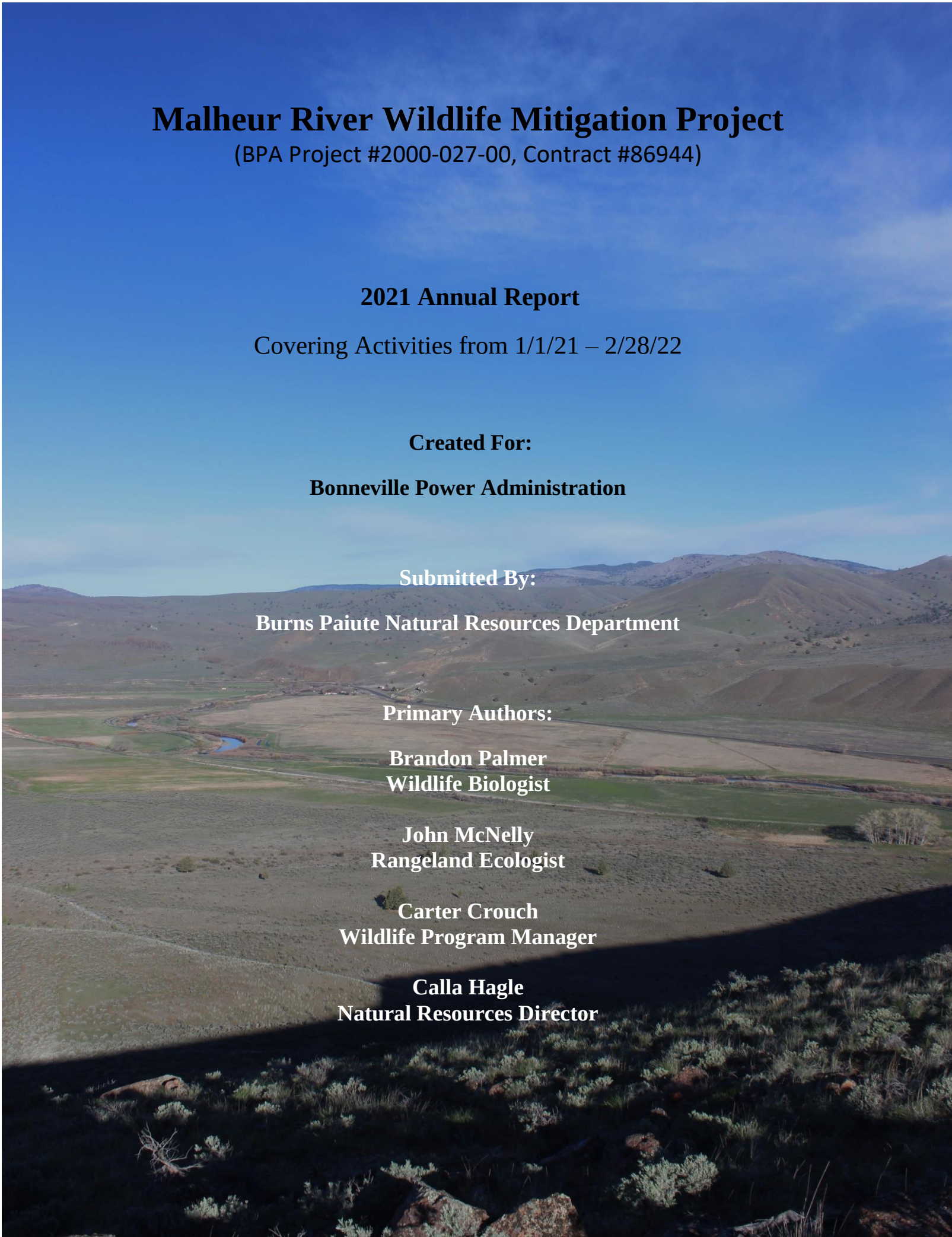
Malheur River Wildlife Mitigation Project

(BPA Project #2000-027-00, Contract #86944)



2021 Annual Report

Covering Activities from 1/1/21 – 2/28/22

Created For:

Bonneville Power Administration

Submitted By:

Burns Paiute Natural Resources Department

Primary Authors:

Brandon Palmer
Wildlife Biologist

John McNelly
Rangeland Ecologist

Carter Crouch
Wildlife Program Manager

Calla Hagle
Natural Resources Director

Table of Contents

List of Figures

List of Tables

List of Appendices

Introduction

In 1998, the Burns Paiute Tribe (BPT) submitted a proposal to Bonneville Power Administration (BPA) for the acquisition of the Malheur River Wildlife Mitigation Site (Project) or MRWMS for short. The proposed mitigation site was for the Denny Jones Ranch and included Bureau of Land Management (BLM) and Oregon Division of State Lands (DSL) leases and grazing allotments. The approval process and acquisition negotiations continued until BPT and BPA entered into a Memorandum of Agreement, which allowed for purchase of the MRWMS in November 2000.

MRWMS is 6,385-acres located seven miles east of Juntura, Oregon and is adjacent to the Malheur River (Figure 1.0.1). Elevation on MRWMS ranges from approximately 2,731–5,374 ft (Google, Inc.).

Associated with the deeded land are 4,154 acres of a DSL allotment and a 21,242 acre BLM allotment (Figure 1.0.2). In total two grazing allotments with eleven different pastures are leased between the two agencies. Deeded land stretches for seven miles along the Malheur River. It is the largest private landholding on the river between Riverside and Harper, Oregon. Approximately 938 acres of senior water rights are included with the ranch.

MRWMS is comprised of meadow, wetland, riparian, and shrub-steppe habitats. The BLM grazing allotment, located south of the ranch, is largely shrub-steppe habitat punctuated by springs and seeps. Hunter Creek, a perennial stream, flows through both private and BLM lands. Similarly, the DSL grazing allotment, which lies north of the ranch, is predominantly shrub/juniper steppe habitat with springs and seeps dispersed throughout the upper end of draws (Figure 1.0.2).

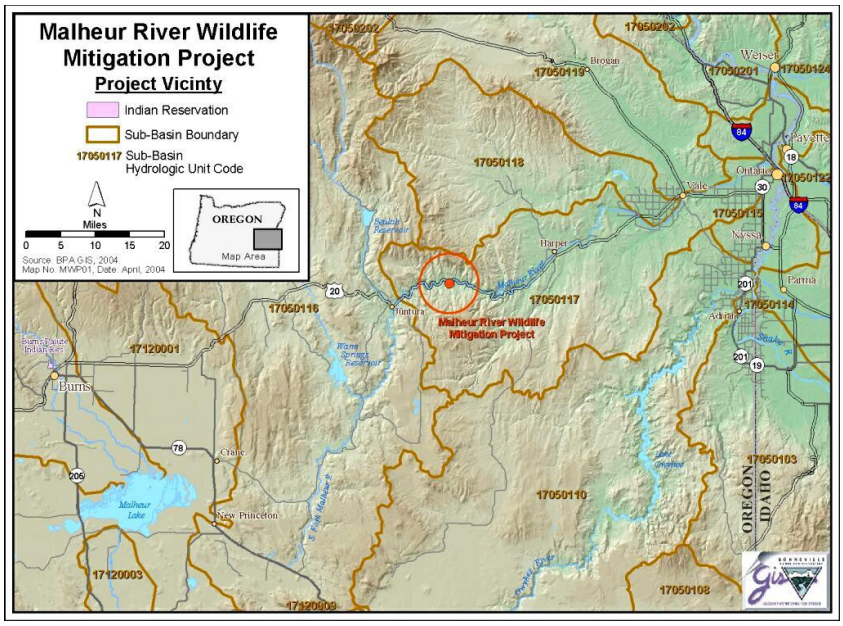


Figure 1.0.1. Location of the Malheur River Wildlife Mitigation Site.

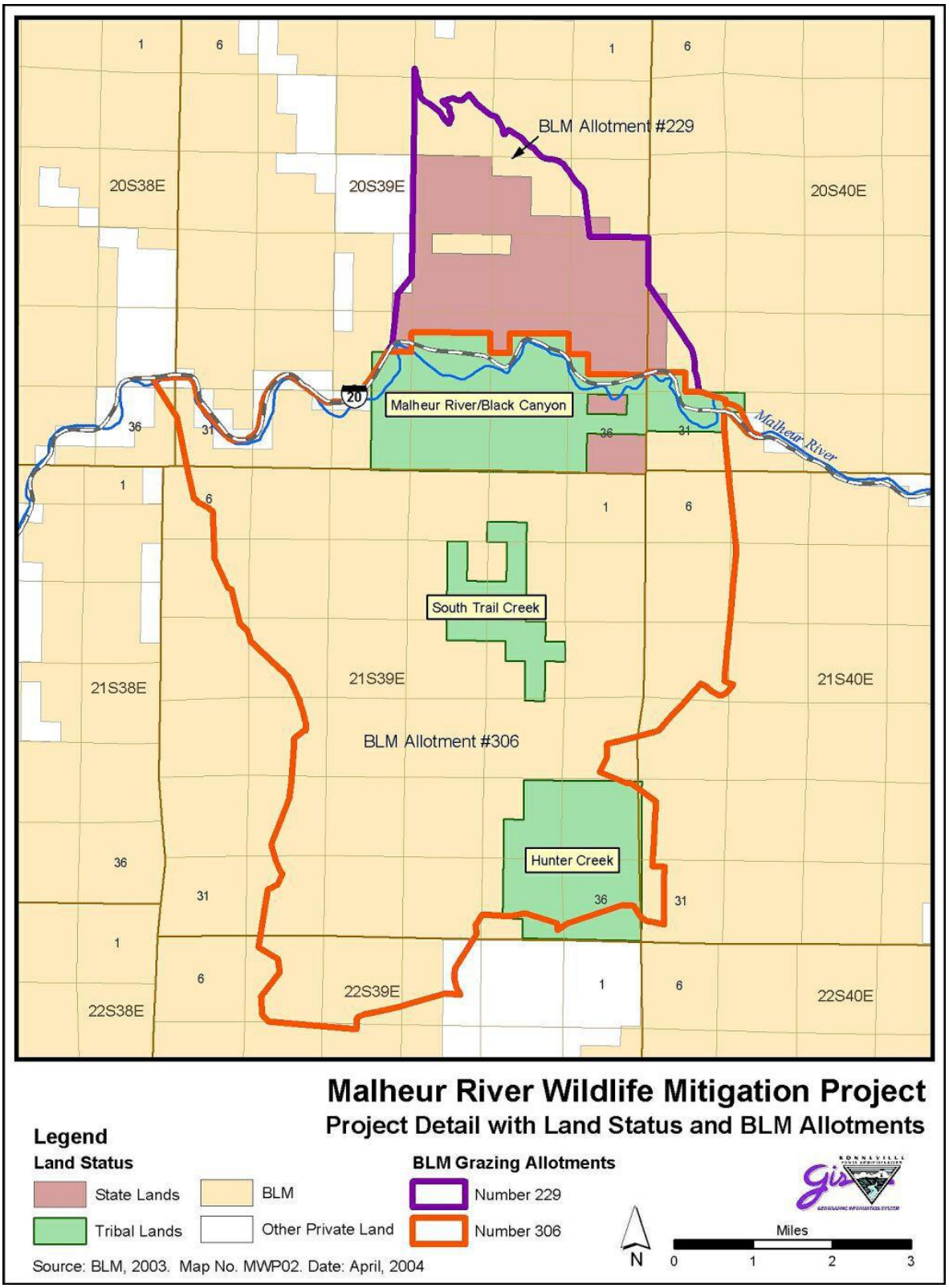


Figure 1.0.2. MRWMS and surrounding land ownership.

Wildlife Value

The Malheur Wild and Scenic River Management Plan (U.S. Forest Service 1993a), *the North Fork Malheur Scenic River Management Plan* (U.S. Forest Service 1993b), and *the Malheur River Subbasin Assessment and Management Plan for Fish and Wildlife Mitigation* (Malheur Watershed Council and Burns Paiute Tribe 2004) identify the MRWMS area as a key component in the restoration of aquatic and terrestrial habitat within the Malheur River basin. Much of the habitat in the Malheur River basin has been marginalized by decades of intense grazing and agricultural practices, making the MRWMS of paramount importance to special status wildlife species present in the ecoregion. Table 1.1.1 outlines species in the ecoregion designated as sensitive, threatened, endangered, or of special concern by state and federal listings. Several species listed are known to occur on the MRWMS.

In 2015, an unprecedented effort to conserve and protect the Greater Sage-Grouse (*Centrocercus urophasianus*) reached its peak. An excerpt from the U.S. Fish and Wildlife Service statement for listing in 2015: "A status review conducted by the Service has found that the Greater Sage-grouse remains relatively abundant and well-distributed across the species' 173-million-acre range and does not face the risk of extinction now or in the foreseeable future. The Service's decision follows an unprecedented conservation partnership across the western United States that has significantly reduced threats to the greater sage-grouse across 90 percent of the species' breeding habitat (U.S. Fish and Wildlife Service, 10/2/2015). The Service has determined that protection for the Greater Sage-Grouse under the Endangered Species Act is no longer warranted and is withdrawing the species from the candidate species list." Large numbers of Greater Sage-Grouse located in designated core sage-grouse habitat have been surveyed annually in the past for lek activity on the Property. This effort will not subside with the recent listing change. The decision to remove the bird from being warranted for an endangered species listing arose due to the immense coordination between researchers, biologist, wildlife managers, and private landowners to protect the bird. BPT will be implementing future projects to further secure the sage brush habitat for this species of concern.

Migratory bird surveys conducted by BPT biologists have detected a suite of species currently listed as sensitive by the Oregon Department of Fish and Wildlife (Table 1.1.1) on the property including Willow Flycatchers (*Empidonax traillii adastus*), Long-billed Curlews (*Numenius americanus*), Black-necked Stilts (*Himantopus mexicanus*), Greater Sandhill Cranes (*Antigone canadensis tabida*), and Caspian Terns (*Hydroprogne caspia*).

Bat surveys conducted on the Property in 2008 (Kesling et al. 2008) potentially identified four sensitive bat species, the Pallid bat (*Antrozous pallidus*), Long-legged bat (*Myotis volans*), Hoary bat (*Lasiurus cinereus*), and California myotis (*Myotis californicus*).

Widespread water impoundments and agricultural diversions have led to the extirpation of three federally threatened anadromous fish in the Malheur River basin. Those are the Coho salmon (*Oncorhynchus kisutch*), Chinook salmon (*Oncorhynchus tshawytscha*) and Steelhead (*Oncorhynchus mykiss*). The Great Basin Redband Trout (*Oncorhynchus mykiss newberrii*) is an ODFW sensitive species and uses the Property (Schwabe et al. 2008). The federally threatened

Bull Trout (*Siphateles alvordensis*) now only exist at higher elevations in the subbasin (Schwabe et al. 2008).

The MRWMS is also known winter range for pronghorn (*Antilocapra americana*), Rocky Mountain elk (*Cervus elaphus*) and Mule deer (*Odocoileus hemionus*).

Literature Cited

Endangered and threatened wildlife and plants; 12-Month finding on a petition to list Greater sage-grouse (*Centrocercus urophasianus*) as an endangered or threatened species. U.S. Fish and Wildlife Service, September 2, 2015.

Kesling, J., C. Abel, L. Schwabe 2008. Malheur River Wildlife Mitigation Project Annual Report. Burns Paiute Tribe. Burns, OR.

Schwabe, L., D. Brown, R.R. Perkins, B. Bangs, S. Gunkel, S. Jacobs, and D. Hawkins. 2008. Evaluate the Life History of Native Salmonids in the Malheur Subbasin. FY 2007 Annual Report. Burns Paiute Tribe. Burns, OR. 167p.

U.S. Forest Service. 1993a. Malheur wild and scenic river management plan. Malheur National Forest, John Day, Oregon.

U.S. Forest Service. 1993b. North Fork Malheur scenic river management plan. Malheur National Forest, John Day, Oregon.

Table 1.1.1. List of Oregon Department of Fish and Wildlife Sensitive Species for the Northern Basin and Range ecoregion.

Common Name	Scientific Name	Oregon Department of Fish and Wildlife: Sensitive Species List
Amphibians and Reptiles		
Columbia Spotted Frog	*Rana luteiventris*	Sensitive-Critical
Western toad	*Anaxyrus boreas*	Senstive
Birds		
American White-Pelican	*Pelecanus erythrorhynchos*	Sensitive
Black-necked Stilt	*Himantopus mexicanus*	Sensitive
Bobolink	*Dolichonyx oryzivorus*	Sensitive
Burrowing Owl (Western)	*Athene cunicularia hypugaea*	Sensitive
Caspian Tern	*Hydroprogne caspia*	Sensitive
Ferruginous Hawk	*Buteo regalis*	Sensitive
Franklin's Gull	*Leucophaeus pipixcan*	Sensitive
Greater Sage-Grouse	*Centrocercus urophasianus*	Sensitive
Greater Sandhill Crane	*Antigone canadensis tabida*	Sensitive
Juniper Titmouse	*Baeolophus ridgwayi*	Sensitive
Long-Billed Curlew	*Numenius americanus*	Sensitive
Mountain Quail	*Oreortyx pictus*	Sensitive
Peregrine Falcon (American)	*Falco peregrinus anatum*	Sensitive
Snowy Egret	*Egretta thula*	Sensitive
Swainson's Hawk	*Buteo swainsoni*	Sensitive
Trumpeter Swan	*Cygnus buccinator*	Sensitive
Willow Flycatcher	*Empidonax traillii*	Sensitive
Fish		
Alvord Chub	*Siphateles alvordensis*	Sensitive
Foskett Speckled Dace	*Rhinichthys osculus robustus*	Sensitive
Great Basin Redband Trout	*Oncorhynchus mykiss newberrii*	Sensitive
Pit Sculpin	*Cottus pitensis*	Sensitive
Mammals		
American Pika	*Ochotona princeps*	Sensitive
California Myotis	*Myotis californicus*	Sensitive
Fringed Myotis	*Myotis thysanodes*	Sensitive
Hoary Bat	*Lasiurus cinereus*	Sensitive
Long-legged Myotis	*Myotis volans*	Sensitive
Pallid Bat	*Antrozous pallidus*	Sensitive
Pygmy Rabbit	*Brachylagus idahoensis*	Sensitive
Silver-haired Bat	*Lasionycteris noctivagans*	Sensitive
Spotted Bat	*Euderma maculatum*	Sensitive
Townsend's Big-eared Bat	*Corynorhinus townsendii*	Sensitive-Critical
White-tailed Jackrabbit	*Lepus townsendii*	Sensitive

Cultural Relationship

The MRWMS is culturally significant to BPT because it lies within the Tribes' former reservation and aboriginal territory. Historically, BPT members gathered roots, hunted, and fished along the Malheur River corridor.

Both BPT and the public have a shared interest in the MRWMS's permanent protection. Habitat protection and enhancement measures to the resident plant community will benefit diverse fish and wildlife assemblages. General management goals include improving water quality, enhancing upland, wetland, floodplain meadow and riparian habitats; controlling noxious weeds; protecting springs and seeps; managing grazing on the BLM and DSL allotments to meet wildlife objectives; preserving cultural resources; and providing public hunting and recreation opportunities.

Habitat Management

Grass and Forb Production

Haying practices have been utilized as a management tool since the Tribe acquired the Project Area. Haying has been used to control weeds, remove decadent material, and improve foraging opportunities for avian species and ungulates throughout the Project area. In 2021, irrigation was later than normal due to leaking ditch repair. This and drought led to poor hay production this year. Given the poor hay production, we did not hay any of the fields.

Wetland field, Field 2, and Triangle field (Figure 2.1.1) are meadow grass pastures, mainly composed of Timothy (*Phleum pretense*), Orchard grass (*Dactylis glomerate*), and Meadow Foxtail (*Alopecurus pratensis*) and irrigated annually. Triangle and Field 2 were mowed in the last weekend of August. Wetland field was not mowed to avoid fawning and nesting season.

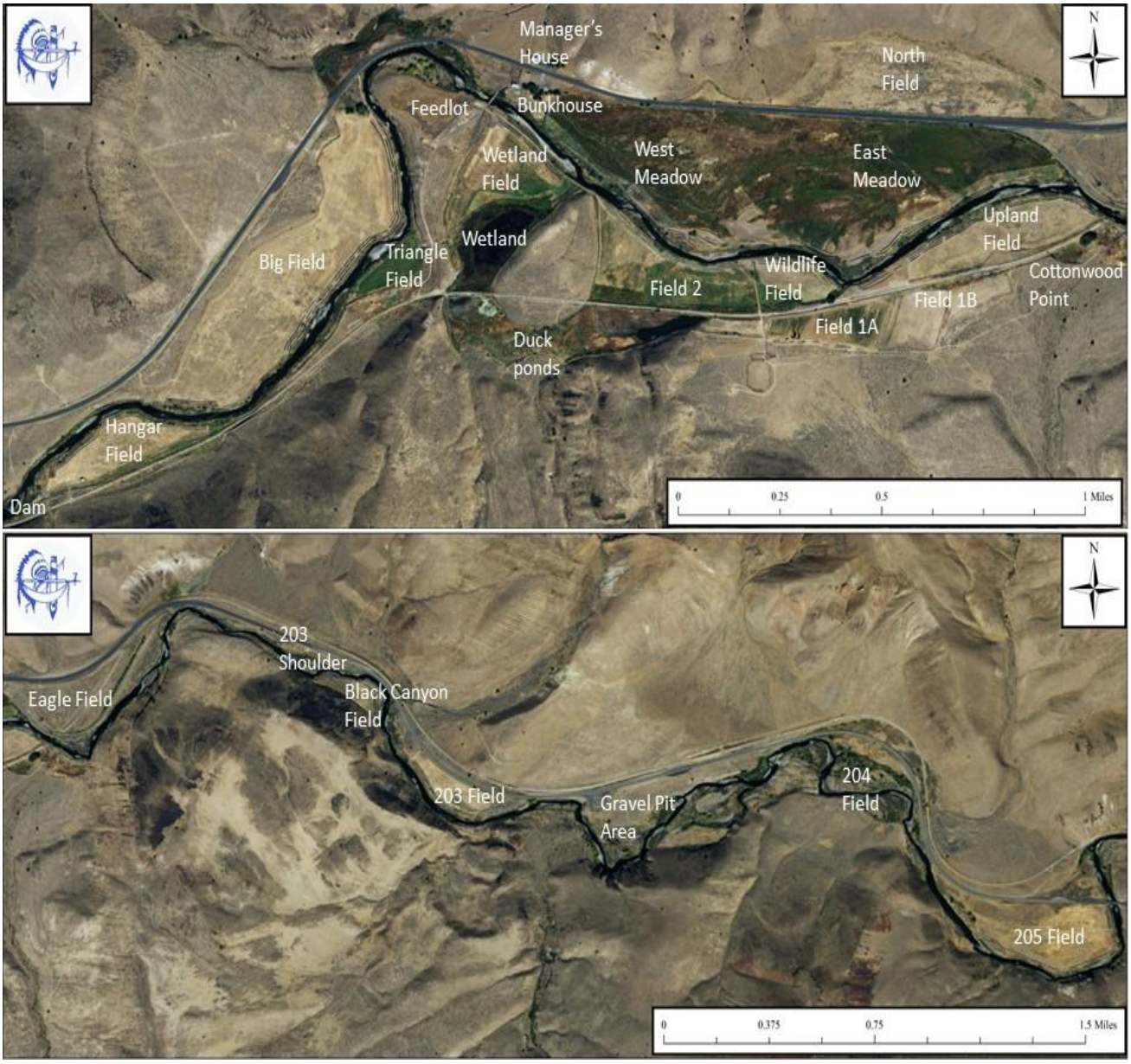


Figure 2.1.1. Map of field names for MRWMS.

Vegetation Management

Under previous ownership this site was subject to high cattle stocking rates, lack of ecologically sound grazing, and an introduction of prolific noxious invasive weeds (Kesling et. al. 2014). This has severely impacted wildlife habitat on the Property. BPT expends a large amount of time and funds on controlling noxious weeds in this area, with various control techniques, not only to restore MRWMS to a desirable ecological condition but to reduce the chance of spreading the invasive plant species to other areas (DiTomaso 2000, BLM 2015). Both

chemical and mechanical methods were used to control different species of invasive plants in 2021.

Mowing and Burning

Mowing and burning practices have been employed in order to reduce noxious weed numbers in native vegetation stands, provide accelerated growth for native vegetation, clear irrigation conveyances and provide foraging opportunities for wildlife (DiTomaso et al. 2006). Sections of Big, Upland field, Wildlife field, Hangar field, and CREP areas adjacent to Upland field were mowed to reduce decadent plant material and remove stands of broadleaf weeds. Traditionally they would have been burned but due to hotter than usual conditions and the poor forage production, mowing was a similar option.

Grazing

Appropriate grazing can be used as a management tool for wildlife habitat (Holechek et al. 1982, DiTomaso et al. 2000). Removal of decadent material in the spring and early fall can jump-start vegetative growth in the early spring which improves forage conditions for avian species and ungulates in the late spring and summer when forage growth is reduced due to dry conditions. Targeted grazing can also be used to reduce invasive plant seed production by stressing invasive plants and allowing native plants to compete more effectively.

The Burns Paiute Tribe worked in conjunction with a cattle owner to graze the ‘Meadow’ field during the times when native grasses were dormant and would benefit from removal of decadent material. This is the first year of 2-3 year rested grazing on the north side of the highway (DSL and adjacent Tribally owned land). Many of the acres were treated with herbicide following the Indian Creek Fire.

A total of 130 AUM’s were utilized in the Meadow Field (Figure 2.2.1). The Indian Creek and Antelope Swale pastures were rested following medusahead treatments in 2020. The remaining BLM allotments and the Tribal lands south of the river were grazed in the spring and summer. A total of 734 AUMs were utilized in the Jonesboro BLM allotment and the adjacent tribal lands. Under 75% of the available acreage was grazed and the remaining was rested due to poor growing conditions.

In 2021, BPT staff managed stocking rates by using the estimated AUM/acre method, with the goal of 50% or less available forage utilization based on carrying capacity of each pasture.

Start Date	# of Cow:calf pairs	Pasture	End Date
3/16/2021	70	Saddle Horse	6/18/2021
3/16/2021	70	Trail Cr	4/6/2021
4/7/2021	89	Trail Cr	4/30/2021
5/1/2021	69	Trail Cr	5/8/2021
5/9/2021	89	Trail Cr	6/18/2021
5/1/2021	20	Sperry Creek	5/8/2021
6/19/2021	80	Horse Camp/Dinner Creek	8/9/2021
6/19/2021	79	Tim's Peak	8/9/2021
8/10/2021	159	Meadow field	9/4/2021

Table 2.2.1. Pasture and grazing/supplement rotation schedule in the State Allotments at MRWMS in 2021.

