WYOMING GAME & FISH DEPARTMENT

NONGAME SECTION

ANNUAL COMPLETION REPORT

2022-2023

NONGAME SECTION

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The Wyoming Game and Fish Nongame Section would like to thank the volunteers and wildlife professionals from this and other natural resource management agencies for their valuable contributions. We would also like to extend our gratitude to the landowners across the state that allow us access and ability to perform fieldwork on private land. Without the generous contribution from these people, the work of the Nongame Section would not be possible.

The Nongame Section would additionally like to thank all funding sources that contribute to work on nongame species throughout the state. Without these funds nongame management within Wyoming would not be possible.

The reports included in this document are the annual summaries of current work the Nongame Section has completed from April 15, 2022 - April 15, 2023. If additional information is needed for any of the projects listed in this report, please contact the Nongame Section at (307) 332 - 2688.

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NONGAME BIRDS

NONGAME MAMMALS

Front and back cover photos: Mark Gocke

BALD EAGLE MONITORING IN WESTERN WYOMING

The Bald Eagle is an uncommon resident in Wyoming. It is classified as a Species of Greatest Conservation Need in the Wyoming State Wildlife Action Plan with a Native Species Status 3 (NSS3), Tier II (moderate conservation priority), due to limited population size and breeding distribution, and vulnerability to human disturbance during the breeding season.

The Wyoming Game and Fish Department (WGFD) initiated statewide monitoring for Bald Eagles in 1978. Although Bald Eagles nest along all major river systems in the state and increasingly in other habitats adjacent to water bodies, the largest number of nesting pairs is found in northwestern Wyoming in the Greater Yellowstone Area (GYA) along the Snake River drainage and its tributaries. Bald Eagles in northwestern Wyoming are part of a genetically distinct Rocky Mountain population that extends into neighboring Idaho and Montana. Following severe range-wide declines from effects of organochloride pesticides, recovery of the species in Wyoming began in the 1980s, centered on the Jackson area. As the distribution of the species expands in the state, the numerous territories located along the Snake River continue to serve as a source population for other areas of Wyoming and the GYA.

Bald Eagle. Photo by Frank Stetler.

Annual fixed-wing aerial surveys are conducted by WGFD to monitor occupancy and productivity of known Bald Eagle nesting territories in portions of western Wyoming. Survey visits are made beginning in early April to document the number of occupied sites (defined as an incubating adult or a pair perched at the nest site), and in late May or early June to determine nesting success and count the number of mature young (defined as approximately 80% of fledging age). In 2022, we surveyed 162 Bald Eagle nesting territory sites for occupancy and productivity. Of 162 sites checked, 82 (51%) were occupied and 80 (49%) were unoccupied or had undetermined status. Nesting attempts were initiated by 80 (49%) pairs, of which 46 (58%) succeeded to produce at least one mature young and 34 (42%) apparently failed. The 80 occupied nests with known outcomes produced a total of 71 mature young, or 0.89 young per occupied nest with known outcome and average brood size at fledging of 1.54 young per successful nest.

The size of the population and the number of known occupied nesting territories has grown steadily over time, including a substantial increase since 2000 in the number of pairs nesting in the Green River Basin and adjacent areas of the Salt River and Bear River drainages (Figure 1). Although variable effort among years limited our ability to compare the proportion of occupied to unoccupied sites, the count of 82 known occupied sites in 2022 exceeded the 20-year average of 72 from 2002-2021 (excluding 2019, when a partial survey was completed).

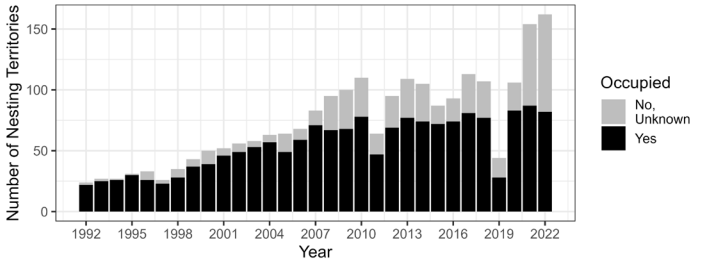


Figure 1. *Occupancy of Bald Eagles in western Wyoming, 1992-2022. Plot shows annual counts of nesting territories classified as occupied (black bars) and not occupied or unknown status (gray bars).*

Productivity of 0.89 young per nesting pair in 2022 was the lowest documented during the last 20 years of monitoring (Figure 2). The previous low point of 0.96 young per nesting pair occurred in 1995 and productivity in recent years of 1.24 young per successful pair in 2021 and 1.28 in 2020 was similar to the 20-year average of 1.24 young per successful pair from 2002-2021. Low productivity may have been related to the unusually cold and wet spring of 2022, which led to severe flooding in parts of the GYA. It is also possible the population was affected by the ongoing outbreak of highly-pathogenic avian influenza, which caused at least one known mortality of a Bald Eagle in Wyoming during 2022.

In the future, additional surveys may be necessary to determine occupancy of territories classified as unknown status. Additionally, we recommend analyzing occupancy and productivity relative to long-term patterns in weather, climate, habitat, and human development to inform management of this population and evaluate the need for continued monitoring.

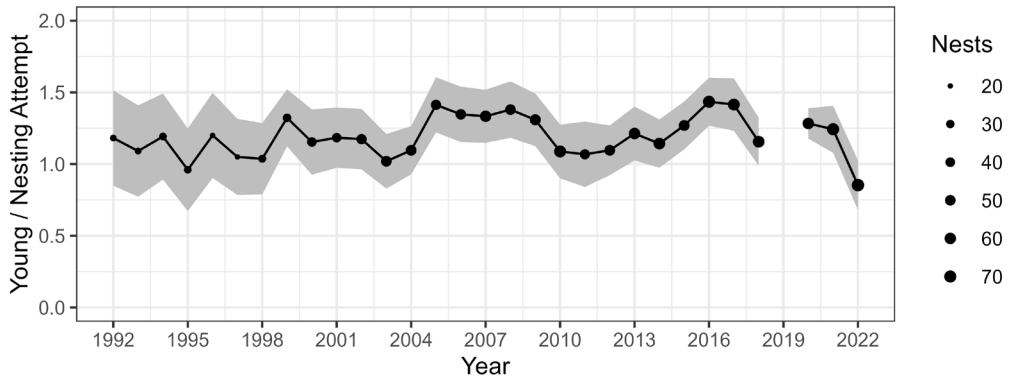


Figure 2. *Productivity of Bald Eagles in western Wyoming, 1992-2022. Plot shows the annual average number of mature young produced per nesting attempt with known outcome (points), with 90% confidence intervals (gray shading) and point size indicating the number of nesting attempts monitored.*

Prepared by: Zach Wallace, Nongame Bird Biologist
Funding Sources: Wyoming Game and Fish Commission, United States Army Corps of Engineers

THE BREEDING BIRD SURVEY IN WYOMING

Wilson's Warbler Photo by Amy Anderson

The North American Breeding Bird Survey (BBS) is a continental, multi-species avian monitoring program that has provided data on the distribution and status of birds in Wyoming since 1968. The BBS is sponsored jointly by the United States Geological Survey Patuxent Wildlife Research Center (USGS PWRC) and the Canadian Wildlife Service. This roadside survey was launched in 1966, with 600 routes established in the United States east of the Mississippi River and in Canada. Today, over 4,600 BBS routes are located across the continental United States and Canada, including 107 active routes in Wyoming (Figure 1). Routes are randomly located in order to sample habitats that are representative of the entire region and provide a continent-wide perspective of avian population change (Sauer et al. 1997).

As of May 1, 2023, BBS had not released the final 2022 dataset. For purposes of this report, we downloaded preliminary results from the BBS Coordinators Database Interface. In Wyoming, 45 observers surveyed 72 of 107 (67%) active routes. Twelve of these volunteers surveyed two or more routes and three conducted four or more routes. Since 1990, the number of routes surveyed in Wyoming has decreased by 0.26 routes per year. In contrast to this trend, the number of routes surveyed in 2022 (72 routes) was greater than the average number of routes completed annually from 1990-2021 (65 routes).

Available data included 64 of the 72 routes due to delayed submittal for one survey and BBS data processing for

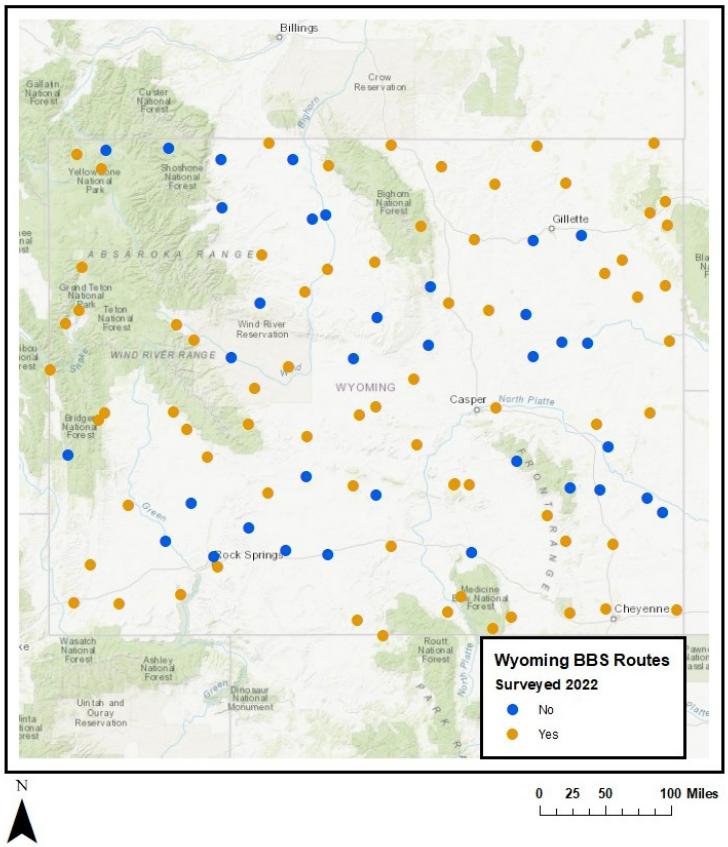


Figure 1. *Wyoming Breeding Bird Survey (BBS) route locations with 2022 survey status.*

an additional seven routes. Observers detected 35,441 individual birds representing 191 species in Wyoming. Since 1990, the number of individual birds detected has decreased by 3.3 individuals per route per year and the number of species detected has increased by 0.11 species per route per year. Consistent with these

trends, the number of individuals detected per route in 2022 (554 individuals) was greater than the average number of individuals detected per route from 1990-2021 (521 individuals), and the number of species detected per route in 2022 (40 species) was slightly greater than the mean number of species detected per route from 1990-2021 (38 species). The preliminary 2022 dataset is available at the BBS website (https://www.pwrc.usgs.gov/BBS/RawData/). The most current final dataset contains information for surveys conducted through 2021 (Ziolkowski Jr., et al. 2022).

The most recent published BBS trend analysis included data through 2019 (Sauer et al. 2019) and was summarized in 2021 with an emphasis on Wyoming's Species of Greatest Conservation Need (SGCN, WGFD 2021). Future trend analyses will contribute to the Department's recommendations for SGCN monitoring, especially for species exhibiting significant population declines at the state level. BBS provides a long-term perspective on population trends of Wyoming's birds that complements other avian monitoring efforts, including the Integrated Monitoring in Bird Conservation Regions program and eBird. Information on population status, range, and distribution from BBS also contribute to future decisions about which avian species will be designated as SGCN in Wyoming's State Wildlife Action Plan.

Lazuli Bunting pair near Red Canyon, Fremont County. Photo by Amy Anderson.

American Robin nest with eggs near South Pass, Fremont County. Photo by Amy Anderson.

Prepared by: Courtney Rudd, Nongame Biologist; United States Geological Survey, Patuxent Wildlife Research Center
Funding Source: Wyoming Game and Fish Commission

INTEGRATED MONITORING IN BIRD CONSERVATION REGIONS

Population monitoring is an essential component of effective wildlife management and conservation. Besides improving understanding of species' distributions, monitoring allows us to determine the status of populations by tracking changes over time, identify species that are at risk, and evaluate their responses to management actions and changes in landscape and climate. Long-term population trends for many species of North American landbirds have declined due to human influences, including habitat loss and degradation, and disturbance. Thus, it is a priority for the Wyoming Game and Fish Department to identify and implement programs to monitor the population status of avian Species of Greatest Conservation Need (SGCN) across the state. While some rare species require their own dedicated monitoring efforts, many of Wyoming's birds can be tracked efficiently and effectively through broad-scale, multi-species surveillance monitoring programs, such as the Integrated Monitoring in Bird Conservation Regions (IMBCR) program.

IMBCR is based on a spatially balanced sampling design that provides information on avian populations at various scales, from local management units to entire states or Bird Conservation Regions (BCRs), facilitating conservation at local and national levels. The nested design also provides a consistent and flexible framework for understanding and comparing the status and annual changes of bird populations

Mountain Bluebird. Photo by Frank Stetler

with local and regional context. Collaboration across organizations and spatial scales increases sample sizes and improves the accuracy and precision of population estimates. The robust survey protocol and sampling design of the IMBCR program complement other less structured bird monitoring efforts in Wyoming, including the North American Breeding Bird Survey and eBird. For these reasons, the IMBCR program is well-positioned to address conservation and management needs for a wide range of stakeholders,

encouraging an interdisciplinary approach to bird conservation that combines monitoring, research, and management. In Wyoming, IMBCR continues to provide information on the distribution and status of Wyoming's bird populations that is essential to setting priorities and implementing the State Wildlife Action Plan.

Surveys are conducted at a random sample of 1 - km_2 grid cells, each consisting of 16 evenly spaced survey points (McLaren et al. 2019). Birds are counted by sight and sound at each sampling point. The distance and time period of detection are recorded for each bird group, as well as additional data on habitat and vegetation. Wyoming contains 37 strata (Figure 1) and a minimum effort of two sampling grids per stratum is required to estimate population parameters.

