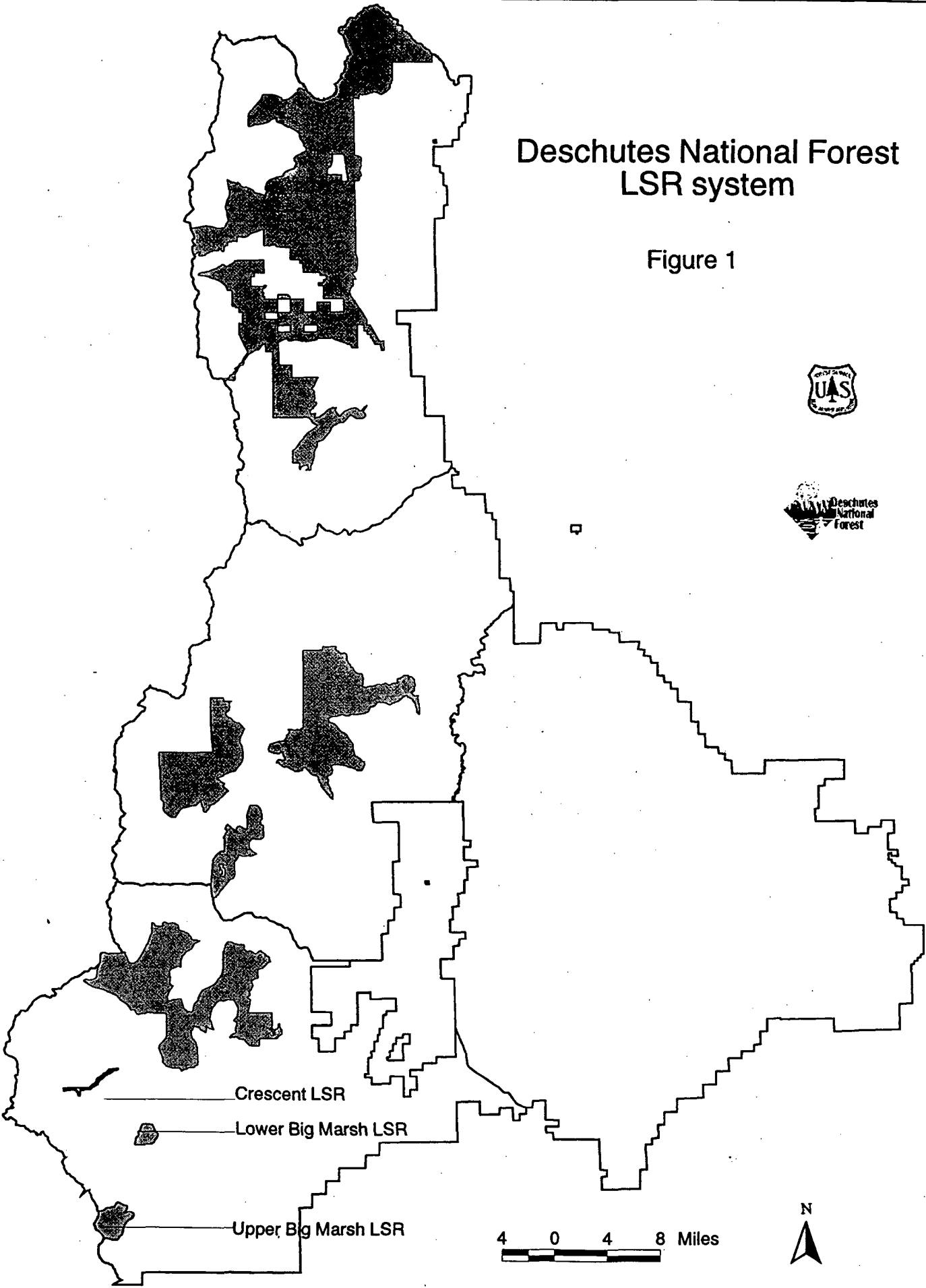
This LSR is the southern most LSR on the Deschutes National Forest. It is located several miles south of the Lower Big Marsh LSR. Vegetative communities are characterized by moist mixed conifer and mountain hemlock. Late-successional and old growth related species include the northern spotted owl, Cascade frog, and *Allotropa virgata*.

Deschutes National Forest Plan

The 1990 Deschutes National Forest Land and Resource Management Plan (DNF LRMP) allocated several areas within the Big Marsh LSRs to be managed to provide specific wildlife habitats. One Bald Eagle Management Area is located within the Crescent Lake LSR; the Lower Big Marsh LSR contains a Wild and Scenic River as well as the entire LSR being allocated as an Old Growth Management Area. The entire Upper Big Marsh LSR is located within the Oregon

Deschutes National Forest LSR system

Figure 1



Crescent LSR

Lower Big Marsh LSR

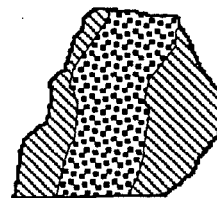
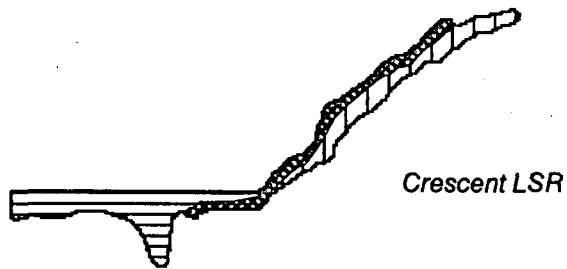
Upper Big Marsh LSR

4 0 4 8 Miles

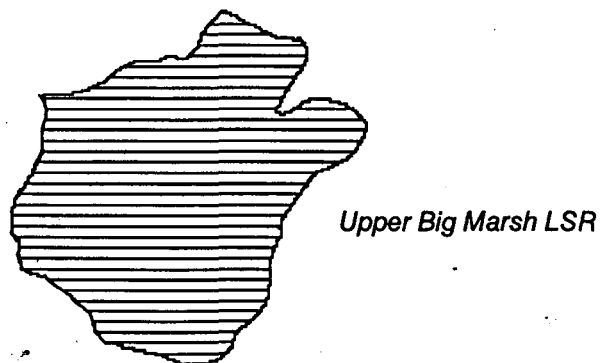


BMW LSRs Forest Plan Allocation

Figure 2



- BEMA
- General Forest
- Intensive Recreation
- Oregon Cascades Recreation
- Old Growth
- Wilderness
- Big Marsh Wild and Scenic River



Cascades Recreation Area (OCRA) and a portion of it is classified as being within the Big Marsh Wild and Scenic River Corridor (See Figure 2).

Big Marsh Watershed Analysis

The Big Marsh Watershed LSR Assessments are considered to be a continuation of the 1997 Big Marsh Watershed Analysis which set the overall physical, social, and biological context for the Big Marsh LSRs, including Upper and Lower Big Marsh and Crescent LSRs (See Figure 3).

Information about wildlife species in the Big Marsh LSRs has already been documented in the 1997 Big Marsh Watershed Analysis (Big Marsh WA). Appendix B, of the Big Marsh WA contains lists of the species found in the Plant Association Groups (PAGs) and the structural stages that they utilize for breeding, foraging and/or resting habitat.

The LSR team attempted to minimize repetition of information already documented in the Big Marsh WA and its appendices. Therefore, this LSR assessment primarily incorporates information from the watershed analysis by reference.

The following is an index for the eight elements to be included in a Late-Successional Reserve Assessment. The location of pertinent information addressing each element is identified.

1) A history and inventory of overall vegetative condition;

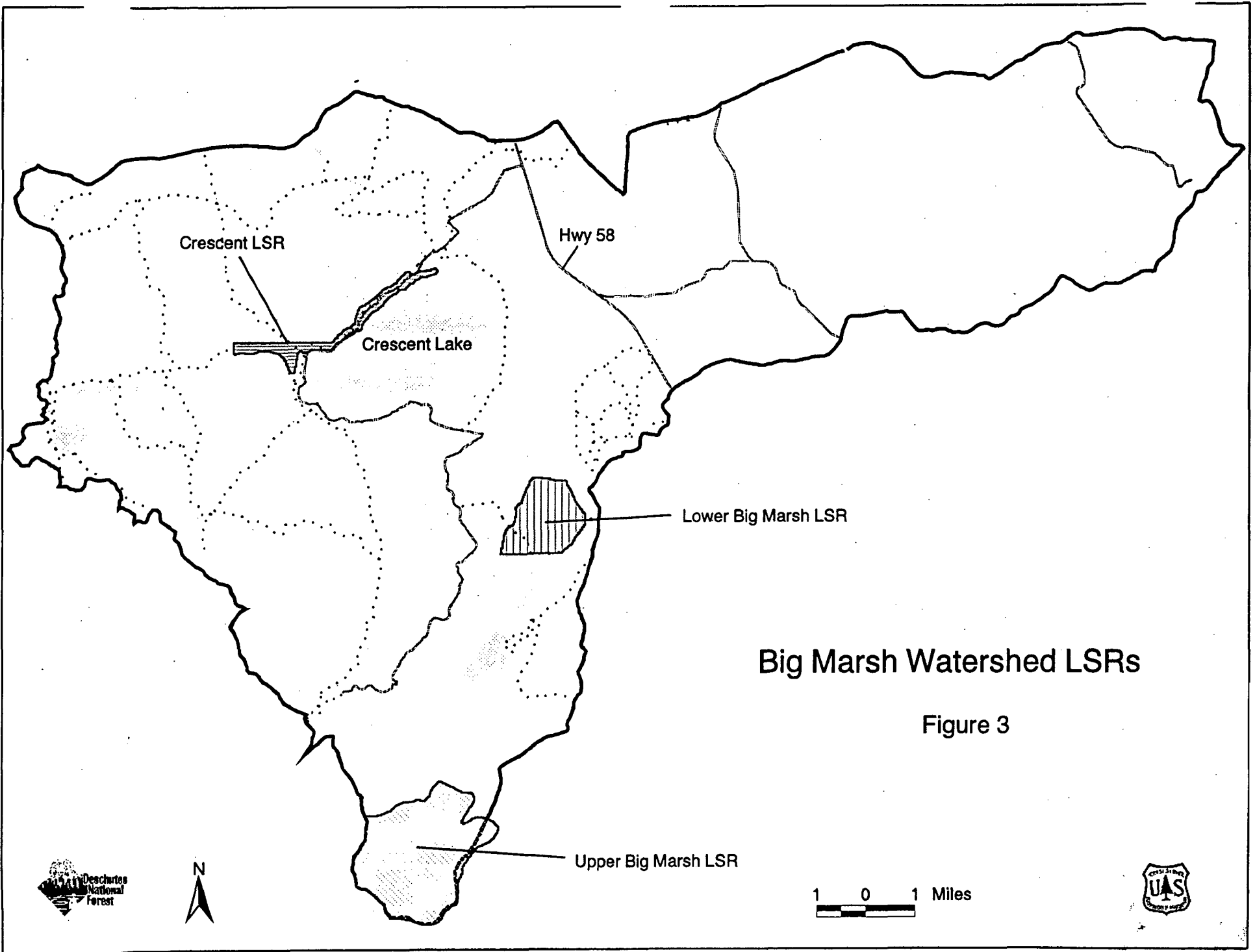
- Big Marsh Watershed Analysis - Historic Range of Variability and Plant Association Group discussions.
- Big Marsh LSR Assessment.
 - Chapter 2, Plant Association Group Descriptions Deschutes LSR Overview - Forest overview of vegetative conditions.
 - Chapter 4, Existing Condition, Fragmentation, Late and Old Structured Stands, Forest Dynamics.
 - Chapter 3, LOS Protection Strategies.

2) A list of identified late-successional associated species;

- Deschutes LSR Overview - Forest context of habitats.
- Big Marsh Watershed Analysis - Biological Domain.
- Big Marsh LSR Assessment.
 - Chapter 2, Components of the Wildlife Composite Map with Documentation.
 - Chapter 3, Areas with a Common Habitat Type and Function Description.
 - Chapter 4, Existing Condition, Wildlife.

3) A history and description of current land uses within the reserve;

- Big Marsh Watershed Analysis - Social Domain.



Crescent LSR

Hwy 58

Crescent Lake

Lower Big Marsh LSR

Big Marsh Watershed LSRs

Figure 3

Upper Big Marsh LSR



4) A fire management plan;

 Big Marsh LSR Assessment.

- Chapter 4, Existing Condition, Fire; Management Options, Fire Suppression
- Chapter 2, Fire Component - Fire History, Hazard, and Risk
- Appendix A, Fire Management Plan

5) Criteria for developing appropriate treatments;

 Northwest Forest Plan, Record of Decision Big Marsh Watershed Analysis - Goals, objectives, and opportunities Deschutes Land and Resource Management Plan - Standards and guidelines, Bald Eagle Management Plans, etc. Big Marsh LSR Assessment

- Chapter 3, Management Strategy Overview
- Chapter 4, Emphasis and Selected Species; Criteria for Developing Appropriate Treatments - Objective, Desired Condition, and Management Options

6) Identification of specific areas that could be treated under those criteria;

 Big Marsh LSR Assessment,

- -Chapter 4, Objectives and Management Options
- -Chapter 3, Management Strategy Overview, LOS Protection Strategies, and LOS Enhancement Strategies

7) A proposed implementation schedule tiered to high order (i.e. larger scale) plans;

 Big Marsh LSR Assessment.

- Chapter 4, Objectives and Management Options
- Chapter 3, LOS Protection Strategies and LOS Enhancement Strategies

8) Proposed monitoring and evaluation components to help evaluate if future activities are carried out as intended and achieve desired results.

 Big Marsh LSR Assessment.

- Chapter 4, Monitoring of Management Options; Monitoring, Evaluation, and Research
- Chapter 3, Monitoring Priorities

 Big Marsh Watershed Analysis

Public And Interagency Participation

A majority of the public input concerning the Big Marsh LSRs was conducted for the Big Marsh Watershed Analysis, which immediately preceded the LSR Assessment.

Interagency participation during the Big Marsh Watershed Analysis also benefited the Big Marsh LSR Assessments. During the Watershed Analysis process, two representatives from the US Fish and Wildlife Service helped review our assessment process and consequent management options.

CHAPTER 2

ANSWERING THE KEY QUESTIONS

LSR OBJECTIVE

"Late-Successional Reserves are to be managed to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for late-successional and old-growth related species including the northern spotted owl. These reserves are designed to maintain a functional, interacting, late-successional and old-growth forest ecosystem." (Northwest Forest Plan C-11).

Key Questions To Answer

In response to the objectives set for LSRs in the Northwest Forest Plan (C-11), the Big Marsh LSR Assessment Team developed two key questions to guide and streamline their data gathering and analysis process. The two key questions were stated as follows:

FIRST - How do the Big Marsh Late Successional Reserves serve as habitat for late successional and old growth related species including the northern spotted owl?

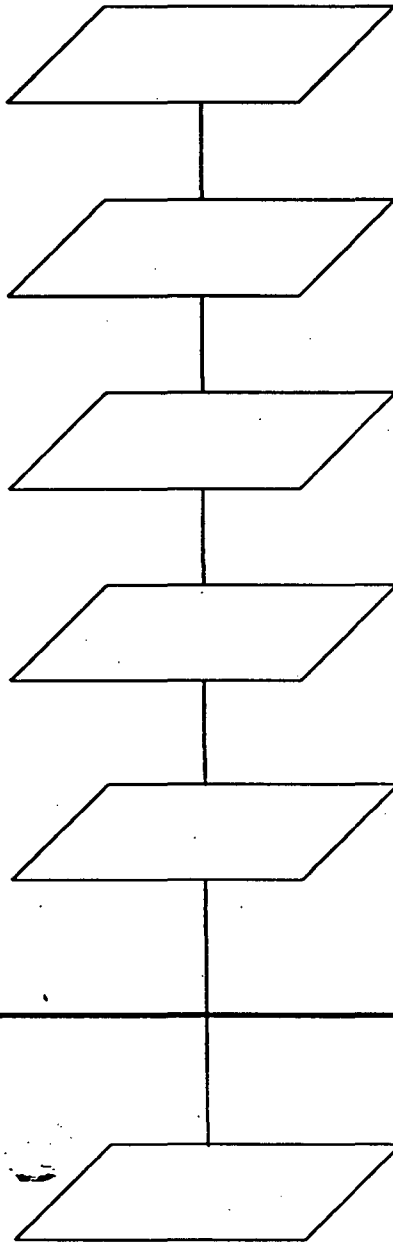
This question was developed to understand the different types of late-successional and old growth habitat that exist, or have the potential to exist, within the Big Marsh LSRs.

SECOND - Where and when are forest management activities needed to protect and enhance the existing and potential habitat for late-successional and old growth related species within the Big Marsh LSRs?

This question was then developed to understand the existing condition of LSRs to determine "when" and "where" management activities should be recommended to protect and enhance their late and old-structured components. The scope of potential management activities was confined to the issues and opportunities identified in the Northwest Forest Plan, the Deschutes National Forest LSR Overview, and the 1997 Big Marsh Watershed Analysis. The following activities were considered:

- Development/Maintenance/Enhancement of habitat for late-successional and old-growth related species (including wildlife, plants, fungi, etc.)
- Wildfire suppression
- Reduction of the risk of catastrophic fire disturbances
- Reduction of the risk of catastrophic insect and disease disturbances
- Utilization of fire, insect, and disease disturbances to meet habitat needs
- Monitoring/Evaluation of management activities
- Protection/Enhancement of threatened, endangered and sensitive species habitats
- Attainment of LSR-related objectives and opportunities in the Big Marsh Watershed Analysis
- Management of noxious weeds
- Restoration/Maintenance of soil quality within the LSRs
- Management of commodities within the LSRs
- Management of recreational use within LSRs
- Identification of resource inventory needs

How do the Big Marsh Late-Successional Reserves serve as habitat for late-successional and old growth related species including the northern spotted owl?



Known northern spotted owl activity centers - nest sites and home range radius.

Existing and potential northern spotted owl nesting, roosting, and foraging habitat.

Plant Association Groups - historic, existing, and potential vegetation.

Existing and potential habitat for black-backed and white headed woodpeckers, great gray and flammulated owls, goshawks, and forest carnivores.

Wildlife Management Areas allocated in the Deschutes National Forest Plan for bald eagle and elk.

Wildlife observation sites.

Riparian areas and their associated habitat.

A composite map illustrating areas within the Big Marsh LSRs that share a common dominant habitat type and function for late-successional and old growth related species

How do the Big Marsh LSRs serve as habitat for late-successional and old growth related species including the northern spotted owl?

Because the end product of the LSR Assessment should be a strategy that protects and enhances habitat for all late successional and old growth species known or suspected to occur in the Big Marsh LSRs, it is necessary to make conscious decisions about where to manage for which species and over what time period. A balance between species needs must be achieved and sustained over time.

Equally important are the interactions of these species and their culmination in a functioning forest ecosystem. Although it was not possible to visually illustrate the concept of "the whole is more than a sum of its parts" in this process, ecosystem function as well as emphasis species needs were considered to be key components in delineating the different habitat areas within the Big Marsh LSRs.

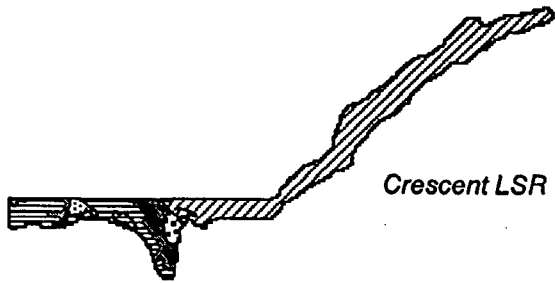
The following species or species groups and their associated habitats were selected to provide a means of focusing and prioritizing areas within the LSR for protection and enhancement activities: northern spotted owl, pileated woodpecker, northern goshawk, black-backed woodpecker, great gray owl, flammulated owl, white-headed woodpecker, northern bald eagle, osprey, wolverine, marten, fisher, elk, amphibians, and neotropical migratory birds. These emphasis species were selected because they utilize and represent a broad spectrum of habitat types in the various plant association groups (PAGs). Refer to Figure 5 for the distribution of the PAGs within the LSRs.

The black-backed woodpecker primarily utilizes late and old growth stands in the lodgepole pine PAG, and the spotted owl utilizes late and old growth stands in the mixed conifer PAGs. Moreover, various species may prefer different structural conditions within the same plant association group. In the mixed conifer dry PAG, the white-headed woodpecker utilizes forest stands with a more open structure, while spotted owls utilize stands with a more dense, multi-storied structure. It is assumed that by protecting and enhancing late successional ecosystems and attempting to accommodate the diverse habitat needs of these emphasis species, other late successional species will also be protected. (i.e., bryophytes, lichens, fungi, vascular plants, and invertebrates).

Figure 4 illustrates the thought process that was used to determine and delineate areas within the LSRs that share a common dominant habitat type and/or function. A prototype composite map, which is not included as part of this document, was first created by overlaying all of the habitat maps illustrated in Figure 4. Different habitat areas were delineated based on the current condition of habitat for these species and biological judgement. From this wildlife habitat composite map, areas were delineated where it was desirable to maintain habitat for certain species. If an area presently functions as a spotted owl activity center, it was delineated to serve as "climatic-climax" type habitat versus "fire-climax".

One area identifies where it is desirable to maintain a functional late and old structured (LOS) ecosystem in the mixed conifer PAG. This area would provide nesting, roosting, foraging (NRF) habitat for the spotted owl and the myriad of other plant and wildlife species that are associated with this type of ecosystem. Another area on the map illustrates an area of lodgepole pine PAGs where it is desirable to provide habitat for black-backed woodpeckers and a multitude of riparian associated species.

The wildlife habitat composite map illustrates the first step toward delineating specific areas to manage within each of the LSRs. The following is a general description of each component that contributed to the identification of the areas with a common dominant habitat type or function within the LSR. Detailed descriptions of habitat needs and their existing conditions can be found in Chapter 2, Biological Domain and Appendix B of the Big Marsh Watershed Analysis and in Chapter 4 of this assessment.

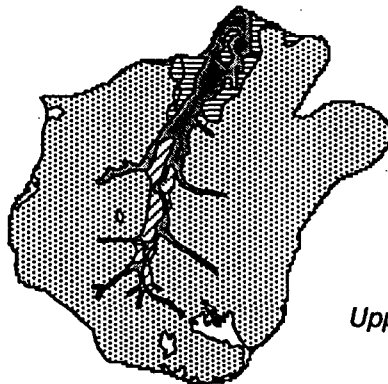


BMW LSRs Plant Association Groups (PAGs)

Figure 5

PAG Legend

	LPD
	LPW
	MCD
	MCW
	MDW
	MHD
	RIP
	ROCK



Northern Spotted Owl Component

The Big Marsh LSRs are located at the eastern edge of the range for the northern spotted owl. Protection of the owl in this fringe habitat is believed to be important for the viability of the species. Individuals and populations at the edge of a species range often possess the genetic constitution that expands the adaptive capability of the species. This capability affords the species protection from random catastrophic events and enhances its ability to adapt to large-scale changes such as global warming.

One known spotted owl activity center is located in the Upper Big Marsh LSR, and one activity center is located northwest of the Crescent LSR. Information on the Crescent Lake pair has been collected since 1987 and since 1982 for the Big Marsh pair (Crescent District Records). The Big Marsh pair was last confirmed in 1995, since then it has been surveyed for but not detected. The Crescent pair was last confirmed in 1990. The last time it was surveyed for was in 1995. Within the LSRs there are 1,542 acres of spotted owl nesting, roosting, and foraging habitat (NRF). Currently NRF habitat occurs on 31% of the LSRs. Dispersal habitat is located on 3,501 acres or 69% of the LSRs. (See Figure 6). The following table illustrated the breakdown by individual LSR.

Table 2-1, Northern Spotted Owl Habitat

	Dispersal Habitat (acres)	NRF Habitat (acres)
Crescent LSR	193 (31%)	406 (66%)
Lower Big Marsh LSR	1160 (97%)	37 (3%)
Upper Big Marsh LSR	2148 (66%)	1099 (34%)

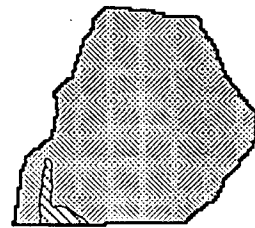
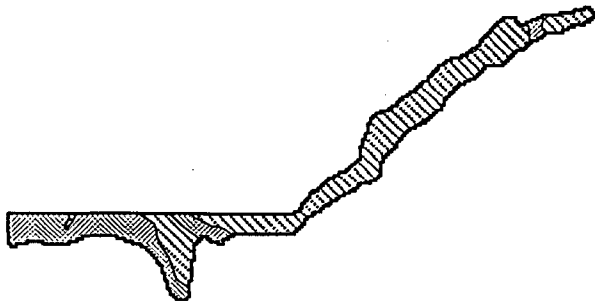
An assumption was made that mixed conifer wet and dry, lodgepole wet, and riparian plant association groups can be managed to create and sustain NRF and/or dispersal habitat and lodgepole dry, mountain hemlock, and lodgepole high dry can only be managed to create dispersal habitat. The mixed conifer wet and dry PAGs are the primary plant associations providing NRF habitat for the spotted owl. It must be recognized that NRF habitat is generally not considered sustainable long-term in the mixed conifer dry PAG without management intervention. Currently, the structure within the mixed conifer dry PAG that the owls are using has developed as a result of fire suppression and the consequent encroachment of white fir in the understory. This habitat type is unstable. The mixed conifer wet PAG most likely provided the majority of NRF habitat historically. It is believed that NRF habitat in the mixed conifer wet PAG is more sustainable long-term. Refer to the Big Marsh Watershed and Chapter 3 of this document for additional PAG information.

A limited amount of harvest has occurred within the three LSRs. Within the lodgepole PAGs 23 acres have been harvested in the last two decades. Within the mixed conifer PAGs a few acres were salvage harvested approximately 20 years ago along Crescent Lake, so late and old forest conditions that provide NRF habitat for the owl have not been reduced by harvesting.

The following table documents the amount of existing NRF habitat within a 0.7 mile and 1.2 mile radius (home range radius of a spotted owl) around each owl activity center.

