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Strategy for the Cooperative Recovery of Rare Species Affecting Training Ranges:

Integrated Prairie-Oak Conservation Report for Oregon and Washington

The Nature Conservancy of Washington

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Prepared by:
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1. INTRODUCTION

1.1. **Why Prepare an Integrated Prairie-Oak Conservation Report?**

Prairie-oak habitat is one of the most imperiled habitats in the western United States. The Willamette Valley – Puget Sound – Georgia Basin (WPG) Ecoregion, which straddles Oregon, Washington and British Columbia, is host to some of the most valuable remaining prairie-oak habitat in the country. That habitat supports many rare and declining species, including four species which are candidates for US listing as endangered species.

The importance of prairie-oak habitat in the WPG Ecoregion is recognized in the Wildlife Action Plans for Oregon and Washington.[1] Both the Plans identify strategies and actions designed to preserve, rehabilitate and expand prairie-oak habitat in the Ecoregion. This Integrated Prairie-Oak Conservation Report extensively draws from, and builds upon, those Plans.

This Report is divided into four sections. This first section explains why this Report was prepared, and briefly describes the defining characteristics of prairie-oak habitat. The second section draws from Oregon and Washington's Wildlife Action Plans to list the limiting factors to prairie-oak habitat in the WPG Ecoregion, and the actions to counteract those factors. The third section, also based on the States' Wildlife Action Plans, lists the species of greatest conservation need (SGCN) which occur in the prairie-oak habitat of the WPG Ecoregion, and the actions necessary to protect those species. The fourth section then uses the previous two sections as a springboard, recommending areas where The Nature Conservancy (TNC) envisages that a coordinated, ecoregional prairie-oak conservation effort may be most effective.

The overall aim of this Report is to provide a detailed roadmap for prairie-oak habitat conservation in the WPG Ecoregion in Oregon and Washington. While the Report itself is a TNC document, and does not purport to represent the opinions of the Oregon or Washington wildlife protection agencies, TNC hopes that it will be used as a reference tool by those agencies, as well as by governmental and private landowners, land trusts, biologists and others interested in protecting prairie-oak habitat in this area. Ultimately, TNC hopes to expand this Report to include the portion of the WPG Ecoregion which lies within British Columbia, so that the whole WPG Ecoregion can be addressed in one integrated Report.

Note: Throughout this Report, references to relevant pages in the Oregon and Washington Wildlife Action Plans are respectively referred to as "OR __" and "WA __".

[1] See Oregon Department of Fish & Wildlife, *The Oregon Conservation Strategy*, February 2006, and Washington Department of Fish and Wildlife, *Washington's Comprehensive Wildlife Conservation Strategy*, September 15, 2005.

1.2. **Characteristics of Prairie-Oak Habitat**

Prairie-oak habitat is characterized by areas of locally low annual precipitation, excessively drained soils, and exposure to dry southwest winds.[2] Prairie-oak habitat can be made up of three different components: grasslands, oak savanna and oak woodlands.

Grasslands occur on dry slopes or plateaus and have well-drained sandy or loamy soils.[3] In all but the most shallow rocky soils, grasslands are maintained through disturbances such as periodic fire, soil upheaval by rodents, frostheave, wind or salt spray.[4] The vast majority of grassland has been lost in the western United States –estimated at over 90 percent loss in Washington,[5] and 99 percent loss in the Willamette Valley in Oregon.[6] The remaining grasslands are fragmented and isolated.[7]

Oak savannas are grasslands with scattered Oregon white oak trees *(Quercus garryana)*, generally only one or two trees per acre. Oak trees in savannas are usually large with well-developed limbs and canopies.[8] These trees continue to be lost, depriving species such as the western grey squirrel of valuable habitat.[9]

Oak woodlands are characterized by an open canopy dominated by Oregon white oak. The understory is generally relatively open with shrubs, grasses and wildflowers. The tree canopy of an oak woodlands obscures from 30 percent to 70 percent of the sky when looking up at it. Oak habitats are maintained through fire, which removes small conifers and maintains a low to moderate shrub cover.[10] Today, oak woodlands are found in small isolated pockets surrounded by other land uses, such as development and agriculture.[11]

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[2] WA 319
[3] OR 270
[4] OR 270
[5] WA 324
[6] OR 272
[7] OR 272
[8] OR 271
[9] OR 274, 280; WA 325
[10] OR 279
[11] OR 279

2. LIMITING FACTORS IN PRAIRIE-OAK HABITAT

The Oregon and Washington Wildlife Action Plans identify the following factors which limit prairie-oak habitat, and the conservation actions required to address those factors.

2.1. **Altered Fire Regimes**

Maintenance of grasslands is dependent in part on periodic fire. Fire suppression has led to encroachment by shrubs and conifer trees in some areas. With fire suppression, Douglas-fir encroaches into oak habitats and eventually shades out oak trees and seedlings, as well as other plants that require open growing conditions. Without active management, many grasslands and oak woodlands will eventually become conifer forests.[12]

When conditions are dry enough to use prescribed fire, there are usually concerns with risk to surrounding forests. For example, in the Willamette Valley of Oregon, prescribed fire poses challenges such as conflicts with surrounding land use, smoke management and air quality, and safety.[13]

Conservation Actions:

2.1.1. Maintain open grassland structure and open canopy oak-dominated woodlands by using multiple site-appropriate tools such as prescribed burns,[14] mowing, controlled grazing, hand-removal of encroaching shrubs and trees, or thinning. [15] For all tools, minimize ground disturbance and impacts to native species.[16]

2.1.2. Carefully evaluate individual sites to determine if prescribed fire is appropriate. Be particularly cautious in low productivity sites where recovery times are prolonged or in sites with invasive annual grasses.[17]

2.1.3. Re-introduce fire at locations and at times where conflicts such as smoke and safety concerns can be minimized.[18]

2.1.4. Carefully manage livestock grazing to maintain native plants and soil crust (cryptogrammic crust) in low cheatgrass areas. Minimize the spread of cheatgrass. Control fires in cheatgrass-dominated areas.[19]

2.1.5. Re-establish site-appropriate native grasses, herbaceous plants and shrubs.[20]

[12] OR 280
[13] OR 272
[14] WA 295, 339
[15] OR 272
[16] OR 272
[17] OR 51
[18] OR 272
[19] OR 272
[20] OR 280

2.2. **Invasive Plants**

All remaining prairie habitats are under stress from encroachment by both native and alien plants.[21]

Grasslands are impacted by invasive plants such as Scot's broom, Himalayan blackberry, mouse-ear hawkweed and pasture grasses. These are of particular concern because they can change the composition, structure and ecological processes of native plant communities.[22] Other invasives include medusahead, spotted knapweed, leafy spurge, Canada thistle, St. John's wort, tansy ragwort, evergreen blackberry, false brome, Harding grass, and tall oatgrass.[23] Most low elevation grasslands are almost entirely dominated by invasive grasses, forbs, and/or shrubs.[24]

Oak woodlands are degraded by invasive plants such as Himalayan blackberry, evergreen blackberry, Scot's broom, and false brome.[25] In many oak woodland stands, the overstory is intact but the understory is highly degraded.[26]

*Conservation Actions***:**

- 2.2.1. Identify the best remaining native grasslands and native oak woodlands and work with landowners to maintain quality and limit the spread on invasives.[27]
- 2.2.2. Emphasize prevention, risk assessment, early detection and quick control to prevent new invasives from becoming fully established.[28]
- 2.2.3. Prioritize control efforts and use site-appropriate methods to control newly-established invasive plant species.[29]
- 2.2.4. Re-seed with site appropriate native grasses and forbs after control efforts.[30]
- 2.2.5. Conduct research to determine methods to manage established species such as cheatgrass, medusahead rye, and false brome.[31]
- 2.2.6. Where appropriate, manage livestock grazing and recreational use to minimize new introductions in grasslands.[32]
- 2.2.7. Support current prevention programs such as weed-free hay certification.[33]
- 2.2.8. Develop a regional plan for the detection, rapid response and eradication of invasive species.[34]

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[21] WA 325
[22] WA 325
[23] OR 273
[24] OR 273
[25] OR 281
[26] OR 281
[27] OR 273, 281
[28] OR 273, 281
[29] OR 273, 281
[30] OR 273, 281
[31] OR 273
[32] OR 273
[33] OR 273
[34] WA 297, 340

2.2.9. Work with other public agencies and private agricultural organizations such as the Washington Farm Bureau and Washington Grange to develop basic techniques for mapping and monitoring the spread of invasive plant species over time.[35]

2.2.10. Participate in federal and state agency partnerships to develop and implement weed control strategies for impacted sites and ecosystems.[36]

2.2.11. Promote adequate funding and coordination of weed control efforts on both public and private lands using environmentally sound methods. [37]

2.2.12. Develop educational and public information materials to increase public awareness of the ways that invasive alien species are introduced to sensitive ecosystems.[38]

2.2.13. Use integrated pest management practices to control currently established invasive species with help from volunteers.[39]

2.2.14. Reduce the occurrence of European beachgrass at coastal sites used by snowy plover, streaked horned lark, and Siuslaw sand tiger beetle. [40]

2.2.15. Prescribed burning may be useful for management of some invasive species, particularly shrubs.[41]

2.2.16. Develop an invasive species implementation tool that evaluates the ecological impact and management approaches for invasive species identified as priorities.[42]

2.3. **Land Use Conversion**

Remnant low-elevation grasslands are subject to conversion to agricultural, residential or urban uses.[43] Oak woodlands continue to be converted to agricultural (especially vineyards), rural, residential, and urban uses.[44]

Conservation Actions:

