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Memorandum

To: Non-Federal Lands Division Manager,
Oregon Fish and Wildlife Office, Portland, Oregon

From: Endangered Species Division Manager,
Oregon Fish and Wildlife Office, Portland, Oregon 

Subject: Formal Consultation and Conference on Issuance of a Section 10(a)(1)(B) Permit
for the Benton County Prairie Species Habitat Conservation Plan

This document transmits the Oregon Fish and Wildlife Office's (OFWO) intra-service biological opinion and conference opinion on the issuance of an incidental take permit to Benton County for the implementation of the Benton County Prairie Species Habitat Conservation Plan (HCP), in Benton County, Oregon. The incidental take permit will be issued pursuant to section 10(a)(1)(B) and section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*). The U.S. Fish and Wildlife Service (Service) proposes to issue the incidental take permit to Benton County for a period of 50 years.

The Benton County Prairie Species HCP provides coverage for take of the endangered Fender's blue butterfly (*Icaricia icarioides fenderi*), endangered Willamette daisy (*Erigeron decumbens* var. *decumbens*), endangered Bradshaw's lomatium (*Lomatium bradshawii*), threatened Kincaid's lupine (*Lupinus sulphureus* var. *kincaidii*), threatened Nelson's checker-mallow (*Sidalcea nelsoniana*), candidate Taylor's checkerspot butterfly (*Euphydryas editha taylori*) and peacock larkspur (*Delphinium pavonaceum*), a species of concern.

After reviewing the current status of the species, the environmental baseline for known populations, the effects of permit issuance and the cumulative effects, we conclude that these activities will not jeopardize the continued existence of Fender's blue butterfly, Willamette daisy, Bradshaw's lomatium, Kincaid's lupine, Nelson's checker-mallow, Taylor's checkerspot butterfly or peacock larkspur, nor will they destroy or adversely modify designated critical habitat for Fender's blue butterfly, Willamette daisy or Kincaid's lupine. This biological opinion is based on information provided in the April 2010 Draft Benton County Prairie Species HCP,

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the Draft Environmental Assessment for the issuance of the section 10(a)(1)(B) permit, available recovery plans and information and reference material in our files at the OFWO.

Consultation History

The acting Non-Federal Lands Division Manager requested consultation on March 3, 2010. Staff from that division provided the draft Habitat Conservation Plan on May 24, 2010, and the draft Environmental Assessment on June 21, 2010. Our review of these documents revealed some important analyses were missing (*e.g.*, effects to critical habitat and estimates of individual Fender's blue butterflies and Taylor's checkerspot butterflies adversely affected), and we requested additional information from the Non-Federal Land Division and the Institute for Applied Ecology, the County's consultant, on June 21, 2010. These analyses were provided on July 6 and 30, 2010, respectively.

BIOLOGICAL OPINION

I. DESCRIPTION OF THE PROPOSED ACTION

Benton County has submitted a draft HCP (Benton County 2010a) to the U.S. Fish and Wildlife Service and the Oregon Department of Agriculture to allow the County to receive an incidental take permit under the Endangered Species Act section 10(a)(1)(B) for Fender's blue butterfly, Willamette daisy, Bradshaw's lomatium, Kincaid's lupine, Nelson's checker-mallow, Taylor's checkerspot butterfly and peacock larkspur ("covered species"). An incidental take permit from the U.S. Fish and Wildlife Service will allow the County to continue to perform its otherwise lawful duties, which have the potential to affect these covered species. State law requires non-Federal public landowners who which to conduct activities that may harm threatened or endangered plants to obtain a permit from the Oregon Department of Agriculture. To offset effects to the covered species, the County will minimize and mitigate its impacts. The incidental take permit, once issued, will be in effect for 50 years.

The proposed action is discussed in the draft HCP in Chapter 3 (Plan Area), Chapter 4 (Covered Activities), Chapter 6 (Conservation Measures, including Restrictions and Best Management Practices) and Chapter 7 (Monitoring and Adaptive Management). We provide a summary of the proposed action below. The HCP (Benton County 2010a) is incorporated by reference into this biological opinion.

Benton County seeks authorization to issue Certificates of Inclusion to: (1) persons requiring a County permit or agricultural building authorization and (2) Cooperators, including select non-federal public agencies, two utility companies and a conservation organization. Cooperators will also be required to enter into a Cooperative Agreement with the County; this agreement sets forth the responsibilities of the parties with respect to minimization and mitigation measures.

An activity is covered under the HCP only if it is one of the types of impact evaluated in the HCP and:

1. There is sufficient take coverage available under the incidental take permit issued to Benton County for that activity;
2. The activity does not preclude achieving the biological goals and objectives of the HCP;
3. The activity must be an action under the jurisdiction of Benton County, one of the Cooperators, or certain private landowners;
4. The activity must occur within the Plan Area; and
5. The activity must occur within the term of the incidental take permit.

Covered Entities and Lands

The Plan area includes lands owned or managed by Benton County. Those listed below may obtain coverage for their activities under the HCP by requesting a Certificate of Inclusion from Benton County:

1. Private landowners seeking a County permit or agricultural building authorization for work in the Fender's Blue Zone (a region of potential habitat based on known Fender's blue butterfly population locations and typical butterfly dispersal distances)(see section 5.1.0.0 in the HCP for additional description and a map of the Fender's Blue Zone); and
2. HCP Cooperators:
 - a. City of Corvallis
 - b. Oregon Department of Transportation (ODOT)
 - c. Oregon State University (OSU)
 - d. Greenbelt Land Trust
 - e. Pioneer Telephone Cooperative
 - f. NW Natural

Covered Activities

Covered Activities include:

1. Ground-disturbing activities necessary to allow home, farm and forest construction;
2. Management of public and conservation organization lands; and
3. Activities providing essential public services in the County (*e.g.*, transportation and water system management and utilities construction and maintenance).

The overall biological goal of the HCP is to achieve sustainable populations of covered species, while maintaining local populations and enhancing connectivity. Through the proposed conservation measures, the County and Cooperators will accomplish this by enhancement of selected existing covered species populations and habitats and increasing the distribution and connectivity of covered species populations in the County.

The HCP also proposes managing select habitat for the covered species, including reducing or managing for current threats to the species on over 200 ha (500 acres) of lands owned or managed by the County or Cooperators. These areas will be designated as Prairie Conservation Areas (PCAs). Lands designated as PCAs will be areas where the covered species are present or where there is suitable habitat for introductions of the covered species. PCAs are lands under public ownership or conservation easement and set aside for active conservation, and where

habitat restoration and enhancement will take place. Some areas of some PCAs may be used as mitigation sites for impacts to the covered species resulting from covered activities at the discretion of Benton County or the Cooperators.

Table I-1. Benton County Prairie Species HCP Covered Activities and Entities.								
Covered Activities	Benton County	City of Corvallis	ODOT	OSU	Greenbelt Land Trust	Pioneer Telephone	NW Natural	Private Landowners
Home, Farm and Forest Construction								x
Benton County Permits and Authorizations	x							
Utility Construction and Maintenance						x	x	
Public Service Facility Construction	x							
Transportation Activities and Authorized Work in Rights-of-Way								
-- Transportation construction and maintenance	x		x					
-- Work in right-of-way, road approach and utility work	x					x	x	
Water and Wastewater Management		x						
Parks / Natural Areas / Open Space Management								
-- Voluntary habitat restoration, enhancement and management	x	x		x	x			
Agricultural Activities		x						
HCP Implementation Activities								
-- Habitat restoration, enhancement and management for mitigation	x	x		x	x	x	x	
-- Monitoring	x	x		x	x	x	x	
-- Plant materials collection and population enhancement	x	x		x	x	x	x	
-- Conservation measures	x	x	x	x	x	x	x	x
-- Mitigation	x	x	x	x	x	x	x	x
Emergency Response Activities	x	x	x	x	x	x	x	

Home, Farm and Forest Construction

Home, farm and forest construction activities covered by the HCP include, but are not limited to the following:

- Site-built dwellings (single family residences with or without attached garages);
- Manufactured homes (including medical hardship dwellings);
- Residential accessory structures (un-attached garage, shop, shed, pool, etc.);
- Agricultural buildings and structures (including those exempt from building permit requirements but requiring County authorization);
- Septic system feasibility studies;
- Septic system installation, alterations and repairs;
- Driveways, if associated with a County-issued permit;
- Installation of underground or above ground plumbing, mechanical, or electrical facilities; and
- Additions to structures (attached garage, added room, etc.).

Benton County Permits and Authorizations

The County issues permits for activities on both private and public lands, including its own lands. Permits and authorizations covered by the HCP include:

- Building permits for dwellings and other structures;
- Benton County Health Department assistance and permitting for the installation of septic and sewage systems; and
- Public Works Department permits for activities occurring on the County's road system, work in County rights-of-way, utility permits for installation and maintenance of utilities and road approach permits. Construction activities associated with these permits may include land disturbance, including trenching, movement of heavy equipment and potential disruption of surface hydrology. Maintenance activities include routine or emergency repairs, minor grading or soil disturbance and vegetation management.

Utility Construction and Maintenance

Pioneer Telephone Company constructs and maintains their facilities in public rights-of-ways and on private lands. Techniques for burying cables may include plowing and boring.

NW Natural has existing natural gas pipeline infrastructure that is almost exclusively under existing pavement. Expansion of the pipeline system, or maintenance and repair of the system, may include excavation or trenching or directional boring.

Public Service Facility Construction

Activities included under this category include, but are not limited to, construction of rural schools or rural fire stations within the Fender's Blue Zone.

Transportation Activities and Authorized Work in Rights-of-Way

Transportation work includes maintenance activities that occur within existing Benton County or ODOT rights-of-way, easements or Public Road Districts under County jurisdiction. All activities will follow the best management practices (BMPs) and avoidance and minimization measures described in Chapter 6 of the HCP.

Transportation Maintenance

The County has jurisdiction over 740 km (460 miles) of roads: 435 km (270 miles) paved, 306 km (190 miles) gravel, in addition to 124 km (77 miles) of Public Road Districts (Public Roads). The County conducts road maintenance activities for other local communities (*e.g.*, the City of Corvallis), state and federal governments and fire departments. The number of roads and mileage maintained varies with funding availability.

In addition to road maintenance work, the County also maintains the land from the edge of the road surface to the outer edge of County's right-of-way. The County's right-of-way starts at the road centerline and can vary from 6.1 m to 30 m (20 ft to 100 ft) outward, but generally averages around 12 m (40 ft) to 18 m (60 ft) either side of the centerline.

Transportation maintenance activities carried out by the County with potential to impact the covered species include:

- Bridge construction and maintenance. Benton County maintains 98 bridges within the county; an estimated 15 bridges will need to be replaced within the life of the permit. Annual routine bridge maintenance includes washing and cleaning, deck sealing, deck resurfacing, guardrail repairs, approach and deck pavement repairs, scour repair and bank stabilization.
- Culvert installation, maintenance and repair. The County owns or maintains 7,000 culverts. New culverts are installed as needed, generally to replace existing failing structures. The County generally inspects cross culverts on a seven-year cycle timed with chip seal maintenance projects. Approximately 700 to 1,000 culverts are cleaned annually.
- Cut banks for sight distance.
- Dead deer removal.
- Deicing.
- Ditch cleaning. Ditches are inspected annually to determine whether cleaning is needed and work is completed in late spring. Ditches are cleaned with an excavator, grader, or ditch head depending on the size of the ditch. The maintenance cycle for ditch cleaning is every seven years.
- Ditch realignment. This activity is rare and only occurs if the ditch is overflowing, erosion is occurring, or a road or shoulder is being widened.
- Emergency management. Unscheduled work on the road system involving a natural or manmade event causing damage or that could cause damage to the road system and/or pose a significant threat to public safety or the environment. This activity includes cleanup from vehicle accidents, hazardous material spill, landslides or wind storms and snow plowing.
- Fence installation, repair and removal. Benton County installs or repairs field fencing (metal T-post and wire) whenever it removes or damages private landowner fencing as part of a road project. The County does not maintain the fencing.
- Grading of gravel roads.
- Gravel road stabilization and surface rock replacement.
- Legend installation and repair.
- Litter pick-up.
- Mailbox installation.
- Pavement repairs, repainting and resurfacing.
- Sanding.
- Shoulder widening and grading.
- Sign installation and maintenance.
- Vegetation management. Vegetation management activities carried out in County managed rights-of-way include mechanical, chemical and manual control of vegetation to maintain sight distances, control of noxious weeds and removal of hazard trees.
 - One pass mowing: Between April and September, the County mows all County maintained rights-of-way (756 km)(470 miles), cutting vegetation 15 to 20 cm (6 to 8 in) in height. A 2 m (6 ft) wide swath is mowed, with equipment remaining on the highway. Mowing focuses on reducing grass height.
 - Full pass mowing: The entire right-of-way is mowed between October and April. The County attempts to do a full pass mowing on all County rights-of-way, but timing and budgetary considerations may prevent this task from being

accomplished on all County maintained roads. Full pass mowing targets shrubs and trees.

- Spraying: Approximately 483 km (300 miles) of road shoulders are sprayed with herbicide each year. Adjacent property owners may elect to participate in the County's no-spray program. Between April and June broad-spectrum pre- and post-emergent herbicides are applied along road shoulders to control grasses and weeds. Site- and weed-specific spot application of broadleaf herbicide is used for control of invasive and/or problematic species periodically during May and June. Most of the broadleaf herbicide for Himalayan blackberry (*Rubus armeniacus*) and poison oak (*Toxicodendron diversilobum*) control is applied between October and November.
- Shrub and tree removal: Occurs year-round, as needed. Hazard trees are taken down by chainsaw and generally left on site, although trees will be removed away from drainage areas. Shrubs are removed using mowers.

Transportation Construction Activities

Transportation construction projects, including but not limited to, extension and widening of roadways, bike paths and bridges will be covered under the HCP.

Authorized Work in Rights-of-Way

Authorized work in rights-of-way includes activities authorized by Benton County through Utility Permits, Road Approach Permits and Work in Right-of-Way Permits.

Water and Wastewater Management

The City of Corvallis owns and operates a water supply and delivery system with water received from the Willamette River and the Rock Creek Watershed. Projects and activities conducted by the City of Corvallis that are related to water and wastewater management covered under this Plan include:

- Construction, installation, extension and maintenance of surface water intake facilities, pumping plants, water treatment facilities and water supply pipelines. Specific maintenance activities within existing rights-of-way or easements include inspection, cleaning, rehabilitation, repair and/or replacement of pipelines, pumping stations, etc.
- Construction, installation, replacement and maintenance of wastewater facilities.
- Annual vegetation management of streams within Corvallis city limits is conducted by the City of Corvallis Public Works Department. Weed-eating, mowing, or other vegetation removal methods will take place in Nelson's checker-mallow habitat, however this activity is not covered. Impacts to Nelson's checker-mallow will be avoided by surveying prior to conducting activities in waterways and following timing guidelines for vegetation management in the HCP.

