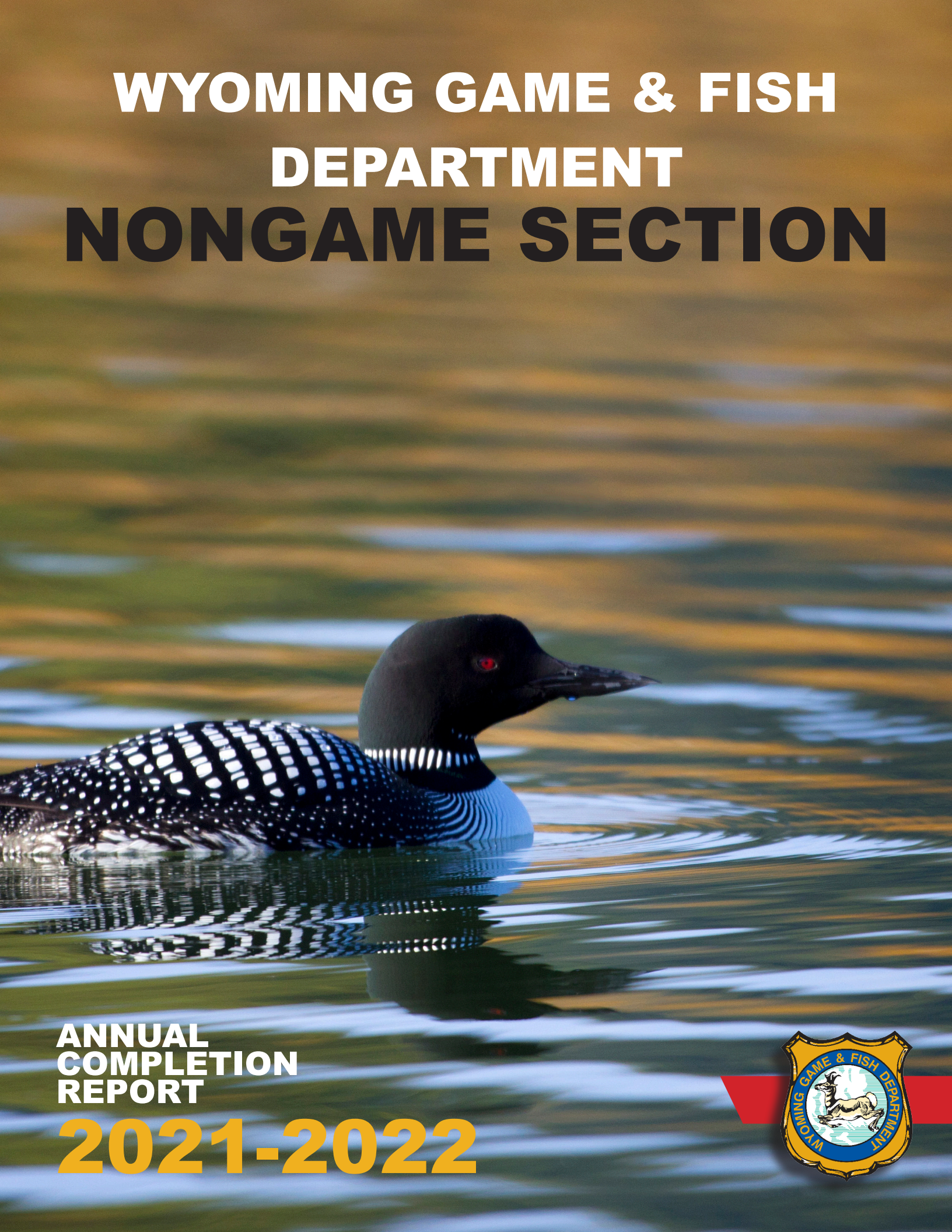
WYOMING GAME & FISH DEPARTMENT

NONGAME SECTION



ANNUAL COMPLETION REPORT

2021-2022

NONGAME SECTION

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The reports included in this document are the annual summaries of current work the Nongame Section has completed from April 15, 2021 - April 15, 2022. If additional information is needed for any of the projects listed in this report, please contact the Nongame Section at (307) 332 - 2688.

Report compiled by: Chelsea Ramage

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LITERATURE CITED

Front and back cover photos: Mark Gocke

TRANSCONTINENTAL TRAVEL: MIGRATION OF WYOMING'S BURROWING OWLS ACROSS NORTH AMERICA

Burrowing owl. Photo: Mark Gocke

Burrowing Owls used to be common across grasslands in the United States and Canada during the summer breeding season. However, in some parts of the owls' breeding range, decades of survey data show that their populations have declined and their distribution has contracted. To understand the reasons why, we also need to know where Burrowing Owls spend the winter months and their migration routes between their breeding grounds and wintering grounds.

The Burrowing Owl is an uncommon summer resident in Wyoming (Orabona et al. 2021). It is classified as a Tier I (high conservation priority) Species of Greatest Conservation Need in the Wyoming State Wildlife Action Plan with a Native Species Status of Unknown (NSSU; WGFD 2017). The reasons for this listing include currently unknown population trends, habitat loss or a decline in the quality of habitat, and land use practices that may be incompatible with the owls.

One potential cause of declines is the elimination of prairie dogs across the owls' range. All year-round, Burrowing Owls need prairie dog burrows for nesting sites, shelter, and to escape from predators. Other potential causes of declines include control of grasshopper outbreaks (an important food item), changes in prairie dog populations due to the disease plague (thus, fewer burrows available for the owls), or problems along the owls' migration routes or on their wintering grounds.

To address knowledge gaps, the Wyoming Game and Fish Department became a partner in a regional Burrowing Owl study that includes 12 states and 3 provinces. The purpose of this collaborative study is to document the migration routes and wintering areas of owls that breed in the western United States and Canada. Since 2013, 125 Burrowing Owl adults and 3 juveniles have been captured on their breeding grounds across the region and fitted with solar-powered transmitter backpacks so biologists can follow their seasonal movements. We call this a full annual cycle conservation project.

In 2021, we received nest site locations (potential trapping sites) and voluntary field assistance from 21 contributors representing project donors, state and federal biologists, private landowners, community members, photographers, writers, conservation

organizations, the oil and gas industry, and the coal industry. We received funding from 6 outside sources in 2021, for which we are extremely grateful.

We trapped Burrowing Owls during 7 days (25 June-1 July) at 20 nest sites in 5 locations: south of Pinedale (BLM), Chain Lakes Wildlife Habitat Management Area (WHMA)/Stratton Road (northwest of Rawlins), north of Casper (private land), east of Cheyenne (private land), and the Leucite Hills Mine (private land). We captured Burrowing Owls in 4 of the 5 locations.

We used 3 types of traps to capture owls—a 2-way trap on female nest burrows, a 2-way MP3 player trap on male burrows (the MP3 played the male's "coo-coo" territorial call), and a bow-shaped spring trap baited with a live mouse in a wire cage. We caught owls in all 3 types of traps.

We had 32 total captures of 31 individual Burrowing Owls: 27 adults (14 males and 13 females, 1 of which escaped and was recaptured) and 5 juveniles. We attached a uniquely numbered federal leg band on each captured owl, and put a solar-powered PTT satellite transmitter backpack unit on 24 owls (14 males and 10 females), including 7 pairs where both the male and female of the pair were transmittered. Juvenile owls ranged in age from about 13-21 days old.

To date, we have results of the fall and spring migration for the transcontinental project through the 2021 fall migration (Figure 1). We received infrequent locations during the winter because of the shorter day-lengths and more overcast skies, but we see increased action in the spring as the days get longer, the solar-powered transmitters recharge, and the owls begin their northward migrations back to their breeding grounds.

A Burrowing Owl is fitted with a PTT transmitter. Photo: Mark Gocke

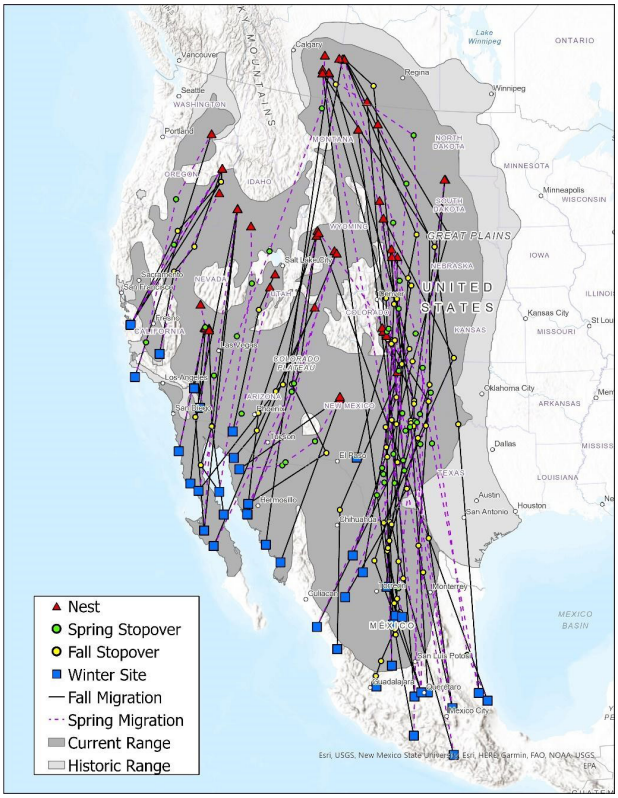


Figure 1. *Nesting sites, fall and spring migration routes, and wintering locations of transmittered Burrowing Owls across the transcontinental area through fall 2021.*

MIGRATION HIGHLIGHTS

4 of the transmittered Burrowing Owls started their 3 of the transmittered Burrowing Owls started their fall migration movements on 4 October 2021—a female from south of Pinedale, a female from the Chain Lakes WHMA, and a male from Stratton Road.

On 13 and 14 October 2021, 6 owls were actively engaged in fall migration—1 was in southern Wyoming, 2 were in Colorado, 1 was in Oklahoma, 1 was in Arizona, and 1 was in Texas.

On 19 October, 7 owls were actively engaged in fall migration—1 was in Colorado, 2 were on New Mexico, 3 were in Arizona, and 1 was in Mexico near the Salton Sea (the first to arrive in Mexico after a direct flight from southwestern Wyoming).

Between 5 and 19 November 2021, 1 owl was in Colorado, 2 were in Arizona, 2 were in Utah, 2 were in California (the first time Burrowing Owls from Wyoming wintered in California), and 5 owls were in Mexico.

On 13 December 2021, a female from the Chain Lakes

WHMA migrated into the southern state of Oaxaca, Mexico, the farthest south that a Burrowing Owl from the U.S. has ever been documented migrating (Figure 2).

A female owl transmittered in 2020 in the Boulder area crossed over the Rocky Mountains in Colorado on her 2020 fall migration (a first in this tri-national study), and was the first owl in this study to winter on the east coast of Mexico near Veracruz. In spring 2021, she returned to her 2020 breeding area in Wyoming. In fall 2021, she again successfully crossed the Continental Divide in Colorado and wintered in her same location on the east coast of Mexico. This shows site fidelity to both breeding and wintering areas (Figure 3).

Thus far, for Burrowing Owls that breed in Wyoming, the timing and length of migrations and stopovers varies; parts of Arizona, Colorado, Kansas, Oklahoma, Texas, and Utah are key migratory stopover hotspots, and several locations in Mexico are important wintering grounds, including the west coast of Sonora, the east coast of Veracruz, and several states in the central portion of the country.

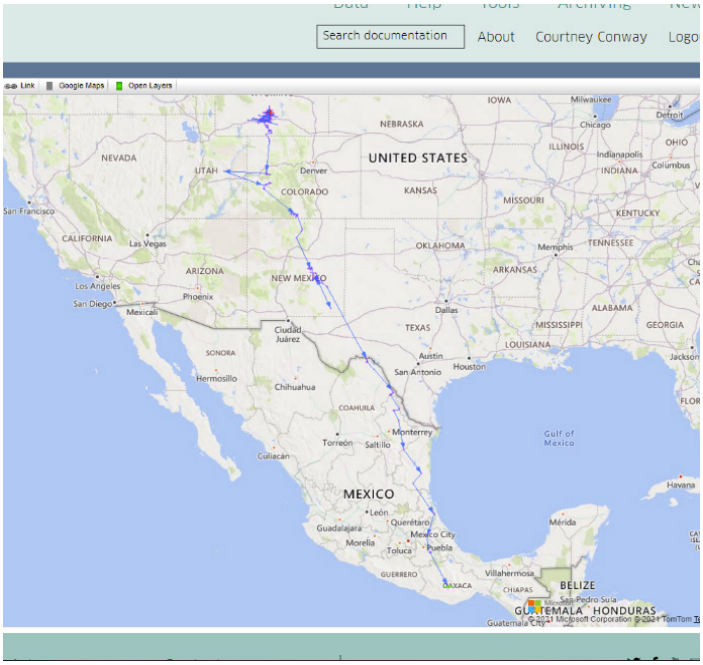


Figure 2. *Female Burrowing Owl that nested on the Chain Lakes WHMA and that took a 69-day migration to winter in the southern state of Oaxaca, Mexico, the farthest south that a Burrowing Owl from the U.S. has ever been documenting migrating.*

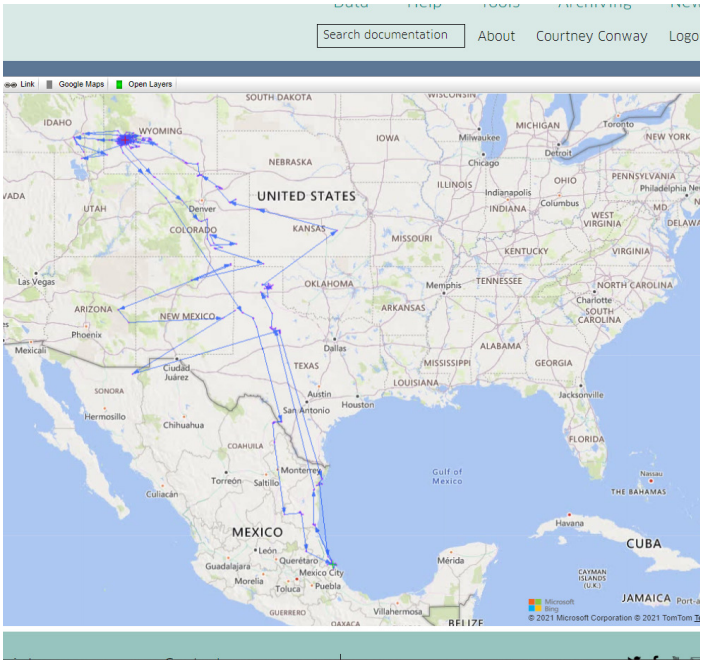


Figure 3. *Full annual life cycle travels of a female Burrowing Owl captured in 2020 on BLM land southwest of Boulder, Wyoming. In 2020 and 2021, she crossed over the Rocky Mountains Continental Divide during spring migration, wintered on the east coast of Mexico near Veracruz, and nested at the same location in Wyoming. This owl shows site fidelity to both breeding and wintering grounds.*

Prepared by: Andrea Orabona, Nongame Bird Biologist and Dr. Courtney Conway, USGS University of Idaho Cooperative Fish and Wildlife Research Unit
Funding sources: Wyoming Game and Fish Commission, Bureau of Land Management (BLM) Pinedale Office, Antelope Coal/Navajo Transitional, Great Plains Wildlife Consulting, Vince Semonsen, Caryn Talbot Throop, anonymous donor

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

The Trumpeter Swan (swan) is an uncommon resident in Wyoming (Orabona et al. 2021). 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; WGFD 2017). In 1989, the Tri-State Area Flock (TSAF; Wyoming, Montana, and Idaho) was petitioned for listing as a Distinct Population Segment (DPS) under the Endangered Species Act. However, in 2003, the US Fish and Wildlife Service (USFWS) determined that listing was not warranted because the Tri-State Area flock did not represent a DPS (USFWS 2003).

