

# AFFECTS OF COMMUNITY STRUCTURE ON AVIAN POPULATIONS IN JUNIPER WOODLANDS AND SHRUB STEPPE: WORK IN PROGRESS

Rick Miller, Mitch Willis, Jeff Rose, Dan Reinkensmeyer,  
and Bob Anthony

## SUMMARY

A large proportion of the juniper/sagebrush/bunchgrass communities are in transition from sagebrush/bunchgrass to closed juniper woodlands. Closed woodlands typically have few to no shrubs in the understory and may or may not have an intact herbaceous understory. However, the majority of avian surveys and studies in juniper communities have treated the woodlands generically despite the large degree of variability in community structure and composition. The greatest abundance and diversity of birds is usually found in the mid successional woodlands or open old growth woodlands with an intact shrub steppe component in the understory. As the woodland closes and shrubs decline ground and shrub nesters vacate the site.

## INTRODUCTION

In southeastern Oregon, the greatest number of wildlife species have been reported in sagebrush/bunchgrass and juniper/sagebrush/bunchgrass communities, with the exception of riparian areas (Maser et al. 1984). A large proportion of the juniper/sagebrush/bunchgrass communities are in transition from sagebrush/bunchgrass to closed juniper woodlands. Closed woodlands typically have few to no shrubs in the understory and may or may not have an intact herbaceous understory. The juniper/shrub/bunchgrass communities with the high wildlife diversity described in Maser's et al. (1984) report are early to mid successional communities proceeding to closed woodlands. In addition to changes over time due to woodland succession, environmental factors such as soils, topographic position, elevation, and disturbance history also influence woodland structure and composition. Changes in woodland structure due to succession or site characteristics affects wildlife habitat for a broad array of species. For example, open juniper woodlands in early to mid succession with an intact shrub bunchgrass understory typically have the greatest structural diversity with multiple plant layers (e.g. trees, shrubs and grasses) compared to a shrub grassland or closed juniper woodland. Community structure, particularly vegetation layers, have been closely related to avian diversity. However, the majority of avian surveys and studies in juniper communities have treated the woodlands generically despite the large degree of variability in community structure and composition. We must consider the dynamics of juniper woodlands to effectively manage for avian populations.

Several studies evaluating avian populations in semi-arid woodlands have been conducted in the pinyon-juniper zone with mixed results. Mason (1981) reported bird numbers and diversity increased on burned areas over comparable unburned areas in pinyon-juniper woodlands of northeast Nevada. O'Meara et al. (1981) found bird densities to be higher on unchained than chained areas in pinyon-juniper woodlands.

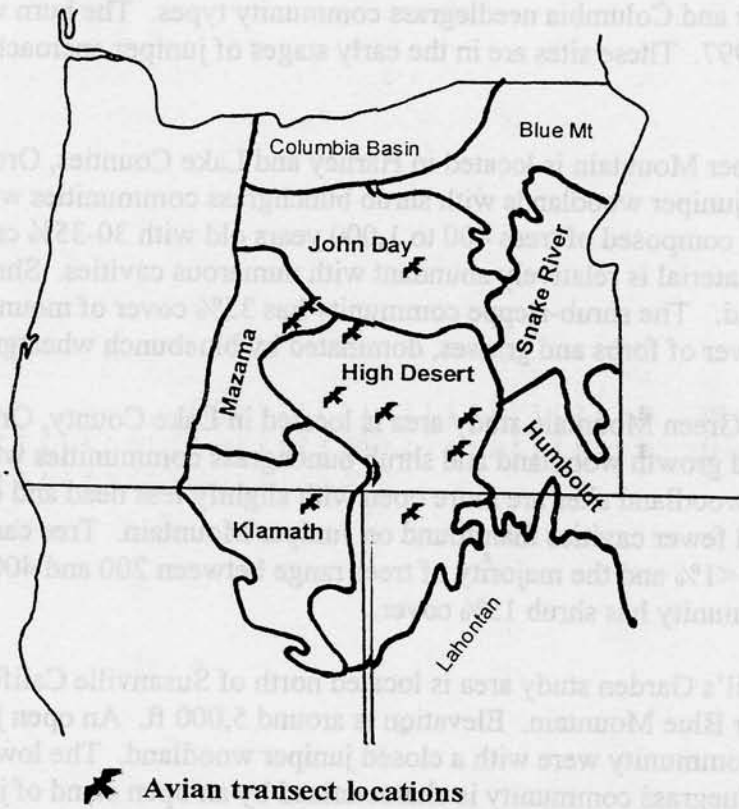
They believed the adverse effects of chaining on non-game wildlife could be minimized by favoring survival of shrubs and young trees, retaining selected cavity trees, and limiting widths of clearings when chaining. Sedgwick and Ryder (1987) found 7 of the 16 most common bird species in a pinyon-juniper study in Colorado used the untreated woodland plot more, while only 1 used the chained plot more. However, these studies failed to report the structure and composition of treated and untreated woodlands.

