United States Department of the Interior

FISH AND WILDLIFE SERVICE

Oregon Fish and Wildlife Office
2600 SE 98th Avenue, Suite 100
Portland, Oregon 97266
Phone: (503)231-6179 FAX: (503)231-6195

Reply To: 01EOFW00-2014-F-0139
File Name: WEW RMP.doc
TS Number: 14-512
TAILS: 01EOFW00-2014-F-0139
Doc Type: Final

AUG 08 2014

Memorandum

To: Eugene District Manager, Bureau of Land Management, Eugene, Oregon

From: For State Supervisor/Deputy State Supervisor, Oregon Fish & Wildlife Office, Portland, Oregon

RE: Formal consultation on the Resource Management Plan for the West Eugene Wetlands. [FWS *reference*: 01EOFW00-2014-F-0139].

This memorandum and enclosed Biological Opinion (BO) respond to your request for formal consultation with the U.S. Fish and Wildlife Service (Service) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq.*), as amended (Act). At issue in this consultation are the effects resulting from adoption by the Bureau of Land Management of the West Eugene Wetlands Resource Management Plan (RMP) and the associated *West Eugene Wetlands Plant and Invertebrate Monitoring Plan* as updated December 18, 2013, on the endangered Bradshaw's lomatium (*Lomatium bradshawii*), threatened Kincaid's lupine (*Lupinus oreganus*), endangered Willamette daisy (*Erigeron decumbens* var. *decumbens*), endangered Fender's blue butterfly (*Icaricia icarioides fenderi*), endangered Taylor's checkerspot butterfly(*Euphydryas editha taylori*) and the threatened streaked horned lark (*Eremophila alpestris strigata*), and the critical habitats of the Kincaid's lupine, Willamette daisy and Fender's blue butterfly. Your request for formal consultation was received in our office on April 7, 2014. Our conclusion for formal consultation is that implementation of the activities as described within the Biological Assessment would not jeopardize the continued existence of any listed species described within the BO nor would it adversely modify their critical habitat.

If you have any questions regarding this BO, please contact Paul Bridges at 541-957-3404, or Brendan White at (503) 231-6179.

Attachment: BO

BIOLOGICAL OPINION for the
RESOURCE MANAGEMENT PLAN for the
WEST EUGENE WETLANDS in LANE COUNTY, OREGON
on the
U.S. Bureau of Land Management, Eugene District
(FWS Reference Number 01EOFW00-2014-F-0139)

Prepared by the Oregon Fish and Wildlife Office
U.S. Fish and Wildlife Service
Portland, Oregon

Paul Henson

Paul Henson, Ph.D., State Supervisor

8-5-2014

Date

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service or USFWS) Biological Opinion (BO) based on our review of the Proposed Resource Management Plan (RMP) for the West Eugene Wetlands in Lane County, Oregon, and adoption by the BLM of the associated *West Eugene Wetlands Plant and Invertebrate Monitoring Plan*, as updated December 18, 2013. This document was prepared in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq*.). The request for formal consultation was received by the Service on April 7, 2014.

The proposed action would affect the endangered Bradshaw's lomatium (*Lomatium bradshawii*), threatened Kincaid's lupine (*Lupinus oreganus*), endangered Willamette daisy (*Erigeron decumbens* var. *decumbens*), endangered Fender's blue butterfly (*Icaricia icarioides fenderi*), endangered Taylor's checkerspot butterfly (*Euphydryas editha taylori*) and the threatened streaked horned lark (*Eremophila alpestris strigata*), and the critical habitats of the Kincaid's lupine, Willamette daisy and Fender's blue butterfly. The proposed action would not affect the critical habitats of the Taylor's checkerspot or streaked horned lark as neither occurs in the action area (FR 78: 61506 – 61589).

This BO is based on the following major sources of information: The April 3, 2014, Biological Assessment (BA) for the RMP for the West Eugene Wetlands; the *West Eugene Wetlands Plant and Invertebrate Monitoring Plan* (updated December 18, 2013) (Monitoring Plan) the *Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington* (USFWS. 2010) (Recovery Plan), and the *final rule* on the critical habitats of the Kincaid's lupine, Willamette daisy and Fender's blue butterfly (FR 71[210]:63862- 63977) (*final rule)*, and also our files and communications between the Eugene BLM and Service staff.

This BO does not address the effects of propagating federally-listed plants in the action area, or in association with the proposed action, with respect to seed collection, growth or transplant, as these effects are addressed separately (see USFWS 2008a). In addition, this BO does not address effects from scientific research; the Service address research-related effects and permitting through a separate process.

Because the golden paintbrush *(Castilleja levisecta)* is not suspected to occur in the action area, and due to the recent (October 3, 2013) listings of the Taylor's checkerspot butterfly and streaked horned lark, the *West Eugene Wetlands Plant and Invertebrate Monitoring Plan*, dated December 18, 2013, does not address these species and the Proposed RMP does not address monitoring these species. The BLM will consult on the effects of monitoring these species, if any, separately or through reinitiation of this consultation.

CONSULTATION HISTORY

On February 11, 2013, the BLM provided to the Service a Conservation Assessment (CA) which provided an evaluation of the Preferred Alternative of the Draft Resource Management

Plan/Draft Environmental Impact Statement for the West Eugene Wetlands. The BLM prepared that CA in partial fulfillment of BLM mandates under ESA sec. 7(a)(1). The Service issued its associated Conservation Review (CR) on March 8, 2013. The BLM addressed the Service's recommendations in the CR with the Service's designated representatives. Here the Service summarizes those recommendations and the subsequent BLM decisions as reflected in the Proposed RMP/EIS:

- The Service recommended that the BLM continue to collect survey and monitoring data to facilitate future, project-level ESA sec. 7(a)(2) consultation. The BLM provides the Service with the *West Eugene Wetlands Plant and Invertebrate Monitoring Plan*, updated December 18, 2013, as a means to approve the implementation of that document (Appendix A).
- The Service recommended that the BLM expand the Prairie Restoration Area (PRA) land use allocation (LUA) to include all extant populations of Bradshaw's lomatium and Willamette daisy in the action area, and an "area adjacent to KL-12B" (71 FR 63891) which was "overlooked" by the *final rule*. The BLM expanded the PRA to include those areas, and plants specifically:
  - Willamette daisies at Vinci (17 plants total).
  - Bradshaw's lomatium at Rosy (344 plants total), Willow Corner Annex (4 plants total) and North Taylor (810 plants total).
  - The BLM verified that the "area adjacent to KL-12B" would be in the PRA.
- The Service recommended that the BLM survey the action area for the streaked horned lark and Taylor's checkerspot butterfly. In June 2013, cooperator surveyors verified for the first time the occurrence in the action area of nesting streaked horned larks. The BLM did not survey for Taylor's checkerspot butterflies in 2013 but plan to survey in 2014. Due to the recent listing of these species (October 3, 2013), the BLM did not address them in the *West Eugene Wetlands Plant and Invertebrate Monitoring Plan* (December 18, 2013). The BLM would consult separately, as warranted, on the effects of survey and monitoring on these species.
- In our evaluation, the BLM and Service identified a 93-acre patch of BLM-administered land in the action area that could be restored to support foraging and nesting by the streaked horned lark, of which the BLM proposed restoring 65 acres to support grassland birds. The Service recommended restoring all 93 acres (*i.e.*, 28 additional acres) even though the resulting patch would remain below the 300-acre minimum contiguous patch size recommended for the horned lark (78 FR 61459). The BLM subsequently determined that the current uses and condition of non-federal lands adjacent to these 93 acres provide the BLM with an opportunity to contribute to a near-contiguous 300-acre patch of low-quality upland and low-quality wetland prairie subject to the management of the adjacent lands which the BLM does not control. With verification of nesting streaked horned larks in this area, the BLM added the 28 acres to the PRA (*i.e.*, the BLM will restore the entire 93-acre parcel).
- The Service recommended that the BLM enhance and restore habitat for Taylor's checkerspot in the Natural Maintenance Area (NMA) LUA if new evidence indicates that harsh paintbrush (*Castilleja hispida*) or blue-eyed Marys (*Collinsia parviflora, Collinsia grandiflora*) can serve as a larval host plant for this species in lieu of the non-native English plantain (*Plantago lanceolata*). The BLM modified the definition of the NMA to allow for (but not require) habitat enhancement. If evidence indicates that a native species can support

the checkerspot in the action area, the BLM would pursue checkerspot habitat enhancement in the NMA subject to other management priorities and available staff and funds.

- The Service recommended that the BLM use proactive measures to help prevent trespass and unauthorized uses in the action area. The BLM added management standards 28 and 46, which require the BLM to place signs, fences or other infrastructure, or implement controls, to help protect plants and animals from trespass.
- The Service recommended that the BLM add language to three management standards. The BLM adopted the recommended language as follows (the recommended language is italicized):

Management Standard 22 (now Management Standard 25). Do not operate heavy machinery within 6 feet of federally-listed plants during the growing season of the federally-listed plants (generally February to August). *Avoid the use of heavy machinery in areas wet enough that the machinery would cause permanent rutting or changes to the hydrologic function of a site.*

Management Standard 29 (now Management Standard 22). Do not seed or plant plugs within 6 feet of *naturally-occurring* federally-listed plants.

Management Standard 41 (now included in the management direction for the NMA; see Section 1.2.1.2). Within the NMA, allow herbicides for the control of noxious weeds*, invasive non-native plants, and invasive native plants* where prescribed burning, manual, mechanical, and other non-chemical vegetation treatments do not provide sufficient vegetation control to avoid spread of noxious weeds *and other invasive plants*.

- The Service recommended that the BLM annually provide it with project implementation and monitoring reports of activities addressed by the RMP that affect listed species or critical habitat. The BLM agreed to provide those reports.
- The Service recommended that the BLM provide it with all future reports and findings related to federally-listed species and critical habitats in the action area. The BLM agreed to provide those reports and findings.

Additional Changes between the Preferred Alternative as reviewed by the Service and the Proposed RMP/EIS

- `The BLM included the Long Tom Area of Critical Environmental Concern (ACEC) in the PRA LUA instead of a separate LUA. Because the management objectives and standards for the PRA were designed to be consistent with protecting the relevant and important values for which we originally designated the Long Tom ACEC was originally designated, the ACEC designation no longer would be needed.
- The BLM expanded the PRA LUA from 414 acres to 556 acres (44 percent[1] of the action area) to include all extant populations of federally-listed species, the Long Tom ACEC (7 acres), 28 acres that the Service recommended be added to support the streaked horned lark and the "area adjacent to KL-12B" (71 FR 63891) which was "overlooked" by the *final rule*.

[1] All percentages are based on 1,275 acres of habitat-capable land. This land includes the 1,340 acres of managed lands (but does not include the 96 acres with BLM easements) *minus* open water, roads and other lands incapable of supporting riparian or upland habitat.

- With these additions to the PRA, the NMA LUA would contract from 854 acres to 719 acres (56 percent).
- The BLM allowed herbicide use in the NMA to control native invasive plants and help achieve habitat goals for the recovery of federally-listed species.
- The BLM agreed to coordinate herbicide use in the NMA with the Confederated Tribes of the Grand Ronde, as appropriate, to identify application locations, timings, rotations and target species to meet weed and invasive plant management needs in association with opportunities for the uses of traditional use plants.
- The BLM would reduce the area to be planted with golden paintbrush, a possible host plant for the Taylor's checkerspot butterfly, from 65 acres to 22 acres because they subsequently determined that the remaining 43 acres that were identified originally are areas to be restored for Kincaid's lupine.
- The BLM would close the planning area to salable mineral[2] exploration and development.
- The levels and types of recreation use in the NMA would increase (see the description of the NMA LUA in Section 1.2.1.2, and Section 1.2.3.6).
- The BLM would designate the Fern Ridge Path and Stewart Pond as Special Recreation Management Areas.
- The BLM would add a recreation objective and associated management standards, including direction to develop a disc golf course at Stewart Pond.
- The BLM would add management direction to maintain and enhance habitat for the Taylor's checkerspot butterfly and streaked horned lark to support functioning populations that are stable or increasing.
- The BLM included the following management standards (see Section 1.2.1.2):
- Management standards 4, 6 and 7 regarding wildfire suppression.
- Management standards 28 and 46 to help protect sites from natural or human-caused damage processes.
- Management standards 29 and 30 to help protect Bradshaw's lomatium and Willamette daisy during habitat restoration activities.
- Management standard 37 to help create habitat for grassland birds.
- Management standard 50 to help protect fragile soils from mowing operations.
- Management standards 65 and 66 regarding public recreation.
- Management standards 73 – 76 regarding visual resource management.
- Management standard 79 regarding the collection of plant species.
- Management standard 83 regarding managing the action area as a single Travel Management Area.
- Standard 12 originally read: "On sites with listed plants where spring mowing is needed to control overwhelming weed infestations, maintain a buffer of 6 feet from the nearest listed plants if this will meet the management objective. However, if needed to control serious infestations of weeds that reproduce mainly by seed, up to one-half of the listed plant population at a site may be mowed in an effort to reduce seed set by non-native weeds. Set tractor mower decks at a level high enough to avoid killing listed plants but low enough to remove weed flowers." The last two sentences would be deleted as unnecessary.

[2] Salable minerals include sand and gravel; the most likely salable mineral in the action area is potting clay. Salable minerals are distinct from locatable and leasable minerals which are defined in Section II C 3 j (footnote).

- Standard 22 originally read: "Do not seed or plant plugs within 6 feet of naturally occurring federally-listed plants." The BLM would delete "seed or" because recent research (Stanley *et al*. 2011b, and Tom Kaye, exec. dir., Institute for Applied Ecology, Corvallis, OR, pers. comm. to Sally Villegas-Moore via e-mail, December 18, 2013[3]) shows the benefit of seeding annual plant species after herbicide application.
- Standard 34 originally read: "Implement prescribed burning on sites with Fender's blue butterfly. The center of any portion of burned occupied habitat must be within 300 feet of unburned occupied habitat." The BLM would delete the second sentence in favor of standards 35 and 36.

BIOLOGICAL OPINION

1.0 DESCRIPTION OF THE PROPOSED ACTION

The Federal Land Policy and Management Act of 1976 (FLPMA) requires the BLM to develop resource management plans to provide for the use of public lands. Among other requirements, FLPMA directs the BLM to use and observe the principles of multiple use management in the development of resource management plans. There are specific considerations in the West Eugene Wetlands planning area that led the BLM to focus management on resident threatened and endangered species: the regional scarcity of the federally-listed species and their habitat, the importance of the planning area to the recovery of these federally-listed species, and the purposes for which the BLM acquired lands in the planning area. Therefore, the purpose and need for the West Eugene Wetlands RMP/EIS are more specific than the broad mandate of multiple use management alone.

The Recovery Plan describes the importance of BLM-administered lands in the West Eugene Wetlands to the recovery of Fender's blue butterfly, Willamette daisy, Bradshaw's lomatium, and Kincaid's lupine, and recommends recovery strategies and objectives relevant to BLM management. ESA sec. 7(a)(1) requires the BLM to use its authorities to further the purposes of the ESA by implementing programs for the conservation of federally-listed species and the ecosystems upon which they depend. The BLM Special Status Species Management Manual 6840 explains, "Ways in which the BLM can carry out these responsibilities include … Developing and implementing agency land use plans, implementation plans, and actions in a manner consistent with conservation and/or recovery of federally-listed species" (BLM 2008:6840.1E5). The BLM Special Status Species Management Manual further explains that the "BLM will incorporate objectives and actions identified in recovery plans into BLM documents, as appropriate. Examples of such documents include land use plans, implementation level plans, and species conservation plans or agreements" (BLM. 2008:6840:1B2). The West Eugene Wetlands include some of the last remaining rare Willamette Valley wet upland prairie habitat,

[3] Tom Kaye wrote, "Yes. I would plan for seeding with native vegetation after any effort to eradicate invasives. The rationale is that if invasives are removed, then other invasives or the same ones will reestablish in the opening created by the eradication effort. Replacing these invasives with native vegetation is the desired outcome. Planting with native perennial grasses and forbs, often with some annuals mixed in, is the correct approach. This applies to situations with and without Threatened and Endangered plants. Although T&E species may respond to competition from natives, they respond very negatively to invasive vegetation. If natives are re-seeded, the manager can select the species that re-establish based on their compatibility with the T&$ species of concern. Therefore, re-seeding with desired native vegetation is the best management practice."

of which less than one percent remains in comparison to historical extent. With so little habitat left, and with more than one-third of the planning area designated as critical habitat for federally-listed species, it is unlikely that recovery of these species can be achieved in this recovery zone without the BLM-administered lands in the West Eugene Wetlands.

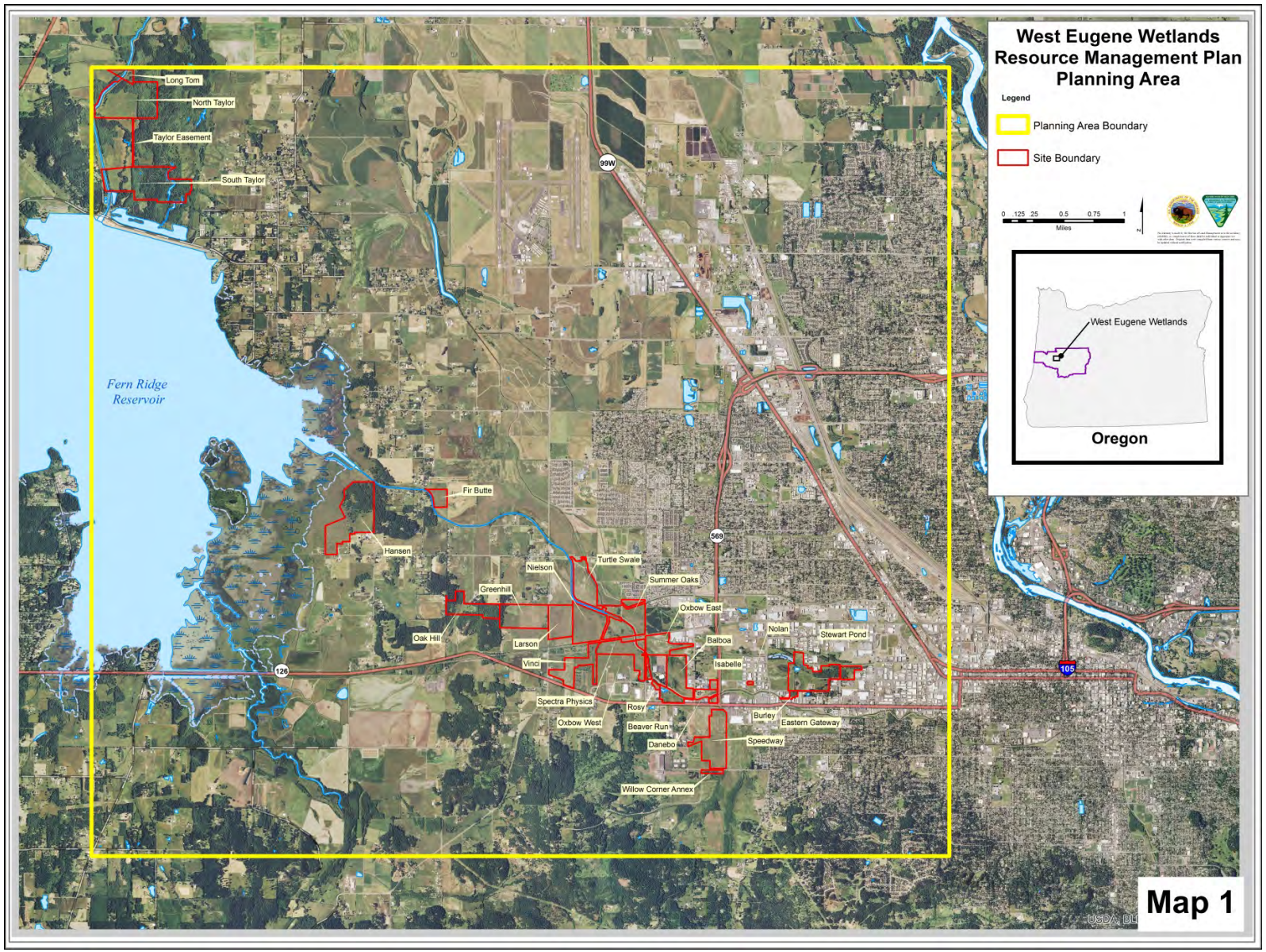
The RMP proposes to manage BLM-administered lands in the West Eugene Wetlands to contribute to the recovery of federally-listed species while providing other benefits, particularly water quality enhancement, and storm water and flood control, habitat for native plant and animal communities, and recreation and environmental education opportunities, to the extent compatible with threatened and endangered species management.

1.1 Action Area

The action area is shown in Figure 1and includes all BLM-administered lands in the RMP planning area: 1,340 acres of BLM-administered lands and 96 acres of land on which the BLM has a conservation easement. The BLM will divide the action area into two LUAs of which prairie restoration (necessary for the recovery of federally-listed species) would occur throughout the PRA, habitat maintenance would occur throughout the NMA, and habitat restoration would be allowed throughout the NMA. Because all sites in the action area are sufficiently close, vehicles, traveling between sites, even with controls, could ferry seeds from the NMA to the other areas. Thus, the NMA is included in the action area because, among other reasons, habitat maintenance in the NMA would affect prairie restoration in the PRA. Figure 1 also shows the names of the BLM-administered parcels discussed throughout this BO.

The action area is comprised of low-quality wet prairie (834 acres), ash swale/riparian (173 acres), oak woodland (120 acres), low-quality upland prairie (116 acres) and low-quality oak savanna (23 acres). “Low-quality” describes communities that do not meet the standards of high-quality habitat in Appendix D of the Recovery Plan. No sites (other than small patches) currently meet recovery targets for prairie quality or diversity.

Figure 1. The RMP/EIS planning area (yellow) and the action area (red).



1.2 Overview of the Proposed RMP/EIS

1.2.1 Land Use Allocations

1.2.1.1 Prairie Restoration Area (PRA)

A) Management Objective

- Restore, enhance and maintain habitat for prairie-related plant and animal species.

B) Management Direction

- Apply vegetation management treatments, including prescribed burning, mowing and manual control, as needed, to restore and maintain high-quality habitat for prairie-related species.
- Apply herbicides[4] for vegetation control where prescribed burning, manual, mechanical and other non-chemical vegetation treatments do not provide sufficient vegetation control for restoration and maintenance of high-quality habitat for prairie-related species. Herbicides may be used for control of noxious weeds, invasive non-native plants and invasive native plants. Use standard operating procedures for herbicide application (BLM 2014, Appendix 1).
- Allow collection of traditional use plants where consistent with other resource objectives and subject to restrictions as needed to avoid conflict with restoration and maintenance of high-quality habitat for prairie-related species (BLM 2014). Collection of traditional use plants is subject to restrictions as needed to avoid resource damage and to provide for the continued availability of traditional use plants.
- Exclude new rights-of-way subject to valid existing rights (BLM 2014, Appendix 2) and with the exception of buried lines in the rights-of-way of existing roads.
- Prohibit salable mineral exploration, development and disposal.

1.2.1.2 Natural Maintenance Area (NMA)

A1) Management Objective

- Maintain and enhance existing plant and animal habitat and provide opportunities for a variety of goods and services.

B1) Management Direction

- Apply vegetation management treatments, including prescribed burning, mowing and manual control, as needed, to control noxious weeds and invasive native and non-native plant species.
- Maintain and enhance remnant higher-quality prairie habitat patches, Bureau sensitive species/species of concern habitat sites, seed collection sites and traditional use plant sites, using vegetation management treatments, including prescribed burning, mowing and manual control.

[4] As described in Section II D, without herbicide use, prairie and savanna habitats cannot be restored to high-quality habitat conditions.

- Apply herbicides for vegetation control where prescribed burning, manual, mechanical and other non-chemical vegetation treatments do not provide sufficient vegetation control for maintenance and enhancement of existing plant and animal habitats. Herbicides may be used for control of noxious weeds, invasive non-native plants and invasive native plants to achieve habitat goals (including habitat restoration) identified as part of recovery or delisting goals or for conservation management of special status species. Use standard operating procedures for herbicide application (BLM 2014, Appendix 1).
- Manage sites for the availability and accessibility of traditional use to the extent feasible and subject to demand for traditional use plant collection.
- Allow collection of traditional use plants where consistent with other resource objectives and subject to restrictions as needed to avoid resource damage and to provide for the continued availability of traditional use plants.
- Application of herbicides in areas identified for collection of traditional use plants would be timed and located so that herbicide application would not impede opportunities for plant collection. Where herbicide use would impede collection of traditional use plants and herbicide use has not been identified as needed to promote or preserve the occurrence or persistence of desired plant or animal habitats, herbicide application would be prohibited.
- Close to salable mineral exploration, development and disposal.

A2) Management Objective

- Increase levels and types of recreation uses that contribute to meeting recreational demand and quality visitor experiences.

B2) Management Direction

- Extend existing trails and construct new trails in the future depending on recreational demand and feasibility.
- Pave the parking area at Stewart Pond.
- Install a concrete vault restroom at the Stewart Pond parking area.
- Construct additional loop trails at Stewart Pond to create routes of various lengths.
- Improve facilities at Stewart Pond, including kiosks, picnic tables, benches, interpretive signs.
- Designate the Stewart Pond site as a Special Recreation Management Area for wildlife viewing, hiking and disc golf.
- Develop a disc golf course at Stewart Pond that incorporates the following Management Direction:
    - Develop course to reduce conflict with other recreational opportunities (*e.g.*, trail running, walking) available in the Stewart Pond area.
    - Develop the course routes and tee/basket locations to provide for year-round play. Course routes and tee/basket locations installed in seasonally wet areas would be subject to seasonal closure.
    - Design course to include a variety of challenge for player skill and interest through varying fairways or development of skill shots.

- Reduce compaction at baskets by placing woodchip or other appropriate materials on the ground around the basket and providing for multiple basket location options where available.
- Apply woodchip or other appropriate materials along trails, fairways, around tees and baskets, or otherwise as needed to ameliorate soil impacts, reduce tramping of vegetation and clearly define designed route of travel.
- Route course in a manner to avoid hazards to players, such as roads or poisonous plants.
- Trail rehabilitation work to ameliorate compaction using mechanized equipment should occur when soil moistures are low (approximately 25 percent).
- Tees shall be clearly locatable and properly designed to reduce compaction.
- Install trunk/limb protection as needed.
- Incorporate environmental education opportunities throughout the course to include information about local features of the various habitat types.

The PRA (Figure 2) would include 556 acres or 44 percent of the planning area. The remaining 56 percent of the planning area would be allocated to the NMA. The Fern Ridge Path and Stewart Pond would be designated Special Recreation Management Areas; the remainder of the planning area would be designated an Extensive Recreation Management Area[5]. All extant populations of federally-listed plants, the Fender's blue butterfly and the parcel where streaked horned larks were observed in June 2013 would be included in the PRA.

1.2.2. Habitat Maintenance and Restoration

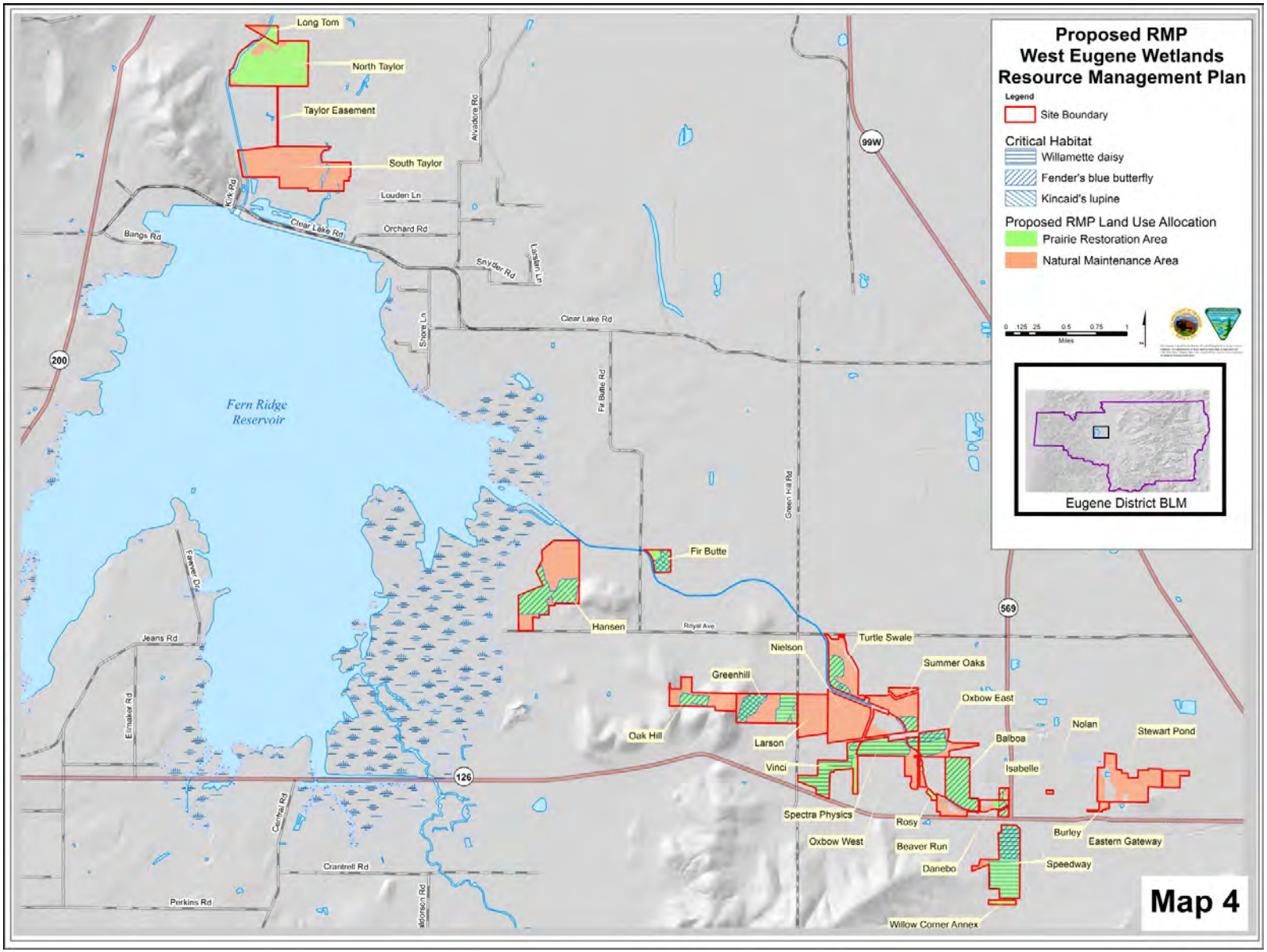
Under the Proposed RMP, all restoration techniques, including herbicide application, would conform to the standards of, and proceed in accordance with the Recovery Plan.

The restoration goals for special status plants would be to maintain and enhance habitats and populations for:

- Willamette daisy and Bradshaw's lomatium to support three populations totaling 15,000 individuals of each species that are stable or increasing over 10 years.
- Kincaid's lupine to support three populations totaling 7,500 square meters (1.8 acres) in size that are stable or increasing for 10 years.

[5] The BLM designates a Special Recreation Management Area to manage that area for specific recreation opportunities and infrastructure as required by its approved Resource Management Plan. In contrast, an Extensive Recreation Management Area is open to casual recreation uses, such as bird watching, cycling and walking, but the BLM is not required by its approved Resource Management Plan to manage for those uses other than to protect resources and the public from those uses.

Figure 2 The arrangement of land use allocations under the Proposed RMP/EIS.



- Golden paintbrush to support one population of at least 1,000 flowering individuals that is stable or increasing over 5 years.
- Shaggy horkelia (*Horkelia congesta* ssp. *congesta*), Hitchcock's blue-eyed grass (*Sisyrinchium hitchcockii*), cluster goldweed (*Pyrrocoma racemosa* var. *racemosa*), and Oregon timwort (*Cicendia quadrangularis*) to support three populations totaling 15,000 individuals of each species that are stable or increasing over 10 years.
- Thin-leaved peavine (*Lathyrus holochlorus*) to support one population of at least 1,000 individuals that is stable or increasing over 10 years.
- White-topped aster (*Sericocarpus rigidus*) to support a population of 7,500 square meters (1.8 acres) that is stable or increasing over 10 years.
- The BLM sensitive mosses *Bruchia flexuosa*, *Ephemerum crassinervium*, and *Ephemerum serratum*.

The restoration goals for special status animals would be to:

- Maintain and enhance habitat for Fender's blue butterfly to support functioning populations that are stable or increasing to meet targets for downlisting and delisting the species (USFWS 2010: IV-29 – IV-30).
- Maintain and enhance habitat for Taylor's checkerspot butterfly to support functioning populations that are stable or increasing.
- Maintain and enhance habitat for streaked horned lark to support functioning populations that are stable or increasing.
- Maintain and enhance habitat for western pond turtles (*Actinemys marmorata marmorata*) to support populations that are stable or increasing.
- Maintain at least one patch of 200 acres of contiguous high-quality wet prairie or upland prairie, and enhance up to four patches of at least 50 acres or more of contiguous high-quality wet prairie or upland prairie for grassland birds, such as Oregon vesper sparrow (*Pooecetes gramineus affinis*) and grasshopper sparrow (*Ammodramus savannarum*).
- Enhance forest habitats by increasing abundance of snags in forested plant communities.
- Maintain and enhance 100 acres of oak woodland habitats in patches of at least 15 acres in size for species associated with oak woodlands, such as Lewis' woodpecker (*Melanerpes lewis*).

The Proposed RMP includes herbicides among the management tools for both the PRA and NMA. The herbicides available for use would be glyphosate, clopyralid and triclopyr. Aminopyralid and fluazifop would be available for limited use for research and demonstration to evaluate the effectiveness of these herbicides to control noxious weeds, invasive non-native plants, and invasive native plants to achieve habitat goals identified as part of recovery or delisting or for conservation management of special status species in the planning area. Herbicide use would be permitted in the NMA for management of noxious weeds, native invasive plants and non-native invasive plants to allow for habitat maintenance and restoration.

The following standards are taken from Appendix 1 of the BA (BLM 2014):

- Herbicide treatments that are implemented when listed plants are growing and Fender's blue butterfly are active (i.e., in the spring) will be done in a manner that minimizes effects to listed species by using targeted application methods (e.g., wick application or spot spray),

and distance buffers and/or baffling systems to minimize the risk of listed species coming into contact with herbicides.

- Glyphosate (by broadcast or spot-spray) and triclopyr, clopyralid, or aminopyralid (by spot-spray or direct basal application) could be applied any time outside of patches of listed plants as long as application is within label directions.
- Within patch of listed plants, application of glyphosate, triclopyr, clopyralid, or aminopyralid would generally be conducted in fall when listed plants are dormant. Occasional within-patch treatments could occur anytime, but listed plants would be protected by distance or baffling systems unless nectar species are abundant in a site.
- Invasive woody species within Kincaid's lupine patches could be treated with triclopyr (spot-spray or direct basal application) in the fall with no contact with listed plant species.
- Fluazifop could be broadcast using boom sprayers or handguns mounted on tractors or all-terrain vehicles, applied by workers on foot with backpack sprayers, or spot applied to manage competitive grasses.
- Fluazifop could be applied in spring or fall (approximately 3 weeks after burning) when target plants are actively growing within or outside of patches of listed plants.

1.2.3 Management Objectives and Standards

The following management objectives and standards are part of the proposed action.

1.2.3.1 Air Quality/Prescribed Burning/Wildfire Suppression

A) Management Objectives

- Avoid impacts to air quality in non-attainment areas.
- Reduce hazards to the public, fire-fighters and resources from prescribed burning.
- Reduce risk to public, fire-fighters and resources through active suppression of wildfire.

B) Management Standards

1. Implement prescribed burns in compliance with Lane Regional Air Pollution Authority and the unit-specific prescribed fire burn plans.
2. Implement prescribed burning in late summer and early fall, when soils have low moisture values and can support fire-fighting vehicles without damage to the soils.
3. Ignite prescribed burns by hand, using propane torches, fusees, hand-launched flares and/or drip torches.
4. Suppress unplanned ignitions (wildfire) to minimize risk to values while minimizing resource damage caused by suppression operations.
5. Accomplish fire control/suppression with the use of existing barriers, wet-lining, fire retardant foam, fire-retardant gel and/or mowing an area approximately 10-20 feet wide around the outside boundary of the burn unit. Where necessary to minimize risk to values due to woody fuels, topography, or critical holding points, fire control will be accomplished by constructing a fireline composed of bare-mineral soil: reseeding would be required. Avoid

fire retardant chemicals or use sparingly near listed plant species and follow labeled restrictions and state regulations or guidelines for use near water.

6. Restrict vehicle travel necessary to accomplish fire control/suppression primarily to the perimeter of the burn unit. Vehicle travel within the interior of the burn unit is limited to tactical missions. Consolidate vehicle travel within units to minimize number of trails.
7. Implement mop-up and line construction operations in a manner to minimize mixing or displacement of soils and to avoid damaging of anthills. Ground-disturbing operations would require reseeding. Mop-up and line construction would avoid all threatened and endangered and bureau sensitive sites, as feasible.

1.2.3.2 Plants

A) Management Objectives

- Maintain and enhance habitat for Willamette daisy and Bradshaw's lomatium to support three populations[6] of each species of at least 5,000 individuals each.
- Maintain and enhance habitat for Kincaid's lupine to support a total of 7,500 square meters of plant cover in three populations that are stable or increasing for 10 years.
- Maintain and enhance habitat for golden paintbrush to support one population of at least 1,000 flowering individuals that is stable or increasing over 5 years.
- Maintain and enhance habitat for the BLM sensitive plants shaggy horkelia, Hitchcock's blue-eyed grass, cluster goldweed and Oregon timwort to support three populations of each species of at least 5,000 individuals each that are stable or increasing over 10 years.
- Maintain and enhance habitat for the BLM sensitive plant thin-leaved peavine to support one population of at least 1,000 individuals that is stable or increasing over 10 years.
- Maintain and enhance habitat for the BLM sensitive plant white-topped aster to support a population of 7,500 square meters that is stable or increasing over 10 years.
- Maintain and enhance high-quality wet prairie for the BLM sensitive mosses *Bruchia flexuosa*, *Ephemerum crassinervium* and *Ephemerum serratum*.

B) Management Standards

8. Apply the following management tools as needed to restore, enhance and maintain habitat: prescribed burning, mowing, haying, thinning, hand weeding, shade cloth, solarization, thermal treatments, tilling/disking, fill removal, raking, grazing and plant augmentation.

[6] In these management objectives and throughout the analysis of the Proposed RMP/EIS, "population" is used in the general sense to refer to any discrete spatial group of individuals of a species. From a technical standpoint, "population" would more accurately refer to a group of freely interbreeding individuals sufficiently separated from other groups that there is infrequent or no gene flow. The use of a more general definition of population here maintains consistency with the *Recovery Plan* usage (see, *e.g.*,USFWS 2010:IV-25).

9. Implement prescribed burning in late summer or early fall after listed plant species have gone See *Air Quality* for additional Management Standards for implementing prescribed burns.
10. Mow using tractor mowers or hand-held mowers to control invasive plants and enhance prairie habitats.
11. On sites with listed and Bureau sensitive plants, generally mow in the late summer, fall and winter, after listed plants have senesced for the season (generally after August 15 through February). Mowing height will be sufficiently high to avoid soil gouging or displacement (generally 6 inches on deck-set mowers).
12. On sites with listed plants where spring mowing is needed to control overwhelming weed infestations, maintain a buffer of 2 meters (6 feet) from the nearest listed plants if this will meet the management objective. Apply thinning to control and remove invasive woody plants and reduce tree density. Pile or chip all cut material and spread away from populations of listed plants or haul off-site for disposal or burning.
13. Implement hand weeding at any time of year. Generally remove non-native plant material to an off-site location.
14. Do not apply shade cloth, solarization, tilling/disking closer than 6 feet to listed plant species.
15. Do not dispose of fill removal within listed plant habitat.
16. Rake as needed to reduce thatch build-up. Rakes may be mounted on rubber tracked tractors or hand-held. Rake after listed plants have gone dormant for the season.
17. Apply grazing as appropriate under contract for the purpose of habitat restoration or invasive plant control. If needed for habitat restoration or invasive plant control, graze at low or moderate levels during the dry season (typically after August 1). Issue no leases for grazing.
18. Augment populations of Bradshaw's lomatium, Kincaid's lupine, golden paintbrush and shaggy horkelia through planting of plugs and direct seeding.
19. Augment populations of Willamette daisy, white-topped aster, Hitchcock's blue-eyed grass, thin-leaved peavine and cluster goldweed through planting of plugs.
20. Augment populations of Oregon timwort by seeding.
21. For augmentation of Willamette daisy, Bradshaw's lomatium and Kincaid's lupine, use genetic material derived from within the population in the Eugene West Recovery Zone, as available.
22. Do not plant plugs within 6 feet of naturally occurring federally-listed plants.
23. Implement plant augmentation consistent with the guidelines in the USFWS Programmatic Formal Consultation on Western Oregon Prairie Restoration Activities, Biological Opinion (USFWS 2008, pp. 16-18).
24. Seed with native upland and wet prairie species to meet prairie diversity recovery targets, especially after ground-disturbing activities.
25. Do not operate heavy machinery within 6 feet of federally-listed plants during the growing season of the federally-listed plants (generally February to

August). Avoid using heavy machinery in areas wet enough that the machinery causes permanent rutting/changes to hydrology at the site.

26. Minimize use of heavy equipment, do not apply shade cloth or solarization and avoid creating thatch within 300 feet of large populations (>100 square meters) of BLM sensitive mosses *Bruchia flexuosa, Ephemerum crassinervium* and *Ephemerum serratum*.
27. Clean all vehicles and heavy equipment to remove mud, debris and vegetation prior to entering the project area to reduce the spread of noxious weeds and non-native plants.
28. Implement protection measures such as stabilization, fencing and signing, or withdrawal for sites when threatened by natural processes or human activity.
29. Implement prescribed fire or mowing treatment on a rotation of 2 or 3 years for Bradshaw's lomatium populations.
30. Implement prescribed fire or mowing treatment on a rotation of 3 to 5 years for Willamette daisy populations according to monitoring results.

1.2.3.3 Animals

A) Management Objectives

- Maintain and enhance habitat for Fender's blue butterfly to support functioning populations that are stable or increasing to meet targets for downlisting and delisting of the species.
- Maintain and enhance habitat for Taylor's checker butterfly to support functioning populations that are stable or increasing.
- Maintain and enhance habitat for streaked horned lark to support functioning populations that are stable or increasing.
- Maintain and enhance habitat conditions for western pond turtles to support populations that are stable or increasing.
- Maintain and enhance up to four patches of at least 50 acres or more of contiguous high-quality wet prairie or upland prairie for grassland birds, such as Oregon vesper sparrow and grasshopper sparrow.
- Enhance forest habitats by increasing abundance of snags in forested plant communities.
- Maintain and enhance 100 acres of oak woodland habitats in patches of at least 15 acres in size for species associated with oak woodlands, such as Lewis' woodpecker.

B) **Management Standards**

31. Apply the following management tools as needed to restore, enhance and maintain habitat: prescribed burning, mowing, haying, thinning, hand weeding, shade cloth, solarization, thermal treatments, tilling/disking, fill removal and soil recontouring, raking, grazing and plant augmentation, as described above under Plants.
32. On sites with Fender's blue butterflies, do not mow with tractor mowers in the spring. Mowing with hand-held mowers may be implemented during the butterfly flight season (generally May 1 to June 30) as long as a buffer of at

least 25 feet is maintained between the mower and any Kincaid's lupine plant. After the butterfly flight season, but before Kincaid's lupine senescence (generally June 30 through August 15), mowing may occur no closer than 6 feet from the nearest Kincaid's lupine plants. Tractor mowing may be conducted throughout sites with Fender's blue butterflies after Kincaid's lupine senescence and before lupine re-emergence (generally August 15-March 1). Set tractor mower decks at least 6 inches above the ground to reduce impacts to butterfly larvae.

33. Do not mow within ground-nesting and other key bird breeding areas during the nesting season (generally April 15-July 15). If streaked horned larks are found to be nesting, a buffer will be created around breeding pair(s) until August 10.
34. Implement prescribed burning on sites with Fender's blue butterfly.
35. Raking may be used if burning is not feasible to implement on sites with Fender's blue butterflies. Remove thatch and leaf litter to an off-site location.
36. At sites with 100 or more Fender's blue butterflies, burn and/or rake no more than one-third of the occupied habitat actively used by butterflies annually. At sites with less than 100 Fender's blue butterflies, burn and/or rake no more than one-quarter of the occupied habitat actively used by butterflies annually.
37. Create patches of bare ground, seed with a diverse seed mix to create heterogeneous structure and varying vegetation heights (4 to 36 inches) and density for grassland bird habitat requirements.
38. Protect any western pond turtle nest sites found during project implementation and during surveys.
39. Install silt/drift fences where needed to direct western pond turtles away from project activities. Remove fences after project completion.
40. Protect and enhance areas with suitable characteristics for western pond turtle nesting (typically sunny sites on hard, compacted clay soils with south to southwest facing slopes; short, sparse vegetation; and within 500 feet of water bodies). Maintain short vegetation and create bare soil areas for nest excavation. Control woody species to prevent encroachment on nesting areas and reduce shading of nest sites. Recontour soil or augment with other soils if needed to enhance nesting suitability for western pond turtle turtles.
41. Create nesting areas for western pond turtle by building upland mounds (typically at least 10 feet wide and 2 to 3 feet high) that have a south or southwest-facing slope. Create mounds from soils excavated on site or from other sites within the planning area after composting or sterilization to remove viable weed seeds.
42. Remove barriers to western pond turtle movement. Maintain clear visual and travel paths between water bodies and occupied or potential nesting sites and remove obstructions to movement in aquatic corridors/stream channels, including removal vegetation that could obstruct turtle movement.
43. Place logs, large rootwads, or boulders in ponds to create basking sites for western pond turtle.
44. Create 2 permanent ponds to enhance western pond turtle habitat.

45. Retain large snags and create 2 snags per acre >14" diameter breast height where available in forested plant communities (oak woodland, ash swale/riparian, plantation and Douglas-fir forest).
46. Implement protection measures such as stabilization, fencing or withdrawal for sites when threatened by natural processes or human activity.

1.2.3.4 Soils and Water

A) Management Objectives

- Maintain and restore water quality.
- Maintain and restore soil productivity.
- Maintain wet prairie micro-topography on treatment areas.
- Limit soil compaction, displacement and erosion during forest and woodland treatments.
- Maximize wetland water storage to enhance ecological function.
- Prevent soil loss along actively eroding side slopes of streams.

B) Management Standards

47. Apply best management practices as needed to restore or maintain water quality (BLM 2014, Appendix 3).
48. When using tractor mowers, limit soil compaction by using low ground-pressure equipment, rubber-tired or rubber tracked equipment (recommended < 6.5 psi).
49. To the extent possible while achieving other objectives, limit tractor mowing to times of low soil moisture conditions (generally < 25percent moisture and from July 1 to October 15).
50. Mowing equipment shall not expose bare soil or leave visible ruts or indentations under normal operating conditions.
51. To the extent possible while achieving other objectives, avoid mowing over ant mounds.
52. For thinning implemented with vehicle-supported machinery, use low ground-pressure skid-steer tractors with implements to reduce soil disturbance. Conduct thinning activities during times of low soil moisture (< 25percent). Design treatment to limit equipment passes across soil surface (such as by using single passes; designing predetermined skid trails; and walking on slash).
53. Design ground-disturbing activities to retain organic materials.
54. Design excavation of native soils to minimize disturbance to the historic native soil profile.
55. Conduct soil-disturbing work during the dry season to minimize compaction. Use low ground-pressure equipment to minimize compaction. Use tilling for decompaction where needed during low moisture soil conditions.
56. Retain topsoil on site, if possible. Where feasible, salvage disturbed soil, segregate during storage, compost and reuse in a similar location and depth. Where feasible, salvage and reuse wetland soils in wetland areas.

57. Minimize the disturbance and loss of native soil during sod rolling or fill removal.

1.2.3.5 Cultural Resources

A) Management Objective

- Conserve scientific, traditional use, educational, public and recreational values of cultural and resource sites.

B) Management Standards

58. Avoid ground-disturbing actions on sites that are listed (or eligible for listing) on the National Register of Historic Places. Recover scientific value of sites prior to disturbance through practices such as data recovery, which include excavation, relocation, or documentation if avoidance is not practical.
59. Classify cultural properties to the following use categories:
    a. Classify cultural properties that are determined to be available for consideration as the subject of scientific or historical study as scientific use sites or experimental use sites.
    b. Classify unusual cultural properties that are not currently available for scientific or historical study, because of scarcity, a research potential that surpasses the current state-of-the-art, singular historic importance, cultural importance, tribal importance, architectural interest, or comparable reasons as conservation for future use sites. Select sites for the purpose of retaining a representative sample of site types from those available in areas where conflicts with other resource management activities are not anticipated. Preserve these sites.
    c. Classify cultural properties known to be important in maintaining the cultural identity, heritage, or well-being of a specified and recognized tribe as traditional use sites. Manage these sites to accommodate their continuing traditional use.
    d. Classify cultural properties found to be appropriate for use as interpretive exhibits at their original location (i.e., in place), or found to be appropriate for related educational and recreational uses as public use sites. Priority locations for these interpretive exhibits will include developed recreation sites, recreation corridors and locations where recreation is being promoted. Preserve these sites.
    e. Provide no special management for cultural properties that are only important for their scientific values and whose research potential is effectively exhausted (ones where the salient information has been collected and preserved, or has been destroyed by natural or human activity). These are discharged use sites.
60. The use categories for existing sites and new sites may be assigned or changed by comparing the site's characteristics to these use category descriptions.
61. Implement protection measures such as stabilization, fencing or withdrawal for sites classified as traditional use, public use or future use when threatened by natural processes or human activity.

62. Excavate and recover the data where warranted by the scientific importance of the cultural sites threatened by natural processes or human activity.
63. Implement public interpretation and education around the types of archaeological resources and/or traditional uses found within the planning area.

1.2.3.6 Recreation

A1) Management Objective

- Provide opportunities for pedestrian and other non-motorized recreational use in the Special Recreation Management Area.

B1) Management Standards

64. Designate the Fern Ridge Path as a Special Recreation Management Area for pedestrian and non-motorized vehicle use of the path.
65. Manage the Fern Ridge Path Special Recreation Management Area for a community recreation-tourism market.
66. Consistent with the Final Supplementary Rules for Public Land within the West Eugene Wetlands, continue to prohibit motorized vehicle use on the Fern Ridge Path (BLM 2014, Appendix 4).

A2) Management Objective

- Provide opportunities for pedestrian recreational use in the Extensive Recreation Management Area.

B2) Management Standards

67. Maintain existing Tsanchiifin Walk at Balboa and existing trails at Danebo, Stewart Pond and Eastern Gateway.
68. Maintain existing interpretive sites.
69. Improve parking access and facilities at Stewart Pond parking lot.
70. Consistent with the Final Supplementary Rules for Public Land within the West Eugene Wetlands, continue to prohibit motorized and non-motorized vehicle in the Extensive Recreation Management Area off of the roads designated for vehicle use (BLM 2014, Appendix 4).

A3) Management Objective

- Provide opportunities for commercial, competitive, educational and organized group activities in the planning area.

B3) Management Standards

71. Require Special Recreation Permits for organized groups of 20 or more persons per day within the planning area. Consider applications for Special Recreation Permits for organized group activities only where not in conflict with the management objectives of the site. Do not issue Special Recreation Permits for visits to areas occupied by listed or sensitive species if use would adversely affect listed or sensitive species.

72. Continue to apply the Final Supplementary Rules for Public Land within the West Eugene Wetlands, Eugene District, OR, published in the *Federal Register* on July 28, 2005. Application of these rules shall be adopted throughout the planning area on BLM-managed lands. In summary, these rules prohibit the following activities by the public in the planning area:
    - littering;
    - entering areas that are posted or otherwise delineated, fenced, or barricaded to close them to public;
    - using or occupying any area one hour after sunset through one hour before sunrise, except traveling on the Fern Ridge Path;
    - discharge of fireworks, firearms, air guns, slingshots or use any other projectile launching device;
    - leaving personal property unattended;
    - using or operating motorized vehicles on the Fern Ridge Path, or operating motorized or non-motorized vehicles off those roads or paths or parking areas specifically designated for vehicle use;
    - building or using campfires or other open flame fires;
    - possessing, disturbing, or collecting any natural resource unless specifically permitted by the authorized officer;
    - allowing entry of domesticated animals (pets or livestock) into areas closed to pet or livestock use;
    - possessing or consuming alcoholic beverages; and
    - possessing glass beverage containers.

Additional information on these restrictions is provided in the supplemental rules (70 FR 43713 – 43715).

1.2.3.7 Visual Resources

A) Management Objective

- Partially retain the existing character of the landscape in Class III visual resource management areas.

B) Management Standards

73. Designate Long Tom, North Taylor, South Taylor, Hansen, Oak Hill and Fir Butte sites to visual resource management Class III.
74. These sites would be managed to allow for moderate levels of change to the characteristic landscape. Management activities may attract attention, but would not dominate the view of the casual observer. Changes would repeat the basic elements of form, line, color, texture and scale found in the predominant natural features of the characteristic landscape.

A2) Management Objective

- Allow for major modification of the existing character of the landscape in Class IV visual resource management areas.

B2) Management Standards

75. Designate all sites not designated to visual resource management Class III to visual resource management Class IV.
76. These sites would be managed to allow for high levels of change to the characteristic landscape. Management activities may dominate the view and may be the major focus of viewer attention.

1.2.3.8 Special Products

A) Management Objective

- Provide opportunities where consistent with other resource objectives for the harvest and collection of special products, such as boughs and branches, edible and medicinal plants, wood products and firewood.

B) Management Standards

77. Restrict collection amounts and collection activities of special products in a manner that limits adverse impacts to other resources.
78. Rotate or restrict areas for the collection of individual products as needed to maintain the availability and sustainability of products and limit adverse impacts to other resources.
79. Restrict the collection of plant species and plant materials whose sustainability would be in question due to low reproductive rates or other live history factors.

1.2.3.9 Travel and Transportation

A) Management Objective

- Provide public and administrative access in a manner that attains resource objectives and supports the agency's mission. This may include the agency use of motorized vehicles to transport personnel, supplies and equipment.

B) Management Standards

80. Designate OHV management areas consistent with 43 CFR 8342 as "open", "limited", or "closed", as appropriate using route selection criteria to avoid conflicts among various uses of public lands in the planning area.

- Limited: Designate existing "open" roads and parking areas within the planning area as "limited" to motorized vehicle use: restricted to street-legal vehicles only. The designated roads and parking areas within the "limited" OHV management area include:
  - The parking area at the Stewart Pond site off of Stewart Road; and
  - The paved entrance road and gravel parking lot at the Danebo site off of South Danebo Avenue (BLM 2014, Appendix 4).
- Closed: Designate all other existing travel ways, trails and paths as "closed" to motorized vehicle use. Non-motorized vehicle uses would be managed as follows:

- Limit use of the Fern Ridge Path to pedestrian and non-motorized vehicle use.
- Limit use of the existing Tsanchiifin Walk at Balboa and existing trails at Danebo, Stewart Pond and Eastern to pedestrian use Gateway (BLM 2014, Appendix 4).

81. Motor vehicles being used by duly authorized emergency response personnel, including police, ambulance and fire suppression, as well as BLM or BLM-authorized vehicles being used for official duties, are excepted.
82. Restrict non-motorized vehicle use to the designated roads identified above and the Fern Ridge Path, consistent with the 2005 final supplemental rules.
83. Manage all of the planning area as a single Travel Management Area.

1.2.3.10 Minerals and Energy

A) Management Objective

- Manage mineral and energy resources to provide opportunities for exploration and development where consistent with other management objectives.

B) Management Standards

84. Public domain lands[7] (*i.e.*, survey hiatuses) in the planning area would continue to be available for locatable mineral[8] entry under the Mining Act of 1872.
85. Include a no surface occupancy[9] stipulation in any leases for leasable minerals.

1.2.3.11 Lands and Realty

A1) Management Objectives

- Make land tenure adjustments to facilitate the management of resources.
- Manage acquired lands for the purposes for which they were acquired.

B1) Management Standards

86. Lands in Zone 1 would be retained under BLM administration. Lands in Zone 1 would include all parcels in the planning area except the Danebo parcel.

[7] Federal law draws a clear distinction between public domain lands and acquired lands. Except for the Long Tom site and the survey hiatus between North and South Taylor, all BLM-administered lands in the assessment area are acquired lands and most are closed to locatable mineral entry. The only exceptions are Stewart Pond and Eastern Greenway which are open to locatable mineral entry under federal law but remain closed under state law because both sites fall within the limits of the City of Eugene. Thus, BLM-administered lands in the assessment area are *de facto* closed to locatable mineral entry; the Proposed RMP/EIS would not change the status of these lands.

[8] Locatable minerals are "hard rock" minerals such as coal, gold and uranium. Leasable minerals include oil and natural gas.

[9] "No surface occupancy" means that a leasee could acquire rights to oil and gas reserves below the assessment area but could not build or place surface infrastructure (drilling rigs) in the assessment area. To exercise their lease rights, they would have to slant drill from adjacent nonfederal land.

87. Lands in Zone 2 would be available for exchange. No lands in the planning area would be in Zone 2.
88. Lands in Zone 3 would be available for disposal. The only parcel in Zone 3 would be the Danebo parcel, because it is included in Public Law 109-457 (120 Stat. 3392) whereby ownership of this parcel would transfer to the City of Eugene if certain conditions are met. If the conditions are not met, the Danebo parcel will revert back to the United States of America. If the Danebo parcel reverts back to the United States of America, it will be managed under the jurisdiction of BLM and subsequently the parcel would be transferred to Land Tenure Zone 1 without RMP amendment or revision.
89. Any additional BLM-administered lands identified within the planning area boundary shown on Figure1 through the future identification of survey hiatuses would be assigned to Land Tenure Zone 3 and would be available for disposal using appropriate disposal mechanisms.
90. Any future unintentional occupancy trespassed lands (including any unintentional realty-related use, occupancy, or developed lands) in the planning area would be assigned to Land Tenure Zone 3 and would be available for disposal using appropriate disposal mechanisms.
91. Land tenure zones may be changed without RMP amendment or revision due to congressional action, such as mandated land exchanges.
92. Any future land acquisitions within the planning area boundary, if acquired by the BLM under Section 205 or 206 of FLPMA would take on the status of "acquired lands," and would be managed for the purpose for which they were acquired or consistent with the management objectives for adjacent BLM-administered lands.

A2) Management Objectives

- Continue to make BLM-administered lands available for needed rights-of-way, permits, leases and easements where consistent with federal, state and local planning goals and rules and the exclusion areas identified in this RMP.
- Provide legal administrative access to BLM-administered lands adequate to support resource management programs.

