The Willamette Valley Landowner's Guide to Creating Habitat for Grassland Birds

the OREGON CONSERVATION STRATEGY

Oregon's State Bird

The distinctive song of the western meadowlark signaled the arrival of spring to Oregon residents for many years. In 1927, the western meadowlark was selected as the State Bird by Oregon's school children and confirmed by Governor I. L. Patterson. It appealed to the children because of its bright colors, cheerful song and because it was a common sight in meadows, pastures and grasslands throughout the state. Today, due to development, cultivation, invasive species and other issues, the meadowlark is no longer common in some parts of Oregon and has become particularly rare in the Willamette Valley.

USFWS photo

Table of Contents

Grassland Birds Need Conservation

Grassland birds in the Willamette Valley are in trouble. With less than one percent of the area's historic prairie habitats remaining, the species that depend on open, grassy areas to feed and raise their young are declining. At the time of Euro-American settlement, the Valley was a mosaic of wet and dry prairies, oak savannas, and forests. Native Americans, who used many of the prairie plants for food, set fires to grasslands to enhance the growth of their favorite plants and create open areas for hunting and traveling. Fire prevented many shrubs and trees from growing, resulting in vast grasslands and wildflower meadows. Since that time, development and land use, cultivation and restrictive and alternative burning practices have all altered the landscape.

Although it is impossible to recover the prairies lost to development and cultivation, many grassland birds can live alongside people if the existing habitat, e.g. grasslands, fallow fields and pastureland is suitable. Alternative management techniques such as mowing and grazing can be used to mimic historical disturbance regimes. Ungrazed pastures dotted with shrubs can provide great year-round habitat. Lightly grazed or mowed pastures are also good habitat if mowing and grazing are rotated and timed to allow young birds to fledge and for flowers to seed. These surrogate grasslands can provide diverse plant structure and variability sufficient to allow for a place for birds to nest and feed. Wildlife and conservation reserves such as the Basket Slough National Wildlife Refuge north of Dallas or the William L. Finley National Wildlife Refuge near Corvallis provide excellent examples of good habitat for grassland birds.

By maintaining and restoring habitat for grassland birds, landowners will help not only them but many other plant and wildlife species as well including the Western pond turtle, Fender's blue butterfly, Kincaid's lupine and California quail. Habitat restoration also contributes to watershed health by reducing soil erosion and increasing water retention.

Streaked horned lark nestlings. Dr. Randy Moore photo

Birds you might find in Willamette Valley Grasslands and Surrogate Habitats	
Conservation Strategy Species are in bold type	
Common Name	**Habitat**
Acorn woodpecker	Oak woodland-savanna
American goldfinch	Savanna-woodland, Agriculture
American crow	Upland Prairie, Agriculture
American kestrel	Savanna
Barn owl	Upland Prairie, Agriculture
Barn swallow	Wet prairie, Savanna
California Quail	Savanna
Chipping sparrow	Oak-woodland-savanna
Common snipe	Wet prairie, Agriculture
Common yellowthroat	Wet prairie, Agriculture
Common nighthawk	Wet prairie, Upland prairie, Savanna
Dusky Canada Goose	Wet prairie, Agriculture
Grasshopper sparrow	Upland prairie
Great blue heron	Wet prairie, Savanna, Agriculture
House wren	Savanna-woodland
Killdeer	Wet prairie, Upland prairie, Agriculture
Lazuli bunting	Savanna
Lesser goldfinch	Savanna-woodland, Agriculture
Lewis' woodpecker	Savanna-woodland
Mourning dove	Savanna, Agriculture
Northern harrier	Wet prairie, Upland Prairie
Oregon vesper sparrow	Upland prairie, Savanna
Red-tailed hawk	Wet prairie, Upland prairie, Savanna
Rufous hummingbird	Wet prairie, Oak savanna
Savannah Sparrow	Wet prairie, Upland prairie, Savanna, Agriculture
Short-eared owl	Wet prairie, Upland prairie
Song sparrow	Agriculture
Streaked horned lark	Wet prairie, Upland prairie, Agriculture
Turkey vulture	Wet and Upland prairie, Savanna-woodland, Agriculture
Western bluebird	Upland prairie, Savanna
Western kingbird	Wet prairie, Agriculture
Western meadowlark	Wet prairie, Upland prairie, Savanna
White-breasted (slender-billed) nuthatch	Oak woodland-savanna
White-crowned sparrow	Wet prairie, Savanna
White-tailed kite	Upland prairie, Savanna, Agriculture
Wilson's snipe	Wet prairie

An Overview of Habitat Requirements

Grassland obligates generally prefer short to intermediate grass heights with a diversity of plant species. Grasses and forbs provide cover from predators, structure for nesting and food, e.g., insects, seeds. Patches of clumped vegetation in grasslands provide nesting habitat, while intermittent areas with open understories or bare ground allow for accessible foraging. Grassland birds are also sensitive to edge effects, preferring large contiguous habitats. Habitat requirements include:

Size: Optimally ≥ 40 acres

- Minimum size requirements vary by species and geographical region. Grassland patches ≥ 20 acres may be occupied by some species in landscapes with adjacent grassland or surrogate habitats (e.g., fallow fields, pastures).

Shape: Perimeter-area ratio

- Shapes that minimize the amount of edge are most beneficial to grassland birds. Species nest in the interior of grasslands, avoiding edge habitat by several hundred feet. Narrow fields bordered by tall woody vegetation are generally avoided.

Vegetation Structure

- Monocultures (e.g., reed canary grass) are too tall and dense to support grassland birds. Grassland birds prefer heterogeneous structure with varying vegetation heights (6 to 36 inches) and densities, a variety of plant species (e.g., grasses and forbs) and areas of bare ground (> 5 percent).

Plant Composition

- Predominantly grasses (≥ 3 species of grass) with approximately 10 to 30 percent forbs.
- Grassland birds are primarily selecting for the structure and diversity of a grassland, so both native and nonnative species can be used. However habitat with a moderately high percentage of native species composition, including wildflowers, is preferred.

Woody Vegetation

- Little to no woody vegetation present in the grassland; periodic management to eliminate woody vegetation is required.

Threats to Grassland Birds

- Habitat loss: lack of habitat, small fragmented remnants, lack of connectivity, degraded grasslands with little/no management.
- Grassland management practices such as mowing, haying, grazing and herbicide/insecticide application during the nesting season can be detrimental to grassland birds.
- Grassland nesting species are highly sensitive to disturbance during their primary nesting season which is approximately April 1 to July 15. Late nesters or birds that make a second nesting attempt may still be using grasslands into August. People, pets, feral cats and management activities can cause birds to abandon their nests.

The Oregon Conservation Strategy identifies a number of grassland birds that are in need of conservation. Grassland species of most concern include the following species.

Dave Budeau photo.

