



BENTON COUNTY, OREGON

PRAIRIE CONSERVATION STRATEGY

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This document was prepared for Benton County by staff at
the Institute for Applied Ecology



The Institute for Applied Ecology is a non-profit 501(c)(3) organization whose mission is to conserve native ecosystems through restoration, research, and education.

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Cover photos:

Photos top left to right:

Fender's blue butterfly: Tom Kaye

Kincaid's lupine: Lori Wisehart

American Kestrel: Rod Gilbert

Wren upland prairie tour: Rachel Schwindt

Western gray squirrel: Rod Gilbert

Willamette daisy: Lori Wisehart

Photo bottom:

Jackson-Frazier and Owens Farm: Rachel Schwindt

Preamble

The Benton County Prairie Conservation Strategy has been developed to educate citizens and land managers about at-risk habitat and species in Benton County, and to provide voluntary long-term strategies for conservation on both public and private lands. The Strategy is the result of input from local citizens and land managers who participated in meetings, workshops, and a web based survey. The Benton County Habitat Conservation Plan Stakeholder Advisory and Technical Advisory Committees guided the goals and objectives of the Strategy, as well as provided technical information on species and habitats (Benton County 2010). The information in this Strategy provides a reference for landowners and land managers to recognize at-risk habitat and species, and understand where these species occur in Benton County. This information is useful for planning efforts to protect listed species and reintroduce species no longer locally present.

Habitat loss due to land use change and invasive species has led to the decline of many species locally and worldwide. Conservation actions on privately owned land are essential for protection of unique habitats and rare species that occur across multiple ownerships. Several chapters in this Strategy provide additional information specifically for voluntary private landowner conservation actions. This information is appropriate both for those who wish to collaborate on projects with public agencies or who are interested in working independently. For those working independently, relevant chapters in this guide include Chapter 3: Species habitat needs, Chapter 5: Habitat conservation guide for private lands, and Chapter 6: Landowner incentives and opportunities. It is hoped that local citizens will utilize the information in this Strategy to learn about local conservation efforts and to participate where possible.

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Acronyms

The following is a list of acronyms used in the Benton County Prairie Conservation Strategy:

- ESA – Endangered Species Act
- FSA – Farm Service Agency
- NGO – Non-governmental organization
- NRCS – Natural Resources Conservation Service
- ODA – Oregon Department of Agriculture
- ODFW – Oregon Department of Fish and Wildlife
- SWCD – Soil Water Conservation District
- TNC – The Nature Conservancy
- USFWS – United States Fish and Wildlife Service

1 Background and purpose

Benton County encompasses some of the highest quality prairie and oak habitat in the Willamette Valley of Oregon. These habitats support unique plant and animal species and contribute to the scenic landscape enjoyed by Benton County's residents and visitors. Though significant remnants of prairie habitats remain in Benton County, much of the historic prairie, oak savanna, and oak woodlands have been lost to land use conversion, habitat fragmentation, fire and flood suppression, and invasive species introductions (ODFW 2006). Populations of several plant and animal species dependent on prairie and oak habitat have declined and several are listed as threatened or endangered by Federal and State agencies. Strategic conservation planning can help focus conservation actions around the best remaining habitat for the benefit of both listed species and species that may be at risk for future extinction.

This strategy was developed as one of the Conservation Measures of a multi-species Habitat Conservation Plan funded by a U.S. Fish and Wildlife Service grant to Benton County and also serves as a stand-alone reference document. The continued existence of prairie habitats and species depends on the willingness of land managers and private landowners to voluntarily undertake conservation actions. This document provides an overview of voluntary actions that can be enacted in Benton County to increase prairie habitats and recover high priority species.



Prairie conservation strategy vision

The vision for the Prairie Conservation Strategy is that:

Benton County will contain abundant and high value prairie and oak habitat for secure populations of native species. Prairie and oak habitat are valued community assets for native species protection, scenic landscapes, and recreation opportunities.

Benton County conservation issues

In the Willamette Valley, prairie and oak habitats have declined from their historic extent and, unless protected and restored, will likely continue to decline due to a variety of factors, including land use change to accommodate future population growth and invasive species spread. In Benton County, much of the historic open prairie and oak habitat has been developed into farmland and urban areas or has become Douglas-fir forest through natural succession. The few remaining habitat patches have been maintained by low intensity management. Habitat patches that were once interconnected are now isolated from one another by roads, forests, agricultural fields, and other habitat types. This habitat fragmentation makes it difficult for some plant and animal species to disperse between patches, reducing their ability to survive over the long term.



Fire suppression and altered floodplain connections over the last two centuries have allowed native shrubs and trees to displace prairie species and slowly prairies have been replaced by ash and coniferous forests in a process called succession. In addition, non-native species introduced to our region pose a new threat to prairie ecosystems by changing the habitat ecology and composition.

The primary threats to prairie and oak habitat are:

- Habitat loss and fragmentation through development
- Invasion by non-native plant species
- Vegetative succession to shrub and tree species

Benton County conservation opportunities

There are many opportunities for habitat conservation in Benton County due to the remaining intact prairie sites and the conservation interest of Benton County's citizens. Many dedicated individuals and groups are working to restore and protect prairie and oak habitat on private and public lands. State and federal agencies, as well as several non-governmental organizations (NGOs), manage more than 16,000 acres of land for conservation in Benton County. Many private landowners also manage much of the best remaining native habitat on their own or in partnership with public agencies and NGOs and their work is crucial for maintaining habitat for rare native species. Engaging private landowners in prairie conservation is key to this strategy for native prairie and oak habitat retention in Benton County and throughout the Willamette Valley.

How this strategy was prepared

This strategy is the result of input from land managers, scientists, and local citizens who participated in meetings, workshops, and a survey between 2006 and 2009. Groups associated with Benton County's Prairie Species Habitat Conservation Plan were convened to share ideas and information on the species and habitats discussed here. The Stakeholder Advisory Committee to the HCP held a series of meetings to define the vision, goals and objectives of this strategy, as well as obstacles to conservation and solutions to these challenges. In addition, this group set the scope of the strategy, including the habitats and species to be included. Riparian habitats are an integral component of ecosystem processes but were excluded to focus the strategy on prairie and oak habitats.

Technical information on the habitats and species was provided by the Technical Advisory Committee to the HCP and its taxonomic subgroups. An online survey conducted in 2009 provided background information on community willingness to participate in habitat conservation on public and private lands, and identified obstacles, priorities and techniques for community engagement. With technical and community information in hand, the Stakeholders reconvened in a summer workshop to discuss on-the-ground priorities for prairie habitats in Benton County, focusing on site-specific needs of the local landscape and opportunities for establishing connectivity between habitat patches and populations. Benton County Natural Areas and Parks Department staff and consultants assembled the outcomes of this process into a single document. The result is summarized in this strategy.



Strategy goals

Prairie Conservation Strategy goals were developed to guide long-term conservation of prairie and oak habitat for native species in Benton County. Actions recommended by this strategy are voluntary and emphasize opportunities for public and private landowners to work together towards habitat conservation. Funding for conservation is often limited, so efficient methods for species conservation using diverse sources of funding are crucial.

Goal 1: Identify prairie and oak habitats and habitat attributes important to Benton County's at-risk species

Goal 1 Actions

- Identify areas within Benton County that have prairie or oak habitat with a predominantly native plant component.
- Identify actions for strategic habitat conservation.
- Identify at-risk species that would benefit from prairie or oak habitat management and the habitat requirements for these species.
- Identify current habitats in Benton County that support at-risk native species.
- Identify connectivity needs and obstacles for these species and their habitat on unprotected lands.
- Identify actions for strategic species conservation.

Goal 2: Encourage voluntary cooperative partnerships among public and private landowners and the general community to enhance conservation

Goal 2 Actions

- Identify voluntary tools for conservation.
- Identify opportunities to engage private landowners in habitat conservation.

Goal 3: Facilitate access to diverse sources of funding to maximize the likelihood of stable support

Goal 3 Actions

- Identify existing funding sources for conservation.
- Identify gaps in funding for conservation.



Hitchcock's blue-eyed-grass

How to use this strategy

This strategy outlines an approach for interested parties, both public and private, to conserve and restore habitats and recover prairie-dependent species in Benton County in a non-binding, non-regulatory framework. Chapters in this document are structured around the key steps needed for habitat conservation at any location:

- Identify key habitats (Chapter 2)
- Identify key species (Chapter 3)
- Understand habitat geography and locate partners (Chapter 4)
- Identify actions (Chapter 5)
- Get help (Chapter 6)

Identification of the key habitats already, or potentially, present at a site, including wetland prairie, upland prairie and savanna, and oak woodland, is covered in Chapter 2. Chapter 3 discusses key species, from the uncommon to the endangered, that could be supported and describes their habitat, population, and connectivity needs. With this information a landowner or manager can decide which habitats and species their property has the potential to support. Chapter 4 describes the existing network of public and conservation lands in Benton County, putting into geographic context restoration projects on public or private lands. Actions needed to support these habitats and species locally are identified in Chapter 5, with high and low priorities assigned to such activities as enhancing existing sites and populations, creating new populations or restoring habitats to provide connectivity across the landscape, and conducting outreach to the local community. Landowners and managers can find their sites on the maps in this section and learn how their actions can contribute directly to conservation. Finally, chapter 6 describes several conservation tools available to private individuals and public agencies, from technical to financial assistance and existing support programs to new ideas. This strategy puts necessary information into the hands of our local community, enabling conservation through informed action.



Northern red-legged frog
© James Bettaso USFWS

2 Key habitats

Habitat selection criteria

This Prairie Conservation Strategy focuses on three key habitats with opportunities for conservation in Benton County. Upland prairie/oak savanna, wet prairie, and oak woodland habitat types have been identified in the Oregon Conservation Strategy as being particularly reduced by development in the Willamette Valley (ODFW 2006). Additionally, the loss of prairie habitat in Benton County has contributed to the listing of several prairie-dependent species which makes protection of prairie habitat particularly important. The U.S. Fish and Wildlife Service (USFWS) has finalized a Recovery Plan for listed prairie-dependent species and for additional prairie species that may be candidates for listing in western Oregon (USFWS 2010). This Prairie Conservation Strategy applies the USFWS’s recovery criteria from that plan to identify networks of habitat that could assist in the recovery of listed species.



All of the selected habitat types have been mapped in the Willamette Valley by several groups and are defined in the International Terrestrial Ecological Systems Classification system (NatureServe 2009).

The key habitat types addressed in this strategy are:

- **Willamette Valley Upland Prairie and Oak Savanna**
- **Willamette Valley Wet Prairie**
- **North Pacific Oak Woodland**

Conservation of these broadly defined habitat types across our landscape will serve to improve conditions for rare species as well as the diverse suite of species that reside in those habitats. Landscape level conservation actions will also allow for increased connectivity between fragmented sites.

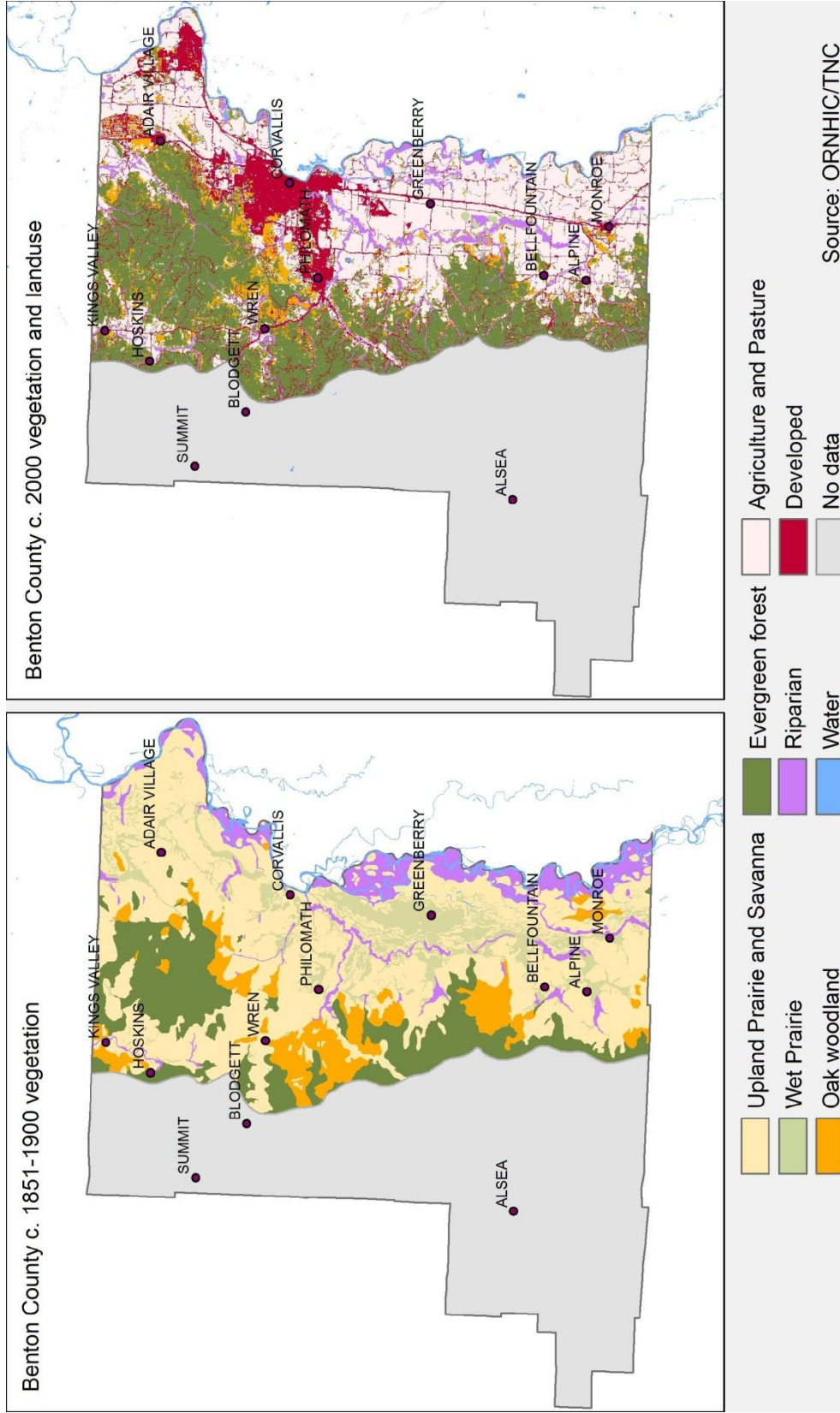


Figure 2.1 Historic and current vegetation/land use in Benton County

Habitat descriptions

Upland prairie and savanna

Upland prairies are among the most threatened ecosystems in Oregon. These open grasslands historically occurred across the Willamette Valley and supported diverse animal and herbaceous plant species. Upland prairies are typically dominated by perennial grasses and annual or perennial forbs. Savanna areas may also contain widely spaced (a few trees per acre) open grown Oregon white oaks (*Quercus garryana*), Douglas-fir (*Pseudotsuga menziesii*), or ponderosa pines (*Pinus ponderosa*) with wide canopies. In the Willamette Valley, upland prairies and savanna typically occur on low elevation,



well draining slopes along the valley bottom and surrounding foothills. This habitat was historically maintained by seasonal fire.

Common native grasses in upland prairie include Roemer's fescue (*Festuca roemeri*), California oatgrass (*Danthonia californica*), prairie junegrass (*Koeleria*

macrantha), blue wildrye (*Elymus glaucus*), and Lemmon's needlegrass (*Achnatherum lemmonii*). Native forbs that are commonly intermixed with the grasses include Oregon sunshine (*Eriophyllum lanatum*), slender cinquefoil (*Potentilla gracilis*), dwarf checkermallow (*Sidalcea virgata*), lance selfheal (*Prunella vulgaris* ssp. *lanceolata*) and Tolmie startulip (*Calochortus tolmiei*).

Plant species that invade the prairie when there is a lack of management include native woody species such as Douglas-fir and non-natives such as oneseed hawthorn (*Crataegus monogyna*), Scot's broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus armeniacus*), false brome (*Brachypodium sylvaticum*) and a wide diversity of other invasive plants.

Key at-risk species associated with upland prairie and savanna include: Fender's blue butterfly (*Icaricia icarioides fenderi*), Taylor's checkerspot butterfly (*Euphydryas editha taylori*), field crescent butterfly (*Phyciodes pulchella*), tailed copper (*Lycaena arota*), Western Meadowlark (*Sturnella neglecta*), Streaked Horned Lark (*Eremophila alpestris strigata*), camas pocket gopher (*Thomomys bulbivorus*), golden paintbrush (*Castilleja levisecta*), Kincaid's lupine (*Lupinus sulphureus* ssp. *kincaidii*), shaggy horkelia (*Horkelia congesta* ssp. *congesta*), and Willamette daisy (*Erigeron decumbens* var. *decumbens*).



Wet prairie

Wet prairies were once a common habitat in the floodplain of the Willamette River. These prairies are a mosaic of ash swales, vernal pools, emergent marsh, and seasonally flooded grasslands that occur on poorly drained clay soils or shallow soils above bedrock. Wet prairies are maintained by seasonal flooding, which creates anaerobic wetland soil characteristics, and many were also historically maintained by late summer fires.

Wet prairies are dominated by herbaceous plants, often including facultative or obligate wetland plant species.



Common native

grass species found in wet prairies include tufted hairgrass (*Deschampsia cespitosa*) and meadow barley (*Hordeum brachyantherum*). One-sided sedge (*Carex unilateralis*) and dense sedge (*C. densa*) are also common. Native forbs found in wet prairie include camas (*Camassia quamash* and *C. leichtlinii*), Oregon sunshine, elegant downingia (*Downingia elegans*), and coyote-thistle (*Eryngium petiolatum*).

Without management or natural disturbance, native tree and shrub species such as Oregon ash (*Fraxinus latifolia*) and Nootka rose (*Rosa nutkana*) invade into the prairie. Non-native invading plants include sweetbriar rose (*Rosa eglanteria*), reed canarygrass (*Phalaris arundinacea*), common St. Johnswort (*Hypericum perforatum*) and many others.

Key at-risk species associated with wet prairies include: American grass bug (*Acetropis Americana*), Wilson's Snipe (*Gallinago delicata*), Northern Harrier (*Circus cyaneus*), Short-eared Owl (*Asio flammeus*), Bradshaw's lomatium (*Lomatium bradshawii*), shaggy horkelia, Nelson's checkermallow (*Sidalcea nelsoniana*), racemed goldenweed (*Pyrocoma racemosa* var. *racemosa*), white-topped aster (*Sericocarpus rigidus*), and Willamette daisy.



Northern Harrier © Rod Gilbert

Oak woodland

In Benton County, oak woodlands are characterized by Oregon white oak and have an open to moderately shrubby understory historically maintained by low severity fire. These woodlands have >30% of the canopy shading the ground. Oak woodlands contain multiple trees as compared to the single open grown oaks in an oak savanna but these woodlands still filter light to the ground to allow oak seedling germination. Oaks do not tolerate shading by other trees and will eventually die if overtopped. These woodlands are found on low elevation slopes and on drier flat terrain. Oaks



provide multiple benefits to wildlife such as acorns for food or cavities for nesting. Most of these habitats have been lost to Douglas-fir encroachment, fire wood cutting, or conversion to agriculture and development.

Common native plant species in oak woodlands include blue wildrye, small camas, Pacific blacksnakeroot (*Sanicula crassicaulis*), poison-oak (*Toxicodendron diversilobum*), common snowberry (*Symphoricarpos albus*), and sword fern (*Polystichum munitum*). Douglas-fir is a common invader that can overtop and shade the oaks resulting in conversion of oak woodlands to conifer forest. Non-native species that colonize this habitat include false brome, Himalayan blackberry, oneseed hawthorn, spurgelaurel (*Daphne laureola*), and Scot's broom.

Key at-risk species associated with oak woodlands include Acorn Woodpecker (*Melanerpes formicivorus*), Chipping Sparrow (*Spizella passerina*), White-breasted Nuthatch (*Sitta carolinensis aculeate*), Western gray squirrel (*Sciurus griseus*), and thin-leaved peavine (*Lathyrus holochlorus*). Red-legged frogs (*Rana aurora*) use this habitat during their summer migration from wetlands to upland habitat.



Thin-leaved peavine © Tom Kaye

3 Key species

Priority species for conservation

In Benton County, several populations of prairie or oak dependent species have declined and are listed as threatened or endangered by the U.S. Fish and Wildlife Service and/or the State of Oregon or are candidates for listing with their status in review. In addition, some species, while not considered threatened, have declining populations which could be increased through targeted restoration within a habitat type.