2.3.1. Because many of the remaining grassland areas are privately-owned, voluntary cooperative approaches are the key to long-term conservation, using tools such as financial incentives, technical assistance, regulatory assurance agreements, and conservation easements. Use and extend existing incentive programs such as the Oregon Conservation Reserve Program and Grassland Reserve Program to conserve, manage and restore grasslands and to encourage no-till and other compatible farming practices.[45]

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[35] WA 297
[36] WA 297
[37] WA 297
[38] WA 297
[39] WA 297
[40] WA 296
[41] OR 281
[42] OR 31
[43] OR 273
[44] OR 280
[45] OR 273

2.3.2. Much of the remaining oak woodland habitat occurs on private land, so cooperative incentive programs are the best approach. Work with private landowners to maintain and restore oak habitats.[46]
2.3.3. Develop oak products compatible with conservation to promote maintenance of oak as an economic use.[47]
2.3.4. Work with local communities to plan development in a manner that conserves critical habitats.[48]
2.3.5. Support and implement existing land use regulations to preserve open spaces, recreation areas, and natural habitats which include prairie habitat.[49]
2.3.6. Prevent grazing that degrades habitat for Taylor's checkerspot, Puget Sound fritillary, and valley silverspot.[50]
2.3.7. Discourage intensive grazing of native grasslands that degrades habitat for Mazama and Brush Prairie pocket gopher.[51]
2.3.8. Determine appropriate levels of grazing for pocket gopher sites.[52]
2.3.9. Create a system for tracking land use changes over time.[53]

2.4. **Land Management Conflicts**

Resource conflicts can arise because high quality grasslands are often high quality grazing resources. Although grazing can be compatible with conservation goals, it needs to be managed carefully because Oregon and Washington's bunch-grass habitats are more sensitive to grazing than the sod-forming grasses of the mid-western prairies. Overgrazing can lead to soil erosion, changes in plant species composition and structure, and degradation by invasive plants.[54]

Conservation Actions:

2.4.1. Use incentive programs and other voluntary approaches to manage and restore grasslands on private lands.[55]
2.4.2. Manage public land grazing to maintain grasslands in good condition. [56]
2.4.3. Conduct research and develop incentives to determine grazing regimes that are compatible with a variety of conservation goals.[57]
2.4.4. Eliminate grazing in oak woodlands on public lands in the Puget Trough.[58]

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[46] OR 280
[47] OR 280
[48] OR 280
[49] OR 273
[50] WA 398
[51] WA 339
[52] WA 336
[53] OR 42
[54] OR 273-4, WA 324-325
[55] OR 274
[56] OR 274
[57] OR 274
[58] WA 340

2.4.5. Restore native grassland habitat when possible, using active work that creates local jobs where passive restoration is impractical due to grassland condition, invasive species, or other issues.[59]

2.4.6. Promote use of native plants and seed sources in conservation and restoration programs.[60]

2.4.7. Develop a cohesive, priority-driven research program for westside grassland habitats that integrates university, agency and private researchers. Inventory important grassy and herbaceous balds. Work with land management agencies and private landowners to protect these habitats from disturbance and development.[61]

2.4.8. Buffer prairies from BTk (biological pest control) spraying to protect Taylor's checkerspot, Puget Sound fritillary, valley silverspot, and hoary elfin.[62]

2.5. **Grassland Fragmentation**

Grassland habitats often occur in small patches such as roadsides and field edges. These patches are valuable habitat for some species, especially some plants. However, small size and poor connectivity of remnant patches limits dispersal for some species, and makes patches more vulnerable to potential impacts from adjacent lands (e.g., herbicide and pesticide drift).[63]

Conservation Actions:

2.5.1. Maintain high priority patches and improve connectivity when possible.[64]

2.5.2. When possible and practical, use a landscape approach in incentive programs to create buffers around key grassland patches.[65]

2.5.3. Protect key connectivity areas and wildlife corridors between fragmented habitats and between protected areas through a variety of techniques include acquisitions, conservation easements, life estates and cooperative agreements with willing landowners.[66]

2.5.4. Use statewide land cover and threats data layers to improve connectivity between priority conservation areas.[67]

2.5.5. Work with USDA Forest Service and other public landowners to protect existing roadless areas and expand the roadless area network where justified for habitat protection and connectivity.[68]

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[59] OR 274
[60] OR 274
[61] WA 293
[62] WA 339
[63] OR 274, WA 329
[64] OR 274
[65] OR 274
[66] WA 338
[67] WA 338
[68] WA 338

2.6. **Loss of Oak Woodlands Habitat Structure**

Large-diameter oak trees with lateral limb structure and cavities have been lost. In many areas, there are not sufficient numbers of replacement trees to maintain these habitat elements over time. In the absence of fire, densely-stocked regenerating oaks often do not develop open-grown structures due to shading. Grazing or very hot fires can lead to development of brushy-structured trees. The shaded or grazed oaks do not develop the lateral limbs, cavities and higher acorn crops of open-grown trees, thus are less valuable to wildlife. Woodcutting often removes snags.[69]

Conservation Actions:

2.6.1. Maintain a diversity of tree size and age across the stand, in particular large oak and ponderosa pine trees.[70]

2.6.2. Remove conifers or small oaks that are competing with larger oaks.[71]

2.6.3. Maintain snags and create snags from competing conifers to provide cavity habitat.[72]

2.6.4. Encourage oak reproduction through planting or protective exclosures.[73]

2.6.5. Improve methods to promote oak reproduction and creation of open-grown structures.[74]

2.6.6. It may be appropriate to use nest boxes as a temporary cavity habitat in oak restoration project areas.[75] Install single-cavity birdhouses and gourds to enhance purple martin and western bluebird populations.[76]

2.6.7. Develop and evaluate methods to enhance cavity development in oak trees (e.g., fungal inoculations, limbing).[77]

2.6.8. Develop and evaluate methods to determine effectiveness of snag creation from competing conifers to provide cavity-nesting habitat for oak-associated birds such as western bluebird, acorn woodpecker and slender-billed (white-breasted) nuthatch.[78]

2.7. **Human Disturbance**

A variety of human activities can impact prairie-oak habitat and their resident species. Military training and activities sometimes disturb nesting streaked horned lark, and can impact Taylor's checkerspot and other butterflies, and result in soil compaction that likely negatively affects Mazama pocket gopher.[79] Recreational activities such as offroad recreational vehicles, horses, mountain bikes, and even hikers can create unauthorized

[69] OR 280-1
[70] OR 281
[71] OR 281
[72] OR 281
[73] OR 281
[74] OR 281, 306
[75] OR 281
[76] WA 337
[77] OR 306
[78] OR 306
[79] WA 332

trails that disturb soil and allow invasive plants to establish. [80] The nature and timing of farm disturbances are increasingly hazardous to wildlife. Tilling, planting and harvesting are more synchronous, widespread and intense, thus stressing wildlife during critical periods of nesting, rearing and dispersal.[81]

Conservation Actions:

2.7.1. Limit disruptive types of recreational activity in beach areas to prevent disturbance of nesting snowy plover and streaked horned lark.[82]

2.7.2. Eliminate vehicular access and campsites in conservation areas identified as sensitive habitats, including prairies.[83]

2.7.3. In sensitive habitats, manage both land and water access by using fencing, trails, elevated boardwalks, railings, seasonal restrictions, signage and livestock restrictions.[84]

2.7.4. Reduce the amount and impact of unauthorized recreational access and use on important wildlife habitat through better enforcement of existing laws, more fencing and posting of critical habitat areas, selective road closures and increased public education and information for recreational users and user groups.[85]

2.8. **Climate Change**

The Oregon and Washington Wildlife Action Plans both contain brief references to climate change, and the fact that it could impact fish and wildlife populations in the future.[86] We understand from discussions with staff at the respective Departments of Fish & Wildlife for Oregon and Washington that more comprehensive work on the impact of climate change is currently being undertaken, and will be included in the next update of their Wildlife Action Plans.

2.9. **Impacts on Wildlife Species**

Many prairie-oak wildlife species are rare and declining, and the biological information necessary to manage and restore those species is lacking.[87] These issues are explored in the context of individual species in Section 3, Prairie-Oak Species of Greatest Conservation Need, below.

[80] WA 332
[81] WA 332
[82] WA 297
[83] WA 297
[84] WA 297
[85] WA 298
[86] OR a:48; WA 687
[87] WA 327

3. PRAIRIE-OAK SPECIES OF GREATEST CONSERVATION NEED

The following species, all of which are found in prairie-oak habitat, are identified in either or both of the Oregon and Washington Wildlife Action Plans as being species of greatest conservation need. The information contained in this section is drawn from those Wildlife Action Plans. A table summarizing the species' status appears at the end of this section.

MAMMALS

3.1. **Brush prairie pocket gopher** *(Thomomys talpoides douglasi)* – WA only.