Trumpeter Swans have been a focal management species for federal and state agencies in the Greater Yellowstone Area (GYA) or the Tri-State Area since the establishment of Red Rock Lakes National Wildlife Refuge in Montana in 1932. This refuge was created to conserve about 70 swans in the GYA, which were believed to be the last remaining Trumpeter Swans in the world. Due to conservation efforts, the number of swans in the GYA increased to >600 by the 1950s (USFWS 1998). However, the population has fluctuated greatly since that time, dropping to a low of 239 white birds (adults and subadults) in 1994. The total number of adult birds in the GYA exceeded 500 white birds in 2015 for the first time since 1967 (Olson 2020). This non-migratory segment of the population remains of concern, even though Trumpeter Swan populations in Alaska, interior Canada, and the mid-western states have been increasing (Groves 2012).

The Pacific Flyway Council (PFC) coordinates management of this swan population and designated swans that nest and reside year-round in the GYA, including western Wyoming, as the TSAF. The TSAF are managed as part of the US segment of the Rocky Mountain Population (RMP) of swans, which includes those that nest in interior Canada and migrate south to winter in the GYA (USFWS 1998). The Wyoming Game and Fish Department (WGFD) coordinates with the USFWS Mountain-Prairie Region Migratory Bird Office and the states of Idaho and Montana to census the number of mature swans and young of the year (cygnets) in the TSAF. Since the late 1980s, the WGFD has worked to expand summer and winter distribution of swans in Wyoming (Patla and Oakleaf 2004). These efforts have established a new nesting population in

A pair of adult trumpeter swans and their cygnets. Photo: USFWS

the Green River Basin. Since 2004, the WGFD has cooperated with willing landowners to restore and create summer habitat in the Upper Green River Basin to accommodate this expanding resident flock (Patla and Lockman 2004, Lockman 2005).

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. The Working Group meets annually to discuss productivity and population trends and to coordinate management actions. Wyoming also coordinates with the PFC RMP Trumpeter Swan Study Sub-committee.

This report summarizes management and monitoring efforts for swans in western Wyoming for the 2021 nesting season. We conducted 3 fixed-wing airplane surveys to collect swan data, and used the same pilot (Mark Packila, Wildlife Air) and Scout aircraft to fly

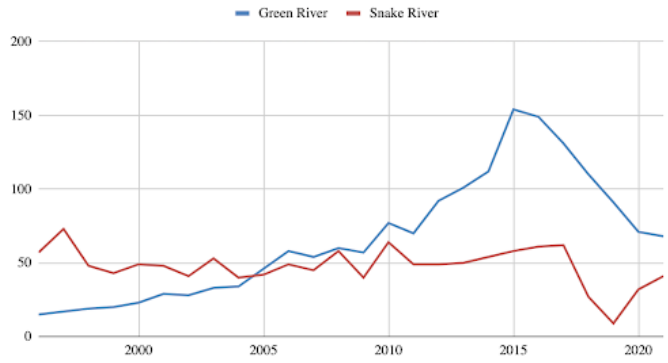


Figure 1. *Trumpeter Swan population trend for the core Snake River and Green River expansion areas. This does not include Snake River and other expansion areas.*

all surveys. Some incidental ground sightings were also included in the data. Flying elevation averaged 100-230 feet above ground level depending on terrain and surface winds; flight speed varied between 85-100 mph. We counted white birds (adults and subadults) and gray cygnets (young).

We surveyed swan nesting areas on May 27, 2021 to determine nest occupancy. We checked 52 core/Snake River territories and 90 expansion sites. Figure 1 presents 2021 results from the core/Snake River area and Green River expansion area (other expansion areas, e.g., the Salt River and Wind River, are not included).

On July 8-12, we surveyed the previously occupied nests for productivity and counted the number of young (cygnets) fledged.

The fall survey was coordinated by USFWS in the Tri-State Area. On 27 September 2021, we flew the Wyoming portion of the fall survey. We counted 124 white birds and 47 cygnets in the WGFD portion of the fall survey (not including Yellowstone National Park, but including the Central Flyway portion of Wyoming). We counted in the core/Snake River area a total of 41 white birds and 19 cygnets, and in the full expansion area 83 white birds and 28 cygnets.

In addition to the primary flights, swan data were collected or provided through site-specific ground surveys, reports provided by 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 2022).

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 our attention, including climate change, drought, diseases, an increase of wintering swans, and human developments and disturbance.

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

SUMMARY OF PEREGRINE FALCON MONITORING IN WYOMING


Photo by Amy Anderson

Peregrine Falcon (Falco peregrinus; hereafter peregrine) is an uncommon summer resident bird of prey found throughout most of Wyoming (Orabona et al. 2021). The species primarily nests in cliff and ledge habitats with proximity to open areas for foraging. Nesting peregrines were nearly extirpated from Wyoming in the 1970's largely due to organochlorine pesticides commonly used in agriculture and forestry practices from approximately 1940 through the 1970's. These pesticides bioaccumulated at toxic levels in their prey species and consequently reduced peregrine eggshell thickness such that nesting success rates declined significantly (White, et. al 2020). In 1970, the Peregrine Falcon was listed as Endangered under the 1969 Endangered Species Conservation Act (subsequently the 1973 Endangered Species Act) and also afforded legal protection under the 1972 Migratory Bird Treaty Act.

Efforts to breed and release peregrines throughout North America commenced in the late 1960's and regional recovery plans were developed after the species was listed, highlighting the need to significantly reduce organochlorine pesticide use. From 1978-1983, no known nesting pairs were located in Wyoming. However, from 1980-1995, 384 captive produced young were released in Wyoming (Oakleaf and Craig 2003, Enderson et al. 2012, Baril et al. 2015). In 1984, the first nesting pair was documented and by 2015, there were at least 121 known nesting territories in Wyoming, primarily in the western and central portions of the state. Peregrine Falcon was delisted at the national level in 1999.

The Wyoming Game & Fish Department (WGFD), Yellowstone National Park (YNP), and Grand Teton National Park (GTNP) continued monitoring peregrine nesting success through 2015 using a standard raptor monitoring protocol and terminology (Steenhoff and Newton 2007), as well as components of the US Fish and Wildlife Service (USFWS) post de-listing protocol (Green et al. 2006). Five general survey areas were monitored: YNP; Bridger-Teton National Forest, GTNP, and adjacent areas; and the Shoshone and Bighorn National Forests and adjacent areas. Said efforts included occupancy and production surveys. Fledging dates, when possible, were documented. Subsequent to these efforts, annual monitoring sites were chosen for each geographic region.

Efforts to monitor peregrine nesting success were warranted beyond 2015 due to the significant investment for recovery, continued high public interest, potential risks from diseases like West Nile Virus, other potentially detrimental compounds that have the potential to become concentrated in the food chain such as brominated flame retardants (Baril, et al. 2015) and other organochlorine contaminants in

peregrine prey (DeWeese 1986). Currently, WGFD designates Peregrine Falcon as a Species of Greatest Conservation Need with a Native Species Status 3 (NSS3), Tier 2 (moderate conservation priority). The reasons for this listing include disturbances associated with human activity, potential for chemical poisoning, extreme wet and dry climatic events, and inclement weather during the nesting and nestling periods (WGFD 2017).

To facilitate clarity in reporting, data for four regional survey areas are presented: GTNP, YNP, Western Wyoming, and Central Wyoming. Each include five annual monitoring sites. A variable number of additional sites in all regional survey areas are visited each year and important for future efforts in the event an annual monitoring site must be replaced due to peregrine abandonment, access issues associated with the nesting site, or to document newly established nesting locations. A summary of 2021 survey efforts is presented below, followed by a 2021 productivity summary by regional survey area. Location specific data for annual monitoring sites in YNP is not available for 2021; however, a summary of this area's monitoring efforts and productivity is discussed below.

2021 PEREGRINE MONITORING RESULTS

Sixty nesting sites were visited during 2021. Of that total, eight were not occupied and occupancy for five sites was unable to be determined, likely due to timing and duration of survey. A total of 63 young were documented at occupied sites. Four sites monitored in 2021 are newly documented sites; one of them produced two young and the remaining three produced one young each. Efforts will be made to visit these sites during the 2022 breeding season.

Observers visited 14 of the Western Wyoming, Central Wyoming, and GTNP annual monitoring sites in 2021. 10 were occupied and produced 16 young (Table 1). One Western Wyoming site was not monitored to protocol, but produced young the previous four years. Another Western Wyoming site was not visited. Efforts will be made to monitor both aforementioned sites to protocol in 2022. 21 additional peregrine nesting sites were visited during 2021 outside YNP. Seventeen were occupied and 25 young were observed. Yellowstone National Park monitored 24 sites; of those, 19 were occupied and 22 young were fledged.

Regional Survey Area	Young per Occupied Monitoring Site	Number of Sites Monitored
Central Wyoming	1.7	5
GTNP	0.75	5
Western Wyoming	2.7	4
YNP[1]	1.2	24
Additional Sites	1.3	35
Average Young/Site per Year[2]	1.6	--

Table 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.

2021 PEREGRINE PRODUCTIVITY

Young per occupied monitoring site was calculated for survey year 2021 (Table 2). While GTNP productivity numbers are lower than other regional survey areas, they are included in the survey wide average. WGFD does not have detailed information about GTNP specific nesting sites and associated data that may provide details about low productivity numbers. Additional information from GTNP will be sought, given five of the six sites were occupied in 2021.

Research suggests when productivity rates average

Regional Survey Area	Young per Occupied Monitoring Site	Number of Sites Monitored
Central Wyoming	1.7	5
GTNP	0.75	5
Western Wyoming	2.7	4
YNP[1]	1.2	24
Additional Sites	1.3	35
Average Young/Site per Year[2]	1.6	--

Table 2. *Young per occupied monitoring site for regional survey areas and additional sites, 2021.*
[1] Calculation includes all occupied sites (n=19).
[2] Calculation does not include Additional Sites

between 1.0 and 2.0 young per occupied territory, populations are stable to increasing (USFWS 2003). 2021 survey wide productivity appears to be influenced by the Western Wyoming regional survey area's number of young observed. Conversely, the lack of young observed at GTNP occupied sites may have influenced survey wide productivity, despite adequate annual sites visited (n=5). WGFD intends to determine whether current monitoring efforts require adjustments going forward.

In summary, we recommend continuing surveys for annual monitoring sites in each of the four regional survey areas in conjunction with multiple agencies and a variety of experienced and committed observers. Observers should be provided with site specific information to ensure that occupancy and productivity data are as accurate as possible. Observers should still plan on at least 1 day in July to record nesting success, and preferably, conduct additional site visits prior to a site's calculated mean fledging date. We also recommend continued efforts to document nesting success at additional known sites throughout the state. We wish to thank the many highly experienced volunteers, active and retired biologists from the Wyoming Game & Fish Department, Yellowstone National Park, Grand Teton National Park, Bighorn National Forest, Bridger-Teton National Forest, Caribou-Targhee National Forest, Shoshone National Forest, and other resource management agencies for their valuable contributions to monitoring peregrine nesting locations. The continued dedication of these individuals and agencies to this monitoring effort makes it possible to collect long-term peregrine production data in Wyoming.

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


Bald Eagle. Photo: USFWS

BALD EAGLE MONITORING IN WESTERN WYOMING

The Bald Eagle is an uncommon resident in Wyoming (Orabona et al. 2021). 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 (WGFD 2017).

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, 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 the northwestern part of the state have long been recognized as part of a distinct population that nests in the Rocky Mountain west. This genetically distinct population extends into Idaho and Montana (Swenson et al. 1986). Management guidelines have been developed for nest sites in the GYA based on a long-term ecological study, and provide valuable information for avoiding disturbance to nesting eagles (GYBEWG 1996). Recovery of the species in Wyoming centered on the Jackson area, beginning in the 1980s. The numerous territories located along the Snake River continue to serve as a source of Bald Eagles for other areas of the GYA and other parts of Wyoming (Harmata and Oakleaf 1992). Since 2000, we have also documented a substantial increase in the number of pairs that nest in the Green River Basin.

In 2021, we conducted aerial surveys over portions of western Wyoming to monitor occupancy and productivity at a majority of known Bald Eagle nesting territories. Fixed-wing aircraft surveys were conducted in early April to document the number of occupied sites with incubating adults, and in late May and early June to determine number of mature young produced per site. Due to the COVID-19 pandemic, passengers were not allowed onboard the aircraft. However, our long-term pilot for these surveys, Mark Packila, is familiar with these nesting territories and was able to conduct all the work and collect necessary data for the WGFD. During aerial surveys, he recorded

Nesting data collected in 2021	Results
Territories checked for occupancy (*n*)	153
Territories occupied (*n*)	86
Percent of territories occupied	78%
Territories unoccupied (*n*)	25
Percent of territories unoccupied	16%
Territories with unknown status (*n*)	42
Percent of territories with unknown status	27%
Pairs that initiated nesting (*n*)	82
Percent of pairs that initiated nesting	95%
Pairs that failed (*n*)	14
Percent of pairs that failed	17%
Pairs with unknown status (*n*)	11
Percent of pairs with unknown status	13%
Pairs that produced young (*n*)	54
Percent of pairs that produced young	66%
Mature young produced (*n*)	86
Number of young per successful nest	1.59

Table 1. *Summary of Bald Eagle nesting data collected in 2021.*

the number of adult and young Bald Eagles observed, UTM coordinates of nests, condition of nests, and species of nest tree.

The Army Corp of Engineers requests nest site data on the Snake River adjacent to the dike system in order to schedule maintenance projects, and provides funding for this aerial survey work.

We evaluated the 2021 nest sites for occupancy and productivity (Table 1). Of the 153 nest sites checked, 86 were occupied with 1 or more adult birds, 25 were unoccupied, and the status of 42 nests were unknown. Of the 86 occupied nests, 82 pairs initiated nesting, 14 pairs failed, and the status of 11 pairs was unknown. Of the 82 pairs that initiated nesting, 54 pairs produced a total of 86 young. The number of young produced per successful nest was 1.59. The 2021 nesting data for the GYA indicate that current productivity (the number of young produced per occupied site) is within the historic range (GYBEWG 1996).

In the future, additional surveys may be needed in areas where energy developments (oil, gas, and wind) occur or are proposed along major drainages or known migration routes and wintering areas. In areas undergoing high levels of development along major river corridors, we hypothesize that Bald Eagles could experience higher mortality rates, lower productivity, or loss of nest sites if adequate mitigation measures are not applied. In addition, aging stands of cottonwood trees that are failing to regenerate may also reduce nesting habitat in some areas.