B2) Management Standards

93. Recognize existing rights-of-way, permits, leases and easements as valid uses (BLM 2014, Appendix 2).
94. Issue no new rights-of-way in right-of-way exclusion areas identified in this RMP, except for buried lines in the rights-of-way of existing roads, which will be evaluated on a case-by-case basis.
95. Outside of right-of-way exclusion areas, evaluate right-of-way and lease requests on a case-by-case basis.
96. Issue temporary-use permits, as identified under FLPMA (Section 302), for a variety of uses, such as, but not limited to, stockpile and storage sites and as tools to authorize unintentional trespass situations pending final resolution.
97. Issue no new leases or permits for landfills or solid waste disposal sites.

98. Utilize land-use authorizations to resolve agricultural or occupancy trespasses, where appropriate.

1.2.3.12 Hazardous Materials

A) Management Objectives

- Limit the use of hazardous materials.
- Eliminate hazardous wastes.

B) Management Standards

99. Respond to hazardous material incidents through actions such as cleanup,proper notifications, criminal investigations and site assessments.
100. Store, treat and dispose of hazardous materials in accordance with applicable laws and regulations.
101. Protect employees and the public from known hazardous materials on BLM-administered lands.
102. Apply best management practices as needed for spill prevention and abatement (BLM 2014, Appendix 3).

1.2.3.13 Research

A) Management Objective

- Provide for research to support the management of lands and resources within the planning area.

B) Management Standards

103. Allow ongoing research projects to continue according to current or updated study plans. If Management Standards on existing study sites conflicts with research objectives, defer implementation of Management Standards until the research is complete.
104. For new research projects, require study plans or project proposals that are consistent with the RMP.

1.2.3.14 Administrative Actions

Administrative actions are routine transactions and activities that are required to serve the public and to provide optimum management of resources. They would be applied in any LUA. Implement administrative actions including, but not limited to the following:

- Facility maintenance
- Improvements to existing facilities
- Road maintenance
- Recreation site maintenance
- Recreation site improvement
- Fence and gate repairs on existing sites
- Lands and realty actions (including the issuance and administration of grants, leases and permits issued under FLPMA)

- Resolution of trespasses
- Hazardous and solid waste materials removal
- Law enforcement
- Surveys to determine legal land or mineral estate ownership
- Engineering support to assist in mapping
- Design of projects including any needed surveys
- Sampling and monitoring, including both non-destructive and destructive data collection
- Incidental removal of trees, snags, or logs for safety or operational reasons

1.3 Efficacy of Management Tools

Under the Proposed RMP/EIS the BLM would employ mowing and other mechanical treatments, manual treatments and prescribed burning to restore and maintain native plant communities. It also would employ herbicides as part of restoration and maintenance treatments. Although mechanical and manual treatments, and prescribed burning, would be effective at maintaining current plant communities and avoiding successional change to other plant communities on a site, in the absence of herbicide use, these treatments would not restore wet prairie, upland prairie or oak savanna in the action area from their current low-quality condition to high-quality habitat condition. This conclusion is consistent with empirical results in the action area in which manual and mechanical treatments and prescribed burning have been applied for a decade without restoring high-quality wet prairie, upland prairie or oak savanna. This conclusion also is consistent with the experience of the West Eugene Wetlands land-owning partners—the City of Eugene, The Nature Conservancy, and the U.S. Army Corps of Engineers (ACOE)—which concluded that non-chemical treatments can be effective on a small scale, but the restoration effects are not lasting (M. Benotsch, The Nature Conservancy, et al. pers. comm., April 14, 2011). Finally, this conclusion is consistent with regional studies of prairie and savanna restoration, as described below.

The Service's *Willamette Valley National Wildlife Refuges Draft Comprehensive Conservation Plan and Environmental Assessment* (USFWS 2011a) analyzed the effectiveness of habitat management tools for prairie and savanna restoration and maintenance in the Willamette Valley, primarily as a summary of existing research. That analysis concluded that no individual treatment was clearly superior in fulfilling restoration objectives. Burning effectively reduced woody cover but also reduced the flowering of key native grass. Hand-removal of woody species also effectively reduced woody cover and promoted the abundance of some native species, but sometimes increased the cover of non-native herbaceous species. Mowing with removal of cut material was ineffective in reducing woody cover and tended to promote non-native herbaceous species. The Service identified the need to include herbicide application together with other non-chemical treatment methods for habitat restoration and maintenance (USFWS 2011a:6-6 – 6-10).

Stanley *et al.* (2011a) also analyzed the effectiveness of habitat management tools for prairie and savanna restoration and maintenance in the Willamette Valley through experimentation. They concluded that a combined management strategy using both herbicides and burning combined

with native plant seeding effectively improved prairie ecosystems. Mowing was ineffective at reducing non-native grasses.

Dennehy *et al*. (2011) analyzed the effectiveness of habitat management tools in controlling invasive plants in prairie and savanna restoration and maintenance in northwestern prairies, savannas and oak woodlands. They concluded that herbicides are effective for control of the important invasive plant species in the action area. Mechanical and manual treatments and prescribed burning without herbicide use are generally not effective for control of most of the invasive plant species in the action area.

The Service issued a biological opinion on the ACOE habitat management program at Fern Ridge Lake (USFWS 2011b:3-5, 17-19 and 22-24), which is adjacent to the action area. That biological opinion summarizes the habitat management tools used for prairie and savanna restoration and maintenance, and describes the role and effectiveness of prescribed burning, mowing and manual treatments in habitat restoration and maintenance. That biological opinion documents the roles of herbicide use and the need for herbicide to manage infestations of weeds that are intractable to other methods of control in the habitat management program of the ACOE.

Under the Proposed RMP/EIS, BLM management in the PRA effectively would restore and maintain high-quality prairie and oak savanna plant communities and the BLM would design vegetation treatments within the NMA primarily to control noxious weeds and invasive native and non-native plants (although habitat restoration in the NMA would be allowed). As a result, the management direction within the NMA most likely would maintain prairie and oak savanna plant communities in their current low-quality condition.

1.4 Monitoring

The *West Eugene Wetlands Plant and Invertebrate Monitoring Plan*, dated December 18, 2013 (Appendix A), is consistent with the recommendations for monitoring in the Recovery Plan.

2.0 FRAMEWORK FOR JEOPARDY AND ADVERSE MODIFICATION ANALYSES

2.1 Analytical Framework for the Jeopardy Determination

The following analysis relies on four components to support the jeopardy determination for the spotted owl: (1) the *Status of the Species*, which evaluates the listed species range-wide condition, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the listed species in the action area, the factors responsible for that condition, and the role of the action area in the survival and recovery of the listed species; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed federal action and the effects of any interrelated or interdependent activities on the listed species; and (4) *Cumulative Effects*, which evaluates the effects of future, non-federal activities in the action area on the listed species.

In accordance with the implementing regulations for section 7 and Service policy, the jeopardy determination is made in the following manner: the effects of the proposed federal action are

evaluated with the aggregate effects of everything that has led to the current status of listed species and, for non-federal activities in the action area, those actions likely to affect the listed species in the future, to determine if, given the aggregate of all of these effects, implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of those listed species found within the action area, in the wild.

The following analysis places an emphasis on using the range-wide survival and recovery needs of the listed species and the role of the action area in meeting those needs as the context for evaluating the effects of the proposed federal action combined with other relevant effects. In short, a non-jeopardy determination is warranted if the proposed action is consistent with maintaining the role of habitat and the populations in the action area for the survival and recovery of the listed species. The jeopardy determination is made on the range-wide scale of any listed species in question.

2.2 **Analytical Framework for the Adverse Modification Determination**

This BO does not rely on the regulatory definition of "destruction or adverse modification" of CH at 50 CFR 402.02. Instead, the Service has relied upon the statutory provisions of the ESA to complete the following analysis with respect to CH.

The following analysis relies on four components to support the adverse modification determination: (1) the *Status of CH*, which evaluates the range-wide condition of designated CH for listed species in terms of primary constituent elements (PCEs), the factors responsible for that condition, and the intended recovery function of the CH overall, as well as the intended recovery function of CH outside the action area at the unit scales; (2) the *Environmental Baseline*, which evaluates the condition of the CH in the action area, the factors responsible for that condition, and the recovery role of the CH in the action area; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed federal action and the effects of any interrelated or interdependent activities on the PCEs and how that will influence the recovery role of affected CH units; and (4) *Cumulative Effects*, which evaluates the effects of future, non-federal activities in the action area on the PCEs and how that will influence the recovery role of affected CH units.

In accordance with Service policy and guidance, the adverse modification determination is made in the following manner: the effects of the proposed federal action on CH are evaluated with the aggregate effects of everything that has led to the current status of the CH range-wide and, for non-federal activities in the action area, those actions likely to affect the CH in the future, to determine if, given those aggregate effects, the CH would remain functional (or retain the current ability for the PCEs to be functionally established in areas of currently unsuitable but capable habitat) to serve the intended recovery role for the species with implementation of the proposed federal action.

The following analysis places an emphasis on using the intended range-wide scale recovery functions of CH and the role of the action area relative to those intended functions as the context for evaluating the effects of the proposed federal action with other relevant effects. In short, a non-adverse modification determination is warranted if the proposed action is consistent with

maintaining the intended recovery role of CH in the action area. The adverse modification determination is made at the range wide scale of CH.

3.0 STATUS OF THE STREAKED HORNED LARK

3.1 Legal Status

The streaked horned lark (*Eremophila alpestris strigata*) was listed as a threatened species on October 3, 2013 (78 FR 61452), under the Endangered Species Act of 1973, as amended (16 U.S. C. 1531 *et seq.*).

3.2 Life History

3.2.1 Taxonomy and Species Description

The horned lark is a bird found throughout the northern hemisphere (Beason 1995, p. 1); it is the only true lark (Family Alaudidae, Order Passeriformes) native to North America (Beason 1995, p. 1). There are 42 subspecies of horned lark worldwide (Clements *et al.* 2011, entire). Twenty-one subspecies of horned larks are found in North America; 15 subspecies occur in western North America (Beason 1995, p. 4). Subspecies of horned larks are based primarily on differences in color, body size, and wing length. Molecular analysis has further borne out these morphological distinctions (Drovetski *et al.* 2005, p. 875).

Western populations of horned larks are generally paler and smaller than eastern and northern populations (Beason 1995, p. 3). The streaked horned lark was first described as *Otocorys alpestris strigata* by Henshaw (1884, pp. 261–264, 267– 268); the type locality was Fort Steilacoom, Washington (Henshaw 1884, p. 267). There are four other breeding subspecies of horned larks in Washington and Oregon: pallid horned lark (*E. a. alpina*), dusky horned lark (*E.a. merrilli*), Warner horned lark (*E. a. lamprochroma*), and Arctic horned lark (*E. a. articola*) (Marshall *et al.* 2003, p. 426; Wahl *et al.* 2005, p. 268). None of these other subspecies breed within the range of the streaked horned lark, but all four subspecies frequently overwinter in mixed species flocks in the Willamette Valley (Marshall *et al.* 2003, pp. 425–427).

Drovetski *et al.* (2005, p. 877) evaluated the genetic distinctiveness, conservation status, and level of genetic diversity of the streaked horned lark using the complete mitochondrial ND2 gene. Streaked horned larks were closely related to the California samples and only distantly related to the three closest localities (alpine Washington, eastern Washington, and Oregon). There was no evidence of immigration into the streaked horned lark's range from any of the sampled localities. Analyses indicate that the streaked horned lark population is well-differentiated and isolated from all other sampled localities, including coastal California, and has ''remarkably low genetic diversity'' (Drovetski *et al.* 2005, p. 875).

Streaked horned lark is differentiated and isolated from all other sampled localities, and although it was ''historically a part of a larger Pacific Coast lineage of horned larks, it has been evolving independently for some time and can be considered a distinct evolutionary unit'' (Drovetski *et al.* 2005, p. 880). Thus, genetic analyses support the subspecies designation for the streaked

horned lark (Drovetski *et al.* 2005, p. 880), which has been considered a relatively well-defined subspecies based on physical (phenotypic) characteristics (Beason 1995, p. 4). The streaked horned lark is recognized as a valid subspecies by the Integrated Taxonomic Information System (ITIS 2012b). For more information on taxonomy, see the proposed rule published on October 11, 2012 (77 FR 61938).

3.2.2 Current and Historical Range

The current range and distribution of the streaked horned lark can be divided into three regions: (1) the south Puget Sound in Washington; (2) the Washington coast and lower Columbia River islands (including dredge spoil deposition and industrial sites near the Columbia River in Portland, Oregon); and (3) the Willamette Valley in Oregon.

The streaked horned lark's breeding range historically extended from southern British Columbia, Canada, south through the Puget lowlands and outer coast of Washington, along the lower Columbia River, through the Willamette Valley, the Oregon coast and into the Umpqua and Rogue River Valleys of southwestern Oregon (Altman 2011). The subspecies has been extirpated as a breeding species throughout much of its range, including all of its former range in British Columbia, the San Juan Islands, the northern Puget Trough, the Washington coast north of Grays Harbor County, the Oregon coast, and the Rogue and Umpqua Valleys in southwestern Oregon (Pearson and Altman 2005).

3.2.3 Breeding Range

Streaked horned larks currently breed on six sites in the south Puget Sound. Four of these sites are on Joint Base Lewis McChord: 13th Division Prairie, Gray Army Airfield, McChord Field, and 91st Division Prairie (Pearson and Altman 2005). Small populations of larks also breed at the Olympia Regional Airport and the Port of Shelton's Sanderson Field airport (Pearson and Altman 2005; Pearson *et al.* 2008).

On the Washington coast, there are four known breeding sites in Grays Harbor and Pacific Counties: Damon Point; Midway Beach; Graveyard Spit; and Leadbetter Point (Pearson and Altman 2005). On the lower Columbia River, streaked horned larks breed on several of the sandy islands downstream of Portland, Oregon. Recent surveys have documented breeding streaked horned larks on Rice, Miller Sands Spit, Pillar Rock, Welch, Tenasillahe, Coffeepot, Whites/Browns, Wallace, Crims, and Sandy Islands in Wahkiakum and Cowlitz Counties in Washington, and Columbia and Clatsop Counties in Oregon (Pearson and Altman 2005; Anderson 2009; Lassen 2011, *in litt*.). Larks also breed at the Rivergate Industrial Complex and the Southwest Quad at Portland International Airport; both sites are owned by the Port of Portland, and are former dredge spoil deposition fields (Moore 2011b).

In the Willamette Valley, streaked horned larks breed in Benton, Clackamas, Lane, Linn, Marion, Polk, Washington, and Yamhill Counties. Larks are most abundant in the southern part of the Willamette Valley. The largest known population of larks is resident at Corvallis Municipal Airport in Benton County (Moore 2008); other resident populations occur at the Baskett Slough, William L. Finley, and Ankeny units of the Service's Willamette Valley

National Wildlife Refuge Complex (Moore 2008) and on Oregon Department of Fish and Wildlife's (ODFW's) E.E. Wilson Wildlife Area (ODFW 2008). Breeding populations also occur at municipal airports in the valley (including McMinnville, Salem, and Eugene) (Moore 2008). Much of the Willamette Valley is private agricultural land, and has not been surveyed for streaked horned larks, except along public road margins. There are numerous other locations on private and municipal lands on which streaked horned larks have been observed in the Willamette Valley, particularly in the southern valley (Linn, Polk, and Benton Counties) (eBird 2013, ebird.org). In 2008, a large population of streaked horned larks colonized a wetland and prairie restoration site on M–DAC Farms, a privately owned parcel in Linn County; as the vegetation at the site matured in the following 2 years, the site became less suitable for larks, and the population declined (Moore and Kotaich 2010). This is likely a common pattern, as breeding streaked horned larks opportunistically shift sites as habitat becomes available among private agricultural lands in the Willamette Valley (Moore 2008).

3.2.4 Winter Range

Pearson *et al*. (2005) found that most streaked horned larks winter in the Willamette Valley (72 percent) and on the islands in the lower Columbia River (20 percent); the rest of the winter is spent on the Washington coast (8 percent) or in the south Puget Sound (1 percent). In the winter, most of the streaked horned larks that breed in the south Puget Sound migrate south to the Willamette Valley or west to the Washington coast; streaked horned larks that breed on the Washington coast either remain on the coast or migrate south to the Willamette Valley; birds that breed on the lower Columbia River islands remain on the islands or migrate to the Washington coast; and birds that breed in the Willamette Valley remain there over the winter (Pearson *et al*. 2005). Streaked horned larks spend the winter in large groups of mixed subspecies of horned larks in the Willamette Valley, and in smaller flocks along the lower Columbia River and Washington Coast (Pearson *et al*. 2005; Pearson and Altman 2005). During the winter of 2008, a mixed flock of over 300 horned larks was detected at the Corvallis Municipal Airport (Moore 2011a, pers. comm.).

3.3 Habitat and Biology

3.3.1 Habitat Selection

Habitat used by larks is generally flat with substantial areas of bare ground and sparse low-stature vegetation primarily composed of grasses and forbs (Pearson and Hopey 2005). Suitable habitat is generally 16–17 percent bare ground, and may be even more open at sites selected for nesting (Altman 1999; Pearson and Hopey 2005). Vegetation height is generally less than 13 in (33 cm) (Altman 1999; Pearson and Hopey 2005). A key attribute of habitat used by larks is open landscape context. Our data indicate that sites used by larks are generally found in open (*i.e.*, flat, treeless) landscapes of 300 acres (120 ha) or more (Converse *et al*. 2010).

Some patches with the appropriate characteristics (*i.e*., bare ground, low stature vegetation) may be smaller in size if the adjacent areas provide the required open landscape context; this situation is common in agricultural habitats and on sites next to water. For example, many of the sites used by larks on the islands in the Columbia River are small (less than 100 acres [40 ha]), but are adjacent to open water, which provides the open landscape context needed. Streaked horned lark populations are found at many airports within the range of the subspecies, because airport maintenance requirements provide the desired open landscape context and short vegetation structure.

Although streaked horned larks use a wide variety of habitats, populations are vulnerable because the habitats used are often ephemeral or subject to frequent human disturbance. Ephemeral habitats include bare ground in agricultural fields and wetland mudflats; habitats subject to frequent human disturbance include mowed fields at airports, managed road margins, agricultural crop fields, and disposal sites for dredge material (Altman 1999).

3.3.2 Foraging

Horned larks forage on the ground in low vegetation or on bare ground (Beason 1995); adults feed on a wide variety of grass and weed seeds, but feed insects to their young (Beason 1995). Larks eat a wide variety of seeds and insects (Beason 1995, p. 6), and appear to select habitats based on the structure of the vegetation rather than the presence of any specific food plants (Moore 2008).

3.3.3 Breeding and Nesting

Horned larks form pairs in the spring (Beason 1995) and establish territories approximately 1.9 acres (0.77 ha) in size (range 1.5 - 2.5 acres [0.6 – 1.0 hectares]) (Altman, 1999). Horned larks create nests in shallow depressions in the ground and line them with soft vegetation (Beason 1995). Female horned larks select the nest site and construct the nest without help from the male (Beason 1995). Streaked horned larks establish their nests in areas of extensive bare ground, and nests are placed adjacent to clumps of bunchgrass (Pearson and Hopey 2004). Studies from Washington sites (the open coast, Puget lowlands and the Columbia River islands) have found strong natal fidelity to nesting sites – that is, streaked horned larks return each year to the place they were born (Pearson *et al*. 2008).

Historically, nesting habitat was found on grasslands, estuaries, and sandy beaches in British Columbia, in dune habitats along the coast of Washington, in western Washington and western Oregon prairies, and on the sandy beaches and spits along the Columbia and Willamette Rivers. Today, the streaked horned lark nests in a broad range of habitats, including native prairies, coastal dunes, fallow and active agricultural fields, wetland mudflats, sparsely-vegetated edges of grass fields, recently planted Christmas tree farms with extensive bare ground, moderately- to heavily-grazed pastures, gravel roads or gravel shoulders of lightly-traveled roads, airports, and dredge deposition sites in the lower Columbia River (Altman 1999; Pearson and Altman 2005; Pearson and Hopey 2005; Moore 2008). Wintering streaked horned larks use habitats that are very similar to breeding habitats (Pearson *et al*. 2005).

The nesting season for streaked horned larks begins in early April and ends mid- to late August (Pearson and Hopey 2004; Moore 2011b). Clutches range from 1 to 5 eggs, with a mean of 3 eggs (Pearson and Hopey 2004). After the first nesting attempt in April, streaked horned larks will often re-nest in late June or early July (Pearson and Hopey 2004). Young streaked horned larks leave the nest by the end of the first week after hatching, and are cared for by the parents until they are about 4 weeks old when they become independent (Beason 1995).

Nest success studies (*i.e.*, the proportion of nests that result in at least one fledged chick) in streaked horned larks report highly variable results. Nest success on the Puget lowlands of Washington is low, with only 28 percent of nests successfully fledging young (Pearson and Hopey 2004, Pearson and Hopey 2005). According to reports from sites in the Willamette Valley, Oregon, nest success has varied from 23 to 60 percent depending on the site (Altman 1999; Moore and Kotaich 2010). At one site in Portland, Oregon, Moore (2011b) found 100 percent nest success.

3.4 Threats

3.4.1 Reasons for Listing

The streaked horned lark was listed as a threatened species because of the following:

- The streaked horned lark has disappeared from all formerly documented locations in the northern portion of its range, the Oregon coast, and the southern edge of its range.
- There are currently estimated to be fewer than 1,600 streaked horned larks rangewide, and population numbers are declining.
- Their range is small may be continuing to contract;
    - The south Puget Sound breeding population is estimated to be less than 170 individuals.
    - The Washington coast and Columbia River islands breeding population is less than 140 individuals.
    - Recent research estimates the number of streaked horned larks in Washington and on the Columbia River islands is declining.
        - This decline considered with evidence of inbreeding depression on the south Puget Sound indicated the larks range may contract further in the future.
- Their habitat is threatened throughout their entire range from loss of natural disturbance regimes, invasion of unsuitable vegetation that alter habitat structure, and incompatible land management practices.
- Large winter congregations are limited to one region, in Oregon's Willamette Valley, which may put larks at risk from stochastic weather events.
- Most sites currently used by larks require some level of disturbance or management to maintain the habitat structure they need. The natural processes that previously provided this disturbance no longer operate.

3.5 Population Estimates and Current Status of the Streaked Horned Lark

Data from the North American Breeding Bird Survey (BBS) indicate that most grassland-associated birds, including the horned lark, have declined across their ranges in the past three decades (Sauer *et al*. 2012). The BBS can provide population trend data only for those species with sufficient sample sizes for analyses. There is insufficient data in the BBS for a rangewide analysis of the streaked horned lark population trend (Altman 2011); however, see below for additional analysis of the BBS data for the Willamette Valley.

An analysis of recent data from a variety of sources concludes that the streaked horned lark has been extirpated from the Georgia Depression (British Columbia, Canada), the Oregon coast, and the Rogue and Umpqua Valleys (Altman 2011); this analysis estimates the current rangewide population of streaked horned larks to be about 1,170–1,610 individuals (Altman 2011). In the south Puget Sound, approximately 150–170 streaked horned larks breed at 6 sites (Altman 2011). Recent studies have found that larks have very low nest success in Washington (Pearson *et al*. 2008); comparisons with other ground-nesting birds in the same prairie habitats in the south Puget Sound showed that streaked horned larks had significantly lower values in all measures of reproductive success (Anderson 2010). Estimates of population growth rate (λ, lambda) that include vital rates from nesting areas in the south Puget Sound, Washington coast, and Whites Island in the lower Columbia River indicate streaked horned larks have abnormally low vital rates, which are significantly lower than the vital rates of the arctic horned lark (Camfield *et al*. 2010). One study estimated that the population of streaked horned larks in Washington was declining by 40 percent per year ($\lambda = 0.61 \pm 0.10$ SD), apparently due to a combination of low survival and fecundity rates (Pearson *et al*., 2008). More recent analyses of territory mapping at 4 sites in the south Puget Sound found that the total number of breeding streaked horned lark territories decreased from 77 territories in 2004, to 42 territories in 2007, a decline of over 45 percent in 3 years (Camfield *et al*. 2011). Pearson *et al*. (2008) concluded that there is a high probability that the south Puget Sound population will disappear in the future given the low estimates of fecundity and adult survival along with high emigration out of the Puget Sound.

On the Washington coast and Columbia River islands, there are about 120–140 breeding larks (Altman 2011). Data from the Washington coast and Whites Islands were included in the population growth rate study discussed above; populations at these sites appear to be declining by 40 percent per year (Pearson *et al*. 2008). Conversely, nest success appears to be very high at the Portland industrial sites (Rivergate and the Southwest Quad). In 2010, nearly all nests successfully fledged young (Moore 2011b); only 1 of 10 monitored nests lost young to predation (Moore 2011b).

There are about 900–1,300 breeding streaked horned larks in the Willamette Valley (Altman 2011). The largest known population of streaked horned larks breeds at the Corvallis Municipal Airport; depending on the management conducted at the airport and the surrounding grass fields each year, the population has been as high as 100 breeding pairs (Moore and Kotaich 2010). In 2007, a large (580- acre [235-ha]) wetland and native prairie restoration project was initiated at M–DAC Farms on a former rye grass field in Linn County (Cascade Pacific RC&D 2012). Large, semipermanent wetlands were created at the site, and the prairie portions were burned and

treated with herbicides (Moore and Kotaich 2010). These conditions created excellent quality ephemeral habitat for streaked horned larks, and the site was used by about 75 breeding pairs in 2008 (Moore and Kotaich 2010), making M–DAC the second-largest known breeding population of streaked horned larks that year. M–DAC had high use again in 2009, but as vegetation at the site matured, the number of breeding larks has declined, likely shifting to other agricultural habitats (Moore and Kotaich 2010).

The Service does not have population trend data in Oregon that is comparable to the study in Washington by Pearson *et al*. (2008); however, research on breeding streaked horned larks indicates that nest success in the southern Willamette Valley is higher than in Washington (Moore 2011a, pers. comm.). The best information on trends in the Willamette Valley comes from surveys by the Oregon Department of Fish and Wildlife (ODFW); the agency conducted surveys for grassland-associated birds, including the streaked horned lark, in 1996 and again in 2008 (Altman 1999; Myers and Kreager 2010). Point count surveys were conducted at 544 stations in the Willamette Valley (Myers and Kreager 2010); over the 12-year period between the surveys, measures of relative abundance of streaked horned larks increased slightly from 1996 to 2008, according to this report. Both detections at point count stations and within regions showed moderate increases (3 percent and 6 percent, respectively) (Myers and Kreager 2010). Population numbers decreased slightly in the northern Willamette Valley and increased slightly in the middle and southern portions of the valley (Myers and Kreager 2010).

Data from the BBS may provide additional insight into the trend of the streaked horned lark population in the Willamette Valley. Although the BBS does not track bird counts by subspecies, the streaked horned lark is the only subspecies of horned lark that breeds in the Oregon portion of the Northern Pacific Rainforest Bird Conservation Region (BCR); therefore it is reasonable to assume that counts of horned larks from the breeding season in the Willamette Valley are actually counts of the streaked horned lark. The BBS data regularly detect horned larks on several routes in the Willamette Valley, and counts from these routes show that horned larks in this BCR have been declining since 1960s, with an estimated annual trend of – 4.6 percent (95 percent confidence intervals –6.9, –2.4) (Sauer *et al*. 2012). The U.S. Geological Survey (USGS), which manages the BBS data, recommends caution when analyzing these data due to the small sample size, high variance, and potential for observer bias in the raw BBS data.

The BBS data from the Willamette Valley indicate that horned larks (as mentioned above, the BBS tracks only the full species) have been declining for decades, which is coincident with the restrictions on grass seed field burning imposed by the Oregon Department of Agriculture (Oregon Department of Environmental Quality and Oregon Department of Agriculture 2011). Prior to 1990, about 250,000 acres (101,170 ha) of grass seed fields in the Willamette Valley were burned each year. Public health and safety issues led the Oregon legislature to order gradual reductions in field burning beginning in 1991. By 2009, field burning was essentially banned in the Willamette Valley (Oregon Department of Environmental Quality and Oregon Department of Agriculture 2011). The Service believes that some of the observed declines lark detections in the BBS data are attributable to the reduction of highly suitable burned habitats due to the field burning ban. Since the ban is now fully in effect, the decline in BBS observations of streaked horned larks is not expected to continue at the previously noted rate. The Service does not have conclusive data on population trends throughout the streaked horned lark's range, but the rapidly

declining population on the south Puget Sound suggests that the range of the streaked horned lark may still be contracting.

3.6 Streaked Horned Lark Critical Habitat

There is no streaked horned lark critical habitat within the action area.

4.0 STATUS OF TAYLOR'S CHECKERSPOT BUTTERFLY

4.1 Legal Status

The Taylor's checkerspot butterfly was listed as an endangered species on October 3, 2013 (78 FR 61452), under the Endangered Species Act of 1973, as amended (16 U.S. C. 1531 *et seq.*). This listing occurred throughout the subspecies' range in Washington, Oregon, and British Columbia.

4.2 Life History

4.2.1 Taxonomy and Species Description

Taylor's checkerspot butterfly is a medium-sized, colorfully marked butterfly with a checkerboard pattern on the upper (dorsal) side of the wings (Pyle 2002, p. 310). Their wings are orange with black and yellowish (or white) spot bands, giving them a checkered appearance (Pyle 1981, p. 607; Pyle 2002, p. 310). The Taylor's checkerspot butterfly was historically known to occur in British Columbia, Washington, and Oregon, and its current distribution represents a reduction from over 80 locations rangewide to 14.

Taylor's checkerspot butterfly is a subspecies of Edith's checkerspot butterfly (*Euphydryas editha*). The Taylor's checkerspot butterfly was originally described by W.H. Edwards (1888) from specimens collected from Beacon Hill Park in Victoria, British Columbia (BC). *Euphydryas editha taylori* is recognized as a valid subspecies by the Integrated Taxonomic Information System (ITIS 2012a). It is one of several rare and threatened subspecies of Edith's checkerspot butterfly, including the Bay checkerspot (*E. e. bayensis*) from the San Francisco Bay area and the Quino checkerspot (*E. e. quino*) from the San Diego, California, region; both are federally listed under the Act. For further information, see the proposed rule published on October 11, 2012 (77 FR 61938).

4.2.1 Current and Historical Range

The current range and distribution of the Taylor's checkerspot butterfly includes British Columbia, Canada; Clallam, Pierce, and Thurston Counties, WA; and Benton County, OR.

Historically, the Taylor's checkerspot butterfly was likely distributed throughout grassland habitat found on prairies, shallow-soil balds (a bald is a small opening on slopes in a treeless area, dominated by herbaceous vegetation), grassland bluffs, and grassland openings within a forested matrix in south Vancouver Island, northern Olympic Peninsula, the south Puget Sound, and the Willamette Valley.

The historical range and abundance of the subspecies are not precisely known because extensive searches for the Taylor's checkerspot butterfly did not occur until recently. Northwest prairies were formerly more common, larger, and interconnected, and would likely have supported a greater distribution and abundance of the Taylor's checkerspot butterflies than prairie habitat does today. According to Dr. Robert Pyle (2012, *in litt.*):
''*Euphydryas editha taylori* was previously more widely distributed and much denser in occurrence than is presently the case on the Puget Prairies.

The checkerspot was abundant on the Mima Mounds Natural Area Preserve (NAP) and surrounding prairies in 1970. In the mid-eighties, Taylor's checkerspot butterfly flew by the thousands on Rock Prairie, a private farm property west of Tenino. All of these sites have since been rendered unsuitable for *E. e. taylori* through management changes, and Taylor's checkerspot butterfly has dropped out of them; meanwhile, many other colonies have disappeared in their vicinity through outright development or conversion of the habitat. The same is true for bluff-top colonies I knew in the early '70s at Dungeness. The ongoing loss and alteration of habitat in the western Washington grasslands has without question led to the shrinkage of Taylor's checkerspot butterfly occurrences from a regional constellation to a few small clusters.''

Before the recent declines observed over roughly the last 10 or 15 years, the Taylor's checkerspot butterfly was known from an estimated 80 locations: 24 in British Columbia, 43 in Washington, and 13 in Oregon (Hinchliff 1996, p. 115; Shepard 2000, pp. 25–26; Vaughan and Black 2002, p. 6; Stinson 2005, pp. 93–96, 123–124). These sites included coastal and inland prairies on southern Vancouver Island and surrounding islands in the Straits of Georgia, British Columbia and the San Juan Island archipelago (Hinchliff 1996, p. 115; Pyle 2002, p. 311), as well as open prairies on post-glacial gravelly outwash and shallow-soil balds in Washington's Puget Trough (Potter 2010, p. 1), the north Olympic Peninsula (Holtrop 2010, p. 1), and grassland habitat within a forested matrix in Oregon's Willamette Valley (Benton County 2010, Appendix N, p. 5).

4.3 Habitat and Biology

4.3.1 Habitat Selection

Taylor's checkerspot butterfly is known from open grasslands and oak balds where food plants for larvae and nectar sources for adults are available. Taylor's checkerspot larvae have been documented feeding on members of the figwort or snapdragon family (Scrophulariaceae), including harsh Indian paintbrush (*Castilleja hispida*), as well as several species of plantains, including the native seashore plantain (*Plantago macrocarpa*) and goose tongue (*P. maritima*)

and the non-native narrow-leaf plantain (*Plantago lanceolata*) (http://www.xerces.org/taylors-checkerspot/).

Habitat for Taylor's checkerspot butterfly consists of patches of early seral, short-statured, perennial bunchgrass plant communities composed of native grass and forb species with little or no overstory forest vegetation that contain the primary larval host plants of narrow-leaved plantain (*Plantago lanceolata*) and harsh paintbrush (*Castilleja hispida*), as well as abundant flowering forbs to provide nectar sources for the adult butterflies. These habitats are associated with open prairies in the Willamette Valley – Puget Sound lowlands, as well as grassy balds and coastal bluff habitats on the north Olympic Peninsula and Gulf Islands in British Columbia. There has been a rapid decline in the spatial distribution of prairies (grassland habitat) throughout the range of Taylor's checkerspot butterfly. Over 90 percent of the historic prairie and grassland habitat has been lost; as a result, the present distribution of Taylor's checkerspot butterfly butterfly is disjunct and isolated throughout the subspecies' historical range. The distribution of Taylor's checkerspot butterfly has been reduced from more than 80 populations to approximately 14 occupied locations with small populations that are known rangewide today. All sites where the Taylor's checkerspot butterfly is extant face ongoing threats associated with forest succession, invasive non-native plants, and other uses the degrade habitat for the Taylor's checkerspot butterfly.

4.3.2 Breeding and Feeding

Taylor's checkerspot butterflies produce one brood per year. They overwinter (diapause) in the fourth or fifth larval instar (developmental) phase and have a flight period as adults of 10 to 14 days, usually in May, although depending on local site and climatic conditions, the flight period begins in late April and extends into early July, as in Oregon, where the flight season has been documented as lasting up to 45 days (Ross 2008, p. 2). All nontropical checkerspot butterflies, including the Taylor's checkerspot butterfly, have the capability to reenter diapause prior to metamorphosis during years that weather is extremely inhospitable or when the larval food resources are restricted (Ehrlich and Hanski 2004, p. 22). It is important to note that while Taylor's checkerspot butterflies are obvious while on the wing during the flight period, they are present and relatively sedentary throughout the rest of the year while in their larval form; they are considered a resident subspecies year-round and especially vulnerable to many forms of disturbance while in the life-history stages prior to metamorphosis.

Female Taylor's checkerspot butterflies and their larvae utilize plants that contain defensive chemicals known as iridoid glycosides, which have been recognized to influence the selection of oviposition sites by adult nymphalid butterflies (butterflies in the family Nymphalidae) (Murphy *et al.* 2004, p. 22; Page *et al.* 2009, p. 2), and function as a feeding stimulant for some checkerspot larvae (Kuussaari *et al.*2004, p. 147). As maturing larvae feed, they accumulate these defensive chemical compounds from their larval host plants into their bodies. According to the work of Bowers (1981, pp. 373–374), this accumulation appears to deter predation. These larval host plants include members of the Broomrape family (Orobanchaceae), such as *Castilleja* (paintbrushes) and *Orthocarpus,* which is now known as *Triphysaria* (owl's clover), and native and nonnative *Plantago* species, wich are members of the Plantain family (Plantaginaceae) (Pyle 2002, p. 311; Vaughan and Black 2002, p. 8). The recent rediscovery in 2005 of Taylor's checkerspot butterflies in Canada led to the observation that additional food plants (*Veronica*

serpyllifolia (thymeleaf speedwell) and *V. beccabunga* ssp. *americana* (American speedwell)) were being utilized by Taylor's checkerspot butterfly larvae (Heron 2008, pers. comm.; Page *et al.* 2009, p. 2). Taylor's checkerspot butterfly larvae had previously been confirmed feeding on *Plantago lanceolata* (narrow-leaf plantain) and *P. maritima* (sea plantain) in British Columbia (Guppy and Shepard 2001, p. 311), narrow-leaf plantain and *Castilleja hispida* (harsh paintbrush) in Washington (Char and Boersma 1995, p. 29; Pyle 2002, p. 311; Severns and Grosboll 2011, p. 4), and exclusively on narrow-leaf plantain in Oregon (Dornfeld 1980, p. 73; Severns and Warren 2008, p. 476). In 2012, the Taylor's checkerspot butterfly was documented preferentially ovipositing on the threatened *Castilleja levisecta* (golden paintbrush) in studies conducted in Washington, and in 2013, *Castilleja levisecta* was subsequently observed being utilized as a larval host plant in both Washington and Oregon (Kaye 2013; Aubrey 2013, *in litt.*), as originally hypothesized by Dr. Robert Pyle (Pyle 2002, p. 311; Pyle 2007, pers. comm.).

4.4 Threats

4.4.1 Reasons for Listing

Taylor's checkerspot butterfly was listed as a threatened species because of the following:

- Habitat loss through conversion and degradation of habitat, particularly from agricultural and urban development, successional changes to grassland habitat, military training, and the spread of invasive plants;
- Inadequate existing regulatory mechanisms that allow significant threats such as habitat loss;
- Other natural or manmade factors, including low genetic diversity, small or isolated populations, low reproductive success, and declining population sizes; and
- Pesticide use (potential threat for the Taylor's checkerspot butterfly).

4.5 Taylor's checkerspot butterfly Critical Habitat

There is no Taylor's checkerspot butterfly critical habitat within the action area.

5.0 STATUS OF FENDERS BLUE BUTTERFLY

5.1 Legal Status

Fender's blue butterfly was listed as endangered, without critical habitat, on January 25, 2000 (USFWS 2000). Critical habitat for the butterfly was designated on October 6, 2006 (USFWS 2006a). A final recovery plan that includes the Fender's blue butterfly was published by the Service in May 2010 (USFWS 2010).

5.2 Life History

5.2.1 Taxonomy and Species Description

The Fender's blue butterfly belongs to the group of blue butterflies in the family Lycaenidae. The Fender's blue butterfly is one of about a dozen subspecies of Boisduval's blue butterfly (*Icaricia icarioides*) found only in western North America. Fender's blue butterfly is small, with a wingspan of approximately 25 mm (1 inch). The upper wings of the males are brilliant blue in color and the borders and basal areas are black. The upper wings of the females are completely brown. The undersides of the wings of both sexes are creamish tan with black spots surrounded by a fine white border or halo. The dark spots on the underwings of male butterflies are small. In contrast, the dark spots on the underwings of the pembina blue butterfly (*Icaricia icariodes pembina*) are surrounded with wide white haloes, and the underside of the hindwings of Boisduval's blue butterfly (*Icaricia icariodes*) is very pale whitish gray with broad haloes around the black spots.

5.2.2 Current and Historical Range

The historic distribution of Fender's blue butterfly is not precisely known due to the limited information collected on this species prior to its description in 1931. Although the type specimen for this butterfly was collected in 1929, few collections were made between the time of the subspecies' discovery and Macy's last observation of the butterfly on May 23, 1937, in Benton County, Oregon (Hammond and Wilson 1992). Uncertainty regarding the butterfly's host plant caused researchers to focus their survey efforts on common lupine species known to occur in the vicinity of Macy's collections. Fifty years passed before the Fender's blue butterfly was found again.

Fender's blue butterfly was rediscovered in 1989 at the McDonald Research Forest, Benton County, Oregon. The species was found to be associated primarily with Kincaid's lupine and occasionally *Lupinus arbustus* or *Lupinus albicaulis* (Hammond and Wilson 1993). Past survey efforts have determined that Fender's blue butterfly is endemic to the Willamette Valley and persists at about thirty sites on remnant prairies in Linn, Yamhill, Polk, Benton, and Lane counties (Hammond and Wilson 1993, Schultz 1996, Schultz *et al.* 2003, Fish and Wildlife Service unpublished data). In 2011, a large Fender's blue butterfly population was found at Hagg Lake in Washington County, Oregon (Hicks 2012a).

Fender's blue butterfly is endemic to native prairie habitats in the Willamette Valley, Oregon. Most of these prairies are early seral (one stage in a sequential progression) habitats, requiring natural or human-induced disturbance for their maintenance. The vast majority of these prairies would eventually be forested if left undisturbed. Fender's blue butterfly is typically found in native upland prairies, dominated by red fescue (*Festuca rubra*) and/or Idaho fescue (*F. idahoensis*). The butterfly uses three lupine species as larval food plants which include: Kincaid's lupine (*Lupinus oreganus,* formerly *L. sulphureus* ssp. *kincaidii*), sickle-keeled lupine (*L. albicaulis*) and spur lupine (*L. arbustus*). Kincaid's lupine occurs on a few small prairie remnants in the Willamette Valley. Adult Fender's blue butterflies use a variety of plants as nectar sources;

these include: tapertip onion (*Allium acuminatum*), narrowleaf onion (*Allium amplectens*), Tolmie's mariposa lilly (*Calochortus tolmiei*), small camas (*Camassia quamash*), clearwater cryptantha (*Cryptantha intermedia*), wooly sunflower (*Eriophyllum lanatum*), Oregon geranium (*Geranium oreganum*), toughleaf iris (*Iris tenax),* pale flax (*Linum angustifolium*), blue flax (*Linum perenne*), Meadow checkermallow (*Sidalcea campestris*), rose checker-mallow (*Sidalcea virgata*), bird vetch (*Vicia cracca*), common vetch (*V. sativa*), and tiny vetch (*V. hirsute*). Native plants that occur on native upland prairies serve as herbaceous indicators of prairie condition. These dry fescue prairies make up the majority of habitat for Fender's blue butterfly. Although Fender's blue butterfly is occasionally found on steep, south-facing slopes and barren rocky cliffs, it does not appear to thrive in the xeric oatgrass communities often found there.

Loss of native prairie has resulted in the isolation of butterfly populations which were once inter-connected. As the number of sites declines and the distance between them increases, opportunities for adult movement between populations are reduced. Populations isolated in this manner face a higher risk of extinction because they are more vulnerable to natural and human-made disturbances. (See link for more information: http://www.fws.gov/oregonfwo/Species/Data/FendersBlueButterfly/default.asp 10/30/2009).

5.3 Habitat and Biology

5.3.1 Habitat Selection

Habitat requirements for Fender's blue butterfly include lupine host plants (Kincaid's lupine or *Lupinus arbustus*, and occasionally *Lupinus albicaulis*) for larval food and oviposition sites and native wildflowers for adult nectar food sources. Non-native vetches (*Vicia sativa* (garden vetch) and *Vicia hirsuta* (tiny vetch) are also frequently used as nectar sources, although they are inferior to the native nectar sources (Schultz *et al.* 2003). Population size of Fender's blue butterfly has been found to correlate directly with the abundance of native nectar sources (Schultz *et al.* 2003). At least 6 ha (15 acres) of high quality habitat are necessary to support a population of Fender's blue butterfly (Crone and Schultz 2003, Schultz and Hammond 2003). Most prairies in the region are degraded and of low quality, and thus a much larger area is likely required to support a viable Fender's blue butterfly population.

Kincaid's lupine is the larval host plant at most known Fender's blue butterfly population sites. At two sites, Coburg Ridge and Baskett Butte, the butterfly feeds primarily on *Lupinus arbustus*, even though Kincaid's lupine is present (Schultz *et al.* 2003). *Lupinus albicaulis* is used by the butterfly where it occurs in poorer quality habitats (Schultz *et al.* 2003). It is interesting to note that Fender's blue butterfly has not been found to use *Lupinus latifolius* (broadleaf lupine), a plant commonly used as a food source by other subspecies of *Icaricia icarioides*, even though it occurs in habitats occupied by the butterfly (Schultz *et al.* 2003).

Adult Fender's blue butterfly live approximately 10-15 days and apparently rarely travel farther than 2 km (1.2 miles) over their entire life span (Schultz 1998). Although only limited observations have been made of the early life stages of the butterfly, the life cycle of the species likely is similar to other subspecies of *Icaricia icarioides* (Hammond and Wilson 1993). The life cycle of Fender's blue butterfly may be completed in one year. An adult female butterfly may

lay approximately 350 eggs over her 10-15 day lifespan, of which perhaps fewer than two will survive to adulthood (Schultz 1998, Schultz *et al.* 2003). Females lay their eggs on Kincaid's lupine, *Lupinus arbustus* (longspur lupine) or occasionally *Lupinus albicaulis* (sickle-keeled lupine), which are the larval food plants, during May and June (Ballmer and Pratt 1988). Newly hatched larvae feed for a short time, reaching their second instar in the early summer, at which point they enter an extended diapause. Diapausing larvae remain in the leaf litter at or near the base of the host plant through the fall and winter when the lupine plant senesces. Larvae become active again in March or April of the following year. Some larvae may be able to extend diapause for more than one season depending upon the individual and environmental conditions. Once diapause is broken, the larvae feed and grow through three to four additional instars, enter their pupa stage, and after about two weeks emerge as adult butterflies in May and June (Schultz *et al.* 2003).

Fender's blue butterflies have limited dispersal ability. Adult butterflies may remain within 2 km (1.2 miles) of their natal lupine patch (Schultz 1998), although anecdotal evidence exists of adult butterflies dispersing as far as 5-6 km (3.1-3.7 miles) (Hammond and Wilson 1992, Schultz 1998). Dispersal of this magnitude is not likely anymore because of habitat fragmentation. At large patches like the main area at Willow Creek in Lane County, 95 percent of adult Fender's blue butterfly are found within 10 m (33 feet) of lupine patches (Schultz 1998).

5.4 Threats

5.4.1 Reasons for listing

Habitat loss, encroachment of shrubs and trees into prairie habitats due to fire suppression, fragmentation, invasion by non-native plants, and elimination of natural disturbance regimes all threaten the survival of Fender's blue butterfly. Few populations occur on protected lands. Most occur on private lands which are not managed to maintain native prairie habitats. These populations are at high risk of loss to development or continuing habitat degradation (USFWS 2000).

The prairies of western Oregon and southwestern Washington have been overtaken by non-native plants that shade-out or crowd-out important native species. Fast growing non-native shrubs (*Rubus armeniacus* (Himalayan blackberry) and *Cytisus scoparius* (Scotch broom), non-native grasses such as *Arrhenatherum elatius* (tall oatgrass), and non-native forb, such as *Centaurea debeauxii* (meadow knapweed), can virtually take over the prairies, inhibiting the growth of the lupine host plants and native nectar sources (Hammond 1996, Schultz *et al.* 2003). When these highly invasive non-native plants become dominant, they can effectively preclude Fender's blue butterfly from using the native plant species the butterfly needs to survive and reproduce (Hammond 1996). In the absence of a regular disturbance regime, succession of native trees and shrubs also threaten to alter prairie habitats. Common native species found to encroach on undisturbed prairies include *Pseudotsuga menziesii* (Douglas-fir), *Quercus garryana* (Oregon white oak), *Fraxinus latifolia* (Oregon ash), *Crataegus douglasii* (Douglas' hawthorn) and *Toxicodendron diversilobum* (Pacific poison oak).

Habitat fragmentation has isolated some Fender's blue butterfly populations to such an extent that butterfly movement among suitable habitat patches may now occur only rarely. This reduction in movement is not expected to maintain the population over time (Schultz 1998). The rarity of host lupine patches and fragmentation of habitat are thought to be the major ecological factors limiting reproduction, dispersal, and subsequent colonization of new habitat (Hammond and Wilson 1992, 1993, Hammond 1994, Schultz 1997, Schultz and Dlugosch 1999). Extirpation of remaining small populations as a result of localized events and/or probable low genetic diversity associated with small populations is expected (Schultz and Hammond 2003).

Previous population viability analyses determined that the Fender's blue butterfly is at high risk of extinction throughout most of its range (Schultz and Hammond 2003). However, several relatively large populations have been found that were not previously known to occur and methodologies for population estimates have been improved (Collins *et al.* 2010 and Hicks 2012b) data quality. Therefore, the Service is currently evaluating options for completing another population viability analysis with more current and improved data.

5.5 Population Estimates

In 2012, Fender's blue butterfly was found to occupy an estimated 66 sites in Oregon with a total species abundance estimate of approximately 11,630 adults (Fitzpatrick 2013). The status of Fender's blue butterfly has improved over the recent years primarily from habitat management/restoration activities and survey efforts identifying new population sites.

Fender's blue butterfly populations occur on upland prairies characterized by native *Festuca* spp. (bunch grasses). The association of Fender's blue butterfly with upland prairie is mostly a result of its dependence on Kincaid's lupine, although the butterfly often uses wet prairies for nectaring and dispersal habitat. Sites occupied by the Fender's blue butterfly butterfly are predominantly located on the western side of the Willamette Valley, within 33 km (21 miles) of the Willamette River.

5.6 Fenders Blue Butterfly Critical Habitat

Critical habitat units for the Fender's blue butterfly have been designated in Benton, Lane, Polk and Yamhill Counties, Oregon (USFWS 2006a). The PCEs of critical habitat for the Fender's blue butterfly are the habitat components that provide the following.

1. Early seral upland prairie, wet prairie, or oak savanna habitat with a mosaic of low-growing grasses and forbs, an absence of dense canopy vegetation, and undisturbed sub-soils;
2. Larval host-plants *Lupinus sulphureus* ssp. *kincaidii*, *Lupinus arbustus*, or *Lupinus albicaulis*;
3. Adult nectar sources, such as: *Allium acuminatum* (tapertip onion), *Allium amplectens*, *Calochortus tolmiei*, *Camassia quamash* (common camas), *Cryptantha intermedia* (Clearwater cryptantha), *Eriophyllum lanatum*, *Geranium oreganum*, *Iris tenax* (Oregon iris), *Linum angustifolium* (pale flax), *Linum perenne* (blue flax), *Sidalcea campestris*

(meadow checker-mallow), *Sidalcea malviflora* ssp. *virgata*, *Vicia cracca* (bird vetch), *Vicia sativa* and *Vicia hirsuta*; and

4. Stepping-stone habitat consisting of undeveloped open areas with the physical characteristics appropriate for supporting the short-stature prairie oak savanna plant community (well-drained soils), within approximately 2 km (1.2 miles) of natal lupine patches.

6.0 STATUS OF KINCAID'S LUPINE

6.1 Legal Status

Kincaid's lupine was listed as threatened, without critical habitat, on January 25, 2000 (USFWS 2000). A recovery outline for the Kincaid's lupine was published in 2006 (USFWS 2006a), and a final recovery plan that includes this species (Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington) was published by the Service in May 2010 (USFWS 2010).

6.2 Life History

6.2.1 Taxonomy and Species Description

Kincaid's lupine is a perennial species in the pea or legume family (Fabaceae). With its low growing habit and unbranched flower stalk, Kincaid's lupine is easily distinguished from other species of lupine. Its aromatic flowers have a slightly reflexed, distinctly ruffled banner and are yellowish-cream colored, often showing shades of blue on the keel. The leaflets are deep green with a smooth upper surface. The plants are low-growing, 16-30 inches, with flowering stems that exceed the height of the branched crown. Flowering typically occurs in May and June. Seeds are dispersed from fruits that open explosively upon drying. (See link for more information: http://www.fws.gov/oregonfwo/Species/Data/KincaidsLupine)

6.2.2 Range and Distribution

Kincaid's lupine is found in dry upland prairies from Lewis County, Washington, in the north, south to the foothills of Umpqua Valley in Douglas County, Oregon. However, most of the known and historical populations are found in the Willamette Valley. Historically, the species was documented from Vancouver Island, British Columbia, Canada (Dunn and Gillet 1966), but has not been located in that region since the 1920s (Kaye 2000). Kincaid's lupine is currently known at about 57 sites, comprising about 160 ha (395 acres) of total coverage (Kaye and Kuykendall 1993, Wilson *et al.* 2003). Until the summer of 2004, Kincaid's lupine was known from just two extant populations in Washington, in the Boistfort Valley in Lewis County, more than 160 km (100 miles) from the nearest population in the Willamette Valley. In 2004, two small populations were found at Drew's Prairie and Lacamas Prairie to the east of the Boistfort Valley in Lewis County. Only one plant was observed at Drew's Prairie and more than 40 plants were found at Lacamas Prairie (Caplow and Miller 2004). Before Euro-American settlement of the region, Kincaid's lupine was likely well distributed throughout the prairies of western

Oregon and southwestern Washington. Today, habitat fragmentation has resulted in existing populations that are widely separated by expanses of unsuitable habitat.

6.3 Habitat and Biology

6.3.1 Habitat Selection

In the Willamette Valley and southwestern Washington, Kincaid's lupine is found on upland prairie remnants where the species occurs in small populations at widely scattered sites. A number of populations are found in road rights-of-ways and between the road shoulders and adjacent fence lines, where they have survived because of limited or non-agricultural disturbance. Common native species typically associated with Kincaid's lupine include: *Festuca idahoensis* ssp. *roemeri*, *Danthonia californica*, *Calochortus tolmiei*, *Eriophyllum lanatum*, and *Fragaria virginiana* (Virginia strawberry). The species appears to prefer heavier, generally well-drained soils and has been found on 48 soil types, typically Ultic Haploxerolls, Ultic Argixerolls, and Xeric Palehumults (Wilson *et al.* 2003).

In Douglas County, Oregon, Kincaid's lupine appears to tolerate more shaded conditions, where it occurs at sites with canopy cover of 50-80 percent (Barnes 2004). In contrast to the open prairie habitats of the more northerly populations, in Douglas County, tree and shrub species dominate the sites, including *Pseudotsuga menziesii*, *Quercus kelloggii*, *Arbutus menziesii*, *Pinus ponderosa*, *Calocedrus decurrens* (incense-cedar), *Arctostaphylos columbiana* (hairy manzanita) and *Toxicodendron diversilobum*.

In contrast to historical ecosystem composition, invasive and non-native species are a significant component of Kincaid's lupine habitat today. Common invasive species include: *Arrhenatherum elatius*, *Brachypodium sylvaticum* (slender false brome), *Dactylis glomerata*, *Schedonorus phoenix*, *Rubus armeniacus*, and *Cytisus scoparius* (Wilson *et al.* 2003). In the absence of fire, some native species, such as *Toxicodendron diversilobum* and *Pteridium aquilinum* (bracken fern), invade prairies and compete with Kincaid's lupine.

6.3.2 Ecology and Reproduction

Flowering of Kincaid's lupine begins in mid-April and extends through June. As the summer dry season arrives, Kincaid's lupine becomes dormant, and is completely senescent by mid-August (Wilson *et al.* 2003). Pollination is largely accomplished by small native bumblebees (*Bombus mixtus* and *Bombus californicus*), solitary bees (*Osmia lignaria*, *Anthophora furcata*, *Habropoda* sp., *Andrena* spp., *Dialictus* sp.) and occasionally, European honey bees (*Apis mellifera*) (Wilson *et al.* 2003). Insect pollination appears to be critical for successful seed production (Wilson *et al.* 2003).

Kincaid's lupine reproduces sexually by seed and vegetatively by rhizomes. It is able to spread extensively through underground growth. Individual clones can be several centuries old (Wilson *et al.* 2003), and become quite large with age, producing many flowering stems. Excavations and morphological patterns suggest that plants 10 m (33 feet) or more apart can be interconnected by below-ground stems, and that clones can exceed 10 m (33 feet) across (Wilson

et al. 2003). As part of a genetic evaluation, collections taken from small populations of Kincaid's lupine at the Baskett Slough National Wildlife Refuge were found to be genetically identical, indicating that the population consists of one or a few large clones (Liston *et al.* 1995). Reproduction by seed is more common in large populations where inbreeding depression is minimized and ample numbers of seeds are produced. In small populations, seed production is often reduced and this appears to be due, at least in part, to inbreeding depression (Severns 2003).

Kincaid's lupine is vulnerable to seed, fruit, and flower predation by insects, which may limit seed production. Seed predation by bruchid beetles and weevils and larvae of other insects has been documented and may result in substantially reduced production of viable seed (Kaye and Kuykendall 1993, Kuykendall and Kaye 1993). Floral and fruit herbivory by larvae of the silvery blue butterfly (*Glaucopsyche lygdamus columbia*) has also been reported (Kuykendall and Kaye 1993, Schultz 1995). The vegetative structures of Kincaid's lupine support a variety of insect herbivores, including root borers, sap suckers, and defoliators (Wilson *et al.* 2003). Kincaid's lupine is the primary larval host plant of the endangered Fender's blue butterfly (Wilson *et al.* 2003). Female Fender's blue butterflies lay their eggs on the underside of Kincaid's lupine leaves from May-June. The larvae hatch several weeks later and feed on the plant for a short time before entering an extended diapause, which lasts until the following spring (Schultz *et al.* 2003). Kincaid's lupine, like other members of the genus *Lupinus*, is unpalatable to vertebrate grazers. Kincaid's lupine forms root nodules with *Rhizobium* spp. bacteria that fix nitrogen and also have vesicular-arbuscular mycorrhizae, which may enhance the plant's growth (Wilson *et al.* 2003).

6.4 Threats

6.4.1 Reasons for listing

The three major threats to Kincaid's lupine populations are habitat loss, competition from non-native plants, and elimination of historical disturbance regimes (Wilson *et al.* 2003, USFWS 2010). Habitat loss from a wide variety of causes (*e.g.,* urbanization, agriculture, silvicultural practices and roadside maintenance) has been the single largest factor in the decline of Kincaid's lupine (USFWS 2000). Land development and alteration in the prairies of western Oregon and southwestern Washington have been so extensive that the remaining populations are essentially relegated to small, isolated patches of habitat. Habitat loss is likely to continue as private lands are developed. At least 49 of 54 sites occupied by Kincaid's lupine in 2000 at the time listing occurred were on private lands and are at risk of being lost unless conservation actions are implemented (USFWS 2000).

Habitat fragmentation and isolation of small populations may be causing inbreeding depression in Kincaid's lupine. The subspecies was likely wide-spread historically, frequently outcrossing throughout much of its range, until habitat destruction and fragmentation severely isolated the remaining populations (Liston *et al.* 1995). There is some evidence of inbreeding depression, which may result in lower seed set (Severns 2003). Hybridization between Kincaid's lupine and *Lupinus arbustus* has been detected at Baskett Slough National Wildlife Refuge (Liston *et al.* 1995).

Invasion by a few aggressive plant species is a threat to many prairies and the presence of other non-native species within degraded prairies contributes to lower prairie quality and concomitant reduced population viability of native species, including Kincaid's lupine. Some aggressive non-native plants form dense monocultures, which compete for space, water and nutrients with the native prairie species, and ultimately inhibit the growth and reproduction of Kincaid's lupine by shading out the plants (Wilson *et al.* 2003).