The prairie species considered in this strategy include those covered by the Oregon Conservation Strategy (ODFW 2006) and USFWS Recovery Plan for Prairie Species of Western Oregon and Southwest Washington (USFWS 2008) that occur in Benton County. Several species that may have secure populations region-wide, but which are currently locally rare, were also included. These at-risk species are highly associated with the strategy habitats or utilize close approximations of their historic habitat, such as pasture lands or mowed roadsides.



Taylor's checkerspot nectaring on native strawberry

Several of the species, such as pond turtles and red-legged frogs, are dependent on prairies or oaks during a part of their lifecycle, while others remain in a single habitat type over their lifespan. Some species, such as Dusky Canada Goose, were not selected for inclusion because habitat conditions outside of Benton County are responsible for the species viability. All of the selected species have specific habitat requirements that should be addressed by restoring diverse vegetation structure within a key habitat.

The species summarized in this strategy have habitat requirements that may overlap with the needs of other species (Table 3.1). Conserving diverse and connected habitats can benefit many species by opening up new territory and providing opportunities for migration and genetic exchange. Ideal habitat patch or population size is the recommended minimum for sustaining a breeding population and is based on territory requirements or genetic viability (Altman 2000, Altman personal communication June 10, 2009, USFWS 2010). Some species can be found in smaller habitat patches than recommended and in smaller population sizes, but generally a larger habitat patch is preferable. Large or very open territory requirements can be achieved through single ownership or multiple adjacent properties of suitable habitat.

Table 3.1 Prairie Conservation Strategy key species habitat requirements.

See Chapter 7 for web links to additional species information.

Ideal habitat patch or population size is the recommended minimum for sustaining a breeding population and is based on territory requirements or genetic viability (Altman 2000, Altman pers. Comm. June 10, 2009, USFWS 2010).

Common name	Scientific name	Status		ODFW Strategy species	Ideal habitat conditions	Habitat patch size for small population (animals) or population size (plants)
		Fed ¹	State ²			
Amphibians:						
Northern red-legged frog	<i>Rana aurora</i>	SOC	SV	✓	Oak Woodland-Wet prairie: Floodplain, lowland, and foothill ponds and wetlands with shallow areas and access to adjacent upland habitat Connectivity: <1 km (0.6 mi) between habitat patches in wetland/upland mosaic (Hammerson 2005)	Information needed
Birds:						
Grasshopper Sparrow	<i>Ammodramus savannarum</i>		SV	✓	Upland prairie: Lowland prairie with low to moderate grass height (Johnson et al 1998)	>80 ha (200 acre)
Short-eared Owl	<i>Asio flammeus</i>			✓	Wet prairie-Upland prairie: Lowland and floodplain prairie with large open expanses (Canning 2001)	>80 ha (200 acre)
Common Nighthawk	<i>Chordeiles minor</i>		SC	✓	Upland prairie: Gravel bars and sparse low growing vegetation and some bare ground in floodplain, lowland, or foothills	>80 ha (200 acre)
Northern Harrier	<i>Circus cyaneus</i>				Wet prairie-Upland prairie: Lowland and floodplain prairie with large open expanses	>80 ha (200 acre)
Streaked Horned Lark	<i>Eremophila alpestris strigata</i>	C	SC	✓	Upland prairie: Lowland and floodplain prairie with significant bare ground patches and sparse low growing vegetation	>80 ha (200 acre)
American Kestrel	<i>Falco sparverius</i>				Savanna: Small groves of scattered oak or ponderosa pine with nesting cavities and herbaceous understory in floodplain, lowland, or foothills	20-40 ha (50-100 acre)
Wilson’s Snipe	<i>Gallinago delicata</i>				Wet prairie: Floodplain prairie with low growing vegetation	8-20 ha (20-50 acre)

Acorn Woodpecker	<i>Melanerpes formicivorus</i>	SOC	SV	✓	Oak woodland-Savanna: Lowland valley areas with mature oaks and open understory with dead limbs or snags for storing acorns Connectivity: <9.7 km (6 mi) habitat patch from existing occupied patch (Vesely and Rosenberg 2010)	8-20 ha (20-50 acre)
Lazuli Bunting	<i>Passerina amoena</i>				Savanna-Upland prairie: Foothill prairie with scattered shrubs and trees with grassy openings	4-8 ha (10-20 acre)
Oregon Vesper Sparrow	<i>Pooecetes gramineus affinis</i>	SOC	SC	✓	Upland prairie-Savanna: Lowland and foothill prairie with scattered shrubs and trees and some bare ground with grassy openings	4-8 ha (10-20 acre)
Western Bluebird	<i>Sialia mexicana</i>		SV	✓	Savanna-Upland prairie: Lowland areas with scattered shrubs or small trees for perches or foraging with grassy (herbaceous) understory and oak cavities or nesting boxes for nesting	4-8 ha (10-20 acre)
White-breasted Nuthatch (Slender-billed)	<i>Sitta carolinensis aculeata</i>		SV	✓	Oak woodland-Savanna: Mature oaks with nesting cavities in savanna groves or open woodland (Grubb and Pravosudov 2008)	8-20 ha (20-50 acre)
Chipping Sparrow	<i>Spizella passerina</i>			✓	Oak woodland-Savanna: Herbaceous cover in understory of oak woodlands or savanna in foothills or rural areas	0.8-4 ha (2-10 acre)
Western Meadowlark	<i>Sturnella neglecta</i>		SC	✓	Upland prairie-Savanna: Lowland or floodplain areas with large patches of scattered shrubs or trees for perches. Locate restoration sites in areas with few grass seed fields (Vesely and Rosenberg 2010)	>80 ha (200 acre)
Western Kingbird	<i>Tyrannus verticalis</i>				Upland prairie-Savanna: Scattered oaks with a grassy (herbaceous) understory in floodplain, lowland, or foothills	8-20 ha (20-50 acre)

Invertebrates:

American grass bug	<i>Acetropis americana</i>	SOC		✓	Wet prairie: Wet prairie with tufted hairgrass	Information needed
Taylor's checkerspot	<i>Euphydryas editha taylori</i>	C		✓	Upland prairie-Savanna: Upland prairie and savannas with host plant species such as <i>Castilleja</i> and plantain and nectar plants like strawberry (<i>Fragaria virginiana</i>) and rosy plectritis (<i>Plectritis congesta</i>). Connectivity: 1.5 km (0.9 mi) dispersal distance between habitat patches (Converse 2009)	> ~2 ha (5 acre) for annual survival probability >5% (Converse 2009)

Fender's blue	<i>Icaricia icarioides fenderi</i>	E		✓	Upland prairie-Savanna: Lowland and foothill open upland prairie Connectivity: 2 km (1.2 mi) dispersal distance to host lupine plants and open upland or wet prairie within 1 km (0.6 mi) for nectaring (USFWS 2010)	>6 ha (15 acre) (USFWS 2010)
Tailed copper	<i>Lycaena arota</i>				Upland prairie-Savanna-Oak Woodland: Open areas with yellow and mauve composites for nectar, near shrubby or riparian areas with <i>Ribes divaricatum</i> Connectivity: habitat patches 0.5 km/0.3 mi (possibly 4-10 km/2.5-6 mi) dispersal distance between habitat patches (Schweitzer, 2001b)	Information needed
Field crescent	<i>Phyciodes pulchella</i>				Upland prairie-Savanna: Meadows with diverse composite species, larvae feed on asters such as <i>Symphotrichum hallii</i> or <i>Erigeron decumbens</i> Connectivity: 2 km/1.2 mi (possibly up to 10 km/6 mi) dispersal distance between habitat patches (Schweitzer 2001c)	Information needed
Sonora skipper	<i>Polites sonora</i>				Upland prairie-Savanna: Meadows with diverse floral species, larvae feed on <i>Danthonia californica</i> , possibly <i>Festuca roemerii</i> and <i>Panicum occidentale</i> Connectivity: 1 km/0.6 mi (possibly 4-10 km/2.5-6 mi) dispersal distance between habitat patches (Schweitzer, 2001a)	Information needed

Mammals:

Western gray squirrel	<i>Sciurus griseus</i>		SV	✓	Oak woodland: Continuous canopy within 200 feet of nest site in lowlands and foothills oak/conifer forest Connectivity: 0.1 km (2-5 km and greater) dispersal distance between habitat patches (Hammerson 2005)	>2 ha (5 acre) with goal of >4 ha (10 acre) (Ryan and Carey 1995)
Camas pocket gopher	<i>Thomomys bulbivorus</i>	SOC			Upland prairie: Floodplain to lowland open meadows in areas with heavy clay, but not wetland, soils Connectivity: 1-3 km (0.6-1.9 mi) dispersal distance between habitat patches, roads >30 m (100 ft) are rarely crossed (Cannings and Hammerson 2004)	Information needed

Plants:

Golden paintbrush (not currently found growing wild in Oregon)	<i>Castilleja levisecta</i>	T	E	✓	Upland prairie-Wet prairie: Dry to moist meadows and flat prairies on hill tops and at low elevations in lowlands and foothills Connectivity: Populations within 3 km (2 mi) pollinator travel distance	200 individuals per patch; 1,000 individuals in several populations in Corvallis West Recovery Zone (USFWS 2010)
Peacock larkspur	<i>Delphinium pavonaceum</i>	SOC	E	✓	Wet prairie-Upland prairie-Savanna: Well-drained native prairie or dry sites within wet prairie, or dry roadsides in floodplain, lowlands and foothills Connectivity: Populations within 3 km (2 mi) pollinator travel distance	200 individuals per patch; 5,000 individuals in several populations in Corvallis West Recovery Zone (USFWS 2010)
Willamette daisy	<i>Erigeron decumbens</i> var. <i>decumbens</i>	E	E	✓	Wet prairie-Upland prairie: Open, flat prairie with heavier soils, as well as wetlands and balds in floodplains, lowlands, and foothills Connectivity: Populations within 3 km (2 mi) pollinator travel distance	200 individuals per patch; 10,000 individuals in several populations in Corvallis West Recovery Zone (USFWS 2010)
Shaggy horkelia	<i>Horkelia congesta</i> ssp. <i>congesta</i>	SOC	C		Wet prairie-Upland prairie: Drier microhabitats within wet prairie and in open native upland prairie in floodplains, lowlands, and foothills Connectivity: Populations within 3 km (2 mi) pollinator travel distance	200 individuals per patch; 5,000 individuals in several populations in Corvallis West Recovery Zone (USFWS 2010)
Howellia (Not currently found growing wild in Benton County)	<i>Howellia aquatilis</i>	T	T	✓	Wet prairie-Riparian: Vernal pools and sloughs that dry up by the end of the year in floodplains; dry fall is best for vegetative growth and a wet spring is best for flowering	200 individuals per patch; 5000 individuals in several populations in Corvallis West Recovery Zone (USFWS 2010)
Thin-leaved peavine	<i>Lathyrus holochlorus</i>	SOC			Upland prairie-oak woodland ecotone in lowlands and foothills Connectivity: Populations within 3 km (2 mi) pollinator travel distance	200 individuals per patch; 5000 individuals in several populations in Corvallis West Recovery Zone (USFWS 2010)

Bradshaw's lomatium	<i>Lomatium bradshawii</i>	E	E	✓	Wet prairie: Flat, moist native prairies with heavy clay soils in floodplains Connectivity: Populations within 3 km (2 mi) pollinator travel distance	200 individuals per patch; 10,000 individuals in several populations in Corvallis West Recovery Zone (USFWS 2010)
Kincaid's lupine	<i>Lupinus sulphureus</i> ssp. <i>kincaidii</i>	T	T	✓	Upland prairie-Savanna: Native open prairie or woodland edge in lowlands and foothills Connectivity: Populations within 3 km (2 mi) pollinator travel distance	60 m ² foliar cover per patch; 7,500 m ² foliar cover in several populations in Corvallis West Recovery Zone (USFWS 2010)
Racemed goldenweed (Not currently found growing wild in Benton County)	<i>Pyrrcoma racemosa</i> var. <i>racemosa</i>				Wet prairie-Upland prairie: Flat, native prairies with heavy clay soils in lowlands and foothills Connectivity: Populations within 3 km (2 mi) pollinator travel distance	200 individuals per patch; 5,000 individuals in several populations in Corvallis West Recovery Zone (USFWS 2010)
White-topped aster (Not currently found growing wild in Benton County)	<i>Sericocarpus rigidus</i>	SOC	T	✓	Wet prairie: Low elevation native prairie in floodplains Connectivity: Populations within 3 km (2 mi) pollinator travel distance	200 individuals per patch; 5,000 individuals in several populations in Corvallis West Recovery Zone (USFWS 2010)
Nelson's checkermallow	<i>Sidalcea nelsoniana</i>	T	T	✓	Wet prairie: Relatively open areas on damp soil, in meadows, wet prairie remnants, fencerows, roadsides, deciduous forest edges, and occasionally Oregon ash wetlands in floodplains and foothills Connectivity: Populations within 3 km (2 mi) pollinator travel distance	200 individuals per patch or 60 m ² foliar cover; 20,000 individuals or 10,000 m ² foliar cover in several populations in Corvallis West Recovery Zone (USFWS 2010)
Hitchcock's blue-eyed-grass (Not currently found growing wild in Benton County)	<i>Sisyrinchium hitchcockii</i>	SOC			Upland prairie-Wet prairie: Open prairie habitat in floodplain and lowlands Connectivity: Populations within 3 km (2 mi) pollinator travel distance	200 individuals per patch; 5000 individuals in several populations in Corvallis West Recovery Zone (USFWS 2010)

Reptiles:

Pacific pond turtle	<i>Actinemys marmorata</i>	SOC	SC	✓	Wetland prairie-Upland prairie-Oak woodland: Ponds and adjacent open ground up to 250 m (nesting <200 m) from water in floodplain, lowlands, and foothills (Rosenberg et al 2009). Clay soils with <25% vegetative cover and <40% litter cover for appropriate nesting habitat (Thorpe 2007) Connectivity: 1 km (0.6 mi) between habitat patches, usually along stream corridors (Hammerson 2001a)	Information needed
Northern painted turtle	<i>Chrysemys picta</i>		SC	✓	Upland prairie: Ponds and adjacent open nesting ground up to several hundred meters from water in floodplain and lowlands Connectivity: 1 km/0.6 mi (3-10 km/1.9-6 mi) between habitat patches, usually along stream corridors (Hammerson 2001b)	Information needed

¹Federal Status October 2009:

- E – Listed Endangered
- T – Listed Threatened
- C – Candidate for listing
- SOC – Species of Concern

²State Status October 2009:

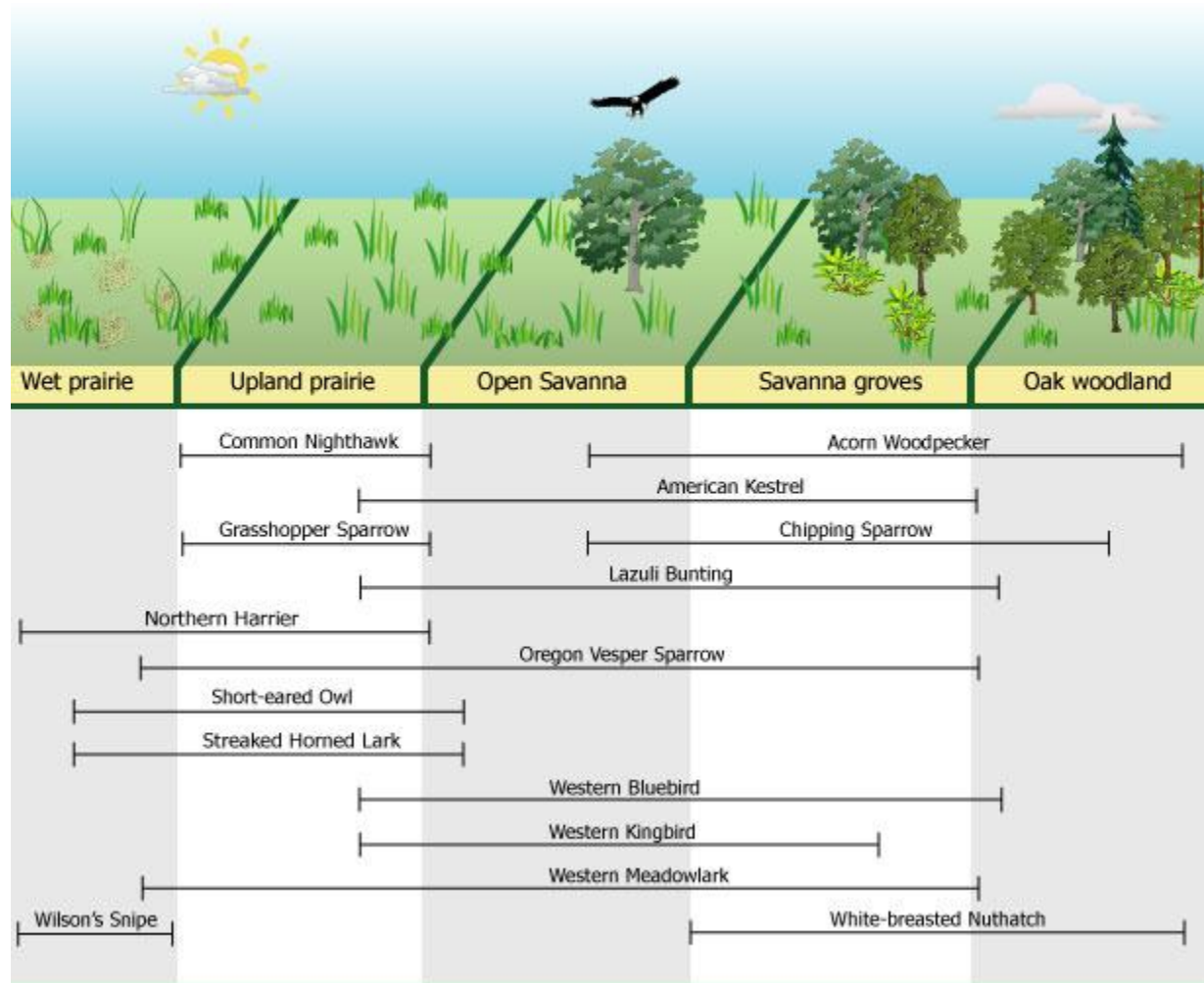
- E – Listed Endangered
- T – Listed Threatened
- C – Candidate (plants only)
- SC – Sensitive Species, Critical category
- SV – Sensitive Species, Vulnerable Category (note: Sensitive Species applies to vertebrates only)

Note: An endangered species is in danger of extinction throughout all or a significant portion of its range. A threatened species is likely to become endangered in the foreseeable future.

Species habitat needs

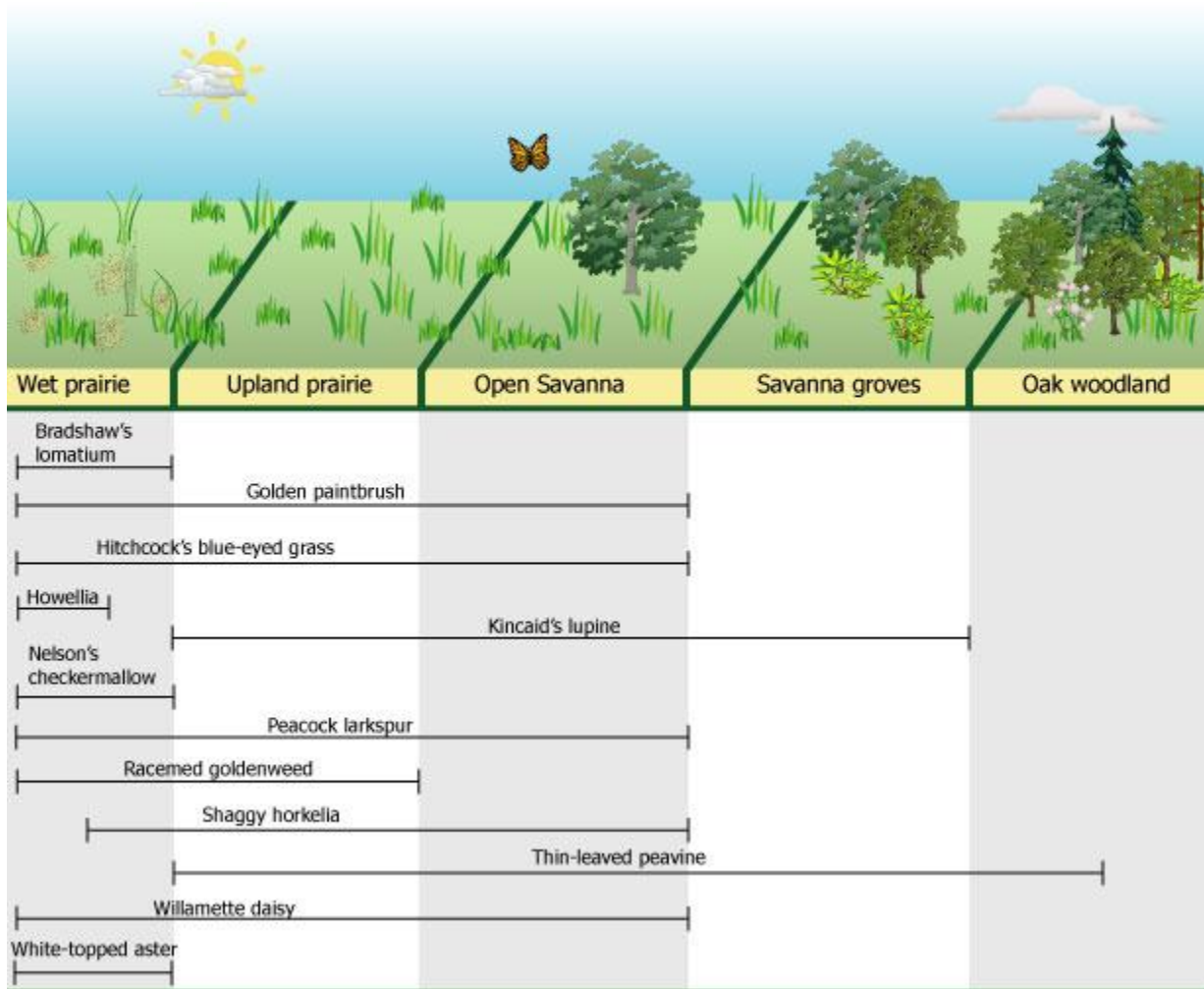
Many bird species are able to quickly colonize restored habitat, but plants, insects, and turtles are not always able to cross barriers such as forests or highways. Riparian areas and roadsides can provide pathways for animal movement and are important areas to enhance with native vegetation. Even small parcels of property can provide habitat for certain key species. When several neighbors with smaller properties enhance suitable habitat on adjoining property areas, this action can benefit species that require larger territories. Figures 3.1-3.3 graphically outline some of the key species habitat requirements.