Table 2 - 2, NRF Habitat Within 0.7 Mile and 1.2 Mile Radii

Owl Number	0.7 Mile Radius		1.2 Mile Radius	
	NRF Acres	% NRF	NRF Acres	% NRF
2007	346	35%	789	27%
2009	376	38%	923	31%

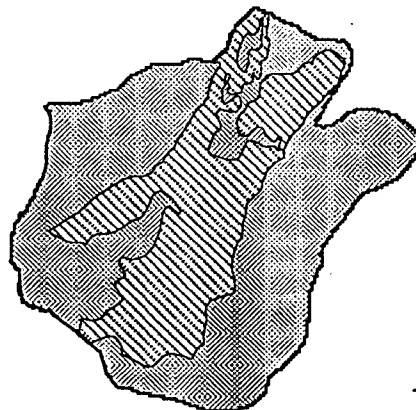


Northern Spotted Owl Habitat

Figure 6

Spotted Owl Habitat

-  Dispersal
-  NRF



If there is less than 50% suitable NRF habitat within the 0.7 mile radius or less than 40% within the 1.2 mile radius, then the owl is considered to be in the "take" category. This implies that further degradation or modification of the habitat, which results in a change from NRF to non-NRF, will constitute a "take" under the Endangered Species Act.

There is limited additional habitat available that is potential NRF habitat within the home range radii of the spotted owls. This is due to the distribution of the plant associations across the landscape. The area that is currently suitable NRF habitat is surrounded by mountain hemlock and lodgepole high/dry PAGs, which are not considered to be suitable NRF habitat. Some of the acres that are currently classified as mountain hemlock are believed to actually be mixed conifer dry. Refer to Page 3-2 for additional information. Additional mixed conifer acreage would provide habitat for the spotted owl and increase the percentage of the LSRs in NRF habitat.

Black-backed Woodpecker Component

There are documented current and historical sightings of the black-backed woodpecker within the Big Marsh LSRs (Crescent District Records). Currently 1,765 acres within the LSRs or 35% exist as black-backed habitat.

Approximately 1,392 acres within the LSRs are located in the lodgepole pine PAGs. An additional 479 acres exist in the mixed conifer PAGs. Although lodgepole pine is considered optimal habitat in the eastern Cascades, black-backed woodpeckers are also documented in the mixed conifer PAGs. The acreages from both PAGs were combined to estimate potential habitat in the LSRs. Approximately 1,871 acres, or 37% of the LSRs, are potential habitat for black-backed woodpeckers and other lodgepole pine associated species. (See Figure 7)

Table 2-3 Black-backed woodpecker habitat

	Black-backed woodpecker habitat (acres)	Percentage of the LSR
Crescent LSR	517	86%
Lower Big Marsh LSR	1060	89%
Upper Big Marsh LSR	188	6%

Great Gray Owl Component

Three recent sightings of the great gray owl have occurred in the vicinity of the Upper and Lower Big Marsh LSRs (1995 and 1997, Crescent District Records). The potential for additional birds to be present within and around the LSRs is high.

Currently, suitable nesting and foraging habitat exists for the great gray owl in all three LSRs. Foraging habitat includes meadows, riparian areas, and lodgepole wet stands. A total of 149 acres of foraging habitat exists in all three LSRs, and 1,059 acres of suitable nesting habitat are present. Nesting habitat is located in the mixed conifer and lodgepole PAGs within a quarter of a mile of suitable foraging habitat. (See Figure 8)

Table 2-4 Great gray owl habitat

	Great gray owl nesting habitat (acres)	Percentage of the LSR	Great gray owl foraging habitat (acres)	Percentage of the LSR
Crescent LSR	159	26%	0	0%
Lower Big Marsh LSR	426	36%	124	10%
Upper Big Marsh LSR	180	6%	7	0%

Northern Goshawk Component

There are no documented sightings or known nest sites for goshawks within the LSRs, however, nests are located in the vicinity and several sightings occurred around Big Marsh in 1997 (Crescent District Records).

Suitable nesting, post-fledging, and foraging habitat exists in all three LSRs. A total of 1,318 acres of suitable foraging habitat (26% of the LSRs) is located in the mixed conifer and lodgepole PAGs within the LSRs. Within the mixed conifer and lodgepole PAGs 983 acres of suitable nesting and post-fledging habitat exists. This constitutes 20% of the LSRs. In addition, there are 353 acres of riparian habitat that function as both nesting and foraging habitat. The acres listed for nesting/post-fledging and foraging habitat are not mutually exclusive, so there is overlap. See Figure 9 for the location and distribution of suitable goshawk habitat within the LSRs.

Table 2-5 Northern goshawk habitat

	Goshawk nesting habitat (acres)	% of the LSR	Goshawk foraging habitat (acres)	% of the LSR	Goshawk riparian habitat (acres)	% of the LSR
Crescent LSR	328	54%	383	63%	55	9%
Lower Big Marsh LSR	560	47%	829	69%	39	3%
Upper Big Marsh LSR	96	3%	106	3%	260	8%

American Marten Component

Documented marten sightings have occurred in the Upper Big Marsh LSR (1997 Crescent District Records). It is also strongly suspected that marten occur in the Lower Big Marsh and Crescent LSRs, due to the high quality habitat and documented sightings in the vicinity of the LSRs.

There are 4,258 acres of suitable marten habitat in the LSRs within the mixed conifer, lodgepole, mountain hemlock, and riparian PAGs. This equates to 84% of the LSRs. Virtually the entire area within the LSRs could provide suitable habitat for the marten, since they use a variety of PAGs.

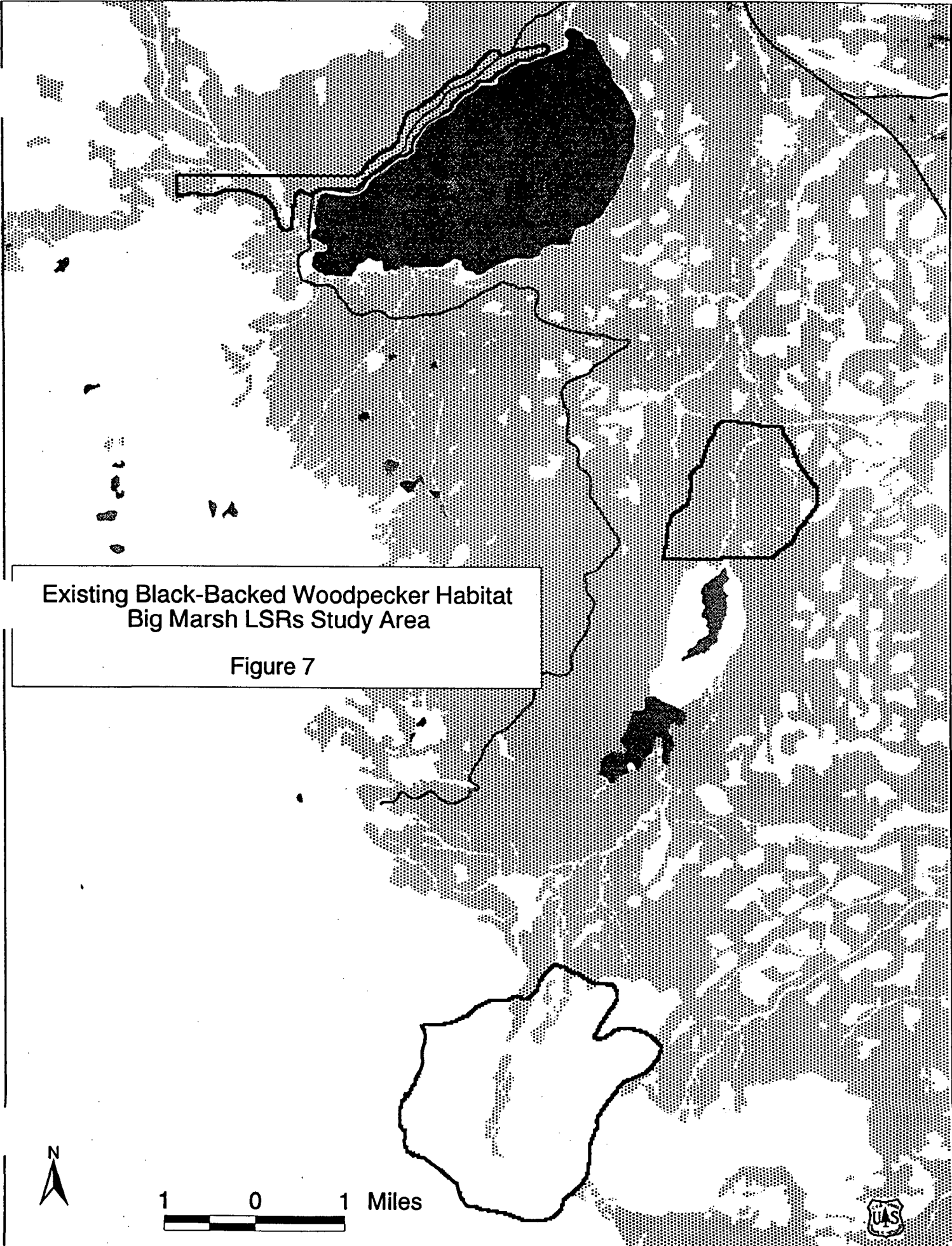
Down woody debris levels and crown cover are the factors that eliminated portions of the LSRs from providing suitable marten habitat at this time. See Figure 10 for the location of marten habitat within the LSRs.

Table 2-6 American Marten habitat

	American Marten habitat (acres)	% of the LSR
Crescent LSR	553	92%
Lower Big Marsh LSR	603	50%
Upper Big Marsh LSR	3104	96%

Flammulated Owl and White-Headed Woodpecker Component

There are no documented sightings of either flammulated owls or white-headed woodpeckers within any of the LSRs. The presence of flammulated owls and white-headed woodpeckers was confirmed within the Big Marsh Watershed between 1994 and 1996 (Crescent District Records). Potential habitat for both species exists within the LSR, and the probability of utilization is high.



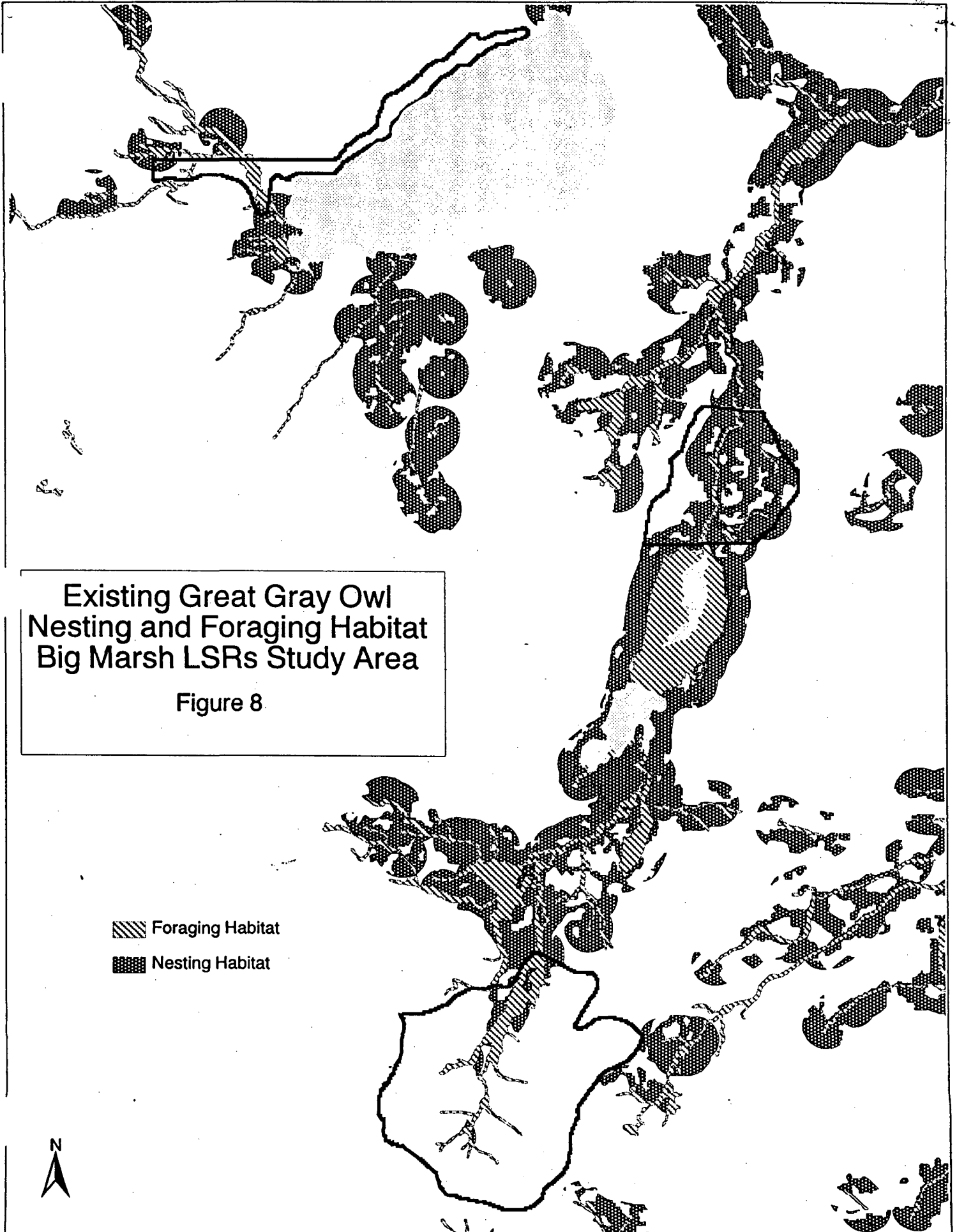
Existing Black-Backed Woodpecker Habitat
Big Marsh LSRs Study Area

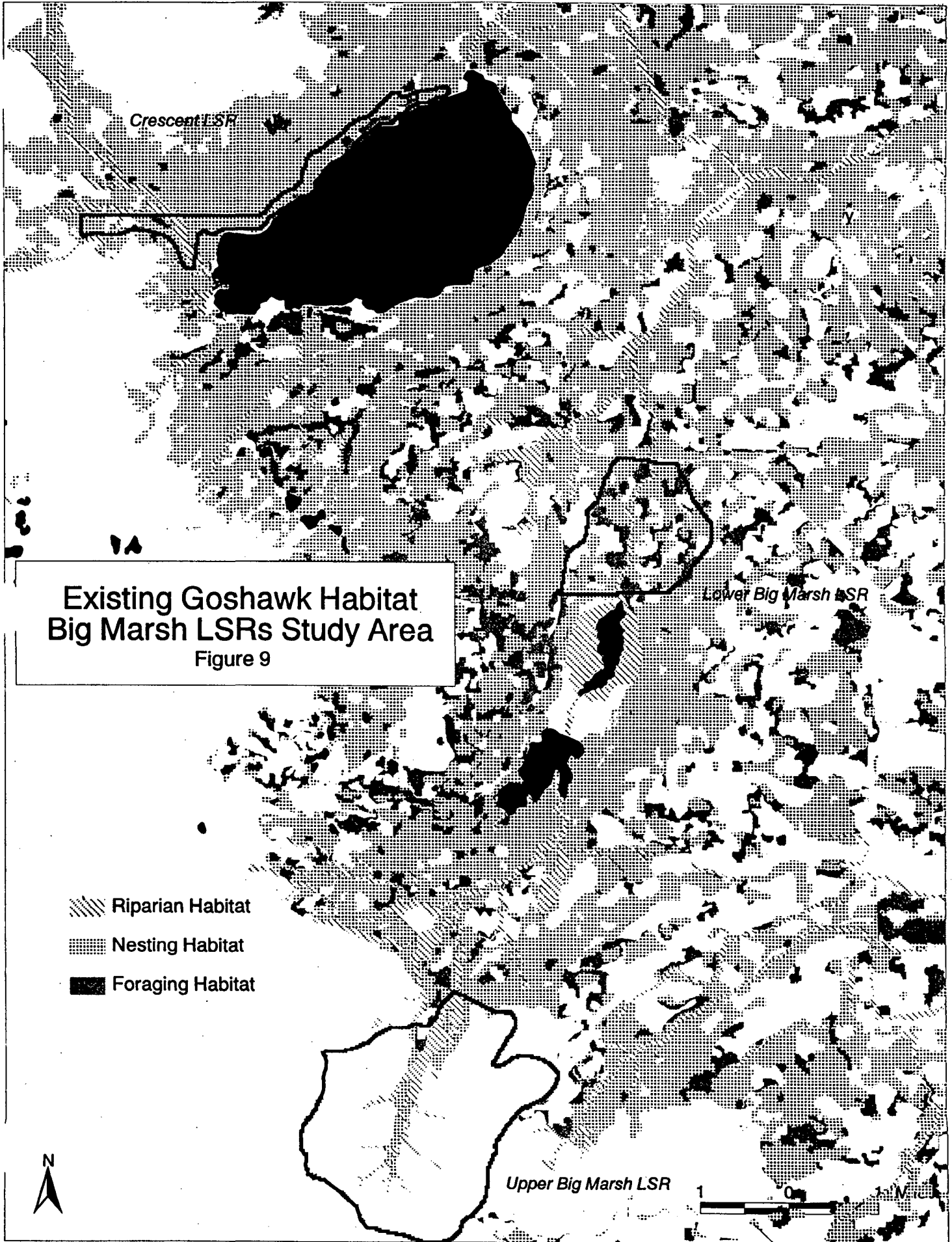
Figure 7

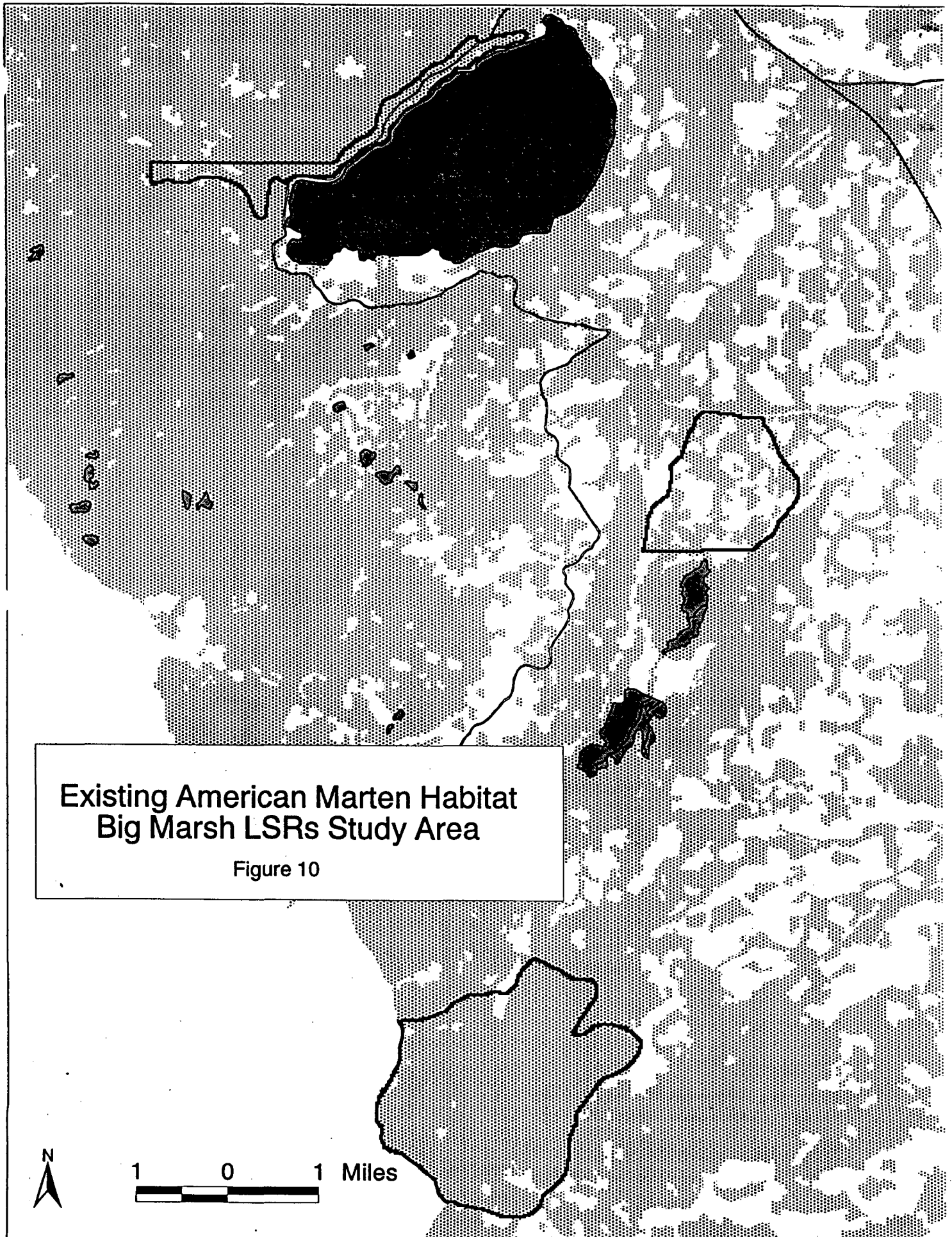


1 0 1 Miles









Existing American Marten Habitat
Big Marsh LSRs Study Area

Figure 10



1 0 1 Miles

Some areas within the mixed conifer dry PAG that are at high risk for insect/disease/fire were identified as habitat that should be managed for the white-headed woodpecker and flammulated owl. Some of these selected areas are currently NRF owl habitat but cannot be sustained as such. These areas could be treated, i.e. thinned, and would serve as optimal habitat for flammulated owls and white-headed woodpeckers for the next few decades. Concurrently these areas would remain foraging habitat for spotted owls.

Northern Bald Eagle Component

Existing and potential habitat for bald eagles are believed to be adequately represented by the current forest land allocation of the Bald Eagle Management Area (BEMA). The Crescent Lake Northwest BEMA, which is 145 acres, is located within the Crescent LSR. There are 399 acres of existing and potential habitat for bald eagles and ospreys within the Crescent LSR, which equates to 66% of the LSR (See Figure 11). There is another BEMA, the Crescent Lake East BEMA, located on the opposite side of Crescent Lake. In addition, there are approximately 200 acres of suitable eagle habitat located outside the BEMAs and LSR. The suitable habitat areas were identified in a study by the Oregon Eagle Foundation (Isaacs, 1992). Eagles currently utilize the Crescent LSR as roosting habitat. The Upper and Lower Big Marsh LSRs do not contain suitable habitat for the bald eagle.

Riparian Component

The Big Marsh Watershed Analysis provided a thorough analysis of the riparian habitats within the Big Marsh LSRs. Riparian Reserves were delineated and their functions for riparian-related species were documented. This information was used to help determine opportunities within the Big Marsh LSRs to provide habitat for riparian related species (See Figure 12). See Big Marsh Watershed Assessment pp., 5-23,24 for a complete description of the proposed riparian reserves.

Connectivity Component

The degree of fragmentation and connectivity between Big Marsh LSRs and adjacent LSRs was examined. Connectivity between the Upper and Lower Big Marsh LSRs is provided along the west side of Big Marsh through the Oregon Cascades Recreation Area (OCRA). The mixed conifer habitat along the east side of the marsh has been heavily fragmented by harvest activities.

Connectivity between Upper and Lower Big Marsh LSRs and the Crescent LSR is provided through the OCRA and Diamond Peak Wilderness along the south and west sides of Crescent Lake. The area between the Lower Big Marsh and Crescent LSRs along the east and north sides of Crescent Lake has been fragmented by harvest activities, private land including homes and developments, and roads.

The Diamond Peak Wilderness and the roadless area along Maklaks Mountain and Maiden Peak provide connectivity between the Crescent and Davis LSRs. The area between the Lower Big Marsh and Davis LSRs has been extensively fragmented by private land, roads, and timber harvest activities especially within the mixed conifer plant associations. Efforts should be made to enhance the connectivity between these LSRs to allow travel and movement of species.