Most prairie sites require frequent disturbances to hold back the natural succession of trees and shrubs. Before settlement by Euro-Americans, the regular occurrence of fire maintained the open prairie habitats essential to Kincaid's lupine. The loss of a regular disturbance regime, primarily fire, has resulted in the decline of prairie habitats through succession by native trees and shrubs, and has allowed the establishment of numerous non-native grasses and forbs. When this species was listed, it was estimated that 83 percent of upland prairie sites were succeeding to forest in the range of Kincaid's lupine (USFWS 2000).

6.4.2 New Threats

One concern that was not addressed at the time this species was listed was the possibility for Kincaid's lupine to hybridize with co-occurring lupine species. Hybridization, the result of cross breeding between two species, can be detrimental if the offspring that result are maladapted, but compete for the same resources as the co-occurring lupine plants that are capable of sexual reproduction. Hybridization may also be detrimental if continued intermixing results in back crossing to the more common parent plant and, ultimately, swamping of the rare parent genes (Tom Kaye, Institute for Applied Ecology, pers. comm., 2010; Rebecca Currin, Oregon Department of Agriculture, pers. comm., 2010). Kincaid's lupine and spur lupine (*Lupinus arbustus*) are known to hybridize at Baskett Slough National Wildlife Refuge (Liston et al., 1995). In order to determine the role of hybridization and any risk it may pose to this species, additional genetic information is needed for Kincaid's lupine populations throughout its range.

Hybrids, first generation crosses between two species, are generally not regulated by the Act. However, the tendency for plants to share some traits and characteristics based on historic interbreeding is a subject which has not been fully addressed by a Service Policy and is open to interpretation. Because broadly sympatric occurring lupine species (including Kincaid's lupine) appear to frequently interbreed (Hitchcock and Cronquist 1961), The Service recommends that plants showing the dominant traits of Kincaid's lupine be regarded as Kincaid's lupine until such time as they are conclusively shown to be the result of direct hybridization, not historic introgression, through genetic studies. This topic will be reviewed as additional information becomes available.

6.5 Population Estimates

The recovery criteria as described in the recovery plan for this species (Service 2010a) call for a minimum of 20 populations totaling at least 50,000 m^2 of foliar cover distributed across eight recovery zones. At present, there are166 named sites distributed between the recovery zones and 154 are believed to be extant at this time (Table 1). Of the extant named sites, only six have a reported foliar cover of at least 500 m^2 and the majority of sites with data support less than 50 m^2 of foliar cover. A large number of sites, 68 of the 154 extant sites, do not have reliable population data associated with the location information. Based on the currently available data, none of the recovery zones have met the abundance goals outlined in the recovery plan (Service 2010a, 2010b). In addition to abundance goals, the recovery plan also stipulates that populations should show evidence of reproduction and stable or increasing populations (an attribute that cannot be determined with current foliar cover estimates) and the habitat should be managed to maintain or improve prairie quality and control threats. The recovery plan also recommends that a substantial portion of the populations be secured either by a government agency or a private conservation organization (Service 2010a).

Although the number of populations and the rough population estimate of foliar cover have increased since the time of listing, many of the populations are still unsecured and/or unmanaged. The recovery goals for Kincaid's lupine have not been reached as none of the recovery zones have met the abundance criteria established for this species and the threats of habitat degradation and habitat loss identified at the time of listing have not been removed. Therefore, Kincaid's lupine meets the definition of threatened as it is likely to become endangered within the foreseeable future throughout its range (USFWS 2010).

6.6 Kincaid's lupine Critical Habitat

Critical habitat was designated on October 6, 2006 (USFWS 2006a). Critical habitat units for Kincaid's lupine have been designated in Benton, Lane, Polk and Yamhill counties, Oregon, and Lewis County, Washington. The PCEs of critical habitat are the habitat components that provide: (1) early seral upland prairie or oak savanna habitat with a mosaic of low growing grasses, forbs, and spaces to establish seedlings or new vegetative growth, with an absence of dense canopy vegetation providing sunlight for individual and population growth and reproduction, and with undisturbed sub-soils and proper moisture and protection from competitive invasive species; and (2) the presence of insect pollinators, such as bumblebees (*Bombus mixtus* and *Bombus californicus*), with unrestricted movement between existing lupine patches, critical for successful lupine reproduction. Critical habitat does not include human-made structures existing on the effective date of the rule and not containing one or more of the PCEs such as buildings, aqueducts, airports, and roads, and the land on which such structures are located.

7.0 STATUS OF BRADSHAW'S LOMATIUM

7.1 Legal Status

Bradshaw's lomatium was listed as endangered, without critical habitat on October 31, 1988 (53 FR 38448). A recovery plan was published in 1993, and a final recovery plan that includes this species (Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington) was published by the Service in May 2010 (USFWS 2010).

7.2 Life History

7.2.1 Taxonomy and Species Description

Bradshaw's lomatium is perennial herb in the parsley family (Apiaceae). It can reach 20-50 cm (8-20 in) in height, with mature plants having only 2-6 leaves. Leaves are chiefly basal and are divided into very fine, almost threadlike, linear segments. The yellow flowers are small, measuring about 1 mm (0.05 in) long and 0.5 mm (0.025 in) across, and are grouped into asymmetrical umbels. Each umbel is composed of 5-14 umbellets, which are subtended by green bracts divided into sets of three. This bract arrangement differentiates Bradshaw's from other lomatiums. Bradshaw's lomatium blooms during April and early May, with fruits appearing in late May and June. Fruits are oblong, about 1.2 cm (0.5 in) long, corky and thick-winged along the margin, and have thread-like ribs on the dorsal surface. This plant reproduces entirely from seed. Insects observed to pollinate this plant include a number of beetles, ants, and some small native bees.

7.2.2 Range and Distribution

At the time of listing, the geographic range of Bradshaw's lomatium was thought to be from Stayton, Oregon to just south of Eugene, Oregon, with 11 known sites. In 1994, two additional sites were discovered in Clark County in southwestern Washington. The current geographic range extends from southwestern Washington to Cresswell, Oregon with 47 occurrences listed in the Oregon Natural Heritage Information Center database as of August 2008. Most of these populations are small, ranging from about 10 to 1,000 individuals, although the four largest sites each have over 100,000 plants (USFWS 2009).

7.3 Habitat and Biology

7.3.1 Habitat Selection

The majority of Bradshaw's lomatium populations occur on seasonally saturated or flooded prairies, adjacent to creeks and small rivers in the southern Willamette Valley. Soils at these sites are dense, heavy clays, with a slowly permeable clay layer located 15-30 cm (6-12 in) below the surface. This clay layer results in a perched water table during winter and spring, and is critical to the wetland character of these grasslands, known as tufted hair-grass (Deschampsia cespitosa) prairies. Bradshaw's lomatium occurs on alluvial (deposited by flowing water) soils. The species

occurs on soils in the Wapto, Bashaw and Mcalpin Series (NRCS mapped soil unit STATSGO 81). (For further information, please see link: http://www.fws.gov/oregonfwo/Species/Data/BradshawsLomatium/ 9/22/2008)

7.3.2 Ecology and Reproduction

Bradshaw's lomatium is a low, erect perennial arising from a long slender taproot and has small light yellow flowers that occur in umbels. Bradshaw's lomatium blooms in the spring, usually in April and early May. The flowers have a spatial and temporal separation of sexual phases, presumably to promote outcrossing, resulting in protandry on a whole plant basis, and protogyny within the flowers (Kaye and Kirkland 1994). A typical population is composed of many more vegetative plants than reproductive plants. The plant is pollinated by insects. Over 30 species of solitary bees, flies, wasps and beetles have been observed visiting the flowers (Kaye and Kirkland 1994, Jackson 1996). The very general nature of the insect pollinators probably buffers Bradshaw's lomatium from the population swings of any one pollinator (Kaye 1992).

Bradshaw's lomatium does not spread vegetatively and depends exclusively on seeds for reproduction (Kaye 1992). It does not maintain a persistent soil seed bank, and most seeds either germinate or die within one year. Average fruit production of 10.8 fruits per plant was observed by Kaye and Kirkland (1994) and varies from 0.3-18.0 fruits per plant in response to site, year, and burning regime (Pendergrass et al. 1999). The large fruits have corky thickened wings, and usually fall to the ground fairly close to the parent. Fruits appear to float somewhat, and may be distributed by water. The fine-scale population patterns at a given site appear to follow seasonal microchannels in the tufted hairgrass prairies, but whether this is due to dispersal, habitat preference, or both, is not clear (Kaye 1992, Kaye and Kirkland 1994).

The species generally responds positively to disturbance. Low intensity fire appears to stimulate population growth of Bradshaw's lomatium. The density and abundance of reproductive plants increased following fires (Kaye and Pendergrass 1998, Pendergrass *et al.* 1999), although monitoring showed the effects to be temporary, dissipating after one to three years. Frequent burns may be required to sustain population growth, as determined from population models (Caswell and Kaye 2001, Kaye *et al.* 2001).

Studies of the effects of cattle grazing on Bradshaw's lomatium populations show mixed results. Livestock grazing in the springtime, when the plants are growing and reproducing, can harm the plants by biomass removal, trampling and soil disturbance; however, late-season livestock grazing, after fruit maturation, has been observed to lead to an increase in emergence of new plants, and the density of plants with multiple umbels, although it did not alter survival rates or population structure (Drew 2000). Observed increases in seedlings may be due to small disturbances in the soil, a reduction of shading by nearby plants, and reduced herbivory by small mammals.

Propagation studies have found that long-term (8 weeks) cold stratification was necessary to fully break dormancy in this species (Kaye *et al.* 2003). Bradshaw's lomatium plants can be grown from seed in a greenhouse environment (Kaye *et al.* 2003). Plants may be successfully established at existing populations or new locations throughout-planting of greenhouse-grown

plants. Fertilizing transplants may have a negative effect on survival in some cases. Direct seeding has a relatively high success rate (17 to 38 percent), and is improved by removal of competing vegetation (Kaye and Kuykendall 2001, Kaye *et al.* 2003). Seeds of this species have been banked at the Berry Botanic Garden in Portland, Oregon (BBG 2005) and the University of Washington Botanic Garden.

7.4 Threats

7.4.1 Reasons for listing

Bradshaw's lomatium is threatened by historic and continued habitat loss and modification. Only about one percent of historic bottomland/wet prairie habitat remains in the Willamette Valley. At the time of listing the most significant threat identified was conversion of native prairie habitat to agricultural land. Although this threat still exists, the current most significant threat to Bradshaw's lomatium is habitat loss due to succession to woody plants and competition from invasive species.

Most of the populations are surrounded by residential and industrial development which continues to threaten some of the remaining habitat through urban expansion and changes in hydrology.

7.4.2 Other Threats

The Draft Recovery Plan identified the following threats to current habitat:

- On-site agriculture conversion and management practices
- Adjacent land use practices
- Historic management / disturbance
- Housing / urban development
- Hydrologic alterations
- Improper prairie management
- Invasive species
- Isolation / fragmentation
- Road development / maintenance
- Utilities installation and maintenance
- Wildfire / burning

7.4.3 New Threats

New threats were identified during the five-year review (USFWS 2009) which include:

- Overutilization for commercial, recreational, scientific, or educational purposes
- Field research activities
- Recreation
- Over-collecting / poaching
- Disease or predation

  - Herbivores / predators
- Livestock grazing
- Parasites

7.5 Population Estimates

For many years *Lomatium bradshawii* was considered an Oregon endemic, its range limited to the area between Salem and Creswell, Oregon (Kagan 1980). However, in 1994, two populations of the species were discovered in Clark County, Washington. The Washington populations, though few in number, are large in population size, with one site estimated to have over 800,000 individuals (USFWS unpublished data). Because of their proximity, these two populations are considered to be a single occurrence under NatureServe guidelines. In addition to the Washington populations, there are currently more than 60 sites with *Lomatium bradshawii*, concentrated in three population centers located in Benton, Lane, Linn, and Marion Counties, Oregon (Gisler 2004, Oregon Natural Heritage Information Center 2007). Most of these populations are small, ranging from about 10 to 1,000 individuals, although the two largest sites each have over 100,000 plants (Oregon Natural Heritage Information Center 2007). The total area of occupied habitat is about 300 hectares (742 acres).

Some populations that were large when discovered have since declined in size substantially. A large population at Buford Park near Eugene, Oregon, dropped from about 23,000 plants in 1993 to just over 3,000 plants in 1994 (Greenlee and Kaye 1995), recovered to 20,000 plants in 2000, and declined to about 200 plants in 2007 (Kate Norman, USFWS, Portland, Oregon, 2010a). Herbivory by a booming vole population was suspected to be the cause of the decline.

8.0 STATUS OF WILLAMETTE DAISY

8.1 Legal Status

Willamette daisy is a perennial herb that was listed as endangered without critical habitat, on January 25, 2000 (71 FR 63862).

8.2 Life History

8.2.1 Taxonomy and Species Description

Willamette daisy is a perennial herb in the composite family (Asteraceae) and can reach 15-62 cm (6-24 in) tall. Basal leaves are 5-18 cm (2-7 in) long and less than 1.2 cm (0.5 in) wide, becoming gradually shorter along the stem. The flowering stems, which are taller than the vegetative stems, produce 2 to 5 flower heads. The flowers are daisy-like, with yellow centers and 25-50 pinkish to blue rays, often fading to white with age. Flowering typically occurs during June and early July.

8.2.2 Range and Distribution

The Willamette daisy is endemic to the Willamette Valley of western Oregon. Herbarium specimens show a historical distribution of Willamette daisy throughout the Willamette Valley;

frequent collections were made in the period between 1881 and 1934, yet no collections or observations were recorded from 1934 to 1980, and the plant was presumed to be extinct (Clark *et al.* 1993, Gisler 2004). The species was rediscovered in 1980 in Lane County, Oregon.

Willamette daisy has been collected in Benton, Clackamas, Lane, Linn, Marion, Polk, Yamhill, and Washington Counties, Oregon, but today the species occurs in Benton, Lane, Linn, Marion, and Polk Counties, Oregon; at those sites, there are about 94 hectares (233 acres) of occupied habitat.

8.3 Habitat and Biology

8.3.1 Habitat Selection

This species occurs on alluvial soils (deposited by flowing waters). The Willamette daisy occurs on soils in the Wapto, Bashaw and Mcalpin Series. The species is known to have been extirpated (destroyed or no longer surviving) from an additional 19 historic locations. Willamette daisy populations are known mainly from bottomland but one population is found in an upland prairie remnant.

Willamette daisy typically occurs where woody cover is nearly absent and where herbaceous vegetation is low in stature (Clark *et al.* 1993). It occurs in both wet prairie grasslands and drier upland prairie sites. The wet prairie grassland community is typically dominated by *Deschampsia cespitosa*, *Danthonia californica* and a number of Willamette Valley endemic forbs. It is a flat, open, seasonally wet prairie with bare soil between the pedestals created by the bunching *Deschampsia cespitosa* (Kagan and Yamamoto 1987). On drier upland prairie sites, associated species commonly include *Symphotrichum hallii*, *Festuca idahoensis* ssp. *roemeri* and *Toxicodendron diversilobum* (Meinke 1982, Clark *et al*. 1993). *Willamette daisy* prefers heavier soils, and has been found on the following soil associations: Bashaw, Briedwell, Chehulpum, Dayton, Dixonville, Dupee, Hazelair, Marcola, Natroy, Nekia, Pengra, Philomath, Salkum, Saturn, Stayton, and Witzel.

8.3.2 Ecology and Reproduction

Willamette daisy is an herbaceous perennial that occurs as single plants or clumps of genetically identical ramets (Clark *et al.* 1993). It blooms in June and early July and produces seeds in late summer (Cronquist 1955). Seedlings emerge in late winter or early spring, and plants require two to four years in the wild to reach flowering size. Large plants appear to spread vegetatively, but this spread is localized around the established plant (Clark *et al.* 1995). Field investigators have developed a distance-based rule for consistently differentiating closely-spaced plants. If it is unclear that two adjacent clumps are united underground, they are assumed to be distinct individuals if they are separated by 7 centimeters (3 inches) or more. Clumps closer than 7 centimeters (3 inches) are assumed to be part of the same plant (Kaye and Benfield 2005).

The fruits of Willamette daisy are single-seeded achenes, like those of other *Erigeron* species, and have a number of small capillary bristles (the pappus) attached to the top, which allow them to be distributed by the wind. Population size can substantially affect reproductive success in this

species. Populations of Willamette daisy with fewer than 20 individuals appear to suffer a high rate of reproductive failure due to inbreeding depression and reduced probability of being pollinated by a compatible mate (Wise and Kaye 2006).

A variety of insects have been observed to visit the flowers of *Willamette daisy*; potential pollinators include solitary bees (*Ceratina* sp., *Megachile* sp., *Nomada* sp., *Halictus ligatus,* and *Ashmeadiella* sp.), beetles (*Meligethes nigrescens* and *Acanthoscelides pauperculus*), flies (*Toxomerus marginata, T. occidentalis* and *Tachina* sp.), and butterflies (*Phyciodes campestris*) (Kagan and Yamamoto 1987, Clark *et al.* 1993, Jackson 1996, Gisler 2004).

8.4 Threats

8.4.1 Reasons for listing

Like many native species endemic to Willamette Valley prairies, Willamette daisy is threatened by habitat loss due to urban and agricultural development, successional encroachment into its habitat by trees and shrubs, competition with non-native weeds, and small population sizes (Kagan and Yamamoto 1987, Clark *et al.* 1993, Gisler 2004). The Service (2000a) estimated that habitat loss is occurring at 80 percent of the remaining 84 remnants of native prairies occupied by Willamette daisy and Kincaid's lupine. At the time of its listing, the Service estimated that 24 of the 28 extant Willamette daisy populations occurred on private lands "expected to be lost in the near future unless conservation actions are implemented" (USFWS 2000: 3882).

Populations occurring on private lands are the most vulnerable to threats of development, because state and federal plant protection laws have little effect on private lands, although publicly owned populations are not immune from other important limitations or threats to the species. For instance, Clark *et al.* (1993) identified four populations protected from development on public lands (Willow Creek, Basket Slough National Wildlife Refuge, Bald Hill Park, and Fisher Butte Research Natural Area), but stated that even these appear to be threatened by the proliferation of non-native weeds and successional encroachment of brush and trees. Likewise, vulnerability arising from small population sizes and inbreeding depression may be a concern for the species, regardless of land ownership, especially among 17 of the 28 remaining sites that are smaller than 3.5 hectares (8 acres) (USFWS 2000). Given that the majority of populations are on private lands, working with private landowners is critical to promote the eventual conservation and recovery of Willamette daisy.

8.5 Population Estimates

Population size may fluctuate substantially from year to year. Monitoring at the Oxbow West site, near Eugene, found 2,299 *Erigeron decumbens* var. *decumbens* plants in 1999, 2,912 plants in 2000, and only 1,079 plants in 2001. The population at Baskett Butte declined to 48 percent of the original measured population between 1993 and 1999 (Clark 2000). Detecting trends in *E. decumbens* var. *decumbens* populations is complicated by the biology and phenology of the species. For instance, Kagan and Yamamoto (1987) found it difficult to determine survival and mortality between years because of sporadic flowering from year to year. They suggested that some plants may not flower in some years, as indicated by the sudden appearance of large plants

where they were not previously recorded, and the disappearance and later re-emergence of large plants within monitoring plots. In addition, Clark *et al.* (1993) stated that non-reproductive individuals can be very difficult to find and monitor due to their inconspicuous nature, and that the definition of individuals can be complicated when flowering clumps overlap.

8.6 Willamette Daisy Critical Habitat

Critical habitat was designated on October 31, 2006 (71 FR 63862). Critical habitat units for Willamette daisy have been designated in Benton, Lane, Linn, Marion and Polk Counties, Oregon. The primary constituent element of critical habitat is early seral upland prairie, wet prairie, or oak savanna habitat with a mosaic of low-growing grasses, forbs, and spaces to establish seedlings or new vegetative growth; an absence of dense canopy vegetation; and undisturbed subsoils. Critical habitat does not include human-made structures existing on the effective date of the rule and not containing one or more of the primary constituent elements, such as buildings, aqueducts, airports, and roads, and the land on which such structures are located.

9.0 ENVIRONMENTAL BASELINE

The environmental baseline is defined as "the past and present impacts of all federal, state or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation in process [50 CFR 402.02].**"**

9.1 Overview of the Recovery Plan

9.1.1 The Recovery Plan recommends specific actions for species recovery. The recommended actions for Bradshaw's lomatium, Kincaid's lupine and Willamette daisy are:

- Preserve, restore, and manage existing populations and habitat.
- Develop and implement a standardized population monitoring protocol.
- Monitor prairie quality and diversity at all population sites.
- Collect and bank seeds.
- Identify reintroduction sites, develop and implement outplanting protocol, reintroduce populations and restore habitat, as necessary, to meet recovery goals, and manage and monitor reintroduced populations.
- Identify and implement further research needed for the conservation of the species.
- Monitor effectiveness of management actions and apply adaptive management measures, as needed.
- Develop post-delisting monitoring plans prior to delisting. (USFWS 2010:vi.)

9.1.2 The recommended actions for golden paintbrush are:

- Evaluate protected sites established for other listed prairie species in this plan as potential introduction sites for golden paintbrush.

- Introduce golden paintbrush to restored prairie reserve sites.
- Manage and monitor introduced populations.
- Monitor effectiveness of management actions and apply adaptive management measures, as needed. (USFWS2010:vi.)

9.1.3 The recommended actions for Fender's blue butterfly are:

- Preserve, restore, and manage existing populations and habitat for Fender's blue butterfly.
- Coordinate management with recovery efforts for Kincaid's lupine, the larval host plant for Fender's blue butterfly.
- Implement a standardized population monitoring protocol.
- Monitor prairie quality and diversity at all population sites.
- Reintroduce populations and restore habitat, as necessary, to meet recovery goals.
- Implement further research needed for the conservation of the species.
- Develop a post-delisting monitoring plan prior to delisting. (USFWS 2010:vi.)

9.1.4 The recommended actions for Taylor's checkerspot are:

- Determine this species' status in the area addressed by the Recovery Plan.
- "Protect and restore populations and habitats to preclude the further decline" of this species. (USFWS 2010: IV-69 and III-9.)

9.1.5 Recovery Plan established recovery targets for managed sites:

- Cover of native vegetation: Sites with populations of target species should have relative cover of natives of 50 percent or more.
- Cover of woody vegetation: For each site, woody vegetation should make up no more than 15 percent of the absolute vegetative cover, and woody species of management concern will make up no more than five percent (unless the site is savanna habitat, in which case the upper limit would be about 25 percent woody vegetation).
- Prairie diversity: For each population site, native prairie species richness must exceed 10 species (measured in 25-m^2 plots), of which seven or more must be forbs and one must be a bunch grass.
- Non-native vegetation: At each reserve, no single non-native plant will have more than 50 percent cover. Non-natives of particular concern, as identified in Table D-2 of the Recovery Plan, will have no greater than 5 percent cover.
- Nectar flower abundance and diversity: There should be sufficient abundance of flowers that provide nectar for Fender's blue butterfly; the target abundance is a minimum of 20 mg nectar sugar/m2 of habitat. Each population site should have a minimum of five native nectar species.

- Lupine host plant abundance: Sites that provide breeding habitat for Fender's blue butterfly should have a minimum of 30 lupine leaves/m^2 of habitat.
- Nectar plant availability: Nectar plants should be available at the habitat patch throughout the entire flight season of the pollinator species (March through September of each year) to ensure the continued viability of the pollinators and the species they pollinate. (USFWS2010:D-1 – D-3)

The Proposed RMP does not address the development of post-delisting monitoring plans as those are a Service responsibility. The Proposed RMP addresses all other recovery actions.

The Recovery Plan does not address the streaked horned lark. Although the horned lark is "highly associated with native grasslands" and is "now uncommon to rare in the region," its conservation is not addressed by the Recovery Plan because "its preferred habitat is relatively bare, ruderal grasslands that differ from the native prairies occupied by the other species addressed in this recovery plan" (USFWS 2010.:I-10).

9.2 Species Overviews

9.2.1 Federally-listed Plants

Three federally-listed plant species occur in the action area: Willamette daisy, Bradshaw's lomatium and Kincaid's lupine. The action area might be within the historical range of the federally-listed golden paintbrush but there are no known historical or current sites in the action area.[10]

- Willamette daisy is an herbaceous perennial that is listed as endangered. It is endemic to the Willamette Valley of western Oregon. Although Willamette daisy is found in a variety of wetland and upland habitat throughout its range, all existing sites of Willamette daisy in the action area are in wet prairie habitats. Threats to this species include habitat loss due to urban and agricultural development, successional encroachment into its habitat by trees and shrubs, competition with non-native weeds, and small population sizes.

- Bradshaw's lomatium is an herbaceous perennial that is listed as endangered. It is found from Lane County, Oregon, to southwestern Washington. Bradshaw's lomatium is restricted to wet prairie habitats. Threats to this species include expanding urban development, pesticides, encroachment of woody and invasive species, and grazing.

- Kincaid's lupine is an herbaceous perennial that is listed as threatened. It is found from Douglas County, Oregon, to southwestern Washington. Threats to this species include habitat loss, competition from non-native plants and elimination of historical disturbance regimes.

[10] There is a new introduction site of golden paintbrush on ACOE land within the vicinity of the action area, but plant establishment is not confirmed.

- Golden paintbrush is an herbaceous perennial that is listed as threatened. The Recovery Plan describes its historical range as extending from the Willamette Valley of Oregon to British Columbia. This species was extirpated from Oregon, but new populations are being reintroduced. Based on extant populations in British Columbia and Washington, the Recovery Plan assumes that upland prairie is habitat for this species. Threats to this species include habitat modification as succession changes prairies and grasslands to shrub and forest lands; development for commercial, residential, and agricultural use; low potential for expansion of populations and their refugia because existing habitat is constricted; and recreational picking.

9.2.1.1 Eugene West Recovery Zone

Current populations/distributions of federally-listed plants in the Eugene West Recovery Zone are shown in Table 1.

Table 1. Current (2013 data for BLM-administered lands; 2011 data for other lands) populations of threatened and endangered plant species on managed and protected sites within the RMP/EIS planning area.

Land ownership	Willamette daisy (# of plants)	Bradshaw's lomatium (# of plants)	Kincaid's lupine (m^2)
BLM (action area)	9,275	3,907	2,555
ACOE	8,517	41,900	629
City of Eugene	1	59,282*	530
The Nature Conservancy	1,350	31,000	5,000
Total	**19,143**	**136,089**	**8,714**

*includes approximately 57,900 individuals in the Amazon Park site, which is located outside the action area boundary but within the Eugene West Recovery Zone

Willamette daisy. The current abundance of approximately 19,000 plants in the Eugene West Recovery Zone exceeds the recovery target for plant abundance of 15,000 plants. There are currently three large populations in the recovery zone: (1) the BLM Speedway and The Nature Conservancy Willow Creek sites; (2) the BLM Oxbow West and associated BLM sites; and (3) the ACOE Fischer Butte sites. These three populations satisfy the recovery target of at least three populations of at least 2,000 individuals in this recovery zone with a minimum overall total of 15,000 individuals.

Bradshaw's lomatium. The current abundance of approximately 136,000 plants in the Eugene West Recovery Zone exceeds the recovery target for plant abundance of 15,000 plants. There are currently five large populations in the recovery zone: (1) the City of Eugene Amazon Park site (which is outside the RMP/EIS planning area) has 57,900 plants; (2) the BLM Speedway and The Nature Conservancy Willow Creek sites have 31,000 plants; (3) the ACOE Fischer Butte sites have 20,500 plants; (4) the ACOE Fern Ridge sites have 21,400 plants; and (5) the BLM North Taylor and Long Tom sites have 1,600 plants.

Kincaid's lupine. The current abundance of approximately 8,700 m^2 of plant cover in the Eugene West Recovery Zone exceeds the recovery target for plant abundance of 7,500 m^2. There are currently two large populations in the recovery zone: (1) The Nature Conservancy Willow Creek site (5,000 m^2), and (2) the BLM Fir Butte site and ACOE Fern Ridge sites (3,100 m^2). Therefore, at least one additional large population of Kincaid's lupine would be needed to meet the recovery target for populations in the recovery zone.

9.2.1.2 Status in the Action Area

Populations of Willamette daisy, Bradshaw's lomatium and Kincaid's lupine in the action area have fluctuated over time, but do not exhibit consistent or strong trends in abundance (Figure 3). Populations of Willamette daisy and Kincaid's lupine have shown a general increase, but the short time extent of survey information and the gaps in survey information limit the ability to interpret population trends.

Figure 3. Populations of threatened and endangered plant species in the action area over time (Willamette daisy and Bradshaw's lomatium in # of plants; Kincaid's lupine in m^2). The graphs do not include data through 2013 (shown in Table 1).

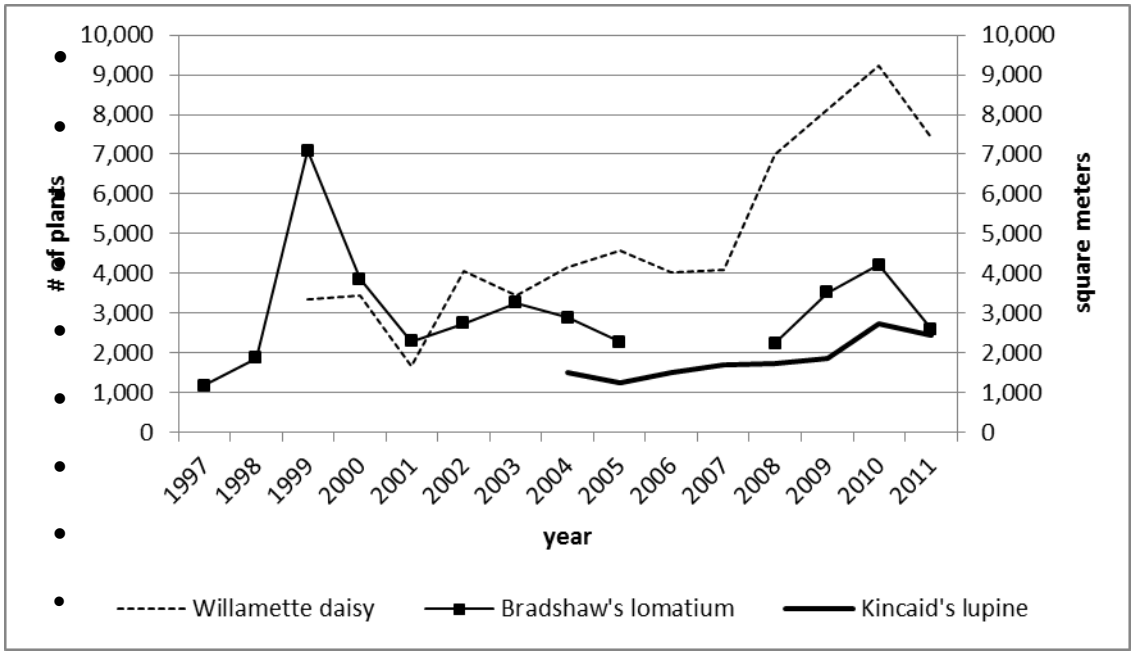


Table 2 shows sites in the BO with extant populations of listed plants in 2013. Most of the existing plants in the action area are naturally occurring, but the BLM has conducted some seeding and planting to augment existing populations. The BLM has introduced or augmented Willamette daisy at Greenhill, Bradshaw's lomatium at Greenhill, Balboa and Rosy, and Kincaid's lupine at Greenhill, Oxbow West, Turtle Swale, Hansen and Isabelle.

9.2.2 Fender's Blue Butterfly

The endangered Fender's blue butterfly is confined to the Willamette Valley of Oregon. The Recovery Plan describes its status and critical habitat, population trends and distribution, life history and ecology, habitat characteristics, and threats/reasons for listing, and recommends specific conservation measures (USFWS 2010: II-1 – II-8; III-1 – III-9; IV-6 – IV-18). Those descriptions are incorporated here by reference.

Table 2. Current populations of federally-listed plant species in the action area by site. Crosshatched areas indicate that past survey found no plants. "No survey" indicates that no survey has been done to date.

Site	Willamette daisy (# of plants)	Bradshaw's lomatium (# of plants)	Kincaid's lupine (m^2)
Greenhill	170	537	no survey
Balboa	553	148	
Oxbow West	5,244		70.2
Speedway	2,533	368	
Vinci	775		
Long Tom		1192	
Spectra Physics			
North Taylor		1100	
Willow Corner Annex		4	
Rosy		558	
Summer Oaks		no survey	
Fir Butte			2,426*
Turtle Swale			24.2
Hansen			33.4
Isabelle			1.6
Total	**9,275**	**3,907**	**2,555**

* 2011 survey data; the last year of survey.

The Fender's blue butterfly is found exclusively in prairie habitats containing its larval food plants, primarily Kincaid's lupine, but also spur lupine (*Lupinus arbustus*) and occasionally sickle-keeled lupine (*L. albicaulis*). Fender's blue butterflies feed on the nectar of several plant species. In its range, the conservation of this species is threatened by the loss and fragmentation of native prairie to urban development, habitat degradation, woody vegetation and invasive weed encroachment, and the vulnerability of small, isolated populations to extirpation from local events. These butterflies have limited dispersal ability and remain close to their natal lupine patches when foraging: more than 95 percent of Fender's blue butterflies are found within 33 feet of lupine patches (Schultz 1998).

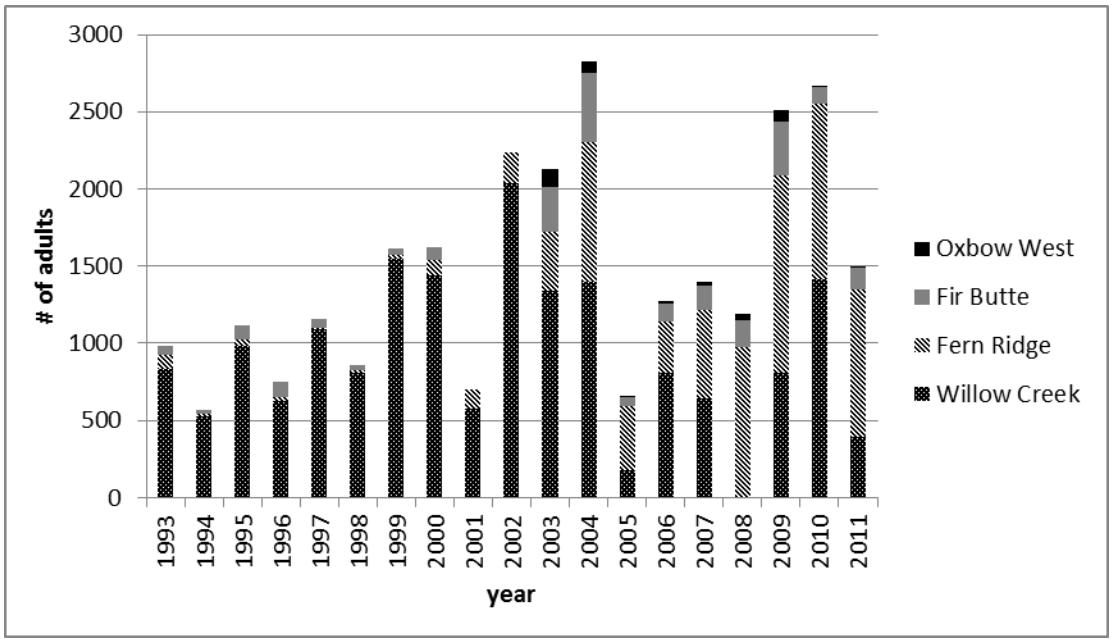
9.2.2.1 Eugene West Recovery Zone

The action area is located within the Eugene recovery zone (USFWS2010:IV-10), an area spanning the valley floor and foothills from east to west and ranging from south of the city of Eugene generally to the northern Lane County border. There currently are 4,441 – 6,839 butterflies in sixteen isolated populations or subpopulations within the recovery zone.

9.2.2.2 Status in the Action Area

The Fender's blue butterfly population in and immediately adjoining the action area totaled an estimated 604 adults in 2012, and has ranged from 109 to 525 adults between 2003 and 2011. Adult blue butterflies and/or their eggs have been monitored within the three West Eugene Wetland partner-managed land bases (The Nature Conservancy, ACOE, and BLM) since 1993. These populations exhibit natural year-to-year variability, driven primarily by weather (Figure 4).

Figure 4. Fender's blue butterfly populations (1993 – 2011) on West Eugene Wetlands partner lands, within (Oxbow West and Fir Butte) and adjacent to (Fern Ridge and Willow Creek) the action area.



The BLM manages one large population in the action area at Fir Butte and smaller stepping stone populations at Oxbow West, Turtle Swale, Isabelle and Hansen. The largest populations in the RMP/EIS planning area are managed by The Nature Conservancy at Willow Creek and the ACOE at Fern Ridge. In 2011, the most recent year of survey, The Nature Conservancy found 136 Fender's blue butterflies at Fir Butte, 2 each at Oxbow West and Hansen, and 0 at Turtle Swale and Isabelle (Fitzpatrick 2013:28). These were the only 2011 survey sites in the action area. In 2012 the BLM changed monitoring methods from weekly counts to peak counts because

the latter are "a better and more precise method of counting butterflies" (Fitzpatrick 2013:12). In 2012 Fitzpatrick estimated that Fir Butte supported 604 (95 percent conf. interval 416 – 789) Fender's blue butterflies, but Fender's blue butterflies had disappeared at Hansen, Isabelle, Oxbow and Turtle Swale (Fitzpatrick 2012:12, 23, and 87 -). Fitzpatrick (2013:90, 105, 106, 121, 134, 135, 145 and 147) wrote:

Fir Butte: "The upland habitat at Fir Butte is in poor condition. Blackberries continue to be a huge problem and were the only woody species recorded in the low-intensity habitat monitoring for the upland. They covered an average 25.9 % of the nine 1 m^2 plots monitored this year. Tall Oatgrass continues to encroach on the lupine and Fender's blue butterfly habitat and the average number of native species in the upland was extremely low, averaging .67 species—the most common of which was *Lupinus oreganus*. The wet prairie habitat is in better shape, dominated by tufted hair grass, and still maintains much of its natural hummocky topography with a fair amount of native plant diversity…."

"This year weather conditions were much more favorable than the previous two years, with most days being fairly warm and sunny…."

Oxbow West: "Based on low-intensity habitat monitoring performed this year, the wet prairie habitat seems to be in fairly good shape. Average native cover was slightly higher than non-native cover. Grasses made up the highest percentage of the native cover, specifically *Deschampsia cespitosa* which is dominant throughout the wet prairie habitat. The upland habitat at this site is in poor shape; dominated by non-native species, this habitat has very low native species diversity and cover. Neither habitat exceeded thresholds for woody species. Prior to monitoring, woody species were removed by a youth crew in a large area of wet prairie where the *E. decumbens* is located. Both habitats did exceed thresholds for litter and thatch…no Fender's Blues were observed at this site."

Turtle Swale: "High- and low-intensity habitat monitoring showed that the wet prairie and emergent habitats are in pretty good shape with a high level of native species cover and diversity. The upland habitat is in worse condition with a high level of non-native species, particularly non-native grasses, and a low level of native species cover and diversity. The prescribed fire had a positive effect on the site, bringing on a flush of native species in particular *Eriophylum lanatum*. Due to mastication efforts last year woody species presence was low in the remnant wet prairie habitat….No adult *I. icarioides fenderi* have ever been observed at the Turtle Swale unit."

Isabelle: "Woodies continue to be a problem at this site; low-intensity monitoring found the highest concentration of woodies in the western most portion of the wet prairie. Exotic grasses are a problem in this area as well, particularly *Agrostis stolonifera*. The upland habitat is pretty degraded and had very low percent cover and diversity of natives. *Agrostis stolonifera* was the main exotic grass found in the upland and wet prairie area during low-intensity monitoring.

Lupine populations seem to have rebounded slightly from last year and the monitoring crew was unable to relocate the *Sericocarpus rigidus* patch…No adult *I. icarioides fenderi* have ever been observed at the Isabelle unit."

Hansen: "Native species, particularly the *Camassia quamash*, responded positively to the prescribed fire from last fall with a huge flush of plants, turning some areas of the site almost completely blue this spring. Low-intensity habitat monitoring found the upland habitat to be in poor shape with all monitored plots exceeding 50% cover of non-natives that mostly consisted of exotic grasses; thatch levels were also very high. The wet prairie habitat is in better shape than the uplands with a higher cover of natives, but non-natives still dominated this landscape, especially invasives such as *Anthoxanthum odoratum*, *Agrostis stolonifera* and *Hypocharis radicata*. The wet prairie habitats have very low species diversity and are dominated mostly by the native grass *Deschampsia cespitosa*. Invasives that continue to be of management concern include *Centaurea pratensis*, *Phalaris arundinaceae*, *Rubus armeniacus*, as well as other woody species like Roses. *Lupinus oreganus* populations seem to be holding steady while *Sericocarpus rigidus* populations seem to be on the decline, mostly due to poor habitat conditions where they are being shaded out in the Oak woodland areas or being encroached upon by aggressive non-native species…. In 2010, a single female *Icaricia icarioides ferderi* was observed at the Hansen unit. This was the first time a Fender's blue butterfly had been seen since the initial planting of *L. oreganus* in 1999."

9.2.2.3 Potential Functioning Networks

The Recovery Plan identifies two "potential functioning networks" within and adjacent to the action area: Willow Creek and West Eugene; potential functioning networks are areas having the greatest potential to support viable Fender's blue butterfly populations (USFWS2010:IV-12 – IV-18)[11]. The Willow Creek network, which is adjacent to the action area, includes no BLM-administered land; the West Eugene network includes all of the current BLM-administered Fender's blue butterfly sites (Table 3). Not all sites within these networks currently support Fender's blue butterfly populations.

[11] The Coburg network, which the *Recovery Plan* identifies as a potential functioning network within the Eugene recovery zone, is not within the vicinity of the action area or the geographic scope of this analysis.

Table 3. Existing Fender's blue butterfly sites within the vicinity of the action area.

Network	Site	Ownership
Willow Creek	Fir Grove	The Nature Conservancy
	Willow Creek Bailey Hill	The Nature Conservancy
	Willow Creek Main	The Nature Conservancy
	Willow Creek North Area	The Nature Conservancy
West Eugene	Big Spires	ACOE
	Eaton Lane (N & S)	ACOE
	Fir Butte	BLM
	N. Fisher Butte	ACOE
	N. Green Oaks	ACOE
	S. Green Oaks	ACOE
	Turtle Swale	BLM
	Oxbow West	BLM/City of Eugene
	Hansen	BLM
	Isabelle	BLM

All Fender's blue butterfly habitat in the action area is necessary for species recovery due to its role in connecting the current West Eugene and Willow Creek populations, and supporting population persistence and dispersal (McIntire *et al*. 2007, USFWS 2010, IV-50).

9.2.2.3 Current Habitat Conditions

This analysis addresses the total habitat, suitable habitat and connectivity of habitat for Fender's blue butterfly.

- Total habitat is all high-quality wet prairie, high-quality upland prairie and high-quality oak savanna. These plant communities provide the larval and/or nectar species, but may not meet requirements for patch size and connectivity, described in the Recovery Plan.
- Suitable habitat is high-quality wet prairie, high-quality upland prairie and high-quality oak savanna in patches of $\geq$ 15 acres and located $\leq$ 1.2 mile from another patch; or smaller patches that are within $\leq$ 0.6 mile of another patch (USFWS2010:IV-10).
- Connectivity of habitat is described both in the terms identified for suitable habitat and with a smaller distance between patches, as described in detail below in the issue related to native plant communities.

Currently, within the range of the Fender's blue butterfly, only 457 acres support foraging and/or breeding populations. Of the sites that comprise these acres, half are less than five acres in size and, thus, do not support suitable habitat.

Within the action area, 14 acres support foraging and/or breeding Fender's blue butterflies. Although these acres support Fender's blue butterflies and their host plant, Kincaid's lupine, their habitat conditions are limited to low-quality wet prairie, low-quality upland prairie or low-quality oak savanna due to excessive litter layers, woody vegetation and cover of non-native species, and low diversity and numbers of native nectar species present (Inst. Applied Ecol. 2010). Therefore, there currently are no acres of high-quality suitable habitat, or connectivity of habitat, in the action area.

Similarly, none of the Fender's blue butterfly sites in the vicinity of the action area support high-quality wet prairie, high-quality upland prairie or high-quality oak savanna.

9.2.3 Streaked Horned Lark

The streaked horned lark was confirmed both inhabiting and nesting in the action area in June 2013 (B. Altman, pers. comm. to Sally Villegas, June 4, 2013), the first time surveys were conducted. Prior to that, it was a documented summer resident in Lane County (Ore. Biodiv. Info. Cen. 2010:16). In the Willamette Valley, this ground-nesting bird is associated with herbaceous-dominated habitat and wetland mudflats dominated by short grasses (0 to 6 inches high), a relatively high percent of bare ground (17 percent) for territories and a higher percent of bare ground (31 percent) for nest sites. To avoid predators, horned larks forage and nest in flocks of more than 100 birds. Thus, they prefer large expanses of habitat of undefined extent, but assumed to be similar to that needed by the grasshopper sparrow (*i.e.*, contiguous patches ≥ 200 acres in size; "contiguous" may have gaps ≤ 75 feet; the *listing rule* [78 FR:61459] identifies contiguous patches of ≥ 300 acres). Although well-adapted to light grazing, disturbances associated with low-quality remnant upland prairie, such as agriculture, heavy grazing and shrub/tree conversion, are detrimental to this species (ODFW 2011:2, 6 and 7, Pearson and Altman 2005).

9.2.4 Taylor's Checkerspot butterfly

Although the Taylor's checkerspot butterfly is not known to inhabit the action area[12], it is documented to occur in Lane County (Ore. Biodiv. Info. Cen. 2010:31) and known to inhabit Willamette Valley low elevation prairie remnant meadows. (Some of this information conflicts with the *listing rule* (2013) which reports that the checkerspot butterfly occurs in Oregon only in Benton County; (78 FR 61452). Its status is due to habitat loss; encroachment by shrubs and trees due to fire suppression and industrial forest land management, invasion by non-native plants, elimination of natural disturbance regimes, cattle grazing, agriculture and urbanization. Coarse habitat for this butterfly includes prairies, savanna, and possibly some types of oak woodlands. Taylor's checkerspot butterfly uses a number of native and non-native plant species

[12] In 2009 and 2010, the Eugene/Springfield North American Butterfly Association surveyed for butterflies on two sites in the vicinity of the action area: the Briggs site, managed by The Nature Conservancy, and Dragonfly Bend, owned and managed by the city of Eugene (Hagen & Hagen 2010). They found no Taylor's checkerspots. In addition, no checkerspots were observed during the Fourth of July Butterfly Counts (2001-2011) or during spring field trips (May 2005-2011) at the Tsanchiifin Walk site (area west of the Red House across Danebo Street) and The Nature Conservancy's Willow Creek site. No other surveys "for checkerspots" have been done in the Wetlands.

as nectar sources. In Oregon, the species currently is known to use only the non-native English plantain (*Plantago lanceolata*) as a larval host. In Washington, harsh paintbrush (*Castilleja hispida*) and blue-eyed Marys (*Collinsia parviflora, C. grandiflora*) are larval food plants (Stinson 2005:87). Although these latter two species are native plants in Lane County, uncertainties remain regarding how these species might be affected by habitat restoration in the action area and whether either plant could effectively replace English plantain as a larval host. As with Fender's blue butterfly, because of its association with specific host and nectar plants, Taylor's checkerspot butterfly is strongly associated with short-stature prairie and oak savanna habitats that have a mosaic of low-growing grasses and forbs, low-density canopy cover (high solar exposure) and relatively undisturbed soils. However, because the species' only known larval host plant is a non-native, restoration might be detrimental. The species' host and nectar plants and their upland prairie and oak savanna habitats are present in the action area. Dispersal and nectaring distances for this species are poorly understood; best information estimates this species can disperse up to 0.9 mile between habitat patches under favorable conditions (*i.e.,* low shrub-height vegetation). Dense stands of forest probably are barriers to flight (Benton County 2010, BLM. 2010, USFWS2010, Stinson 2005 and Weiss *et al*. 1987).

9.3 Critical Habitats

The critical habitats of the Kincaid's lupine, Willamette daisy and Fender's blue butterfly are described in 71 FR 63862. For all three species, the primary constituent elements of these critical habitats "include, but are not limited to, space for individual and population growth and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, and rearing (or development) of offspring; and habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species" (71 FR 63874).

9.3.1 Kincaid's Lupine

The primary constituent elelments for Kincaids lupine include: (1) early seral upland prairie or oak savanna habitat with a mosaic of low-growing grasses and forbs and spaces to establish seedlings or new vegetative growth, an absence of dense canopy vegetation, and undisturbed subsoils; and (2) the presence of insect outcrossing pollinators, such as *Bombus mixtus* and *B. californicus* (bumblebees), with unrestricted movement between existing lupine patches. Critical habitat does not include human-made structures existing on the effective date of the rule and not containing one or more of the primary constituent elements, such as buildings, aqueducts, airports, and roads, and the land on which such structures are located (USFWS 2010:II-20).

Critical habitat for Kincaid's lupine is intended to protect current lupine populations and native prairie remnants, maintain areas of open ground between low-growing bunchgrasses that provide sufficient space and sunlight for plant establishment and population expansion, and establish "large populations with many individuals or multiple plant patches of unrelated individuals that are functionally connected." Specific goals include augmenting, through planting, existing lupine populations and establishing multiple new lupine patches that are at least 0.1 ha in size and situated no more than 8 km apart to facilitate cross-pollination and reduce genetic depression through inbreeding (71 FR 63874 and 63875).

Figure 5 shows critical habitat units (CHUs) in the RMP/EIS planning area, including those overlaying the action area (71 FR 63975). The acres of CHU in each BLM site are shown in Table 4. All critical habitat in the action area is included in the PRA.

Figure 5. Kincaid's lupine critical habitat units in the RMP/EIS planning area, including those overlaying the action area (red).

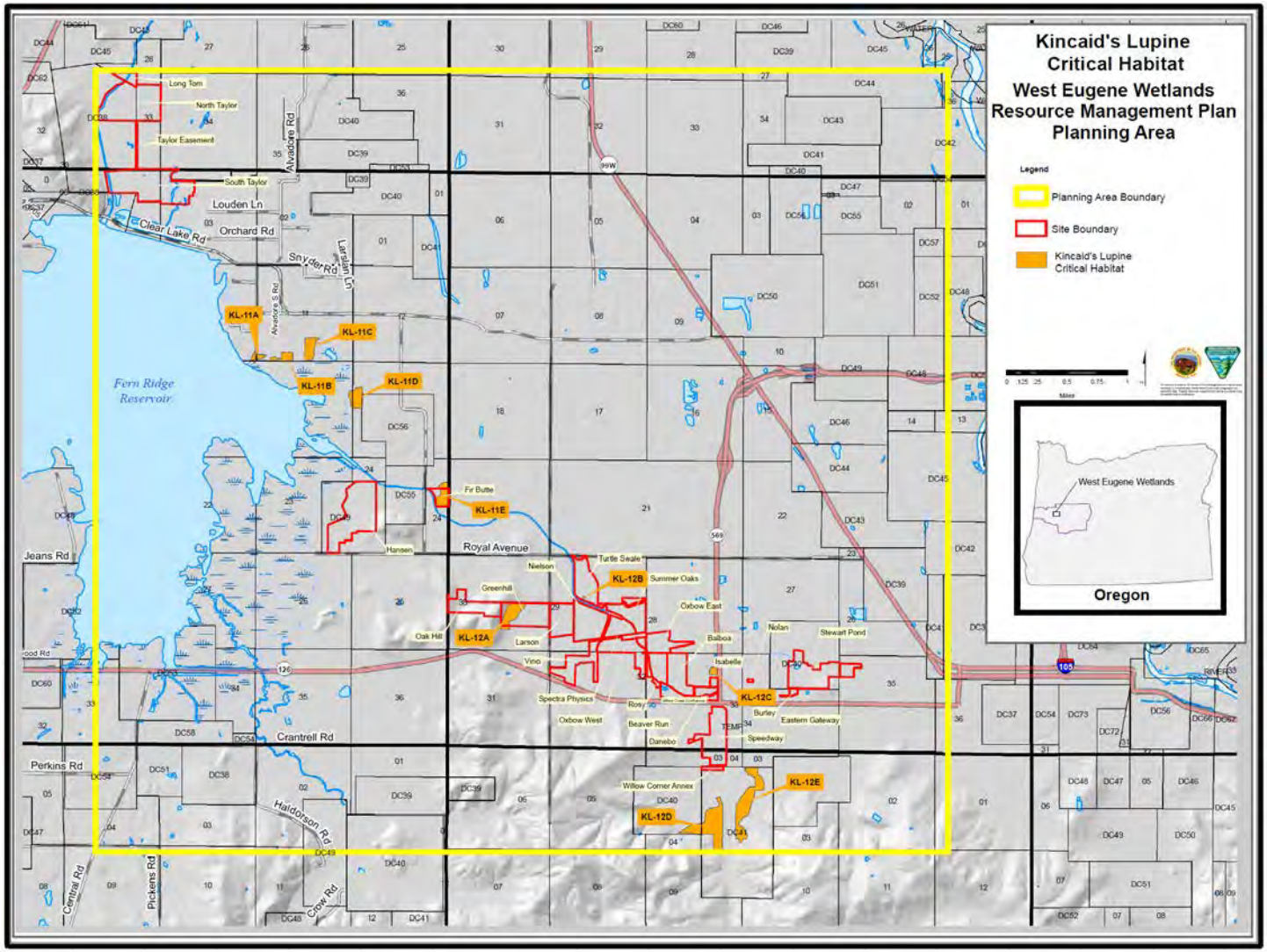


Table 4. Acres of critical habitat in each BLM-administered site.

	Fender's blue butterfly	Kincaid's lupine	Willamette daisy
Balboa	54.64		
Beaver Run	2.11		0.10
Danebo	2.64		
Fir Butte	13.29	13.10	
Greenhill	20.77	20.77	22.24
Hansen	61.44		
Isabelle	2.19		
Larson			0.02
Oak Hill	12.84		
Oxbow East	12.27		31.53
Oxbow West	2.57		35.52
Spectra Physics	1.60		
Speedway	29.58		77.79
Summer Oaks	9.59		
Turtle Swale	20.26	0.37	
Vinci			40.68
Willow Creek Confluence	3.24		
Totals	**249.02**	**34.25**	**207.86**

CHU KL–11 and KL–12 "collectively represent a series of upland habitat patches distributed across West Eugene interspersed with wet prairie habitat patches. This type of extensive network of wetland and upland prairie does not occur anywhere else in the Willamette Valley…. They each support the largest remaining [Kincaid's lupine] populations in this portion of their range, they are located in relatively close [*sic*] proximity to one another, thus increasing potential for cross pollination and increased reproductive success; and there is substantial surrounding prairie habitat available for population expansion (71 FR 63891)."

CHU Kl-11 is divided into five subunits, of which only a portion of subunit KL-11E (Fir Butte) occurs in the action area. Subunits KL-11A – D are managed by the ACOE and support lupine populations that "are scattered across the area" and "threatened by the presence of invasive grasses, predominantly *Arrhenatherum elatius* (tall oat grass), which limits the overall diversity of the site[s] and the opportunity for population growth." In subunit KL-11E, Kincaid's lupine "is sparsely distributed," making it difficult to identify separate lupine patches. Subunit KL-11E "is severely threatened by the presence of exotic species, primarily *Rubus armeniacus* (Himalayan blackberry) (71 FR 63891)."

CHU KL-12 is also divided into five subunits, of which only subunits KL-12A (Greenhill) and 12B (Turtle Swale) occur in the action area. "KL–12D and 12E are owned by TNC [The Nature Conservancy] and support the highest quality upland prairie remaining in this portion of the species' range." Subunits KL-12A, 12B and 12C support "relatively small" populations of Kincaid's lupine. "Units KL-12A, 12B, and 12C, collectively provide a series of stepping-stone habitat patches between the [lupine] populations owned and managed by TNC and those populations occupying Unit KL–11."

NOTE: As stated in the *final rule* (71 FR 63891): "During the proposed critical habitat mapping for KL–12B, an area adjacent to KL–12B was overlooked. The BLM has identified this area adjacent to KL–12B as suitable for expanding the existing population. This adjacent area provides opportunity for contributing to the conservation of [Kincaid's lupine] by expanding the relatively small population [in KL-12B] and increasing the stability of the overall metapopulation in this area." This site will be included in the PRA.

9.3.2 Willamette Daisy

The primary constituent element of critical habitat is early seral upland prairie, wet prairie, or oak savanna habitat with a mosaic of low-growing grasses, forbs, and spaces to establish seedlings or new vegetative growth; an absence of dense canopy vegetation; and undisturbed subsoils. Critical habitat does not include human-made structures existing on the effective date of the rule and not containing one or more of the primary constituent elements, such as buildings, aqueducts, airports, and roads, and the land on which such structures are located (USFWS 2010 II-9).

Critical habitat goals for Willamette daisy parallel those of Kincaid's lupine except that the daisy conservation strategy focuses specifically on the size and distribution of wet prairie plant and animal communities, both in prairie remnants and patches created through habitat restoration. The daisy strategy places the same emphasis on maintaining or creating areas of open ground between low-growing bunchgrasses that provide space and sunlight for plant establishment and population expansion. However, unlike the lupine strategy, the daisy strategy does not have quantified patch size and spacing (71 FR: 63875).

Figure 6 shows critical habitat units in the RMP/EIS planning area, including those overlaying the action area (71 FR: 63949). The acres of CHU in each BLM site are shown in Table 4. All critical habitat in the action area is included in the PRA.

"Units WD–6, WD–7, WD–8, and WD–9 occur in West Eugene, Oregon, and collectively represent the largest, most connected, functional network of suitable prairie habitat for [Willamette daisy]" as well as "the only large metapopulation of [Willamette daisy] across its current range…." The daisy populations in these CHUs "are threatened to varying degrees by the encroachment of invasive species and active management will be necessary to ensure the longterm [*sic*] persistence of this large metapopulation. Additionally, habitat enhancement may be necessary to expand populations across this metapopulation and further increase connectivity (71 FR 63893)."

CHU WD–7 is divided into two subunits, both of which occur in the action area[13]. Subunit WD–7A (Greenhill) supports a "moderately sized" Willamette daisy population and has habitat available for population expansion. Willamette daisies are "patchily distributed across" Subunit WD–7B (Vinci, Oxbow West and Oxbow East), which also has "enough supporting habitat to allow for population growth." CHU WD–7 also is "less than 0.6 mile (I km) from the nearest neighboring population, providing for pollinator connectivity between habitat patches and

[13] The *final rule* (71 FR:63893) incorrectly describes WD–7A as managed by the Army Corps of Engineers.

increasing the potential for successful reproduction." CHU WD–7 "supports a stable population and has a role in support of the only large metapopulation…. (71 FR: 63893)."