Figure 3.1 Habitat guide for key bird species in Benton County



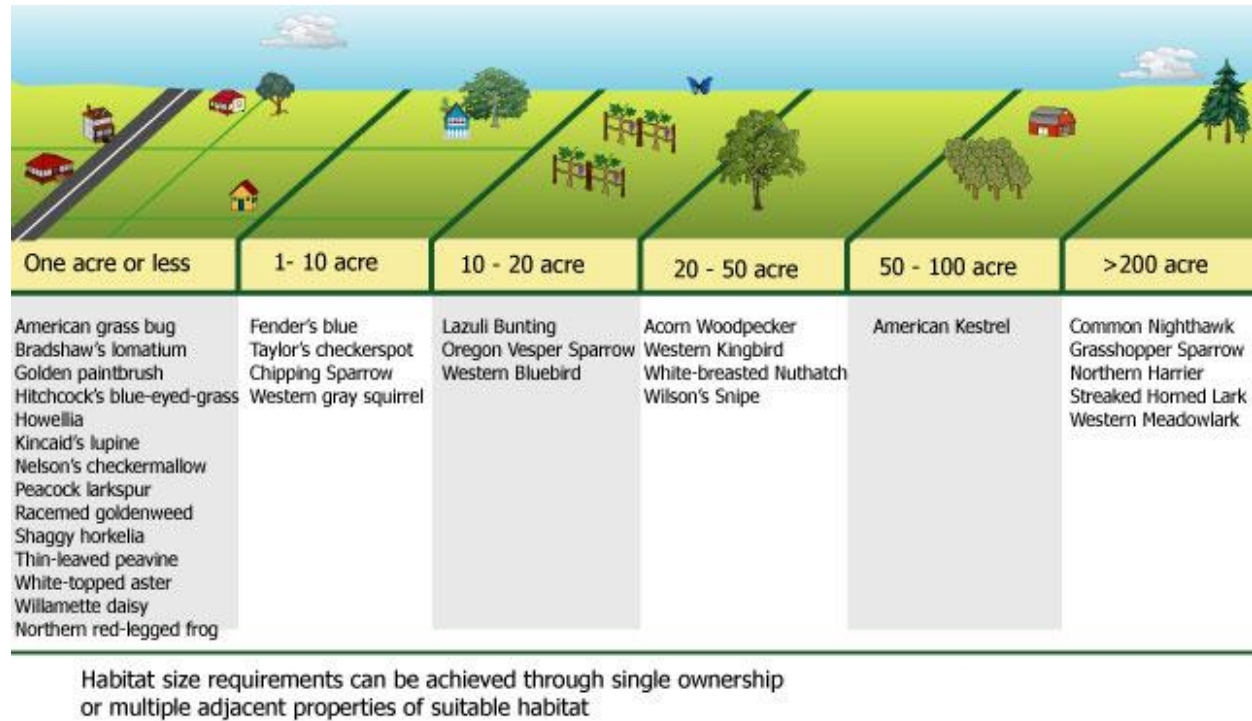
Symbols courtesy of the Integration and Application Network (ian.umces.edu/symbols/), University of Maryland Center for Environmental Science.

Figure 3.2 Habitat guide for key plant species in Benton County



Symbols courtesy of the Integration and Application Network (ian.umces.edu/symbols/), University of Maryland Center for Environmental Science.

Figure 3.3 Minimum area required for small population of key species in Benton County



Symbols courtesy of the Integration and Application Network (ian.umces.edu/symbols/), University of Maryland Center for Environmental Science.

Prairie Species Recovery Plan

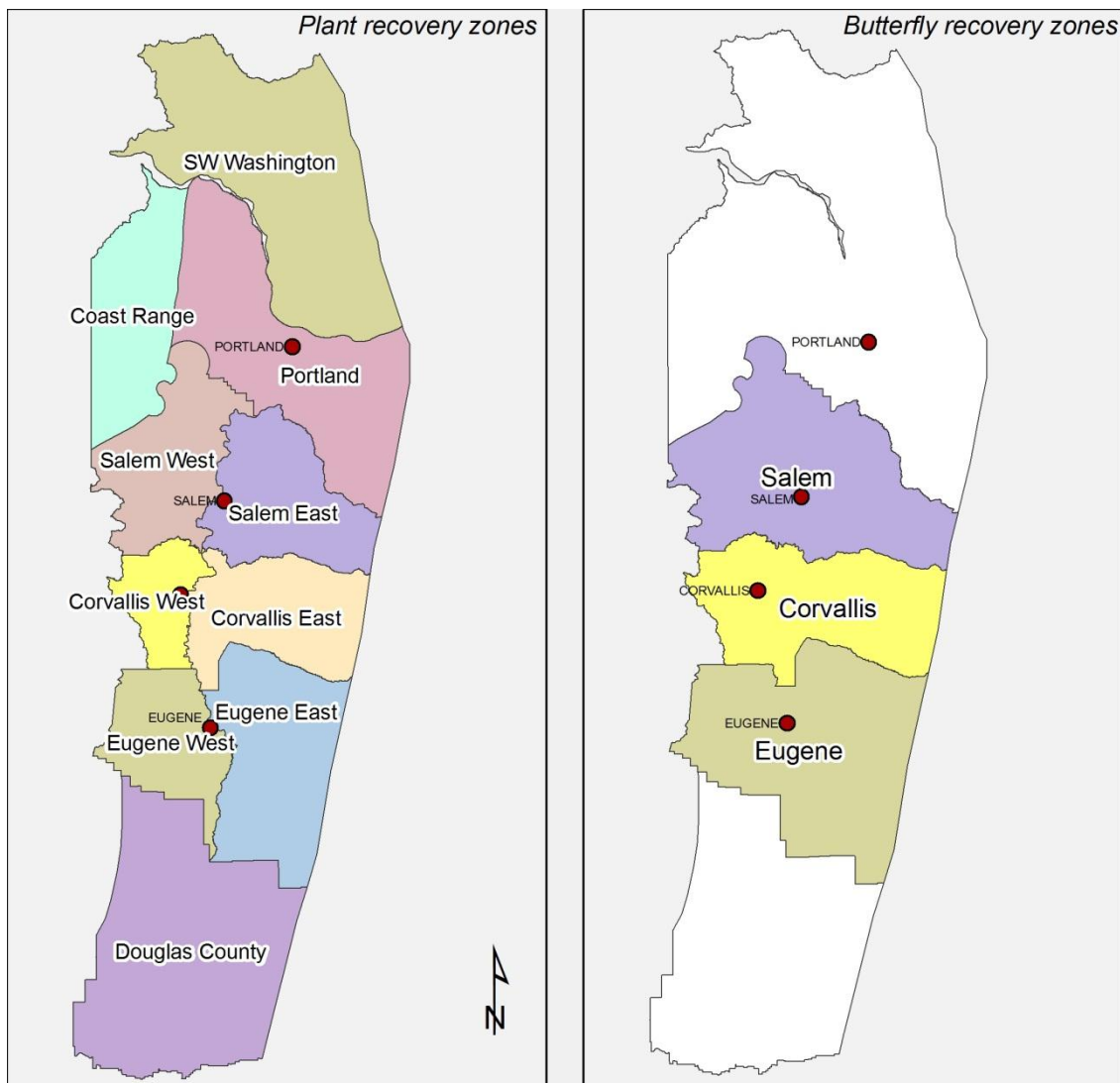
The U.S. Fish and Wildlife Service has prepared a Recovery Plan for listed prairie species of Western Oregon and Southwestern Washington, including Fender's blue butterfly, Bradshaw's lomatium, Willamette daisy, Kincaid's lupine, Nelson's checkermallow, and golden paintbrush (USFWS 2010). The plan also provides conservation measures for Taylor's checkerspot butterfly, a candidate for listing, and addresses six species of concern: pale larkspur, peacock larkspur, Willamette Valley larkspur, white-topped aster, shaggy horkelia, and Hitchcock's blue-eyed grass. The goal of the recovery plan is to achieve viable populations of listed species to ultimately remove them from the Endangered Species list and to enhance native prairie habitat to preclude the need to list additional species.

The recovery strategy calls for the preservation and appropriate management of native prairies, and the establishment of networks of diverse prairie reserves across the historical geographic range of the species. **To count towards recovery, sites must be under long term protection by either a public agency or conservation agreement on private land.**

High quality prairie habitat requires active management to limit woody species encroachment and invasion by non-natives. Reserve sites require a diversity of native vegetation with a relative cover of more than 50% of the site and <15% woody vegetation cover. Additionally, high quality prairie habitat for Fender’s blue butterflies should include at least five nectar flower species available throughout the flight season as well as robust Kincaid’s lupine populations (USFWS 2010).

USFWS has designated nine recovery zones in Oregon for prairie dependent plant species and three zones for Fender’s blue butterfly (Figure 3.4). One of the recovery zones for plants is Corvallis West, which encompasses much of the historic prairie area within Benton County. For Fender’s blue, the Corvallis recovery zone encompasses Benton County as well as adjacent Linn County.

Figure 3.4 USFWS recovery zones for prairie species in Oregon and SW Washington



Recovery implementation

Implementation of the prairie species recovery plan in Benton County can contribute to removing these threatened and endangered plants and butterflies from the U.S. endangered species list. Through this recovery plan, USFWS has established criteria for the number, size, and connectivity of populations in each recovery zone necessary for downlisting and delisting species (USFWS 2010).

For each zone, downlisting Fender's blue butterfly will require at least:

1. **A minimum number of butterflies and habitat patches:** >200 butterflies each year for 10 years in a network of habitat that contains at least three butterfly subpopulation patches of >6 ha (15 acre), and in addition there must be a second network or two large independent populations also >6 ha (15 acre). The patches must be separated by <2 km (1.2 mi) or linked by smaller lupine stepping stone patches < 1 km (0.6 mi) apart, and
2. **Protected habitat and active management:** All sites must be under long-term protection, have a management plan approved by USFWS, and be managed for habitat quality. Larval host plants, such as Kincaid's lupine, and nectar plant species must be present.

Delisting Fender's blue butterfly requires greater minimum population sizes such that the probability of persistence is 95% over the next 100 years (USFWS 2010). The Wren area has a large population of Fender's blue butterfly which can function as a population network. Populations in OSU McDonald Forest could be linked to Lupine Meadows, and potentially Fitton Green along the Oak Creek corridor. Enhancing habitat and working with landowners on creating stepping stone patches less than 1 km apart will require coordination between USFWS, Benton County Natural Areas and Parks Department, Greenbelt Land Trust, Marys River Watershed Council, Oregon State University, The Nature Conservancy, additional NGOs, and private landowners.

USFWS has identified Finley National Wildlife Refuge as a potential Fender's blue butterfly network. Additionally, E.E. Wilson has the potential to support Fender's blue butterfly and could form a network with Kincaid's lupine patches currently existing along the Soap Creek drainage and along the Benton/Polk county border. Creating stepping stone patches less than 1 km apart in north Benton County will require coordination and cooperation between USFWS, ODFW, Oregon National Guard, Oregon State University, Luckiamute Watershed Council, additional NGOs, and private landowners.

Listed species recovery actions

The following actions are suggested to strategically promote habitat conservation and species reintroductions for listed and at-risk species throughout Benton County.

Actively manage for open habitat

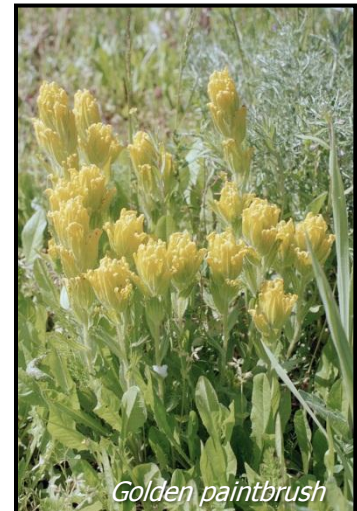
- Actively manage protected sites to reduce woody species encroachment and to reduce non-native plant invasions using appropriate management techniques developed for the conditions at each site.
- Provide open habitat for pollinator dispersal between known habitat patches. Prairie species require relatively open habitat. Barriers, such as coniferous forest, limit dispersal or pollinator movement between habitat patches.

Identify habitat network opportunity areas

- Identify privately owned sites where landowners are willing to enhance stepping stone habitat to connect known habitat patches that are currently too far for pollinator dispersal.
- Work with USFWS to identify programs that encourage conservation in areas that currently do not have listed species but that are close to possible reintroduction sites.

Use adaptive management

- Utilize adaptive management principles to improve conservation methods over the long-term. Adaptive management allows the latest, most effective information learned from restoration actions and monitoring to be incorporated into future management actions for an individual site.
- Monitor projects to evaluate their effectiveness and to help land managers utilize effective strategies to conserve species. Evaluation and monitoring of reintroduction efforts is especially important for recovery of listed species.
- Share conservation strategies and monitoring results via site tours, conferences, and written project evaluations. The Oregon Conservation Registry, a website to upload or search for project information, is one way to share information about the effectiveness of conservation actions (<http://or.conservationregistry.org/>).



Use genetically appropriate materials

- Work with USFWS, ODA, and other appropriate entities to determine the appropriate genetic source of plant materials for reintroduction. Benton County is considered a single genetic zone for most species, with the exception of locally extirpated species such as golden paintbrush (USFWS 2010).
- Provide education on plant material collection laws to private landowners. A permit is required to collect seeds or plant material on Federal lands. ODA requires a permit to collect seeds or plant materials from non-federal public lands, transport seeds or plant materials on non-federal public lands (i.e. roads), and

propagate or cultivate state-listed plant species. Plant material collection can harm wild populations and should be done to minimize risk.

Create production partnerships

- Reintroduction efforts require new plant materials, preferably from seeds or cuttings of nearby populations. Plant material production partnerships between ODA and local farmers can enhance the amount of material available locally for recovery.

Identify funding sources

- The USFWS provides grants for projects benefiting listed species through its Cooperative Endangered Species Conservation Fund (section 6 of the ESA). These grants require a 25% match of the estimated project cost. See additional landowner assistance programs under Voluntary Conservation Tools (Chapter 6) or visit the USFWS website at <http://www.fws.gov/endangered/grants/section6/index.html>.
- Identify incentive programs, such as reduced property tax assessment, for private landowners who wish to enhance and protect habitat for listed animal species.

Table 3.2 Summary of recovery objectives from the Western Oregon and Southwestern Washington Prairie Species Recovery Plan (USFWS 2010)

Criteria	Willamette daisy, Bradshaw’s lomatium, Kincaid’s lupine, Nelson’s checkermallow	Fender’s blue butterfly
Population trend and evidence of reproduction	<ul style="list-style-type: none"> • Stable or increasing for at least 10 years (15 years for delisting). • Evidence of reproduction (seed set, seedlings). 	
Habitat quality and diversity	<ul style="list-style-type: none"> • ≥50% relative cover of non-woody natives at 70% of local populations. • ≤15% cover of woody species. • No single non-native species >50% cover. 	<ul style="list-style-type: none"> • ≥50% cover of non-woody natives at 70% of populations. • 10% (20% for delisting) nectar species. • ≥5 ha of quality habitat in network; ≥2 ha in subpopulations.
Size of each population network (group of local populations with connectivity)	<ul style="list-style-type: none"> • Varies per species 	<ul style="list-style-type: none"> • Downlisting: 90% probability of persistence for 25 years. • Delisting: 95% probability of persistence for 100 years.

Criteria	Willamette daisy, Bradshaw’s lomatium, Kincaid’s lupine, Nelson’s checkermallow	Fender’s blue butterfly
Distribution and size of local populations	<ul style="list-style-type: none"> • At least two local populations per population network. • 10,000 plants/zone for Willamette daisy and Bradshaw’s lomatium. • 7,500 m2 foliar cover for Kincaid’s lupine delisting. • 20,000 plants (10,000 m2 foliar cover for Nelson’s checkermallow. • 3 km maximum distance between local populations. • Sufficient area for expansion. 	<ul style="list-style-type: none"> • Distance between local populations ≤ 1 km, none ≥ 2 km.
Security of habitat	<ul style="list-style-type: none"> • Habitat of local populations must be owned or managed by a government agency or conservation organization that manages the site specifically for the species in question. Or the site must be under permanent or long-term conservation easement that commits present and future landowners to the conservation of the species. 	
Management, monitoring, and threat abatement	<ul style="list-style-type: none"> • Sites must be managed to ensure quality habitat. • Management plans must be developed for each site. 	

4 Protected habitat sites

Private landowners who wish to enhance their land for at-risk species are encouraged to do so. Creating or maintaining native prairie for plants and insects requires a commitment to long term management, but some key species, especially birds, do well in grassy areas that are kept open by fall mowing or light grazing. See the private lands habitat conservation guide in Chapter 5 for actions to enhance key habitats.

The key to conserving native species is conservation of native habitat across the county. Private landowners can help native species on their land by retaining native habitats such as prairie and oak woodlands, planting native species, and removing invasive plants such as Scot's broom, Himalayan blackberry, and Douglas-fir. See Chapter 6 for existing assistance programs.

Habitat locations and quality

High quality habitat can be found throughout Benton County but often these areas are beyond the dispersal ability of populations of plants and animals. Creating a network of protected habitat (through partnerships, conservation easements and property acquisition), along dispersal corridors facilitates native species movement and reduces genetic isolation. Understanding the current distribution of protected sites helps identify areas within Benton County that are beyond the dispersal ability of at-risk species.

Several questions that still need to be answered include:

- Is there suitable habitat on private lands for species dispersal from known population sites?
- Where can restoration work take place to enhance current species habitat?
- What are the habitat improvement and population introduction/augmentation needs in the county?
- Where are the connectivity problems for species/habitat on unprotected lands?

