

Bird Monitoring as an Aid to Meadow Restoration

Findings from the Rogue River-Siskiyou National Forest in Oregon

Photos © Jim Livaudais



Lazuli Bunting
5/30/10, Lower Table Rock Ore.



MacGillivray's Warbler
6/27/11, McGee's Park Ore.



Western Bluebird
8/27/10, Agate Lake Ore.

Meadow Habitats

Meadows are open vegetated areas in otherwise forested landscapes. In any given meadow, the plant and animal communities present will be influenced by numerous factors, such as the meadow's hydrology, soil characteristics, elevation, and geography. Meadows can be classified as dry (xeric), moist (mesic), or wet, depending on how long soil moisture is available during the growing season. Some meadows occur on serpentine soils that are deficient in essential nutrients and often organic matter too, resulting in rocky and sparsely vegetated meadows.

Although individual meadows vary considerably in appearance and species composition, what remains consistent across meadows in the southern Oregon portion of the Klamath-Siskiyou Bioregion—and across broader regions as well—is that these habitats are havens of biodiversity in landscapes dominated by forests; meadows (much like riparian areas in the West) make up only a small proportion of the total acreage at the landscape scale but they support a disproportionately high number of species.

Meadows in southwestern Oregon support a rich array of grasses, forbs, and shrubs that attract arthropods, small mammals, and grass- and shrub-nesting songbirds. These meadows also provide high quality forage for Columbia black-tailed deer and Roosevelt elk, and hunting grounds for Peregrine Falcons and Flammulated Owls.

What is a DST?

Decision Support Tools convey the best available science to audiences who implement strategies that benefit birds and their habitats. DSTs highlight bird conservation opportunities within land management constraints.



A Need for Meadow Conservation

Meadow acreage across public lands in the West is declining due to conifer encroachment, a process in which conifers establish in meadows, reducing meadow acreage and altering conditions to favor shade-tolerant species at the expense of meadow species. The west side of the Rogue River-Siskiyou National Forest in Oregon experienced an estimated 25% reduction in meadow acreage during a 65-year period in the 20th century (USDA Forest Service 1989). Even more dramatically, a more recent study by Takaoka and Swanson in the central western Cascade Range of Oregon reported a 55% reduction in the acreage of nonforest vegetation patches from 1946 to 2000 (2008).

There are likely multiple factors responsible for recent conifer encroachment trends. Fire can maintain meadows by burning encroaching conifers that are young and therefore more susceptible to fire, and it is widely believed that decades of fire suppression policies have contributed to the steady encroachment of conifers into meadows. That said, a study in the Three Sisters Wilderness in Oregon (western Cascades Range) found a correspondence between the establishment of conifers in dry/moist montane meadows and both the cessation of sheep grazing and the onset of wetter summers (Miller and Halpern 1998). Fire history, grazing history, climatic changes, and other factors may interact or act alone to determine the occurrence of meadows on the landscape.

Given the critical role for meadows in maintaining regional biodiversity (above), recent landscape-level reductions in meadow acreage are cause for concern for land managers and others interested in protecting meadow floras and faunas.

Meadow Restoration in the Rogue River-Siskiyou National Forest

Beginning in 2010, and with funding from the American Recovery and Reinvestment Act, the Klamath Bird Observatory partnered with the USDA Forest Service Wild Rivers Ranger District and the Siskiyou Field Institute to restore six degraded meadows (five of them serpentine meadows) to their historically more open conditions. As part of the project, a suite of carefully selected focal bird species are being monitored as indicators of restoration success; each focal bird species represents one or more key meadow habitat attributes, and together the abundance of these birds reflects the ecological integrity of the sites. The six focal species that are hypothesized to benefit from restoration activities are the following: **Chipping Sparrow, Lazuli Bunting, Olive-sided Flycatcher, Townsend's Solitaire, Western Bluebird, and Western Wood-Pewee.**

The bird monitoring portion of this project uses a Before After Control Impact study design. In this design, each of six treatment meadows (i.e., meadows scheduled for restoration) is paired with a control meadow (selected to represent desired ecological conditions) and all meadows are to be surveyed before and after management activities are implemented. We expect that if restoration is successful the bird communities in the treatment meadows will become more similar to the bird communities in the control meadows following restoration activities.