CHU WD–8 is divided into five subunits of which only the largest, WD–8A (Speedway), occurs in the action area. "The western half of subunit WD–8A includes high-quality remaining wet prairie; the eastern portion of the site includes much lower quality habitat. WD–8A is a relatively large remnant prairie and provides excellent opportunity for population growth and expansion." CHUs WD–8, WD–6 and WD–7 "are all in close [*sic*] proximity to one another, thus increasing the potential for cross pollination between populations and reducing the risk of inbreeding depression. The primary threat to this habitat [CHU WD–8] is that it is surrounded by development, reducing pollinator connectivity to the other populations (71 FR 63893).

9.3.2 Fender's Blue Butterfly

The primary constituent elements of critical habitat for the Fender's blue butterfly (i.e., those physical and biological features essential to the conservation of the species) are: (1) early seral upland prairie, wet prairie, or oak savanna habitat with a mosaic of low-growing grasses and forbs, an absence of dense canopy vegetation, and undisturbed subsoils; (2) larval host-plants *Lupinus sulphureus* ssp. *kincaidii*, *L. arbustus* (longspur lupine), or *L. albicaulis* (sickle-keeled lupine); (3) adult nectar sources, such as: *Allium acuminatum* (tapertip onion), *Allium amplectans* (narrowleaf onion), *Calochortus tolmiei*, *Camassia quamash*, *Cryptantha intermedia* (clearwater cryptantha), *Eriophyllum lanatum*, *Geranium oreganum* (Oregon geranium), *Iris tenax* (Oregon iris), *Linum angustifolium* (pale flax), *Linum perenne* (blue flax), *Sidalcea campestris* (meadow checker-mallow), *Sidalcea malviflora* ssp. *virgata*, *Vicia cracca* (bird vetch), *V. sativa* (common vetch), and *V. hirsute* (tiny vetch); and (4) stepping-stone habitat, consisting of undeveloped open areas with the physical characteristics appropriate for supporting the short-stature prairie oak savanna plant community (well drained soils), within 1.2 miles (about 2 kilometers) of natal lupine patches. Critical habitat does not include human-made structures existing on the effective date of the rule and not containing one or more of the primary constituent elements, such as buildings, aqueducts, airports, and roads, and the land on which such structures are located (USFWS 2010 II-1).

Critical habitat for Fender's blue butterfly is intended to reverse historic habitat fragmentation by maintaining and creating large patches of suitable habitat, creating smaller patches of suitable habitat, less than 1 km apart, that act as "stepping stones" between large patches, and restoring the species and diversity of existing plant communities to levels that resemble native plant communities. "The rarity of host lupine patches and habitat fragmentation are the major ecological factors limiting reproduction, dispersal, and subsequent colonization of new habitat." Critical habitat is to be managed to create "enough high-quality habitat to maintain viable populations across the range of the species." This requires habitat restoration activities to create new habitat patches, expand the size of existing habitat patches, and create habitat networks that connect isolated butterfly populations. Because Fender's blue butterflies depend on a variety of native plant species for their survival, the restoration of plant communities that resemble native communities in species and species diversity is a priority (71 FR: 63874).

Figure 6. Willamette daisy critical habitat units in the RMP/EIS planning area, including those overlaying the action area (red).

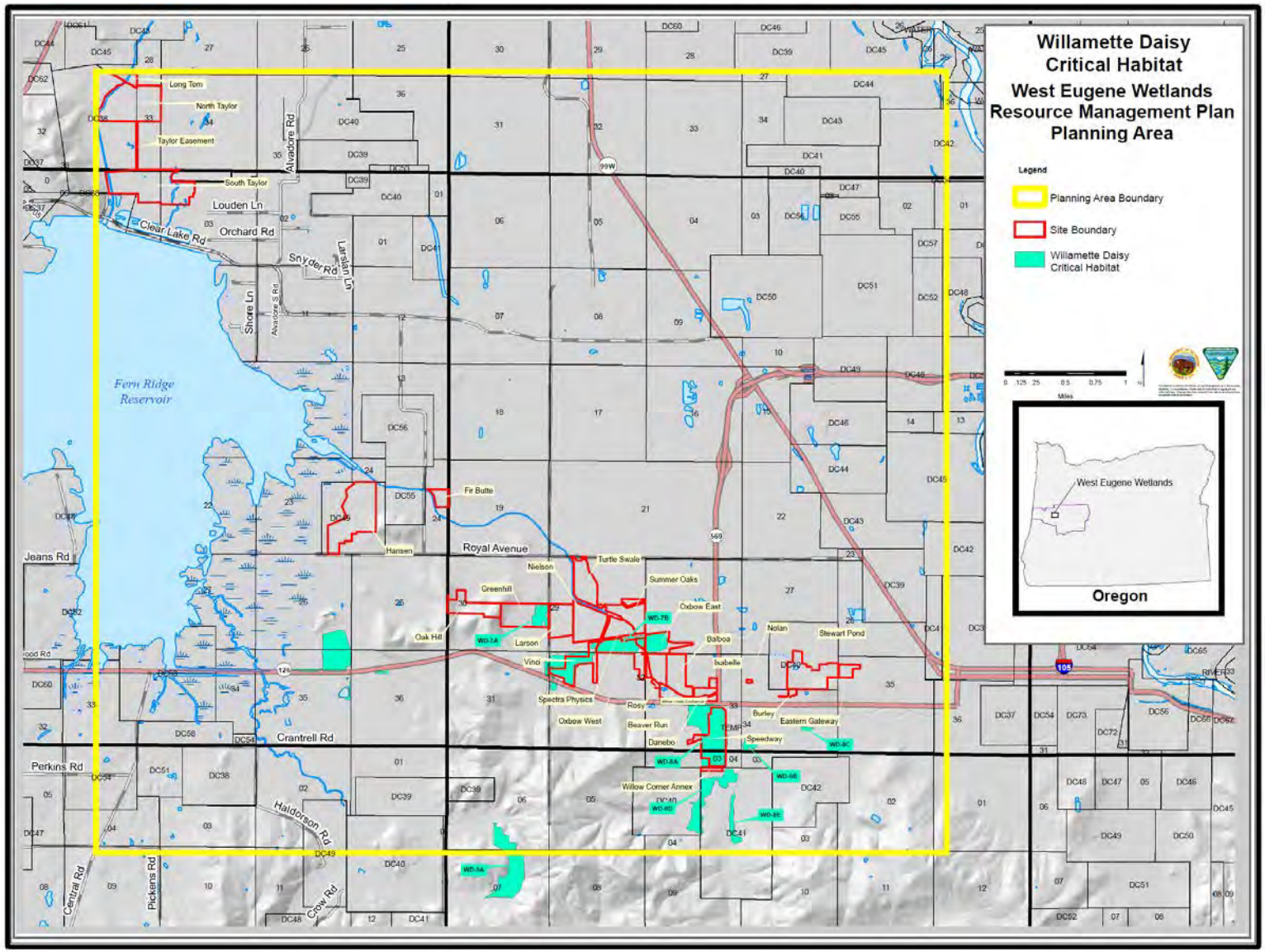


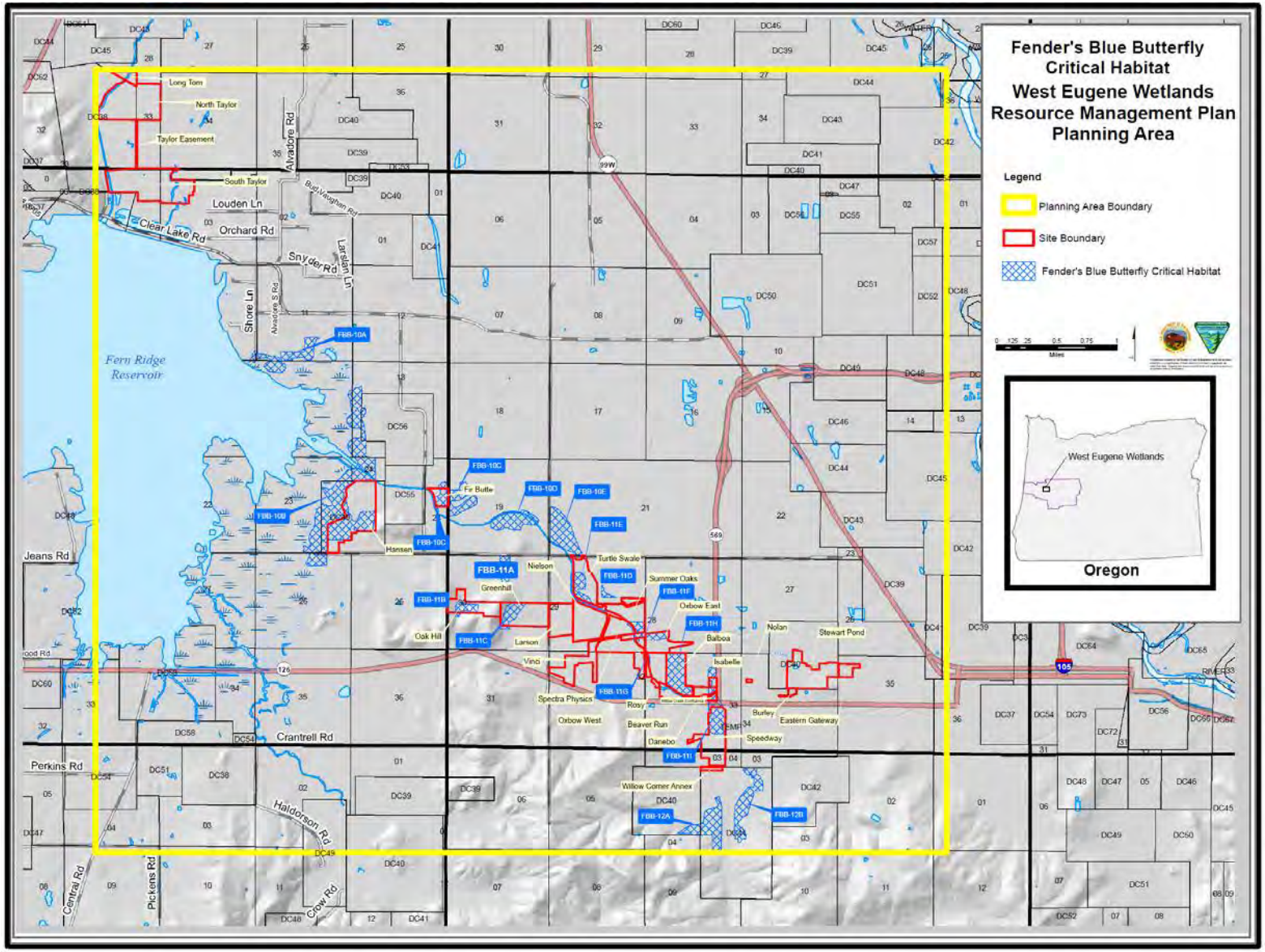
Figure 7 shows critical habitat units in the RMP/EIS planning area, including those overlaying the action area (71 FR 63931). The acres of CHU in each BLM site are shown in Table 4. All critical habitat within the action area is included in the PRA.

Units FBB–10, FBB–11, and FBB–12 support the core populations of the species in the southern portion of its range. Collectively, these units provide the foundation for the West Eugene habitat network. These three CHUs "collectively support two of the largest remaining Fender's blue butterfly metapopulations (FBB–10 and FBB–12); the two metapopulations are located in relatively close [*sic*] proximity to one another providing a unique opportunity to reestablish a larger connected set of populations that functions as a viable metapopulation; the butterfly populations are all supported by [extant populations of Kincaid's lupine]; and there is surrounding prairie habitat available for population expansion. Stepping-stone habitat in FBB–11 is necessary to provide connectivity among core butterfly populations to ensure the long-term persistence of this metapopulation (71 FR: 63886)."

CHU FBB–10 is divided into five subunits, of which subunits FBB–10B (Hansen) and FBB–10C (Fir Butte) occur in the action area. Subunit FBB–10C is "severely threatened by the closed canopy cover of [Himalayan blackberry] that has overtaken large areas of the site." Fender's blue butterfly populations supported by the habitat within subunit FBB–10B would benefit from adult nectar source augmentations. "Habitat management will be necessary to increase the size and connectivity of butterfly populations by restoring additional stepping-stone habitat patches that enhance the connection between the core populations occupying FBB–10A and FBB–10C. Unit FBB–10A–E provides the habitat containing the features essential for two butterfly populations. This unit includes one of the most extensive contiguous prairie remnants, which increases the potential for connectivity between these two core populations. This prairie remnant provides the foundation for reestablishing a large functioning metapopulation within the West Eugene Habitat Network (71 FR 63886 and 63887)."

CHU FBB–11 is divided into nine subunits, of which subunits FBB–11B (Oak Hill), FBB–11C (Greenhill), FBB–11D (Turtle Swale), FBB–11F (Summer Oaks, Oxbow West and Oxbow East), FBB–11H (Balboa) and FBB–11I (Isabelle, Denabo and Speedway) occur in the action area. "Most of the lupine populations scattered across the prairie habitat within this unit are relatively small, but the habitat supporting them is important to the long-term viability of a larger functioning Fender's blue butterfly metapopulation in this southern portion of the species range." Habitats within CHU FBB–11 "will need to be enhanced to increase the size and connectivity of butterfly populations by restoring patches between core metapopulations within FBB–10 and FBB–12. (71 FR 63887)."

Figure 7. Fender's blue butterfly critical habitat units in the RMP/EIS planning area, including those overlaying the action area (red).



9.4 Anticipated Management Outcomes

9.4.1 Plant Community Abundance

Under the Proposed RMP/EIS the BLM would reduce the amount of ash swale/riparian habitat from 173 acres to 107 acres, increasing the amount of wet prairie communities from 834 acres to 867 acres. The BLM would reduce the amount of oak woodland from 120 acres to 111, increasing the amount of total oak savanna communities from 23 acres to 32 acres. In ten years, there would be 481 acres of high-quality wet prairie, 65 acres of high-quality upland prairie, and 9 acres of high-quality oak savanna.

9.4.2 Connectivity of High-quality Prairie and Savanna

Connectivity among subpopulations of threatened and endangered species will depend, in part, on connectivity among patches of high-quality prairie and savanna habitat. The West Eugene Wetlands Threatened and Endangered Plant Augmentation Environmental Assessment (BLM 2011:4) addressed measurements of habitat connectivity in the planning area. That analysis concluded that using a threshold distance of 200 feet between habitat patches best reflects the functional connectivity for the habitats and species of interest in the action area.

This analysis examines the connectivity of habitat patches using FRAGSTATS, a spatial patterns analysis program for categorical maps. FRAGSTATS quantifies the extent and spatial configuration of patches within a landscape (McGarigal *et al*. 2012). This analysis employs the FRAGSTATS connectance index, using a 200-foot threshold distance, treating high-quality wet prairie, high-quality upland prairie, and high-quality oak savanna as patches, in various combinations. The analysis examines the connectivity of high-quality wet prairie alone, which reflects habitat for Willamette daisy and Bradshaw's lomatium. The analysis examines the connectivity of the combined patches of high-quality upland prairie and high-quality oak savanna, which reflects habitat for Kincaid's lupine. The analysis examines the connectivity of the combined patches of high-quality wet prairie, high-quality upland prairie, and high-quality oak savanna, which reflects habitat for various life stages of Fenders' blue butterfly.

The connectance index is defined as the number of functional joinings between patches of the same type within the threshold distance. Connectance is reported as a percentage of the maximum possible connectance given the number of patches. The higher the connectance value, the better connected the network of patches. If each patch of high-quality habitat within the planning area were within 200 feet of every other patch of high-quality habitat, the connectance index would be 100. If no patches were within 200 feet of another patch, the connectance index would be 0. This analysis of connectance includes patches of high-quality upland prairie that are expected to develop on lands managed by the ACOE (BLM 2011).

Under the Proposed RMP/EIS the BLM would create a well-connected network of high-quality prairie and savanna habitat in the action area (*i.e.,* connectance would be maximized). The PRA, where the high-quality prairie and savanna habitat would develop, would be allocated in the "core" of the action area: from Speedway in the southeast to Fir Butte and Hansen in the northwest. This "core" area has an abundance of BLM-administered lands, with most sites close together. This concentration of nearby BLM-administered lands allocated to the PRA would

lead to a highly connected network of high-quality prairie and savanna habitat. Under the Proposed RMP/EIS, North Taylor also would be allocated to the PRA.

9.4.3 Bradshaw's Lomatium, Kincaid's Lupine and Willamette Daisy

Suitable sites for plant augmentation are identified in BLM 2012 which describes analytical assumptions for the analysis of plant augmentation, including suitable planting sites, recommended planting and seeding densities, and short-term survivorship and establishment (BLM 2012,:3 and 4). Those descriptions are incorporated here by reference.

The following evaluation assumes that plant augmentation for Bradshaw's lomatium and Kincaid's lupine would be half from planting and half from seeding, and for Willamette daisy would be all from planting because past efforts with seeding of Willamette daisy has been unsuccessful (BLM 2011:3). The abundances of Bradshaw's lomatium, Kincaid's lupine and Willamette daisy within the planning area boundary already exceed Recovery Plan targets for abundance (Table 5).

Table 5. Short-term populations of threatened and endangered plant species in the planning area; shown in terms of Recovery Plan targets.

	Willamette daisy (# of plants)	Bradshaw's lomatium (# of plants)	Kincaid's lupine (m^2)	golden paintbrush (# of plants)
Current	19,143	136,089	8,714	0
Proposed Action	809,000	8,452,000	18,000	13,665,000
Recovery targets	15,000	15,000	7,500	1,000

The proposed uses of all management tools, including herbicides, would restore and maintain high-quality wet prairie, upland prairie and oak savanna plant communities in the PRA sufficient to continue to meet Recovery Plan targets for habitat quality. In addition, under the Proposed RMP/EIS, the BLM would maximize the fine-scale connectivity of high-quality habitat as described above in Section 9.4.2. As a result of habitat restoration and maintenance, the Service anticipates that long-term survival rates of each of the three species in the PRA would be consistent with short-term survival rates, and augmented populations would persist over the long-term.

9.4.4 Golden paintbrush

This analysis assumes that plant augmentation for golden paintbrush would be half from planting and half from seeding. Short-term seedling establishment and plug survival for golden paintbrush are assumed to be the same as for Kincaid's lupine (BLM 2011:3).

Under the Proposed RMP/EIS the short-term abundance of golden paintbrush would greatly exceed the recovery target (Table 5). The BLM, using all management tools including herbicides, would restore and maintain high-quality wet prairie, upland prairie and oak savanna plant communities in the PRA to meet Recovery Plan targets for habitat quality. The fine-scale

connectivity of high-quality habitat would be substantially improved. As a result of habitat restoration and maintenance, long-term survival rates of golden paintbrush in the PRA would be consistent with short-term survival rates, and augmented populations would persist over the long-term.

9.4.5 Fender's Blue Butterfly

The Recovery Plan recommends targets for distribution and abundance (USFWS 2010:IV-12). Information on how Fender's blue butterfly populations respond to habitat quantity, quality and spatial arrangement is incomplete. Non-habitat factors appear to have substantial year-to-year effects on Fender's blue butterfly populations, complicating any attempt to predict populations based on habitat conditions (USFWS2010 IV-6 – IV-10). As noted in Section 9.2.2.2, Fender's blue butterfly populations in the action area have fluctuated over the past decade while habitat conditions have remained generally unchanged. Surveys of Fender's blue butterfly populations outside the action area show similar fluctuations (USFWS 2010 II-4).

The Recovery Plan recommends the habitat patches and networks of patches needed to achieve the recovery targets for population distribution and abundance (USFWS 2010 IV-13). The Recovery Plan also acknowledges that Fender's blue butterfly populations are associated with the abundance and vigor of Kincaid's lupine (USFWS2010.:II-7 – II-8). Therefore, this analysis evaluates the contributions of the proposed action to recovery targets for distribution and abundance in terms of patches of high-quality habitat with populations of Kincaid's lupine. This analysis assumes that such patches and networks that meet the recovery criteria would meet the recovery targets for population distribution and abundance.

9.4.5.1 Non-chemical Restoration and Maintenance Methods

Under the Proposed RMP/EIS the BLM would employ a range of non-chemical management tools for habitat restoration and maintenance, including mowing, thinning, prescribed burning and plant augmentation. Biological opinions by the Service (USFWS 2005, 2008c:24-48 and 2011b:16-25) on the effects of non-chemical treatments on the Fender's blue butterfly describe short-term adverse effects and long-term beneficial effects, and conclude that the application of appropriate management standards reduce the level and duration of the adverse effects. Similarly, the Recovery Plan concluded that the use of these same management tools would result in substantial, long-term benefits to Fender's blue butterfly populations (USFWS 2010:II-7). The effects of non-chemical management tools in the action area would be similar to those described by the opinions because (1) the management tools are the same as those addressed by the biological opinions and Recovery Plan, (2) habitat conditions of the action area are similar to those addressed by the opinions and (3) the BLM would follow the same management standards described in the opinions and the Recovery Plan. Therefore, with respect to non-chemical management tools, the proposed RMP/EIS would minimize adverse effects on Fender's blue butterfly, as described in the biological opinions and the Recovery Plan. Mowing, thinning and other manual and mechanical vegetation management, and plant augmentation, likely would harm a negligible number of Fender's blue butterfly eggs and larvae through crushing by machinery or foot (USFWS 2008c:47). Prescribed burning and raking likely would harm some Fender's blue butterfly larvae in the treated area. Standards 34 – 36 limit prescribed burning and

raking to one-third of the occupied habitat at sites with Fender's blue butterflies annually. Based on 2012 population numbers at occupied sites in the action area, prescribed burning and raking would harm all larvae associated with 200 adult Fender's blue butterflies.

9.4.5.2 Herbicide Application

Although it is not possible to calculate the number of Fender's blue butterfly adults, eggs or larvae harmed by incidental exposure to herbicides or from accidental crushing during herbicide application, the Service, in its biological opinions, estimated that less than ten percent of larvae and eggs in a treatment area, and less than one percent of adults, would be harmed (USFWS 2011b:25).

9.4.6 Anticipated Outcomes from Prairie Restoration

Under the Proposed RMP/EIS the BLM would meet Recovery Plan targets for habitat quality and management (USFWS 2010: IV-29 and IV-34). Implementation of the Proposed RMP/EIS would create the connectivity shown in Figure 8. Of the 556 acres of high-quality habitat that would develop, 53 acres would be high-quality habitat with populations of Kincaid's lupine. Implementation of the Proposed RMP/EIS would create large patches of high-quality habitat with populations of Kincaid's lupine at Hansen and Greenhill. The large patch at Hansen and the existing small patch at Fir Butte would form a connected network with the high-quality habitat on ACOE land (Fern Ridge) to the north and west. The large patch at Greenhill would form a connected network with small patches at Oak Hill, Summer Oaks and Oxbow West. Small patches at Isabelle and Speedway would be connected to each other and would be near the existing Willow Creek population managed by The Nature Conservancy. However, since The Nature Conservancy has not identified their management plans for action on Recovery Plan goals for the Fender's blue butterfly, if any, the Service cannot estimate reasonably foreseeable development of high-quality habitat in the Willow Creek population. The creation of two large patches and multiple networks of connected patches of high-quality habitat with populations of Kincaid's lupine under the Proposed RMP/EIS, together with patches on ACOE land, would provide the habitat to meet the recovery target for distribution and abundance (USFWS 2010:IV-13, IV-29 and IV-34).

9.4.7 Taylor's Checkerspot butterfly

Taylor's checkerspot butterfly habitat is evaluated as two separate elements: The planting acres of one of its host plants, the golden paintbrush, and the available habitat within dispersal distances of ≤ 0.9 miles.

There currently are 259 acres of low-quality upland prairie, low-quality oak savanna and oak woodlands in the planning area. As a result of low-quality habitats, golden paintbrush is not known or suspected to occur on these lands. Under the Proposed RMP/EIS, the BLM would establish golden paintbrush on 22 acres of restored upland prairie over ten years.

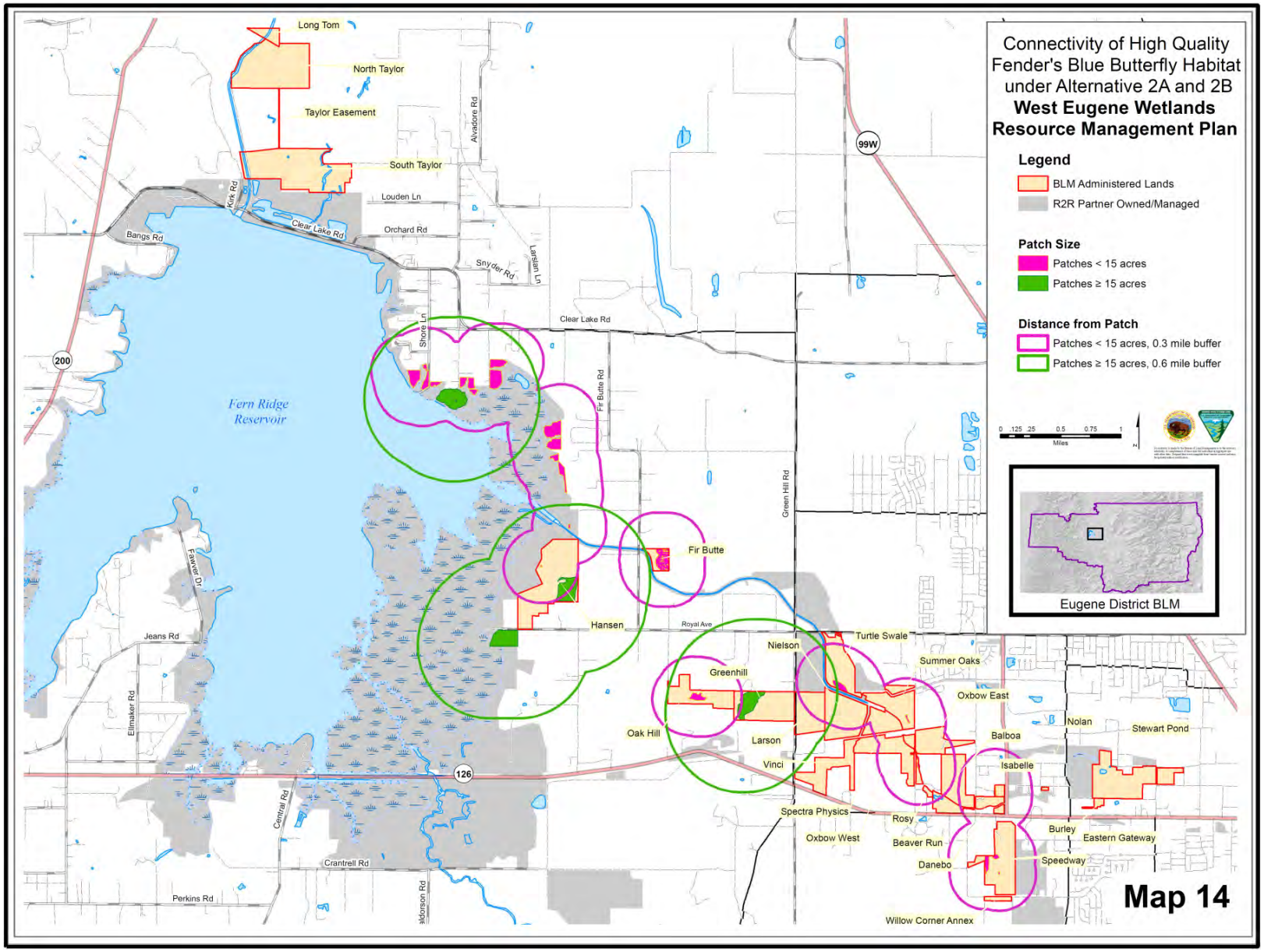
There currently are 626 acres of low-quality wet prairie, low-quality upland prairie and oak communities separated by ≤ 0.9 mile in the planning area. Under the Proposed RMP/EIS the

BLM would plant golden paintbrush on 22 acres of high-quality upland prairie: 18 acres at Greenhill and 4 acres at Oak Hill. These patches would be ≤ 0.9 mile apart. Although upland prairie restoration would reduce vegetation height and cover, potentially improving butterfly movement, and increase the diversity of nectar species, restoration on these 22 acres also would reduce the occurrence of the non-native English plantain, this butterfly's only known larval host in Oregon. Therefore, implementation of the Proposed RMP/EIS might reduce the amount of Taylor's checkerspot butterfly habitat.

9.4.8 Streaked Horned Lark

Streaked horned lark habitat is evaluated in terms of the total acres of high-quality wet prairie or high-quality upland prairie in contiguous patches ≥ 200 acres (contiguous patches may have gaps of ≤ 75 feet). The BLM disagrees somewhat with the Service's evaluation of the streaked horned lark that "its preferred habitat is relatively bare, ruderal grasslands that differ from the native prairies occupied by the other species addressed in this recovery plan" (USFWS 2010 I-10). Instead, the BLM believes that streaked horned larks coevolved with large grazing ungulates, such as bison (*Bison bison*), and wildfire which periodically denuded large swaths of native prairie. Prairie restoration activities in the proposed RMP, which remove woody vegetation, shorten the herbaceous layer and expose more ground, is a basis for evaluating this species.

Figure 8. Connectivity of high-quality Fender's blue butterfly habitat under the Proposed RMP/EIS.



There currently are no acres of high-quality wet prairie or high-quality upland prairie in the planning area. Due to land ownership patterns and physical conditions, the BLM has no opportunity to provide high-quality wet prairie and high-quality upland prairie in contiguous patches of 200 acres or greater. Under the Proposed RMP/EIS the BLM would create 93 acres of contiguous high-quality upland prairie, the maximum it can provide without further land acquisition. The Service believes that this BLM contribution when combined with adjacent non-federal lands will contribute to the survival and recovery of streaked horned larks.

10.0 EFFECTS OF THE PROPOSED ACTION

In accordance with 50 CFR §402.02, "*effects of the action*" refers to the direct and indirect effects of an action on the species and/ or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. *Indirect effects* are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. *Interrelated actions* are those that are part of a larger action and depend on the larger action for their justification. *Interdependent actions* are those that have no independent utility apart from the action under consideration.

Effects of the proposed action are determined in accordance with the standards and definitions of the Consultation Handbook (USFWS & NMFS 1998:4-23 – 4-30).

The Proposed RMP/EIS is most easily described by its individual components. However, the apparent individuality of those components does not override the fact that each is part of the single action under review: approval of the Proposed RMP/EIS. As such, those activities which are described in this section as having "no effect" on listed species or critical habitat still are subject to formal consultation under ESA sec. 7(a)(2) as part of the whole action.

Just as it is easiest to describe the Proposed RMP/EIS by its individual components, it is easiest to describe the effects of the approval of the Proposed RMP/EIS by those same components because the rationales for making determinations-of-effect differ by component.

10.1 Land Use Allocations

A BLM allocation of land commonly is comprised of two components, each with potentially unique affects to federally-listed species or critical habitat. First, a LUA includes a goal or intended outcome such as the PRA goal of prairie restoration. Second, a LUA might include a target such as the PRA target to establish high-quality prairie on 556 acres in ten years. This section discusses the effects, if any, of allocation goals and targets.

10.1.1 Allocation of 719 acres to Natural Maintenance Area LUA

- The proposed allocation of land is unusual in that the action area is exceptionally small compared to other resource management planning areas delineated by the BLM. With designation of the NMA, the BLM does not simply allow habitat maintenance activities at unspecified levels in unspecified areas at unspecified times, but commits to continued habitat maintenance activities on all 719 acres[14]. Thus, habitat maintenance in the NMA is "reasonably certain to occur."
- The control of noxious weeds on 719 acres in the NMA, a component of habitat maintenance, would indirectly benefit the restoration of habitats for federally-listed species, and the management of critical habitats, in the adjacent PRA.
- The Proposed RMP/EIS establishes a habitat maintenance target for the NMA but does not dictate how management will occur. Since habitat maintenance through the control of noxious weeds would foster the restoration of habitats for federally-listed species in the adjacent PRA and the management of critical habitats in the adjacent PRA, the effect of maintaining habitat conditions in the NMA would be ***entirely beneficial***.
- Management objectives for the NMA include maintaining, upgrading and creating sites and infrastructure for public recreation. Because the NMA does not overlay critical habitat or extant populations of any federally-listed species, objectives for recreation in the NMA would have ***no effect*** on the species and critical habitats addressed by this BO.

The allocation of lands to the NMA, and the maintenance of habitats in their current condition on all 719 acres in the NMA, ***may affect, but are not likely to adversely affect***, the federally-listed species and critical habitats addressed by this BO.

10.1.2 Allocation of 556 acres to the Prairie Restoration Area LUA

The allocation of lands to the PRA, and the restoration and maintenance of habitat conditions on all 556 acres in the PRA, ***may affect, and are likely to adversely affect,*** the Taylor's checkerspot butterfly, but ***would not cause harm*** to the Taylor's checkerspot butterfly, and ***may affect, but are not likely to adversely affect***, the other listed species and critical habitats addressed by this BO.

- By establishing specific restoration targets (*i.e.*, 556 acres in the PRA in ten years) for areas occupied by federally-listed species and in critical habitats, restoration and maintenance activities that would affect federally-listed species and critical habitats are "reasonably certain to occur."
- Although the Taylor's checkerspot butterfly is not verified to occur in the PRA, the BLM believes its occurrence is probable. Habitat restoration would degrade habitat for the Taylor's checkerspot butterfly's single known larval host plant species (a non-native) while enhancing habitat for its two suspected native larval host plant species. Until information is available to confirm that one or both of the native host species serve the function of the non-native host species, the Service believes it is more likely that habitat restoration would work to the detriment of Taylor's checkerspot butterflies. However, without evidence that

[14] The Proposed RMP/EIS also allows, but does not obligate, the BLM to restore habitats in the NMA, but such restoration is not "reasonably certain to occur" at this time and, hence, is not addressed. Future restoration activities in the NMA, if any, would be addressed through separate consultation.

Taylor's checkerspot butterflies occur in the action area, it is impossible to anticipate that individuals would be injured or suffer mortality.
- The effects of such restoration and maintenance on the other species and critical habitats addressed by this BO would be ***entirely beneficial*** because these actions would result in improved habitat conditions for those species.

10.2 Habitat Maintenance and Restoration

This section describes the effects of the methods needed to implement the decision to maintain and restore habitat conditions. There may be a significant difference in these effects when compared over the short-term (< 10 years) and over the long-term (> 10 years). While implementation of these methods may produce adverse effects to listed species during the short-term, they will be largely beneficial over the long-term as restoration of habitat occurs.

10.2.1 Bradshaw's Lomatium, Kincaid's Lupine, Willamette Daisy and Critical Habitats for Kincaid's Lupine and Willamette Daisy

- The BLM would restore habitat on all 556 acres of the PRA; some of these acres support extant populations and some of these acres would support newly established populations. As discussed in Section 1.3, restoration requires the use of all methods of habitat restoration, including mowing, prescribed burning, herbicide application and plant augmentation. Thus, the use of habitat restoration methods in all areas where extant populations exist, and where populations would be established, is "reasonably certain to occur."
- Restoration methods place at some degree of risk the existing plant populations shown in Table 2. On average, the BLM annually would mow 153 acres in the PRA, burn 128 acres, thin 8 acres and apply herbicides to 346 acres, some of which support extant populations. The BLM also would use heavy equipment and remove vegetation as needed. Even though the application of standards 1 – 7, 9 – 13, 15, 16 and 25 would limit losses of individual plants and help protect extant populations, some annual losses of federally-listed plants would be unavoidable. Thus, during the short-term, habitat restoration ***may affect, and is likely to adversely affect*** these species.
- During the long-term, the restoration of habitats with extant populations of federally-listed plants would benefit these species within the action area because habitat restoration would support species persistence and expansion.
- The restoration of habitats without extant populations of federally-listed plants ***may affect, but is not likely to adversely affect,*** federally-listed plants in the action area because restoration would support population expansion or establishment during the short-term and long-term, making the effects ***entirely beneficial.***
- As stated in the Introduction, with respect to federally-listed plants in the action area, the collection of seeds, plant propagation and plant augmentation are addressed by a separate ESA sec. 7(a)(2) consultation document.
- The effects of the restoration of critical habitats for species conservation would be ***entirely beneficial***. Even though, immediately after treatment, treated areas might *appear* to be adversely affected by mowing, burning, herbicide application or other treatments, such treatment is needed to meet Recovery Plan goals; *i.e.*, treatment immediately places critical habitat on a better trajectory for species conservation, a trajectory it would not follow without treatment. Stated another way, the effects of restoration and maintenance activities on the

critical habitats addressed by this BO are not evaluated in the same manner as, for example, the restoration of northern spotted owl critical habitat in which the effects of treatment, in terms of altered habitat functionality, may persist for a decade or more. Under the Proposed RMP/EIS, the benefits of the restoration and maintenance activities on the functionality of the critical habitats of the daisy and lupine would be evident by the time of plant reemergence following treatment. Although mowing, which might occur prior to plant senescence, might have immediate adverse effects on any species present in treatment areas, its immediate effects on the functionality of critical habitats would be ***entirely beneficial*** because mowing provides increased light and room for native plants to grow.

The restoration of habitats in the PRA, ***may affect, and is likely to adversely affect***, Bradshaw's lomatium, Kincaid's lupine and Willamette daisy during the short-term, but will be ultimately beneficial to those species during the long-term. The restoration of habitats in the PRA ***may affect, but is not likely to adversely affect***, the critical habitats for Kincaid's lupine and Willamette daisy, the effects of the restoration of habitats are considered ***entirely beneficial***.

- During the short-term, habitat maintenance would not affect Bradshaw's lomatium, Willamette daisy and Kincaid's lupine because no populations are known or suspected to occur in the NMA.
- The maintenance of habitats in the NMA ***may affect, but is not likely to adversely affect*** federally-listed plants in the action area because maintenance would support habitat restoration in the PRA during the short-term and long-term, making the effects to federally-listed plants ***entirely beneficial***.
- The effects of habitat maintenance in the NMA on critical habitats in the adjacent PRA would be ***entirely beneficial*** because habitat maintenance would limit the invasion of noxious weeds and non-native vegetation to critical habitats and foster the restoration of critical habitats for species conservation.

The maintenance of habitats in the NMA would not have any effects on Bradshaw's lomatium, Willamette daisy or Kincaid's lupine during the short-term, but ***may affect, but is not likely to adversely affect*****,** these species during the long-term because these species are not present, but habitat may be improved such that colonization by target species could occur. The maintenance of habitats in the NMA ***may affect, but is not likely to adversely affect***, critical habitats for Kincaid's lupine and Willamette daisy because habitat maintenance would not reduce the ability of these critical habitats to provide for recovery and survival of these species.

10.2.2 Golden Paintbrush

The restoration of habitats in the PRA would not affect golden paintbrush during the short-term but ***may affect, but is not likely to adversely affect***, this species during the long-term.

- This species is not known or suspected to occur in the action area, so short-term restoration activities could not affect the species.
- The long-term effects of establishing this species in the PRA, and maintaining habitats for this species, would be ***entirely beneficial***.

- As stated in the introduction section of this document, with respect to golden paintbrush, the collection of seeds, plant propagation and plant augmentation are addressed by a separate ESA sec. 7(a)(2) consultation document.

The BLM determined that maintenance of habitats in the NMA would have ***no effect*** on golden paintbrush because this species is not known or suspected to occur in the action area.

10.2.3 Fender's Blue Butterfly and Fender's Blue Butterfly Critical Habitat

- This species and its critical habitat would not occur in the NMA.
- The long-term, habitat maintenance in the NMA, including the control of noxious weeds, would directly benefit habitat restoration and expansion in the adjacent PRA—including the restoration of critical habitat—making the effects to the Fender's blue butterfly and its critical habitat ***entirely beneficial***.

The maintenance of habitats in the NMA would not affect the Fender's blue butterfly during the short-term, but ***may affect, but is not likely to adversely affect***, the Fender's blue butterfly during the long-term. The maintenance of habitats in the NMA ***may affect, but is not likely to adversely affect***, critical habitat for the Fender's blue butterfly.

- Habitat restoration would occur on all 556 acres of the PRA, some of which support extant populations and some of which would support newly-established populations. As discussed in Section 1.3, restoration requires the use of all methods of habitat restoration, including mowing, prescribed burning, herbicide application and plant augmentation. Thus, the use of habitat restoration methods in all areas where extant populations exist, and where populations would be established, is "reasonably certain to occur."
- On average, the BLM annually would mow 153 acres in the PRA, burn 128 acres, thin 8 acres and apply herbicides to 346 acres, some of which support extant populations. The BLM also would use heavy equipment and remove vegetation as needed. Even though the application of standards 9, 32 and 34 – 36 would avoid injuring adult Fender's blue butterflies, the incidental losses of larvae on the treated acres would be unavoidable. Thus, during the short-term, habitat restoration ***may affect, and is likely to adversely affect***, and ***would cause injury or mortality*** to Fender's blue butterflies when they occur on the acres treated. The applications of standards 9, 32 and 34 – 36 would ensure that no more than one-third of Fender's blue butterfly larvae in treatment areas would be harmed during any year.
- The application of standards 32 and 34 – 36 would ensure that Fender's blue butterfly populations affected by habitat restoration treatments would recover and improve over time. Thus, during the long-term, habitat restoration in areas with extant populations will be beneficial to Fender' blue butterflies because restoration would support population persistence and growth, and local area expansion.
- The restoration of habitats without extant populations of Fender's blue butterflies ***may affect, but is not likely to adversely affect***, Fender's blue butterflies because restoration would support population persistence and expansion, making the effects ***entirely beneficial***.
- The restoration of critical habitat for species conservation would be ***entirely beneficial***. Even though, immediately after treatment, treated areas might *appear* to be adversely affected by mowing, burning or other treatments, such treatment is needed to meet Recovery Plan goals;

(*i.e.*, with treatment, critical habitat is on a trajectory for species conservation, a trajectory it could not follow without treatment). This restoration will accelerate the improvement of conditions needed to maintain the PCEs of critical habitat deemed essential for recovery and survival of these species.

The restoration of habitats in the PRA ***may affect, and is likely to adversely affect***, the Fender's blue butterfly, and ***would cause harm*** to Fender's blue butterflies, during the short-term, but would be beneficial to the species over the long-term. The restoration of habitats in the PRA ***may affect, but is not likely to adversely affect***, critical habitat for the Fender's blue butterfly.

Disturbance. The application of standards 9 and 32 would help ensure that adult Fender's blue butterflies neither would be disturbed nor have their normal behaviors disrupted by habitat maintenance and restoration activities. The most likely way butterfly eggs and larvae can be disrupted (*harassed*) by restoration activities would be through physically detaching the egg from its host plant or detaching the larvae from its host plant prior to pupation. Eggs and larvae cannot reasonably be disturbed (have their normal behavior modified below the level of harassment) by restoration activities. Activities by the BLM to annually mow an estimated 153 acres, burn 128 acres, thin 8 acres and apply herbicides on 346 acres in the PRA ***may affect, and are likely to adversely affect***, the Fender's blue butterfly through the unintentional detachment of eggs and larvae from host plants where eggs and larvae occur in treatment areas, and ***would cause harm*** to those same eggs and larvae. However, this harm would not be in addition to that already described in this section.

10.2.4 Streaked Horned Lark

The maintenance of habitats in the NMA and the restoration of habitats in the PRA ***may affect, and are likely to adversely affect***, the streaked horned lark during the short-term and long-term and ***would cause injury or mortality*** to the streaked horned lark. This effects determination is based on assumptions that streaked horned larks occupy low-quality prairie habitats in the action area and are known to inhabit patches of at least 200 acres, and would be present in habitat treatment areas and have their normal behaviors disrupted by habitat treatment activities which create smoke, noise and alter vegetation. Although Standard 33 restricts mowing in bird breeding areas, and standards 2 and 9 confine the use of prescribed burning to late summer and early fall when streaked horned lark nesting is likely to be over, these standards are insufficient to ensure that the effects of habitat maintenance and restoration on the streaked horned lark would be discountable. In addition, seasonal impacts to streaked horned larks could not reasonably be avoided by applying additional timing restrictions because of the need to conduct habitat restoration and maintenance activities during the proper season and around the biological requirements of other federally-listed species. Even though the long-term effects of habitat restoration might benefit the horned lark by removing woody vegetation, decreasing the height of herbaceous vegetation and increasing the amount of bare ground in nesting habitat, these benefits would not eliminate the localized but continuing adverse effects of habitat maintenance and restoration.

10.2.5 Taylor's Checkerspot butterfly

The maintenance of habitats in the NMA and the restoration of habitats in the PRA ***may affect, and are likely to adversely affect***, the Taylor's checkerspot butterfly during the short-term and long-term because it would limit the ability of this species to expand its range and inhabit areas within the West Eugene Wetlands.. However, these activities ***would not cause injury or mortality*** to Taylor's checkerspot butterflies because the species is not known or suspected to occur in the action area. No standards afford significant protections to Taylor's checkerspot butterflies from habitat maintenance and restoration. In addition, the restoration of habitats in the PRA would decrease occurrences of the Taylor's checkerspot butterflies' only known larval host plant in Oregon, a non-native species which would limit the potential for the expansion of Taylor's checkerspot butterflies into the action area, thus reducing potential habitat for this species. Even though habitat restoration might increase the occurrences of two suspected native larval host plant species, the Service has insufficient information to claim that this outcome would adequately counter the loss of the one known larval host species.

10.3 Air Quality/Prescribed Burning/Wildfire Suppression

The management objectives and standards for air quality would have ***no effect*** on the federally-listed species or critical habitats addressed by this BO. The BLM would implement prescribed burns only for habitat maintenance and restoration, the effects of which are described in Section 10.2.

Wildfire suppression, because it is an emergency action needed to protect resources or human safety and property, is subject to, and best handled by, emergency consultation procedures (50 CFR §402.05); (*i.e.*, suppression activities are not addressed by this BO). Nor does this BO address the effects of wildfire because wildfire is not caused by an affirmative BLM action that is subject to ESA sec. 7. Instead, this analysis is limited to the proposed decision by the BLM to suppress wildfires on BLM-administered lands in the planning area under all circumstances.

The BLM has determined that their decision to suppress wildfires in the action would have ***no effect*** on the golden paintbrush because it is not known or suspected to inhabit the action area.

- The BLM or City of Eugene responds to wildfires in the planning area[15] about three times per year (mainly due to illegal camping or failures to control prescribed burns on adjacent lands). Thus, wildfire suppression is "reasonably certain to occur."
- However, none of the federally-listed species or critical habitats addressed by this BO are known or suspected to occur in the NMA and suppression activities would help prevent wildfire from spreading to the PRA where these species and critical habitats are found. Thus, the effects of the decision would be ***entirely beneficial*** to the NMA.

[15] Data are not specific to BLM-administered lands. Wildfires generally do not exceed 2 acres due to rapid response by the Eugene Fire Department within the city limits. 2013 saw 35 fires total (well above average), the largest burning 118 acres.

The decision to conduct wildfire suppression activities in the NMA ***may affect, but is not likely to adversely affect***, the other federally-listed species and critical habitats addressed by this BO.

- As stated above, wildfire in the PRA is "reasonably certain to occur."
- Even with the applications of standards 4 – 7, suppression activities would be reasonably certain to occur on grounds occupied by the federally-listed species, and in the critical habitats, addressed by this BO. Because the BLM would be required to suppress all wildfires, and cannot control the timing or location of wildfires, they cannot reasonably avoid the losses of some individual plants and animals, or avoid short-term adverse impacts to critical habitats.
- That said, the level of harm caused by the BLM decision to suppress all wildfires in the PRA cannot reasonably be quantified at this time and would be addressed during emergency consultation.

  The decision to conduct wildfire suppression activities in the PRA ***may affect, and is likely to adversely affect,*** the other federally-listed species and critical habitats addressed by this BO, and ***would cause injury or mortality*** to the Fender's blue butterfly and streaked horned lark.

10.4 Plants and Animals

The effects of habitat maintenance and restoration on the federally-listed species and critical habitats addressed by this BO are evaluated in Section 10.2. The following evaluation is limited to the effects of implementing the management objectives and standards in sections 1.2.3.2 and 1.2.3.3.

The management objectives in sections 1.2.3.2 and 1.2.3.3 (see pages 20-22) and standards 8 – 19, 21 – 27, 32 – 37 and 46, are designed to promote the conservation and recovery of the federally-listed species, and the restoration of the critical habitats, addressed by this BO, or to lessen or avoid negative effects to those species and critical habitats from other actions. As such, these management objectives and standards ***may affect, but are not likely to adversely affect***, the federally-listed species and critical habitats addressed by this BO because their effects would be ***entirely beneficial***.

10.5 Soils and Water

The management objectives for soils and water, and standards 47 – 57 (pages 19-20), would minimize the damage of habitat maintenance and restoration activities, and other management activities, to soil structure and condition, and water quality. As such, these objectives and standards would minimize damage to the local plant and animal communities in the action area. The application of these standards ***may affect, but is not likely to adversely affect***, the federally-listed species and critical habitats addressed by this BO because their effects would be ***entirely beneficial*** to species conservation.

10.6 Cultural Resources

The management objective for cultural resources, and standards 58 – 60, would require the BLM to record, classify and protect cultural resources in the action area. The BLM has determined that the application of this objective and the associated standards would have ***no effect*** on the federally-listed species or critical habitats addressed by this BO because such on-the-ground activities in species occupancy areas or critical habitat are not "reasonably certain to occur." Standards 61 – 63 address the protection, recovery and interpretation of cultural resources and data, some of which might require ground-disturbing activities or temporary surface occupancy. However, since one-third of the action area has been surveyed for cultural resources without discovery, and because cultural resources are unlikely to overlap species occupancy areas, the application of standards 61 – 63 in a manner that would affect any of the species or critical habitats addressed by this BO is not "reasonably certain to occur." Thus, the BLM has determined that the application of standards 61 – 63 would have ***no effect*** on those species and critical habitats.

10.7 Recreation

The management objectives for recreation would require the BLM to provide opportunities for public recreation. The effects of these objectives are the same as those for the management standards that implement them:

- The BLM has determined that the application of standards 64, 65 and 67 – 69 to designate the Fern Ridge Path and manage the Fern Ridge Special Recreation Management Area, maintain Tsanchiifin Walk at Balboa, existing interpretative sites and existing paths at Stewart Pond, and improve the Steward Pond parking lot, would have ***no effect*** on the federally-listed species and critical habitats addressed by this BO because these species and critical habitats do not occur in those areas.
- With the application of Standard 71, which requires groups of 20 or more persons to obtain a recreation permit, permitted activities ***may affect, but are not likely to adversely affect***, the federally-listed species and critical habitats addressed by this BO. Standard 71 prohibits activities by 20 or more persons that would adversely affect the species and critical habitats addressed by this BO. Requiring groups of 20 or more persons to obtain a permit for recreation activities adds a process of evaluation and review, the effects of which would be ***insignificant*** to the species and critical habitats addressed by this BO.
- Regarding casual use (legal activities for which the BLM does not issue a permit), continuing to apply the Final Supplementary Rules for Public Lands (standards 66, 70 and 72) ***may affect, but is not likely to adversely affect***, the federally-listed species and critical habitats addressed by this BO. Casual uses under these or similar rules have occurred in the action area for the past 20 years without typically or measurably affecting habitat conditions or the species addressed by this BO and are considered ***insignificant***.

10.8 Visual Resources

The BLM has determined that the management objectives for visual resources, and the application of standards 73 – 76, would have ***no effect*** on the federally-listed species and critical habitat addressed by this BO because these objectives and standards are applied only through the other land uses and land management practices addressed by this BO (*i.e.*, no additional effect to be evaluated) and because they only minimize visual changes on the landscape.

10.9 Special Products

The management objective and standards 77 – 79 would allow special products to be collected subject to site-specific evaluation and decision-making, and require such collection to be consistent with other resource objectives. Standards 77 and 78 specifically limit adverse impacts to other resources, including the federally-listed species and critical habitat addressed by this BO. As such, adverse effects to the species and critical habitats addressed by this BO are not "reasonably certain to occur." However, since these standards do not prohibit activities that may affect the species and critical habitats addressed by this BO, the collection of special products ***may affect, but are not likely to adversely affect***, these species and critical habitats, but any impacts are expected to be small and are considered ***insignificant.***

10.10 Travel and Transportation

The management objective for travel and transportation would require the BLM to provide public and administrative access consistent with other resource objectives, which include the maintenance and restoration of habitat and critical habitat for federally-listed species. Standards 80 – 82 would impose new prohibitions on vehicle use in areas where it might affect the federally-listed species and critical habitats addressed by this BO. These prohibitions ***may affect, but are not likely to adversely affect***, the species and critical habitats addressed by this BO because their effects would be ***entirely beneficial*** to species conservation.

10.11 Minerals and Energy

- As explained in section 1.2.3.9 (footnote page 31), federal law draws a clear distinction between public domain lands and acquired lands. Except for the Long Tom site and the survey hiatus between the North and South Taylor sites, all BLM-administered lands in the action area are acquired and most are closed to locatable mineral entry. The only exceptions are Stewart Pond and Eastern Greenway which are open to locatable mineral entry under federal law but closed under state law because both sites fall within the limits of the City of Eugene. Thus, even though Standard 84 maintains BLM-administered lands in the action area as open to locatable mineral entry, all lands are *de facto* closed due to state law and the Proposed RMP/EIS would not change that. Since neither Stewart Pond nor Eastern Greenway support extant populations of the federally-listed species, nor overlay the critical habitats addressed by this BO, and since both parcels would occur in the NMA and, therefore, not likely be restored for species conservation, even if the State or Oregon were to open these tracts to locatable mineral entry. Therefore the BLM has determined that the

continuance of locatable mineral entry in the action area would have ***no effect*** on the species and critical habitats addressed by this BO.

- Standard 85 imposes a "no surface occupancy" standard on leasable mineral entry. In the unlikely event that an applicant applies for oil and natural gas exploration in the action area, where the geological structure makes discovery (especially commercial discovery), incredibly unlikely, the surface occupancy restriction would prohibit them from building or placing infrastructure in the action area.
- Management directions for the PRA and NMA close BLM-administered lands in the action area to salable mineral entry.
- Thus, prohibiting surface occupancy in the action area and closing the action area to salable mineral entry ***may affect, but is not likely to adversely affect***, the species and critical habitats addressed by this BO because the effects would be ***entirely beneficial*** to species conservation.

The decision to permit mineral exploration and development consistent with the management of other resource values ***may affect, but is not likely to adversely affect***, the federally-listed species and critical habitats addressed by this BO.

10.12 Lands and Realty

The disposal of the Danebo site to the City of Eugene (Standard 88), and Congressional revision of land tenure decisions (Standard 91), are beyond the discretion of the BLM and, thus, not subject to ESA sec. 7. In addition, the BLM has no discretion to manage lands acquired under Section 205 or 206 of FLPMA other than as "acquired lands;" thus, the application of Standard 92 is not subject to ESA sec. 7. Standard 93 requires the BLM to recognize valid existing rights in the planning area, which also is beyond the discretion of the BLM (90 Stat. 2755) and, thus, not subject to ESA sec. 7.

Standard 95 and a provision of Standard 94 require the BLM to evaluate right-of-way applications on a case-by-case basis. No application for such a right-of-way is before the BLM. Nor does the BLM have information that causes agency to anticipate application. In the absence of application, the Service has no basis for determining effects to federally-listed species and critical habitats. The BLM would need to consult on such effects separately as warranted.

In accordance with standards 86 and 87, the BLM would retain all BLM-administered lands in the action area except the Danebo site. The retention of BLM-administered lands in public ownership ***may affect, but is not likely to adversely affect***, the federally-listed species and critical habitats addressed by this BO because the effects of land retention are ***entirely beneficial*** to the maintenance and restoration of habitat conditions for species conservation. The retention of the Danebo site in BLM ownership if the City of Eugene does not meet specific conditions for its acquisition (Standard 88) ***may affect, but is not likely to adversely affect***, the species and critical habitats addressed by this BO for the same reason.

The Proposed RMP/EIS contains prudent administrative tools that allow the BLM to handle unlikely land use issues. Standards 89 and 90 allow the BLM to dispose of lands that are identified by future survey hiatuses or future unintentional occupancy trespass. The BLM has

determined that the approval of standards 89 and 90 would have ***no effect*** on the federally-listed species or critical habitats addressed by this BO because BLM-administered lands in the planning area have been surveyed extensively, making future BLM activities to resolve mistaken or unmarked boundary delineations not "reasonably certain to occur." Standard 96 allows the BLM to issue temporary use permits; Standard 98 allows the BLM to more easily resolve agricultural and occupancy trespasses. The BLM believes the approval of standards 96 and 98 would have ***no effect*** on the species or critical habitats addressed by this BO because they have no history of needing such tools in the planning area and no expectation that such tools will be needed, making effects to species and critical habitats not "reasonably certain to occur."

Standard 94 excludes new rights-of-way in the action area, subject to valid existing rights, except for buried lines in the rights-of-way of existing roads. Standard 97 prohibits the BLM from issuing new leases or permits for landfills or solid waste disposal sites in the action area. Because these standards address lands currently occupied by federally-listed species, additional lands allocated for the maintenance or restoration of the habitats of federally-listed species, and areas delineated as critical habitat, the application of these standards ***may affect, but is not likely to adversely affect***, the species and critical habitats addressed by this BO because they would prohibit specific realty activities that would adversely affect those species and critical habitats, making their effects ***entirely beneficial*** to species conservation.

10.13 Hazardous Materials

The management objective, and the application of standards 99 – 102, ***may affect, but are not likely to adversely affect***, the federally-listed species and critical habitats addressed by this BO because they would limit the use and occurrence of hazardous materials in the action area and direct immediate containment and cleanup if hazardous materials are found in the action area, reducing the exposure of listed species and critical habitats to hazardous materials. Thus, their effects to listed species and critical habitats would be ***entirely beneficial***.

10.14 Research

The management objective to allow scientific research to support the management of lands and resources in the action area ***may affect, but is not likely to adversely affect***, the federally-listed species and critical habitats addressed by this BO because such research would be consistent with the provisions of the Approved Resource Management Plan/Environmental Impact Statement, making any effects ***insignificant.*** Standard 103 addresses ongoing research that already has undergone ESA sec. 7(a)(2) consultation, as warranted. Standard 104 requires new research to be consistent with the Approved Resource Management Plan/Environmental Impact Statement. New research is considered an activity and is separate from the decision to implement Standard 104. While research itself could adversely affect the federally-listed species and critical habitats addressed by this BO, and could cause injury or mortality listed animals, such research would be subject to consultation outside of this BO. The BLM determined that the approval of Standard 104, by itself, would have ***no effect*** on the species and critical habitats addressed by this BO because they have no applications for or knowledge of pending research, meaning that such activities are not "reasonably certain to occur."

10.15 Administrative Actions

Administrative actions include many of the effects to federally-listed species and critical habitat already addressed by this BO; (*e.g.*, resolving trespasses; managing hazardous materials). To date, administrative actions in the action area have not affected listed species or critical habitats above the levels already discussed in this BO. The Service anticipates that, with applications of the management direction and standards in this BO, continuance of administrative actions in the action area ***may affect, but are not likely to adversely affect***, the species and critical habitats addressed by this BO because their effects would be ***entirely beneficial*** to species conservation. Any individual action that the BLM determines would adversely affect a listed species or critical habitat would be subject to separate ESA sec. 7 consultation.