Immature Bald Eagle. Photo: USFWS

Prepared by: Andrea Orabona, Nongame Bird Biologist
Funding sources: US Army Corps of Engineers and the Wyoming Game and Fish Commission

COMMON LOON RESEARCH AND MONITORING IN WYOMING

Common Loon. Photo: Mark Gocke

The Common Loon (loon) is an uncommon summer resident in Wyoming (Orabona et al. 2021). It is classified as a Species of Greatest Conservation Need (SGCN) with a Native Species Status 1 (NSS1), Tier I (highest conservation priority) in the Wyoming State Wildlife Action Plan (WGFD 2017). Loons in Wyoming have an extremely small and isolated breeding population that is at risk of extirpation, are very sensitive to human disturbance, and have very limited and specific breeding habitat. Common Loon nesting sites in Wyoming are currently restricted to the Greater Yellowstone Ecosystem (GYE), making this the rarest breeding bird species in the state. Since 1987, biologists with the Wyoming Game and Fish Department (WGFD) Nongame Section and Yellowstone National Park (YNP) have been monitoring Common Loon occupancy and productivity in nesting areas within the GYE. This continues to be a cooperative effort in conjunction with personnel from the Caribou-Targhee National Forest (CTNF), Bridger-Teton National Forest (BTNF), Grand Teton National Park (GTNP), Biodiversity Research Institute (BRI), and Rickett's Conservation Foundation (RCF).

The GYE Common Loon population has historically been about 21-23 territorial pairs. Some territories are not occupied every year, some territorial pairs use multiple lakes, and other pairs may not nest (Evers et al. 2019). To address multiple and complex issues with loon management and conservation in the GYE, a collaborative and comprehensive partnership began in 2013 with representation from the WGFD, YNP, CTNF, BTNF, GTNP, BRI, and RCF to investigate and understand the status of the Common Loon population, assess threats to loon survival and reproduction, and inform management actions. In 2019, the Shoshone National Forest (SNF), Wind River Indian Reservation (WRIR), and Idaho Department of Fish and Game were included in this working group to further accomplish

Number of territorial pairs identified	Number of territorial pairs that nested	Number of nesting pairs that produced chicks	Number of chicks produced by nesting pairs	Number of chicks that survived to 6 weeks of age (fledging)	Total chicks surviving per territorial pair
26	21	14	23	22	0.85

Table 1. *Greater Yellowstone Ecosystem Common Loon survey data collected by Ricketts Conservation Foundation researchers from 9 May through 26 August 2022 (Leavitt et al. 2021).*

annual loon population and conservation objectives.

Starting in 2012, BRI has aimed to better define loon territories, locations of nest sites, and reproductive success using shoreline, boat, and aerial surveys and the deployment of audio and visual recording equipment (Brown et al. 2021). From 2013-2019, 20 adult and 13 young loons were captured and sampled (including 5 adult recaptures and 7 chicks that were too young to band), and 8 adult loons were fitted with geolocators to calculate the loon's approximate location (latitude and longitude) and identify approximate migration routes and wintering areas (Evers et al. 2019).

In 2021, RCF researchers conducted Common Loon monitoring across the GYE from 9 May through 26 August (Leavitt et al. 2021; Table 1). A total of 26 territorial pairs nested and 22 chicks survived to fledging age (6 weeks), making 2021 the highest count to date for these data (Figure 1).

Two of the 21 nesting pairs used nest rafts and successfully hatched loon chicks, and 11 of the nesting pairs benefitted from specific lake closures to human presence, producing 9 of the 22 surviving chicks (Leavitt et al. 2021). Nest failures were documented at 8 territories; human disturbance is suspected to be the cause in many cases (Leavitt et al. 2021). Unpaired adults were observed across the population, comprising 12% of the individual loons observed in the GYE population (Leavitt et al. 2021).

RCF researchers also deployed 15 trail cameras to determine human compliance with nesting lake closures (with 42% of loon territories in the GYE covered by specific closures), monitor loon response to the presence of humans, and track nesting phenology (Leavitt et al. 2021). Of the 22 loon chicks that survived to fledging age, 41% were from territories with specific nesting lake closures; therefore, it appears that closures help loons successfully hatch chicks across the GYE (Leavitt et al. 2021).

In YNP, RCF researchers attempted nocturnal captures at 3 territories, with 2 males being successfully captured and samples of blood, feathers, and fecal matter collected for health assessments (Leavitt et al. 2021).

RCF staff also documented loon presence in the Wind River Range, including the first nesting pair since 1987 (Leavitt et al. 2021).

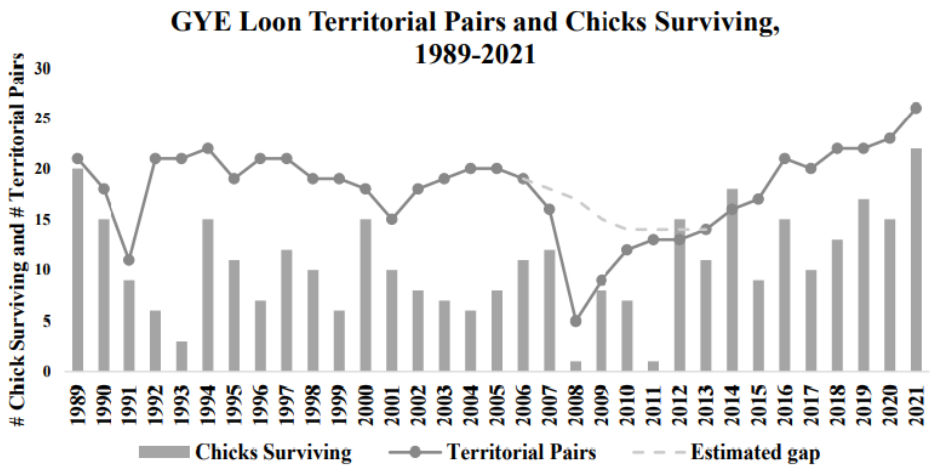


Figure 2. *Observed GYE Common Loon territorial pairs and chicks surviving, 1989-2021. The "estimated gap" is the presumed pair count in years where no, very few, or inconsistent loon surveys were conducted. From Leavitt et al. 2021.*

For more information on Common Loon research and management, contact the WGFD Nongame Section at the Lander Regional Office.

Prepared by: Andrea Orabona, Nongame Bird Biologist
Funding Sources: Biodiversity Research Institute, Ricketts Conservation Foundation, Wyoming Game and Fish Department, Yellowstone National Park

USING THE BREEDING BIRD SURVEY TO MONITOR POPULATIONS OF AVIAN SPECIES IN WYOMING

The Breeding Bird Survey (BBS) has provided long-term monitoring of a variety of avian species in Wyoming since 1968. The BBS is used to monitor trends of breeding birds across North America. The BBS is sponsored jointly by the United States Geological Survey (USGS) Patuxent Wildlife Research Center (PWRC) and the Canadian Wildlife Service. This roadside survey methodology was field tested in 1965 and formally launched in 1966, with 600 routes established in the United States east of the Mississippi River and in Canada (Sauer et al. 1997). In 1967, the BBS spread to the Great Plains states and prairie provinces. By 1968, about 2,000 BBS routes were set up across southern Canada and the contiguous 48 states, and more than 1,000 routes were surveyed annually; establishment of Wyoming's routes were included in this effort. During the 1980s, the BBS expanded further into Alaska and Canada's Yukon and Northwest Territories, and additional routes were added in many states. Today, over 4,600 BBS routes are located across the continental United States and Canada, including 108 active routes in Wyoming (Figure 1).

Red-breasted Nuthatch. Photo: Frank Stetler

The BBS was designed to provide a continent-wide perspective of avian population change. All routes have been randomly located in order to sample habitats that are representative of the entire region. Other requirements are needed to produce comparable data over time (consistent methodology, observer expertise, visiting the same stops each year, and conducting surveys under suitable weather conditions; Sauer et al. 1997). A large sample size (i.e., number of routes conducted) is needed to average local variations and reduce the effects of sampling error (i.e., variation in counts attributable to both sampling technique and real variation in trends).

BBS data can estimate population trends and relative abundance of individual species at continental,

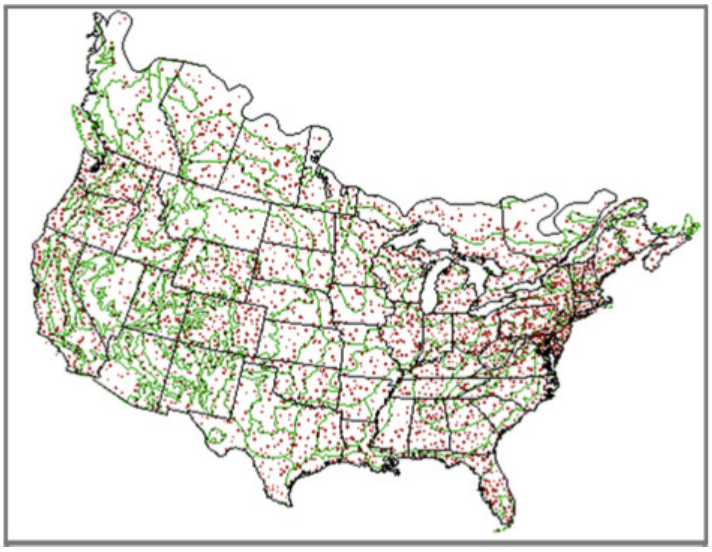


Figure 1. *Location (red dots) of all Breeding Bird Survey routes in the United Statesand Canada (Sauer et al. 1997).*

regional, statewide, and physiographic region scales. The most effective use of BBS data is to analyze population change on survey routes; however, these data do not provide an explanation for the causes of population trends. To evaluate population changes over time, BBS indices from individual routes are combined to acquire regional and continental estimates of trends (Sauer et al. 1997).

Due to the scope of the BBS effort, there is always a lag time between data submittal by observers and data release from USGS PWRC. Typically, observers are instructed to submit data as soon as possible after conducting a route, either online or by mail; an August 31 deadline is mandated in an observer's survey packet. Despite the BBS's best efforts, final data from the survey year immediately preceding is usually not available in time to meet Wyoming Game and Fish Department (Department) spring reporting deadlines. Furthermore, BBS trend analysis is not always released on an annual basis. This year's reporting includes information for survey year 2021 and does not include trend analysis.

Mountain Bluebird. Photo: USFWS

Volunteers are instructed to conduct BBS routes during the height of the avian breeding season when birds are most vocal. This is typically during the month of June, although routes in higher elevations can be conducted through the second week of July. Each route is 24.5 miles long and consists of 50 stops spaced at 0.5 mile intervals along the route. Beginning 0.5 hour before sunrise, observers record birds seen within a 0.25 mile radius and all birds heard at each stop during a 3-minute count period. Each BBS route is surveyed once annually, and data are submitted to the USGS PWRC for analysis.

2020 RESULTS

Due to the Covid-19 pandemic, Breeding Bird Survey routes wre not surveyed in 2020 due to public health safety concerns.

2021 RESULTS

Data includes 59 of the 60 routes due to delayed data submittal for one survey. Observers detected 28,815 individual birds representing 191 species in Wyoming. Since 1990, the number of individual birds detected has decreased by 3.8 individuals per route per year, while the number of species detected has increased by 0.11 species per route per year. Consistent with the first trend, the number of individuals detected per route in 2021 (506 individuals) was slightly less than the average number of individuals detected per route from 1990-2019 (521 individuals). However, the number of species detected per route in 2021 (40 species) was slightly greater than the mean number of species detected per route from 1990-2019 (38 species). The pending 2021 dataset will be available at the BBS website: https://www.pwrc.usgs.gov/BBS/RawData/. The most current final dataset contains information for surveys conducted through 2019 (Pardieck et al. 2020).

BBS TREND ANALYSIS

Trend analysis is not yet available for survey data through 2021. The most recent published analysis is for data through 2019 and was reviewed in last year's report with an emphasis on Wyoming's Species

of Special Concern (SGCN) (Sauer et al. 2019). Regardless, future BBS trend analysis will continue to contribute the Department's recommendations for monitoring of SGCN, especially those exhibiting significant population declines at the state level. Additional regional and local datasets will also be consulted as a component of ensuring which Wyoming avian species and their associated habitats warrant further investigation by the Department. These trends also contribute to future decisions about which avian species will be included on the SGCN list in Wyoming's State Wildlife Action Plan (WGFD 2017).

The Wyoming Game and Fish Department Commission provided funding in part for this project, for which we are extremely grateful. We would like to thank the many volunteers and biologists from this and other natural resources management agencies for their valuable contributions to the 2021 Breeding Bird Survey. The continued dedication of these individuals and agencies to this monitoring effort makes it possible to collect long-term population trend data on numerous avian species in Wyoming.

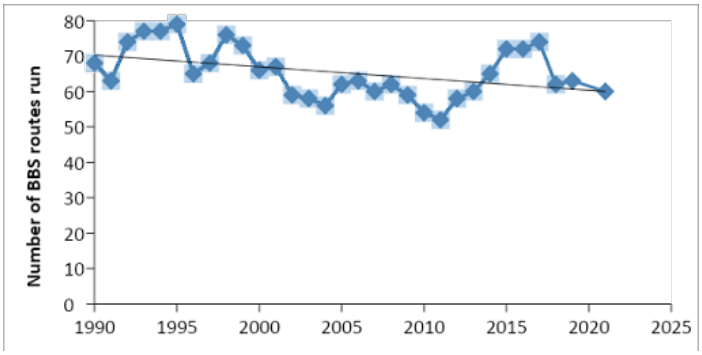


Figure 2. *Number of Breeding Bird Survey routes completed in Wyoming 1990-2021. The black trend line is shown for reference.*

Female Northern Cardinal observed during the 2021 Meeteetse Breeding Bird Survey route. Photo by Frank Stetler.

In closing, the consistent recruiting and retainment of knowledgeable volunteers to conduct active routes is critical to ensuring the future success of the Breeding Bird Survey and our ability to continue to adequately monitor Wyoming populations of breeding birds along roadside surveys.

Prepared by: Courtney Rudd, Nongame Biologist; United States Geological Survey – Patuxent Wildlife Research Center
Funding Sources: Bureau of Land Management Cooperative Agreement, Bureau of Reclamation Cooperative Agreement, National Park Service Cooperative Agreement, United States Fish and Wildlife Service Cooperative Agreement, United States Forest Service Cooperative Agreement, and the Wyoming Game and Fish Commission

WYOMING BIRD RECORDS COMMITTEE: SUMMARY OF REPORTS REVIEWED IN 2020


Curved-bill Thrasher. Photo: Laurel Armstrong

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:

1) To solicit, organize, and maintain records, documentation, photographs, audio recordings, and any other material relative to the birds of Wyoming.

2) To review records of new or rare species or species difficult to identify and offer an intelligent, unbiased opinion of the validity or thoroughness of these reports. From these reviews, the WBRC will develop and maintain an Official State List of Birds in Wyoming.

3) To 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. During 2021, a continued effort was made by the WBRC to encourage birders to prepare and submit rare bird forms due to the frequent eBird postings of rare and unusual bird sightings in Wyoming. The Cornell Lab of Ornithology oversees eBird, a citizen science-based website for avian observations worldwide. During 2021, the eBird platform continued to experience a notable increase (37%) of observers submitting data, as well as an increase (15%) in checklists submitted. Checklists are subsequently reviewed by regional experts. During 2021, four of the five voting WBRC members were Wyoming eBird reviewers. While more rare bird records were reviewed by the WBRC during 2021 than the previous year, more than 50 records were submitted late in 2020 and not reviewed until early 2021.