In 2022, Bird Conservancy of the Rockies (Bird Conservancy), in conjunction with Wyoming Game and Fish and its other partners, conducted the 15th consecutive year of landbird monitoring with the IMBCR program (Reese et al. 2023). The survey effort covered all or parts of 10 BCRs and 15 states, including all of Wyoming. In Wyoming, field technicians completed 170 of 173 planned surveys (98%), conducting 2,173 point counts between May 24 and July 20. Multiple agency partners provided funding for surveys, with 58 grids (34%) funded by Wyoming Game and Fish. A total of 190 bird species were detected, including 43 Species of Greatest Conservation Need (SGCN). Bird Conservancy estimated densities and population sizes for 217 species that were detected in any year during which surveys were conducted, 69 of which are SGCN. The data yielded robust density estimates (CV < 50%) for 94 species. Bird Conservancy estimated the proportion of 1-km² grid cells occupied in Wyoming for 222 species that were detected in any year during which surveys were conducted, 70 of which are SGCN. The data yielded robust occupancy estimates (CV < 50%) for 143 species. Trend results for SGCN birds

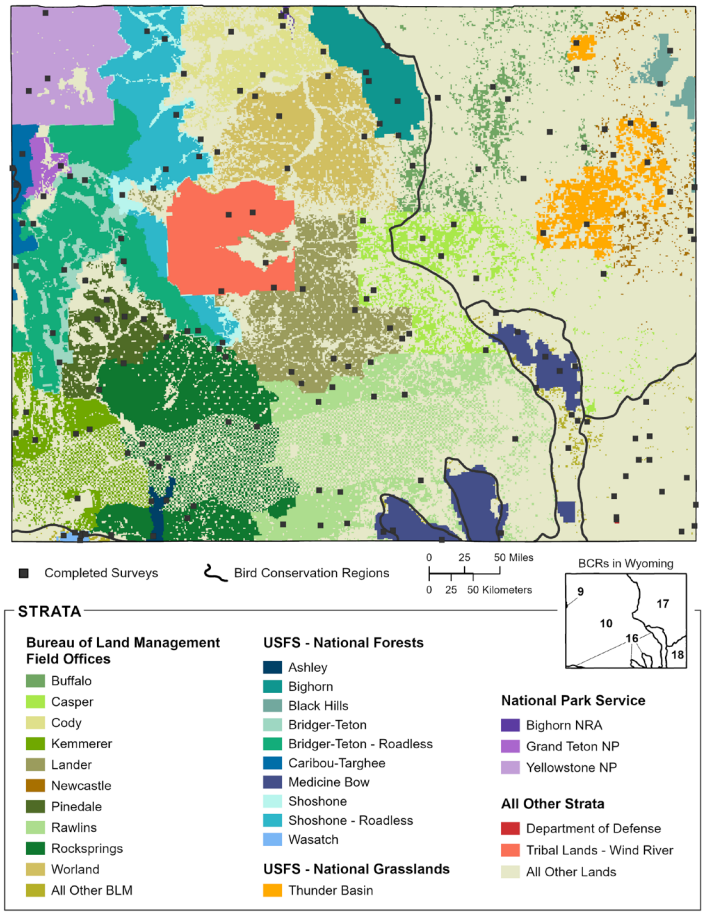


Figure 1. *Summary of annual Peregrine Falcon monitoring sites by regional survey area for 2021.*
[1]YNP figures include all visited monitoring sites.
[2]Totals do not include YNP sites.

from 2009-2022 showed significant (90% confidence) increases for 17 species and decreases for 1 species.

The complete 2022 IMBCR Field Season Report is available online (https://bird-conservancy-of-the-rockies.github.io/IMBCR_AnnualReport_2022/). Density tables and graphs, maps, and trend information are available from the Rocky Mountain Avian Data Center website (https://rmbo.org/v3/avian/home.aspx).

Prepared by: Zach Wallace, Nongame Bird Biologist; Jessie Reese, Matthew McLaren, Jennifer Timmer, Matt Smith, T.C. Walker, Chris White, Quresh Latif, David Pavlacky Jr., and Rob Sparks, Bird Conservancy of the Rockies
Funding Sources: Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service State Wildlife Grants, U.S. Forest Service, and Wyoming Game and Fish Commission

SUMMARY OF PEREGRINE FALCON MONITORING IN WYOMING

Peregrine Falcon (*Falco peregrinus*; peregrine) is an uncommon resident found throughout most of Wyoming. The species nests primarily on cliffs and ledges with proximity to open areas for foraging. The Wyoming Game and Fish Department (WGFD) designates Peregrine Falcon as a Species of Greatest Conservation Need with a Native Species Status 3 (NSS3), Tier 2 (moderate conservation priority).

Nesting peregrines were nearly extirpated from Wyoming prior to the 1970s, primarily due to negative effects of organochlorine pesticides. Efforts to breed and release peregrines throughout North America started in the late 1960s and regional recovery plans were developed after the species was federally listed as Endangered in 1970. Wyoming reported no known nesting pairs from 1978-1983, released 384 captive produced young from 1980-1995, and documented the first new nesting pair in the state in 1984. By 2015, there were at least 121 known nesting territories in Wyoming, primarily in the western and central portions of the state, and the species was federally delisted in 1999.

WGFD, Yellowstone National Park (YNP), and Grand Teton National Park (GTNP) continued monitoring peregrine occupancy and productivity through 2015 using standard methods based on the U.S. Fish and Wildlife Service post-delisting monitoring protocol. In 2016, a subset of five sites were selected for ongoing annual monitoring within each of four historical regional survey areas: Central Wyoming, Western Wyoming, YNP, and GTNP. A variable number of additional sites in each survey area are also surveyed annually. Continued effort to monitor peregrine nesting success is warranted due to the significant investment for recovery, ongoing public interest, and risk of disease and other factors impacting populations.

In 2022, WGFD and partners surveyed a total of 65 peregrine nesting sites. Of those, 50 were occupied, 12 were unoccupied, and the status of three sites was undetermined due to timing and duration of surveys. The 50 occupied sites produced a total of 61 young (1.2 young per occupied territory). Of 20 sites surveyed in the regional survey areas, 17 (85%) were occupied and produced a total of 20 young (Table 1). One site in the Western Wyoming regional survey area was

Survey area	Sites Visited	Number Occupied (%)	Total Young (Young / Occupied)
Central Wyoming	5	5 (100%)	7 (1.4)
Western Wyoming	5	4 (80%)	5 (1.3)
Yellowstone National Park	5	5 (100%)	2 (0.4)
Grand Teton National Park	5	3 (60%)	6 (2.0)
Additional Sites	45	33 (73%)	41 (1.2)
Total (Regional survey)	**20**	**17 (85%)**	**20 (1.2)**
Total (All)	**65**	**50 (77%)**	**61 (1.2)**

Table 1. *Summary of annual Peregrine Falcon monitoring sites by regional area for 2022.*

not monitored to protocol due to time constraints, but occupancy and productivity have been confirmed in previous years. Productivity at the regional survey sites in 2022 (1.19 young per occupied territory) was lower than the average from 2016-2021 (1.37 young per occupied territory; Figure 1). In addition to the regional survey sites, 45 other peregrine nesting sites were visited during 2022. Average productivity across all sites in 2022 (1.20 young per occupied territory) was lower than to the average from 2016-2021 (of 1.39 young per occupied site). The below average productivity observed in 2022 was driven by the small number of young produced in YNP, while productivity in the other regional survey areas was within the range of 1-2 young per occupied territory at which peregrine populations are assumed to be stable or increasing (USFWS 2003).

Since May 2022, three lab-confirmed mortalities of peregrines from Highly Pathogenic Avian Influenza (HPAI) have been documented in Wyoming. While peregrines feed on a variety of birds, the prevalence of HPAI in waterfowl increases their chance of exposure to the virus and is a major concern. A historically productive and conspicuous site in the Central Wyoming regional survey area afforded a unique opportunity to investigate the cause of a failed breeding attempt in 2022. In August, WGFD conducted a drone flight that showed at least one carcass on the ledge and later retrieved a deceased adult and two approximately 21 day-old young. The specimens were too degraded for testing; however, HPAI was the suspected cause of death due to documented positive cases in the vicinity and X-rays that showed no skeletal trauma.

Collaborative efforts to minimize recreational disturbance of nesting peregrines in central Wyoming continued in 2022. WGFD, U.S. Forest Service Shoshone National Forest Wind River District (USFS), and Wyoclimbers, a nonprofit rock climbing organization, initiated a collaborative management effort in 2021 to maintain rock climbing opportunities at locations in the Southern Wind River Mountains with nesting peregrines and Prairie Falcons (*Falco mexicanus*). Partners initially met to gather and share information about regulations, falcon nesting behaviors, the voluntary closure process, and specific rock climbing site details.

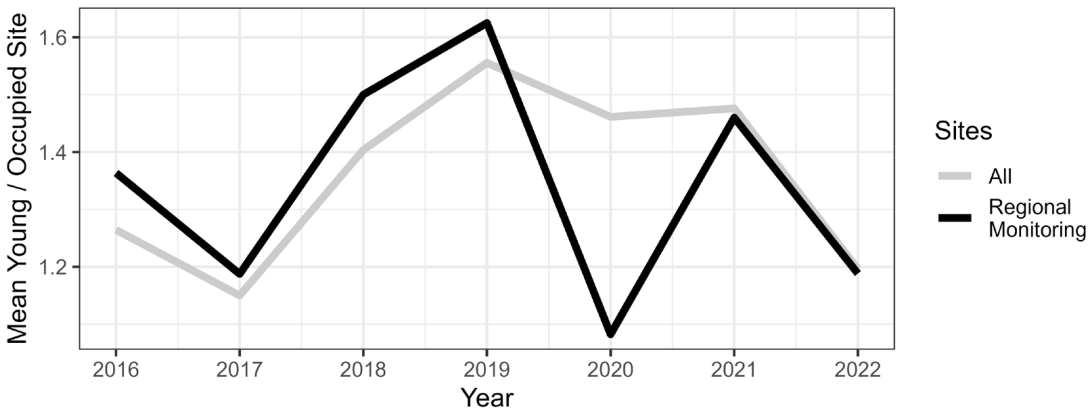


Figure 1. *Peregrine Falcon productivity in Wyoming, 2016-2022. Plot shows the mean number of young per occupied site per year for the regional survey sites (black line) and all sites (gray line).*

WGFD and USFS personnel monitored sites to document falcon occupancy and nest locations at climbing sites, then recommended a fixed voluntary closure with input from Wyoclimbers. Collaborative site visits were useful to assess lines of sight from nesting locations, proximity of nesting to rock climbing activity, and location of access trails to refine voluntary closure recommendations. USFS personnel installed signage at trailheads, boundaries of the closure, and at their local district office. Wyoclimbers posted voluntary closure information on online climbing forums and other climber-based social media sites. WGFD and USFS personnel continued to monitor sites throughout the breeding season to document climbing and falcon activity, and provided updates on nesting phenology and status (e.g., fledging or failure) to inform adaptive management of closures.

We recommend continuing surveys of annual monitoring sites and additional sites in each of the four regional survey areas in collaboration with multiple agencies and experienced observers. We also recommend continuing collaborative efforts to adaptively manage recreational disturbance to nesting peregrines in the southern Wind River Range and elsewhere in Wyoming.

Prepared by: Courtney Rudd, Nongame Biologist; Zach Wallace, Nongame Bird Biologist
Funding Sources: Wyoming Game and Fish Commission, U.S. Forest Service, Grand Teton National Park, Yellowstone National Park

2022 RAPTOR NEST SURVEY FOR THE U.S. FOREST SERVICE THUNDER BASIN NATIONAL GRASSLAND

The purpose of this survey effort is to inventory raptor nests on the U.S. Forest Service Thunder Basin National Grassland (TBNG) in northeastern Wyoming. Several raptor species that occur on TBNG are listed as Species of Greatest Conservation Need (SGCN) in the Wyoming State Wildlife Action Plan (American Kestrel, Bald Eagle, Golden Eagle, Ferruginous Hawk, Swainson's Hawk) and other species not designated as SGCN are also of interest for planning needs of TBNG (Red-tailed Hawk, Turkey Vulture, Great-horned Owl). Since 1996, TBNG has provided funding through a cooperative agreement for the Wyoming Game and Fish Department (WGFD) to conduct aerial inventories of nesting raptors, with surveys in 1996-1999, 2001, 2004-2006, 2008, 2017-2019, 2021, and 2022.

Surveys are conducted in a set of priority areas defined by TBNG that are sampled annually on a rotating basis (Figure 1). Surveys are conducted from fixed-wing aircraft along north-south transects spaced 600 m apart. Observers record the location, status, physical condition, and characteristics of all raptor nests

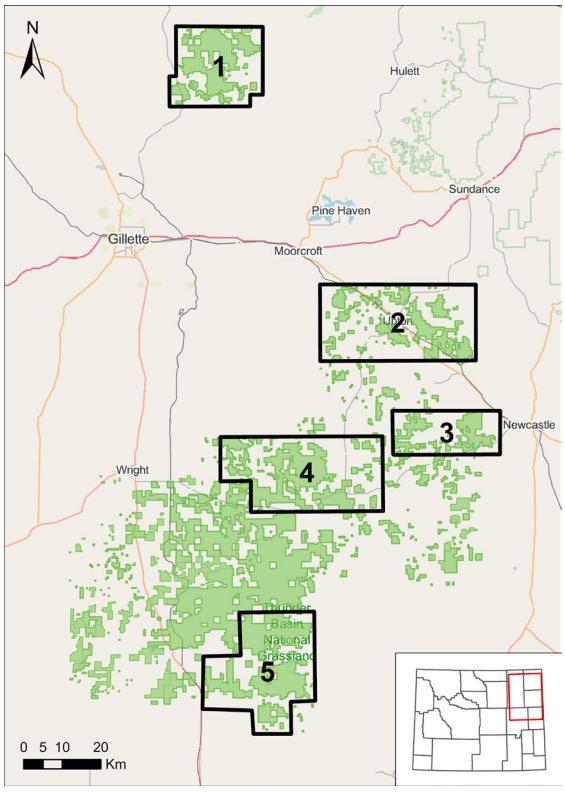


Figure 1. *Thunder Basin National Grassland raptor nest survey Priority Areas. Area 1 was surveyed in 2022.*

detected using the standardized raptor nest survey data sheet and survey codes developed by the Department in cooperation with numerous partners. This protocol defines nest occupancy as one or two adults present at or near the nest and/or fresh lining material, eggs, or young in the nest.

In mid-May 2022, we conducted 7.1 hrs of surveys in Priority Area 1 with Flightline Laird Flying Service (Gillette, Wyoming) in a Cessna 182 fixed-wing aircraft. We located a total of 16 raptor nests (Table 1), including occupied nests of Red-tailed Hawk (n = 5), and unoccupied nests of Ferruginous Hawk (n = 1), Golden Eagle (n = 2), and Red-tailed Hawk (n = 8). We also detected three Great Blue Heron nests at one site, but did not observe nesting activity. Most nests were located in cottonwood trees in riparian habitat along creeks and rivers, or in cottonwood trees growing in ephemeral drainages within grassland and sagebrush habitats.

The 2022 survey coincided with the timing of the incubation and hatching stages for Ferruginous Hawks, and the hatching and nestling stages for Golden Eagles. Although the 2022 survey was conducted in mid-May, after the arrival of migratory Swainson's Hawks, we did not detect that species. We note that falcons cannot be effectively detected using fixed-wing aircraft surveys and instead require ground or helicopter surveys, which were not conducted in 2022. The absence of records in 2022 for raptor species known to occupy habitats in eastern Wyoming should not be considered documentation that they do not occur in the Priority Area surveyed. The prey base (black-tailed prairie dog; *Cynomys ludovicianus*) for all expected raptor species in the area was recovering from a 2019 sylvatic plague outbreak, which likely had a negative effect on raptor nest occupancy during the 2022 breeding season.

Dark morph Ferruginous Hawk. Photo by Frank Stetler.