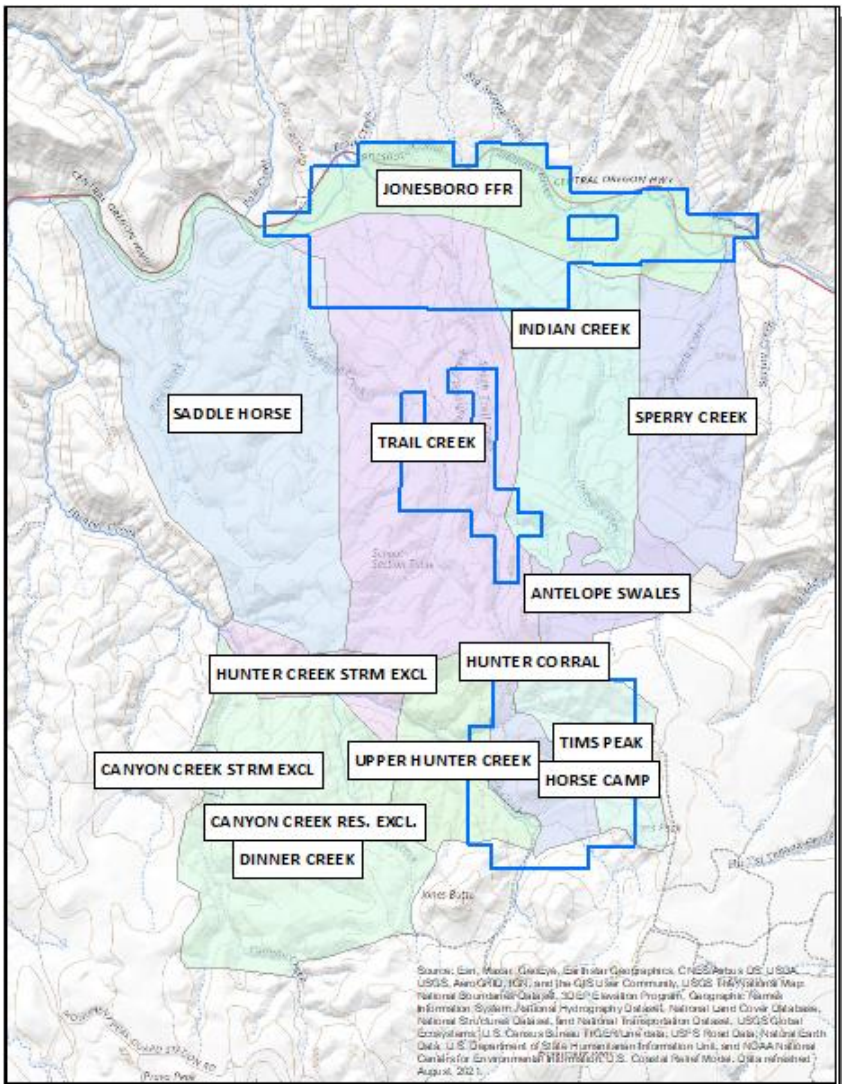


Figure 2.2.1. BLM pastures managed by BPT at MRWMS in 2021.

Herbicide

Using drift reducing nozzles, low pressures, lower boom height, and adjuvants to reduce herbicide drift, spot spraying was conducted wherever feasible to do so throughout the property (Bussan and Dyer 1999).

For control of broadleaf weeds in riparian and non-riparian areas and in adjacent areas, staff spot sprayed by hand with a side-by-side tank sprayer using 1100 gallons of herbicide for control of poison hemlock, Canada thistle and puncture vine. Weedmaster, Milestone, and Syl-

tec was applied at a rate of 18, 3.6, and 9 fl oz./acre respectively over approximately 178 acres in total. (Table 2.2.2).

Table 2.2.2. Herbicide type and estimated amount applied to pastures and Malheur River adjacent areas at MRWMS in 2021.

Date	Specific Site	Product by Name	Amount Used (gallons)	Purpose	Acres
6/7/2021	Equipment lot	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	60	Kochia, Puncturevine, Russian thistle	3.2
6/10/2021	Equipment lot	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	35	Kochia, Puncturevine, Russian thistle	2.28
6/11/2021	Equipment lot	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	60	Kochia, Puncturevine, Russian thistle	5.07
6/14/2021	Equipment lot	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	30	Kochia, Puncturevine, Russian thistle	5.1
6/15/2021	East Railroad	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	60	Kochia, Puncturevine, Russian thistle, Thistle	10.9
6/16/2021	East Railroad	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	25	Kochia, Puncturevine, Russian thistle, Thistle	0.98
6/18/2021	East Railroad	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	60	Kochia, Puncturevine, Russian thistle, Thistle	12.2
6/21/2021	East Railroad	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	60	Kochia, Puncturevine, Russian thistle, Thistle	10.8

6/23/2021	East Railroad	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	25	Kochia, Puncturevine, Russian thistle, Thistle	2.8
6/24/2021	East Railroad	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	55	Kochia, Puncturevine, Russian thistle, Thistle	8.36
6/29/2021	Upland (along railroad grade)	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	25	Kochia, Puncturevine, Russian thistle	1.9
6/30/2021	Upland (along railroad grade)	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	15	Kochia, Puncturevine, Russian thistle	1.57
7/6/2021	Wetland Driveway	Weedmaster: 18 oz Syl-tec 9oz	60	Kochia, Puncturevine, Russian thistle	8.6
7/7/2021	Wetland Driveway	Weedmaster: 18 oz Syl-tec 9oz	30	Kochia, Puncturevine, Russian thistle	3.42
7/8/2021	Wetland Driveway	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	35	Kochia, Puncturevine, Russian thistle	4.37
7/12/2021	Barn, Corrals	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	55	Kochia, Puncturevine, Russian thistle	9.21
7/19/2021	Bunkhouse parking lot	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	60	Kochia, Puncturevine, Russian thistle	10.89
7/20/2021	Bunkhouse parking lot	Weedmaster: 18 oz Milestone: 4oz Syl-tec 9oz	30	Kochia, Puncturevine, Russian thistle	5.38
7/21/2021	Bunkhouse parking lot	Weedmaster: 18 oz Milestone: 4oz Syl-tec 9oz	20	Kochia, Puncturevine, Russian thistle	8.1
7/23/2021	Road toward dam	Weedmaster: 18 oz Milestone: 4oz Syl-tec 9oz	15	Kochia, Puncturevine, Russian thistle, Thistle	4.34

7/28/2021	Triangle field Road	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	20	Kochia, Puncturevine, Russian thistle, thistle	5.16
8/3/2021	Equipment lot	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	55	Kochia, Puncturevine, Russian thistle	13.39
8/4/2021	Equipment lot	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	55	Kochia, Puncturevine, Russian thistle	10.94
8/5/2021	Equipment lot	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	45	Kochia, Puncturevine, Russian thistle	8.19
8/9/2021	Bunkhouse parking lot	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	60	Kochia, Puncturevine, Russian thistle	10.16
8/11/2021	Bunkhouse parking lot	Weedmaster: 18 oz Milestone: 3.6oz Syl-tec 9oz	50	Kochia, Puncturevine, Russian thistle	12.66
		Total:	**1100 gallons**		**178 acres**

Notice of intent to spray herbicide:

The goal of this notice is to put into practice methods of control to minimize the spread of noxious weeds while informing the community and mitigating impact to important plant gathering areas or other community concerns.

The Burns Paiute Tribe Natural Resources Department will be mowing and spraying areas denoted in the maps at Jonesboro. Application will be either broadcast or spot sprayed depending on area. This herbicide application is meant to control broad leaf weeds encroaching in the riparian areas and parking areas on the property.

Target broadleaf species are: poison hemlock, Canada thistle, scotch thistle, Bindweed, knapweeds, whitetop, perennial pepperweed, and puncturevine, and rush skeletonweed.

Milestone and Weedmaster are labeled for use on rangeland, permanent grass pastures, Conservation Reserve Program (CRP) acres, non-cropland areas (such as roadsides), natural areas (such as wildlife management areas, wildlife openings, wildlife habitats, recreation areas, campgrounds, trailheads, and trails), and previously grazed areas in and around these sites.

All herbicide applications must follow United States Environmental Protection Agency label instructions.

Application of herbicides will be suspended when any of the following conditions exists:

•wind velocity exceeds 6 miles per hour (mph)during application of liquids or 15 mph during application of granular herbicides;

•snow or ice covers the foliage of noxious weeds; and

•precipitation is occurring or is imminent (unless acceptable on the label).

Please contact Wildlife Program Manager, Calla Hagle: (541)573-8021, calla.hagle@burnspaiute-nsn.gov with any questions or comments.

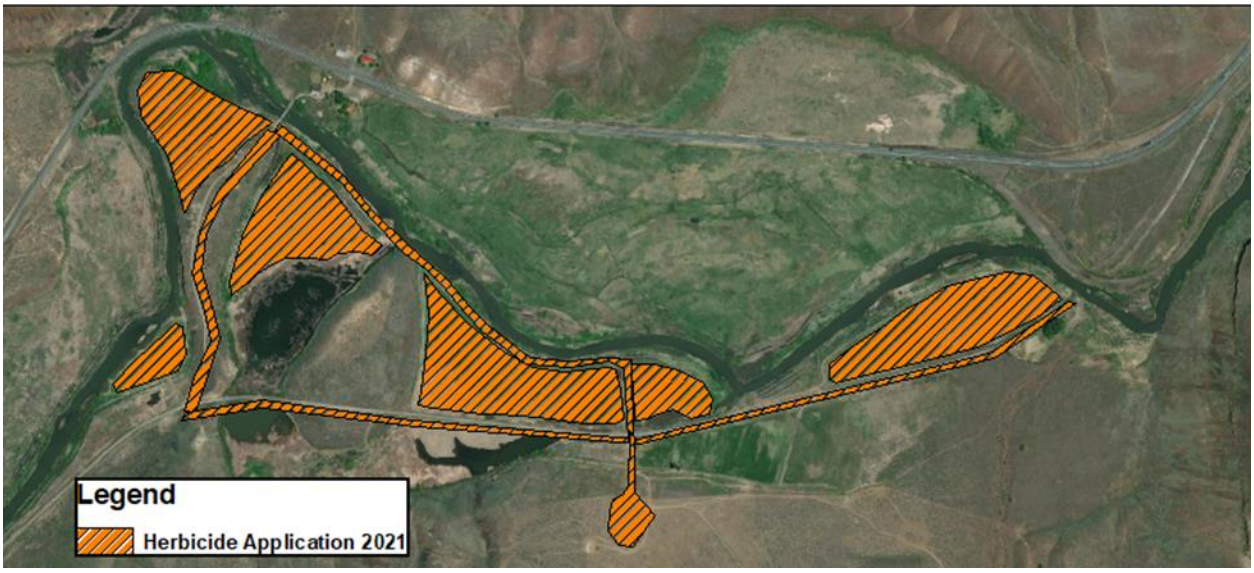


Figure 2.2.2. Location of herbicide application at MRWMS in 2021. See table for denotation of Milestone and Weed master applications.

Rush-skeleton weed

BPT staff coordinated with the Oregon Department of Agriculture and the Malheur County Weed Inspectors Office to treat rush skeleton weed (*Chondrilla juncea*) on the Property as well as adjacent State and BLM lands (Figure 2.2.3). The same sites that were treated in 2017 and in 2019 were treated again in 2021. Continued monitoring and treatment is necessary, as this plant is notoriously difficult to control (Gaskin et al. 2013) and its westward expansion along the Malheur River drainage means the Property is located on the front lines of the control effort. Rush skeleton plants are spot sprayed with Milestone at a rate of 7oz/ac with MSO surfactant.

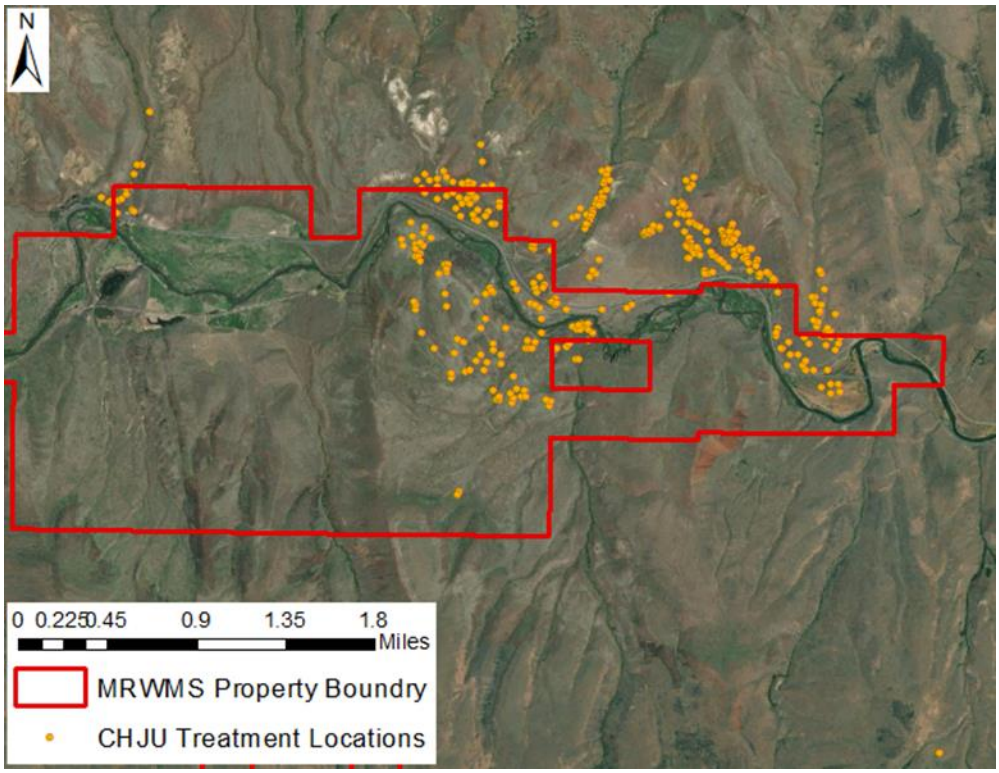


Figure 2.2.3. Rush skeleton weed (CHJU, *Chondrilla juncea*) sites treated in 2021 at MRWMS.

Literature Cited

Bureau of Land Management (BLM). 2015. Integrated invasive plant management for the Burns District Environmental Assessment. U.S. Department of the Interior. DOI-BLM-OR-B000-2011-0041-EA.

Bussan, A. J. and W. E. Dyer. 1999. Herbicides and rangeland. Pages 116–132 In R. L. Sheley and J. K. Petroff, eds. Biology and Management of Noxious Rangeland Weeds. Corvallis, OR: Oregon State University Press.

DiTomaso, J. 2000. Invasive weeds in rangelands: Species, impacts, and management. Weed Science, 48(2), 255-265.

DiTomaso, J.M., Brooks, M.L., Allen, E. B., Minnich, R., Rice, P. M., and Kyser G. B. 2006. Control of Invasive Weeds with Prescribed Burning. Weed Technology. 20 (2), 535-548

Gaskin JF, Schwarzlander M, Kinter L, Smith JF, Novak SJ. 2013. Propagule pressure, genetic structure, and geographic origins of Chondrilla juncea (Asteraceae): An apomictic invader on three continents. American Journal of Botany 100(9): 1871–1882. 2013.

Holechek, J. L., Valdez R., Schemnitz S. D., Pieper R.D. and Davis C. A. 1982. Manipulation of Grazing to Improve or Maintain Wildlife Habitat. Wildlife Society Bulletin. Vol. 10, No. 3 pp. 204-210.

Kesling, J, Cate, B., Six, B. 2014. Malheur River Wildlife Mitigation Project Annual Report. Burns Paiute Tribe. Burns, OR.

Irrigation

Irrigation can be utilized to provide quality forage for ungulates and inundate seasonal ponds and meadow grass fields for migrating waterfowl and neo-tropical bird species. Irrigation waterways and culverts, headgates, and pumps were used to sustain wet meadow habitats and exercise water rights. There is an extensive ditch system at MRWMS (Figure 2.3.1). In 2021, 7.91 miles of irrigation ditch were assessed daily for general maintenance. Approximately 150 acres of the Project utilized flood irrigation in 2021. The direction and use of irrigation water was changed on a daily basis. Maintenance of irrigation systems is constant, with tasks including repair of breeches, cleaning of debris by hand or with prescribed fire in the fall i.e.; removing vegetation to prevent blockage and maintain water velocity and direction, tarp dams, canal linings, maintaining pumps, maintenance of dam structures, and v-ditching canals with farming equipment to remove sedimentation.

The new diversion dam constructed in 2015 has increased the efficiency of flow to the irrigation canals. Issues with damage to the diversion stanchions will have to continue to be addressed each year to keep the structure in working order. In addition, problems remain with the ditch system. In 2015, the department received an OWEB grant to fund construction of a new head gate system which will divert water from the current wetland into the seasonal ones rather than using water seepage from the ditch system into the seasonal wetlands. Construction on this project began in the spring of 2018 and concluded March 2019. Monitoring for the OWEB implementation effectiveness monitoring continued until spring of 2021. Continued efforts to improve the ditch system will allow water to reach fields, such as Field 1B, that have been degraded from insufficient irrigation since 2014.

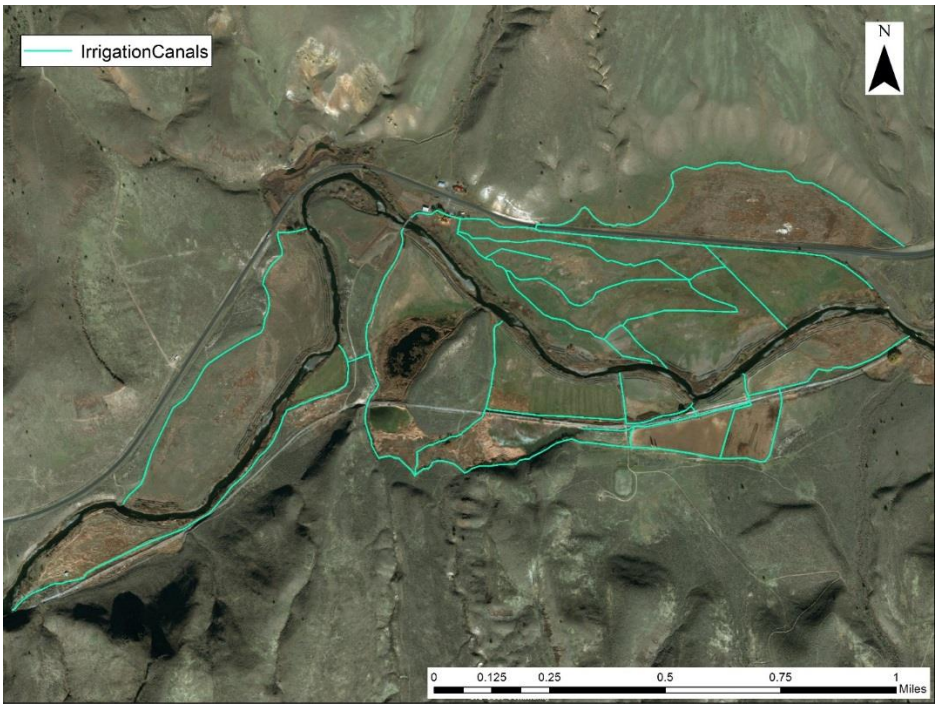


Figure 2.3.1. Irrigation canals (in use) located on the property denoted in green.

Seeding

Indian Creek Fire Seeding

On August 16th, 2020, the Indian Creek Fire started along the north side of US Highway 20 west of Black Canyon. By the 20th, the fire burned 48,128 acres and approximately 1,700 acres of the Road Gulch allotment managed by the Burns Paiute Tribe. In the fall, ODFW contracted out Open Range G treatments on unburned areas and liquid Imazipic treatments on burned acres. In 2021, ODFW, DSL, and BPT through a NRCS EQIP agreement reseeded the areas previously treated with herbicide. ODFW purchased 25,000 lbs., DSL purchased 7,000 lbs., BPT purchased 5,500 lbs. of seed with a NRCS EQIP contract for reseeding. DSL and BPT used the same seed mix (Table 2.4.1) and ODFW used a similar mix (Table 2.4.2).

Table 2.4.1. Seed mix used by DSL and the Tribe for the Indian Creek Fire in 2021.

Common name	Scientific name	Seed Mix %
Crested Wheatgrass	*Agropyron cristatum*	36%
Siberian Wheatgrass	*Agropyron fragile*	35%
Snake River Wheatgrass	*Elymus wawawaiensis*	15%
Sherman bluegrass	*Poa Secunda*	13%
Alfalfa	*Medicago sativa*	1%
Total Seed	**12,500 LBS. of Seed**	

Table 2.4.2. Seed mix used by ODFW on the Indian Creek Fire in 2021.

Common name	Scientific name	Seed Mix %
Crested wheatgrass	*Agropyron cristatum*	40%
Siberian wheatgrass	*Agropyron fragile*	38%
Sherman bluegrass	*Poa Secunda*	10%
Alfalfa	*Medicago sativa*	1%
Lewis flax	*L inum lewisii*	1%
Blue flax	*Linum perenne*	1%
Small burnet	*Sanguisorba minor*	10%
Antelope bitterbrush	*Purshia tridentata*	1%
Wyoming Sagebrush	*Artemesisa tridentata* var. *wyomingensis*	1%
Total Bulk LBS.		**25,000**

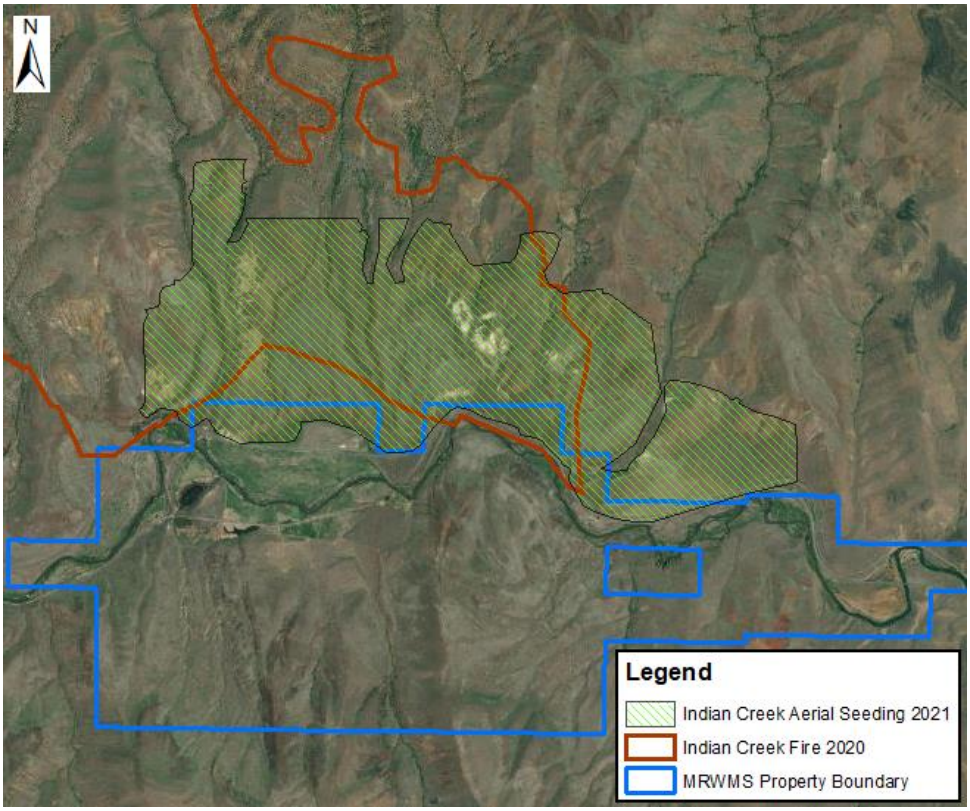


Figure 2.4.1. Aerially seeding treatment of the Indian Creek Fire and previously sprayed land.

Siberian Wheatgrass seeding

We purchased 850 bulk pounds of Siberian wheatgrass (*Agropyron fragile*) with the intention of hand seeding heavily disturbed areas due to the movement of cattle on the property. 700 of pounds of seed was hand seeded across 58 acres to the east of the corral on 12/2/2021. On 2/1/2022 150 pounds of remaining seed was hand spread across 9.7 acres (Figure 2.4.2) within the 2021 MM206 fire northern boundary. Siberian wheatgrass was chosen for its ability to be drought resistant, livestock and wildlife forage, and to compete with cheatgrass as a cool season bunch grass.

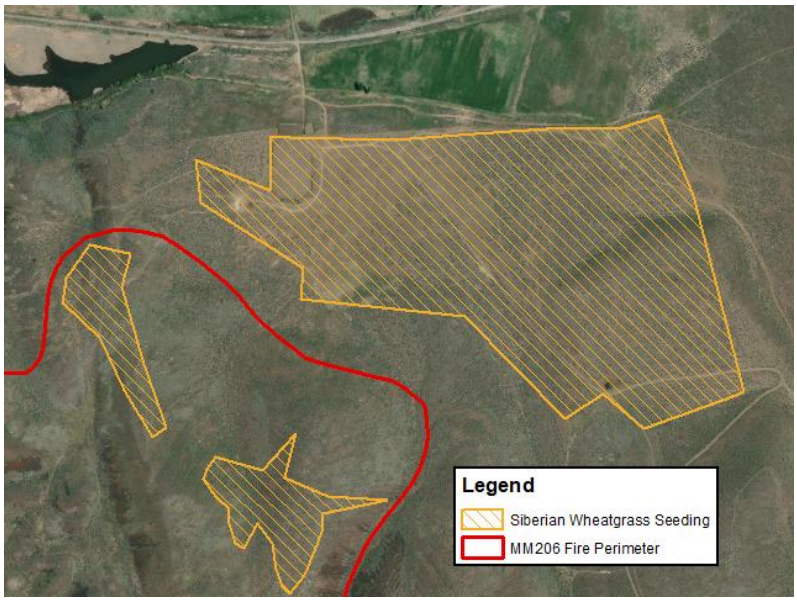


Figure 2.4.2. Seeded units of Siberian wheatgrass within the MM206 boundary and disturbed areas.