10.16 Monitoring

As stated in the introduction section the *West Eugene Wetlands Plant and Invertebrate Monitoring Plan*, dated December 18, 2013, does not address the golden paintbrush, Taylor's checkerspot butterfly or streaked horned lark. Effects of monitoring those species would be addressed, separately, as needed.

10.16.1 Bradshaw's Lomatium, Kincaid's Lupine and Willamette Daisy

The BLM includes standards to minimize the effects of monitoring on federally-listed plants in Section 2.3 A (pages 28 and 29) of the attached Monitoring Plan (Appendix A). With application of these standards, monitoring ***may affect, but is not likely to adversely affect***, the Bradshaw's lomatium, Kincaid's lupine or Willamette daisy. Effects to federally-listed plants result from the necessary handling of plants and inadvertent trampling of plants. Restricting monitoring activities to qualified personnel who are permitted by the Service should make these effects ***insignificant***. Even if individual plants were inadvertently stepped on, the risk of root or permanent damage would be negligible. Finally, monitoring is necessary to evaluate the health of populations and help ensure the accomplishment of recovery goals.

10.16.2 Fender's Blue Butterfly

The BLM include standards to minimize the effects of monitoring on the Fender's blue butterfly in Section 2.3 A (pages 28 and 29) of the attached Monitoring Plan (Appendix A). With application of these standards, monitoring ***may affect, and is likely to adversely affect***, Fender's blue butterflies and ***would cause injury or mortality*** to some individual adults, eggs and larvae. Monitoring requires the capture and handling of adult Fender's blue butterflies and the handling of leaves with attached Fender's blue butterfly eggs and larvae. Restricting monitoring activities to qualified personnel who are permitted by the Service would minimize the levels of adverse effects and injury or mortality, but would not eliminate such effects. That said, monitoring is necessary to evaluate the health of populations and help ensure the accomplishment of recovery goals.

10.16.3 Critical Habitats of Kincaid's Lupine, Willamette Daisy and Fender's Blue Butterfly

The BLM has determined that monitoring would have ***no effect*** on the critical habitats addressed by this BO because it would not modify primary constituent elements.

10.17 Effects Conclusions

The proposed action, in its entirety, ***may affect, and is likely to adversely affect***, the Bradshaw's lomatium, Willamette daisy, Kincaid's lupine, Fender's blue butterfly, Taylor's checkerspot butterfly and streaked horned lark, and *would cause injury or mortality* to the Fender's blue butterfly and streaked horned lark, and ***may affect, but is not likely to adversely affect*** the golden paintbrush, or any of the critical habitats addressed by this BO. Approval of the *West Eugene Wetlands Plant and Invertebrate Monitoring Plan*, dated December 18, 2013, ***may affect, and is likely to adversely affect***, the Fender's blue butterfly, and ***would cause injury or mortality*** to the Fender's blue butterfly, ***may affect, but is not likely to adversely affect***, the Bradshaw's lomatium, Willamette daisy or Kincaid's lupine, and would have ***no effect*** on the critical habitats of these species. This section provides rationales for those determinations.

No activities are interrelated to, or interdependent on, the proposed action.

11.0 **CUMULATIVE EFFECTS**

Cumulative effects are those effects of future State or private activities (not involving federal activities) that are reasonably certain to occur within the action area of the federal action subject to consultation (50 CFR 402.02 Definitions). A Memorandum to the Director of Fish and Wildlife Service, August 27, 1982, Cumulative Effects to be Considered Under Section 7 of the Endangered Species Act set forth the legal requirements for consideration by federal agencies of the cumulative effects. "A non-federal action is *reasonably* certain to occur if the action requires approval of a state or local resource or land use control agency and such agencies have approved the action, and the project is ready to proceed...these indicators must show more than the *possibility* that the non-federal project will occur; they must demonstrate with reasonable certainty that it *will* occur.While some of this cumulative effects section includes discussion of both BLM and ACOE projects, these actions are presented for information and are not cumulative effects as defined by 50 CFR 402.02."

11.1 Species

The Recovery Plan (USFWS 2010) identifies more than 90 existing sites in the Eugene West Recovery Zone with Willamette daisy, Bradshaw's lomatium or Kincaid's lupine. Of these 90+ sites, 35 sites within the RMP/EIS planning area are considered in the Recovery Plan to be managed and protected sites. Those protected sites are managed by the West Eugene Wetlands partners: These include two federal partners: the BLM, and ACOE (W. Messinger, ACOE, pers. comm., May 13, 2012, May 14, 2012), and two non-federal partners: the City of Eugene (T. Taylor, City of Eugene, pers. comm., May 15, 2012), and The Nature Conservancy (M. Benotsch, The Nature Conservancy, pers. comm., May 15, 2012, May 17, 2012). The West Eugene Wetlands *Action Plan* also describes existing populations of Willamette daisy,

Bradshaw's lomatium and Kincaid's lupine on West Eugene Wetlands partner lands (City of Eugene *et al*. 2012:17-22, 36-41 and 52-57).

11.1.1 Habitat Maintenance and Restoration

Plant communities on other ownerships in the planning area include many of the same plant communities found on BLM-administered lands (Table 6). The primary land owners within the planning area boundary that support native plant communities are West Eugene Wetland partners: the City of Eugene, The Nature Conservancy and the ACOE. Within the planning area, the only high-quality prairie or savanna habitat currently is 117 acres of wet prairie and 3 acres of upland prairie on City of Eugene land at Coyote Prairie in the southwest of the planning area.

Table 6. Current plant community conditions on West Eugene Wetlands partnership lands

	Acres			
Plant community	**BLM**	**City of Eugene**	**The Nature Conservancy**	**US Army Corps of Engineers**
high-quality wet prairie	0	117	0	0
low-quality wet prairie	834	424	149	1,322
high-quality upland prairie	0	3	0	0
low-quality upland prairie	116	0	104	148
high-quality oak savanna	0	0	0	0
low-quality oak savanna	23	0	12	0
oak woodland	120	0	61	378
ash swale/riparian	173	150	142	119
Plantation	9	0	0	0
Douglas-fir forest	<1	0	33	44
other*	66			

*open water, freshwater/riverine, or developed areas.

The current condition of wet prairies, upland prairie, and oak savanna (the plant communities that potentially support threatened and endangered plant species) on BLM-administered lands and on West Eugene Wetland partner lands has been summarized by City of Eugene *et al*. (2012:9, 23, 44 and 54). Although many of these sites have been actively managed for over a decade, data from BLM parcels suggests sites do not meet recovery standards for prairie communities with the occurrence of noxious weeds, infestations of non-native grasses and forbs, and the encroachment of native woody vegetation. Those descriptions are incorporated here by reference.

There is likely some smaller acreage of native plant communities on other ownerships in the planning area. Given the absence of long-term management for habitat restoration on these other ownerships, there is no reasonable certainty of the future development of high-quality wet prairie, high-quality upland prairie, or high-quality oak savanna on ownerships other than the West Eugene Wetlands partners.

On non-BLM-administered lands in the planning area, the only sites that reasonably could be expected to develop high-quality prairie or savanna habitat are 94 acres of land managed by the ACOE that will be high-quality upland prairie within ten years (W. Messinger, ACOE, pers. comm., February 7, 2012). Although habitat management continues on other West Eugene Wetlands partner lands, it is not reasonably certain that those sites will attain high-quality prairie or savanna within ten years (D. Steeck, City of Eugene, pers. comm., January 20, 2012; J. Nuckols, The Nature Conservancy, pers. comm., February 6, 2012).

11.1.2 Augmentation of Federally-listed Plants

In addition to augmentation by the BLM of populations of Willamette daisy, Bradshaw's lomatium, Kincaid's lupine and golden paintbrush, it is probable that other land owners within the planning area will augment populations as detailed below (T. Taylor, City of Eugene, pers. comm., May 14, 2012; M. Benotsch, The Nature Conservancy, pers. comm., May 17, 2012).

- Willamette daisy: The Nature Conservancy expects to seed less than one pound of seed.
- Bradshaw's lomatium: The City of Eugene expects to seed approximately one pound of seed; The Nature Conservancy expects to seed less than one pound of seed.
- Kincaid's lupine: The City of Eugene expects to plant approximately 500 to 1,000 plugs; The Nature Conservancy expects to seed approximately 20,000 to 40,000 seeds per year.
- Golden paintbrush: The City of Eugene expects to plant approximately 500 to 1,000 plugs.

11.1.3 Fender's Blue Butterfly

The ACOE is implementing similar habitat restoration activities on lands that they administer for which the Service estimates that prescribed burning will kill the eggs and larvae associated with 430 adult Fender's blue butterflies, herbicide use will kill or injure less than ten percent of the larvae and eggs in treatment areas, and population monitoring will cause the mortality or injury of up to 4 adults and an unquantifiable number of larvae and eggs (USFWS 2011b:25).

The Service estimates that if prescribed burning were implemented on all occupied habitat on non-federal land, all of the eggs and larvae associated with about 1,170 adult butterflies would be killed (USFWS 2008a:48). These short-term effects on Fender's blue butterflies would have an additive effect on overall population numbers within the Eugene West Recovery Zone. In 2008 the Service concluded that this level of short-term adverse effect is not likely to jeopardize the Fender's blue butterfly or destroy or adversely modify its critical habitat (USFWS 2008b:48 and 2011b:25). However, this habitat restoration and population augmentation will result in the creation of two large patches of high quality habitat with populations of Kincaid's lupine and a series of small patches of high quality patches.

11.1.4 Taylor's Checkerspot butterfly and Streaked Horned Lark

The Service has no information regarding planned management activities in the planning area for the streaked horned lark or Taylor's checkerspot butterfly.

11.2 Critical Habitats

Critical habitats in the RMP/EIS planning area for the Kincaid's lupine, Willamette daisy and Fender's blue butterfly are shown, respectively, in figures 6, 7 and 8. Other than 117 acres of high-quality wet prairie and 3 acres of high-quality upland prairie on City of Eugene lands, there are no acres of high-quality wet prairie, high-quality upland prairie or high-quality oak savanna on non-federal lands in the planning area, including those within critical habitat units. Current conditions are summarized by City of Eugene *et al.* (2012:9, 23, 44 and 54). Although many of these sites have been actively managed for over a decade, most remain in poor to fair condition with the occurrence of noxious weeds, infestations of non-native grasses and forbs, and the encroachment of native woody vegetation. Given the absence of long-term habitat restoration on these non-federal lands, and the limited resources of the non-federal partners in this area, there is no reasonable certainty for the future development of high-quality wet prairie, high-quality upland prairie or high-quality oak savanna on non-federal critical habitat units in the planning area.

12.0 **CONCLUSION**

After reviewing the current status of Willamette daisy, Bradshaw's lomatium, Kincaid's lupine, Fender's blue butterfly, Taylor's checkerspot butterfly and the streaked horned lark, the environmental baseline for the action area, the effects of the proposed action on the critical habitats of Willamette daisy, Kincaid's lupine and Fender's blue butterfly, and all foreseeable cumulative effects, it is the Service's biological opinion that the activities, as proposed, are not likely to jeopardize the continued existence of the Willamette daisy, Bradshaw's lomatium, Kincaid's lupine, Fender's blue butterfly, Taylor's checkerspot butterfly, or the streaked horned lark, and are not likely to adversely modify the critical habitats Willamette daisy, Kincaid's lupine and Fender's blue butterfly.

The Service reached these conclusions because the proposed action is likely to appreciably increase the effectiveness of the conservation program established under the Recovery Plan and critical habitat designations to protect these Willamette valley species and their habitat on federal lands within their range including designated critical habitats. Additionally, no known cumulative impacts changed the determinations made under the effects of the proposed action, as the vast majority of adjacent non-federal lands are managed by wetland conservation partners who work in unison with the BLM and Service.

12.1 Summary of effects

12.1.1 Effects of decisions made under the proposed RMP

The proposed RMP holds both decisions and actions that may affect listed species or their critical habitat. Decisions, such as the designation of LUAs for the PRA and NMA may affect listed species or their critical habitat by setting out how individual areas will be managed, and what type of management activities would be compatible under that LUA. The effects of the decisions made under the proposed RMP are displayed in Table 6 below:

Table 6. Effects of implementation of decisions outlined in the proposed RMP.

BO Section	Activity/Category	Affected Species/CH	Effects Determination	Injury/Mortality
10.1.1	Allocation of NMA LUA	All	NLAA EB	N/A
10.1.2	Allocation of PRA LUA	TCB	LAA	NO
		All Others	NLAA EB	N/A
10.3	Fire Suppression in NMA	All but CALE	NLAA EB	N/A
	Fire Suppression in PRA	All but CALE	LAA	Yes[1] FBB/SHL
10.4	Plant and Animal protection standards	All	NLAA EB	N/A
10.5	Soil and Water standards	All	NLAA EB	N/A
10.7	Recreation	All	NLAA I	N/A
10.9	Special Products	All	NLAA I	N/A
10.10	Travel and Transportation	All	NLAA EB	N/A
10.11	Minerals and Energy	All	NLAA EB	N/A
10.12	Lands and Realty	All	NLAA EB	N/A
10.13	Hazardous Materials	All	NLAA EB	N/A
10.14	Research	All	NLAA EB	N/A
10.15	Administrative Actions	All	NLAA EB	N/A
10.16.1	Monitoring	LOBR LUOR ERDE	NLAA I	N/A
10.16.2		FBB	LAA	Y[2]

[1]Any take exempted would come through emergency consultation at the time of the action.
[2]Any take exempted would be handled through the West Eugene Wetland Partner's Recovery Permits as issued by the Service.

Species:
TCB = Taylor's checkerspot butterfly, FBB = Fender's blue butterfly, LOBR = Bradshaw's lomatium, LUOR = Kincaid's lupine, ERDE = Willamette daisy, CALE = golden paintbrush

Effects:
NLAA = Not Likely to Adversely Affect, EB = Entirely Beneficial, I = Insignificant, LAA = Likely to Adversely Affect
N/A Not Applicable

Actions that may affect listed species or designated critical habitat are direct action items such as burning, mowing, thinning or herbicide treatments that will take place annually under the proposed RMP.

Table 7. Restoration actions occurring annually on the PRA LUA.

BO Section	Activity/Category	Affected Species/CH	Effects Determination	Injury/Injury or Mortality	Extent of Injury or Mortality	Maximum Average Acres Annually[1]	Max Treatment Acres Over Ten-Year Period
10.2.1	Restoration in the PRA where species present	LOBR LUOR ERDE	LAA	N/A	N/A	180 (manual) 153 (mow) 128 (burn) 8(thin) 346(herbicide)	1,800 (manual) 1,530 (mow) 1,280 (burn) 80 (thin) 3,460 (herbicide)
	Restoration in the PRA where species not present	LUOR CH ERDE CH	NLAA EB	N/A	N/A	180 (manual) 153 (mow) 128 (burn) 8(thin) 346(herbicide)	1,800 (manual) 1,530 (mow) 1,280 (burn) 80 (thin) 3,460 (herbicide)
10.2.2	Restoration in the PRA	CALE	NLAA EB			180 (manual) 153 (mow) 128 (burn) 8(thin) 346(herbicide)	1,800 (manual) 1,530 (mow) 1,280 (burn) 80 (thin) 3,460 (herbicide)
10.2.3	Maintenance in the NMA	FBB FBB CH	NLAA EB			N/A	719
	Restoration in the PRA where FBB present	FBB FBB CH	LAA NLAA EB	Yes	Burning: Up to 1/3 of FBB larvae in treated area/year Other treatments <5% annually	180 (manual) 153 (mow) 128 (burn) 8(thin) 346(herbicide)	1,800 (manual) 1,530 (mow) 1,280 (burn) 80 (thin) 3,460 (herbicide)
	PRA where FBB not	FBB	NLAA EB	No			

BO Section	Activity/Category	Affected Species/CH	Effects Determination	Injury/Injury or Mortality	Extent of Injury or Mortality	Maximum Average Acres Annually[1]	Max Treatment Acres Over Ten-Year Period
	present						
10.2.4	Restoration in the PRA	SHL	LAA	YES	Y[2]	180 (manual) 153 (mow) 128 (burn) 8(thin) 346(herbicide	1,800 (manual) 1,530 (mow) 1,280 (burn) 80 (thin) 3,460 (herbicide)
10.2.5	Restoration in the PRA	TCB	LAA	NO			556

[1]Acre figures in column are not additive, but based on an average total of 815 acres/year (180 acres manual, 153 acres mechanical, 128 acres burning, 8 acres of thinning and 346 acres of herbicide treatment).
[2]Take will be exempted as appropriate if/when SHL is located within project footprint, and incidental take is warranted.

Species:
TCB = Taylor's checkerspot butterfly, FBB = Fender's blue butterfly, LOBR = Bradshaw's lomatium, LUOR = Kincaid's lupine, ERDE = Willamette daisy, CALE = golden paintbrush

Effects:
NLAA = Not Likely to Adversely Affect, EB = Entirely Beneficial, I = Insignificant, LAA = Likely to Adversely Affect

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2) of the Act, take that is incidental to and not intended as part of the agency action is not considered to be a prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the BLM so that they become binding conditions of any grant or permit issued to any applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The BLM has a continuing duty to regulate the activities covered by this Incidental Take Statement. If the BLM (1) fails to assume and implement the terms and conditions or (2) fails to require cooperators to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, BLM must report the progress of the action and its impact on the species to the Service as specified in this Incidental Take Statement. [50 CFR §402.14(i)(3)]

13.0 **AMOUNT OR EXTENT OF TAKE**

13.1 Fender's Blue Butterfly

The Service anticipates incidental take of Fender's blue butterfly will be difficult to detect because the presence and number of individuals is difficult to determine within a project area and detecting a dead or impaired specimen is highly unlikely. Although the Service anticipates Fender's will be incidentally harassed and harmed (killed or injured) as a result of thinning, burning, mowing, herbicide use, weed whacking and other mechanical treatments accurately quantifying these effects is difficult. For instance, injured butterflies that fly off to areas well beyond the project corridor before dying or that are consumed by birds, bats or other predators because of injuries are not likely to be located for estimating take. Additionally, trampled and mowed-down larvae and eggs will be extremely difficult to find in order to quantify incidental take. Therefore, even though take is expected to occur, data are not sufficiently available to enable the Service to estimate an exact number of individuals which are incidentally taken for most of the proposed activities. For this reason, the Service will specify the amount or extent of incidental take associated with habitat maintenance and restoration using the maximum acres of habitat area that could be treated on an annual basis as a surrogate. In order to more clearly disclose what the Service believes to be the population effects of these restoration activities the Service will also estimate the effect to butterfly larvae on a percentage basis on acres treated by the major restoration categories (mowing, burning and herbicide application) discussed this BO. Incidental take associated with incidental mortality from crushing or capturing butterflies or larvae or collection of eggs for research or for monitoring as described in Appendix A will be exempted under appropriate Recovery Permits as issued to the West Eugene Wetlands Partners (including the BLM), researchers or contractors by the Service. Incidental take (if any) associated with fire suppression activities that occur within the action area will be evaluated and cataloged through the emergency consultation process at the time of occurrence.

The Service anticipates the following maximum annual incidental take of Fender's blue butterflies associated with these activities:

1. Manual habitat maintenance and restoration (includes manual weed treatment): a negligible percentage (<1%) of eggs, larvae and pupae crushed at all occurrences across180 acres annually where these activities occur.

2. Mechanical habitat maintenance and restoration (includes weed whacking and mowing): a small percentage of larvae and eggs crushed or otherwise destroyed at known occurrences where these activities occur. An estimate of < 5% mortality of eggs, larvae and pupae due to crushing or suction. If this activity occurs during the spring harassment of a few adults if mowing overlaps flight season may also occur. These effects are expected to occur on up to 153 acres annually.

3. Prescribed fire: 100 percent mortality of eggs, larvae and pupae at all burned parcels, which could be as much as $^1/_3$ of each site across the 128 acres treated annually.

4. Thinning: a negligible and unquantifiable percentage of larvae and eggs crushed at all occurrences across eight acres annually where these activities occur.

5. Herbicide application: This activity could produce mortality in a small portion of larvae exposed to various herbicides. It is estimated that injury and mortality would not exceed 5% of the eggs, larvae or pupae present on the up to 346 acres treated annually.

13.2 Streaked Horned Lark

Even though Standard 33 restricts mowing in bird breeding areas, and standards 2 and 9 confine the use of prescribed burning to late summer and early fall when streaked horned lark nesting is likely to be over, these standards are insufficient to ensure that the effects of habitat maintenance and restoration on the streaked horned lark would be discountable. Occupancy by this species was only verified a short time ago (within the past year), and it is still considered rare within the action area. Because little data is available on the patterns of habitat use for streaked horned larks within the action area it will be difficult to discern if projects will occur in the presence of streaked horned larks, and cause harm or harassment.

Based on the preceding Effects of the Action analysis regarding future Restoration Activities, there is currently insufficient information available to determine if take of the streaked horned lark is likely to occur; that determination can only be made in conjunction with an assessment of site-specific conditions. For that reason, any appropriate take exemptions, other than provided above, for future actions carried out under the proposed program of work are deferred. The BLM has agreed to submit all of the information needed to support an assessment of incidental take of streaked horned lark if they are encountered. Provided the reported action is consistent with the analysis of the proposed actions described in this BO, a project(s) specific Incidental Take Statement/take exemption (as appropriate) will be provided to the BLM as an amendment to this BO.

14.0 **REASONABLE AND PRUDENT MEASURES**

The Service worked closely with the BLM to develop the *Standards* (section 1.2.3, page 20) that are part of the proposed action. These serve to adequately reduce risks to listed species and their critical habitats within the action area. These include:

- Monitor at a level sufficient to track the effects of take herein in order that the amount of take permitted within this BO is not exceeded.
- Insure the continued viability of listed plant and Fender's blue butterfly populations and habitats by following the Standards outlined within this BO.

15.0 **TERMS AND CONDITIONS**

The Action Agencies shall:

1) Monitor to ensure that actual levels of effects and incidental take do not exceed the effects or incidental take levels anticipated by this BO.

2) The BLM will provide the Service with annual project implementation and monitoring reports of activities addressed by the RMP that affect listed species or critical habitat.

3) The BLM will provide the Service with all future reports and findings (including research findings) related to federally-listed species and critical habitats in the action area.

4) The BLM will insure prescribed burning is conducted in a manner consistent with the Recovery Plan (USFWS 2010; IV-46) in sites supporting 100 or more adult Fender's blue butterflies, the size of the burn unit will be no more than one third of the occupied habitat actively used by butterflies. At sites supporting fewer than 100 adult Fender's blue butterflies, the size of the burn unit will be no more than one quarter of the occupied habitat. The burn unit must be within 100 meters of unburned occupied habitat to facilitate recolonization.

5) The BLM will not dispose of fill removal within listed plant or Fender's blue butterfly habitat.

16.0 **CONSERVATION RECOMMENDATIONS**

Section 7(a)(1) of the Act directs federal agencies to use their authorities to further the purposes of the Act by implementing conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities designed to minimize or avoid adverse effects of a proposed action on listed species or designated CH, to assist in the implementation of recovery plans, or to obtain information.

The Service believes the following conservation recommendation will help the BLM meet its goal of species recovery within the action area faster:

1. Apply restoration activities as outlined for the PRA on portions of the NMA whenever sufficient funds are available to do so.
2. If Feasible prescribed fire for sites with listed plant species will be of low intensity; prescribed burns should therefore target cool, cloudy days later in the dry season to

ensure low intensity fire conditions. Woody vegetation may be removed from the treatment area prior to burning.

3. To avoid causing soil compaction and rutting, tractor mowing should not occur when soils are saturated, and tractor mowers should be rubber tracked.

4. Implement activities to promote and develop "floating" populations of Willamette Daisy, Bradshaw's lomatium and Kincaid's lupine (in addition to the specified number of populations/recovery zone required in the Recovery Plan) in the Eugene West Recovery Zone as feasible.

In order for the Service to be kept informed of actions that minimize or avoid adverse effects or benefit listed species or their habitats, the Service requests notification regarding the implementation of any conservation recommendation.

17.0 **REINITIATION NOTICE**

This concludes formal consultation and conferencing on the actions outlined in your BA. As provided in (50 CFR § 402.16), reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agencies' action that may affect listed species or CH in a manner or to an extent not considered in this BO; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or CH that was not considered in this BO; or (4) a new species is listed or CH designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation of formal consultation.

LITERATURE CITED

Altman, B. 1999. Status and conservation of state sensitive grassland bird species in the Willamette Valley. Report to Oregon Department of Fish and Wildlife. Corvallis, Oregon. 68 pp.

Altman, B. 2011. Historical and Current Distribution and Populations of Bird Species in Prairie-Oak Habitats in the Pacific Northwest. Northwest Science, 85(2):194-222.

Altman, B. 2013. Personal conversation with Sally Villegas at the West Eugene Wetlands on June 4, 2013 concerning the status of streaked horned larks within the West Eugene Wetlands.

Anderson, H. 2009. Streaked horned lark regional working group; minutes from the September 29, 2009 meeting. Prepared by Hannah Anderson, The Nature Conservancy. 11 pp.

Anderson, J.K. 2010. Comparing endangered Streaked Horned Lark (*Eremophila alpestris strigata*) fecundity to other grassland birds. M.S. Thesis, The Evergreen State College, Olympia, Washington. 47 pp.

Ballmer, G.R and G.F. Pratt. 1988. A survey of the last instar larvae of the Lycaenidae (Lepidoptera). Journal of Research on the Lepidoptera 27:1-81.

Barnes, M. 2004. Habitat variation and experimental management of Kincaid's lupine. Bulletin of the Native Plant Society of Oregon 37(9):95-103.

Beason, R.C. 1995. Horned lark (*Eremophila alpestris*). No. 195 *in* The Birds of North America. (A. Poole and F. Gill, editors). The American Academy of Natural Sciences, Philadelphia, PA and the American Ornithologists' Union, Washington, D.C.

Benotsch, M. The Nature Conservancy, et al. pers. comm. to Nancy Sawtelle, BLM, via telephone, April 14, 2011.

Benotsch, M. The Nature Conservancy, pers. comm. to Sally Villegas-Moore, BLM, via telephone, May 15, 2012, May 17, 2012.

Benotsch, M. The Nature Conservancy, pers. comm. to Sally Villegas-Moore, BLM, via telephone, May 17, 2012.

Benton County. 2010. *Prairie Species Habitat Conservation Plan*. 160 pp plus appendices. http://www.co.benton.or.us/parks/hcp.

Berry Botanic Garden (BBG). 2005. The Seed Bank: what's in the collection? Accessed September 29, 2005 at http://seedbank.pdx.edu/taxa-in-the-collection.

Bowers, M.D. 1981. Unpalatability as a defense strategy of western checkerspot butterflies (*Euphydryas scudder*, Nymphalidae). Evolution 35(2):367-375

Camfield, A. F., S. F. Pearson, and K. Martin. 2010. Life history variation between high and low elevation subspecies of horned larks *Eremophila* spp. Journal of Avian Biology 41:273-281.

Camfield, A. F., S. F. Pearson, and K. Martin. 2011. A demographic model to evaluate population declines in the endangered streaked horned lark. Avian Conservation and Ecology 6(2): 4.

Caplow, F. and J. Miller. 2004. Southwestern Washington Prairies: using GIS to find rare plant habitat in historic prairies. Washington Department of Natural Resources, Natural Heritage Report 2004-02. 18 pp.

Cascade Pacific RC&D. 2012. M-DAC Farms Wetland Restoration. http://cascadepacific.org/mdac.htm.

Char, P. and P.D. Boersma. 1995. The effects of prairie fragmentation on butterfly species in western Washington. Final Report Submitted to the Nature Conservancy, Washington Field Office and U.S. Army, Joint Base Lewis McChord, WA.

City of Eugene. 2000. *West Eugene Wetlands Plan*. City of Eugene, Lane County, Oregon. 74 pp.

City of Eugene, The Nature Conservancy, U.S. Army Corps of Engineers and U.S. Bureau of Land Management. 2012. *Action plan - working to recover four prairie species in the West Eugene Wetlands: Fender's blue butterfly, Kincaid's lupine, Willamette daisy, and Bradshaw's lomatium*. Final Draft. February 2012.

Clements, J. F., T. S. Schulenberg, M. J. Iliff, B.L. Sullivan, C. L. Wood, and D. Roberson. 2011. The Clements checklist of birds of the world: Version 6.6. Available from: http://www.birds.cornell.edu/clementschecklist/downloadable-clements-checklist. Accessed by USFWS on 13 Dec 2012.

Converse, S., B. Gardner, S. Morey, J. Bush, M. Jensen, C. Langston, D. Stokes, T. Thomas, J. Bakker, T. Kaye, J. Kenagy, S. Pearson, M. Singer, and D. Stinson. 2010. Parameterizing Patch Dynamics Models in Support of Optimal Reserve Design for Federal Candidates in South Puget Sound. Summary Report from Two Expert Workshops (December 9-11, 2008 and October 21-22, 2009). Report received February 25, 2010. 28 pp.

Collins, M., M. C. Runge, K.Rinehart, E.E. Crone, J. Dillon, G. Fitzpatrick, T. Hicks, W. Messinger, C.B. Schultz, D.C. Brewer. 2010. Monitoring Design for Fender's Blue Butterfly. *A Case Study from the Structured Decision Making Workshop on January 24-28, 2011, at National Conservation Training Center, Shepherdstown, WV, USA.* 23 pp.

Crone, E. E. and C. B. Schultz. 2003. Movement behavior and minimum patch size for butterfly population persistence. Pages 561-576 in: C. Boggs, W. Watt, and P. Ehrlich (eds) Butterflies: Ecology and Evolution Taking Flight. University of Chicago Press.

Currin, R. 2010. Oregon Department of Agriculture. Email to Kate Norman, U.S. Fish and Wildlife Service, Portland, Oregon on 11 August 2010. Peer Review comments.

Dennehy, C., E.R Alversonb, H.E. Andersona, D.R. Clementsc, R. Gilbertd & T.N. Kayee. 2011. Management strategies for invasive plants in Pacific Northwest prairies, savannas, and oak woodlands, *Northwest Science* 85(2):329-351. http://www.bioone.org/doi/abs/10.3955/046.085.0219.

Dornfeld, E.J. 1980. The butterflies of Oregon. Timber Press, Forest Grove, Oregon. 276 pp.

Drovetski, S.V., S.F. Pearson, and S. Rohwer. 2005. Streaked horned lark *Eremophila alpestris strigata* has distinct mitochondrial DNA. Conservation Genetics. 6:875-883

Dunn, D.B. and J.M. Gillett. 1966. The Lupines of Canada and Alaska. Canada Department of Agriculture Monograph No. 2. Queen's Printer, Ottawa.

eBird. 2013. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org.

Edwards, W.H. 1888. Descriptions of two new species of *Melitaeas* belonging to North America. The Canadian Entomologist. 20(5)81-84.

Ehrlich, P.R., and I. Hanski. 2004. Checkerspot research - background and origins. pp 3-16 Chapter 1 *in* On the wings of checkerspots: a model system for population biology. (P.R. Ehrlich, and I.Hanski, editors.) Oxford University Press, New York. 371 pp.

Fitzpatrick, Greg S. 2012. 2011 Status of the Fender's blue butterfly (*Icaricia icarioides fenderi*) (at six locations) in Lane County, Oregon: population estimates and site evaluations. Unpublished report to Oregon Natural Heritage Program and U.S. Fish and Wildlife Service. The Nature Conservancy. 39 pp.

Fitzpatrick, Greg S. 2013. 2012 status of the Fender's blue butterfly (*Icaricia icarioides fenderi*) in the Willamette Valley Oregon: population estimates and nectar assessment. Unpublished report to Oregon Natural Heritage Program and U.S. Fish and Wildlife Service. The Nature Conservancy. 153 pp.

Guppy, C.S. and J.H. Shepard. 2001. Butterflies of British Columbia. University of British Columbia Press, Vancouver. 413 pp.

Hagen, David & Lois Hagen. 2010. A 2010 survey of butterflies at two West Eugene Wetlands sites. Eugene/Springfield North American Butterfly Association, Oregon. 11 pp.

Hammond, P. C. 1996. 1995 study of the Fender's blue butterfly (*Icaricia icarioides fenderi*) in Benton, Polk, and Yamhill Counties. Report to the Oregon Natural Heritage Program and US Fish and Wildlife Service. 25 pp.

Hammond, P. C., and M. V. Wilson. 1992. Fender's blue butterfly populations: habitat descriptions and threats to survival. Report to Oregon Natural Heritage Program.

Hammond, P. C., and M. V. Wilson. 1993. Status of the Fender's blue butterfly. Unpublished report to the US Fish and Wildlife Service. 66 pp.

Hammond, P.C. 1994. 1993 study of the Fender's blue butterfly (*Icaricia icarioides fenderi*). Unpublished report to the Oregon Natural Heritage Program and US Fish and Wildlife Service. 56 pp.

Henshaw, H.W. 1884. The shore larks of the United States and adjacent territory. Auk 1:254-268.

Heron, J. 2008. B.C. Ministry of Environment. Personal Communication. Conversation with T. Thomas, Ecologist, USFWS, Lacey, Washington. RE: First record of a Taylor's checkerspot sighting in British Columbia (or Canada) since 1998.

Hicks, T. 2012a. Monitoring and research on Fender's blue butterfly populations and habitat at Henry Hagg Lake, Washington Co., Oregon. A report for the Bureau of Reclamation Washington County parks Department and US Fish and Wildlife Service. 12 pp.

Hicks, T. 2012b. Monitoring Design For The Fender's Blue Butterfly: Outcomes Of Better Informed Decision Analyses. A report for U.S. Fish and Wildlife Service related to decision analyses on the development of a rangewide monitoring program for Fender Blue butterfly.

Hinchliff, J. 1996. The Distribution of the Butterflies of Washington. The Evergreen Aurelians. Oregon State University. 162 pp. Also see The Evergreen Aurelians below.

Holtrop, K. 2010. Taylor's checkerspot Habitat Inventory and Surveys, Olympic National Forest. Final Report for Interagency Special Status Sensitive Species Program. 19 pp.

Institute for Applied Ecology. 2010. Habitat Monitoring Report. Available at the BLM Eugene District Office, 3106 Pierce Parkway, Springfield, Oregon.

Integrated Taxonomic Information System [Internet]. 2012a. ITIS Standard Report Page: *Euphydryas editha taylori*. [cited 2012 Apr 6]. Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=201295.

Integrated Taxonomic Information System [Internet]. 2012b. ITIS Standard Report Page: *Eremophila alpestris strigata* [cited 2012 Apr 6]. Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=178412.

Kaye, T.N. 2000. Notes on the geographic distribution and taxonomy of *Lupinus sulphureus* ssp. *kincaidii* (Fabaceae): Watch for it in your neighborhood. Botanical Electronic News No. 243. Accessed at http://www.ou.edu/cas/botany-micro/ben/ben243.html.

Kaye, T.N. and C. Benfield. 2005. Kincaid's lupine and Fender's blue butterfly studies in the West Eugene Wetlands: monitoring, mowing, pig effects, and evaluating foliar cover as a measure of abundance. Unpublished report to the Eugene District Bureau of Land Management. Institute for Applied Ecology, Corvallis, Oregon.

Kaye, T.N. 2010. Institute for Applied Ecology. Email to Kate Norman, U.S. Fish and Wildlife Service, Portland, Oregon on 3 August 2010. Peer Review comments

Kaye, T.N. 1992. Bradshaw's desert parsley: population monitoring and pollination biology. Kalmiopsis 2:1-4.

Kaye, T.N. and M. Kirkland. 1994. Population biology of *Lomatium bradshawii* II. Insect interactions, phenology, and breeding system. Oregon Department of Agriculture, Salem, Oregon and Eugene District, BLM, Eugene, Oregon. 13 pp.

Kaye, T.N. and K. Kuykendall. 1993. Status Report for *Lupinus sulphureus* ssp. *kincaidii*. Oregon Department of Agriculture, Salem, and US Fish and Wildlife Service, Portland, Oregon. 71 pp.

Kaye, T.N. and R.J. Meinke. 1996. Breeding system and insect interactions of an endangered species, *Lomatium bradshawii* (Apiaceae). Scandinavian Association for Pollination Ecology, "Ecology and Evolution of Plant Reproduction." UmeΔ, Sweden.

Kaye, T.N. and K. Pendergrass. 1998. Population trends of *Lomatium bradshawii* before and after prairie fires: 1988-1997. Unpublished report to the Eugene District BLM. Oregon Department of Agriculture, Salem, Oregon.

Kaye, T.N., K.L.Pendergrass, K. Finley and J.B. Kauffman. 2001. The effect of fire on the population viability of an endangered prairie plant. Ecological Applications 11:1366- 1380.

Kaye, T.N. and K. Kuykendall. 2001a. Effects of scarification and cold stratification on germination of *Lupinus sulphureus* ssp. *kincaidii*. Seed Science and Technology 29:663-668.

Kaye, T.N. and K. Kuykendall. 2001b. Germination and propagation techniques for restoring rare Pacific Northwest prairie plants. In, Reichard, S.H., P.W. Dunwiddie, J.G. Gamon, A.R. Kruckeberg, D.L. Salstrom, eds. Conservation of Washington's Native Plants and Ecosystems. Washington Native Plant Society, Seattle, Washington. 223 pp.

Kaye, T.N., J. Cramer and A. Brandt. 2003. Seeding and transplanting rare Willamette Valley plants for population restoration: third year (2002) report. Institute for Applied Ecology, Corvallis, Oregon. 49 pp.

Kaye, T.N. 2013. New discovery! Rare Taylor's checkerspots eat rare golden paintbrush. Newsletter of the Institute for Applied Ecology, May 2013.

Kuykendall, K. and T.N. Kaye. 1993. *Lupinus sulphureus* ssp. *kincaidii* survey and reproduction studies. Bureau of Land Management Roseburg District, Roseburg, Oregon and Oregon Department of Agriculture, Salem. 44 pp.

Lassen, M. 2011. Center for Natural Lands Management, Olympia, Washington. E-mail to C. Brown, USFWS, Portland, Oregon, dated 29 September 2011 and 6 October 2011 (Subject: Re: data for 2011 Columbia River islands surveys).

Liston, A., K. St. Hilaire, and M.V. Wilson. 1995. Genetic diversity in populations of Kincaid's lupine, host plant of Fender's blue butterfly. Madrono 42:309-322.

Marshall, D.B., M.G. Hunter, and A.L. Contreras, Eds. 2003. Horned lark Eremophila alpestris in Birds of Oregon: A general reference. Oregon State University Press, Corvallis, OR. 768 pp.

McGarigal, K., S.A. Cushman & E. Ene. 2012. FRAGSTATS(4.x): Spatial Pattern Analysis Program for Categorical and Continuous Maps. Computer software program produced by the authors at the University of Massachusetts, Amherst. Available online: http://www.umass.edu/landeco/research/fragstats/fragstats.html.

McIntire, E.B., C.B. Schultz & E.E. Crone. 2007. Designing a network for butterfly habitat restoration: where individuals, populations and landscapes interact. *J. Applied Ecology* 44: 725-736.

Messinger, W. ACOE, pers. comm. to Nancy Sawtelle, BLM, via telephone, February 7, 2012.

Messinger, W. ACOE, pers. comm. to Sally Villegas-Moore, BLM, via telephone, May 13, 2012, May 14, 2012,

Moore. R. 2008. Inventory of streaked horned lark (Eremophila alpestris strigata) populations on Federal, State, and municipal lands in Oregon's Willamette Valley. Technical Report, USFWS, Portland, OR. 63 pp.

Moore, R. 2011a. Oregon State University, Corvallis, Oregon. In Litt. E-mail to K. Flotlin, USFWS, Lacey, Washington. RE: Streaked Horned Lark Candidate Notice of Review (CNOR) – Candidate Assessment Update.

Moore, R. 2011b. Abundance and Reproductive Success of Streaked Horned Larks (Eremophila alpestris strigata) in Multnomah County, OR: Breeding Season 2010. Report to the USFWS, Portland, Oregon. 32 pp.

Moore, R. and A. Kotaich. 2010. Reproductive Success of Streaked Horned Larks (Eremophila alpestris strigata) in Oregon Varied Agricultural Landscape. Mid- and Southern Willamette Valley, 2009. Report to the USFWS, Portland, Oregon. 60 pp.

Myers, A.M. and D.A. Kreager. 2010. Declining and State Sensitive Bird Species Breeding in Willamette Valley Grasslands: 2008/09 Status Update. Prepared for the Oregon Zoo Foundation and the USFWS. Oregon Department of Fish and Wildlife. 67 pp.

Nuckols, J. The Nature Conservancy, pers. comm. to Nancy Sawtelle, BLM, via telephone, February 6, 2012.

Oregon Biodiversity Information Center. 2010. Rare, threatened and endangered species of Oregon. Institute for Natural Resources, Portland State University.

Oregon Department of Environmental Quality and Oregon Department of Agriculture. 2011. Fact Sheet: Open field burning in the Willamette Valley. http://www.deq.state.or.us/aq/factsheets/07aq019_field.pdf

Oregon Department of Fish and Wildlife (ODFW). 2008. E.E. Wilson Wildlife Area Management Plan. Oregon Department of Fish and Wildlife. Salem, OR. 59 pp.

Pearson, S., and B. Altman. 2005. Range-wide streaked horned lark (*Eremophila alpestris strigata*) assessment and preliminary conservation strategy. Washington Department of Fish and Wildlife, Olympia, WA. 25 pp.

Pearson, S., and M. Hopey. 2004. Streaked horned lark inventory, nesting success and habitat selection in the Puget lowlands of Washington. Natural Areas Report 2004−1. Washington Department of Natural Resources, Olympia. 36 pp.

Pearson, S., and M. Hopey. 2005. Streaked horned lark nest success, habitat selection, and habitat enhancement experiments for the Puget lowlands, coastal Washington, and Columbia River Islands. Natural Areas Report 2005−01. Washington Department of Natural Resources, Olympia. 49 pp.

Pearson, S., M. Hopey, W. D. Robinson, and R. Moore. 2005. Range, Abundance and Movement Patterns of Wintering Streaked Horned Larks (Eremophila alpestris strigata) in Oregon and Washington. Natural Areas Program Report 2005-2. Washington Dept. of Natural Resources. Olympia, WA. 12 pp.

Pearson, S., A.F. Camfield, and K. Martin. 2008. Streaked Horned Lark (Eremophila alpestris strigata) fecundity, survival, population growth and site fidelity: Research progress report. Washington Department of Fish and Wildlife, Wildlife Science Division, Olympia, WA. 24 pp.

Pendergrass, K.L., P.M. Miller, J.B. Kauffman, and T.N. Kaye. 1999. The role of prescribed burning and maintenance of an endangered plant species, *Lomatium bradshawii*. Ecological Applications 9:1420-1429.

Potter, A. 2010. Monitoring Taylor's checkerspot butterfly in the Bald Hill landscape. September 27, 2010. Washington Department of Fish and Wildlife. 7 pp.

Pyle, R.M. 1981. National Audubon Society field guide to North American butterflies. Alfred A. Knopf, New York, New York. 924 pp.

Pyle, R.M. 2002. The Butterflies of Cascadia. Seattle Audubon Society. Print 420 pp.

Pyle, R.M. 2007. Noted Butterfly Expert. Personal Communication. Conversation with T. Thomas, Ecologist, USFWS, Lacey, Washington. RE: Butterfly surveys conducted by R. Pyle.

Ross, D. 2008. Population Estimates for Taylors' Checkerspot at Fitton Green and Beazell Memorial Forest. 7 pp.

Sauer, J.R., J.E. Hines, J.E. Fallon, K.L. Pardieck, D.J. Ziolkowski, Jr., and W.A. Link. 2012. The North American Breeding Bird Survey, Results and Analysis 1966 - 2009. Version 3.23.2011 USGS Patuxent Wildlife Research Center, Laurel, MD. < http://www.mbr-pwrc.usgs.gov/bbs/bbs.html >.

Schultz, C.B. 1995. Status of the Fender's blue butterfly (*Icaricia icarioides fenderi*) in Lane County, Oregon: a year of declines. Report to the Oregon Natural Heritage Program and US Fish and Wildlife Service.

Schultz, C. B. 1996. Status of the Fender's blue butterfly (*Icaricia icarioides fenderi*) in Lane County, Oregon: population ups and downs. US Fish and Wildlife Service Portland, Oregon.

Schultz, C. B. 1997. Planting butterfly seeds: An experiment in restoring habitat for the Fender's blue butterfly. Pp. 88-98 in T.N. Kaye, A. Liston, R. M. Love, D. L. Luoma, R. J. Meinke, and M. V. Wilson, eds. Conservation and Management of Native Plants and Fungi. Native Plant Society of Oregon, Corvallis, OR.

Schultz, C.B. 1998. Dispersal behavior and its implications for reserve design for a rare Oregon butterfly. Conservation Biology 12:284-292.

Schultz, C.B. and K. Dlugosch. 1999. Nectar and host plant scarcity limit populations of an endangered Oregon butterfly. Oecologia 119:231-238.

Schultz, C.B. and P.C. Hammond. 2003. Using population viability analysis to develop recovery criteria for endangered insects: case study of the Fender's blue butterfly. Conservation Biology 17:1372-1385.

Schultz, C.B., P.C. Hammond and M.V. Wilson. 2003. Biology of the Fender's blue butterfly (*Icaricia icarioides fenderi* Macy), an endangered species of western Oregon native prairies. Natural Areas Journal 23:61-71.

Severns, P.M. 2003. Inbreeding and small population size reduce seed set in a threatened and fragmented plant species *Lupinus sulphureus* ssp. *kincaidii* (Fabaceae). Biological Conservation 110:221-229.

Severns, P.M. and A. D. Warren. 2008. Selectively eliminating and conserving exotic plants to save an endangered butterfly from local extinction. Animal Conservation. Print ISSN 1367-9430

Severns, P.M. and Dan Grosboll. 2011. Patterns of reproduction in four Washington Statepopulations of Taylor's checkerspot (*Euphydryas editha taylori*) during the spring of 2010. Report to the Nature Conservancy

Shepard, J.H. 2000. Status of five butterflies and skippers in British Columbia. Wildlife Working Rept. No. WRB101. British Columbia Ministry of Environment, Victoria. 27 pp.

Stanley, A.G., T.N. Kaye & P.W. Dinwiddie. 2011a. Multiple treatment combinations and seed addition increase abundance and diversity of native plants in Pacific Northwest prairies. *Ecological Restoration* 29(1-2): 35-44.

Stanley, A.G., P.W. Dinwiddie & T.N. Kaye. 2011b. Restoring invaded Pacific Northwest prairies: Management recommendations from a region-wide experiment. *Northwest Sci*. 85(2):223 – 246.

Steeck, D. City of Eugene, pers. comm. to Nancy Sawtelle, BLM, via telephone, January 20, 2012;

Stinson, D.W. 2005. Washing State Status Report for the Mazama Pocket Gopher, Streaked Horn Lark, and Taylor's Checkerspot Butterfly. Washington Department of Fish and Wildlife, Olympia, WA. Pp129 + xii.

Taylor,T. City of Eugene, pers. comm. to Sally Villegas-Moore, BLM, via telephone, May 15, 2012

T. Taylor, City of Eugene, pers. comm. to Sally Villegas-Moore, BLM, via telephone, May 14, 2012

U.S. Bureau of Land Management (BLM) . 2008. BLM Manual 6840. U.S. Bur. Land Manage., Washington, DC.

U.S. Bureau of Land Management (BLM). 2011. *West Eugene Wetlands Threatened and Endangered Plant Augmentation Environmental Assessment (DOI-BLM-OR-E050-2011-0001-EA)*. U.S. Bur. Land Manage., Eugene District, Oregon. Available online: http://www.blm.gov/or/districts/eugene/plans/files/EA.pdf.

U.S. Bureau of Land Management (BLM). 2012. *West Eugene Wetlands Threatened and Endangered Plant Augmentation Decision Record (DOI-BLM-OR-E050-2011-0001-EA)*. U.S. Bur. Land Manage., Eugene District, Oregon. Available online: http://www.blm.gov/or/districts/eugene/plans/files/Decision.pdf.

U.S. Bureau of Land Management (BLM). 2014. Biological Assessment of theProposed Resource Management Plan for the West Eugene Wetlands In Lane County, Oregon. Eugene District BLM, Springfield Oregon

US Fish and Wildlife Service (USFWS) 2000. Endangered and Threatened Wildlife and Plants; Endangered status for *Erigeron decumbens* var. *decumbens* (Willamette daisy) and Fender's blue butterfly (*Icaricia icarioides fenderi*) and proposed threatened status for *Lupinus sulphureus* ssp. *kincaidii* (Kincaid's lupine). Federal Register 65:3875-3890.

U.S. Fish and Wildlife Service (USFWS). 2005. Biological opinion on the West Eugene Wetlands ten-year management plan (1-7-06-f-0038), dated December 8, 2005.

USFWS (US Fish and Wildlife Service). 2006a. Final Rule: Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for the Fender's Blue Butterfly (*Icaricia icarioides fenderi*), Lupinus sulphureus ssp. kincaidii (Kincaid's Lupine), and *Erigeron decumbens* var. *decumbens* (Willamette Daisy); final rule. Federal Register 71:63861-63977.

U.S. Fish and Wildlife Service (USFWS). 2008a. Programmatic intra-service section 7consultation for the issuance of permits for the collection of plant materials on federal lands for five listed species: *Castilleja levisecta* (golden paintbrush), *Erigeron decumbens* var. *decumbens* (Willamette daisy), *Lomatium bradshawii* (Bradshaw's lomatium), *Lupinus sulphureus* ssp. *kincaidii* (Kincaid's lupine) and *Sidalcea nelsoniana* (Nelson's checkermallow). U.S. Fish Wildl. Serv, Portland. Ref no. 13420-2008-F-0600.

U.S. Fish and Wildlife Service (USFWS). 2008b. Biological Opinion. Prairie conservation and restoration of federally-listed plants and insects on non-federal lands in the Willamette Valley and Douglas County, Oregon. Ref: 8330.F0072(08). U.S. Fish Wildlife Service., Portland, Oregon.

U.S. Fish and Wildlife Service (USFWS). 2008c. Programmatic Formal Consultation on Western Oregon Prairie Restoration Activities. Oregon Fish and Wildlife Office, Portland, Oregon. 54 pp.

U.S. Fish and Wildlife Service (USFWS). 2009. Bradshaw's Lomatium (Lomatium bradshawii) 5-Year Review Summary and Evaluation. 28 pages, Portland, OR.

U.S. Fish and Wildlife Service (USFWS). 2010. *Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington*.Region 1, Portland.

U.S. Fish and Wildlife Service (USFWS). 2011a. Willamette Valley National Wildlife Refuges Draft Comprehensive Conservation Plan and Environmental Assessment; Ankeny, Baskett Slough and William L. Finley National Wildlife Refuges. U.S. Fish Wildl. Serv., Corvallis, Oregon.

U.S. Fish and Wildlife Service (USFWS). 2011b. Biological Opinion, Fern Ridge Lake, U.S. Army Corps of Engineers management activities for rare plants and insects. Ref: 8330.F0214(11). U.S. Fish Wildl. Serv., Portland, Oregon.

U.S. Fish and Wildlife Service & National Marine Fisheries Service. 1998. *Endangered Species Consultation Handbook*. U.S. Fish Wildl. Serv. and Nat. Marine Fisheries Serv., Washington, DC.

Wahl, T., B. Tweit and S.G. Mlodinow. 2005. Birds of Washington: status and distribution. Oregon State University Press, Corvallis, OR. 436 pp.

Weiss, S.B., R.R White, D.D. Murphy & P.R. Ehrlich. 1987. Growth and Dispersal of Larvae of the Checkerspot Butterfly *Euphydryas editha*. *Oikos* 50(2):161 – 166.

Wilson, M. V., P. C. Hammond, and C. B. Schultz. 1997. The interdependence of native plants and Fender's blue butterfly. Pages 83-87 *in* T. N. Kaye, A. Liston, R.M. Love, D.L. Luoma, R.J. Meinke, and M.V. Wilson, eds. Conservation and Management of Native Plants and Fungi. Native Plant Society of Oregon. Corvallis.

Wilson, M.V., T. Erhart, P.C. Hammond, T.N. Kaye, K. Kuykendall, A. Liston, A.F. Robinson, Jr., C.B. Schultz, and P.M. Severns. 2003. Biology of Kincaid's lupine (*Lupinus sulphureus* spp. *kincaidii* [Smith] Phillips), a threatened species of western Oregon native prairies, USA. Natural Areas Journal 23(1):72-83.

York, M.M. 2002. Relationship between plant and butterfly community composition on upland prairies of the Willamette Valley, Oregon. Master of Science Thesis. Oregon State University, Corvallis. 107 pp.

.

APPENDIX A
WEST EUGENE WETLAND PLANT AND INVERTEBRATE MONITORING PLAN
UPDATE 12-18-2013






WEST EUGENE WETLANDS

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

TABLE OF CONTENTS

Plan Prepared By:

Sally Villegas-Moore
Nancy Sawtelle
Rick Colvin
Eugene District
Bureau of Land Management
Eugene, Oregon

Thomas N. Kaye
Andrea S. Thorpe
Institute for Applied Ecology
563 SW Jefferson Ave.
Corvallis, Oregon
www.appliedeco.org

2010 - 2013 Plan Revision and Update By:

Olivia Duren
Katie MacKendrick
Sally Villegas-Moore
Christine Williams

Acknowledgments:

Many people contributed to this monitoring plan. The West Eugene Wetlands Partners and others met as a group on several occasions to discuss this plan and provide substantial input. We wish to thank Jean Jancaitis, Wes Messinger, Jason Nuckols, Greg Fitzpatrick, Allison Aldous, Carol Apple, Chuck Fairchild, and Sam Friedman for making comments and helpful suggestions on an earlier draft that substantially improved this plan.

1. INTRODUCTION

1.1 Background

The West Eugene Wetlands (WEW) Project is a cooperative venture by the Bureau of Land Management (BLM), Eugene District, and others to protect and restore wetland ecosystems in the southern Willamette Valley of Oregon. This unique program involves a partnership of federal, state, and local agencies and organizations to manage lands and resources in an urban area for multiple public benefits. The eight partners in the WEW Project are the BLM, City of Eugene, The Nature Conservancy (TNC), Oregon Youth Conservation Corps, U.S. Army Corps of Engineers (ACOE), U.S. Fish and Wildlife Service (USFWS), McKenzie River Trust, and Willamette Resources and Educational Network. The BLM became an active partner in 1993 when it adopted the WEW Plan (City of Eugene 2000). The BLM has been involved with its partners in land acquisition, restoration, enhancement, and maintenance of approximately 2,800 acres in the West Eugene area.

In 2005 BLM developed a long-term (10 year) land management implementation schedule for its parcels within the West Eugene Wetlands Project area. This 10 year Environmental Assessment Schedule (hereafter the EA), outlines targets for habitat conditions and provides guidance on the priority of work for the maintenance, enhancement, and restoration projects. There are three levels of priority of work, and funding can be allocated as available, according to project priority. Priority levels are coded with colors: red indicates the high priority, blue means medium, and green is low.

Within the EA, each parcel will be monitored to meet four habitat management targets. In general, these habitat targets include the following: (1) prevent woody vegetation encroachment, (2) prevent invasive plant spread, (3) prevent litter and thatch build up, and (4) maintain existing levels of native plant species diversity. When monitoring indicates that these targets are not being met based on the established thresholds, management actions may be triggered (further outlined in the EA NO. 0R090-0503, Alternative D, pages 58-61).

These EA targets for habitat conditions do not specifically describe monitoring methods or protocols, or assesses the effectiveness of specific treatments in great detail for the four federally listed species and the various habitats in the wetlands project area. The EA specifies that the same actions be taken for the plant community and rare plant species in all habitat classes.

1.2 Goal and Need

The goal of this document is to develop an adaptive monitoring plan for BLM lands within the WEW that is comprehensive, cost effective, and defensible, that assesses the effectiveness of treatments, indicates overall trends in targeted Special Status Species and habitats, and that can be accomplished efficiently by utilizing the expertise and resources within the West Eugene Wetlands Partnership. This plan will allow BLM and its partners to better manage the habitats and plant communities found in the WEW to meet the following specific needs:

1. Provide early warnings of abnormal conditions in time to develop effective mitigation measures and document long-term trends in habitat quality.
2. Document Special Status Species population and habitat trends.
3. Reduce redundancies in coordination, planning, and funding efforts among partners for these rare communities.
4. Inform BLM and partners of the effectiveness of management treatments.

1.3 WEW Partnership Coordination

Every two years starting in 2008 the WEW Partnership will jointly review progress toward meeting the USFWS Recovery Goals for listed species in the area. BLM, ACOE, and TNC together manage the largest populations of four federally listed threatened and endangered species in Oregon and these populations will contribute substantially toward meeting recovery goals in the Eugene West Recovery Zone, one of 10 zones identified in the Recovery Plan. These species include Fender's blue butterfly, Kincaid's lupine, Willamette daisy, and Bradshaw's lomatium.

1.4 Scope

1.4.1 Geographic Scope

This document applies to lands managed by the Eugene District, Bureau of Land Management, within the West Eugene Wetlands (Figure 1). It is also intended to support and be consistent with other monitoring tasks performed by the wider West Eugene Wetlands Partnership where possible.

1.4.2 2013 Update

The monitoring methods and techniques described in the initial Monitoring Plan were employed and evaluated during a two-year trial period intended to fine-tune and prove their effectiveness. The methods, which vary across sites and species, were evaluated to confirm that they can meet the goals and objectives of this plan. In part, the 2013 Monitoring Plan update provides an opportunity to synthesize and incorporate the refined monitoring methods into the plan. In addition, it provides opportunity to incorporate species recovery and habitat standards outlined in the USFWS (2010) *Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington*. As new management lessons, conditions, standards, and guidelines emerge in the coming years, monitoring methods and techniques may need to be adapted. Thus, the monitoring methods will require continual evaluation and refinement to ensure that they meet plan goals and objectives, and the plan may be updated as needed to reflect adaptation.