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

Painted Bunting at a backyard water feature in residential Lander. This species is one of the 157 species currently on the 'All Sightings' list. Photo by Frank Stetler.

As of 31 December 2021, the WBRC has reviewed 1,711 reports of rare and unusual birds in Wyoming. A total of 1,396 (82%) have been accepted and 315 (18%) have not been accepted. A total of 109 reports were reviewed in 2021. Of those, 89 were accepted, 18 were rejected, 1 is pending additional information, and 1 was eventually deleted due to the species not requiring review. Observations of the following species were notable first documented records for Wyoming:

Bell's Vireo (Vireo bellii). Rest area west of Lusk, Niobrara County. This neotropical migrant's breeding range typically includes central and southwestern US, as well as northern Mexico. Primary winter range is thought to include Baja California Sur and the western coast of Mexico. Bell's Vireo prefers shrublands and treed habitats associated with water. The species is not unexpected given confirmed breeding in adjacent states. The observer originally submitted the record to eBird with multiple photos of the bird perched in a deciduous tree, as well as an audio clip.

First documented Wyoming record of Bell's Vireo, Lusk Rest Area, Niobrara County. Photo by Don Jones.

Mexican Duck (Anas diazi). Pond along Pahlow Lane west of Laramie, Albany County. Mexican Duck's resident range comprises southeast Arizona, southern New Mexico, portions of western Texas, and Mexico south to the states of Michocan, Tlaxcala, and Puebla. While the vast majority of this species' population is found in Mexico, there are indicators that the Mexican Duck is expanding its range in the United States. Male and female Mexican Ducks are easily mistaken for a female Mallard Duck. Additional observations of this species have been submitted to the WBRC for review in 2022.

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 the 'All Sightings' list. The second list is known as 'First Latilong' and currently includes 65 species. Latilongs are determined by latitude/longitude degree blocks. There are 28 latilongs in Wyoming (Figure 1).

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 records database to determine if changes are warranted for both lists.

The WBRC review process is also helpful for understanding changes to species' distribution in Wyoming. Of the 109 records reviewed in 2021, 50 updated the distribution of the observed species at the latilong scale. Reports were reviewed for 20 of the 28 latilongs statewide and included a diverse array of species including waterfowl, shorebirds, marshbirds, seabirds, gulls, owls, hawks, falcons, 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).

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 2021, 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. All items are also available on the Department's website under the WBRC heading: https://wgfd.wyo.gov/Wildlife-in-Wyoming/More-Wildlife/Nongame-Birds.

We wish to thank all observers for taking the time to submit their sightings to the WBRC. We are also

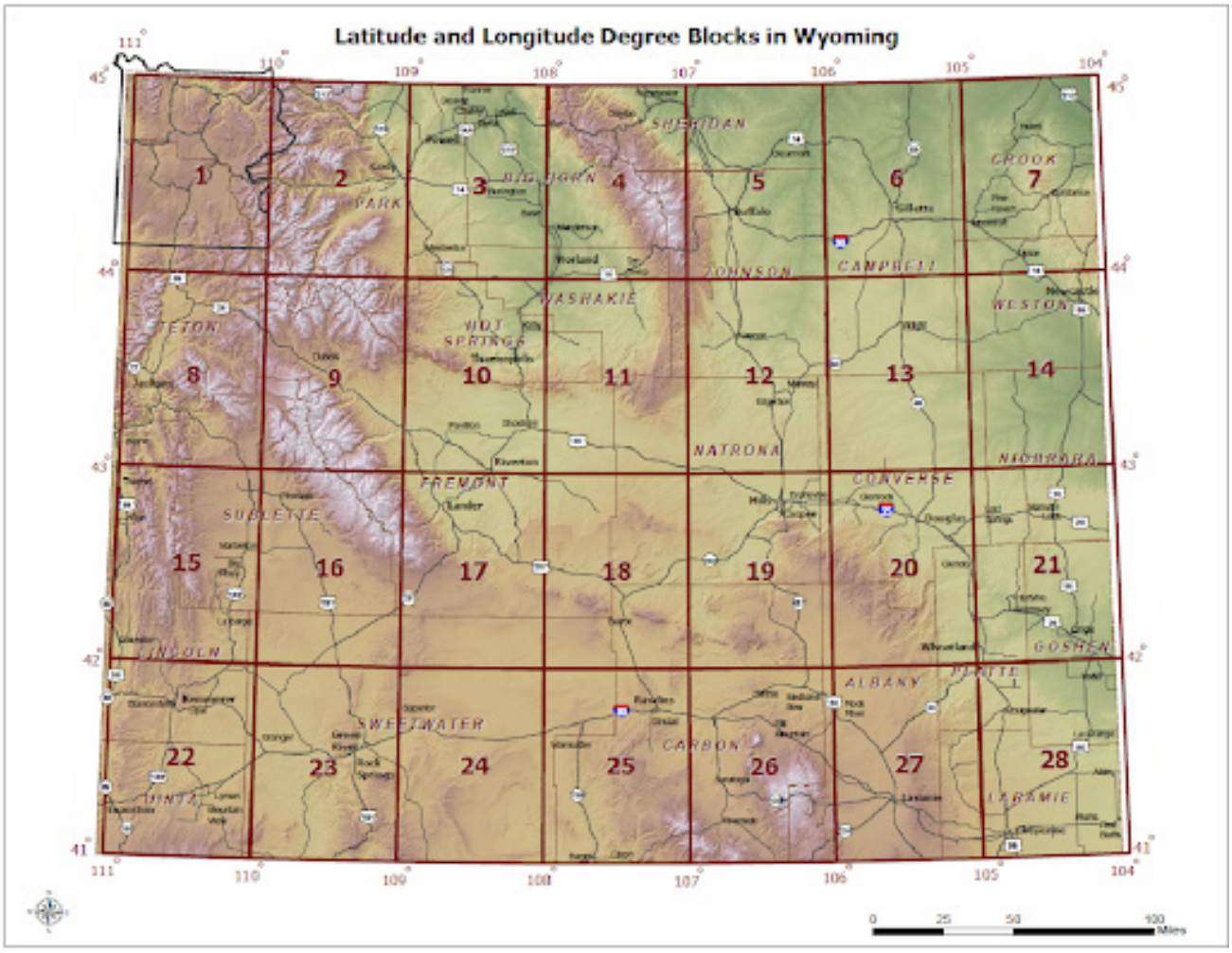


Figure 1. *Wyoming latlong map. Prepared by Game and Fish Wildlife GIS Analyst Nyssa Whitford.*

indebted to the following current Wyoming Bird Records Committee members for their invaluable efforts and expertise: Shawn Billerman, Matt Fraker, Greg Johnson, Don Jones, Frank Stetler, and Diane Thomas.

Prepared by: Courtney Rudd, Nongame Biologist, and Andrea Orabona, Nongame Bird Biologist
Funding: Wyoming Game and Fish Commission, Bureau of Land Management Cooperative Agreement


Western Kingbird. Photo: Ryan Hagerty

WYOMING PARTNERS IN FLIGHT AND INTEGRATED MONITORING IN BIRD CONSERVATION REGIONS

Long-term data analyses indicate that population trends for many species of North American landbirds have declined due to land use changes; habitat loss, fragmentation, and deterioration; pesticide use; and human influences and disturbance (Robbins et al. 1989, Peterjohn et al. 1995, Sauer et al. 1996, Boren et al. 1999, Donovan and Flather 2002). The International Partners in Flight (PIF) program was initiated in 1990 to address and reverse these declines. The PIF mission is to help species at risk and to keep common birds common through voluntary partnerships that benefit birds, habitats, and people. State, regional, national, and international Bird Conservation Plans comprehensively address the issues of avian and habitat conservation on a landscape scale. The North American Bird Conservation Initiative (NABCI) was initiated in 1998 to ensure the long-term health of North America's native bird populations through effective conservation initiatives, enhanced coordination among the initiatives, and increased cooperation among the governments and citizens of Canada, the US, and Mexico (NABCI 2016).

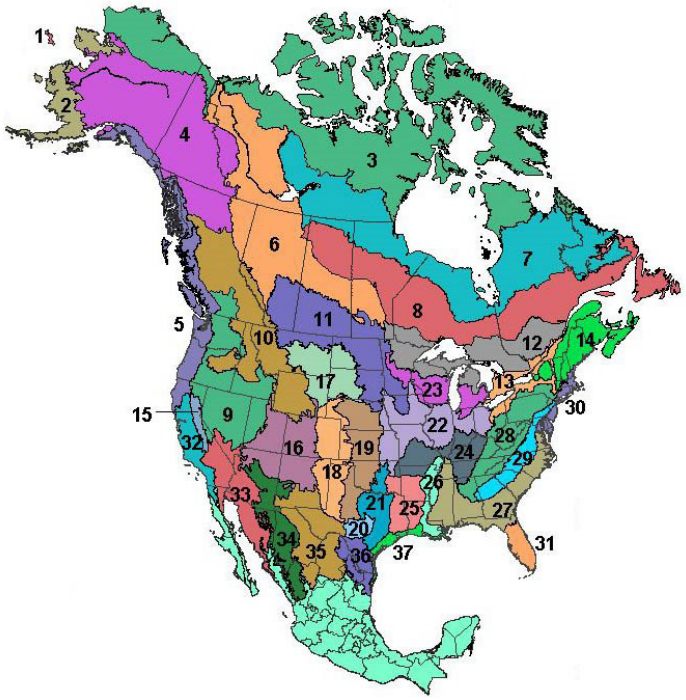


Figure 1. *Bird Conservation Regions (BCRs) throughout North America, excluding Hawaii and Mexico. (Source: http://nabci-us.org/resources/bird-conservation-regions-map/.*

The state PIF working group, Wyoming Partners in Flight (WYPIF), was established in 1991. Participants include Wyoming Game and Fish Department (Department), Bird Conservancy of the Rockies (Bird Conservancy), Bureau of Land Management (BLM), US

Forest Service, US Fish and Wildlife Service, National Park Service, Bureau of Reclamation, Audubon Rockies and affiliate chapters, Wyoming Natural Diversity Database, University of Wyoming, and The Nature Conservancy. The Department's Nongame Bird Biologist serves as the WYPIF chairperson. As a group, WYPIF produced the Wyoming Bird Conservation Plan, Version 2.0 (Plan; Nicholoff 2003). The Plan presents objectives for populations of birds and major habitat groups in the State, Best Management Practices to benefit birds, and recommendations to ensure that populations of birds and the habitats they require remain intact and viable into the future through proactive and restorative management techniques. Many components of the Plan have been used to develop portions of the 2017 Wyoming State Wildlife Action Plan (WGFD 2017).

One of the highest priority objectives for populations of birds throughout the Plan is to implement robust population monitoring programs. Population monitoring is an essential component of effective wildlife management and conservation (Witmer 2005, Marsh and Trenham 2008). Besides improving distribution data, monitoring allows us to evaluate populations of target species and detect changes over time (Thompson et al. 1998, Sauer and Knutson 2008), identify species that are at risk (Dreitz et al. 2006), and evaluate responses of populations to management actions (Lyons et al. 2008, Alexander et al. 2009) and landscape and climate changes (Baron et al. 2008, Lindenmayer and Likens 2009).

In conjunction with many partners, Bird Conservancy conducted the 14th consecutive year of landbird monitoring in 2021 using the Integrated Monitoring in Bird Conservation Regions (IMBCR) program. IMBCR uses a spatially balanced sampling design that allows inferences to avian species occurrence and population sizes at various scales (local management units, entire states, or regions). This facilitates conservation at both local and national levels. The IMBCR sampling design allows analysts to estimate species densities, population sizes, occupancy rates, and trends, providing an understanding of the status and annual changes of bird populations. Collaboration across different organizations and spatial scales increases sample sizes and improves the accuracy of population estimates. Analyzing the data collectively permits us to estimate detection probabilities for species that would otherwise have an inadequate number of detections at local scales. The IMBCR partnership's 6 monitoring objectives are listed in the 2021 IMBCR Field Season Report (McLaren et al. 2022).

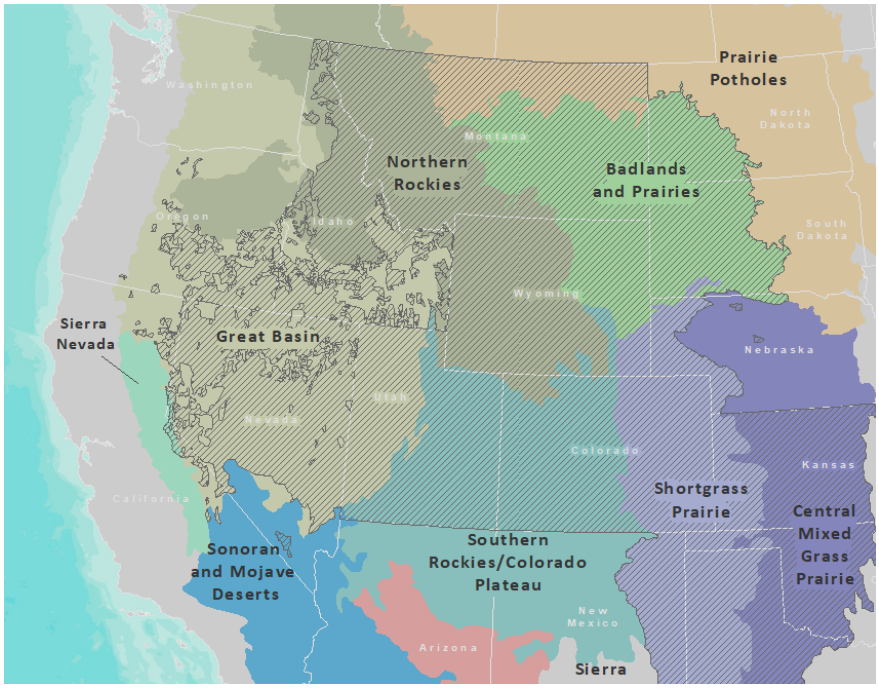


Figure 2. *The spatial extent of the Bird Conservation Regions sampled in 2020 using the IMBCR design.*

Bird Conservation Regions (BCRs) provide a spatially consistent framework for the IMBCR program (Figure 1). In 2021, IMBCR covered all or parts of 16 states, 4 USFS Regions, and 10 BCRs (Figure 2). All monitoring partners collaborated to define strata and superstrata within the BCR sampling frame based on smaller-scale areas upon which we wanted to make inferences (e.g., National Forests, BLM lands, individual states). Bird Conservancy biometricians overlaid BCRs with 1 km2 sample grids, randomly selected the grids to survey, and used a 4 x 4 point count array with 16 survey points spaced 250 m apart and 125 m from the grid boundaries within each sample grid (McLaren et al. 2019). A minimum of 2 sampling grids within each stratum are required to adequately estimate the variances of population parameters, (McLaren et al. 2022). Wyoming contains 37 strata (Figure 3).