Western Meadowlark

The western meadowlark is brownish in color with a bright golden-yellow breast and a black V-shaped patch across its breast. Meadowlarks are most famous for their bubbly, flute-like song. Males, who sing from perches to attract mates and advertise territories during breeding season from April to mid-July, are polygynous and can have two to three mates at a time. A female lays four to five eggs, one per day, approximately one inch long and white with brown and lavender spots; they hatch in 13 to 15 days. Like most young grasslands birds, they remain in the nest for 10 to 12 days after hatching. Unable to fly immediately after fledging, they remain under parental care for up to another two weeks. After the young fledge, the pair may re-nest and raise a second brood. Meadowlarks eat various insects, including beetles, crickets, grasshoppers, caterpillars, craneflies, sow bugs and spiders. Territories average around 20 acres per family during the breeding season, but meadowlarks typically require large, contiguous grassland landscapes greater than 100 acres to establish viable populations. Meadowlarks prefer grasses and forbs of intermediate density and height (greater than 90 percent cover and 12 to 24 inches in height). Because meadowlarks require large plots of land for breeding, land-use practices that result in small, isolated fragments of habitat lead to fewer or no birds.

Wikipedia photo.

Grasshopper Sparrow

Named for their insect-like song, grasshopper sparrows are squat, short-tailed birds that hop and run on the ground, occasionally flitting to the top of a grass stalk or fence post to sing before retreating again to the grasses. These inconspicuous birds are spottily distributed in central and south Willamette Valley, generally limited to lightly grazed pastures with few shrubs. Grasshopper sparrows are very sensitive to the presence of large trees and tall woody vegetation in grasslands. Although this semi-colonial bird has a nesting territory of only three to five acres, it is associated with larger patches of grassland habitat just as meadowlarks are. Preferring grasslands of intermediate height (12 to 18 inches) with some bare ground, nests are built by females in a shallow depression. The rim of the nest is level with the ground, and the entrance is concealed by a grass canopy over the nest. Eggs are creamy-white, sparsely spotted with blotches of reddish-brown over shades of gray and purple. Females incubate four to five eggs for 12 to 13 days and may raise two broods if the conditions are right.

Wikipedia photo.

Oregon Vesper Sparrow

The sweet, tinkling song of the Oregon vesper sparrow can often be heard long after most other birds have ended the day, hence the name vesper. This large, pale, streaked sparrow feeds on insects, grass and forb seed; nestlings primarily eat insects. Nests are shallow depressions on bare ground, often next to dirt clods or under upright plants. The female generally incubates four eggs for 12 to 13 days and may have two broods per season. Eggs are creamy-white with a pale-green cast and are marked by dots, spots, blotches and squiggles of various shades of brown or gray. This migratory bird prefers grasses between six and 12 inches in height interspersed by small woody vegetation and bare ground. They can be found in edge habitat between grassy and wooded areas (e.g., fencerows, transition areas, young Christmas tree farms). Although the nests and eggs of the grasshopper and vesper sparrow are similar, the amount of land they need to successfully raise their young is very different. The vesper sparrow may be present in

smaller patches of habitat (10 to 20 acres) and is less tied to large landscape patches. Studies conducted in the Willamette Valley in 1996 and 2008 showed the vesper sparrow had the lowest measures of abundance and distribution of the Strategy grassland birds studied.

Rod Gilbert photo.

Streaked Horned Lark

The streaked horned lark, a striking bird with tinkling notes and black "horns," prefers short sparsely vegetated prairies and agricultural fields and even gravelly roadsides with short vegetation. Unfortunately, because they nest in vulnerable locations, their nests are often accidentally destroyed by farm machinery, ATVs and traffic. Nomadic in the fall and winter, streaked horned lark form territories when breeding. Eggs are greenish or grayish with brown speckles. Larks typically lay four or five eggs which are incubated 11 days; young are able to fly 9 to 12 days after they hatch. Like meadowlarks and grasshopper sparrows, the species prefers large patches of contiguous grassland habitat in the landscape.

Molly Monroe photo.

Short-eared Owl

This owl, which prefers open country, weedy fields, wet meadows and grasslands, is one of the rarest breeding grassland birds in the Willamette Valley today. It is one of the few that is crepuscular, that is, active at dusk and dawn. Not typically vocal, it is often detected by its slow, moth-like flight patterns and rare but conspicuous "bark." Nests are shallow hollows on the ground often next to low shrubs or grasses. Short-eared owl eggs have been found as early as March, with breeding extending through July and into August. The young are incubated up to 28 days but do not leave the nest for another 12 to17 days; they are capable of flying about 10 days later. Breeding territories range from 50 to 200 acres. Favoring a small-mammal diet, this bird is a voracious hunter of rodents.

Wikipedia photo.

Common Nighthawks

This nighthawk is most active at dusk, where it may be observed hawking insects on the wing. Common nighthawks do not build nests. They lay their eggs on gravel bars, mudflats or sparsely vegetated areas close to or within grasslands, making them very susceptible to disturbance. Its cryptic plumage helps conceal the female who lays two eggs which she incubates for 18 to 20 days, keeping her back to the sun all day long to regulate egg temperatures. Eggs are usually cream to pale gray and dotted brown and gray to blend with the ground. Common nighthawks have territory sizes ranging from 25 to 75 acres, but appear to key in to large, contiguous open patches of habitat. Common nighthawks are often identified by their "peent" call while flying high in the sky from dusk to dawn. They prefer areas near riparian areas, open water and forest clearings for foraging where insects concentrate. These birds winter in South America and migrate to Oregon to breed.

How Landowners Can Help Grassland Birds

This brochure describes actions that landowners can take. In the face of the population growth predicted over the next decades, the time to take action is now. Because most of the Valley is privately owned, the future of grassland birds depends on the efforts of private landowners and the commitment of many. As a landowner, the actions you take will depend on the physical characteristics of your property, including soil type, topography and existing vegetation. Areas of 100 acres or more can provide habitat for meadowlarks and grasshopper sparrows. Smaller areas of five to 10 acres can provide nesting habitat for vesper and savannah sparrows. And don't be discouraged if you are working with a relatively small area, by working with adjacent landowners, it may be possible to create a larger landscape.

Area Requirements for Some Grassland Bird Species
Adapted from the Benton County, Oregon Prairie Conservation Strategy, April 2010

1-10 acres	10-20 acres	20-50 acres	50-100 acres	>200 acres
Chipping sparrow	Lazuli bunting	Acorn woodpecker	American kestrel	Common nighthawk
Savannah sparrow	Oregon vesper sparrow	Western kingbird		Grasshopper sparrow
Wilson's snipe	Western bluebird	White-breasted (slender-billed) nuthatch		Northern harrier
				Short-eared owl
				Streaked horned lark
				Western meadowlark

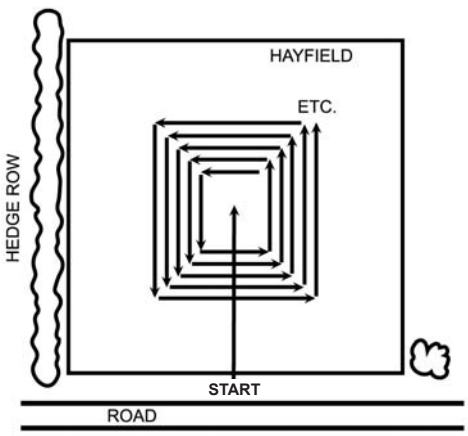
When defining your objectives for grassland bird habitat, consider lands that are adjacent to your property. In addition to your site, the surrounding landscape may contribute to overall habitat size requirements preferred by the various species.