Field workers implemented restoration by removing small trees and shrubs (<8 in diameter), creating and then burning hand piles, and conducting prescribed understory broadcast burns. Also, commercial tree harvesters removed a few large trees, primarily Douglas fir and incense cedar, in some meadows. The Klamath Bird Observatory conducted baseline bird monitoring in summer 2010, a few months before restoration work began.

In this Document

We describe how bird monitoring of a meadows restoration project in Oregon's Rogue River-Siskiyou National Forest produces findings that will inform future restoration, and contributes to the ecosystem conservation vision outlined in the conservation policies of the United States.

Birds as Indicators

Birds are among the best indicators of the health of the environment. To begin with, birds are **diverse** and they represent a large number of specific ecological conditions. Importantly, birds are **well-studied** so their habitat associations are generally well-known. Birds are also **cost-effective** to survey; a simple standardized methodology can detect over 200 species, providing information about associated ecological conditions. Additionally, birds tend to be **high on the food chain** so their persistence on the landscape depends on the presence of multiple other species. Finally, birds are effective indicators because they **respond to habitat changes at various scales**, due to their links to taxa that respond to small- and large-scale disturbance (e.g., plants, insects, and mammals). When these factors are considered together, it is apparent that bird monitoring programs provide useful information about the integrity and functioning of the environment as a whole.

Bird Monitoring Findings

Results from bird surveys conducted prior to the implementation of restoration activities showed that treatment and control meadows have bird communities that are distinct from each other, and these differences stem from different underlying ecological conditions at the sites. The existence of different bird communities is not surprising because the controls represent the desired ecological condition that the treatment meadows are expected to reach following restoration activities. In general, surveys detected forest- and shrub-associated birds at treatment meadows whereas birds associated with open meadow or savannah conditions were present at control meadows.

Five of the six focal bird species expected to benefit from restoration activities were more abundant at control meadows compared to treatment meadows; the sixth species, Townsend's Solitaire, was not detected at close enough range to be included in comparisons. Western Bluebirds were more abundant at control meadows compared to treatment meadows on point count surveys, and this difference was statistically significant. A number of other bird species showed higher abundance on point count surveys in control meadows compared to treatment meadows, although for these species the differences were not statistically significant: Ash-throated Flycatcher, Chipping Sparrow, Common Nighthawk, Lazuli Bunting, Lesser Goldfinch, Mourning Dove, Northern Flicker, Olive-sided Flycatcher, Orange-crowned Warbler, Rufous Hummingbird, Spotted Towhee, Tree Swallow, Western Kingbird, Western Wood-Pewee, and White-breasted Nuthatch.

Habitat Prescriptions for Land Managers

Our suite of focal bird species provides guidance on how to restore ecologically functional meadow habitats in the Klamath-Siskiyou Bioregion of southern Oregon and northern California. By looking at the bird-habitat relationships of the meadow focal species we can identify the habitat features of a meadow capable of supporting a diverse wildlife community. The following habitat attributes are associated with the focal species: (1) large snags as well as live trees that will become future snags, (2) grasses as the predominant ground cover, but also a mixture of native shrubs and forbs to achieve structural and compositional diversity, and (3) exposed perches for singing and hunting. Specific habitat prescriptions by focal species are provided below:

Western Bluebird is a Partners in Flight focal species that indicates the presence of **snags** in open early seral habitats, due to their dependence on cavities for nesting. Cavities can occur naturally in snags, occur as a result of primary excavators (e.g., Hairy Woodpecker), or exist in man-made structures such as nest boxes.