Between 21 May and 21 July 2021, field technicians completed all 182 planned surveys (100%); conducted 2,266 point counts within the 182 surveyed grid cells; and detected 185 bird species, including 46 Species of Greatest Conservation Need (SGCN; McLaren et al. 2022). Bird Conservancy biometricians were able to estimate occupancy (the proportion of 1 km2 grid cells occupied; Psi, ψ) for 224 species that have been detected in any given year of the monitoring program, including 63 SGCN (28%; McLaren et al. 2022). Data provided robust occupancy estimates (CV <50%) for 135 of the 224 species detected (60%; McLaren et al. 2022). Biometricians were able to estimate density (D) and population size (N) for 216 species that were detected in any given year of the monitoring program, including 60 SGCN (28%; McLaren et al. 2022). Data provided robust density estimates (CV <50%) for 88 of the 216 species (41%; McLaren et al. 2022).

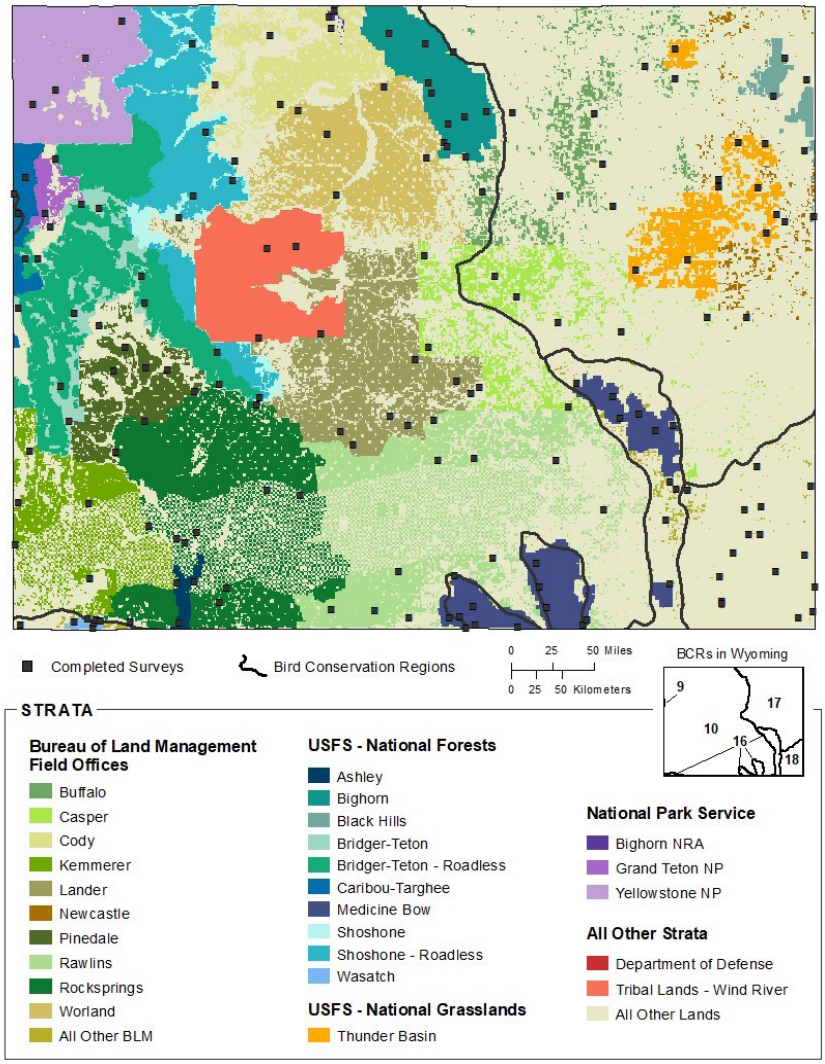


Figure 3. *Strata and 2021 survey locations in Wyoming (McLaren et al. 2022).*

Annual and multi-year reports, species accounts, and density estimate tables and graphs are available on the Rocky Mountain Avian Data Center web site (Bird Conservancy 2022). To view a map of survey locations in Wyoming; occupancy, density, and population estimate results; and species counts across all years of the IMBCR program, follow the link below, click "OK" on the disclaimer box, and click the "Run Query" button highlighted in red near the top of the page. To view just the 2021 field season results, follow the link, select "Year" from the Filter drop down box on the top left of the screen, click the "Add" button, select 2021, click "Add Filter", and then click "Run Query" (McLaren et al. 2022).

http://www.rmbo.org/new_site/adc/QueryWindow.

Prepared by: Matthew McLaren, Matt Smith, Jennifer Timmer, Chris White, David Pavlacky, and Rob Sparks, Bird Conservancy of the Rockies; and Andrea Orabona, Nongame Bird Biologist
Funding sources: Bureau of Land Management, National Park Service, USFWS State Wildlife Grant, US Forest Service, and the Wyoming Game and Fish Commission

SUMMARY OF THE ANNUAL ACTIVITIES OF THE CENTRAL FLYWAY NONGAME MIGRATORY BIRD TECHNICAL COMMITTEE

The Central Flyway Council (CFC) was established in 1951 to represent the 10 states (Montana, Wyoming, Colorado, New Mexico, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas) and 3 Canadian provinces (Saskatchewan, Alberta, and the Northwest Territories) that occur within the flyway.

The function of the CFC is to work with the US Fish and Wildlife Service (USFWS), in conjunction with the councils of the Atlantic and Mississippi Flyways, in the cooperative management of North American migratory game birds. Specific responsibilities include season setting of migratory bird hunting regulations. The CFC, via technical committees, also conducts and contributes to a wide variety of migratory bird research and management programs throughout the United States, Canada, and Mexico.

Considerable technical information is required for the Flyway Councils to accomplish their objectives. Various Technical Committees (TCs) have been established to fulfill this role. The Central Flyway Waterfowl TC and the Pacific Flyway Study Committee were established in 1953 and 1948, respectively. The Central Management Unit TC was formed in 1966 to provide technical input on Mourning Dove management and research issues. In 1967, the scope of this TC was broadened to include species other that doves, and the name was changed to the Central Migratory Shore and Upland Game Bird TC. In 1999, the name was changed to the Central Flyway Webless Game Bird TC, and in 2001, the name was again changed to the Central Flyway Webless Migratory Game Bird TC. The Central Management Unit Mourning Dove TC was established in 2003, and its name was changed to the Central Management Unit Dove TC in 2007 to recognize responsibility for all dove species with regulated hunting seasons. In 2006, the Central Flyway Council established the Central Flyway Nongame Migratory Bird TC (CFNMBTC) to address a growing number of regulatory issues for migratory birds that were not currently addressed by the other TCs, and to broaden the Flyway Council's focus beyond traditional game bird issues (Figure 1).

It is the intent of the CFC and TCs that the division of responsibilities for avian species follows the definition for game birds as defined in the migratory bird conventions with Canada and Mexico. The Central Flyway Waterfowl TC is responsible for the families Anatidae (i.e., ducks, geese, and swans) and Rallidae (i.e., American Coots). The Central Flyway Webless Migratory Bird TC is responsible for the families Rallidae (i.e., rails, gallinules, and other coots), Gruidae (i.e., cranes), Charadriidae (i.e., plovers and lapwings), Haematopodidae (i.e., oystercatchers), Recurvirostridae (i.e., stilts and avocets), Scolopacidae (i.e., sandpipers, phalaropes, and allies), Corvidae (i.e., jays, crows, and their allies), and Columbidae (i.e., pigeons). The Central Management Unit Dove TC is responsible for the Columbidae family (i.e., doves only). The CFNMBTC is responsible for all migratory birds, as per the Migratory Bird Treaty Act, not included in the above division of responsibilities. Technical Committee members do recognize, however, that they may need to collaborate on some issues. For

example, the webless TC should coordinate with the nongame TC on issues related to shorebirds, rails, and federally threatened or endangered species that are not hunted.

The state, provincial, and territorial representatives to the TCs are usually biologists with considerable training and experience in the field of waterfowl, migratory shore and upland game bird, dove, or migratory nongame bird management and research. The function of the TCs is to serve the CFC, with primary responsibility for the technical information needs of the Flyway Council related to management of migratory game birds, wetland resources, and nongame migratory birds. The TCs may also recommend research projects, surveys, and management programs to the Flyway Council for their collective consideration or implementation. The Wyoming Game and Fish Department's Nongame Bird Biologist serves as the state's representative on the CFNMBTC.

Since the its inception, the CFNMBTC has submitted 25 recommendations to the CFC for signing and submission, and 56 letters of correspondence to a variety of recipients on a diversity of nongame issues, both regulatory and non-regulatory. A summary of recommendations and correspondence completed from 2020-2021 thus far is presented in Tables 1 and 2, respectively.

Date	Number	Recommendation
03/08/2021	1	The CFC recommends the formation of a National Golden Eagle Allocation Working Group to scope and resolve procedural issues associated with the National Flyway Council's Golden Eagle Allocation Procedure. The working group should include personnel from the U.S. Fish and Wildlife Service's Division of Migratory Birds representing its raptor management and migratory bird permitting functions, U.S. Department of Agriculture's Wildlife Services Division, and at least one, but preferably two, representatives from each Flyway Council's Nongame Migratory Bird Technical Committee.
03/08/2021	2	The Central Flyway Council recommends that the 48 permits available to the Central Flyway for the passage take of first year Peregrine Falcons for falconry in the United States east of 1000 west longitude and south of 310 north latitude for the 2021 trapping season be allocated among states as follows: 35 permits to the state of Texas with the understanding that 40% of the permits will be reserved for out-of-state falconers, 5 permits to the state of Oklahoma, 5 permits to the state of Kansas, and 3 permits to the state of Nebraska
03/11/2022	4	The Central Flyway Council recommends that the 48 permits available to the Central Flyway for the passage take of first year Peregrine Falcons for falconry in the United States east of 1000 west longitude and south of 310 north latitude for the 2022 trapping season be allocated among states as follows: 35 permits to the state of Texas with the understanding that 40% of the permits will be reserved for out-of-state falconers, 5 permits to the state of Oklahoma, 5 permits to the state of Kansas, and 3 permits to the state of Nebraska.

Table 1. *Summary of recommendations submitted to the Central Flyway Council (CFC) by the Central Flyway Nongame Migratory Bird Technical Committee, 2021-2022.*

Date	Key Central Flyway Remarks
07/14/2020	The CFC provided comments regarding the Draft EIS regarding Double-crested Cormorant management conflicts. The CFC preferred alternative is Alternative A that would create a new take permit specific to state wildlife agencies and federally recognized tribes.
07/17/2020	The CFC asks that the USFWS brings regulatory certainty to the issue of incidental take under the MBTA. Alternatives outlined in the Draft EIS create false choices and are not acceptable. DEIS is incomplete and does not provide a sufficient analysis to bring forward a balanced Alternative that provides needed regulatory certainty to the affected stakeholders and takes proactive and commonsense steps to conserve birds.
08/25/2020	The CFNMBTC informed the CFC that we selected Joel Jorgensen (NE) to represent the Central Flyway on the Waterbird Conservation Council of Waterbird Conservation for the Americas.
03/01/2021	The CFC strongly recommends that the 1/7/2021 Final Rule for the MBTA as it applies to activities that may kill or injure migratory birds scheduled to go into effect on 3/8/2021 be rescinded. The CFC believes there is a need to bring regulatory certainty to the issue of incidental take under the MBTA.
03/19/2021	The CFNMBTC informed the CFC that we selected Sandy Johnson (ND), Mark Howery (OK), and Cliff Shackelford (TX) to represent the Central Flyway on the Double-crested Cormorant Working Group.
03/26/2021	The CFNMBTC informed the CFC that we selected Mark Howery (OK) to represent the Central Flyway on the National Golden Eagle Allocation Working Group, with Daren Riedle (KS) as back-up.
03/30/2021	The CFNMBTC informed the CFC that we selected Sandy Johnson (ND), Mark Howery (OK), and Cliff Shackelford (TX) to represent the Central Flyway on the Double-crested Cormorant Monitoring Technical Team.

Table 2. *Summary of correspondence submitted to the Central Flyway Council by the Central Flyway Nongame Migratory Bird Technical Committee, 2020-2021.*

2021 RAPTOR NEST SURVEY FOR THE UNITED STATES FOREST SERVICE THUNDER BASIN NATIONAL

The purpose of this study is to inventory and monitor known raptor nests and document new raptor nest locations on the United States Forest Service Thunder Basin National Grasslands (USFS TBNG) in northeastern Wyoming. Several raptor species that may inhabit the TBNG (American Kestrel, Bald Eagle, Golden Eagle, Ferruginous Hawk, and Swainson's Hawk) are listed as Species of Greatest Conservation Need in the Wyoming State Wildlife Action Plan (WGFD 2017), while others (Prairie Falcon, Red-tailed Hawk, and Turkey Vulture) are not. Some are year-round residents and some are migratory species (Orabona et al. 2021).

A cost-share agreement to survey for nesting raptors was initiated in 1996 between TBNG and the Wyoming Game and Fish Department (Department), and has continued periodically since (1996-1999, 2001, 2004-2006, 2008, 2017-2019, and 2021; we did not conduct surveys in 2020 due to the COVID-19 pandemic). During all survey years, priority survey areas included specific portions of the TBNG as designated by USFS personnel. Surveys in 2021 focused on Priority Areas A, B, C, and D5 within the TBNG (Figure 1).

Funding for this cooperative effort was provided by the USFS TBNG. Wyoming Game and Fish Department Nongame Section personnel conducted all aerial surveys and prepared the final report.

In May 2021, we conducted aerial surveys with Flightline Laird Flying Service (Gillette, Wyoming) using an Aviat Husky and Cessna 172XP fixed-wing aircraft. We flew north/south transects, with transects placed 600 m apart for compatibility with other Wyoming raptor surveys.

We used a standardized raptor nest survey data sheet and survey codes developed by the Department in cooperation with numerous stakeholders and raptor experts from public agencies and private organizations.

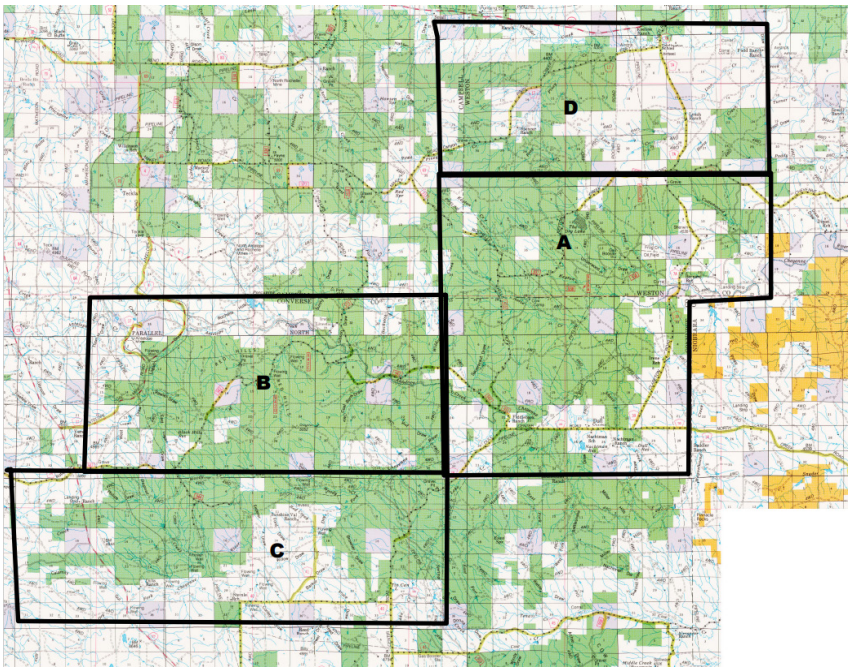


Figure 1. *Raptor nest survey Priority Areas on the Thunder Basin National Grasslands. In 2021, we completed surveys in all Priority Areas.*

The data sheet and codes were first field tested by the author during the 2018 raptor nest surveys.