Ten Management Actions for Landowners

1. *Plant native grasses, wildflowers and scattered shrubs* that are adapted to local conditions and provide the best food and cover for wildlife.
2. *Decide how you can connect your habitats*—fallow fields, pastures and natural meadows—to similar habitats on your own or neighbors' property to create a continuous grassland. If you have the option, create habitat next to a meadow with widely-spaced oaks or shrubs rather than next to a dense woodland. Most grassland birds avoid areas with trees because they provide excellent hiding and perching places for predators such as raptors. If pastures are separated by hedgerows or trees, consider removing them or leaving only a few to create the illusion of uninterrupted grassland.
3. *Keep habitat healthy.* Mow, hay, graze or burn sections (units) of habitat after July 15, in rotation, every three to five years to reduce the encroachment of woody growth, increase grass vigor and reduce weeds. Control noxious weeds that have the potential to take over your managed habitats. These management practices are effective and artificially mimic the effects of fire by creating grasslands with areas of clumped vegetation, bare ground and a variety of vegetation heights.
4. *Reduce disturbance* caused by machinery, people, pets and feral cats and dogs between April 1 and July 15 or later when birds are actively breeding and to accommodate late nesters. Grassland birds are very sensitive to disturbance, which may lead to nest abandonment or destruction.
5. When looking at your property in light of grassland birds, *draw a picture of your property,* and then divide it into sections, or management units as biologists refer to them, to evaluate the existing vegetation and landscape. This step will help you inventory existing habitats and identify ways those habitats complement each other.
6. *Create singing perches.* Although grasslands are characterized by low-growing vegetation, a few shrubs or solitary trees can attract western meadowlarks and other grassland birds to establish breeding territories. Fence posts, telephone poles and wires, snags, or downed large trees or branches and brush and rock piles also work well as perches.
7. *Recognize the value of other habitats.* Riparian areas, white oak woodlands and savannas complement grassland bird habitat and should be maintained.
8. *Don't forget the pollinators.* Ensure a diversity of plants to support a variety of insects. Leave occasional snags and areas of uncovered soil for nesting habitat. Include plants that are necessary for larval development of butterflies as well as a nectar source. A source of water is essential.
9. *Reduce herbicide use* by pulling, spot spraying or mowing noxious weeds. This is critical for increasing the diversity of wildflowers thereby increasing the variety of insects needed by birds. Try to find alternatives to pesticides, but if none can be identified, use the least toxic herbicides available and apply them before or after the breeding season.
10. *Get help.* Investigate conservation incentive programs that provide cost-share opportunities or other financial incentives for creating large areas of habitat 10 to 20 acres or more in size. Some of these are listed on pages 22-24.

Additional Actions for Agricultural Landowners

- When possible, limit activity in the field during the breeding season, April 1 to July 15. Disturbance by machinery, spraying, mowing and harvesting may lead to nest abandonment or destruction.
- Consider creating or increasing the size of planted or weedy fallow fields. In areas that are difficult to access (e.g., corners) or areas of low productivity could be planted to provide habitat and improve soil conservation. Alternatively, mudflats could be maintained as bare ground for breeding by horned larks and common nighthawks.
- Provide small (five to 15 feet wide), randomly-placed scrapes in fields or larger grasslands 10 to 20 acres or more to expose rough, bare ground that can be used by vesper sparrows and horned larks as nesting habitat. These areas also provide bathing and dusting sites for a variety of bird species and nesting areas for some insect species. Leaving areas of bare ground that occur naturally will produce the same benefits.
- Tree lines, fencerows, and hedgerows mark the boundaries of contiguous grasslands for many small grassland birds. When possible, remove barriers between suitable habitats to create larger parcels. Although large hedgerows are habitat for some kinds of wildlife, they provide hiding places for predators that feed on eggs and chicks of grassland birds.
- Mow fields from the inside out. This allows birds and animals to flush while working your fields. If you see any birds flush, slow your equipment down to allow flightless chicks a chance to escape. Leave a 50-foot buffer around nests, if possible.



- If you have watering troughs for livestock, provide wildlife escape ramps. Ramps should not have a slope steeper than 45 degrees and should be built of grippable, long-lasting materials such as painted or coated metal grating, concrete, rock and mortar or high-strength plastic composites. See Water for Wildlife: a Handbook for Ranchers and Range Managers, by Daniel A.R. Taylor and Merlin D. Tuttle for design diagrams.

Ground-nesters Face Great Odds

Grassland birds nest on the ground, and face a perilous environment for raising their young—their eggs and chicks are especially vulnerable to destruction from predators, machinery, people, livestock and pets. Nesting in marginal habitat such as Christmas tree farms, cultivated grass fields and vineyards creates additional challenges. In these environments, landowners are often active in their fields spraying, pruning, tilling, mowing or harvesting their crop during the breeding season. One of the best ways landowners can help is by adjusting the timing and nature of agricultural practices wherever possible to avoid nesting season.

Actions for Commercial Ventures

Grassland birds sometimes nest and forage for insects in grass seed fields, Christmas tree farms and vineyards, because these landscapes share similar features with native grasslands. In addition to the management actions previously noted, here are suggestions for improving the nesting success of birds in these specific types of agricultural fields:

Grass Seed Farms

- Use late-maturing varieties of tall fescue, bentgrass and perennial ryegrass which can be harvested in late-July or August and allow chicks more time to fledge.
- Grassland birds may both nest and forage in grass seed fields. Where possible, position grass seed fields next to other grassland habitats such as pastures and hayfields to increase access to foraging areas.

Christmas Tree Farms

- Some grassland birds may nest in stands of trees that are less than five years old. In these areas, leave weedy

unmowed rows to provide important nesting cover. Refrain from mowing rows between April 1 and July 15 or later, and limit use of herbicides and pesticides during the breeding season.

Vineyards

- Consolidate field activities such as removing suckers and leaves, spraying herbicides, and tucking grapes to reduce the number of entries into fields.
- If you are producing grapes according to Low Input Viticulture and Enology guidelines, consider creating grassland habitat as part of your 5 percent ecological compensation area requirement. If you are not already involved with LIVE, find out about this stewardship incentive program.

How to Create Optimal Grassland Bird Habitat

Site Planning

- Take note of the existing available habitat on your property and its relation to buildings, highly disturbed areas, water sources, and neighboring properties. If possible, enlist the help of a professional wildlife biologist or botanist to help plan your restoration effort and determine if there are any valuable native plants already present on the property, especially if it has never been cultivated.
- Identify any nonnative, invasive plants or noxious weeds that might need to be controlled. Scot's broom, Himalayan blackberry, St. John's wort, Canada thistle and tansy ragwort are some noxious weeds. For more information on noxious weeds, contact the Oregon Department of Agriculture or visit their website, www.oregon.gov/ODA/. Reed canary grass, rye grasses, tall fescue, bentgrass, tall oatgrass and evergreen blackberry are all nonnative species

that can be problems on grassland sites and require active and consistent management.