Habitat Objectives

- (1) Provide an average of 8 snags/ha (3/ac) > 38 cm (15 in) dbh with at least 3/ha (1/ac) > 71 cm (28 in) dbh
- (2) Snags should be > 30 feet tall, well distributed, and of varying decay classes with a relative equal amount of hard and soft snags
- (3) Units that are at least 15 ha (38 ac) in size will meet the needs of multiple pairs of Western Bluebirds

Species to Benefit

Other primary and secondary cavity nesters are expected to benefit, such as Northern Flicker, Red-breasted Sapsucker (soft snags), House Wren, Violet-green Swallow, and Tree Swallow. Non-cavity nesters that use snags for foraging or singing perches and could also benefit include Olive-sided Flycatcher, Western Tanager, Western Wood-Pewee, Red Crossbill, Steller's Jay, Evening Grosbeak, and Red-tailed Hawk.

Chipping Sparrow is a Partners in Flight focal species that indicates **herbaceous understory cover**.

Habitat Objectives

- (1) Interspersion of multiple patches of native shrub cover (e.g., snowberry, poison oak) and herbaceous openings such that shrub cover occurs in 10-40% range and herbaceous cover in the 30-70% range
- (2) <10% blackberry cover in the shrub layer
- (3) Ground layer dominated by grasses

Species to Benefit

The primary species to benefit would be shrub and herbaceous associates such as Vesper Sparrow, Western Meadowlark, Western Kingbird, White-crowned Sparrow, and Lazuli Bunting. Others that may benefit include American Goldfinch, Dark-eyed Junco, and Spotted Towhee.

Habitat Prescriptions (cont.)

Olive-sided Flycatcher is a Partners in Flight focal species that indicates **edges** and **openings** created by wildfire.

Habitat Objectives

- (1) Retain all trees/snags >51 cm (20 in) dbh and >50% of those 30-51 cm (12-20 in) dbh
- (2) Retain patches with mix of live and dead trees/snags to provide potential nest trees (live) within the context of potential foraging and singing perches (dead)
- (3) Maintain snags greater than 12 m tall

Species to Benefit

The primary species to benefit from edges and openings created by fires would be Western Tanager, Cassin's Finch, Western Wood-Pewee, Mountain Bluebird, Northern Flicker, American Kestrel, and American Robin.

Western Wood-Pewee is a Partners in Flight focal species that indicates **canopy edge** and **openings**.

Habitat Objectives

- (1) High edge to opening ratios
- (2) Most abundant in forest stands with least canopy closure (44%) and fewest trees/ha (18) (44/ac)
- (3) Native understory of shrubs interspersed with native herbaceous grasses and forbs where neither is >80% of understory

Species to Benefit

Species to benefit from canopy edges and openings may include Western Tanager, Purple Finch, Black-headed Grosbeak, and Bullock's Oriole.

Lazuli Bunting has the following habitat associations:

- (1) Occurs in grasslands and savannahs where a scattered shrub component exists
- (2) Occurs in meadows bordered with tall trees, dead snags, and other areas providing song perches

Townsend's Solitaire has the following habitat associations:

- (1) Occurs during breeding in or near natural forest openings, burned areas, shelterwood cuts, and clearcuts to timberline
- (2) Typical sites for this species have residual shrubbery at the forest interface and low-growing forbs, shrubs, and grasses in the interior



Sam Brown Meadow in Rogue River-Siskiyou National Forest

Additional Considerations for Land Managers

Spatial Considerations for Restoration

- (1) In a comparison of small- (7—42 ha) and large-scale (>100 ha) fuels reduction treatments (i.e., removal of shrubs manually or by mechanical mastication) in Oregon oak woodlands and chaparral, Seavy and co-authors (2008) found preliminary evidence that open-habitat bird species responded positively to the large-scale treatments whereas edge-associated bird species responded positively to the small-scale treatments. Access the full text article here to learn more: www.klamathbird.org/resources/science-publications
- (2) Many meadow plants are not represented in the seed bank (Lang and Halpern 2007). In order to increase the likelihood that meadow plant species will disperse into restored meadow areas, restoration sites should be adjacent to existing meadow habitat, either at the forest-meadow edge or at small tree islands within meadows.

Timing of Restoration Soil chemical and biological properties change rapidly (i.e., within decades) following conifer encroachment, creating a positive feedback loop that favors forest herbs and the further progression of conifer encroachment (USDA Forest Service 2007). Therefore, tree removal early in the encroachment process is recommended.