All nests we located were georeferenced using Universal Transverse Mercator (UTM) coordinates. We also used an on-board Global Positioning System (GPS) unit to maintain accurate flight patterns on survey transects and as a backup recording system, if needed.

Each nest we located was checked for evidence of nesting activity and the presence of adult birds, young birds, or eggs. We recorded the nest status, nest status level, nest outcome, physical condition of each observed nest, nest substrate, nest type, and the primary habitat type in which each nest occurred. We recorded all raptor nests encountered, regardless of activity status or condition. We expended 26.4 hours

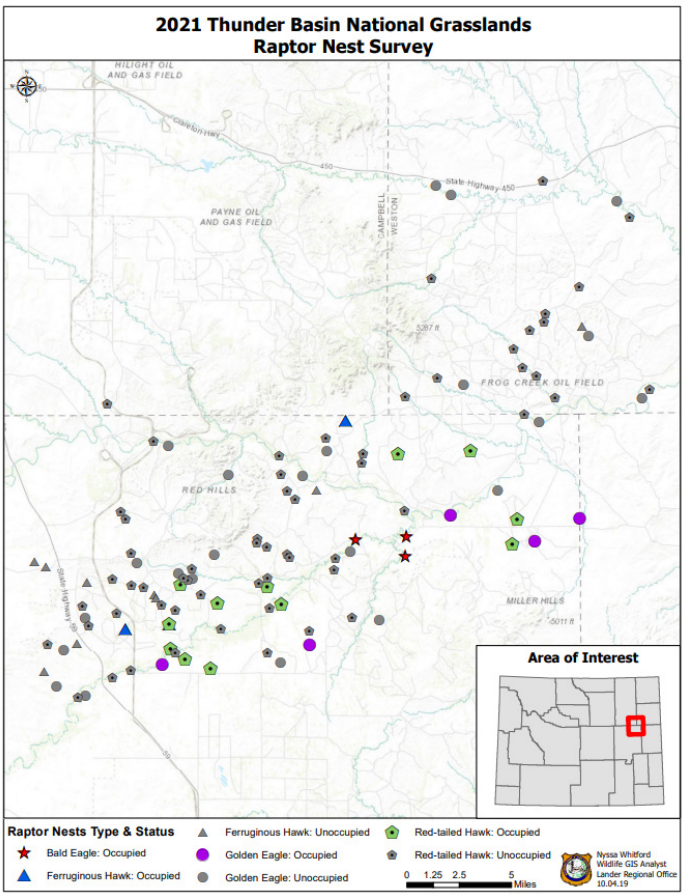


Figure 2. *Locations of raptor nests we detected during the 2021 aerial survey in the US Forest Service Thunder Basin National Grassland Priority Areas A, B, C, and D. Note the different colored symbols denoting occupied and unoccupied nests.*

of flight time, and were able to complete surveys in all four Priority Areas.

During the May 2019 survey, we located a total of 114 diurnal raptor nests within the Thunder Basin National Grassland Priority Areas A, B, C, and D (Figures 2-4). We located 23 occupied raptor nests—Ferruginous Hawk (n=3), Golden Eagle (n=5), Bald Eagle (n=3), and Red-tailed Hawk (n=5). We also detected Turkey Vulture, but did not observe nesting activity. Occupied nests are those with one or two adults present at or near the nest and/or fresh lining material in the nest. We also recorded 91 unoccupied raptor nests (Figures 2-4)—Ferruginous Hawk (n=9), Golden Eagle (n=23), and Red-tailed Hawk (n=59). Unoccupied nests are those with no apparent recent use or adult presence at the time of observation. Most nests were located in cottonwood trees in riparian habitat along creeks or rivers, or in cottonwood trees growing in ephemeral drainages within grassland habitat or a combination of sagebrush/grassland habitat. Some Ferruginous Hawk nests were placed on rock outcrops or on the ground on hillside edges, and one Red-tailed Hawk nest was located on a power pole.

The 2021 survey coincided with the timing of the incubation and hatching stages for Ferruginous Hawks and the incubation, hatching, and nestling stages for Golden Eagles. Although the 2021 survey was conducted in mid-May, we still noted a lack of Swainson's Hawk detections. In addition, falcons cannot be effectively detected using fixed-wing aircraft surveys; these species require adequate ground or helicopter surveys instead, neither of which were conducted in 2021.

The absence of records in 2021 for raptor species known to occupy habitats in eastern Wyoming should not be considered documentation that they do not occur in the Priority Areas surveyed.

Lastly, the prey base (black-tailed prairie dogs) for all expected raptor species in the area was recovering from a recent sylvatic plague outbreak, which inevitably had negative effects on raptor nest occupancy and productivity during the 2021 breeding season.

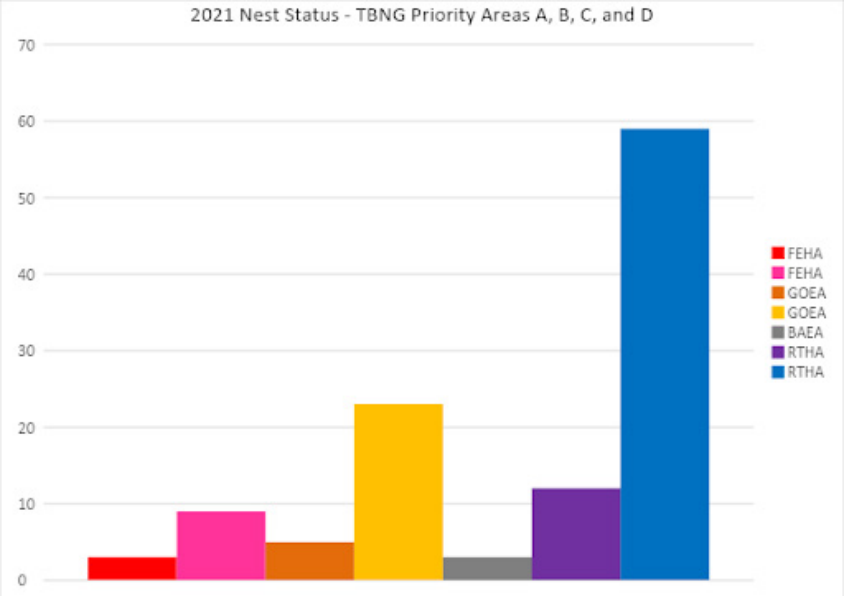


Figure 3. *Number of occupied (OCCU; n = 23) and unoccupied (UNOC; n = 91) nests we detected during the 2021 aerial surveys for nesting raptors on Thunder Basin National Grassland Priority Areas A, B, C, and D. FEHA = Ferruginous Hawk, GOEA = Golden Eagle, BAEA = Bald Eagle, and RTHA = Red-tailed Hawk.*

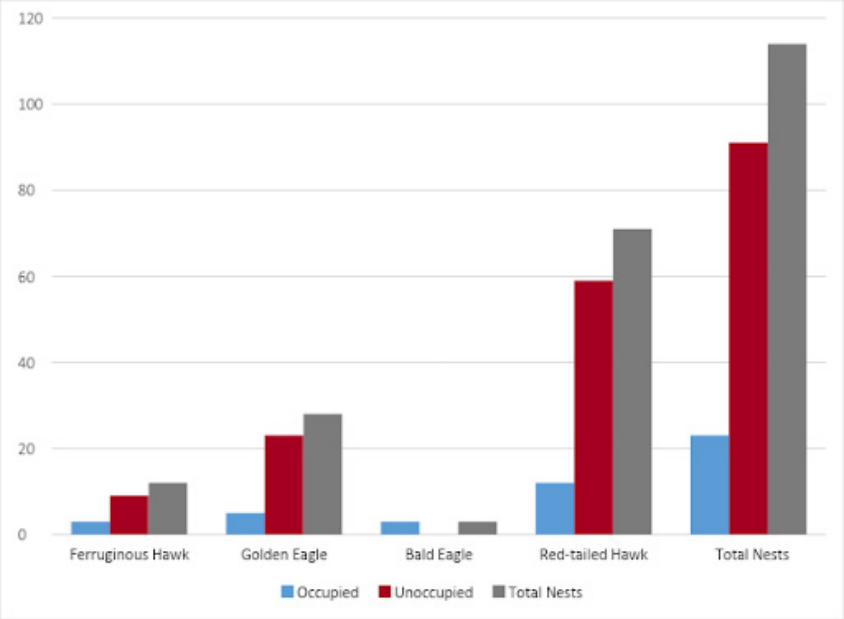


Figure 4. *A summary by species and total number of occupied and unoccupied nests located during the 2021 raptor nest survey we conducted for the Thunder Basin National Grassland Priority Areas A, B, C, and D.*

Prepared by: Andrea Orabona, Nongame Bird Biologist
Funding Sources: United States Department of Interior, US Forest Service, Thunder Basin National Grassland; Wyoming Game and Fish Commission

WYOMING STATEWIDE FLAMMULATED OWL SURVEY: 2021 FINAL REPORT

Flammulated owl. Photo credit David Tonnessen

The Flammulated Owl (Psiloscops flammeolus) is a small, cavity nesting, migratory owl with a widespread breeding distribution in montane forests of western North America. In Wyoming, Flammulated Owl is designated as a Species of Greatest Conservation Need by the Wyoming Game and Fish Department, primarily due to a lack of information about its distribution and population status. Prior to 2016, the only known breeding population of Flammulated Owls in Wyoming was on the western slope of the Sierra Madre in far south-central Carbon County. Since 2016, researchers with the Teton Raptor Center (TRC) have discovered at least 23 breeding territories in the Jackson Hole area, and in 2019 a statewide survey project jointly conducted by TRC and the Wyoming Natural Diversity Database (WYNDD) documented singing Flammulated Owls at 33 points across 5 mountain ranges in which the species had not been previously reported during the breeding season.

In 2021, WYNDD and TRC implemented a second year of statewide surveys for Flammulated Owls. We used the same deductive habitat model developed for 2019 surveys and expert opinion to identify areas to survey in 2021. We focused our survey effort on locations which had not been previously visited and prioritized sites at the periphery of the species known range in the Bighorn Mountains and Black Hills. Between mid-May and the end of June, we sampled 615 points using nocturnal playback surveys and deployed 29 autonomous recording units (ARUs). We detected Flammulated Owl on only 1 playback survey in 2021, in the Sierra Madre where the species was already known to occur (Figure 1). We also detected Flammulated Owls on 4 ARU deployments at 3 sites where the species was first found in 2019 in the Laramie, Wind River, and Snowy Ranges. Additionally, we detected 5 other owl species, 2 nightjar species, and 2 other nocturnal bird species in 2021.

The results from this survey indicate that breeding Flammulated Owls either do not occur or occur at very low densities in the Black Hills and the Bighorn Mountains, where geographic isolation may be a significant barrier to colonization. Elsewhere in Wyoming, Flammulated Owls appear to be rare and patchily-distributed in apparently suitable forested habitat. Detections during resurveys at sites where owls were found in 2019 suggest that Flammulated Owls persisted in areas of suitable habitat. Summaries of habitat composition and occupancy model results both indicated positive associations of Flammulated Owls with aspen and ponderosa pine forest types. Results of occupancy models suggested cumulative detection probabilities for the standard 10-minute playback survey used in our study were moderate (0.60), resulting in imprecise occupancy estimates,

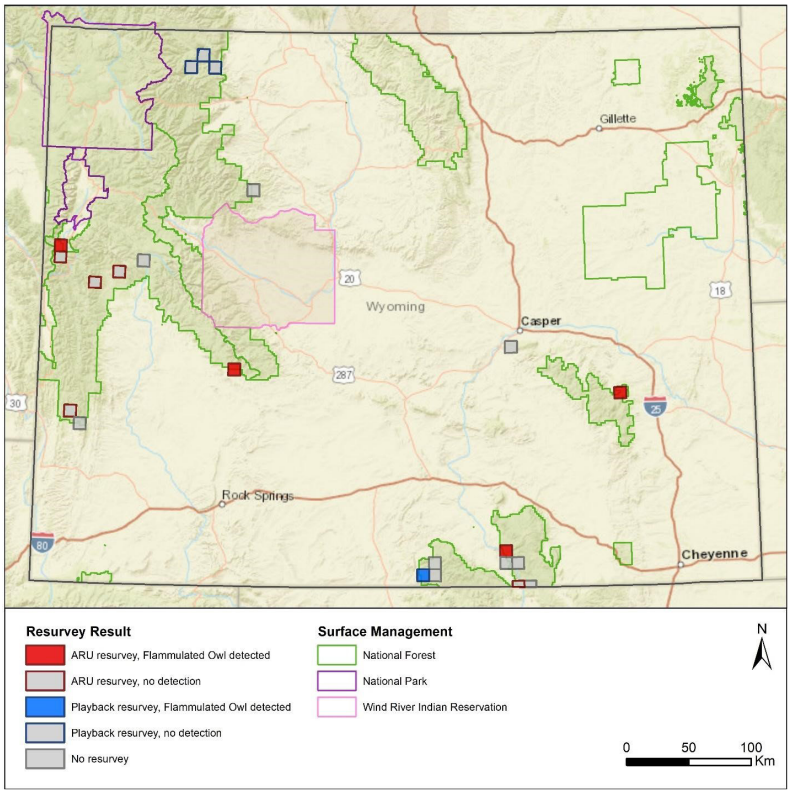


Figure 1. *Locations of Flammulated Owl detected in 2019 with 2021 resurvey status. Map shows surveys within townships by method (playback or autonomous recording units, ARU) and 2021 resurvey result.*

and emphasizing the high degree of uncertainty involved in inferring absence of a rare species from a short-term inventory of a large area. Future research on Flammulated Owls in Wyoming should focus on further clarifying the range and distribution of the species in the state, as well as quantifying habitat selection, demography, and prey selection of known populations in Wyoming.