Parks / Natural Areas / Open Space Management Activities

Covered activities involved with managing parks, natural areas and open space for public enjoyment as well as preservation of biological resources are described below. Some of these areas are managed as Prairie Conservation Areas.

Voluntary Habitat Restoration, Enhancement and Management

Benton County, Oregon State University, City of Corvallis and Greenbelt Land Trust are seeking coverage for the following activities that are conducted for the purposes of voluntary habitat restoration, enhancement and management:

- Mowing (spring, summer, and fall/winter);
- Raking;
- Shade cloth;
- Sod rolling, solarization and tilling/disking;
- Livestock grazing managed such that it does not reduce the ability of any of the covered species to survive or reproduce;
- Prescribed burning;
- Herbicide application (Glyphosate, Triclopyr, Oryzalin and 2, 4-D amine);
- Removal of encroaching trees and shrubs;
- Planting native species; and
- Road and trail decommissioning and restoration.

Agricultural Activities

City of Corvallis allows agricultural activities including hay and vegetable crop production on their Herbert Farm and Natural Area, Rock Creek Watershed and Owens Farm properties, and is seeking coverage for these activities at Owens Farm, subject to implementation of minimization and avoidance measures described in the HCP.

HCP Implementation Activities

Benton County and all Cooperators except ODOT (which will obtain any needed coverage independently) are seeking coverage of HCP implementation activities, including but not limited to mitigation-related habitat restoration, enhancement and management, and covered species monitoring. These activities may result in temporary impacts to the covered species and may occur in Prairie Conservation Areas and/or other public lands within the Plan Area as well as roadside rights-of-way where covered species are present.

Habitat Enhancement, Restoration and Management for Mitigation

Habitat restoration, enhancement and management activities described in the HCP will be covered for Benton County and all Cooperators except ODOT (which will obtain coverage independently) for the purpose of HCP Implementation, provided the actions follow recommendations in the HCP.

Monitoring

Monitoring actions include but are not limited to:

- Species presence/absence surveys;
- Species abundance surveys; and
- Monitoring activities associated with habitat restoration, enhancement and management.

Monitoring activities for covered plants or for butterfly habitat that are required for HCP implementation are addressed provided they follow protocols described in the HCP. Monitoring activities for Fender's blue butterfly that require any netting or other handling of the butterfly are not covered, because such take is not considered "incidental." The biologists conducting such work must possess the appropriate section 10(a)(1)(A) permits from the U.S. Fish and Wildlife Service.

Plant Materials Collection

Restoration and enhancement activities may call for the collection of seeds and plant materials for introduction, relocation and augmentation projects. Plant material collection activities include:

- Seed collection;
- Plant material (tubers, rhizomes, etc.) removal; and
- Removal of the entire plant or population and its relocation to another site.

Activities related to collection of plant materials required for HCP implementation will be addressed for the County and Cooperators (excluding ODOT) provided they follow protocols described in the HCP.

Plant Population Augmentation and Introduction

Covered plant populations may be augmented or introduced to increase the number and viability of listed plant populations. Augmentation may be accomplished by sowing seeds or planting propagules to increase the population size. Introduction (via seeds or propagules) of covered plants at an unoccupied site may be used to create new populations or to recreate a lost population at suitable sites. Population augmentation and introductions may include the covered plant species as well as nectar and host species for Fender's blue butterfly and Taylor's checkerspot butterfly.

Activities related to plant population augmentation and introduction required for HCP implementation will be covered provided they follow protocols described in the HCP.

Emergency Response Activities

Benton County and all Cooperators are seeking coverage for emergency response activities where public health, safety and welfare are involved that may have occasional impacts on populations of covered species. Emergency activities foreseeable during the term of the incidental take permit include but are not limited to firefighting, utility repairs, hazardous materials clean up, traffic accident clean up, disaster relief and medical assistance. The coverage extended applies only to the response to the emergency, and not to the causes of the emergency. Emergency activities that result in substantial adverse impacts to the covered species are considered changed circumstances and are described in Section 8.7 of the HCP.

Conservation Measures

The biological goal of the HCP is to maintain viable populations of the covered species in Benton County. The County has developed a Prairie Conservation Strategy (see Appendix E in the HCP). The strategy outlines an approach for interested parties, both public and private, to work together to help conserve and restore rare habitat and recover at-risk prairie-dependent species in Benton County in a non-binding, non-regulatory framework. The continued existence of rare habitats and species depends on the willingness of land managers and private landowners to undertake voluntary conservation actions. The Prairie Conservation Strategy document provides an overview of voluntary actions that can be implemented in Benton County to increase rare habitat and recover at-risk species. Developed as part of the HCP, the strategy serves as a stand-alone document but is one component of the conservation measures identified in the HCP.

The objectives and specific conservation measures in the HCP are:

Objective 1: Conserve covered species populations and habitats.

- 1.1 Acquire from willing sellers and manage properties (as Benton County Fender's Blue Butterfly Conservation Areas) with existing populations of Fender's blue butterfly and prairie habitat.
- 1.2 Establish roadside Special Management Areas (SMAs) for roadside populations of covered plants.
- 1.3 Implement best management practices for roadside populations.
- 1.4 Designate PCAs on lands within the County managed for prairie habitat and conservation of the covered species. Some areas of some PCAs may be designated for use as mitigation sites.
- 1.5 Implement best management practices for covered species populations in Prairie Conservation Areas and other covered lands owned by Benton County or the Cooperators.
- 1.6 Implement Taylor's checkerspot butterfly management plan.
- 1.7 Conduct outreach to the public.
- 1.8 Work with County permit and agricultural building authorization applicants in the Fender's Blue Zone to avoid impacts to Fender's blue butterfly habitat from private development.
- 1.9 When Special Event Permits are issued by Benton County in areas where covered species occur, the County will mandate avoidance of impacts to covered species.
- 1.10 Permits issued for utility work, other work and road approach permits in County rights-of-way will mandate avoidance of all impacts to covered species on Type 1 roadsides and mandate avoidance and minimization of impacts where possible in Type 2 roadsides.

Objective 2: Enhance covered species populations and habitats.

- 2.1 Implement best management practices during any habitat restoration, enhancement and management at the PCAs.
- 2.2 Augment populations of covered plant species using appropriate genetic sources, to mitigate for impacts.
- 2.3 Enhance habitat for populations of Fender's blue butterfly and associated Kincaid's lupine at Fender's Blue Butterfly Conservation Areas.
- 2.4 Enhance habitat for populations of Taylor's checkerspot butterfly.

2.5 Manage and maintain Type 1 roadside populations of peacock larkspur, Kincaid's lupine and Nelson's checker-mallow.

2.6 Conduct restoration activities including burning, seeding with native plant species and planting plugs of native plant species at PCAs.

Objective 3: Increase the distribution and connectivity of covered species populations.

3.1 Develop, update and maintain a Prairie Conservation Strategy (see Appendix E in the HCP) to facilitate effective conservation actions that contribute to the recovery of the covered species and other imperiled prairie species in Benton County.

Mitigation

Mitigation will occur when adverse impacts are unavoidable and will be completed at sites with appropriate habitat at the closest appropriate location in Benton County (*e.g.*, for Fender's blue butterfly, within the Fender's Blue Zone). Mitigation may be achieved by butterfly habitat enhancement or species augmentations for covered plants. Mitigation will take place at sites already supporting the affected species, or at currently unoccupied sites containing suitable habitat. Mitigation will not take place at sites where there is not suitable habitat for the species. Habitat enhancement or species augmentations must establish the amount of plants or butterfly habitat required for mitigation regardless of the pre-existing population or habitat amounts at the site. The estimated quantity of mitigation required for impacts requested in the HCP is shown in Table I-2.

Table I-2 Summary of mitigation to be completed by Benton County and Cooperators. Amounts reported are the minimum required, and assume pre-mitigation will be completed. If mitigation is concurrent, a higher mitigation ratio will be applied, and a larger amount of mitigation will be required.									
	Bradshaw's lomatium (#)	Willamette daisy (#)	Peacock larkspur (#)	Nelson's checker-mallow (#)	Kincaid's lupine (m ²) outside Fender's blue zone	Kincaid's lupine (m ²) inside Fender's blue zone	Native nectar for Fender's blue butterfly (m ²)	Non-native nectar for Fender's blue butterfly (m ²)	Taylor's checkerspot butterfly habitat (m ²)
Mitigation for Private Lands Impacts under HCP:									
Home, Farm and Forest Construction	-	-	-	-	-	346	5364	n/a	-
Telephone Utility Construction & Maintenance	-	-	-	-	-	6.4	101.1	n/a	-
Natural Gas Utility Construction & Maintenance	-	-	-	-	-	0.2	1.4	n/a	-
<i>Private Lands subtotal</i>						352.6	5466.5		
Mitigation for Benton County & Cooperator Impacts:									
Public Service Facility Construction	-	-	-	-	-	12.3	222	n/a	-
Transportation Activities & Authorized Work in Rights-of-Way									
-- Construction, maintenance, utility work & road approach	-	-	21	507	12.9	35	4134	n/a	-
-- Maintenance, utility & road approach outside known populations	-	-	57	80	0.4	1.3	61	n/a	-
Water & Wastewater Management	-	-	-	30	-	-	-	-	-
Agriculture	-	-	-	15	-	-	-	-	-
Emergency Response Activities	7	2	91	33	10.1	3.3	265	n/a	172
<i>County & Cooperator lands subtotal</i>	7	2	169	665	23	51	4682	n/a	172
<i>Mitigation Total</i>	20*	20*	169	665	23.4	756.7	15615	n/a	172

* a minimum of 20 plants will be established for any covered plant mitigation project.

Action Area

The action area is the prairie habitat and potential prairie habitats within Benton County, Oregon, on lands owned or managed by non-federal public agencies and conservation organizations included in the draft HCP, and on private lands (see Figure 3.1 in Chapter 3 of the HCP). The action area does not include Federal lands.

II. STATUS OF THE SPECIES

Fender's Blue Butterfly

Listing Status and Critical Habitat

Fender's blue butterfly was listed as endangered, without critical habitat, on January 25, 2000 (U.S. Fish and Wildlife Service 2000). Critical habitat for the Fender's blue butterfly was

designated on October 6, 2006 (U.S. Fish and Wildlife Service 2006). Critical habitat units have been designated in Benton, Lane, Polk and Yamhill Counties, Oregon. The primary constituent elements of critical habitat for the Fender's blue butterfly are the habitat components that provide: (1) early seral upland prairie or oak savanna habitat with undisturbed subsoils that provides a mosaic of low-growing grasses and forbs, and an absence of dense canopy vegetation allowing access to sunlight needed to seek nectar and search for mates; (2) larval host-plants: *Lupinus sulphureus* ssp. *kincaidii*, *L. arbustus* (longspur lupine), or *L. albicaulis* (sickle-keeled lupine); (3) adult nectar sources, and (4) stepping stone habitat: undeveloped open areas with the physical characteristics appropriate for supporting the low-growing prairie, oak savanna plant community (well drained soils), within and between natal lupine patches (about 2 kilometers [1.2 miles]), necessary for dispersal, connectivity, population growth, and, ultimately, viability. 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.

Population Trends and Distribution

Fender's blue butterfly was believed to be extinct for nearly 50 years, and was rediscovered in 1989 at the McDonald Research Forest, Benton County, Oregon; it was found to be associated primarily with *Lupinus sulphureus* ssp. *kincaidii*, a rare lupine, and occasionally *L. arbustus* or *L. albicaulis* (Hammond and Wilson 1993). Recent surveys have determined that Fender's blue butterfly is endemic to the Willamette Valley and persists in about 17 populations on remnant prairies in Yamhill, Polk, Benton, and Lane Counties (Hammond and Wilson 1993, Schultz *et al.* 2003, U.S. Fish and Wildlife Service unpublished data). Fender's blue butterfly populations occur on upland prairies historically characterized by native bunch grasses (*Festuca* spp.) The association of Fender's blue butterfly with upland prairie is mostly a result of its dependence on *Lupinus sulphureus* ssp. *kincaidii*, although Fender's blue butterfly often uses wet prairies for nectaring and dispersal habitat. Sites occupied by Fender's blue butterfly are predominantly located on the western side of the Willamette Valley, within 33 kilometers (21 miles) of the Willamette River. A 2003 synthesis of existing data estimated the current rangewide number of butterflies to be about 3,000 to 5,000 individuals (Schultz *et al.* 2003). Fewer than ten sites with populations of 100 adult butterflies or more are known (Table II-1). We acknowledge, however, that our data on Fender's blue butterfly populations are incomplete, and show some inconsistencies. Three different survey methods have been used to count populations over the last 20 years, and their results are not directly comparable (Fitzpatrick 2009). The quality of survey data depends on the experience level of the surveyors, weather conditions and the ability to schedule surveys at the peak of the species' short flight season (Fitzpatrick 2009). In addition, not all sites have been surveyed each year, and in most years, population counts have been obtained on only a portion of known sites, which results in incomplete counts and biased population estimates.

Table II-1. Fender's blue butterfly: estimated population sizes, 2000-2008.

Most estimates are derived from surveys of only a portion of the habitat, and are not based on complete counts of the populations. Different survey techniques are used at different sites, thus estimates are not directly comparable among sites.

Population	County	Year								
		2000	2001	2002	2003	2004	2005	2006	2007	2008
Oak Ridge	Yamhill	168	192	293	240	259	96	100?	226 ²	226
Gopher Valley	Yamhill	12	7	22	21	10	12	20	80 - 100 ²	(b)
Mill Creek	Polk	25	22	48	50	43	20	?	12	(ns)
Dallas ¹	Polk	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)	6	6
Monmouth Road ¹	Polk	2	0	1	1	5	0		4	(ns)
McTimmonds Valley ¹	Polk	4	10	6	6	10	3	(ns)	2	5
Baskett	Polk	922	223	753	1236	1615 ²	768	1520	1385	(b)
Wren	Benton	(ns)	(ns)	(ns)	75	484 ²	180 - 200	>800 ²	1282	(b)
Lupine Meadows	Benton	(ns)	103	132	211	307	216	370	235	(b)
Butterfly Meadows	Benton	667	494	451	425	509	84	98	370	420
Greasy Creek ¹	Benton	(a)	(a)	(a)	(a)	1	2	20	20	(ns)
N. County	Benton	(a)	(a)	(a)	(a)	(a)	(a)	(a)	12 eggs	(ns)
Oak Basin	Linn	(a)	(a)	(a)	(a)	(a)	(a)	23	(ns)	45
Bond Butte	Linn	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(c)	(c)
Coburg	Lane	(ns)	(ns)	(ns)	154	236	23	221	355	121
Willow Creek	Lane	1439	577	2039	1336	1400	174	806	644	(b)
W. Eugene	Lane	179	119	195	795	1426	479	470	755	1188

¹ Estimates at these sites are the actual count of individuals detected, not populations estimates.

² Substantial additional habitat area discovered this year.

(ns) = Not surveyed.

(a) = Population not yet known.

(b) = Bad weather during flight season, no count conducted.

(c) = Adult Fender's blue butterflies observed but no count conducted.