1.4.2 Duration

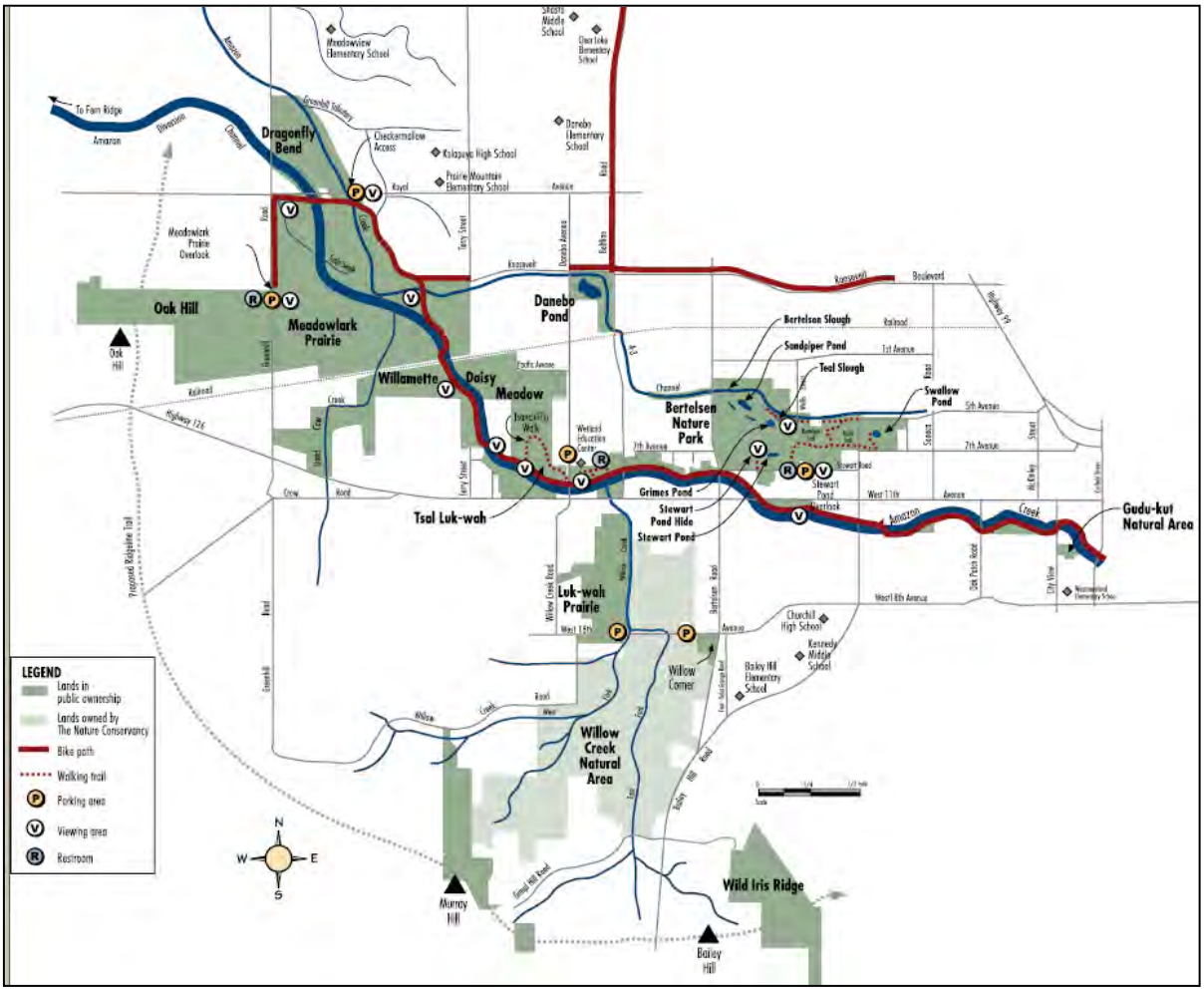
This plan is intended to be in place for 10 years, with an expectation of renewal each decade. Review and update will occur on a three-year schedule (2013, 2016, 2019) with input from the WEW Partnership, or as needed and as time and resources permit.

1.4.3 Special Status Species

This monitoring plan addresses 13 Special Status Species:

- Fender's blue butterfly (*Icaricia icarioides fenderi*), Endangered
- Kincaid's lupine (*Lupinus oreganus),* Threatened
- Willamette daisy (*Erigeron decumbens*), Endangered
- Bradshaw's lomatium (*Lomatium bradshawii*), Threatened
- White-topped aster (*Sericocarpus rigidus* [=*Aster curtus*]), Species of Concern
- Shaggy horkelia (*Horkelia congesta*), Species of Concern
- Thin-leaved peavine (*Lathyrus holochlorus*), Species of Concern
- Meadow checker-mallow (*Sidalcea campestris)*, Bureau Sensitive Species
- Clustered goldenweed *(Pyrrocoma racemosa var. racemosa)*, Bureau Sensitive
- Hitchcock's blue-eyed grass (*Sisyrinchium hitchcockii*), Species of Concern
- Bruchia moss (*Bruchia flexuosa*), Bureau Sensitive Species
- Ephemerum moss (*Ephemerum crassinervium*). Bureau Sensitive Species
- Serrate ephemerum moss (*Ephemerum serratum*), Bureau Sensitive Species

Figure 1. The West Eugene Wetland area as managed by the Partnership.



1.5 Conformances with Land Use Plans

This WEW Monitoring Plan is consistent with the WEW Plan (City of Eugene 1992, 2000) and the BLM, Eugene District RMP, ROD (1995) as amended.

The BLM, Eugene District, adopted the WEW Plan for land management on BLM lands within the WEW on March 23, 1993. This plan was revised, and BLM adopted the revision (City of Eugene, 2000) on September 17, 2001. For actions within the WEW, the alternatives considered in the EA are consistent with the WEW Plan. For actions within the Long Tom ACEC, the alternatives comply with the BLM, Eugene District RMP, ROD (1995) as amended. See Appendix A for a summary of the needs and requirements of the EA.

A biological opinion resulting from formal and informal consultation with the U.S. Fish and Wildlife Service over the WEW EA addresses effects of the proposed actions for maintenance, enhancement, and restoration activities for four species listed as endangered or threatened (Fender's blue butterfly, Kincaid's lupine, Willamette daisy, and Bradshaw's lomatium) by the USFWS (WEW BO 120205 Dec. 08, 2005).

1.6 Other Important Documents and Programs

1.6.1 Critical Habitat, Recovery Plan and BLM Policy

The USFWS has designated critical habitat for three prairie species: Fender's blue butterfly, Kincaid's lupine, and Willamette daisy which include some BLM WEW parcels (71 FR 63861, October 31, 2006). The USFWS has also issued a Recovery Plan for Prairies Species of Western Oregon and Southwestern Washington (2010). The 2010 Recovery Plan sets clear recovery goals and habitat standards for one threatened butterfly, one threatened plant, and two endangered plant species that occur in the WEW. It also provides conservation considerations for one candidate butterfly and four plant species of conservation concern.

1.6.2 City of Eugene Mitigation Bank Program

The Mitigation Bank is operated by the City of Eugene Public Works Department. Its goals are to implement wetland mitigation projects in compliance with the West Eugene Wetlands Plan and serve other community needs in cooperation with the City's wetland partners. Following a logical and integrated plan of wetland restoration, the Bank manages a program that maintains a viable, contiguous wetland system within the southern Willamette Valley.

The Mitigation Bank program has restored and plans to continue restoring and enhancing BLM parcels for mitigation credit within the WEW. Mitigation Bank projects undertaken on BLM land are monitored and managed by the City during a five year monitoring period (Memorandum of Agreement No. 95 – 00266). After a project meets the specified performance standards, BLM management of the land resumes and monitoring of the land should follow BLM WEW Monitoring Plan guidance.

1.7 Biological Resources

Many of the 22 sites managed by the BLM in the WEW contain multiple habitat types (wetland, vernal/emergent, upland, oak, riparian, Douglas-fir) and Special Status Species. See the EA for a complete description of these biological resources and Appendix B for lists of sites and local Special Status Species populations.

The Emerald Chapter, Native Plant Society of Oregon (2009) and the Oregon Biodiversity Information Center (formerly the Oregon Natural Heritage Information Center) (2010) list 24 vascular plant, three nonvascular plant, and one invertebrate species found in the West Eugene Wetlands as rare or uncommon. Thirteen of these species have a BLM designation; nine have federal or state protected status, including four species listed as endangered or threatened by the USFWS. Appendix B Table B3 lists these species. The USFWS Recovery Plan for Prairie Species of Western Oregon and Southwestern Washington (2010) provides biological information, including life history, phenology, reproductive biology, distribution, habitat characteristics, management conflicts or needs, and threats for the four federally listed species.

1.8 Adaptive Management

The monitoring actions described in this document play a central role in management of habitats in the West Eugene Wetlands. Figure 2 illustrates how monitoring can be used to inform management, help direct actions to achieve goals, and learn from on-going habitat treatments.

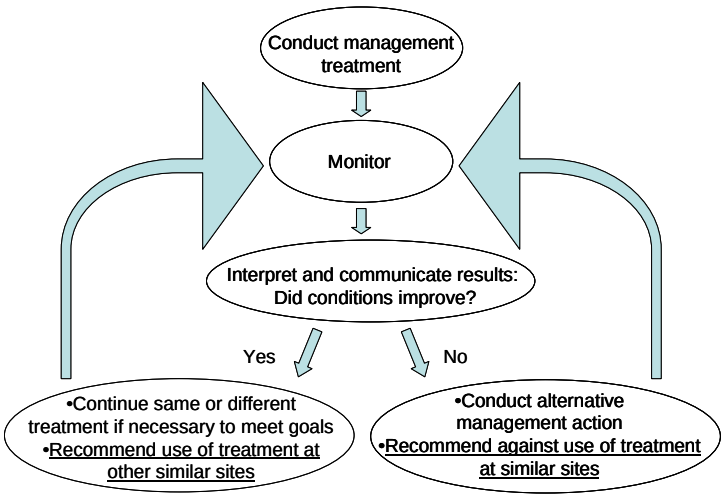


Figure 2. The role of monitoring in adaptive management of the West Eugene Wetlands.

As management treatments are applied, monitoring is conducted, and then the results are interpreted. If conditions at the site improve, additional use of the treatment at the site may be advisable, if needed to achieve local habitat goals. However, no additional action or a different treatment might be necessary. For example, burning may reduce thatch accumulation, but follow-up mowing and seeding may be deemed necessary to meet weed reduction and native species diversity goals. In addition, if the treatment works well, it may be recommended for use at other sites with similar existing conditions. Either way, monitoring at the site continues.

If conditions at the site worsen as a result of the treatment, an alternative management action may be conducted, and the result monitored and interpreted. The failing treatment may also be

discontinued or used only under different site conditions where it assists in achieving site-specific goals.

2. MONITORING

Monitoring in the West Eugene Wetlands addresses habitat conditions as well as Special Status Species populations, and each type of monitoring has its own set of objectives and methods. The two types of monitoring overlap where Special Status Species occur because information on populations *and* their habitat conditions are needed to meet monitoring objectives at sites with protected species. Monitoring and sampling objectives for habitat and Special Status Species monitoring are summarized in Table 3.

2.1 Habitat Monitoring Goals, Objectives and Approach

The goals of habitat monitoring are to determine a) if management actions are necessary and, if implemented, did they have their intended effects, and b) determine long-term trends in habitat quality. To meet both of these goals, monitoring shall document the abundance of each of the following indicators of habitat quality (from the WEW Schedule EA):

1. woody vegetation
2. invasive plants
3. thatch and vegetative litter
4. native plant species (abundance and diversity)

These habitat indicators are identified in the EA and were selected to determine when management actions are necessary to restore or maintain habitat quality. For each of the habitat indicators listed above, specific thresholds have been set beyond which management is triggered (Table 1). Information on habitats obtained from monitoring guides short and long-term decisions about habitat management at BLM-managed sites within the WEW. Over the long-term, trends in these indicators document the cumulative changes in habitat quality as a result of management or natural processes. Other indicators of habitat quality could also be measured, such as hydrology (seasonal duration of soil saturation and fluctuation in ground water), but these need additional planning and implementation (e.g., establishment of water wells) and are not discussed further here. Inclusion of them will require amendment of this plan. Examples of habitat management actions and treatments available in the WEW are listed in Table 2.

The approach to habitat monitoring in the WEW employs two levels of monitoring intensity, a frequent, low intensity method and a less frequent, high intensity method. Low intensity monitoring is rapid and provides information to assess current management needs. High intensity monitoring is more detailed and measures management treatment effectiveness and documents site-wide trends in habitat quality. In addition to low and high intensity habitat monitoring invasive weeds are also monitored and mapped. Altogether, these monitoring methods meet the habitat monitoring goals of this plan.

2.1.1 Low Intensity Monitoring

Low intensity monitoring is conducted every three years at all sites to measure the four habitat indicators listed above (woody plants, invasive species, litter/thatch, and native plants). It relies on the random or non-random placement of a small number of sample plots within each habitat type of each site and can be accomplished quickly by one or two people. Several plots are placed at each site. Plot size varies according to habitat type and variable measured, and the characteristics of each indicator are measured by visual estimation and recorded on data sheets. Protocols for this type of ocular monitoring follow Villegas-Moore (2006), are consistent with meeting the objectives of the Ten Year EA, and are included in Appendix C. Information from this monitoring is used to determine if maintenance treatments and/or small scale management treatments are needed in a specific area. Additionally this rapid assessment method can capture general habitat trends efficiently and allow managers to evaluate an upward or downward trend of habitat conditions. It is intended for coarse data gathering only, and is not designed to provide the detail nor statistical rigor of quantitative monitoring (See Appendix I for a detailed monitoring schedule).

2.1.2 High Intensity Monitoring

High intensity monitoring is conducted to thoroughly document baseline conditions prior to management actions, site-wide trends in habitats, and responses to management actions. It is applied regularly on a three-year schedule at all red (priority 1) sites. More information is gathered with this method and it requires more field time than the low intensity method. Information from this monitoring is then used to assess the effectiveness of management and measure responses in terms of the thresholds outlined in the EA, BO and Recovery Plan. High intensity monitoring is based on point-intercept (for ground cover and open areas) and line-intercept (for woody and forested vegetation) methods, which are described in detail in Appendix D. It measures the effects of management treatments in a defensible and repeatable manner and allows managers to determine if site specific objectives have been met. Point-intercept monitoring plots, which are the most common given the typical vegetation at most sites, are placed at a rate of 1-2 per 10 acres of habitat, and generally take half a day to complete with a team of 2-3 people.

To spread the work load among years, each site is monitored every three years, but only a third of the sites are monitored in any given year. Appendix I provides a schedule of low and high intensity monitoring for all sites and habitats for 2007 through 2018. This schedule, which is based on the frequencies of monitoring described above, allows for a predictable work load to facilitate planning. The work load is likely to be heaviest during the first three years of monitoring while plots are established and baseline data are acquired.

2.1.2.1 Sampling objectives for high intensity monitoring

The sampling objectives for high intensity habitat monitoring are to estimate the percentage cover of target vegetation components (i.e., woody vegetation, invasive species, thatch and litter, and native plants) within the macroplots to within ±25% of the true mean abundance with 90% confidence. Comparisons between sampling events should detect at least a 30% change with statistical power of 80% (a 20% missed change error rate).

2.1.3 USFWS Recovery Plan Habitat Evaluation Criteria

The USFWS *Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington* (2010) states in addition to monitoring listed species, each population site must be managed to achieve prairie quality recovery goals. Appendix D of the Recovery Plan (USFWS 2010) offers additional criteria to evaluate prairie quality within degraded native prairie sites managed for the recovery of listed plant species. These criteria follow; Appendix H describes them in greater detail:

a. Relative cover of native vegetation 50% or more*
b. Woody vegetation less than 15% of absolute vegetation cover; woody species of management concern less than 5% (or less than 25% for savanna habitat)
c. Based on 25 1m^2 plots, native prairie species richness exceeds 10 species (7 or more forbs, one bunch grass)
d. All non-native species less than 50% cover; non-natives of particular concern less than 5% cover**

*USFWS suggests calculating relative cover by adding cover values for each individual native prairie species and dividing by the total cover value for all species present at the site; requires recording cover values for all native and non-native species

** The presence of non-natives of particular concern or other invasive species would disqualify a site from contributing to recovery goals unless they are managed aggressively to maintain less than 5 percent cover.

In 2013 the monitoring crew began using the above criteria to evaluate low intensity habitat data collected. In the future the above criteria should be used to evaluate habitat quality and determine what management activities if any should be implemented in the future.

The USFWS (2010) also offers additional criteria to evaluate prairie quality within sites managed for the recovery of Fender's blue butterfly, sites requiring resources for adult and larval Fender's. These criteria follow and are described in more detail, including native nectar species, in Appendix H.

a. Sufficient nectar flower abundance (at minimum 20 mg nectar sugar/m^2 of habitat) and diversity (at minimum 5 native nectar species)
b. At minimum 30 host lupine plant leaves/m^2 of habitat for FBB breeding sites
c. Available nectar plants throughout entire pollinator flight season (March-September each year)

2.1.4 Invasive species monitoring

Another part of habitat monitoring is invasive species monitoring which includes weed mapping, as well as tracking weed treatments when they occur. Invasive species monitoring is conducted to monitor changes in habitat conditions and ensure actions are taken when conditions reach or exceed the management thresholds outlined in the EA regarding invasive and woody vegetation. The priority invasive plant species mapped include species targeted in past management in the West Eugene Wetlands and species on the Oregon Department of Agriculture noxious weeds list. In addition to non-native invasive species, the list includes several native trees and shrubs in order to track their encroachment into wet and upland prairies. Methods for invasive species mapping are described in detail in (see Appendix G for more details on mapping invasives). With access to new technology, the methods used for invasive species mapping may evolve and this plan may be updated to reflect any changes.

To map the spread and density of invasive species, species lists are recorded and invasive species (woody, grass, and forb species) are mapped on all BLM lands in the WEW. The schedule for invasive species mapping varies based on site priority, T & E presence and management treatments. Invasive species are mapped at all priority 1 (red) habitats containing T&E species every two to three years; however, highly invasive species may be monitored more frequently. Lower priority habitats are mapped every three to five years. Sites scheduled to receive management treatments are also mapped the years preceding and proceeding treatment, as is necessary and as funding allows. Appendix I provides a detailed monitoring schedule for invasive species mapping.

2.1.5 Timing

The optimum time for monitoring all habitats covered in this plan is during the peak of the growing season which can be anytime from April through July. This peak can vary from year to year, species to species, or site to site so each year monitoring times may be different.

Table 1. Monitoring indicators and corresponding thresholds of management actions from the Environmental Assessment (further outlined in the EA, Alternative D, pages 58-61; see also Appendix A) as well as from the USFWS Recovery Plan for the prairie species of Western Oregon and Southwestern Washington 2010 (Appendix D pages D1-D4)

Habitat Indicator	WEW E.A. Thresholds	USFWS 2010 Recovery Goals - Assessment of prairie quality and diversity
Native vegetation and diversity.	-When there is a loss of 5%-10% of a site's existing cover and number of native plant species.	-Relative cover of natives 50% or more -Must exceed 10 species (measured in 25- m2 plots) of which 7 must be forbs and one a bunch grass.
Woody vegetation	-When canopy cover exceeds the level appropriate for the local habitat type (see Appendix A) - 5-10% for wet-prairie/vernal pool and upland prairie habitats	-Absolute cover no more than 15% -Woody species of management concern no more than 5%
Non-natives	-When combined encroachment reaches 10%-35% or greater of the habitat block -A weed population covers >50% of a 1m2 area, depending on site conditions and species present	-No single plant species will have more than 50% cover. -Non-natives of particular management concern no greater than 5%
Litter & Thatch	-When the litter layer exceeds 10-20% cover and litter layer is detrimentally impacting native forb plant diversity or rare plant habitat	-Not addressed quantitatively

Table 2. Types of management actions and treatments permitted in the West Eugene Wetlands under the EA and BO, with restrictions for use in habitats containing federally listed Threatened or Endangered species.

Treatment	Listed Species Present
Carbon addition	not allowed
Chainsaws/Thinning	permitted
Biosolid Treatments	not allowed
Fill removal	not allowed
Livestock grazing	permitted
Girdling trees	permitted
Grind tree stumps	permitted
Manual Weed Removal (hoeing, grubbing, pulling, clipping)	permitted
Mowing	permitted
Mycorrhizae addition	not allowed
Planting propagules/Seeding	permitted
Prescribed burning	permitted
Raking	permitted
Seeding	permitted
Shade cloth	permitted
Sod rolling	not allowed
Solarization	permitted
Spot tilling	not allowed
Thermal (flame weeder, hot foam, propane)	Permitted
Tilling	not allowed
Weed whacking	Permitted

Table 3. Summary of habitat and Special Status Species monitoring and sampling objectives, methods and frequencies in the West Eugene Wetlands.

	Monitoring objectives	Sampling objectives	Method	Frequency
Habitat monitoring				
Low intensity	>Estimate percent cover of woody vegetation, invasive species, litter/thatch, and native plants. >Document need for management treatments.	>Provide rough estimate of cover values throughout each habitat type.	>Small plots placed arbitrarily throughout each habitat type.	>Every three years, staggered with high intensity, and invasives mapping
High intensity	>Same as above, plus: >Document trends and effects of management treatments.	>Estimate cover to within +25% of true value with 90% confidence. >Detect changes of at least 30% with 80% power.	>Point-intercept for herbaceous vegetation. >Line-intercept for woody vegetation.	>Every three years
Special Status Species monitoring				
Bradshaw's lomatium, Willamette daisy, Kincaid's lupine	>Determine population sizes and trends at each site, and response to habitat treatments. >Document habitat quality (handled above under habitat monitoring).	>Estimate abundance to within 20% of the true mean with 90% confidence. >Detect at least 20% change with 80% power.	>Census or subsample; varies with site	>Annual
Fender's blue butterfly	>Same as above.	>Same as above.	>Distance sampling, peak count, or presence absence survey depending on site	>Annual
White top aster, shaggy horkelia, thin-leaved peavine, meadow checker-mallow, clustered goldenweed, Hitchcock's blue-eyed grass, rare mosses.	>Same as above.	>Same as above.	>Census; may vary with site	>Every three years

2.2 Special Status Species Monitoring Goals, Objectives and Approach

The goals for federally listed Special Status Species are outlined in a summary of Recovery Objectives (Table 4) and include measurement of population size, trend, and habitat quality, as well as connectivity, site security and threat abatement. Federally listed species are monitored in compliance with the Oregon/Washington BLM Special Status Species policy, which calls for monitoring to evaluate the effects of management actions on these species. Thresholds of species changes that are relevant to management are described below in section 2.2.1.

Protocols for monitoring Special Status Species populations in the WEW vary among species and sites (see below and Appendix E). Monitoring methods for plant species fall into two categories, population census and subsample (with extrapolation to the whole population). In most cases, populations of plant species on BLM-managed lands are relatively small (<100 individuals). Population census techniques are employed in these small populations. Census techniques generally rely on the placement of macroplots that surround most if not all plants in a patch or population. More than one macroplot is needed at many sites to capture all of the individuals. The macroplots are subdivided into 1 m^2 sections, and the individuals in each section are counted and measured. For clonal species (Kincaid's lupine and white-topped aster), vegetative cover is measured in lieu of number of plants because individuals are difficult to distinguish. Subsample methods use numerous randomly placed plots to sample the species of interest and extrapolate to the entire population. Subsample methods are currently in use at two populations on BLM-managed lands in the WEW, including Kincaid's lupine at Fir Butte, and Willamette daisy at Oxbow West. Subsampling may also be employed in future monitoring efforts for Willamette daisy at the Speedway site.

Monitoring for Fender's blue butterfly is based on distance sampling, peak counts, or presence absence surveys, these methods were developed by the USFWS to synchronize monitoring methods for this species throughout the valley. Currently data collection is done by BLM/WEW staff and the data sent to USFWS personnel for final population numbers, Habitat monitoring in Special Status Species populations is conducted according to the low and high intensity habitat monitoring protocols in Appendices C and D. As methods are revised and developed, respectively, this plan can be amended to include the most up to date techniques.

2.2.1 Management Thresholds for Special Status Species:

- If a species population declines more than 20% in response to a management treatment (or lack thereof), reasons for the decline will be evaluated and use of that treatment method in populations of that species will be re-assessed. For Willamette daisy, if a population falls below 20 individuals, the potential to reintroduce additional individuals of the species to the site will be evaluated and implemented if appropriate.

- For plants, if monitoring shows that a population has fewer than 200 flowering individuals for Willamette daisy, Bradshaw's lomatium, and shaggy horkelia, or 60 m^2 vegetative cover for Kincaid's lupine and 10m^2 for white-topped aster (the minimum size to contribute to a recovered metapopulation for the species), management actions should be implemented to increase the number of reproductive or vegetative plants. For Fender's blue butterfly, management actions should be implemented if a local population has fewer than 300 adults.

- If the five year population trend for any special status sensitive plant population shows a significant decline as measured by a negative slope of the regression line of population size vs. years, management actions should be implemented to increase the population growth rate sufficiently to cause the population to be stable or increasing. Management actions will be triggered for Fender's blue butterfly populations if their population growth rate is less than 1.1 and/or variance greater than 0.25.

- If a local population does not show evidence of reproduction, management actions shall be implemented to promote flowering, seed production, and/or seedling recruitment.

2.1.2.1 Sampling objectives for Special Status Species populations

Where Special Status Species populations are sampled rather than counted through a census, the sampling objectives are to estimate their abundance at each site to within 20% of the true mean abundance with 90% confidence. Comparisons between sampling events should detect at least a 20% change with statistical power of 80% (a 20% missed change error rate).

2.2.2 Timing and Frequency

Dates and phenology: The optimum time for monitoring all of the plant species in this plan is during peak flowering. This phenological stage differs among the species so that monitoring-time needs to be adjusted for each (Table 5). For example, Bradshaw's lomatium blooms earlier than the others, typically from mid-April through May. White-topped aster blooms latest, normally in July and August. Also, peak flowering for each of these species can vary from year to year and site to site, so that adjustments to this schedule may be necessary on a case by case basis.

Frequency: Monitoring for federally listed species is conducted annually, while Bureau Sensitive Species are monitored every three years. Low intensity habitat monitoring is conducted annually at all Special Status Species locations, when time and funding allow. High intensity habitat monitoring will be conducted at three year intervals at the same time standard habitat monitoring for that site is completed.

Appendix I provides a monitoring schedule for all Special Status Species at each site for 2007 through 2018.

Table 4. Summary of downlisting and delisting criteria (USFWS 2010). The plan specifies criteria for downlisting and delisting Fender's blue, Willamette daisy, and Bradshaw's lomatium, and delisting Kincaid's lupine. For downlisting, the plan calls for 3 populations (15,000 total plants) for Bradshaw's lomatium and Willamette daisy within the Eugene West Recovery Zone; and either two functioning networks (200 butterflies minimum) or one functioning network and two independent populations for Fender's blue butterfly in the Eugene Recovery Zone (Eugene East + Eugene West). For delisting, it calls for 3 populations (7,500 m^2 foliar cover) for Kincaid's lupine within the Eugene West Recovery Zone.

Downlisting and Delisting Fender's Blue Butterfly		
	Downlisting from Endangered to Threatened	**Delisting from Threatened**
Distribution and abundance	• For at least 10 years, 1 functioning network: min. 200 butterflies distributed among 3 subpopulations • Additional functioning network or 2 independent populations: butterflies present each year	• Each recovery zone (3) with functioning networks and/or independent populations, probability of persistence is 95% over the coming 100 years; min. number of butterflies every year for 10 consecutive years
Size of each population network (group of local populations with connectivity)	• 200 butterflies min. per functioning population network (distributed among 3 subpopulations) OR 200 butterflies among 2 independent populations (90% probability of persistence for 25 years)	• e.g. 2 functioning networks and 2 independent populations per recovery zone require 1,000 and 1,000 butterflies (per FN and IP) every year for 10 consecutive years.
Habitat quality and management	• Sites managed for high quality prairie habitat – includes: o diverse native forbs o nectar plants in bloom March-September, o low frequency woodies, aggressive non-natives o nest sites, food plants for native pollinators o host plant species (*Lupinus albicaulis*, *L.oreganus*, L. *arbustus*)	• See downlisting
Security of habitat	• Substantial portion of habitat managed/owned by government agency or private conservation org. • Primary site management objective is maintenance of FBB and prairie habitat	• See downlisting
Management, monitoring, and control of threats	• Each population site or stepping stone patch managed for high quality prairie • Use of herbicides, mowing, burning, or livestock grazing timed to avoid impacts to FBB, nectar and host plants • Management coordinated with adjacent land owners • Potential threats managed • Individual management and monitoring plans developed for each population, USFWS approved o includes management responses to population declines o includes actions to protect habitat heterogeneity within protected sites and across elevation and aspect (as means to buffer climate change effects)	• See downlisting

Downlisting and Delisting Willamette daisy and Bradshaw's lomatium, and Delisting Kincaid's lupine		
	Downlisting from Endangered to Threatened	**Delisting from Threatened**
Distribution and abundance	• As is practicable, population distribution reflects historical geographic range • Subpopulations exist within pollinator flight range (3 km or 2 mi.)	• See downlisting
Size of each population network (group of local populations with connectivity)	• ERDED – Eugene West: minimum 3 populations, 15,000 plants • LOBR – Eugene West: minimum 3 populations, 15,000 plants	• ERDED – Eugene West: minimum 3 populations, 15,000 plants • LOBR – Eugene West: minimum 3 populations, 15,000 plants • LUSUK – Eugene West: minimum 3 populations, 7,500 m^2 foliar cover
Population trend and evidence of reproduction	• Number of individuals is stable or increasing over at least 10 years; trend must not be declining given natural year-to-year variability • Populations show evidence of reproduction, seed set or seedlings present	• Number of individuals in population (area foliar cover for Kincaid's lupine) stable or increasing for 15 years; trend must not be declining given natural year-to-year variability • Populations show evidence of reproduction, seed set or seedlings present
Habitat quality and management	• Sites managed for high quality prairie habitat – includes: o diverse native forbs o low frequency of aggressive non-native plant species and encroaching woody species. o nest sites, food plants for native pollinators	• See downlisting
Security of habitat	• Substantial portion of habitat managed/owned by government agency or private conservation org. • Primary site management objective is maintenance of FBB and prairie habitat	• See downlisting
Management, monitoring, and control of threats	• Each population managed for high quality prairie • Use of herbicides, mowing, burning, and livestock grazing timed to avoid impacts to listed plants • Management coordinated with adjacent land owners • Potential threats managed • Individual management and monitoring plans developed for each population, USFWS approved o includes standardized monitoring and performance criteria to assess effectiveness and allow for adaptive management o includes actions to protect habitat heterogeneity within protected sites and across elevation and aspect (as means to buffer climate change effects)	• See downlisting • Species capable of hybridizing with Kincaid's lupine should be managed to avoid contact

Table 5. Recommended sampling period and frequency for each of the 13 Special Status Species included in this plan (listed in order of priority, frequency and timing).

Species	Recommended sampling period	Frequency
Bradshaw's lomatium	mid April through May	Annual
Kincaid's lupine	late May through June	Annual
Fender's blue	early May through early June	Adults: Annual
Willamette daisy	June through early July	Annual
Thin-leaved peavine	late May through June	Every three years*
Meadow checker-mallow	June through early July	Every three years*
White-topped aster	July and August	Every three years*
Clustered goldenweed	July through August	Every three years*
Shaggy horkelia	July through August	Every three years*
Hitchcock's blue-eyed grass	May through July	Every three years*
Bruchia moss	April through May	Every three years*
Ephemerum moss	April through May	Every three years*
Serrate ephemerum moss	April through May	Every three years*

*If management treatments are applied, monitoring is conducted before application and for the following two years; after that, the three year cycle is resumed.

2.2.3 Federally Listed Species and Site Specific Monitoring

2.2.2.1 Willamette daisy (*Erigeron decumbens* var. *decumbens)*

Recommended monitoring: Minimum monitoring requirements for this species include number of individuals and flower heads (capitula) produced per plant (see Appendix E for more details on site specific needs for this species). Table 6 lists the sites and methods the BLM uses to monitor Willamette daisy within the WEW.

Table 6. Monitored populations of Willamette daisy and associated methods and purposes on BLM lands in the WEW.

Site	Method	Purpose
Balboa	Census	Trend monitoring
Balboa (introduced*)	Census	Trend monitoring
Greenhill (Ash Swale)	Census	Trend monitoring
Greenhill (introduced*)	Census	Trend monitoring
Oxbow West	Sub-sample	Trend monitoring
Speedway	Census	Trend monitoring
Vinci	Census	Trend monitoring

*introduced means species was planted or seeded at the site

Rationale: Willamette daisy is a perennial plant that reproduces by seed only. Individual plants can usually be distinguished from one another in the field, so counting all plants in a population or those in sample plots is an effective method of determining population size. In some cases, plants can grow very close to each other, making it difficult to determine if two clumps are actually one plant or two. Field investigators have developed a distance-based rule for consistently treating closely spaced plants such that if it is unclear if two adjacent clumps are united underground, they are assumed to be distinct individuals if they are

separated by 7 cm or more, and each is measured independently. Clumps closer than 7 cm are assumed to be part of the same plant (Kaye and Benfield 2005a).

Reproductive status is an important measure of plant performance. Plants can easily be categorized as reproductive or not based on the presence of flowers. The flowers of Willamette daisy are clustered in heads known as capitula, with both disc and ray flowers. Even if no flowers on a plant produce seeds in a given year, that plant can still be considered reproductive because it produces pollen that may be moved around by insects from one plant to another, thus contributing to sexual reproduction in the population. Insect mediated cross-pollination appears to be necessary in Willamette daisy because the species is self-incompatible. Further, the number of flowering plants in a population of this species may be crucial to successful reproduction because populations with fewer than twenty individuals appear to suffer a high rate of reproductive failure (Thorpe, Kaye and Guitaud 2007).

Plant size and fecundity are also considered good measures of population vigor. For Willamette daisy, plant size is typically measured as elliptical crown cover and height, and fecundity as number of flower heads produced. Crown cover and height measurements were measured from 1999-2007 as part of a research study aimed at investigating the effects of different management treatments on this species, but were abandoned in 2008. Crown cover was determined by measuring the diameter of the leaf rosette in the widest dimension as well as the dimension perpendicular to that and calculating as follows (Kaye and Benfield 2005a):

Elliptical crown cover = (½ *widest diameter) * (½*perpendicular diameter) * π

Crown cover is a useful measure for comparing management treatments. Fecundity is measured simply by counting the number of flower heads per plant. This may not fully quantify seed production in any given year, but counting viable seeds in this species is time consuming and costly, and flower production is a suitable index of reproduction potential in any given year. Inspecting plants for flowers is also used for determining if an individual plant is reproductive.

These measures of population health can be used to track trends in populations of this species, and they can also be used to compare the effects of various management treatments for maintaining and improving habitat, such as mowing and burning. (See Appendix E for more details on site specific monitoring needs for this species)

2.2.2.2 Bradshaw's lomatium (Lomatium bradshawii)

Recommended Monitoring: Minimum monitoring requirements for this species include number of individuals in vegetative and reproductive size classes. For general monitoring purposes that track population trends and responses to management treatments (not involving an experimental design), it is sufficient to count all individuals into six size classes: vegetative with 1, 2, and more than 3 leaves, reproductive with one, two, and more than 3 umbels (see Appendix E for more details on site specific monitoring needs for this species). Table 7 lists the sites and methods the BLM uses to monitor Bradshaw's lomatium within the WEW.

Table 7. Monitored populations of Bradshaw's lomatium and associated methods and purposes on BLM lands in the WEW.

Site	Method	Purpose
Balboa (introduced*)	Census	Trend monitoring
Greenhill (Ash Swale)	Census	Trend monitoring
Greenhill (introduced*)	Census	Trend monitoring
Long Tom ACEC	Census	Trend monitoring
Taylor North	Census	Trend monitoring
Rosy (introduced*)	Census	Trend monitoring
Spectra Physics	Census	Trend monitoring
Speedway	Census	Trend monitoring
Willow Corner Annex	Census	Trend monitoring

*introduced means species was planted or seeded at the site

Rationale: Bradshaw's lomatium is a long-lived, taprooted perennial plant species in the parsley family (Apiaceae). Flower clusters (umbels) have a complex system of spatial and temporal separation of sexual phases that limit opportunities for self-pollination, and field experiments confirm that insects are required for pollination and seed production (Kaye and Kirkland 1994). Plants that produce one umbel are all-male and do not produce seeds. On plants with two or more umbels, the first umbel is all male and the next umbel(s) possesses both male and hermaphroditic flowers. Therefore, size classes of reproductive plants that distinguish one-umbel from larger plants are important to count separately when evaluating the reproductive potential of populations.

As a taprooted plant, Bradshaw's lomatium individuals are typically easy to distinguish in the field. Even closely spaced plants can be differentiated because the plants are upright and enter the ground at the taproot. Occasionally, large plants divide into two or more main stalks, but these are always very closely spaced, usually within 2 cm of one another and of similar stature (i.e., if two stalks emerge from one taproot, they will usually be of similar size and reproductive status). Counts of individual plants are typically straightforward because of this growth form.

Long-term monitoring has been conducted at several populations of this species, including populations involved in experiments to measure the effects of grazing on population changes (Drew 2000) and controlled burns on population density, growth rate and viability (Kaye, Pendergrass and Findley 1994, Kaye and Pendergrass 1998, Pendergrass et al. 1999, Caswell and Kaye 2001, Kaye et al. 2001). These detailed demographic studies categorized plants into six different size classes, including seedling (first year plants), small vegetative (1-2 leaves) or large vegetative (3 or more leaves), and reproductive with one, two, or three or more umbels (coded as S, $V_{1\text{-}2}$, V_3, R_1, R_2, R_3, respectively). These classes have been used frequently for monitoring Bradshaw's lomatium as well as Cook's lomatium, a related threatened species of southern Oregon (Kaye and Cramer 2005).

2.2.2.3 Kincaid's lupine (Lupinus oreganus)

Recommended monitoring: Minimum monitoring requirements for this species include foliar cover and inflorescence production (see Appendix E for more details on monitoring rationale and site specific needs for this species). Table 8 lists the sites and methods the BLM uses to monitor Kincaid's lupine within the WEW.

Table 8. Monitored populations of Kincaid's lupine and associated methods and purposes on BLM lands in the WEW.

Site	Method	Purpose
Fir Butte	Sub-sample	Trend monitoring
Hansen (introduced*)	Census	Trend monitoring
Oxbow West (remnant & introduced*)	Census	Trend monitoring
Turtle Swale (remnant & introduced*)	Census	Trend monitoring
Isabelle (introduced)	Census	Trend monitoring
Greenhill (introduced)	Census	Trend monitoring

*introduced means species was planted or seeded at the site

Rationale: Kincaid's lupine is an herbaceous perennial that reproduces by seed and vegetative spread. It requires insects for successful fertilization and seed formation (Kaye, 1999). Plants form clumps of basal leaves and eventually produce one or more flowering stems. Plants expand vegetatively with extensive underground root systems. Individual clumps that appear distinct above ground may be connected below the soil surface and clones of plants may cover several square meters. In addition, clones may overlap so that individual plant clumps can be difficult or impossible to assign to one individual or another. Because of this clonal spread, counting individual plants is not recommended for this species. Leaf counts have been used in the past for estimating its abundance, but recent studies have shown that estimates of vegetative cover are highly correlated with leaf counts, and are more efficient in the field (Kaye and Brandt 2005b). In Lane County, foliar cover of lupine was consistently and strongly correlated with leaf counts, explaining 87% to 95% of the variation in leaf numbers.

Abundance of flowering in this species appears to vary substantially from year to year (Kaye and Benfield 2005b, Thorpe and Kaye 2006, Menke and Kaye 2006). Seed production may be so limited at some sites in poor years that few if any seeds are produced, with negative effects on seedling recruitment in the following year (Wilson et al. 2003). Therefore, monitoring of inflorescence production helps assess reproductive potential as well as overall plant health.

2.2.2.4 Fender's blue butterfly (Icaricia icaroides ssp. *fenderi)*

Recommended monitoring frequency and scope: Monitoring for Fender's blue butterfly should be conducted annually for adults and may include eggs counts every five years at each site. If management treatments are applied, monitoring for eggs may be more frequent to determine the effects of treatments on egg abundance. For example, burning or new treatment of 1/3 of the available habitat at a site should be followed up with egg counts the

next year to confirm adult utilization of the burned or treatment habitat, and determine if burning increased egg abundance (see Appendix E for more details on monitoring rationale and site specific needs for this species). Table 9 lists the sites and methods the BLM uses to monitor Fender's blue within the WEW.

Table 9. Monitored populations of Fender's blue butterfly and associated methods and purposes on BLM lands in the WEW.

Site	Method	Purpose
Fir Butte	Distance sampling (adults) and Sub-sample (eggs)	Trend monitoring
Oxbow West	Presence/absence or Peak count (adults)/ Census (eggs)	Trend monitoring
Turtle Swale	Presencce/absence or Peak count (adults)/ Census (eggs)	Trend monitoring
Hansen	Presence/absence or Peak count (adults)/ Census (eggs)	Trend monitoring
Isabelle	Presence/absence or Peak count (adults)/ Census (eggs)	Trend monitoring

Rationale: Fender's blue butterfly uses Kincaid's lupine as its primary host plant. The butterflies are mature adults in May and June, when they fly, eat nectar, and mate. The primary nectar species (Table 10) are crucial for population health, and monitoring for this species needs to include habitat with an emphasis on nectar sources. Appendix H offers considerations for evaluating Fender's habitat, including additional nectar plants. The females lay small white eggs on the underside of lupine leaves (Figure 2). The eggs hatch in a few weeks, then the larvae feed on lupine leaves until late June or early July, then crawl under nearby vegetation and plant litter and enter diapause. They remain in that state until February or early March, when they begin feeding again on the newly emerging lupines. Near the end of April they pupate then re-emerge as butterflies in May (Schultz and Crone 1998).

Table 10. Important nectar species for Fender's blue butterfly.

Latin name	Native or non-native
Allium amplectens	native
Calochortus tolmiei	native
Camassia quamash	native
Eriophyllum lanatum	native
Geranium oreganum	native
Iris tenax	native
Lupinus oreganus	native
Sidalcea malviflora	native
Vicia hirsuta	non-native
Vicia sativa	non-native

For Fender's blue butterfly three different monitoring methods are used presence/absence, peak count, and distance sampling. The method used is determined by site size and number of fenders that the site could likely support. Presence/absence is the least intensive method and is used to confirm a population's existence as well as persistence on a site. It is typically used on sites which contain less than 50 butterflies. The peak count method is slightly more intensive and requires visiting the site approximately 3 times during the flight season to catch

the peak flight period for the site. During the survey the area most likely to be inhabited by butterflies is walked and the total number of adult butterflies is recorded. Then a subsample of that population is netted and a ratio of Fender's to Silvery blue butterflies is established. Distance sampling is the most intensive method used and is typically for sites that can support more than 200 butterflies. This "survey technique can account for undetected butterflies, observer differences, variability in detectability due to abiotic and biotic factors (e.g. weather, vegetation) and generates confidence intervals around population estimates" (Hicks 2013). Transects are established at a site and the surveyor walks these transects with a long 3-4 meter pole marked at half meter increments. As the surveyor walks they note its location of first detection along the pole. The data is then analyzed using the program Distance to determine population sizes; currently the USFWS does data analysis for data gathered in the WEW.

*esiveaeris radicata nectar plants. rations for evaluating Fender'sy within the WEW.d allow for adaptive management

va10 years.e

Optimum census dates for Fender's blue vary annually. For example, in 2005 Fender's blue were first observed on May 12 (Fitzpatrick 2005). Whereas, in 2004 and 2002, Fender's blue were first observed on May 3 and May 8 respectively. In 2005, the butterfly census period lasted 29 days compared to 34 days in 2004, 38 days in 2003, 36 days in 2002 and 29 days in 2001. The average census period from 2000 to 2004 was 35 days. The census periods tend to be shorter during cool wet springs, as in 2005, and longer during dry warm springs. Optimum times for surveying "should take place between 10AM-4PM on days with less than 50% cloud cover, greater than 60 F air temperature, and winds less than 12 mph" (Hicks 2013).

Figure 2. Eggs of Fender's blue butterfly are identifiable as white dots on the undersides of Kincaid's lupine leaves.

The flight period of the Fender's blue overlaps with the morphologically similar Silvery blue butterfly (*Glaucopsyche lygdamus*). Silvery blue butterflies and male Fender's blue butterflies are indistinguishable from a distance. To estimate the percentage of Fender's blue butterflies, approximately 10% of the total male blues counted are identified in order to estimate the percentage of Fender's.

2.2.4 Bureau Sensitive Species and Site Specific Monitoring

2.2.3.1 White-topped aster (Sericocarpus rigidus [Aster curtus])

Recommended monitoring: Minimum monitoring requirements for this species include foliar cover and number of reproductive stems per unit area. Monitoring for this Bureau Sensitive Species should be conducted every three years at all locations. If management

treatments are applied, monitoring should be conducted prior to the treatment and for two years after, resuming the three year frequency after that (see Appendix E for more details on monitoring rationale and site specific needs for this species). Table 11 lists the sites and methods the BLM uses to monitor white-topped aster within the WEW.

Table 11. Monitored populations of white-topped aster and associated methods and purposes on BLM lands in the WEW.

Site	Method	Purpose
Balboa	Census	Trend monitoring
Beaver Run (remnant & introduced*)	Census	Trend monitoring
Fir Butte	Census	Trend monitoring
Hansen	Census	Trend monitoring
Isabelle	Census	Trend monitoring
Greenhill (remnant & introduced*)	Census	Trend monitoring
Oak Hill	Census	Trend monitoring
Oxbow West	Census	Trend monitoring
Speedway	Census	Trend monitoring
Spectra physics	Census	Trend monitoring
Vinci	Census	Trend monitoring

*introduced means species was planted or seeded at the site

Rationale: White-topped aster is a strongly rhizomatous perennial herb in the Aster family. It reproduces by seed, but seedling recruitment is poorly understood and most population expansion may be from clonal growth. In small populations where the number of genets (genetically different individuals) is low, seed production is reduced to very low levels (Giblin and Hamilton 1999). This has been observed in Washington populations and appears to operate at WEW sites as well. Where monitoring has been conducted in the WEW, most populations appear to be stable or increasing, except where damaged by large-scale projects like expansion of West 11th at Beaver Run.

Individual plants of this species can be difficult or impossible to distinguish in the field. Clones inter-grow and mix, and individual plants can send out below ground rhizomes several meters. Up to one meter of spread in a single year was observed in reintroduced plants at Beaver Run. Estimation of frequency has been used at some sites to track population trends, but this method may not detect some changes in abundance at any particular site and does not measure reproductive potential. Foliar cover estimates combined with inflorescence counts began in 2008 and will continue as they provide more extensive information on the species in order to better determine population trends.

2.2.3.2 Shaggy horkelia *(Horkelia congesta* ssp. *congesta)*

Recommended monitoring: Minimum monitoring requirements for this species include number of individuals, vegetative and flowering, and reproductive stems per plant (see Appendix E for more details on monitoring rationale and site specific needs for this species). Table 12 lists the sites and methods the BLM uses to monitor shaggy horkelia within the WEW.

Table 12. Monitored populations of shaggy horkelia and associated methods and purposes on BLM lands in the WEW.

Site	Method	Purpose
Balboa (remnant and introduced*)	Census	Trend monitoring
Long Tom ACEC	Census	Trend monitoring
Greenhill (remnant and introduced*)	Census	Trend monitoring
Rosy (introduced*)	Census	Trend monitoring
Speedway	Census	Trend monitoring
Vinci	Census	Trend monitoring

*introduced means species was planted or seeded at the site

Rationale: Shaggy horkelia is a long-lived perennial herb in the rose family. It reproduces from seed only, and plants form rosettes of basal leaves and eventually produce one or more flowering stems. No studies have documented the breeding system of the species, but field observations indicate that insects (solitary bees and syrphid flies) are responsible for cross-pollination (Kaye and Benfield 2004). A demographic study of this species was conducted at the Long Tom ACEC and results of that study (Kaye and Benfield 2004) are used to recommend monitoring standards for this species throughout the WEW.

In general, distinguishing individuals of this species is straightforward in the field and counting individuals is the appropriate technique for measuring population size. However, in rare instances closely spaced rosettes can be difficult to assign to one individual or another. Excavations of individuals have shown that rosettes within 10 cm of one another may or may not be connected underground. Occasionally, the root caudex splits beneath the soil surface, thus producing rosettes that appear separate but are connected under the soil surface. Therefore, distance-based rules for distinguishing individuals of shaggy horkelia can be misleading and are not recommended here. Instead, evidence of prior years' rosettes (leaf bases, and/or raised, dead root-crowns) between two adjacent rosettes should be used as an indicator of below ground connection. In the absence of this evidence, separate rosettes should be considered independent plants and counted separately.

In addition to plant counts for populations, appropriate measures for individual plants include reproductive status and plant size. Plant size should be measured as rosette diameter (cm) and number of reproductive (flowering) stems. Grazing by deer on reproductive stems (which removes most or all flowers) is often observed, and should be recorded. If a plant consists of more than one rosette, the diameter and number of flowering stems should be for both the largest rosette and the whole cluster. Plant height measurements have been recorded at Long Tom ACEC but do not appear to be useful measures of plant size.

2.2.3.3 Thin-leaved peavine (Lathyrus holochlorus)

Recommended Monitoring: A direct count of the number of vegetative and flowering individuals should be performed every three years (see Appendix E for more details on monitoring rationale and site specific needs for this species). Table 13 lists the sites and methods the BLM uses to monitor thin-leaved peavine within the WEW.

Table 13. Monitored population of *Lathyrus holochlorus* and associated method and purpose on BLM lands in the WEW.

Site	Method	Purpose
South Taylor	Census	Trend monitoring

Rationale: Thin-leaved peavine is a rhizomatous perennial herb in the legume family. The plants have climbing stems that are often supported by shrubs with pinnately compound leaves that terminate with a well developed tendril. Thin-leaved peavine is easily recognized in the field by the large showy white to buff leguminous flowers. Individuals are also easy to distinguish in the field, and are easy to count.

2.2.3.4 Meadow checker-mallow (Sidalcea campestris)

Recommended Monitoring: A direct count of the number of vegetative and flowering individuals should be performed every three years (see Appendix E for more details on monitoring rationale and site specific needs for this species). Table 14 lists the sites and methods the BLM uses to monitor meadow checker-mallow within the WEW.

Table 14. Monitored populations of *Sidalcea campestris* and associated methods and purposes on BLM lands in the WEW.

Site	Method	Purpose
Taylor North	Census	Trend monitoring
Taylor South	Census	Trend monitoring

Rationale: Meadow checker-mallow is a long lived perennial herb in the mallow family. It reproduces primarily from seed, and is currently extremely limited within its range. Populations are generally limited to roadsides and fencerows, and occasionally within remnant prairies in the Willamette Valley. Plants can be up to 2 meters tall, with tall raceme inflorescences of showy light pink flowers. Tall racemes arise from a basal rosette of reniform leaves. This species can be distinguished from other *Sidalcea* species by the stellate hairs on the calyx.

2.2.3.5 Clustered goldenweed (Pyrrocoma racemosa var. racemosa)

Recommended Monitoring: A direct count of the number of vegetative and flowering individuals, and number of flower stalks and capitula per plant should be performed every three years (see Appendix E for more details on monitoring rationale and site specific needs

for this species). Table 15 lists the sites and methods the BLM uses to monitor clustered goldenweed within the WEW.

Table 15. Monitored populations of *Pyrrocoma racemosa* var. *racemosa* and associated methods and purposes on BLM lands in the WEW.

Site	Method	Purpose
Oxbow West	Census	Trend monitoring
Turtle Swale	Census	Trend monitoring
Greenhill	Census	Trend monitoring
Willow Corner Annex	Census	Trend monitoring

Rationale: Clustered goldenweed is a long-lived perennial herb in the aster family. It reproduces by seed, and individual rosettes or crowns are easily distinguished in the field. The Willamette Valley is the northern most extent for what is currently described as clustered goldenweed. Within the valley the species is extremely rare and only six populations remain of varying sizes. Research performed by Paul Severns, Stephanie McKnight, and Wes Messinger has found some evidence that this species exhibits outbreeding depression, a relatively rare breeding system for plants. Seed collection and seeding of this species should be carried out in a way to keep specific genetics isolated until further research can fully support the initial findings of outbreeding depression.

2.2.3.5 Hitchcock's blue-eyed grass (Sisyrinchium hitchcockii)

Recommended Monitoring: In 2012, *Sisyrinchium hitchcockii* populations were confirmed by botanist Ed Alverson on 4 sites Balboa, Greenhill, Turtle Swale, and Vinci (See report on file by E. Alverson 2012.). Monitoring methods and purposes should be developed to accurately track this species. Table 16 lists the sites in which the BLM has sited Hitchcock's blue-eyed grass within the WEW.

Table 16. Sited populations of *Sisyrinchium hitchcockii* on BLM lands in the WEW.

Site	Method	Purpose
Balboa	TBA	TBA
Greenhill	TBA	TBA
Turtle Swale	TBA	TBA
Vinci	TBA	TBA

Rationale: Hitchock's blue-eyed grass is a perennial, rhizomatous member of the iris family. Botanists have had considerable trouble distinguishing it from two other *Sisyrinchium* species, which overlap in distribution, *S. bellum* (found from southern Washington to southern California) and *S. idahoense* var. *idahoense* (found from British

Columbia to northern California) (Groberg et al. 2010). Past keys (Henderson 1976 and Cholewa and Henderson 2002) have helped to accurately identify *Sisyrinchium* species in the Pacific Northwest, but have relied on characters difficult to obtain when dealing with rare plants such as rhizome length. Several factors, including varying morphologies within a population and fragile flowers which seldom persist intact on herbarium specimens have contributed to ambiguity in identification (Henderson 1976). Groberg et al. (2010) offer a key to the *Sisyrinchium* species of western Oregon that relies on perianth length and width-to-length ratio, tepal color, spathe bract length, filament length and color, and yellow eye prominence. Based on their key to western Oregon blue-eyed grass species, Groberg et al. (2010) suggest *S. hitchcockii* is limited in range to only a few sites in Douglas County; however they do not demonstrate that it is extirpated from Lane and Benton counties.

Monitoring methods for *S. hitchcockii* could mirror those conducted elsewhere on nearby public lands. Macroplots could be established to locate and direct *S. hitchcockii* population censes on BLM lands in the WEW. To monitor the populations, macroplots could be divided into 1 m^2 subplots; in each microplot the number of plants, vegetative and reproductive, and the number of reproductive stems could be recorded. Because *S. hitchcockii* can spread vegetatively by a short creeping rhizome, stems less than 10 cm apart could be considered the same individual. Additionally, because it is common for the flowering stem to branch, multiple flowering stems could be counted only if they originate directly from the rhizome. (Blakely-Smith and Kaye 2006)

2.2.3.6 Bruchia moss (Bruchia flexuosa), ephemerum moss (Ephemerum crassinervium), serrate ephemerum moss (Ephemerum serratum)

Recommended monitoring: While these species have been documented on BLM lands in the WEW (2008 & 2010), no formal monitoring protocol exists. In the future, early season surveys for ephemeral mosses, including bruchia moss, ephemerum moss, and serrate ephemerum moss on select sites could aid in developing a formal protocol, along with methods for identification and purposes for monitoring. Table 17 lists the sites in which the BLM sited rare moss species in 2008 and 2010 within the WEW.

Table 17. Sited populations of rare mosses on BLM lands in the WEW.

Site	Method	Purpose
Danebo	TBA	TBA
Fir Butte	TBA	TBA
Hansen	TBA	TBA
Long Tom ACEC	TBA	TBA
Oxbow West	TBA	TBA
Speedway	TBA	TBA
Vinci	TBA	TBA

Rationale: The ephemeral moss species found on BLM lands in the WEW are small, even for mosses. They are most visible late winter/early spring when moisture levels are high and moss species are reproducing. The rare ephemeral moss species found in the WEW, like most prairie bryophytes, require bare soil, high light levels, and seasonal moisture (Wilson et al. 1998). Because of their need for bare ground and the lack of fire in the WEW, available habitat is shrinking. To better understand their habit, ability to access appropriate habitat, competition with other native and nonnative moss species, and extent within the WEW, protocols are needed for monitoring and identification. Moss species identification relies on microscopic characteristics; thus protocols for identification could assist seasonal staff in monitoring and ensure least impact to the species. Wlson et al. (1998) suggest surveying vernally flooded bare soil, old animal excavations, eroded slopes, and ridgetops. In the future, monitoring protocols could be developed beginning with the seven sites surveyed and in 2008 and 2010. Upon establishment of protocols, monitoring could be expanded to additional BLM lands in the WEW and areas within them such as those suggested by Wilson et al. (1998) could be surveyed.

2.3 Monitoring for Research

Monitoring for research purposes will be tailored to the specific research question or hypothesis and may involve substantially different protocols than the monitoring outlined in this plan. Even so, results from research into habitat treatment methods or sensitive species management may be used to improve management techniques or recommend changes to existing monitoring protocols.

2. 3 A. Design Features for Monitoring & Permits

All monitoring conducted on BLM parcels will have a qualified expert, either a botanist or wildlife depending on the monitoring. The methods, frequency and amounts of monitoring would be chosen annually by BLM staff based on: site-specific monitoring needs for local population biological information (e.g., population trends); or ongoing management actions (e.g., habitat restoration); and the efficacy and biological effects of monitoring to individual Fender's blue butterfly populations.

Monitoring will be conducted to minimize trampling effects by walking around existing plants or designating a single path to complete federal list plant monitoring.

All individuals that monitor or survey for Fender's blue butterfly adults or eggs would be permitted by the USFWS and follow the most current Terms and Conditions, methods, and Authorizations of these permits.

Under the current version of these permits, the permittee is authorized to harass, survey by pursuit, capture, and handle adults, larvae, and eggs of the Fender's blue butterfly in association with monitoring the species and research activities, provided that (excerpts from permit):

a. Care shall be taken when conducting population monitoring activities to avoid stepping on plants that may have eggs or larvae on them.
b. Capture shall be by netting, and butterflies shall be handled for the minimal amount of time necessary.
c. Trampling of actively growing *Lupinus sulphureus ssp. kincaidii* (Kincaid's lupine) plants shall be limited to less than25 percent of lupine cover during the growing season.
d. The OFWO shall be kept informed of actions benefiting listed species or their habitats, and a copy of any publications summarizing results of restoration activities shall be provided to the OFWO.
e. A maximum of 20 percent of the blue butterflies (Glaucopsychyley damus) and male Fender's blue butterflies) counted at all surveyed sites would be captured each week of the flight season to determine the ratio of listed Fender's blue butterflies to the unlisted silvery blue butterflies. The permittee shall only survey sites identified by the OFWO during the annual butterfly working group meeting.
f. Also under these permits, it is recognized that the number of Fender's blue butterflies anticipated to be incidentally injured or killed during survey and monitoring activities is two adults. An undeterminable number of Fender's blue butterfly larvae or eggs are anticipated to be incidentally injured or killed by trampling during survey and monitoring activities or seed collection. The following standards apply (excerpts from the permit):
g. Any incidental injury or killing [adults] shall be reported within 3 working days to the PRO and the OFWO by telephone or fax.
h. In the event that the number of individuals [adults] allowed to be injured or killed is exceeded during performance of permitted activities, the permittee shall :

    i. Immediately cease activities until reauthorized by the PRO, who may, after analysis of the circumstances of mortality or injury, revoke or amend the permit.
    ii. Immediately notify the PRO and the OFWO. Within 3 working days, the permittee shall follow-up such verbal notification in writing to both offices, and a copy shall be

sent to the Oregon Natural Heritage Program, 821 SE. 14th Avenue, Portland,Oregon 97214 (telephone 503-731-3070).

iii. In the written notification, the permittee shall include a report of the circumstances that led to the injury or mortality. A description of the changes in activity protocols that would be implemented to reduce the likelihood of such injury or mortality from happening again would be included, if appropriate. The incident shall also be discussed in the annual report that is subsequently submitted.