Spring Development seeding

The spring development site is located in the southernmost portion of the property along the west side of the road. As one of the few water sources in the area, the site is used by various wildlife and livestock. However, the repeated presence of cattle can be seen by disturbances as hummocked spring bank and cleared area in a sagebrush community nearby. A springbox and trough to divert water away from the spring source was planned but the slope and spring pressure made it unfeasible. In 2022, a fence is planned to restrict the movement of cattle in the area.

On 2/1/22 extra seed from cultural and pollinator friendly species were spread in the area (Figure 2.4.3). A majority of seed mix used (Table 2.4.3). was collected locally from Jonesboro the previous year. The basin wildrye, showy milkweed, giant hyssop all are culturally important species. Blanket flower, basalt milkvetch, and yarrow are all used by pollinators as well as forbs more suited to the dryer side of the seeded area.

Figure 2.4.3. Seed mix being spread in the spring development site.

Table 2.4.3. Seed mix used at the spring development site in 2021.

Common name	Scientific name	Seed Mix %
Basin Wildrye	*Leymus cinereus*	90.9%
Showy Milkweed	*Asclepias speciosa*	2.47%
Giant Hyssop	*Anise hyssop*	0.67%
Blanket Flower	*Gaillardia aristata*	5.9%
Basalt Milkvetch	*Astragalus filipes*	0.02%
Yarrow	*Achillea millefolium*	0.02%
Total Bulk		**525.7 g**

Greenhouse and Native Species Plantings

In the past we have purchased plants for large scale plantings. In 2019, we started large scale propagation in house. We collected seeds from forbs and shrubs in 2020 and previous years from the MRWMS, primarily from the established CREP plantings. In 2021, we propagated many of these forbs and shrubs in cones and tree pots in the greenhouse (Figure 2.5.1). In 2022 we plan on increasing the number of seedlings grown in the greenhouse to approximately 3,000 plants. In contrast to the riparian seedlings of 2021, we are transitioning to include upland plants and primarily Wyoming sagebrush.

Figure 2.5.1. Native currant seedlings held over the winter in the greenhouse in 2021.

Native Seedling planting

In October 2021, we planted 367 plants (Table 2.5.1) on MRWMS with NRCS Conservation Stewardship Program (CSP) cost share and volunteer groups. Most seedlings were planted in the eastern edge of the 205 field and the rest planted at the spring development site. Black cottonwood seedlings were also planted along Hunter Creek. A majority of the riparian seedlings were held over the winter and transferred to larger containers to increase establishment chances.

Table 2.5.1. Native seedlings planted at MRWMS across three sites in 2021.

Common name	Scientific name	Number planted
Blanketflower	*Gaillardia aristata*	34
Blue elderberry	*Sambucus cerulea*	75
Golden currant	*Ribes aureum*	55
Giant Hyssop	*Agastache scrophulariifolia*	31
Wood's Rose	*Rosa woodsii*	9
Dogwood	*Cornus nuttallii*	4
Black Cottonwood	*Populus trichocarpa*	88
TOTAL		**367**

Juniper Treatment

In 2013, the Burns Paiute Tribe enrolled in a program sponsored by the Natural Resource Conservation Service (NRCS) to treat encroaching juniper on tribal and state lands. This program is part of the state-wide Sage-Grouse Initiative (SGI) that aims to create partnerships between ranchers, agencies, universities, and non-profit groups to work together with a shared vision of achieving wildlife conservation goals through sustainable ranching. The focus of this program is on habitat restoration to benefit Greater Sage-Grouse populations in Core Areas of habitat. The Malheur River Wildlife Mitigation Site falls in an area that has been designated as core area habitat for sage grouse. Juniper encroachment is a major threat to sage grouse, as pinyon and juniper encroachment leads to both avoidance and can negatively affect demographic variables (Doherty et al. 2010, Baruch-Mordo et al. 2013, Coates et al. 2017).

We completed the 2013 and 2015 units in 2018-2019. In 2019, we secured an EQIP (Environmental Quality Incentives Program) contract to cut additional juniper acres (Figure 2.6.1). This contract will include cutting junipers on 858 acres from 2021–2023. We did not cut these units in 2020 due to limitations brought on by the COVID-19 pandemic and the limited volunteer trips. In 2021, we began cutting these units in with volunteers and staff. We completed the hand cutting of the 4 northern unites with volunteers, and we are using chainsaws for the larger trees in the spring of 2022. In the spring and summer of 2022, we will host volunteer trips to cut the two farther

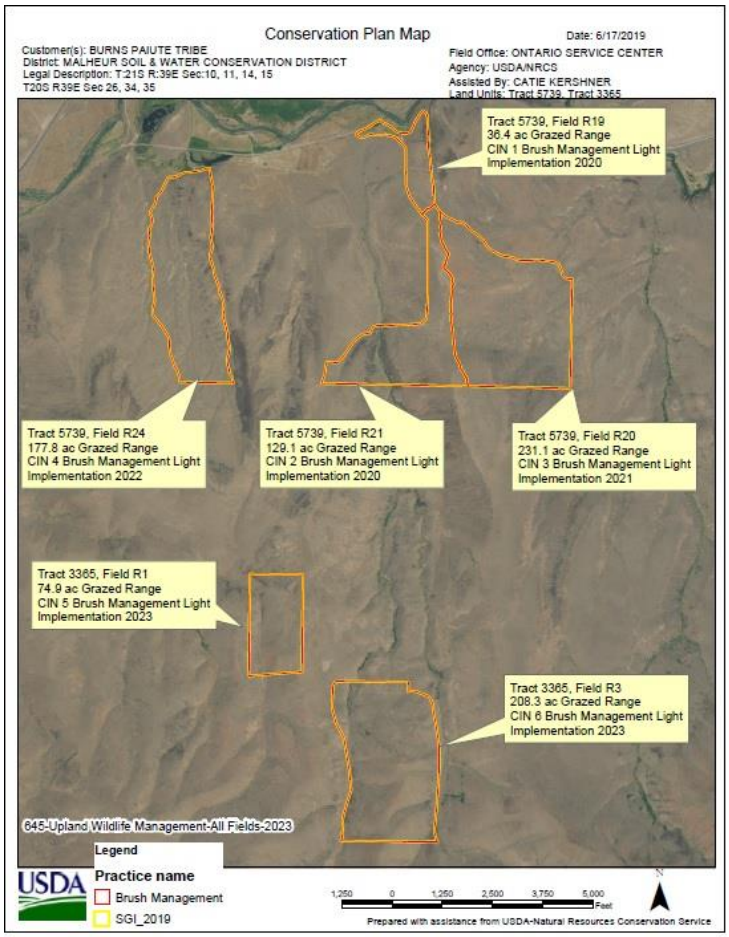


Figure 2.6.1. EQIP juniper cutting contract with unit acres to be treated at MRWMS until 2023.

Literature Cited

Baruch-Mordo, S., J.S. Evans, J.S. Evans, J.P. Severson, D.E. Naugle, J.D. Maestas, J.M. Kiesecker, M.J. Falkowski, C.H. Hagen, K.P. Reese. 2013. Saving Sage-Grouse from the trees: a proactive solution to reducing a key threat to a candidate species. Biological Conservation 167:233–241.

Coates, P.S., B.G. Prochazka, M.A. Ricca, K.B. Gustafson, P. Ziegler, and M.L. Casazza. 2017. Pinyon and juniper encroachment into sagebrush ecosystems impacts distribution and survival of Greater Sage-Grouse. Rangeland Ecology and Management 70:25–38.

Doherty, K.E., D.E. Naugle, and B.L. Walker. 2010. Greater Sage-Grouse nesting habitat: the importance of managing at multiple scales. The Journal of Wildlife Management 74:1544–1553.

Infrastructure Management

New Construction

In 2021, the Burns Paiute Tribe Wildlife Program oversaw the construction of a new storage shed at the Burns Paiute Reservation to hold greenhouse supplies.

Corral Repairs

In 2021, we continued work on replacing crossbars along the corral near the Jonesboro houses and barns. The corral had been falling apart and was no longer fully functional. We removed crosspoles and have been replacing them with new lodgepole pine poles (Figure 3.2.1). This work is ongoing and expected to be completed in 2022.

Figure 3.2.1. Corral photos in June 2020 (top) and February 2022 (bottom). We have replaced dilapidated crossbars with new lodgepole pine crossbars.

Annual Infrastructure Management

As a mitigation measure, BPT staff removed the dam boards and stanchions in the Malheur River diversion dam. This measure is taken annually to prevent ice flows from damaging the dam. Dam boards and stanchions are removed in the fall and are replaced in the spring following ice break-up. This re-installation is done before Warm Springs and Beulah Reservoirs begin letting water for irrigation.

Wildlife and Habitat Monitoring

Fisheries Research

For fisheries work performed in the Malheur Subbasin including work performed on the Logan Valley Wildlife Mitigation Site, please reference BPT's FY2021 Annual Report for BPA Project# 1997-019-00 – Evaluate the Life History of Native Salmonids in the Malheur Subbasin.

Greater Sage-Grouse Monitoring

Greater Sage-Grouse Lek Surveys

Greater Sage-Grouse (*Centrocercus urophasianus*) surveys were conducted in coordination with the Oregon Department of Fish and Wildlife. We visited ten separate active and non-active lek locations: Roy Reservoir, Tim's Peak Reservoir, Upper Deacon Flat, Antelope Swale, Wildhorse Basin, and Lake Ridge (combined #1 and #2), Arrien Reservoir, McCloud Reservoir, Bull Canyon, and Big Swale (Figure 4.2.1).

Figure 4.2.1. Greater Sage-Grouse male on a lek near the MRWMS in 2021.

Protocol

We follow the protocol from the Greater Sage-Grouse Conservation Assessment and Strategy for Oregon: A Plan to Maintain and Enhance Populations and Habitat (Hagen 2011). However, BPT staff has not always followed this protocol perfectly, as there are intervals both too short and too long between visits. BPT attempts to survey each of the active leks three times a year according to the protocol but has surveyed a lek as many as five times in past years and as few as one in other years.

"The following lek counting procedures are based on the premise that once lek attendance begins, a high proportion of the males that attend any given lek do so each day. Some authors have indicated that each lek should be counted at least three (Jenni and Hartzler 1978) or four (Emmons and Braun 1984) times each season at 7 to 10-day intervals between mid-March and early to mid-May to reduce count variability within a given year. The highest of the three/four (lek or lek complex) counts should be used in population estimation/modeling exercises (Emmons and Braun 1984, Autenreith 1981).

The following criteria should guide lek counts in Oregon:

1. Counts should be conducted between March 15 and April 30 each year. (Note: There may be local variation between districts that will dictate minor modifications to these dates).

2. Counting ideally should be done within the first 2 hours after daybreak under clear, calm, and dry weather conditions.

3. Each lek/ lek complex should be counted at least 3 times with a minimum of 7 to 10-day between visits.

4. If a lek complex is counted, all leks in the vicinity of the complex area should be counted on the same day. Count results for each individual lek site should be kept separate for individual lek trend comparisons. Data from all leks within lek complex should be summed, and the count day with the highest count for the entire complex will be reported for population trend analysis (Page 165, Hagen 2011)."

Analysis

In past analyses BPT staff has reported the average number of males on a lek in a year. However, in this report, like the past two years, we took the maximum number of males seen on that lek complex each year regardless of how many times it was surveyed (Range 1:5). This follows the protocol outlined by Hagen (2011). This methodology excludes data from days in which the weather was poor, unless weather was poor on all days that data was collected. Poor weather can lower abundance estimates, as weather can affect lek attendance (Bradbury et al. 1989, Fremgen 2014). Following methodology by Hagen (2011), we pooled data from lek complexes into a single point for this analysis, essentially treating lek complexes as one single expansive lek. For example, on April 3, 2012, BPT staff observed nine males on Upper Deacon Flat Reservoir #1 and 5 males on Upper Deacon Flat Reservoir #2. We treated this as 14 males seen at the Upper Deacon complex on that day. In previous years, staff has taken the average of the parts of the complex, but we have rectified this in this report.

The primary, or most recently used, location was used as the coordinate for these complexes. For example, Lake Ridge #2 appeared to be the primary lekking point for the Lake Ridge complex in previous years. However, it has shifted to Lake Ridge #1 in recent years, so we used the coordinate for #1 as the complex point.

Results

The number of displaying males on each active lek surveyed in 2021 varied when compared to 2020 lek counts (Table 4.2.1, Figure 4.2.2.). Of the 7 active leks surveyed, 3 contained numbers of lekking males that were above the long-term average. The leks with numbers of lekking males above the long-term average were those at the Upper Deacon Flat, Arrien Reservoir, and Wildhorse Basin. Antelope Swale had 0 lekking males for the fifth consecutive year. This is likely due to the lingering effects of the dam that was washed out in previous years which was fixed in the winter of 2017–2018. We will continue to monitor this lek

into the future. Big Swale also had no lekking males, marking this the third consecutive year with none found. Bull Canyon was not surveyed in 2021 as there have been 0 lekking males found in previous years, leading it to be designated as inactive by ODFW.

The Roy Reservoir lek exhibited a modest rebound in the maximum number of lekking males in 2021 after a drastic decline in 2020. The maximum number of displaying males at the Lake Ridge Complex declined precipitously in 2021 after holding the highest number of lekking males in 2020 amongst leks surveyed. Roy Reservoir continues to have the highest long-term average abundance of lekking males with a long-term (17-year) average maximum of 41.18 males. This is followed by the Lake Ridge complex with a long-term (10-year) average maximum of 24.90 lekking males.

Table 4.2.1. Maximum number of Greater Sage-Grouse males at lek locations from 2005–2021 and the long-term average maximum. A zero represents no birds seen, while a period (.) represents no data collected.

	Roy Reservoir	Tim's Peak (Reservoir)*	Antelope Swale	Upper Deacon Flat Reservoir*	Wildhorse Basin	Lake Ridge*	McCloud Reservoir	Bull Canyon Reservoir	Big Swale Reservoir	Arrien Reservoir
2005	41	5	.	.	.	.	.	.	.	.
2006	43	7	.	.	.	.	.	.	.	.
2007	20	16	0	.	.	.	0	.	.	.
2008	15	7	0	14	.	.	0	0	.	.
2009	24	5	.	11	12	.	.	0	0	.
2010	59	1	12	26	25	.	0	.	.	.
2011	57	0	8	25	25	.	0	.	.	.
2012	49	0	17	14	14	13	0	.	.	.
2013	40	7	10	18	8	26	.	.	.	.
2014	48	7	9	11	18	22	.	.	.	.
2015	67	11	9	13	16	28	.	.	.	.
2016	63	12	4	19	9	22	0	0	0	.
2017	54	10	0	10	12	23	0	0	0	.
2018	53	18	0	17	29	43	0	0	5	.
2019	37	6	0	7	20	29	.	.	0	10
2020	12	11	0	23	16	30	0	.	0	11
2021	18	6	0	18	18	13	.	.	0	16
Average	**41.18**	**7.59**	**4.93**	**16.14**	**17.08**	**24.90**	**0.00**	**0.00**	**0.71**	**12.33**

* Denotes a lek complex. There may be multiple lek locations within this complex that fluctuate over survey years.

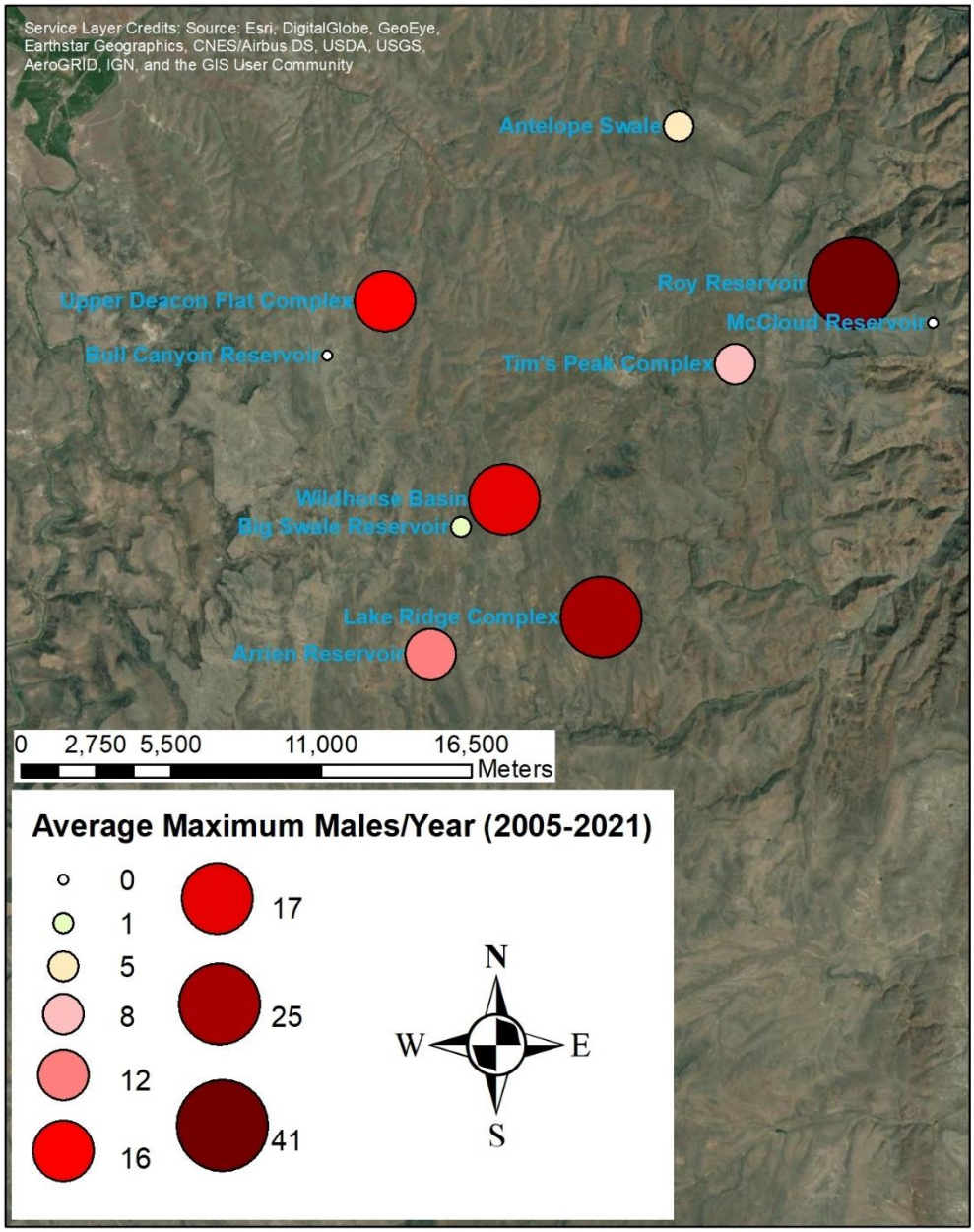


Figure 4.2.2. Maximum number of Greater Sage-Grouse males at active lek locations near the MRWMS from 2005–2021.

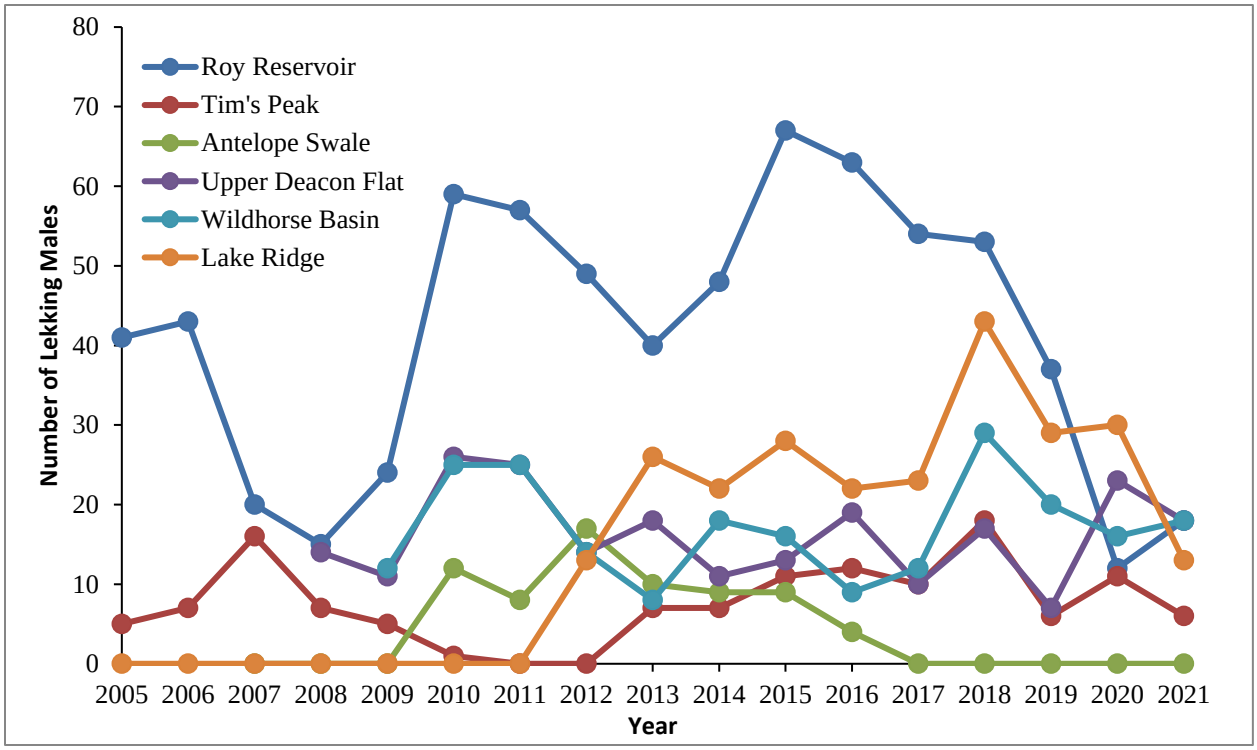


Figure 4.2.3. Long term (2005–2021) maximum number of male Greater Sage-Grouse on lek locations each year near the MRWMS. The primary or most recently used location was used as the coordinate for the lek complexes. Note that coordinates are approximate and lek locations can move or drift over time.

Discussion

Similar to 2020, the number of lekking males on each active lek surveyed in 2021 varied when compared to the previous year, with some leks exhibiting a decrease while others increased. Of note, the number of lekking males at Roy Reservoir increased after a sharp decline in 2020. The lek at Roy Reservoir had been showing a continued and marked decrease since 2018. Additionally, the lek at Arrien Reservoir, for the third consecutive year since BPT staff began monitoring it, has shown an increase in the number of lekking males. The maximum number of lekking males at all other active leks that were surveyed decreased from 2020.

Declines in the number of displaying males at leks may not be cause for immediate concern as some males can disperse between lek sites within and among years (Dalke et al. 1963, Dunn and Braun 1985, Schroeder and Robb 2003). Although, the percentage of males that switch lek sites appears to vary and can be rare. Gibson et al. (2014) determined that the annual probability of a male moving away from the lek it was captured on was 3% in a study conducted in Nevada. This appeared to be a statewide trend, due in part to a late winter affecting lekking behavior, but also likely due to an observable population decline.

Greater Sage-Grouse Study

In 2020, due to financial and staff constraints, OSU ended the Sage-grouse tracking part of this project in the Crowley Priority Area for Conservation.

Also in 2020, to avoid OSU having to remove the raptor, raven, and songbird component in the Crowley Priority Area for Conservation, BPT staff took over this portion of the project. See the OSU Avian Surveys chapter for more information.

Literature Cited

Autenreith, R.E. 1981. Sage-grouse management in Idaho. Wildlife Resource Sec. Idaho Dept. of Fish and Game. Wildlife Bulletin No. 9:1–238.

Bradbury, J.W., S.L. Vehrencamp, and R.M. Gibson. 1989. Dispersion of displaying male sage grouse: I. Patterns of temporal variation. Behavioral Ecology and Sociobiology 24:1–14.

Dalke, P.D., D.B. Pyrah, D.C. Stanton, J.E. Crawford, and E.F. Schlatterer. 1963. Ecology, productivity, and management of sage grouse in Idaho. Journal of Wildlife Management 27:811–841.

Dunn, P.O., and C.E. Braun. 1985. Natal dispersal and lek fidelity of sage grouse. The Auk 102:621-627.

Emmons, S.R., and C.E. Braun. 1984. Lek attendance of male sage-grouse. Journal of Wildlife Management 48:1023–1028.

Fremgen, A.L. 2014. Lek ecology of male Greater Sage-Grouse in Carbon County, Wyoming. Thesis, University of Missouri, Columbia, USA.

Gibson, D., E.J. Blomberg, M.T. Atamian, J.S. Sedinger. 2014. Lek fidelity and movement among leks by male Greater Sage-Grouse *Centrocercus urophasianus*: a capture-mark-recapture approach. IBIS 156:729–740.

Hagen, C.A., 2011. Greater Sage-Grouse conservation assessment and strategy for Oregon: a plan to maintain and enhance populations and habitat. Oregon Department of Fish and Wildlife.

Jenni, D.A., and J.E, Hartzler. 1978. Attendance at a sage-grouse lek: implications for spring censuses. Journal of Wildlife Management. 42:46–52.

Schroeder, M.A. and L.A. Robb. 2003. Fidelity of Greater Sage-Grouse *Centrcercus urophasianus* to breeding areas in a fragmented landscape. Wildlife Biology 9:291–299.

OSU Avian Surveys

Beginning in 2020, we have collaborated with graduate students under the direction of Dr. Jonathan Dinkins from Oregon State University (OSU) on avian point counts. OSU students are using this data as part of a long-term, large-scale study examining songbird response to reducing Common raven (*Corvus corax*) abundance aimed at increasing Greater sage-grouse nest success and chick survival. This study is conducted on Priority Areas for Conservation (PAC's) for Sage-grouse designated by ODFW. We conducted avian surveys in the Crowley PAC. These survey points are located just south of the Malheur River Wildlife Mitigation Site (Figure 4.3.1).