- Choose plant species that fit the site's soil type, drainage, moisture and competitiveness with other desired plants. There are many grasses and forbs now available from nurseries in the Willamette Valley that have originated from local seed sources, thus discouraging the introduction of nonnative species.
- Removing trees will help attract a greater number of grassland species to your field. Nest predation and brood parasitism rates increase near woodland edges and as a result many grassland species avoid these areas. Tree lines, fencerows, and hedgerows mark the boundaries of contiguous grasslands for many small grassland birds. Some birds will also avoid using grasslands with high densities of trees present.
- Develop a timeline for implementing the project that can include: plant availability, soil preparation, planting dates, weed control and site evaluation. If you find a particular strategy isn't working, don't be afraid to adapt or modify your management if needed.

Site Preparation

Seedbed preparation may be the most important factor when creating successful grassland habitat. The goal of seedbed preparation is to remove the undesired existing vegetation and weed seed from the seed bank. This is necessary because nonnative plants are very good competitors and will out-compete native species in the race to acquire space and nutrients. The method you choose to prepare the seedbed will depend on site characteristics and your resources.

While there are several approaches that can be taken, plowing or disking is generally not an effective method for preparing the seedbed. This method stimulates the weedy seed bank dormant in the soil. Research has shown that one of the most successful methods of site preparation is to remove standing dead vegetation in the fall with a burn (most preferable) or by haying (preferable to mowing as it eliminates the build-up of thatch). Follow this with an herbicide treatment after the first flush of greening occurs and again with additional herbicide treatments in the following spring and fall. There are soy-based surfactants available that decrease the harmfulness of herbicides for those who prefer to use less toxic means of treatments.

Strategies
Timing is everything.
Several techniques may have to be used.
Be patient: Site preparation is essential if you are to have success.
Be prepared to manage for the long-term.

While this approach to site preparation may appear time-consuming, restoration efforts throughout the Valley have shown this approach to be far more successful in the long-term, reducing the amount and intensity of future management efforts. Additional sources that provide detailed prescriptions and examples of site preparation and restoration techniques are available at the end of this publication.

Seed Application

Once weeds are under relative control, planting can commence. In general, it may be preferable to plant native forbs for the next year or two, followed by the introduction of grasses. This will allow for continued use of grass-specific herbicides as the forbs become established. While you can plant grasses and forbs at the same time, grasses may compete with native perennials, which can take two or more years to establish. This may result in a grass-dominated community with too little bare ground available for the establishment of forbs or one with patchy growth and higher susceptibility to weed invasions. An exception may be for more heterogenous sites such as fallow fields, when planting grasses that are slower to establish (e.g., *Danthonia californica,* California oatgrass) allows for forbs to develop without the competition.

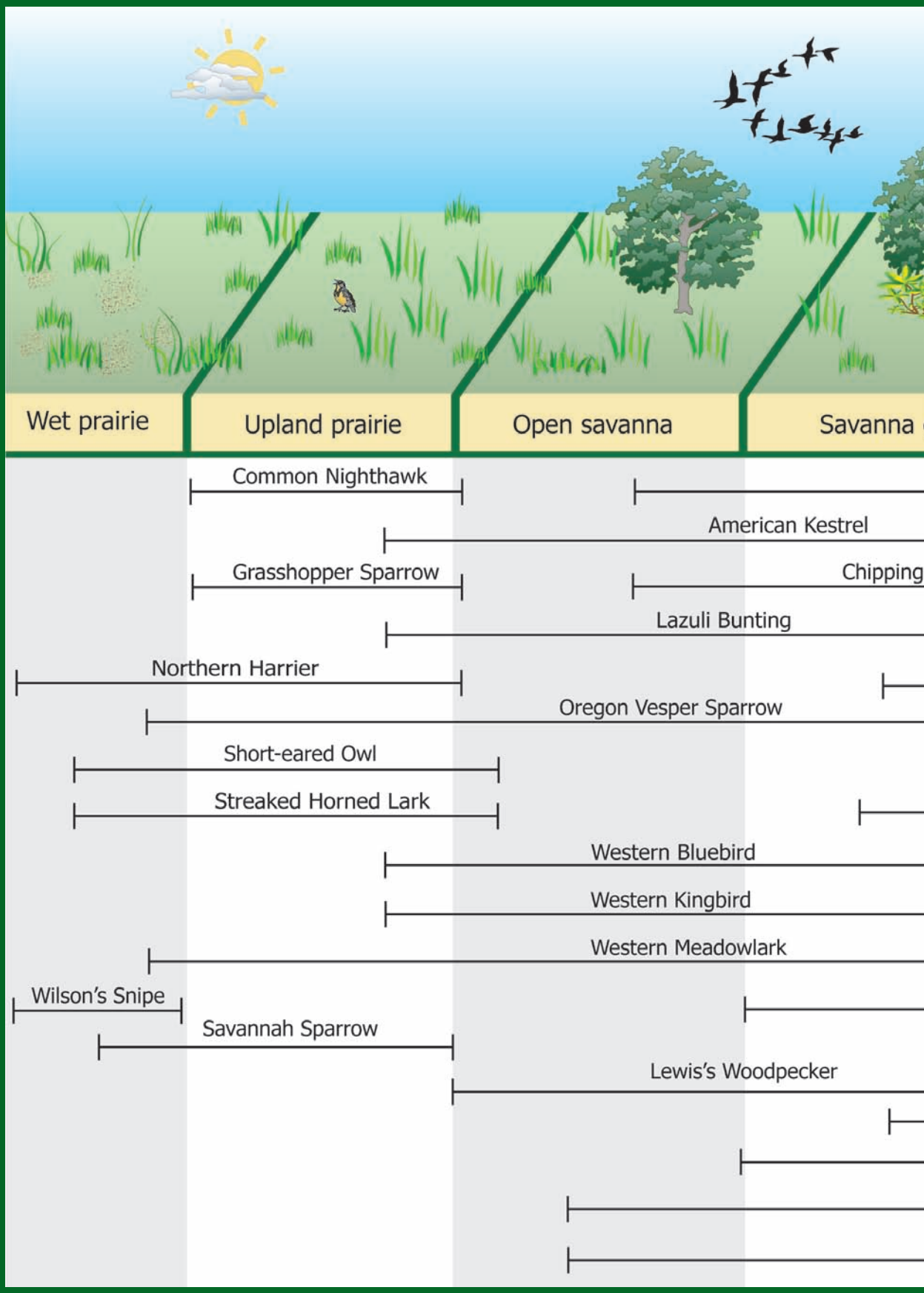
Sample Calendar for a Nonnative Grass-dominated Site