Background (WA 69)	**Monitoring** (WA 69)
Fossorial herbivore; occurs in open areas with low herbaceous vegetation. Isolated subspecies of the northern pocket gopher; trend unknown. Limited in distribution to south-central Clark County.	No routine surveys, occurrence information from museum collections, historic research and survey projects, and scientific collection permit information.
Limiting Factors (WA 69)	**Actions** (WA 69)
• Loss and fragmentation of habitat • Trapping by landowners and mortality by pets • Genetic and demographic effects of small population size, catastrophic events • Degradation of suitable habitat	3.1.1. Protection of prairies, meadows, grasslands 3.1.2. Grassland restoration through voluntary and legal means 3.1.3. Inform local residents of gopher colonies, prohibit trapping 3.1.4. Promote non-lethal methods of damage control 3.1.5. Determine status and conduct surveys to monitor presence and relative abundance 3.1.6. Remove invasive trees, scotch broom from prairie/grassland areas

3.2. **Gray-tailed vole** *(Microtus canicaudus)* – WA only. WA Status: Candidate

Background (WA 72)	**Monitoring** (WA 73)
Medium sized vole, limited distribution, occurs in hayfields, pastures, fallow grassy areas, and grain fields. Common in limited areas. Limited in distribution to the Willamette Valley of Oregon and Clark County, WA	No formal surveys. Occurrence information from museum specimen collections, research projects and scientific collection permits
Limiting Factors (WA 73)	**Actions** (WA 73)
• Limited distribution • Lack of survey effort • Loss and fragmentation due to development • Demographic and genetic effects of small population size and disjunct	3.2.1. Small mammal surveys to detect presence and define small mammal community composition in range 3.2.2. Protect and restore habitat through legal and voluntary means 3.2.3. Evaluate/model habitat based on surveys of potentially suitable areas

3.3. **Mazama pocket gopher** *(Thomomys mazama)* – WA only. WA Status: Threatened; USA Status: Candidate species

Background (WA 70)	**Monitoring** (WA 70)
Fossorial herbivore; occurs in prairies, grasslands and alpine meadows; requires herbs and loose, dry soil for burrowing Declining; several populations extinct Occurs in the southern Puget Sound area	No routine surveys, periodic spot surveys by WDFW, limited historic by University of Puget Sound, University of Washington as part of research projects, recent local surveys by The Evergreen State College. Occurrence information from museum specimen collections, research projects, and scientific collection permits.
Limiting Factors (WA 70-71)	**Actions** (WA 70-71)
Limiting Factors • Development • Loss and fragmentation of habitat • Harvest and persecution • Trapping by landowners • Mortality by pets • Limited distribution • Genetic and demographic effects of small population size • Catastrophic events • Invasive plants • Degradation of suitable habitat	3.3.1. Conserve suitable habitat 3.3.2. Outreach and education, including informing local residents of gopher colonies 3.3.3. Enforcement of existing laws: prohibit trapping 3.3.4. Prairie/grassland restoration through voluntary and legal means 3.3.5. Promote non-lethal methods of damage control 3.3.6. Determine population status and conduct surveys to monitor presence and relative abundance 3.3.7. Remove invasive trees, scotch broom from prairie/grassland areas

3.4. **Western gray squirrel** *(Sciurus griseus)* – OR and WA. OR Status: Undetermined Status; WA Status: Threatened; USA Status: Species of Concern

Background	**Monitoring (WA)**
Habitat specialist tree squirrel, strongly associated with oak/ponderosa pine or oak/Douglas fir forests. Historical declines in Washington; occurs in 3 isolated subpopulations: Klickitat County, southern Okanogan-eastern Chelan Counties, and Fort Lewis in Pierce County. (WA 68) Needs: Oak woodland and savanna; mixed oak-pine-fir woodlands; older trees with larger limbs; continuous canopy for movement (OR 323)	Intensive surveys conducted by WDFW through research projects in Klickitat and Okanogan Counties and Fort Lewis in Thurston County. Survey and monitoring partners have included WDFW, The Nature Conservancy, University of Washington, and timber industry. (WA 68)
Limiting Factors & Data Gaps	**Actions**
Limiting Factors • Habitat loss and fragmentation (OR 323, WA 68) • Vegetation changes due to fire suppression (OR 323) • Residential and urban development (OR 323) • Limited distribution (WA 69) • Timber harvest (WA 68) • Competition from non-native eastern gray and fox squirrels (WA 68) • At risk from loss of genetic diversity, disease and demographic factors (WA 68) • Mange can cause high mortality in populations (WA 327) **Data Gaps** • Population locations and trends (OR 323) • General ecology (OR 323) • Competition and other impacts from non-native squirrels (OR 323) • Dispersal patterns and needs for canopy travel corridors (OR 323)	3.4.1. Create future survey protocols for long-term management (WA 68) 3.4.2. Protect areas with concentrations of squirrel nests from timber harvest (WA 68) 3.4.3. Provide protective buffers around trees with nests (WA 68) 3.4.4. Develop critical habitat rule (WA 68) 3.4.5. Work with counties to conserve habitat (WA 68) 3.4.6. Monitor and research population and habitat (WA 69) 3.4.7. Assess feasibility of population augmentations and implement where feasible (WA 69) 3.4.8. Monitor and control invasive animals, including limited control of eastern gray and fox squirrels (WA 68) 3.4.9. Work with private landowners to maintain and restore oak and mixed oak/pine/fir woodlands, especially large patches (OR 323) 3.4.10. Maintain and plant mast species such as Oregon white oak and California hazel (OR 323) 3.4.11. Maintain older trees with large limbs (OR 323) 3.4.12. Maintain continuous canopy within 200 feet of nest sites (OR 323) 3.4.13. Protect habitat from residential and recreational development through management plans, conservation agreements, easements, and acquisitions (WA 337)

BIRDS

3.5. **Acorn woodpecker** *(Melanerpes formicivorus)* – OR and WA (but not in Puget Trough). OR Status: Vulnerable; Federal Status: Species of Concern

Background	**Monitoring (WA only)**
Dependent on snags for nesting and roosting, cooperative breeder, acquires prey items by gleaning and fly-catching. Very localized, uncommon resident in Klickitat Co. Only confirmed nesting in WA is in Klickitat County. (WA 139) Needs: Oak woodlands with a high canopy and relatively open understory; dead limbs or snags for storing acorns. (OR 324)	No formal surveys conducted. Incidental observations and general data reported from multiple sources that visit the known WA site. (WA 140)
Limiting Factors & Data Gaps	**Actions**
Limiting Factors • Loss of oak woodlands in Willamette Valley (OR 324) • Small, localized populations (OR 324) • Competition for nesting cavities from European starlings (OR 324) • Colonial (OR 324) • Lock of information re extent of occurrence (WA 140) **Data Gaps** • Nesting ecology, especially nest site requirements (OR 324)	3.5.1. Work with private landowners to maintain and restore oak woodlands with open understories, especially large patches (OR 324) 3.5.2. Maintain snags and older trees with dead limbs (OR 324) 3.5.3. Survey oak and pine-oak woodlands in Klickitat and other counties where potentially suitable habitat occurs to determine extent of distribution in WA at northern part of its range (WA 140)

3.6. **Chipping sparrow** *(Spizella passerine)* – OR only

Background	**Monitoring**
Needs: Open areas of herbaceous understory for foraging in understory of oak woodlands (OR 327)	
Limiting Factors & Data Gaps (OR 327)	**Actions (OR 327)**
Limiting Factors • Declining populations • Loss and degradation of oak woodland habitats due to development • Loss of natural fire regimes and invasive encroachment in understory • Possibly cowbird parasitism **Data Gaps** • Effects of cowbird parasitism on productivity • Effects of feral cats in residential nesting areas • Agricultural management in agricultural areas (e.g. orchards)	3.6.1. Maintain areas of open herbaceous understory in oak woodlands 3.6.2. Control key invasive plants

3.7. **Common nighthawk** *(Chordeiles minor)* – OR only. OR Status: Critical (in Willamette Valley ecoregion only)

Background (OR 328)	**Monitoring**
Needs: Gravel bars and other sparsely vegetated grasslands for nesting; aerial insectivore prey base for foraging	
Limiting Factors & Data Gaps (OR 328)	**Actions** (OR 328)
Limiting Factors • Loss of nesting habitat • Increased predation by corvids, gulls and house cats • Reduction in prey base (aerial insects) **Data Gap** • Inventory of gravel bars along large rivers for nesting birds	3.7.1. Maintain sparsely vegetated grassland patches 3.7.2. Restore riparian and wetland habitats for insect prey base

3.8. **Grasshopper sparrow** *(Ammodramus savannarum)* – OR only. OR Status: Vulnerable

Background (OR 329)	**Monitoring**
Needs: Dry grassland habitat with low to moderate grass height and low percent shrub cover	
Limiting Factors & Data Gaps (OR 329)	**Actions** (OR 329)
Limiting Factors • Small, disjunct populations • Loss of grassland habitats due to conversion and tree/shrub encroachment • Nesting failure due to timing of land use practices (e.g., mowing, haying, spraying) **Data Gaps** • Complete population inventory and habitat evaluation • Effects of habitat patch size on abundance and productivity • Effectiveness of planting mixtures to favor this species • Impact of grazing and agricultural management on productivity	3.8.1. Maintain or restore grassland habitat 3.8.2. Increase plant diversity for greater insect diversity 3.8.3. Maintain high percent native grass cover and <10% shrub cover in patches >20 acres 3.8.4. Delay mowing and other field management until after July 15 at known nesting areas 3.8.5. Control key invasive plants

3.9. **Oregon vesper sparrow** *(Pooecetes gramineus affinis)* – OR and WA. OR Status: Critical; WA Status: Candidate animal; US Status: Species of Concern

Background	**Monitoring (WA only)**
A ground-dwelling species that breeds in dry, open habitats with short, sparse and patchy herbaceous vegetation; some bare ground; and scattering of low to moderate shrubs. In danger of extirpation. Occupies remnant prairies and grasslands in western Washington. (WA 153) Needs: Grasslands for foraging and nesting, usually with scattered shrubs and trees and some bare ground (OR 332)	No formal surveys conducted. Incidental observations, data and combined surveys from streaked horned lark research (Rogers 2000), BBS routes, and other neotropical migrant surveys. (WA 153)
Limiting Factors & Data Gaps	**Actions**
Limiting Factors • Small disjunct populations (OR 332) • Loss and degradation of grassland habitats due to invasive plants and lack of fire (OR 332, WA 153) • Nesting failure due to timing of land management practices (OR 332) • Conversion of prairie habitat to residential development, farmland (WA 153) • Potential threat from herbicide and pesticide spraying (WA 153) **Data Gap** • Impact of grazing and agricultural management on productivity (OR 332)	3.9.1. Maintain and restore grassland habitat (OR 332, WA 153) 3.9.2. Increase plant diversity for greater insect diversity (OR 332) 3.9.3. Control key invasive plants (OR 332) 3.9.4. Use easements, acquisitions, or agreements to conserve habitat (WA 153) 3.9.5. Minimize disturbance during nesting season (4/15-7/15) at known nesting areas (OR 332) 3.9.6. Conduct research to evaluate potential exposure to toxins from pesticide and herbicide applications (WA 153)