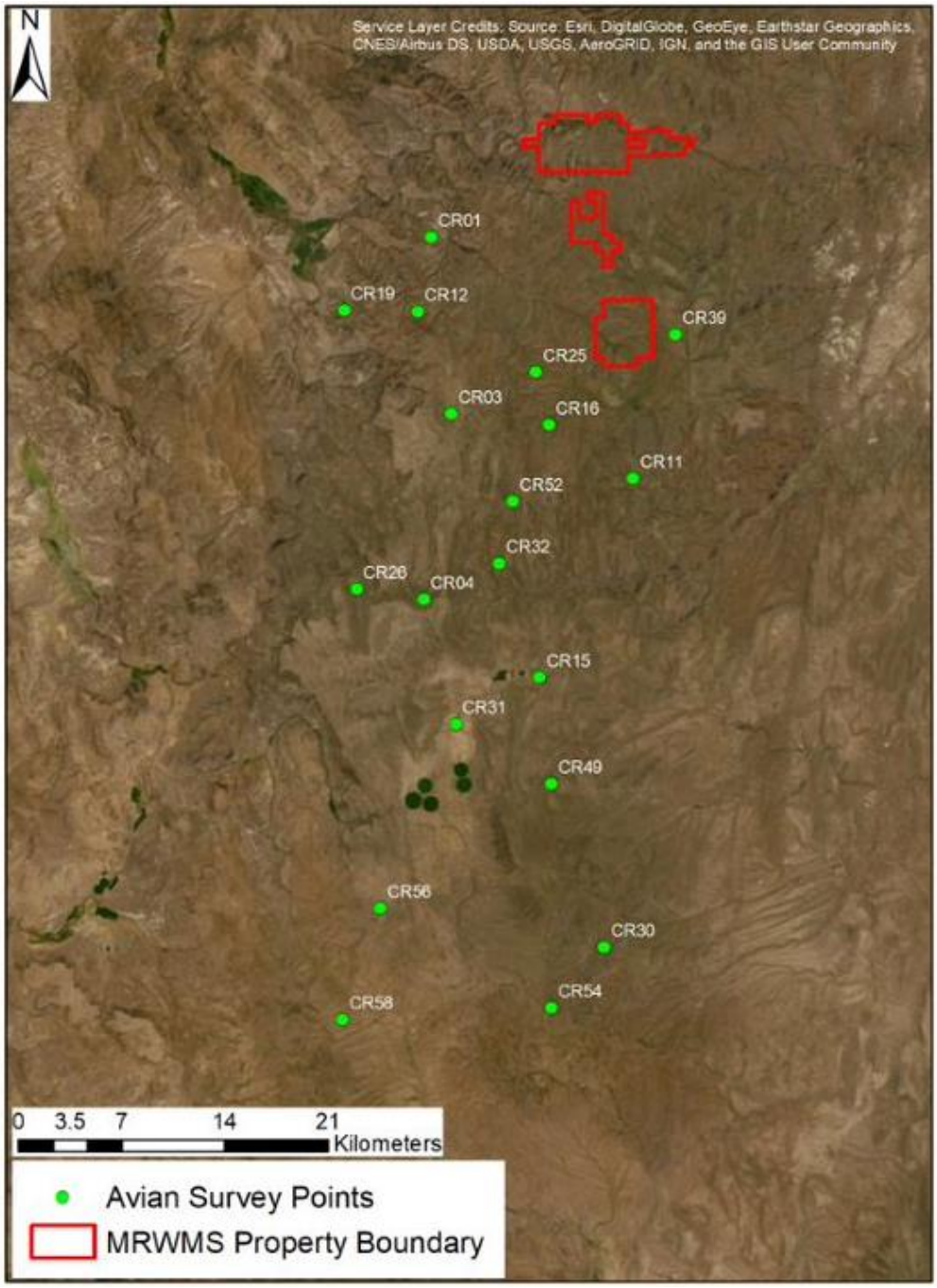


Figure 4.3.1. Map of avian survey points within the Crowley PAC near MRWMS. BPT staff surveyed all points except for CR31 and CR54, which were surveyed by local landowners.

Survey Protocol

The survey protocol below was adapted from that which was developed for use in Wyoming (Dinkins et al. 2012). Point count surveys are conducted at random points, and sage-grouse nest and brood locations, twice per month from early May to early July. All surveys are

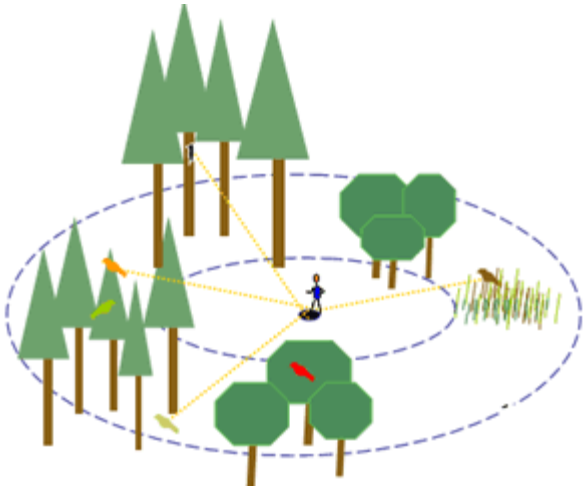
conducted in fair weather conditions with no active precipitation or wind >20 mph. The surveys are divided into two separate surveys, with raptor/Corvid surveys lasting 10 minutes and songbird surveys being conducted for 5 minutes.

Corvids:		**Falcons:**	
CORA	Common Raven	AMKE	American Kestrel
AMCR	American Crow	MERL	Merlin
BBMA	Black-billed Magpie	PEFA	Peregrine Falcon
		PRFA	Prairie Falcon
Accipiters:			
COHA	Cooper's Hawk	**Buteos:**	
NOGO	Northern Goshawk	FEHA	Ferruginous Hawk
NOHA	Northern Harrier	RTHA	Red-tailed Hawk
SSHA	Sharp-Shinned Hawk	SWHA	Swainson's Hawk
Eagles:		**Owls:**	
BAEA	Bald Eagle	BANO	Barn Owl
GOEA	Golden Eagle	BUOW	Burrowing Owl
		GHOW	Great Horned Owl
Other:		LEOW	Long-Eared Owl
OSPR	Osprey	SEOW	Short-Eared Owl
TUVU	Turkey Vulture		

Songbird BBL	Common Name
BRSP	Brewer's Sparrow
SASP	Sagebrush Sparrow
SATH	Sage Thrasher
Other Common Species	
*note if confident in ID	
LOSH	Loggerhead Shrike
VESP	Vesper Sparrow
WEME	Western Meadowlark
MODO	Mourning Dove
LASP	Lark Sparrow
BRBL	Brewers Blackbird
HOLA	Horned Lark
GRFL	Gray Flycatcher
BHCO	Brown-headed Cowbird

We utilized the following survey methods while conducting the surveys:

1. Set up sound recorder on tripod and press record. When finished, document file name on data sheet.
2. Scan the entire 360° area equally and repeatedly throughout the duration of the survey, using binoculars AND the naked eye.



3. Record data for every corvid, raptor, or sagebrush-obligate songbird detected:
    a. Species, number in group, time, distance and compass bearing when first detected
    b. Denote visual or auditory detection (defer to visual as the detection category if the bird is seen and heard)
    c. IF CORVID OR RAPTOR IS PRESENT WITHIN VIEW OF THE POINT COUNT LOCATION WHILE AN OBSERVER APPROACHES THE SURVEY LOCATION, RECORD THE ESTIMATED LOCATION (BEARING AND DISTANCE) OF THE BIRD PRIOR TO THE BIRD MOVING IN RESPONSE TO THE APPROACHING OBSERVER. For example, if a raven is at the 0 m of the point count location and moves as you are approaching, then record the raven at 0 m when you start the survey.
    d. Behavior when first detected:
        1) Perching
        2) Standing
        3) Foraging
        4) Flying
        5) Copulating
        6) Incubating

7) Territorial defense (aggressive behavior toward other birds)

e. Grazing should be documented using BLM protocol:

Grazing Class	Description
No Use (0-5%)	The rangeland shows no evidence of grazing; or the rangeland has the appearance of negligible grazing. No evidence of grazing beneath shrub canopies (if present).
Slight (6-20%)	The rangeland has the appearance of very light grazing. The herbaceous forage plants may be topped or slightly used. Current seedstalks and young plants are little disturbed. No evidence of grazing beneath shrub canopies (if present).
Light (21-40%)	The rangeland may be topped, skimmed, or grazed in patches. The low value herbaceous plants are ungrazed and 60-80 percent of the number of current seedstalks of herbaceous plants remain intact. Most young plants are undamaged. Grazing beneath shrub canopies (if present) is infrequent.
Moderate (41-60%)	The rangeland appears entirely covered as uniformly as natural features and facilities will allow. Fifteen to 20 percent of the number of current seedstalks of herbaceous species remain intact. No more than 10 percent of the number of low-value herbaceous forage plants are utilized. ≤ 15% of forage plants beneath shrub canopies (if present) show evidence of grazing.
Heavy (61-80%)	The rangeland has the appearance of complete search. Herbaceous species are almost completely utilized, with less than 10 percent of the current seedstalks remaining. Shoots of rhizomatous grasses are missing. More than 10 percent of the number of low-value herbaceous forage plants have been utilized. 15-30% of forage plants beneath shrub canopies (if present) show evidence of grazing.
Severe (81-100%)	The rangeland has a mown appearance and there are indications of repeated coverage. There is no evidence of reproduction or current seedstalks of herbaceous species. Herbaceous forage species are completely utilized. The remaining stubble of preferred grasses is grazed to the soil surface. > 30% of forage plants beneath shrub canopies (if present) show evidence of grazing.

f. Wind speed should be documented using the Beaufort wind scale (below). Surveys should not be conducted if wind is considered to be a 5 or greater.

Code	Wind speed	Description	Indicator
0	**1 mph**	**Calm**	**Smoke rises vertically.**
1	**2 mph**	**Light**	**Smoke drifts.**
2	**5 mph**	**Light breeze**	**Leaves rustle.**
3	**10 mph**	**Gentle Breeze**	**Lighter branches sway.**
4	**15 mph**	**Moderate Breeze**	**Dust rises. Branches move.**
5	**21 mph**	**Fresh Breeze**	**Small trees sway.**
6	28 mph	Strong Breeze	Larger branches move.
7	35 mph	Moderate gale	Trees move.
8	42 mph	Fresh Gale	Twigs break.
9	50 mph	Strong Gale	Branches break.
10	59 mph	Whole gale	Trees fall.
11	69 mph	Storm	Violent blasts.
12	75 mph	Hurricane	Structures shake.

4. Record any ground predators seen (badgers, foxes, coyotes, bobcats, raccoon, etc.)
5. Record any **livestock** detected:
    a. Species, time, distance, and compass bearing at detection
    b. Behavior when first detected:
        1) Standing
        2) Grazing
        3) Walking
    c. *Note: if more than one livestock species is detected at a time, use a separate line on the data form for each species.*
6. Record any **anthropogenic subsidies** detected (or known to be just out of sight):
    a. Compass bearing and distance from observation point to the center of the subsidy. For linear features such as powerlines, fences, and major roads record one bearing and indicate the direction of the subsidy.
    b. Permanent subsidies only need to be documented once on first survey.
7. Take a photo in all four cardinal directions at the survey site, once per month.
    a. Note the photo file ID on the data sheet for each photo.

Results

We surveyed all 17 points 5 times each in 2021, meeting our goal of surveying across all survey periods.

The most common raptor/corvid species detected at survey points included Common raven, Northern harrier, Turkey vulture, Red-tailed hawk, and Swainson's hawk (Figure 4.3.2).

Similar to 2020, Sagebrush sparrow was not detected in any of the survey points. The highest detection average for Brewer's sparrow and Sage thrasher was 4 and 2.2, respectively (Table 4.3.1). Of the other species found at these survey points, the most commonly detected species was Western meadowlark followed by Horned lark and Vesper sparrow (Figure 4.3.3). Other commonly found species included Rock wren and Gray flycatcher. These data also present the ability to look at species abundance across the landscape (Figure 4.3.4 and 4.3.5).

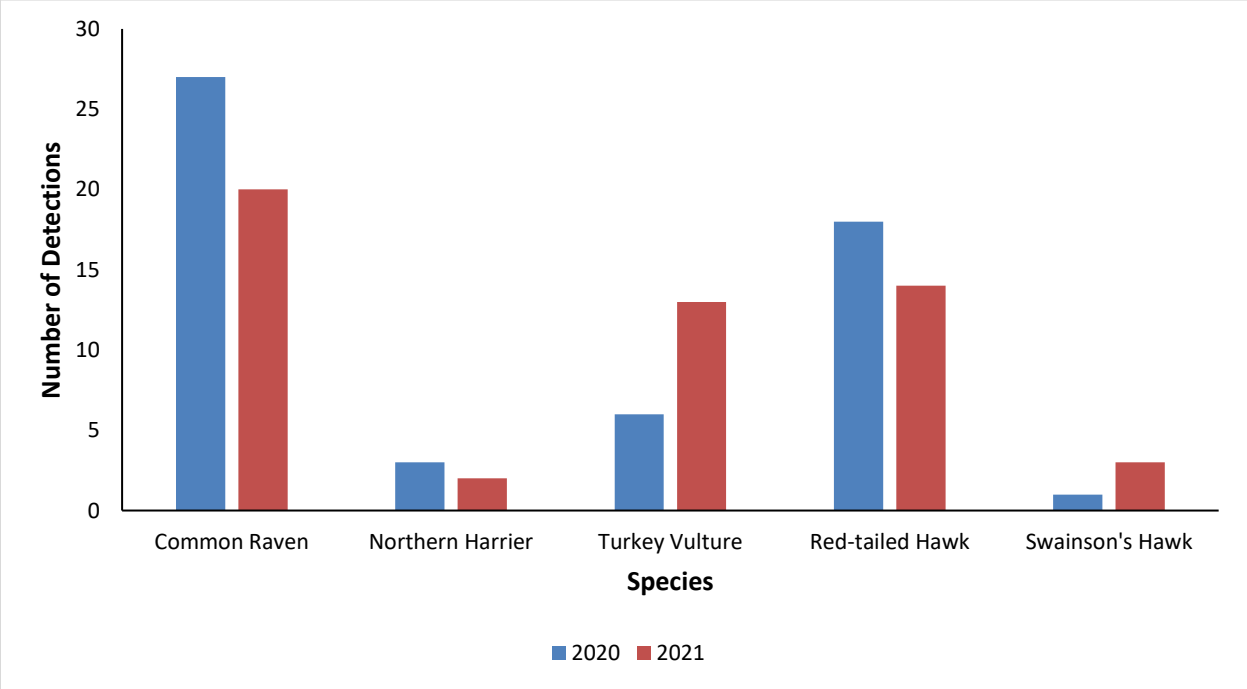


Figure 4.3.2. Number of total detections, auditory and visual, of common corvid/raptor species at all survey points in 2020-2021. In 2020, there were points we surveyed only 4 times due to access and wind speed, which may have affected our total detections.

Table 4.3.1. Average number of each sagebrush obligate songbird species detected at each survey point in 2021. The average is from 5 days of surveying between early May and early July.

	Species		
Site	Brewer's Sparrow	Sagebrush Sparrow	Sage Thrasher
CR01	0.2	0	0
CR03	3.2	0	1.4
CR04	1.6	0	0.8
CR11	1.2	0	0
CR12	0.6	0	0.6
CR15	1.2	0	0.6
CR16	4	0	1
CR19	0.2	0	0
CR25	0.4	0	0
CR26	0.2	0	0.8
CR30	0.2	0	0.8
CR32	2.6	0	1.4
CR39	0.8	0	0
CR49	0.6	0	0.4
CR52	3.4	0	2.2
CR56	0.8	0	0.2
CR58	0.8	0	0

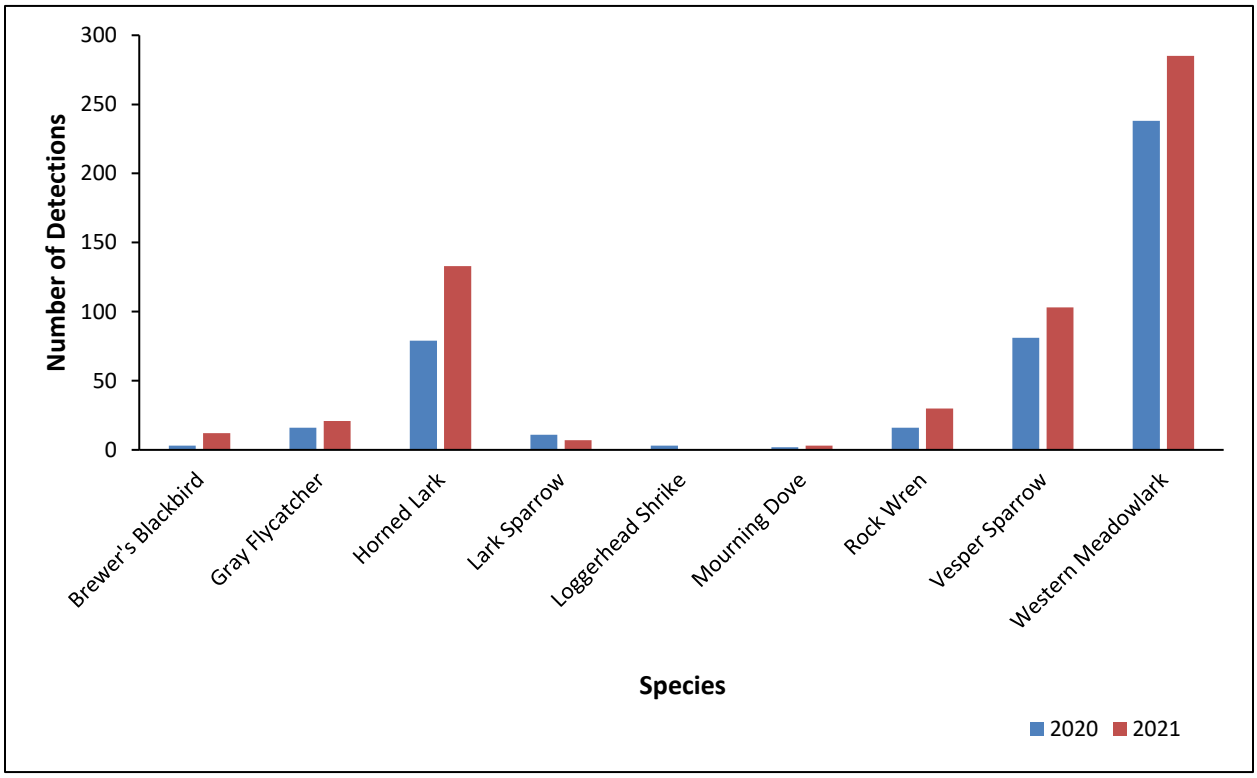


Figure 4.3.3. Number of total detections, auditory and visual of common non-sagebrush obligate species at all survey points in 2020–2021. In 2020, there were points we surveyed only 4 times due to access and wind speed, which may have affected our total detections.

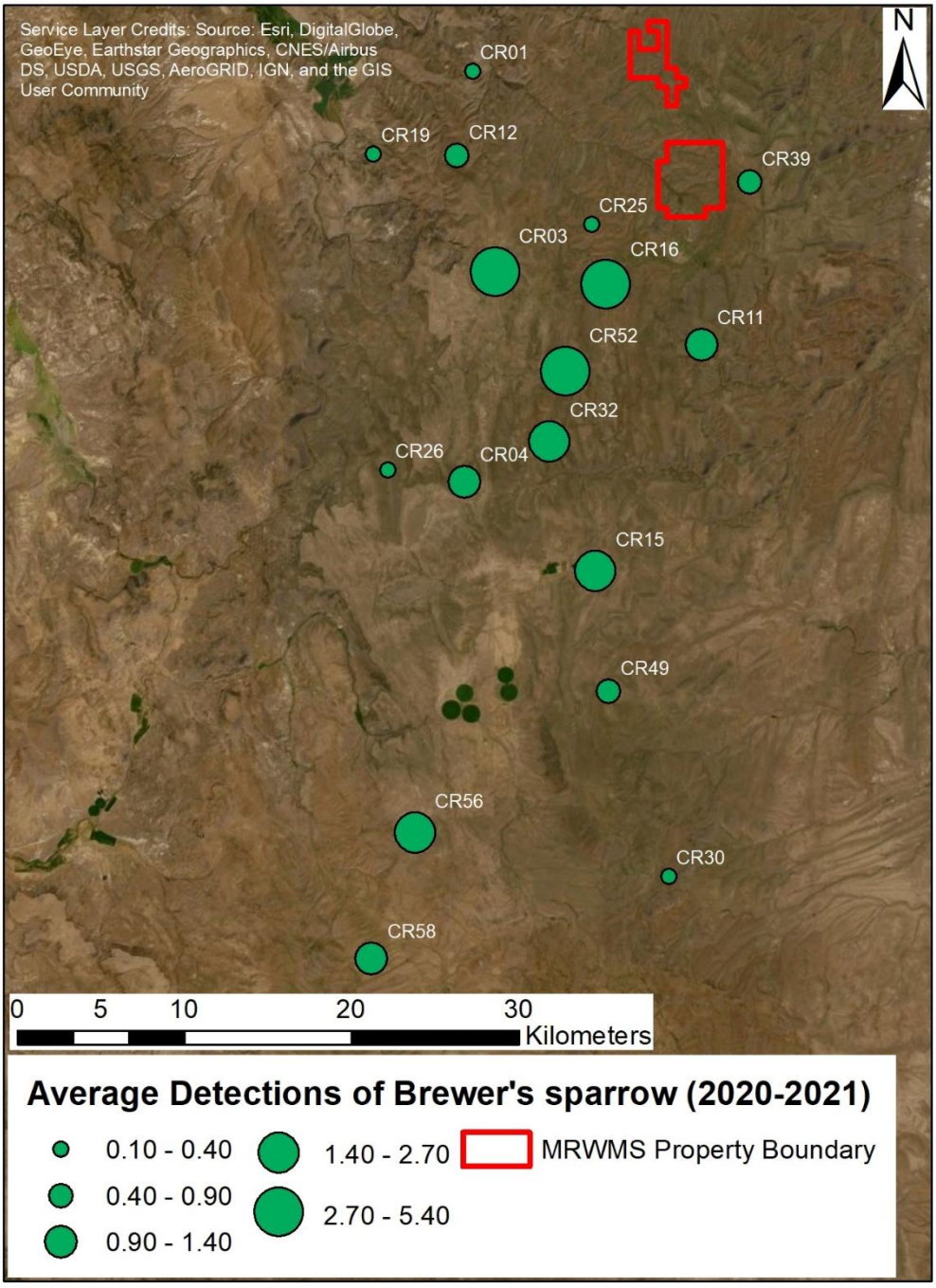


Figure 4.3.4. Average number of detections of Brewer's sparrow from 2020–2021 at survey points near MRWMS.

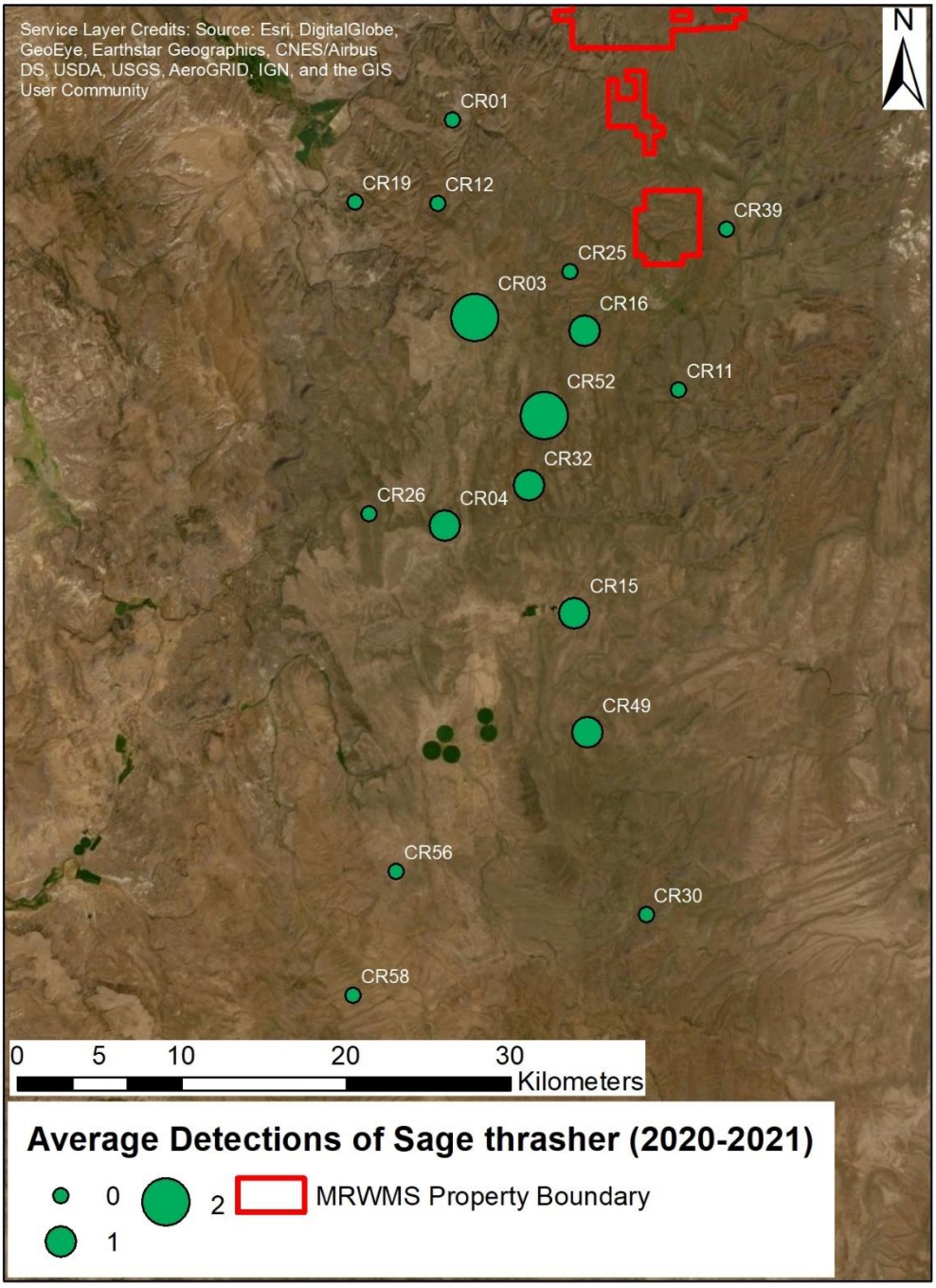


Figure 4.3.5. Average number of detections of Sage thrasher from 2020–2021 at survey points near MRWMS.