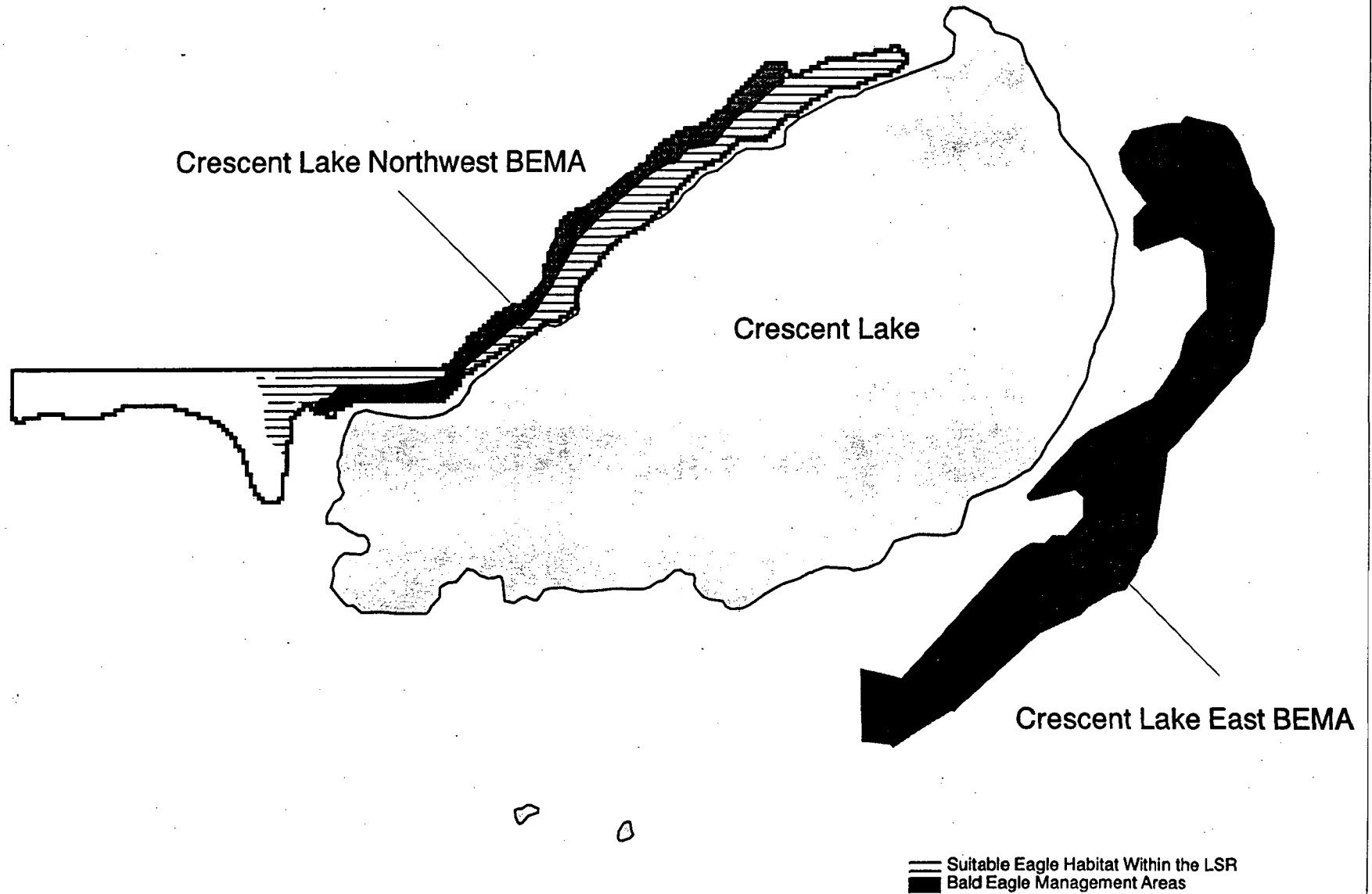
Elk Component

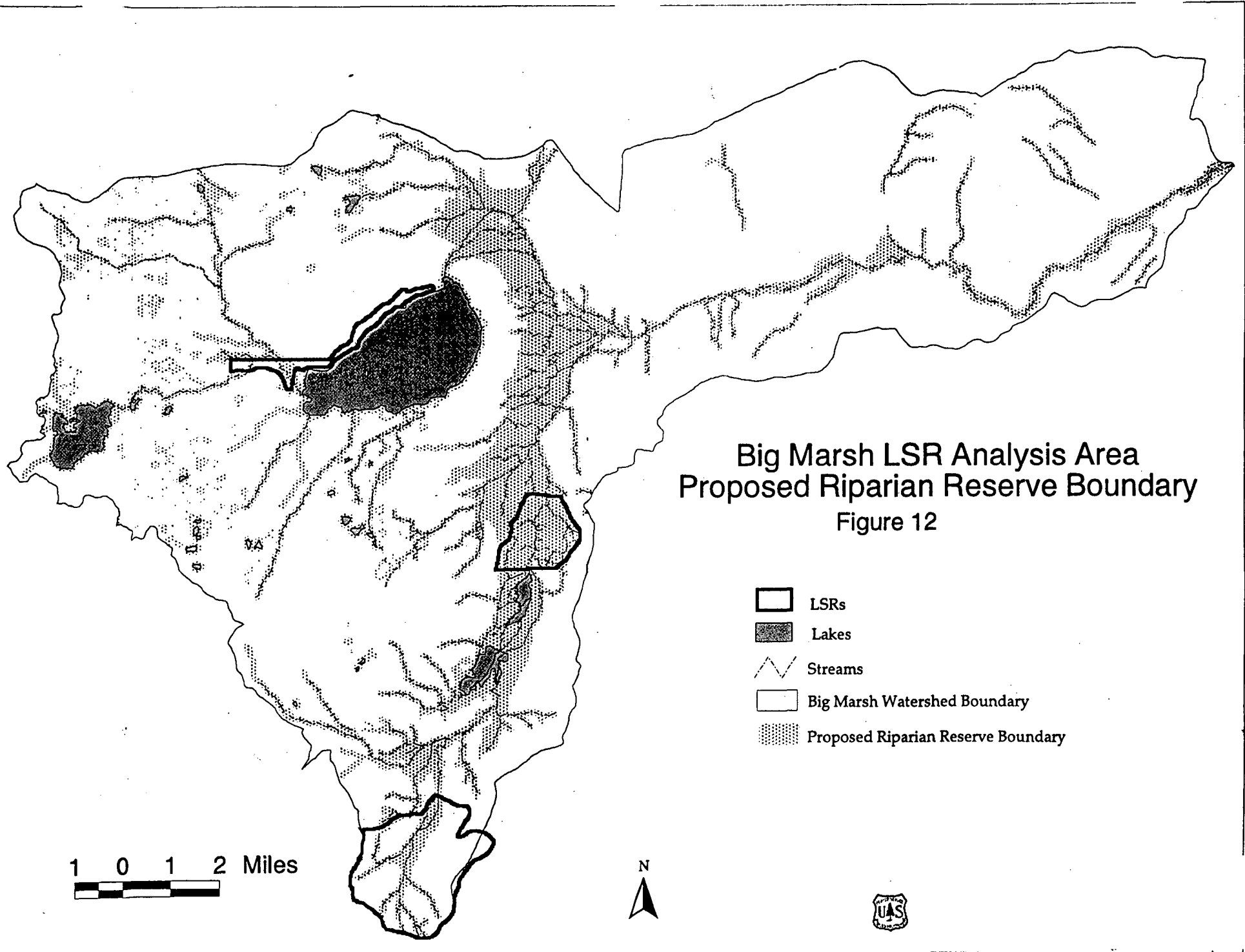
Two key elk habitat areas are located in the vicinity of the Upper and Lower Big Marsh LSRs (See Figure 13). These areas are delineated in the Deschutes National Forest Land and Resource Management Plan and were designated in cooperation with the Oregon Department of

Fish and Wildlife (ODFW). Key elk management areas provide important calving grounds for the species in addition to both summer and winter habitat.

Crescent LSR Bald Eagle Habitat

Figure 11





Big Marsh LSR Analysis Area Proposed Riparian Reserve Boundary

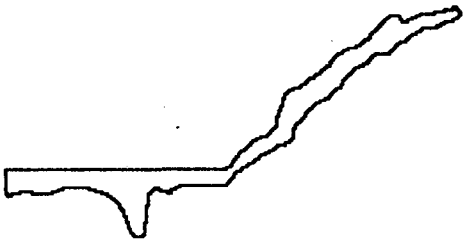
Figure 12

- LSRs
- Lakes
- ~ Streams
- Big Marsh Watershed Boundary
- ▨ Proposed Riparian Reserve Boundary

1 0 1 2 Miles



Crescent LSR

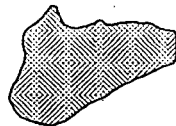


Lower Big Marsh LSR

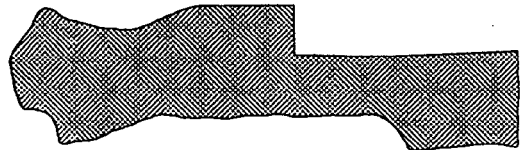


Key Elk Management Areas

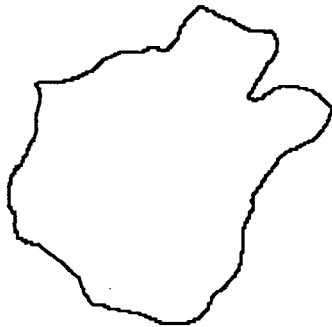
Figure 13



Fly -- Key Elk Area



Hemlock -- Key Elk Area



Upper Big Marsh LSR

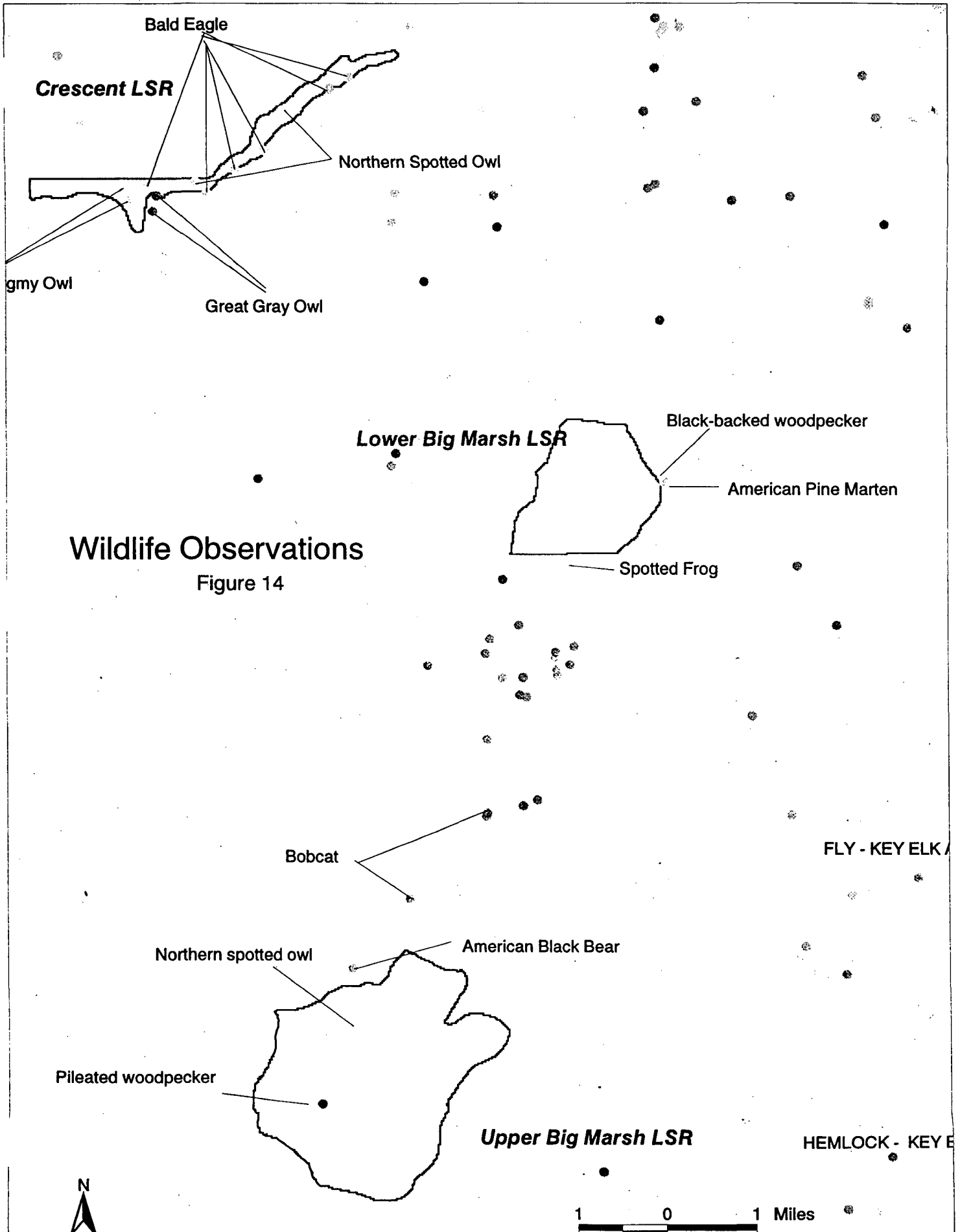


1 0 1 Miles



Wildlife Observations

The Crescent Ranger District maintains a database of all reported wildlife observations. Although this database is not a complete record of wildlife locations or movements, it provides good insights into where certain species spend a good portion of their time on the district (See Figure 14).



Where and when are forest management activities needed to protect and enhance the existing and potential habitat for late-successional and old growth related species within the Big Marsh LSRs?

The map generated by answering the first key question was used as the base map for delineating specific areas where activities are needed to protect and enhance late-successional habitats within the LSRs. Figure 15 illustrates the additional information that was used to determine the existing condition of the late-successional habitats within the Big Marsh LSRs and delineate specific areas for management.

Existing Late and Old Structured Forested Areas Component

Existing forested areas having a late and old structured (LOS) condition were mapped. This information was obtained in the following manner: size structure polygon information from the Landsat (PMR Data) maps was combined with specific stand information in the Geographic Information System (GIS) stand database to model the LOS stands. This information was updated based on the Large Tree Database, which was created in 1996 (See Figure 16).

Past Timber Harvesting Component

Regenerated areas are stands where past regeneration harvest activities occurred and reverted the vegetation to an early successional stage. Typically, the harvest activities that occurred were individual tree selection and seed-tree harvests.

Vegetation Component

The following table summarizes the acres and percentage of the plant association groups by LSR.

Table 2 - 7, Plant Association Groups Within Each LSR

LSR	LPD		LPW		MCD		MCW		MH		RIP		ROCK	
	acres	%	acres	%	acres	%	acres	%	acres	%	acres	%	acres	%
Crescent	136	23%	0	0%	374	62%	25	4%	12	2%	54	9%	3	0%
Lower	970	81%	168	14%	0	0%	0	0%	0	0%	59	5%	0	0%
Upper	120	4%	0	0%	80	3%	0	0%	2708	83%	130	4%	195	6%

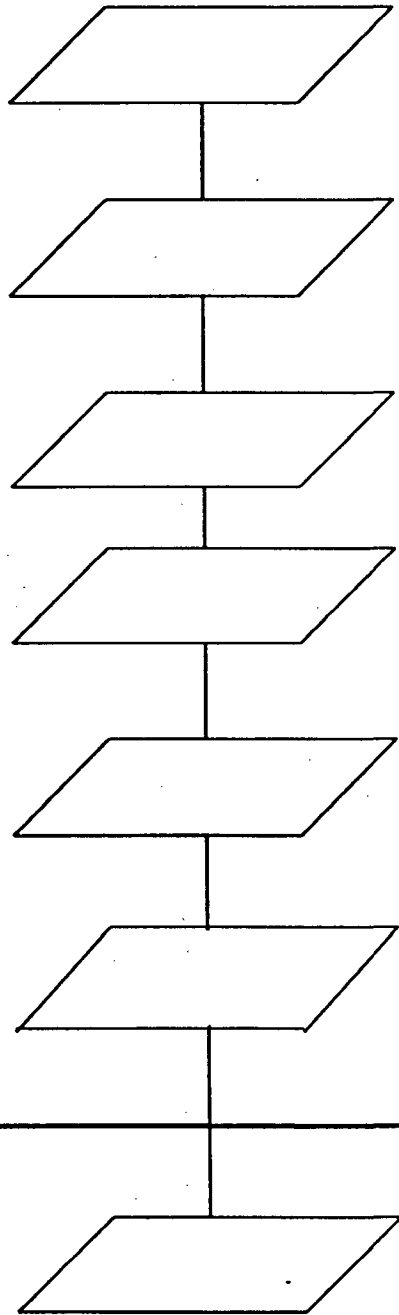
Refer to Chapter 2 of the Big Marsh Watershed for additional vegetation information.

Fire Component

The natural disturbance regimes, existing fire hazard, and fire risk were determined. Fire hazard relates to the severity of wildfire occurrence based on existing fuel profiles and risk relates to the probability of fire occurrence based on ignition sources (human versus lightning).

Fire management planning has been identified as a critical component of Late-Successional Reserve assessment planning east of the Cascade Mountains (ROD, Standards & Guidelines). Large-scale disturbance has the potential to eliminate old-growth and late-successional habitat on hundreds or thousands of acres by limiting the critical structural components of eastside late-successional habitat. Furthermore, the alteration or elimination of fire as a natural process in fire-dependent ecosystems (Big Marsh LSRs) is known to threaten the existence of plant and animal species adapted to such conditions. For these reasons, fire management planning becomes a significant issue in late-successional and old-growth management.

Where and when are forest management activities needed to protect and enhance the existing and potential habitat for late-successional and old growth related species within the Davis Late-Successional Reserve (LSR)?



Areas within the Big Marsh LSRs that share a common dominant habitat type and function for late-successional and old growth related species.

Existing forested areas in late and old structured condition.

Areas of past timber harvest activities - seed-tree harvest.

Existing Fire Hazard and Existing Fire Risk - risk of catastrophic loss of existing late and old structured forest due to fire.

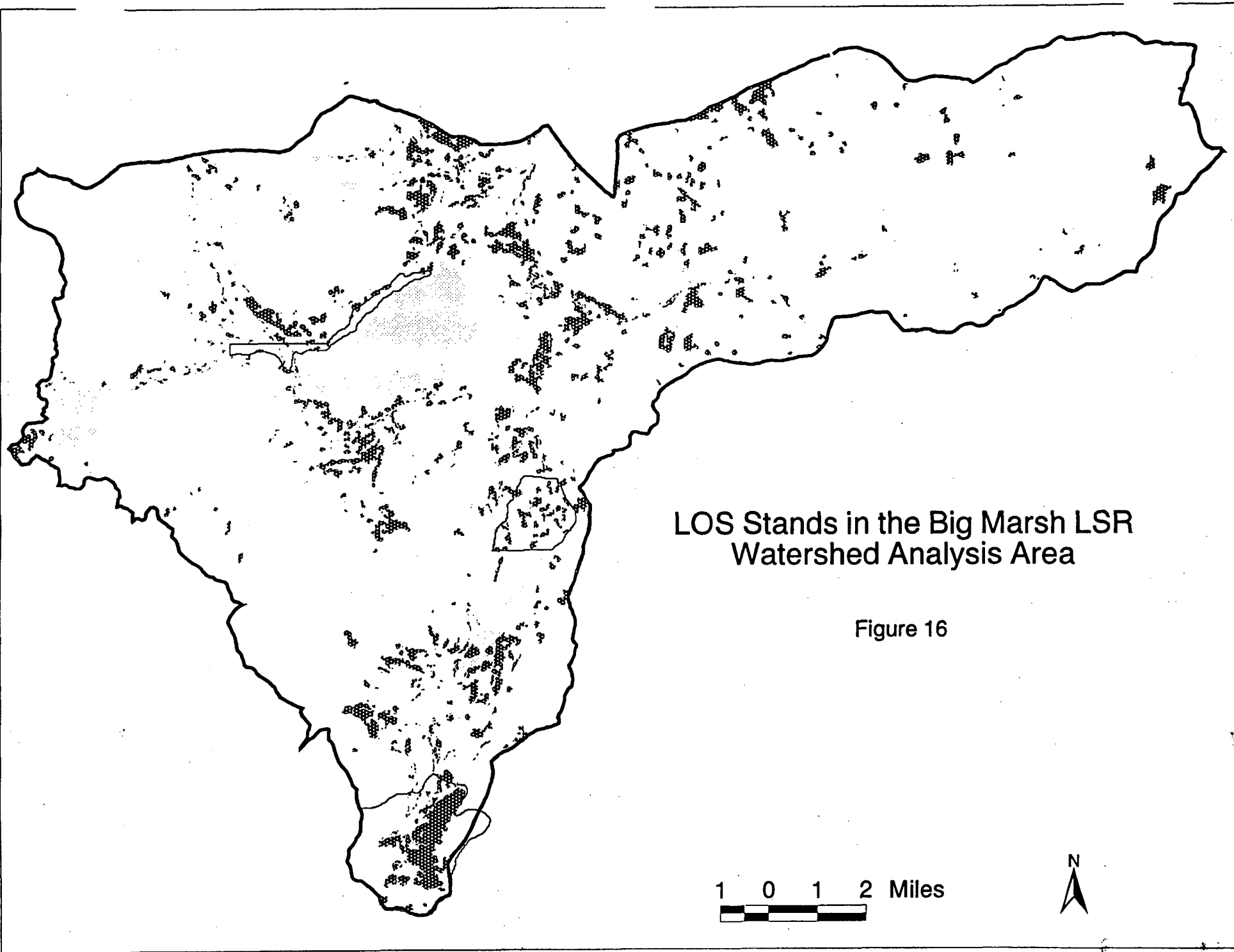
Forest Health - Risk of catastrophic loss of existing late and old structured forest due to insects and disease.

Plant Association Groups - potential habitat for sensitive plants, noxious weeds, and indicator of soil quality.

Landscape Areas from the Big Marsh Watershed Analysis - sets the overall social, physical, and biological context for the Big Marsh LSRs.

1990 Deschutes Land and Resource Management Plan land allocations and Crescent Travel and Access Opportunities and Restrictions.

A base map delineating specific areas within the Big Marsh LSRs to develop management objectives and criteria for the protection and enhancement of late-successional and old growth related species.



Historic Conditions and Natural Disturbance Regimes

Fire is a natural process that has played a role in shaping the landscape of the Big Marsh LSRs Area. Fire suppression and the effects of fire exclusion have also played a role in shaping the current landscape patterns (Metolius WA, Heath 1995). "Fire changes an ecosystem, community and population structure either by selectively favoring certain species or creating conditions for new species to invade. It usually favors early successional species, but sometimes can accelerate succession to favor late successional species" (Agee 1993).

Mixed Conifer (Dry and Wet)

Approximately 454 acres of mixed conifer dry (MCD) and 25 acres of mixed conifer wet (MCW) are located within the Big Marsh LSRs. Together the mixed conifer PAGs constitute 479 acres or 9.5% of the LSRs. Refer to the Big Marsh Watershed Analysis, Chapter 4 – Trend 3, for information on the role of fire within the mixed conifer PAGs. Refer to Figure 5 on Page 2-4 for the location of the mixed conifer PAGs.

Mountain Hemlock Dry

Approximately 2,709 acres or 53.9% of the Upper Big Marsh LSR is located in the mountain hemlock dry (MHD) PAG. There are 12 acres of this PAG in the Crescent LSR. This PAG typically falls into a high severity fire regime. Refer to the Big Marsh Watershed Analysis, Chapter 4 – Trend 3, for information on the role of fire within the mountain hemlock dry PAG. Refer to Figure 5 on Page 2-4 for the location of the mountain hemlock dry PAG.

Lodgepole Pine (Dry and Wet)

Approximately 1,226 acres of lodgepole dry (LPD) and 168 acres of lodgepole wet (LPW) are located within the Big Marsh LSRs. Together these two PAGs account for 1,394 acres or 27.0% of the landbase. Refer to the Big Marsh Watershed Analysis, Chapter 4 – Trend 3, for information on the role of fire within the lodgepole pine PAGs. Refer to Figure 5 on Page 2-4 for the location of the lodgepole pine PAGs.

Existing Condition

Management activities, primarily fire exclusion, and to a minor extent, stand management, have had notable effects on vegetation and fire regimes within the Big Marsh Late-Successional Reserves. The development of a heterogeneous landscape pattern has been interrupted by fire suppression, allowing regeneration and more shade-tolerant species to colonize the landscape. Consequently, the structural architecture of the vegetation in portions of the LSRs has been altered both horizontally and vertically. Larger, denser, patches of shade-tolerant vegetation have replaced the spatial distribution of a mosaic of clumped groups and even-aged trees. The subsequent increase in the vertical continuity of vegetation and fuelbeds allows surface fires to develop into understory or crown fires under moderate weather conditions (Newberry Fire 1995). Concurrent to the increase in average fire intensity, average fire tolerance of vegetation is decreasing as a result of shading and overstocking.

Risk and Hazard Analysis

In conjunction with high fire hazard; recreational use, urban interface, social activities, and lightning occurrences have resulted in a relatively moderate fire occurrence rate within the Big Marsh LSRs. The following chart shows the number of fires, human and lightning-caused, that have occurred in each of the LSRs since 1940, and the resulting risk rating.

Upper Big Marsh LSR

This LSR contains the mountain hemlock dry, mixed conifer dry, and a minor amount of lodgepole dry PAGs. The overall risk from insects and disease is moderate to high. Within the mountain hemlock PAG the risk would fall into the moderate category, while the remaining area would be classified as high risk for insects and disease. Stands for the most part are mature to overmature in structural stage, and stocked above the UMZ. Insects and diseases in the area include bark beetles, white pine blister rust, and root rots. Laminated root rot pockets are found in the mountain hemlock PAG. The potential exists for spruce budworm in the mixed conifer PAGs. The trend, assuming no management intervention occurs, will be for stands to continue moving towards later seral stages and increased stocking. As a result the risk for stand replacement events from insects, disease, and fire will increase. Refer to the Big Marsh Watershed Analysis, Chapter 4 - Trend 1, for additional information.

Botanical Component

Forest lands designated as Late Successional Reserves in the Northwest Forest Plan (NWFP) serve several objectives. The plan recognizes that there are a variety of species associated with late-successional forests, which play key roles in ecosystem functions. While past attention has focused primarily on late-successional vertebrate species such as the spotted owl, the NWFP addresses biodiversity concerns in a wider context. As one part of the consideration of plant and invertebrate animal biodiversity the plan requires "survey and manage" provisions for species of concern be applied as standards and guidelines common to all land allocations (ROD, C-4).

The survey and manage standard and guideline provides benefits to species of fungi, lichens, bryophytes, vascular plants, invertebrate animals, and other species. At this time very little specific information exists on most species of concern. Most habitat descriptions are based on few records and will be broadened as new sites are discovered. The following discussion is an effort to assess and apply existing information. Refer to the Big Marsh Watershed Analysis, Chapter 2, Botany, for a discussion on sensitive plants, species of concern (fungi, lichens, bryophytes, and vascular plants), and noxious weeds.

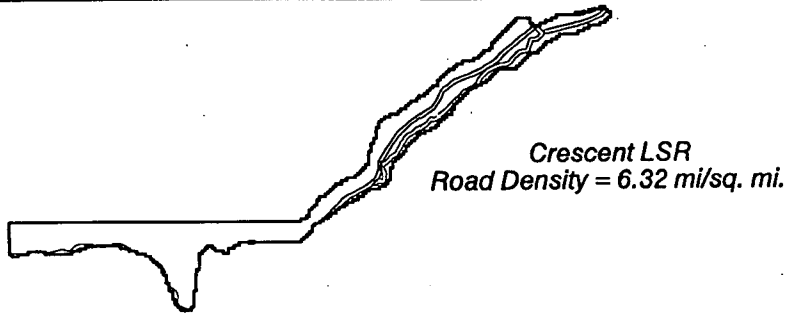
Species of Concern -- Vascular Plants

Surveys for vascular plants have been performed in portions of the LSRs. A review of plant lists from surveys conducted for projects identifies one species on the NWFP Appendix J2 list that has been found in the LSRs.

Sugar stick - *Allotropa virgata* -- Occurs in closed-canopy pole, mature, and old-growth seral stages in Douglas-fir and true fir. The plant is not abundant and may not emerge above ground or flower every year. *Allotropa virgata* has an obligate mycorrhizal relationship with a fungus and vascular plant for establishment and survival. One of the mycobionts may be *Tricholoma magnivelare*, the matsutake mushroom. Large woody debris and long rotations are important to the viability of this plant. It occurs on sites that are associated with past fires. Prescribed fire standards and guidelines may increase its viability over the long-term.

Populations of *Allotropa virgata* are isolated and although they are not restricted to old-growth, larger populations are found there. This plant has been observed in 60 year-old stands and stands with trees larger than 11 inches DBH. This plant needs large unfragmented areas to maintain viability and to promote gene exchange due to its small ephemeral seeds and obligate mycorrhizal relationship.