3.10. **Purple martin** *(Progne subis)* – OR and WA. OR Status: Critical. WA Status: Candidate. US Status: Species of concern

Background	**Monitoring (WA only)**
Secondary cavity user. Primarily depends on artificial nest structures. Occurs in Puget Trough, Grays Harbor, Willapa Bay and lower Columbia River. (WA 145) Needs: Abundant cavities for colonial nesting. Proximity to water or large, open areas for foraging. (OR 334)	Local intensive surveys of artificial nest boxes and natural nests. Otherwise, no formal surveys conducted. Incidental observations and data from BBS routes and other neotropical migrant surveys. (WA 146)
Limiting Factors & Data Gaps	**Actions**
Limiting Factors • Loss of nesting cavities (OR 334, WA 146) • Competition with Europeans starlings and house sparrows for nest cavities (OR 334, WA 146) • Adequate aerial insect prey base (OR 334) **Data Gaps** • Complete inventory of distribution (OR 334) • Ability to attract migrating birds with nesting structures (OR 334)	3.10.1. Create and maintain appropriate snags (OR 334) 3.10.2. Maintain nest box programs for cavity habitat in the short-term (OR 334, WA 146) 3.10.3. Design and place nest boxes to minimize use by starlings (OR 334) 3.10.4. Trap and kill European starlings and house sparrows near remaining and former breeding areas of martins (WA 146)

3.11. **Short-eared owl** *(Asio flammeus)* – OR only.

Background (OR 332)	**Monitoring**
Needs: Large expanses of marshes and wet prairies for foraging and nesting	
Limiting Factors & Data Gaps (OR 332)	**Actions** (OR 332)
Limiting Factors • Loss of large expanses of wetland (marsh and wet prairie) habitat • Small population • Nests and communally roosts on ground, which makes species vulnerable to disturbance **Data Gaps** • Complete breeding season inventory of suitable nesting habitat • Habitat relationships of breeding and wintering birds	3.11.1. Maintain and restore wetland habitats, with an emphasis on maintaining large patches and/or expanding smaller ones 3.11.2. Minimize disturbance at known communal roost sites

3.12. **Slender-billed white-breasted nuthatch** *(Sitta carolinensis aculeate)* – OR and WA. WA Status: Candidate animal

Background	**Monitoring (WA)**
Secondary cavity user for nest sites, very local, rare and in decline in w. Washington (WA 146) Confined to Vancouver WA vicinity, especially Ridgefield NWR. Rare and local in Skamania Co.; may be extirpated in Steilacoom/Fort Lewis area. (WA 146) Needs: Mature oaks for foraging and nesting cavities (OR 333)	No formal surveys conducted. Incidental observations and general data reported from multiple sources. Will develop protocol when and if reintroduced.
Limiting Factors & Data Gaps	**Actions**
Limiting Factors • Habitat loss: fewer mature oaks, fewer cavities (OR 333, WA 146) • Limited distribution (WA 146) • Lack of Information (WA 146) • Conversion of oak and oak-conifer woodlands (WA 146) • Small size and isolation of Washington populations (WA 146) • Current status is unclear without systematic surveys (WA 146) **Data Gap** • Patch size requirements (OR 333)	3.12.1. Maintain large oaks >22 in. dbh. (OR 333) 3.12.2. Develop nest box programs for cavity habitat in the short term (OR 333) 3.12.3. Work with landowners to incorporate conservation of this species and oak woodlands into long-term land management (WA 147) 3.12.4. Conduct feasibility study for reintroductions (WA 147) 3.12.5. Implement translocations (WA 147) 3.12.6. Conduct surveys where pairs were historically found, characterize habitat, and identify additional areas to target surveys (WA 147) 3.12.7. Assess factors that may account for loss of pairs at formerly occupied sites (WA 147)

3.13. **Streaked horned lark** *(Eremophila alpestris strigata)* – OR and WA. OR Status: Critical; WA Status: Endangered; USA Status: Candidate species

Background	**Monitoring (WA)**
Breeds on remnant prairie and grassland of south Puget Sound, coastal beaches and islands in the lower Columbia; winters in Oregon and on lower Columbia sites. (WA 144) Entire population about 330 birds in Washington, and 450 in Oregon. (WA 144) Local breeder in remnant grasslands in prairies and beaches of western Washington. Endemic subspecies of Washington and Oregon; likely extirpated in British Columbia. (WA 144) Populations have been extirpated from San Juan Islands and most of Puget Trough. (WA 145) Needs: Open, treeless expanse of sparsely vegetated grassland areas (including bare ground patches) for nesting and foraging. (OR 333)	Current intensive monitoring and research by Scott Pearson, WDFW, formerly WADNR. Previous rangewide surveys by Russell Rogers (1999 and 2000), WDFW and formerly The Evergreen State College and WDFW P. MacLaren (2000).
Limiting Factors & Data Gaps	**Actions**
Limiting Factors • Loss of habitat to development (WA 144, OR 333) • Fire suppression (WA 144) • Introduction of exotic plants (WA 144) • Dense growth of European beachgrass reduces nesting and foraging beach habitat (WA 145) • Disturbance of nesting beaches by recreational activity (WA 145) • Crow predation on nests (WA 145) • Limited distribution and declining populations (WA 145, OR 333) • Nesting failure due to timing of land management practices (e.g. mowing, haying, spraying) (OR 333) **Data Gaps** • Identification of factors limiting nest success and post-fledgling survival (OR 333) • Habitat relationships of wintering birds (OR 333)	3.13.1. Conserve and restore function to remaining prairie habitat (WA 144, OR 333) 3.13.2. Protect and manage dredge spoil islands in Columbia River as nesting habitat (WA 144) 3.13.3. Control and monitor invasive species, e.g. reduce the occurrence of European beachgrass in coastal areas (WA 145, OR 333) 3.13.4. Develop conservation strategies with Joint Base Lewis McChord, and area airports in Washington (WA 144) 3.13.5. Minimize disturbance during nesting season (4/15- 7/15) at known nesting areas, including public beaches (OR 333, WA 145) 3.13.6. Create nesting areas (OR 333) 3.13.7. Conduct predator control programs as necessary (WA 145) 3.13.8. Where habitat is restored, reintroduce populations to formerly occupied sites (WA 145) 3.13.9. Increase plant diversity for greater insect diversity (OR 333) 3.13.10. Designate locations to manage core populations (OR 333)

3.14. **Western bluebird** *(Sialia Mexicana)* – OR and WA. OR Status: Vulnerable; WA Status: Monitor

Background	**Monitoring (WA)**
Inhabits open, park-like forests and edge habitats with sufficient number of larger trees and snags to provide nest and perch sites; secondary cavity user. Locally fairly common and widely distributed summer resident in e. Washington and c. and SW. Washington except for high elevation, dense forests, and the Columbia Basin. Inhabits woodland/prairie mosaic and Puget Sound Douglas-fir in w. Washington. (WA 149) Needs: Grasslands and oak savannas for foraging, cavities, especially in savanna oaks for nesting, scattered trees or shrubs as hunting perches. (OR 334)	Intensive nest box monitoring in Pierce and Thurston Counties by George Walter. Similar efforts by NGOs at local sites throughout the state, especially Klickitat County. No formal surveys conducted. Incidental observations and data from BBS routes and other neotropical migrant surveys. (WA 149)
Limiting Factors & Data Gaps	**Actions**
Limiting Factors • Habitat loss (OR 334, WA 149) • Degradation due to invasive non-native plants (OR 334) • Clearcut logging (WA 149) • Fire suppression (WA 149) • Snag removal (WA 149) • Commercial and residential development (WA 149) • Competition for nest cavities in snags and birdhouses by European starlings and house sparrows (WA 150) **Data Gap** • Location and factors key to success for natural cavity-nesting pairs (OR 334)	3.14.1. Conserve/restore habitat by management of snags and using prescribed fire (OR 334, WA 149) 3.14.2. Maintain oaks >22 inches dbh (OR 334) 3.14.3. Create snags from competing conifers (OR 334) 3.14.4. Conserve habitat for primary cavity excavators in order to provide nest sites (WA 149) 3.14.5. Provide nest boxes as short term solution to cavity limitation (OR 334, WA 149) 3.14.6. Design nest boxes to minimize use by starlings (OR 334) 3.14.7. Trap and kill European starlings and House Sparrows near remaining and former breeding areas of bluebirds (WA 150) 3.14.8. Install single cavity birdhouses and gourds to enhance bluebird populations (WA 150) 3.14.9. Conduct surveys to determine trend in population and whether listing is needed (WA 150)

3.15. **Western meadowlark** *(Sturnella neglecta)* – OR only. OR Status: Critical

Background (OR 334)	**Monitoring**
Needs: Large expanses of grasslands for foraging and nesting due to relatively large home range requirements; scattered shrubs, trees or posts for singing perches.	
Limiting Factors & Data Gaps (OR 334)	**Actions** (OR 334)
Limiting Factors • Declining populations • Loss and degradation of grassland habitats • Nesting failure due to timing of land management practices (e.g., mowing, haying, spraying) **Data Gap** • Impact of grazing and agricultural management on productivity	3.15.1. Maintain or restore grassland habitat – especially large expanses of habitat (e.g., >100 acres) 3.15.2. Increase plant diversity for greater insect diversity 3.15.3. Control key non-native plants 3.15.4. Minimize disturbance during breeding season (4/15 – 7/1) at known areas

REPTILES

3.16. **Pacific gopher snake** *(Pituophis catenifer catenifer)* – WA only.