Life History and Ecology

Adult Fender's blue butterflies live approximately 10 to 15 days and apparently rarely travel farther than 2 kilometers (1.2 miles) over their entire life span (Schultz 1998). Although only limited observations have been made of the early life stages of Fender's blue 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 Fender's blue butterfly may lay approximately 350 eggs over her 10 to 15-day lifespan, of which perhaps fewer than two will survive to adulthood (Schultz 1998, Schultz *et al.* 2003). Females lay their eggs on perennial lupines (*Lupinus sulphureus* ssp. *kincaidii*, *L. arbustus*, or occasionally *L. albicaulis*), 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. When the lupine plant senesces, diapausing larvae remain in the leaf litter at or near the base of the host plant through the fall and winter. Larvae become active again in March or April of the following year, although 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 pupal 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 kilometers (1.2 miles) of their natal lupine patch (Schultz 1998), although anecdotal evidence exists of adult Fender's blues dispersing as far as 5 to 6 kilometers (3.1 to 3.7 miles) (Hammond and Wilson 1992, Schultz 1998); dispersal of this magnitude is not likely anymore because of habitat fragmentation. At large patches, such as the main area at Willow Creek in Lane County, 95 percent of adult Fender's blue butterflies are found within 10 m (33 ft) of lupine patches (Schultz 1998).

Habitat Characteristics

Habitat requirements for Fender's blue butterfly include lupine host plants (*Lupinus sulphureus* ssp. *kincaidii* or *L. arbustus*, and occasionally *L. albicaulis*) for larval food and oviposition sites and native wildflowers for adult nectar food sources. Nectar sources used most frequently include *Allium amplexans*, *Calochortus tolmiei*, *Sidalcea malviflora* ssp. *virgata*, *Eriophyllum lanatum* and *Geranium oreganum* (Wilson *et al.* 1997, York 2002, Schultz *et al.* 2003). Non-native vetches (*Vicia sativa* and *V. hirsuta*) 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 5 hectares (12 acres) of high quality habitat are necessary to support a population of Fender's blue butterflies (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 butterfly population.

Lupinus sulphureus ssp. *kincaidii* is the preferred larval host plant at most known Fender's blue butterfly populations. At two sites, Coburg Ridge and Baskett Butte, Fender's blue butterfly feeds primarily on *Lupinus arbustus*, even though *Lupinus sulphureus* ssp. *kincaidii* is present (Schultz *et al.* 2003). A third lupine, *Lupinus albicaulis*, is used by Fender's blue butterfly where it occurs in poorer quality habitats (Schultz *et al.* 2003). Fender's blue butterfly has not been found to use *Lupinus latifolius* (broadleaf lupine), a plant commonly eaten by other subspecies of *Icaricia icarioides*, even though it occurs in habitats occupied by the butterfly (Schultz *et al.* 2003).

Threats/Reasons for Listing

Habitat loss, encroachment into prairie habitats by shrubs and trees 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 (U.S. Fish and Wildlife Service 2000). Prairie habitats have been invaded by tall non-native grasses that may be limiting the ability of the Fender's blue butterfly to find its host plant (Severns 2008). There is concern about the effects of pesticide application for agriculture, gypsy moth control, or mosquito control (Oregon Department of Human Service 2003, Oregon Department of Agriculture 2006). Recent population viability analyses have determined that the Fender's blue butterfly is at high risk of extinction throughout most of its range (Schultz and Hammond 2003).

Even the largest populations have a poor chance of survival over the next 100 years (Schultz *et al.* 2003).

Willamette Daisy

Listing Status and Critical Habitat

Willamette daisy was listed as endangered, without critical habitat, on January 25, 2000 (U.S. Fish and Wildlife Service 2000). Critical habitat was designated on October 6, 2006 (U.S. Fish and Wildlife Service 2006). Critical habitat units for Willamette daisy have been designated in Benton, Lane, Linn, Marion and Polk Counties, Oregon. The primary constituent elements of critical habitat are the habitat components that provide 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 subsoils and proper moisture and protection from competitive invasive species. 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.

Population Trends and Distribution

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, and has since been identified at more than 30 sites. 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 (U.S. Fish and Wildlife Service unpublished data).

Population size may fluctuate substantially from year to year. Monitoring at the Oxbow West site, near Eugene, found 2,299 Willamette daisy plants in 1999, 2,912 plants in 2000, and only 1,079 plants in 2001 (Kaye 2002). The population at Baskett Butte declined to 48 percent of the original measured population between 1993 and 1999 (Clark 2000). Detecting trends in Willamette daisy 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.

Life History and Ecology

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 2005b).

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).

Habitat Characteristics

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.

Threats/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 U.S. Fish and Wildlife Service (2000) 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, we estimated that 24 of the 28 extant Willamette daisy populations occurred on private lands that, "without further action, are expected to be lost in the near future" (U.S. Fish and Wildlife Service 2000).

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 noted 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) (U.S. Fish and Wildlife Service 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.

Bradshaw's Lomatium

Listing Status and Critical Habitat

Bradshaw's lomatium (also known as Bradshaw's desert-parsley) was listed as endangered, without critical habitat, on September 30, 1988 (U.S. Fish and Wildlife Service 1988).

Population Trends and Distribution

Bradshaw's lomatium was historically overlooked and poorly documented, and there were no known collections between 1941 and 1969, leading to the assumption that the taxon might be extinct. By 1980, following a study of the species, six populations of the species had been located, including one large population (Kagan 1980). Since 1980, over 40 new sites have been discovered, including three large populations.

For many years Bradshaw's lomatium 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. In addition to the Washington populations, there are currently more than 60 sites with Bradshaw's lomatium in three populations 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; the total area of occupied habitat is about 300 hectares (742 acres) (U.S. Fish and Wildlife Service unpublished data).

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), and continued to decline to less than 1,000 plants in 1999. Herbivory by a booming vole population was suspected to be the cause of the decline. The Washington populations, though fewer in number, are larger in population size, with one site estimated to have over 800,000 individuals (U.S. Fish and Wildlife Service unpublished data). Because of their proximity, these two populations are considered to be a single occurrence under Nature Serve guidelines.

Life History and Ecology

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. 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). 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 (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). Annual fall mowing has significantly increased the number of individual Bradshaw's lomatium plants persisting in the City of Eugene's Amazon Park, from 10,134 individuals in 1995 to 31,252 individuals in 2005 (Trevor Taylor, City of Eugene, *in litt.* 2008).

Habitat Characteristics

Bradshaw's lomatium is restricted to wet prairie habitats. These sites have heavy, sticky clay soils or a dense clay layer below the surface that results in seasonal hydric soils. Most of the known Bradshaw's lomatium populations occur on seasonally saturated or flooded prairies, which are found near creeks and small rivers in the southern Willamette Valley (Kagan 1980). The soils at these sites are dense, heavy clays with a slowly permeable clay layer located between 15 and 30 centimeters (6 and 12 inches) below the surface. This slowly permeable clay layer, which results in a perched water table in winter and spring, allows soils to be saturated to the surface or slightly inundated during the wet season. The soils include Dayton silt loams, Natroy silty clay loams or Bashaw clays; other soils on which the species has been found include Amity, Awbrig, Coburg, Conser, Courtney, Cove, Hazelair, Linlaw, Oxley, Panther, Pengra, Salem, Willamette, and Witzel.

Less frequently, Bradshaw's lomatium populations are found on shallow, basalt areas in Marion and Linn County near the Santiam River. The soil type is characterized as Stayton Silt Loam; it is described as well drained, in alluvium underlain by basalt (Kaye and Kirkland 1994). The shallow depth to bedrock, 50 centimeters (20 inches) or less, results in sites which are poorly suited to agriculture. This soil type occurs at scattered locations in sites with deeper soils belonging to the Nekia-Jory association, which were originally vegetated by grassland and oak savanna (Alverson 1990). Bradshaw's lomatium at these sites occurs in areas with very shallow soil, usually in vernal wetlands or along stream channels.

Bradshaw's lomatium is often associated with *Deschampsia cespitosa*, and frequently occurs on and around the small mounds created by senescent *Deschampsia cespitosa* plants. In wetter areas, Bradshaw's lomatium occurs on the edges of *Deschampsia cespitosa* or sedge bunches in patches of bare or open soil. In drier areas, it is found in low areas, such as small depressions, trails or seasonal channels, with open, exposed soils. The grassland habitat of Bradshaw's lomatium frequently includes these species: *Carex* spp., *Danthonia californica*, *Eryngium petiolatum*, *Galium cymosum* (bedstraw), *Grindelia integrifolia* (Willamette Valley gumweed),

Hordeum brachyantherum, *Juncus* spp., *Luzula comosa* (Pacific woodrush), *Microseris laciniata* (cut-leaved microseris), and *Perideridia* sp. (yampah) (Kagan 1980). In most sites, introduced pasture grasses (*Anthoxanthum odoratum*, *Holcus lanatus*, *Poa pratensis* [Kentucky bluegrass], *Agrostis capillaris* [colonial bentgrass], *Dactylis glomerata* and *Festuca arundinacea*) are present. Invasive bentgrasses, including *Agrostis stolonifera*, have been found at many protected sites with Bradshaw's lomatium populations, including The Nature Conservancy's Willow Creek Preserve and William L. Finley National Wildlife Refuge (Kate Norman, U.S. Fish and Wildlife Service, Portland, Oregon, pers. comm., 2009).

Threats/Reasons for Listing

Expanding urban development, pesticides, encroachment of woody and invasive species, herbivory and grazing are threats to remaining Bradshaw's lomatium populations (U.S. Fish and Wildlife Service 1988). The majority of Oregon's Bradshaw's lomatium populations are located within a 16-kilometer (10-mile) radius of Eugene. The continued expansion of this city is a potential threat to the future of these sites. Even when the sites themselves are protected, the resultant changes in hydrology caused by surrounding development can alter the species' habitat (Meinke 1982, Gisler 2004). The majority of sites from which herbarium specimens have been collected are within areas of Salem or Eugene which have been developed for housing and agriculture. The populations in Washington occur on private lands and are not protected (Gisler 2004).

Populations occurring on roadsides are at risk from maintenance activities, and from adverse effects of management on adjacent lands. Pesticide use on agricultural fields and herbicide application adjacent to roads may harm Bradshaw's lomatium populations across its range. There is concern that pesticides kill the pollinators necessary for plant reproduction; Bradshaw's lomatium does not form a seed bank, therefore, any loss of pollinators (and subsequent lack of successful reproduction) could have an immediate effect on population numbers (Kaye and Kirkland 1994). Herbicides may drift, and even when Bradshaw's lomatium is not the target, applications near a population may damage or kill the plants outright. For example, an herbicide application on private land adjacent to the William L. Finley National Wildlife Refuge drifted onto the refuge and damaged or killed Bradshaw's lomatium plants in 2006 (Jock Beall, U.S. Fish and Wildlife Service, Corvallis, Oregon, pers. comm., 2008).

Kincaid's Lupine

Listing Status and Critical Habitat

Kincaid's lupine was listed as threatened, without critical habitat, on January 25, 2000 (U.S. Fish and Wildlife Service 2000). Critical habitat was designated on October 6, 2006 (U.S. Fish and Wildlife Service 2006). Critical habitat units for Kincaid's lupine have been designated in Benton, Lane, Polk and Yamhill Counties, Oregon, and Lewis County, Washington. The primary constituent elements 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 subsoils and proper moisture and protection from competitive invasive species; and (2) the presence of insect pollinators, such as bumblebees (*Bombus mixtus* and *B. 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 primary constituent elements, such as buildings, aqueducts, airports, and roads, and the land on which such structures are located.

Population Trends and Distribution

Kincaid's lupine is found in dry upland prairies from Lewis County, Washington, in the north, south to the foothills of Douglas County, Oregon; however, most of the known and historical populations are found in the Willamette. 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 164 sites, comprising about 246 hectares (608 acres) of total coverage (U.S. Fish and Wildlife Service unpublished data). 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 kilometers (100 miles) from the nearest population in the Willamette Valley. In 2004, two small populations were found at Drew's Prairie and Cowlitz 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 Cowlitz Prairie (Caplow and Miller 2004, Ted Thomas, U.S. Fish and Wildlife Service, Lacey, Washington, pers. comm., 2006, Joe Arnett, Washington Department of Natural Resources, *in litt.* 2008). 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.

Monitoring the size of Kincaid's lupine populations is challenging because its pattern of vegetative growth renders it difficult to distinguish individuals (Wilson *et al.* 2003). Instead of counting plants, most monitoring for this species relies on counting the number of leaves per unit area, partly because there is a strong correlation between Fender's blue butterfly egg numbers and lupine leaf density (Schultz 1998, Kaye and Thorpe 2006). Leaf counts are time consuming, however, and recent evaluations have shown that lupine cover estimates are highly correlated with leaf counts, much faster to perform, and useful for detecting population trends (Kaye and Benfield 2005a).

Life History and Ecology

Flowering begins in 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 *B. 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 by seed and vegetative spread. 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 ft) or more apart can be interconnected by below-ground stems, and that clones can exceed 10 m (33 ft) 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 common in large populations where inbreeding depression is minimized and ample numbers of

seeds are produced. In small populations, seed production is reduced and this appears to be due, at least in part, to inbreeding depression (Severns 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 in May and 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 is vulnerable to seed, fruit and flower predation by insects, which may limit the production of seeds. 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). The vegetative structures of Kincaid's lupine support a variety of insect herbivores, including root borers, sap suckers and defoliators (Wilson *et al.* 2003).

Habitat Characteristics

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-way, between the road shoulder and adjacent fence line, where they have survived because of a lack of agricultural disturbance. Some of the populations in Washington occur in pastures and appear to benefit from light grazing by livestock, which reduces the cover of competing shrubs and grasses (Joe Arnett, Washington Department of Natural Resources, *in litt* 2008). Common native species typically associated with Kincaid's lupine include: *Festuca idahoensis* ssp. *roemeri*, *Danthonia californica*, *Calochortus tolmiei*, *Eriophyllum lanatum*, and *Fragaria virginiana*. 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 to 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* (Douglas-fir), *Quercus kelloggii* (California black oak), *Arbutus menziesii* (Pacific madrone), *Pinus ponderosa* (ponderosa pine), *Calocedrus decurrens* (incense cedar), *Arctostaphylos columbiana* (hairy manzanita) and *Toxicodendron diversilobum*.

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

Threats/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). 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 (U.S. Fish and Wildlife Service 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 of listing were on private lands and are at risk of being lost unless conservation actions are implemented (U.S. Fish and Wildlife Service 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).

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. 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). When Kincaid's lupine was listed, we estimated that 83 percent of upland prairie sites within its range were succeeding to forest (U.S. Fish and Wildlife Service 2000).

Nelson's Checker-mallow

Listing Status and Critical Habitat

Nelson's checker-mallow was listed as threatened, without critical habitat, on February 12, 1993 (U.S. Fish and Wildlife Service 1993).