Common Name	Scientific Name	SGCN Ranking	Occupied (N)	Unoccupied (N)
Red-tailed Hawk	*Buteo jamaicensis*	None	5	8
Ferruginous Hawk	*Buteo regalis*	NSS4 (Cb) Tier II	0	1
Golden Eagle	*Aquila chrysaetos*	NSS4 (Bc) Tier II	0	2
American Kestrel	*Falco sparverius*	NSS4 (Bc) Tier III	0	0
Bald Eagle	*Haliaeetus leucocephalus*	NSS3 (Bb) Tier II	0	0
Turkey Vulture	*Cathartes aura*	None	0	0
Great Horned Owl	*Bubo virginianus*	None	0	0
Swainson's Hawk	*Buteo swainsoni*	NSSU (U) Tier II	0	0

Table 1. *Focal raptor species for aerial surveys of Thunder Basin National Grassland, with scientific name, Wyoming Game and Fish Species of Greatest Conservation Need (SGCN) rank, and number of nests detected in 2022 by occupancy status.*

Prepared by: Andrea Orabona, Nongame Bird Biologist (retired); Courtney Rudd, Nongame Biologist; Zach Wallace, Nongame Bird Biologist
Funding Sources: United States Department of Interior, U.S. Forest Service, Thunder Basin National Grassland, Wyoming Game and Fish Commission

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

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

Sagebrush Sparrow. Photo by Marky Mutchler.

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

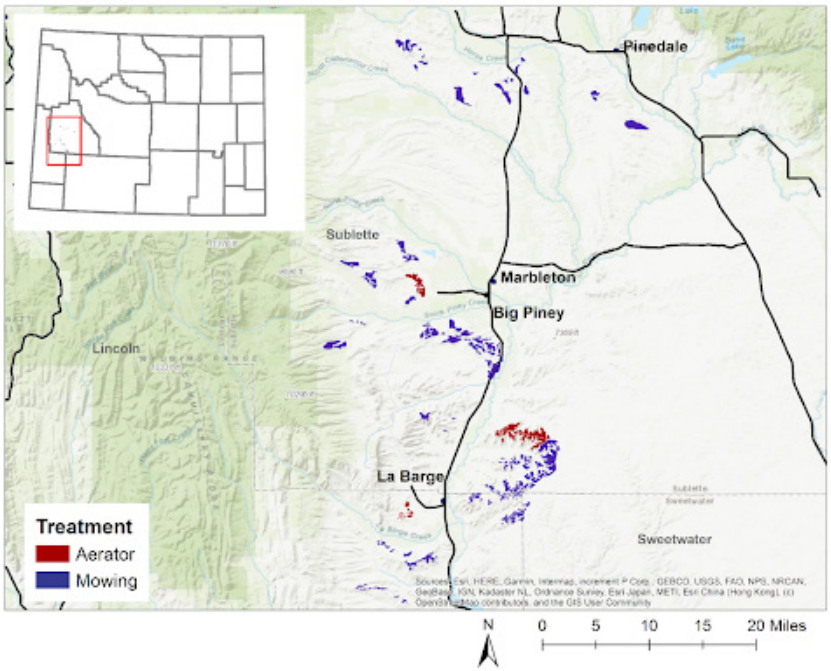


Figure 1. *Overview map of the project study area in Southwest Wyoming.*

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

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

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

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

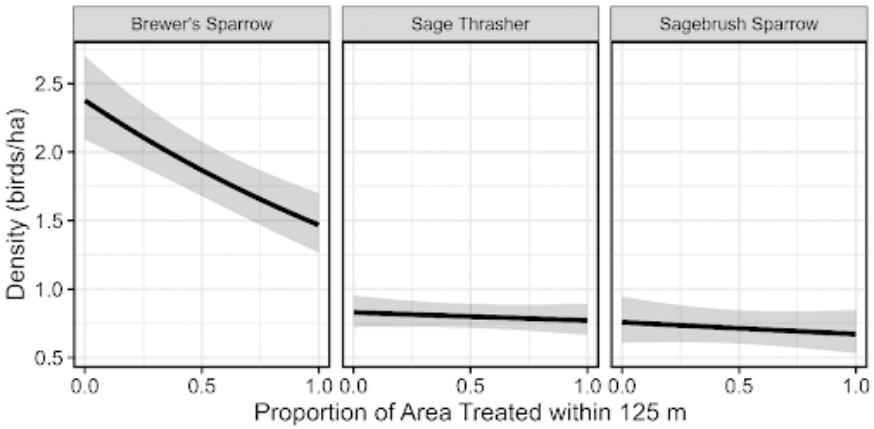


Figure 2. *Estimated density of Brewer's Sparrow, Sage Thrasher, and Sagebrush Sparrow in relation to the proportion of the area mechanically treated within a 125-m-radius of the survey point. Plots show the mean response (black lines) with 90% confidence bands (gray shading). Estimates are corrected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

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

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

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

Prepared by: Katie Sauer, Nongame Biologist
Funding Source: State Wildlife Grants

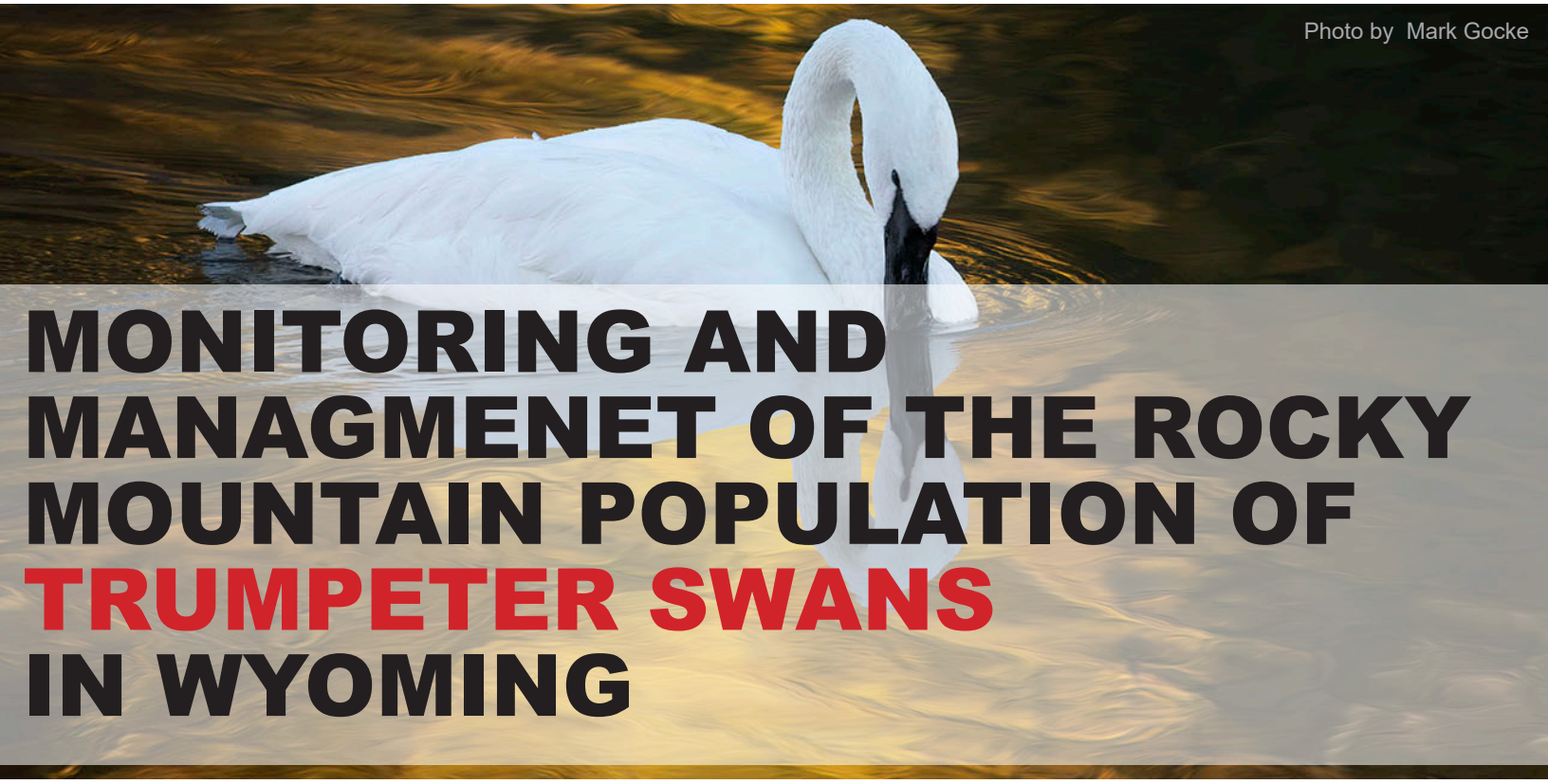


Photo by Mark Gocke

MONITORING AND MANAGMENET OF THE ROCKY MOUNTAIN POPULATION OF TRUMPETER SWANS IN WYOMING

The Trumpeter Swan (*Cygnus buccinator*; swan) is an uncommon resident in Wyoming. It is classified as a Species of Greatest Conservation Need in the Wyoming State Wildlife Action Plan with a Native Species Status 2 (NSS2), Tier II (moderate conservation priority).

Trumpeter Swans have been a priority management species for federal and state agencies in the Greater Yellowstone Area (GYA) since the establishment of Red Rock Lakes National Wildlife Refuge in Montana in 1932 to conserve what were believed to be the last 70 remaining Trumpeter Swans in the world. Since then, the Trumpeter Swan population has grown due to range wide conservation efforts, including in Wyoming. Since the late 1980s, the Wyoming Game and Fish Department (WGFD) has worked to expand summer and winter distribution of swans through releases of captive-reared cygnets and habitat improvement projects. These efforts have succeeded in establishing a new nesting population in the Green River Basin. Overall, the U.S. Breeding Segment of the Rocky Mountain Population (RMP) has remained between 900 and 1000 individuals since 2015, though it experienced major fluctuations in years prior. This non-migratory segment of the population remains of concern, even though migratory Trumpeter Swan populations in Alaska, interior Canada, and the mid-western states have been increasing.


Trumpeter Swan. Photo by Mark Gocke.

Swans that nest and reside year-round in the GYA, including western Wyoming, are designated as the Greater Yellowstone Flock (GYF), formerly the Tri-State Area Flock. The Pacific Flyway Council (PFC) coordinates management of this swan population.

The GYF is managed as part of the RMP, which includes swans that nest in interior Canada and migrate south to winter in the GYA. The WGFD is a member of the Greater Yellowstone Trumpeter Swan Working Group, which consists of state and federal agencies, non-governmental organizations, and interested citizens that meet annually to discuss population trends and coordinate management actions. The WGFD coordinates with the USFWS Mountain-Prairie Region Migratory Bird Office, the states of Idaho and Montana, and managers of areas hosting restoration flocks to annually census the number of mature swans and young of the year (cygnets) in the U.S. Breeding Segment of the RMP, and conducts annual surveys of swan nesting territory occupancy and productivity in Wyoming outside Yellowstone National Park.

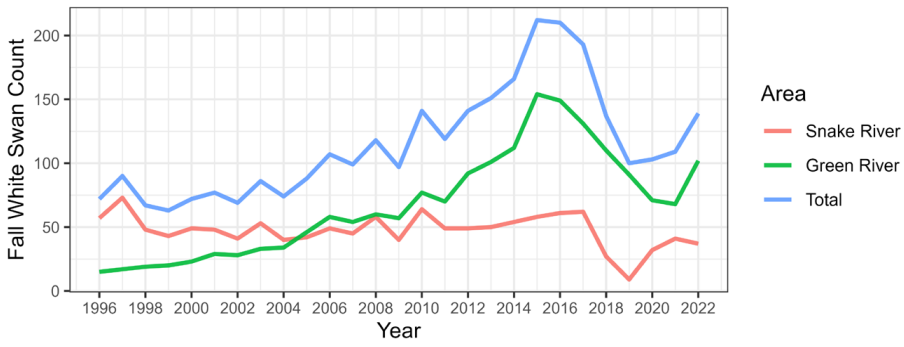


Figure 1. *Trumpeter Swan population trends from the fall count of adult and sub-adult (i.e., white) swans in Wyoming, 1996-2022. Plot shows annual counts for the Snake River core area (red line), Green River expansion area (green line), and the total Wyoming population outside Yellowstone National Park (blue line).*

During 2022, we conducted three fixed-wing aerial surveys to monitoring nesting territory occupancy, productivity, and population abundance of swans in western Wyoming. All surveys were conducted by pilot Mark Packila (Wildlife Air) in a Scout aircraft. We surveyed nest occupancy on June 2-3, 2022, and found 53 of 236 swan nesting areas occupied by pairs. An additional 21 sites had greater or fewer than two swans. Territories with swans received a productivity survey on July 12-16, during which we counted a total of 44 cygnets hatched at 17 nesting territories, or an average brood size of 2.6 cygnets per successful nesting attempt. The annual fall population survey was coordinated by USFWS in the Tri-State Area. On September 28-29, 2022, we conducted the Wyoming portion of the fall survey (excluding Yellowstone National Park and including the Wyoming portion of the Central Flyway), during which we counted 150 white swans (adults and subadults) and 42 gray cygnets. WGFD has historically reported population counts separately for the Snake River area and the Green River expansion areas. In 2022, we counted 37 white swans in the Snake River area, and 102 white swans in the Green River expansion area (Figure 1). The total 2022 fall count was greater than the prior four years, suggesting an increase following steady declines from the population peak in 2016. The increase in 2022 was driven by the larger Green River segment of the population, while the smaller Snake River population declined slightly. In addition to the aerial surveys, swan data were collected or provided through site-specific ground surveys, reports from federal agencies, and observations from the public. The USFWS Migratory Birds and State Programs Mountain-Prairie Region Office produces an annual report summarizing results for the coordinated RMP surveys that includes data collected in Wyoming (Olson 2023).

Compared to the 1990s, the status of the resident Wyoming Trumpeter Swan population has greatly improved. Both number and distribution of swans have increased, as well as the amount of important wetland habitat. However, certain risks still need attention, including climate change, drought, disease, competition for resources with wintering swans from other populations, and human development and disturbance.

Prepared by: Noelle Smith, Migratory Game Bird and Wetland Habitat Biologist; Zach Wallace, Nongame Bird Biologist
Funding Source: Wyoming Game and Fish Commission

Scissor-tailed Flycatcher. Photo by Frank Stetler.

WYOMING BIRD RECORDS COMMITTEE: SUMMARY OF REPORTS REVIEWED IN 2022

The Wyoming Bird Records Committee (WBRC) was established by the Wyoming Game and Fish Department (Department) Nongame Program in 1989 to accomplish the following goals:

- Solicit, organize, and maintain records, documentation, photographs, audio recordings, and any other material relative to the birds of Wyoming.
- Review records of new or rare species or species difficult to identify, offer an unbiased opinion of their validity or thoroughness, and use them to develop and maintain an Official State List of Birds in Wyoming.
- Disseminate useful and pertinent material concerning the field identification of Wyoming birds in order to assist Wyoming birders and ornithologists with increasing their knowledge and skill.