Sites managed for permanent habitat conservation

There are many sites in Benton County that have key habitat or the potential for key habitat after restoration. Those that are permanently protected by public ownership or conservation easement specifically for habitat conservation meet USFWS's guidelines for species recovery. Several sites have protected habitat but are specifically managed for recreation. These sites provide important habitat while connecting people with wildlife. (Bird species checklists were determined from Birdnotes.net)

Table 4.1 Benton County sites managed for permanent habitat conservation by local, state, and federal government agencies

See Table 3.1 for species habitat requirements

Site #	Site name	Area ha (acre)	Key Habitat	Key species present (*Planted)
Benton County Natural Areas and Parks				
1	Bezell Memorial Forest	237 (586)	Upland Prairie	Taylor's checkerspot butterfly Chipping Sparrow Kincaid's lupine*
2	Fitton Green Natural Area	125 (308)	Upland Prairie Oak woodland	Taylor's checkerspot butterfly Lazuli Bunting Oregon Vesper Sparrow Kincaid's lupine*
3	Fort Hoskins Historical Park	51 (126)	Upland prairie and savanna Oak woodland	Taylor's checkerspot butterfly Chipping Sparrow Northern Harrier Western Bluebird
4	Jackson-Frazier Wetland	58 (144)	Wet prairie	American Kestrel Wilson's Snipe Northern Harrier American grass bug Bradshaw's lomatium Kincaid's lupine Nelson's checkermallow
City of Corvallis Parks and Recreation				
5	Bald Hill Park	115 (284)	Upland prairie Oak woodland	American Kestrel Chipping Sparrow Lazuli Bunting Western Bluebird White-breasted Nuthatch Kincaid's lupine* Willamette daisy Nelson's checkermallow
6	Chip Ross Park	51 (126)	Upland prairie	Bird checklist needed
7	Rock Creek Park	12 (30)	Upland prairie	Peacock larkspur Bird checklist needed
8	Caldwell Open Space	15 (36)	Wet prairie	Bird checklist needed
9	Herbert Farm and Natural Area	90 (221)	Upland prairie Wet prairie	Pacific pond turtle Red-legged frog Chipping Sparrow White-breasted Nuthatch Streaked Horned Lark Kincaid's lupine Nelson's checkermallow Peacock larkspur Thin-leaved peavine

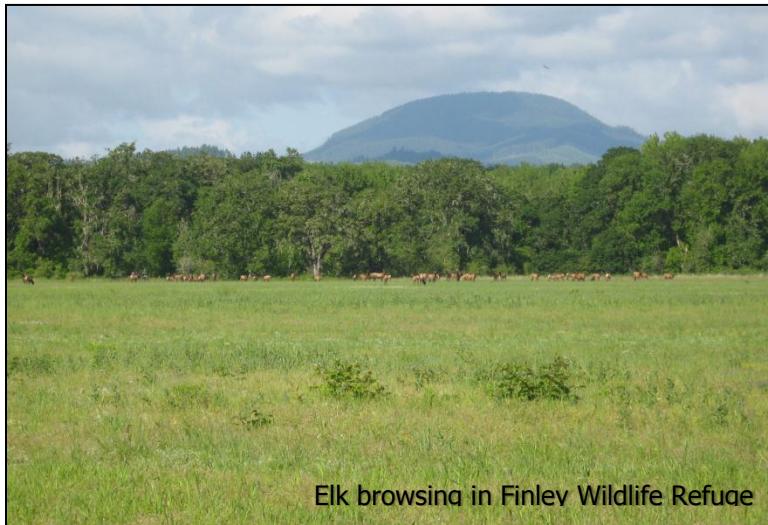
Site #	Site name	Area ha (acre)	Key Habitat	Key species present (*Planted)
10	Marys River Natural Area	30 (74)	Wet prairie	Kincaid's lupine* Nelson's checkermallow* Northern Harrier Bird checklist needed
11	Noyes Natural Area	2 (5)	Wet prairie	Nelson's checkermallow Bird checklist needed
12	Owens Open Space	53 (131)	Wet prairie Oak woodland	Nelson's checkermallow Bird checklist needed
13	Timberhill Open Space	19 (47)	Upland prairie Oak woodland	Lazuli Bunting Thin-leaved peavine
14	Witham Hill Natural Area	14 (35)	Oak woodland	Bird checklist needed
Bureau of Land Management (BLM)				
15	Maxfield Creek meadows	130 (321)	Upland Prairie Oak woodland	Kincaid's lupine* Bird checklist needed
Oregon Department of Fish and Wildlife (ODFW)				
16	E. E. Wilson Wildlife Area	681 (1,683)	Upland prairie Wet prairie Oak woodland	Red-legged frog Acorn Woodpecker American Kestrel Common Nighthawk Wilson's Snipe Lazuli Bunting Northern Harrier Oregon Vesper Sparrow Short-eared Owl Western Bluebird Western Kingbird Western Meadowlark White-breasted Nuthatch Camas pocket gopher Western gray squirrel Kincaid's lupine Nelson's checkermallow Pacific pond turtle
Oregon Parks and Recreation Department (OPRD)				
17	Luckiamute State Park Natural Area – South tract	126 (311)	Upland prairie Wet prairie Oak woodland	American Kestrel Wilson's Snipe Northern Harrier Western Bluebird Western Meadowlark White-breasted Nuthatch Camas pocket gopher Pacific pond turtle

Site #	Site name	Area ha (acre)	Key Habitat	Key species present (*Planted)
Oregon State University (OSU)				
18	Butterfly Meadows	2 (5)	Upland Prairie	Fender's blue butterfly Kincaid's lupine Bird checklist needed
United States Fish and Wildlife Service (USFWS)				
19	Finley Wildlife Refuge	2,155 (5,325)	Upland prairie Wet prairie Oak woodland	Red-legged frog Acorn Woodpecker American Kestrel Chipping Sparrow Wilson's Snipe Lazuli Bunting Northern Harrier Oregon Vesper Sparrow Short-eared Owl Western Kingbird Western Meadowlark White-breasted Nuthatch American grass bug Camas pocket gopher Western gray squirrel Bradshaw's lomatium Golden paintbrush* Kincaid's lupine* Nelson's checkermallow Peacock larkspur Thin-leaved peavine Willamette daisy* Pacific pond turtle Northern painted turtle
US Army Corps of Engineers				
20	Oregon National Guard Rifle Range	206 (509)	Upland prairie Wet prairie Oak woodland	Streaked Horned Lark Kincaid's lupine Nelson's checkermallow Bird checklist needed

Table 4.2 Benton County sites managed for permanent habitat conservation by non-governmental organizations (owned or under conservation easement)

See Table 3.1 for species habitat requirements

Site #	Site name	Area ha (acre)	Key habitat	Key species present (*Planted)
Greenbelt Land Trust				
21	Lupine Meadows	24 (58)	Upland Prairie Wet prairie	Oregon Vesper Sparrow Fender's blue butterfly Kincaid's lupine Nelson's checkermallow Racemed goldenweed*
22	Owens Farm	38 (95)	Wet prairie Oak woodland	Bradshaw's lomatium* Nelson's checkermallow Bird checklist needed
23	Evergreen Creek	89 (221)	Upland prairie Wet prairie Oak woodland	Bird checklist needed
24	Private land easements	>120 (>300)	Upland prairie Wet prairie Oak woodland	
The Nature Conservancy (TNC)				
25	Wren Preserve	4 (9)	Upland Prairie	Fender's blue butterfly Bird checklist needed
26	Philomath Prairie (Easement)	48 (119)	Upland prairie	Kincaid's lupine Bird checklist needed



Elk browsing in Finley Wildlife Refuge

Sites managed for limited timeframe habitat conservation

There are many sites in Benton County protected under short term habitat conservation agreements or that provide mitigation for habitat impacts elsewhere in Benton County (**Figure 4.1**). These agreements benefit land owners who receive financial or technical help with conservation. See Chapter 6 for descriptions of conservation assistance tools.

Table 4.3 Benton County sites managed for habitat conservation under limited timeframe protection

See Table 3.1 for species habitat requirements

	Site name	Area ha (acre)	Key habitat	Key species present (*planted)
Natural Resource Conservation Service (NRCS) WRP land easements				
	Private – Finley NWR vicinity	9 (23)	Wet prairie	Pacific pond turtle
	Private – Finley NWR vicinity	49 (120)	Wet prairie Upland prairie	Pacific pond turtle
	Private – E.E. Wilson vicinity	10 (24)	Wet prairie	
	Private – Corvallis airport vicinity	116 (286)	Wet prairie Upland prairie Oak woodland	Bradshaw’s lomatium Kincaid’s lupine Nelson’s checkermallow
	Private – Finley NWR vicinity	44 (108)	Wet prairie Upland prairie Oak woodland	Pacific pond turtle
	Private – Finley NWR vicinity	24 (60)	Upland prairie Wet prairie Oak woodland	Kincaid’s lupine*
Oregon Department of Transportation (ODOT)				
	Mitigation site	1 (3)	Upland prairie	
	Mitigation site	2.5 (6)	Upland prairie	
Oregon State University – FSA CREP agreement				
	Oak Creek dairy	22 (55)	Wet prairie	
	Horse Center	2 (5)	Wet prairie	Nelson’s checkermallow
	Sheep Farm	19 (48)	Wet prairie	
	Soap Creek Ranch	46 (103)	Wet prairie	
	Walnut St.	19 (47)	Wet prairie	Nelson’s checkermallow
USFWS Partners for Fish and Wildlife Program				
	Newton Creek Wetlands - Philomath	8 (21)	Wet prairie Oak woodland	Red-legged frog Acorn Woodpecker Thin-leaved peavine Pacific pond turtle
	Private – Wren area	20 (50)	Upland prairie Oak woodland	Fender’s blue butterfly Kincaid’s lupine
	Private – Wren area	3 (7)	Upland prairie Oak woodland	

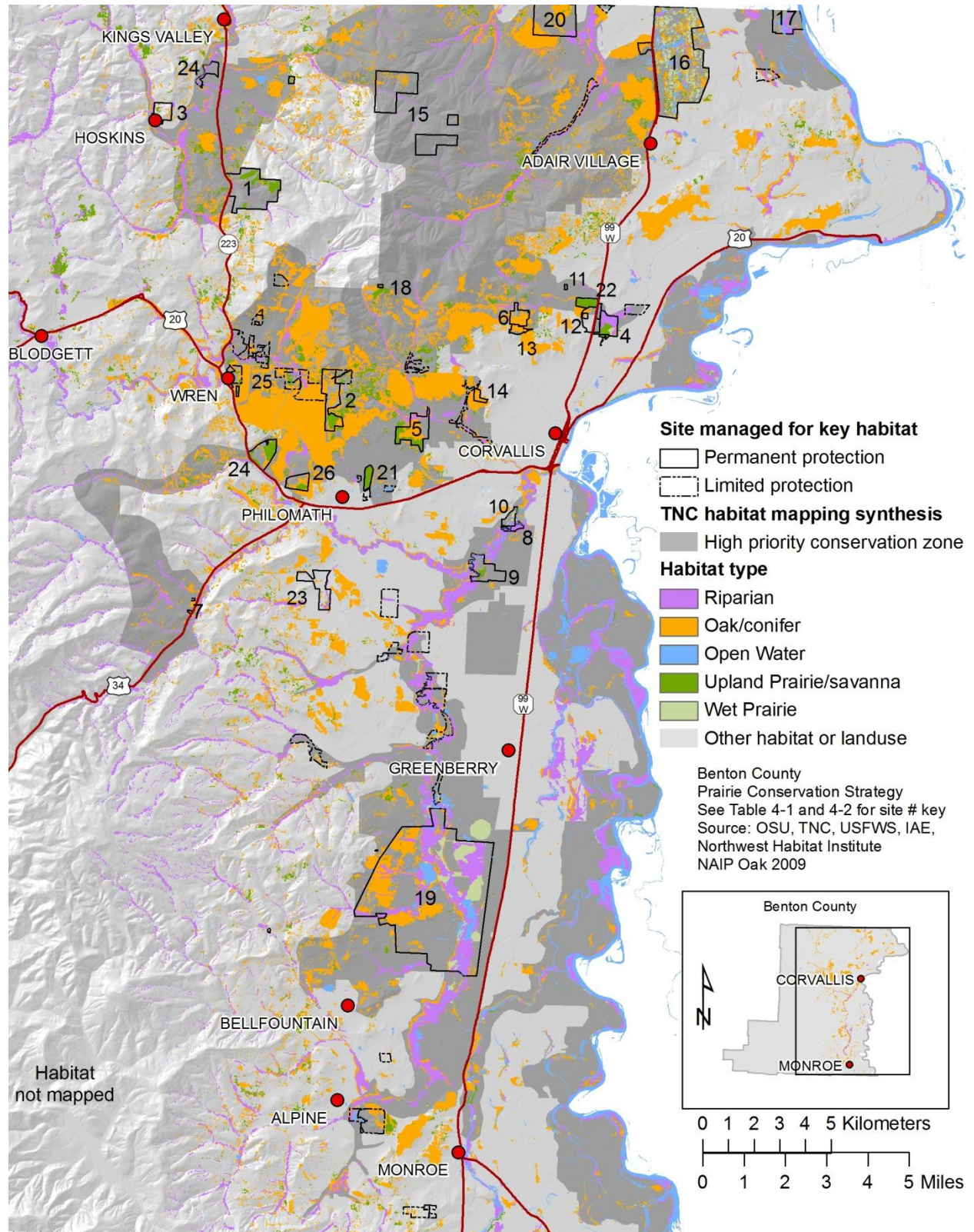
	Site name	Area ha (acre)	Key habitat	Key species present (*planted)
	Private – Wren area	43 (106)	Upland prairie	Fender’s blue butterfly Kincaid’s lupine Pacific pond turtle
	Private – Wren area	8 (21)	Upland prairie	Pacific pond turtle
	Private – Wren area	2 (5)	Upland prairie	Fender’s blue butterfly Kincaid’s lupine
	Private – Wren area	13 (32)	Upland prairie Oak woodland	Fender’s blue butterfly Kincaid’s lupine
	Private – Wren area	39 (95)	Upland prairie	Fender’s blue butterfly Kincaid’s lupine
	Private – Wren area	3 (6.5)	Upland prairie	Fender’s blue butterfly
	Private – Wren area	26 (64)	Upland prairie	Fender’s blue butterfly Kincaid’s lupine
	Private – Wren area	2 (5)	Upland prairie	Fender’s blue butterfly Kincaid’s lupine
	Private – Wren area	4 (10)	Upland prairie Oak woodland	Fender’s blue butterfly Kincaid’s lupine
	Private – Wren area	1 (3)	Upland prairie	
	Private – Wren area	0.6 (1.5)	Upland prairie	
	Private – Wren area	35 (87)	Upland prairie Oak woodland	Kincaid’s lupine
	Private – Wren area	82 (202)	Upland prairie Oak woodland	Kincaid’s lupine
	Private – Corvallis airport vicinity	16 (40)	Wet prairie	Pacific pond turtle
	Private – Finley NWR vicinity	32 (80)	Wet prairie	Pacific pond turtle
	Private – Finley NWR vicinity	1.5 (3.5)	Upland prairie	
	Private – Finley NWR vicinity	13 (33)	Wet prairie	
	Private – Finley NWR vicinity	46 (113)	Upland prairie	
	Private – Finley NWR vicinity	84 (208)	Upland prairie Wet prairie	Kincaid’s lupine*
Wetland mitigation banks				
	Evergreen	71 (175)	Wet prairie	Streaked Horned Lark
	Frazier	11 (26)	Wet prairie	
	Mid-Valley	17 (43)	Wet prairie	
	Muddy Creek	44 (108)	Wet prairie	

Priority habitat zones

Several planning efforts have defined areas of high priority for conservation in the Willamette Valley, including the Oregon Conservation Strategy (ODFW 2006). A planning group, led by The Nature Conservancy, came together in 2007 to combine the identified high priority areas into a single map for the Willamette Valley (The Nature Conservancy 2009). This mapping effort includes high priority forest land and riparian areas, as well as prairie and oak woodland (Figure 4.1). These areas can currently be considered the highest priority for habitat and species conservation actions in Benton County. Areas outside of this zone contain important habitat and can provide opportunities for meaningful habitat acquisition and restoration, but focusing in priority areas makes strategic use of limited funding.



Figure 4.1 Key protected prairie and oak habitat in Benton County



5 Key Conservation Actions

Habitat conservation actions

Landowners in all parts of Benton County, urban to rural, can provide habitat for native species and can participate in conservation of prairie and oak habitat by actively managing to maintain open vegetation. The following actions are suggested to strategically promote habitat conservation throughout Benton County.

Conserve and protect the best remaining key habitats

- Inventory and map the best remaining prairie and oak sites in Benton County to determine habitat quality and opportunities for enhancement. Public agencies and conservation groups should share mapped habitat information and integrate it into their planning and management programs.
- Conserve and enhance high quality sites. Focus on preserving large habitat blocks and areas that provide connectivity for wildlife.
- Engage private landowners who are interested in habitat assessment and conservation on their land. The USFWS Partners for Fish and Wildlife Program offers assistance with rare habitat enhancement.

Enhance and restore degraded key habitats

- Maintain prairies with site specific management strategies to improve the habitat structure and increase native species. Tools such as carefully timed mowing, prescribed burning, and well managed grazing can promote some native species and inhibit shrub, conifer, and Scot's broom encroachment.
- Engage landowners in invasive species removal and long-term management. Education on false brome and meadow knapweed (*Centaurea pratensis*) management will be crucial to control these very invasive species. See Benton SWCD brochures available on their webpage www.bentonswcd.org or download the Field Guide to Weeds of the Willamette Valley (www.appliedeco.org/invasive-species-resources/) for more information.
- Minimize soil disturbance to reduce new weed infestations.
- Maintain large oaks and reintroduce oaks to appropriate sites. In agricultural areas, single oaks planted along hedgerows can replace those lost to attrition.
- Remove trees that will overtop and kill oak trees through shading.
- Leave several large dead trees for wildlife habitat.
- Maintain oak woodlands by removing Douglas-fir trees



Invasive meadow knapweed



Invasive false brome

growing through the canopy and utilize appropriate management to encourage native species.

- Create wet prairies and vernal pools as part of mitigation programs.
- Provide landowners with technical assistance and education regarding the importance of vernal pools to wildlife.
- Provide information about oak habitat and technical assistance to landowners in both rural and urban areas since oaks can attract native wildlife in most locations.

Identify conservation tools for private landowners

- Many of the best remaining prairie and oak sites are on privately owned lands. Voluntary tools such as technical assistance, financial incentives, and conservation easements can assist landowners with conservation on their own land (see Chapter 6: Voluntary Conservation Tools for a list of programs) (ODFW 2006)
- Provide links to educational materials. For example, OSU Extension Service ecology field cards for students describe Willamette Valley habitat attributes and species. See <http://extension.oregonstate.edu/benton/natural/eco>.
- Provide management guidelines and resources to interested landowners. Habitat conservation and restoration actions should be implemented to protect remaining high quality habitats and key sites for connectivity, and to reduce the impact of invasive plant species on these habitats and on at-risk plant populations.

Several documents provide management guidelines for enhancement of prairies and oak habitats:

1. *Restoring Rare Native Habitats in the Willamette Valley* ([Campbell 2004](#))
2. *A Landowner's Guide for Restoring and Managing Oregon White Oak Habitats* ([Vesely 2004](#))
3. *Native Willamette Valley prairie and oak habitat restoration site preparation and seeding information* ([Boyer 2009](#))
4. *Techniques for restoring native plant communities in upland and wetland prairies in the Midwest and west coast regions of North America* ([Fitzpatrick 2004](#))
5. *Use of prescribed fire in Willamette Valley native prairies* ([Alverson 2006](#))
6. *Benton County Prairie Species Habitat Conservation Plan* (Benton County 2010)



Habitat conservation guide for private lands

Private landowners can contribute to conservation of prairie and oak habitat by taking actions to enhance the habitat on their property. USFWS or NRCS also have programs to assist private landowners with habitat conservation actions (Chapter 6). The following actions are suggested to strategically promote habitat conservation on private lands throughout Benton County.

Enhance upland prairie and savanna habitat:

- Remove invasive shrubs such as Scot's broom and blackberry by mowing and/or pulling small plants or cutting down large plants.
- Remove Douglas-fir trees by pulling small trees or girdling/removing large trees. Where there is a need to block views or winds, limb the lower Douglas-fir branches to enable light to reach the ground.
- Identify large oaks to retain.
- Mow after native flowers have set seed.
- Work with knowledgeable person or group such as a watershed council or SWCD to identify invasive plants and determine the appropriate management timing.
- Allow grazing after July 15 to control woody vegetation. See (Benton County 2010)
- Minimize soil disturbance to reduce invasion of non-native plants. Many non-native seeds last many years in the soil and will germinate when brought to the surface.
- Plant local native flowering species to encourage pollinators. Many local nurseries sell native plants and the Benton SWCD and OSU master gardeners each hold a yearly native plant sale.
- Identify bird and turtle nesting sites and avoid impacting those areas during the nesting season.

Enhance wet prairie habitat:

- Remove rose and hawthorn shrubs, and ash trees that shade prairie plants. Mow and/or pull small plants or cut large plants.
- Work with knowledgeable person or group to determine if the site's hydrology has been altered by dikes or tile drains, and restore hydrology if needed.
- Minimize disturbance to the soil, especially when the ground is wet. Heavy vehicles can permanently change a site's hydrology by creating ruts where water pools.
- Plant local native flowering species to encourage pollinators.

Enhance oak woodland habitat:

- Identify live, large oaks that have been shaded by Douglas-fir or other conifers.
- Remove shrubs such as Scot's broom, spurge laurel, and Himalayan blackberry by mowing and/or pulling small plants or cutting large plants.
- Remove Douglas-fir trees by pulling small trees or removing/girdling large trees.
- Leave large snags for wildlife.
- Avoid management during wildlife nesting season.