Discussion

This was the second year that BPT staff assisted with data collection for this project. We believe that this data will continue to provide insights into distribution of sagebrush obligate songbirds and other songbird species at a much larger scale than our previous songbird surveys (which were discontinued in 2020). In addition, we are contributing to a much larger regional data set that will be publishable. We will continue these surveys in 2022.

Literature Cited

Dinkins, J. B., Conover M.R., Kirol C. P., and Beck J. L. 2012. Greater sage-grouse (Centrocercus urophasianus) select nest sites and brood sites away from avian predators. The Auk 129(4):600-610.

Amphibian Surveys

The goal for amphibian monitoring at the MRWMS is to document presence and breeding of amphibians present, with particular emphasis on Columbia spotted frog (*Rana luteiventris*). Columbia spotted frogs are designated as a sensitive species in the state of Oregon (Oregon Conservation Strategy 2016). In October of 2015, the Great Basin Distinct Population Segment (DPS) of Columbia spotted frogs was removed from the list of Endangered Species Act candidate species by the U.S. Fish and Wildlife Service (USFWS 2015a). This decision was based on the discovery of additional populations, fairly stable populations and distribution, as well as the conservation practices occurring throughout the range of the DPS (USFWS 2015a, 2015b). Columbia spotted frog data can help aid BPT staff in future management decisions and assessing management effects on this important species. Information obtained on other amphibian species can also frame future management decisions.

In 2018–2019, BPT implemented wetland alterations on MRWMS with funding through an Oregon Watershed Enhancement Board (OWEB) awarded grant. These alterations should allow BPT staff to have greater control of water depth, wetland size, and longevity of inundation. This will allow BPT staff to provide additional Columbia spotted frog habitat in wetlands located on the MRWMS.

Methods

In 2019, the Burns Paiute Tribe (BPT) was issued an Oregon Department of Fish and Wildlife scientific take permit to complete amphibian surveys. Visual encounter amphibian surveys conducted on the MRWMS were adapted from methods used by Pearl at al. (2010) to survey for Oregon spotted frogs (*Rana pretiosa*). In 2019, one egg mass survey was conducted. We surveyed on April 24th. Weather was mostly sunny with a light wind. A summer adult and juvenile survey was not conducted in 2019.

Much of the wetland cannot be surveyed due to dense cattail coverage and deep waters. Instead, the amphibian surveys focus on the edges and fringe areas with shallow water. Columbia spotted frogs tend to breed in shallow water and the warmer parts of a pond (USFWS 2015b, and citations therein), so these edges are the most important places to check. The surveyors walked along and in the shallows of the available wetlands and water-filled ditches and counted all egg masses and individual amphibians observed. For each observation, the relative age of each individual is also noted. In every year, all surveyors are educated in egg mass identification or carry an amphibian guide with them to aid in identification (Stebbins 2003).

In 2018, we began tracking each surveyor's route on GPS units. After surveying, we deleted the parts of the track where we weren't actually surveying (i.e., walking back to the vehicle away from the wetland). This allows us to map the route, and have a total distance surveyed in addition to the total time. We continued with this methodology in 2020.

Results

On April 27th, 2021, we surveyed from 1019 to 1145 MST and surveyed a combined total of 2,942 m (Figure 4.4.1). Temperatures ranged from 40–50 degrees Fahrenheit with clear skies and a wind speed of 5–10 miles per hour. We found no Columbia Spotted Frog egg masses for the second consecutive year, which is a stark contrast from 2019, in which 12 egg masses were spotted. This could be due to water levels remaining low at the time of surveying.

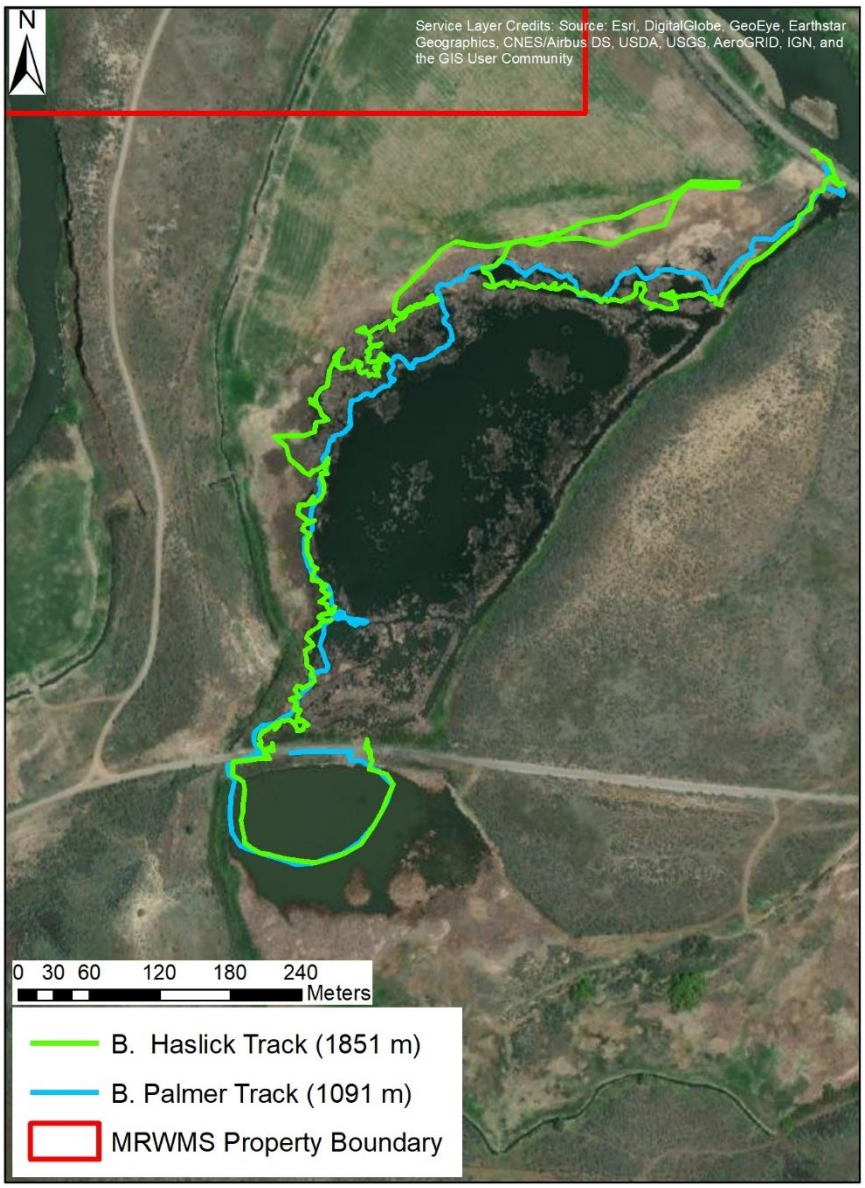


Figure 4.4.1. Map of amphibian survey routes on April 27th, 2021, at the MRWMS (includes surveyor and distance).

Discussion

Detecting no Columbia Spotted Frog egg masses for two consecutive years is alarming but is most likely due to the lower water levels while surveying. This was a stark contrast from 2019, in which we detected 12 egg masses. We will continue to monitor the wetlands for amphibians in 2022.

Recommendations

One of the primary limitations for spring egg mass surveys for Oregon spotted frogs is the short time frame available to detect egg masses (Pearl et al. 2010), and surveys for the similar Columbian spotted frog likely suffer from the same limitation. If time permits, running multiple cycles of surveys could help prevent missing the critical breeding interval. GPS points should continue to be taken at each location. This information may be helpful in mapping breeding locations in the MRWMS wetlands. We also recommend continuing to track and map survey routes in future years as it provides useful data on survey effort and will allow for better year to year comparisons.

The wetland alterations were implemented in 2018–2019. Amphibian surveys should continue following this after implementation to track changes through the years. Management will focus on keeping the south wetland inundated for longer periods of the year. Keeping standing water in parts of the south wetland throughout the year, as opposed to the ephemeral wetland management strategy we currently utilize, should benefit Columbia spotted frogs. This is likely the best way to increase Columbia spotted frogs on the MRWMS, as it would represent an addition of a wetland with a permanent hydroperiod.

The MRWMS is located near the edge of the range for both the Great Basin and Northern DPS clades of Columbia spotted frogs (USFWS 2015b). Collection of Columbia spotted frog genetic samples should be considered as a future avenue for Columbia spotted frog research on the MRWMS.

Literature Cited

Oregon Conservation Strategy. 2016. Columbia spotted frog. Oregon Department of Fish and Wildlife, Salem, Oregon. http://oregonconservationstrategy.org/strategy-species/columbia-spotted-frog/ Accessed: January 24, 2018.

Pearl, C.A., D. Clayton, and L. Turner. 2010. Surveys for presence of Oregon spotted frog (*Rana pretiosa*): Background information and field methods. Interagency Special Status Sensitive Species Program (ISSSSP). 48 p. Portland, Oregon.

Stebbins, Robert C. 2003. A Field Guide to Western Reptiles and Amphibians. 3rd ed. Houghton Mifflin. New York, New York.

[USFWS] U.S. Fish and Wildlife Service. 2015a. Endangered and Threatened Wildlife and Plants; 12-Month Findings on Petitions to List 19 Species as Endangered or Threatened Species. Federal Register 80: 60834-60850.

[USFWS] U.S. Fish and Wildlife Service. 2015b. Species status assessment report for the Columbia spotted frog (*Rana luteiventris*), Great Basin Distinct Population Segment. Reno Fish and Wildlife Office, Reno, Nevada. vii + 86 pp.

Conservation Innovation Grant Medusahead Project

In 2019, the Burns Paiute Tribe secured a NRCS state Conservation Innovation Grant for "Innovative Approach to Controlling Medusahead at a Management Scale". The $36,294.10 awarded for this grant will fund medusahead treatments and researching the effects of those treatments.

Introduction

Medusahead (*Taeniatherum caput-medusae*) is a problematic invader in the western United States. Medusahead can outcompete native vegetation, often to the point of almost total replacement (Torell et al. 1961). In greenhouse and lab studies medusahead grew twice as fast as a native perennial blue-bunch wheatgrass (*Agropyron spicatum*) and accumulated biomass, leaf area, and root length twice as fast as the native squirreltail (*Elymus elymoides*) (Goebel et al. 1988, Young and Mangold 2008). The effects of medusahead invasion on the vegetation community are well established (Young and Evans 1970). Medusahead invaded sites have lower plant richness and diversity, lower cover, density, and biomass production of all native herbaceous functional groups (Davies and Svejcar 2008). Medusahead density also explained 62% of the variation in plant diversity and had a strong negative correlation to plant species diversity and richness (Davies 2011). Medusahead can even outcompete and replace the invasive cheatgrass (*Bromus tectorum*) (Torell et al. 1961, Hironaka 1961). The method of this replacement may be related to a higher overwinter mortality of cheatgrass, and reduced seed production of cheatgrass when competing with medusahead (Hironaka 1994). Wisdom et al. (2005) identified >350 species of conservation concern that occupy that sagebrush ecosystem, the majority of which were vascular plants, so the expansion of medusahead and other invasive plants is a concern for native flora.

A slow decomposition rate of medusahead related to its high silica content (Bovey et al. 1961), leads to an accumulation of a thick layer of litter. Dense medusahead litter increases the likelihood of fire (Torrell et al. 1961, Young 1992) and limits the ability of other species to germinate and establish (Young 1992). Unlike cheatgrass, which is preferred forage for livestock seasonally, medusahead is not very palatable and often leads to livestock injury due to its sharp seeds and barbed awns (Bovey et al. 1961, Young 1992). The establishment of medusahead in some areas has led to a reduction in livestock grazing capacity by as much as 50–80% (Hironaka 1961).

The effects of medusahead on wildlife are not as well understood as its other effects. However, in a study investigating the selectivity of grass seeds by birds, introduced annuals (cheatgrass and medusahead) had the lowest rates of removal, with medusahead lower than cheatgrass (Goebel and Berry 1976). While Chukar (*Alectoris graeca*) often utilize cheatgrass in the wild, feeding trials of medusahead seeds and cheatgrass caryopses led to severe weight loss, but the authors believed the birds that were fed cheatgrass were in better condition than birds fed medusahead (Savage et al. 1969). The sagebrush steppe provides foraging and nesting habitat for as many as 100 species of birds (Braun et al. 1976, and citations therein), with 17 of these species of conservation concern (Paige and Ritter 1999). The list of >350 species of conservation

concern that occupy the sagebrush ecosystem compiled by Wisdom et al. (2005) included invertebrates, reptiles, birds, and mammals. While much of the sagebrush steppe is still present, it has undergone qualitative changes due to grazing, altered fire regimes, and the spread of introduced grasses (Noss et al. 1995). It is likely that these qualitative changes to the sagebrush steppe have various consequences for the animals that utilize this ecosystem. For example, Schroeder et al. (2004) found large disparities between the potential pre-settlement habitat and current range of Greater Sage-Grouse (*Centrocercus urophasianus*) and Gunnison Sage-Grouse (*C. minimus*). The authors attributed these differences to habitat alteration and degradation, including introduction and expansion of invasive plant species and encroachment by trees, among other things. While both conifer encroachment and the increase of introduced annual grasses threaten this ecosystem, management to address conifer encroachment often succeed, while restoration of annual grass invaded sites often fail (Davies et al. 2011).

Davies and Johnson (2008) argued that we are at a critical threshold, and if we do not act fast, millions of hectares could be lost to this species. Of course, this call to arms was not a novel stance; managers and researchers have been attempting to eradicate, control or limit the spread of medusahead for a long time. As early as 1961, medusahead was referred to as "the worst range weed in Idaho", and methods were being utilized to attempt to control this species (Torrell et al. 1961, p. 124). Many different types of treatments to control or remove medusahead have been attempted through the years, including grazing (DiTomaso 2008), prescribed fire (Young et al. 1972, Kyser et al. 2008), herbicide (Young et al. 1971), and combinations of treatments (Kay 1963, Kay and McKell 1963, Monaco et al. 2005, Kyser et al. 2007, Sheley et al. 2007, Davies and Sheley 2011).

Research shows that medusahead can be controlled and successfully revegetated with more desirable plants, by utilizing prescribed fire, followed by a fall application of imazapic, and seeding the following fall (Davies 2010). Imazapic provides pre- and post-emergent control of annual and perennial grasses and broadleaf plants, by inhibiting acetohydroxy acid synthase (ALS), which is involved in protein synthesis (Tu et al. 2001). Although the successful control of medusahead and revegetation in medusahead dominated sites has been demonstrated, these studies were done on a small experimental scale (5 m x 5 m blocks; Davies 2010). Johnson and Davies (2012, p. 37) stated, "There is a critical need to test these and other integrated control and revegetation strategies at a meaningful scale to provide land managers solid management recommendations for medusahead-invaded rangeland."

One of the most promising herbicides which still requires large-scale testing is Indaziflam. Indaziflam (Bayer CropScience) is a recently developed pre-emergent herbicide for annual grasses and broadleaf weeds that acts as a cellulose-biosynthesis inhibitor (Myers et al. 2009, Bradham et al. 2014). Early research on the efficacy of indaziflam is promising. In a greenhouse study, application rates to obtain 50% reduction in growth rate on 6 invasive winter annual grasses were lower for indaziflam than imazapic and significantly lower for 5 of the 6 species (Sebastian et al. 2016a). Application rate for 50% reduction in growth for medusahead was 5.75 times lower for indaziflam than for imazapic. In a field study, Sebastian et al. (2017) determined that two years after treatment indaziflam provided superior control of three invasive annual grasses compared to imazapic, while also promoting forbs and perennial grasses. Sebastian et al. (2016b) found that in two sites both indaziflam and imazapic provided similar

cheatgrass control 1 year after treatment, but indaziflam controlled cheatgrass better 2 and 3 years after treatment. In a third site, indaziflam outperformed imazapic in all three years, providing 100% cheatgrass control 3 years after treatment compared to 32% by imazapic (Sebastian et al. 2016b). Given the successful control of medusahead in the greenhouse and extended control of other annual grasses in field conditions, documenting the effects of indaziflam on medusahead in the field is an important step.

While initial removal of medusahead is a vital step in long term medusahead control, revegetation with desirable vegetation is crucial to long term medusahead management. Dahl and Tisdale (1975) found that perennial cover is a deterrent to invasion of medusahead and cheatgrass. In experimental introductions, medusahead cover and density was negatively correlated with tall tussock perennial grass density (Davies 2008). An experimental removal of functional groups also documented the importance of perennial bunchgrasses in resisting medusahead invasion, as Sheley and James (2010) found that removing perennial grasses nearly doubled medusahead density and biomass compared to removal of other functional groups.

It is important to wait a year to seed, or the herbicide will limit the establishment of seeded plants. Davies et al. (2014) found perennial grass cover was eight times greater in the sites planted a year after imazapic application compared to the sites seeded simultaneously with imazapic application by the second-year post-seeding. Although native perennials are preferable to non-natives for aesthetic and ecological reasons, successful plantings with native species are uncommon and non-natives tend to perform better (Robertson et al. 1966, James et al. 2011).

Project objectives

The objectives of this project were: (1) to test the applicability of the combination of prescribed fire, pre-emergent herbicide application, and re-seeding at controlling medusahead and revegetation with more desirable vegetation at a management scale; (2) to compare the efficiency of indaziflam and imazapic within these treatment combinations; (3) to compare the cost and benefits of indaziflam and imazapic within these treatment combinations; and (4) to share methods and results with local and regional land managers and researchers.

Study area

We conducted treatments on the Malheur River Wildlife Mitigation Site (MRWMS) in Malheur County, OR. The MRWMS is 2,584-ha property owned and managed by the Burns Paiute Tribe (BPT) as a wildlife mitigation site. It is located seven miles east of Juntura, OR and is adjacent to the Malheur River in the Range and Basin ecoregion. The *Malheur Wild and Scenic River Management Plan* (U.S. Forest Service 1993a) and the *North Fork Malheur Scenic River Management Plan* (U.S. Forest Service 1993b), identify the MRWMS area as a key component in the restoration of aquatic and terrestrial habitat within the Malheur River basin. Migratory bird surveys conducted by BPT biologists have detected many species currently listed as sensitive by the Oregon Department of Fish and Wildlife. The MRWMS includes both low density habitat and priority areas for conservation for Greater Sage-Grouse.

Experimental design

Prior to treatments, we established 5 treatment areas (blocks) and a nearby untreated control plot by aerial mapping obvious medusahead acreage that was largely devoid of sagebrush (Figure 4.5.1). However, the prescribed fire burned some of the control and not all of Treatment Area 3 and Treatment Area 4. Following the fire, the indaziflam side of the Original Treatment area 4 became a second control and we combined parts of the original Treatment Area 3 and Treatment Area 4 into a New Treatment Area 4 (Figure 4.5.2). The use of multiple treated areas will allow us to account for differences in slope, aspect, soil differences, and vegetation differences between these 4 sites. After these plots were established, we randomized which direction the plots would be split in half (north/south, or east/west). We were not able to randomize the direction the New Treated 4 plot was split, and we split it east and west. After splitting the plots into approximately equal acreage, we then randomized which side of the plot received which herbicide. This experimental design will allow us to compare the efficiency of each herbicide within the treatment combination of prescribed fire, pre-emergent herbicide, and range-seed drilling.

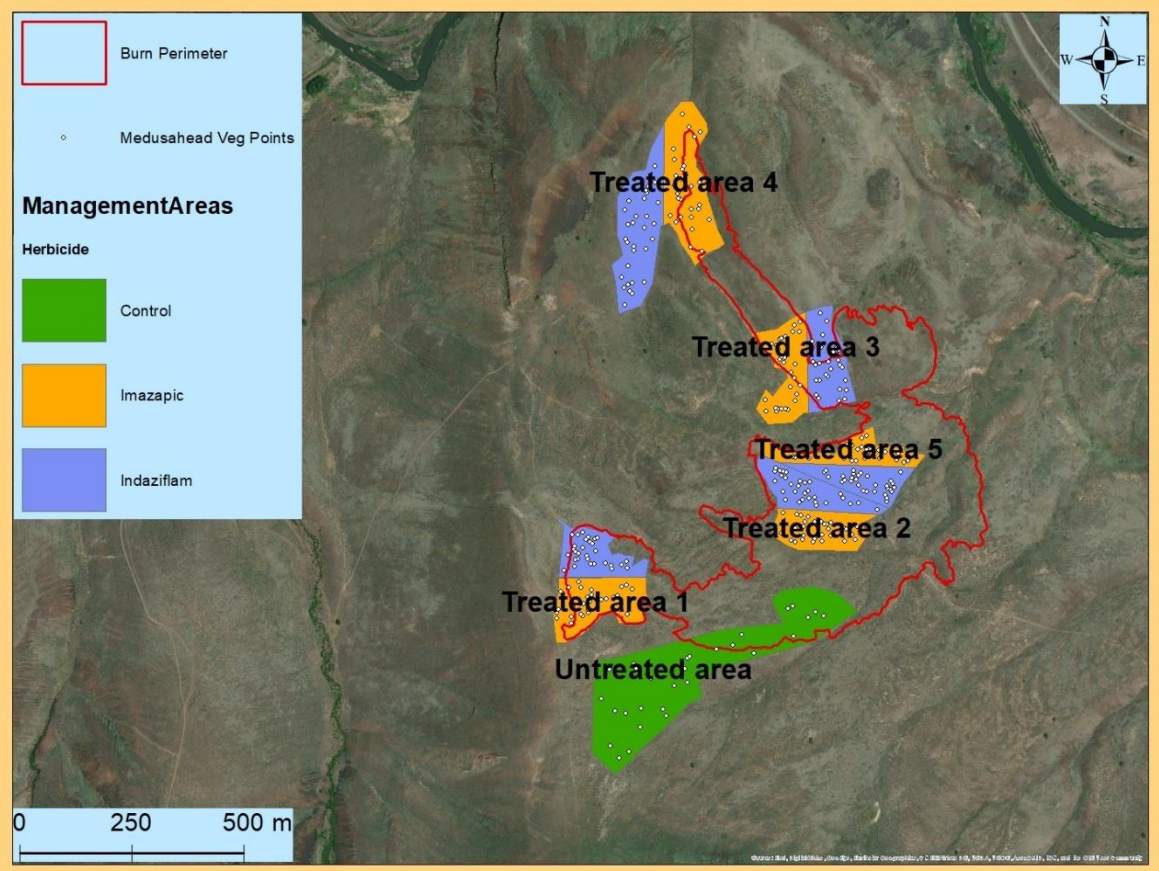


Figure 4.5.1. Original Treatment Areas prior to the prescribed fire. The prescribed fire boundary is shown in red, and the original vegetation monitoring points are shown.

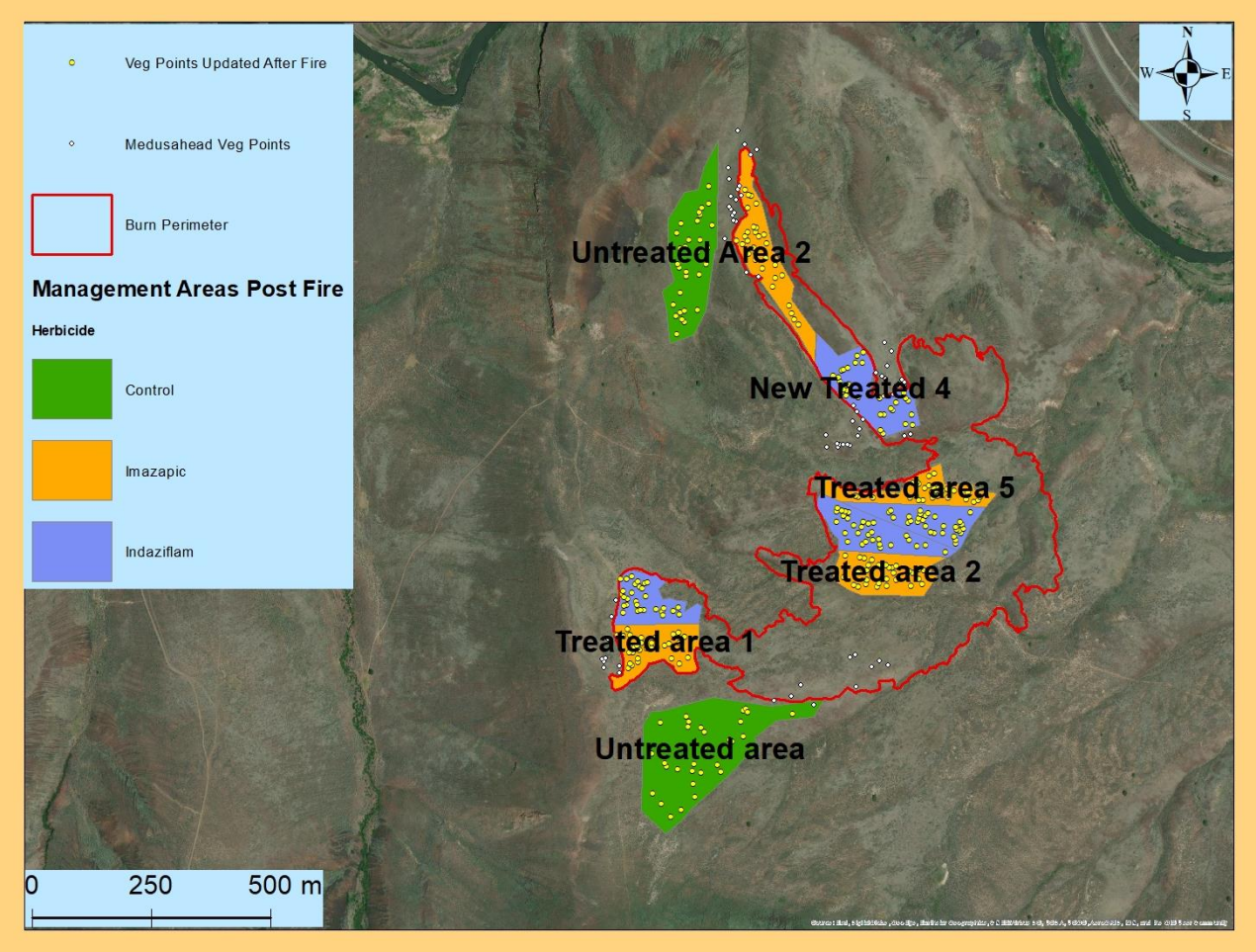


Figure 4.5.2. Adjusted Treatment Areas following the prescribed fire. The prescribed fire boundary is shown in red, and both the original and the adjusted vegetation monitoring points are shown.