Year	Season	Action
0	Fall	Mow/burn or mow/hay
0	Spring	Glyphosate entire site
0	Summer	Hydrologic manipulation/restoration
1	Fall	Seed (forbs, sedges, and rushes)
1	Spring/Summer	Grass-specific herbicide
1	Spring/Summer	Spot spray or hand weed
2	Fall	Seed (forbs, sedges, and rushes)
2	Spring/Summer	Grass-specific herbicide
2	Spring/Summer	Spot spray or hand weed
2	Spring/Summer	Monitoring
3	Fall	Seed grasses (and forbs, sedges, and rushes)
3	Fall	Seed areas disturbed by weed control methods
3	Spring/Summer	Spot spray or hand weed
4	Fall	Seed areas disturbed by weed control methods
4	Fall	Prescribed burn or mow
4	Spring/Summer	Spot spray or hand weed
5	Fall	Seed areas disturbed by weed control methods
5	Spring/Summer	Spot spray or hand weed
5	Summer	Monitoring

Adapted from Natural Area Restoration Team, City of Eugene Parks and Open Space with contributions from the Nature Conservancy

A general guide to habitat types for gra

Source, Benton County Pra



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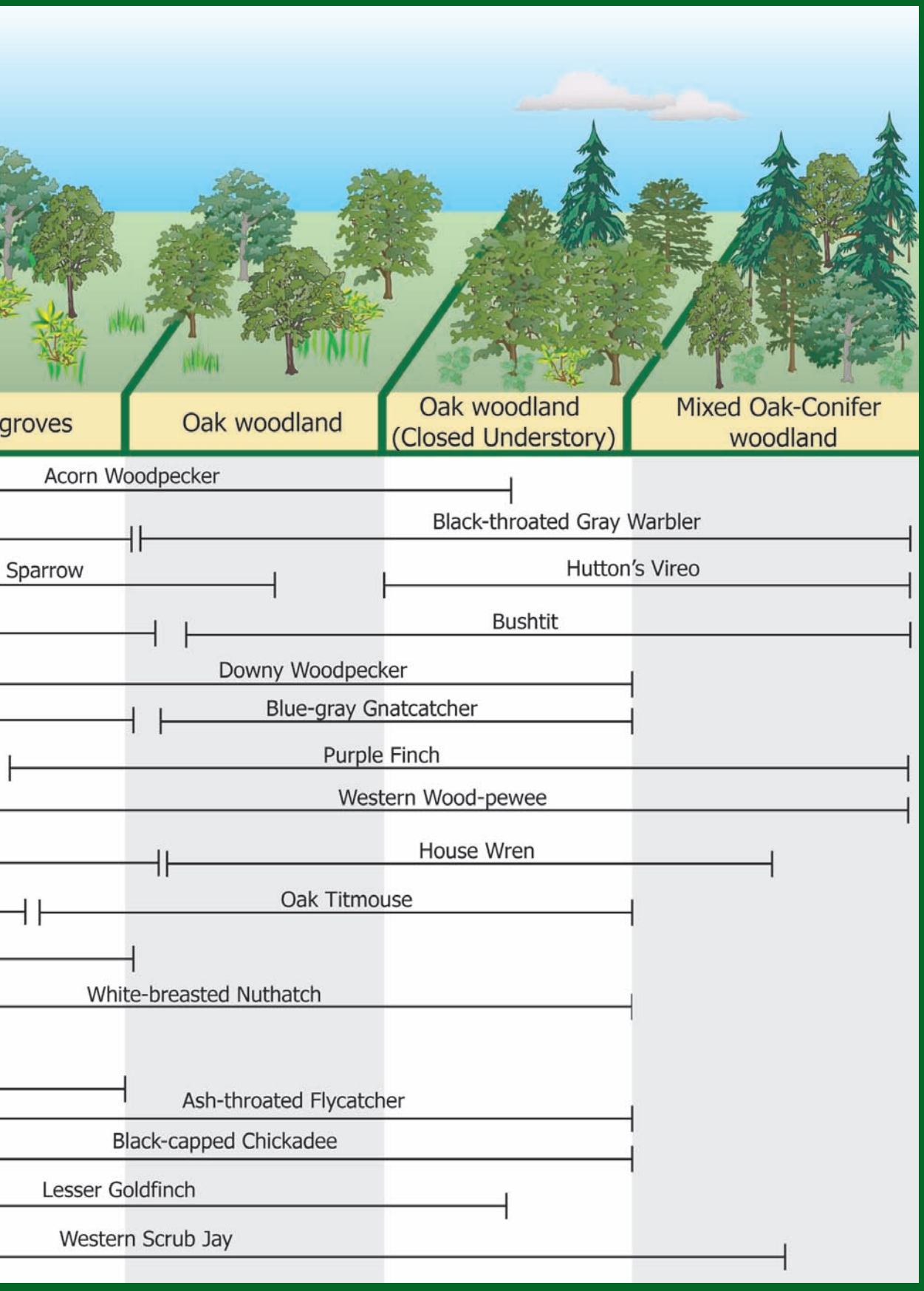

The goal of any planting plan is to establish your plant community quickly in order to out-compete nonnative species and to use a diverse seed mix that provides a multitude of functions, such as host plants for butterflies and variable flowering times to provide a nectar source throughout the season.

To reduce soil disturbance, a no-till drill should be used for seeding grasses, although forb seed may be hand- or mechanically-broadcast. If sedges and rushes are to be planted, these should go in at the same time as the forbs. Keep in mind it is important to have direct soil contact if your seeds are to successfully germinate.

Planting Strategies

Sow species over 3-4 years.
Plant plugs, bare root, and bulbs for species that do not germinate easily.
Plant species with varying structures and flowering times.

Seed Application Options

Three commonly used seeding methods are drill, no-till drill and broadcast seeding. In areas that can be intensively farmed, plowing followed by drill seeding followed by rolling to pack seed is the best method for increasing the establishment of seeded species. Although this method generally results in better establishment, it creates uniform stands that lack a natural appearance as well as encourages weed growth.

The no-till drill is a tractor-pulled machine that opens a furrow in untilled ground, drops seeds at a given rate and depth and rolls the furrow close. This method is practical on sites accessible to machinery, is less expensive than tillage, and reduces the threat of erosion. This application process is generally limited to sites that have been disked or sprayed with a non-selective herbicide because this method alone does not remove competitive plants. It disturbs the soil less than conventional drilling so is less problematic in bringing new weed seeds to the surface. No-till drilling gives seeds good contact with the soil which generally improves germination and establishment over broadcast seeding methods.

Broadcast seeding is recommended on sites with poor access for machinery or for small-scale projects. Seeds are broadcast using a hand-held scattering device or a spinning bucket pulled by a tractor or ATV followed by a drag harrow and/or roller to pack seed. This method is considerably more labor intensive and requires a heavier seeding rate (twice the drill rate) because of lower seed germination than either the drill or no-till drill seeding; however, this method allows you to place seeds depending on specific site conditions and creates a natural appearance. This method places seed on the soil surface and would be desirable for seed of many native plants that require light to germinate. Conventional and no-till drill methods may place seed too deep for some species to germinate. It may be desirable to plant some species using drill or no-till drill seeding and then broadcasting light-requiring (e.g. generally small-seeded

species) species onto the soil surface to insure the best germination and establishment of your plant community.

Fall seed applications are recommended to coincide with the natural supply of precipitation and to reduce problems with seed dormancy or stratification. If you choose to plant your site in the spring, irrigation may be necessary throughout the summer to ensure good germination and plant growth. Be aware that special seed treatment may be required for some species if you plan to seed in the spring.

