MONITORING AVIAN AND SMALL MAMMAL SAGEBRUSH OBLIGATE RESPONSE TO HABITAT MANAGEMENT PRACTICES IN SOUTHWEST WYOMING

Sagebrush (*Artemisia spp.*) dominated ecosystems are some of the largest in the Western United States, spanning approximately 160 million acres and providing habitat for over 350 wildlife species, including mule deer (*Odocoileus hemionus)*, pronghorn (*Antilocapra americana*), and Greater Sage-grouse (*Centrocercus urophasianus*). However, sagebrush ecosystems are now among the most threatened in North America due to several factors, including frequent wildfires, intensive herbivory, and fragmentation from changes in land use. Natural and anthropogenic disturbances have the potential to alter sagebrush ecosystems by reducing the total amount of sagebrush cover across the landscape and changing the composition of sagebrush vegetation communities, both of which can result in increased fragmentation and reduced habitat suitability for sagebrush-dependent wildlife. The state of Wyoming, particularly the Green River basin in the southwest portion of the state, contains some of the most intact tracts of sagebrush in existence, making the region a refuge for many sagebrush obligate species and a high priority for conservation efforts. In recent years, federal, state, and community-led

Sagebrush Sparrow. Photo by Marky Mutchler.

organizations have taken an interest in sagebrush conservation and restoration, primarily in response to the proposed listing of the Greater Sage-grouse under the Endangered Species Act. The Wyoming Game and Fish Department (WGFD) identified sagebrush

ecosystems as one of the top priority habitats to enhance or maintain within its Statewide Habitat Plan, and categorized low-elevation shrub communities as at risk to cheatgrass invasion. Additional concerns about steadily declining mule deer populations across Wyoming and deteriorating habitat quality in crucial mule deer winter range prompted the WGFD Commission to adopt the Wyoming Mule Deer initiative in 2007 and the Wyoming Range Mule Deer Plan in 2011. One major result of these plans was implementation of habitat improvement projects in sagebrush communities across the state. These improvements included direct mechanical treatments to sagebrush, such as mowing, aerating, and chaining, as well as mechanical removal of encroaching conifer species and aerial spraying to control invasive annual grasses. While the primary focus of these projects was habitat improvement for sage-grouse and mule deer, it remains unclear how the treatments and management practices affect o ther sagebrush-dependent wildlife.

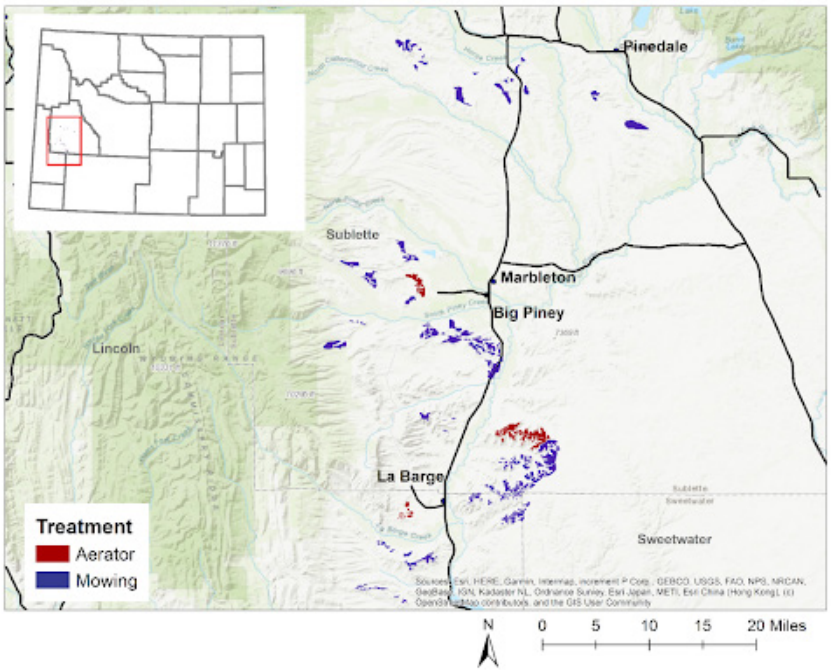

Figure 1. *Overview map of the project study area in Southwest Wyoming.*

Concomitant with decreasing sage-grouse and mule deer populations and the disappearance of sagebrush habitat is the decline of many sagebrush obligate species. Three songbirds, the Sage Thrasher (*Oreoscoptes montanus)*, Sagebrush Sparrow (*Artemisiospiza nevadensis*), and Brewer's Sparrow (*Spizella breweri*), and two small mammal species, the Pygmy Rabbit (*Brachylagus idahoensis*), and Sagebrush Vole (*Lemmiscus curtatus*), are designated as Species of Greatest Conservation Need (SGCN) in Wyoming and all require sagebrush habitat for their survival. The Sage Thrasher, Brewer's Sparrow, Sagebrush Sparrow, and Sagebrush Vole are ranked by the Wyoming Game and Fish Department as Native Species Status (NSS) 4-Tier II, because of their vulnerability to habitat loss and, in the case of the avian species, because of documented population declines across their ranges. The Pygmy Rabbit is ranked as NSS3-Tier II due to the risk of habitat loss and fragmentation, as well as uncertainties about the species' abundance in Wyoming.