Opportunity areas for species conservation

Habitat and species conservation opportunity areas occur across Benton County. These areas have potential habitat that can be enhanced or restored to benefit key species. While specific habitat condition maps are not available for Benton County, general habitat maps can help land owners and land managers assess the types of species they may be able to retain, attract, or plant. Figure 5.1 divides Benton County into elevation and gradient areas that roughly correspond to the species requirements listed in Table 3.1. These areas were based on historic vegetation. Wet prairie, upland prairie and oaks, and foothill prairie and oaks may be found in any geographic area depending on local soil and moisture conditions, but broad expanses of prairie habitats were more likely historically in lowland and floodplain areas.

Where information was available, species locations or potential habitats were mapped in Benton County to give readers a sense of the distribution of at-risk species in the county. Maps showing general species locations, as well as habitat types, indicate possible areas for conservation and habitat enhancement (Figure 5.2, Figure 5.3, Figure 5.4, Figure 5.5, Figure 5.6). Several of the key plant species are not currently found in Benton County (Table 3.1) and current information is not available for other species.

The habitat types represented on several of the maps in this section indicate potential habitat that may be an opportunity for enhancement to suitable habitat but may not show currently suitable habitat for a particular species. Future work to identify suitable habitat for at-risk species on public and private lands should include:

1. Mapping of prairie and oak habitat quality.
2. Outreach to private landowners.

Figure 5.1 Opportunity areas for key species in Benton County based on historic vegetation and elevation

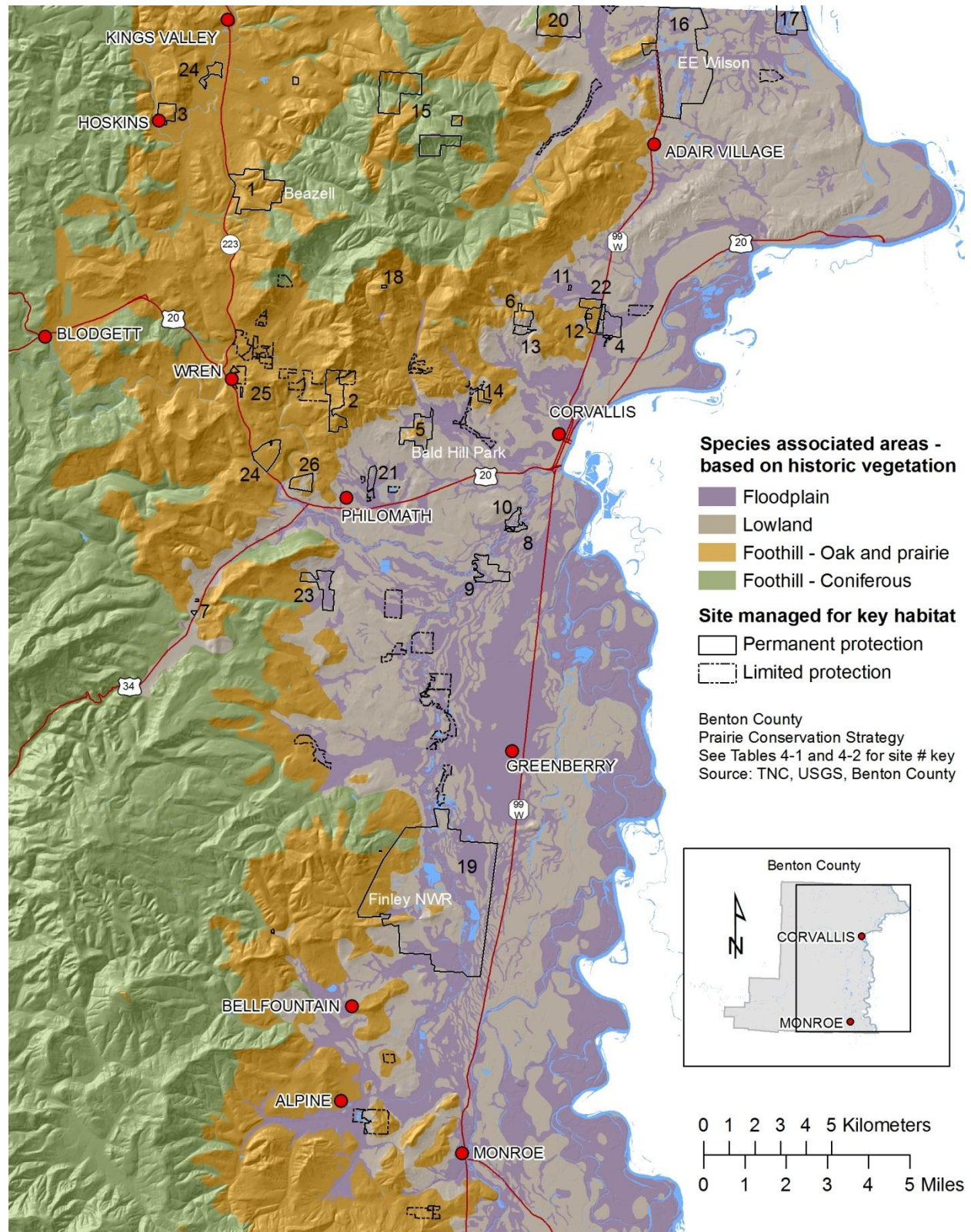


Figure 5.2 Opportunity areas for key butterfly species in Benton County

Shaded or hatched areas are within the dispersal distance of Fender’s blue and Taylor’s checkerspot and represent potential habitat.

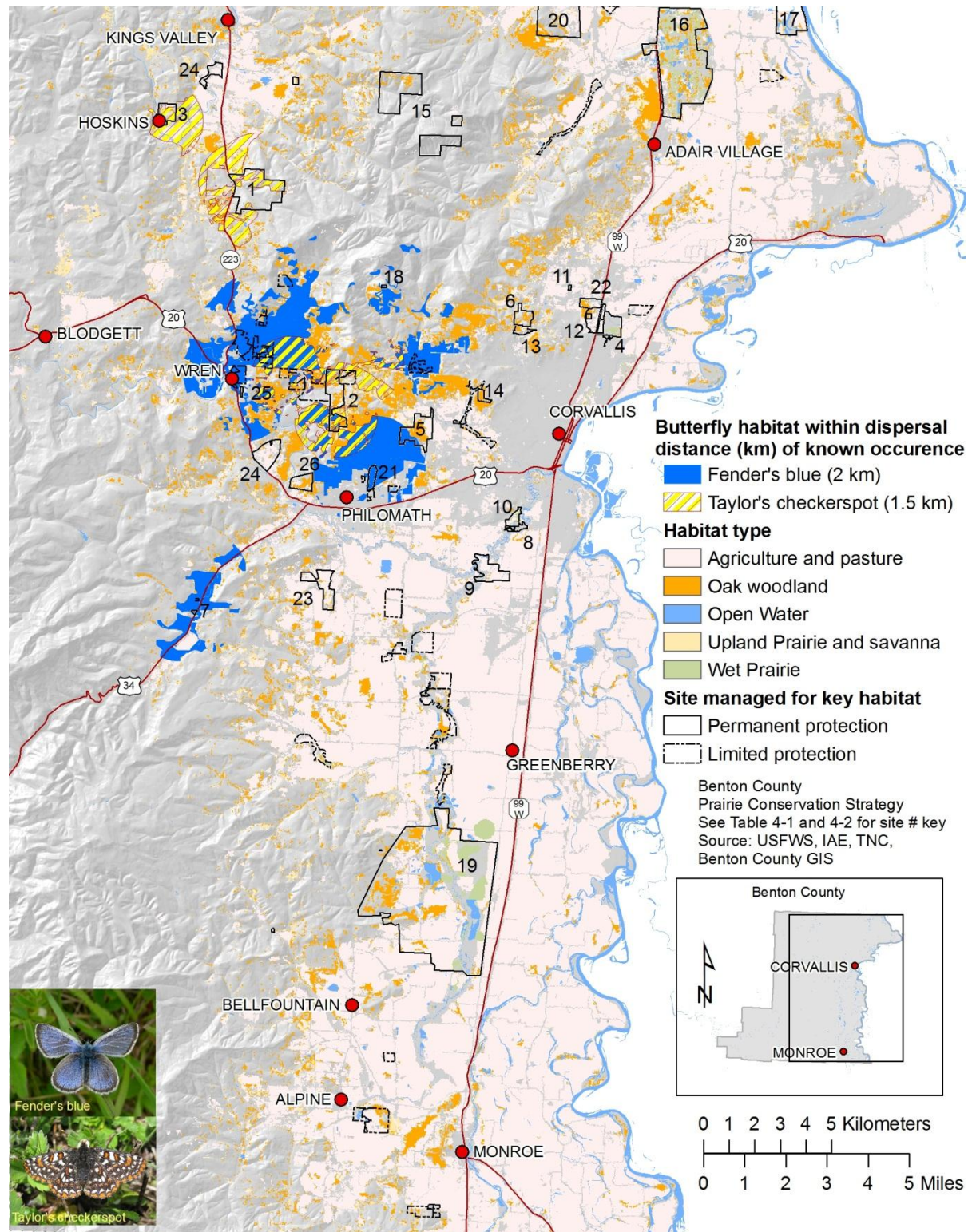


Figure 5.3 Opportunity areas for key turtle species in Benton County

Turtle locations indicate areas where turtles have been found in the recent past.

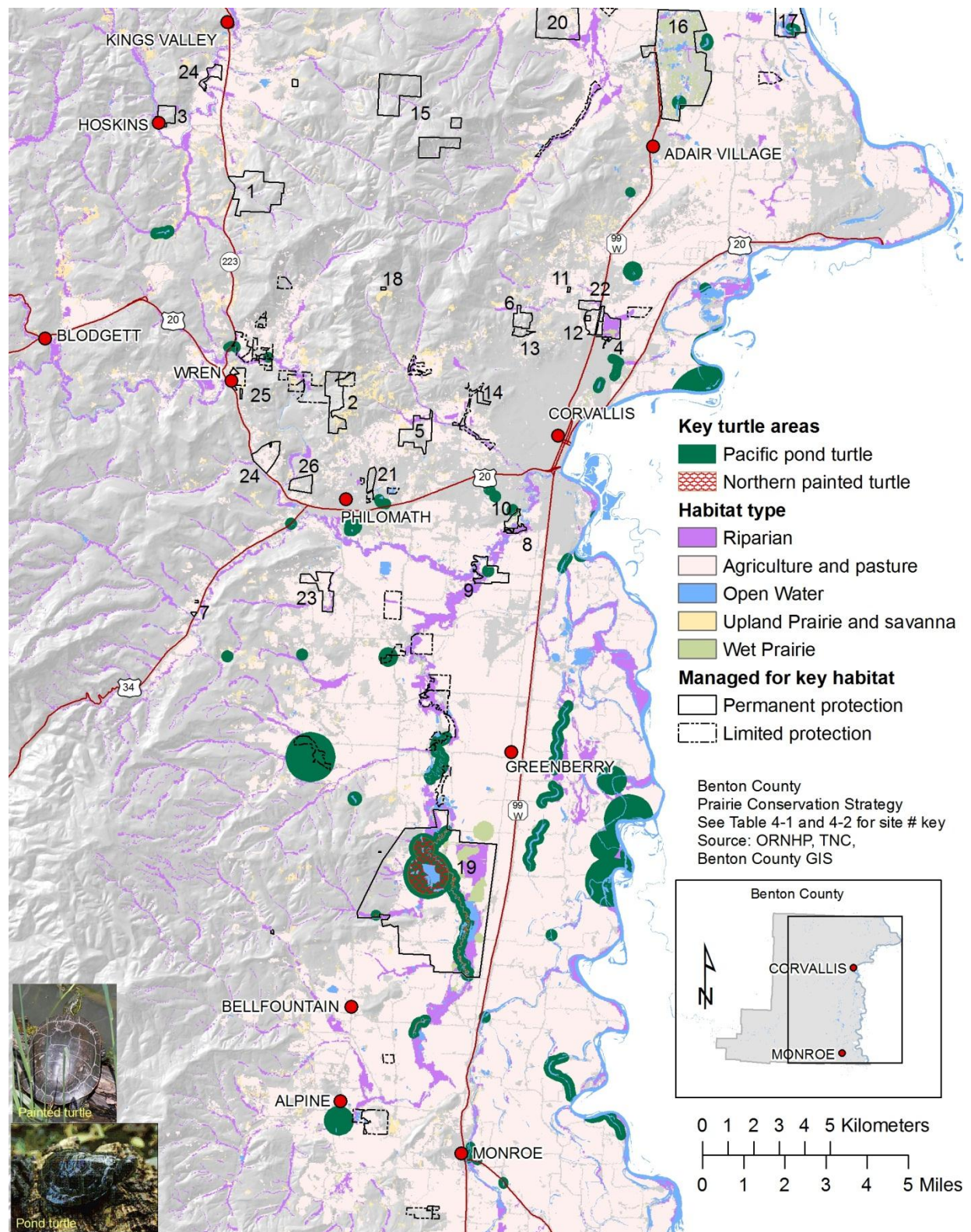


Figure 5.4 Opportunity areas for Peacock larkspur, Bradshaw's lomatium, and Nelson's checkermallow in Benton County

Plant locations indicate areas where plants have been found in the recent past.

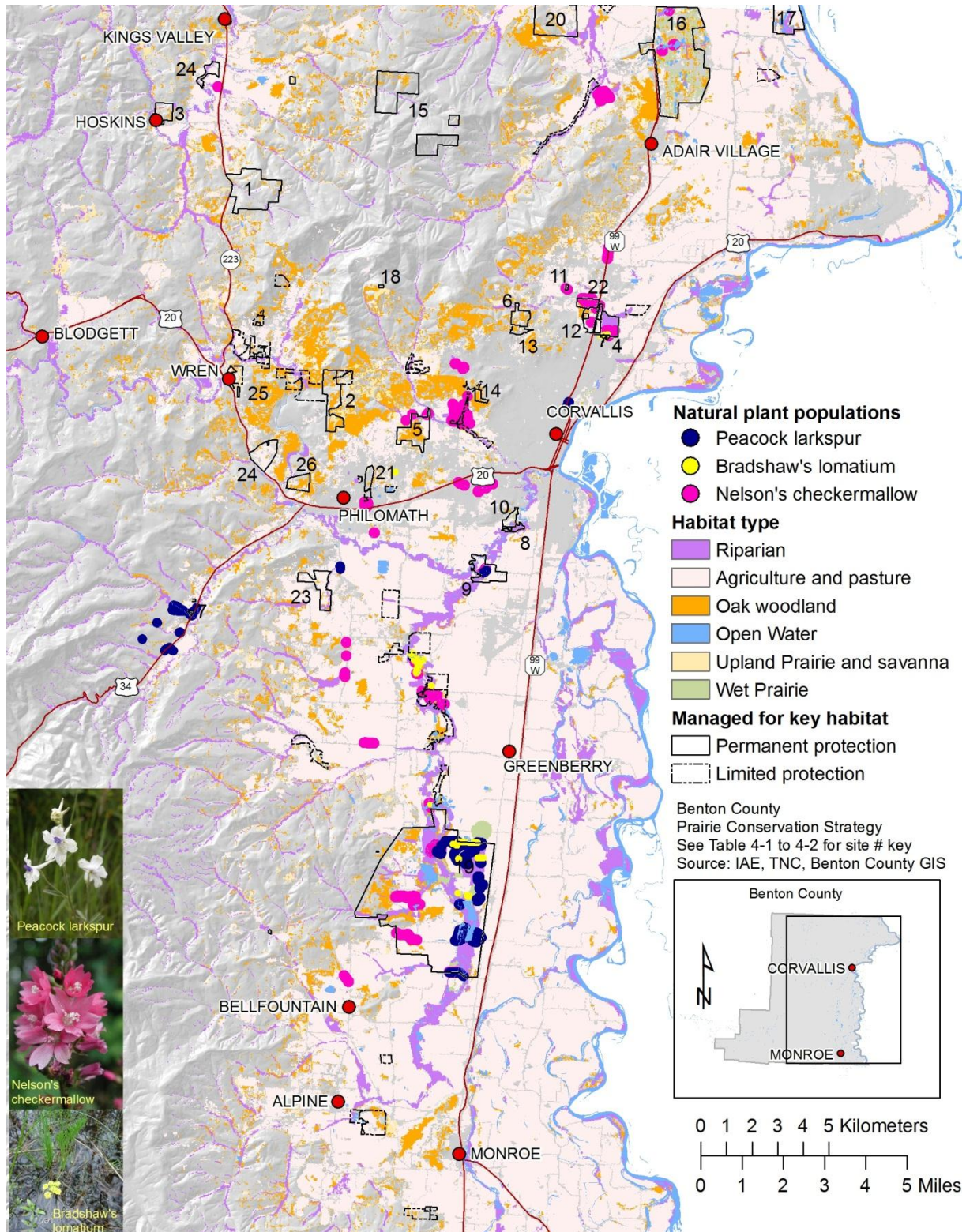


Figure 5.5 Opportunity areas for Kincaid's lupine and shaggy horkelia in Benton County

Plant locations indicate areas where plants have been found in the recent past.