In a recent symposium on the management of pinyon-juniper in the Intermountain West, two studies evaluating avian diversity and abundance in pinyon juniper woodlands conducted across Utah, failed to identify stand structure and age. In one of the studies, two of the 17 stands contained several shrub and ground nesting birds including Brewer's and vesper sparrows. Both stands were mid succession woodlands with a shrub layer compared to the remaining closed stands where shrubs were absent. A third stand contained a high percentage of cavity nesters, attributed to the unusually large size of the juniper trees. However, the stand was an old growth woodland containing considerable dead wood and cavities. A second study compared avian diversity and abundance among different conifer types including a pinyon-juniper woodland. Among the seven upland forest cover types sampled, the pinyon-juniper woodland ranked second in bird abundance, third in species richness, and third in overall diversity. The woodland type ranked first in percentage of obligate and semi-obligate species. Although not identified in the study, the pinyon-juniper woodland was an old growth stand with a diverse understory.

We are currently conducting avian surveys across central and southeastern Oregon, northwestern Nevada, and northeastern California (Fig. 1). Our overall goal is to evaluate the affects of succession in shrub steppe juniper woodland communities on bird density, diversity, species richness, and composition during the breeding season and during the winter. We also intend to relate the relative abundance of birds with structural components of the vegetation. Communities being evaluated include grasslands (recently burned sagebrush bunchgrass), sagebrush grassland, mid successional sagebrush bunchgrass woodlands, closed postsettlement woodlands, and old growth juniper woodlands. In addition to burning, we are also evaluating the affects of juniper thinning and clearcut with slash left in place on avian populations. We currently have from one to three years of data across 10 locations (Fig. 1). We are currently in the process of analyzing the data collected during the past three years and will continue to conduct bird surveys in 1999 and 2000.

### STUDY AREAS

Bird surveys have been conducted in 10 areas: Page Ranch near John Day, Krumbo Ridge and Deep Creek on Steens Mountain, Juniper Mountain, Green Mountain, Pine Mountain, Badlands, and West Butte in Oregon, Devil's Garden in Modoc California and Sheldon National Wildlife Refuge in Nevada (Fig. 1).



**Figure 1.** Avian bird study areas located across four ecological provinces. Ecological provinces are derived from Anderson 1956, Cronquist et. al. 1972, and Bailey 1994.

The Page Ranch is located along Warren Creek approximately 8 miles northwest of Mount Vernon in Grant County, Oregon at 4,600 ft. The area is occupied by a late successional juniper woodland with about 40% tree canopy cover and 100-130 trees/acre. Understory vegetation is primarily a mix of grasses and forbs with few shrubs. Three 50 acre plots were marked out on a northwest slope. Half of each plot (approx. 25 ac) were cut to compare both plant and avian response to tree removal. Trees were cut and left in place.

Krumbo Ridge is located on the northern end of Steens Mountain at about 5,000 ft. in Harney County, Oregon. Treatments are thinned and uncut woodlands. Uncut sites are in mid to late woodland succession with 10-20% tree cover and 100 trees/acre. Shrub cover varied between 7-15%, although well over half of the shrub canopy, both sagebrush and bitterbrush, were dead. Herbaceous cover was 5-10%. The three cut sites were thinned to 2-3 trees/acre (1-2% canopy cover) in the spring of 1995.

The Deep Creek area is located on the south end of Steens Mountain near the headwaters of the Blitzen in Harney County, Oregon, at an elevation of 6200 ft. Comparisons are being made between burned and unburned mountain big sagebrush and

Idaho fescue and Columbia needlegrass community types. The burn was conducted in the fall of 1997. These sites are in the early stages of juniper encroachment with < 1% tree cover.

Juniper Mountain is located in Harney and Lake Counties, Oregon at 6,000 ft. Old growth juniper woodlands with shrub bunchgrass communities were compared. The woodland is composed of trees 400 to 1,000 years old with 30-35% crown closure. Dead and down material is relatively abundant with numerous cavities. Shrub cover is <1% in the woodland. The shrub-steppe community has 35% cover of mountain big sagebrush and 12% cover of forbs and grasses, dominated by bluebunch wheatgrass.

The Green Mountain study area is located in Lake County, Oregon at 5,000 ft. Adjacent old growth woodland and shrub bunchgrass communities were compared. The old growth woodland sites are more open with slightly less dead and down woody material and fewer cavities than found on Juniper Mountain. Tree canopy is 10-15% and shrub cover <1% and the majority of trees range between 200 and 400 years. The shrub steppe community has shrub 15% cover.