The WBRC is comprised of five voting members and the Department's Nongame Bird Biologist, who serves as a non-voting Secretary. The WBRC is interested in promoting and maintaining quality and integrity in the reporting of Wyoming bird observations, and it treats all bird records as significant historical documents. The WBRC operates under a set of bylaws that were approved in 1991 and updated in 1992, 1998, and 2015. Currently, the WBRC requests reports for species that are included on two separate lists. The first list is known as "All Sightings" and includes 157 species that are reviewed, regardless of the location observed in Wyoming. When a species is documented for the first time in Wyoming, it is automatically placed on

A vagrant Groove-billed Ani on the National Elk Refuge, Teton County. This species had not been previously documented in Wyoming. Photo by Kari Cieszkiewi.

the "All Sightings" list. The second list is known as "First Latilong" and currently includes 65 species. Latilongs are the 28 latitude-longitude degree blocks in Wyoming. When a species on the "First Latilong" list is observed in a latilong with no previously confirmed WBRC record, we request a report from the observer. In addition, if nesting activity is observed for any species on the "First Latilong" list, the WBRC requests a report for that observation, regardless of whether the species has been previously documented in that latilong. The WBRC is currently reviewing the observation database to determine if changes are warranted for both lists.

During 2022, the WBRC made a continued effort to engage with eBird, a worldwide community science database for avian observations maintained by the Cornell Lab of Ornithology. Two of the five voting WBRC members served as Wyoming eBird reviewers. The WBRC tracked eBird postings to find records of rare and unusual bird sightings for review and also encouraged birders to submit rare bird forms directly to the WBRC for observations shared through eBird. During 2022, the eBird platform experienced an increase (2%) in observers submitting data in Wyoming and a slight decrease (0.2%) in the number checklists submitted. The increase in observers participating in eBird did not result in an increase in rare bird records, as the WBRC reviewed approximately the same number of records in 2022 as previous years.

As of May 1, 2023, the WBRC has reviewed a total of 1,825 reports of rare and unusual birds in Wyoming, of which 1,486 (81%) have been accepted and 339 (19%) have not been accepted. In 2022, the WBRC reviewed 114 reports. Of those, 90 were accepted, 23 were not accepted, and 1 is pending additional information to make a final determination.

The WBRC review process is also helpful for understanding changes to species' distribution in Wyoming. Of the 114 records reviewed in 2022, 64 resulted in an update the distribution of the observed species at the latilong scale. Reports were reviewed for 17 of the 28 latilongs statewide and represented a diverse array of species including waterfowl, shorebirds, marshbirds, seabirds, gulls, owls, woodpeckers, and numerous passerines. These changes have been incorporated into the Department's Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming (Orabona et al. 2021).

Observations of the following species were notable first documented records for Wyoming:

Neotropic Cormorant (*Nannopterum brasilianum*). Bump-Sullivan Reservoir, Goshen County. This tropical cormorant's typical breeding range includes the gulf coasts of Texas and Louisiana,

King Eider pair, Lake Hattie, Albany County. First documented record in Wyoming and the Rocky Mountain region. Photo by Jonathan Lautenbach.

inland colonies in the southern United States, the majority of South America below altitudes of 4,000 m, large portions of Central America, northwestern Mexico, Cuba, and many Bahamian islands. Neotropic Cormorant is tolerant of a variety of fresh, brackish, and saltwater habitats with trees for nesting and water depths adequate for diving (Telfair II and Morrison 2022). The species is not unexpected in Wyoming given confirmed observations in all adjacent states. The observer originally submitted the record to eBird with multiple photos of the bird resting and flying among Double-crested Cormorants.

King Eider (*Somateria spectabilis*). Lake Hattie, Albany County. This sea duck's breeding range typically includes extreme northern arctic coastal areas with adjacent tundra habitats. King Eider nest

in vegetated areas near open freshwater bodies. Winter range in North America comprises coastal areas including the Bering Sea, southwestern Alaska, Bristol Bay, Labrador, Newfoundland, the Gulf of St. Lawrence, and the Atlantic Coast south to Virginia. King Eider are also known to winter on Lakes Erie and Ontario. Female King Eider can be mistaken for female Common Eider (Powell and Suydam 2020). This is the first King Eider record submitted to the WBRC and was accompanied by photos; it is also the first record for the U.S. Rocky Mountain states.

Groove-billed Ani (*Crotophaga sulcirostris*). National Elk Refuge, Teton County. This remarkable fall vagrant was photographed and originally submitted to eBird. Groove-billed Ani is primarily a year-round resident in south Texas, Mexico, Central America and northern portions of western South America. This omnivorous species prefers open habitats such as grasslands or pasturelands where it feeds on insects, spiders, berries, fruits, and small reptiles. Additional vagrant records have been recorded in most of the United States as well as a few central Canadian provinces (Bowen 2020).

While the WBRC had not previously reviewed a record for the species below, historical and unverified records are documented in the Department's Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming [Atlas; (Orabona et al. 2021)]. Thus, the following observation is a significant WBRC first documented record:

Northern Hawk Owl (*Surnia ulula*). East of Yellowstone Lake, Yellowstone National Park, Park County. This fall wanderer was photographed and originally submitted to eBird. Following the initial report, a WBRC member observed two adults perched in a standing dead conifer before they flew to a distant tree stand. Northern Hawk Owl are resident breeders throughout large portions of Canada, Alaska, and occasionally the far northern reaches of the United States (e.g., Idaho, Montana, and Minnesota). It prefers boreal forests with somewhat open conifer or conifer-deciduous stands near wetlands or open areas. This species has demonstrated irruptive migrations when prey is scarce or productivity is high in its established breeding range (Duncan and Duncan 2020).

Northern Hawk Owl, Yellowstone National Park, Park County. One of a pair observed during Fall 2022 and the first WBRC accepted record of this species. Photo by Frank Stetler.

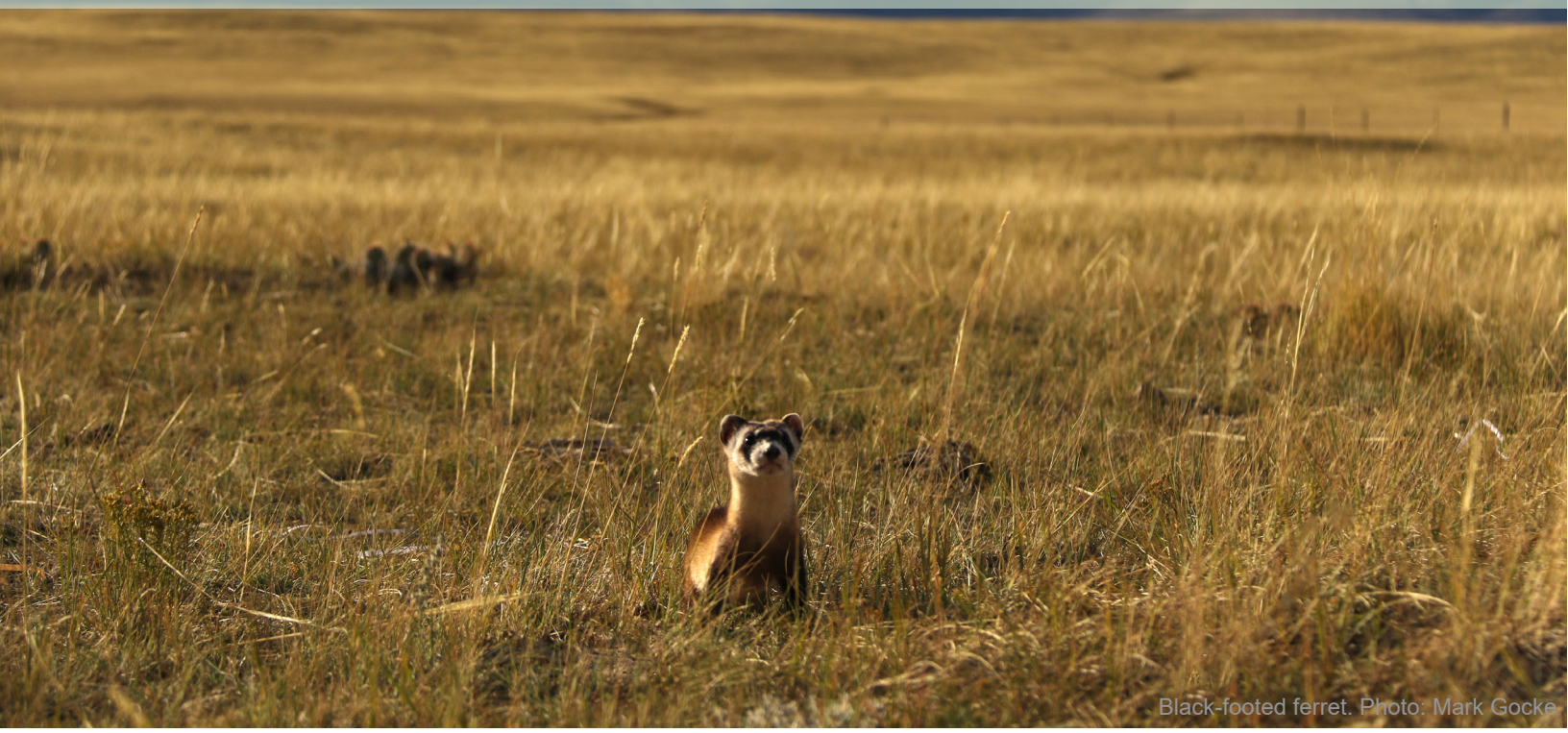
The WBRC database is a dynamic document, typically updated once or twice a year following the review of a record batch. A full report of all sightings submitted to the WBRC through 2022, species for which the WBRC requests documentation, rare and unusual bird sighting forms, information on how to document rare and unusual birds, and the WBRC bylaws are available from the Nongame Bird Biologist in the Department's Lander Regional Office.

The WBRC website continues to provide a variety of information about birding in Wyoming, species of interest for Committee review, WBRC background and history, and an online rare and unusual bird submittal form. The website address is: https://wybirdrecordscommittee.wordpress.com/.

We are indebted to the following current Wyoming Bird Records Committee members for their invaluable efforts and expertise: Shawn Billerman, Bob Hargis, Don Jones, Frank Stetler, and Diane Thomas.

Prepared by: Courtney Rudd, Nongame Biologist
Funding source: Wyoming Game and Fish Commission

BLACK-FOOTED FERRET MANAGEMENT IN WYOMING



Black-footed ferret. Photo: Mark Gocke

Wyoming has a unique history with black-footed ferrets (*Mustela nigripes*; hereafter ferrets). The species was declared extinct twice before being rediscovered on a Meeteetse, Wyoming ranch in 1981. The subsequent captive breeding program and first reintroduction were both within the state's borders. For over four decades, Game & Fish has worked in collaboration with private landowners as well as state and federal agencies and non-governmental organizations. The Wyoming Black-footed Ferret Working Group meets annually to discuss progress towards recovery and management goals as well as plans for the future of the recovery efforts. Critical is the cooperation and generosity of the many private landowners involved in the efforts, which insures ferret management in Wyoming remains collaborative, adaptive, and nimble even as new challenges are encountered and technology continues to develop.

Prairie dogs *(Cynomys spp.)* are keystone species and are critical for healthy and functional rangeland ecosystems. They aid in soil aeration, nutrient cycling as well as provide shelter or food sources for burrowing owls, badgers, birds of prey, and many other species. Ferrets, in particular, spend most of their lives in prairie dog burrows, where the rodent makes up 90% of their diets—each adult ferret must capture and consume a prairie dog about every three days. Consequently, managing ferret habitat requires maintaining prairie dog colonies of adequate size and density. Efforts to conserve ferret habitat are hindered by human eradication of prairie dogs as well as by sylvatic plague, caused by the bacterium Yersinia pestis. Plague is transmitted by fleas and can cause severe die-offs of both ferrets and prairie dogs.

While the monitoring and management of prairie dogs and disease is common to all ferret reintroduction areas on the continent, the history, size, and specific methodologies and strategies used at each vary. Management decisions at reintroduction sites are informed by annual monitoring efforts conducted by Game & Fish personnel and volunteers. Prairie dog colonies are mapped (either on the ground with GPS units or through a combination of remote and field verification) to estimate active and potential area of ferret habitat. Density of prairie dogs is estimated through visual count surveys at each reintroduction

area. The standard protocol is to visit 200 m^2 plots for three consecutive days between 0730-1030 on warm, dry mornings in June and July. Relative density of prairie dogs is assessed before other management activities, such as controlling plague or releases of captive-bred ferrets.

Due to the nocturnal behavior of ferrets, nighttime spotlighting is the primary survey method used to locate ferrets and estimate population size. Surveyors use high-powered spotlights to search portions of previously mapped prairie dog colonies looking for distinctive ferret eyeshine in blocks of three consecutive nights. To coincide with kit emergence and dispersal, surveys are conducted from August through September. During these efforts, ferrets are trapped, anesthetized, implanted with PIT tags, vaccinated against plague and canine distemper, and then returned to their point of capture. Ferret abundances are generally reported as the Minimum Number Alive, the smallest number able to be verified based on recaptures and timing/location of observations, within each reintroduction area. If enough animals are captured, approximately 30 individuals, population size can be estimated with statistical methods. If populations are thought to be diminishing, the Department can supplement with releases of captive-bred kits or kits translocated from other sites.

In 2020–2022, we altered normal field protocols to protect both ferrets and field personnel due to the SARS-CoV-2 pandemic. Rather than anesthetizing captured animals for a full workup (measurements, weighing, etc.), we instead processed animals while they are conscious but confined in trap. All personnel wore PPE and all equipment was decontaminated between contact with different ferrets. In 2022, the US Fish and Wildlife Service determined that ferrets, while able to be infected by SARS-CoV-2, do not face high rates of mortality from the disease as in other mustelid species. We envision returning to anaesthetizing ferrets for a full workup in 2023, though with continual evaluation of protocols in light of best available research and guidance.

To help guide the recovery process within Wyoming, the Game & Fish Commission approved the Wyoming Black-footed Ferret Management Plan in 2018, which details statewide population objectives as well as conservation and management strategies. The plan calls for at least five reintroduction areas, and

Ferret Biologist Andrew Gygli tries to convince an ornery captive-bred ferret kit to leave his carrier and be released into the wild near Meeteetse, WY. Photo by Mark Gocke.

Wyoming currently supports two: the Shirley Basin Reintroduction Area, established in 1991, and the Meeteetse Reintroduction Area, established in 2016.

Shirley Basin Reintroduction Area

The Shirley Basin Reintroduction Area (SBRA) is the first location where ferrets were released following their rediscovery and the establishment of a captive breeding program. It remains the longest lasting and arguably most successful reintroduction area on the continent; its long-term success is typically attributed to the large amount of quality ferret habitat and relatively untouched landscape. Estimates of white-tailed prairie dog (*C. leucurus)* colony area have been recorded as more than 180,000 acres, and Shirley Basin remains one of the least populated regions in the state. Due to this massive scale, it is impossible to adequately monitor the entirety of the SBRA annually.