Prepared by: Don Jones and Zach Wallace, Wyoming Natural Diversity Database; Bryan Bedrosian, Allison Swan, and Julie Polasik, Teton Raptor Center
Funding Sources: State Wildlife Grants Program

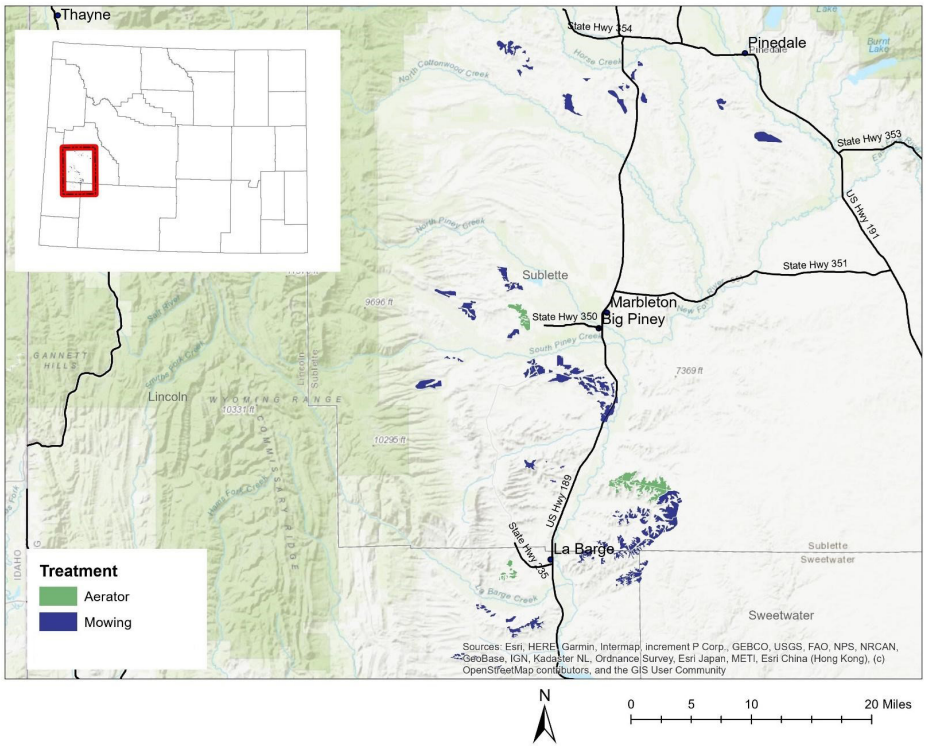
MONITORING SAGEBRUSH SGCN IN RESPONSE TO HABITAT MANAGEMENT

Sagebrush (Artemisia spp.) dominated landscapes are some of the largest ecosystems in the Western United States, spanning approximately 160 million acres and providing habitat for over 350 wildlife species including mule deer, pronghorn, and greater sage-grouse (Remington et al. 2021). However, due to several factors including frequent wildfires, infestations of invasive species such as cheatgrass, conifer encroachment, unmanaged herbivory, and fragmentation stemming from energy development, sagebrush habitats are among the most threatened ecosystems in North America (Knick et al. 2003). Changes to sagebrush community composition in the form of increased abundance in non-native annual grasses or woody tree species and an overall reduction in sagebrush land cover are just a few ways that these threats have altered sagebrush ecosystems (Pyke et al. 2015). 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 the U.S., making the region a refuge for many sagebrush obligate species and a high priority for conservation efforts (Rowland et al. 2011).

In recent years, many federal, state, and community-led organizations have taken an interest in sagebrush conservation and restoration, primarily in response to the threat of listing the greater sage-grouse under the Endangered Species Act. The Wyoming Game and Fish Department identified sagebrush as one of the top priority habitats to enhance or maintain within its Statewide Habitat Plan (SHP), and categorized low elevation shrub communities as one of most at risk to cheatgrass infestations (WGFD 2015, 2015a). Additionally, declining mule deer populations across Wyoming and concerns about deteriorating habitat quality in crucial mule deer winter range prompted the adoption of the Wyoming Mule Deer initiative in 2007 and the Wyoming Range Mule Deer Plan in 2011. One major result to come out of these plans was to implement habitat improvement projects in

Sagebrush Sparrow. Photo by Marky Mutchler

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 cheatgrass. While the primary focus of these habitat improvement projects was for the benefit of Sage-Grouse and mule deer, it remains unclear how these same treatments and management practices affect other sagebrush-dependent wildlife (Carlisle et al. 2018).



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 (Hansley and Beauvais 2004, 2004a; Buseck, Keinath, and McGee 2004; Dobkin and Sauder 2004). The Sage Thrasher, Brewer's Sparrow, Sagebrush Sparrow, and Sagebrush Vole are ranked by the Wyoming Game and Fish Department (WGFD) as Native Species Status (NSS) 4-Tier II, because of the species' vulnerability to habitat loss and, in the case of the avian species, because of documented population declines across their ranges (Knick and Rotenberry 2002; Buseck, Keinath, and McGee 2004; Dobkin and Sauder 2004; Sauer et al. 2017). 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 (Keinath and McGee 2004).

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 important indicators of sagebrush ecosystem health (Knick and Rotenberry 2000). Similarly, alterations of sagebrush habitat designed to benefit a singular species may have unintended effects on non-target species which co-occur in the area. Our objective for this project is to assess how habitat treatments, 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 previously undergone treatment and to lay out priority areas for monitoring. We chose four treatments to evaluate based on the relative amount of acres treated: Mowing < 50% mosaic, Mowing > 50% mosaic, Aeration < 50% mosaic, and Aeration >50% mosaic. 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 (BLM) land in southern Lincoln County and most of Sublette County, Wyoming (Figure 1). To select our specific monitoring sites, we placed 250 m2 grids over the entire study area (stratifying by treatment type) and used a spatially balanced sampling design to select

survey grids (Pavlackey et al. 2017).

To evaluate density and occupancy of songbirds in each treatment area, we used field protocols adapted from the Integrated Monitoring in Bird Conservation Regions (IMBCR) program (Hanni et al. 2018) and modified to fit our survey area (Van Boer et al. 2018). For each 250 m2 survey grid, we used a 2 × 2 array to space 4 survey points evenly throughout the grid. We conducted 6-min point counts at each survey location in early morning during peak vocalization periods to maximize detections. Surveys were conducted spring through early summer to target birds when they were most vocal and to avoid counting migrants. At each point, we recorded all individuals observed with an emphasis on sagebrush obligate and other SGCN. We also recorded distance to each individual and time of detection (Hanni et al. 2018).

We used standardized capture and survey techniques outlined in the Wyoming Game and Fish Department's Handbook of Biological Techniques (Cudworth et al., 2013) to survey for sagebrush-obligate mammals. To survey for Pygmy Rabbits, we used our established survey grids as a starting point and randomly selected treated and untreated grids to be used as sites to conduct transect surveys. Each survey consisted of eight parallel 400 m transects spaced 50 m apart and observers walked each transect looking for evidence of Pygmy Rabbits, including individuals, pellets, and burrows. To assess the abundance of small mammal species requiring capture for a reliable identification, we place baited, live traps near key habitat features in a 4 x 13 grid (Harkins et al. 2019). Captured individuals were marked, weighed, and key measurements were taken prior to release.
Vegetation data was also collected within a 50m radius of each avian point count and within each of the small mammal trap grids. We recorded habitat characteristics such as percent cover of each plant species, mean vegetation height of all tree, shrub, and grass species, and percent bare ground cover. Vegetation data was used to test for differences in plant community composition within each treatment, and to determine avian and small mammal habitat selection within the different treatment areas.

During the 2021 field season, we completed 258 avian point counts between 26 May and 8 July and observed 1,411 individuals from 40 different species. We observed target species on all treatments and in total, we observed 317 Brewer's sparrows, 234 Sagebrush Sparrows, and 200 Sage Thrashers. We also observed a number of non-target avian SGCN, including American Kestrel, Burrowing Owl, Common Nighthawk, Long-billed Curlew, and Swainson's Hawk. We conducted live-trapping surveys at 6 sites between 3 August and 1 September for a total of 936 trap nights and captured 27 individuals, including Perognathus species. Finally, we conducted Pygmy Rabbit surveys from 1 November 2021 to 31 March 2022 at 10 sites across the study area and observed signs of occupancy at 5 of them. In summer of 2022 we plan to increase the number of point counts and trap nights to add to our preliminary dataset.

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

BLACK-FOOTED FERRET MANAGEMENT IN WYOMING

Black-footed ferret. Photo: Mark Gocke

Wyoming has a unique history with the conservation of 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 and Fish has worked in collaboration with private landowners as well as state and federal agencies to ensure ferret populations succeed in the wild. Game & Fish remains committed to recovering the native, critically endangered ferret through management of the animal and its habitat. To that end, 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.

Prairie dogs (Cynomys spp.) provide the burrows in which ferrets live as well as the majority of their diet—each ferret must capture and consume a prairie dog every three days. Consequently, managing ferret habitat requires maintaining prairie dog colonies of adequate size and density. Efforts to maintain ferret habitat are most 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 both ferrets and prairie dogs. While monitoring and management of prairie dogs, disease, and ferrets are common to all reintroduction areas on the continent, the history, size, and specific methodologies used at each site vary. Currently, Wyoming supports two reintroduction areas: the Shirley Basin Reintroduction Area, established in 1991, and the Meeteetse Reintroduction Area, established in 2016.

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. Standard protocol is to visit 200 m2 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 habit of ferrets, 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 mid-August through mid-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 within each reintroduction area—that is, the smallest number able to be verified based on recaptures and timing/location of observations. If enough animals are captured—around 30 individuals—population size can be estimated with statistical methods. If populations are thought to be diminishing, we can supplement with releases of captive-bred kits or kits translocated from other sites.

As ferrets are susceptible to SARS-CoV-2, the pandemic required the modification of field plans. To protect field personnel and the ferrets themselves, both being susceptible to SARS-CoV-2, ferret survey protocols have been adapted to minimize staff and contact with ferrets. Rather than anesthetizing captured animals for a full workup (measurements, weighing, etc.), we instead process animals while they are conscious but confined in trap. All personnel wear PPE and all equipment is decontaminated between contact with different ferrets. As we pivot into a future with endemic SARS-CoV-2, we will continually evaluate out protocols and precautions in light of the best available research and guidance.

In Wyoming, black-footed ferrets are managed by Game and Fish, but recovery efforts are the product of engagement with and support of many stakeholders. The Wyoming Black-footed Ferret Working Group is comprised of representatives from local, state, and federal agencies as well as non-governmental organizations. It meets annually to discuss progress towards recovery and management goals as well as plans for the future of the recovery efforts. Most important is the cooperation and generosity of the many private landowners involved in the efforts. To date, 18 landowners across the state lend aid to conservation efforts. These partnerships are essential so, as new challenges are encountered and technology continues to develop, ferret management in Wyoming remains collaborative, adaptive, and nimble.

A black-footed ferret emerges from a prairie dog burrow near Medicine Bow, WY. While ferrets are primarily nocturnal, they occasionally venture to the surface during daytime hours.

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 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, 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." Within the main study area, 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 plague outbreak in 2012-2013. The population has stabilized in recent years and seen moderate growth, but numbers have not returned to their recorded maxima.

Since 2017, prairie dog density has been estimated from surveys at 15 visual count plots within the main

A family of ferrets confirmed via remote camera following nighttime spotlighting efforts at the SBRA.

study area. Density decreased slightly from 2020, the average prairie dog density (x = 2.15 prairie dogs per acre) at visual count plots within the main study area suggests stability, as the average is comparable to counts since recording began. Additionally, we verified remotely sensed prairie dog colonies across the SBRA. We first used aerial imagery to classify 500 m2 cells as containing no burrows, low burrow density (<50% of the cell), or high burrow density (>50% of the cell) across 2.2 million acres. Over 115,000 acres were classified as high density, including 65,000 acres that had never been mapped or surveyed previously. Over 40% of all cells contained at least a few prairie dog burrows, highlighting the large amount of potential habitat available for ferrets in the SBRA. To date, we have evaluated current prairie dog activity on the ground on 404 cells, including assessments at 229 visual count plots and 528 burrow activity locations. These efforts help us identify areas of high density of prairie dogs where future management may be focused as well as areas prairie dogs have ceased to exist.

Shirley Basin is a vast area and ferrets have been released at many locations in the last 30 years. Due to this history, coupled with the ferrets' ability to disperse without notice by Game and Fish personnel or local residents, we expect many additional ferrets occupy lands outside of the main study area and. Consequently, the population is likely substantially larger than the number of ferrets reported from spotlight surveys alone.

To enhance our ability to detect ferrets over large areas, we used scent detection dogs and remote cameras to survey across 55,000 acres of Shirley Basin. Using our estimates of prairie dog abundances as a guide, we deployed scent dogs to 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 historical release points and 2 areas previously unknown to us. In the summer of 2022, we will complete our scent dog survey efforts. Additionally, we will spotlight across all locations where ferrets were discovered to gain accurate and precise estimates of the range, distribution, and abundance of ferrets as well as to vaccinate as many as possible for sylvatic plague and canine distemper.

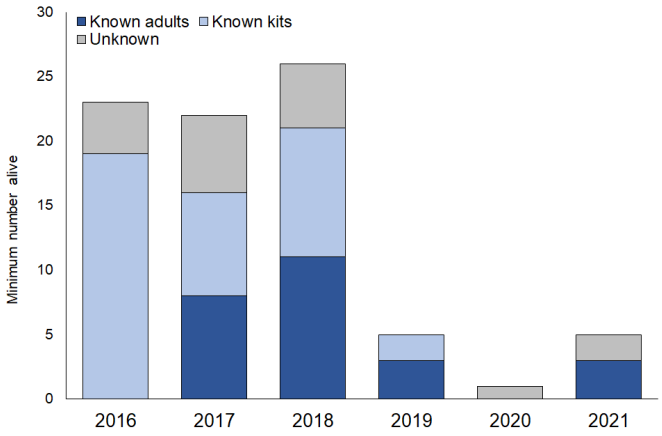
MEETEETSE REINTRODUCTION AREA

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 colonies and, through collaboration with a multi-agency disease management team, 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. Additionally, we completed multiple pilot projects to assess the efficacy of scent detection dogs as a method for detecting ferrets and of an oral bait designed to vaccinate prairie dogs to plague. 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 2021, we treated 3,943 acres of prairie dog colonies, with priority given to areas with higher prairie dog density and previous ferret detections. The BLM secured funding to continue this effort until 2027, and we intend to begin rotating treatment types to maximize efficacy and efficiency.

Prairie dog visual count surveys were conducted at 17 plots across the MRA (x = 0.37 prairie dogs per acre), which suggested a reduction in average density of 87%

since 2017. Based on these numbers and qualitative assessments via windshield surveys, we estimate ~4,000 acres remains with any amount of prairie dogs. Overall, prairie dog densities and patterns of distribution continue to decline. While alarming, we observed many nursing prairie dogs and noted marked increases in density in some portions of the MRA. These are positive signs, and we are guardedly optimistic.



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 increases in both prairie dog density and ferret survival in 2021; we are cautiously optimistic the severity of the epizootic may be diminishing.

In September 2021, we conducted 368 hours of spotlight surveys covering 4,791 acres of the MRA, and we focused on areas with high to moderate prairie dog density. During surveys, we captured 3 and the Minimum Number Alive observed was 4 but could be as high as 6. We did not find evidence of any reproduction—2020 and 2021 were the only years in which reproduction was not documented. All captured ferrets observed in 2021 were released in 2020. On September 24, 2021, we released 20 captive-reared ferret kits (10m:10f) to bolster the population.

In 2022, we intend to continue monitoring ferret habitat and population status, including a cursory evaluation of prairie dog density prior to scheduled plague management treatments and visual count surveys in mid-June. We will continue to treat the site with deltamethrin dust and incorporate fipronil-coated grain in an effort to reduce sylvatic plague. To

Ferret Biologist Andrew Gygli uses hair dye to mark a captured ferret near Meeteetse, WY. All ferrets were processed in the open air while conscious to minimize potential of transferring COVID-19 to the local ferret population. Photo by Kirby Lau.

better understand the effectiveness of fipronil grain in suppressing ectoparasites of prairie mammals, we will complete a Before-After-Control-Impact study in cooperation with the US Geological Survey. We will again conduct spotlight surveys of similar scale to those conducted in 2021, specifically targeting the portions of the MRA supporting suitable habitat. Additional captive-bred ferrets may be released, pending allocation from the US Fish and Wildlife Service and sufficient prairie dog density.