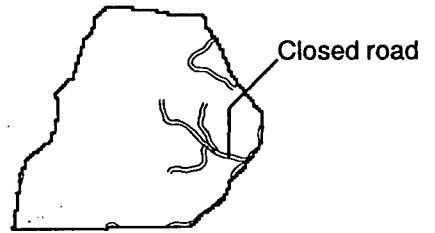
Fire suppression, fragmentation of habitat, and reductions of coarse woody debris are primary factors contributing to the decline of this species. Small patches of LOS forest contribute significantly to the predicted viability due to its limited dispersal capabilities. Fragments may



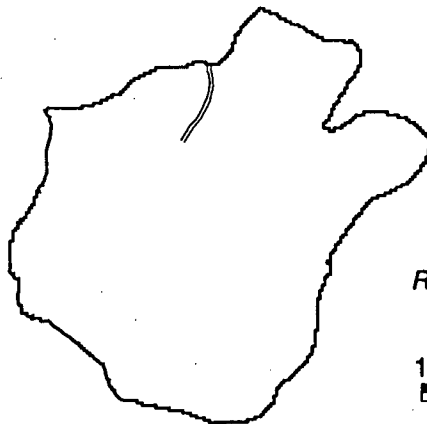
Big Marsh LSRs Open and Closed Roads

Figure 17


 LSR Boundaries
 Open Roads

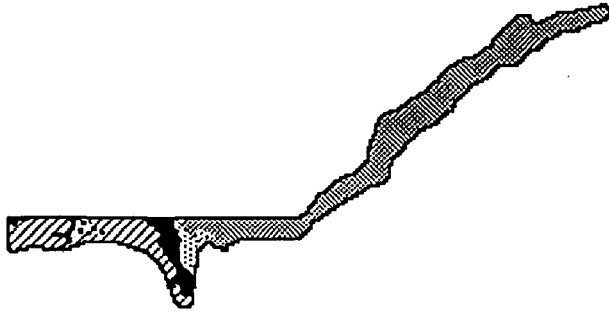


Lower Big Marsh LSR
Road Density = .48 mi./sq. mi.








Upper Big Marsh LSR
Road Density = .11 mi./sq. mi.

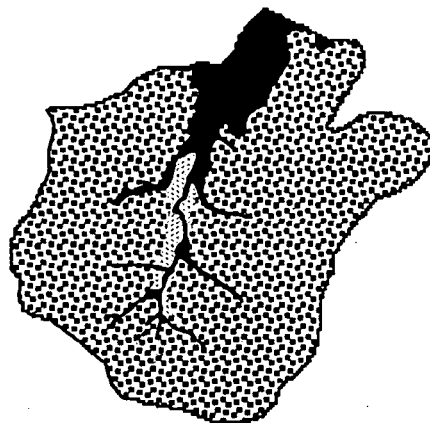





Big Marsh LSRs Late-Successional Forest Habitats

Figure 18

-  Mixed conifer for bald eagle
-  Mixed conifer for spotted owl
-  Mixed conifer/lodgepole connectivity
-  Lodgepole and/or riparian for black-backed wp
-  Mountain hemlock for wolverine



0.6 0 0.6 1.2 Miles




CHAPTER 3

MANAGEMENT STRATEGY OVERVIEW

BIG MARSH LSRs MANAGEMENT STRATEGY OVERVIEW

This chapter is intended to be an overview of the management strategies to protect and enhance the Big Marsh LSRs. These strategies range from identifying the desired levels of snags and large woody debris to reducing the risk of catastrophic loss of late and old structured (LOS) forest within the LSR. Where appropriate, priorities for management activities and appropriate scales and schedules are recommended. Chapter 4 provides specific information and management recommendations for each individual LSR.

Management strategies for the Big Marsh LSRs are designed to protect and enhance a composition of five types of late-successional forest habitats. Emphasis/indicator species were selected for each of the five habitat types and their habitat needs were quantified to characterize the desired late-successional conditions. The five forest types include: (Figure 18)

- Mixed conifer for spotted owl
- Mixed conifer for bald eagle
- Mixed conifer/lodgepole with dual connectivity function
- Lodgepole with/without riparian for black-backed woodpecker and/or riparian habitat
- Mountain hemlock for wolverine.

Area Descriptions

Mixed conifer for northern spotted owl – This type is comprised of areas that currently function as nesting, roosting and foraging habitat for the northern spotted owl and provides habitat for other old growth related species with similar habitat needs. Mixed conifer wet and dry plant association groups (PAGs) occupy the majority of the area. The desired condition for this mixed conifer area is to provide climatic-climax habitat versus a fire-climax condition. It is recognized that this climatic-climax condition may leave the desired components of habitat at high risk or imminently susceptible to insect attack and/or wildfire on the east side of the Cascades. The overall management strategy for this area is to reduce the imminent susceptibility of habitat loss while maintaining the highest quantity and quality of climatic-climax habitat as possible in the short and long-term. The breakdown by LSR is:

Table 3-1, Mixed Conifer for Northern Spotted Owl

	Crescent	Lower Big Marsh	Upper Big Marsh
Mixed conifer for NSO	25 acres*	0 acres	78 acres +

*These figures need further explanation. In Crescent LSR, the decision was made to manage for the bald eagle in the mixed conifer dry PAG. The team felt that this LSR would provide much needed bald eagle habitat in the vicinity of Crescent Lake. Since the LSR is comparatively narrow and small, it was felt that managing for the bald eagle in the narrow strip of LSR would make the most sense. This strategy will make the best use of the surrounding land allocations for the northern spotted owl, (Wilderness and OCRA) while effectively utilizing the narrow strip of land near the lakeshore for the bald eagle. Much of the nearby wilderness and OCRA lands adjacent to the Crescent LSR are potential NRF habitat for the northern spotted owl. One third of the acreage in the LSR is currently allocated as a Bald Eagle Management Area under the Deschutes LRMP. In calculating the above acreages, mixed conifer dry was allocated for bald eagle habitat in the Crescent LSR. The 25 acres identified as spotted owl habitat are the mixed conifer wet PAG acres.

+ In the case of the Upper Big Marsh LSR, new satellite data suggests that approximately 1,119 acres of what is now classified as the mountain hemlock PAG may actually be mixed conifer dry PAG. This information is based on the Large Tree Database that was completed under a contract by the Deschutes National Forest in the spring of 1997. This information is currently being verified on a district level. Until that work is complete, the Crescent District will continue to use the information that is currently available in the forest Geographical Information System files. If the acres need adjusting, it will be done after this document is published and then on a forest-wide basis. The District silviculturist believes that a majority of the hemlock acres are indeed mixed conifer dry. When these PAG discrepancies are adjusted, many of the wildlife habitat maps throughout this document will need to be adjusted.

Mixed conifer for bald eagle - This area encompasses approximately 374 acres of the Crescent LSR, the area primarily consisting of stands in the mixed conifer dry PAG that are proximate to Crescent Lake. This area currently provides habitat for the bald eagle and dispersal habitat for the northern spotted owl. The overall management strategy for this area is focused on sustaining and enhancing a large tree component to accommodate the bald eagle in the short and long-term. The stands near Crescent Lake will move toward a fire-climax type habitat to retain and enhance the large tree component and help reduce the risk of a catastrophic event in the LSR. Stands in the adjacent Diamond Peak Wilderness are capable of sustaining a greater density of trees and should continue to provide nesting, roosting, and foraging habitat for the northern spotted owl.

Table 3-2, Mixed Conifer for Bald Eagle

	Crescent	Lower Big Marsh	Upper Big Marsh
Mixed Conifer for Bald Eagle	374 acres	0	0

Mixed conifer/lodgepole with dual connectivity function - These areas encompass 136 acres of the Crescent LSR. They are mostly comprised of the lodgepole PAG and connect other large patches of late and old-structured suitable lodgepole habitat within the Big Marsh Watershed. The location and physiographic features of these areas also make them an important link for connecting existing spotted owl activity centers. Although these areas are not capable of providing nesting, roosting, or foraging habitat, the strategy is to manage these stands to provide dispersal habitat for the northern spotted owl and suitable LOS lodgepole habitat.

Table 3-3, Mixed Conifer/Lodgepole With Dual Connectivity

	Crescent	Lower Big Marsh	Upper Big Marsh
Lodgepole connectivity	136 acres	0	0

Lodgepole with/without riparian for black-backed woodpecker and/or riparian habitat - This area encompasses approximately 1507 acres within the Big Marsh LSRs. This basin is dominated by lodgepole pine PAGs and bisects the mixed conifer stands and spotted owl habitat within the LSR. The overall strategy for this area is to provide large contiguous blocks of mature and overmature lodgepole for the black-backed woodpecker and marten throughout the short and long-term. Large blocks (1000+ acres) of late and old structured lodgepole will be rotated throughout the area in and around the LSRs to sustain an area of old growth over time and reduce the risk of a catastrophic fire. This type of area includes all of Lower Big Marsh LSR.

Table 3-4, Lodgepole and Riparian for Black-backed Woodpecker

	Crescent	Lower Big Marsh	Upper Big Marsh
Lodgepole and Riparian for Black-backed Woodpecker	0	1177 acres	330 acres

Mountain hemlock for wolverine - This mostly roadless area encompasses about 2709 acres of the Upper Big Marsh LSR and is characterized by the mountain hemlock and lodgepole high elevation PAGs. The vegetation within this area is believed to be within its historic range of variability and is not highly susceptible to catastrophic loss of existing structure or character due to insects or wildfire. The overall management strategy for this area can be best described as little to no activity necessary. At this time the existing condition is consistent with the desired condition.

Table 3-5, Mountain Hemlock for Wolverine

	Crescent	Lower Big Marsh	Upper Big Marsh
Mountain Hemlock for Wolverine	12 acres	0	2709 acres*

* Based on the discussion documented under Mixed Conifer for the Northern Spotted Owl on Page 3-2, the acres within the mountain hemlock PAG that would function for wolverine would be decreased.

DESIRED LATE SUCCESSIONAL CONDITIONS

The intent of the following section is to: (1) provide a quantitative overview of the LSRs in terms of how much suitable habitat for the selected late-successional and old-growth related species is sustainable within the plant association groups; (2) provide a quantitative description of the desired suitable habitats for the emphasis late-successional related species by PAG; and (3) document the motivation, thought processes, and criteria utilized to develop these descriptions.

Overall Desired LSR Conditions

Although it has been recognized for some time that forest conditions east of the Cascades are more susceptible to catastrophic fire and insect and disease infestation than westside forests, the reality of how these differences would affect the management of the Big Marsh and other LSRs on the Deschutes National Forest was not fully realized until the spring of 1996. As various LSR and project implementation teams across the Deschutes National Forest began comparing suitable habitat conditions with stand conditions that silviculturists, entomologists, and pathologists consider sustainable, the determination was made that suitable habitat is not sustainable in most of the eastside ecosystems.

This determination made it clear that a strategy was needed to determine how LSRs on the Deschutes National Forest could be managed to retain both suitable and sustainable habitat conditions on a temporal and spatial scale. A Science Team was established to develop a scientifically credible strategy to address the issue. Documents detailing the processes, research, and products of the Science Team are included in the Appendix to the Davis Late Successional Reserve. The following summarizes the findings of the Science Team that affect the management strategies for the Big Marsh LSRs.

To quantify and define "sustainable habitat", the Science Team developed criteria to classify forest stands as *imminently susceptible to insect attack or wildfire*. **Imminently susceptible** is defined as

a situation where the conditions are such that it is very likely there will be significant change in structure or character of forest stands on a large scale as a result of insect attack and/or fire within the next 10 years. Changes that would result in large scale loss of existing late and old-structured components within the LSR were the primary concern of the LSR team.

The upper management zone (UMZ) for a given plant association group represents the point at which tree mortality begins to occur due to competition for site resources. The UMZ is the site-specific density level of trees at which a suppressed class of trees develops (Cochran et al 1994). This density level, which varies by PAG, also identifies the point at which pine-associated bark beetles and other density-related pests can develop to epidemic levels. The non-density related pests also benefit from stands above the UMZ in that they have considerable opportunity to become established in the stands especially when periodic droughts occur.

The upper management zones established for the various PAGs within the Big Marsh LSRs were used along with fuel profiles to determine "sustainable habitat". Therefore, only forest stands with a density level equal to or below the UMZ established for each PAG ($\leq 100\%$ UMZ) are considered to be sustainable in the long-term. The UMZ and fuel profiles were chosen as indicators of risk because bark beetle epidemics and high intensity wildfires are the most common causes of significant and unexpected large tree mortality.

The difference between what is believed to be "sustainable habitat" versus what is currently functioning as "suitable habitat" within the Big Marsh LSRs is illustrated by the example below. This table displays Basal Areas (BA) and Trees Per Acre (TPA) for an existing late and old-structured mixed conifer dry stand within the Big Marsh LSRs. Values in the first column indicate suitable habitat conditions for the northern spotted owl (nesting, roosting, and foraging habitat). Values in the second column indicate sustainable habitat as defined by stand density indexes and upper management zones (Cochran et al 1994).

<u>SUITABLE HABITAT</u>	<u>SUSTAINABLE HABITAT (100% UMZ)</u>
BA = 169 Range (135-203)	BA = 120 Range (115-128)
TPA = 345 Range (276-414)	TPA = 90 Range (40-175)

The differences between "suitable habitat" and "sustainable habitat" challenged the Science Team to determine an appropriate balance of vegetative conditions that would allow the LSRs to function as intended and be sustainable in the short and long-term. The following considerations were factored into quantifying the desired balance:

- Habitat thresholds for LOS associated species;
- Context of the LSRs within the surrounding landscape and management allocations;
- Upper management zones;
- Historical Range of Variability (HRV); and
- Cycling structural stages to provide suitable habitats throughout time.

The table below is one of the final products developed by the Science Team. The table displays a balance of three vegetative conditions including an effective proportion of both "suitable" and "sustainable" habitats. The third vegetative condition represents a "transitional" stage in which forest stands do not contain the desired "suitable" and/or "sustainable" habitat conditions. Stands in this condition could have tree densities above the upper management zone ($>100\%$ UMZ) and/or structural components that do not provide suitable habitat.

Table 3-6, Desired Late Successional Reserve Condition

PAG	Suitable Habitat		% \geq UMZ but < Suitable Habitat	% < UMZ
	% Climatic	% Fire		
MH	70 (40-70)	N/A	15 (0-30)	15 (0-30)
MCW	60 (51-69)	N/A	10 (0-20)	30 (20-40)
MCD	40 (30-50)	10 (5-10)	25 (20-30)	25 (20-30)
PPW/PPD	5 (0-1)	55 (40-70)	20 (10-30)	20 (10-30)
LPW/LPD	50 (30-70)	N/A	10 (0-20)	40 (20-60)

This quantitative description of the overall desired condition for the LSR serves several important functions. First, it sets clear and measurable objectives for future management of the Big Marsh LSRs as a whole. Secondly, it provides project planning teams a means to evaluate the existing condition of the LSR in relationship to the desired condition. This allows teams to prioritize management activities within the LSR.

This table also provides baseline data to evaluate and monitor how effectively future projects move the LSR toward the desired condition. This baseline can also facilitate an evaluation and comparison of LSR conditions across the Deschutes National Forest.

The manner in which the desired balance of vegetative conditions (Table 3-6) is spatially distributed throughout Big Marsh LSRs over time is best illustrated by the five areas described at the beginning this chapter (p. 3-1). Areas designated within the LSR to provide "mixed conifer for northern spotted owl" will retain the appropriate percentage of climatic-climax suitable habitat in the mixed conifer dry and wet PAGs. Areas designated to provide "mixed conifer for bald eagle" will be managed to provide the balance of fire-climax suitable habitat in the mixed conifer dry PAG.

Areas designated as "Lodgepole with/without riparian for black-backed woodpecker and/or riparian habitat" or "Mixed conifer/lodgepole with dual connectivity function" will be managed to attain the desired balance of vegetative conditions within the lodgepole pine wet and dry PAGs. The area designated as "Mountain hemlock for wolverine", will continue to provide a balance of conditions as quantified for the mountain hemlock PAG.

Over time, the desired percentages of each PAG in the "sustainable" or "transitional" conditions will shift spatially throughout the LSR based on the existing conditions of vegetation and the associated habitats. Chapter 4 provides detailed descriptions of the existing conditions within each LSR and identifies when and where changes in the existing conditions are appropriate in the short and/or long-term.

Suitable Habitat Descriptions by PAGs and Emphasis Species

Table 3-7 describes and quantifies "suitable habitat" as referenced above in Table 3-6. These descriptions are organized by plant association groups and the associated emphasis/indicator species. These suitable habitat conditions were based on peer-reviewed literature most appropriate for eastside habitat conditions and research conducted on existing habitats within the Deschutes National Forest.

The suitable habitat conditions characterized in the following tables should be used to determine appropriate silvicultural treatments and prescribe appropriate levels of snags and down wood throughout the Big Marsh LSRs. As previously mentioned, each LSR described in Chapter 4 delineates the desired locations for these conditions within the Big Marsh LSRs. The five areas previously described by PAG and emphasis species such as "mixed conifer for the northern spotted owl" provide a conceptual picture of how these habitats should be distributed across the LSR.

Additional Recommendations For Managing Dead Wood Component

Table 3-7 summarizes the recommended levels of snags and coarse woody debris needed to provide the desired suitable habitat conditions by PAG. Treated stands should retain dead wood that represents the species composition of the original stands. The material that is retained should be among the largest available. The recommendations listed below provide additional guidance in project implementation to help obtain and sustain the desired habitat conditions.

Management of Dead Wood in Existing Regenerated Areas (i.e. seed-tree units)

Manage regenerated areas such that natural mortality will occur to create the desired dead wood components over time. In the first few decades this will be accomplished by leaving 15% of the area untreated within precommercial thinning units. In subsequent decades this will be accomplished by varying thinning densities in treated units.

Management of Dead Wood in Forested Areas That Do Not Need Treatment

Active snag or down wood creation is not recommended unless there are other objectives for entering a stand. Allow natural mortality to occur to provide snags and future down woody debris.

Management of Dead Wood in Forested Areas That Need Treatment, Including Selection Cutting, Commercial Thinning, Firewood and Underburning

All treated stands should comply with the following guidelines:

- Retain dead wood that represents the species composition of the original stand.
- Retain material among the largest available on the site to meet dead wood requirements.
- Retain adequate green tree replacements to provide future dead wood at levels specified in Table 3-7.
- Retain snags and down woody debris in all decay classes.

If treated stands are below the following snag levels, diseased trees will be retained to accomplish this level:

- Mixed conifer PAGs: 4 snags/acre of > 16" dbh
- Lodgepole PAGs: 5 snags/acre of > 7" dbh.

If inadequate down woody debris is present within a stand and trees are being felled to meet risk reduction objectives, whole trees that are among the largest felled should be left on site at levels specified in Table 3-7 for suitable habitat. No live trees should be felled with the sole objective of meeting down woody debris requirements, i.e. trees that need to be felled to meet desired basal areas should be left on site rather than falling additional trees for down wood and taking the stand lower than target basal areas.

Table 3-7, Suitable Habitat by Plant Association Group

LOGEPOLE PINE DRY

PAGs	Snags/Logs ≥9" Tons/Acre & Cu. Ft./Acre	Canopy Cover	Canopy Layers	Total Mean		Sapling 1.0 – 4.9"	Pole 5.0 – 8.9"	Small 1 9.0 – 14.9"	Small 2 15 – 20.9"	Med 1 21 – 24.9"	Med 2 25 – 31.9"	Large ≥ 32"	Special Features and Key Tree Species
				TPA									
LPD (Climatic) Indicators: BBWP GGO NG	8-12 tons/ac. or 700- 1000ft ³ /ac. Snags: 100%≥11"dbh (ex.13-27/ac.) Logs: 100%≥11" dia. (ex. 34-72/ac.)	Avg. 40%	≥1	TPA	353 (282- 424)	150 (96-144)	120 (96-144)	70 (56-84)	13 (10-16)				BBWP- Maintain trees with heart rot, gall rust cankers, trunk scars or mistletoe at just less than epidemic levels. Provide areas of dead or burned trees <years old for foraging and roosting GGO – young owlets require dense cover and/or leaning trees to escape predation NG – Maintain a diversity of large trees scattered through the stands, especially near small breaks in the canopy Tree Species: PICO
				BA	117 (94- 140)	7 (6-8)	32 (26-38)	55 (44-66)	23 (18-28)				
				Stand SDI	214 172- 259)	18 (15-22)	64 (52-77)	96 (77-115)	36 (28-45)				

INDICATOR SPECIES

AM American marten
 BO boreal owl
 PWP pileated woodpecker
 NSO northern spotted owl
 BE bald eagle
 FO flammulated owl
 BBWP black-backed woodpecker
 GGO great gray owl
 NG northern goshawk

TREE SPECIES

PIMO western white pine
 ABMAS Shasta red-fir
 PIPO ponderosa pine
 PSME Douglas-fir
 TSME mountain hemlock
 TABR pacific yew
 PILA sugar pine
 LAOC western larch
 CADE3 incense cedar
 PICO lodgepole pine
 PIEN Englemann spruce

PLANT ASSOCIATION GROUPS (PAGs)

MH mountain hemlock
 MCW mixed conifer
 MCD mixed conifer
 PPW ponderosa pine wet
 PPD ponderosa pine dry
 LPD lodgepole dry
 LPW lodgepole wet

LOGEPOLE HIGH AND DRY

PAGs	Snags/Logs ≥9" Tons/Acre & Cu. Ft./Acre	Canopy Cover	Canopy Layers	Total Mean		Sapling 1.0 – 4.9"	Pole 5.0 – 8.9"	Small 1 9.0 – 14.9"	Small 2 15 – 20.9"	Med 1 21 – 24.9"	Med 2 25 – 31.9"	Large ≥ 32"	Special Features and Key Tree Species
				TPA									
LPHD (Climatic)	8-12 tons/ac. or 700- 1000ft ³ /ac.	Avg. 40%	≥1	TPA	360	150	170	40					BBWP- Maintain trees with heart rot, gall rust cankers, trunk scars or mistletoe at just less than epidemic levels. Provide areas of dead or burned trees <years old for foraging and roosting Tree Species: PICO ABMAS PIAL PIMO
Indicators	Snags:			BA	83	7	45	31					
BBWP	100%≥11"dbh (ex.13-27/ac.) Logs: 100%≥11" dia. (ex. 34-72/ac.)			Stand SDI	164	18	91	55					

INDICATOR SPECIES

AM	American marten
BO	boreal owl
PWP	pileated woodpecker
NSO	northern spotted owl
BE	bald eagle
FO	flammulated owl
BBWP	black-backed woodpecker
GGO	great gray owl
NG	northern goshawk

TREE SPECIES

PIMO	western white pine
ABMAS	Shasta red-flr
PIPO	ponderosa pine
PSME	Douglas-fir
TSME	mountain hemlock
TABR	pacific yew
PILA	sugar pine
LAOC	western larch
CADE3	incense cedar
PICO	lodgepole pine
PIEN	Englemann spruce

PLANT ASSOCIATION GROUPS (PAGs)

MH	mountain hemlock
MCW	mixed conifer
MCD	mixed conifer
PPW	ponderosa pine wet
PPD	ponderosa pine dry
LPD	lodgepole dry
LPW	lodgepole wet

LOGEPOLE WET

PAG's	Snags/Logs ≥9" Tons/Acre & Cu. Ft./Acre	Canopy Cover	Canopy Layers	Total Mean		Sapling 1.0 – 4.9"	Pole 5.0 – 8.9"	Small 1 9.0 – 14.9"	Small 2 15 – 20.9"	Med 1 21 – 24.9"	Med 2 25 – 31.9"	Large ≥ 32"	Special Features and Key Tree Species
				TPA									
LPW (Climatic) Indicators BBWP, GGO NG	12-24 tons/ac. or 1000-2150ft ³ /ac.	Avg. 60%	≥1	TPA	370 (296-444)	150 (120-180)	120 (96-144)	70 (56-84)	20 (16-24)	10 (8-12)			BBWP- Maintain trees with heart rot, gall rust cankers, trunk scars or mistletoe at just less than epidemic levels. Provide areas of dead or burned trees <5 years old for foraging and roosting GGO – young owlets require dense cover and/or leaning trees to escape predation NG – Maintain a diversity of large trees scattered through the stands, especially near small breaks in the canopy Tree Species: PICO PIEN
	Snags: 50% 11-20" dbh (ex.3-8.5/ac)			BA	158 (127-190)	7 (6-8)	32 (26-38)	55 (44-66)	35 (28-42)	29 (23-46)			
	Logs: 50% >20" dbh (ex. 1-3.5/ac) 50% 11-15" dia (ex. 13-43/ac.) 50% >15" dia (ex. 6-19/ac.)			Stand SDI	278 (222-353)	18 (15-22)	65 (52-77)	96 (77-115)	56 (44-67)	43 (34-72)			

INDICATOR SPECIES

AM	American marten
BO	boreal owl
PWP	pileated woodpecker
NSO	northern spotted owl
BE	bald eagle
FO	flamulated owl
BBWP	black-backed woodpecker
GGO	great gray owl
NG	northern goshawk

TREE SPECIES

PIMO	western white pine
ABMAS	Shasta red-fir
PIPO	ponderosa pine
PSME	Douglas-fir
TSME	mountain hemlock
TABR	pacific yew
PILA	sugar pine
LAOC	western larch
CADE3	incense cedar
PICO	lodgepole pine
PIEN	Englemann spruce

PLANT ASSOCIATION GROUPS (PAGs)

MH	mountain hemlock
MCW	mixed conifer
MCD	mixed conifer
PPW	ponderosa pine wet
PPD	ponderosa pine dry
LPD	lodgepole dry
LPW	lodgepole wet

PONDEROSA PINE DRY

PAGs	Snags/Logs ≥9" Tons/Acre & Cu. Ft./Acre	Canopy Cover	Canopy Layers	Total Mean		Sapling 1.0 – 4.9"	Pole 5.0 – 8.9"	Small 1 9.0 – 14.9"	Small 2 15 – 20.9"	Med 1 21 – 24.9"	Med 2 25 – 31.9"	Large ≥ 32"	Special Features and Key Tree Species
				TPA									
PPD (Climatic) Indicators WHWP NP	10-15 tons/ac. or 900-1300 ft³/ac. Snags: 15% 10-12" dbh (ex. 2.5-5/ac.) 30% 12-20" dbh (ex. 1-2.5ac.) 25% 20-31" dbh (ex. .25-.75 ac.) 30% >31" dbh (ex. .25-.5/ac) Logs: 100% >20" dia (ex. 7-15/ac.)	Avg. 40%	≥1	TPA	180 (144-216)	40 (32-48)	40 (32-48)	40 (32-48)	20 (16-24)	15 (12-18)	15 (12-18)	10 (8-12)	WHWP – Old growth should be maintained at >37% over the PAG. NG – Maintain a diversity of large trees scattered through the stands, especially near small breaks in the canopy Tree Species: PIPO – large tree component. PICO
				BA	232 (186-278)	2 (1-3)	11 (9-13)	31 (25-37)	35 (28-42)	18 (14-22)	64 (51-77)	71 (57-85)	
				Stand SDI	394 (313-472)	5 (4-6)	21 (17-26)	55 (44-66)	56 (44-67)	66 (52-79)	93 (74-111)	≥78 (77-116)	
PPD (Fire) Indicators: BE, WHWP, FO	Snags: BE 1-2>25" WHWP, FO 1-5> 25" Logs: BE 1-2>25" WHWP,FO 1-5> 25"	30-50%	≥1	TPA	35+ ±20% (8-273)	0-80 ±50% (0-120)	0-50 ±50% (0-75)	0-35 ±50% (0-52)	10 ±50% (5-15)	7 ±50% (3-11)	11 ±50% (6-11)	7 ±50% (4-11)	
				BA	144 (115-173)	10 total (5-15)			18 (9-27)	20 (10-30)	47 (24-71)	49 (25-74)	
				Stand SDI	195+ (27-216)	X (0-14)	X (0-40)	X (0-72)	28 (14-42)	31 (13-48)	68 (34-102)	68 (32-102)	