Background (WA 163)	**Monitoring** (WA 163)
Inhabited prairie and dry woodland; winters in communal dens. Probably extirpated. Distribution in south Puget Sound prairies.	Occasional surveys in south Puget Sound prairies by WADNR Natural Heritage and WDFW
Limiting Factors (WA 163)	**Actions** (WA 163)
Limiting Factors • Lack of information	3.16.1. Determine and map distribution 3.16.2. Develop a formal species-specific protocol; use it to conduct systematic surveys to determine if any extant population

3.17. **Racer (snake)** *(Coluber constrictor)* – WA only.

Background (WA 159)	**Monitoring** (WA 159)
Diurnal snake of grassland and talus; high fidelity to communal winter dens. Probably extirpated; no records since 1939. Distribution in south Puget Sound prairies.	Occasional surveys in south Puget Sound prairies by WADNR Natural Heritage and WDFW.
Limiting Factors (WA 159)	**Actions** (WA 159)
Limiting Factors • Lack of information about life history and habitat; not seen in western Washington for >65 years.	3.17.1. Determine and map distribution 3.17.2. Develop a formal species-specific protocol; use it to conduct systematic surveys to determine if any extant population

3.18. **Western rattlesnake** *(Crotalus viridus)* – OR only. OR Status: Critical (in Willamette Valley only)

Background (OR 336)	**Monitoring**
Needs: Dry areas with low or sparse vegetation. Rocky areas for basking, refuge den sites and hibernacula	
Limiting Factors & Data Gaps (OR 336)	**Actions** (OR 336)
Limiting Factors • Habitat loss • Eradication efforts **Data Gap** • Locations of remnant western rattlesnake populations and hibernacula	3.18.1. Maintain or restore low grassland habitat near rocky areas 3.18.2. Minimize disturbance at key den and hibernacula sites

AMPHIBIANS

3.19. **Foothill yellow-legged frog** *(Rana boylii)* – OR only. OR Status: Critical in Willamette Valley, Vulnerable elsewhere; US Status: Species of concern

Background (OR 338)	**Monitoring**
Needs: Slow-moving streams with coarse-substrate gravel bars, bedrock substrate with potholes, and low-flow backwaters.	
Limiting Factors & Data Gaps (OR 338)	**Actions** (OR 338)
Limiting Factors • Habitat loss due to habitat loss from inundation and other hydrogeologic factors • Loss of gravel bars and low-flow nursery areas • Sedimentation **Data Gaps** • Current distribution • Non-breeding season habitat • Overwintering habitat • Feasibility studies on reintroduction at historic sites • Comparison of population dynamics and natural history between populations toward center of range (Klamath Mountains ecoregion) and those at the northern end of the range (Willamette Valley and West Cascades ecoregion)	3.19.1. Maintain natural water flow patterns and streamside vegetation and protect from other impacts at priority breeding sites 3.19.2. Especially for West Cascades and Willamette Valley: use results of feasibility studies to guide specific conservation actions and management decisions for reintroductions

3.20. **Northern red-legged frog** *(Rana aurora)* – OR only. OR Status: Vulnerable; US Status: Species of concern

Background (OR 339)	**Monitoring**
Needs: Ponds and wetlands with shallow areas and emergent plants. Access to forested habitats (forested wetland, upland)	
Limiting Factors & Data Gaps (OR 339)	**Actions** (OR 339)
Limiting Factors • Loss of egg-laying habitat • Predation and competition by invasive fish and bullfrogs **Data Gaps** • Identify overwintering habitat • Clarify impacts of pollutants, ultraviolet radiation and parasites on populations	3.20.1. Maintain wetland habitat with emergent plants 3.20.2. Maintain adjacent forested habitats 3.20.3. Control bullfrogs and invasive fish and key sites

3.21. **Oregon spotted frog** *(Rana pretiosa)* – OR and WA. OR Status: Species of Concern; WA Status: Endangered. US Status: Candidate species

Background	**Monitoring (WA only)**
Highly aquatic; extant populations inhabit large shallow wetlands associated with streams; breeds in seasonally flooded margins, moves underwater in winter. Requires source of well-oxygenated water in winter, temperatures above freezing. Declined; only 6 populations remain in Thurston and Klickitat counties. (WA 172) Needs: Permanent ponds, marshes and meandering streams through meadows for breeding and foraging, especially with shallow water and a bottom layer of dead and decaying vegetation. Springs and other sites with low, continuous water flow for overwintering. (OR 339)	Annual egg mass surveys conducted at 5 of 6 known populations by WDFW, WADNR Natural Heritage Program, USFWS. Decade long population study at Dempsey Creek by WDFW. Spring trapping surveys conducted in Black River Watershed to find new populations and determine dispersal patterns by WDFW. (WA 172)
Limiting Factors & Data Gaps	**Actions**
Limiting Factors • Slow to reach reproductive maturity. (OR 339) • High fidelity to egg-laying sites. (OR 339) • Predation and competition by invasive fish and bullfrogs. (OR 339) • Siltation. (OR 339) • Some populations are isolated and vulnerable to inbreeding and extinction. (OR 339) • Livestock grazing removes cover along stream edges and allows sediment and excessive aquatic vegetation to decrease habitat value. (OR 339) • Altered hydrology can eliminate habitat. (WA 172) • Potential impacts of land use, etc not understood. (WA 172) • Loss of beaver and beaver ponds may be important. (WA 172) **Data Gaps** • Impacts of invasive fish and bullfrogs (OR 339) • Documentation of historic sites, and current range status (OR 339) • Feasibility studies on reintroduction at historic sites (OR 339) • Population trends (WA 327)	3.21.1. Maintain vegetation buffers around known populations (OR 339) 3.21.2. Control bullfrogs and invasive fish at priority sites (OR 339, WA 172) 3.21.3. Install small predator exclosures over parts of isolated breeding sites. (OR 339) 3.21.4. Use results of feasibility studies to guide specific conservation actions and management decisions for reintroductions (OR 339) 3.21.5. Conserve beaver populations and dynamic stream processes (WA 172) 3.21.6. Investigate limiting factors (WA 172)

3.22. **Western toad** *(Anaxyrus boreas; formerly Bufo boreas)* – WA only. WA Status: Candidate. US Status: Species of Concern

Background (WA 170)	**Monitoring** (WA 170)
Breed in ponds, lakes and still water off-channel river habitats; development to metamorphosis takes about 2 months, after which toadlets disperse en masse. Locally common, but rapid unexplained declines resulted; absent from portions of historic range. Distribution in forest, prairie and canyon grasslands throughout WA; mostly absent from shrub-steppe regions.	No formal statewide inventory. Annual monitoring activities on Tahuya State Forest and Ft. Lewis Military Reservation by WADNR Natural Heritage Program and WDFW. Ongoing research activities at Mt. St. Helens by USDA Forest Service. Ongoing surveys to locate breeding sites by WADNR Natural Heritage Program and WDFW. Occasional monitoring activities by some districts of the Colville National Forest.
Limiting Factors (WA 170)	**Actions** (WA 170)
Limiting Factors • Taxonomic uncertainty may mean one or more taxa are in greater decline; causes of declines not understood; distributional data needed. • Roadkill mortality when moving to and from breeding sites.	3.22.1. Survey and map distribution 3.22.2. Conduct genetic studies 3.22.3. Avoid road building near breeding sites, or provide crossings

INVERTEBRATES

3.23. **American grass bug** *(Acetropis Americana)* – OR only. US Status: Species of concern

Background (OR 350)	**Monitoring**
Needs: Wet prairies, especially dominated by tufted hairgrass	
Limiting Factors & Data Gaps (OR 350)	**Actions** (OR 350)
Limiting Factors • Loss of wet prairie habitat **Data Gaps** • Undetermined	3.23.1. Maintain or restore wet prairie habitat

3.24. **Dog star skipper (butterfly)** *(Polites sonora siris)* – WA only.

Background (WA 216)	**Monitoring** (WA 216)
Grasslands, forest glades. Grasses are larval food plant. Reduced populations in other states; status in WA is unknown. Distribution: western WA lowlands.	Incidental surveys for a few sites in recent years while conducting searches for other rare butterflies using similar habitat that have overlapping flight times.
Limiting Factors (WA 216)	**Actions** (WA 216)
Limiting Factors • Herbicides along roadsides • Exotic species • Survey and identification expertise not widely held • Current distribution not known	3.24.1. Identify limiting factors 3.24.2. Identify sites for protection 3.24.3. Develop management recommendations 3.24.4. Survey historic sites and potential habitat 3.24.5. Determine and map distribution

3.25. **Fender's blue (butterfly)** *(Icaricia icarioides fenderi)* – OR only. US Status: Endangered

Background (OR 350)	**Monitoring**
Needs: Seasonally wet native prairies; requires Kincaid's lupine as a host plant	
Limiting Factors & Data Gaps (OR 350)	**Actions** (OR 350)
Limiting Factors • Habitat loss • Habitat degradation due to invasive plants **Data Gaps** • Undetermined	3.25.1. Maintain and restore wet prairie habitat and populations of Kincaid's lupine 3.25.2. Use caution when implementing gypsy moth control in nearby forests