Devil's Garden study area is located north of Susanville California on the USFS 47 road near Blue Mountain. Elevation is around 5,000 ft. An open juniper low sagebrush community were with a closed juniper woodland. The low sagebrush Sandberg bluegrass community is characterized by an open stand of juniper, <5% canopy cover.

The Sheldon Refuge area is located in northern Washoe County, Nevada at 6,400 ft. The community type being evaluated is a mountain big sagebrush/Columbia needlegrass community type. Three unburned sites and three burned sites were evaluated. The burn communities were in the third growing season following fire.

In Central Oregon (Horse Ridge just east of Bend and Fort Rock), a two year intensive bird study is being conducted comparing avian populations among recently burn shrub bunchgrass, shrub bunchgrass, mid-succession juniper woodland, and old growth woodlands. Bird surveys are being conducted during the winter and spring. Bird transects are distributed from the Badlands just north of highway 20 east of Bend, south to near Christmas Valley. First year has been completed.

## METHODS

Bird inventories are being conducted on each study area using the variable circular-plot technique outlined by Reynolds et al. (1980). Surveys commence within 0.5 h of sunrise and do not extend beyond 4 h after sunrise. At each point, all birds seen or heard as well as cluster size, and distance from station center are recorded for a 5 minute period following a 1 minute period for acclimation (Verner 1988). On mornings with winds > 10 mph or precipitation, surveys are not conducted. Plots were surveyed 4 times during a one week period with the exception of the intensive bird survey where plots were survey 5 times during May and June, and monthly December through April.

The Shannon-Weiner diversity index was calculated from field observations for each plot summing across days.

## DISCUSSION

The following are a few general conclusions based on data summaries. Data have not yet been statistically analyzed. In cut versus uncut woodlands avian diversity and density were higher in cut juniper treatments than in uncut blocks at both Page Ranch and Krumbo Ridge study areas. We suspect that cutting juniper and leaving slash within the stands at the Page Ranch created additional structural diversity for the birds. Cover of herbaceous vegetation greatly increased on the cut plots. On the Krumbo Ridge site, tree selective species, including the Dark-eye junco, mountain chickadee, chipping sparrows, and flycatchers were more abundant on uncut plots but also used the thinned stands. Shrub and ground nesting birds including Green-tailed and Rufous-sided Towhees were more abundant on the thinned plots. Chipping sparrows were probably the most ubiquitous species across treatments. They appeared to be highly dependent on the slash in the cut sites. We also noted the majority of birds in the uncut closed woodland on the Page Ranch used the edge adjacent to the cut plots. In the cut plots birds were evenly distributed across the treatment.

Closed old growth woodlands were compared to shrub steppe communities at Juniper Mountain, Green Mountain, and Devils Garden. Avian diversity among these juniper stands and shrub steppe communities were notably different only at Juniper Mountain. At Green Mountain and Devil's Garden the indices were all very close although species composition was different between woodlands and shrub bunchgrass communities. Chipping sparrow density was consistently higher in the woodland treatments. Western Meadowlarks and Green Tailed Towhees were found exclusively in the shrub treatments in all 3 areas.

In the Central Oregon transects (Bend and Fort Rock areas), the highest bird numbers, approximately 45, and diversity indices occurred in open old growth woodland and early successional postsettlement woodland, compared to all of the other transects we have surveyed. Both communities contained less than 15% tree cover, and a shrub grassland understory is intact. This compares to 16 to 26 bird species in closed juniper woodlands with no shrub layer.

In recently burned and shrub steppe communities on the Sheldon National Wildlife Refuge we recorded approximately 21 and 24 bird species, respectively. However, the burned plots contained a greater density of birds (169/ha) compared to unburned (107/ha). Diversity indices were similar between treatments but composition was different.

A preliminary summary of data shows avian diversity among the different community types was greatest in mid succession shrub steppe woodland communities and open old growth stands, where the tree canopy is open and the shrub steppe

understory is still intact. The composition and structure of the understory appears to be a key factor influencing avian abundance and diversity in these woodland communities. However, if juniper woodlands are allowed to fully develop, both the shrub layer and potential berry crops will be lost as well as the opportunity to burn these stands. Maintaining a balance of trees with other plant forms such as shrubs, grasses, and forbs will provide the greatest opportunity for the maximum number of avian species at the community level. In addition, the maintenance of different successional stages in shrub steppe communities, from recently burned to fully developed sagebrush bunchgrass stands will increase opportunities for ground and shrub nesting birds, and foraging for a broad array of bird species.

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