PONDEROSA PINE WET

PAGs	Snags/Logs ≥9" Tons/Acre & Cu. Ft./Acre	Canopy Cover	Canopy Layers	Total Mean		Sapling 1.0 – 4.9"	Pole 5.0 – 8.9"	Small 1 9.0 – 14.9"	Small 2 15 – 20.9"	Med 1 21 – 24.9"	Med 2 25 – 31.9"	Large ≥ 32"	Special Features and Key Tree Species
				TPA									
PPW (climatic) Indicators: FO,WHWP	12-24 tons/ac. Or 500-2200 ft³ Snags: 50% 18-28" dbh (ex..5-3/ac) 50% >28" dbh (ex..25-1.5/ac) Logs: 100% >20" dia. (ex. 1-9/ac.)	Avg. 40%	≥1	TPA	187 (150- 224)	40 (32-48)	40 (32-48)	40 (32-48)	20 (16-24)	15 (12-18)	15 (12-18)	10 (8-12)	WHWP – old growth should be maintained at > 37% over the PAG Tree Species: PIPO – large tree component PICO – species diversity
				BA	285 (228- 342)	2 (1-3)	11 (9-13)	31 (25-37)	35 (28-42)	18 (14-22)	64 (51-77)	71 (57-85)	
				Stand SDI	433 (347- 535)	5 (4-6)	21 (17-26)	55 (44-66)	57 (45-66)	66 (52-79)	93 (74-111)	≥78 (77-116)	
PPW (Fire) Indicators: BE, WHWP, FO	Snags: BE 1-2>25" WHWP, FO 1-5> 25" Logs: BE 1-2>25" WHWP,FO 1-5> 25"	30-50%	≥1	TPA	35+ ±20%	0-80 ±50% (0-120)	0-50 ±50% (0-75)	0-35 ±50% (0-52)	10 ±50% (5-15)	7 ±50% (3-11)	11 ±50% (6-11)	7 ±50% (4-11)	
				BA	144 (115- 173)	10 total (5-15)			18 (9-27)	20 (10-30)	47 (24-71)	49 (25-74)	
				Stand SDI	195+ (27- 216)	X (0-14)	X (0-40)	X (0-72)	28 (14-42)	31 (13-48)	68 (34-102)	68 (32-102)	

MIXED CONIFER DRY

PAGs	Snags/Logs ≥9" Tons/Acre & Cu. Ft./Acre	Canopy Cover	Canopy Layers	Total Mean		Sapling 1.0 – 4.9"	Pole 5.0 – 8.9"	Small 1 9.0 – 14.9"	Small 2 15 – 20.9"	Med 1 21 – 24.9"	Med 2 25 – 31.9"	Large ≥ 32"	Special Features and Key Tree Species
				TPA									
MCD (climatic)	12-24 tons/ac. Or 1100-2100 ft³ Snags: 70% 12-20" dbh (ex.3-9/ac) 30% >20" dbh (ex.75-2ac) Logs: 100% >15" dia. (ex. 5-14/ac.)	Avg. 70%	2-3	TPA	345 (276-414)	200 (160-240)	74 (59-80)	35 (28-42)	16 (13-19)	10 (8-12)	6 (5-7)	4 (3-5)	PWP – Roost stands of white fir with >4 TPA >20" live or dead NSO - >40% white fir understory >8" dbh. Large trees with cavities for nesting. NG – Maintain a diversity of large trees scattered throughout the stands, especially near small breaks in the canopy. BE – Insure large ponderosa pine and Douglas-fir trees of the super canopy provide and open flight path from tree. Maintain large trees, especially snags along riparian edges that provide panoramic views and open exposure on at least one side.
				BA	169 (135-203)	10 (8-12)	20 (16-24)	28 (22-34)	28 (22-34)	29 (23-35)	26 (21-31)	28 (22-34)	
				Stand SDI (PSME)	251 (201-301)	33 (26-40)	43 (34-52)	46 (28-63)	39 (13-65)	35 (28-42)	28 (22-34)	27 (22-32)	
MCD (Fire)	Snags: BE 1-2 >25" WHWP, FO 1-5 >25" Logs: BE 1-2 >25" WHWP, FO 1-5 >25"	30-50%	≥1	TPA	35+ ±20% (23-42)	0-80 ±50% (0-120)	0-50 ±50% (0-75)	0-35 ±50% (0-52)	10 ±50% (5-15)	7 ±50% (3-11)	11 ±20% (9-13)	7 ±20% (6-8)	BBWP – Maintain trees with heart rot, gall rust cankers, trunk scars or mistletoe at just less than epidemic levels. Provide areas of dead or burned trees < 5 years old for foraging and roosting Tree species: PIPO, PSME
				BA	144 (115-173)	10 total (5-15)			18 (9-27)	20 (10-30)	47 (38-56)	49 (39-59)	
				Stand SDI	195+ (141-373)	X (0-14)	X (0-40)	X (0-72)	28 (14-42)	31 (13-48)	68 (56-80)	68 (58-77)	

MIXED CONIFER WET

PAGs	Snags/Logs ≥9" Tons/Acre & Cu. Ft./Acre	Canopy Cover	Canopy Layers	Total Mean		Sapling 1.0 – 4.9"	Pole 5.0 – 8.9"	Small 1 9.0 – 14.9"	Small 2 15 – 20.9"	Med 1 21 – 24.9"	Med 2 25 – 31.9"	Large ≥ 32"	Special Features and Key Tree Species
				TPA	357 (284- 430)								
MCW (climatic) Indicators: PWP, NSO	25-35 tons/ac. or 2200-3100 Snags: 60% 9-16" dbh (ex. 9-17/ac) 20% 16-25" dbh (ex. 1-2/ac) 20% >25" dbh (ex. 1-2/ac) Logs: 60% 19-25" dia. (ex. 7-16/ac.) 40% >25" dia. (ex. 3-6/ac.)	>70%	2-3	TPA	357 (284- 430)	150 (120- 180)	70 (56-84)	70 (56-84)	30 (24-36)	15 (12-18)	12 (9-15)	10 (7-13)	PWP – roost stands of white fir with >4TPA >20" live or dead. NSO - ≥ 40% of white fir understory >8" dbh. Tree species: PIPO and PSME – large tree components. LAOC, TSME, TABR – species diversity.
				BA	270 (263- 324)	7 (6-8)	19 (15-23)	55 (44-66)	53 (42-64)	14 (11-17)	51 (41-61)	71 (57-85)	
				Stand SDI (PSME)	476 (365- 581)	18 (14-21)	37 (30-45)	97 (77-116)	85 (68-102)	66 (52-79)	74 (56-93)	≥78 (68-125)	

INDICATOR SPECIES

AM American marten
 BO boreal owl
 PWP pileated woodpecker
 NSO northern spotted owl
 BE bald eagle
 FO flammulated owl
 BBWP black-backed woodpecker
 GGO great gray owl
 NG northern goshawk

TREE SPECIES

PIMO western white pine
 ABMAS Shasta red-fir
 PIPO ponderosa pine
 PSME Douglas-fir
 TSME mountain hemlock
 TABR pacific yew
 PILA sugar pine
 LAOC western larch
 CADE3 incense cedar
 PICO lodgepole pine
 PIEN Englemann spruce

PLANT ASSOCIATION GROUPS (PAGs)

MH mountain hemlock
 MCW mixed conifer
 MCD mixed conifer
 PPW ponderosa pine wet
 PPD ponderosa pine dry
 LPD lodgepole dry
 LPW lodgepole wet

MOUNTAIN HEMLOCK

PAGs	Snags/Logs ≥9" Tons/Acre & Cu. Ft./Acre	Canopy Cover	Canopy Layers	Total Mean		Sapling 1.0 – 4.9"	Pole 5.0 – 8.9"	Small 1 9.0 – 14.9"	Small 2 15 – 20.9"	Med 1 21 – 24.9"	Med 2 25 – 31.9"	Large ≥ 32"	Special Features and Key Tree Species
				TPA	275 (220- 330)								
MH (climatic)	25-40 tons/ac. or 2700-4300 ft³	Avg. 70%	2-3	TPA	275 (220- 330)	80 (64-96)	80 (64-96)	17 (14-20)	24 (19-29)	24 (19-29)	25 (20-30)	25 (20-30)	AM – within PAG retain ≥50% of forest stand in mature/old growth for linkage blocks of mature/old growth must be linked to provide connectivity. Tree species: PIMO – blister rust ABMAS - heartrot
Indicators: AM,BO	Snags: 85% >21" dbh (ex.6(15/at) 15% 15-21" dbh (ex.2-3/ac) Logs: 100% >31" dia. And 33' long. (ex. 7-24/ac.)			BA	433 (346- 520)	4 (3-5)	21 (17-25)	13 (10-16)	42 (34-50)	69 (55-76)	107 (86-128)	177 (142- 212)	
				Stand SDI (PSME)	620 (411- 744)	10 (10-16)	43 (37-56)	23 (18-26)	66 (46-70)	101 (67-102)	148 (95-142)	234 (138- 208)	

INDICATOR SPECIES

AM	American marten
BO	boreal owl
PWP	pileated woodpecker
NSO	northern spotted owl
BE	bald eagle
FO	flamulated owl
BBWP	black-backed woodpecker
GGO	great gray owl
NG	northern goshawk

TREE SPECIES

PIMO	western white pine
ABMAS	Shasta red-fir
PIPO	ponderosa pine
PSME	Douglas-fir
TSME	mountain hemlock
TABR	pacific yew
PILA	sugar pine
LAOC	western larch
CADE3	incense cedar
PICO	lodgepole pine
PIEN	Englemann spruce

PLANT ASSOCIATION GROUPS (PAGs)

MH	mountain hemlock
MCW	mixed conifer
MCD	mixed conifer
PPW	ponderosa pine wet
PPD	ponderosa pine dry
LPD	lodgepole dry
LPW	lodgepole wet

Silvicultural Treatment: Salvage of Dead Lodgepole

Salvage should not occur on disturbed sites smaller than 10 acres or where canopy cover is greater than 40% (ROD C-14). Standing green overstory trees should be retained on site to the greatest extent possible to serve as a live stand component currently and as a source of dead wood in the future.

Snags and down woody debris will be retained on site to levels and criteria specified for suitable habitat in Table 3-7. Among the largest available dead wood on the site should be retained.

At least one small (about 5' tall, 10' long, 10' wide; 100 square feet) grapple pile per acre and one landing pile (average 9' tall, 15' long, 15' wide) per 100 acres should be retained to provide habitat for marten and its prey. Piles should have an abundance of protruding logs to serve as subnivian access points for marten and should contain some dirt and litter to enhance habitat for prey.

LOS PROTECTION STRATEGIES

The goal of the LOS protection strategy is to move the Big Marsh LSRs toward the desired balance of vegetative conditions as quantified in Table 3-6 in order to reduce the risk of losing the desired late and old-structured components at stand-replacing levels to insects, disease, and/or wildfire in both the short and long-term. The urgent and aggressive nature of this strategy is in response to an analysis of over 60,000 acres of stand exams conducted in a 155,000 acre project area.

The results of the project level analyses support the assumptions of the LSR team and the findings of the Science Team. There is an immediate need to reduce the risk of losing the desired LOS components within the Crescent LSR. The urgency for action does not include the Lower or Upper Big Marsh LSRs. These areas are still believed to be within their historic range of variability and represent the desired balance of vegetative conditions.

The focus of the protection strategy is to aggressively adjust the existing balance of vegetative conditions in the mixed conifer and lodgepole PAGs within and around the LSR to a more sustainable balance over the next five years. However, the aggressiveness of treatments in terms of scale and scheduling is limited by the desire to retain the existing function of the Big Marsh LSRs for known late-successional and old-growth forest related species that currently utilize and depend on existing habitats within the LSR for their viability.

Vegetative Management

Based on the existing conditions and functions within each LSR, the team has recommended appropriate and inappropriate areas in which to manipulate the existing vegetative condition in the short-term in order to retain a functional LSR in the short and long-term. The following provides an overview of the protection strategy for the lodgepole and mixed conifer PAGs. Site-specific opportunities and constraints are identified for each LSR in Chapter 4.

Lodgepole PAGs

The desired condition of lodgepole pine PAGs that occupy the Big Marsh Watershed is to have at any given point in time approximately 50% of the area in large contiguous blocks (1000+ acres) of suitable climatic lodgepole habitat. This rotation of large blocks will help ensure the presence of effective lodgepole habitat throughout the short and long-term.

Since the Lower Big Marsh LSR is approximately 1200 acres in size and for the most part has never been treated, it is providing one such contiguous block of LOS habitat. The IDT thought that the

LSR should remain as one block and that no treatment was appropriate at this time. Any treatment would fragment the block, and many treatments in this type of lodgepole stand are not successful in saving or creating LOS. The idea behind leaving it as one block would be to provide a forest ecosystem that would provide suitable lodgepole LOS habitat at intermittent stages in a naturally occurring cyclic pattern. However, this pattern could be interrupted by fire at any time during this cycle.

Mixed Conifer PAGs in Climatic-Climax and Fire-Climax Conditions

Based on recommendations from the Science Team to attain a sustainable balance of late-successional suitable habitat within the mixed conifer PAGs, approximately 40% of the mixed conifer dry PAG should be in the climatic-climax condition and 10% in the fire-climax condition across the landscape (Table 3-1). The mixed conifer wet PAG may have 60% in the climatic-climax condition and still be considered sustainable.

At this time, 90% of the mixed conifer PAGs or approximately 430 acres within the Big Marsh LSRs function as climatic-climax suitable habitat. None of this area is occupied by the mixed conifer wet PAG. Less than 1% of the area within the mixed conifer PAGs is currently considered to be in the fire-climax condition due to the exclusion of historic fire regimes. Fire suppression activities have allowed the majority of unharvested mixed conifer stands to progress toward the climatic-climax condition.

The majority of the stands in the climatic-climax condition have been determined to be at high risk of losing their late and old-structured components such as large diameter ponderosa pine and Douglas-fir to insect attack and/or wildfire. These components if lost, are not easily replaced within the Big Marsh LSRs due to a shortage of replacement trees of adequate size and/or species composition. Currently, white fir and lodgepole comprise the majority of second-story vegetation and are not considered suitable replacement trees.

It is recognized that these existing conditions developed over several decades. In most cases, returning the desired percentage of these stands to a tree density below the upper management zone (sustainable habitat) will require a similar amount of time and involve several entries or treatments. The retention of the existing function of the LSR in the short-term also limits the timeline for attaining the desired balance of vegetative conditions within the mixed conifer PAGs.

The following parameters are recommended to guide the transition of the existing condition to a sustainable balance of LOS conditions within the mixed conifer PAGs (Table 3-6): These are general guidelines provided to future Interdisciplinary teams (IDT) working at the project level. These more site specific teams may need to adjust these guidelines after a more detailed analysis of a project area.

- Although the following areas are imminently susceptible to insect attack and/or wildfire, in order to maintain a functional LSR in the short-term for known old growth dependent species, no treatments should occur within these areas over the next 20 years unless stands begin to lose desired structural components at catastrophic levels:
 - Nesting, roosting, foraging habitat within the home range radius (1.2 mile) of the known spotted owl nest sites;
 - Existing stands of climatic-climax suitable habitat that do not have the potential to respond to risk reduction treatments. These areas would possibly function as old growth for a longer period if left alone.

The objective of these treatments is to transition the stands to densities below the upper management zone (<100% UMZ) and restore 10% of the mixed conifer dry PAG across the landscape to a fire-climax condition over time. The following four scenarios describe how the recommended treatments will accomplish these objectives and affect climatic-climax habitat. Figure 19 is an illustration of the existing condition.

Scenario A: This would be the primary treatment strategy in stands managed for the northern spotted owl and associated species. See Figure 20.

This scenario is described as 90% of the UMZ, multi-story. Treat stands currently at high risk in order to lower the existing tree density to 90% of the UMZ. Approximately 1/3 of the basal area will be treated per entry. The highest possible quality of existing climatic-climax habitat will be retained. Trees should be removed from most or all of the size classes (depending on the existing stand structure) in such a way that all of the existing canopy layers would remain. Most of the mixed conifer wet and dry stands outside the Bald Eagle Management Area (BEMA) would be included in this scenario.

Following treatment(s), some stands (particularly in good sites in the mixed conifer wet PAG) may remain NRF habitat following treatment. This is dependent on stand densities prior to treatment, levels of large down wood and snags retained during the operation, and residual stand damage (i.e. loss of seedlings, saplings, pole-sized and understory trees).

The majority of the treated stands will not retain all of the habitat components and structure that are believed important for the life cycle and reproductive success of spotted owls. On average stands will lack the canopy cover and vertical structure that characterize suitable NRF habitat. It is also likely that harvest operations will remove some of the dead wood component and may impact the spotted owl prey base availability in the short-term. Treated stands are expected to retain greater than 50% canopy cover and will remain in a multi-storied forested condition with a substantial large tree component.

In summary, treated stands will remain high quality foraging habitat and will have the potential to meet suitable NRF habitat conditions again in approximately two decades.

Scenario B: This would be the primary treatment strategy in stands managed for the fire-climax associated species such as the bald eagle. See Figure 21.

This scenario is described as 90% of the UMZ, single-story. Treat stands currently at high risk in order to lower the existing tree density to 90% of the UMZ. Approximately 1/3 of the basal area will be treated per entry. Maximize the removal of understory trees to attain the desired condition. Overstory trees will be removed only if necessary to reach the desired condition, and then, only after individual tree consideration. The intent of this scenario is to retain the overstory canopy and a seedling/sapling layer. Most of the mixed conifer dry stands in the Crescent Lake BEMA would be included in this scenario.

Following treatment(s), stands will meet criteria for dispersal habitat and are expected to serve a dispersal function for spotted owls. Two canopy layers generally characterize foraging habitat for spotted owls. Treated stands will lack the canopy cover and vertical structure that provides thermal regulation benefits and predator protection for owls. Although owls may utilize this habitat type for foraging, it is not expected to provide "good foraging habitat". The area will function as sustainable and functional bald eagle habitat.

Scenario C: This would be the primary treatment strategy in stands managed for the northern spotted owl and associated species and planned for long-term and/or replacement habitat development. See Figure 22.

This scenario is described as 67% of the UMZ, multi-story. Treat stands currently at high to moderate risk in order to lower the existing tree density to 67% of the UMZ. Trees should be removed from most or all of the size classes (depending on the existing stand structure) in such a way that all of the existing canopy layers would remain. Mixed conifer wet and dry and ponderosa pine stands outside the BEMA would be included in this scenario to develop resistant stands in the short-term in order to obtain suitable habitat in the long-term. Some lodgepole pine stands important as dispersal habitat could also be included in this scenario. Many of these stands would currently be considered suitable climatic-climax habitat.

Following treatment(s), stands will remain in a multi-storied condition with a substantial large tree component. However, they will not provide the canopy cover or vertical structure characteristic of suitable NRF habitat or good foraging habitat for the northern spotted owl. Treated stands will serve as dispersal habitat and have the potential to become suitable NRF again in approximately three to five decades.

Scenario D: This would be the primary treatment strategy in stands managed for the fire-climax associated species, such as the bald eagle, and planned for long-term and/or replacement habitat development. See Figure 23.

This scenario is described as 67% of the UMZ, single-story. Treat stands currently at high to moderate risk in order to lower the existing tree density to 67% of the UMZ. Trees would be removed from the understory with some of the smaller overstory removed if necessary to reach the desired condition. The intent of this scenario would be to retain the existing overstory canopy and some of the seedling/sapling layer. Most of the mixed conifer dry stands in the BEMAs and some lodgepole pine stands would be included in this scenario.

Following treatment(s), stands will minimally meet dispersal habitat criteria and function for the northern spotted owl, however they will provide functional, sustainable bald eagle habitat.

Large Trees

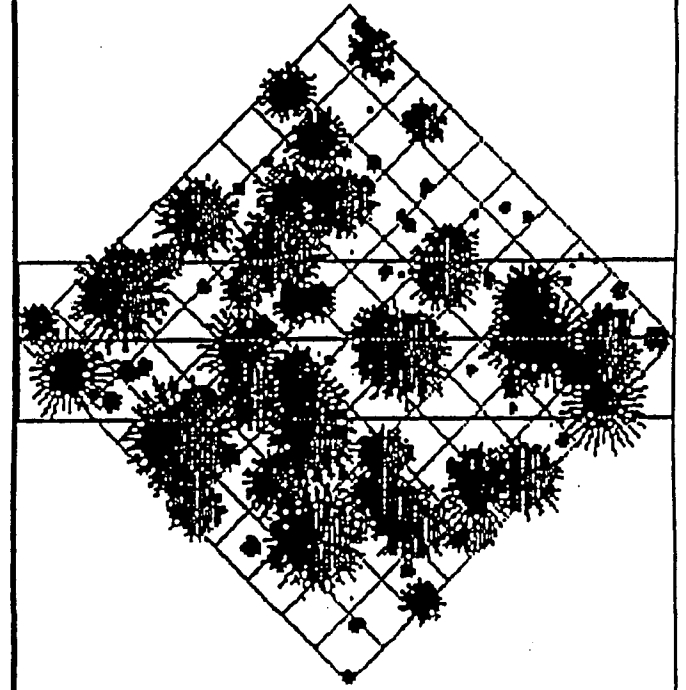
Protection of large trees (trees > 21" dbh) is important in the Big Marsh LSRs. Harvest of these trees will be avoided, if possible. Suitable conditions for the removal of large trees are anticipated to be rare.

There may be instances where cutting of larger trees is necessary to meet resource objectives. Large trees may be killed and left standing or felled in the case of safety concerns or skyline corridor clearing. To the extent possible, these trees would not be included in the treatment objectives for the site. The following describes circumstances when cutting or killing large trees (21"+) may occur within the LSR:

Overstory Removal of trees highly infected with dwarf mistletoe may occur where conditions are such that the developing understory (of the same species) in areas > 10 acres will be prevented from reaching LOS.