Plant Forms and Functions									
Common Name	**Latin Name**	**Habitat**	**Forb**		**Flowers**	**Function**			
			Annual	**Perennial**		**Nectar/ Host**	**Food**	**Nesting**	**Cover**
Narrowleaf onion	*Allium amplectens*	upland, wet prairie		X	mid	X			
Dense sedge	*Carex densa*	wet prairie			mid		X		
California oatgrass	*Danthonia californica*	upland, wet prairie			mid			X	X
Annual hairgrass	*Deschampsia danthonioides*	wet prairie			early			X	X
Denseflower willowherb	*Epilobium densiflorum*	vernal pool, wet prairie	X		late	X			
Woolly sunflower	*Eriophyllum lanatum*	upland, wet prairie		X	late	X			
California fescue	*Festuca californica*	upland prairie			mid		X	X	X
Entire-leaved gumweed	*Grindelia integrifolia*	wet prairie		X	late	X			
Common rush	*Juncus effusus*	wet prairie			early		X		X
Fragrant popcorn flower	*Plagiobothrys figuratus*	vernal pool, wet prairie	X		early	X			
Buttercup	*Ranunculus occidentalis*	upland, wet prairie		X	early	X			
Willow dock	*Rumex salicifolius*	upland, wet prairie		X	mid	X			

Select species that provide varying vertical structure and flowering times throughout the season to ensure the availability of seeds and insects.

2006: A photo of Coyote Prairie which was in ryegrass production before the City of Eugene restored the wet prairie. City of Eugene photo.

2008: Post-restoration. City of Eugene photo.

Pollinators: An Essential Element of Success

An adequate food source is essential if birds will occupy an area and successfully raise young. Approximately 96 percent of terrestrial birds use insects as their primary food source. And without plant diversity, especially forbs, there are few insects available. By making abundant native plants available on your site, you increase the diversity of insects, and therefore, birds.

Management for pollinators is essential, and the tools used to maintain grassland habitat are the same as those used to maximize pollinator habitat as well. Once a grassland habitat is in place, you will have to maintain the open grass landscape so that shrubs, trees, and weeds do not take over the site. You can maintain your grassland by mowing, burning or lightly grazing sections of the area in rotation.

Mowing

You should mow and hay the site at the end of the second growing season, after seeds have set and fallen/dispersed (late July) but before fall precipitation. This is necessary because accumulating thatch or litter creates the right environment for weedy nonnative species to invade and dominate. Mow a mosaic patchwork as opposed to an entire site and never more than once a year. Aside from creating a mixed structural component, this helps lessen the impact to insect eggs and larvae. To provide nesting and winter habitat, mow and hay every two to three years, in rotation.

Burning

Historically, prairie communities of the Willamette Valley were burned frequently resulting in low-intensity fires. Burning reduces vegetation density, removes litter layer, exposes areas of bare ground, stimulates plant growth, and controls woody vegetation. If you choose to manage your grassland with prescribed burning, you will need to plan your first burn three to five years after planting, making sure there is enough fuel for a low-intensity fire. High-intensity fires tend to create conditions that favor noxious weeds like Canada thistle, Scot's broom, and Himalayan blackberry. Low-intensity burns should be conducted every three to five years, in rotation. To minimize impacts to pollinators, only 30 percent of a site or less should be burned at any one time. Rotational burning will provide adequate colonization potential and refugia for the insects. Be sure to investigate if burning permits are required in your area.

A controlled burn to improve prairie habitat for grassland birds of conservation concern. Matt Blakely-Smith photo.

Grazing

Proper grazing can be an effective management tool because it creates heterogeneous vegetation structure with varying grass heights and areas of bare ground, reduces the buildup of litter and stimulates grass growth. Timing, duration, and intensity are critical, however, as a diverse pollinator population is dependent on flowering sources throughout the growing season. Keep grazing periods short to allow for adequate recovery, and avoid grazing when butterfly larvae or adults are active. The intensity of grazing affects the structure of the grassland/pasture and will affect the bird's ability to nest. If the grass is grazed too heavily the grass will be too short and birds will be unable to find the structure to nest in, or protection from predators. Use a deferred rest-rotation system that leaves at least one-third of the pasture per year ungrazed, concentrates the impacts of grazing, and limits animal access during the bird's breeding season. You can initiate grazing three to five years after your grassland has established. You can also use a light grazing rotation system that maintains >30 percent of the vegetation at ≥ 10 inches in height. Grazing fence posts can provide song perches.

Weed Control

Nonnative, invasive plant species will be present at some level in restored habitats and will always require some level of treatment. Weeds of this sort compete for important resources, such as water, soil nutrients, sunlight, and space better than our native plants. Furthermore, they have no natural enemies, grow very quickly, produce lots of seeds and do well in disturbed areas. You can help native plants succeed by controlling nonnative weeds through intensive mowing, hand-pulling, grazing, herbicides, or in some cases, biological controls. Controlled burning also may enhance native plants and reduce nonnative, invasive weeds. Time broadcast spraying herbicides to avoid impact to native forbs. Spot spraying herbicides helps you select for invasive weed species. Remember to time these practices outside the nesting season (April 1 – July 15).

A recently mowed field was found attractive by Oregon vesper sparrow and western meadowlark. ODFW photo.

Every Plant has its Home

Not all plant species are created equally. Some species are better suited for dry sites, whereas others grow better in wet areas. So, a different seed mixture should be developed for each site. The seeds selected should be based on site-specific factors such as soil type, drainage, landscape features, and the competitive ability of individual plants. At least three grass species should be used in each seed mixture to maximize the use of micro-sites in your field. A habitat specialist (ODFW, NRCS or County Extension) can help you develop a mixture tailored to your site. For example, planting Roemer's fescue *(Festuca idahoensis ssp. roemeri)*, prairie junegrass *(Koeleria macrantha)* and California oatgrass *(Danthonia californica)* on well-drained areas might be a compatible combination since they are suited for dry upland sites and would not aggressively compete with each other. On the other hand, California brome *(Bromus carinatus)* blue wildrye *(Elymus glaucus)* and slender rush *(Juncus tenuis)* would be well suited for moist swales. Adding wildflowers to your mix will further improve the resulting habitat. See native grassland species lists on pages 20-21 .

Creating a Seed Mix

Grasslands composed of at least some native plant species provide the best habitat for grassland birds, butterflies, and other wildlife. Native plants produce the greatest variety and amount of beneficial insects, which in turn provide food for birds, pollinate crops, and kill some kinds of harmful insects. Further, some native insects require native plants to survive. For example, the native Fender's blue butterfly only lays eggs on plants of three native lupine species. You can collect native seeds from plants on your own property (which should increase your success) or purchase them from selected nurseries. Try to purchase locally native seed whenever possible.

Native seeds from the Willamette Valley are becoming more available and affordable as landowners are recognizing the benefits of "going native." There are several online websites that can assist you in your selection as well as direct you to vendors. Your local Watershed Council, Soil and Water Conservation District or ODFW conservation specialist may be able to provide technical assistance.