Large population fluctuations have occurred through the site's long history. Reintroduced ferret populations were slow to establish in the 1990s, experienced near-exponential growth in the mid-2000s, and then declined sharply during a suspected plague outbreak

in 2012-2013, though drought conditions may have played a role. The population has stabilized in recent years and seen moderate growth, but numbers have not yet returned to their recorded maxima. Since 2017, most monitoring and management activities for prairie dog and ferret populations within the SBRA have largely been concentrated within the approximately 20,000 acres supporting the highest density of ferrets, referred to as the "main study area." Prairie dog density within the main study area is estimated from surveys at 15 visual count plots. In 2022, overall density was approximately 2.93 per acre—an increase of 36% from 2021. This increase is encouraging and suggests steady, stable growth. Additionally, over 542 of 834 randomly selected prairie dog burrows had obvious signs of habitation. Given the amount of precipitation over the winter, we are optimistic for lush vegetation growth and a productive breeding season. Barring an unforeseeable catastrophe, we are confident the prairie dog population within the main study area is healthy.

The entirety of the Shirley Basin is a vast area and ferrets have been released at many locations since 1991. Due to this history, coupled with the ferrets' ability to disperse without notice by personnel or local residents, we expect ferrets occupy areas unknown to the department. In 2021, we began an effort to reconnoiter large portions of the SBRA not regularly surveyed for ferrets. To do this, we used scent detection dogs (Working Dogs for Conservation, Missoula, MT) to locate areas with ferret scent and remote cameras to verify the dogs' alerts. In the last two summers, we surveyed 76,500 acres in locations where ferrets were released in the last 30 years as well as where they could disperse on their own. We located ferrets at 4 of the 5 major historical release points and 3 areas previously unknown to us.

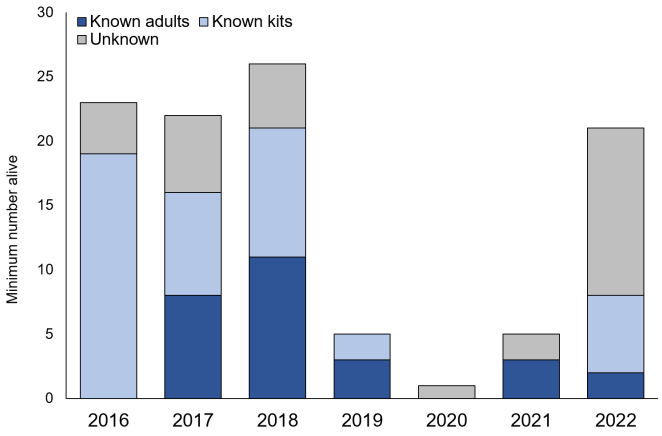
During annual spotlighting, we focused all efforts on the 3 areas discovered by the scent dogs. Over 15 nights of spotlighting, 45 unique surveyors covered 16,819 acres and expended 578 hours of effort. We located at least one ferret at each new location, all of which were wild born, and located evidence of successful breeding in 2 of 3 locations. One new area is densely populated by ferret standards, and we estimate 3–5 litters produced were produced there in 2022. In total, we can account for at least 30 unique ferrets in the new areas, though the actual number is likely higher.

We are optimistic for the future of ferrets in the Shirley Basin Reintroduction Area. The discovery of locations ferrets have dispersed to, either through our own efforts or by sightings from the public, indicates that ferrets can succeed with little active management in Shirley Basin. However, energy development in Shirley Basin will likely continue for the foreseeable future and the impacts of that development on prairie dog colonies and ferrets are currently unknown. Additionally, as the SBRA and the ferret program continues to grow, it becomes increasingly difficult to monitor and manage populations in ecologically and statistically valid ways with current levels of available resources.

Meeteetse Reintroduction Area

The Meeteetse Reintroduction Area (MRA) was established in 2016, returning black-footed ferrets to the same land where they were rediscovered in 1981. The MRA consists of approximately 6,200 acres of white-tailed prairie dog colony and, through collaboration with a multi-agency disease management team,

A ferret peeks over the edge of its burrow near Meeteetse, WY. Photo by Mark Gocke.



Minimum number of live ferrets detected during spotlight surveys at the Meeteetse Reintroduction Area at every year since its establishment in 2016. Local prairie dog density dropped precipitously due to sylvatic plague in 2019 and the ferret population followed suit. We observed promising signs in both prairie dog density and ferret survival in 2021, and surveys in 2022 indicate the population is recovering.

has been actively managed for plague suppression annually since the reintroduction. The population started strong, with multiple instances of successful litter production bolstered by supplemental releases to provide increased reproductive opportunities for ferrets. However, sylvatic plague was detected in 2018, and the populations of ferrets and prairie dogs both dropped precipitously.

We continue to suppress ectoparasites which spread sylvatic plague in cooperation with the BLM, USFWS, and USDA APHIS Wildlife Services. In 2022, we treated 3,943 acres of prairie dog colonies, with priority given to areas with higher prairie dog density and previous ferret detections. We also incorporated fipronil grain with the previously used deltamethrin dust. We intend to strategically rotate their use across time and space to inhibit the development of resistance to a single pesticide in the local ectoparasite populations.

As in previous years, we conducted prairie dog visual count surveys at 17 plots across the MRA. In 2021, the average density of prairie dogs was 0.37 per acre, a reduction of 87% since 2017. However, we noted observed many nursing prairie dogs and marked increases in density in some portions of the MRA. In 2022, we estimated prairie dog density to be 1.49 per acre, a 4-fold increase. This is very encouraging and, while density is not back to pre-plague outbreak levels, indicates a positive population trend and that plague suppression efforts appear to be working.

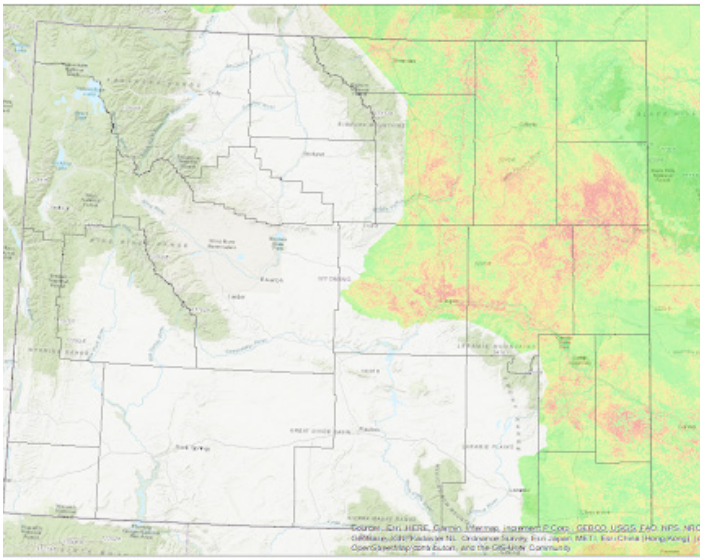
In August 2022, 51 volunteers conducted 248 hours of spotlight surveys covering 5,647 acres of the MRA, and we focused on areas with high to moderate prairie dog density. During surveys, we located 2–3 litters of ferrets and observed at least 3 solitary adults on the landscape. We caught 4 unique ferrets, with 2 being released in 2021 and 2 being wild born in 2022. Based on the timing and location of all observations, we can account for 12 ferrets, with at least 8 being wild born in 2022. The situation is much improved compared to 2020, when only a single ferret was known to exist at the MRA. We are cautiously optimistic that, with continued plague management, the positive trend will continue. On September 28, we release 18 captive bred ferrets (12m:6f) to further bolster the population. They were released according to locations of observed wild born ferrets to maximize the reproductive opportunities.

In 2023, we intend to continue monitoring ferret habitat and population status, including annual evaluations of prairie dog density prior to scheduled plague management treatments. As the borders of prairie dog colonies have not been delineated since 2016, we will redraw borders to reflect the post-plague outbreak reality. The updated spatial data will aid in analyses, Federal reporting mandates, and in effectively deploying plague-suppressing pesticides. We will again conduct spotlight surveys of similar scale to those conducted in 2022, specifically targeting the portions of the MRA supporting suitable habitat. Depending on the number of captive-bred ferrets produced by the US Fish and Wildlife Service, we may release kits to enhance reproductive opportunities.

Prepared by: Andy Gygli, Ferret Project Biologist
Funding Sources: USFWS State Wildlife Grants, USFWS Section 6 grants, Wyoming Big Game License Coalition

BLACK-TAILED PRAIRIE DOG COLONY MAPPING UPDATE

The black-tailed prairie dog (BTPD; *Cynomys ludovicianus)*, is a fossorial, colonial rodent that occupies grassland habitats of the western United States. In Wyoming, BTPD range includes lower elevation habitats in the eastern third of the state. Although historically abundant and widely distributed, BTPD are susceptible to a number of threats which have led to their decline including habitat loss, epizootic diseases, and targeted control programs. In response to range-wide declines and subsequent petitions to list the species under the Endangered Species Act in 2011, the Interstate Prairie Dog Conservation Team (PDCT) recommended standard survey protocols which could be utilized range-wide and would be consistent among states, with monitoring occurring at 6-year intervals. In 2015, the Wyoming Game and Fish Department (Department) coordinated with other states to provide the first range-wide assessment of the species. To maintain consistency



Black-tailed prairie dog (Cynomys ludovicianus) range in Wyoming, with warmer colors representing more suitable habitats.

Sampled 2 × 2 mile grid cells (green squares, n = 1,694) for Black-tailed prairie dog (Cynomys ludovicianus) colony mapping surveys in Wyoming.

and following delays related to the COVID-19 epidemic, BTPD statewide monitoring was repeated in 2022 in cooperation with the PDCT and associated states.

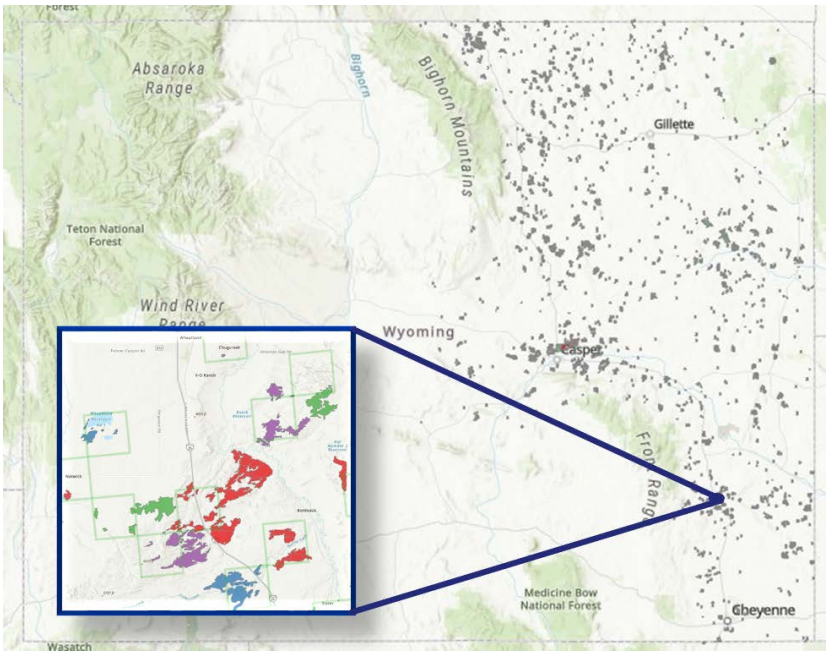
Initial 2015 surveys were conducted by Western Ecosystems Technology, Inc. (WEST), using standardized sampling and methods across the west-wide range of BTPD. Statewide surveys in 2022 were conducted internally by the Department utilizing the same sampling design and desktop mapping methods, but with an updated observer interface and data archiving framework. Using a desktop computer and ArcGIS Online interface, observers visually searched the same 2 × 2 mile grid cells sampled in 2015, and mapped BTPD colony perimeters from 2019 NAIP (National Agricultural Imagery Program) imagery. Grid cells were reviewed by one of four independent observers, with a subsample of grid cells reviewed by a second independent observer to calculate detection probability.

A total of 1,694 grid cells were reviewed in BTPD range by single observers, with a subset of 180 grid cells reviewed by a second observer. A total of 3,088 polygons were digitized for identified BTPD colony perimeters, covering a total of 184,872 acres. After completing computer-based surveys, 54 grid cells where BTPD colonies were identified were visited on the ground to verify the presence of colonies and to confirm active or inactive status. Nine of the sites surveyed on the ground (17%) were misidentified from aerial imagery and were structures other than BTPD colonies (e.g., rocks, ant mounds, ground squirrel colonies). Thirty-five of the remaining 45 sites surveyed on the ground were active BTPD colonies (78%), while the remaining 10 sites were inactive BTPD colonies (22%).

Further compilation, quality assurance review, and spatial analysis of data from this project is ongoing, with the goal of completing work by August 2023. Spatial analysis of survey results will compare changes in BTPD colony acres from 2015 and 2022 surveys to identify areas of expansion and retraction. Findings from ground confirmation surveys will be incorporated with range-wide results to adjust for detection errors and to approximate the proportion of active versus inactive colonies. Results from these recurring surveys will help to inform management actions to conserve BTPD colonies where appropriate and support associated species of concern.

Ultimately, Wyoming will continue to participate and contribute information on BTPD colony status to the PDCT to achieve management objectives for the species across their native range.

Black-tailed prairie dog colonies are identifiable on aerial imagery due to the high density of visible burrow mounds, worn paths between mounds, and clipped vegetation within the colony. The visibility of colonies on aerial imagery lends itself to digitally mapping colonies on a statewide scale.



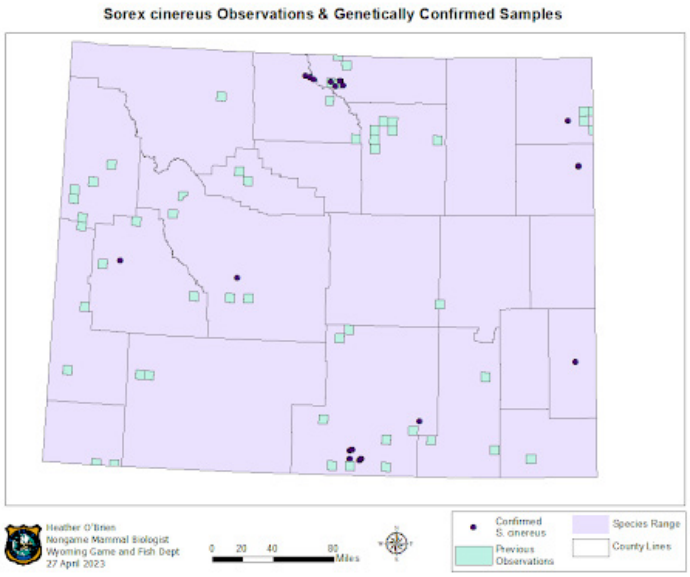
Initial results of 2022 statewide BTPD colony mapping and digitizing using 2019 NAIP (National Agricultural Imagery Program) imagery, with zoomed image to illustrate colony digitizing. Colored polygons represent digitizing completed by different observers.