Population Trends and Distribution

In the past, Nelson's checker-mallow has been collected in Benton, Clackamas, Linn, Marion, Polk, Tillamook, Yamhill, and Washington Counties, Oregon, and Cowlitz and Lewis Counties, Washington. Nelson's checker-mallow is currently known from about 90 sites, comprising about 517 hectares (1,277 acres) of total cover, distributed from southern Benton County, Oregon, northward through the central and western Willamette Valley, to Cowlitz and Lewis Counties, Washington (CH2MHill 1997, U.S. Fish and Wildlife Service 1998, U.S. Fish and Wildlife Service unpublished data). This species also occurs in several higher elevation west slope Coast Range meadows that flank the western Willamette Valley in Yamhill, Washington and Tillamook Counties, Oregon. Known populations range in elevation from 45 to 600 m (150 to 1,970 ft).

In the Willamette Valley, populations of Nelson's checker-mallow occur at low elevations (below 200 m [650 ft]) within a mosaic of urban and agricultural areas, with concentrations around the cities of Corvallis and Salem. In the Coast Range, Nelson's checker-mallow populations range in elevation from 490 to 600 m (1,610 to 1,970 ft), and are found in open, grassy meadows within a larger matrix of coniferous forest.

Life History and Ecology

In the Willamette Valley, Nelson's checker-mallow begins flowering as early as mid-May, and continues through August to early September, depending upon the moisture and climatic conditions of each site. Coast Range populations experience a shorter growing season and generally flower later and senesce earlier. Nelson's checker-mallow inflorescences are indeterminate, and often simultaneously exhibit fruits, open flowers, and unopened buds. Seeds are deposited locally at or near the base of the parent plant and may be shed immediately or persist into winter within the dry flower parts that remain attached to the dead stems. Above-ground portions of the plant die back in the fall, usually followed by some degree of regrowth at the base, with the emergence of small, new leaves that persist through the winter directly above the root crown. It is not uncommon for some plants to continue producing some flowers into the fall and early winter, although this is usually limited to one or two small stems per plant, consequently with little seed production (U.S. Fish and Wildlife Service 1998).

Perfect-flowered Nelson's checker-mallow are protandrous, with complete temporal separation of male and female phases in individual flowers (Gisler and Meinke 1998). This prevents self-fertilization, and combined with the bottom-to-top foraging observed among most bee visitors, also discourages selfing through geitonogamy. Outcrossing is encouraged because pollinators leave male-phase flowers at the top of one raceme and then fly to female phase flowers on the bottom of the next raceme. Some selfing will still occur in perfect-flowered plants, however, due to within-plant, between-raceme foraging. Female plants, which lack male flowers, are obligately outcrossed (Gisler and Meinke 1998). In most Willamette Valley (but not Coast Range) populations, female (male-sterile) Nelson's checker-mallow plants vastly outnumber perfect plants. Nelson's checker-mallow is also capable of vegetative expansion via rhizomes or laterally spreading root systems that form multiple crowns bearing distinct clusters of flowering stems (CH2MHill 1986, Glad *et al.* 1994).

Nelson's checker-mallow is pollinated by a variety of insects, including at least 17 species of bees, 3 species of wasps, 9 species of flies, 6 species of beetles, and 5 species of lepidopterans (Gisler 2003). Three species of bumblebees (*Bombus californicus*, *B. sitkensis* and *B. vosnesenskii*) were the most common and active pollinators (Gisler 2003). One solitary bee pollinator, *Diadasia nigrifrons*, is a checker-mallow specialist, and may also pollinate Nelson's checker-mallow in the Willamette Valley (Gisler and Meinke 1998).

Pre-dispersal seed predation by weevils (*Macrorhoptus sidalceae*) is extremely high in many populations, and may severely curtail, if not virtually eliminate, seed survival in many populations (Gisler and Meinke 1998). The weevils appear to be restricted to Willamette Valley, southwestern Washington and lower Coast Range populations (around Grand Ronde), but do not infest the Coast Range populations in Yamhill, Tillamook, and Washington Counties. The weevils are native, host-specific, and are themselves parasitized by tiny undescribed wasps (Gisler and Meinke 1998).

Habitat Characteristics

In the Willamette Valley, Nelson's checker-mallow is known from wet prairies and stream sides. Although occasionally occurring in the understory of *Fraxinus latifolia* (Oregon ash) woodlands or among woody shrubs, Willamette Valley Nelson's checker-mallow populations usually occupy open habitats supporting early seral plant species. These native prairie remnants are frequently found at the margins of sloughs, ditches, and streams; roadsides; fence rows; drainage swales; and fallow fields. Soil textures of the occupied sites vary from gravelly, well drained loams to poorly drained, hydric clay soils (CH2MHill 1986, Glad *et al.* 1994).

Some of the native plants commonly associated with Nelson's checker-mallow in the Willamette Valley include: *Achillea millefolium* (yarrow), *Juncus effusus* (common rush), *Carex* spp. (sedge), *Spiraea douglasii* (western spiraea), *Crataegus douglasii* (Douglas' hawthorn), *Geum macrophyllum* (large-leaved avens), and *Fraxinus latifolia* (Oregon Department of Agriculture 1995). Most sites have been densely colonized by invasive weeds, especially introduced forage grasses. Common non-native species found with Nelson's checker-mallow include *Festuca arundinacea*, *Rosa* spp. (rose), *Cirsium arvense* (Canada thistle), *Hypericum perforatum* (common St. John's wort), *Rubus* spp. (blackberry), *Phleum pratense* (timothy), *Holcus lanatus* (velvet grass), *Vicia* spp., *Chrysanthemum leucanthemum* (oxeye-daisy), *Agrostis capillaris*, *Alopecurus pratensis*, *Phalaris arundinacea*, *Geranium* spp. (geranium), *Lotus corniculatus* (bird's-foot trefoil) and *Daucus carota* (Oregon Department of Agriculture 1995).

Coast Range Nelson's checker-mallow populations typically occur in open, wet to dry meadows, intermittent stream channels, and along margins of coniferous forests, with clay to loam soil textures (Glad *et al.* 1987). These areas generally support more native vegetation than Willamette Valley sites. Native plants commonly associated with Nelson's checker-mallow in the Coast Range include *Senecio triangularis* (spear-head senecio), *Fragaria virginiana*, *Juncus* spp., *Carex* spp., and *Achillea millefolium*; non-native associated species often include *Senecio jacobaea* (tansy ragwort), *Holcus lanatus*, and *Phleum pratense*.

A variety of animal species are associated with Nelson's checker-mallow. Stems and inflorescences are commonly eaten by deer and elk. Nelson's checker-mallow flowers are visited by a diverse assemblage of insects, including leafcutter bees (Megachilidae), honey bees (Apidae), bumble bees (Bombidae), hover flies (Syrphidae), butterflies (Hesperiidae), and pollen-foraging beetles (Cerambycidae and Meloidae). The species is also a host for various phytophagous insects such as aphids (Aphididae), stinkbugs (Pentatomidae), scentless plant bugs (Rhopalidae), spotted cucumber beetles (Chrysomelidae), plant bugs (Miridae), milkweed bugs (Lygaeidae), spittlebugs (Cercopidae), butterfly larvae (Lycaenidae: *Strymon melinus*; Nymphalidae: *Vanessa anabella*), and in the Willamette Valley, weevils (Curculionidae: *Macrohoptus sidalcae*). Other insects found in association with Nelson's checker-mallow include ants (Formicidae) and earwigs (Forficulidae) (Bureau of Land Management 1985, CH2M Hill 1986, Oregon Department of Agriculture 1995).

Threats/Reasons for Listing

As with the other rare prairie plants addressed in the HCP, Nelson's checker-mallow is threatened by urban and agricultural development, ecological succession that results in shrub and tree encroachment of open prairie habitats, and competition with invasive weeds (U.S. Fish and Wildlife Service 1993).

At many Willamette Valley sites, seedling establishment is inhibited by the dense thatch layer of non-native grasses (Gisler 2004). Other factors specific to Nelson's checker-mallow include pre-dispersal seed predation by weevils (Gisler and Meinke 1998), the potential threat of inbreeding depression due to small population sizes, and habitat fragmentation (Gisler 2003).

Taylor's Checkerspot Butterfly

Conservation Status

Taylor's checkerspot butterfly is a candidate for Federal listing (U.S. Fish and Wildlife Service 2001). The species is listed as endangered by the State of Washington (Washington Natural Heritage Program 2008); the species has no state protection in Oregon since invertebrates are not protected under the Oregon Endangered Species Act.

Population Trends and Distribution

Historically, Taylor's checkerspot was likely distributed throughout prairies in the Willamette Valley, Puget Sound, and south Vancouver Island. Historic range and abundance are not precisely known because extensive searches did not occur until recently. Northwest prairies were formerly more common, larger, and interconnected, and likely would have supported a greater distribution and abundance of Taylor's checkerspot than exist today. Before its decline, the checkerspot was documented at more than 70 sites in British Columbia, Washington, and Oregon (U.S. Fish and Wildlife Service 2005). These sites included coastal and inland prairies on southern Vancouver Island and surrounding islands in British Columbia and the San Juan Island archipelago, as well as open prairies on post-glacial gravelly outwash and balds in Washington's Puget Trough and Oregon's Willamette Valley. In Oregon, there were 13 recorded sites from which this subspecies had been either collected or observed over the last century (U.S. Fish and Wildlife Service 2005).

There are two known extant populations in Oregon, both in Benton County (Vaughan and Black 2002, U.S. Fish and Wildlife Service 2005). One population occurs in a Bonneville Power Administration right-of-way and the other occurs in Benton County's Beazell Park. The combined population at these sites may exceed 1,000 individuals.

Life History and Ecology

Taylor's checkerspot butterflies produce one brood per year. They overwinter (diapause) in the fourth or fifth larval instar phase, usually in May. Adults emerge in the spring, and have a flight period as adults of 10 to 14 days during April and May, when they mate and lay clusters of as many as 1,200 eggs. Larvae emerge and grow until the fourth or fifth instar. Larvae feeding on wildflowers in Puget Trough have been documented to enter diapause in mid-June to early July, hibernating through the winter.

Habitat Characteristics

Habitat requirements for the Taylor's checkerspot consist of open prairies and savannas 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 paintbrush (*Castilleja hispida*) as well as native and non-native *Plantago* spp. in the plantain family (Plantaginaceae) (Dornfield 1980, U.S. Fish and Wildlife Service 2005). The last remaining populations in Oregon depend upon the non-native *Plantago lanceolata*.

Threats/Reasons for Decline

The major limiting factors affecting this species are the significant loss of suitable habitat that is largely due to agricultural and urban development, encroachment of trees, and spread of invasive plants which threaten the native grasslands in which the species is found (Vaughan and Black 2002, U.S. Fish and Wildlife Service 2005). Pesticide use and recreational activities pose a direct threat to the butterflies themselves. The impact of these threats has led to extirpation of many small populations. Most of the remaining checkerspot populations are a considerable distance from one another, likely well beyond dispersal distance. Natural re-colonization is unlikely as populations disappear.

Peacock Larkspur

Conservation Status

Peacock larkspur is a Federal species of concern (U.S. Fish and Wildlife Service 2010). It is endemic to the Willamette Valley, and is listed as endangered by the State of Oregon (Oregon Department of Agriculture 2008).

Population Trends and Distribution

Currently, only 19 populations of Peacock larkspur are known to persist, which are found generally in the southern Willamette Valley in Benton, Clackamas, Marion and Polk Counties (Gisler 2004, Oregon Natural Heritage Information Center 2007). The species occurs at elevations from 45 to 120 m (150 to 400 ft) (Darr 1980, Gisler 2004). The largest populations occur on the William L. Finley National Wildlife Refuge in Benton County.

Life History and Ecology

Peacock larkspur typically flowers from April to June. The plant does not spread vegetatively and reproduces only by seed; seedlings germinate in the winter and may take at least three years before flowering (Goodrich 1983). Flowers are pollinated by insects; bumblebees (*Bombus californicus* and *B. appositus*) and unidentified moths have been observed pollinating the flowers (Goodrich 1983, McKernan 2004). Infrequent fires appear to benefit the species (McKernan 2004). Peacock larkspur is able to hybridize with other *Delphinium* species, including *D. leucophaeum* and *D. menziesii* (Meinke 1982, Goodrich 1983).

Habitat Characteristics

Peacock larkspur is found in native wet prairie habitats, on the edges of *Fraxinus latifolia* and *Quercus garryana* woodlands, and along roadsides and fence rows, in soils that are generally moist heavy clay loams or dry, well drained heavy clays (Darr 1980, Meinke 1982, Gisler 2004).

Threats/Reasons for Decline

The species is threatened by continued loss of habitat to urban and agricultural development, herbicides, road maintenance, successional encroachment and habitat invasion by exotic species (Gisler 2004).

III. ENVIRONMENTAL BASELINE

Status of the Species in the Action Area

Fender's Blue Butterfly

Fender's blue butterfly is endemic to the Willamette Valley. There are currently several known population areas in Benton County: Wren; Butterfly Meadows (= McDonald Forest) and the Oak Creek roadside population; Greasy Creek; and Lupine Meadows (=West Hills/Philomath); each is composed of several subpopulations. See Table II-1 for population estimates.

Three critical habitat units have been designated for Fender's blue butterfly in the action area. Units FBB-7, FBB-8, and FBB-9 collectively represent the areas of habitat containing the features essential to the conservation of the Fender's blue butterfly populations in northern Benton County. Unit FBB-7 consists of approximately 11.5 acres (4.6 ha) of private and State lands within Benton County. The habitat in this unit, uniquely located in a meadow surrounded by forested land, supports the second largest known Fender's blue butterfly population and occurs in McDonald Forest located off Oak Creek Road. Approximately 15 percent of the habitat supporting the PCEs within FBB-7 occurs on Oregon State University lands and the remaining 85 percent occurs on private lands. Unit FBB-7 provides a diverse composition of high quality habitat used by all life stages of the Fender's blue butterfly. Unit FBB-8 encompasses approximately 716.7 acres (290 ha) of private lands within Benton County. This unit is located in Wren, Oregon, between Kings Valley Highway, Cardwell Hill Road and Blakesly Creek Road, approximately 2 miles (3.2 km) southwest of Unit FBB-7. The high quality, large prairie habitat included within Unit FBB-8 contains the features essential for all life stages of the Fender's blue butterfly metapopulation. Unit FBB-9 consists of approximately 48.5 acres (19.6 ha) of private lands located north of Philomath. The habitat occurs primarily to the south of West Hills Road and to the west of 19th Street. The Greenbelt Land Trust recently obtained a conservation easement for 51 percent of the prairie habitat supporting this population. Unit FBB-9 provides the habitat features essential for all life stages of Fender's blue butterfly, and is one of the core populations in Benton County.

Willamette Daisy

Two of the three naturally occurring Willamette daisy populations in Benton County occur on private lands, with only a small population (57 individuals) on public land at Bald Hill Park. Suitable potential habitat for Willamette daisy occurs at several protected sites (such as Fitton Green Natural Area) at which the species could be reintroduced. A planted population occurs at William L. Finley National Wildlife Refuge, and a total of 750 Willamette daisies were planted at Bald Hill in 2007 and 2008.