Any dead specimens [adults] shall be preserved in accordance with standard museum practices. Before expiration of the permit, all preserved specimens shall be properly labeled and deposited with the designated depository. The permittee shall supply the depository with a copy of this permit to validate that the specimens were taken pursuant to a permit.

3. RECOMMENDED DATA STORAGE AND ANALYSIS

The data that result from monitoring in the WEW will be of two major types, habitat and Special Status Species. These data will be most useful to managers if they are documented thoroughly, maintained in a standardized fashion, summarized regularly, and made available electronically.

3.1 Metadata

Documentation of data sets, also known as metadata, is necessary to keep complete records of the location, method of acquisition, date, and purpose of the information available. This information is tied to each data set, and can be managed simultaneously as the data itself in a relational data base such as Access. Minimum metadata requirements for this monitoring plan include: purpose of acquisition, date, investigator name, location of plots (site name and GIS coordinates), number of plots, plot numbers or codes, method of plot marking, instructions for relocating plots, data types and units (e.g., percentage cover, number of individuals, etc.), species name for Special Status Species, site history (as well as year and season of management treatments), and name, address, phone number and/or email of individual to contact with questions.

3.2 Data Types, Storage, and Needed Summaries

3.2.1 Habitat data

Habitat data are derived from both low intensity and high intensity monitoring. Low intensity monitoring at each site produces information on percent cover of non-native, native, woody, and litter and thatch as well as the diversity of native plants and species present.

High intensity monitoring provides information on the frequency of all vascular plant species and litter in a plot. These data should be summarized to provide estimates of abundance of categories of species similar to those in the low intensity monitoring method (i.e., invasive species, woody plants, thatch, and native plants), along with measures of uncertainty (95% confidence intervals). In addition, data on individual species of interest can be examined to track trends.

Invasive species mapping provides information on habitat conditions and the severity and extent of highly aggressive invasive species. The data gathered through mapping is digitized in GIS to produce a rough assessment of the approximate area infested by each species.
Information from habitat monitoring should be stored either in a spreadsheet format, a relational database such as Access, or both. All data files should be backed up off site.

Low and high intensity habitat monitoring, and invasive species mapping data should be summarized in the same year they are collected. As years go by, trends should be plotted graphically to examine changes over time at each site. Comparisons of conditions before and after management should be made promptly to inform managers about the effectiveness of specific treatments. Also, data from monitoring in each year should be compared to the thresholds and triggers described above to determine if management treatments are necessary.

3.2.2 Special Status Species Data

Population data from Special Status Species monitoring will vary among species and sites. For example, at most sites a population census is performed, but for large populations subsampling is conducted and data are recorded for individual plots. Also, for species like Willamette daisy and Fender's blue butterfly the number of individuals is counted, while for Kincaid's lupine plant abundance is measured as area of vegetative groundcover. Because of these species and site differences, data types vary and so will storage formats and summaries.

As with habitat data, information from Special Status Species monitoring should be stored either in a spreadsheet format, a relational database such as Access, or both. Also Special Status Species data should be entered yearly into the GeoBOB database for state and local tracking. All data files should be backed up off site.

In all cases data should be summarized in the year it is collected to promptly make available information on current population status. If a treatment was applied, that information should be documented and changes in population size or reproductive success (e.g., flowering rate) should be examined to determine if management actions are effective. Also, overall population sizes, trends, and population growth rates should be compared to the thresholds and triggers identified above to determine if management actions are necessary.

4. LITERATURE CITED (IN TEXT AND APPENDICES)

Blakeley-Smith, M. and T.N. Kaye. 2006. Sensitive Plant Species Monitoring on the Upper Willamette Resource Area. Unpublished report to the Eugene District BLM. Institute for Applied Ecology, Corvallis, Oregon.

Caswell, H. and T.N. Kaye. 2001. Stochastic demography and conservation of an endangered perennial plant (*Lomatium bradshawii*) in a dynamic fire regime. Advances in Ecological Research 32:1-51.

Drew, A.D. 2000. Effects of livestock grazing and small mammal populations on endangered Bradshaw's desert parsley (*Lomatium bradshawii*) at Oak Creek, Willamette Valley, Oregon. Masters thesis, Department of Fisheries and Wildlife, Oregon State University.

Duren, Olivia. 2010. WEW Monitoring Reports 2010. (Unpublished reports on file with the Eugene District BLM).

Fitzpatrick, G. 2005. Status of the Fender's blue butterfly (*Icaricia Icarioides fenderi*) (at six locations) in Lane County, Oregon: Population estimates and site evaluations and Effects of mowing on the Fender's blue butterfly (*Icaricia icarioides fenderi*): implications for conservation management. Unpublished report to Oregon Natural Heritage Program and United States Fish and Wildlife Service. The Nature Conservancy, Eugene, Oregon.

Fitzpatrick, G. 2008. Butterfly Census Methods. (Unpublished report on file with the Eugene District BLM.)

Giblin, D.E. and C.W. Hamilton. 1999. The relationship of reproductive biology to the rarity of endemic *Aster curtus* (Asteraceae). Canadian Journal of Botany 77:140-149.

Groberg, M., Meyers S., Amsberry K., and R.J. Meinke. 2010. Taxonomic and status evaluation of *Sisyrinchium hitchcockii* (Hitchcock's blue-eyed grass). Roseburg District BLM. L09PX00624.

Hammond, P. C. 1994. 1993 study of the Fender's blue butterfly. (*Icaricia icarioides fenderi*) in Benton, Polk and Yamhill Counties. Unpublished report to the U. S. Fish and Wildlife Service and the Oregon Natural Heritage Program, Portland, Oregon.

Henderson, D.M. 1976. A biosystematic study of Pacific northwestern blue-eyed grasses (Sisyrinchium, Iridaceae). Brittonia 28: 149-176.Hicks, T. 2013. Fender's Blue Butterfly Monitoring Handbook. DRAFT.

Jancaitis, J. 2006. Monitoring methods for field crew use. Unpublished report on file with the Eugene District BLM. (This information can be found in Bank Mitigation annual reports on file with the Eugene District BLM.)

Kaye, T.N. 1999. Obligate insect pollination of a rare plant: *Lupinus sulphureus* ssp. *kincaidii*. Northwest Science 73:50-52.

Kaye, T.N. 2005. Monitoring Plan for Bradshaw's lomatium at Oak Creek Unit, Finley National Wildlife Refuge, Willamette Valley, Oregon. Unpublished report to the U.S. Fish and Wildlife Service. Institute for Applied Ecology, Corvallis, Oregon.

Kaye, T.N. and C. Benfield. 2004. Population monitoring and viability analysis for *Horkelia congesta* ssp. *congesta* at the Long Tom Area of Critical Environmental Concern. Unpublished report to the Eugene District BLM. Institute for Applied Ecology, Corvallis, Oregon.

Kaye, T.N. and C. Benfield. 2005a. Population monitoring for experimental habitat manipulation of Willamette daisy at the Oxbow west site, west Eugene. Unpublished report to the Eugene District BLM. Institute for Applied Ecology, Corvallis, Oregon.

Kaye, T.N. and C. Benfield. 2005b. Kincaid's lupine and Fender's blue butterfly studies in the West Eugene Wetlands: Monitoring, mowing, pig effects, and evaluating foliar cover as a measure of abundance. Unpublished report to the Eugene District BLM. Institute for Applied Ecology, Corvallis, Oregon.

Kaye, T.N. and A. Brandt. 2005. Seeding and transplanting rare Willamette Valley prairie plants for population restoration. Unpublished report to the Eugene District BLM. Institute for Applied Ecology, Corvallis, Oregon.

Kaye, T.N. and J. Cramer. 2005. *Lomatium cookii* population monitoring in the Illinois Valley, Josephine County, Oregon. Unpublished report to the Medford District BLM. Institute for Applied Ecology, Corvallis, Oregon.

Kaye, T.N. and M. Kirkland. 1994. Population biology of *Lomatium bradshawii* II. Insect interactions, phenology, and breeding system. Unpublished report to the Eugene District BLM. Oregon Department of Agriculture, Salem, Oregon.

Kaye, T.N. and K. Pendergrass. 1997. Population trends of *Lomatium bradshawii* before and after prairie fires: 1988-1997. Unpublished report to the Eugene District BLM. Oregon Department of Agriculture, Salem, Oregon.

Kaye, T.N., K. Pendergrass, and K.K. Finley. 1994. Population biology of *Lomatium bradshawii*. I. Population viability analysis under three prairie burning treatments. Unpublished challenge cost share report funded jointly by Oregon Department of Agriculture and Bureau of Land Management Eugene District.

Kaye, T.N., K. Pendergrass, K. Findley and J.B. Kauffman. 2001. The effect of fire on the population viability of an endangered prairie plant. Ecological Applications 11:1366-1380.

McKnight, S. 2008. WEW Monitoring Reports 2008. (Unpublished reports on file with the Eugene District BLM)

Menke, C. and T.N. Kaye. 2006. Population monitoring for *Lupinus sulphureus* ssp. *kincaidii* on the BLM Roseburg District. Unpublished report to the Roseburg District BLM. Institute for Applied Ecology, Corvallis, Oregon.

Pendergrass, K.L., P.M. Miller, J.B. Kauffman, and T.N. Kaye. 1999. The role of prescribed burning in maintenance of an endangered plant species, *Lomatium bradshawii*. Ecological Applications 9:1420-1429.

Schultz, C. B. 1994. Status of the Fender's blue butterfly (Icaricia icarioides fenderi) in Eugene Oregon: A Population at Risk. Unpublished report to the U. S. Fish and Wildlife Service and the Oregon Natural Heritage Program, Portland, Oregon.

Schultz, C. B. 1995. Status of the Fender's blue butterfly (Icaricia icarioides fenderi) in Lane County, Oregon: A Year of Declines. Unpublished report to the U. S. Fish and Wildlife Service and the Oregon Natural Heritage Program, Portland, Oregon.

Schultz, C.B. & E. E. Crone. 1998. Burning prairie to restore butterfly habitat: a modeling approach to management tradeoffs for the Fender's blue. *Restoration Ecology* 6(3):244-252.

Schultz, C.B. and K.M. Dlugosch. 1999. Nectar and hostplant scarcity limit populations of an endangered Oregon butterfly. Oecologia 119 (2): 231-238.

Thorpe, A.S. and T.N. Kaye. 2006. Population monitoring for *Lupinus sulphureus* ssp. *kincaidii* (Kincaid's lupine) at Eagle's Rest. Unpublished report to the Eugene District BLM. Institute for Applied Ecology, Corvallis, Oregon.

Thorpe, A.S., T.N. Kaye, and T. Guitaud. 2007. Minimum population size for reproduction in Willamette daisy, Eugene District BLM, Oregon. Unpublished report to the Eugene District BLM. Institute for Applied Ecology, Corvallis, Oregon.

USDI 2001. BLM Manual 6840 Special Status Species Management. U.S. Department of Interior, Washington, DC.

U.S. Fish and Wildlife Service. 2010. Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington. U.S. Fish and Wildlife Service, Portland, Oregon. xi + 241 pp. http://www.fws.gov/endangered/recovery/index.html.

U.S. Fish and Wildlife Service. 2006. Biological Opinion and Letter of Concurrence on effects of implementation of the ten-year schedule of management activities to maintain, enhance, and expand prairie habitats within West Eugene Wetlands, FY 2006-2016, on Fender's blue betterfly (*Icaricia icariodes fenderi*), Kincaid's lupine (*Lupinus sulphureus* spp. *kincaidii*), Willamette daisy (*Erigeron decumbens* ssp. *decumbens*), and Bradshaw's lomatium (*Lomatium bradshawii*), Siuslaw Resource Area, Eugene District, Bureau of Land Management. U.S. Fish and Wildlife Service (1-7-06-F-0038), Portland, OR. 84 pp.

USDI Bureau of Land Management, Eugene District. 2005. West Eugene Wetlands Environmental Assessment No. OR090-05-03. Eugene, OR. 78 pp.

Villegas-Moore, S. 2006. Guidance to completing the WEW Habitat Monitoring Forms (1-3) for the 10 year schedule EA. Unpublished report on file with the Eugene District BLM.

Wilson, M.V, T. Erhart, P.C. Hammond, T.N. Kaye, K. Kuykendall, A. Liston, A.F. Robinson, Jr., C.B. Schultz, and P.M. Severns. 2003. Biology of Kincaid's lupine (*Lupinus sulphureus* ssp. *kincaidii* [Smith] Phillips), a threatened species of western Oregon native prairies. Natural Areas Journal 23:72-83.

Wilson, Mark V., Paul C. Hammond, John A. Christy, Deborah L. Clark, Kathy Merrifield, and David H. Wagner. 1998. Upland Prairie. Contributed Chapter. Part I the U.S. Fish and Wildlife Service Willamette Basin Recovery Plan. U. S. Fish and Wildlife Service, Oregon State Office, Order no. 13420-6-0287 (3).

APPENDIX A: Summary of Environmental Assessment Needs and Requirements

The Environmental Assessment (EA) provides a long-term (10 year) integrated treatment schedule for BLM lands within the WEW and is designed to maintain, enhance, and expand the amount of high and medium quality habitat of each of the eight habitat types delineated in the planning area.

As described in the Introduction, sites were ranked based on site quality characteristics including, (1) the presence of rare plants, Fender's blue butterfly, and the western pond turtle; (2) the diversity of native plants present on the site; (3) the size of the site and habitat block; and (4) the site's importance in maintaining the habitat connectivity of the wetlands, and then designated as high, medium, or low quality. The alternative chosen for management of the WEW was Alternative D, which manages or treats 1,340 acres (100%) of the planning area, with the following goals for each class of habitat:

> Class 1. Treat 500 acres of the highest quality examples of each plant community type, such that there would be no net loss of the highest quality communities over the life of this plan.
>
> Class 2. Treat 420 acres of high and medium quality habitat adjacent to the highest quality communities of the eight community types over the life of this plan.
>
> Class 3. Treat 420 acres of low quality habitat to increase the amount of medium and high quality habitat.

With this breakdown, funding is to be allocated as available, with actions in Class 1 implemented first, proceeding through to actions in Class 2, and then Class 3. Actions specifically required by City or County ordinances, or other law or policy (e.g., weed mowing and fire suppression) are to continue to occur. Project implementation within classes is ranked and scheduled across acreage and habitats based on site conditions identified through monitoring, available funding, and other management guidelines.

The Environmental Assessment specifies that the same actions be taken for the plant community and rare plant species in all habitat classes. Actions regarding the western pond turtle differ for the different classes, but are not covered by this monitoring plan.

Action 1: Woody vegetation
Monitor yearly woody vegetation encroachment. Control woody vegetation encroachment on this acreage by using the following management guidelines:

> a) Treat all invasive native and non-native trees and shrubs when present.
> b) Recommend acreage for control of woody vegetation when encroachment reaches the percent cover threshold corresponding to the habitat type listed in Table A1, except where a more shrub-dominant community is desired.

Table A1. Percentage cover thresholds, above which woody vegetation should be controlled (except where a more shrub dominant community is desired).

Desired plant community	Small Diameter		Large Diameter		
	DBH (cm)	Canopy Cover (%)	DBH (cm)	Canopy Cover (%)	Equivalent # of trees/acre
Emergent	N/A	N/A	N/A	N/A	N/A
Open Water	N/A	N/A	N/A	N/A	N/A
Freshwater/Riverine	N/A	N/A	N/A	N/A	N/A
Ash Swale/Riparian	<15–30	5–10	>15–30	50–100	5–15
Wet-prairie/vernal pool	N/A	5–10	N/A	N/A	N/A
Upland Prairie	N/A	5–10	N/A	N/A	N/A
Oak woodland	<15–30	10–15	>15–30	50–80	7–15
Oak savanna	<20–30	5–10	>20–30	40–60	3–7

Action 2: Invasive species

Monitor yearly the occurrence and spread of invasive plant species. Control invasive species on the acres using the following management guidelines:

a) Recommend areas for control of non-native species when combined encroachment reaches 10% to 35% or greater of the habitat block and/or a weed population covers >50% of a $1m^2$ area, depending on site conditions and species present.

b) Remove all populations of highly aggressive weeds species including, but not limited to those listed in Table A2.

Table A2. Highly aggressive weed species as mentioned in the WEW Environmental Assessment. All populations of these and other highly aggressive weeds should be removed.

Name	Life-form	Listing
Phalaris arundinaceae (reed canarygrass)	grass	none
Phalaris aquatica (Harding grass)	grass	none
Centaurea pratensis (Meadow knapweed)	forb	ODA, B-listed weed
Brachypodium sylvaticum (false brome)	grass	ODA, B-listed weed
Dipsacus fullonum (teasel)	forb	none
Cytisus scoparius (scotch broom)	shrub	ODA, B-listed weed
Cytisus striatus (Portuguese broom)	Shrub	ODA, B-listed weed

Action 3: Thatch

Monitor yearly the existing levels of litter/thatch in grasslands and oak communities. Treat areas according to the following management guidelines:

a) Reduce the buildup of litter when the litter layer exceeds 10-20% cover and litter layer is detrimentally impacting native forb plant diversity or rare plant habitat.

b) Do not treat areas within five years of soil-disturbing activities.

c) Treat no more than 1/3 of the total acres in any year.

Action 4: Native species cover
Monitor yearly the existing levels of native plant species cover on 500 acres. Maintain the existing levels of native plant species diversity. Areas should be management according to the following guidelines:

a) Recommend vegetation treatments to maintain existing levels of native plant species cover when monitoring shows a loss of 5 to10 percent of a site's existing number of native plant species.

b) Schedule treatments to allow needed time to acquire seed, equipment and resources to accomplish the project.

APPENDIX B: Biological Resources in the WEW

Many of the 22 sites managed by the BLM in the WEW contain multiple habitat types (see table B1 for habitat types within each BLM site by priority). The eight habitat types are:

Freshwater/Riverine (<5 acres): The channel and riparian areas of streams. The associated plant community consists of herbaceous species, including rushes and sedges, and trees and shrubs, including cottonwood, ash, and willow species.

Open water (20 acres): Areas that contain water year-round. The edges of the ponds support trees, shrubs, and snags.

Emergent wetlands (145 acres): Deep, ephemeral wetlands which fill annually from precipitation or runoff and dry completely by late summer. Inundation lasts from approximately October through mid- to late July. Associated plant communities are dominated by perennial rushes and sedges, and some annual forbs.

Wet Prairie/Vernal Pool (720 acres): Vernal pools are shallow, ephemeral wetlands. Inundation is typically from mid-October through early-June in the WEW. The Wet Prairie communities are dominated by perennial grasses. High quality wet prairies also have a relatively high proportion of forbs (relative to grasses) and medium to large populations of species in the Liliaceae. High quality wet prairies have highly variable microtopography and are often very hummocky.

Upland Prairie (115 acres): High quality upland pools are characterized by native grasses and forbs, including *Lupinus oreganus*.

Oak Communities (145 acres): *Quercus garryana* (Oregon white oak) is the dominant tree on oak communities; the vast majority of understory species are the same as in upland prairies.

Ash Swale/Riparian (170 acres): The understory of this habitat type may contain some rare species, but is dominated by perennial grasses, sedges, and rushes.

Douglas-fir forest (3 acres): This upland community is characterized by a dense canopy dominated by *Pseudotsuga menzeisii* and a sparse understory.

There are 24 plant species in the West Eugene Wetlands listed as rare and uncommon by the Native Plant Society of Oregon (2009) and the Oregon Biological Diversity Information Center (formerly Oregon Natural Heritage Information Center) (2010) (Table B3). Ten of these species have BLM designations. Nine species have federal or state designations, including four species listed as endangered or threatened by the USFWS (2010).

Table B1. Habitat types of the West Eugene Wetlands within each BLM site by priority class.

Site	Alternate name	Habitat Types
Class 1 (red) sites		
Balboa	Tsal Luk-wah	wet prairie, ash swale, and emergent
Beaver Run	Tsal Luk-wah	wet prairie and emergent
Danebo	Tsal Luk-wah	Habitat types: wet prairie, ash swale, and emergent
Fir Butte	(none)	upland prairie and wet prairie
Hansen	See-Sil Savanna	wet prairie, ash swale, and upland prairie
Isabelle	Tsal Luk-wah	wet prairie and upland prairie
Long Tom ACEC	(none)	wet prairie and ash swale
Nielson	Meadowlark Prairie	wet prairie and emergent
North Greenhill	Oak Hill	wet prairie, ash swale, and upland prairie, and oak woodland
Oxbow East	Willamette Daisy Meadow	wet prairie and ash swale
Oxbow West	Willamette Daisy Meadow	wet prairie, ash swale, and emergent
Rosy	Tsal Luk-way	wet prairie and emergent
Spectra Physics	Meadowlark Prairie	wet prairie and emergent
Speedway	Luk-wak prairie	wet prairie and emergent
Taylor North	Richardson	wet prairie, ash swale, oak woodland, and emergent
Taylor South	Richardson	wet prairie, ash swale, oak woodland, and emergent
Turtle Swale	Meadlowlark Prairie	wet prairie, upland prairie, ash swale, and emergent
Vinci	Willamette Daisy Meadow	wet prairie
Willow Corner Annex	(none)	wet prairie
Willow Creek Confluence	Tsal Luk-wah	wet prairie
Class 2 (blue) sites		
Balboa	Tsal Luk-wah	Emergent
Beaver Run	Tsal Luk-wah	wet prairie/vernal pool
Hansen	See-Sil Savanna	oak woodland
Larsen	Meadowlark Prairie	wet prairie/vernal pool
Nielson	Meadowlark Prairie	wet prairie/vernal pool
North	Oak Hill	wet prairie/vernal pool

Greenhill		
Oxbow East	Willamette Daisy Meadow	wet prairie/vernal pool
Oxbow West	Willamette Daisy Meadow	Emergent
Taylor North	Richardson	wet prairie/vernal pool
Taylor South	Richardson	emergent, oak woodland, wet prairie/vernal pool
Vinci	Willamette Daisy Meadow	wet prairie/vernal pool
Class 3 (green) sites		
Balboa	Tsal Luk-wah	emergent, wet prairie/vernal pool
Beaver Run	Tsal Luk-wah	emergent, open water, wet prairie/vernal pool
Hansen	See-Sil savanna	emergent, upland prairie
Isabelle	Tsal Luk-wah	wet prairie/vernal pool
Long Tom ACEC	(none)	emergent, wet prairie/vernal pool
Nielson	Meadowlark Prairie	Emergent
Nolan East	Tsal Luk-wah	wet prairie/vernal pool
North Greenhill	Oak Hill	oak woodland, upland prairie, emergent
Oxbow East	Willamette Daisy Meadow	wet prairie/vernal pool
Oxbow West	Willamette Daisy Meadow	wet prairie/vernal pool
Taylor North	Richardson	Emergent
Taylor South	Richardson	Emergent
Turtle Swale	Meadowlark Prairie	emergent, upland prairie

Table B2. Sites with listed species as covered in the Biological Opinion

Site	Alternate name	Management element	Area in acres
Balboa	Tsal Luk-wah	*Erigeron decumbens*	4.7 (natural)
		Lomatium bradshawii	0.8 (introduced)
Fir Butte	(none)	*Icaricia icariodes fender*	12.0
		Lupinus oreganus	12.0 (natural)
Hansen	See-Sil Savanna	*Icaricia icariodes fenderi*	0.9 (introduced)
		Lupinus oreganus	
Isabelle	Tsal Luk-wah	*Icaricia icariodes fender*	0.2
		Lupinus oreganus	0.2 (introduced)
Long Tom ACEC	(none)	*Lomatium bradshawii*	1.7 (natural)
North Greenhill	Oak Hill	*Erigeron decumbens*	4.5 (natural) 0.5 (introduced)
		Lomatium bradshawii	0.2 (natural) 2.0 (introduced)
		Lupinus oreganus	0.06 (introduced)
Oxbow West	Willamette Daisy Meadow	*Erigeron decumbens*	13.3 (natural)
		Icaricia icariodes fender	0.2
		Lupinus oreganus	0.1 (natural)
Rosy	Tsal Luk-wah	*Lomatium bradshawii*	0.9 (introduced)
Spectra Physics	Meadowlark Prairie	*Lomatium bradshawii*	0.03 (natural)
Speedway	Luk-wak Prairie	*Erigeron decumbens*	14.6 (natural)
		Lomatium bradshawii	7.0 (natural)
Taylor North	Richardson	*Lomatium bradshawii*	acres included with Long Tom ACEC
Turtle Swale	Meadlowlark Prairie	*Icaricia icariodes fender*	0.3
		Lupinus oreganus	0.3 (natural, introduced within natural population)
Vinci	Willamette Daisy Meadow	*Erigeron decumbens*	18.2 (natural)
Willow Corner Annex	(none)	*Lomatium bradshawii*	0.3 (natural)

Table B3. Listed rare and uncommon vascular and nonvascular plants and invertebrates documented or suspected to occur in the West Eugene Wetlands. Species included in this Monitoring Plan are in bold.

Plant Species	Federal Designation	State Designation*	BLM Designation	Documented in BLM WEW
Apocynum cannabinum	None	None	None	Yes
Aristida oligantha	None	None	None	Yes
Asclepias fascicularis	None	None	None	Yes
Bruchia flexuosa	None	None	Sensitive	Yes
Calochortus uniflorus	None	None	None	Yes
Cicendia quadrangularis	None	None	Sensitive	Yes
Dodecatheon pulchellum var. *macrocarpum*	None	None	None	No
Ephemerum crassinervium	None	None	Sensitive	No
Ephemerum serratum	None	None	Sensitive	No
Erigeron decumbens	Endangered	Endangered	N/A	Yes
Geranium oreganum	None	None	Eugene District Review	Yes
Horkelia congesta* ssp. *congesta	Species of Concern	Candidate	Sensitive	Yes
Lasthenia glaberrima	None	None	Eugene District Review	Yes
Lathyrus holochlorus	Species of Concern	None	Sensitive	Yes
Lomatium bradshawii	Endangered	Endangered	N/A	Yes
Lupinus oreganus	Threatened	Threatened	N/A	Yes
Montia howellii	None	Candidate	None	Yes
Navarretia willamettensis	None	None	Strategic	Yes
Orobanche californica ssp. *californica*	None	None	None	Yes
Pyrrocoma racemosa var. ***racemosa***	None	None	Sensitive	Yes
Prunus subcordata	None	None	None	Yes
Sericocarpus rigidus	Species of Concern	Threatened	Sensitive	Yes

Sidalcea campestris	None	Candidate	None	Yes
Sidalcea cusickii	None	None	None	Yes
Sisyrinchium hitchcockii	Species of Concern	None	Sensitive	Yes

Invertebrate Species	Federal Designation	State Designation*	BLM Designation	Documented in BLM WEW
Icaricia icarioides fenderi	Endangered	None	N/A	Yes

*State Listed Threatened are managed as Bureau Sensitive

Within each habitat type at each site, there are five issues that, according to the Environmental Assessment (EA), must be considered in management. These issues are, (1) woody vegetation, (2) invasive plant species, (3) litter/thatch in grasslands and oak communities, (4) native plant diversity, and (5) western pond turtle habitat. The specific actions for the first four management issues are described in Appendix A as part of the EA summary.

APPENDIX C: Low Intensity Monitoring Methods (From Villegas [2006])

Guidance to Completing the WEW Habitat Monitoring Form for the 10 Year Schedule EA

INTRODUCTION

BLM has developed a long-term (10 year) land management implementation schedule for its parcels within the West Eugene Wetlands (WEW). This ***WEW 10 year Schedule EA*** (hereafter the EA) outlines the changes in habitat conditions that trigger the need for management action and it also provides guidance on the priority of work for the maintenance, enhancement, and expansion projects.

Each parcel will be monitored every one to three years utilizing the four habitat management objectives listed in the EA. (Each priority 1 parcel will be monitored annually with a complete plant survey with invasive species mapping that will be completed during Special Status Species monitoring.) These objectives include (1) the prevention of woody vegetation encroachment, (2) the prevention of invasive plant spread, and (3) the prevention of litter and thatch build up, (further outlined in the EA, Alternative D, pages 58-61). When monitoring indicates that these objectives are not being met based on the established thresholds, management actions are triggered.

PURPOSE

The purpose of qualitative monitoring is to assess the condition of each site in general terms. Data gathered are then used to plan future resource management activities. This information can help BLM and the West Eugene Wetland partners plan and obtain funding. Qualitative monitoring is intended for course data gathering. It is not intended to provide the detail of quantitative monitoring nor will it be used to evaluate the success of treatment prescriptions.

GENERAL PROCESS FOR COMPLETING THE MONITORING FORM:

1. Obtain aerial photos
2. On the aerial photo, delineate and name polygons around the habitat types present in the management unit utilizing habitat codes.
3. Determine the number and placement of sample plots necessary to characterize conditions in each habitat polygon.
4. Ideal time to assess habitat conditions is between June and August. Species identification throughout the season in all habitat types is necessary to achieve accurate estimates during low-intensity habitat monitoring.
5. Assess BLM sites according to priority classes (See EA, Map 5 – Alternate D). For those sites with multiple priority classes present, it may be more efficient to assess all classes in one visit.
6. Assessments for all three objectives (woody, invasive, & thatch/litter) shall be conducted by utilizing visual ocular estimates, unless the habitat is wooded, in which case a densiometer is utilized for canopy cover.
7. Assess woody vegetation in all plots.
8. Assess invasive species in all plots.

9. Assess litter and thatch build up in all plots.
10. Assess native plant abundance and diversity in all plots.
11. Compile species list of entire site with invasive species populations mapped on an aerial photo.
12. Compile monitoring results every season into excel tables.
13. Analyze monitoring data every season which will aid in determining where management actions will be triggered.

This document instructs the user how to collect information about the three habitat conditions found in the wetlands and complete the data form. We recommend careful reading of the following guidance before filling out the form.

NECESSARY FIELD EQUIPMENT TO ASSESS HABITAT

1. Aerial photos (or premade GIS map) for each unit you plan to visit for that day with existing sample plots marked.
2. Data sheets (See Appendix F)
2. Measuring tapes
3. Quadrat frame (1m²)
3. Camera
4. GPS and coordinates for established sample plots
5. Compass
6. Densiometer
7. Plant keys and current West Eugene Wetlands species list

DETAILED GUIDANCE FOR THE HABITAT ASSESSMENT

I. Obtain Aerial Photos of the Site

1. Aerial photo with property boundaries (or premade GIS map with sample plot points) can be obtained from BLM's ArcGIS coverages.
   a. Map scale should be similar from year to year, unless unforeseen circumstances have altered boundary of unit. Choose a scale for the map which provides sufficient room to clearly present all pertinent details. The site map(s) shall be at a scale suitable for the site size and for legibility.
   For most purposes, an appropriate map scale is 1 inch = 100 feet or in ArcGIS 1:5000. Site map(s) must be clear and legible.
   b. Site maps must contain as a minimum:
   - The boundaries of the entire UNIT(s).
   - Habitat polygon codes and sample plots.
   - 10-Year Schedule EA Priority Classes
   - Title, North arrow and scale bar.

Table C1. Habitat codes.

Habitat	Habitat Code
Ash swale/riparian	AS/RP
Wet prairie/vernal pool	WP

Habitat	Habitat Code
Upland	UP
Oak woodland	OW
Oak savanna	OS

II. Delineate Polygons by Habitat Types.

1. All BLM sites have been delineated by habitat types in the office using aerial photos and botanist knowledge; and all delineations have been field-verified and updated.
2. See Map 6 from WEW 10 year Schedule EA for general delineation of these habitat types. If not already done, delineate habitat type polygons and name habitats by habitat type codes (utilizing Table C1.) on aerial photos/GIS site maps. Make corrections once site conditions have been verified in the field.
3. Within each habitat polygon, sample plots will be established according to the following guidelines:
   a. Every habitat polygon must be at least ¼ acre in size (minimum size of a habitat polygon) and have at least one sample plot.
   b. For larger habitat polygons (larger than 2.5 acres), up to 10 sample plots may be required in locations that best represent the overall habitat within the polygon being assessed. The number of sample plots required will vary with the complexity and diversity of the habitat on the site. For example, a field with vegetation composed almost entirely of annual ryegrass will not require more than one or two sample plots to characterize, while a small site, with several habitat communities may require numerous sample plots to accurately characterize the vegetation. Exercise professional judgment when determining the number of plots necessary.
   c. Sample plot size should vary by habitat type. For wet and upland prairie, emergent, vernal pool, agriculture field or old pasture, use a 1 m² sample plot. For shrub or forest habitats, use a 10m² sample plot (broken down into four 5m² sub plots, depending on size and shape of habitat type polygon. See Appendix I. for plot layout specifics.
4. Label the sample plot within each habitat polygon alphabetically, by following the directions below.
   a. Choose the appropriate code for each habitat type found within the unit utilizing the Habitat Code (Table C1.). If there is more than one occurrence of a habitat type on a site, number each occurrence separately.
      Examples:
      i. For a site with three wet prairie polygons, label the polygons as follows: WP1, WP2, and WP3.
      ii. For a site with two upland habitat polygons, label the polygons as follows: UP1 and UP2.
   b. For sample plots add the alphabet to the end of each habitat type code. So the final result would be as follows:
      Examples:
      i. A site containing one wet prairie habitat polygon and three sample plots would be labeled as follows: WP1a, WP1b, and WP1c.

ii. A site with two upland polygons, containing three sample plots each, would use the following labeling system: UP1a, UP1b, UP1c and UP2a, UP2b, UP2c.

c. When shrubs and trees are both present in a single habitat polygon, record both percent covers.

Examples:

i. For oak woodland polygon 1, plot a, use the following codes to distinguish between the dominant/tree story and shrub cover: OW1aD, and OW1aS. See Table C2. for Multiple Story Codes.

Table C2 – Multiple story codes.

Code	Name	Description
D	Dominant story	Vegetation ranging > 20 feet tall
S	Shrub	Vegetation ranging from < 20 feet tall

DETAILS FOR COMPLETING THE LOW INTENSITY HABITAT MONITORING FORM – (APPENDIX J).

Column 1 – Habitat Type Code and Sample Plot.
Follow the guidelines in Section II, 4 above for naming plots.

Column 2 – Priority Class.
Choose the appropriate "Priority Class" for the habitat from 1(high) or 2 (medium) or 3(low) or a combination. These "priority classes" can be found on the WEW 10 year Schedule EA Map 5 – Alternative D

DETAILS FOR ASSESSING – SECTION 1: WOODY VEGETATION

Columns 3-6 – Plant Species Code
For each sample plot, record woody plant species and record their percent cover using ocular estimates in separate columns. See Section II, 4c for more details on methodology for sample plots.

Column 7 – Total Percent Cover.
Record total percent cover. When shrubs and trees are found together in a single habitat type polygon, record both percent covers using percent cover categories found on the low-intensity habitat monitoring form or an average of densiometer readings taken from the center of each 5 m² from all four cardinal directions.

Page 2 (for woodland plots) (See Appendix J): Sketch out the existing trees and shrubs within the square map, and label with the associated species number in Column 2.

Column 1 – Habitat Type Code and Sample Plot.
Column 2 – Enter Species number if labeled on map.
Column 3 – Species Code.

Column 4 – Estimated % cover of canopy or shrub layer using densiometer readings from all four cardinal directions.
Columns 5-8 – Densiometer readings from all four cardinal directions.
Column 9 – Number of trees in sample plot. (trees are >20 ft).

DETAILS FOR ASSESSING – SECTION 2: NON-NATIVE PLANT SPECIES

I. The existing 1 m^2 and 5 m^2 woody vegetation sample plots will be utilized for assessing non-native invasive plants.

II. Sample plot labels for the non-native invasive plant species will remain the same as the existing woody vegetation sample plots. No new labeling is necessary for the litter and thatch or native plants assessments.

III. In priority 1 habitat polygons with sensitive species populations, an invasive plant survey is performed annually as a supplement to high intensity monitoring. This is the only annual low intensity monitoring for priority 1 habitats with sensitive species and will result in early detection of invasive species.

Columns 8-15 – Plant Species Code
For each sample plot, record all non-native invasive plant species utilizing the six letter plant code (or longer if necessary; e.g. *Galium trifidum* and *G. triflorum*) and record the percent cover for each species within the 1 m^2 plot.
Column 16 – Total Percent Cover.
Record total percent cover.

DETAILS FOR ASSESSING – SECTION 3: LITTER/THATCH LEVELS

I. The existing 1 m^2 sample plots from the woody vegetation and non-native invasive plant assessment will be utilized for assessing the litter and thatch levels.

II. Sample plot labels for the litter and thatch levels will remain the same as the existing woody vegetation and non-native invasive plant species sample plots. No new labeling is necessary for the litter and thatch assessment.

Column 13-16 – Plant Species Code
For each sample plot, record litter and thatch plant species utilizing the six letter plant code (see Appendix A) with at least 10% cover using visual ocular estimates within the 1m^2 plot.
Column 17 – Total Percent Cover.
Record total percent cover of litter/thatch. Assume 100 percent cover under live vegetation.

DETAILS FOR ASSESSING – SECTION 4: NATIVE PLANT COVER AND DIVERSITY

I. The existing 1 m^2 sample plots from the woody vegetation, non-native invasive plant species and litter and thatch assessment will be utilized for assessing the native plant cover and diversity levels.

II. Sample plot labels for the native plant cover and diversity levels will remain the same as the existing woody vegetation, non-native invasive plant, and litter and thatch sample plots. No new labeling is necessary for the native plant abundance assessment.

III. For each sample plot, record percentage cover of all native grasses combined, native forbs combined, and native sedges/rushes combined, using visual ocular estimates within the $1m^2$ plot. (Native woody vegetation is estimated in Section 1).

Column 18 – Record the cover of all native grasses present in the sample plot.
Column 19 – Record the cover of all native forbs present in the sample plot.
Column 20 – Record the cover of all native sedges & rushes present in the sample plot.
Column 21 – Total Percent Cover.
Record total percent cover
Column 22 – Plant Codes of Species Present.
Record all native species utilizing the six-letter plant code.
Column 23 – Total Number of Native Species.
Record total number of native plant species (grasses, forbs and sedges and rushes). The total number of species present equals diversity.
Time permitting –
Compile a complete species list as each habitat polygon is assessed.

DETAILS FOR DETERMINING RECOMMENDED MANAGEMENT TREATMENTS

Column 24 – Recommended Management Treatment

I. Use the total percent cover from sections 1 (woody vegetation) and 3 (litter and thatch) to determine if they exceed the threshold outlined in the 10-Year Schedule EA. If a threshold is exceeded suggest a management action from allowed management actions in table 2, page 9.

II. For section 2, if the total percent cover of non-native invasive plant species exceeds 50% of a $1m^2$ sample plot, or if a single species cover exceeds 10-35% of a habitat polygon then management is required. If a new highly aggressive noxious weed is present, management is required immediately and should be noted.

II. To determine if management is required for section 4: native plant cover and diversity, compare values to previous years' estimates to determine percentage change of cover or change in the total number of species present. If there is a drop of 5-10% for either column, then management actions are required to increase the cover and diversity of native species. If previous year's native species diversity data for WEW sites do not exist for comparison, assume habitat polygons exceed the threshold for native cover if the average number of natives per sample plot is one or less.

DEFINITIONS OF TERMS

Ash swale/riparian – In wetter areas where fire has been suppressed, ash swales have developed. These often contain populations of rare species, but the under story is dominated by perennial grasses, sedges, and rushes.

Wet prairie/vernal pool – An herbaceous plant community typically dominated by *Deschampsia cespitosa* (tufted hairgrass) that is seasonally flooded or saturated. Perched water tables and relatively impermeable clay soils are often present in this wetland type. Wet prairies are usually wet in the late spring and gradually dry out during the summer, being completely dry by late summer. Hummocky microtopography is characteristic of this wetland type.

Upland – The plant composition for this community is dominated by bunchgrasses, including *Festuca roemeri*, *Danthonia californica*, *Elymus glaucus*, and *Achnatherum lemmonii*, the spaces between the bunchgrasses are typically covered by mosses, fruticose lichens or native forbs. These prairies occur on well drained lowlands and valley soils, especially along valley margins.

Oak woodland – Oak woodlands have a canopy cover that is greater than 30%. The large amount of variation in canopy cover is likely due to varying fire frequency and intensity. The high tree density of oak woodlands results in a thin, tall canopy on each oak tree. The dense stands largely shade out herbaceous plants. Additionally, the absence of fire has allowed for the invasion of other trees, such as Douglas-fir, to colonize open areas. Whether the result of an altered fire regime or not, California black oak (*Quercus kelloggii*) and madrone (*Arbutus menziesii*) are also occasionally present. Additionally, the increased shade in woodlands results in a more shade-tolerant understory.

Oak savanna – Some savanna-specific species such as California fescue (*Festuca californica*) and fawn lily (*Erythronium oreganum*). The dominant trees are Oregon white oak (*Quercus garryana*). California black oak (*Quercus kelloggii*) and madrone (*Arbutus menziesii*) are sometimes present as well.

Woody Vegetation – Native tree and shrub species that invade prairie and savanna include Nootka rose (*Rosa nutkana*), Oregon ash (*Fraxinus latifolia*), Douglas-fir (*Pseudotsuga menziesii*), black hawthorn (*Crataegus douglasiii*), Oregon crabapple (*Malus fusca*), and cascara (*Rhamnus purshiana*).
Non-native species include paradise apple (*Malus x domestica*), one seed hawthorn (*Crataegus monogyna*), and hybrid hawthorn (*Crataegus monogyna x suksdorfii*).

Non-native invasive plants - Non-native invasive species that represent special challenges in the planning area include Harding grass (*Phalaris aquatica*), reed canarygrass (*Phalaris arundinacea*), pennyroyal (*Mentha pulegium*), smooth cat's ear (*Hypocharis radicata*), common teasel (*Dipsacus fullonum*), and hairy hawkbit (*Leontodon taraxacoides*). All can degrade prairie habitats by forming dense monocultures and reducing biological diversity. Other invasive species present in the WEW include false brome (*Brachypodium sylvaticum*), meadow knapweed (*Centaurea pratensis*), Canada thistle (*Cirsium arvense*), bull thistle

(*Cirsium vulgare*), Scotch broom (*Cytisus scoparius*), common St. Johnswort (*Hypericum perforatum*), Himalayan blackberry (*Rubus armeniacus*), English ivy (*Hedera helix*), and tansy ragwort (*Senecio jacobaea*).

Litter and thatch build up - A layer of undecomposed organic residues just above the soil surface and rhizomes and stolons between the crown of the grass plant and the root. Litter is defined as woody material and leaves, and thatch will be defined as remnant grass materials for the purposes of low intensity monitoring.

Native species – Plants that occur naturally in the west Eugene area (within a 20-mile radius of the red house located on Danebo Ave. and west 11th) prior to Euro – American settlement.

Sample Plot – An area **of** land used for measuring or observing existing conditions.

APPENDIX D: High intensity monitoring protocols for groundcover and shrubs and trees (from Jancaitis 2006)

Groundcover:
Point-intercept sampling is a method of sampling vegetation to obtain measures of individual species frequency or cover as well as abundance of habitat characteristics like thatch and litter, and bare soil. Some of the advantages of this method are that it is usually efficient, provides predictable and strong confidence intervals on individual estimates of frequency (with adequate sample size), has flexible plot size (up to 100 x 100 m), and has relatively low investigator bias. The latter is important because turnover in field crew personnel can be high and it is important to reduce the variation in sampling results due only to investigators. The method involves lowering a pin (a narrow metal rod) and recording the surface(s) that the pin touches as it is lowered to the ground. This process is repeated many times in different locations, and the resulting data are used to estimate frequency and cover of species, and when pooled, important species groups (such as natives, non-natives, perennials, annuals, etc.).

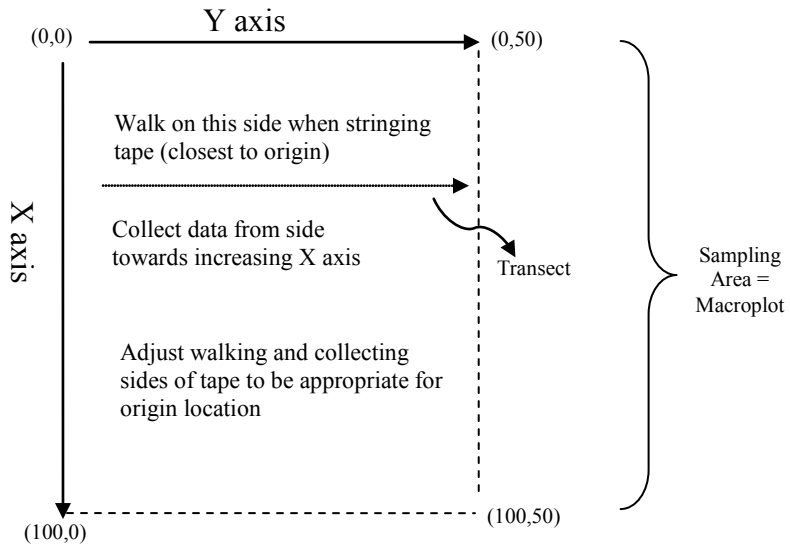
This method has been widely applied to mitigation bank sites in the WEW to monitor vegetation establishment at restored sites (Jancaitis 2006). It can be adapted for use in this monitoring plan at BLM sites with minor modification. The version of the point-intercept method used elsewhere in the WEW and suggested here obtains cover estimates from areas ranging in size from 25m x 25m to 100m x 100m. Plots of this size can be placed either randomly or non-randomly within treatment areas, as appropriate. This method samples the vegetation at determined intervals along a grid (created by laying one tape as a baseline, and running transects perpendicular to the baseline). The only species counted are those touched by the very tip end of the point intercept machine. This method provides a way of determining which species are dominant in the macroplot. The percentage of ground covered by each species is calculated by dividing the total number of observations of each plant by the total number of points. Cover estimates can be given with 90% or 95% binomial confidence intervals.

Sampling large acreages with this method will require the placement of more than one plot. The precise number of macroplots will depend on variation in vegetation across the site. A general rule of thumb for necessary plot numbers is 1-2 per ten acres of habitat, with additional plots needed if the habitat is patchy or made up of differing plant community types. Plot marking should use t-posts (metal fence posts) so that monuments are easy to locate, avoidable by mowers, and fire proof. Posts should be tagged with labels that indicate site name, plot number, and plot corner. All plots should include GPS coordinates. Plots may not be permanently marked if reducing the visual impact of monitoring in public areas is necessary. However, all plots in Sensitive Species habitat should be marked with monuments on the ground in some manner.

Plot set up protocol (following protocols in Jancaitis 2006):

1. Position the first-time placement of the macroplot by selecting locations on an aerial photograph or by random placement on-site, or find the existing macroplot by locating posts or using information from earlier field forms.

2. Choose one side of the macroplot as the baseline (X) (usually pre-determined—check maps), and lay out a transect (line) with a tape from the macroplot's origin the whole length of the baseline. Secure the ends on the baseline posts.
3. Randomly select the location of the first perpendicular transect from meters 0 to 5. Mark it w/ a pin flag.
4. Observe the plot and create a species list of all vascular plants in the plot.
5. The distance between each transect is calculated so that at least 200 points are sampled within the macroplot (macroplot area/200 $\geq$ distance between transects * distance between points). After these distances have been chosen, mark the locations of all transects with pin flags and take up the baseline tape.
6. Lay out a tape along the first Y transect, at 90 degrees from the baseline, securing the ends with surveyors stakes ("candysticks"). Several Y transects can be laid out at once with several tapes.



7. Look around the plot and calibrate the team on what is 'litter', 'mosses, or 'bare ground.'

Sampling a point:

1. Choose a random number, from 1 to 4, for starting sampling locations along the Y transect, and carry the Point Intercept Tripod to that meter. Place its leading (front) leg by that meter, and make sure the tripod is level.
2. Team member #1 - drop the pin slowly, without guiding it. Using a bit of cloth can help to maintain control of the pin while slowly lowering it.
3. Team member #2 - watch the pin as it's being lowered & identify any plants that the pin touches as it goes down. Only the **very bottom** of the pin **tip** matters here.
4. Team member #2 (or #3 if there are three people) - enter plant names into the data collector. A species is only entered once per pin drop. If the pin does not touch any plants, enter either 'litter, moss or bare ground' (as defined by your team leader). Also enter the habitat for that point (emergent, vernal pool, *Deschampsia cespitosa* dominated wet prairie, side slope, or old field). Habitat codes: 1=vernal pool, 2=DECE dominated, 3=emergent, 4=side slope, 5=old field, 6=ash grove.

5. To move the Y transect tapes, either roll up and restart, or move all at once, with one person at each end. Check that the compass bearing is 90 degrees from the baseline's orientation.

Shrubby/woody vegetation:

To measure the abundance of woody vegetation at sites with substantial shrub encroachment, line-intercept sampling may be used because point-intercept methods only evaluate vegetation close to the ground. This method can assess sites for thresholds for woody vegetation abundance and progress toward meeting goals of woody vegetation removal.

Sampling protocol:

1. The line-intercept method is utilized for estimating the percent cover of shrubs in an enhancement area.
2. Transects are run perpendicular to a macroplot baseline (a rate of two randomly selected transects every 10 meters has been used at some sites). The segments of the transect covered by shrubs are recorded, naming the shrub and giving the start and stop-coverage readings. If a gap between coverage is > 10 centimeters, a new record is started, even if the two coverages are caused by the same shrub. These readings can also include trees by looking up into the canopy, but this application is only recommended to accommodate sites with few trees present (looking up to estimate line intercept on the tape below is useful only for coarse estimates; see Tree Sampling, below, for sampling trees at heavily wooded sites).
3. The percentage cover of each shrub species is computed by dividing the length of all transects covered by that species by the combined length of all transects.
4. Equipment: Measuring tapes, data entry equipment, pin flags, flagging.

APPENDIX E: Additional Site Specific Monitoring for Special Status Species

For all species covered here, the primary objective of monitoring is to determine population size, plant size, and reproduction success in order to detect responses to habitat treatments, track trends through time, and assess population health. Monitoring has been conducted at many sites within the WEW for Sensitive Species and the existing protocols are often site specific to adjust to local population size and habitat complexity. For example, a total population census is accomplished at many of the smaller populations, while sub-sampling is employed to gain estimates of population and plant sizes and trends in large populations. Plot sizes and number vary considerably among sites.

White-topped aster (*Sericocarpus rigidus*)

Balboa: Population census for the white-topped aster population at Balboa is conducted in one macroplot (73 x 64 m), positioned to encompass the entire population as well as 12 "patches" scattered throughout the site. Monitoring at the site included frequency only through 2006, but the protocol was updated in 2008 to include foliar cover and number of reproductive stems.

Beaver Run: The majority of plants at Beaver Run were reintroduced to the site in 1999 and 2000 after road widening of West 11th damaged a small remnant population. A small number of transplants and seeded plots were established at the site in 1999, and larger numbers of container plants were outplanted to three plots in 2000. Protocols for relocating these plots are available in Kaye and Brandt (2005). Two small remnant patches of *Sericocarpus rigidus* also remain at this site, and a monitoring protocol should be implemented for them in 2012.

Fir Butte: There are four *Sericocarpus rigidus* patches that were estimated in size prior to 2008. Since 2008, the number of vegetative and flowering stems have beendirectly counted.

Hansen: There are approximately 40 occurrences of *Sericocarpus rigidus* within the Hansen/See-sil site, that are monitored by directly counting the number of vegetative and flowering ramets, and estimating the total cover (m^2) of each patch.

Isabelle: Monitoring at this site included a direct count of the number of white-topped aster ramets from 2002 through 2006, and since 2008 the number of vegetative and flowering stems have been directly counted.

Oxbow West: There are 11 white-topped aster occurrences or patches throughout the wet prairie at Oxbow West marked in the center with rebar. Between 2002-2008, they were monitored with an extent monitoring protocol. Since 2008 each patch has been directly counted for the number of vegetative and flowering stems.

North Greenhill (Ash Swale): Monitoring at North Greenhill began in 1997 and included frequency through 2006. In 2008, the protocol was updated to include foliar cover and number of reproductive stems. *Erigeron decumbens* var. *decumbens* and shaggy horkelia are also monitored within three plots which contain these species' populations. Monitoring protocols for this location are available in McKnight (2008).

North Greenhill (reintroduced population): Individuals of *Sericocarpus rigidus* were introduced to the restored prairie vegetation at North Greenhill in 2000 through both outplanting of greenhouse grown plants as well as direct seeding. Transplants are in a 20 x 30 m area with coordinates for each plant. Very few seeded plants are located at the site, and these are in 1 x 1 m plots. Monitoring occurred at the site annually from 2000 to 2004. Continued monitoring can be accomplished following the protocols in Kaye and Brandt (2005) to document the number of individuals and flower production. As these individuals grow, they are likely to become larger clones and difficult to distinguish. Therefore, a monitoring protocol using cover and flowering stem counts needs to be developed for this site.

Spectra Physics: Twelve patches of *Sericocarpus rigidus* at Spectra Physics are monitored by directly counting the number of vegetative and flowering ramets, and estimating the total cover (m^2) of each patch.

Speedway: Three patches of *Sericocarpus rigidus* at Speedway are monitored by estimating the total number of ramets and the total area covered (m^2) by each patch.

Vinci: The *Sericocarpus rigidus* population at Vinci is censused within a 40 x 65 m macroplot. Monitoring to measure frequency occurred in 2005 and 2006. In 2008, the protocol switched to measure foliar cover and number of reproductive stems. Monitoring protocols for this location are available in McKnight (2008).

Willamette daisy (*Erigeron decumbens* var. *decumbens*)

Balboa: Population censes for the Willamette daisy population at Balboa are conducted in three macroplots, varying in size (12 x 14 m, 73 x 64 m, 27 x 56 m) and position to encompass the entire population. Newly introduced plants are also monitored in separate macroplots. The number of individuals and flower heads per plant are counted in 1 m^2 cells of each macroplot. Monitoring protocols for this location are available in Jancaitis (2006) and Duren (2010).

North Greenhill (Ash Swale): Initiated in 1997, monitoring at this site involves a census of individuals and flower heads per plant in 1 m^2 cells in three macroplots. White-topped aster and shaggy horkelia are also monitored within these plots. Monitoring protocols for this location are available in Jancaitis (2006).

North Greenhill (reintroduced population): Individuals of *Erigeron decumbens* var. *decumbens* were introduced to the restored prairie vegetation at Greenhill Road in 2000 through both outplanting of greenhouse grown plants as well as direct seeding. Transplants are in a 20 x 30 m area with coordinates for each plant. Very few seeded plants are located at the site, and these are in 1 x 1 m plots. Monitoring occurred at the site annually from 2000 to 2004. Continued monitoring can be accomplished following the protocols in Kaye and Brandt (2005) to document the number of individuals and flower production.

Oxbow West: Since 1999, the Willamette daisy population has been monitored at the Oxbow West site. From 1999-2007 monitoring was conducted in combination with a habitat

management study (Kaye and Benfield 2005a). As part of the habitat management study, the population was divided into 20 15 x 45 m plots and each plot was assigned to a management treatment: mowing, burning, or control (no treatment). . All plants within all 20 of the 15 x 45 m plots were counted; all plants were measured in 14 plots and subsampled for measurement in six with particularly high plant densities. All details of this monitoring protocol are described in Kaye and Benfield (2005).

In 2009, monitoring methods were altered to use limited resources more effectively. In 2009 and 2010, a randomly chosen subsample of *E. decumbens* var. *decumbens* plots was monitored at Oxbow West. Number of plants, vegetative and reproductive, and flower heads were recorded within three plots from each treatment type (nine total plots out of the 20 present). The method of predicting the total population size from the subsample was changed from an unweighted averaging method in 2009 to a weighted averaging method in 2010 after it was noted that rates of plant number change in plots with few plants were unduly influencing total population predictions. Details of the subsampling monitoring protocol and calculation are described in Duren (2010).

In addition to monitoring within the 20 15 x 45 m plots, a 45 x 75 m macroplot has been established at the Oxbow West site to capture additional plants.. Plants are censused and their flower head production is recorded. The City of Eugene has monitored this 45 x 75 m macroplot since 2004 as part of Bank Mitigation monitoring activities.

Speedway: Speedway has been divided into four sections and one macroplot (46 x 20 m) to census the Willamette daisy population. The northern half of the site is bisected by a ditch that runs north to south from West 11th Street to the racetrack in the center of the Speedway site. The ditch separates NE and NW quadrants. The portion of prairie that borders W. 11th to the north of the Speedway site is included in the census even though it is not owned by the BLM. The southern half of the site is divided around ERDE macroplot one. The section west of the macroplot makes up a SW quadrant. The section surrounding the macroplot all directions besides west and continuing beyond the macroplot east to the creek and south to LOBR macroplot 4N makes up a SE quadrant. The few plants located along the western property edge north of the mini track remnant are included within the NW quadrant. All plants, vegetative and reproductive, and flower heads are recorded within the macroplot and four quadrants. Details for *E. decumbens* var. *decumbens* monitoring at Speedway are described in Duren (2010).

Vinci: The Willamette daisy population at Vinci is censused by counting all plants, vegetative and reproductive, and flower heads within a 25 x 65 m macroplot and 20 patches outside the macroplot (19 of which are navigable by GPS coordinates, one surrounds the macroplot). Monitoring at this site was initiated in 2005. Details for *E. decumbens* var. *decumbens* monitoring at Vinci are described in Duren (2010).

Shaggy horkelia (*Horkelia congesta* ssp. *congesta*)

Balboa (remnant population): Census for this population is conducted in three macroplots, varying in size (12 x 14 m, 73 x 64 m, 27 x 56 m) and position to encompass the entire

population. Number of individuals and flower counts are conducted by 1 m^2 cells in each macroplot. Monitoring protocols for this location are available in Jancaitis (2006).

Balboa (reintroduced population): A shaggy horkelia population was reintroduced to Balboa just west of Danebo Street in 1999 by seeding directly into fifteen plots. These plots were 1 m x 1 m in size and randomly placed in a band 10 m wide and 100 m long (north-south). Protocols for monitoring these plots are available in Kaye and Benfield (2004). This reintroduction work included seeding and transplanting with Bradshaw's lomatium, and 1 m x 1 m plots for this species were paired with the shaggy horkelia plots.

Long Tom ACEC: Shaggy horkelia population monitoring at Long Tom ACEC was established in 1994 to document population trends and develop computer models for population viability analysis. Four rectangular macroplots (18 x 8 m, 8 x 5 m, 8 x 6 m, and 10 x 10 m) are present at the site for monitoring in which all individuals can be measured and mapped (optional) in 1 m^2 cells of each macroplot. An additional circular plot was also established to encompass a small patch of plants. When all plots are measured at this site the monitoring is a census. This population was monitored in 2004, and then in 2008 and 2009 to document the effects of a 2007 prescribed fire. Monitoring protocols for Long Tom ACEC are available in Kaye and Benfield (2004).

North Greenhill (Ash Swale): Shagggy horkelia monitoring at North Greenhill (ash swale) involves a census of individuals and flowers by 1 m^2 cells in one 17 x 18 m macroplot. Monitoring at this site was initiated in 1997 and continues annually (data is absent only for 2007). Monitoring protocols for North Greenhill are available in Jancaitis (2006).