Prepared by: Heather O'Brien, Nongame Mammal Biologist; Troy Gerhardt, GIS Analyst; Jason D. Carlisle, Quantitative Biologist
Funding Sources: State Wildlife Grant, Governor's ESA Grant

GENETIC IDENTIFICATION OF WYOMING SHREW SPECIES

Photo by Dana Nelson

Wyoming supports a diverse assemblage of shrews, with 9 species found in the state. While some shrew species are considered common, 4 of the 9 shrew species are classified as Species of Greatest Conservation Need (SGCN) in Wyoming's State Wildlife Action Plan (SWAP). Of these, 3 are ranked with an Unknown Native Species Status (NSSU) due to a lack of data. Because of their small size, largely nocturnal and semi-fossorial habits, and limited movements, shrews are rarely observed and are only incidentally captured during small mammal trapping efforts. Targeted surveys for shrews require dedicated effort and specialized trapping techniques (i.e., pitfall traps). Without data on distribution, trends, and habitat requirements, it is difficult to assess the status of shrew species, assess potential threats, or develop management recommendations.



Map of species range, previous field observations, and confirmed sample locations for Sorex cinereus in Wyoming.

Further complicating efforts to monitor shrews is the difficulty in identifying individuals, even in hand. Currently the best technique for species identification is through examination of the teeth, which requires individuals to be killed and teeth to be in good condition. Even when teeth are in perfect condition, differentiating among similar species can

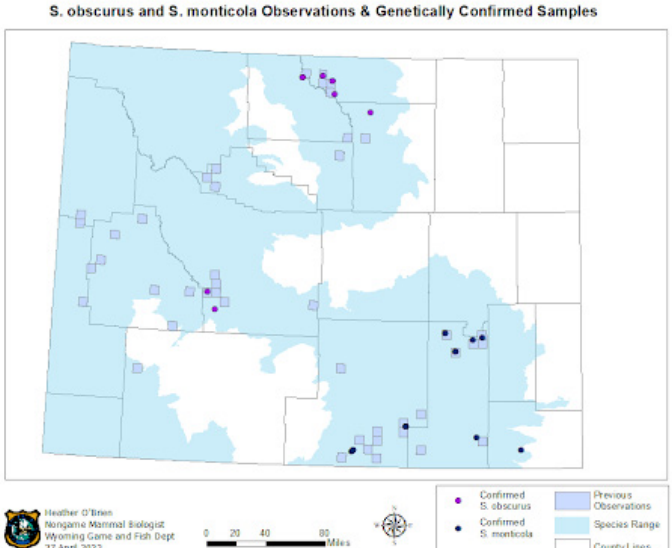
be difficult. Consequently, the Wyoming Game and Fish Department (Department) sought to evaluate alternative identification techniques for shrews. Tissue samples from specimens already in hand were processed by the lab of Dr. John Demboski at the Denver Museum of Nature and Science (DMNS) to assess the effectiveness of genetic analyses as an identification technique. Goals of the project were to evaluate the use of genetic analyses to identify shrew species on a statewide scale, update species distribution and Department databases including the WOS; SWAP; and Atlas of Birds, Mammals, Reptiles, and Amphibians in Wyoming, and use results to develop future survey and collection protocols to be used for both live and dead shrews.

Results of Genetic Analysis of Wyoming Shrews

Species	Common Name	Lineage	Sample Total
Sorex cinereus	Common or Masked Shrew	*Southwest*	60
Sorex cinereus		*West*	6
Sorex cinereus		*Sorex sp. SW*	1
Sorex cinereus		*Sorex sp. RM*	1
Sorex monticola	Southern Montane Shrew	*Southern continental*	20
Sorex obscurus	Northern Montane Shrew	*Northern continental*	10
Sorex nanus	Dwarf Shrew		1
Sorex navigator	Western Water Shrew		33

Results of genetic analysis by the Denver Museum of Nature and Science to identify species of shrews from Wyoming field samples (n=132).

A total of 132 shrew samples collected in 2012, 2014, and 2016-2021 from throughout Wyoming were processed by the DMNS. The complete mitochondrial cytochrome b gene was sequenced and examined within a phloygenetic framework using both published (e.g., GenBank) and unpublished (DMNS) Sorex sequences to provide comparative species identifications and insights into intraspecific lineages. Molecular analyses identified 5-7 shrew species based on recent summary publications by Woodman (2019), Burgin et al. (2020), Dembowski and Cook (2001), and Sawyer et al. (2019).



Map of species range, previous field observations, and confirmed sample locations for Sorex obscurus and Sorex monticola in Wyoming.

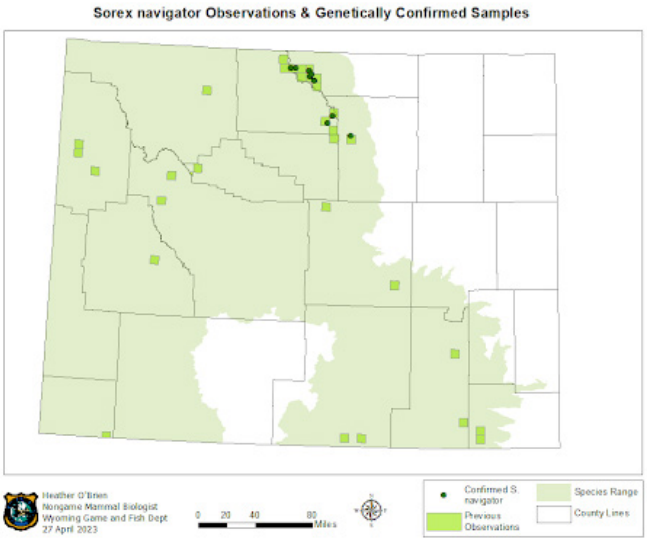
More than half (n=68) the specimens examined were identified as *Sorex cinereus*, one of Wyoming's most common and widespread species of shrew. Analysis of the 68 cinereus shrews revealed four different lineages as identified by Hope et al. (2012), with 60 specimens identified as the Southwest lineage and 6 identified as the West lineage. The two remaining specimens aligned with two undescribed species from Hope et al. (2012), Sorex sp. Rocky Mountain (RM) and Sorex sp. Southwest (SW). Both specimens were collected from more arid basin habitats at lower elevations compared to other shrews examined. While it may be premature to conclude much from these specimens, presence of these outlier lineages suggests survey efforts along riparian zones in low-elevation, drier environments in Wyoming may yield yet unknown diversity within the Sorex taxon.

Thirty samples were identified a s montane shrew, which is also common and widespread in Wyoming. Examined specimens included representatives of both the Northern and Southern continental lineages. Recent taxonomic treatments have suggested these be separated into distinct species - the Southern continental lineage being *Sorex monticola* (n=20) and the Northern continental lineage being *Sorex obscurus* (n=10). The spatial distribution of specimens identified in this analysis illustrates a phylogeographic break between lineages in Wyoming, with *S. obscurus* samples originating from the northwestern ranges and *S. monticola* samples

originating from the central and southeastern ranges. Additional survey work to collectand identify shrew specimens in surrounding areas would further resolve our understanding of the distribution and geographic boundaries between these species.

Thirty-three samples were identified as S*orex navigator*, the western species of water shrew. This species is recognizable in-hand given its large size, fringe of stiff hairs on the hind feet, and dark velvety fur. All examined specimens of this species originated from the Big Horn Mountains. Finally, one sample originating from the Big Horn Mountains was identified as *Sorex nanus*, the dwarf shrew. This species is recognized as an SGCN by the SWAP, with a status of NSS3 [Bb] Tier II. The dwarf shrew is considered uncommon in Wyoming and other parts of the west, and confirmed records of the species are rare.

Genetic analysis has proven valuable as a tool to improve our understanding of the distribution of shrew species and lineages in the state. All findings from this analysis have been added to update the Wildlife Observation System maintained by the Wyoming Natural Diversity Database.



Map of species range, previous field observations, and confirmed sample locations for Sorex navigator in Wyoming.

This project represents the first step in addressing statewide objectives for this taxon, which can eventually be used to improve our understanding of the status and distribution of shrews, provide information on habitat use and requirements, and revise predictive range maps. Results also provide insight to direct future research in Wyoming, and identify areas where additional surveys could provide new information to guide conservation and management decisions.

Prepared by: Heather O'Brien – Nongame Mammal Biologist, Nichole Bjornlie – Former Nongame Mammal Biologist, Dr. John Demboski – Denver Museum of Nature and Science
Funding Source: Wyoming Governor's Big Game License Coalition

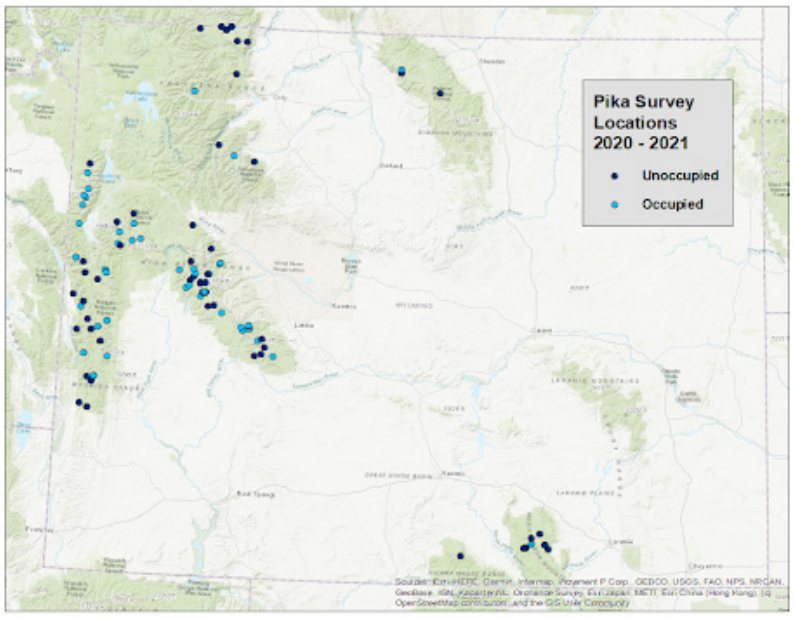
AMERICAN PIKA OCCUPANCY SURVEYS IN WYOMING

Photo by Mark Gocke

The American pika (*Ochotona princeps*, pika) is a small lagomorph that occupies rocky talus slopes of alpine and subalpine habitats of the western United States. In Wyoming, their range includes high elevation habitats within the Central Rocky Mountains, Snowy Range, and Bighorn Mountains. Pikas maintain a high metabolic rate, making them vulnerable to heat stress when temperatures are high. Thus, pikas seek refuge in the interstitial spaces between rock structures to thermoregulate on warm days. Pikas do not hibernate; rather, they cache vegetation as haypiles to survive the winter months under talus rocks covered by snowpack. The thick layer of snow over alpine talus also provides thermal stability during the winter.

Pikas have relatively low fecundity, and their dispersal ability is limited by their low tolerance for heat and specialized habitat needs. Because of their unique physiology and reliance on specific g eographic a nd t hermal characteristics for survival in alpine habitats, pikas may serve as an indicator species to detect the ecological effects o f c limate c hange. F luctuations i n pika populations over time may also signal changes in alpine habitat quantity and quality.

Based on growing concerns regarding theeffects of climate change on population and habitat persistence, pikas were petitioned for listing under the Endangered Species Act in 2007 and 2016. In both cases the US Fish and Wildlife Service determined listing was not warranted, due in part to a lack of range-wide data on population trends and response to climate change.



American Pika (Ochotona princeps) statewide occupancy survey locations and results, 2020 – 2021.

While there have been several targeted studies of pikas in Wyoming, previous research has been limited in scale and has focused on populations in the Greater Yellowstone Ecosystem.

To address gaps in knowledge and initiate the collection of long-term trend data, the Nongame Section developed and implemented statewide occupancy surveys for pikas in 2020 and 2021. Survey sites were selected using a spatially balanced sample of potential sites, which were then evaluated based on suitable habitat characteristics and accessibility. A total of 167 surveys were conducted at 100 unique sample sites during mid to late summer of 2020 and 2021, when pikas are actively collecting vegetation for haypiles. Pika presence at each site was determined either by seeing or hearing pikas, or by identifying the presence of fresh haypiles. A variety of site-specific data (e.g., slope, aspect, vegetative cover, and habitat composition) were also collected to evaluate factors which may influence pika occupancy. To assess the relationship between ambient and subsurface temperatures and pika presence, half the survey sites were selected at random and equipped with temperature loggers.

Observation data were collected across the two survey seasons, with both single and dual observation surveys utilized within each year. Spatial distribution of site visits was uneven between years as surveyors sought to efficiently cover survey regions across the state. To account for these differing survey scenarios, a stacked single-season occupancy model was fit to observed encounter histories where the site-year was treated as the site. Analysis using the software package unmarked in Program R resulted in an estimated statewide occupancy rate (Ψ) of 0.571 (SE = 0.065, 95% CI = 0.441 -0.692) with an estimated probability of detection (p) of 0.78 (SE = 0.067, 95% CI = 0.622 – 0.884) across the two survey seasons. Vegetation, habitat, and temperature data are currently being analyzed and compared to pika occupancy. Relationships between environmental factors and pika presence will provide insight into the specific habitat needs of pika, help to project changes over time, and inform future management of the species across the state.

An American pika (Ochotona princeps) gathers vegetation to store in haypiles beneath the talus. Pikas do not hibernate, and they rely on haypiles as an overwinter food source. Photo credit: Mark Gocke

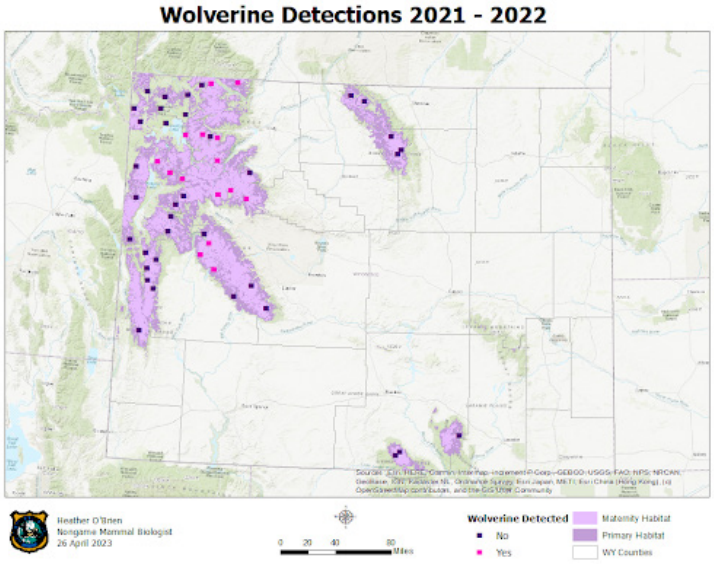
The initiation and completion of statewide surveys for pika was a hefty but successful undertaking in its first seasons. Vetting new survey sites required a sizable time commitment to evaluate safety and determine efficient access, and the implementation of surveys at many sites was remote and laborious in nature. With this initial effort complete, statewide pika surveys can be repeated in future years to accumulate information on population trends. Trends in pika occupancy can then be evaluated either statewide or regionally to detect population changes at varying spatial scales. Coordinating future efforts with the National Parks Service, US Forest Service, and other partners could improve survey efficiency while providing the opportunity to collect more fine-scale habitat data. Future cooperative work would provide a more comprehensive picture of pika status in the state, while also creating the opportunity for collaboration between interested contributors.