3.26. **Hoary elfin (butterfly)** *(Incisalia polia obscura)* – OR and WA

Background	**Monitoring (WA only)**
Found in prairies, heaths; larval host is kinnikinnick; flight period April-May. Few populations known. Distribution in South Puget Sound and Kitsap Peninsula of Washington. (WA 224) Needs: coastal bluffs. (OR 350)	Incidental surveys for a few sites in recent years while conducting searches for other rare butterflies using similar habitat that have overlapping flight times. No populations are regularly monitored. (WA 224)
Limiting Factors & Data Gaps	**Actions**
Limiting Factors • Narrow distribution (subspecies is endemic) (OR 350, WA 224) • Isolation of populations (WA 224) • Habitat loss due to residential development (OR 350, WA 224) • Habitat degradation due to fire suppression (OR 350) • Invasive plants (OR 350) **Data Gap** • Life history (OR 350)	3.26.1. Determine and map current distribution and potential habitat (WA 224) 3.26.2. Conserve known sites of occurrence and suitable habitat (OR 350, WA 224) 3.26.3. Restore degraded habitat – prairies, heaths and woodlands (WA 224) 3.26.4. Restore coastal bluff grasslands (OR 350)

3.27. **Island marble (butterfly)** *(Euchloe ausonides insulanus)* – WA only. WA Status: Candidate; US Status: Species of concern

Background (WA 219)	**Monitoring** (WA 219)
Grassland associate. Extremely rare: 2 or 3 known populations. Distribution: north Puget Sound.	Systematic searches of all potential habitat were conducted in 2005; a few sites have been searched in multiple years. All known sites were monitored in 2005.
Limiting Factors (WA 219)	**Actions** (WA 219)
• Limited distribution • Limited habitat • Specific limiting factors not known	3.27.1. Determine and map distribution 3.27.2. Conserve suitable habitat 3.27.3. Continue searching for new populations and monitoring extant populations 3.27.4. Determine threats to larval food plants, occupied sites and nectar species 3.27.5. Seek easements, management agreements 3.27.6. Education 3.27.7. Volunteer programs

3.28. **Mardon skipper (butterfly)** *(Polites mardon)* – WA only. WA Status: Endangered. US Status: Candidate species

Background (WA 215)	**Monitoring** (WA 215)
Associated with grassland. Grasses are larval food plant. Population endangered. Distribution: two disjunct areas in WA, south Puget Sound and vicinity of Mt. Adams.	Ongoing surveys to determine distribution and range in southern Puget Sound and in the southern Cascades. Limited monitoring of population on WDFW-managed site. Developed survey protocol.
Limiting Factors (WA 215)	**Actions** (WA 215)
• Grassland conversion • Recreational use • Inappropriate grazing • Fire • Exotic grasses and weeds	3.28.1. Determine appropriate levels of grazing
	3.28.2. Benefits of military training to maintain and enhance populations (Ft. Lewis)
	3.28.3. Conduct full surveys of western WA grasslands and heath/shrublands with respect to the distribution, habitat, and management requirements
	3.28.4. Control exotic species

3.29. **Oregon branded skipper (butterfly)** *(Hesperia Colorado oregonia)* – WA only.

Background (WA 214)	**Monitoring** (WA 214)
Grasslands, glacial outwash prairies, grasses are larval food plant. Very irregular and rare. Distribution: southwestern WA lowlands, San Juan Islands.	Incidental surveys for a few sites in recent years while conducting searches for other rare butterflies that have overlapping flight times.
Limiting Factors (WA 214)	**Actions** (WA 214)
Limiting Factors • Invasive species • Survey and identification expertise not widely held • Distribution, biology, needs poorly known	3.29.1. Identify sites for protection
	3.29.2. Develop management recommendations
	3.29.3. Control invasives and exotics
	3.29.4. Survey historic sites and potential habitat
	3.29.5. Determine and map distribution
	3.29.6. Research natural history and conservation

3.30. **Oregon silverspot (butterfly)** *(Speyeria zerene hippolyta)* – OR and WA

Background	**Monitoring (WA)**
Associated with coastal grasslands / salt-spray meadows. (OR 351, WA 227) Depends on 2 species of violet as host plant (early blue and western blue). (OR 351) Spruce trees adjacent to meadows serve as shelter and windbreaks. (OR 351) Population endangered. Extirpated from Washington. Distribution in coastal dunes and grasslands south of Westport, WA. (WA 227)	Searches were conducted irregularly during the 1980's; regular searches were conducted during the 1990's.
Limiting Factors & Data Gaps	**Actions**
Limiting Factors • Habitat loss due to development (OR 351) • Recreation (OR 351) • Fire suppression that allows grass to overshadow early blue violets (OR 351) • Accelerated succession due to dune stabilization (WA 227) • Exotic species (WA 227) **Data Gap** • Management techniques for violet host plants	3.30.1. Continue to implement actions identified in recovery plan (OR 351) 3.30.2. Protect known sites, with long-term management to maintain suitable habitat characteristics and monitoring (OR 351) 3.30.3. Work to restore habitat at sites on the Long Beach Peninsula, WA (WA 227) 3.30.4. Coordinate with USFWS to facilitate reintroduction into Washington from Oregon (WA 227) 3.30.5. Restore degraded habitats (WA 227) 3.30.6. Increase distribution (WA 227)

3.31. **Propertius' duskywing (butterfly)** *(Erynnis propertius)* – WA only.

Background (WA 213)	**Monitoring** (WA 213)
Associated with Garry oak (*Quercus garryana*). Eastern WA: Not uncommon where oaks remain intact, Western WA: Declining, few isolated populations. Distribution: Garry oak stands: low-elevation Eastern Cascades, primarily south of I-90; and patchily distributed sites in Puget Sound.	Incidental surveys in recent years while conducting searches for other rare butterflies using similar habitat that have overlapping flight times. Focal searches have occurred in SW WA small oak patches. Target species of recent academic study researching gene flow, abundance, and range impacts from climate change.
Limiting Factors	**Actions**
• Limited habitat (WA 213) • Survey and identification expertise not widely held (WA 214) • Current distribution unknown (WA 214) • Oak stands being logged or cleared for development (WA 214) • Encroachment/overtopping by Douglas fir (WA 214)	3.31.1. Conserve suitable habitat through easements, management agreements (WA 213) 3.31.2. Restore edge and understory habitat (WA 213) 3.31.3. Survey historic sites and potential habitat (WA 214) 3.31.4. Determine and map distribution (WA 214) 3.31.5. Conserve suitable habitat through easements, management agreements (WA 214) 3.31.6. Remove firs (WA 214) 3.31.7. Education (WA 214) 3.31.8. Volunteer programs (WA 214)

3.32. **Puget (Blackmore's) blue (butterfly)** *(Icaricia icarioides blackmorei)* –WA only

Background	**Monitoring**
Grassland associated with Lupines. Populations isolated, uncommon, declining. Distribution in Southern Puget Sound lowlands and Olympic Mountains. (WA 225)	Coordinated searches have occurred on south Puget Sound grasslands over the last few years. Research being conducted on life history, captive rearing and behavior. No monitoring of Olympic Mountain populations. (WA 225)
Limiting Factors	**Actions**
Limiting Factors • Invasive exotic plant species (WA 225) • Habitat loss and degradation (WA 225)	3.32.1. Conserve suitable habitat (WA 225) 3.32.2. Restore degraded habitat (WA 225) 3.32.3. Manage grassland habitats to maintain *Lupinus albicaulis* in southern Puget Sound (WA 225)

3.33. **Puget Sound fritillary (butterfly)** *(Speyeria cybele pugetensis)* –WA only. WA Status: Monitor

Background	**Monitoring (WA)**
Inhabits grasslands and edges of oak woodlands and forest openings. Population status unknown. Distribution in southern Puget Sound lowlands. (WA 226)	Incidental surveys for a few sites in recent years while conducting searches for other rare butterflies using similar habitat that have overlapping flight times. No populations are regularly monitored. (WA 226)
Limiting Factors	**Actions**
• Habitat Loss and degradation (WA 226) • Development (WA 226) • Invasive species (WA 226)	3.33.1. Conserve suitable habitat (WA 226)
	3.33.2. Restore degraded habitat (WA 226)
	3.33.3. Determine and map distribution (WA 226)
	3.33.4. Survey, identify, and protect additional sites (WA 226)
	3.33.5. Control and monitor invasive species (WA 226)
	3.33.6. Develop management recommendations (WA 226)

3.34. **Valley silverspot (butterfly)** *(Speyeria zerene bremnerii)* –WA only. WA Status: Candidate animal

Background	**Monitoring (WA)**
Grasslands and forest bald associate. Highly localized population. Distribution in Willapa Hills, Puget Trough lowlands, Olympic Mountains. (WA 228)	Incidental surveys for a few sites in recent years while conducting searches for other rare butterflies using similar habitat that have overlapping flight times. No populations are regularly monitored. (WA 228)
Limiting Factors	**Actions**
Limiting Factors • Habitat Loss (WA 228) • Degradation of grassland habitat (WA 228)	3.34.1. Conserve suitable habitat (WA 228)
	3.34.2. Restore degraded habitat (WA 228)
	3.34.3. Increase distribution (WA 228)
	3.34.4. Identify and protect additional sites (WA 228)
	3.34.5. Control exotics and invasive plants at protected sites (WA 228)

3.35. **Taylor's checkerspot (butterfly) *(Euphydryas editha taylori)*** – OR and WA. WA Status: Endangered; US Status: Candidate species

Background	**Monitoring (WA)**
Found in grasslands / low elevation upland prairies (WA 230, OR 352). Recent declines in population, few populations remaining. Distribution in the Puget Trough, including San Juan Islands and north coast of the Olympic Peninsula, WA. (WA 230) Currently using the non-native narrow leafed plantain as a host plant. (OR 352)	Considerable searching for new sites has occurred during last few years, this includes incidental surveys at many sites conducted while searching for other rare butterflies using similar habitat that have overlapping flight times. Most South Puget Sound sites have been monitored for 2 years. Little monitoring of Olympic Peninsula populations has occurred. (WA 230)
Limiting Factors & Data Gaps	**Actions**
Limiting Factors • Habitat loss (WA 230) • Habitat degradation due to invasive species (scotch broom, exotic grasses) and lack of fire. (OR 352, WA 230) • Development (WA 230) • Recreation (WA 230) • Reintroductions/translocation likely necessary: methods have not been developed (WA 230) • Population fluctuations annually and over time unknown (WA 230) **Data Gap** • Historic native host plant (OR 352)	3.35.1. Conserve suitable habitat (WA 230) 3.35.2. Restore degraded grassland habitat and improve habitat quality (WA 230, OR 352) 3.35.3. Develop methods for successful reintroduction/translocation (WA 230) 3.35.4. Regular monitoring (WA 230) 3.35.5. Test captive rearing, reintroduction and translocation methods (WA 230) 3.35.6. Determine female food plant preference (WA 230) 3.35.7. Standardize annual monitoring (WA 230) 3.35.8. Increase plant diversity for nectar plants (OR 352) 3.35.9. Control key invasive non-native plants (OR 352)

3.36. **Plants**

The Oregon Wildlife Action Plan identifies the following prairie-oak plant species as being species of greatest conservation need. Details as to their special needs, limiting factors, data gaps and conservation actions can be found on the pages of the Oregon Wildlife Action Plan noted below.