Partial Cutting will not cut trees over 21" DBH unless there are two or more trees 21" or larger left within 50 feet of the tree to be cut. The following are cases where large trees may need to be cut:

see
REO
letter



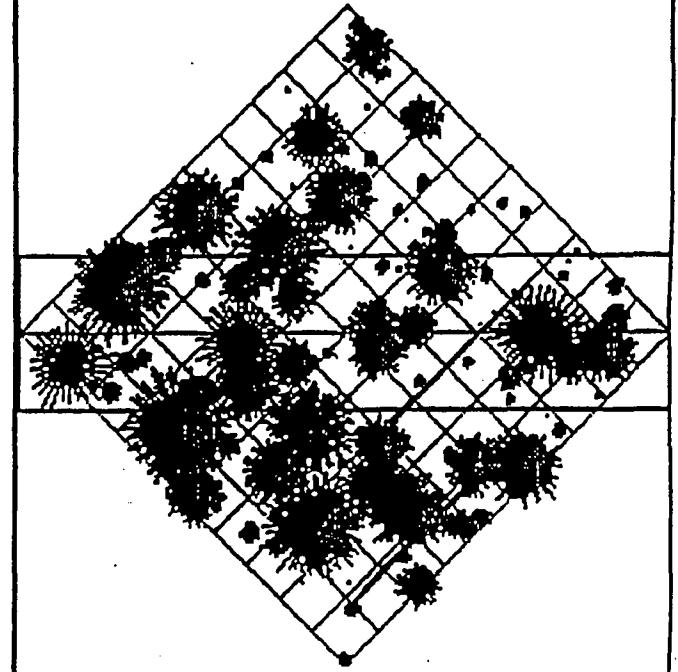
Stand 112
Original (Existing) Condition

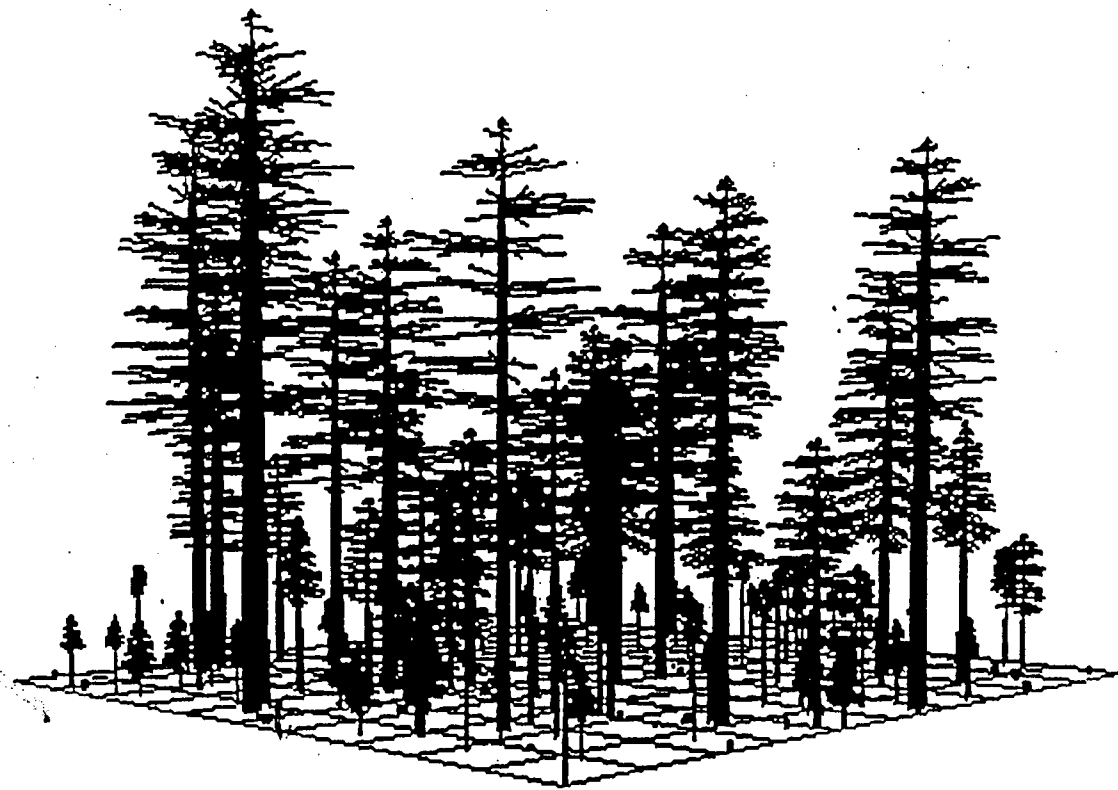
Figure 19



Stand 112 - Treatment Scenario A
90% UMZ, Multi-story

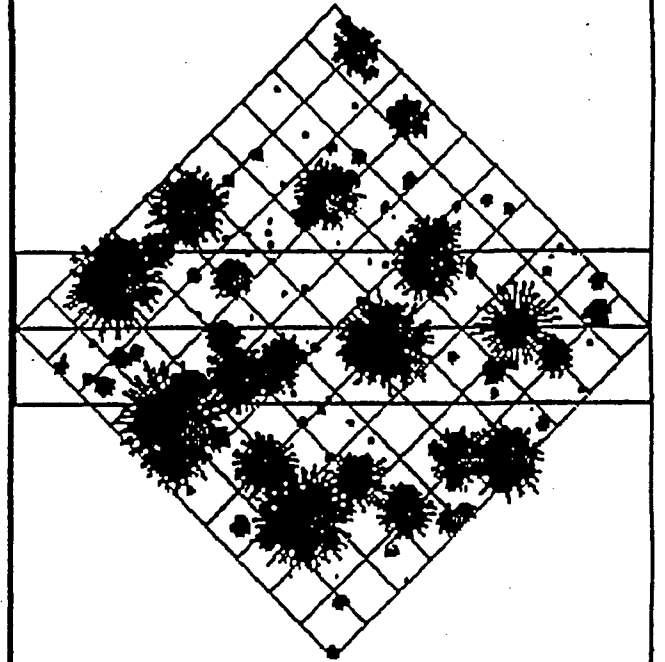
Figure 20

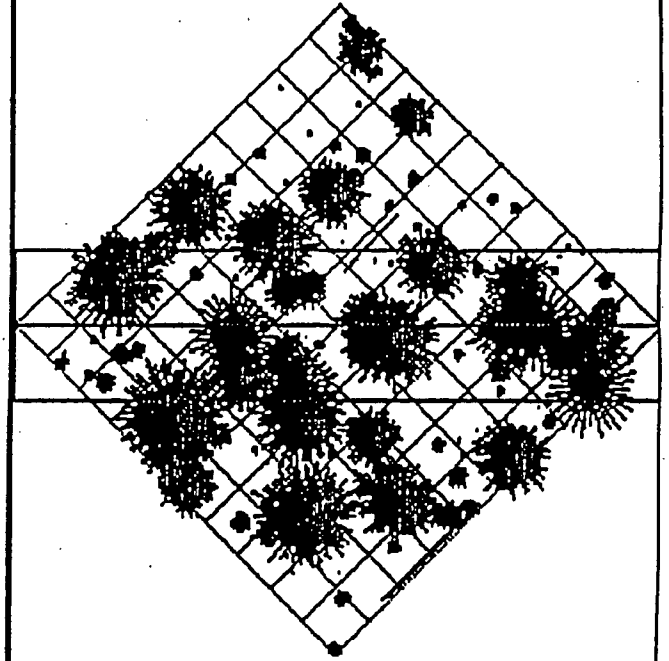
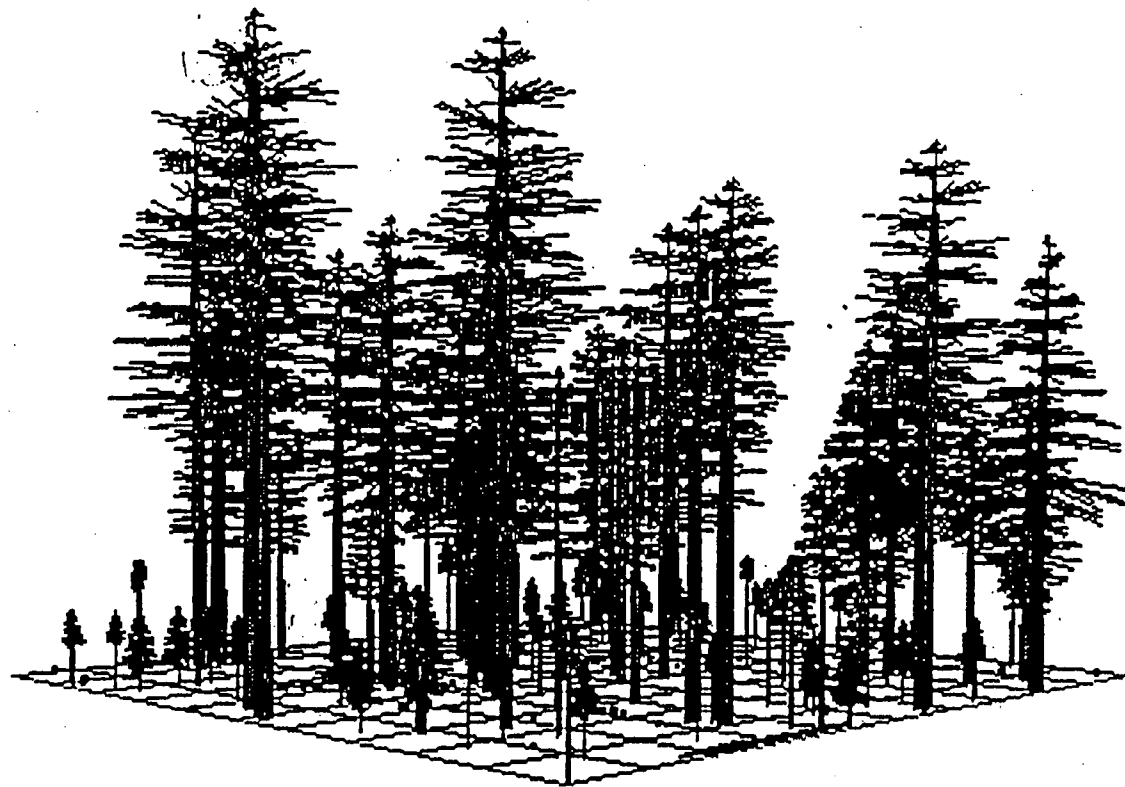




Stand 112 - Treatment Scenario C
67% UMZ, Multi-story

Figure 21





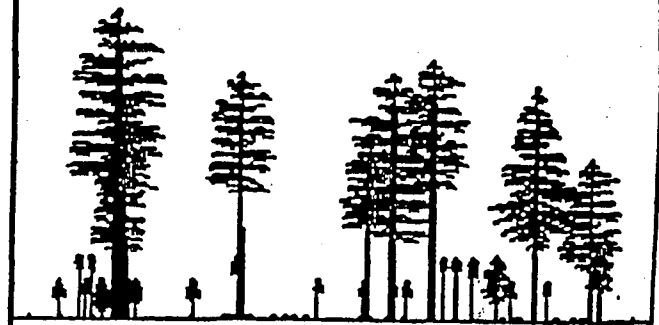
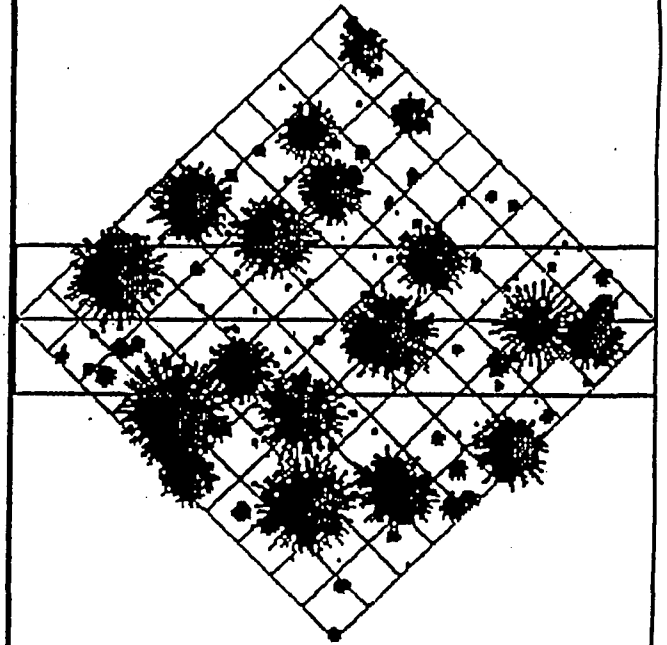
Stand 112 - Treatment Scenario B
90% UMZ, Single-story

Figure 22



Stand 112 - Treatment Scenario D
67% UMZ, Single-story

Figure 23



- To remove scattered mistletoe infected trees in relatively uninfected stands to prevent spread of the disease;
- Stands with stocking above UMZ in trees 21+". The smallest of the big trees will need to be harvested/killed to obtain desired stocking levels;
- Mixed species stands where true fir are removed to reduce host trees for western spruce budworm; and
- Stands where a multi-story condition is desired, such as for spotted owls, and it is necessary to remove large trees to maintain or promote smaller trees in the stand.

See
REA
Letter

Fire Suppression

See Chapter 4 for specific fire suppression strategies for each LSR.

Animal Damage Management

Animal damage management activities may be appropriate to protect desired habitat components within the LSR. Endemic levels of animal damage do not justify control activities. Specific National Environmental Protection Act (NEPA) analysis must be completed and should include discussion of both natural and artificial control methods, e.g. introducing fisher to help control porcupine populations in some portion(s) of the LSR. Animal damage control should not occur prior to completion of forest carnivore surveys and should not detrimentally impact LOS associated species.

LOS ENHANCEMENT STRATEGIES

The LOS enhancement strategy addresses activities in the Big Marsh LSRs that are either neutral or beneficial to the LSR in terms of maintaining or enhancing the desired late and old-structured habitat components as quantified in Table 3-2. The overall priority for enhancement activities is to treat regenerated areas such as past seed-tree harvest units to accelerate tree growth as a means to return to LOS more quickly.

Regenerated Areas

The only regenerated areas within the LSRs are two seed-tree units totaling 23 acres within a lodgepole pine stand in the Lower Big Marsh LSR. Pre-commercial thinning (PCT) will result in more rapid development of suitable LOS habitat than would occur without treatment. In general, PCT prescriptions should maximize tree growth while maintaining stand diversity options.

Thinning of pre-commercial sized trees should occur within the following parameters:

- Use mechanical thinning methods to manipulate densities and species mixes appropriate to the site. The objective would be to reach the UMZ and commercial thinning size at approximately the same time.
- Maintain 15% of the regeneration stands in unthinned conditions at this time to promote a diversity of structure. Refer to "Habitat Connectivity" further below for additional rationale.
- Maintain or enhance a diversity of species and structural composition within units and across the landscape.

-- Manage stands to allow development of endemic levels of mistletoe, heartrot, and tree deformity to provide wildlife habitat.

-- Use innovative means to accomplish these objectives if necessary. For example, selling Christmas trees in units with designated cut or leave trees may be an option.

Forested Areas

Enhancement activities are only appropriate in those areas that are not functioning as suitable LOS habitat. Activities included in this prioritization scheme include: treatments to accelerate the development of suitable climatic-climax habitat for the spotted owl; treatments to develop and maintain a fire-climax condition in BEMAs and other appropriate areas; and treatments to develop and maintain a viable lodgepole LOS forest. See individual LSRs for specific rationale.

Selective thinning, tree culturing and underplantings are the primary enhancement activities recommended for forested areas that do not meet the characteristics of suitable LOS habitat.

Selective Thinning - Selective thinning would be appropriate in stands within the mixed conifer PAGs where the understory is primarily comprised of true fir and lodgepole. Selective thinning would be prescribed to move the stands toward suitable LOS habitat for the emphasis species as quantified in Table 3-2. Treatments would either move toward a multi-story structure to attain the climatic-climax condition or a single-story fire-climax condition. Ponderosa pine and Douglas-fir would be favored for retention in all mixed conifer PAGs.

Selective thinning in lodgepole PAGs may be appropriate in the Crescent LSR to attain the uneven-aged objective and provide dispersal habitat for the spotted owl.

Tree Culturing - Tree culturing consists of removing all competing trees for a distance around existing large trees to help sustain them throughout the short and long-term. This activity would favor large ponderosa pine, sugar pine and Douglas-fir in the mixed conifer PAGs. This activity is most appropriate in stands managed to attain the fire-climax condition and bald eagle habitat.

Culturing should be designed to modify the form of potential nest trees for the bald eagle so that lateral branches develop that are capable of supporting nests in the future. This may involve the removal of all competing trees for a distance around large ponderosa pine and Douglas-fir so that lateral branches are not shaded by competing vegetation.

Tree culturing in mixed conifer to attain suitable climatic-climax habitat should only occur to diversify the structure of stands and accelerate the growth of future large trees.

Prescribed Fire, Underburning - In stands that are emphasizing fire-resistant species such as ponderosa pine and Douglas-fir, underburning may be appropriate for enhancement of those species.

Underplantings - Species diversity can be enhanced through underplantings of more shade tolerant species that have longer lifespans. Douglas-fir should be underplanted when the canopy cover is less than 35% in portions of the mixed conifer PAGs. Blister rust resistant white pine should be planted in mountain hemlock root rot pockets and other suitable areas to ensure that white pine are present in the LSR in the future.

Habitat Connectivity

Various management activities, such as salvage, thinning, and prescribed fire, are recommended by the LSR team as appropriate tools to utilize in the event that they are needed to accomplish

protection and/or enhancement goals. However, it is recognized that maintaining connectivity of LOS habitat is also essential and must be a primary consideration in the application of these tools in areas adjacent to the LSRs.

It is recognized that management activities as indicated above may isolate populations of some species or impact unique habitats. Thus, prior to implementation, the potential implications of management activities should be weighed against the potential implications of no activity. The following are some of the mitigations that the team believes will facilitate retention of habitat connectivity for many species:

- Consider leaving 15% of any unit in an untreated condition. Implementation of this mitigation for all management activities, commercial and precommercial thinning, salvage, burning, firewood cutting, etc., will preserve biological legacies, retain biodiversity, and enhance dispersal for a variety of plant and animal species.
- In commercial thinning activities and prescribed fire, (particularly in mixed conifer PAGs) retention of the overstory; maintenance of LOS stand structure (be it fire-climax or climatic-climax); and retention of recommended levels of snags and down woody debris should allow treated stands to serve connectivity functions for many LOS associated species.
- In salvage and firewood activities (particularly in the lodgepole PAGs), retention of recommended levels of snags and down woody debris, limited or no treatment in riparian areas; no treatment of unique habitats such as lava pressure ridges; no treatment around sensitive plant locations; and maintenance of the green tree overstory component should allow treated stands to maintain some, but not all of their habitat connectivity functions.
- In areas that are currently fragmented and thus present a "barrier" to LOS habitat connectivity, adopting an aggressive precommercial thinning program to accelerate development of LOS stands will facilitate meeting long-term habitat connectivity objectives. Also consider foregoing any treatment exclusions in these areas.

see
REQ
Letter

Soil Restoration

The recommendations for soil restoration, e.g. subsoiling, were based on information and figures in the Big Marsh Watershed Analysis, Chapter II - Physical Domain. Refer to Figure 30, p. 5-26 in the Big Marsh Watershed Analysis for a map of soil restoration priorities within the watershed.

Management activities should minimize detrimental impacts to soils and/or should enhance soil productivity.

Travel and Access Management

In general, the existing levels of access are not considered to be a major issue within any of the Big Marsh LSRs. Where access is a concern, it will be discussed in the appropriate LSR. The following guidelines are designed to ensure that access does not become a major issue in the future:

- Road construction in the LSR for silvicultural, salvage, and other activities is not recommended unless potential benefits exceed the costs of habitat impairment. If new roads are necessary to implement a practice that is otherwise in accordance with these guidelines, they will be kept at a minimum, be routed through non-late successional habitat where possible, and designed to minimize adverse impacts. Alternative access methods, such as aerial logging, should be considered to provide access for activities in reserves. (NWFP C-16).

- Road maintenance may include felling hazard trees along right-of-ways. Leaving material on site should be considered as an alternative. (NWFP C-16).
- Road management will be in compliance with all requirements specified in the Aquatic Conservation Strategy. Specific mitigations are identified in NWFP C-32 and 33.
- Open road density in the LSR should be reduced to the minimal level needed to provide access for fire protection and administrative needs. The target open road density for roaded areas in the LSRs is 1 mile/square mile.

Noxious Weed Management

Prevent introduction of noxious weeds and other non-native species. Contain, control, or eradicate existing and newly discovered occurrences of noxious weeds and other non-native species using methods and strategies that are compatible with LSR objectives. (NWFP C-19)

Prevent the introduction of new non-native wildlife species and seek opportunities to mitigate the impacts of existing non-natives on LOS associated species.

Other Activities

Bryophyte, Lichen, and Mollusk Inventory

Conduct inventories for species listed in Appendix J2 according to the survey strategies as stated in the ROD (C-49-61) especially in areas where planned activities will be taking place.

Matsutake Mushroom Harvesting

The Special Forest Products section of the ROD (C-18) states "evaluate whether activities have adverse effects on LSR objectives... Where these activities are extensive (e.g. collection of... fungi), it will be appropriate to evaluate whether they have significant effects on late successional habitat. Restrictions may be appropriate in some cases." Currently, mushroom harvest is prohibited in all LSRs on the Crescent Ranger District.

Current research indicates that several important prey species of the northern spotted owl utilize a variety of fungi species in their diet (Cork and Kenagy 1989, Maser et al. 1985, Maser et al. 1978). Rosenter (1995) indicated that the primary prey species for the owl, the northern flying squirrel, utilizes fungi almost exclusively. Appendix J2-250 documents that the matsutake mushroom may be a mycobiont for one of the known J2 species in the LSR, *Allotropa virgata*. Because existing research indicates a potential detrimental impact on LOS associated species; it is believed that this activity is not neutral or beneficial to LOS species or habitat. Consequently, the LSR team recommends that no commercial or personal matsutake mushroom collection should occur within the Big Marsh LSRs, since they are reserves within the context of the larger landscape where such activities will continue.

Other Special Forest Products

Evaluate the appropriateness of other special forest product utilization on a site-specific basis to determine the consistency with the "protect and enhance" objectives of this LSR. (Examples of the intent of this management criteria: harvest of Christmas trees will generally be a neutral or beneficial impact in regenerated areas.)

MONITORING, EVALUATION, and RESEARCH

The following is a list of recommended information gathering activities that should occur within all or portions of the LSRs:

- Evaluation of stand conditions to determine if desired structural components and habitat function are being maintained in the LSRs. Establish a rotating schedule such that monitoring of all LSRs occurs every 3-5 years.
- Complete a comprehensive Bald Eagle Management Plan for the Crescent Lake West BEMA.
- Determine if suitable habitat and known sites for the Survey and Manage species listed in Table C-3 exist.

CHAPTER 4

LSR MANAGEMENT STRATEGIES

CRESCENT LSR

Existing Condition

Wildlife

Emphasis Species -- Bald Eagle and Northern Spotted Owl

The Crescent Lake Northwest Bald Eagle Management Area (BEMA), which is 145 acres in size, is located within this LSR. The BEMA constitutes approximately one-third of the LSR. Suitable eagle habitat exists on 115 acres or 79% of the LSR. Prior to vegetation management, a Bald Eagle Management Plan must be completed. The LSR contains suitable nesting and perching sites for the eagle; however, the area is currently used for perching only.

Currently, virtually the entire LSR functions as suitable habitat for the spotted owl. A historic spotted owl nest is located approximately one mile northwest of the LSR. A small portion of the 1.2 mile home range radius overlaps with this LSR. The mixed conifer PAG provides suitable nesting, roosting, and foraging habitat and the lodgepole PAG combined with the mixed conifer provide dispersal habitat for the owl.

Selected Other Species

- Northern goshawk, pileated woodpeckers, and marten are also species that utilize habitat contained in this LSR.
- The riparian area around Whitefish Creek provides habitat for species such as amphibians, osprey, great gray owl, and Preble's shrew.
- Flammulated owl, white-headed woodpecker, and neotropical migratory birds.
- Black-backed woodpecker

Fragmentation

Fragmentation within this LSR is moderate and is caused by the 60 Road and summer home access routes, and the summer homes themselves. Past timber harvest activities have been limited to salvage and removal of hazard trees along roads and adjacent to the summer homes, therefore the LSR is not fragmented by timber harvest.

Late and Old Structured Stands

Within the LSR 350 acres or 58.0% is considered late and old multi-storied mixed conifer dry, and 17 acres or 2.8% is LOS lodgepole dry.

Snags and Down Woody Debris

Snag and down woody debris levels may be lower than would occur naturally in areas near summer homes and recreation areas due to firewood collection and debris clean up. Human safety will continue to be a priority in these areas. Elsewhere in the LSR, snags and downed woody debris are at levels consistent with or slightly higher than historic levels due to the limited amount of timber harvesting and the exclusion of fire.

Botanical

Emphasis Species – *Allotropa virgata*

The LSR contains known populations of candy stick and matsutake mushroom, a potential mycobiont of candy stick.

Refer to page 2-10 through 2-13 of the Big Marsh Watershed Analysis for additional information on the status of fungi, bryophytes, lichens, noxious weeds, vascular plants, and species of concern within the LSRs.

Invertebrates

Mollusks -- No surveys of mollusks have been performed in the Crescent LSR. Refer to page 2-13 of the Big Marsh Watershed Analysis for information on mollusks.

Arthropods -- See page 2-13 of the Big Marsh Watershed Analysis for information on arthropods.

Forest Dynamics

PAG(s)

Table 1A - Crescent LSR - PAG Table

Structural stage	Plant Association Group (PAG)				
		Lodgepole Dry (LPD)	Mixed Conifer Dry (MCD)	Mixed Conifer Wet (MCW)	Mountain Hemlock Dry (MHD)
ES – Early/Single	acres	13			
	percent	2.2			
EM – Early/Multi	acres				
	percent				
MO – Mid/Open	acres	10			
	percent	1.6			
MC – Mid/Closed	acres				
	percent				
MM – Mid/Multi	acres	96	24	25	12
	percent	15.9	4.0	4.1	2.0
LM – Late/Multi	acres	17	350		
	percent	2.8	58.0		
LS – Late/Single	acres				
	percent				
Total Acres		136	374	25	12
Total Percent		22.5%	62.0%	4.1%	2.0%

In addition to the PAGs listed above, the Riparian PAG constitutes 9% and the Rock PAG 0.4% of the LSR.

Seral/Structural Stages

Table 2A - Crescent LSR Crown Cover

Crown Cover	PAGs (acres)					Total % by Category
	LPD	LPW	MCD	MCW	MHD	
Rock, sparsely vegetated	3 (0.5%)		1 (0.2%)			0.7%
Shrub - cc 41-55%						
Tree - cc 11-25%						
Tree - cc 26-40%	15 (2.5%)		11 (1.8%)		1 (0.2%)	4.5%
Tree - cc 41-55%	3 (0.5%)		59 (9.8%)		2 (0.3%)	10.6%
Tree - cc 56-70%	106 (17.5%)		135 (22.4%)	1 (0.2%)	9 (1.5%)	41.6%
Tree - cc 71-100%	9 (1.5%)		168 (27.8%)	24 (3.9%)		33.2%
Totals	136 (22.5)		374 (62.0%)	25 (4.1%)	12 (2.0%)	

Note: Rock and riparian account for 9.4% of this LSR and are not included in the figures above.

Crescent LSR - 85.4% of the LSR has greater than 40% crown cover, 74.8% has greater than 55% crown cover, 33.2% has greater than 70% crown cover.

Fire

Historic Fire Regime -- See page 4-23 of the Big Marsh Watershed Analysis for a historic perspective on fire in the mixed conifer PAG.

Hazard Analysis -- High

Increased vertical fuel loading by overstocked stands and increased horizontal fuel loading by natural down woody accumulations increases fire hazard. Both of these factors are primarily the result of natural fire exclusion.

Fuel Model Summary:

Fuel Model	% of LSR
6	13%
8	1%
9	17%
10	26%
11	42%

Crown Fire Potential:

Crown Fire Potential	% of LSR
Null	19%
Low	28%
Mod	37%
High	11%
Extreme	5%

Risk Analysis -- High

There have been no lightning fires with suppression action taken in five and a half decades. All twenty-two of the recorded fires are human-caused, with the majority occurring in the summer home area between Road 60 and Crescent Lake. Fire Occurrence Rate (FOR) = 65%.