North Greenhill (introduced population): Individuals of shaggy horkelia were introduced to the restored prairie vegetation at Greenhill Road in 2000 through both outplanting of greenhouse grown plants as well as direct seeding. Transplants are in a 20 x 30 m area with coordinates for each plant. Very few seeded plants are located at the site, and these are in 1 x 1 m plots. Monitoring occurred at the site annually from 2000 to 2004. Continued monitoring can be accomplished following the protocols in Kaye and Brandt (2005) to document the number of individuals and flower production.

Rosy (introduced population): The shaggy horkelia population was reintroduced to Rosy just west of the Balboa site along Amazon Creek by seeding directly into fifteen plots following the same protocols as those used at Balboa. These plots were 1 m x 1 m in size and randomly placed in a band 10 m wide and 100 m long (north-south). Protocols for monitoring these plots are available in Kaye and Benfield (2004). This reintroduction work included seeding and transplanting with Bradshaw's lomatium, and 1 m x 1 m plots for this species were paired with the shaggy horkelia plots.

Speedway: At the Speedway site all individuals are counted by walking the entire site in 10 meter transects and counting all individuals, and by performing a census within one established macroplot to provide a total population census. Current monitoring involves counting the number of individuals and the number of flowering stems per plant. Monitoring protocols for this location are available in McKnight (2008).

Vinci: At Vinci, only a few shaggy horkelia individuals remain, and they are directly counted and recorded every three years, in order to document the condition of their habitat, and the number of individuals.

Bradshaw's lomatium (*Lomatium bradshawii*)

Balboa (introduced population): A Bradshaw's lomatium population was reintroduced to Balboa just west of Danebo Street in 1999 by seeding and transplanting directly into fifteen plots. The plots were 1 m x 1 m in size and randomly placed in a band 10 m wide and 100 m long (north-south). Protocols for monitoring these plots are available in Kaye and Benfield (2004). This reintroduction work included seeding with shaggy horkelia, and 1 m x 1 m plots for this species were paired with the Bradshaw's lomatium plots.

Long Tom ACEC: Bradshaw's lomatium monitoring at Long Tom ACEC began in 1997 and involves a census of individuals, vegetative and reproductive, and counts of umbels in four macroplots. Monitoring protocols for Long Tom ACEC are available in Duren (2010).

North Greenhill (Ash Swale): Bradshaw's lomatium monitoring at North Greenhill (ash swale) begain in 1997 and involves a census of individuals, vegetative and reproductive, and counts of umbels in one macroplot. Monitoring protocols for North Greenhill are available in Duren (2010).

North Greenhill (introduced population): Individuals of Bradshaw's lomatium were introduced to the restored prairie vegetation at Greenhill in 2000 through both outplanting of greenhouse grown plants as well as direct seeding. Transplants are in a 20 x 30 m area with coordinates for each plant. The seeded plants are located at the site in 10 1 x 1 m plots. Monitoring occurred at the site annually from 2000 to 2004. Continued monitoring can be accomplished following the protocols in Kaye and Brandt (2005) to document the number of individuals and flower production.

Rosy (introduced population): A Bradshaw's lomatium population was reintroduced to Rosy just west of the Balboa site along Amazon Creek by seeding and transplanting directly into fifteen plots following the same protocols as at Balboa. The plots were 1 m x 1 m in size and randomly placed in a band 10 m wide and 100 m long (north-south). Protocols for monitoring these plots are available in Kaye and Benfield (2004). This reintroduction work included seeding with shaggy horkelia, and 1 m x 1 m plots for this species were paired with the Bradshaw's lomatium plots.

Spectra Physics: Only one individual remains at this site, and a direct count is performed annually.

Speedway: Bradshaw's lomatium monitoring protocols for Speedway are available in Duren (2010) and involve a complete census using a series of small macroplots that encompass all of the known plants.

Taylor North: Bradshaw's lomatium monitoring at Taylor North involves a census of individuals, vegetative and reproductive, and counts of umbels in three small macroplots. Monitoring within macroplot four began in 1997, and monitoring in macroplots five and six began in 2008, upon discovery of an additional population. Monitoring protocols for Taylor North are available in Duren (2010).

Kincaid's lupine (*Lupinus oreganus*)

Fir Butte -- The Fir Butte Kincaid's lupine population was monitored as part of a management treatment evaluation project from 1998 to 2007 (Kaye and Benfield 2005b) to compare mowing and burning as methods for controlling blackberry while maintaining or enhancing Kincaid's lupine and Fender's blue butterfly. Eighteen macroplots (45 m x 100 m) have been established to encompass the entire population at the site, and these macroplots are subsampled with two 2 m x 100 m plots in each. This monitoring strategy has served the dual purpose of measuring population size and trends through time while comparing management treatments. Whole population estimates of lupine abundance and inflorescence production are possible by calculating mean plot values and multiplying by total number of possible plot locations. Uncertainty terms (Standard error, 90% confidence intervals) are estimated with this method as well.

From 1998 through 2005, monitoring included counting leaves and inflorescences within the sampling plots. In addition, blackberry cover and Fender's blue butterfly eggs were measured in each plot (see Fender's blue butterfly monitoring, below). In 2005, monitoring protocols included estimation of lupine cover, and in 2006 leaf counts were dropped in favor of cover estimates. Current monitoring protocols include lupine cover and inflorescence counts, and these methods are described in detail in Kaye and Benfield 2005b).

In late summer, early fall of 2007 the entire site was mowed, and the management treatments are no longer implemented for the research study. Data is now analyzed for population trends of Kincaid's lupine and Fender's blue butterfly.

Hansen (introduced population)– A Kincaid's lupine population was reintroduced to Hansen in the late 1990s by Cheryl Schultz. A monitoring protocol to measure lupine cover and count the number of racemes is conducted. Details of the monitoring protocol for Hansen are available in Duren (2010).

Isabelle (introduced population) -- A Kincaid's lupine population was introduced to Isabelle in 1999, 2000 and 2003. All of the plants present at the site are the result of this reintroduction experiment. Plants were established in ten seeded plots (1 m x 2 m) in 1999 and t10 adjacent seeded plots in 2003. Transplants were placed at the site in a grid in 2000. Current monitoring protocols include lupine cover and inflorescence counts.

North Greenhill (introduced population) -- A small group of Kincaid's lupine plants was reintroduced to North Greenhill in 2000. Originally, three 3 m x 4 m plots in wetland habitat and one 2 m x 3 m on a small upland mound were planted, but all plants in the wetland plots died

within three years. However, a few plants survived on the upland mound and constitute a small patch of only twoto four individuals. No plots have been established to track these plants, but they are so well delineated on the small upland mound that no plot has been needed for their relocation. Lupine cover and number of racemes are recorded annually at North Greenhill to track the established lupine plants. Additional information on plantings at this site is available in Kaye and Brandt (2005).

Turtle Swale – Kincaid's lupine plants at Turtle Swale are censused within a 25 m x 28 m macroplot. In past years, leaf and inflorescence counts per 1 m^2 section of a grid were recorded; leaf counts have since been replaced with foliar cover estimates. Monitoring protocols for Turtle Swale are available in Kaye and Benfield (2005b).

Turtle Swale (reintroduced population) – Reintroduction of Kincaid's lupine to the Turtle Swale site was initiated in 2002 in response to observations of chronic reproductive failure of the remnant population. It was hoped that the addition of plants of neighboring (Fir Butte) genetic stock would result in greater genetic diversity and more successful seed production in the remnant plants. Transplanting and seeding were attempted in two macroplots, one (5 m x 20 m) on the north and one (5 m x 10 m) on the south side of the remnant population. Protocols for locating and monitoring plots associated with reintroductions are available in Kaye and Benfield (2005b).

Oxbow West – A 17 x 30 m macroplot was established at this site in 1999 to monitor Kincaid's lupine population trends. The macroplot is monitored in 1 m^2 grid cells. Leaf and inflorescence counts were conducted through 2005, and in 2006 leaf counts were replaced by estimates of foliar cover. Protocols for monitoring the macroplot are available in Kaye and Benfield (2005b).

Oxbow West (reintroduced population) – Eleven transplants were placed at this site adjacent to the remnant population in 2000. By 2005, the remaining transplants had grown together in such a way that individual plants could not be distinguished; and total leaf and inflorescences were conducted in that year. Since that time, cover estimates have replaced leaf counts. Establishment of permanent posts and a new grid system to track the small patch of plants is recommended.

Fender's blue butterfly (*Icaricia icarioides* ssp. *fenderi*)

Fir Butte – Monitoring Fender's blue butterflies at Fir Butte uses distance sampling methods to determine adult populations. Appendix F describes the protocol used to monitor Fender's in more detail.
In addition, eggs are counted in sub-sample plots used for lupine monitoring. In those plots, where lupine leaf abundance exceeds 1000 per 2 m x 5 m plot segment, 25% of the leaves are inspected and the number of eggs encountered is multiplied by four. See Kaye and Benfield (2005b) for more details of egg counting protocols. Egg counts are suggested to be performed every three years unless burning or other large scale restoration projects are implemented at a site that may affect the butterfly population.

Oxbow West – Adult butterfly monitoring at Oxbow West uses the presence/absence method described in Hicks 2013, Appendix F describes the protocol used to monitor Fender's in more detail.

Turtle Swale – Adult butterfly monitoring at Turtle Swale uses the presence/absence method described in Hicks 2013, Appendix F describes the protocol used to monitor Fender's in more detail.

Isabelle -- Adult butterfly monitoring at Isabelle uses the presence/absence method described in Hicks 2013, Appendix F describes the protocol used to monitor Fender's in more detail.

Hansen.-- Adult butterfly monitoring at Hansen uses the presence/absence method described in Hicks 2013, Appendix F describes the protocol used to monitor Fender's in more detail..

BLM Sensitive Species Suggested Monitoring:

Thin leaved Peavine (*Lathyrus holochlorus*)

Taylor South – A complete census is performed by counting the number of individuals present.

Meadow checker-mallow (*Sidalcea campestris*)

Taylor North – The meadow checker-mallow population at Taylor North was fenced off in 2009 to prevent grazing. A complete census is performed by counting the number of individuals and the number of racemes.

Taylor South –A complete census is performed by counting the number of individuals and the number of racemes.

Clustered goldenweed (*Pyrrocoma racemosa* var. *racemosa*)

Oxbow West – One plant comprises the remaining clustered goldenweed population at Oxbow West. The plant can be located by GPS coordinates, and a complete census performed by directly counting the number of plants, vegetative and reproductive, and the number of inflorescences/reproductive plant as well as the number of flower heads/inflorescences.

Turtle Swale – Turtle Swale supports a population of clustered goldenweed which extends from the northwest to the northeast corner of the site, dispersed among the wet prairie/vernal pool habitat on the north side of Amazon Creek, which was restored during phase two of bank mitigation in 2002. A complete census is performed by directly counting the number of plants, vegetative and reproductive, and the number of inflorescences/reproductive plant as well as the number of flower heads/inflorescences. The site has no established macroplot, but the sizeable *P. racemosa* var. *racemosa* populations present at Turtle Swale and Greenhill offer an opportunity to install trial plots to study the effects of different treatments. Plants are not of sufficient density to set up replication plots, but perhaps one large macroplot can be set up at each site and a single treatment applied to half of each plot, with the other half serving as a

control. The advantage of installing a macroplot would be increased consistency in plant counts year to year.

North Greenhill – The North Greenhill site supports a sizeable, dispersed population of clustered goldenweed present in the wet prairie/vernal pool habitat restored as part of bank mitigation restoration initiated in 1996. A complete census is performed by directly counting the number of plants, vegetative and reproductive, and the number of inflorescences/reproductive plant as well as the number of flower heads/inflorescences.

Willow Corner Annex - Willow Corner Annex supports a small population of clustered goldenweed which is located near the small population of Bradshaws lomatium at the edge of the ash swale. A complete census is performed by directly counting the number of plants vegetative and reproductive and the number of inflorescences/reproductive plant as well as the number of flower heads/inflorescences.

Hitchcock's Blue-eyed-grass (*Sisyrinchium hitchcockii*)

Balboa – In 2012, Ed Alverson surveyed the site and found _ small populations of Hitchcocks blue-eyed-grass.

North Greenhill Road (Ash Swale) – In 2010, one *Sisyrinchium hitchcockii* population was confirmed using a new key to the *Sisyrinchium* species of western Oregon (Groberg et al. 2010). In 2011, identification should be checked against other keys. After positive identification, monitoring methods and purposes should be developed to accurately track this species.

Turtle Swale – In 2010, one *Sisyrinchium hitchcockii* population was confirmed using a new key to the *Sisyrinchium* species of western Oregon (Groberg et al. 2010). In 2011, identification should be checked against other keys. After positive identification, monitoring methods and purposes should be developed to accurately track this species.

APPENDIX F: Monitoring Methods for Censusing Fender's Blue Butterfly (Taken from Hicks 2013)

MONITORING

TECHNIQUES

Monitoring of FBB takes on three forms of varied intensity. The least intensive form of monitoring is presence/absence monitoring, followed by the modified peak count method, and finally the most intensive monitoring, distance sampling. Factors determining which technique should be used include: season, site size, site protection, the potential FBB population size, and the goals of the monitoring project. Use the questions in Table II to determine which method of monitoring is recommended for your site. If you are uncertain consult with USFWS.

Table II. Use this table and the questions below to determine which level of monitoring is appropriate.

	Yes	No
Is the site larger than 1 ha?		
Is the site likely to support more than 200 FBB?		
Do you want to measure FBB response to management or restoration?		
If you answered yes to any of the above questions you should implement Distance sampling. If you answered no to all the questions above proceed below.		
Is the site under protection (e.g. conservation easement, federal lands)?		
Is the site likely to support more than 50 FBB?		
Is the site within 1 km of another FBB population?*		
If you answered yes to all of the above questions use a modified peak count. If you answered no to one or more of the above confirm presence/absence on an annual basis if possible. * Contact USFWS if uncertain.		

PRESENCE/ABSENCE

Presence/absence is the least intensive method of monitoring with broadest temporal window for completion. The objective of presence/absence is to confirm occupancy and monitor persistence of FBB populations. FBB populations, especially small populations, are subject to periodic extinctions and recolonization events. Presence/absence can be established from early April through the end of June using immature and adult life stages. However, it is recommended that monitoring of adult life stages be used when possible. For most sites adults are flying from mid-May through mid-June. Observers may wish to visit multiple times across the season to confirm presence/absence. However, once presence is confirmed additional visits during that year are not necessary. Presence/absence of adults is best achieved by slowly walking the site and visiting key resource areas including: lupine patches, areas rich in nectar, and any exposed wet mud where males may congregate. During presence/absence surveys a rough count of the total adult FBB should be noted.

Besides adults, eggs offer a viable alternative to presence/absence monitoring and can be useful if poor survey weather conditions prohibit adult surveys. The underside of lupine leaves can be checked during June for the presence of FBB eggs. Lupine leaves can be rapidly assessed by gently bending the stems so the underside of the leaf is facing you and rolled between your fingers so that the entire underside of a leaf can be assessed. SBB will occasionally lay eggs on the underside of leaves. When monitoring the presence/absence of FBB eggs you should check between 250-1000 leaves across the site. Focus your efforts on small isolated plants as they tend to hold larger numbers of eggs. If one to nine eggs are found the site is considered "probable" for presence. If more than 10 eggs are found the site is considered "confirmed" for presence. The most difficult life stage to use in establishing presence/absence is the larval stages due to their low detectability. However, it does allow for monitoring during April prior to the flight season. Post-diapause larvae are most easily found in April by searching carefully at the base of the plants where new shoots are emerging. Choose plants that show damage from larval feeding to increase your odds of locating a larva. Post-diapause larvae are frequently tended by ants and a lupine with ants crawling on it are a good sign that a FBB larva might be present. Pre-diapause larvae may be encountered during June when searching for eggs.

Table III. Levels of confirmation of presence/absence of FBB.

Absent	Probable	Confirmed
- No adult or immature life stages of FBB present	- 1 to 9 eggs of suitable size and color found on the underside of lupine leaves	- Adult or larval FBB present - 10 or more eggs of suitable size and color found on the underside of lupine leaves

MODIFIED PEAK COUNT

The objective of the modified peak count is to provide an approximate estimate of FBB population size with a minimal amount of time invested in surveying. The accuracy of the estimate is principally determined by the observer's ability to survey during the peak flight period of male FBB. Male FBB populations tend to peak within 1 to 3 weeks after the first adult ecloses or emerges from the pupa. In order to ensure that the site is surveyed during the peak male flight multiple visits during early to late May are necessary. Early visits to sites should serve to inform the surveyor of the relative size of the FBB population (e.g. are there many or very few adults flying early in the flight season), the distribution of resources (e.g. lupine, nectar, mud) at the site that should be surveyed during the peak count, and the temporal proximity to peak male flight. For most sites in most years peak flight will occur between the 18th to 31st of May. In cooler years or at later sites peak may occur in early June. **Good indications of peak flight include: 30-40% of the FBB individuals observed are female and a sudden spike in the number of fresh (brightly colored and no wing wear) males flying**. Nearby sites (< 2 km away) with similar slopes and aspects can be used as sentinel sites to determine peak at outlying sites.

For most sites surveyors should plan to visit a site at least once between the 10th and 17th of May to get a sense of the relative flight phenology. An additional two visits will likely to be necessary between May 18th and the 31st (or early June for some sites) to complete the peak survey count or confirm the peak flight period has passed. Surveys should take place between 10 AM – 4 PM on days with less than 50% cloud cover, greater than 60 F air temperature, and wind less than 12 mph. In some years surveyors may be forced to survey during sub-optimal weather. During each visit surveyors should thoroughly survey all

resources where adult male FBBs are likely to congregate including: lupine patches, nectar patches, and exposed wet mud where males gather to collect salts (Fig. 10). Areas of prairie with no FBB resources do not need to be surveyed. During each survey the total number of adult blue butterflies should be recorded. Either during the survey or after the survey is complete a subset consisting of at least 10 male blues (if < 100 male blues counted) or 10% of the total male blues counted should be captured or viewed through binoculars and identified to the species level and that data should be recorded. Surveyor should record the start and end time of surveys, weather condition, site data, total number of males blues counted, and the FBB/SBB ratios on a data sheet during each survey (Appendix II).

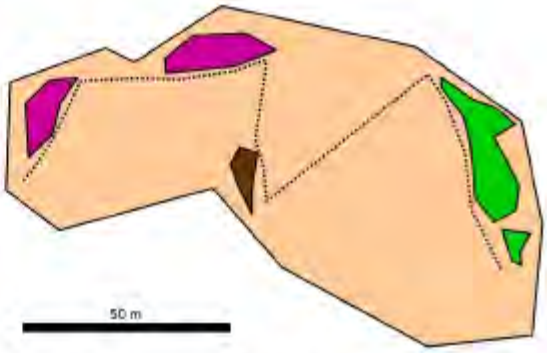


Figure 10. When surveying for presence/absence or completing a peak count all resources of a site should be visited including: nectar (pink), mud puddles (brown), and lupine (green). All other areas can be ignored.

DISTANCE SAMPLING

Distance sampling is the most intensive method of monitoring FBB. It is a transect based survey technique that can account for undetected butterflies, observer differences, variability in detectability due to abiotic and biotic factors (e.g. weather, vegetation) and generates confidence intervals around population estimates. Distance sampling is widely employed in monitoring animals especially those occurring in open landscape such as prairie. It is currently used in monitoring the endangered Karner Blue Butterfly (*Lycaeides melissa samuelis*) in the Great Lakes region.

There are three major assumptions that need to be met when completing Distance sampling surveys. Meeting these assumptions is critical to accurately estimating FBB populations and are explained in more detail below.

1.) Butterflies on the transect line are detected with certainty.
2.) Distance measures are accurate.
3.) Distance measures are to the location where the butterfly was first detected.

Survey Design

The first step in Distance sampling FBB is establishing survey transects. An assumption of Distance sampling is that the butterflies locations are independent of the survey transects. This assumption is met by choosing a random start point and systematically placing transects across the site. Transects should be placed 5-20 m apart and each transect should be given a unique alphanumeric identifier. Use larger spacing to more efficiently survey large sites and use smaller spacing at smaller sites, sites known or expected to support low densities of butterflies, or where lupine patches are small and infrequent. Transects should be oriented to maximize length for more efficient and complete coverage of the site

(Fig. 11). For large sites with localized lupine resources it may be more cost and time efficient to delineate smaller patches that are surveyed rather than surveying an entire site (Fig. 12). With this approach you will have higher FBB population densities but a smaller occupied area. Transect start and end points should be flagged or marked in a manner that will last the field season. For transects longer than 50 m or in hilly terrain it is often useful to periodically flag along transects so that surveyors do not deviate from the transect lines.

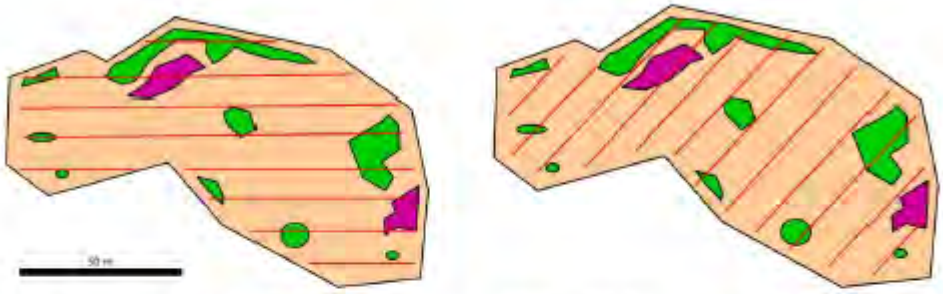


Figure 11. A comparison of efficient (left) versus inefficient (right) transect placement. When placing transects it is more efficient to orient transects to maximize length. This reduces the amount of time surveys spend not surveying walking between transects.

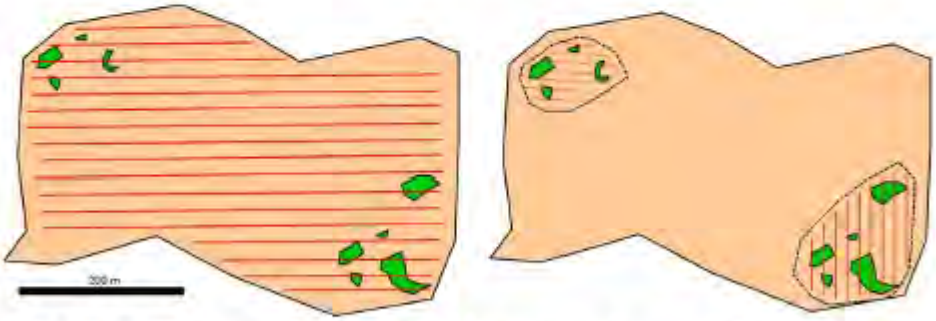


Figure 12. For large prairie patches with isolated lupine it may be more efficient to designate smaller FBB patches for surveys (right) rather than survey the entire site (left).

Completing Surveys

Each site will need to be surveyed a minimum of five times during the flight male FBB flight season from early to mid-May to mid-June. Surveyors should attempt to complete at least one survey at or near the peak flight period. Prior to each survey surveyors should record the location, date, time, temperature, wind speed, and percent cloud cover. It is recommended that surveyors record survey data using a digital recorder or record app on their smartphone and later transcribe the data onto data sheets. This allows the

observer to continuously keep their eyes on the survey transect. At the beginning of each new transect surveyors should note the transect identifier.

During each survey surveyors should walk each transect line at a steady pace. Surveyors should focus most of their attention directly in front of them in order to ensure that all male blue butterflies on or near the line are detected. When surveyors detect a blue butterfly they should note its location of first detection in front of them and whether or not it was flying or sitting at time of detection. If multiple butterflies are interacting (e.g. chasing or mating) the "cluster size" or number of individuals should be noted on the datasheet. When surveyors reach the location perpendicular to the original butterfly(ies) location along the survey transect they should measure the distance from the survey transect to the original point of detection (Fig. 13). This measurement is best accomplished using a 3 to 4 m lightweight pole made from aluminum with distance bins of 0.25 to 0.5 m in width marked out along the pole. Distance greater than the pole can be estimated. Collapsible poles of this length can be readily purchased from entomological suppliers such as Bioquip. Distance to the butterfly can be estimated to the nearest tenth of meter or butterflies can be placed into distance bins 0.25 to 0.5 m in width. Surveyors should to their best ability avoid double counting butterflies on a single transect and may need to note the locations of several butterflies at one time (Fig. 13). Surveyor should only record data while walking survey transects. When all transects have been surveyed surveyors should record the time and note any significant changes in the weather or other pertinent notes on their audio recorders. Either during the survey or after the survey is complete a subset consisting of at least 10 male blues (if < 100 male blues counted) or 10% of the total male blues counted should be captured or viewed through binoculars and identified to the species level and that data should be recorded.

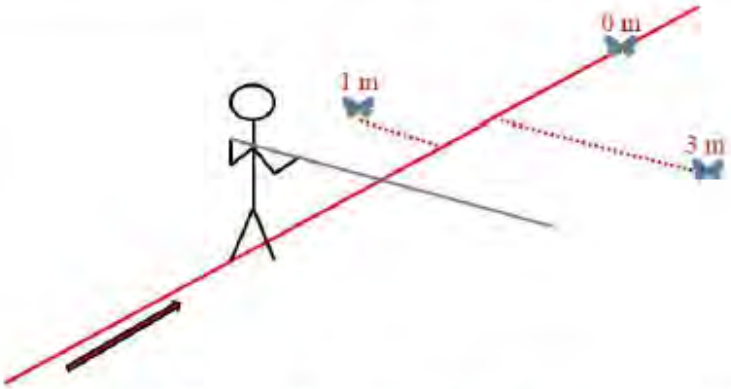


Figure 13. Surveyors should walk each transect and measure and record the perpendicular distance of each male blue butterfly from the transect line.

Data Analysis

After completing surveys data should be transcribed from audio recordings onto data sheets or directly into a database. Data analysis is completed within the program Distance (http://www.ruwpa.st-and.ac.uk/distance/). Data analysis should be completed by someone trained in analysis of Distance

sampling data and familiar with the life history, behavior, and sites occupied by FBB. Contact USFWS if you are unable to find someone who can complete analysis of your Distance sampling data.

Databases should be prepared in a manner to facilitate importation in to the program Distance. Data for detections is entered in rows. Each detection gets its own row of data. The columns are populated with information on the site, time, weather, distance, cluster size, and FBB/SBB ratio. If a transect is surveyed and no individuals are encountered then a row is entered with no values entered in the perpendicular distance, behavior, cluster size, or sex column (Fig. 14). Data can be entered into Excel, Google Spreadsheets, or tab/comma delimited text files.

Columnar data should be entered in the following sequence (Fig. 14).

1.) Site
2.) Patch (if applicable)
3.) Surveyor
4.) Date
5.) Start Time (follow military time)
6.) End Time (follow military time)
7.) Temp (F or C but be consistent)
8.) Wind (mph, kph, or beaufort)
9.) Cloud Cover
10.) Transect identification
11.) Transect length (meters only)
12.) Perpendicular distance to butterfly or butterfly cluster (leave blank if no detections on transect)
13.) Behavior (flying or sitting) (leave blank if no detections on transect)
14.) Cluster size (leave blank if no detections on transect)
15.) Sex
16.) % Fenders

Site	Patch	Surveyor	Date	Start Time	End Time	Temp F	Wind	Cloud Cover	Transect	Length	Perp Dist	Behavior	Cluster	Sex	% Fenders
BSNWR	Area 5	TLH	5/18/2012	1353	1426	65	1	20	1	57	0.5	Flying	1	M	0.62
BSNWR	Area 5	TLH	5/18/2012	1353	1426	65	1	20	2	85					0.62
BSNWR	Area 5	TLH	5/18/2012	1353	1426	65	1	20	3	141					0.62
BSNWR	Area 5	TLH	5/18/2012	1353	1426	65	1	20	4	198	1	Flying	1	M	0.62
BSNWR	Area 5	TLH	5/18/2012	1353	1426	65	1	20	4	198	0	Flying	1	M	0.62
BSNWR	Area 5	TLH	5/18/2012	1353	1426	65	1	20	4	198	0	Flying	2	M	0.62
BSNWR	Area 5	TLH	5/18/2012	1353	1426	65	1	20	4	198	1	Flying	1	M	0.62
BSNWR	Area 5	TLH	5/18/2012	1353	1426	65	1	20	5	170	2	Flying	2	M, F	0.62
BSNWR	Area 5	TLH	5/18/2012	1353	1426	65	1	20	6	57	0.5	Flying	1	M	0.62
BSNWR	Area 5	TLH	5/18/2012	1353	1426	65	1	20	6	57	0	Sitting	1	M	0.62
BSNWR	Area 5	TLH	5/18/2012	1353	1426	65	1	20	7	85					0.62
BSNWR	Area 5	TLH	5/18/2012	1353	1426	65	1	20	8	85					0.62

Figure 14. An example of FBB Distance sampling database. Note how transects with no detections are left blank.

APPENDIX G. Methods for Invasive Species Mapping

INTRODUCTION

Invasive species mapping methods were refined in 2010 to include additional target species, increase mapping precision, note weed percent cover in broad classes derived from management thresholds, and align geographic information system (GIS) formats with Bureau of Land Management (BLM) Region 6 data. Methods described here are based on methods used in 2010 and described in Duren (2010). However, as access to technology increases (i.e. hand-held GPS units capable of mapping species location and extent), methods used to map invasive species may change to increase efficiency and effectiveness, and this plan may be altered to reflect those changes.

DATA COLLECTION

In the field, broad swaths are walked back and forth through a habitat area within a site to assess the encroachment of each of the target weed species (Table 1). Hardcopy site maps with an aerial photo overlay are used to hand draw polygons of species extent, with each species represented by an arbitrary symbol or color; separate maps for woody species, forbs, and grasses are used to ease later interpretation. Species with different levels of aggressiveness or that require different treatments are mapped individually, rather than generalized by genus (e.g., *Cirsium arvense* and *C. vulgare*). Along with site name and mapping date, species percent cover in each polygon is recorded on a datasheet in broad classes that correspond to management thresholds outlined in the 10-year Schedule EA, including trace (T; <1%), low (L; 1-9%), moderate (M; 10-35%), and high (H; >35%). Combined cover of non-native or native weedy species 10 – 35% or greater within a habitat type indicates a need for management action (Villegas-Moore 2006).

DATA DIGITIZATION

Weed information from the West Eugene Wetlands is combined with information from other BLM Districts into a region-wide database for Oregon and Washington. Therefore, the information collected, and its format in GIS, must match the overall regional database. Attributes entered for each weed polygon should include the USDA plant species code, site name, BLM District code (09 for the Eugene District), source for weed coordinates (e.g., MAP for polygons digitized from hardcopy maps), the accuracy of polygon location, and the date the weeds were mapped (allowed attribute values and formats are detailed in a document available at P:\Weeds\Weed Mapping Protocols, or contact BLM staff Tom Jackson). The species cover class for each polygon is also recorded within the attribute table, though this information is not retained in the regional weed database (similarly, the regional database includes information on the number of plants and the units of that number, but these metrics were seen as less applicable to many of the species mapped on the West Eugene Wetlands and so can be left blank). Polygon area is easily calculated within each attribute table.

Hardcopy weed maps are digitized in GIS using heads-up (free-hand) digitizing. For each habitat and site mapped, polygons for weeds documented in a previous year are copied into the

current year shapefiles when the polygon was not duplicated by the current year's efforts. (For sites and habitats not mapped in the current year, the last year for which data exists should represent the most recent weed documentation. Some sites and habitats within sites may not have existing digitized data and earlier hardcopy maps such as those by Jean Jancaitis (2005) may also prove useful. An eventual goal should be consolidating and digitizing all weed information.) Each weed species is digitized as a separate shapefile so that each species layer can be viewed separately to ease interpretation. Layers for new species can easily be created as feature classes within the existing personal database. Then, attribute tables can quickly be defined by importing characteristics from already existing layers.

At the end of the field season, the most current information for sites not mapped that year should be extracted, and placed on the network (P: drive) along with the current year's weed shapefiles. The most up-to-date shapefiles available for all sites in the West Eugene Wetlands should then be submitted to BLM GIS Specialist Tom Jackson for inclusion with the regional database (i.e., by notifying Tom of the file locations as he has access to the P: drive).

Table 1. Invasive species recorded during mapping.

Shrubs/Trees	**Perennial/Biennial Forbs**	**Other Weed Species Present**
Pseudotsuga menziesii	*Asparagus officinalis*	**annual grasses**
Pinus ponderosa	*Centaurea pratensis*	*Aira caryophyllea*
Fraxinus latifolia	*Cirsium arvense*	*Avena fatua*
Rosaceaous trees *(Crataegus monogyna, Malus spp., Prunus spp., Pyrus spp., Sorbus aucuparia)*	*Cirsium vulgare*	*Briza minor*
Cytisus scoparius	*Dipsacus fullonum*	*Bromus hordeaceus (B. mollis)*
Cytisus striatus	*Hedera helix*	*Bromus japonicus*
Ilex aquifolium	*Iris pseudacorus*	*Bromus rigidus*
Ligustrum sp.	*Lepidium heterophyllum*	*Cynosurus echinatus*
Mazus japonicus	*Leucanthemum vulgare (Chrys. leuc.)*	*Echinochloa crus-galli*
Rosa eglanteria, R. multiflora, & R. pisocarpa	*Lotus corniculatus*	
Rubus armeniacus & R. laciniatus	*Lysimachia nummularia*	**perennial/biennial grasses**
	Lythrum hyssopifolia	*Agrostis alba/tenuis*
Perennial/Biennial Grasses	*Lythrum salicaria*	*Cynosurus cristatus*
Agrostis stolonifera	*Pteridium aquilinum* (Fir Butte only)	*Festuca rubra*
Alopecurus pratensis	*Ranunculus repens*	*Lolium multiflorum*
Anthoxanthum odoratum	*Senecio jacobea*	*Lolium perenne*
Arrhenatherum elatius	*Vinca major*	
Brachypodium sylvaticum	*Hypericum perforatum*	
Dactylis glomerata	**Annuals**	
Festuca arundinacea	*Anthemis cotula*	
Holcus lanatus	*Geranium lucidum*	
Phalaris aquatica	*Lythrum portula (Peplis portula)*	
Phalaris arundinacea		
Phleum pratense		
Poa pratensis		

DATA UTILITY AND PRECISION

Hand recording weed location and extent on paper maps obviously trades accuracy and precision for speed. Accuracy and precision further degrade when locations are interpreted during digitization. Accuracy for each polygon is listed at 30 feet in GIS attribute tables, but is likely to vary widely depending on the recorder and the ease at which one's position is estimated in a site (e.g., position is likely to be less accurate in sites with few topographical or other identifiable features). Data are best used to assess species presence at a site and general level of infestation rather than in analyses that depend on a high degree of spatial accuracy and precision. GPS locations should be recorded for highly invasive species (e.g. *Brachipodium sylvaticum, Phalaris aquatic, P. arundinacea, Hedera helix, Iris pseudacorus, Lysimachia nummularia, Lythrum* spp., *Ranunculus repens, Vinca major,* and *Geranium lucidum*).

Despite data limitations, weed percent cover classes, along with area of each weed polygon calculated in GIS, enables a rough assessment of the approximate area infested by each species in sites mapped with this method (Table 2).

Table 2. Example calculation for estimated area infested by *Dipsacus fullonum* in Balboa, 2010.

Polygon	USDA Sp Code	Site	Cover class		Extent area (ac)	Low estimate	High estimate	Est. area (ac) infested
1	DIFU2	Balboa	low	1-9%	0.168	=0.01*0.168	=0.09*0.168	0.007 - 0.065
2	DIFU2	Balboa	low	1-9%	0.041			
3	DIFU2	Balboa	low	1-9%	0.033			
4	DIFU2	Balboa	low	1-9%	0.188			
5	DIFU2	Balboa	low	1-9%	0.290			

Weed cover class information is available in GIS attribute tables, and weed maps alone do not convey the level of weed infestation. Weed cover should also not be interpreted as complete; areas in which invasive species are present also often contain substantial native cover and diversity. Weed maps are useful for noting weed species presence and extent, and identifying areas for treatment (e.g. hand pulling and mowing), but alone should not be used to judge the level of weed infestation or to assess site quality.

APPENDIX H. Additional Habitat Evaluation Criteria – from the Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington (USFWS 2010)

INTRODUCTION

The USFWS (2010, Appendix D) offers criteria for evaluating prairie quality and diversity within sites managed for listed plant species and the Fender's blue butterfly. These criteria are summarized here to inform monitoring on BLM lands in the WEW. The USFWS suggests achieving these standards for a site should signify the presence of diverse native plants supporting pollinator populations and few invasive, non-native species.

CRITERIA FOR LISTED PLANT SPECIES

The USFWS (2010) suggests the following criteria for evaluating prairie quality within degraded native prairie sites managed for the recovery of listed plant species:

a. Relative cover of native vegetation 50% or more*
*Calculate relative cover by adding cover values for each individual native prairie species and dividing by the total cover value for all species present at the site; requires recording cover values for all native and non-native species

b. Woody vegetation less than 15% of absolute vegetation cover; woody species of management concern less than 5% (or less than 25% for savanna habitat). Table 1 lists woody species the USFWS considers to be of management concern.

c. Based on 25 1m^2 plots, native prairie species richness exceeds 10 species (7 or more forbs, one bunch grass)

d. All non-native species less than 50% cover; non-natives of particular concern less than 5% cover. Non-native plants should never be planted or seeded in areas being managed for recovery of listed prairie species.

Table 1. USFWS Woody species of management concern (source: USFWS 2010, Appendix D)

Scientific name	Common name
Crataegus monogyna	oneseed hawthorn
Crataegus suksdorfii	Suksdorf's hawthorn
Cytisus spp.	non-native brooms (*e.g.*, Scotch broom, Spanish broom, others)
Pyrus communis	feral common pear
Rosa eglanteria	sweetbriar rose
Rosa multiflora	multiflora rose
Rubus armeniacus	Armenian blackberry
Rubus laciniatus	cutleaf blackberry
Toxicodendron diversilobum	poison oak

Table 2. Partial list of invasive non-native plant species. (source: USFWS 2010, Appendix D)
The presence of these or other invasive species would disqualify a site from contributing to recovery goals unless they are managed aggressively to maintain less than five percent cover.

Scientific name	Common name
Arrhenatherum elatius	tall oatgrass
Brachypodium sylvaticum	false-brome
Centaurea X pratensis	meadow knapweed
Cytisus scoparius	Scotch broom
Phalaris arundinacea	reed canary grass
Pyrus communis	feral common pear
Rubus armeniacus	Armenian blackberry
Rubus vestitus	European blackberry

CRITERIA FOR FENDER'S BLUE BUTTERFLY

The USFWS (2010) suggests the following criteria for evaluating prairie quality within prairie sites managed for the recovery of Fender's blue butterfly, sites requiring resources for adult and larval Fender's:

a. Sufficient nectar flower abundance (at minimum 20 mg nectar sugar/m^2 of habitat) and diversity (at minimum 5 native nectar species)

b. At minimum 30 host lupine plant leaves/m^2 of habitat for FBB breeding sites

c. Available nectar plants throughout entire pollinator flight season (March-September each year). Table 3 lists the species the USFWS (2010) suggests as nectar plants for Fender's blue.

Table 3. Partial list of plant species used as nectar sources by Fender's blue butterfly (source: UWFWS 2010, Appendix D).
Plants known to produce high amounts of nectar (defined here as > 3.0 mg sugar per floral unit or > 0.1 mg sugar per individual flower) utilized by the butterflies are indicated as "abundant nectar producers." On average, native plants produce greater quantities of nectar utilized by Fender's blue butterfly than non-natives (Schultz and Dlugosch 1999).

Scientific name	Common name	Abundant Nectar Producer?	Native Species?
Allium amplectans	narrowleaf onion	Yes	Yes
Anthemis arvensis	corn chamomile	No	No
Bellis perennis	lawndaisy	No	No
Calochortus tolmiei	Tolmie star-tulip	Yes	Yes
Camassia quamash	small camas	Yes	Yes
Cryptantha intermedia	clearwater cryptantha	No	Yes
Eriophyllum lanatum	common wooly sunflower	Yes	Yes
Hypochaeris radicata	hairy cat's-ear	Yes	No
Lathyrus sphaericus	grass pea	No	No
Leucanthemum vulgare (Chrysanthemum leucanthemum)	oxeye daisy	Yes	No
Linum angustifolium (L. bienne)	pale flax	No	No
*Lupinus arbustus (= L. laxiflorus)**	longspur lupine*	No	Yes

Lupinus oreganus *	Kincaid's lupine*	Yes	Yes
Myosotis discolor	changing forget-me-not	No	No
Sidalcea malviflora ssp. virgata	rose checker-mallow	Yes	Yes
Vicia hirsuta	tiny vetch	No	No
Vicia sativa	common vetch	Yes	No
Vicia villosa	winter vetch	Yes	No
*these species also serve as larval host plants			

In considering potential nectar plant species for Fender's blue, the BLM has made note of additional species as possible nectar sources, based on prior research and site observations. However, further research should be conducted to verify these species as nectar sources, determine what amount of nectar they produce, and identify their appropriateness on BLM lands in WEW before they are relied upon in restoration and maintenance of nectar species in Fender's sites. Table 4 lists additional species the BLM has recorded as nectar sources for Fender's.

Table 4 . Additional nectar species documented for Fender's blue butterfly.

Scientific Name	Common name	Native species?	Documentation
Balsamorhiza deltoidea	deltoid balsamroot	Yes	WSUV Planting Experiments*
Brodiaea congesta	field cluster lily	Yes	Wilson et al. 1997
Camassia leichtlinii ssp. *suksdorfii*	Suksdorf's large camas	Yes	Schultz and Dlugosch 1999
Collomia grandiflora	large flowered collomia	Yes	WSUV Planting Experiments*
Delphinium menziesii	Menzies' larkspur	Yes	WSUV Planting Experiments*
Geranium oreganum	Oregon geranium	Yes	Wilson et al. 1997
Heracleum lanatum	cow parsnip	Yes	"Fender's Blue Butterfly Monitoring Notes", original source unknown
Iris tenax	toughleaf iris	Yes	WEW FBB datasheets (source unknown)
Lomatium nudicaule	barestem desert-parsley	Yes	S. Villegas notes, original source unknown (In Fir Butte seed mix)
Microseris laciniata	cut-leaved microseris	Yes	S. Villegas notes, original source unknown (In Fir Butte seed mix)
Nemophila menziesii var. *atomaria*	baby blue eyes	Yes	WSUV Planting Experiments*
Plectritis congesta	rosy plectritis	Yes	WEW FBB datasheets (source unknown)
Ranunculus occidentalis	western buttercup	Yes	Hays et al. 2000
Sisyrinchium idahoense var. *idahoense*	Idaho blue-eyed grass	Yes	S. Villegas notes, original source unknown (In Fir Butte seed mix)
Zigadenus venenosus	meadow deathcamas	Yes	WSUV Planting Experiments*

*Nectar species list for Willow Corner Restoration - WSUV Planting Experiments

APPENDIX I: Annual Monitoring Plan for All Sites (by Habitat and Species) in the WEW from 2007 through 2018

Monitoring type in each year (for habitats: high=high intensity, low=low intensity)-(weed map=invasive species mapping) (for species: census=count of entire population, sample=counts in sample plots to estimate population total)

Site	Priority	Habitat	*Species*	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Balboa	red	wet prairie/vernal pool			low	high	weed map	low	high	weed map	low	high	weed map	low	high
Balboa	red		*Erigeron*	census	census	census	census	census	census	census	census	census	census	census	census
Balboa	red		*Lomatium*	census	census	census	census	census	census	census	census	census	census	census	census
Balboa	red		*Horkelia*		census	census			census			census			census
Balboa	red		*Sericocarpus*		census	census			census			census			census
Balboa			*Sisyrinchium*					census							
Balboa	red	ash swale			low		weed map	low	weed map		low	weed map		low	weed map
Balboa	red	emergent			low		weed map	low	weed map		low	weed map		low	weed map
Balboa	blue	emergent			low		weed map	low		weed map	low		weed map	low	
Balboa	green	wet prairie/vernal pool			low		weed map	low		weed map	low		weed map	low	
Balboa	green	ash swale			low		weed map	low		weed map	low		weed map	low	
Balboa	green	emergent			low		weed map	low		weed map	low		weed map	low	
Beaver Run	red	wet prairie/vernal pool			low		weed map	low	weed map		low	weed map		low	weed map
Beaver Run	red		*Sericocarpus*		census	census	weed map		census			census			census
Beaver Run	red	emergent			low		weed map	low	weed map		low	weed map		low	weed map
Beaver Run	blue	wet prairie/vernal pool			low		weed map	low		weed map	low		weed map	low	

Site	Priority	Habitat	*Species*	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Beaver Run	green	wet prairie/vernal pool			low		weed map	low		weed map	low		weed map	low	
Beaver Run	green	emergent			low		weed map	low		weed map	low		weed map	low	
Bertelsen Nature Park	red	oak woodland			low			low	weed map		low	weed map		low	weed map
Bertelsen Nature Park	red	emergent			low			low	weed map		low	weed map		low	weed map
Bertelsen Nature Park	blue	upland prairie			low			low		weed map	low		weed map	low	
Bertelsen Nature Park	green	wet prairie/vernal pool			low			low		weed map	low		weed map	low	
Danebo	red	wet prairie/vernal pool			low		weed map	low	weed map		low	weed map		low	weed map
Danebo	red	emergent			low		weed map	low	weed map		low	weed map		low	weed map
Danebo	red	ash swale			low		weed map	low	weed map		low	weed map		low	weed map
Fir Butte	red	wet prairie/vernal pool			low	low	weed map	low	weed map		low	weed map		low	weed map
Fir Butte	red	upland prairie		high	low	high	weed map	low	high	weed map	low	high	weed map	low	high
Fir Butte	red		*Lupinus*	sample	sample	sample	sample	sample	sample	sample	sample	sample	sample	sample	sample
Fir Butte	red		*Icaricia*	census	census	census	census	census	census	census	census	census	census	census	census
Greenhill	red	wet prairie/vernal pool			low		high	weed map	low	high	weed map	low	high	weed map	low
Greenhill	red	upland prairie			low		weed map	low	weed map		low	weed map		low	weed map
Greenhill	red	ash swale			low		weed map	low	weed map		low	weed map		low	weed map
Greenhill	blue	wet prairie/vernal pool			low		weed map	low	weed map		low	weed map		low	weed map

Site	Priority	Habitat	*Species*	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Greenhill	green	oak woodland			low		weed map	low	weed map		low	weed map		low	weed map
Greenhill	green	emergent			low		weed map	low	weed map		low	weed map		low	weed map
Greenhill	green	upland prairie			low		weed map	low	weed map		low	weed map		low	weed map
Greenhill	red		*Pyrrocoma*		census	census	census		census			census			census
Hansen	red	wet prairie/vernal pool			low		weed map	low	weed map		low	weed map		low	weed map
Hansen	red	upland prairie			low		weed map	low	weed map		low	weed map		low	weed map
Hansen	red		*Lupinus*	census	census	census	census	census	census	census	census	census	census	census	census
Hansen	red		*Icaricia*					census	census	census	census	census	census	census	census
Hansen	red		*Sericocarpus*	census	census	census			census			census			census
Hansen	blue	oak woodland			low		weed map	low		weed map	low		weed map	low	
Hansen	green	emergent			low		weed map	low		weed map	low		weed map	low	
Hansen	green	upland prairie			low		weed map	low		weed map	low		weed map	low	
Isabelle	red	wet prairie/vernal pool			low		weed map	low	weed map		low	weed map		low	weed map
Isabelle	red	upland prairie			low		weed map	low	weed map		low	weed map		low	weed map
Isabelle	red		*Lupinus*	census	census	census	census	census	census	census	census	census	census	census	census
Isabelle	red		*Icaricia*	census	census	census	census	census	census	census	census	census	census	census	census
Isabelle	red		*Sericocarpus*		census	census			census			census			census
Isabelle	green	wet prairie/vernal pool			low		weed map	low		weed map	low		weed map	low	

Site	Priority	Habitat	*Species*	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Larsen	blue	wet prairie/vernal pool			low			low		weed map	low		weed map	low	
Long Tom ACEC	red	wet prairie/vernal pool			low, high		low	high	weed map	low	high	weed map	low	high	weed map
Long Tom ACEC	red		*Lomatium*	census	census	census	census	census	census	census	census	census	census	census	census
Long Tom ACEC	red		*Horkelia*		census	census			census			census			census
Long Tom ACEC	red	ash swale			low			low	weed map		low	weed map		low	weed map
Long Tom ACEC	green	emergent			real estate prevents monitoring										
Long Tom ACEC	green	wet prairie/vernal pool			real estate prevents monitoring										
Nielson	blue	wet prairie/vernal pool			low			low		weed map	low		weed map	low	
Nielson	green	emergent			low			low		weed map	low		weed map	low	
Nolan East	green	wet prairie/vernal pool			low			low		weed map	low		weed map	low	
North Greenhill	red		*Sericocarpus*		census	census			census			census			census
North Greenhill			*Horkelia*	census			census			census			census		
North Greenhill			*Erigeron*	census	census	census	census	census	census	census	census	census	census	census	census
North Greenhill	red		*Lomatium*	census	census	census	census	census	census	census	census	census	census	census	census
North Greenhill	red		*Lupinus*	census	census	census	census	census	census	census	census	census	census	census	census
North Greenhill	red		*Sericocarpus*		census	census			census			census			census
North Greenhill	red		*Horkelia*		census	census			census			census			census

Site	Priority	Habitat	*Species*	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
North Greenhill	red		*Erigeron*	census	census	census	census	census	census	census	census	census	census	census	census
North Greenhill	red		*Lomatium*	census	census	census	census	census	census	census	census	census	census	census	census
North Greenhill	Red		*Sisyrinchium*					census							
Oak Hill/Maliner	red	wet prairie/vernal pool			low			low	weed map		low	weed map		low	weed map
Oak Hill/Maliner	red		*Sericocarpus*		census	census			census			census			census
Oak Hill/Maliner	green				low			low		weed map	low		weed map	low	
Oxbow East	red	wet prairie/vernal pool			low			low	weed map		low	weed map		low	weed map
Oxbow East	blue	wet prairie/vernal pool			low			low		weed map	low		weed map	low	
Oxbow East	green	wet prairie/vernal pool			low			low		weed map	low		weed map	low	
Oxbow West	red	wet prairie/vernal pool		high	low		high	low	weed map	high	low	weed map	high	low	weed map
Oxbow West	red		*Lupinus*	census	census	census	census	census	census	census	census	census	census	census	census
Oxbow West	red		*Icaricia*	census	census	census	census	census	census	census	census	census	census	census	census
Oxbow West	red		*Erigeron*	sample	sample	sample	sample	sample	sample	sample	sample	sample	sample	sample	sample
Oxbow West	red	upland prairie			low	high		low	high	weed map	low	high	weed map	low	high
Oxbow West	red	emergent			low			low	weed map		low	weed map		low	weed map
Oxbow West	red	ash swale			low			low	weed map		low	weed map		low	weed map

Site	Priority	Habitat	*Species*	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Oxbow West	blue	emergent			low			low		weed map	low		weed map	low	
Oxbow West	green	wet prairie/vernal pool			low			low		weed map	low		weed map	low	
Oxbow West	red		*Pyrrocoma*		census	census	census		census			census			census
Rosy	red	emergent			low		weed map	low	weed map		low	weed map		low	weed map
Rosy	red	wet prairie/vernal pool			low		weed map	low	weed map		low	weed map		low	weed map
Rosy	red		*Lomatium*	census	census	census	census	census	census	census	census	census	census	census	census
Rosy	red		*Horkelia*		census	census			census			census			census
Spectra Physics	red	emergent			low			low	weed map		low	weed map		low	weed map
Spectra Physics	red		*Lomatium*	census	census	census	census	census	census	census	census	census	census	census	census
Spectra Physics	red		*Sericocarpus*		census	census			census			census			census
Spectra Physics	red	wet prairie/vernal pool			low	high		low	high	weed map	low	high	weed map	low	high
Speedway	red	emergent			low			low			low			low	
Speedway	red	wet prairie/vernal pool			low, high	low	low	high	low	low	high	low	low	high	low
Speedway	red		*Erigeron*	census	census	census	census	census	census	census	census	census	census	census	census
Speedway	red		*Lomatium*	census	census	census	census	census	census	census	census	census	census	census	census
Speedway	red		*Sericocarpus*		census	census			census			census			census
Speedway	red		*Horkelia*		census	census			census			census			census
Swallow Pond	blue	wet prairie/vernal pool			low			low		weed map	low		weed map	low	

Site	Priority	Habitat	*Species*	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Swallow Pond	green	wet prairie/vernal pool			low			low		weed map	low		weed map	low	
Taylor North	red	wet prairie/vernal pool			low, high		low	high	weed map	low	high	weed map	low	high	weed map
Taylor North	red		*Lomatium*	census	census	census	census	census	census	census	census	census	census	census	census
Taylor North	red		*Sidalcea campestris*		census	census			census			census			census
Taylor North	red	emergent			low			low	weed map		low	weed map		low	weed map
Taylor North	red	oak woodland			low			low	weed map		low	weed map		low	weed map
Taylor North	red	ash swale			low			low	weed map		low	weed map		low	weed map
Taylor North	blue	wet prairie/vernal pool			low			low		weed map	low		weed map	low	
Taylor North	green	emergent			low			low		weed map	low		weed map	low	
Taylor South	red	wet prairie/vernal pool			low		weed map	low	weed map		low	weed map		low	weed map
Taylor South	red	emergent			low		weed map	low	weed map		low	weed map		low	weed map
Taylor South	red	oak woodland			low			low	weed map		low	weed map		low	weed map
Taylor South	red		*Lathyrus holochlorus*		census	census			census			census			census
Taylor South	red		*Sidalcea campestris*			census			census			census			census
Taylor South	red	ash swale			low			low	weed map		low	weed map		low	weed map
Taylor South	blue	wet prairie/vernal pool			low			low		weed map	low		weed map	low	

Site	Priority	Habitat	*Species*	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Taylor South	blue	emergent			low			low		weed map	low		weed map	low	
Taylor South	blue	oak woodland			low			low		weed map	low		weed map	low	
Taylor South	green	emergent			low			low		weed map	low		weed map	low	
Turtle Swale	red	wet prairie/vernal pool			low			low	weed map		low	weed map		low	weed map
Turtle Swale	red	emergent			low			low	weed map		low	weed map		low	weed map
Turtle Swale	red	upland prairie			low			low	weed map		low	weed map		low	weed map
Turtle Swale	red		*Lupinus*	census	census	census	census	census	census	census	census	census	census	census	census
Turtle Swale	red		*Icaricia*	census	census	census	census	census	census	census	census	census	census	census	census
Turtle Swale	red		*Sericocarpus*		census	census			census			census			census
Turtle Swale	red		*Pyrrocoma*		census	census	census		census			census			census
Turtle Swale			*Sisyrinchium*					census							
Turtle Swale	green	emergent			low			low		weed map	low		weed map	low	
Turtle Swale	green	upland prairie			low			low		weed map	low		weed map	low	
Vinci	red		*Horkelia*		census	census			census			census			census
Vinci	red	wet prairie/vernal pool			low			low	weed map		low	weed map		low	weed map
Vinci	red		*Erigeron*	census	census	census	census	census	census	census	census	census	census	census	census
Vinci	red		*Sericocarpus*		census	census			census			census			census
Vinci	blue	wet prairie/vernal pool			low			low		weed map	low		weed map	low	

Site	Priority	Habitat	*Species*	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Willow Corner Annex	red	wet prairie/vernal pool			low			low	weed map		low	weed map		low	weed map
Willow Creek Confluence	red	wet prairie/vernal pool			low			low	weed map		low	weed map		low	weed map

APPENDIX J: DATA SHEETS FOR LOW INTENSITY HABITAT MONITORING

Site Name:								Date:																
Observers:								Legal Description: T			R	Sec.				*#Native plant spp. does not include woody natives								
		1 Section: Woody Vegetation						2 Section: Non-native Plants								3 Section	4 Section: Cover and Diversity of Native Plants							Mgmt.
Thresholds						>5-10%								10-35%, >50%		>10-20%			Drop of 5-10%					
Habitat Type Code AS/RP/EM/WP/UP/OW/OS	Priority Class (1,2, or 3)	Sp. Code/ % Cover	Sp. Code/ % Cover	Sp. Code/ % Cover	Sp. Code/ % Cover	Total % Cover (∑)	Sp. Code/ % Cover	Sp. Code/ % Cover	Sp. Code/ % Cover	Sp. Code/ % Cover	Sp. Code/ % Cover	Sp. Code/ % Cover	Sp. Code/ % Cover	Sp. Code/ % Cover	Total % Cover (∑)	Total % Cover	% Cover Native Grasses	% Cover Native Forbs	% Cover Native Sedges/Rushes	Total % Native Cover (∑)	Codes of Spp. Present	# Native Plant Spp.*	Recommended Mgt. Treatment
		ex: CRDO / 6%																					

Site Name:

_____ Date_____
Observer(s)_____Legal Description:T_____R_____Sec____

Section 1: Woody Vegetation (Woodland Plots), Page 2:

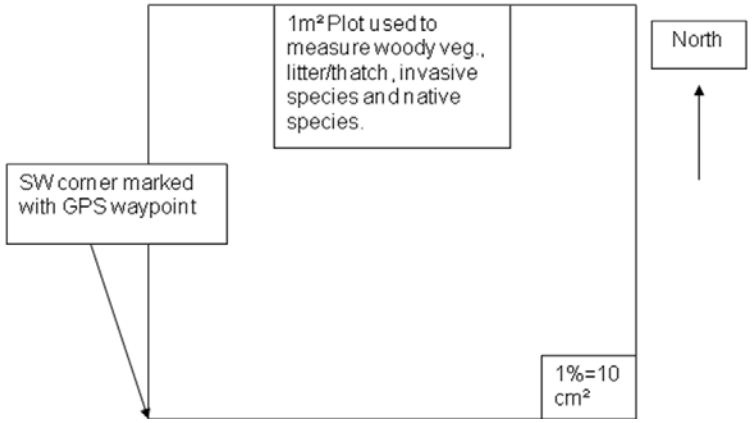
10 Meter Square Plot, Divide into 4 - 5 X 5 meter subplots, Label each plot from SW corner – counterclockwise, 1%=1 m² (of entire plot), 0.01%=10 cm

Plot ID	Species Number on Map	Species Code	Estimated % Cover of Canopy	N	S	E	W	Number of Trees in plot

APPENDIX K: LOW INTENSITY HABITAT MONITORING PLOT LAYOUT

Plot layout used for Low Intensity Habitat Monitoring (Wet Prairie/Vernal Pool, Emergent, Upland)

Figure 9. 1 x 1 meter sample plot.



Plot layout used for Low Intensity Woodland Plots (Ash Swale, Oak Woodland, Oak Savannah)

Figure 10. 10 x 10 meter sample plot.