Meadow Type In the Cascade Range in Oregon, moist meadows and meadows dominated by forbs appeared more susceptible to conifer encroachment than dry meadows and shrub-dominated meadows. Thus, moist and forb-dominated meadows are likely to be higher priority sites for restoration (USDA Forest Service 2007).

Conservation Policy in the USA

Conservation policy in the United States is rooted in a philosophy of ecosystem conservation. Here is a synopsis of that history:

In 1929, the *Migratory Bird Conservation Act* authorized the establishment of wildlife refuges to protect suites of migratory birds. In 1942, a U.S. Department of the Interior report, titled *Fading Trails: The Story of Endangered Wildlife*, highlighted a link between failing ecological integrity and an increased need for at-risk species protection, thereby suggesting the need to maintain ecological balance. In 1973, Congress passed the *Endangered Species Act* in order to protect species and, “the ecosystems upon which they depend.” More recently, President Clinton signed Executive Order 13186 in 2001, confirming that federal land management agencies have a responsibility to protect and manage for migratory landbird species.

While US policy promotes a progressive vision for ecosystem conservation, actual ecosystem conservation efforts are falling short of achieving this vision. For example, greater than 30% of the bird species in the United States are threatened, endangered, or of conservation concern, according to the 2009 US *State of the Birds* report, an alarming indication of broad-scaled environmental degradation.

Achieving Ecosystem Conservation

Partners in Flight (PIF) provides an approach for achieving ecosystem conservation in the United States, based on the country’s successful waterfowl conservation model. PIF is a cooperative and voluntary partnership designed to achieve landbird conservation at the continental scale. PIF helps species at risk and works to keep common birds common. Because birds are excellent ecological indicators, we expect healthy and diverse bird communities to represent healthy ecosystems. In this way, success at landbird conservation is a reasonable surrogate for ecosystem conservation success.

The PIF approach uses science-based tools to accomplish ecosystem conservation. First, measurable conservation targets are set for landbird species using the PIF species assessment database. Second, the management needed to meet these targets is outlined in a series of bird conservation plans. Third, coordinated conservation actions are implemented by partners at multiple scales. Fourth, bird monitoring is used to evaluate the effectiveness of management actions. Finally, the process is refined through adaptive management as we continue to learn from a growing body of science and ongoing evaluation.

A hallmark of the PIF approach is the use of focal bird species to guide the implementation of conservation actions. Each focal species is carefully chosen based on its high degree of association with a specific and important habitat attribute, such as a native shrub understory. In each habitat type, a suite of focal species is used to represent the key habitat components needed to support numerous birds and other wildlife species in that habitat.

The PIF approach depends on voluntary partnerships and we encourage land managers to incorporate bird conservation objectives—as described in PIF bird conservation plans—into existing management plans to help achieve ecosystem conservation in the United States. PIF Conservation Plans are available here: www.partnersinflight.org/conservation_plans/

The Meadows Project Advances Ecosystem Conservation

The meadows restoration project in the Rogue River-Siskiyou National Forest in southwestern Oregon is using bird monitoring to evaluate our ability to manage for key habitat attributes of meadows. Baseline and future monitoring results will be compared to measure the wildlife benefits of restoration activities, and to inform the adaptive management process, with expected benefits for wildlife and humans. By collecting and analyzing empirical data on the ecological responses to habitat management actions we can understand whether conservation actions are successful and how to improve conservation actions in the future.

When projects like these are coordinated with land management programs that work at different scales, decision-makers can ensure the landscape supports diverse habitat features in sufficient proportions to support our native wildlife at a regional scale.

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Steering Management

Birds and habitats are dynamic, and bird-habitat relationships vary in space and time. In order to achieve the best management possible, we start by steering management using established bird-habitat relationships from the scientific literature, but we adapt and continue to refine our understanding of these relationships using new data as they come in from bird monitoring programs. Ultimately, conservation plans and bird monitoring results work together to direct management toward the appropriate path.

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