Social Context

Reference to Big Marsh Watershed Analysis

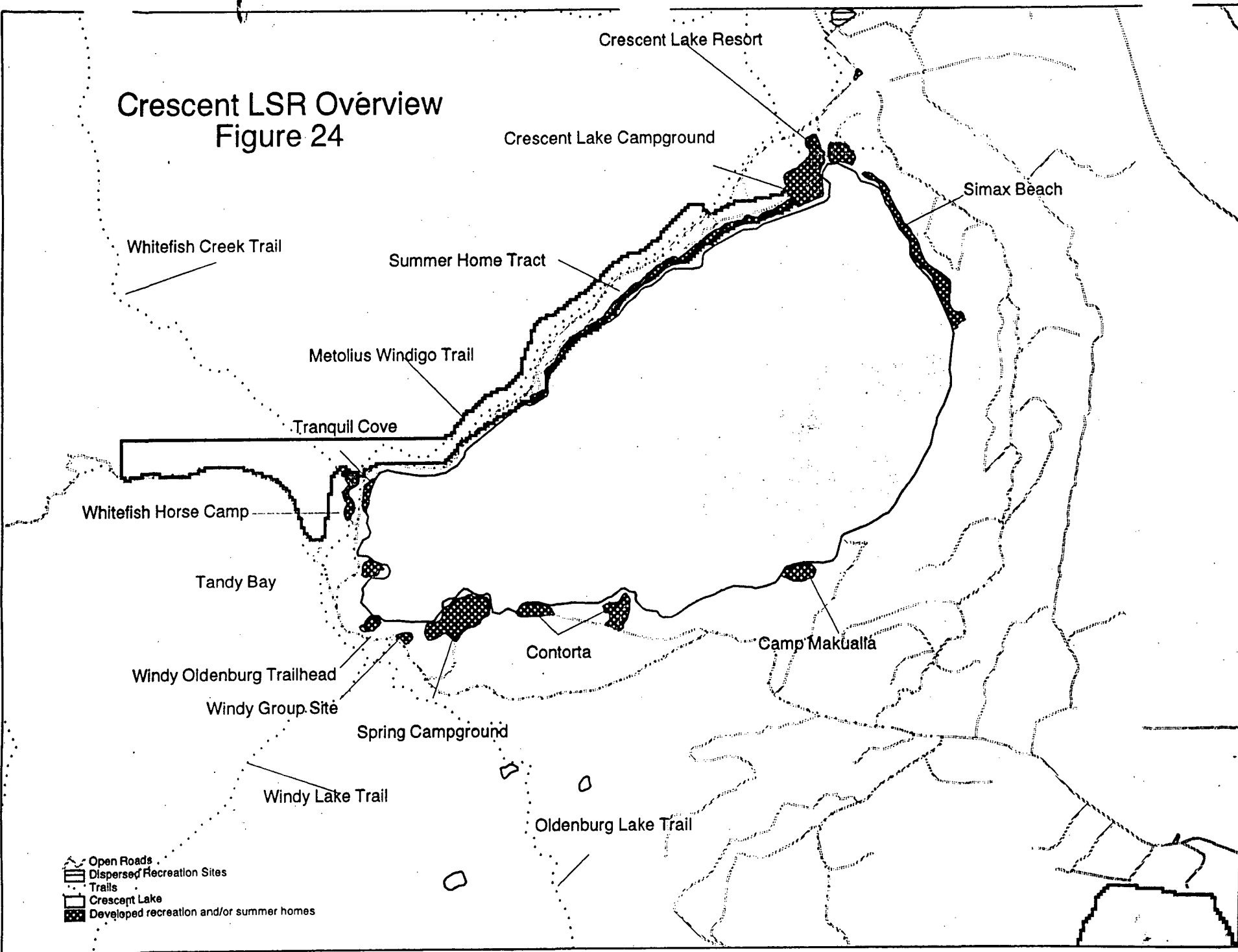
To understand how Crescent LSR functions from a social perspective, refer to the Big Marsh Watershed Analysis, which describes the area of Crescent Lake LSR (identified as Landscape Area B in the watershed analysis) in terms of social expectations; human settlements influencing the area; access and travel; recreational use; scenic values; commercial use and commodities; and heritage resources. Refer to page 2-32 of the Big Marsh Watershed Analysis for more information. (Figure 24)

Summary of Trends

- The overall risk from insects and diseases is high.
- Stands are mature and stocked above the Upper Management Zone (UMZ).
- Fir engraver, Armillaria root rot, and mountain pine beetle have caused some mortality in the past few years. There is a high potential for additional mortality in the near future from these same agents, plus spruce budworm.
- Assuming no management intervention, the stands will continue to move towards later seral stages and increased stocking.
- The risk for stand replacement events from insects, disease, and fire will increase.

Crescent LSR Overview

Figure 24



Crescent Lake Resort

Crescent Lake Campground

Simax Beach

Whitefish Creek Trail

Summer Home Tract

Metolius Windigo Trail

Tranquil Cove

Whitefish Horse Camp

Tandy Bay

Camp Makualla

Contorta






Windy Oldenburg Trailhead

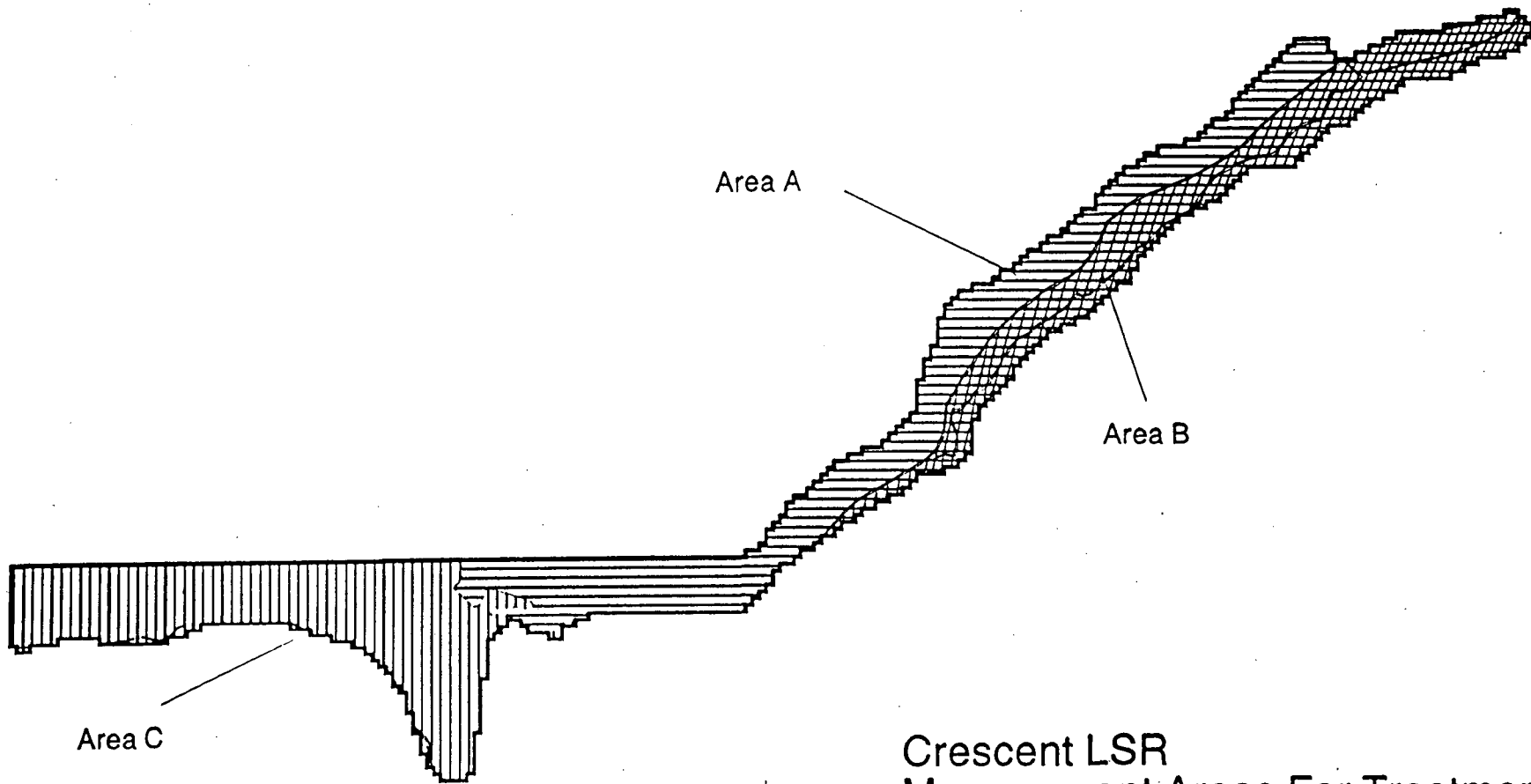
Windy Group Site

Spring Campground

Windy Lake Trail

Oldenburg Lake Trail

-  Open Roads
-  Dispersed Recreation Sites
-  Trails
-  Crescent Lake
-  Developed recreation and/or summer homes



Crescent LSR Management Areas For Treatment

Figure 25



CRESCENT – SUMMARY TABLE

ACRES – 604

PAGs – MCD, LPD, MCW

ELEVATION RANGE (ft) – 4900-5100

LRMP ALLOCATION –BEMA, INR (Intensive Recreation), OCRA

WILDLIFE – northern spotted owl, bald eagle, goshawk, amphibians

BOTANICAL – *Allotropa virgata*

FRAGMENTATION – moderate along summer homes; low elsewhere

LOS – 60.2%

INSECT AND DISEASE – high

SOIL RESTORATION PRIORITY – high along lakeshore, low elsewhere

FIRE RISK – high

FIRE HAZARD – high

ACCESS – high

ACTIVITIES – lake recreation, hiking, camping, winter recreation, summer homes

Criteria for Developing Appropriate Treatments – Crescent LSR

Desired Condition

In stands that have the site potential, manage to obtain or move towards the conditions for suitable mixed conifer dry fire-climax and the description below. Maintain an overstory of ponderosa pine and Douglas-fir which meets the following characteristics: 1) Dominant or codominant trees are >35 inches in dbh, have a limb structure that will support a bald eagle nest, and provide a view of the primary foraging area, (Areas A and B), and 2) Suitable replacement trees are developing in the stand (Anthony and Isaacs 1989).

Manage to provide and maintain a healthy riparian system according to the Aquatic Conservation Strategy and a viable LOS lodgepole pine and mixed conifer wet component through time which would provide dispersal and foraging habitat for the spotted owl and associated species (Area C).

(Area A = BEMA; B = 60 Road to Summer Homes; and C = LP/riparian) (Figure 25)

Objective

- Maintain and enhance the LSR as optimal bald eagle habitat to the greatest extent possible while maintaining current recreational opportunities.
- Obtain a balance of sustainable and suitable habitat across the LSR and in conjunction with the Wilderness and OCRA as described in the desired condition chart in Chapter 3. The focus for the mixed conifer dry plant association within this LSR is to provide sustainable fire-climax habitat in the short-term.

Management Options

Management of Forested Areas

- In areas of the LSR where the Desired Condition exists and is believed to be sustainable, no treatment is recommended at this time. However, when considered in conjunction with adjacent stands and habitat conditions, if an imbalance of habitat types is noted, then treatment may be recommended. (Short-term)
- Manage forested stands within Areas A and B for maintenance of mixed conifer dry fire-climax habitat conditions while maintaining highly functional dispersal habitat for the spotted owl. Utilize silvicultural treatments, e.g. the single-story treatment scenarios described in Chapter 3, and prescribed burning to promote and maintain fire-climax conditions with an abundant large tree component using the following criteria:
 - ❖ Maintain areas within the mixed conifer dry PAG as functional dispersal habitat for spotted owls.
 - ❖ Thin the understory shrub and small tree component prior to reintroduction of fire where appropriate. Leave denser pockets of vegetation to screen the summer homes from the 60 Road where there is a direct line-of-site to the homes and the distance between the road and homes is narrow. Thin dense pockets of vegetation around the summer homes to reduce stocking around the large trees, if large trees are not present, denser pockets of vegetation can remain for screening between homes. Thin no more than 70% of the mixed conifer dry PAG in the next 10 years.

Rationale: Due to the stand stocking, the large trees in this LSR are being stressed. From a visual standpoint, maintenance of the large trees is the most important factor. Screening of the summer homes should be maintained as viewed from Crescent Lake

and from the 60 Road when there is a direct line of sight. Maintaining screening between the summer homes is less important than maintaining the health of the large trees.

Rationale: Thinning of up to 70% of the mixed conifer dry PAG was recommended to reduce the stress on the large trees, due to the density of the stands. Since the area currently does not have an active eagle nest, it was felt that thinning across the area should be accomplished at this time, whereas in the future eagles might be nesting there. The team felt that it was important to improve stand sustainability throughout the mixed conifer dry PAG, as a result thinning 70% of the PAG was recommended. The 30% that was not thinned would provide habitat diversity.

- ❖ Manage to provide 35+ inch dbh ponderosa pine and Douglas-fir for nest trees. Plant ponderosa pine in root rot pockets, areas with a lower than average crown cover following thinning, and other openings.
- ❖ No more than 70% of the mixed conifer dry PAG would be blackened through prescribed burning in the next decade to maintain future management options and provide diversity. The initial burning entry would occur under spring-like conditions; multiple burning entries would be needed. Utilize thinning and hand piling rather than underburning in the immediate vicinity of the summer homes, e.g. from the old utility corridor to the lake.
- ❖ The harvest unit should be interspersed with patches of unthinned, unburned areas, and be located strategically to reduce the risk of human-caused fire.
- ❖ Maintain a large snag and large down woody debris component throughout the lifetime of the LSR.
- ❖ Maintain the unburned, unthinned patches in a mosaic pattern. (Short and Long-term)
- ◆ Monitor *Allotropa virgata* abundance before and after management activity.

Rationale: Mixed conifer dry stands in the LSR were historically fire-climax stands. Human fire suppression activities have resulted in a dense understory condition that leaves the large overstory trees vulnerable to insects, disease, and fire. Heavy utilization of the area by humans greatly increases the probability of fire in the LSR. It is assumed that management activities such as those recommended will provide protection from these elements.

Rationale: The LSR team recommended managing the NRF habitat within the BEMA and mixed conifer dry PAG for bald eagles, since eagles are limited to forested areas in the proximity of water. Since this is one of the few areas with suitable habitat for eagles in the vicinity of Crescent Lake, the recommendation is to manage it as such, while maintaining suitable dispersal habitat for owls. Treating NRF habitat for fire-climax within the BEMA and mixed conifer dry should provide minimum functioning foraging habitat for spotted owls as long as 40% crown cover and adequate down wood for prey base habitat are maintained.

Rationale: Treatment of the mixed conifer dry PAG in order to promote fire-climax conditions will also effectively reduce the fuel accumulation and risk of fire within this LSR and will provide a modified natural fuel break to the Wilderness, spotted owl activity center, and the associated NRF habitat. Fire also plays a role in enhancing habitat for *Allotropa virgata* (Appendix J2).

- If catastrophic loss of habitat does occur, treat to enhance and obtain LOS habitat characteristics as described in Chapter 3 – Suitable Habitat Condition. (Short and Long-term)

Rationale: The LSR recognized that the lodgepole PAG is in imminent risk of being lost to insects, disease, or fire, however, due to the small scale of the lodgepole in the area and its function for selected species, the team recommended no treatment at this time.

- A Bald Eagle Management Plan needs to be prepared prior to the occurrence of any vegetative management within the BEMA.

Snags and Down Woody Debris

- Within the context of individual stands site potential, maintain coarse woody debris and snags at levels indicated in the Suitable Habitat Condition Tables and Additional Guidance for Dead Wood Management section located in Chapter 3. (Short and Long-term)
- Remove snags, dying trees and other trees that are a hazard to humans, such as ones that might hit a summer home or fall onto Road 60. Optimize the number of snags outside hazard zones.

Fire Suppression

- Use appropriate suppression strategies (confine, contain, control) to keep all fires regardless of intensity to a 20 acre maximum and outside the Wilderness boundary and summer home tract using the least aggressive ground-disturbing tactics in the safest manner. For example: aerial suppression is preferable to a bulldozer line. Use adaptive management as the stands conditions change. (Short-term until fuels reduction treatment is accomplished) Keep all fires to a 60 acre maximum after fuels treatment is accomplished and for the long-term.
 - ◆ Monitor overstory loss due to fire.
 - ◆ Monitor for changes in fire occurrence.

Riparian Areas

- Manage areas consistent with the Aquatic Conservation Strategy and the Big Marsh Watershed Analysis.

Soils

- Protect and enhance long-term site productivity. (Short and Long-term)

Wildlife and Botanical

- Habitat protection takes precedence over the protection of individual plants or animals with the exception of known sites of species listed in Table C-3 of the Northwest Forest Plan. For those species protection of individual plants or animals takes precedence.
- Prevent, eradicate, or control noxious weed populations using current vegetative management guidelines.
- Protect and enhance *Allotropa virgata* plants and habitat according to the NWFP standards and guidelines.
 - ◆ Monitor to determine if bald eagles are nesting within the LSR.

Education

- Utilize interpretation to inform and educate the summer home owners about the natural role of fire, how to safely burn debris, and to identify and eradicate noxious weeds.

Access and Infrastructure

- Seek opportunities to mitigate the impacts of existing non-neutral, non-beneficial

infrastructures and human uses. For instance, delineate access and parking within the summer home area to reduce compaction and damage to vegetation, especially large trees, from vehicles.

- Only neutral or beneficial new developments, facilities, or human uses are appropriate in this LSR. Maintenance, such as hazard tree felling along utility rights-of-way, is appropriate.

To be or not to be an LSR?

- This LSR may not function in and of itself as a “Late-Successional Reserve”, however, when looked at in conjunction with the OCRA and Diamond Peak Wilderness, a functional area for late-successional species exists.
- The LSR designation enables us to manage for both bald eagles and spotted owls in the area, whereas using the LRMP Management Area designations, only the bald eagle would be managed for in the BEMA.
- The LRMP designation of Intensive Recreation highlights the importance of recreation, with wildlife being a secondary concern. With an LSR designation, the importance of the area for wildlife is stressed with other uses such as development being of lesser importance.
- There is limited late and old successional habitat around Crescent Lake. With increasing human use in the area, it is important to maintain LOS habitat and large trees for wildlife and visual purposes.

LOWER BIG MARSH LSR

Existing Condition

Wildlife

Emphasis Species – Black-Backed Woodpecker and Northern Goshawk

The majority of the LSR provides existing and potential nesting, post-fledging, and foraging habitat for the northern goshawk. The portions of the LSR with an open canopy cover do not provide suitable habitat. Virtually the entire LSR provides suitable habitat for the black-backed woodpecker. The LSR provides a relatively undisturbed block of lodgepole pine that is rare in the Eastside Cascade ecosystem and designated LSRs. The lodgepole ecosystem provides suitable LOS for relatively brief periods in its life span. This LOS habitat is not sustainable in the long-term.

Selected Other Species

- Northern spotted owl -- Approximately 37 acres of suitable nesting, roosting, and foraging habitat are located within the LSR along Big Marsh Creek. Suitable dispersal habitat is found on 1,160 acres.
- Species associated with riparian habitat – Good habitat for the following species is located in and along Big Marsh Creek: spotted frog, other amphibians, elk, neotropical migratory birds, sandhill cranes, great gray owl, and bull trout (historic habitat).
- American marten -- The riparian habitat as well as the lodgepole pine having a denser canopy cover provide good habitat for American marten.

Fragmentation

Human-caused fragmentation within this LSR is minimal. Two regenerated areas totaling 23 acres or 1.9 percent of the LSR are present along the eastern edge of the LSR. These units were seed-tree harvested in 1991. Due to the location of these units along the edge of the LSR, they increase the amount of early structure in the LSR, but do not substantially fragment it. Natural fragmentation is caused by mortality pockets within portions of the lodgepole stands. The road density within this LSR is also low.

Late and Old Structured Stands

Within this LSR 178 acres or 14.9% is considered LOS lodgepole dry, and 17 acres or 1.4% is considered LOS lodgepole wet. The existing percentage of LOS in each of the lodgepole PAGs is believed to be significantly higher than that indicated above. The numbers listed above were obtained from GIS data that often underestimates the amount within the late structural stage and overestimates the amount in the mid stage.

Snags and Down Woody Debris

Snags and down woody debris levels are consistent with or slightly higher than historic levels due to the limited amount of timber harvesting and exclusion of fire. These levels are believed to be suitable for a functional late or old structured ecosystem. As the lodgepole stands experience mortality from insects, disease or fire, the levels of snags and down woody debris will increase.

Botanical

Refer to page 2-10 through 2-13 of the Big Marsh Watershed Analysis for additional information on the status of fungi, bryophytes, lichens, noxious weeds, vascular plants, and species of concern within the LSRs.

Invertebrates

Mollusks -- No surveys of mollusks have been performed in the Lower Big Marsh LSR. Refer to page 2-13 of the Big Marsh Watershed Analysis for information on mollusks.

Arthropods -- See page 2-13 of the Big Marsh Watershed Analysis for information on arthropods.

Forest Dynamics

PAG(s)

Table 1B - Lower Big Marsh LSR - PAG Table

Structural stage	Plant Association Group (PAG)		
		Lodgepole Dry (LPD)	Lodgepole Wet (LPW)
ES -- Early/Single	acres	61	5
	percent	5.1	0.4
EM -- Early/Multi	acres		
	percent		
MO -- Mid/Open	acres	5	
	percent	0.4	
MC -- Mid/Closed	acres	96	2
	percent	8.0	0.2
MM -- Mid/Multi	acres	630	144
	percent	52.6	12.0
LM -- Late/Multi	acres	178	17
	percent	14.9	1.4
LS -- Late/Single	acres		
	percent		
Total Acres		970	168
Total Percent		81%	14%

In addition to the PAGs listed above, the Riparian PAG constitutes 5% of the LSR.

Seral/Structural Stages

Table 2B - Lower Big Marsh LSR Crown Cover

Crown Cover	PAGs (acres)					Total % by Category
	LPD	LPW	MCD	MCW	MHO	
Rock, sparsely vegetated	1 (0.1%)					0.1%
Shrub - cc 15-25%	23 (1.9%)					1.9%
Shrub - cc 41-55%	3 (0.3%)	3 (0.3%)				0.6%
Tree - cc 11-25%	114 (9.5%)	3 (0.3%)				9.8%
Tree - cc 26-40%	395 (33.0%)	23 (1.9%)				34.9%
Tree - cc 41-55%	284 (23.7%)	86 (7.2%)				30.9%
Tree - cc 56-70%	137 (11.4%)	49 (4.0%)				15.4%
Tree - cc 71-100%	13 (1.1%)	4 (0.3%)				1.4%
Totals	970 (81.0%)	168 (14.0%)				

Note: Wet meadow and riparian PAGs account for 5.0% of this LSR and are not included in the figures above.

Lower Big Marsh LSR - 47.7% of the LSR has greater than 40% crown cover, 16.8% has greater than 55% crown cover, 1.4% has greater than 70% crown cover.

Fire

Historic Fire Regime -- See pages 4-23 of the Big Marsh Watershed Analysis for a historic perspective on fire in the lodgepole dry PAG.

Hazard Analysis -- High

Lodgepole pine is nearing the end of its 80-120 year life cycle and is beginning to break apart. Natural down woody accumulations are high due to the exclusion of the natural role of fire. The lodgepole stands in this area of the district are more like the high elevation lodgepole since the stand structure allows for the creeping "cigarette" type burns typical of high elevation lodgepole stands. Because of the increasing amount of down woody debris, we are losing the opportunity for this typical lower intensity type burn.

Fuel Model Summary:

Fuel Model	% of LSR
1	8%
8	3%
9	9%
10	2%
11	78%

Crown Fire Potential:

Crown Fire Potential	% of LSR
Null	0%
Low	60%
Mod	33%
High	7%
Extreme	0%

Risk Analysis -- High

Three human and three lightning fires have occurred where suppression action was taken in the last five and a half decades. See Figure 24 on page 4-5. Camping and Boy Scout activity on the southern edge of the LSR at Big Marsh Creek are the highest areas for concern over fire starts within this LSR. Fire Occurrence Rate (FOR) = 10%

Social Context

Reference to Big Marsh Watershed Analysis

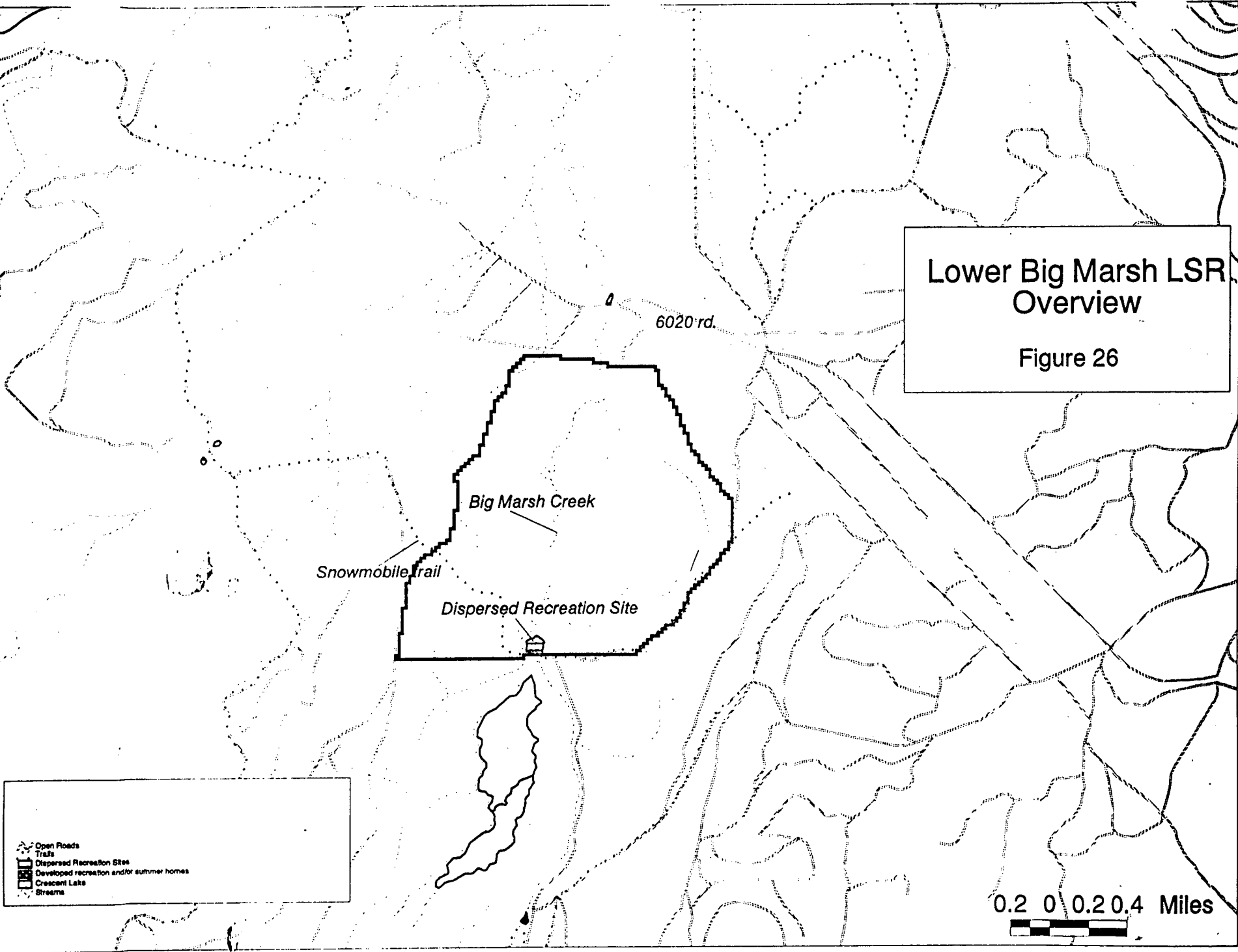
To understand how Lower Big Marsh LSR functions from a social perspective, refer to the Big Marsh Watershed Analysis, which describes the areas that includes the Lower Big Marsh LSR (identified as Landscape Area F in the watershed analysis) in terms of social expectations; human settlements influencing the area; access and travel; recreational use; scenic values; commercial use and commodities; and heritage resources. Refer to page 2-32 of the Big Marsh Watershed for more information. (Figure 26)

Summary of Trends

- The overall risk from insects and disease is high.
- The majority of the lodgepole is either mature or close to mature and stocked above the UMZ.
- A small portion of the LSR experienced some mortality from the mountain pine beetle in the early to mid 1980s, and the potential exists for additional beetle mortality in the near future.
- Dwarf mistletoe is moderate to heavy in a significant portion of the area, and is causing reduced tree vigor.
- Assuming no management intervention, the stocking will continue to increase as the risk for stand replacement events from insects, disease, and fire.