One critical habitat unit has been designated for Willamette daisy in the action area. Unit WD-4 encompasses approximately 9.3 acres (3.8 ha) of private and City of Corvallis land occurring in Benton County. This unit is located north of SW Reservoir Avenue and south of NW Oak Creek Drive and is part of Bald Hills Park. Approximately half of the habitat within this unit is located on City of Corvallis land and half on private land. The habitat supporting this population of *Erigeron decumbens* var. *decumbens* occurs in two distinct habitat patches (WD-4A and 4B) approximately 0.6 mi (1 km) apart. A portion of the *E. decumbens* var. *decumbens* population occupying this unit occurs along a hiking trail located on private land with a City of Corvallis access easement. Although the *Erigeron decumbens* var. *decumbens* population occupying this

unit is relatively small, it is one of the largest remaining populations in this portion of the species' range and is supported by a large habitat patch with a moderate diversity of indicator species. Unit WD-4 supports a core population fundamental to the continued persistence of the species in this portion of its current range.

Bradshaw's Lomatium

Seven naturally occurring sites with Bradshaw's lomatium are known in Benton County, totaling over 1,500 plants. One population is split between City of Corvallis and County ownerships at Jackson-Frazier Wetland, two occur at William L. Finley National Wildlife Refuge, and the remaining four occur on private lands. About 20 Bradshaw's lomatium plants have been planted on County land at Jackson-Frazier Wetland, and sufficient habitat exists there to support further augmentation of the population.

Kincaid's Lupine

In Benton County, 17 population areas are known with approximately 59 subpopulations. These occur primarily in the Philomath, Greasy Creek, Soap Creek, Wren and Kings Valley area. Twenty-eight subpopulations occur on private lands with no conservation easement. A large population of Kincaid's lupine occurs in the Soap Creek area of the County on lands managed by Oregon State University for cattle grazing. Small scattered populations are also found on roadside rights-of-way, on City of Corvallis property, and at Oregon Department of Fish and Wildlife's E.E. Wilson Wildlife Area.

Three critical habitat units have been designated for Kincaid's lupine in the action area. Units KL-8, KL-9 and KL-10 collectively represent the areas of habitat containing the features essential to the conservation of the Kincaid's lupine populations in northern Benton County. Unit KL-8 consists of approximately 11.5 acres (4.6 ha) of private and State lands in Benton County. This unit occurs in McDonald Forest located off Oak Creek Road and supports one of the highest quality remaining prairies. This site is the second largest known Fender's blue butterfly population, and 100 percent of Unit KL-8 is included in Unit FBB-7. Approximately 14 percent of the lands supporting the PCEs within this unit occur on Oregon State University lands, and the remaining 86 percent occurs on private lands. Unit KL-8 provides high quality upland prairie habitat, including the short-grass stature necessary to maintain the openness of the habitat.

Unit KL-9 encompasses approximately 171.6 acres (69.4 ha) of private lands within Benton County. This unit is located in Wren, Oregon, between Kings Valley Highway, Cardwell Hill Road, and Blakesly Creek Road, approximately 2 mi (3.2 km) southwest of Unit KL-8. One hundred percent of Unit KL-9 is included within Unit FBB-8. The habitat identified in Unit KL-9 is one of the largest remaining contiguous prairie patches supporting a large population of Kincaid's lupine; it provides opportunity for population expansion; and this subpopulation increases the long-term viability of neighboring populations by contributing individuals to the overall metapopulation.

Unit KL-10 consists of approximately 17.9 acres (7.2 ha) of private lands within Benton County and is located north of Philomath, with the habitat occurring primarily to the south of West Hills Road and to the west of 19th Street. All of the area within Unit KL-10 is included in Unit FBB-9. The Greenbelt Land Trust recently obtained a conservation easement for the habitat and began managing prairie to enhance the areas supporting the features essential to the conservation of both the Kincaid's lupine and Fender's blue butterfly populations. The habitat identified in Unit

KL-10 has the features essential to the conservation of this species; it is one of the highest quality remaining prairie patches supporting Kincaid's lupine; there is surrounding prairie habitat available for population expansion; and this subpopulation increases the long-term viability of neighboring populations by contributing individuals to the overall metapopulation.

Nelson's Checker-mallow

In Benton County there are 23 population and approximately 39 subpopulations. Eight subpopulations are located on private lands, of which only four are under temporary or permanent conservation easement. Over 30 percent of the known Nelson's checker-mallow plants in Benton County are found on roadside rights-of-way. Large populations are found at the Oregon Department of Fish and Wildlife's E.E. Wilson Wildlife Area and the U.S. Fish and Wildlife Service's William L. Finley National Wildlife Refuge. Smaller populations are distributed across Jackson-Frazier Wetland and Oregon State University properties.

Taylor's Checkerspot Butterfly

There are currently two known populations of Taylor's checkerspot in Oregon; both are in Benton County. One population is found in the Bonneville Power Administration powerline corridor, and the second occurs at Beazell Memorial Forest (owned and managed by Benton County). Each of these two populations has an estimated size of approximately 500 butterflies, with a total population size of 1,000 Taylor's checkerspot butterflies in Oregon (Ross 2005).

Peacock Larkspur

In Benton County, there are approximately 10 population areas and 17 subpopulations of peacock larkspur. Three entire populations and one large subpopulation reside on private land with no conservation easement. While the largest population resides at William L. Finley National Wildlife Refuge, important populations are also found on land owned by the City of Corvallis (Herbert Farm and Natural Area and the Corvallis Watershed). Significant populations are also found in Benton County rights-of-way in Special Management Areas and in ODOT rights-of-way.

IV. EFFECTS OF THE ACTION

Basis for Effects Analysis

The HCP and the Environmental Assessment (EA) (Benton County 2010b) describe and quantify the unavoidable impacts to the covered species that are predicted to result from covered activities over the 50-year term of the HCP. Our analyses in this biological opinion are based on these documents.

For Fender's blue butterfly, effects are quantified based on impacts to two components of butterfly habitat: Kincaid's lupine and nectar plants; see the HCP and EA for detailed descriptions of the methods used to determine the extent of suitable habitat and to predict effects to Fender's blue butterflies. Benton County and its consultants used the following process to determine effects to Fender's blue butterfly over the 50-year term of the permit:

1. Survey and map habitat. Gather information about population locations and habitat conditions for Fender's blue butterfly, Kincaid's lupine, and nectar species during four

years of field work throughout Benton County, in which approximately 4,010 ha (9,910 acres) were surveyed.

2. Establish Fender's Blue Zone map. Develop a map to delineate a region of potential habitat based on known Fender's blue butterfly population locations, and typical butterfly dispersal distances.
3. Forecast construction impacts. Estimate the amount of area within the mapped butterfly habitat likely to be affected over the next 50 years.
4. Measure habitat occupancy. Estimate the proportion of this area likely to contain Kincaid's lupine and nectar plants.
5. Determine Take. Calculate the total area of habitat loss to estimate take of Fender's blue butterfly habitat. An estimate of the number of Fender's blue butterflies likely to be killed can then be extrapolated from the area of habitat (nectar/host plants) to be affected. An estimate of 0.474 butterflies/m² of host or nectar plants was calculated using best available data from a single site in Cardwell Hill (Area 5)(Hammond 2005), the only known site that had both butterfly population estimates (Hammond 2005, 2007) and host/nectar plant census data (Benton County unpublished data cited in the HCP). This extrapolation from habitat area to number of individuals likely results in a substantial overestimate of the number of Fender's blue butterflies to be taken over the course of the permit because the County assumes that all suitable habitat affected is high-quality and fully occupied. These numbers are useful for quantifying the effects to the species in this biological opinion, albeit at an upper limit of the likely amount of take. Detecting take of individual butterflies in the field is difficult, however, therefore the County will track actual take by using the surrogate of area of habitat affected over the course of the 50-year permit.

Effects to Taylor's checkerspot butterfly were quantified on the basis of area of known occupied habitat (nectar plants and host plants) affected. Known occupied habitat for this butterfly is quite limited and dispersal and nectaring distances are poorly understood (Stinson 2005). The best available information estimates this species is likely to disperse approximately 1.5 km (0.93 miles) between habitat patches (U.S. Fish and Wildlife Service 2008). Benton County estimates that host and nectar species for the Taylor's checkerspot butterfly cover 10 percent of the ground area within habitat occupied by Taylor's checkerspot butterfly. Expected loss of Taylor's checkerspot butterflies was estimated based on the area of occupied habitat to be affected, and then extrapolating to individual butterflies using an estimate of 0.084 butterflies/m² of habitat (calculated using butterfly data from Beazell Memorial Forest) (Ross 2009).

Effects to plants are quantified on the basis of square meters of foliar cover impacted for Kincaid's lupine, and on the basis of individual plants affected for all other covered plant species.

We analyzed effects to designated critical habitat for Fender's blue butterfly, Willamette daisy and Kincaid's lupine by evaluating the change in the primary constituent elements caused by the activities covered in the HCP.

Effects to Covered Species by Activity

This section includes the potential direct and indirect impacts resulting from covered activities on the covered species. Direct impacts result from activities causing ground disturbance or

removing land cover, habitat, or populations (or portions of populations) of covered species. Indirect impacts are caused by the covered activities but occur, or are reasonably certain to occur, later in time. See Chapter 5 of the HCP and Chapter 4 in the EA for additional detail on the effects analyses discussed here.

Several of the activities covered by the HCP are similar in nature and have been combined for purposes of analyzing the impacts. These include:

1. **Building Construction Activities.** These are activities under Home, Farm, and Forest Construction, Benton County Permits and Authorizations (construction aspects), and Public Service Facility Construction.
2. **Linear Projects.** These include activities under Transportation Activities and Authorized Work in Rights-of-Way, Benton County Permits and Authorizations (utility and road project aspects), Utility Construction and Maintenance and Water and Wastewater Management.
3. **Habitat Restoration, Enhancement, and Management Activities.** These include activities under Parks/Natural Areas/Open Space Management, and HCP Implementation Activities.

This section separately analyzes the impacts of the remaining covered activities under Agricultural Activities and Emergency Response Activities.

Building Construction Activities

The County estimates that private landowners will seek County permits or agricultural building authorizations to construct up to 1,280 buildings and structures within the Fender's Blue Zone within a 50-year period, and therefore the County is seeking take authorization for 346 m² (3,724 ft²) of Kincaid's lupine and 5,364 m² (57,737 ft²) of native nectar species. Public service facility construction is expected to account for another loss of 12.3 m² (132.4 ft²) of Kincaid's lupine and 222 m² (2,390 ft²) of native nectar species. The direct effects of building construction activities to Fender's blue butterfly will include death of adults, eggs and larvae by crushing and trampling from land clearing, and increased road mortality from an increase in vehicle traffic as the human population increases within the Fender's Blue Zone. Indirect effects include habitat loss (conversion of host and native nectar species habitat), habitat fragmentation, population fragmentation, killing of butterflies through starvation (through habitat conversion of butterfly's nectar habitat), a reduction of dispersal corridors, and mortality from secondary poisoning due to herbicide use on private properties. The resulting estimated direct impact to Fender's blue butterfly from building construction projects is loss of 2,818 Fender's blue butterflies (Table IV-1). Additional loss of Fender's blue butterflies from indirect impacts is expected, but cannot be quantified.

The proposed action does not include Taylor's checkerspot butterfly habitat located on private lands, therefore no adverse effects to the species is expected from building construction activities.

Activity	Bradshaw's lomatium (#)	Willamette daisy (#)	Peacock larkspur (#)	Nelson's checker-mallow (#)	Kincaid's lupine (m ²) outside Fender's Blue Zone	Kincaid's lupine (m ²) inside Fender's Blue Zone	Native nectar species for FBB (m ²)	Non-native nectar species for FBB (m ²)	Fender's blue butterfly (estimated #)	Taylor's checkerspot butterfly habitat (m ²)	Taylor's checkerspot butterfly (estimated #)
Home, Farm and Forest Construction	---	---	---	---	---	346	5,364	8,835	2,707	---	---
Public Service Facility Construction	---	---	---	---	---	12.3	222	366	111	---	---
TOTAL	---	---	---	---	---	358.3	5,586	9,201	2,818	---	---

Some of the private lands covered in the HCP on which home, farm, and forest construction would occur, may have occurrences of covered threatened and endangered plants. Given the types of activities and habitats likely to be impacted, the only species likely to be affected by building construction activities are Kincaid's lupine and peacock larkspur. Construction projects could result in direct killing of these species through ground clearing and disturbance activities (Table IV-2). Indirect effects from loss of pollinators and herbicide drift could occur but can not be quantified.

	Bradshaw's lomatium (#)	Willamette daisy (#)	Peacock larkspur (#)	Nelson's checker-mallow (#)	Kincaid's lupine (m ²) outside Fender's Blue Zone	Kincaid's lupine (m ²) inside Fender's Blue Zone	Native Nectar Species for FBB (m ²)	Non-Native Nectar Species for FBB (m ²)	Taylor's checkerspot butterfly habitat (m ²)
Covered Species on Private Lands	---	---	1,358	---	---	2,583*	141,815**	233,577**	---
<p>* Actual amount found during on-the-ground surveys. Not all lands have been surveyed. Projections based on acreage and average Kincaid's lupine cover of 0.028% estimate a total of 8,165 m² could be present. ** Projected abundance, based on average native nectar species cover of 1.39% along roadsides and 1.7% in all other areas, and non-native nectar species cover of 1.36% along roadsides and 2.8% in all other areas.</p>									

The expected adverse effects of the covered building construction activities will be offset by the County's mitigation program. Benton County will mitigate for impacts to Fender's blue butterfly habitat from building construction activities with the acquisition of 20-24 ha (50-60 acres) of conservation easements on high quality prairie habitat supporting Fender's blue butterfly within the Fender's Blue Zone, to establish the Benton County Fender's Blue Butterfly Conservation Areas. This habitat contains approximately 733 m² (7,890 ft²) of Kincaid's lupine and 285 m² (3,068 ft²) of native nectar species. The property will be enhanced and maintained to protect, in perpetuity, habitat for the Fender's blue butterfly according to the conservation

measures set forth in the HCP (See Chapter 6 of the HCP). Without the permit, mitigation for impacts to Fender's blue butterfly habitat would occur on-site, in a fragmented, piecemeal fashion. Protection of large parcels of habitat has a greater conservation benefit to the species than small scale mitigation sites.

Kincaid's lupine at the proposed Benton County Fender's Blue Butterfly Conservation Areas accounts for 27 percent of the known Kincaid's lupine within the Fender's Blue Zone. To mitigate building construction impacts, Benton County will enhance Fender's blue butterfly habitat at the Fender's Blue Butterfly Conservation Areas by increasing Kincaid's lupine by 358 m² (3,853 ft²) and native nectar species by 5,586 m² (60,127 ft²), based on a 1:1 mitigation ratio, with resulting beneficial effects to Fender's blue butterfly and Kincaid's lupine.