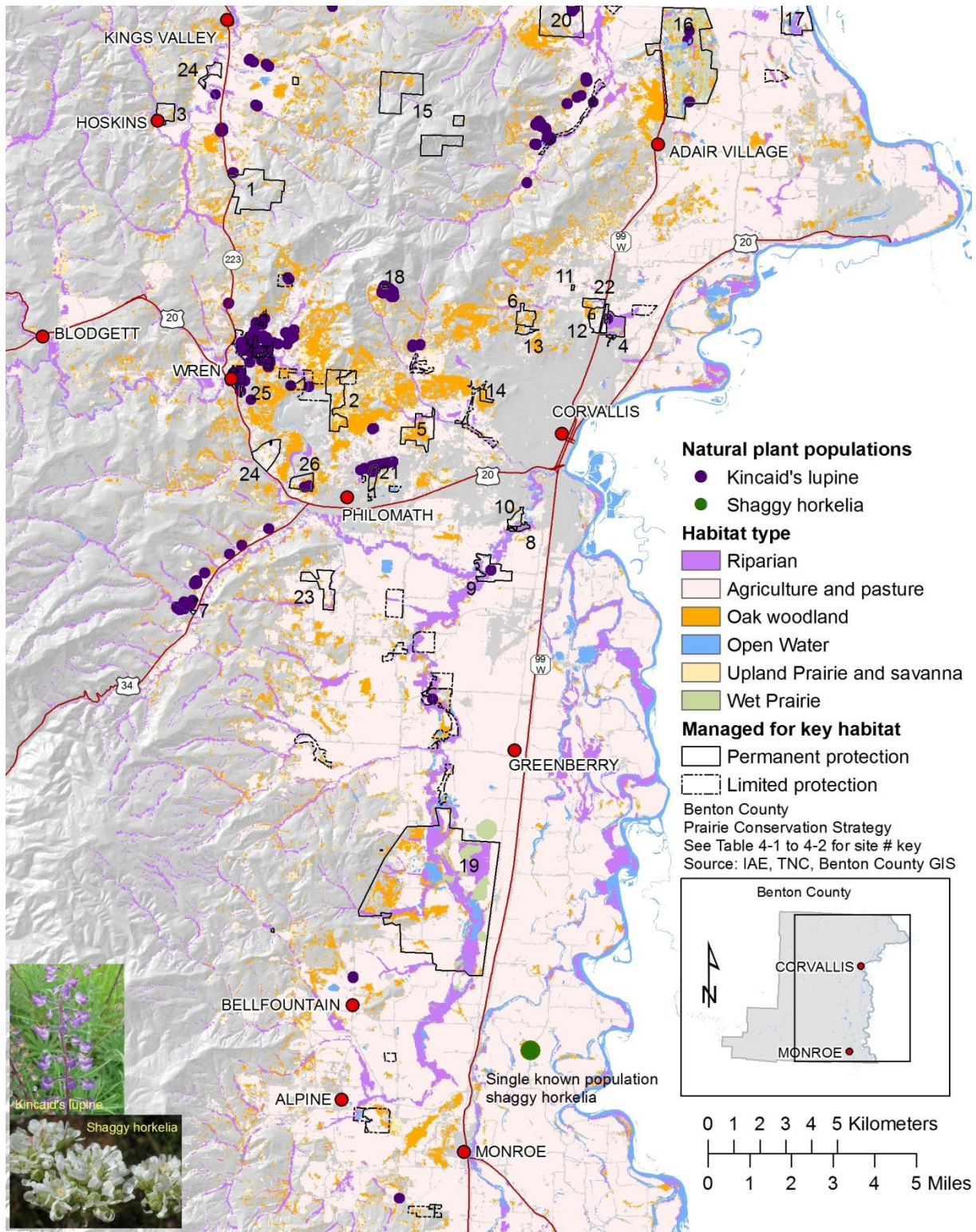
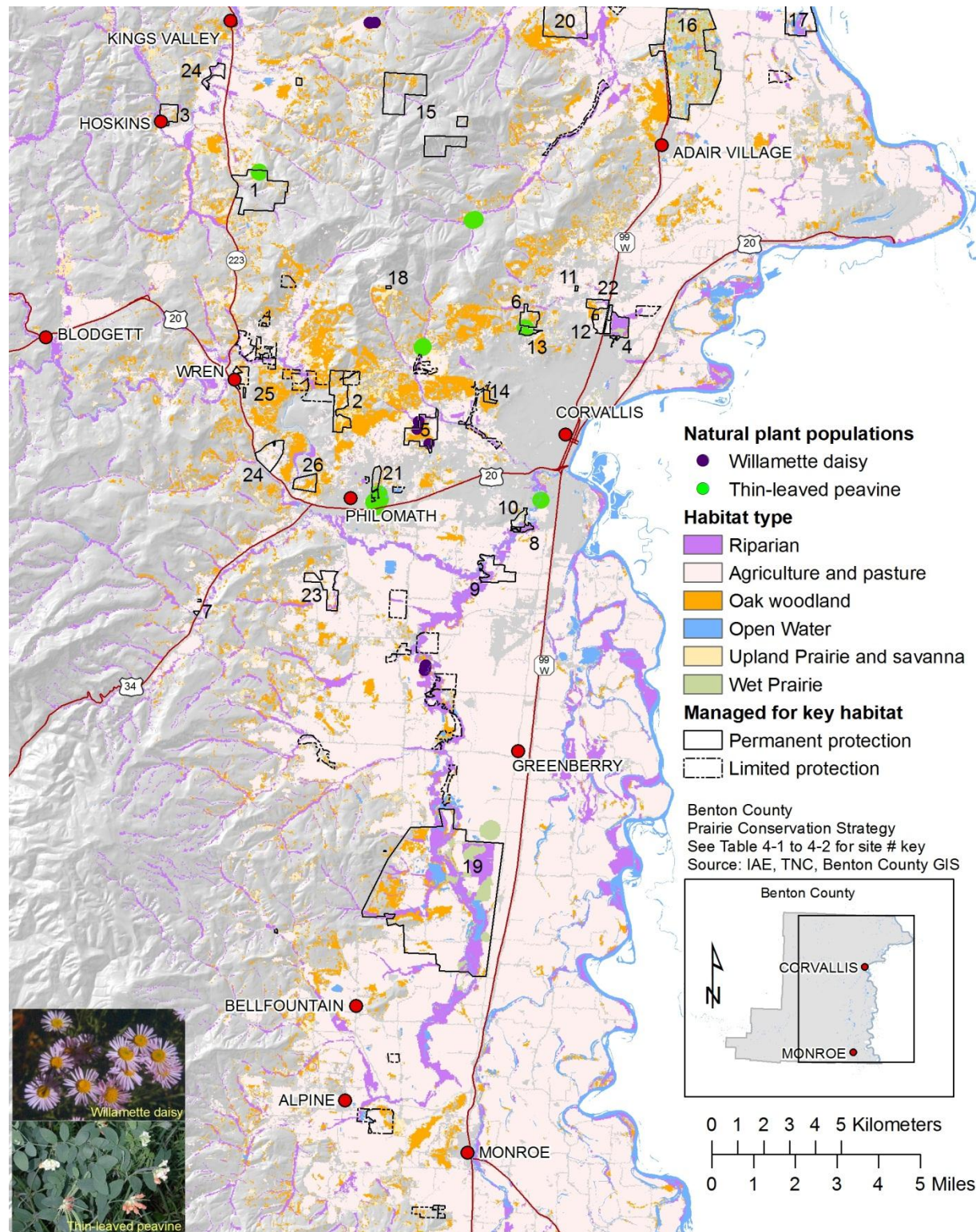


Figure 5.6 Opportunity areas for Willamette daisy and thin-leaved peavine in Benton County

Plant locations indicate areas where plants have been found in the recent past.



Key species conservation actions

Areas within Benton County identified as particularly important for conservation were prioritized for short or long term action.

1. Short term actions are those that can reasonably begin in the near future and are critical for listed species recovery or to prevent listing of additional species.
2. Long term actions are those that will require landowner engagement, significant habitat enhancement, or voluntary conservation easements/acquisition.

Priority actions are shown on several maps in this chapter and can be identified by the letters O for outreach, C for connectivity, and E for enhancement.

These actions identify geographic conservation areas within Benton County for strategic habitat conservation. Only public lands are specifically identified but private landowners who wish to work towards prairie conservation can consult the maps included here to identify the key actions needed to support habit for species on their property.

Priority short term actions (Figures 5.7 through 5.11)

Outreach – Benton County-wide

O:

Work with landowners to enhance and protect key habitats throughout Benton County by providing learning opportunities such as field trips to local habitat sites and workshops on species identification and habitat restoration techniques.

Provide private landowners with printed or web-based information on habitat management, conservation incentive programs, and easement programs.

Locate extant populations of golden paintbrush, Hitchcock's blue-eyed-grass, howellia, and racemed goldenweed. Identify potential reintroduction sites for extirpated species.

Work with private landowners to plant nectar species in potential butterfly habitat.

Work with private landowners, including those in eastern Benton County, to identify and protect large oaks that are important to wildlife such as Western gray squirrel and Acorn Woodpecker.

Connect habitat

C1: Connect Fender's blue butterfly habitat in OSU McDonald Forest to Fitton Green by creating or enhancing nectar and Kincaid's lupine habitat patches at Audubon's Hesthavn property, at the OSU sheep ranch along Oak Creek, through Bald Hill, and at Lupine Meadows. Stepping stone habitat patches should be less than 1 km apart.

Enhance habitat

E1: Enhance habitat for Taylor's checkerspot butterfly and Fender's blue butterfly between Lupine Meadows and Fitton Green by reducing flight path barriers through thick conifer stands, planting nectar species in open habitat patches, and planting Kincaid's lupine in open areas. Introduce harsh paintbrush (*Castilleja hispida* var. *hispida*), golden paintbrush (*Castilleja levisecta*), and small-flower blue-eyed Mary (*Collinsia parviflora*) for Taylor's checkerspot butterfly host plant use to provide possible alternatives to non-native English plantain (*Plantago lanceolata*).

E2: Enhance current Fender's blue butterfly habitat in the Wren area by actively managing for open habitat, and increasing habitat connectivity between current habitat patches and along transmission line corridors by reducing flight path barriers through thick conifer stands.

E3: Enhance habitat with nectar species at Finley Wildlife Refuge for future Fender's blue butterfly reintroduction efforts so that a new population network can be created. Enhance habitat for Streaked Horned Lark.

Priority long term actions (Figures 5.7 through 5.11)

Connect habitat

C2: Connect Fender's blue butterfly populations at Lupine Meadows to populations on Highway 34 by enhancing habitat patches with nectar species and Kincaid's lupine and by decreasing barriers, such as conifer stands and invasive shrubs, to butterfly dispersal. Connect these populations to populations in Wren with stepping stone patches less than 1 km apart.

C3: Connect Fender's blue butterfly habitat in McDonald Forest to habitat in the Wren area by planting sickle-keeled lupine (*Lupinus albicaulis*) in the clear cut mosaic that divides these areas. Sickle-keeled lupine populations could wink in and out as clearcuts are established and replanted.

C4: Connect and enhance Taylor's checkerspot butterfly populations between Bezell and Fort Hoskins by working with private landowners to create protected stepping stone habitat patches closer than 1.5 km.

C5: Connect Fender's blue butterfly habitat in the Soap Creek watershed from Oregon State University's property to E.E. Wilson by protecting stepping stone habitat patches less than 1 km apart. Work with interested private landowners who are willing to plant nectar species and provide information on conservation easements and incentive programs.

C6: Connect and enhance habitat for and introduce Willamette daisy and Bradshaw's lomatium to Herbert Natural Area, Caldwell Natural Area, and Marys River Natural Area. Introduce Kincaid's lupine, Nelson's checkermallow, and peacock larkspur to Caldwell Natural Area and Marys River Natural Area to join populations currently greater than 3 km apart.

C7: Connect and enhance habitat for and introduce peacock larkspur north of Finley Wildlife Refuge to join populations currently greater than 3 km apart.

Enhance habitat

E4: Enhance and protect turtle habitat along the Marys River from Marys River Natural Area upstream to Blodgett, along the Muddy Creek corridor, and along the Willamette River by protecting and restoring riparian zones and increasing floodplain connectivity. Minimize barriers to turtle migration between riparian and upland nesting habitat by locating trails and roads away from riparian areas. Identify occupied nests and avoid driving farm equipment over the nest. Protect nests from predators, such as raccoons, by using temporary fencing until the eggs hatch.

E5: Enhance Taylor's checkerspot butterfly habitat between Beazell and Fort Hoskins by establishing nectar species in habitat patches and minimize flight path barriers, such as dense stands of conifers, to butterfly dispersal. Introduce harsh paintbrush (*Castilleja hispida* var. *hispida*), golden paintbrush (*Castilleja levisecta*), and small-flower blue-eyed Mary (*Collinsia parviflora*) at Beazell for butterfly host plant use to provide possible alternatives to non-native English plantain (*Plantago lanceolata*).

E6: Enhance habitat for Streaked Horned Lark, Western Meadowlark, Western Kingbird, and Short-eared Owl in areas around Herbert Natural Area, Caldwell Natural Area, and Marys River Natural Area.



Figure 5.7 Areas of high priority for conservation actions to benefit key species in Benton County

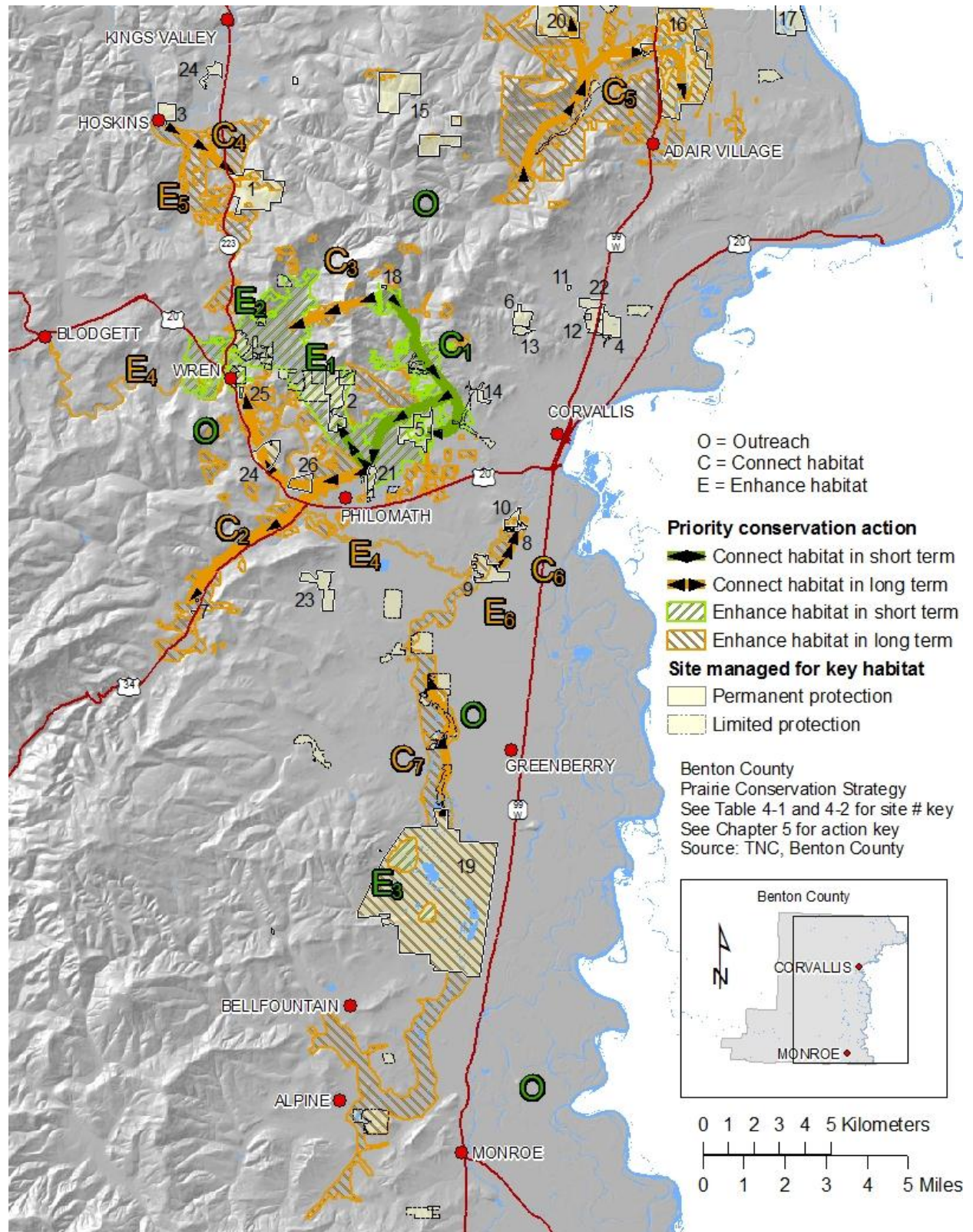
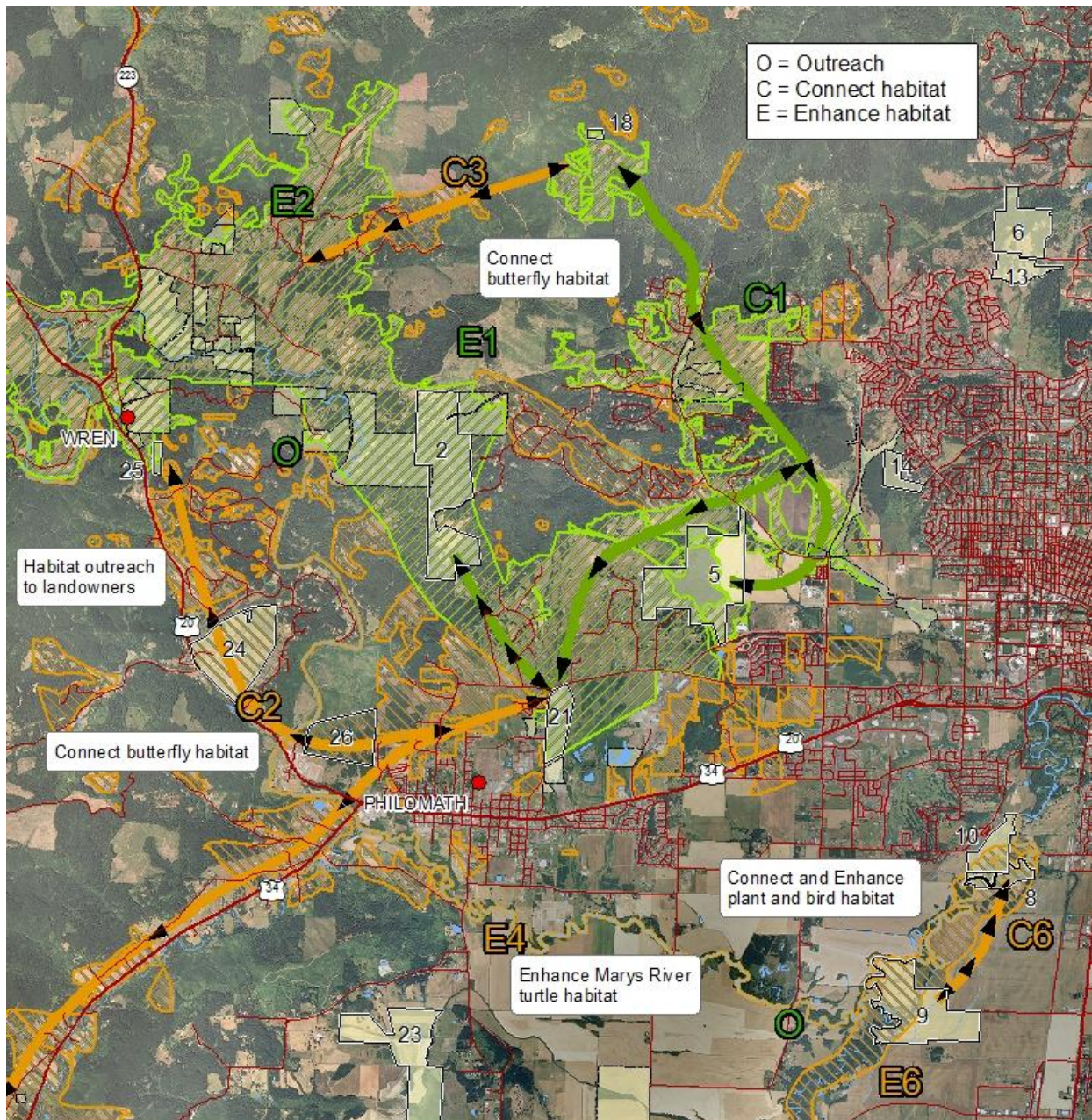


Figure 5.8 Areas of high priority for conservation actions near Wren, Philomath, and West Corvallis



Priority conservation action

- Connect habitat in short term
- Connect habitat in long term
- Enhance habitat in short term
- Enhance habitat in long term

Site managed for key habitat

- Permanent protection
- Limited protection



Benton County
 Prairie Conservation Strategy
 See Table 4-1 and 4-2 for site # key
 See Chapter 5 for conservation action key
 Source: TNC, Benton County
 2005 NAIAP Aerial photo

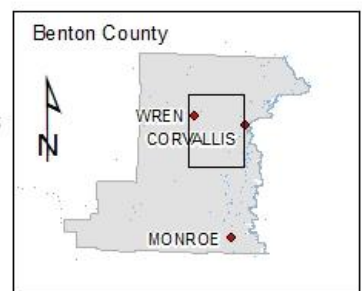
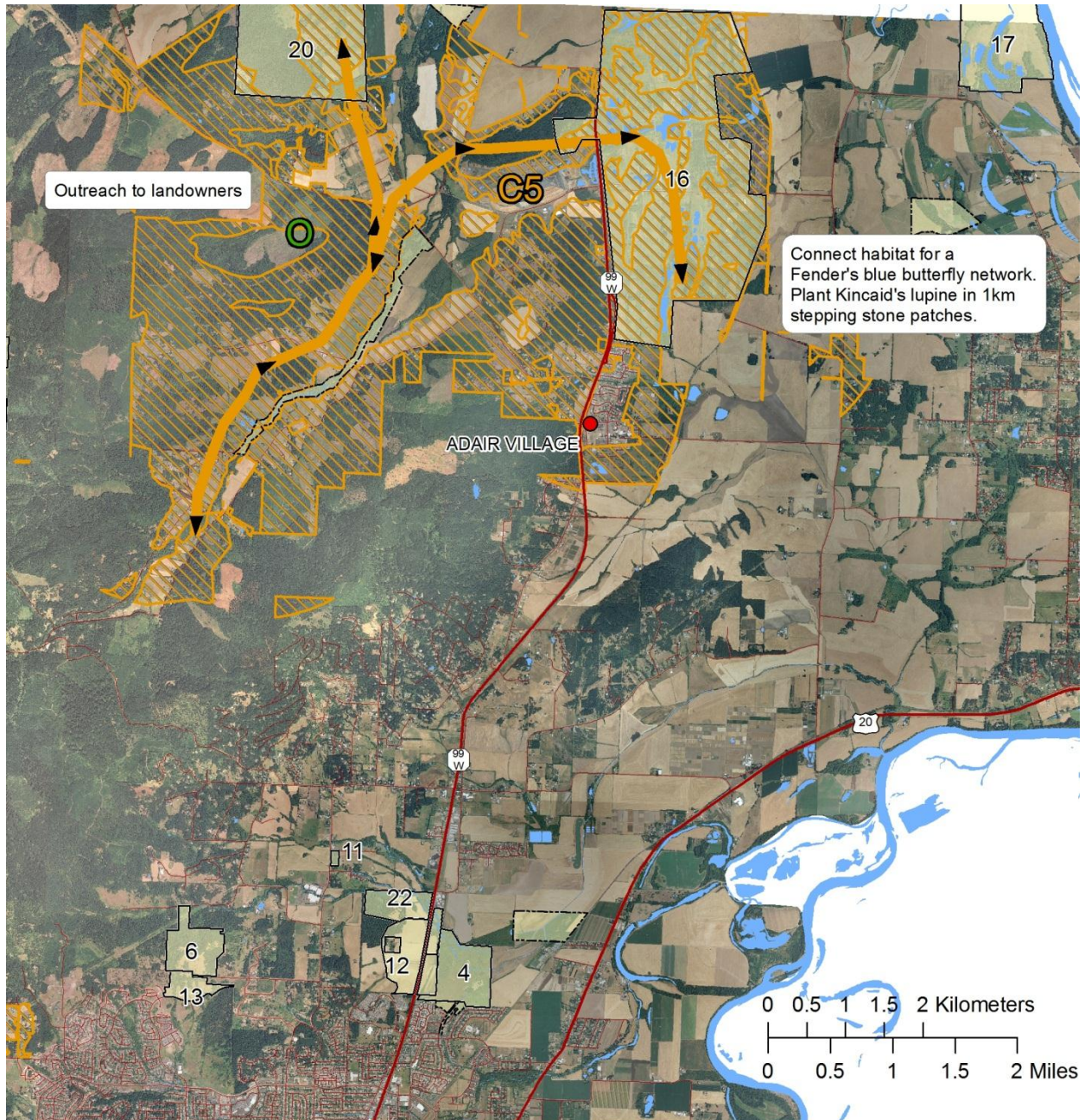