Lower Big Marsh LSR Overview

Figure 26



- Open Roads
- Trails
- Dispersed Recreation Site
- Developed recreation and/or summer homes
- Crescent Lake
- Streams

0.2 0 0.2 0.4 Miles

LOWER BIG MARSH – SUMMARY TABLE

ACRES – 1197

PAGs – LPD, riparian

ELEVATION RANGE (ft) – 4700-4860

LRMP ALLOCATION – old growth, wild and scenic river

WILDLIFE – Riparian associated, amphibians, American marten, elk, migratory birds

BOTANICAL – riparian associated species

FRAGMENTATION – low

LOS – 16.5%

INSECT AND DISEASE – high

SOIL RESTORATION PRIORITY – low

FIRE RISK – high

FIRE HAZARD – high

ACCESS – low

ACTIVITIES – hunting, river floating

Criteria for Developing Appropriate Treatments – Lower Big Marsh

Desired Condition

Provide a lodgepole forest ecosystem that provides suitable LOS habitat for black-backed woodpeckers, and dispersal habitat for northern goshawk and the northern spotted owl, at intermittent stages throughout its life cycle. Since this type of lodgepole habitat is not sustainable, it is understood that LOS habitat will only occur at intermittent stages of the lodgepole life cycle. It is desirable to maintain the stand as an unfragmented block of habitat. Manage the LSR to provide and maintain a healthy riparian system according to the Aquatic Conservation Strategy.

Objective

- Provide a large block of unfragmented lodgepole pine to serve as optimal habitat for the black-backed woodpecker and other species with similar habitat needs and dispersal habitat for the northern spotted owl (Short and Long-term).
- Utilize prescribed burning to enhance habitat for the black-backed woodpecker.
- Obtain a balance of suitable and sustainable habitat in a mosaic across the landscape, including areas outside of the LSR.
- The objective of maintaining the unfragmented integrity of this LSR will take precedence over maintaining a sustainable level of LOS stands.

Management Options

Management of Regenerated Areas

- Emphasize management of regenerated stands to accelerate growth as a means to return to LOS more quickly. Refer to the LOS Enhancement Strategies section located in Chapter 3, which describes appropriate treatments for accelerating growth in regenerated stands. Deviations from these methods may occur on a site-specific basis to meet specific wildlife objectives. (Short and Long-term)

Management of Forested Areas

- No treatment is recommended in the short term. Continue to evaluate LOS habitat within the LSR and opportunities to enhance habitat outside and adjacent to the LSR for the long-term. Opportunities for LOS enhancement are limited within pure lodgepole stands, therefore, areas outside of the LSR are important in providing habitat that complements the structural characteristics within the LSR.
- Concentrate prescribed burning in areas adjacent to the LSR in order to create black-backed woodpecker foraging habitat.
- Minimize management actions in the long-term; allow natural processes to occur, until such time as large-scale loss of habitat occurs. At that time treat to enhance and obtain LOS habitat characteristics as described in Chapter 3 - Suitable Habitat Condition. (Long-term)

Rationale: Since this LSR is comprised primarily of lodgepole pine and is only 1,200 acres in size, the team thought that it should be managed as one block and should be allowed to function without fragmentation. Management techniques to create or enhance LOS characteristics are limited within lodgepole stands. Maintaining unfragmented habitat is important to maintain options

and habitat for the future. The natural cycle of lodgepole pine will prevent this LSR from maintaining suitable amounts of LOS habitat in perpetuity. This is the reason that it is important to treat areas outside the LSR to enhance and maintain areas of LOS habitat in the area, if and when the LSR fails to provide such habitat because of insects, fire, or other large-scale loss of LOS habitat.

Snags and Down Woody Debris

- Within the context of individual stand site potential, maintain coarse woody debris and snags at levels indicated in the Suitable Habitat Condition tables and Additional Guidance for Dead Wood Management section located in Chapter 3. (Short and Long-term)

Fire Suppression

- Control fire using minimum impact suppression tactics and natural barriers. (Short-term, for the next 20 years). Use natural barriers and roads to contain fire within the LSR. (Short and Long-term)
- After 20 years evaluate the natural role of fire throughout the LSR. (Long-term)

Riparian Areas

- Manage areas consistent with the Aquatic Conservation Strategy and Big Marsh Watershed Analysis.
- Boy Scout Use - Maintain current use in stretch of Big Marsh Creek from the snowmobile bridge on Road 340 to the 6020 Road. Allow the moving or removal of down wood from the stream channel to the minimal extent needed to allow safe canoe passage.
- Minimize impacts to riparian habitat.
- Maintain or enhance the suitability of the riparian habitat for bull trout, should future reintroduction of the species occur.
- Protect or enhance habitat for the spotted frog.

Soils

- Monitor following wildfires to determine the impacts to soil productivity.

Wildlife and Botanical

- Habitat protection takes precedence over the protection of individual plants or animals with the exception of known sites of species listed in Table C-3 of the Northwest Forest Plan. For those species protection of individual plants or animals takes precedence.
- Prevent, eradicate, or control noxious weed populations using current vegetative management guidelines, especially reed canary grass.
- Monitor MIJE abundance following wildfire or prescribed fire.

Access

- Maintain current levels of access.

UPPER BIG MARSH LSR

Existing Condition

Wildlife

Emphasis Species -- Northern Spotted Owl

Currently, virtually the entire LSR functions as suitable habitat for the spotted owl. Approximately 1,099 acres of suitable nesting, roosting, and foraging habitat are located within the LSR along Big Marsh Creek. While an additional 2,148 acres of dispersal habitat are located in the mountain hemlock PAG. A historic spotted owl nest is located approximately one-half mile west of Big Marsh Creek within the LSR. Information on the spotted owl in the LSR has been collected since 1982. The pair was last confirmed in 1995. In 1996 and 1997, the pair was surveyed for but not detected.

Selected Other Species

- Species associated with riparian habitat including Cascade frog, other amphibians, great gray owl, sandhill crane, and elk.
- Forest carnivores – marten, fisher, and wolverine. Virtually the entire LSR functions as habitat for the American marten. Marten have been commonly observed in the area. Due to the excellent habitat and undisturbed nature, this LSR provides good potential habitat for both the fisher and wolverine. Carnivore surveys were conducted in the LSR during the 1996-1997 winter. Marten were repeatedly found, however, neither fisher nor wolverine were detected.
- Northern goshawk -- Suitable nesting habitat for the goshawk is located along the riparian area and within the mixed conifer PAGs in this LSR.
- Habitat for the black-backed woodpecker is located within the lodgepole pine and mixed conifer PAGs.

Fragmentation

Fragmentation within this LSR from harvesting and roads is minimal. No timber harvesting has occurred within this LSR.

Late and Old Structured Stands

Within this LSR 2,071 acres or 63.7% is considered to be LOS mountain hemlock dry, 79 acres or 2.5% is LOS mixed conifer dry, and 52 acres or 1.6% is LOS lodgepole dry. Note: Base on the Large Tree Database information, approximately 1,119 acres of what is shown in the previous figures as mountain hemlock dry should actually be in mixed conifer dry. This would change the mountain hemlock figure from 63.7% to 29.3%, and the mixed conifer figure from 2.5% to 36.9%.

Snags and Down Woody Debris

Existing levels of snags and down woody debris are most likely consistent with the levels identified as providing suitable habitat (See Chapter 3).

Botanical

Emphasis Species -- Allotropa virgata

The LSR contains known populations of candy stick and a potential mycobiont, the matsutake mushroom.

Refer to page 2-10 through 2-13 of the Big Marsh Watershed Analysis for additional information on the status of fungi, bryophytes, lichens, noxious weeds, vascular plants, and species of concern within the LSRs.

Invertebrates

Mollusks -- No surveys of mollusks have been performed in the Lower Big Marsh LSR. Refer to page 2-13 of the Big Marsh Watershed Analysis for information on mollusks.

Arthropods -- See page 2-13 of the Big Marsh Watershed Analysis for information on arthropods.

Forest Dynamics

PAG(s)

Table 1C - Upper Big Marsh LSR - PAG Table

Structural stage	Plant Association Group (PAG)			
		Lodgepole Dry (LPD)	Mixed Conifer Dry (MCD)	Mountain Hemlock Dry (MHD)
ES -- Early/Single	acres	13		4
	percent	0.4		0.1
EM -- Early/Multi	acres			
	percent			
MO -- Mid/Open	acres			
	percent			
MC -- Mid/Closed	acres			11
	percent			0.3
MM -- Mid/Multi	acres	55	1	622
	percent	1.7	0.0	19.1
LM -- Late/Multi	acres	52	79	2071
	percent	1.6	2.5	63.7
LS -- Late/Single	acres			
	percent			
Total Acres		120	80	2708
Total Percent		3.7%	2.5%	83.3%

In addition to the PAGs listed above, the Riparian PAG constitutes 4% and the Rock PAG 6% of the LSR.

Seral/Structural Stages

Table 2C - Upper Big Marsh LSR Crown Cover

Crown Cover	PAGs (acres)					Total % by Category
	LPD	LPW	MCD	MCW	MHO	
Rock, sparsely vegetated					6 (0.2%)	0.2%
Shrub - cc 41-55%						
Tree - cc 11-25%	8 (0.2%)					0.2%
Tree - cc 26-40%	18 (0.6%)		1 (0.0%)		22 (0.7%)	1.3%
Tree - cc 41-55%	14 (0.4%)		1 (0.0%)		212 (3.5%)	6.9%
Tree - cc 56-70%	19 (0.6%)		12 (0.4%)		517 (15.9%)	16.9%
Tree - cc 71-100%	61 (1.9%)		66 (2.1%)		1951 (60.0%)	64.0%
Totals	120 (3.7%)		80 (2.5%)		2708 (83.3%)	

Note: Riparian and rock account for 10.5% of the LSR and are not included in the figures above.

Upper Big Marsh LSR - 87.8% of the LSR has greater than 40% crown cover, 80.9% has greater than 55% crown cover, 64.0% has greater than 70% crown cover.

Fire

Historic Fire Regime -- See pages 4-24 of the Big Marsh Watershed Analysis for a historic perspective on fire in the mountain hemlock dry PAG.

Hazard Analysis -- Low

Natural down woody accumulations are occurring within the HRV and pose no immediate hazard.

Fuel Model Summary:

Fuel Model	% of LSR
0	2%
1	3%
8	48%
9	15%
10	17%
11	14%

Crown Fire Potential:

Crown Fire Potential	% of LSR
Null	5%
Low	20%
Mod	59%
High	15%
Extreme	1%

Risk Analysis -- Low

Only three fires have occurred where suppression action was taken in the last five and a half decades. All three fires occurred in 1995-1996. Refer to Figure 24 on page 4-5.

Social Context

Reference to Big Marsh Watershed Analysis

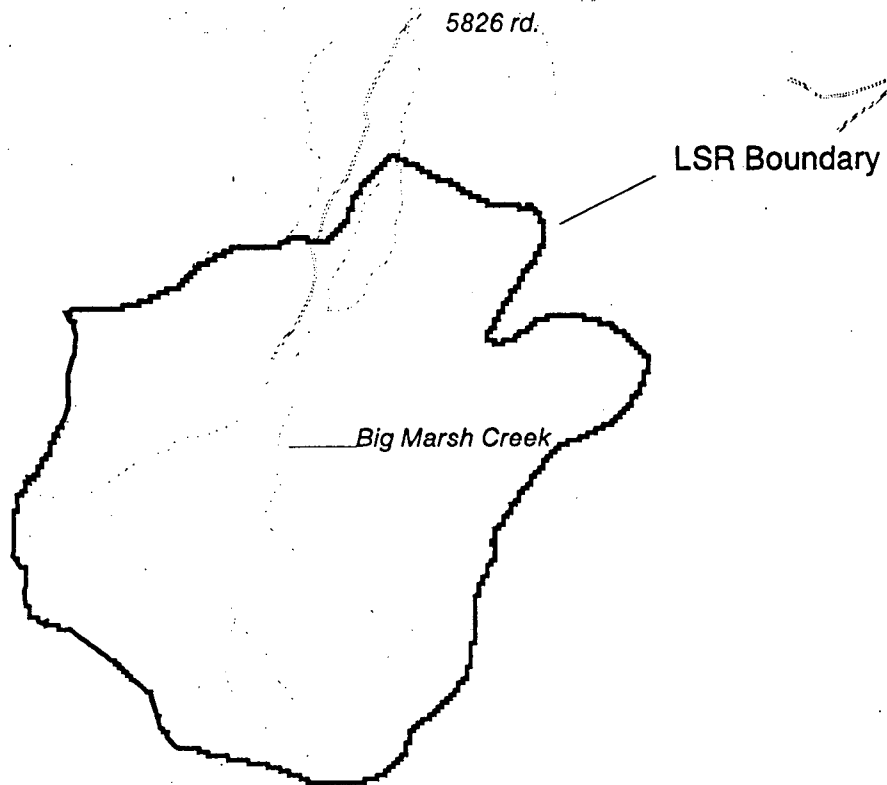
To understand how Upper Big Marsh LSR functions from a social perspective, refer to the Big Marsh Watershed Analysis, which describes the area that includes the Upper Big Marsh LSR (identified as Landscape Area F in the watershed analysis) in terms of social expectations; human settlements influencing the area; access and travel; recreational use; scenic values; commercial use and commodities; and heritage resources. Refer to page 2-32 of the Big Marsh Watershed for more information. (Figure 27)

Summary of Trends

- The overall risk from insects and disease is moderate to high. The risk in the mountain hemlock PAG is moderate, while the remaining area is high.
- Stands are mature to overmature, and stocked above the UMZ.
- Insects and diseases in the area include bark beetles, white pine blister rust, and root rots. Within the mountain hemlock PAG laminated root rot pockets occur. The potential exists for spruce budworm in the mixed conifer type.
- Assuming no management intervention, the stands will continue moving towards later seral stages and increased stocking.
- The risk for stand replacement events from insects, disease, and fire will increase.

Upper Big Marsh LSR Overview

Figure 27



Open Roads
Streams
Trails



0.6 0 0.6 1.2 Miles



UPPER BIG MARSH – SUMMARY TABLE

ACRES – 3250

PAG – MHD

ELEVATION RANGE (ft.) – 4800 – 7000

LRMP ALLOCATION – OCRA

WILDLIFE – wolverine, fisher, American marten, northern goshawk, Cascade frog

BOTANICAL – *Allotropa virgata*

FRAGMENTATION – low

LOS – 67.8%

INSECT AND DISEASE – moderate

SOIL RESTORATION PRIORITY – low

FIRE RISK – low

FIRE HAZARD – low

ACCESS – low

ACTIVITIES – recreation, hunting

Criteria for Developing Appropriate Treatments – Upper Big Marsh

Desired Condition

Maintain areas in a contiguous, multi-storied, forested condition throughout the LSR. Mixed conifer stands should be managed to obtain or move towards the conditions identified in the NRF description located at the beginning of this chapter and the mixed conifer climatic-climax suitable habitat descriptions located in Chapter 3.

Maintain highly functional dispersal habitat for spotted owls in the mountain hemlock stands.

Manage to provide and maintain a healthy riparian system according to the Aquatic Conservation Strategy.

Objective

Short-term (0-50 years) --

- Allow this LSR to function as a natural, relatively unmanaged, mixed conifer/mountain hemlock old growth ecosystem to provide contiguous habitat for spotted owls and a diversity of other species. This LSR will also provide an area where information can be obtained on a “natural” ecosystem.

Long-term (50+ years) --

- Maintain a minimum of 70% of the LSR in suitable climatic-climax LOS habitat for emphasis and selected species.

Rationale: It is believed that this LSR can sustain a minimum of 70% in suitable LOS mixed conifer and mountain hemlock climatic-climax condition. This determination was based on the site potential and existing and desired condition for both the mixed conifer and mountain hemlock PAGs. The majority of the LSR is in the mountain hemlock PAG which can sustain a higher percentage of LOS. Maintaining a minimum of 70% LOS was recommended, because the team believed that natural processes, i.e. fire, insects and diseases, would preclude maintaining a higher percentage of suitable habitat over an extended period of time.

Management Options

Management of Forested Areas

- No silvicultural treatments are recommended within this LSR unless a catastrophic event such as a fire or insect epidemic began to or had already occurred. All vegetative treatments would be compatible with the Aquatic Conservation Strategy and standards and guidelines for the Wild and Scenic River, Riparian Reserves, and OCRA. (Short and Long-term)
- Maintain a viable blister rust resistant western white pine component in the ecosystem for vegetative species diversity in root rot pockets (Short and Long-term)
- ◆ Opportunity -- Evaluate the incidence of white pine blister rust within the area.

Snags and Down Woody Debris

- Within the context of individual stands site potential, maintain coarse woody debris and snags at levels indicated in the Suitable Habitat Condition Tables and Additional Guidance for Dead

Wood Management section located in Chapter 3. (Short and Long-term)

Fire Suppression

- A fire plan should be developed for the OCRA and should evaluate moving from a control to a confine and/or contain strategy that would allow fire to play a more natural role in helping to maintain sustainable processes. Development of a fire plan should include discussion and analysis of managed fires regardless of ignition source. Use appropriate confine, contain, and control strategies until a fire plan is completed, with the emphasis being placed on confine and contain. Control strategies may be needed if a fire was nearing the LSR boundary. (Short-term)
- Use control strategies for fire suppression should a fire occur in the vicinity of the spotted owl nest. The nest is located approximately one-half mile west of Big Marsh Creek. If the nest is not detected for several years, reevaluate the use of control strategies in this area.
- Manage fire events at their natural rates and intensities to facilitate minimal stand replacement events. (Long-term)
Opportunity -- Use prescribed natural fire, wildfire monitoring, and/or other techniques to retain appropriate levels of fire activity which maintain historic functions and processes across the landscape and within the LSR.

Riparian Areas

- Manage areas consistent with the Aquatic Conservation Strategy and Big Marsh Watershed Analysis.
- Protect or enhance habitat for the Cascade frog.

Wildlife and Botanical

- Habitat protection takes precedence over the protection of individual plants or animals with the exception of known sites of species listed in Table C-3 of the Northwest Forest Plan. For those species protection of individual plants or animals takes precedence. Protect the spotted owl nest.
 - ◆ Monitor -- Conduct surveys for and monitor known ALVI populations.
 - ◆ Monitor -- Spotted owl historic nest site.
- Maintain or enhance habitat for wildlife species such as the wolverine, fisher, and marten.
 - ◆ Continue to conduct carnivore surveys.
- Prevent, eradicate, or control noxious weed populations using current vegetative management guidelines.
- Monitor MIJE abundance following wildfire.

APPENDIX A

BIG MARSH WATERSHED – FIRE MANAGEMENT PLANS

Fire Management Plan Fact Sheet Crescent LSR #O-571

Total Acres - 604

Elevation (feet) - 4900-5100

PAGs –

LPD = 22%

MCD = 62%

MCW = 4%

MHD = 2%

RIP = 9%

Nearest Landmark -

Crescent Lake and Red Top Mountain

Areas of Concern -

Location is between Crescent Lake summer homes and Diamond Peak Wilderness boundary. BEMA (Crescent NW) with in this LSR, no active nest as of 1997

Hazard Analysis - HIGH

Increased vertical fuel loading by overstocked stands and increased horizontal fuel loading by natural down woody accumulations , both due to the exclusion of the natural role of fire

Fuel Model Summary:

Fuel Model	% of LSR
6	13%
8	1%
9	17%
10	26%
11	42%

Crown Fire Potential:

Crown Fire Potential	% of LSR
Null	19%
Low	28%
Mod	37%
High	11%
Extreme	5%

Risk Analysis - HIGH

Prevention Analysis - HHH*

There have been no lightning fires with suppression action taken in five and a half decades. All recorded fires are human caused, with the majority occurring from the summer home area between road 60 and Crescent Lake. FOR = 65%

Suppression -

Use appropriate suppression strategies (confine, contain, control) to keep all fires regardless of intensity to a 20 acre maximum and outside the Wilderness boundary and

summer home tract using the least aggressive ground-disturbing tactics in the safest manner. For example: aerial suppression is preferable to a bull dozer line. Use adaptive management as the stands conditions change. (Short-term until fuels reduction treatment is accomplished) Keep all fires to a 60 acre maximum after fuels treatment is accomplished and for the long-term.

Monitor overstory loss due to fire.

Monitor for changes in fire occurrence.

Treatment Proposals -

Understory thinning and removal to reduce crown fire potential, followed by hand pile/burn or Underburning to reduce surface fuels build up. This would help protect and enhance LOS

Road Access -

Western boundary is the wilderness with no road access. If fire starts on west side of Road 60, it will make its run up the slope into the wilderness.

Hazard Rating	Low	Mod	High	Extreme
Flame Length	1-2'	2-6'	6-8'	8'+
Fuel Model	1, 8, 9	6,9,11	6,10,1	6,10,12
Crown Potential	ground	torch	active	independent

Flame length direct attack limits = Hand crews <4' - dozer, 8'.

Flame length outputs based on 1hr = 4, 10hrs = 5, 100hr = 6, live = 60%, July/Aug., slope = 20%, mfw = 5 -10 mph at 220 (cross slope).

Risk Rating	Low	Mod	High	Extreme
Fire Occurrence Rate - 1940-1996	0-20	25-50	50-75	75-100

FOR = Number of fires ÷ Number of thousands of acres in area ÷ number of years.

*Prevention value - first letter = risk, 2nd = hazard, 3rd = value

Fire Management Plan Fact Sheet

Lower Big Marsh LSR #O-572

Total Acres - 1197

Elevation (feet) - 4700-4860

PAGs –

- LPD = 92%
- LPW = 2%
- MCD = 2%
- RIP = 4%

Nearest Landmark -

Big Marsh is just south.

Areas of Concern -

Location has Wild and Scenic waterway through the middle.

Hazard Analysis - HIGH

Lodgepole pine nearing the end of its 80-120 year life cycle. Natural down woody accumulations increasing due to exclusion of the natural role of fire.

Fuel Model Summary:

Fuel Model	% of LSR
1	8%
8	3%
9	9%
10	2%
11	78%

Crown Fire Potential:

Crown Fire Potential	% of LSR
Null	0%
Low	60%
Mod	33%
High	7%
Extreme	0%

Risk Analysis - HIGH

Prevention Analysis - HHH*

3 human and 3 lightning fires have occurred with suppression action being taken in five a half decades. Camping and Boy Scout Camp activity on the south boundary at Big Marsh Creek is the highest area for concern that would threaten fire starts in the LSR.

Suppression -

Alternative 1 – Control fire using minimum suppression techniques and natural barriers within the LSR. Control fire outside the LSR boundary, with the understanding that a fire could burn the entire LSR.

After 20 years evaluate the natural role of fire throughout the LSR. (Long-term)

Treatment Proposals -

Reintroduce fire into 1/3 of the LSR using natural boundaries to initiate early seral stage before the stand as a whole begins to collapse, losing all LOS attributes in the other 2/3rds. (Alternative 2)

Road Access -

Eastern boundary is the 6020-340 road to the south ending at Big Marsh Creek outlet.
Road 6020 could be a defensible line if fire comes out of this LSR.

Hazard Rating	Low	Mod	High	Extreme
Flame Length	1-2'	2-6'	6-8'	8'+
Fuel Model	1, 8, 9	6,9,11	6,10,1	6,10,12
Crown Potential	ground	torch	active	independent

Flame length direct attack limits = Hand crews <4' - dozer ,8'.

Flame length outputs based on 1hr = 4, 10hrs = 5, 100hr = 6, live = 60%, July/Aug., slope = 20%, mfw = 5 -10 mph at 220 (cross slope).

Risk Rating	Low	Mod	High	Extreme
Fire Occurrence Rate - 1940-1996	0-20	25-50	50-75	75-100

FOR = Number of fires ÷ Number of thousands of acres in area ÷ number of years.

*Prevention value - first letter = risk, 2nd = hazard, 3rd = value

Fire Management Plan Fact Sheet Upper Big Marsh LSR #O-573

Total Acres - 3250

Elevation (feet) - 4800-7000

PAGs -

LPD = 4%
MHD = 83%
MCD = 2%
RIP = 4%
ROC = 3%

Nearest Landmark -

Tolo Mountain on southwest boundary and Big Marsh to the north.

Areas of Concern -

Location has Wild and Scenic waterway through the middle.

Hazard Analysis - LOW

Natural down woody accumulations are occurring within the HRV and should be due for stand replacement fire in the next 100-200 years.

Fuel Model Summary:

Fuel Model	% of LSR
0	2%
1	3%
8	48%
9	15%
10	17%
11	14%

Crown Fire Potential:

Crown Fire Potential	% of LSR
Null	5%
Low	20%
Mod	59%
High	15%
Extreme	1%

Risk Analysis - LOW

Prevention Analysis - MLL*

Only 3 fires have occurred with suppression action taken in five and a half decades, in 1995-1996.

Suppression -

A fire plan should be developed for the OCRA and should evaluate moving from a control to a confine and/or contain strategy that would allow fire to play a more natural role in helping to maintain sustainable processes. Development of a fire plan should include discussion and analysis of managed fires regardless of ignition source. Use appropriate confine, contain, and control strategies until a fire plan is completed, with the emphasis being placed on confine and contain. Control strategies may be needed if a fire was nearing the LSR boundary. (Short-term)

Manage fire events at their natural rates and intensities to facilitate minimal stand replacement events. (Long-term)

Treatment Proposals -

Allow fire to play a natural role in this LSR.

Road Access -

None

Hazard Rating	Low	Mod	High	Extreme
Flame Length	1-2'	2-6'	6-8'	8'+
Fuel Model	1, 8, 9	6,9,11	6,10,1	6,10,12
Crown Potential	ground	torch	active	independent

Flame length direct attack limits = Hand crews <4' - dozer ,8'.

Flame length outputs based on 1hr = 4, 10hrs = 5, 100hr = 6, live = 60%, July/Aug., slope = 20%, mfw = 5 -10 mph at 220 (cross slope).

Risk Rating	Low	Mod	High	Extreme
Fire Occurrence Rate - 1940-1996	0-20	25-50	50-75	75-100

FOR = Number of fires ÷ Number of thousands of acres in area ÷ number of years.

*Prevention value - first letter = risk, 2nd = hazard, 3rd = value

APPENDIX B

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