Linear Projects

County road construction (including grading, excavation, filling and paving) and road maintenance activities and activities authorized within the County's right-of-way (e.g., utility construction, driveway construction) have the potential to affect Fender's blue butterfly nectar habitat, Kincaid's lupine (both inside and outside the Fender's Blue Zone), Nelson's checker-mallow and peacock larkspur. These species are located within areas designated by the County as Special Management Areas (SMA). The County has further categorized each SMA as either a Type 1 or Type 2 SMA based upon size, connectivity potential, and quality of associated vegetation (see Section 5.2.3.0 of the HCP for details). Within Type 1 rights-of-way, no take of the covered species would be allowed, whereas within Type 2 rights-of-way, take would be allowed in the amounts identified in Table IV-3. On ODOT's rights-of-way, impacts to 701 m² (7,546 ft²) of Fender's blue butterfly habitat (native nectar species only) are anticipated during the permit term at the following areas: Hwy 34 (near Rock Creek/Henkle Way), Hwy 20 (near Wren) and Hwy 223 (from split with Hwy 20 north to Cardwell Hill Drive).

Effects to covered species from linear projects would include direct killing of Fender's blue butterflies, destruction of larval host plants and nectar sources, increased fragmentation of already small populations and degradation of potential dispersal habitat for Fender's blue butterfly. Covered plants could be affected by crushing or removal and reduction in suitable habitat for pollinator species. Benton County also anticipates impacts to populations of the covered plants that are currently not known, and may exist in rights-of-way that have not yet been surveyed for covered species, estimating this impact to be 3 percent of the populations currently known to occur in the rights-of-way. Anticipated impacts from road maintenance activities are summarized in Table IV-3.

Water and wastewater management activities have the potential to destroy 10 Nelson's checker-mallow plants (Table IV-3). These activities, to be conducted by the City of Corvallis, include ground disturbing activities associated with the construction and installation of pipelines, intake facilities, pump houses, treatment facilities and pipeline maintenance.

Telephone utility maintenance activities on private land have the potential to destroy 6.4 m² (68.9 ft²) of Kincaid's lupine and 101.1 m² (1,088 ft²) of native nectar species. These activities, to be conducted by Pioneer Telephone Cooperative, include ground disturbing activities associated with either boring or plowing trenches for installation of copper or fiber telephone cable. The total area to be disturbed (outside existing road surfaces) within the Fender's Blue

Zone is approximately 2.30 ha (5.68 acres) or 0.079 percent of the private property within the Fender's Blue Zone (Table IV-3).

Natural gas utility activities on private land have the potential to remove 0.2 m² (2.16 ft²) of Kincaid's lupine and 1.4 m² (15 ft²) of native nectar species (Table IV-3). These activities, to be conducted by NW Natural, include habitat removal by trenching for installation of natural gas pipelines. The total area to be disturbed (outside existing road surfaces) within the Fender's Blue Zone is approximately 0.72 ha (1.77 acres) or 0.025 percent of the private property within the Fender's Blue Zone.

Table IV-3. Direct loss and destruction from linear projects.											
Activity	Bradshaw's lomatium (#)	Willamette daisy (#)	Peacock larkspur (#)	Nelson's checker-mallow (#)	Kincaid's lupine outside Fender's Blue Zone (m ²)	Kincaid's lupine inside Fender's Blue Zone (m ²)	Native Nectar Species for FBB (m ²)	Non- Native Nectar Species for FBB (m ²)	Fender's blue butterflies (estimated #)	Taylor's checkerspot butterfly habitat (m ²)	Taylor's checkerspot butterfly (estimated #)
Transportation Construction, Maintenance and Activities Authorized within ROW– Benton County	--	--	7	169	4.3	35	2031	1987	979	--	--
Transportation Maintenance and Activities Authorized within ROW – unknown populations – Benton County	--	--	19	27	0.1	1.3	61	60	30	--	--
Transportation Maintenance – ODOT	--	--	--	--	--	--	701	686	332	--	--
Telephone Utility Maintenance on Private Lands	--	--	--	--	--	6.4	101.1	137.4	51	--	--
Natural Gas Utility Maintenance on Private Lands	--	--	--	--	--	0.2	1.4	1.4	1	--	--
Water and Wastewater Management	--	--	--	10	--	--	--	--	--	--	--
TOTAL	--	--	26	206	4.4	42.9	2,895	2872	1393	--	--

The adverse effects of linear projects to covered species will be offset by mitigation. Mitigation projects will likely have some short-term adverse effects to listed plants, but will have predominantly positive long-term benefits to the species through increased population sizes, improved habitat quality and greater habitat security. Mitigation ratios are specified in the HCP and will be determined by the affected site and mitigation site quality, mitigation site protection, and timing of mitigation. See Chapter 6 of the HCP for discussions of mitigation locations and estimated mitigation ratios; Table IV-4 shows mitigation estimates for linear projects.

Table IV-4. Mitigation estimates for linear projects.								
Activity	Bradshaw's lomatium (#)	Willamette daisy (#)	Peacock larkspur (#)	Nelson's checker-mallow (#)	Kincaid's lupine (m ²) outside the Fender's Blue Zone	Kincaid's lupine (m ²) inside the Fender's blue Zone	Nectar habitat for FBB (m ²)	Taylor's checkerspot butterfly habitat (m ²)
Transportation Construction, Maintenance and Activities Authorized within ROW– Benton County	--	--	21	507	12.9	35	2,031	--
Transportation Maintenance and Activities Authorized within ROW – unknown populations – Benton County	--	--	57	80	0.4	1.3	60	--
Transportation Maintenance – ODOT	--	--	--	--	--	--	2403	--
Telephone Utility Maintenance on Private Lands	--	--	--	--	--	6.4	101.1	--
Natural Gas Utility Maintenance on Private Lands	--	--	--	--	--	0.2	1.4	--
Water and Wastewater Management	--	--	--	30	--	--	--	--
TOTAL	--	--	78	617	13.3	42.9	4,597	--

The overall population-level effects of linear projects are expected to be minimal to Nelson's checker-mallow, Kincaid's lupine, Fender's blue butterfly native nectar species, and peacock larkspur. Of the known populations on all lands within Benton County (including Federal lands), only 5.8 percent of Nelson's checker-mallow, 0.5 percent of the projected Kincaid's lupine in the Fender's Blue Zone, 1.9 percent of native nectar and 1.2 percent of non-native nectar species within the Fender's Blue Zone Nectar Zone, 1.1 percent of Kincaid's lupine outside the Fender's Blue Zone, and 0.6 percent of peacock larkspur will be affected by these linear projects. No effects are anticipated for Bradshaw's lomatium, Willamette daisy or Taylor's checkerspot butterfly habitat as a result of linear projects.

Habitat Restoration, Enhancement and Management Activities

Habitat restoration, enhancement and management activities will occur on covered County and Cooperator lands. The goal of these activities is to enhance the growing conditions for covered species by: (1) reducing or eliminating invasive species and woody species, (2) reducing thatch, (3) preparing sites for seeding and planting, (4) increasing available light, nutrients, and water for native species, (5) raising soil pH, (6) enhancing native plant diversity and abundance, (7) increasing the number of covered plant species through augmentation of existing populations, and (8) increasing the amount of prairie habitat necessary for the support of Fender's blue butterflies and Taylor's checkerspot butterflies. These outcomes are beneficial, but there will be short-term adverse effects associated with these activities.

Mowing

In Fender's blue butterfly or Taylor's checkerspot butterfly habitat with eggs or larvae present, mowing may crush or suck up and kill a small number (< 5 percent) of eggs (spring mowing) and/or larvae (spring, summer, fall/winter mowing). During the spring, adults may be harassed if mowing overlaps the flight season. However, these short term effects are off-set by the greater long-term positive effects of mowing. Mowing is an effective tool for controlling non-native species which tend to out-compete butterfly host plants and native nectar species (Kaye and Thorpe 2006). The abundance of Fender's blue butterfly eggs is correlated with the abundance of Kincaid's lupine leaves, with eggs increasing substantially in numbers at sites treated to control non-native species (Schultz *et al.* 2003).

Mowing also helps in preparing a site to plant or seed. Mowing is one of the most effective techniques for increasing native prairie species cover while reducing competing invasive species (Kaye and Benfield 2005a). Spring and summer mowing within patches of covered plant species may remove much of the above ground growing parts of the plants, reducing the growth and reproductive success of the plant. If spring or summer mowing must occur to control invasive species, then no more than one-half of the population of the covered plant species will be mowed at any one time. Fall mowing after the covered plants have senesced is not likely to adversely affect the covered plant species. The County and Cooperators do not anticipate mowing in the spring or summer months, and will generally wait until the covered plants have senesced.

Manual Invasive Plant Removal, Tree and Shrub Removal, and Tree Girdling

Removal and girdling of woody plants will be conducted by hand, and will be selectively applied. No adverse effects are anticipated, and the results of these activities will be entirely beneficial.

Raking

Raking removes thatch, which enhances growing conditions for native prairie plants. Raking will occur after the covered plant species have senesced for the season, resulting in minimal adverse effects through the removal of above ground growing parts of the covered plant species. Raking may cause soil compaction which would have a small adverse effect on Fender's blue butterfly or Taylor's checkerspot butterfly eggs and larvae, by crushing and killing. Raking may also adversely affect butterfly eggs and larvae present in the thatch by removing the protective thatch layer and exposing the eggs and larvae to predation. At sites with greater than 100 Fender's blue butterflies or Taylor's checkerspot butterflies present, raking will be limited to one-third of the site. Sites with fewer than 100 Fender's blue butterflies or Taylor's checkerspot butterflies present, raking will be limited to one-quarter of the site. These limits ensure that if 100 percent of the eggs or larvae within the area raked are killed, the area could be recolonized by individuals in the un-raked portion of the site.

Nelson's checker-mallow senesces later in the fall than the other plants covered in the HCP. Fall raking could damage or kill Nelson's checker-mallow, therefore thatch raking will not be implemented at Nelson's checker-mallow sites.

Shade Cloth

Shade cloth is used to prepare a site for planting. The heavy cloth blocks out all light and kills the weedy plants underneath. Shade cloth will only be used to prepare sites with no existing

populations of covered species. There will therefore be no short-term adverse effects of the technique, and the long-term effects will be entirely beneficial.

Sod Rolling, Solarization, and Tilling/Disking

Sod rolling, solarization and tilling or disking are harsh treatments that are used to prepare weedy sites for restoration. These techniques would destroy any individuals of the covered species present on the site, and therefore, will not be used at sites with existing populations of the covered species, and will only be used at least 10 m (30 ft) away from individuals of the covered species. There will therefore be no short-term adverse effects of the technique, and the long-term effects will be entirely beneficial.

Livestock Grazing

Fall grazing can be an effective tool to control non-native plants and to maintain desired vegetation height, however, livestock can trample and kill eggs and larvae of Fender's blue butterfly and Taylor's checkerspot butterfly, and livestock may destroy Nelson's checker-mallow plants, which may not have senesced by early fall. Grazing will not be used in sites with these three species; at sites with other covered species, livestock grazing will only be used as a habitat management technique during the fall.

Prescribed Burning

Prescribed burning improves habitat for the covered species by reducing thatch and increasing the amount of native species cover, including the butterflies' host and nectar species. Fall burning kills the larvae of Fender's blue butterfly and Taylor's checkerspot butterfly in the area burned. To limit the effects of prescribed burning on the covered butterflies, at sites supporting populations of greater than 100 butterflies, no more than one-third of the site will be burned at any one time; at sites supporting fewer than 100 butterflies, no more than one-quarter of the site will be burned at any one time. These limits ensure that if 100 percent of the butterfly larvae within the area burned are killed during the prescribed burn, the population in the unburned portion of the site will be able to recolonize the burned area.

For Fender's blue butterfly populations at conservation sites, the sites will be treated with prescribed fire ten times during the permit term. The affected Fender's blue butterfly habitat to be burned is 112.5 m² (1,211 ft²), of which 100 percent mortality of the butterfly eggs and/or larvae would be expected during each prescribed fire in the portion of the habitat burned. The combined effects over the permit term would result in the mortality of all eggs/larvae residing within 1,125 m² (12,110 ft²).

For Fender's blue butterfly at mitigation sites, prescribed burning will occur ten times during the permit term. The affected area to be burned is 404 m² (4,348.6 ft²), of which 100 percent mortality of the butterfly eggs and/or larvae would be expected. The combined effects over the permit term would result in the mortality of all eggs/larvae residing within 4,038 m² (43,464.7 ft²).

For Taylor's checkerspot butterfly management at Benton County Natural Areas and Parks sites, prescribed burning will occur ten times during the permit term. The affected area to be burned is 5,743 m² (61,817.1 ft²), of which 100 percent mortality of the butterfly eggs and/or larvae would be expected. The combined effects over the permit term would result in the mortality of all eggs/larvae residing within 57,430 m² (618,171.4 ft²).

As mitigation sites for Taylor's checkerspot butterfly, prescribed burning will occur two times during the permit term. The affected area to be burned is 172 m² (1,851.4 ft²), of which 100 percent mortality of the butterfly eggs and/or larvae would be expected. The combined effects over the permit term would result in the mortality of all eggs/larvae residing within 345 m² (3,713.6 ft²).

Heavy equipment used in prescribed burning may cause soil compaction which could adversely affect the covered species. Adverse effects to the covered plant species will be alleviated by conducting burns after August 15 after the plants have senesced (with the exception of Nelson's checker-mallow), specifying routes that avoid covered plant species, and using rubber tracks on tractors. If the prescribed burn occurs prior to Nelson's checker-mallow senescence in later fall, effects to the species may be adverse. To minimize adverse affects to Nelson's checker-mallow, only one-half of the site occupied by the species will be burned at any given time. This allows the Nelson's checker-mallow within the unburned portion of the site to serve as a recolonization source for the burned area.

Prescribed burning is likely to kill seeds of the covered plants located at or near the soil surface. Seeds above the soil surface will be destroyed, and some rhizomes (*i.e.*, Willamette daisy, Kincaid's lupine) may be injured or destroyed. However, fall burning is effective in reducing invasive species cover, and research has shown that Kincaid's lupine (Wilson *et al.* 2003) and Bradshaw's lomatium (Pendergrass *et al.* 1999) respond positively to fire. Benton County estimates that only 5 percent of the seeds produced annually would be affected each time an area with the covered plants is burned, with an estimated ten prescribed burns during the permit term.

In summary, there are likely to be significant adverse affects to individuals of the covered species from prescribed burns, but the net long-term effects to the butterfly and plant populations are highly beneficial.

Herbicide Application

Limited use of herbicides is often necessary to manage degraded prairie habitats, although herbicide application may result in adverse effects to the covered species. Habitat restoration and management projects may use the herbicides Triclopyr, Glyphosate, Oryzalin or 2, 4-D amine to manage invasive species. In areas with Fender's blue butterfly or Taylor's checkerspot butterfly populations, only one-third of the habitat will be sprayed when the butterfly population exceeds 100 individuals, and only one-quarter of the site will be sprayed when there are fewer than 100 individual butterflies present. To lessen the impacts of herbicides on butterflies, spraying will occur when the butterflies are in diapause and the covered plant species have senesced. Herbicide application is likely to affect less than five percent of butterfly larvae in a given year through incidental exposure.