Methods:

We conducted the prescribed fire on October 22nd, 2020 (Figure 4.5.3). We burned the plots from 1200-2100 MST. Treatment Area 1 was burned and completed by 1255. We started Treatment Area 2 and 5 simultaneously at 1423 MST. The fire got outside of the lines and burned some of the control, some of the original Treatment Area 3 and Treatment Area 4, and many acres between the Treatment Areas before we got it out. Wind speed ranged from approximately 1−6 mph (1.6−9.7 km/hr) during the burn. Temperatures ranged from 45−52° F (7.2−11.1 ° C) during the burn, and relative humidity ranged from 27−37%. Herbaceous fuel loads ranged within the burned area were 1,580.9 ± 277.7 lbs/acre (1,771.9 ± 311.3 kg/ha, *n*=37 0.5 X 0.5 m frames).

On October 28th-29th, 2020 we treated the Treatment Areas with herbicide (Figure 4.5.4). In collaboration with Gary Page at Malheur County Weed/Vector Control, we treated 33.3 acres of the Treatment Areas with either imazapic or indaziflam. We used 2 UTV's and 1 ATV for the herbicide applications. The ATV was a Honda Rubicon ATV that was calibrated at 12.5

gallons/acre (116.9 l/ha) at 25 PSI (172.4 kPa) with a 36-foot (11.0 m) swath width. One of the UTVs was a Kubota RTV 900 that was calibrated at 15 gallons/acre (140.3 l/ha) at 25 PSI (172.4 kPa) with a 38-foot (11.8 m) swatch width, and the other UTV was a Kubota RTV 1120 that was calibrated at 10 gallons/acre (93.5 l/ha) at 25 PSI (172.4 kPa) with a 42-foot (12.8 m) swath width. We treated the imazapic side of each Treatment Area with 6 oz/acre (105.1 g ai/ha) of imazapic (Panoramic 2SL Alligaire, LLC., Opelika, AL). We treated the indaziflam side of each Treatment area with 5−5.3 oz/acre (43.8−46.7 g ai/ha) of indaziflam (Esplanade 200SC, Bayer CropScience LP, Environmental Science Division, Research Triangle Park, NC 27709). We used an adjuvant (Grounded, Helena Chemical Company, Collierville, TN 38017) at a rate of 24-25.6 oz/acre (59.3−63.3 oz ai/ ha). We also used herbicide dye (HI-LIGHT® Blue and HI-LIGHT® Red, BASF Corporation, Research Triangle Park, NC 27709) at a rate 8-8.5 oz/ acre (19.8-21.1 oz/ha). Wind speed during herbicide application ranged from 1−9 mph (1.6−14.5 km/hr).

Figure 4.5.3. Prescribed fire on October 22nd, 2020.

Figure 4.5.4. Herbicide applications on October 28th–29th, 2020.

On November 23-24, 2021, we used a home-made 12 foot (3.66 m) wide Metal Master no-till range seed drill to seed the Treatment Areas at a rate of 11.46 PLS lbs/acre (12.84 PLS kg/ha; Table 4.5.1, Figure 4.5.5). Rows were 10 inch (25.4 cm) apart with a 0.25 inch (0.635 cm) maximum planting depth. On November 23, 2021, the weather windy (15−25 mph, 24−40 km/hr) with temperatures 35−45° F (1.7−7.2 ° C). It snowed a little overnight on the night of November 22−23, but all had melted by the time we started seeded. It sprinkled for a bit in the morning but was dry for the rest of the day. On November 24, 2021, it was mostly sunny calm day (3−5 mph, 4.8−8 km/hr) with temperatures 38−45° F (3.3−7.2° C).

Table 4.5.1. Seed mix and seeding rates (seeded with a rangeland seed drill in November 2021).

Species	Scientific name	Origin	Bulk seed used (lbs.)	Area seeded (acres)	lbs of bulk seed mix/acre	% pure seed	Germ.	PLS lbs/acre	PLS kg/ha
Vavilov II Siberian Wheatgrass	*Agropyron fragile* (Roth) Candargy	Canada	485	35.95	13.49	39.40%	88%	4.68	5.24
Ephraim Crested Wheatgrass	*Agropyron cristatum* (L.) A. Gaertn.	Canada	485	35.95	13.49	36.88%	94%	4.68	5.24
Turkey Lake Bottlebrush Squirreltail	*Elymus elymoides* (Raf.) Swezey	Washington	485	35.95	13.49	14.45%	96%	1.87	2.10
Wyoming Big sagebrush	*Artemesia tridentata wyomingensis*	Idaho	485	35.95	13.49	2.06%	84%	0.23	0.26
Inert	NA	NA	NA	NA	NA	7.13%	NA	NA	NA
Other crop	NA	NA	NA	NA	NA	0.08%	NA	NA	NA
Total								**11.46**	**12.84**

Figure 4.5.5. Range seed drill seeding on November 23rd–24th, 2021.

Within each treatment area we established 30 random points with the create random points tool (ArcMap 10.6.1) with a minimum distance of 5 m between points. Each point was placed at least 10 meters within the original boundary to avoid edge effects and problems with herbicide drift.

We used Garmin GPS units (GPSmap 62stc, GPSmap 64s) to navigate to the vegetation points, and we dropped the frame as soon as the GPS read 0 ft. If the frame fell entirely on a boulder, we moved the frame to the closet point. We used a 1 X 1 m frame to estimate canopy cover and frequency to the species level (Figure 4.5.6). We estimated cover of bare ground, litter, rock and for each species as <1% (trace), 1%, 2%, 3% 4%, 5%. For percentages above 5%, we estimated to the closest 5%. We estimated relative canopy cover, so frames add up to ~100%.

However, if there were shrubs in the frame, we estimated their cover and the herbaceous cover underneath them. So, in frames with shrubs, total cover likely adds to greater than 100. We read frames with each surveyor at the beginning of each survey year to calibrate canopy cover estimation between observers. We also took photos at each number 1, 15, and 30 in each block and treatment area. We collected pre-treatment data on June 18th, 19th, 20th, and 24th in 2019 and June 29th–30th, 2020. We collected data on the first growing season post-herbicide on June 14, 2021.

Figure 4.5.6. A 1 m x 1m frame placed over one of the sampling points to estimate canopy cover and frequency of species.

Following the fire, we needed to move some of the vegetation points into or outside of the burned areas. We moved 9 points out of the burned areas and into the Control. We moved 7 points into the burn in imazapic side of Treatment 1, 3 points in the indaziflam side of Treatment 1, and 21 points in the imazapic side of New Treatment Area 4. We followed the same protocol for establishing these points as we used to establish the original points (5 m minimum between points and at least 10 m within the Treatment Area boundary.

For the analysis, we graphed the average and SE for canopy coverage of medusahead and cheatgrass. For trace (<1%) canopy cover in a frame, we treated it as 0.25% canopy cover for canopy cover analyses. These methods can be used for other species, species groups, or cover

types. We also present the frequency of occurrence of medushead, cheatgrass, and sunflower (*Helianthus annuus*) out of 30 frames.

Results

Imazapic performed far better than indaziflam at controlling medusahead and cheatgrass in the first growing season after application. Medusahead cover ranged from 40.67-75.5% in the treatment areas and controls prior to treatment in 2020. Following the prescribed fire and herbicide applications, the imazapic treated sites ranged from 0.02% cover in Treatment area 5 to 9.6% cover in Treatment area 2. The indaziflam treated sites ranged from 3.7% in Treatment area 1 to 33.4% in Treatment area 4. The Untreated areas (controls) contained 30.4% and 46.7% medusahead canopy cover (Figure 4.5.7). We saw similar, albeit less clear, trends with cheatgrass canopy cover (Figure 4.5.8).

The difference between herbicide effects is even more pronounced when looking at the frequency data. While medusahead frequency in the imazapic treated areas dropped to 6.7−36.7% in the first growing season after application, medusahead frequency ranged from 83.3–100% in the indaziflam treated areas (Figure 4.5.9). A similar trend was seen with cheatgrass frequency, with the imazapic treated areas performing better than the indaziflam treated areas (Figure 4.5.10). The difference between herbicide treatment effects is highlighted with a photo from April 2021 (Figure 4.5.11).

One of the more pronounced results we saw in the first growing season following herbicide application, was an obvious increase in common sunflower in the indaziflam treated areas. This was apparent for both the canopy cover and frequency data (Figure 4.5.12 and 4.5.13). It is also apparent in photographs (Figure 4.5.14).

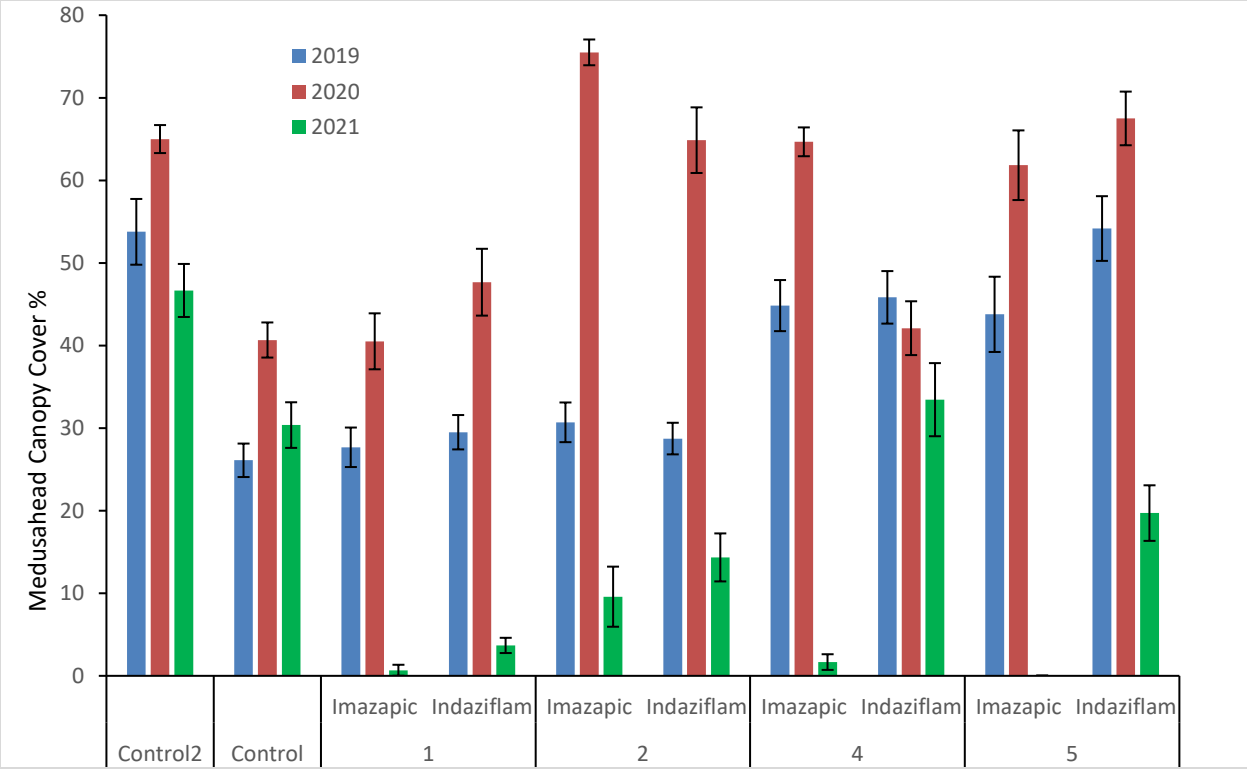


Figure 4.5.7. Medusahead canopy coverage % on all the Treatment Areas and the Untreated controls in 2019–2021. Herbicide was applied in October 2020, so 2021 represents the first growing season post-herbicide and 2019–2020 are both pre-treatment years. Average and SE's shown.

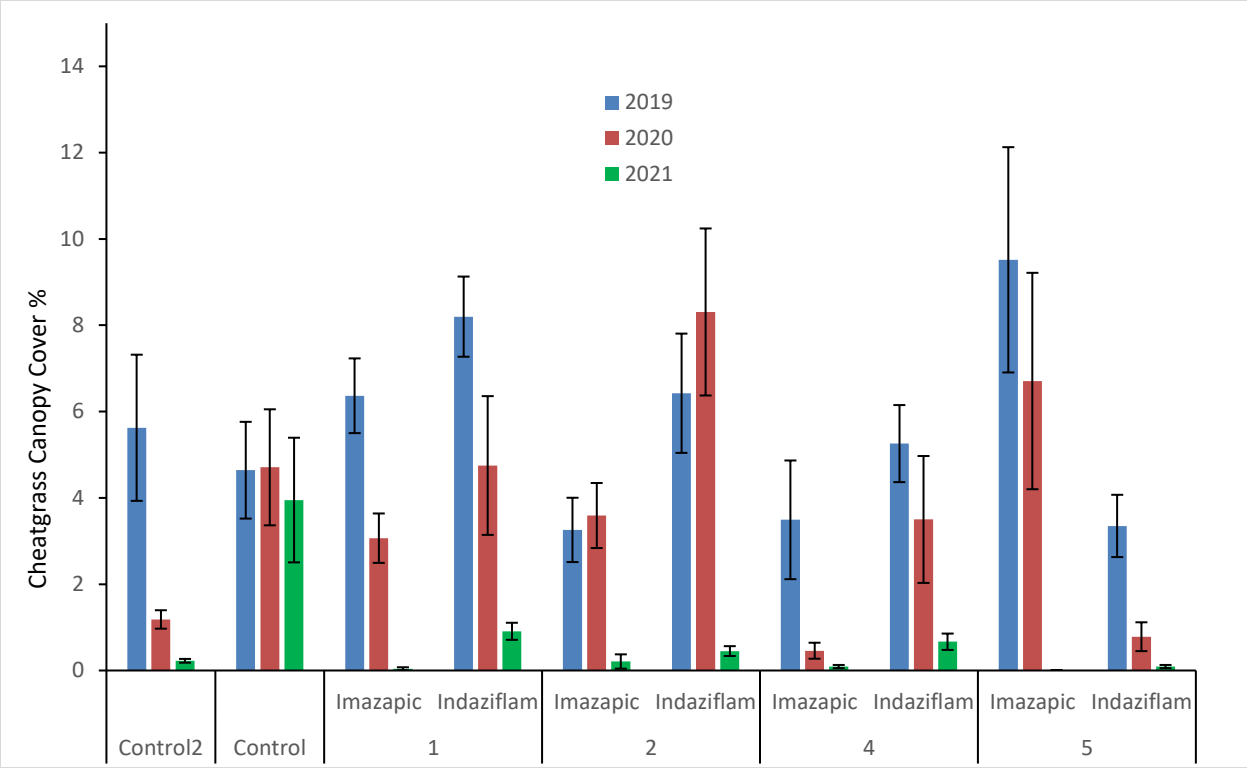


Figure 4.5.8. Cheatgrass canopy coverage % on all the Treatment Areas and the Untreated controls in 2019–2021. Herbicide was applied in October 2020, so 2021 represents the first growing season post-herbicide and 2019–2020 are both pre-treatment years. Average and SE's shown.

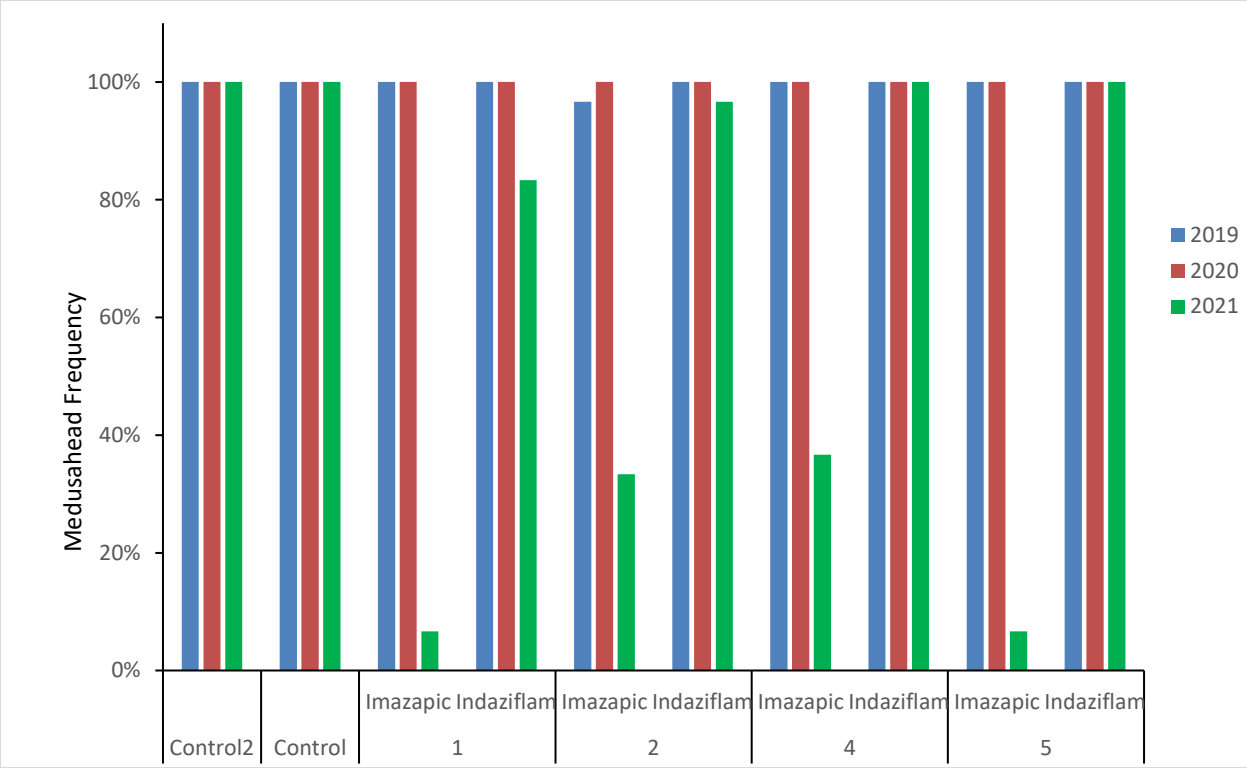


Figure 4.5.9. Medusahead frequency out of 30 frames in each herbicide side of each Treatment Area and each Untreated Control in 2019−2021. Herbicide was applied in October 2020, so 2021 represents the first growing season post-herbicide and 2019−2020 are both pre-treatment years. Average and SE's shown.

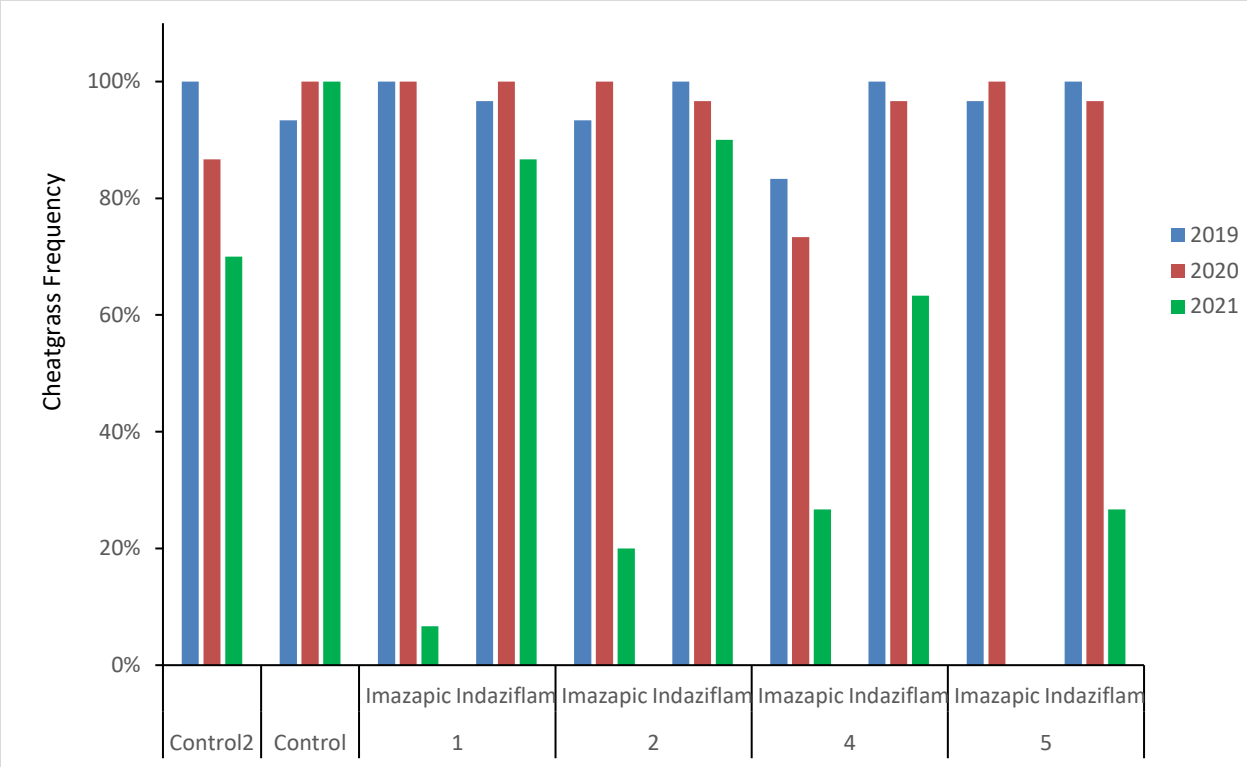


Figure 4.5.10. Cheatgrass frequency out of 30 frames in each herbicide side of each Treatment Area and each Untreated Control in 2019–2021. Herbicide was applied in October 2020, so 2021 represents the first growing season post-herbicide and 2019–2020 are both pre-treatment years. Average and SE's shown.

Figure 4.5.11. An overview shot of Treatment Area 5 taken in April 2021. The indaziflam side shows considerably more annual grass germination and growth than the imazapic side.

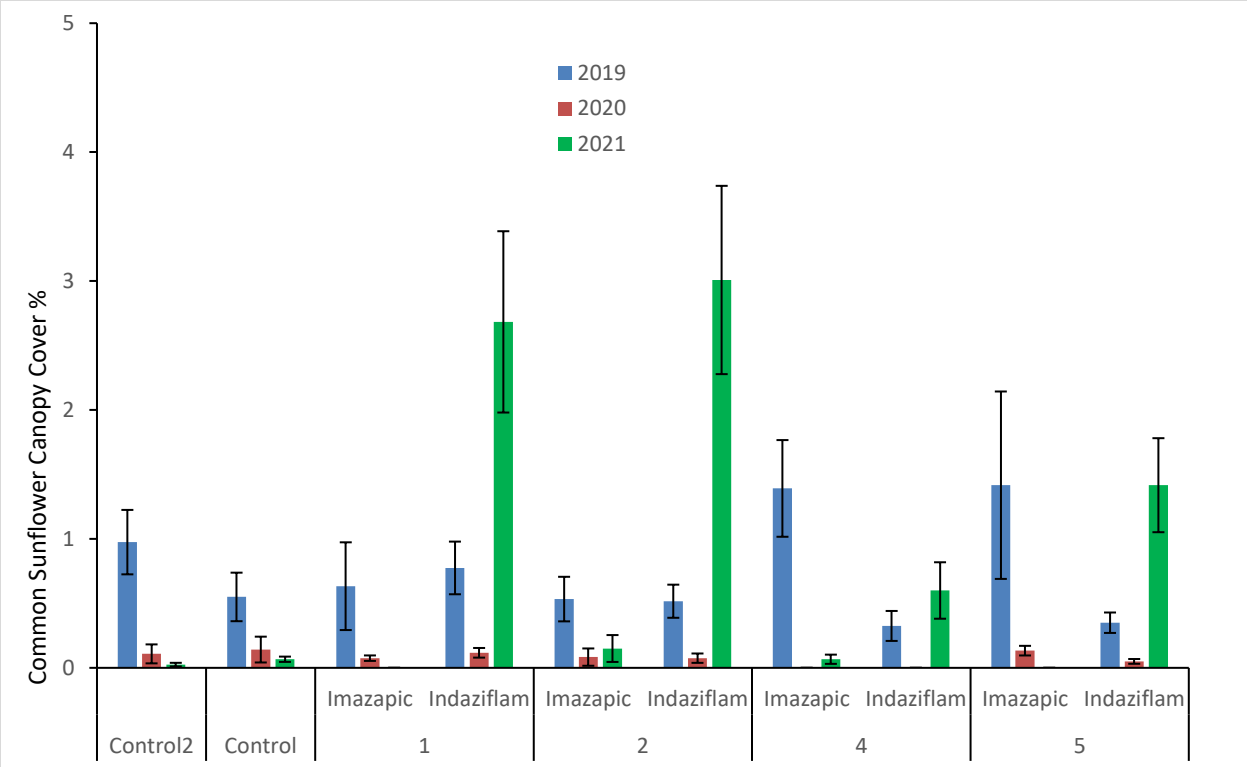


Figure 4.5.12. Common sunflower (*Helianthus annuus*) canopy coverage % on all the Treatment Areas and the Untreated controls in 2019−2021. Herbicide was applied in October 2020, so 2021 represents the first growing season post-herbicide and 2019−2020 are both pre-treatment years. Average and SE's shown.