Figure 5.9 Areas of high priority for conservation actions in north Benton County

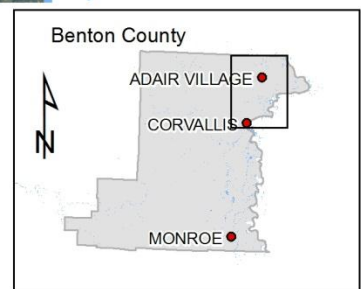


Priority conservation action

- Connect habitat in short term
- Connect habitat in long term
- Enhance habitat in short term
- Enhance habitat in long term

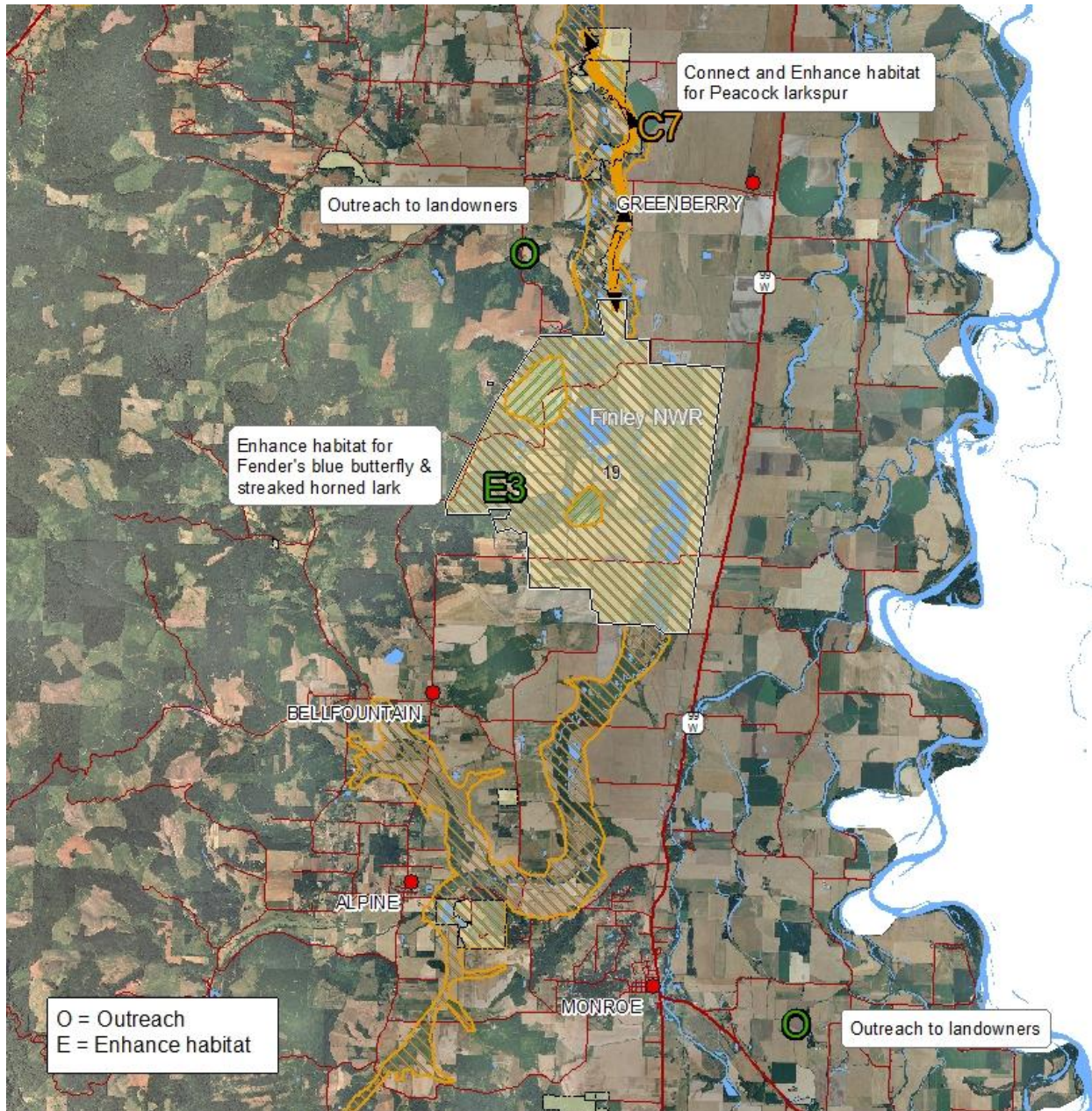
Site managed for key habitat

- Permanent protection
- Limited protection
- Outreach
- Connect habitat



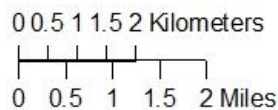
Benton County Prairie Conservation Strategy
 See Table 4-1 and 4-2 for site # key, See Chapter 5 for conservation action key
 Source: Benton County GIS, 2005 NAIP Aerial photo

Figure 5.10 Areas of high priority for conservation actions in south Benton County



Priority conservation action

- Connect habitat in short term
- Connect habitat in long term
- Enhance habitat in short term
- Enhance habitat in long term



Site managed for key habitat

- Permanent protection
- Limited protection

Benton County
 Prairie Conservation Strategy
 See Tables 4-1 and 4-2 for site # key
 See Chapter 5 for conservation action key
 Source: Benton County GIS,
 2005 NAIP Aerial photo

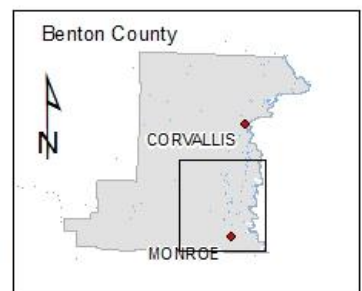
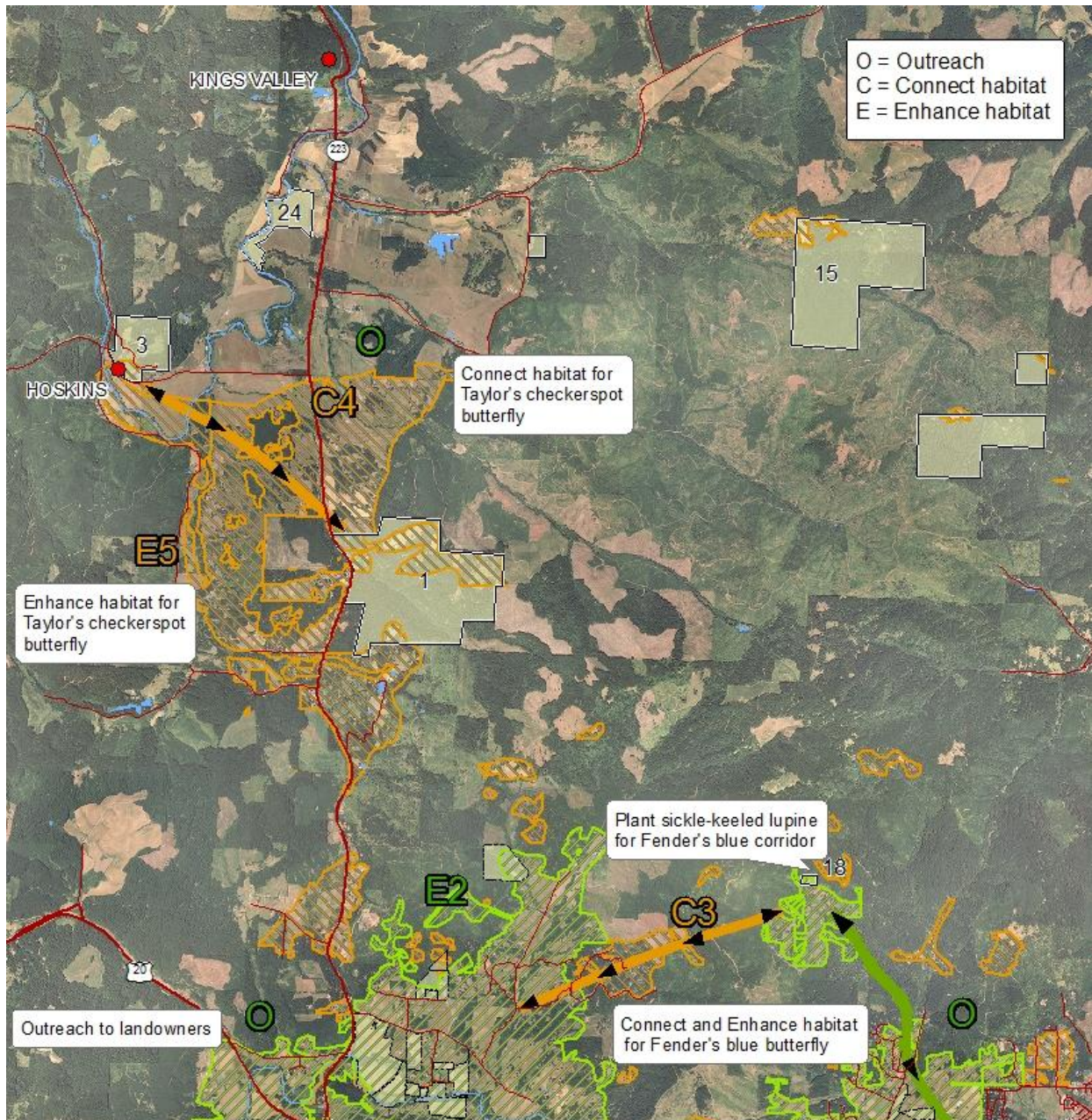


Figure 5.11 Areas of high priority for conservation actions near Kings Valley

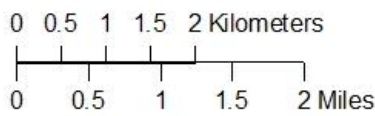


Priority conservation action

- Connect habitat in short term
- Connect habitat in long term
- Enhance habitat in short term
- Enhance habitat in long term

Site managed for key habitat

- Permanent protection
- Limited protection



Benton County
 Prairie Conservation Strategy
 See Tables 4-1 and 4-2 for site # key
 See Chapter 5 for conservation action key
 Source: Benton County GIS,
 2005 NAIP Aerial photo



Research needed

Research has been conducted on many of the key species covered by this strategy but further studies will be essential to reduce gaps in our current understanding. The Oregon Conservation Strategy (ODFW 2006) and USFWS Recovery Plan (USFWS 2010) list data gaps for specific prairie species covered in those documents.

Habitat management and restoration

- Evaluate habitat patch size and configuration for maintaining viable populations.
- Evaluate the effectiveness of prairie management techniques such as the timing and intensity of mowing, burning, and removal of woody vegetation.
- Assess the use of livestock grazing to manage prairie habitat.
- Assess the use of mowing to control vole populations in prairies.
- Evaluate the effectiveness of providing passage around barriers to migrating wildlife.
- Investigate innovative weeding methods.
- Investigate the impacts of global climate change on habitats.

Species conservation

All species

- Determine population size and trends for all Strategy species.
- Evaluate the interactions between Strategy species and introduced species, for example predation of juvenile pond turtles by bull frogs or competition for food between Western gray squirrels and Eastern gray squirrels.
- Evaluate genetic diversity within and among populations.
- Examine the effects of climate change on local populations to develop strategies for improving their resiliency.

Amphibians and reptiles

- Evaluate the impacts of disease introduced and spread by non-natives.
- Clarify impacts of pollutants and UV radiation in amphibians.

Plants

- Develop effective management techniques through demographic studies to understand effects of treatments on birth and death rates. Compare management treatments experimentally (including mowing, burning, grazing with livestock, de-thatching, reduction of grass competition) to improve best management practices for these species.
- Examine the effects of herbivory by voles and gophers on the population dynamics of target species and develop techniques to exclude or inhibit these animals, if necessary.
- Evaluate the incidence of hybridization with related species for Nelson's checkermallow, peacock larkspur, and Kincaid's lupine.

- Conduct population genetic analysis using either molecular or common garden studies on listed plant species to develop seed transfer guidelines and evaluate the need for genetic rescue of inbred populations.
- Evaluate the importance of mycorrhizae and other below-ground micro-organisms on plant performance.
- Identify the most frequent pollinator species and their habitat needs.
- Evaluate the importance of seed-eating weevils on Nelson’s checkermallow and Kincaid’s lupine and develop techniques to reduce their impact.



Nelson's checkermallow



Willamette daisy

6 Voluntary conservation tools

There are many opportunities for landowners to voluntarily conduct conservation on their own land or for interested citizens to participate in conservation on public lands. Habitat conservation actions such as removal of Douglas-fir in prairies and oak woodlands can help numerous species beyond those protected by federal and state law. Private landowners can contribute to recovery of listed species and can also provide habitat for non-listed native species. Several programs are available to help landowners with habitat conservation and management.

Landowner incentives and opportunities

Private lands conservation is essential for preserving native habitat and rare species. Several programs are available to Benton County landowners that provide technical and financial assistance for restoration and enhancement of wetlands, riparian areas and wildlife habitat. These programs are offered through a variety of state and federal agencies such as Oregon Department of Fish and Wildlife ([ODFW](#)), USDA Natural Resource Conservation Service ([NRCS](#)), USDA Farm Service Agency ([FSA](#)), and U.S. Fish and Wildlife Service ([USFWS](#)). Conservation programs often lack secure funding, therefore availability of programs can vary over time. **See links under each subject for more information.**

Several organizations offer help accessing programs and funding:

- Benton Soil and Water Conservation District ([Benton SWCD](#)) – County wide
- Greenbelt Land Trust ([GBLT](#)) – County wide habitat easements
- Long Tom Watershed Council ([LTWC](#)) – South Benton County
- Luckiamute Watershed Council ([LWC](#)) – North Benton County
- Marys River Watershed Council ([MRWC](#)) - Mid Benton County

Technical assistance programs

- **Conservation of Private Grazing Land ([CPGL](#))** – NRCS technical assistance program for private landowners with grazing lands. Unfunded as of 6/2009.
- **Conservation Technical Assistance ([CTA](#))** – NRCS technical assistance to landowners for conservation, maintenance, and improvement of natural resources.

Habitat improvement programs

- **Access and Habitat Program (A&H)** – ODFW grants for improving wildlife habitat, increasing public hunting access to private land or for solving a wildlife damage issue.
- **Conservation Incentive Program (CIP)** – BSWCD local property tax funded program to maintain and improve water and soil quality.
- **Conservation Innovation Grants (CIG)** – This nationally competitive grant program awards funds to projects that “stimulate the development and adoption of innovative conservation approaches and technologies while leveraging Federal investment in environmental enhancement and protection, in conjunction with agricultural production”.
- **Conservation Security Program (CSP)** – This NRCS program provides technical and financial assistance to agricultural producers who undertake or increase conservation actions on their lands. These actions can include increasing native pollinator plants in hedgerows or creating windbreaks for native habitat.
- **Cooperative Endangered Species Conservation Fund (Section 6)** – USFWS grants to States that may, in turn, be provided to individual landowners and groups to benefit endangered species conservation.
- **Environmental Quality Incentives Program (EQIP)** – NRCS cost share program to help landowners install or implement structural and management practices on eligible agricultural land.
- **North American Wetland Conservation Act (NAWCA)** – USFWS matching grants to organizations and individuals who have developed partnerships to carry out wetlands conservation projects.
- **USFWS Partners for Fish and Wildlife (PFW)** – USFWS provides technical and financial assistance to private landowners who are willing to work with USFWS and other partners on a voluntary basis to help meet the habitat needs of Federal Trust Species.
- **Wildlife Habitat Incentive Program (WHIP)** – A voluntary program, administered by NRCS, designed to help private landowners who want to develop and improve wildlife habitat on their lands. NRCS provides technical assistance and up to 75% match (funding) to assist with establishing and improving fish and wildlife habitat.

Easement programs

- **Conservation Reserve Program (CRP)** – This FSA program provides annual payments for 10-15 years for those landowners who retire highly erodible croplands or cropped wetlands. The intent of the program is to reduce soil erosion, reduce sedimentation into lakes and streams, improve water quality, establish wildlife habitat, and restore and enhance wetland and forest resources. Landowners are required to plant the enrolled lands with native species.

- **Conservation Reserve Enhancement Program (CREP)** – This offshoot of the CRP program retires erodible agricultural lands to enhance riparian and wetland wildlife habitat. Funds are also contributed by state and federal agencies.
- **Emergency Watershed Protection (EWP) Program** – NRCS floodplain easement program on land that has been impaired by flooding at least once in the past year or at least twice in the past 10 years. NRCS maintains a permanent conservation easement on the land and undertakes habitat restoration.
- **Forest Legacy Program (FLP)** – US Forest Service program, administered locally by ODF, provides a conservation easement payment to help protect private forest lands from development or fragmentation.
- **Grassland Reserve Program (GRP)** – Conservation easement or cost share program administered by NRCS and FSA that helps landowners and operators restore and protect grassland, including rangeland, pastureland, shrubland, and certain other lands, while maintaining the areas as grazing lands.
- **Wetlands Reserve Program (WRP)** – This program, administered by NRCS, provides a financial incentive to private landowners to restore and protect wetlands in exchange for retiring marginal agricultural lands.

Tax incentives

- **Riparian Lands Tax Incentive ([web link](#))** – An ODFW property tax incentive program for improving or maintaining qualifying riparian lands up to 100 feet from a stream. Landowners receive property tax exemption for riparian lands.
- **Wildlife Habitat Conservation and Management Program (WHCMP)** - Private landowners currently in Exclusive Farm Unit (EFU) zoning, Forestland zoning, or in designated wildlife areas can receive a reduced property tax assessment to voluntarily conserve native wildlife habitat. See the Benton County Assessor's office for more information on your property's zoning. There is no additional tax for switching to a wildlife special assessment.
- **Conservation Easement Special Assessment** – Land that has a recorded conservation easement can qualify for a reduced property tax assessment. The easement must be held in perpetuity. The property is assessed at the forestland or farm use special assessment rate.

Endangered species regulatory assurance

- **Safe Harbor Agreement (SHA)** - A Safe Harbor Agreement (SHA) is a voluntary agreement between USFWS and a non-federal landowner to promote habitat management for listed species on non-federal lands. During the term of the agreement, the landowner sets aside all or a portion of a property for listed species habitat management. By entering into the agreement, the USFWS provides the landowner with assurances that if habitat management attracts or increases the population of a listed animal species, when the agreement ends

the landowner may use the property in any legal manner that does not place the species below the baseline condition assessed at the beginning of the agreement. An agreement is only entered into when the USFWS finds the covered species will receive a net conservation benefit from the management actions to be taken by the landowner.

The USFWS has developed a programmatic Fender's blue butterfly SHA to streamline the enrollment process for private landowners (USFWS 2008a). The coverage area includes Benton County and neighboring counties.

- **Candidate Conservation Agreement with Assurances (CCAA)** - Candidate Conservation Agreements are voluntary agreements between the USFWS and non-federal landowners that encourage species conservation stewardship. A Candidate Conservation Agreement applies only to species that are candidates for listing species, e.g., the Streaked Horned Lark and Taylor's checkerspot butterfly. Some landowners may manage their property to prevent or discourage colonization of their property by candidate species because future listings can result in land use restrictions. A CCAA provides additional assurances beyond a Candidate Conservation Agreement that the property owner is assured that their conservation efforts will not result in future regulatory obligations in excess of those they agree to at the time they enter into the agreement. Non-candidate species may be included. The conservation benefits sought through the CCAA are the same as those under Safe Harbor Agreements.