For Fender's blue butterfly at conservation sites, herbicide application will occur on up to 10 percent of the area annually or 100 percent of the area could be sprayed five times over the permit term. The affected area to be sprayed is 156.5 m² (1,685 ft²), of which 5 percent mortality of the butterfly eggs and/or larvae would be expected. The combined effects over the permit term would result in the death of all eggs/larvae residing within 39.1 m² (421 ft²).

For Fender's blue butterfly at mitigation sites, herbicide will occur on up to 10 percent of the area annually or 100 percent of the area could be sprayed five times over the permit term. The affected area to be sprayed is 404 m² (4,348.6 ft²), of which five percent mortality of the butterfly eggs and/or larvae would be expected. The combined effects over the permit term could result in the death of all eggs/larvae residing within 101 m² (1,087.2 ft²).

For Taylor's checkerspot butterfly at conservation sites, herbicide application will occur on up to 10 percent of the area annually or 100 percent of the area could be sprayed five times over the permit term. The affected area to be sprayed is estimated to be 5,743 m² (61,817.1 ft²), of which five percent mortality of the butterfly eggs and/or larvae would be expected. The combined effects over the permit term would result in the death of all eggs/larvae residing within 1,436 m² (15,457 ft²).

For Taylor's checkerspot butterfly at mitigation sites, herbicide application will occur on up to 60 percent of the entire area. The affected area to be sprayed is 172 m² (1,851.4 ft²), of which five percent mortality of the butterfly eggs and/or larvae would be expected. The combined effects over the permit term would result in the death of all eggs/larvae residing within 5 m² (53.8 ft²).

Soil compaction from equipment used to spray the herbicides or from foot traffic may degrade habitat quality for the covered species, although the effects are expected to be small. These effects will be alleviated by minimizing foot and vehicle traffic in areas occupied by the covered species.

Herbicide application of Glyphosate, Triclopyr, Oryzalin and 2, 4-D amine during the spring growing season will be applied with precautions to avoid covered plant species, although there may be some incidental adverse effects due to drift. Fall herbicide application will have no adverse effects on Willamette daisy, Kincaid's lupine, Bradshaw's lomatium or peacock larkspur. Since Nelson's checker-mallow senesces later than the other covered plant species, Nelson's checker-mallow plants will be covered during fall herbicide application to protect the plants from adverse effects.

Monitoring

Covered activities include pre- and post-activity and effectiveness monitoring. Monitoring activities may adversely affect a small number of covered species, including butterfly eggs and larvae. Monitoring for adult Fender's blue butterflies or Taylor's checkerspot butterflies that requires capture is not covered by the permit. Plant and butterfly surveys could result in the death or injury of a small percentage of Fender's blue butterfly and Taylor's checkerspot larvae and eggs if the larvae or eggs are dislodged from their host plants during monitoring activities. The larvae and eggs also could be crushed and injured or killed by foot traffic. Covered plants could be stepped upon during monitoring, crushing the plants. The HCP estimated that monitoring activities could result in some disturbance or destruction of up to one percent of the known covered species in Benton County, however the actual extent of impacts to covered species from monitoring activities are expected to be negligible.

Plant Material Collection

Benton County and Cooperators seek to increase the size and number of covered species populations at conservation and mitigation areas. However, plant collection activities (*e.g.*,

propagule collection, transport, storage and cultivation) will have short-term negative effects to the covered plant species. Limited seed and rhizome collections of individual covered plant species will remove some propagules from the wild, potentially reducing reproduction and recruitment in affected populations. Collections will conform to the Plant Material Collection and Plant Introduction Protocols (see Appendix K of the HCP) to ensure that effects to wild populations are minimized, and to ensure that propagule survival is maximized. The long-term effects of plant material collection will be beneficial to the covered plant species. Plant material collection will have no adverse effects on Fender's blue or Taylor's checkerspot butterfly.

In summary, the effects of the habitat restoration, enhancement and management components of the HCP will have short-term adverse effects to all of the covered species (Table IV-5). These effects will be minimized by the implementation of the guidelines and protocols set forth in Appendix I (Prairie Habitat Vegetation Management Guidelines) and Appendix K (Plant Material Collection and Plant Introduction Protocols) of the HCP. The long-term effects of the habitat restoration, enhancement and management components of the HCP will be increased reproduction and distribution of the covered species.

IV-5. Estimated adverse effects to covered plant species from Habitat Restoration and Enhancement Activities, Monitoring, and Plant Material Collection.								
Activities	Bradshaw's lomatium	Willamette daisy	Peacock larkspur	Nelson's checker-mallow	Kincaid's lupine Outside the Fender's Blue Zone	Kincaid's lupine Inside the Fender's Blue Zone	Native Nectar Species for FBB	Taylor's checkerspot butterfly habitat
Habitat restoration and enhancement activities for conservation	249 seeds	1,426,739 seeds	274,635 seeds	5,552,250 seeds	418 seeds	2,649 seeds	Seeds produced in 4,406 m ²	Seeds produced in 2,872m ²
Habitat restoration and enhancement activities for mitigation	86 seeds	10,798 seeds	7,280 seeds	1,097,575 seeds	220 seeds	17,819 seeds	Seeds produced in 6,756m ²	Seeds produced in 17 m ²
Monitoring	4 plants	11 plants	34 plants	29 plants	207 m ²	9 m ²	244 m ²	59 m ²
Plant material collection	748 seeds	23,082 seeds	119,838 seeds	2,235,060 seeds	2,468 seeds	3,242 seeds	0	0
TOTAL SEEDS	1,083	1,460,619	401,753	8,884,885	3,120	19,788	Seeds produced in 8,313 m ²	Seeds produced in 2,889m ²
TOTAL PLANTS OR m² PLANTS	4 plants	11 plants	34 plants	29 plants	207 m ²	9 m ²	244 m ²	59 m ²

Agricultural Activities

The HCP covers agricultural activities on City of Corvallis lands at Owens Farm. These agricultural activities are likely to kill five Nelson's checker-mallow plants, located between the road edge and the agricultural field, through mowing and herbicide spraying. The City of Corvallis will mitigate for impacts to these five Nelson's checker-mallow plants with the augmentation of 15 Nelson's checker-mallow plants at the Lancaster Property.

Emergency Response Activities

Emergency response activities, such as responding to a fire or a vehicular accident, may result in a variety of adverse effects to covered species. The effects are likely to be scattered and relatively small in scale, but are likely to include crushing or killing individuals of any or all of the covered species and habitat degradation. Benton County anticipates impacts from emergency activities on County and Cooperator covered lands at one percent of the known populations above the previously described effects for other covered activities (Table IV-6). Impacts from emergency response activities will be mitigated at one of the designated mitigation sites by the County or Cooperator as set forth in the HCP (See Chapter 6 of HCP).

Activity	Bradshaw's lomatium (#)	Willamette daisy (#)	Peacock larkspur (#)	Nelson's checker-mallow (#)	Kincaid's lupine (m ²) outside the Fender's Blue Zone	Kincaid's lupine (m ²) inside the Fender's Blue Zone	Native Nectar Species for FBB (m ²)	Non-Native Nectar Species for FBB (m ²)	Fender's blue butterfly (estimated #)	Taylor's checkerspot butterfly habitat (m ²)	Taylor's checkerspot butterfly (estimated #)
Impacts from Emergency Activities	2	1	30	11	3.4	1.1	88	146	42	57	5
Mitigation for Impacts from Emergency Activities	20	20	91	33	10.1	3.3	265	n/a	n/a	172	n/a

Effects to Designated Critical Habitat

The HCP area includes portions of seven critical habitat units for Fender's blue butterfly, Kincaid's lupine and Willamette daisy. The primary constituent elements (PCEs) of critical habitat for each of the species are described in the Status of the Species section of this biological opinion.

FBB-7

This critical habitat unit is described as Butterfly Meadows in the HCP. The site is occupied by Fender's blue butterfly and Kincaid's lupine. A small part of the site is owned by Oregon State University, whereas the majority is privately owned. The site is designated as a PCA in the HCP, and may also be designated as a mitigation area for impacts covered by the HCP.

Covered activities in the OSU-owned portion of the unit include habitat restoration, enhancement and management, and emergency response activities. Habitat restoration activities, including prescribed burning, mowing and herbicide treatment, will benefit the early seral upland prairie and oak savanna habitat at the site, by enhancing low-growing grasses and forbs, removing thatch and creating spaces to establish seedlings or new vegetative growth; and reducing dense canopy vegetation (FBB PCE 1), in addition to controlling invasive species at the site. Some

short-term adverse impacts to Kincaid's lupine (FBB PCE 2) and native nectar species (FBB PCE 3) may occur, as some seeds on the soil surface may be destroyed during prescribed fire. However, both these PCEs will experience a net benefit over time, through reduced competition and increased open space for seedling establishment. Restoration activities will follow guidelines described in Appendix J (Prairie Habitat Vegetation Management Guidelines) of the HCP. Emergency response activities (*e.g.*, off road travel by emergency vehicles) could result in temporary damage (*e.g.*, crushing or other damage to vegetation) to early seral upland prairie habitat and oak savanna, (FBB PCE 1), larval host plants (FBB PCE 2), and adult nectar sources (FBB PCE 3). As this critical habitat unit represents a core population that is currently greater than 1.2 km from the nearest known population, stepping stone habitat (FBB PCE 4) will not be affected.

Covered activities in the privately-owned area of the unit include home, farm and forest construction. These activities could result in removal of early seral upland prairie habitat and oak savanna, (FBB PCE 1), larval host plants (FBB PCE 2), and adult nectar sources (FBB PCE 3) within the disturbance area of construction activities. The amount of habitat removed from this activity is limited as this critical habitat unit intersects only two lots on private property, both of which are currently zoned for forest conservation, not rural residential use. The buildability of the site is also limited by the steep topography. As this critical habitat unit is a core population greater than 1.2 km from the nearest known population, stepping stone habitat (FBB PCE 4) will not be affected.

FBB-8

This critical habitat unit includes the Cardwell Hill area. It is occupied by Fender's blue butterfly and Kincaid's lupine. It is primarily in private ownership, although Benton County is negotiating conservation easement or fee simple acquisition of parcels for mitigation purposes. The unit includes roadside rights-of-way managed by Benton County, and has been identified as a potential area to construct two public service facilities (a rural school and fire station) during the permit term of the HCP.

Covered activities in this critical habitat unit include building construction (home, farm and forest structures and public service facilities), linear projects, and emergency response activities. Limited building construction in this area, which is zoned for exclusive farm use or forest conservation use, will result in removal of some early seral upland prairie habitat and oak savanna (FBB PCE 1); a portion of the critical habitat unit has already been converted from prairie to vineyard or exists as degraded pasture. Some larval host plants (FBB PCE 2) are also likely to be removed, though under the HCP, Benton County land use planners will encourage building permit applicants to site structures to avoid known Kincaid's lupine patches. Loss of adult nectar sources (FBB PCE 3) and stepping stone habitat (FBB PCE 4) will also likely occur within the footprint of building areas. Linear projects such as road construction and maintenance, utility construction and maintenance, and driveway approach construction would result in the removal of roadside vegetation. Much of this work occurs in the gravel or highly degraded vegetation on or adjacent to a road shoulder. Such projects could result in temporary damage (*e.g.*, crushing or other damage to vegetation) to early seral upland prairie habitat and oak savanna, (FBB PCE 1), larval host plants (FBB PCE 2), adult nectar sources (FBB PCE 3) or stepping stone habitat (FBB PCE 4). Emergency response activities (*e.g.*, off road driving by emergency vehicles) could result in temporary damage (*e.g.*, crushing or other damage to

vegetation) to early seral upland prairie habitat and oak savanna, (FBB PCE 1), larval host plants (FBB PCE 2), adult nectar sources (FBB PCE 3) or stepping stone habitat (FBB PCE 4).

When property in the Cardwell Hill critical habitat unit is acquired by Benton County, habitat restoration activities will be covered. Benton County plans to acquire 20-24 hectares (50-60 acres) of lands containing high quality occupied Fender's blue butterfly habitat (Benton County 2010a, pg. 38). Management activities, including prescribed burning, mowing and herbicide treatment, will benefit the early seral upland prairie and oak savanna habitat at the site, by enhancing low-growing grasses and forbs, removing thatch and creating spaces to establish seedlings or new vegetative growth; and reducing dense canopy vegetation (FBB PCE 1), in addition to controlling invasive species at the site. Some short-term adverse impacts to Kincaid's lupine (FBB PCE 2) and native nectar species (FBB PCE 3) may occur, as some seeds on the soil surface may be destroyed during prescribed fire; however, both these PCEs will experience a net benefit over time, in terms of reduced competition and increased open space for seedling establishment. Restoration activities will follow guidelines described in Appendix J (Prairie Habitat Vegetation Management Guidelines) in the HCP.

In summary, substantial adverse impacts to this critical habitat unit are expected from a range of activities, but Benton County's acquisition and management of mitigation lands in this unit will more than offset the negative effects, ensuring that critical habitat unit FBB-8 will continue to provide for the conservation of Fender's blue butterfly and associated native prairie species.

FBB-9

This unit is discussed in the HCP as Lupine Meadows. The site supports both Kincaid's lupine and Fender's blue butterfly. It is owned by the Greenbelt Land Trust and is managed for conservation purposes. The site is designated as a PCA in the HCP, and may also be designated as a mitigation area for impacts covered by the HCP.

Covered activities in this critical habitat unit include habitat restoration and emergency response activities. Habitat restoration activities, including prescribed burning, mowing and herbicide treatment, will benefit the early seral upland prairie and oak savanna habitat at the site, by enhancing low-growing grasses and forbs, removing thatch and creating spaces to establish seedlings or new vegetative growth; and reducing dense canopy vegetation (FBB PCE 1), in addition to controlling invasive species at the site such as meadow knapweed (*Centaurea debeauxii*). Short-term adverse impacts to Kincaid's lupine (FBB PCE 2) and native nectar species (FBB PCE 3) may occur, as some seeds on the soil surface may be destroyed during prescribed fire. However, both these PCEs will experience a net benefit over time, in terms of reduced competition and increased open space for seedling establishment. Restoration activities will follow guidelines described in Appendix J (Prairie Habitat Vegetation Management Guidelines) in the HCP. Emergency response activities (*e.g.*, off road travel by emergency vehicles) could result in temporary damage (*e.g.*, crushing or other damage to vegetation) to early seral upland prairie habitat and oak savanna, (FBB PCE 1), larval host plants (FBB PCE 2), and adult nectar sources (FBB PCE 3). Stepping stone habitat (FBB PCE 4) will not be affected.

WD-4A & B

This critical habitat unit is owned by the City of Corvallis, as part of Bald Hill Park. The site is designated as a PCA in the HCP, and may also be designated as a mitigation area for impacts covered by the HCP.