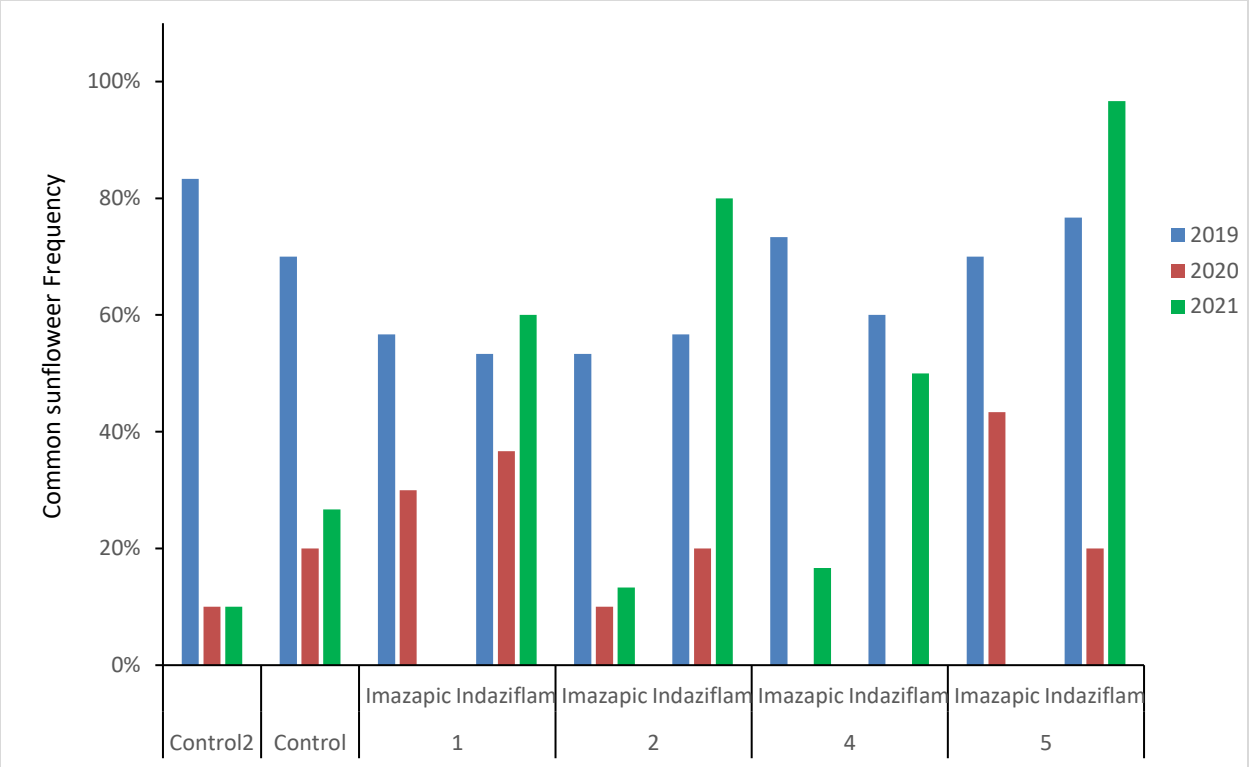


Figure 4.5.13. Common sunflower (*Helianthus annuus*) frequency out of 30 frames in each herbicide side of each Treatment Area and each Untreated Control in 2019–2021. Herbicide was applied in October 2020, so 2021 represents the first growing season post-herbicide and 2019–2020 are both pre-treatment years.

Figure 4.5.14. A photograph down the middle of Treatment Area 1 taken in November 2021. The indaziflam side on the left shows a high density of senesced Common sunflower (*Helianthus annuus*) compared to the imazapic side on the right.

Discussion

The imazapic clearly performed better at controlling medusahead and cheatgrass in the first growing season following a post-fire application. Since we deployed the herbicide so late in the year, we may have treated too late for indaziflam. While imazapic has both pre- and post-emergent effects, indaziflam is a pre-emergent herbicide only (Tu et al. 2001, Myers et al. 2009). Due to the late application, annual grasses that germinated before the indaziflam was activated by rain may have escaped the herbicide. It is recommended to apply indaziflam in August for medusahead control (Harry Quick, personal communication). It is also worth pointing out that since we did not include a burned control that it is hard to separate the effects of the fire and the herbicides.

The increase in sunflowers in the indaziflam treated areas could be due to the disturbance associated with prescribed fire, partial control of annual grasses leading to greater availability of water and/or nutrients, or a combination of the two.

We range-seed drilled these sites on November 23–24, 2021. We will continue to monitor these plots for at least two years post seeding. The scale of these treatments and the rigorous monitoring should be a very helpful contribution to rangeland science. The side-by-side comparison of indaziflam and imazapic within these treatment combinations should also be very helpful to others interested in medusahead control.

Acknowledgments

The Natural Resources Conservation Service provided project funding through a state Conservation Innovation Grant (Original Agreement number NR190436XXXXG010). Smoked Goose Consulting, LLC. and A1 Firestorm, LLC. conducted the prescribed fire. Gary Page and the Malheur County Weed/Vector Control provided equipment, supplies, and staff time that were critical to the herbicide applications. Bayer CropScience LP Environmental Science Division provided Esplanade 200SC for the herbicide treatments. Branch 7 Enterprises, LLC. conducted the rangeland seed drilling.

Literature Cited

Bovey, R. W., D. Le Tourneau, L. C. Erickson. 1961. The chemical composition of medusahead and downy brome. Weeds 9:307–311.

Brabham, C., L. Lei, Y. Gu, J. Stork, M. Barrett, S. DeBolt. 2014. Indaziflam herbicidal action: a potent cellulose biosynthesis inhibitor. Plant Physiology 166:1177–1185.

Braun, C. E., M. F. Baker, R. L. Eng, J. S. Gashwiler, and M. H. Schroeder. 1976. Conservation committee report on effects of alteration of sagebrush communities on the associated avifauna. Wilson Bulletin 88:165-171.

Dahl, B. E. and E. W. Tisdale. 1975. Environmental factors related to medusahead distribution. Journal of Range Management 28:463–468.

Davies. K. W. 2008. Medusahead dispersal and establishment in sagebrush steppe plant communities. Rangeland Ecology Management 61:110–115.

Davies, K. W. 2010. Revegetation of medusahead-invaded sagebrush. Rangeland Ecology Management 63:564–571.

Davies, K. W. 2011. Plant community diversity and native plant abundance decline with increasing abundance of an exotic annual grass. Oecologia 167:481–491.

Davies, K. W., C. S. Boyd, J. L. Beck, J. D. Bates, T. S. Svejcar, and M. A. Gregg 2011. Saving the sagebrush sea: an ecosystem conservation plan for big sagebrush plant communities. Biological Conservation 144:2573–2584.

Davies, K. W. and D. D. Johnson. 2008. Managing medusahead in the intermountain west is at a critical threshold. Rangelands 30:13–15.

Davies, K. W., M. D. Madsen, A. M. Nafus, C. S. Boyd, and D. D. Johnson. 2014. Can imazapic and seeding be applied simultaneously to rehabilitate medusahead-invaded rangeland? Single vs. multiple entry. Rangeland ecology and Management 67:650:656.

Davies, K. W. and R. L. Sheley. 2011. Promoting native vegetation and diversity in exotic annual grass infestations. Restoration Ecology 19:159–165.

Davies, K. W., and T. J. Svejcar. 2008. Comparison of medusahead-invaded and noninvaded Wyoming big sagebrush steppe in southeastern Oregon. Rangeland Ecology and Management 61:623–629.

DiTomaso, J. M., G. B. Kyser, M. R. George, M. P. Doran, and E. A. Laca. 2008. Invasive Plant Science and Management 1:241–247.

Goebel, C. J., M. Tazi, AND G. A. Harris. 1988. Secar bluebunch wheatgrass as a competitor to medusahead. Journal of Range Management 41:88–89.

Goebel, C. J., G. Berry. 1976. Selectivity of range grass seeds by local birds. Journal of Range Management 29:393–395.

Hironaka, M. 1961. The relative rate of root development of cheatgrass and medusahead. Journal of Rang Management 14:263–267.

Hironaka, M. 1994. Medusahead: natural successor to the cheatgrass type in the northern Great Basin. in S. B. Monsen and S. G. Kitchen, eds. Proceedings: Ecology and Management of Annual Rangelands. Ogden, UT: United States Department of Agriculture, Forest Service, Intermountain Research Station. General Technical Report INT-GTR-313. pp. 89–91.

James, J. J., T. J. Svejcar, and M. J. Rinella. 2011. Demographic processes limiting seedling recruitment in arid grassland restoration. Journal of Applied Ecology 48:961–969.

Johnson, D. D. and K. W. Davies. 2012. Medusahead management in sagebrush-steppe rangelands: prevention, control, and revegetation. Rangelands 34:32–38.

Kay, B. L. 1963. Effects of Dalapon on a medusahead community. Weeds 11:207–209.

Kay, B. L. and C. M. McKell. 1963. Preemergence herbicides as an aid in seeding annual rangelands. Weeds 11:260–264.

Kyser, G. B., J. M. DiTomaso, M. P. Doran, S. B. Orloff, R. G. Wilson, D. L. Lancaster, D. F. Lile, and M. L. Porath. 2007. Control of medusahead (Taeniatherum caput-medusae) and other annual grasse with imazapic. Weed Technology 21:66–75.

Kyser, G. B., M. P. Doran, N. K. McDougald, S. B. Orloff, R. N. Vargas, R. G. Wilson, and J. M. DiTomaso. 2008. Site characteristics determine the success of prescribed burning for

medusahead (Taeniatherum caput-medusae) control. Invasive Plant Science and Management 1:376–384.

Monaco, T. A., T. M. Osmond, S. A. Dewey. 2005. Medusahead control with fall- and spring-applied herbicides on northern Utah foothills. Weed Technology 19:653–658.

Myers, D.F., R. Hanrahan, J. Michel, B. Monke, L. Mudge, L. Norton, C. Olsen, A. Parker, J. Smith, and D. Spak. 2009. Indaziflam/BCS AA170717- A new herbicide for preemergent control of grasses and broadleaves in turf and ornamentals. Proceedings Southern Weed Science Society. 62:393.

Noss, R. F., E. T. LaRoe III, and J. M. Scott. 1995. Endangered ecosystems of the United States: A preliminary assessment of loss and degradation. National Biological Service Biological Report 28, Washington, DC.

Paige, C. and S. A. Ritter. 1999. Birds in a sagebrush sea: managing sagebrush habitats for bird communities. Partners in Flight western Working Group, Boise, ID.

Robertson, J. H., R. E. Eckert Jr., and A. T. Bleak. 1966. Responses of grasses seeded in an Artemisia tridentata habitat in Nevada. Ecology 47:187–194.

Savage, D. E., J. A. Young, and R. A. Evans. 1969. Utilization of medusahead and downy brome caryopses by Chukar partridges. Journal of Wildlife Management 33:975–978.

Schroeder, M. A., C. L. Aldridge, A. D. Apa, J. R. Bohne, C. E. Braun, S. D. Bunnell, J. W. Connelly, P. A. Deibert, S. C. Gardner, M. A. Hilliard, G. D. Kobriger, S. M. McAdam, C. W. McCarthy, J. J. McCarthy, D. L. Mitchell, E. V. Rickerson, and S. J. Stiver. 2004. Distribution of Sage-Grouse in North America. The Condor 106:363–376.

Sheley, R. L. and J. James. 2010. Resistance of native plant functional groups to invasion by medusahead (Taenitherum caput-medusae). Invasive Plant Science and Management 3:294–300.

Sheley, R. L., M. F. Carpinelli, and K. J. Reever Morghan. 2007. Effects of imazapic on target and nontarget vegetation during revegetation. Weed Technology 21:1071–1081.

Sebastian, D. J., M. B Fleming, E. L. Patterson, J. R, Sebastian, and S. J. Nissen. 2017. Indaziflam: a new cellulose-biosynthesis-inhibiting herbicide provides long-term control of invasive winter annual grasses. Pest Management Science 73:2149–2162.

Sebastian, D. J., S. J. Nissen, and J. D. Souza Rodrigues. 2016a. Pre-emergence control of six invasive winter annual grasses with imazapic and indaziflam. Invasive Plant Science and Management 9:308–316.

Sebastian, D. J., J. R. Sebastian, S. J. Nissen, and K. G. Beck. 2016b. A potential new herbicide for invasive annual grass control on rangeland. Rangeland Ecology & Management 69:195–198.

Torell, P. J., L. C. Erickson, R. H. Haas. 1961. The medusahead problem in Idaho. Weeds 9:124–131.

Tu, M., C. Hurd, J.M. Randall, and The Nature Conservancy. 2001. Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas. All U.S. Government Documents (Utah Regional Depository). Paper 533. https://digitalcommons.usu.edu/govdocs/533.

Wisdom, M. J., M. M. Rowland, L. H. Suring, L. Schueck, C. W. Meinke, and S. T. Knick. 2005. Evaluating species of conservation concern at regional scales. in: Wisdom, M. J., M. M. Rowland, and L. H. Suring (Eds.), Habitat Threats in the Sagebrush Ecosystem – Methods of Regional Assessment and Applications in the Great Basin. Alliance Communications Group, Lawrence, KS, pp. 5–74.

U.S. Forest Service. 1993a. Malheur wild and scenic river management plan. Malheur National Forest, John Day, Oregon.

U.S. Forest Service. 1993b. North Fork Malheur scenic river management plan. Malheur National Forest, John Day, Oregon.

Young, J. A. 1992. Ecology and management of medusahead (Taeniatherum caput-medusae ssp. asperum Melderis). Great Basin Naturalist 52:245–252.

Young, J. A. and R. A. Evans. 1970. Invasion of medusahead into the Great Basin. Weed Science 18:89–97.

Young, J. A., R. A. Evans, and B. L. Kay. 1971. Response of medusahead to Paraquat. Journal of Range Management 24:41–43.

Young, J. A., R. A. Evans, and J. Robison. 1972. Influence of repeated annual burning on a medusahead community. Journal of Range Management 25:372–375.

Young, K., and J. Mangold. 2008. Medusahead outperforms squirreltail through interference and growth rate. Invasive Plant Science and Management 1:73–81.

Stream Photos

There are 14 stream photo points on the Project to monitor vegetative components and changes in stream structure. An upstream and downstream azimuth is used to make the photograph repeatable. The purpose of the stream photos is for qualitative analysis for visual historic reference, see Appendix A. A noticeable growth in riparian vegetation is present in many photo points when comparing 2007 to 2021.

Nest Box Program

Densities of cavity nesting birds can be limited by the number of cavities available, with densities in areas correlated to the number of nest sites, and populations changing with experimental manipulations of nest site density (Newton 1994). Supplemented nest sites can be a valuable conservation tool. Nest box programs have demonstrated the ability to increase population numbers for American Kestrels (*Falco sparverius*) (Hamerstrom et al. 1973, Shave and Lindell 2017), and the recovery of the Eastern Bluebird (*Sialia sialis*) has been attributed in part to the promotion of nest boxes (American Bird Conservancy 2018).

In 2018, we initiated a nest box program on MRWMS, LVWMS, other tribal properties, and private property in southeastern Oregon. We have continued to expand this program. We monitor these nest boxes and collect the data requested by the American Kestrel Partnership (AKP) on all boxes (regardless of which species the boxes were intended).

In 2018, Carter obtained a Bird Banding Lab subpermit and a state permit to band American Kestrels, Mountain Bluebirds (*Sialia currucoides*), Western Bluebirds (*Sialia mexicana*), Northern Saw-whet Owls (*Aegolius acadicus*), Flammulated Owls (*Psiloscops flammeolus*), Northern Pygmy Owls, and Violet-green Swallows (*Tachycineta thalassina*). With these permits he will band nestlings from the nest box program and incorporate bird banding field days with Tu Wa-kii Nobi for education and outreach. In 2020, Carter received his Master Bander permit and will continue banding under this permit.

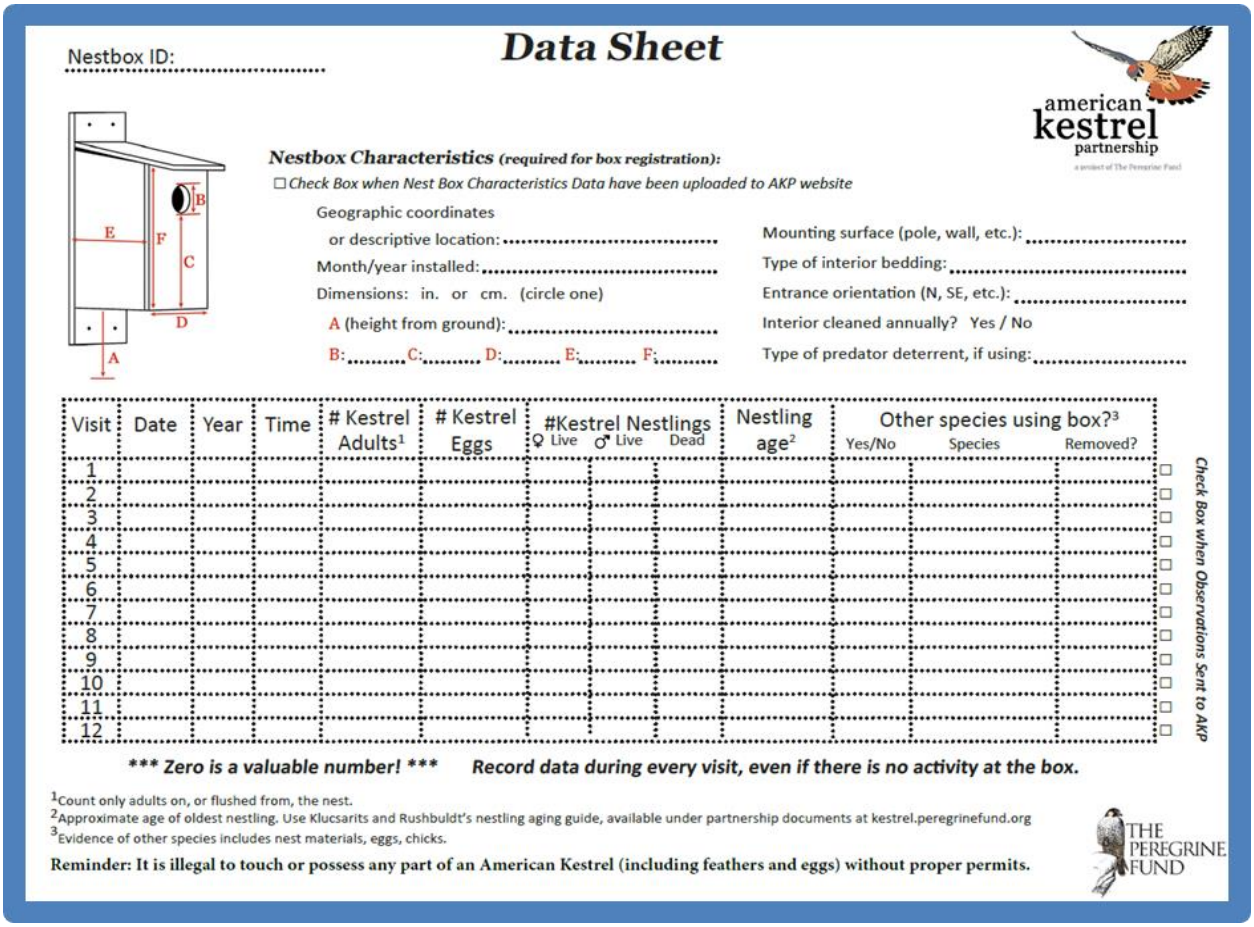
Due to his research background with American Kestrels (*Falco Sparverius*), Carter was asked to take on the role of state coordinator for the American Kestrel Partnership (AKP) in Oregon. "Launched 2012 in response to long-term population declines of kestrels in North America, The Peregrine Fund's American Kestrel Partnership is a network of citizen and professional scientists working to collaboratively understand kestrel demographics and advance kestrel conservation (https://kestrel.peregrinefund.org/)." With this role, Carter oversees field questions, and encourage folks to collect data according to protocol and submit soon after the breeding season, as well as recruiting new Partners for the AKP. Most of the recruiting will take place in southeastern Oregon. Carter will manage the nest box program for the Burns Paiute Tribe, as well as collaborate with other partners and help them run their own programs. With his banding permit he will also help them band nestlings from other partner's nest boxes. The experience with the BPT nest boxes will help him guide others.

Methods

For installation and monitoring, we collect the data requested by the AKP on all boxes, regardless of it was for kestrels (Figure 4.7.1). These data include measurements and other data on the box, as well as what occupies it through the breeding season. The AKP recommends checking the box every two weeks during the breeding season but leaves the decisions up to the

party managing the box. It is unlikely we will be able to check every two weeks, but we will check as frequently as our schedule allows. We will submit data from the kestrel boxes to the AKP each year. If nests contain European Starlings (*Sturnus vulgaris*) or House Sparrows (*Passer domesticus*) nests, we will remove them and try to trap the adults, as these non-native species can negatively affect native birds.

Before fledging, we will band all kestrel nestlings. Bluebirds and swallows have short banding windows so we will band them opportunistically. Banding will take place near the end of the nestling stage but early enough to avoid force fledging any nestlings. For kestrels this will take place when nestlings are 17–26 days old.



Nestbox ID: .....

Data Sheet

american kestrel partnership

Nestbox Characteristics *(required for box registration):*

☐ *Check Box when Nest Box Characteristics Data have been uploaded to AKP website*

Geographic coordinates
or descriptive location: .....
Month/year installed: .....
Dimensions: in. or cm. (circle one)
A (height from ground): .....
B: ..... C: ..... D: ..... E: ..... F: .....

Mounting surface (pole, wall, etc.): .....
Type of interior bedding: .....
Entrance orientation (N, SE, etc.): .....
Interior cleaned annually? Yes / No
Type of predator deterrent, if using: .....

Visit	Date	Year	Time	# Kestrel Adults[1]	# Kestrel Eggs	#Kestrel Nestlings ♀ Live	#Kestrel Nestlings ♂ Live	#Kestrel Nestlings Dead	Nestling age[2]	Other species using box?[3] Yes/No	Species	Removed?	Check Box when Observations Sent to AKP
1													☐
2													☐
3													☐
4													☐
5													☐
6													☐
7													☐
8													☐
9													☐
10													☐
11													☐
12													☐

*** Zero is a valuable number! *** **Record data during every visit, even if there is no activity at the box.**

[1]Count only adults on, or flushed from, the nest.
[2]Approximate age of oldest nestling. Use Klucsarits and Rushbuldt's nestling aging guide, available under partnership documents at kestrel.peregrinefund.org
[3]Evidence of other species includes nest materials, eggs, chicks.

Reminder: It is illegal to touch or possess any part of an American Kestrel (including feathers and eggs) without proper permits.

THE PEREGRINE FUND

Figure 4.7.1. Example data sheet used for box deployment and monitoring.

Results

Box deployment

Prior to the 2019 breeding season, we deployed 7 kestrel boxes and 10 bluebird boxes on or near the MRWMS (Figure 4.7.2) and we deployed 11 kestrel boxes, 1 Northern-Pygmy Owl box, and 15 bluebird boxes on or near the LVWMS (Figure 4.7.3). We deployed 2 kestrel boxes at tribal employees' houses in Harney County, and 5 kestrel boxes on Beech Creek, another tribal property in Grant County. We have also monitored 5 kestrel boxes that had already been deployed on private properties in Burns, OR, and we have also assisted Crane Middle/High School, Portland Audubon, and the U.S. Forest Service Prairie City Ranger District Office in deploying their own boxes to manage.

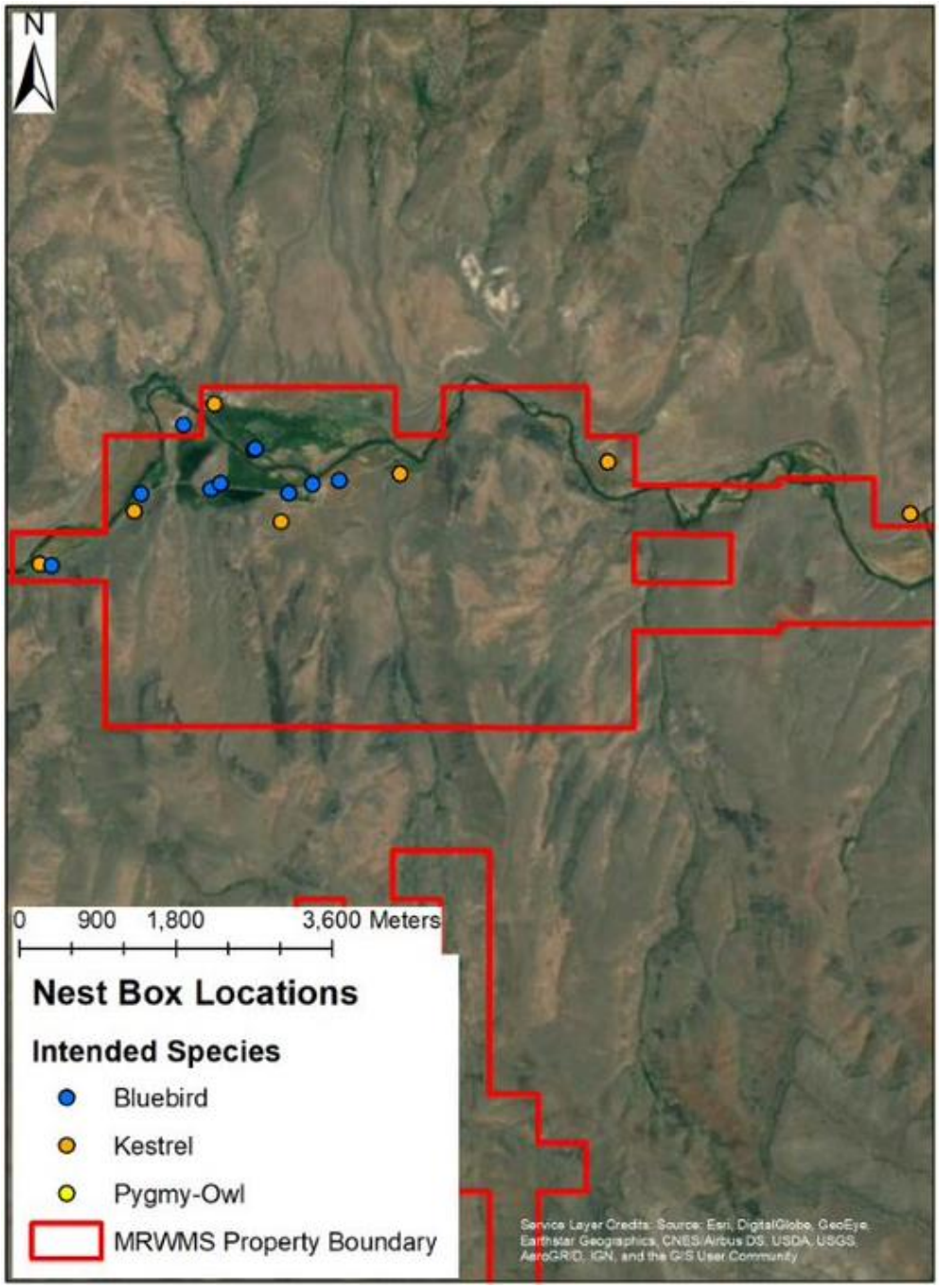


Figure 4.7.2. Nest box locations on the MRWMS.