Conservation Banking

A conservation bank is a parcel or parcels of land containing natural resource values that are conserved and managed in perpetuity for listed or at-risk species and their habitat. In exchange for permanently protecting an area, the landowner receives credits from USFWS that they may use to offset impacts to habitat or species in other areas or can sell the credits to others. This concept is similar to wetland mitigation banks that sell credits for impacts to wetlands from development. Generally it costs less per acre to manage a conservation bank than the equivalent acreage on many smaller isolated parcels of land. Additionally, larger acreage reserves are more likely to ensure ecosystem functions, biodiversity, and conservation of the species. Advantages of a conservation bank include:

- Streamlined permitting process
- Reduced cost of compliance with regulations
- Increased economic value of the conservation bank land
- Reduced administrative burden of permitting on regulatory agencies
- Supports endangered species recovery
- Effective management and monitoring in a preserve system
- Opportunity for large, un-fragmented, high quality habitat preservation
- Market incentive for habitat preservation, restoration, and enhancement

Habitat acquisition

Habitat acquisition from voluntary sellers is an important conservation measure that ensures long-term protection of a site. Property can be acquired outright (fee simple) by purchasing property from a willing seller or through a conservation easement whereby the current landowner retains ownership of the property but the use of that property is restricted. Non-profit groups such as The Greenbelt Land Trust, Marys River Watershed Council, Luckiamute Watershed Council, Long Tom Watershed Council, The Nature Conservancy, and Trust for Public Lands can provide assistance.

- **Acquisition, Donation, Land Exchange:** Public agencies and non-profit groups can acquire property at fair market value from a willing landowner and may accept donations of land. A land exchange usually involves trading public land for private land, but it can involve trading land between public land agencies.
- **Conservation Easement:** A conservation easement is a legal contract between the landowner who wishes to retain the land and the easement holder. Easements can be held by state or federal agencies, tribes, and non-profit groups. The landowner gives up certain development rights and agrees to certain restrictions on the property in exchange for compensation (money and/or tax benefits). The landowner can donate the conservation easement to a qualified not-for-profit organization, such as a land trust, or to a public agency. The easement can be in perpetuity or for a term of years. Landowners with a conservation easement can apply to the Benton County assessor for a special tax assessment of the property. See Tax Incentives section above.

Funding sources and assistance for voluntary acquisition

Several programs offer financial assistance with easement and acquisition projects.

- **The Oregon Watershed Enhancement Board ([OWEB](#)):** The Oregon Watershed Enhancement Board (OWEB) is a state agency that promotes and funds voluntary conservation activities around Oregon using dedicated lottery funds. Eligible applicants include any individual, organization, local government, or institute of higher education. State or federal agencies must be a co-applicant with another eligible applicant. These competitive grants require a 25% match from another funding source (OWEB, 2009). OWEB has adopted ecological priorities for acquisition funding which include upland prairies and savanna, oak woodlands, and wet prairies in the Willamette Basin. Several of the priority species identified by OWEB are key species identified in this strategy, including:
Acorn Woodpecker, American Kestrel (natural nest sites only), Chipping Sparrow, Oregon Vesper Sparrow, Short-eared Owl (nest and roost habitat only), Streaked Horned Lark, Western Meadowlark, White-breasted Nuthatch, western gray squirrel, red-legged frog, northern painted turtle, pacific pond turtle, Fender's blue butterfly,

Taylor's checkerspot butterfly, white-topped aster, golden paintbrush, peacock larkspur, Willamette daisy, Howellia, Bradshaw's lomatium, Kincaid's lupine, and Nelson's checkermallow.

- **U.S. Fish and Wildlife Service Recovery Land Acquisition Fund ([web link](#)):** The USFWS provides land acquisition funding for species covered under the Endangered Species Act that have draft or final recovery plans in place. State agencies that have a cooperative agreement with the Secretary of the Interior may apply for these acquisition funds. In addition, individuals or groups (land conservancies or conservation organizations, cities, counties, or community organizations) may be a subgrantee with a State agency that has a cooperative agreement. Funding can not be used for acquisition of lands associated with a permitted Habitat Conservation Plan. 25% non-Federal matching funds are required for individual state applications.
- **U.S. Fish and Wildlife Service Habitat Conservation Plan ([HCP](#)) Land Acquisition Program:** This program provides funds to States or subgrantees to State agencies for land acquisition in areas covered by an HCP. The funds can be used for land that is not part of mitigation required by the HCP and covers habitat for listed or candidate species. Only one proposal per HCP may be submitted, though multiple parcels may be identified.
- **National Fish and Wildlife Foundation ([NFWF](#)) – Acres for America:** In 2005, the National Fish and Wildlife Foundation partnered with Wal-Mart Stores Inc. to offset the footprint of Wal-Mart's development in the United States. These grants require a 1:1 match of cash or in-kind contribution. Conservation of important species and public access to the property is preferred.

Conservation opportunity actions

The following actions are suggested to strategically promote habitat conservation throughout Benton County.

Coordinate a Strategy outreach and implementation action plan

Action: *Conduct outreach to landowners to jumpstart priority conservation actions in Benton County.*

- Let landowners know about this Strategy through newsletters, list serves, outreach groups, OSU Extension Service, and the BSWCD.
- Utilize a citizen mentors program to provide information to local areas within the County.
- Conduct neighborhood meetings with presentations in priority areas to provide information about this Strategy to landowners.
- Post signs at project sites to provide project information to inform neighbors.

Lobby state to fund for private land conservation programs

Action: Lobby state government to fund and staff state conservation programs, such as the Wildlife Habitat Conservation and Management Program (WHCMP), which provide private lands conservation incentives.

- Property taxes in Oregon are valued and based upon the real market value of the property. Urban and suburban areas are encroaching on farm and forest lands which make these properties more valuable and therefore potentially subject to higher taxes. The Oregon legislature offers a reduced property tax assessment program to property owners in farm and forest designated areas to encourage retention of farm land and native forests. A comparable program was developed in 1997 to provide a reduced property tax incentive for landowners to conserve habitat for native wildlife. The Wildlife Habitat Conservation and Management Program (WHCMP), administered by ODFW, allows properties in areas zoned Exclusive Farm Use (EFU) or Forest Conservation (FC), and in County designated wildlife zones, to receive reduced property tax assessment for providing wildlife habitat.

Though the WHCMP incentive program provides reduced taxes, property owners give up the ability to generate income from farming or timber and must come up with funding to develop management plans or restoration actions. This reduces the long term incentive to private landowners who need technical advice on habitat management. This program could provide a greater incentive for landowner participation if state funds were dedicated to the WHCMP for staff to work with landowners.

Work to reduce regulatory disincentives to conservation

Action: Identify regulations that hinder conservation in Benton County and work with state and federal regulators to address these issues.

- An ESA listing may be a disincentive for some landowners to conserve or enhance habitat for listed species due to the possibility of future land use restrictions on their property. Safe Harbor Agreements (SHA) and Candidate Conservation Agreements with Assurances (CCAAs) were developed to reduce this disincentive by removing future land use regulation if conservation actions are implemented. These programs may not provide sufficient assurances for some landowners due to uncertainty regarding timelines, conservation actions, government involvement, or complex paperwork. Identifying and modifying regulations that hinder conservation on private lands, as well as expanding technical and financial assistance programs, can promote habitat conservation actions on private lands.

Provide clear information on regulations

Action: *Provide clear species regulatory information to local citizens in newsletters, websites, and other accessible means.*

- ESA listings are often a surprise to impacted landowners even though the listing process can take years. Information on how the listing of animal species can impact private property owners should be provided in a clear manner. The Endangered Species Act is a federal program that is regulated at the federal level, but education can happen locally.
- Examples of information:
 1. Plant species listed by state or federal endangered species laws are not protected on private lands unless they provide habitat to a listed animal species or if federal funds are involved in projects on that particular private property.
 2. The USFWS is the federal agency responsible for regulating native species that are federally listed as threatened or endangered. Impacting a protected plant species on federal land or a protected animal species or its habitat on any land requires one of three types of permit:
 - a. An incidental take permit is required when non-Federal activities will result in “take” of a threatened or endangered species. The permit application must be accompanied by a habitat conservation plan (HCP) which “ensures that the effects of the authorized incidental take are adequately minimized and mitigated” (USFWS 2008b).
 - b. An enhancement of survival permit is “required for non-Federal landowners participating in Safe Harbor Agreements or Candidate Conservation Agreements with Assurances. These agreements encourage landowners to take actions to benefit species while also providing assurances that they will not be subject to additional regulatory restrictions as a result of their conservation actions” (USFWS 2008b).
 - c. A recovery and interstate commerce permit is “issued to allow for take as part of activities intended to foster the recovery of listed species. A typical use of a recovery permit is to allow for scientific research on a listed species in order to understand better the species’ long-term survival needs. Interstate commerce permits also allow transport and sale of listed species across State lines (e.g., for purposes such as a breeding program)” (USFWS 2008b).
 3. The Oregon Department of Fish and Wildlife (ODFW) is the state agency responsible for the management of animals that are listed as threatened or endangered by the state of Oregon. Oregon regulates listed animal species only on non-federal public lands. Animals listed by the state but not by the federal government are not regulated on private lands.
 4. The Oregon Department of Agriculture (ODA) is the state agency responsible for the management of native plants that are listed as threatened or

- endangered by the state of Oregon on non-federal public lands. Plants listed by the state of Oregon are only regulated on non-federal public lands.
- a. A permit is required if a listed plant is moved across public lands, such as roads.
 - b. A permit is required for activities that involve “take” which includes transporting listed plants on public roads or transporting seeds of listed species to plant on private property.
 - c. A permit is required for any propagation/cultivation of state-listed plants.
5. The Oregon Natural Heritage Program is the state agency responsible for state listed invertebrates and in addition USFWS has granted ONHIP limited authority to manage a program for federally listed invertebrates.

Identify interest in specific conservation tools

Action: *Survey local citizens on tools that would be most valuable for conservation and provide clear information.*

- In a June 2009 survey for the Prairie Conservation Strategy (Benton County 2010), respondents wrote of their frustrations with a lack of clear information from regulators and with punitive regulations. Participants in Prairie Conservation Strategy workshops consistently requested information on endangered species conservation on their land, technical assistance and incentives for habitat conservation, and changes to portions of the US Endangered Species Act.

Provide endangered plant seeds to private landowners

"Remember that in our enlightened community there are many who would like to grow these beautiful though threatened species. We provide free land for experiments."
2009 Prairie Conservation Strategy Survey response

Action: *Work with state agencies to create a plant material registry program.*

- A plant material registry program would provide a way for private landowners to participate in recovery of listed species by planting threatened and endangered species on their land. For a program to occur, several steps would be required:
 1. ODA would administer the program.
 2. USFWS would distribute seeds to landowners with appropriate habitat and would report seed amounts and planting locations to ODA. Landowners would receive educational materials to correctly report their habitat type.
 3. Anyone receiving plant materials would be required to sign an affidavit declaring the destination of the plant material. This way, genetically appropriate plant materials would be distributed to appropriate sites and ODA would have a tracking system.
 4. Plant materials would be provided or sold by ODA permitted nurseries or vendors with materials collected in Benton County or within genetically

appropriate areas as approved by ODA. Funding for initial seed collection would need to be determined.

5. A sufficient amount of seeds would need to be in production to augment limited seed resources.
6. Minimum seed numbers would be required for planting. This would ensure sufficient establishment due to high mortality of seedlings.
7. Educational materials provided to program participants.
8. Program participants could provide voluntary feedback on planting success.

Create new conservation programs

Action: *Work to create "adopt a roadside" program.*

- Many populations of listed plants reside along roadsides due to management practices that favor open habitat. These populations are important for genetic diversity and connectivity between larger populations. Individuals or volunteer groups could "adopt" roadside populations and maintain the habitat through a registry program and be recognized for the effort. A program would require:
 1. A registry system coordinated by a local or state agency.
 2. Funds to administer a program and provide recognition to volunteers.

Action: *Work with local groups to create a habitat evaluation program.*

- Volunteers currently provide invasive plant assessments for private land owners through the Soil and Water Conservation District's Weed Spotter Program. A voluntary program to assess habitat conditions, similar to Energy Star, could be implemented by a state or local agency to determine if private landowners have native habitat. These volunteers could provide educational materials and point out sources of additional information to private landowners.

Action: *Create community equipment and knowledge share.*

- Some private landowners do not wish to work with federal or state agencies to enhance their habitat, but want technical advice and to borrow equipment. Local government, non-profit groups, or volunteers could provide information, such as printed technical information, to citizens who wish to work on their own habitat. A tool and equipment sharing program could help private landowners gain access to expensive equipment and could be run by a local conservation group who could provide educational material or on-site advice. For a program to occur there would need to be:
 1. Coordination by a local group.
 2. Equipment available for public use.
 3. Liability issues would need to be addressed.

Action: *Recognition program for exceptional habitat conservation.*

- Some private landowners have protected exceptional habitat in Benton County. A recognition program is a "pat on the back" to these landowners and their experience can provide a valuable outreach to neighboring landowners.

Action: *Conservation/recovery implementation working group.*

- Conservation working groups aim to understand and communicate ecological issues to diverse audiences. These informal groups are concerned for a

particular habitat type or species and work to promote and improve conservation. The Oregon Oak Communities Working Group and the South Puget Sound Prairie Landscape Working Group are two examples of groups working on oak and prairie conservation. A group consisting of scientists, agency personnel, land managers, and concerned citizens could provide recommendations to state and federal agencies and provide information to the general public on strategies for prairie conservation in Oregon. A Prairie Conservation Strategy implementation group made up of local partners would provide guidance and recommendations to local land managers working on habitat enhancement or species recovery.



White-topped aster © Tom Kaye



Oregon vesper sparrow © Rod Gilbert

7 Additional species resources

Amphibians

Northern red-legged frog (*Rana aurora*)

NatureServe explorer database (Accessed March 2010):

<http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Rana+aurora>

Birds

Acorn Woodpecker (*Melanerpes formicivorus*)

Cornell Lab of Ornithology (Accessed March 2010):

http://www.allaboutbirds.org/guide/Acorn_Woodpecker/id

American Kestrel (*Falco sparverius*)

Cornell Lab of Ornithology (Accessed March 2010):

http://www.allaboutbirds.org/guide/American_Kestrel/id

Chipping Sparrow (*Spizella passerina*)

Cornell Lab of Ornithology (Accessed March 2010):

http://www.allaboutbirds.org/guide/Chipping_Sparrow/id

Common Nighthawk (*Chordeiles minor*)

Cornell Lab of Ornithology (Accessed March 2010):

http://www.allaboutbirds.org/guide/Common_Nighthawk/id

Grasshopper Sparrow (*Ammodramus savannarum*)

Cornell Lab of Ornithology (Accessed March 2010):

http://www.allaboutbirds.org/guide/Grasshopper_Sparrow/id

Horned Lark (*Eremophila alpestris*)

Cornell Lab of Ornithology (Accessed March 2010):

http://www.allaboutbirds.org/guide/Horned_Lark/id

Lazuli Bunting (*Passerina amoena*)

Cornell Lab of Ornithology (Accessed March 2010):

http://www.allaboutbirds.org/guide/Lazuli_Bunting/id

Northern Harrier (*Circus cyaneus*)

Cornell Lab of Ornithology (Accessed March 2010):

http://www.allaboutbirds.org/guide/Northern_Harrier/id

Short-eared Owl (*Asio flammeus*)

Cornell Lab of Ornithology (Accessed March 2010):

http://www.allaboutbirds.org/guide/Short-eared_Owl/id

Vesper Sparrow (*Pooecetes gramineus*)

Cornell Lab of Ornithology (Accessed March 2010):

http://www.allaboutbirds.org/guide/Vesper_Sparrow/id

Western Bluebird (*Sialia mexicana*)

Cornell Lab of Ornithology (Accessed March 2010):

http://www.allaboutbirds.org/guide/Western_Bluebird/id

Western Kingbird (*Tyrannus verticalis*)

Cornell Lab of Ornithology (Accessed March 2010):

http://www.allaboutbirds.org/guide/Western_Kingbird/id

Western Meadowlark (*Sturnella neglecta*)

Cornell Lab of Ornithology (Accessed March 2010):

http://www.allaboutbirds.org/guide/Western_Meadowlark/id

White-breasted Nuthatch (*Sitta carolinensis*)

Cornell Lab of Ornithology (Accessed March 2010):

http://www.allaboutbirds.org/guide/White-breasted_Nuthatch/id

Wilson's Snipe (*Gallinago delicata*)

Cornell Lab of Ornithology (Accessed March 2010):

http://www.allaboutbirds.org/guide/Wilsons_Snipe/id

Insects

American grass bug (*Acetropis Americana*)

US Department of Agriculture, US Forest Service 2005 fact sheet (Accessed March

2010): <http://www.fs.fed.us/r6/sfpnw/issssp/documents/planning-docs/20050906-fact-sheet-acetropis-americana.doc>

Fender's blue butterfly (*Icaricia icarioides fenderi*)

USFWS fact sheet (Accessed March 2010):

<http://www.fws.gov/oregonfwo/Species/Data/FendersBlueButterfly/>

Butterfly Conservation Initiative (Accessed March 2010):

http://www.butterflyrecovery.org/species_profiles/fenders_blue/

Taylor's checkerspot butterfly (*Euphydryas editha taylori*)

Butterfly Conservation Initiative (Accessed March 2010):

http://www.butterflyrecovery.org/species_profiles/taylors_checkerspot/

Tailed copper (*Lycaena arota*)

NatureServe explorer database (Accessed March 2010):

<http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Lycaena+arota>

Field crescent (*Phyciodes pulchella*)

NatureServe explorer database (Accessed March 2010):

<http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Phyciodes+pulchella>

Mammals

Camas pocket gopher (*Thomomys bulbivorus*)

NatureServe explorer database (Accessed March 2010):

<http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Thomomys%20bulbivorus>

Western gray squirrel (*Sciurus griseus*)

Washington Department of Fish and Wildlife (Accessed March 2010):

<http://wdfw.wa.gov/wlm/diversty/soc/wgraysquirrels/index.htm>

Plants

Bradshaw's lomatium (*Lomatium bradshawii*)

Oregon State University, 2002 Oregon Flora Project Rare Plant Guide (Accessed March 2010): <http://www.oregonflora.org/rarepdfs/lombra.pdf>

Golden paintbrush (*Castilleja levisecta*)

Oregon State University, 2002 Oregon Flora Project Rare Plant Guide (Accessed March 2010): <http://www.oregonflora.org/rarepdfs/caslev.pdf>

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

Oregon State University, 2002 Oregon Flora Project Rare Plant Guide (Accessed March 2010): <http://www.oregonflora.org/rarepdfs/sishit.pdf>

Howellia (*Howellia aquatilis*)

Oregon State University, 2002 Oregon Flora Project Rare Plant Guide (Accessed March 2010): <http://www.oregonflora.org/rarepdfs/howaqu.pdf>

Kincaid's lupine (*Lupinus sulphureus* ssp. *kincaidii*)

Oregon State University, 2002 Oregon Flora Project Rare Plant Guide (Accessed March 2010): <http://www.oregonflora.org/rarepdfs/lupsulkin2.pdf>

Nelson's checkermallow (*Sidalcea nelsoniana*)

Oregon State University, 2002 Oregon Flora Project Rare Plant Guide (Accessed March 2010): <http://www.oregonflora.org/rarepdfs/sidnel.pdf>

Peacock larkspur (*Delphinium pavonaceum*)

Oregon State University, 2002 Oregon Flora Project Rare Plant Guide (Accessed March 2010): <http://www.oregonflora.org/rarepdfs/delpav.pdf>

Racemed goldenweed (*Pyrrocoma racemosa* var. *racemosa*)

Oregon State University, 2002 Oregon Flora Project Rare Plant Guide (Accessed March 2010):
<http://www.oregonflora.org/rarepdfs/pyrracrac.pdf>

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

Oregon State University, 2002 Oregon Flora Project Rare Plant Guide (Accessed March 2010):
<http://www.oregonflora.org/rarepdfs/horconcon.pdf>

Thin-leaved peavine (*Lathyrus holochlorus*)

Oregon State University, 2002 Oregon Flora Project Rare Plant Guide (Accessed March 2010):
<http://www.oregonflora.org/rarepdfs/lathol.pdf>

White-topped aster (*Sericocarpus rigidus*)

Oregon State University, 2002 Oregon Flora Project Rare Plant Guide (Accessed March 2010): <http://www.oregonflora.org/rarepdfs/astcur.pdf>

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

Oregon State University, 2002 Oregon Flora Project Rare Plant Guide (Accessed March 2010): <http://www.oregonflora.org/rarepdfs/eridecdec.pdf>



Reptiles

Pacific pond turtle (*Actinemys marmorata*)

Oregon Conservation Strategy (Accessed March 2010):
<http://www.dfw.state.or.us/conservationstrategy/turtles.asp>

Northern painted turtle (*Chrysemys picta*)

Oregon Conservation Strategy (Accessed March 2010):
<http://www.dfw.state.or.us/conservationstrategy/turtles.asp>

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<http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Chrysemys+picta>

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