Prepared by: Heather O'Brien, Nongame Mammal Biologist; Nichole Bjornlie, Former Nongame Mammal Biologist; Jason D. Carlisle, Quantitative Biologist
Funding Sources: USFWS State Wildlife Grants; Governor's ESA Grant

WOLVERINE OCCUPANCY SURVEYS IN WYOMING

The wolverine (*Gulo gulo*) is the largest terrestrial member of the mustelid or weasel family. It is a largely solitary species, occupying dense boreal and alpine forests in the western United States, Canada, and other circumpolar regions of the globe. Wolverines are elusive and prefer large, contiguous areas of suitable habitat with little to no human disturbance. They tend to occupy higher elevations during the summer months, but may travel to lower elevations in the winter in search of carrion and other food sources. Wolverines do not hibernate and are adept at traveling long distances over deep snow. Wolverines have low fecundity, and offspring are dependent upon their mother for 2-3 years. Because of their low population density and secretive habits, knowledge of the current distribution and population status of wolverines in Wyoming and much of the western United States is imperfect. Despite historic ranges that extended south through Colorado, the Greater Yellowstone Ecosystem Region of Wyoming is currently considered the southernmost extent of occupied wolverine habitat.

Wolverines are defined by Wyoming state statute W.S. § 23-1-101 as a protected species and are classified as a Species of Greatest Conservation Need by the Wyoming Game and Fish Department (Department) (NSS3 [Bb], Tier II). Due to their slow reproductive rate, elusiveness, and the potential for habitat loss, wolverines were petitioned for listing under the Endangered Species Act in 1994 and legal deliberations have been ongoing. Because they occur at low densities, prefer rugged and remote habitats,



Wolverine suitable habitat, survey sites (n = 51), and detection results from 2021-2022 occupancy surveys.

and are averse to human disturbance, monitoring wolverine distribution on a large scale is a challenging task. Occupancy surveys which utilize remote cameras provide a noninvasive method to detect wolverine presence in their preferred habitats while minimizing intrusion. Following the initial launch of remote camera occupancy surveys in 2016-2017, the Department introduced the first Wyoming wolverine management plan in July 2020. Goals of the plan were to collaborate with other western states to develop and implement a large-scale monitoring strategy every five years starting in winter 2021-2022, identify wolverine research opportunities, collaborate with federal land management agencies and other stakeholders to make informed management decisions, and engage the public through media and outreach efforts.

Through coordination with the Western Association of Fish and Wildlife Agencies (WAFWA) Forest Carnivore Subcommittee, wolverine occupancy surveys were conducted in Wyoming and seven other western states following a unified protocol during the winter of 2021-2022. In Wyoming, fifty-one 15 × 15 km grid cells were selected in suitable habitat within western Wyoming mountain ranges, the Bighorn Mountains, and the Snowy Range using a Generalized Random Tessellation Stratified sampling method. Survey sites were selected within each grid cell based on accessibility, proximity to alpine tree line, and location of natural travel corridors. Based on winter accessibility, camera trap survey sites were either baited with road-killed deer quarters and lure, or equipped with a programmable lure dispenser. Efforts were also made to collect hair snare samples at each survey site to obtain genetic data and assess population connectivity. Data collection at survey sites was active for four months, from 1 December 2021 through 31 March 2022.

Over 127,000 camera trap images were collected from survey sites during the 2021-2022 season. Of those, 4,975 photos contained wolverines from 15 unique survey sites. A variety of other species were also identified and recorded from survey images including grizzly bear (*Ursus arctos horribilis*), grey wolf (*Canis lupus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), mountain lion (*Puma concolor*), bobcat (*Lynx rufus*), Pacific marten (*Martes caurina*), and long-tailed weasel (*Mustela frenata*). Analyses using the software package RMark in Program R with occasions defined

WGFD wolverine technicians Houston Thompson, Owen Kanter, Colin Cikoski, and Autumn Ruskell pose for a trail camera photo while retrieving gear from a remote survey site.

by survey month and parameters held constant resulted in an estimated statewide occupancy rate (Ψ) of 0.298 (SE = 0.067, 95% CI = 0.182 – 0.449) with an estimated probability of detection (p) of 0.478 (SE = 0.077, 95% CI = 0.334 – 0.625). Hair snares at survey sites yielded 39 samples confirmed as wolverine. Analysis to identify samples to individuals is near completion, and will be available by fall 2023 in the final wolverine occupancy survey report.

Comparisons of survey results suggest an increase in wolverine occupancy in Wyoming from 2016-2017 to 2021-2022, though it should be noted there is considerable overlap of confidence intervals between survey periods. The majority of survey sites remained the same between survey periods, with only four survey sites lost and three new sites added to the 2021-2022 season. During 2016-2017 surveys, wolverines

Parameter	Estimate	SE	95% LCL	95% UCL
Occupancy (Ψ)	0.298	0.069	0.182	0.449
Detection probability (*p*)	0.478	0.077	0.334	0.625

Estimated probability of occupancy (Ψ) and probability of detection (*p*) for wolverine (*Gulo gulo*) in Wyoming, 2021 & 2022.

Year	Estimated Occupancy (Ψ)	SE	95% LCL	95% UCL
2016-17	0.15	0.05	0.07	0.26
2021-22	0.30	0.07	0.18	0.45

Comparison of estimated occupancy (Ψ) for wolverine (Gulo gulo) in Wyoming between 2016-2017 and 2021-2022 survey seasons.

were detected at 6 unique sites, and analyses yielded an estimated occupancy rate (Ψ) of 0.15 (SE = 0.05, 95% CI = 0.07 – 0.26). Total number of camera images with wolverine detections was also lower, with 1,740 images from the 2016-2017 season. Hair sampling was lower in the initial survey season as well, with 19 confirmed wolverine samples. While it is more difficult to quantify, confirmed incidental sightings of wolverines in the state seem to have increased slightly between the survey periods.

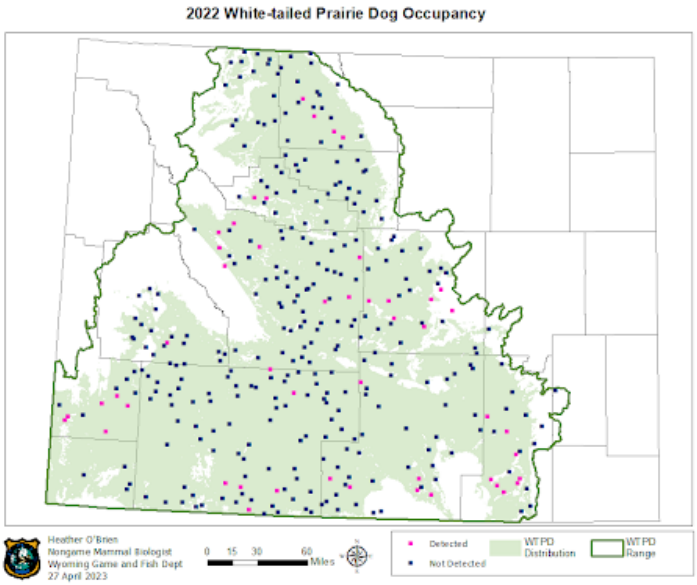
Overall, the combined data collected appear to indicate an increase in wolverine presence in Wyoming from 2015-2016 to 2021-2022. Improved field methods such as better camera and bait configuration may have increased wolverine detections slightly during the 2021-2022 season, having learned valuable field lessons from the initial survey season. However, a doubling in estimated occupancy between survey seasons is more likely a consequence of increasing wolverine presence. Future surveys should be refined to improve field crew accessibility and safety, and further improve camera trap setup and function. Nested occupancy surveys for other forest carnivores such as Pacific marten (*Martes aurina*) may also be possible, utilizing the same grid cells with additional survey sites.

Occupancy surveys and analyses help provide information regarding changes in wolverine distribution and population status in Wyoming, and can be used to inform management decisions in suitable habitats. Repeating statewide occupancy surveys every five years will provide trend data which may also illuminate the influences of climate change on wolverine presence and distribution. As managers learn more about wolverine populations in Wyoming, knowledge gaps can be identified and research targeted to address specific conservation and management needs. Survey results and images have already been compiled and presented to the public, who take great interest in such a dynamic but elusive species. Most importantly, wolverine occupancy surveys conducted in Wyoming contribute to the larger multi-state data set, which will be used to provide updated information to make management decisions on both regional and federal scales.

Prepared by: Heather O'Brien, Nongame Mammal Biologist; Eric Newkirk, Principal Wildlife Biologist Funding Source: Wyoming Game and Fish Commission

WHITE-TAILED PRAIRIE DOG OCCUPANCY SURVEYS IN WYOMING

The white-tailed prairie dog (WTPD; *Cynomys leucurus*) is a fossorial, colonial mammal that occupies sagebrush steppe and grassland habitats of the western United States. Distribution of the species includes portions of northwestern Colorado, southern Montana, northeast Utah, and Wyoming. In Wyoming, WTPD range includes lower elevation habitats within the western two-thirds of the state. WTPD are classified as wildlife by state statute, and as nongame mammals by Wyoming Game and Fish Commission Regulation. Prairie dogs are additionally designated as a pest by the Wyoming Department of Agriculture under the Wyoming Weed and Pest Control Act. The dichotomy of these different regulatory designations complicates the management of prairie dogs, which are seen as burdensome by some and valued by others. Perceptions of prairie dog populations in Wyoming vary depending on individual land use needs, drought conditions, disease status, and land status. While the presence of prairie dogs may be appreciated and conserved in one area, colonies may be controlled or removed in others.



White-tailed prairie dog (Cynomys leucurus) detection results from 2022 statewide occupancy surveys, with predicted range and distribution.

Across their occupied range, outbreaks of plague as well as habitat loss and fragmentation contribute to declines in WTPD populations. As a result of these and other stressors, the USFWS was petitioned to list WTPD under the federal Endangered Species Act in 2002. Following a series of challenges and reevaluations, the USFWS released a decision in 2017 that listing was not warranted. Although federal protections were not introduced at that time, many state and local wildlife managers acknowledged the need to monitor and maintain WTPD populations across their jurisdictions.

From an ecological perspective, prairie dog colonies often support a suite of other wildlife species including

Survey Method	Ψ	SE	95 % LCL	95% UCL
Ground	0.134	0.021	0.096	0.179
Aerial	0.704	0.164	0.344	0.985
Overall	0.270	0.044	0.178	0.349

Predicted occupancy probability (Ψ), standard error, and 95% confidence intervals for ground, aerial, and combined overall surveys for white-tailed prairie dogs in Wyoming, 2022.

	2016	95% CI	2022	95% CI
Occupancy probability (Ψ)	0.211	0.144 - 0.298	0.270	0.178 - 0.349
Est. occupied sites (500m × 500m)	74,265	50,701 - 104,889	95,191	62,756 - 123,044
Est. occupied habitat (km^2)	18,598	12,692 - 26,266	23,827	15,705 - 30,751

Comparison of predicted occupied survey sites (500m × 500m grid cells) and predicted occupied habitat (km^2) for white-tailed prairie dogs from 2016 & 2022 surveys in Wyoming.

burrowing owls, ferruginous hawks, mountain plovers, swift foxes, and black-footed ferrets. Recognizing the importance of WTPD populations, their species associations, and the ongoing need for range-wide management, the Western Association of Fish and Wildlife Agencies (WAFWA) formed a multi-agency Prairie Dog Conservation Team (PDCT) in 2008. Goals of the PDCT were to develop conservation assessment tools, coordinate and standardize monitoring, and collaborate across agencies to manage prairie dogs, associated species, and habitats. As a product of those goals, a range-wide protocol was established for conducting occupancy surveys for white-tailed and Gunnison's prairie dogs. Protocols included guidelines for sampling design, survey timing, field methods, and appropriate repetition of surveys to detect long-term trends.

Occupancy surveys provide a framework to monitor the distribution of a species including colonization and extinction dynamics over time at a statewide and regional scale, giving managers the ability to identify when and where management actions are most beneficial. Wyoming first participated in coordinated surveys for WTPD in 2016, yielding the first baseline estimate of statewide occupancy. The resulting data, methods, and recommendations from this effort also established a framework to guide future surveys. Participating states agreed to coordinate and repeat occupancy surveys on a 5-year rotation to evaluate trends on a range-wide scale over time. Following COVID-19-related delays, agency personnel across WTPD range agreed to conduct occupancy surveys during the spring and summer of 2022. Objectives for 2022 WTPD surveys were to estimate the statewide occupancy rate, compare 2016 and 2022 occupancy rates to understand trends, provide management recommendations, and contribute to the range-wide dataset maintained by the PDCT.

WTPD occupancy surveys in 2022 followed standardized methodology developed for the PDCT, which were first applied at a statewide scale in Wyoming in 2016 by the Wyoming Natural Diversity Database. A balanced acceptance sampling protocol was used to select survey sites from a frame of 500 × 500 m grid cells layered over predicted suitable habitat for WTPD. The majority of selected sites were accessible from the ground and surveyed by two independent observers, while the remaining inaccessible sites were surveyed by aircraft using a single observer. Ground surveys were conducted from 3 May through 24 August 2022, to coincide with consistent above-ground WTPD activity; aerial surveys were conducted on 1 and 2 July 2022. Ground survey observers worked independently of one another and confirmed WTPD presence by walking the perimeter of survey sites while visually searching for WTPDs. Additional environmental and habitat data were collected at each survey site to analyze potential relationships with WTPD occupancy. Single-season occupancy models were fit to observed encounter histories for ground surveys using the software package unmarked in Program R. Since aerial surveys were only conducted once per site, a detection probability could not be directly calculated for 2022. Instead, the estimated detection probability from 2016 surveys was applied to 2022 aerial surveys to produce an estimated occupancy rate. An overall statewide occupancy estimate was then calculated by incorporating estimated occupancy rates and detection probabilities from both ground and aerial surveys.

A total of 351 grid cells were surveyed in 2022, comprised of 267 ground and 84 aerial surveys. WTPD

were detected at a total of 48 grid cells, comprised of 35 cells surveyed from the ground and 13 surveyed from the air. The overall estimated occupancy from 2022 surveys was 0.270 (SE = 0.044, 95% CI = 0.178 – 0.349), which was slightly higher than the 2016 estimate but with substantial overlap of confidence intervals. When applied across available habitat, the overall estimated number of occupied plots was 95,191 (95% CI = 62,756 – 123,044) of 352,561 sites available within the sampling frame, or 23,827 km² (95% CI = 15,705 – 30,751) of occupied WTPD habitat.

Occupancy surveys are an appropriate, repeatable technique to monitor trends in WTPD distribution at a statewide scale over time. Trend data produced by repeated occupancy surveys will help elucidate relationships and influences of environmental and habitat variation on WTPD populations. Fluctuations in precipitation, habitat quality, disease prevalence, predator populations, and human land use activities may all be factors that contribute to changes in WTPD occupancy on a statewide and regional scale. Continued statewide occupancy surveys on a 5-year cycle in Wyoming can help assess the relative importance of these and other factors on WTPD populations. Consistent surveys would also provide information not only to support the management of prairie dogs, but also to support the management of associated species.