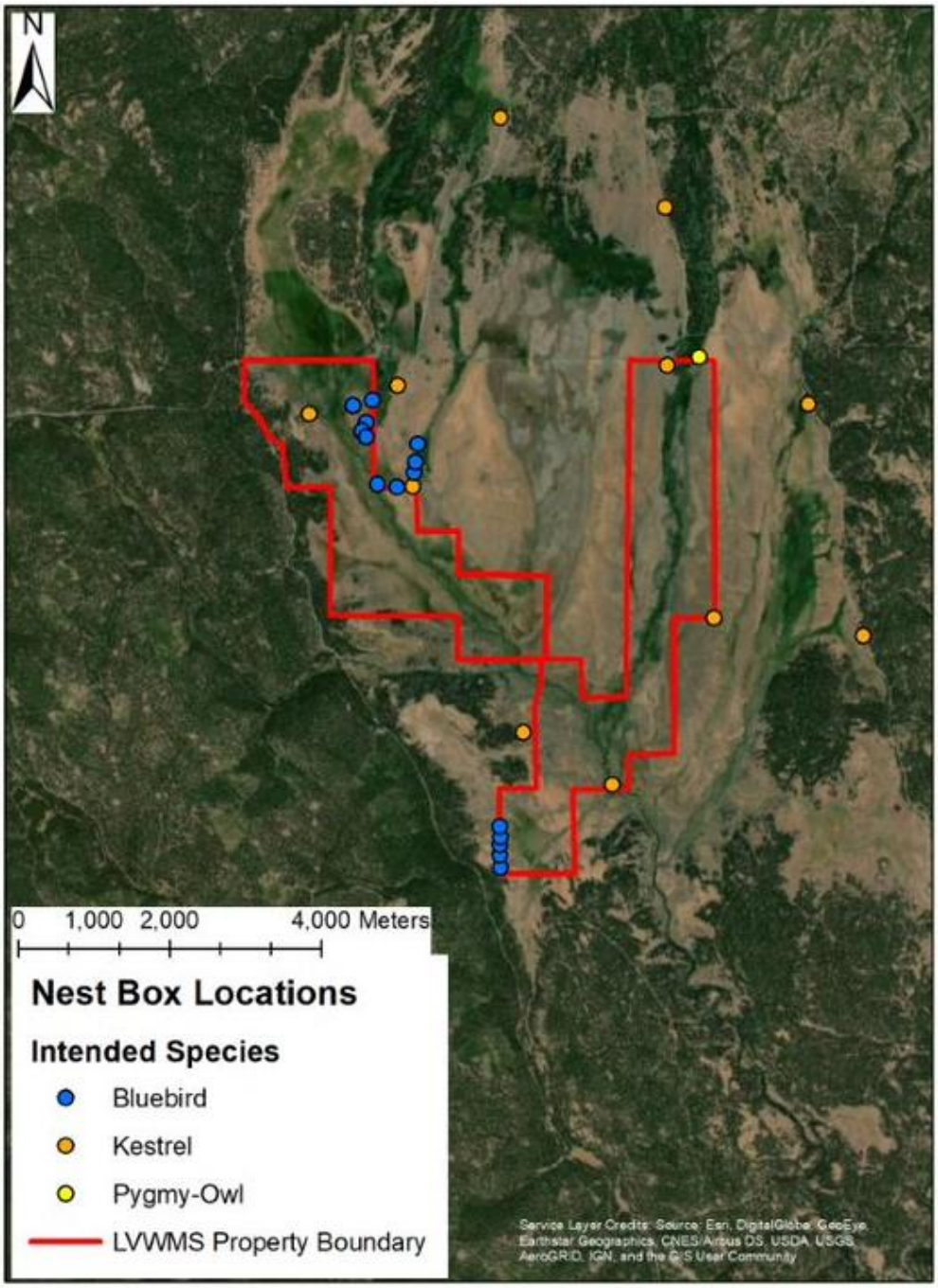


Figure 4.7.3. Nest box locations on the LVWMS.

Box occupancy and success

All data from the kestrel boxes, even unoccupied boxes, were submitted to the AKP database for inclusion in their large-scale nest box monitoring program.

On the MRWMS, 5 of 7 kestrel boxes deployed were occupied by kestrels. Only 2 hatched young and 1 of these nests successfully fledged young. Of note, nestlings were found dead in one of the nest boxes in late June. Low nesting success and low survival are likely due to drought conditions and extreme heat that occurred at MRWMS during the nesting season. On the LVWMS, 7 of 11 kestrel boxes deployed were occupied by kestrels which initiated nests. Six of these boxes successfully hatched and fledged young. Only 1 of 5 boxes at Beech Creek were occupied by kestrels and fledged all 3 young. Two of 6 boxes monitored at private residences around Burns, were occupied by kestrels. However, only one box fledged young. Occupancy, nesting activity, and fledging success are all displayed in Table 4.7.1.

Table 4.7.1. Occupancy and nesting and fledging success at kestrel nest boxes deployed at each site in 2021.

Property	**% & # of boxes occupied in 2021**	**Total number of eggs in 2021**	**Number of nests that hatched ≥1 nestling in 2021**	**Number of nestlings in 2021**	**Number of nests that fledged ≥1 nestling in 2021**	**Number of nestlings fledged in 2021**	**TOTAL number of nestlings fledged since 2018**
MRWMS	5/7 = 71.4%	26	2/5	9	1/5	5*	56*
LVWMS	7/11 = 63.6%	32	6/7	23	6/7	25	59
Beech Creek	1/5 = 20%	4	1/1	4	1/1	3	12
Other	2/7= 28.6%	8	2/2	8	1/2	5	26

*1 fledgling was not in nest box when others were dead, so it is possible that it fledged

One of the 10 bluebird boxes deployed at MRWMS were occupied by bluebirds. However, this nest was abandoned and later occupied by an Ash-throated flycatcher. Four of these boxes were occupied by Tree Swallows (*Tachycineta bicolor*). The unknown status of nesting at boxes is typically due to gaps in monitoring and a short window between hatching and fledging. At LVWMS, Mountain Bluebirds were found at 13 out of 15 boxes deployed. The only other native species found using these nest boxes were Tree Swallows. Occupancy and success are shown in Table 4.7.2 below.

Table 4.7.2. Occupancy and success at bluebird boxes deployed at each site in 2021. Some boxes are occupied more than once in a year.

Property	% Occupied 2021	Species (# of boxes) *	# Success	# Fail	# Unk.
MRWMS	5/10 = 50%	TRES (4), ATFL (1), MOBL (1)	3	1	1
LVWMS	15/15 = 100%	MOBL (13), TRES (2)	15	0	0

*Each species labeled by its 4 letter Alpha code

Figure 4.7.4 Mountain bluebird nestlings in a box in 2021.

Figure 4.7.5. Kestrel adult and eggs in one box and nestlings in another box in 2021.

Bird Banding

On 7 days during the summer of 2021, we hand-captured and banded 37 Kestrel and 11 Mountain Bluebird nestlings at MRWMS and LVWMS (Table 4.7.3). At MRWMS, we only banded a total of 4 kestrel nestlings from 1 nest box. This is a significant decrease from 2020, in which we banded 22 at MRWMS across all 7 boxes deployed. We banded 20 kestrel nestlings at 5 nest boxes and banded 11 nestling Mountain Bluebirds at 2 bluebird boxes at LVWMS. At Beech Creek we banded 3 kestrel nestlings at one nest box, and we banded 10 other kestrel nestlings at other locations.

Table 4.7.3. Total number of each species captured and banded at MRWMS, LVWMS, and other locations in 2021.

Species	MRWMS	LVWMS	Beech Creek	Other
American Kestrel	4	20	3	10
Mountain Bluebird	0	11	0	0

Figure 4.7.6. Carter banding a male kestrel nestling at one of the nest boxes at LVWMS in 2021.

Outreach

On July 9th, 2021, BPT staff banded 12 kestrel nestlings at 3 nest boxes at LVWMS and gave a demonstration to Tribal Stewards and Forest Service seasonal employees. BPT staff and Forest Service employees then banded 5 nestlings in a Forest Service box.

Discussion

Our nest box program has shown great promise with high occupancy rates of many native species, despite the marked decrease in occupancy in 2021 at MRWMS. This is likely due to drought conditions and extreme heat, leading to decreased availability of food. The increased occupancy by Mountain bluebirds at our boxes at LVWMS is promising. Since nesting sites can be a limiting factor for cavity nesting birds, nest boxes can be very beneficial to these species. The data sharing with AKP benefits a large-scale effort to understand the declines of American Kestrels and to better understand their breeding ecology. The nest box program has also been a powerful educational tool that we will continue to build on. We will continue to monitor these nest boxes into 2022.

Literature Cited

American Bird Conservancy. 2018. Eastern Bluebird. https://abcbirds.org/bird/eastern-bluebird/.

Hamerstrom, F., F. N. Hamerstrom, and J. Hart. 1973. Nest boxes: an effective management tool for kestrels. The Journal of Wildlife Management 37:400-403.

Newton, I. 1994. The role of nest sites in limiting the numbers of hole-nesting birds: a review. Biological Conservation 70:265-276.

Shave, M. E., and C. A. Lindell. 2017. Occupancy modeling reveals territory-level effects of nest boxes on the presence, colonization, and persistence of a declining raptor in a fruit-growing region. PLoS ONE 12(10): e0185701.

Winter Raptor Surveys

In 2019, BPT staff was asked to take on a route for the winter raptor survey by the project coordinator.

The following provides a brief introduction, of the winter raptor survey:

"In an effort to get a better understanding of the biology of wintering birds of prey in Oregon, the southern portions of Washington, the California portion of the Klamath Basin, and in Idaho, the East Cascades Audubon Society located in Bend, OR sponsors an extensive survey project designed to reveal population levels and densities for the species that choose to winter in

the project area. Volunteers in this citizen science project conduct surveys during November through March on established route transects under the guidance of a Project Coordinator who assists with volunteers needs as well as receives all data collected on the surveys which is then displayed in various project charts and graphs."

Methods

Staff agreed to survey the Double OO route that runs south and west of Burns; it is approximately 102 miles long (Fig 4.8.1).

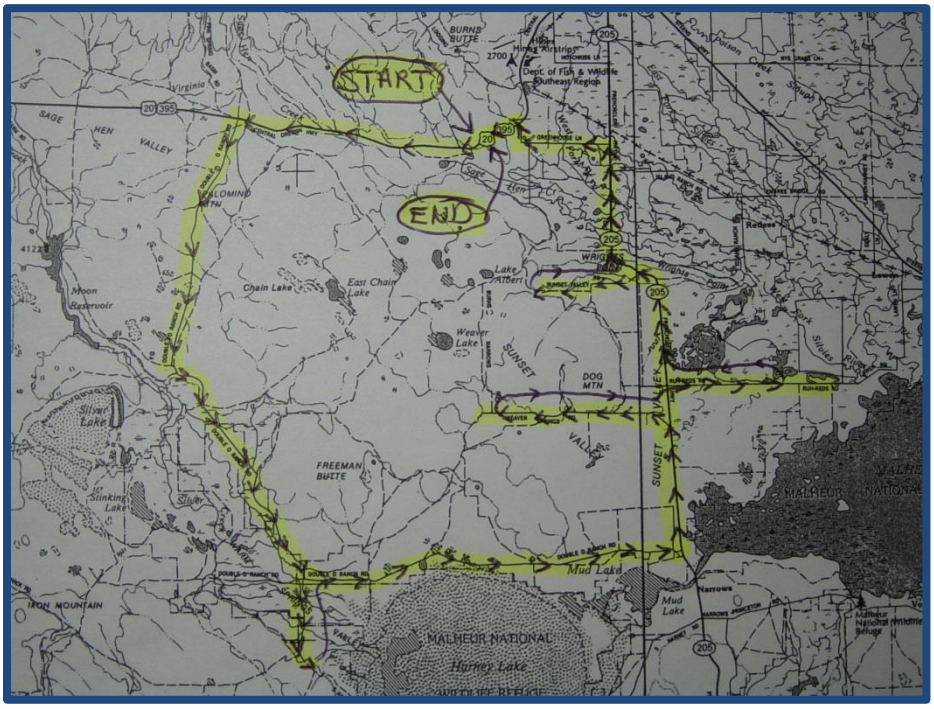


Figure 4.8.1. Double OO winter raptor survey route located south and west of Burns, OR.

Survey methods

1. Routes will be surveyed once a month during the months of December, January, and February. Additional survey options decided on by each volunteer include surveys conducted during November and March and doing more than one survey in a given month. All survey dates will be determined by each volunteer based on their own life schedules.

2. Surveys should be conducted during favorable weather conditions to get the most return for the effort expended. Excessive wind, fog, and precipitation will force birds to shelter and thus make them less visible to see. If a volunteer's life schedule dictates conducting

a survey during inclement weather, it will be better to have the survey completed versus having no data for that given month.

3. Volunteers are encouraged to make stops along the route path in order to scan favorable habitat for birds. These stops will be at the discretion of the volunteer, most routes do not have planned stopping points built into the route path.

4. Volunteers should drive slow enough to be able to properly scan all available habitat that they can see that might hold birds. This includes viewing power poles, fence posts, trees, water wheel lines, trees, and any other structure that a bird can perch on. In addition, the skies should be scanned for soaring birds and the ground should be scanned for perching/feeding birds.

5. Suggested driving speeds range up to 30-35 mph to insure viewing coverage. Driving SAFETY will dictate if these slower speeds are safe to do. Volunteers should not compromise their or anyone else's safety on the roads. ECAS will not be held responsible for any accidents resulting from unsafe driving by volunteers. When in doubt, do not drive in an unsafe manner. Volunteers should also make sure that when stopped to view birds, they are parked in a safe and legal manner so as not to disrupt traffic flow around them and compromise their individual safety.

6. All birds observed along the route path should be counted. Every attempt should be made to determine species of the bird viewed. If that is not possible, an attempt should be made to determine the type of bird it is, ie, falcon, eagle, buteo, owl, accipiter, etc and reported as UNID falcon, etc. If that is not possible, birds can then be classified as unidentified raptors.

7. Birds viewed at some distance may have the possibility of being counted from another part of the survey route depending on the design of the route path. Volunteers should be aware of possible double counting in these circumstances. If there is concern about the possibility of double counting a bird, it will be best to be conservative and not count the bird.

8. Some routes will have circumstances where it will be necessary to back track over previously surveyed roads. In these instances, any NEW birds viewed on the second pass can be added to the survey.

9. Age and sex information of birds counted is not necessary with the exception of aging Bald Eagles. For them, the only age differentiation that we would like to have would be if the bird is a white headed/tailed adult bird (A) or a dark subadult bird (S). Age differentiation for the first four years of a Bald Eagles life, when they do NOT have a white head or tail, is not necessary.

Each route will have their own specific data collection form to be used during surveys. These forms display a sequential list of roads that are driven for each route as well as a suggested

list of the more common species that will be seen in the area. Four letter codes are used to denote different species that have been found in this project. Following are codes to be used on the data forms:

The data collection forms are to be completed as follows:

1. Each time a bird is located, it should be entered on the appropriate road line and in the appropriate species column on the form.

2. Each form will have a few columns designated for family groupings of birds, ie, falcons, accipiters, owls. To keep the data form to a manageable size in the field, these family grouping columns are included for the less apt to be seen species. When one of these species is encountered, the bird should be entered into the appropriate family column on the appropriate road line using one of the above listed codes to indicate what species was seen.

3. Because owls are the least likely birds to be seen on any given survey, the owl column can be used to record other species found.

4. In addition to bird data, the top of the form displays other data that must be entered as well. These include the DATE that the survey was completed, the amount of TIME that the survey took to complete (minutes recorded in 5 minute increments), and the MILES that were driven to conduct the survey (recorded down to tenths of a mile). Miles driven to get to the start of the route from home and to get from the end of the route back to home should NOT be included.

5. Additional voluntary information that could be included on the form would be weather conditions, other species of interest seen on the survey, non-route miles, or anything of note that you thought would be of interest to record. All of this information can be added to the bottom of the form below the TOTALS line.

6. When the survey is completed, the TOTALS line needs to be filled out accurately.

7. Completed forms need to be submitted to the Project Coordinator as soon after each survey as possible. The reason for timely submission is because at the end of each month a summary chart is prepared that will include all the data collected for all of the routes surveyed. This summary chart is then sent to all of the project volunteers as soon as possible to keep everyone informed as to what is being seen and where in as close to real time as possible. Preparation of this summary chart is much quicker if the data is submitted throughout the month rather than waiting until the end when I would have to deal with data from close to 200 routes.

Although we are not required to count corvids, we made the decision to count Common Ravens (*Corvus corax*) due to their importance to sage-grouse and potential population management in the future.

Results

Three days of survey routes were run in the winter of 2021–2022. The December survey was conducted on the 19th with temperatures ranging from 18-25º F, little to no wind, and cloud cover starting at approximately 10% but switching to 100% as the day progressed. We tallied a total of 6 Rough-legged Hawks (*Buteo lagopus*). The January survey was conducted on the 28th with temperatures at approximately 25–29 º F, winds at 10–11 mph, and cloud cover at 75% and progressively clearing up to no cloud cover. The February survey was conducted on the 7th with temperatures ranging from approximately 43–45º F, calm conditions, and cloud cover around 40-45%. We tallied a total of 53 Common Ravens (*Corvus corax*) in the February survey.

Table 4.8.1. Winter raptor road survey results for the Double OO route in the winter of 2021–2022. Un-identified (UNID) birds were not seen well enough to accurately identify the species but were put in the most precise grouping.

Group	Buteos				Falcons		Eagles					
Species	Red-tailed Hawk	Rough-legged Hawk	Ferruginous Hawk	UNID Buteo	American Kestrel	Prairie Falcon	Bald Eagle	Golden Eagle	Northern Harrier	Short-eared Owl	UNID Raptor	Common Raven
12-19-21	11	6	2	2	0	2	5	6	4	0	0	49
1-28-22	5	5	0	0	0	0	8	2	1	0	2	50
2-7-22	15	19	0	1	0	1	5	3	0	0	1	53

Discussion

Data collected during these surveys will provide data from an area with an abundance of wintering raptors and will be included in a large-scale data set.

Administration

Cultural Resources

Federally funded projects require an environmental review of all ground disturbing activities before project implementation can begin. This often entails a cultural resources survey with Tribal and State Historic Preservation Office (SHPO) consultation. Much of the MRWMS has been surveyed for significant cultural resources since its acquisition, however, each year there are new projects that require additional surveys or have never been surveyed before. All ground disturbing activities were monitored by BPT Tribal Staff under the Cultural Department.

Ceremonial Hunting Tags and Landowner Preference Tags

In 2021, the Wildlife Program successfully facilitated the negotiations to 15 elk, 8 deer, and 4 pronghorn ceremonial hunting tags for Burns Paiute tribal members with Oregon Department of Fish and Wildlife. Tribal Council and elders decided on how tags will be distributed and the traditional nature of the hunts. This will continue into 2022, but we are working to expand the hunt to include a mule deer tag on the Malheur National Wildlife Refuge. We will continue to support this process in whatever role is designated by the Council.

Landowner Preference Tags will continue to be distributed in the same manner as currently conducted. Tribal members cannot draw for the same tag (species) two years in a row.

1. Tribal members sign up to draw for LOP deer and elk tags (around May 5th)
2. Names are randomly drawn using a random number generator
3. Submit DEER Tag Distribution Form (must arrive at Salem before May 15th)
4. Tribal members must purchase their hunting license before their names can be submitted (must enter hunter ID on form)
5. Submit ELK Tag Distribution Form (must arrive in Salem before September 15th, address is at bottom of form)
6. Tribal members must purchase their hunting license before their names can be submitted (must enter hunter ID on form)

Outreach and Education

For most of 2021, due to continued limitations brought on by the COVID-19 pandemic, the BPT Natural Resources Department did not participate in many outreach and education activities. On August 18th, BPT led a fishing day with youth from Tu-Wa-kii Nobi at Yellowjacket Lake near Burns, OR. We also banded kestrel nestlings with the Tribal Stewards group and Forest Service staff at LVWMS on August 9th.

Staff attended and represented the tribe at local collaboratives and meetings such as the Harney County Restoration Collaborative, Harney Basin Wetlands Initiative, Harney County Wildland Fire Collaborative, Vale Local Implementation Team meetings (Sage-Grouse), Tribal Council and all staff meetings. Wildlife staff also attended the virtual SageCon Summit in November. The Wildlife Program Manager also attended and presented at the virtual Raptor Research Foundation meeting in October. The Wildlife Biologist served on the interview panel for hiring the new Lakeview and Burns Local Implementation Team Coordinator position. In February 2022, BPT staff attended the Oregon Chapter of The Wildlife Society annual meeting in Newport, Oregon.

In 2021, BPT staff partnered with multiple agencies and entities in their work at MRWMS and eastern Oregon. We collected lek data for inclusion in ODFW sage-grouse lek monitoring, kestrel nest box data for inclusion in the American Kestrel Partnership's monitoring program, songbird and raptor monitoring data for a long-term and large-scale project conducted by OSU graduate students, and winter raptor survey data for inclusion in the East Cascades Audubon Society winter raptor monitoring efforts. The Wildlife Program Manager also continued the role as Oregon State Coordinator for The American Kestrel Partnership, to help streamline nest box data collection in the state and recruit interested partners.

Access Permits

In 2021, 8 permits were issued, and hunter success continued to climb (Table 5.4.1). Highlights from the 2020 harvest include a Gray Partridge and an American Wigeon that was banded in 2019 in Butte County, California.

Table 5.4.1. Access permits issued for MRWMS from 2005–2021 (calendar year, not hunting season).

Year	Permits Issued	Returned Reports	Hours Hunting Waterfowl	Hours Hunting Upland	Waterfowl Harvest	Upland Harvest	Avg. Birds/Hunter Hour
2005	47	24		230		200	0.87
2006	58	36	51.5	225.25	61	238	1.08
2007	35	29	73	205	66	122	0.68
2008	30	15	45.5	105	35	63	0.65
2009	19	12	25.5	74.5	54	101	0.96
2010	18	13	57	152	32	78	0.53
2011	12	8	22.5	48	36	32	0.96
2012	21	19	11.5	62.5	19	35	0.72
2013	14	10	11.5	20	14	7	0.66
2014	16	11	76.5	34.5	30	40	0.63
2015	20	20	36	26.5	57	39	1.54
2016	27	23	49.5	68.5	98	138	1.91
2017	6	6	4	10.5	7	5	1.11
2018	5	5	4	6	7	0	0.7
2019	6	2*	3	14	4	6	0.59
2020	10	7**	13	28.5	16	28	1.06
2021	8	8	2	55	9	43	0.91

*One hunter only traveled through the property, one hunter cancelled their hunt due to an emergency, another hunter ended up hunting somewhere else, and one hunter didn't respond to emails.
** One hunter only traveled through the property so didn't fill out a report.

Project Income

Table 5.5.1 Accounting of project generated income for MRWMS in 2021.

2021 Beginning Balance		**$174,617.01**
CSP Payment	$356,951.85	$531,568.86
Vehicle Insurance Payment from Wreck	$13,676.05	$545,244.91
Malheur and Hunter Creek CREP	$19,812.00	$565,056.91
BLM land use agreement parking/water (2020 fire)	$3,800.00	$568,856.91
Bentonite refund	$2,310.20	$571,167.11
Ford Taurus Vehicle Sale	$1,500.00	$572,667.11
2007 Polaris Ranger Vehicle Sale	$700.00	$573,367.11
1999 Ford F250 Vehicle Sale	$2,600.00	$575,967.11
2009 Polaris Ranger Vehicle Sale	$900.00	$576,867.11
Arctic Cat 400 Vehicle Sale	$400.00	$577,267.11
BLM Land use agreement water (2021 fire)	$400.00	$577,667.11
Grazing	$17,288.00	$594,955.11
Salaries	($10,758.03)	$584,197.08
Fringe	($1,128.59)	$583,068.49
Travel	($163.00)	$582,905.49
Communication	($314.86)	$582,590.63
Office Supplies	($2,316.65)	$580,273.98
F&W Supplies	($5,071.62)	$575,202.36
Seed for DSL land (will be reimbursed by NRCS)	($30,909.00)	$544,293.36
Repairs and Maintenance	($1,160.75)	$543,132.61
Vehicle Operating Expense	($1,726.81)	$541,405.80
Vehicle Repair from Wreck	($10,209.07)	$531,196.73
Indirect Expenses	($17,788.46)	$513,408.27
Utilities	($237.20)	$513,171.07
Property Tax	($705.57)	$512,465.50
Subcontracts	($5,584.98)	$506,880.52
2021 Ending Balance		**$506,880.52**

Staff

The Project's success can be attributed to the following staff members:

Calla Hagle – Natural Resource Director
Carter Crouch – Wildlife Program Manager
Brandon Palmer – Wildlife Biologist
John McNelly – Rangeland Ecologist
Lucas Samor – MRWMS Site Manager
Eric Hawley – LVWMS Lead Technician
Daneen Richards – Fish and Wildlife Technician
Brandon Haslick – Fisheries Program Manager
Rebecca Fritz – Fisheries Biologist

Appendix A. Photo points at MRWMS comparing 2007 to 2021 riparian vegetation and stream bank condition.

M1: Upstream 2007

M1: Upstream 2021

M1: Downstream 2007

M1: Downstream 2021

Appendix A. Photo points at MRWMS comparing 2007 to 2021 riparian vegetation and stream bank condition.

M2: Upstream 2007

M2: Upstream 2021

M2: Downstream 2007

M2: Downstream 2021

M3: Upstream 2007

M3: Upstream 2021

Appendix A. Photo points at MRWMS comparing 2007 to 2021 riparian vegetation and stream bank condition.

M3: Downstream 2007


M3: Downstream 2021

M4: Upstream 2007


M4: Upstream 2021

M4: Downstream 2007


M4: Downstream 2021

Appendix A. Photo points at MRWMS comparing 2007 to 2021 riparian vegetation and stream bank condition.

M5: Upstream 2007


M5: Upstream 2021

M5: Downstream 2007


M5: Downstream 2021

Appendix A. Photo points at MRWMS comparing 2007 to 2021 riparian vegetation and stream bank condition.

M6: Upstream 2007

M6: Upstream 2021

M6: Downstream 2007

M6: Downstream 2021

M7: Upstream 2007

M7: Upstream 2021

Appendix A. Photo points at MRWMS comparing 2007 to 2021 riparian vegetation and stream bank condition.

M7: Downstream 2007


M7: Downstream 2021

M8: Upstream 2007


M8: Upstream 2021

M8: Downstream 2007


M8: Downstream 2021

Appendix A. Photo points at MRWMS comparing 2007 to 2021 riparian vegetation and stream bank condition.

M9: Upstream 2007


M9: Upstream 2021

M9: Downstream 2007


M9: Downstream 2021