Monitoring population trends for sagebrush obligate SGCN is important for the conservation of sagebrush habitats; their sensitivity to local and landscape changes make these wildlife species key indicators of sagebrush ecosystem health. Consequently, alterations of sagebrush habitat designed to benefit a single species, such as Sage-grouse or mule deer, may have unintended effects on non-target species which co-occur in the area. Our objective for this project is to assess how mechanical alterations to sagebrush habitat, in the form of mowing and aeration, affect the abundance of sagebrush obligate SGCN.

We worked with WGFD habitat biologists in the Green River and Pinedale regions to identify areas of sagebrush habitat that had undergone treatment and to select priority areas for monitoring. We chose four treatments to evaluate based on the relative amount of acres treated: Mowing <50%, Mowing >50%, Aeration <50%, and Aeration >50%. We also identified areas of nearby untreated sagebrush to use as control sites. The entire study area includes sagebrush shrublands on Bureau of Land Management land in southern Lincoln and Sublette Counties, Wyoming (Figure 1). We evaluated density and occupancy of sagebrush obligate songbirds and mammals in each treatment area using field protocols adapted from the Integrated Monitoring in Bird Conservation Regions program and the Wyoming Game and Fish Department's Handbook of Biological Techniques. We determined the relative abundance of songbirds in our study area by conducting 6-min point counts in the morning from

May-July. At each point, we recorded all individuals seen and heard within the survey window, with an emphasis on sagebrush obligates and other SGCN. To survey for small mammals, we placed baited, live traps near key habitat features in a 4 x 20 grid in both treated and untreated plots. Traps were spaced 20 m apart, resulting in a 2.28 hectare trapping area. Traps were checked each morning for three consecutive days and captured individuals were marked, weighed, and measured prior to release. Finally, we conducted Pygmy rabbit surveys in late fall and early spring in both treated and untreated areas. Observers walked line transects at each survey location looking for evidence of pygmy rabbits, including individuals, pellets, and burrows. We also collected vegetation data within a 50-m radius of each avian point count and within each of the small mammal trap grids.

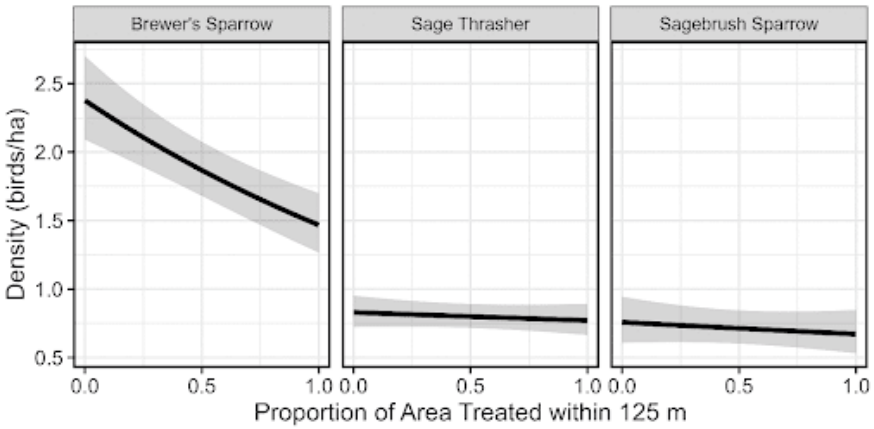

Figure 2. *Estimated density of Brewer's Sparrow, Sage Thrasher, and Sagebrush Sparrow in relation to the proportion of the area mechanically treated within a 125-m-radius of the survey point. Plots show the mean response (black lines) with 90% confidence bands (gray shading). Estimates are corrected for detection using multiple-covariate distance sampling models.*

During the 2022 field season, we completed 355 avian point counts between 18 May and 30 June and observed a total of 3,248 individuals of 54 different species. We observed our target species on all treatment types. In total, we counted 794 Brewer's Sparrows, 585 Sagebrush Sparrows, and 507 Sage Thrashers. We also observed a number of other avian SGCN, including American Kestrel, Burrowing Owl (*Athene cunicularia*), Greater Sage-grouse, Long-billed Curlew (*Numenius americanus*), and Swainson's Hawk (*Buteo swainsoni)*. Preliminary results of analyses suggest that areas where sagebrush had been mechanically treated had lower abundance of Brewer's Sparrows, Sage Thrashers, and Sagebrush Sparrows (Figure 2), and higher abundance of Vesper Sparrows (*Pooecetes gramineus*), and Horned Larks (*Eremophila alpestris*).

We conducted live-trapping surveys for small mammals at 10 sites between 6 July and 11 August for a total of 2,237 trap nights and 227 individuals captured. The majority of species captured were deer mice (*Peromyscus maniculatus*) and chipmunks (*Neotamias spp.*); however, we also observed Sagebrush Voles (*Lemmiscus curtatus*), which were one of our target SGCN. Preliminary results indicate that sites with greater shrub and herbaceous cover had a higher likelihood of being occupied by mice, chipmunks, and voles.

We conducted Pygmy Rabbit surveys from 1 November 2022 to 31 March 2023 at 6 sites across the study area and observed signs of occupancy at 2 sites. A final year of field data collection is planned for summer 2023, when we will continue point counts for sagebrush obligate birds and live trapping for small mammals.

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