Monitoring prairie dog populations at a statewide and regional scale with occupancy modeling also allows managers to track overall distribution and range of the species. To better understand area-specific trends, current and future data can also be compared at a regional scale, which may be more appropriate to inform on-the-ground management decisions. As the state containing the majority of WTPD range, Wyoming will continue to participate in occupancy surveys and collaborate with state and federal managers to monitor the persistence of healthy prairie dog populations.

Prepared by: Heather O'Brien
Funding Source: State Wildlife Grants and Governor's ESA

BATS: STATEWIDE MONITORING AND LEADING EDGE WHITENOSE SYNDROME SURVEILLANCE

Photo by Jessica Grant

There are 18 species of bats in Wyoming, all of which are insectivorous. Wyoming's bats prey on a wide variety of insects, many of which are considered pests or disease vectors, such as mosquitoes. Many of Wyoming's bats have special conservation status with Game and Fish or with federal agencies; for instance, bats make up 25% of the mammalian Species of Greatest Conservation Need (SGCN) in Wyoming. Because bats are small, nocturnal, cryptic, and volant, they are difficult to study, so large knowledge gaps exist in our understanding of their basic ecology. These gaps include estimates of population size and basic life history strategies that will be needed to support populations through various conservation challenges. Bats have a very slow reproductive strategy, with most species having only one pup each year and individuals of several species capable of living into their 30s. Because of these traits, if populations become depressed for any reason, they are not capable of a rapid recovery.

According to the Western Bat Working Group, the most important conservation challenges facing bats are climate change, habitat loss, persecution, wind energy development, and white-nose syndrome (WNS). These challenges are not evenly distributed across the country, and they affect Wyoming's bats to varying degrees. It is unclear how climate change will affect bat populations in Wyoming, but it has the potential to disrupt important life history events, such as reproduction and hibernation. The effect of habitat loss on Wyoming's bats is difficult to measure as well. We have a basic understanding of habitat use in the state, but population numbers and trends within these habitats are largely unknown. Persecution in Wyoming has not been studied explicitly, and more information is needed to evaluate this potential threat to Wyoming's bat populations. Proper training and education in handling bat human interactions as wildlife conflict, rather than pest control issues, may improve outcomes for both bats and humans. Wind development, which causes mortality by collision and barotrauma, has the largest impact on migratory bats. Mitigation of this threat is difficult on the landscape scale, as migration routes for bats in North America remain largely unknown. WNS is a fungal disease that causes mortality during hibernation, but these impacts may be difficult to observe directly in Wyoming as bats in the state do not hibernate in easily surveyed colonies. In order to assess the impacts of any of these conservation challenges on Wyoming's bat populations, long-term monitoring of these species is necessary; this is the primary responsibility of the bat program within the Nongame Section of Wyoming Game and Fish.

The North American Bat Monitoring Program in Wyoming

The NABat Program is an international, multiagency program that uses four monitoring approaches to

gather data to assess changes in bat distributions and abundance: hibernaculum counts, maternity colony counts, mobile acoustic surveys, and acoustic surveys at stationary points (Loeb et al 2015). Previous capture and roost inventories have laid the groundwork for bat monitoring in Wyoming by establishing species distribution and locating many important roosts. Game and Fish implemented the North American Bat Monitoring (NABat) Protocol on a statewide basis in 2018.

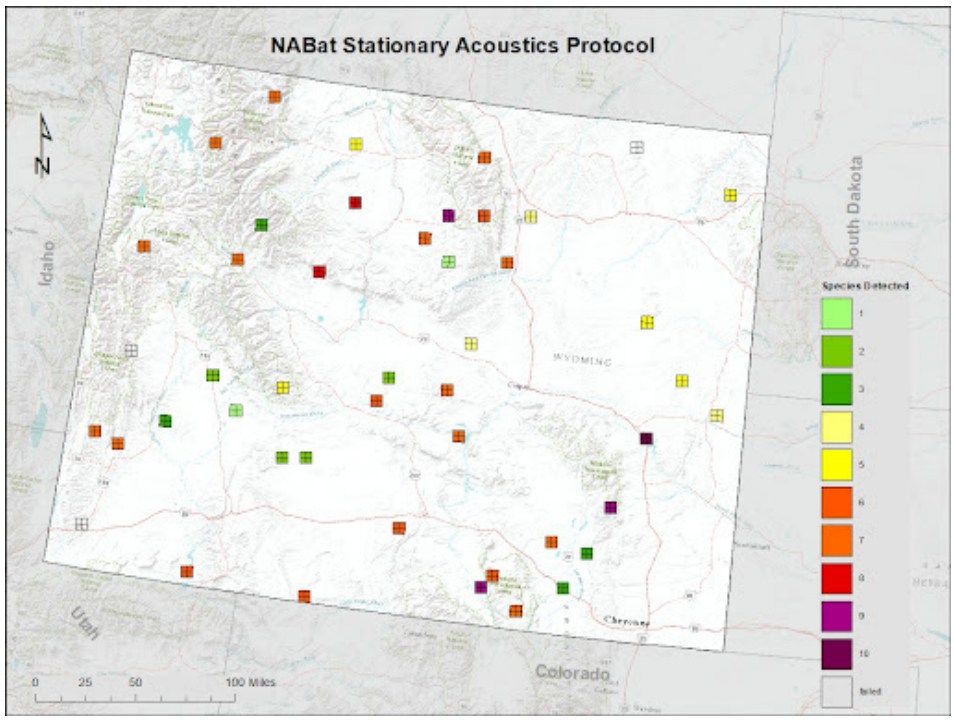


Figure 1. *Pd and WNS status for Wyoming by country and site after 2022 sampling season.*

The acoustic portions of the NABat Protocol gathers bat occupancy data using acoustic techniques. During the summer of 2018, Game and Fish implemented the stationary acoustic survey portion of the NABat Protocol on a statewide basis. Equipment was deployed at the same sites in 2019 -2022 with a few exceptions where permission could not be obtained during a field season. We have continued to add cells using the priority scheme found in the master sampling list, to develop the monitoring effort toward the goal of consistently monitoring 2% of priority cells in the state. In 2022, detectors were successfully deployed at 105 sites at 43 cells (Figure 1). An additional 3 cells failed entirely, 1 due to lack of permission and 2 due to equipment failure, and were not successfully resurveyed (Figure 1). Forty two deployments failed, though the majority of these were successfully resurveyed. We continue to work to mitigate and correct issues that result in failures, such as livestock interference and operator error. Yearly monitoring at these locations will allow Game and Fish, in partnership with the NABat Program, to document changes in bat distribution and activity through time.

The Nongame Section is currently serving the needs of technical support, coordination, data processing, and call analysis for this project. The field implementation of the NABat Program as established in Wyoming relies on the continued effort of regional personnel from state and federal natural resource management agencies. While this use of regional personnel in a large state such as Wyoming is necessary, bat detectors are not generally user-friendly, and few wildlife professionals are trained or experienced in bat behavior or acoustic survey techniques. Thus, it is important that technical support be available to maintain and troubleshoot equipment. Central coordination of survey timing also remains necessary to ensure sites are surveyed at similar times each year and facilitate gear transfer among locations. Per the NABat Protocol, Game and Fish is responsible for classifying calls and uploading all data to the NABat database. Data from this project require considerable time to analyze and should be examined in reference to trends between years as well as species occurrence within cells. The NABat Program will provide continent-wide trend analysis of all submitted data; however, statewide analysis using this dataset is possible as well and may be completed on a five-year basis by the Nongame Section.

The original implementation of this project in 2018 was especially timely, as the fungus that causes WNS was documented in the southeastern corner of the state in the spring of 2018. The NABat Program may provide insight into the effect of the disease on bat populations and community assemblages as it progresses throughout the state (Ford et al 2011). In Wyoming, most of the species currently or suspected to be affected by WNS echolocate in the high frequency

category (above 30kHz), while most of the species that echolocate in the low frequency category (below 30kHz) have not been found to be affected by the disease. This frequency division between WNS-affected and unaffected bat species provides a convenient, though imperfect, method for using acoustic monitoring to assess statewide effects of the disease. Though not all bat calls are of sufficient quality to be assigned to a species, even calls of poor quality can be confidently categorized as either high or low frequency, allowing a relative activity index to be easily and reliably produced. Appreciable changes in this index could indicate a shift in species assemblages as the fungus progresses across Wyoming and increases in prevalence on the landscape.

In addition to tracking trends in species assemblages, the NABat Program will enable detection of changes in species occupancy across the state. Bats in North America face a variety of conservation challenges that can act in combination to exacerbate the negative pressure on populations. Monitoring continued occupancy in known ranges and potential expansion or contraction of populations will allow managers to better serve the conservation needs of this taxon in the face of these combined threats.

White-nose Syndrome Surveillance

WNS is a disease caused by the introduced fungal pathogen *Pseudogymnoascus destructans (Pd)*, that attacks bats when their immune systems are depressed during hibernation. Species occurring in Wyoming that are known to be affected by WNS elsewhere in their range include the Tri-colored bat (*Perimyotis subflavus*), Northern Long-eared myotis (*Myotis septentrionalis*), and the little brown myotis (*Myotis lucifugus*). Tri-colored bat and Northern Long-eared myotis are federally listed species, and the little brown myotis is under review for federal listing. WNS is the major reason for the continuing decline of each of these species nationally. The rest of the Myotis genus are expected to be affected, though some western species have not yet encountered the fungus. Mortality in hibernacula in the East has been reported as high as 99.9% for many colonies. Mortality in the West will be extremely difficult to assess, as less is known about hibernation behavior and habitat of western bats.

Pd surveillance is done by swabbing bats or bat carcasses during or shortly after hibernation, sampling the substrate of winter roosts, or by swabbing active bats in the early spring, often as they return to maternity roosts. Guano samples can also be taken during any of these sampling efforts. All samples are tested for the fungal DNA. Samples directly from bats are preferred, as they have been shown to result in detection of the fungus earlier in the invasion than substrate samples, but the latter allows sampling without disturbing bats during the critical hibernation season or handling them in the early spring, when body condition may still be poor following hibernation. Spring capture for Pd surveillance is an important tool in the effort to manage bats in the face of WNS. Spring capture sites are selected for their potential to yield high numbers of myotis, due to their susceptibility to WNS. In addition to these targeted surveillance efforts, Game and Fish coordinates with the USGS National Wildlife Health Center to test bats submitted for rabies testing for WNS. All bats submitted in this manner for Pd testing must first test negative for rabies. A combination of these sampling measures are employed by Wyoming Game and Fish and partners to monitor the spread of the fungus. The nongame section

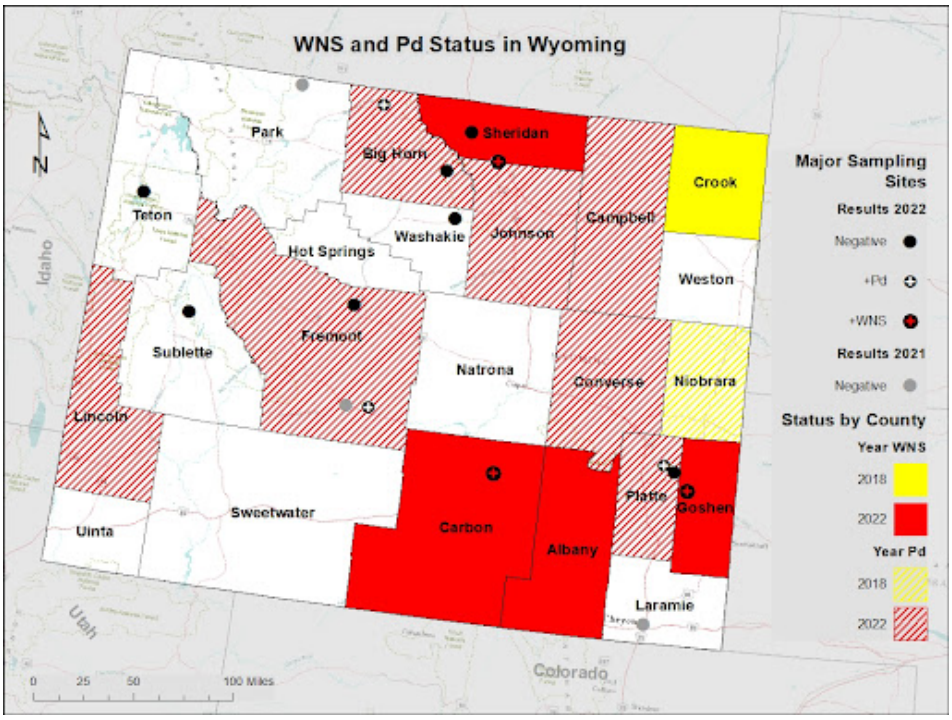


Figure 2. *Cells monitored with the sationary acoustic protocol in 2022, showing number of bat species detected.*

of Wyoming Game and Fish coordinates Pd/WNS in the state, to maximize geographical coverage of this effort and maintain communication between all parties involved and needful of this information. Results are used to make Pd/WNS determinations on a county wide basis. All results contributing to status changes within the state from February 2022- January 2023 are reported here for simplicity.

Status changes across the state resulted from each sampling strategy, demonstrating the need for a diversity of approaches to WNS surveillance. A combination hibernacula and Townsend's Big-eared Bat (*Corynorhinus townsendii*) maternity roost in Platte County tested positive for Pd during winter surveillance (February 2021). A hibernacula in Carbon County tested Pd+ during winter sampling (January 2022), with carcasses from this site collected in the spring confirming WNS mortality (June 2022). This was the first known mortality in the state due to the disease; significant declines were not yet observable in the population during the survey. Lincoln and Albany Counties were found to be Pd+ through sampling of rabies lab bats, with one bat from Albany County showing disease stage WNS. Samples from bridge roosts in Converse, Campbell, and Johnson Counties in the spring tested positive for Pd. Free flying bats in Sheridan County tested positive during spring landscape capture. Results from the two hibernacula sampled were mixed, with one testing negative and one testing positive for Pd. Bighorn and Fremont Counties both have large maternity roosts which tested positive for Pd during spring capture, though at least one site in each county tested negative in the same season.

The 2022 sampling year saw large advancements of the fungus across the state (Figure 2), with the majority of Wyoming counties (13/23) considered Pd or WNS positive at the time of writing. As the statewide sampling effort in 2021 was similar to that in 2022, it is most likely that the 2021-22 winter was the first hibernation season where bats at these sites encountered the fungus. Within the positive counties, the Pd status is mixed with some sites continuing to test negative for the fungus (Figure 2). This mixed status within counties is probably due to the area being recently infected, and highlights the importance of WNS decontamination protocols between sites. Bats spread the fungus most effectively, but natural connectivity between sites is unknown, so it remains important to minimize the potential for movement of the fungus between sites by researchers. Game and Fish will continue to coordinate and conduct surveillance at selected sites statewide as possible to document the spread of WNS and Pd across Wyoming.

Prepared by: Laura Beard
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