- Bradshaw's Desert Parsley *(Lomatium bradshawii)* (OR 357)
- Golden Paintbrush *(Castilleja levisecta)* (OR 359)
- Kincaid's lupine *(Lupinus sulphureus ssp. Kincaidii)* (OR 360)
- Nelson's checker-mallow *(Sidalcea nelsoniana)* (OR 361)
- White-topped aster *(Aster curtus)* (OR 366)

3.37. **Summary of Wildlife Species Status**

Name	OR Status	WA Status	US Status
Species in both OR and WA Wildlife Action Plans			
Western gray squirrel *(Sciurus griseus)*	Undetermined Status	Threatened	Species of Concern
Acorn woodpecker *(Melanerpes formicivorus)*	Vulnerable	- [Not in Puget Trough]	Species of Concern
Oregon vesper sparrow *(Pooecetes gramineus affinis)*	Critical	Candidate animal	Species of Concern
Purple martin *(Progne subis)*	Critical	Candidate	Species of concern
Streaked horned lark *(Eremophila alpestris strigata)*	Critical	Endangered	Candidate species
Slender-billed white-breasted nuthatch *(Sitta carolinensis aculeate)*	-	Candidate animal	-
Western bluebird *(Sialia Mexicana)*	Vulnerable	Monitor	-
Oregon spotted frog *(Rana pretiosa)*	Critical	Endangered	Candidate species
Hoary elfin (butterfly) *(Incisalia polia obscura) –*	-	-	-
Oregon silverspot (butterfly) *(Speyeria zerene hippolyta)*	-	-	-
Taylor's checkerspot (butterfly) *(Euphydryas editha taylori)*	-	Endangered	Candidate species

Species in only OR Wildlife Action Plan			
Chipping sparrow *(Spizella passerine)*	-	-	-
Common nighthawk *(Chordeiles minor)*	Critical (in Willamette Valley only)	-	
Grasshopper sparrow *(Ammodramus savannarum)*	Vulnerable	-	-
Short-eared owl *(Asio flammeus)*	-	-	-
Western meadowlark *(Sturnella neglecta)*	Critical	-	-
Western rattlesnake *(Crotalus viridus)*	Critical (in Willamette Valley only)	-	
Foothill yellow-legged frog *(Rana boylii)*	Critical in Willamette Valley, vulnerable elsewhere	-	Species of concern
Northern red-legged frog *(Rana aurora)*	Vulnerable	-	Species of concern
American grass bug *(Acetropis Americana)*	-	-	Species of concern
Fender's blue (butterfly) *(Icaricia icarioides fenderi)*	-	-	Endangered
Species in only WA Wildlife Action Plan			
Brush prairie pocket gopher *(Thomomys talpoides douglasi)*	-	-	-
Gray-tailed vole *(Microtus canicaudus)*	-	Candidate	-
Mazama pocket gopher *(Thomomys mazama)*	-	Threatened	Candidate species
Pacific gopher snake *(Pituophis catenifer catenifer)*	-	-	-
Racer (snake) *(Coluber constrictor)*	-	-	-

Species in only WA Wildlife Action Plan cont…			
Western toad *(Anaxyrus boreas; formerly Bufo boreas)*	-	Candidate	Species of Concern
Dog star skipper (butterfly) *(Polites sonora siris)*	-	-	-
Island marble (butterfly) *(Euchloe ausonides insulanus)*	-	Candidate	Species of concern
Mardon skipper (butterfly) *(Polites mardon)*	-	Endangered	Candidate species
Oregon branded skipper (butterfly) *(Hesperia Colorado oregonia)*	-	-	-
Propertius' duskywing (butterfly) *(Erynnis propertius)*	-	-	-
Puget (Blackmore's) blue (butterfly) *(Icaricia icarioides blackmorei)*	-	-	-
Puget Sound fritillary (butterfly) *(Speyeria cybele pugetensis)*	-	Monitor	-
Valley silverspot (butterfly) *(Speyeria zerene bremnerii)*	-	Candidate animal	-

4. RECOMMENDATIONS TO ACHIEVE AN ECOREGIONAL APPROACH TO PRAIRIE-OAK CONSERVATION

The previous two Sections of this Report identify the many different actions to conserve prairie-oak habitat and its resident species which are listed in Oregon and Washington's Wildlife Action Plans. While the actions cover a wide range of topics, some common themes emerge. This Section draws out those common themes, and recommends areas where an ecoregional approach could be of most benefit.

4.1. **Ecoregional cooperation groups**

A necessary precondition to ecoregional cooperation is that groups or alliances exist to work upon the various ecoregional opportunities that arise in a strategic fashion to achieve the greatest conservation impact. Notably, one of Oregon's six overall recommended actions for all key conservation issues in its Wildlife Action Plan is to "promote collaboration across jurisdictional and land ownership boundaries."[88] Similarly, one of Washington's six "guiding principles" for its Wildlife Action Plan is to "strengthen conservation partnerships".[89]

The following groups are either already in place or could be created to move ecoregional prairie-oak conservation forward in a coordinated manner.

4.1.1. Cascadia Prairie Oak Partnership (CPOP) – this is currently a loose alliance of prairie-oak conservation partners, including the Department of Defense, federal and state wildlife agencies, private groups and non-profits. CPOP could be formalized and staffed to lead and coordinate prairie-oak conservation across the WPG Ecoregion. TNC is currently preparing a business plan to evaluate the feasibility of this. CPOP's role could include the coordination of species-specific working groups, noted in the next point.

4.1.2. Species-specific working groups – The following species are identified as SGCN within both Oregon and Washington:

- Western Gray Squirrel
- Streaked horned lark
- Slender-billed white-breasted nuthatch
- Western bluebird
- Oregon vesper sparrow
- Oregon spotted frog
- Hoary elfin (butterfly)
- Oregon silverspot (butterfly)
- Taylor's checkerspot (butterfly)

[88] OR 36
[89] WA 3

Ecoregional working groups already exist to focus on the streaked horned lark and Taylor's checkerspot. These working groups, which currently are coordinated by TNC, meet annually and are comprised of governmental, private and non-profit participants. The working groups provide a mutual resource for the latest research and information relating to the relevant species, and generate and update species-specific action plans aimed at species recovery. Additional species-specific working groups addressing the remaining SGCN which occur in both Oregon and Washington would be highly useful.

4.1.3. Conservation Registry – CPOP (or another entity) could ensure that prairie-oak conservation projects are routinely listed on the existing Conservation Registry, which is a national online, centralized database that records, tracks and maps on-the-ground conservation projects. Currently, there is only ad hoc listing of prairie-oak conservation projects in the WPG Ecoregion on the Conservation Registry. This would provide another avenue by which ecoregional contacts and coordination could occur. It also accords with Oregon's Wildlife Action Plan, which recommends the creation of a statewide registry for tracking conservation actions and programs.[90]

4.2. **Species-specific action plans**

The ecoregional working groups for the streaked horned lark and Taylor's checkerspot butterfly (discussed above) have both created action plans for their respective species which identify and prioritize conservation actions to preserve the species. They are not recovery plans. Rather, these action plans are relatively short-term (3-5 years) plans that take into account actions already in place or underway. They are designed to illuminate the *Next Most Important Thing* to do for range-wide conservation of the species. Species-specific action plans for the remaining SGCN which occur in both Oregon and Washington (listed in section 4.1.2 above) would be useful to guide future ecoregional conservation for these species.

While this Report lists all of the conservation actions recommended in the States' Wildlife Action Plans for these species, species-specific action plans facilitate a more focused and up-to-date statement of conservation actions, can set specific recovery targets, and also allow for prioritization of actions, which does not occur within the States' Wildlife Action Plans. Further, as these action plans would be ecoregional, they would allow for actions which span more than one State (such as cross-State translocations). Individual States' Wildlife Action Plans do not typically allow for such cross-State initiatives.

[90] OR 87-89. Oregon's Wildlife Action Plan also identifies "Institutional barriers to voluntary conservation" as one of its six key conservation issues, and proposes that it be remedied, in part, by the improvement of "data management, coordination and sharing between various conservation partners to support voluntary conservation." OR 64.

4.3. **Creation of best management practices**

The following conservation actions occur repeatedly throughout Oregon's and Washington's Wildlife Action Plans. Their demonstrated importance to prairie-oak conservation, as well as the frequency with which they are undertaken in practice, warrants the creation of ecoregional best management practices on those topics. Where best management practices exist, they could be reviewed and consolidated to reflect an ecoregional approach.