Grasslands created with nonnative plant species can also provide habitat for grassland nesting birds, as long as these plants are not invasive. Nonnative seed mixtures should be designed using a variety of species that will provide different plant heights and types (grasses and forbs) necessary for grassland birds. Nonnative seeds can be mixed with native seeds to create improved, and more affordable, grassland. Most seed suppliers will be able to help you with this process. However, avoid using pre-made wildlife or pasture mixes that some suppliers offer. Pre-made mixes may not provide the right habitat structure for grassland songbirds and may introduce invasive species to the area.

Connect Landscapes for Greater Success

Since larger landscapes are better for the majority of grassland birds, think about ways to maximize your efforts. One way is by creating new habitat next to an old pasture or fallow field. Removing vegetation fencerows that act as barriers will create larger contiguous habitat for grassland birds. Work with your neighbors to identify areas that could be connected. Develop a neighborhood strategy or common area to increase the amount of habitat attractive to meadowlarks. Over-the-fence conservation with neighbors not only maximizes the amount of ideal habitat but also helps share the task of providing it. By working together, small patches of habitat can become larger patches.

A grasshopper sparrow was detected in this pasture with grass heights ranging from 12 to 18 inches, Creswell, Oregon. ODFW photo.

Western meadowlark and grasshopper sparrow shared this pasture. Indian Hills, Oregon. ODFW photo.

Commercially Available Native Plant Species

Grass and Grass-like Species for Dry Upland Sites

(Use at least three species)
California brome *(Bromus carinatus)* *****
California oatgrass *(Danthonia californica)*
Blue wildrye *(Elymus glaucus)*
Roemer's fescue *(Festuca roemeri)*
Slender rush *(Juncus tenuis)*
Prairie junegrass *(Koeleria macrantha)*
Slender wheatgrass *(Elymus trachycaulus)*
Foothill sedge *(Carex tumulicola)*

***** Do not use nonnative varieties or cultivars of this species because they are highly invasive.

Grass and Grass-like Species for Moist Lowland Sites

(Use at least three species)
Spike bentgrass *(Agrostis exarata)*
American slough grass *(Beckmannia syzigachne)*
Dense sedge *(Carex densa)*
One-sided sedge *(Carex unilateralis)*
Green-sheath sedge *(Carex feta)*
California oatgrass *(Danthonia californica)*
Tufted hairgrass *(Deschampsia cespitosa)******
Annual hairgrass *(Deschampsia danthonioides)*
Western mannagrass *(Glyceria occidentalis)*
Meadow barley *(Hordeum brachyantherum)*
Spreading rush *(Juncus patens)*
Slender hairgrass *(Deschampsia elongata)*

*Tufted hairgrass can become dominant and should be seeded at least two years after forbs.

Shrub Species for Dry to Moist Sites

(Plant less than 10 percent per area)
Western serviceberry (*Amelanchier alnifolia)*, dry
Nutkana rose *(Rosa nutkana)*, moist
Clustered wild rose *(Rosa pisocarpa)*, moist
Mock orange *(Philadelphus lewisii)*, dry
Oceanspray *(Holodiscus discolor)*, dry
Hardhack *(Spiraea douglasii)*, moist to dry
Tall Oregon grape *(Berberis aquifolium)*, dry
Red-flowering currant *(Ribes sanguineum)*, dry
Baldhip rose *(Rosa gymnocarpa)*, dry
Common snowberry *(Symphoricarpos arbus)*, moist to dry

Wildflowers for Dry Upland Sites

(Use at least 10 or more wildflower species)
White yarrow (*Achillea millefolium)*
Tapertip onion *(Allium acuminatum)*
Western columbine (*Aquilegia formosa)*
Hall's aster *(Aster hallii)*
Northern brodiaea *(Brodiaea congesta)*
Common cat's-ear *(Calochortus tolmiei)*
Fairwell-to-spring *(Clarkia amoena)*
Grand collomia *(Collomia grandiflora)*
Wild hyacinth *(Dichelostemma congesta)*
Wooly sunflower *(Eriophyllum lanatum)*
Mountain strawberry *(Fragaria virginiana)*
Blue-head Gilia *(Gilia capitata)*
Common lomatium *(Lomatium utriculatum)*
American birds-foot trefoil *(Lotus unifoliotus)*
Broadleaved lupine *(Lupinus latifolius)*
Showy tarweed *(Madia elegans)*
Baby blue-eyes (Nemophila meziesii)
Northwest cinquefoil *(Potentilla gracilis)*
Heal-all *(Prunella vulgaris var. lanceolata)*
Western buttercup *(Ranunculus occidentalis)*
Meadow checkermallow *(Sidalcea campestris)*
Rose checkermallow (Sidalcea virgata)
Canada goldenrod *(Solidago canadensis)*
American vetch *(Vicia americana)*
Early blue violet *(Viola adunca)*

Wildflowers for Moist Lowland Sites

(Use at least 10 or more wildflower species)
Slimleaf onion *(Allium amplectens)*
Hall's aster *(Aster hallii)*
Crown brodiaea *(Brodiaea coronaria)*
Leichtlin's camas *(Camassia leichtlinii)*
Common camas *(Camassia quamash)*
Henderson's shooting-star *(Dodecatheon hendersonii)*
Bigleaf lupine *(Lupinus polyphyllus)*
Common monkey-flower *(Mimulus guttatus)*
Rosy plectritis (*Plectritis congesta)*
Northwest cinquefoil *(Potentilla gracilis)*
Oregon's saxifrage *(Saxifraga oregana)*
Narrow-leaf wyethia (Wyethia angustifolia)
Blue-eyed grass *(Sisyrinchium idahoense)*
Wooly sunflower *(Eriophyllum lanatum)*
Self-heal *(Prunella vulgaris var. lanceolata)*
Dense-spike primerose *(Epilobium densiflorum)*
Gumweed *(Grindelia integrifolia)*
Fragrant popcornflower *(Plagiobothyrs figuratus)*
Downingia *(Downingia elegans & D. yina)*
Seaside lotus *(Lotus formosissimus)*
Linear-leaf montia (*Montia linearis)*
Yampa *(Perideridia gairdneri and P. oregano)*
Western buttercup *(Ranunculus occidentalis)*
Straight-beak buttercup *(Ranunculus orthorynchus)*

Additional Resources

Plant and Animal

Birds

- Cornell Laboratory of Ornithology, website: http://www.allaboutbirds.org
- eBird: On online birding community which allows you to share and create information on birds, website: http://ebird.org
- Partners in Flight, http://www.partnersinflight.org/
- The State of the Birds 2011: National assessment of the distribution of birds on public lands, website: www.stateofthebirds.org

Pollinators

- The Xerces Society: Identification, farming practice alternatives, conservation guides and regional plant lists, website: www.xerces.org
- Pollinator Partnership: Planting guides, digital library and other resources, website: www.pollinator.org
- North American Butterfly Association: Native Plant lists for butterfly gardening in the Willamette Valley, Eugene-Springfield Chapter, website: www.naba.org/chapters/nabaes/btrfly-gdng1.html