Covered activities in this unit include habitat restoration and emergency response activities. Habitat restoration activities, including prescribed burning, mowing and herbicide treatment, will benefit the early seral upland prairie and oak savanna habitat at the site. Such activities will enhance low-growing grasses and forbs, remove thatch and create spaces to establish seedlings or new vegetative growth, and reduce dense canopy vegetation (WD PCE 1). Restoration activities will follow guidelines described in Appendix J (Prairie Habitat Vegetation Management Guidelines) in the HCP.

Management will also control invasive species at the site. Emergency response activities (emergency vehicle off-road driving, etc.) could result in temporary (*e.g.*, crushing of vegetation) or permanent damage to the early seral upland prairie and oak savanna habitat (WD PCE 1).

KL-8

This unit is described as Butterfly Meadows in the HCP. The site is occupied by Fender's blue butterfly and Kincaid's lupine. A small part of the site is owned by Oregon State University, whereas the majority is privately owned.

Covered activities in the OSU-owned portion of the unit include habitat restoration and emergency response activities. Habitat restoration activities will be conducted to enhance the PCEs for Kincaid's lupine, and will benefit the early seral upland prairie and oak savanna habitat at the site (KL PCE 1). Burning, mowing, and targeted herbicide use will promote low growing grasses and forbs, control invasive species and reduce thatch to encourage spaces for native prairie species recruitment. These restoration activities will also reduce canopy cover and competition from encroaching tree and shrub species, including Douglas-fir (*Pseudotsuga menziesii*), scotch broom (*Cytisus scoparius*) and hawthorn (*Crataegus monogyna*). Restoration activities will follow guidelines described in Appendix J (Prairie Habitat Vegetation Management Guidelines) in the HCP.

Reductions in woody species are likely to have no effect or positive effects on movement of insect outcrossing pollinators (such as species of *Bombus*) between existing lupine patches (KL PCE 2). Emergency response activities (*e.g.*, emergency vehicle off-road driving) could result in temporary or permanent damage to the early seral upland prairie and oak savanna habitat (KL PCE 1), but would not likely affect pollinators (KL PCE 2), unless a ground nest were directly destroyed.

Covered activities on the privately owned portion of the unit include home, farm and forest construction. These activities could result in removal of early seral upland prairie habitat and oak savanna, (KL PCE 1) and within the footprint of building areas. The amount of habitat removed by these activities is likely limited as this critical habitat unit intersects only two lots on private property, both of which are zoned for forest conservation, not rural residential use. The buildability of the site is also limited by the site's steep topography.

KL-9

This unit includes the Cardwell Hill area, and is occupied by Fender's blue butterfly and Kincaid's lupine. It is primarily in private ownership, although Benton County is negotiating conservation easement or fee simple acquisition of parcels for mitigation purposes under the HCP. The unit includes roadside rights-of-way managed by Benton County. The Cardwell Hill

area has been identified as a potential area to construct two public service facilities (a rural school and fire station) during the permit term of the HCP.

Covered activities in this critical habitat unit include building construction, linear projects, and emergency response activities. Building construction (for home, farm and forest structures or public service facilities) would result in removal of early seral upland prairie habitat and oak savanna, (KL PCE 1) within the footprint of building areas. Linear projects such as road construction and maintenance, utility construction and maintenance, and driveway approach construction would result in the removal of roadside vegetation. Much of this work occurs in the gravel or highly degraded vegetation on or adjacent to a road shoulder; adverse effects to early seral upland prairie habitat (KL PCE 1) and pollinators (KL PCE 2) are likely minimal to non-existent. Emergency response activities (*e.g.*, emergency vehicle off-road driving) could result in temporary (*e.g.*, flattening or crushing of vegetation) or permanent damage to the early seral upland prairie and oak savanna habitat (KL PCE 1), but would not likely affect pollinators (KL PCE 2), unless a ground nest was directly destroyed.

When property within the critical habitat unit is acquired by Benton County, habitat restoration activities will also be covered. Benton County plans to acquire 20-24 hectares (50-60 acres) of lands containing high quality occupied Fender's blue butterfly habitat (Benton County 2010a, pg. 38). Management activities will be conducted to enhance the PCEs for Kincaid's lupine, and will benefit the early seral upland prairie and oak savanna habitat at the site (KL PCE 1). Burning, mowing and targeted herbicide use will promote low growing grasses and forbs, and reduce thatch to encourage spaces for native prairie species recruitment. These restoration activities will also reduce canopy cover and competition from tree and shrub species, which will enhance movement of insect outcrossing pollinators (such as species of *Bombus*) between existing lupine patches (KL PCE 2). Restoration activities will follow guidelines described in Appendix J (Prairie Habitat Vegetation Management Guidelines) in the HCP.

In summary, substantial adverse impacts to this critical habitat unit are expected from a range of activities, but Benton County's acquisition and management of mitigation lands in this unit will more than offset the negative effects, ensuring that critical habitat unit KL-9 will continue to provide for the conservation of Kincaid's lupine and associated native prairie species.

KL-10

This unit is discussed in the HCP as Lupine Meadows. The site supports both Kincaid's lupine and Fender's blue butterfly. It is owned by the Greenbelt Land Trust and is managed for conservation purposes. The site is designated as a PCA in the HCP, and may also be designated as a mitigation area for impacts covered by the HCP.

Covered activities in this unit include habitat restoration and emergency response activities. Habitat restoration activities will be conducted to enhance the PCEs for Kincaid's lupine, and will benefit the early seral upland prairie and oak savanna habitat at the site (KL PCE 1). Burning, mowing, and targeted herbicide use will promote low growing grasses and forbs, and reduce thatch to encourage spaces for native prairie species recruitment. These restoration activities will also reduce canopy cover and competition from tree and shrub species, which will enhance movement of insect outcrossing pollinators (such as species of *Bombus*) between existing lupine patches (KL PCE 2). Restoration activities will follow guidelines described in Appendix J (Prairie Habitat Vegetation Management Guidelines) in the HCP. Emergency

response activities (*e.g.*, emergency vehicle off-road driving) could result in temporary (*e.g.*, crushing of vegetation) or permanent damage to the early seral upland prairie and oak savanna habitat (KL PCE 1), but would not likely affect pollinators (KL PCE 2), unless a ground nest was directly destroyed.

See Table IV-7 for a summary of the anticipated effects to designated critical habitat units from the implementation of the HCP.

Table IV-7. Summary of anticipated effects to designated critical habitat units.							
(- = adverse effect; + = beneficial effect; 0 = Not applicable or no effect).							
Activity	Critical Habitat Unit						
	FBB-7	FBB-8	FBB-9	WD-4A & B	KL-8	KL-9	KL-10
Home, farm and forest construction	- (if occurs)	-	0	0	- (if occurs)	-	0
Public service facility construction	0	-	0	0	0	-	0
Linear projects	0	-	0	0	0	-	0
Habitat restoration, enhancement and management	+	+	+	+	+	+	+
Emergency response activities	- (if occurs)	- (if occurs)	- (if occurs)	- (if occurs)	- (if occurs)	- (if occurs)	- (if occurs)

V. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. The Benton County HCP addresses most of the likely development that will affect prairie habitats on private lands in the action area. We are unaware of any other non-federal actions in the action area that are reasonably certain to occur.

VI. CONCLUSION

During the 50-year term of the 10(a)(1)(b) permit for the HCP, the permit will authorize take of covered species associated with the construction of an additional 195 new homes, 41 medical hardship dwellings, 513 accessory structures, 413 structure additions, 118 agricultural buildings, two rural schools and two rural fire stations. Table VI-1 shows the current estimated abundance of the covered species in Benton County, the amount of take to be authorized by the permit, and the estimated percentage of the total population of each species that the take represents. Over the

life of the permit, activities covered by the Benton County HCP will result in relatively minor adverse effects to each of the covered species. The mandated habitat restoration, enhancement, and management activities will all have some short term negative effects on the covered species, but in the long term, the effects would be beneficial, and each of the covered species will be more protected and secure than they are at present.

After reviewing the status of the Fender's blue butterfly, Willamette daisy, Bradshaw's lomatium, Kincaid's lupine and Nelson's checker-mallow, the environmental baseline for the action area, and the effects of the proposed action, including all measures proposed to avoid, minimize and mitigate adverse effects and the cumulative effects, it is the U.S. Fish and Wildlife Service's biological opinion that the issuance of an incidental take permit to Benton County pursuant to section 10(a)(1)(B) of the Act is not likely to jeopardize the continued existence of any of these listed species nor destroy or adversely modify designated critical habitat.

After reviewing the current status of Taylor's checkerspot butterfly and peacock larkspur, the environmental baseline for the action area, and the effects of the proposed action, including all measures proposed to avoid, minimize and mitigate adverse effects and the cumulative effects, it is the U.S. Fish and Wildlife Service's opinion that should either of these species be listed in the future, issuing an incidental take permit that includes these species as covered species and that that authorizes the incidental take of the currently unlisted animal species is not likely to jeopardize the continued existence of either species.

	Bradshaw's lomatium (#)	Willamette daisy (#)	Peacock larkspur (#)	Nelson's checker-mallow (#)	Kincaid's lupine (m ²) outside the Fender's Blue Zone	Kincaid's lupine (m ²) inside the Fender's Blue Zone	Fender's blue butterflies (estimated #)	Taylor's checkerspot butterflies (estimated #)
Abundance of Covered Species on all lands	1,572	426	4,432	3,351	418	8,234	76,820	737
Amount of permanent take requested over the 50-year term of the permit	2	1	56	222	8	402	4,253	5
Percentage of current population for which take is requested	0.13	0.23	1.26	6.62	1.91	4.9	5.54	0.65

VII. INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened animal species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to 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, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, Benton County has requested that the 10(a)(1)(B) permit issued for the HCP include the plants addressed in the HCP, to protect the County in the event that the Act is ever amended to prohibit the take of plants. Accordingly, the take exemption for plants would be authorized under the HCP permit at the time, if ever, that the Act is amended to prohibit such take.

The draft Benton County Prairie Species HCP and its associated documents identify anticipated impacts to Fender's blue butterfly, Willamette daisy, Bradshaw's lomatium, Kincaid's lupine, Nelson's checker-mallow, Taylor's checkerspot butterfly and peacock larkspur that are likely to result from the proposed action and the measures that are necessary and appropriate to minimize those impacts. All conservation measures described in the draft HCP together with terms and conditions described in the associated Implementing Agreement and any section 10(a)(1)(B) permit issued for the Benton County Prairie Species HCP, are hereby incorporated by reference as reasonable and prudent measures and terms and conditions within this incidental take statement pursuant to 50 CFR 402.14(i). Such terms and conditions are non-discretionary and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) to apply. If the permittee fails to adhere to these terms and conditions, the protective coverage of the section 10(a)(1)(B) permit and section 7(o)(2) may lapse. The amount or extent of incidental take anticipated under the draft Benton County HCP, associated reporting requirements, and provisions for disposition of dead or injured animals are as described in the HCP and its accompanying section 10(a)(1)(B) permit.

Amount or Extent of Take Anticipated

The disturbance and conversion of land that will follow from issuing the proposed 10(a)(1)(B) permit to Benton County is expected to result in incidental take of Fender's blue butterfly and Taylor's checkerspot butterfly. Take will be in the form of disturbance, harm and death of individuals. Estimates of the total amount of lethal take of individuals are shown in Table VI-1; take that results in non-lethal harm and harassment cannot be quantified. We expect that a maximum of 4,253 Fender's blue butterflies and 5 Taylor's checkerspot butterflies will be killed over the 50-year term of the permit as a result of the issuance of a permit for the Benton County

HCP; these numbers represent approximately 5.5 percent of the predicted abundance of Fender's blue butterfly (based on the County's extrapolation of population size from habitat area as described previously [see page 31]) and 0.65 percent of the Taylor's checkerspot butterfly population on covered lands in Benton County over the 50-year term of the permit. We expect that actual incidental take of Fender's blue butterfly and Taylor's checkerspot butterfly will be difficult to detect or quantify in the field for the following reasons: (1) the cryptic nature and relatively small body size of the butterflies makes the finding of a dead specimen unlikely, and (2) species abundance may be masked by seasonal fluctuations in numbers or other causes. Given the difficulty of tracking take of individuals, Benton County will track take using the surrogate measure of area of habitat affected (see Table 5.1 in the HCP).

Should the Act ever be amended to prohibit the take of plants, we estimate that the disturbance and conversion of land that will follow from issuing the proposed 10(a)(1)(B) permit to Benton County would be expected to result in incidental take of Willamette daisy, Bradshaw's lomatium, Kincaid's lupine, Nelson's checker-mallow and peacock larkspur. Take would be in the form of killing plants and seeds. Estimates of the total amount of take for each species are shown in Table VI-1.

Effect of the Take

For the reasons stated in the analyses of the proposed project's effects, we have determined that the level of incidental take specified in the effects of the action and this Incidental Take Statement is not likely to jeopardize the continued existence of Fender's blue butterfly, Taylor's checkerspot butterfly, Willamette daisy, Bradshaw's lomatium, Kincaid's lupine, Nelson's checker-mallow or peacock larkspur.

Reasonable and Prudent Measures and Terms and Conditions

The draft Benton County Prairie Species HCP and its associated documents clearly identify anticipated impacts to affected species likely to result from the proposed taking and the measures that are necessary and appropriate to minimize those impacts. All conservation measures described in the proposed HCP, together with terms and conditions described in the associated Implementing Agreement and any section 10(a)(1)(B) permit or permits issued with respect to the proposed HCP, are hereby incorporated by reference as reasonable and prudent measures and terms and conditions within this Incidental Take Statement pursuant to 50 CFR 402.14(i). Such terms and conditions are non-discretionary and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) to apply. If the Applicants fail to adhere to these terms and conditions, protective coverage of the section 10(a)(1)(B) permit and section 7(o)(2) may lapse.

Reporting Requirements

Sections 7.2.0 of the HCP and 8.1 of the Implementing Agreement require Benton County to submit Annual Compliance Reports to the U.S. Fish and Wildlife Service and the Oregon Department of Agriculture by March 31st of each year. The annual reports shall include, at a minimum, the following information:

1. Summary of assessment of implementation of HCP terms and conditions;

2. Amount of take authorized during the year, including the number of Certificates of Inclusion issued to private landowners and the amount of take authorized for each species;
3. Conservation measures undertaken by Benton County and the Cooperators, including mitigation information and voluntary conservation activities;
4. Effectiveness monitoring data; and
5. Monitoring results requiring changes to management techniques (adaptive management outcomes).

VIII. REINITIATION – CLOSING STATEMENT

This concludes formal consultation on the issuance of a permit to implement the Benton County Prairie Species HCP. 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 that the agency action may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat 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 reinitiation. The Incidental Take Statement provided in this biological opinion for unlisted covered species (Taylor's checkerspot butterfly) does not become effective until the species is listed and the conference opinion is adopted as the biological opinion issued through formal consultation. If you have any questions regarding this consultation, please contact Rollie White or Cat Brown of my staff at (503) 231-6179.

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