4.3.1. Prescribed burns.[91]
Note that the Oregon Wildlife Action Plan identifies the disruption of disturbance regimes – including fire - as a key conservation issue that affects species and habitats Statewide. The Plan identifies several goals and actions to tackle this issue[92] *– this framework could be used ecoregionally, targeted towards prairie-oak habitat.*

4.3.2. Invasive plant control and removal (including grasses, shrubs and trees).[93]
The Oregon Wildlife Action Plan similarly identifies invasive species as a key conservation issue, and identifies goals and actions to tackle the issue.[94] *This framework could be used ecoregionally, targeted towards prairie-oak habitat. The Washington Wildlife Action Plan also identifies invasive species as a Statewide conservation problem.*[95]

4.3.3. Native plant restoration and re-seeding.[96]

4.3.4. Controlled grazing.[97]
The Washington Wildlife Action Plan identifies livestock grazing practices as a Statewide conservation problem.[98]

4.4. **Educational programs**

Educational programs could be developed on an ecoregional basis on the following topics:

4.4.1. Information for landowners on the importance of prairie-oak habitat and reasons for its protection.

4.4.2. Invasive plants: prevention, risk assessment, early detection and quick control.[99] Promote adequate funding and coordination of weed control

[91] See Actions 2.1.2, 2.1.3, 2.1.4, 2.2.15, 3.5.1. The Oregon and Washington Wildlife Action Plans also attribute fire suppression to the decline of numerous wildlife species.
[92] See OR 47-52.
[93] See Actions 2.2.1-2.2.16, 2.4.5, 3.2.7, 3.3.3, 3.6.3, 3.10.5, 3.12.5, 3.13.9. The Oregon and Washington Wildlife Action Plans also attribute invasive species to the decline of numerous wildlife species.
[94] See OR 43-47.
[95] See WA 27-28.
[96] See Actions 2.1.5, 2.2.4, 2.2.7, 2.4.5, 2.4.6.
[97] See Actions 2.1.1, 2.1.4, 2.2.6, 2.3.6, 2.3.7, 2.3.8, 2.4.2, 2.4.3.
[98] See WA 32-33.

efforts on both public and private lands using environmentally sound methods.[100]

4.4.3. Information for recreational users and user groups on reasons for restricting access to prairie-oak habitat.[101]

4.4.4. Buffering prairies from BTk (biological pest control) to protect declining butterfly populations.[102]

4.5. **Conservation programs**

The following Programs, which are recommended actions in the States' Wildlife Action Plans, could be operated or coordinated or an ecoregional basis:

4.5.1. Program for the detection of, rapid response to, and eradication of invasive species.[103]

4.5.2. Development of an invasive species implementation tool that evaluates the ecological impact and management approaches for invasive species identified as priorities.[104]

4.5.3. Invasive plant prevention programs such as weed-free hay certification.[105]

4.5.4. Use and extension of existing incentive programs such as the Oregon Conservation Reserve Program and Grassland Reserve Program to conserve, manage and restore grasslands and encouraging no-till and other compatible farming practices.[106]

4.5.5. Predator control programs to protect streaked horned lark.[107]

4.6. **Production**

Economies of scale may exist to develop and produce the following items which are used in prairie-oak conservation:

4.6.1. Nest boxes[108]

4.6.2. Native seeds[109]

4.6.3. Oak products compatible with conservation to promote maintenance of oak as an economic use.[110]

4.6.4. Small predator exclosures over parts of isolated breeding sites for Oregon spotted frog.[111]

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[99] See Actions 2.2.2 and 2.2.12
[100] See Action 2.2.11
[101] See Action 2.8.4
[102] See Action 2.4.8
[103] See Action 2.2.8
[104] See Action 2.2.16
[105] See Action 2.2.7
[106] See Action 2.3.1
[107] See Action 3.12.7
[108] See Actions 2.6.6, 3.10.3, 3.13.2, 3.14.5, 3.14.6
[109] See Actions 2.1.5, 2.2.4, 2.2.7, 2.4.5, 2.4.6
[110] See Action 2.3.3
[111] See Action 3.21.3

4.7. **Research and coordination opportunities**

The Wildlife Action Plans for Oregon and Washington list many topics which require further research and coordination. The items covering issues or species found in both States are listed below, and may merit research and coordination on an ecoregional basis.[112]

4.7.1. Inventory of remaining prairie-oak habitat[113]

4.7.2. Restoring habitat connectivity:[114]

- use statewide land cover and threats data layers to improve connectivity between priority conservation areas[115]
- work with USDA Forest Service and other public landowners to protect existing roadless areas and expand the roadless area network where justified for habitat protection and connectivity[116]

4.7.3. Creating a system for tracking land use changes over time.[117]

4.7.4. Methods to manage established invasive species such as cheatgrass, medusahead rye, and false brome.[118]

4.7.5. Working with other public agencies, and private agricultural organizations such as the Washington Farm Bureau and Washington Grange to develop basic techniques for mapping and monitoring the spread of invasive plant species over time.[119]

4.7.6. Participation in federal and state agency partnerships to develop and implement weed control strategies for impacted sites and ecosystems.[120]

4.7.7. Improving methods to promote oak reproduction and creation of open-grown structures.[121]

4.7.8. Developing and evaluating methods to enhance cavity development in oak trees (e.g., fungal inoculations, limbing).[122]

4.7.9. Developing and evaluating methods to determine effectiveness of snag creation from competing conifers to provide cavity-nesting habitat for oak-associated birds such as western bluebird, acorn woodpecker and slender-billed (white-breasted) nuthatch.[123]

4.7.10. For western gray squirrel:

- Survey protocols.[124]
- Critical habitat rule.[125]

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[112] This list excludes research relating to species identified as being of greatest conservation need in *only* Oregon or Washington, rather than in both States.
[113] See Actions 2.2.1, 2.4.7
[114] See Actions 2.5.1, 2.5.3
[115] See Action 2.5.4
[116] See Action 2.5.5
[117] See Action 2.3.9
[118] See Action 2.2.5
[119] See Action 2.2.9
[120] See Action 2.2.10
[121] See Action 2.6.5
[122] See Action 2.6.7
[123] See Action 2.6.8
[124] See Action 3.4.1

- Data gaps:[126]
    - Population locations and trends
    - General ecology
    - Competition and other impacts from non-native squirrels
    - Dispersal patterns and needs for canopy travel corridors

4.7.11. For acorn woodpecker: Data gap: Nesting ecology, especially nest site requirements.[127]

4.7.12. For Oregon vesper sparrow:

- Data gap: Impact of grazing and agricultural management on productivity [128]
- Conducting research to evaluate potential exposure to toxins from pesticide and herbicide applications.[129]

4.7.13. For purple martin: Data gaps:[130]

- Complete inventory of distribution
- Ability to attract migrating birds with nesting structures

4.7.14. For slender-billed white-breasted nuthatch:

- Conducting feasibility study, and implementing reintroductions.[131]
- Assessing factors that may account for loss of pairs at formerly occupied sites.[132]

4.7.15. For streaked horned lark: Data gaps:[133]

- Identification of factors limiting nest success and post-fledgling survival
- Habitat relationships of wintering birds
- Data gap: Patch size requirements.[134]

4.7.16. For western bluebird:

- Conducting surveys to determine trend in population and whether listing is needed.[135]
- Data gap: Location and factors key to success for natural cavity-nesting pairs:[136]

4.7.17. For Oregon spotted frog:

- Feasibility studies to guide specific conservation actions and management decisions for reintroductions.[137]
- Investigating limiting factors.[138]

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[125] See Action 3.4.4
[126] See Sub-section 3.4
[127] See Sub-section 3.5
[128] See Sub-section 3.9
[129] See Action 3.6.6
[130] See Sub-section 3.10
[131] See Actions 3.12.4, 3.12.5
[132] See Action 3.12.7
[133] See Sub-section 3.13
[134] See Sub-section 3.13
[135] See Action 3.14.9
[136] See Sub-section 3.14
[137] See Action 3.21.4
[138] See Action 3.21.6

- Data gaps:[139]
    - Impacts of invasive fish and bullfrogs
    - Documentation of historic sites, and current range status
    - Feasibility studies on reintroduction at historic sites
    - Population trends

4.7.18. For hoary elfin (butterfly):

- Determining and mapping current distribution and potential habitat.[140]
- Data gap: Life history.[141]

4.7.19. For Oregon silverspot (butterfly):

- Coordinating with USFWS to facilitate reintroduction into Washington from Oregon.[142]
- Data gap: Management techniques for violet host plants. [143]

4.7.20. For Taylor's checkerspot (butterfly):

- Developing methods for successful reintroduction/translocation.[144]
- Test captive rearing, reintroduction and translocation methods.[145]
- Determining female food plant preference.[146]
- Standardizing annual monitoring.[147]
- Data gap: Historic native host plant [148]

4.8. **Climate change**

As noted in Section 2.8 above, climate change is the subject of current research by the Departments of Fish and Wildlife in both Oregon and Washington. An ecoregional approach toward the current research, as well as any work arising out of that research, would be beneficial.

4.9. **Plant species of greatest conservation need**

Washington does not include plant species in its Wildlife Action Plan. It would be useful to identify the plants in Washington which are of the greatest conservation need, and then coordinate with Oregon to protect those plant species which occur in both states.

[139] See Sub-section 3.21
[140] See Action 3.26.1
[141] See Sub-section 3.26
[142] See Action 3.30.4
[143] See Sub-section 3.30
[144] See Action 3.35.3
[145] See Action 3.35.5
[146] See Action 3.35.6
[147] See Action 3.35.7
[148] See Sub-section 3.35

4.10. **Conclusion**

This Integrated Prairie-Oak Conservation Report brings together the knowledge, research and hard work of many people working in prairie-oak conservation across Oregon and Washington. It aims to lead to more cooperation on the topics specifically mentioned above, as well as to generally promote an ecoregional approach to prairie-oak conservation in the future.

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