Native Plants

- Plants Database – Natural Resources Conservation Service: Fact sheets and plant guides to native plants as well as invasive and noxious weeds, website: http://plants.usda.gov

Restoration and Management Resources

- Heritage Seedlings: Prairie and oak restoration site preparation and seeding information (pdf), http://www.heritageseedlings.com/PDF/nativePrairieandOakRestorationMethodsMarch2020.pdf
- Pacific Northwest Invasive Plant Council, website: http://www.pnw-ipc.org/
- West Eugene Wetland, Native Plant Materials Program, website: http://www.eugene-or.gov/portal/server.pt?open=512&objID=667&PageID=1501&cached=true&mode=2&userID=2

Plant and Seed Sources

- Plant Native: Guide to nurseries, plants lists and tutorials, website: http://plantnative.org/
- Institute for Applied Ecology; Search for native seed vendors and species lists and recommendations, website: http://appliedeco.org/native-seed-network

Conservation and Restoration Resources

- Benton County Prairie Conservation Strategy, (pdf) http://wwwcobenton.or.us/parks/pcs/documents/PrairieConservationStrategy_000.pdf
- Oregon Conservation Strategy, website: http://www.dfw.state.or.us/conservationstrategy/
- Prairie Landowner Guide for Western Washington, (pdf) http://southsoundprairies.org/documents/PrairieLandownerGuide_WesternWA.pdf
- Prairie 101: Restoration Techniques for a Variety of Starting Conditions (pdf) http://www.heritageseedlings.com/PDF/stewardship/Prairie101Presentation.pdf
- Prairie Restoration Research: Regional Strategies for Restoring Native Prairies, http://appliedeco.org/conservation-research/prairie-restoration-research

- Restoring Rare Native Habitats in the Willamette Valley: A Landowner's Guide to Restoring Oak Woodlands, Wetlands, Prairies and Bottomland Hardwood and Riparian Forests (pdf) http://www.southsoundprairies.org/documents/Landownerguide.pdf

- Restoration Site-Preparation and Seeding Information (pdf) http://www.heritageseedlings.com/PDF/native/PrairieandOakRestorationMethodsMarch2010.pdf

- Wildlife Conservation in the Willamette Valley's Remnant Prairie and Oak Habitats: A Research Synthesis, (pdf) http://www.heritageseedlings.com/PDF/stewardship/WildlifeConservationinWillametteValleyPrairieandOak.pdf

Conservation and Assistance Programs

A variety of voluntary incentive and technical assistance programs are offered to assist landowners interested in conservation actions and help access funding opportunities.

- Oregon Soil and Water Conservation Districts: A program of the Oregon Department of Agriculture, the SWCD is available to provide technical assistance and educational outreach. The SWCD can help access available assistance programs and funding opportunities. Website: http://www.oregon.gov/ODA/SWCD/about_us.shtml

- Oregon Watershed Councils: A network of councils throughout Oregon designed to help enhance watershed health and local communities. Website: http://oregonwatersheds.org/oregoncouncils

USDA Natural Resource Conservation Service Programs

NRCS Habitat Improvement Programs, website: http://www.nrcs.usda.gov/

- Wildlife Habitat Incentive Program (WHIP) provides technical assistance and pays up to 50 percent of the cost for wildlife habitat development. The program objectives are to connect upper and lower watershed habitats, enhance native plant communities, increase biodiversity, and improve habitat for threatened and endangered species. Website: http://www.or.nrcs.usda.gov/programs/whip/fy10/index.html

- Conservation Reserve Program (CRP) is a Farm Services Program encouraging landowners with highly erodible wetlands or croplands to establish approved conservation practices, providing annual payments for 10-15 years. Website: http://www.nrcs.usda.gov/programs/crp/

- Conservation Reserve Enhancement Program (CREP) provides technical assistance, cost-share, and rental payments to create and maintain habitat. This program focuses on long-term, voluntary protection of environmentally sensitive cropland through filter strips, forested riparian areas, establishment or restoration of wetlands, and restoration of rare and declining habitats. Website: http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=cep

- Conservation Stewardship Program (CSP) provides financial and technical assistance is a voluntary program that encourages landowners to undertake additional conservation activities. Website: http://www.or.nrcs.usda.gov/programs/csp/index.html
- Environmental Quality Incentives Program (EQIP) is a cost-share program aimed at implementing conservation practices that improve wildlife habitat conditions on private lands. Website: http://www.or.nrcs.usda.gov/programs/eqip/
- Grassland Reserve Program (GRP) is a voluntary conservation program administered by NRCS and FSA that emphasizes support for working grazing operations, enhancement of plant and animal biodiversity and protection of grassland under threat of conversion to other uses. Website: http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=grp

Oregon Department of Fish and Wildlife

Tax Incentives

Wildlife Habitat Conservation and Management Program (WHCMP) is administered by the Oregon Department of Fish and Wildlife and provides a property tax incentive to encourage landowners to protect and enhance wildlife habitat on private land. Website: http://www.dfw.state.or.us/lands/whcmp/index.asp

Glossary

Fledge: When a young bird acquires the ability to fly.

Forb: A broad-leaved herbaceous plant that is not grass, sedge or woody plant, such as annuals or perennial

Grasses and grass-like plants: Plants that have thin blade-like leaves and non-descript flowers. This includes true grasses, sedges, and rushes.

Grasslands: Vegetation communities that are dominated by grasses or grass-like plants, such as prairies, savannas, and sedge meadows, and are associated with fewer than 5 percent tree cover.

Grassland birds: Species that require grasslands for most or all parts of their breeding cycles. They may use non-grassland habitats but do not require them for their survival.

Invasive (nonnative, exotic, weedy) species: A plant or animal that is native to another region or country. Nonnative species may be introduced accidentally or intentionally and tend to thrive and spread aggressively outside their natural range.

Surrogate grasslands: Broadly defined to include habitats similar to the native grasslands that historically occurred in the Willamette Valley but are largely composed of nonnative grasses and forbs. Examples include agricultural habitats such as row crops, pastures, and hayfields. Young tree plantations and orchards, old fields, parks, and airports can also be considered surrogate if structural components of grassland habitats are present.

Native plants: Plants that occur naturally in your region and which were historically present in the Pacific Northwest prior to Euro-American settlement. Native plants are best adapted to local soil and weather conditions and provide the best habitat for wildlife.

Prairie: A grassland habitat that has only or nearly all native plants, characterized by a mix of grasses and forbs (flowering plants/wildflowers). Native prairies once covered the Willamette Valley but are now extremely rare.

Savanna: Grassland habitats with scattered trees, generally only one or two per acre.

Strategy species: A species in need of focused conservation actions as defined in the Oregon Conservation Strategy.

Weed: A nonnative plant growing where it is unwanted.

Wet Prairie: Grasslands characterized by vegetation consisting of forbs and grasses that occur in seasonally-wet habitat conditions that persist for at least a portion of the year.

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Field cluster lily. Ann Kreager photo.

Notes

Oregon Department of Fish and Wildlife

3406 Cherry Avenue NE
Salem, OR 97303-4924
Phone (503) 947-6000
www.dfw.state.or.us
www.dfw.state.or.us/conservationstrategy