Prepared by: Andy Gygli, Ferret Project Biologist
Funding sources: State Wildlife Grants and the Wyoming Game and Fish Commission

Preble's meadow jumping mouse. Photo: USFWS

PREBLE'S MEADOW JUMPING MOUSE SURVEYS IN SOUTHEASTERN WYOMING

Preble's meadow jumping mouse (Zapus hudsonius preblei; hereafter PMJM) is a small rodent found in southeastern Wyoming and eastern Colorado. Habitat is defined by heavy riparian vegetation and shrubs that are adjacent to upland habitats used for hibernation (Figure 1). In 1998, PMJM was listed as Threatened under the ESA due to loss of habitat from agricultural, residential, and commercial development. Conservation of PMJM is a high priority, but effective management has been complicated by taxonomic and distributional uncertainty. The closely related and morphometrically similar western jumping mouse (Z. princeps; hereafter WJM) completely overlaps the distribution of PMJM in Wyoming, further complicating species identification in the field. While genetic investigations have clarified taxonomic status, there remains considerable uncertainty about the distribution of the taxon, particularly in the northern part of its range in Wyoming.

Figure 1. *Example of jumping mouse habitat along Friend Creek in the Lower Laramie HUC. Both PMJM and WJM were detected at this site in 2020.*

HUC	Year	Location	*Zapus*	Species
Glendo Reservoir	2020	La Bonte Creek	No	n/a
		Horseshoe Creek	No	n/a
		North Cottonwood Creek	Yes	PMJM
	2021	La Bonte Creek	Yes	WJM
		Horseshoe Creek	Yes	PMJM
		Trail Creek	Yes	PMJM
Lower Laramie	2020	Friend Creek	Yes	PMJM, WJM
		Bear Creek	Yes	PMJM, WJM
		Laramie River	No	n/a
		Johnson Creek	Yes	PMJM
	2021	Bear Creek	Yes	WJM
		Arapaho Creek	Yes	PMJM
Horse	2020	Bear Creek	No	n/a
		Horse Creek	Yes	WJM
Crow	2020	Middle Crow Creek	Yes	WJM
Lone Tree-Owl	2020	Duck Creek	Yes	WJM
Cache La Poudre	2020	Dale Creek	Yes	WJM

Table 1. *Capture efforts and resulting genetic analyses targeting PMJM in Wyoming in 2020 and 2021.*

The PMJM Recovery Plan calls for the designation and protection of at least one medium population (500 – 2,499 individuals) in Wyoming and up to three small populations (<500 individuals) throughout each of the remaining hydrologic units (HUCs) within the range of the subspecies in the state. The primary goal of this study was to locate PMJM populations throughout their range in Wyoming that may have the potential of serving as recovery populations. We conducted live-trapping surveys at five sites throughout two HUCs in southeastern Wyoming between 2 June and 1 July 2021, for a total of 5,233 trap nights. We captured a total of 25 jumping mice, representing 16 unique individuals; each site resulted in captures of jumping mice. We collected tissue samples via ear punches for 15 individuals. We also captured 50 nontarget individuals representing at least three species. Nontarget captures, in order of number of captures, included: deer mouse (Peromyscus maniculatus), vole (Microtus spp.), and bushy-tailed woodrat (Neotoma cinerea).

Tissue samples collected in 2021 were combined with those from 2020 to further identify jumping mice to species. In total, 74 samples were submitted from 13 sites throughout the range of the subspecies in Wyoming; 38 samples could be assigned to species (Table 1). PMJM were confirmed at 5 sites within the Lower Laramie HUC; all other sites either confirmed only WJM or samples were unable to be assigned to the species level (Figure 2). Interestingly, despite dedicated trapping effort throughout the range of PMJM in Wyoming, PMJM has yet to be confirmed in the southern HUCs in the state – Upper Lodgepole, Crow, Lone Tree-Owl, and Cache La Poudre – although WJM have been confirmed at multiple locations throughout these HUCs. While some HUCs have received substantial trapping effort throughout potential habitat (e.g., Crow), others are likely in need of targeted efforts to determine if PMJM are in fact present (i.e., Upper Lodgepole and Lone Tree-Owl). Two HUCs (Lone Tree-Owl and Cache La Poudre), however, are thought to support PMJM downstream where they cross into Colorado.

These results, coupled with the confirmed overlap of PMJM and WJM in other portions of Wyoming, highlight the need for continued genetic verification throughout the range of the subspecies. These results will ultimately be used to guide management and conservation efforts in support of recovery and delisting goals.

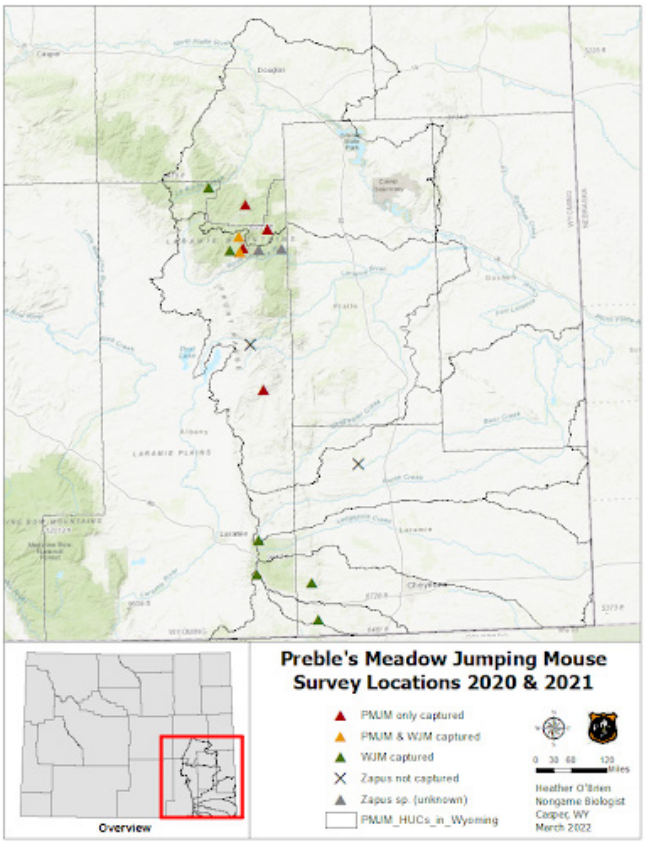


Figure 2. *Results from trapping efforts and genetic analyses targeting PMJM in Wyoming in 2020 and 2021. Triangles represent locations were jumping mice were captured, with colors differentiating among locations with PMJM, WJM, or both.*

Prepared by: Nichole Bjornlie, Nongame Mammal Biologist

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Bat cluster. Photo: Laura Beard

BATS: MONITORING, WHITE-NOSE SYNDROME SURVEILLANCE, AND LIFE-HISTORY INVESTIGATIONS

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 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 mid-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; to that end, the Nongame Program recently completed a Statewide Bat Monitoring Plan.

The Statewide Bat Monitoring Plan outlines the distribution, population, and disease monitoring efforts and methods currently conducted in the state, borrowing the majority of its structure from the North American Bat Monitoring (NABat) Program - a comprehensive, international bat monitoring program housed at the US Geological Survey. Distribution and population monitoring efforts contribute data to the NABat database, while the WNS surveillance included in this plan contribute to the National WNS Response coordinated by the US Fish and Wildlife Service. By contributing to these national initiatives, the Nongame Program is able to leverage data management and analysis structures already in place. The Statewide Bat Monitoring Plan is intended to further maximize the use of bat monitoring resources in Wyoming by describing priorities and coordinating monitoring across the state. A major goal of this document is to ensure that the data collected are useful and available to state and federal land and wildlife management agencies in the implementation of bat management activities.

In March of 2020, COVID-19, the respiratory disease caused by the virus SARS-CoV-2, could be transmissible to North American bats. In response to that concern, Game and Fish suspended all bat handling in the state. As a result, bat research and monitoring necessarily pivoted to remote monitoring techniques where possible or was delayed where remote monitoring techniques were not suitable. Several projects conducted by Game and Fish were affected by the suspension of bat handling as well as human safety concerns related to travel and working in teams at close quarters. Affected projects included spring capture to monitor for the fungus that causes WNS, fall capture and radio tagging to track bats to hibernacula, and hibernacula surveys for population and WNS monitoring. Most restrictions were lifted for the 2021 spring and summer capture season, though precautions are against the transmission of respiratory diseases from researchers to bats are still required as part of the Department's Chapter 33 handling permit. These precautions have been well received by the bat research community, and are likely a reasonable precaution going forward, as they are likely to be protective against unknowing transmission of many pathogens from researchers into the bat population.

Western Small footed myotis hibernating in a cave. Photo: WGFD.

THE NORTH AMERICAN BAT MONITORING PROGRAM IN WYOMING

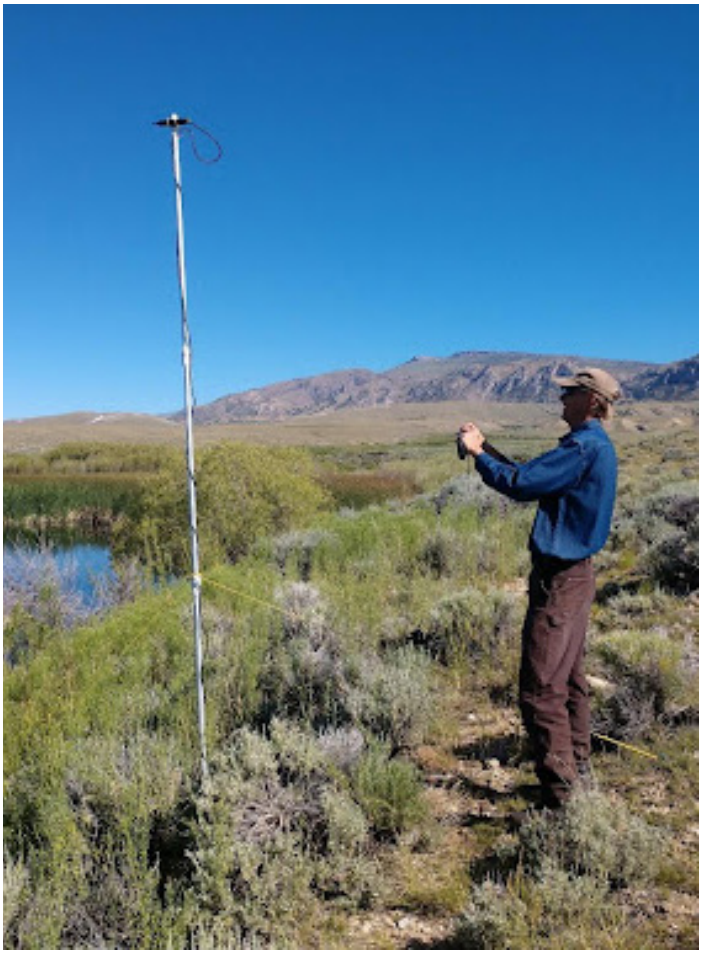
Prior to 2018, long-term monitoring of bats in Wyoming was limited to a few known roosts and limited areas of special interest in the state. Conservation challenges to bats, such as WNS and wind energy development, required a more comprehensive monitoring scheme. To this end, Game and Fish implemented the North American Bat Monitoring (NABat) Protocol on a statewide basis in 2018.

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.

The roost monitoring portions of the NABat Protocol are designed to support ongoing roost monitoring as well as to guide new efforts. One of the longest running bat monitoring efforts in Wyoming focuses on locating and monitoring roosts. These efforts are on-going, and while previous efforts focused on subterranean structures, the Nongame Program is working to expand knowledge of and monitoring at maternity roosts. Many of these locations house colonies that are far larger than any known hibernacula, allowing for improved disease and population monitoring. The NABat database housed at USGS has the capacity to store and make widely available all information on bat roosts to users nationwide without divulging specific location information. In 2019, we uploaded all recent and historic roost information belonging to Game and Fish into the NABat database, housed in a colony count project, to allow for easy collaboration with partners. Prior to this upload, all identifiable features, such as cave names and specific location information, were removed to protect roost locations. Location specific information is available from Game and Fish to relevant partners to facilitate collaboration. The Statewide Bat Monitoring Plan documents the contributions of various stakeholders within the NABat colony count project, with the hope that users will have greater ability to contribute data to the state and national bat monitoring efforts, as well as having greater access to data for their own research and management needs.

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, 2020, and 2021 with a few exceptions where permission could not be obtained during a field season. We have continued to develop the monitoring effort toward the goal of consistently monitoring 2% of priority cells in the state. In 2021, 98 sites in 38 cells were successfully monitored for bat activity, while additional 11 sites



US Fish and Wildlife Service Biologist Pat Hnilicka assists with NABat Surveys. Photo: WGFD.

in 8 cells were attempted, but failed for a variety of reasons, including detector failure and interference by livestock. We continue to work to mitigate these issues. Yearly monitoring at these locations will allow Game and Fish, in partnership with the NABat Program, to document changes in bat distribution and activity though time.

The Nongame Program 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, which will provide seamless data sharing for partners. 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 Program.

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 access 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.

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. The exact means of mortality is unknown but is thought to include starvation and exposure. Species occurring in Wyoming that are known to be affected by WNS elsewhere in their range include big brown bats (Eptesicus fuscus), American perimyotis (Perimyotis subflavus, widely known as the tri-colored bat), and several myotis species. The rest of the Myotis genus are expected to be affected, though many 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. A common strategy for selecting these sites is to target maternity roosts in the early spring as bats are returning to their summer roosts. Sampling at maternity roosts is done primarily through capture, with guano collection as

Swabbing a bat during Pd surveillance. Photo: WGFD.

an additional measure at a subset of suitable sites. 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 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.

Pd surveillance began in Wyoming in 2014 and the fungus was first documented in the state in 2018, in Goshen County during spring sampling at a maternity roost. Hibernacula sampling was not conducted in the 2020-21 season due to Covid 19 travel and bat handling restrictions, so that sampling at maternity roosts was limited to guano collection at one site, which yielded an inconclusive result that was not repeatable by the lab. No Pd status change was implemented, and the site was prioritized for sampling the following season. During spring of 2021 five maternity roosts were sampled for Pd, with one inconclusive result. The inconclusive result from 2021 was at a different roost than that in 2020, and the inconclusive site from 2020 yielded no positive or inconclusive results, despite greatly increased sampling at that site in 2022. No status change was made due to the inconclusive result from 2021, but the site will be a priority for sampling in the spring of 2022.

Hibernacula sampling resumed in the 2021-2022 hibernation season and was carried out by the Department as well as by partners. All results are reported here for simplicity. The first subterranean detections of the fungus in the state occurred in February of 2022, in Platte and Carbon Counties. In both sites, bats tested positive for the fungus. In the Platte County site, soil samples did not contain the fungus, which could indicate that the infection is in the early stages at this site, as it can take a full season or two of infection for the fungus to be detected in the soil. No soil samples were taken in the Carbon County site as this cave houses sufficient bats to make up the full sampling requirement; this site was last sampled with no Pd detections in February of 2020 by swabbing hibernating bats, so it is most likely that the infection occurred after that time. A mine site in Platte County and two natural caves in Sheridan County tested negative for the fungus. Samples from bridge sites in the eastern 1/3 of the state, as well as samples from lab submitted rabies negative bat carcasses, are awaiting processing at the time of writing.

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. The disruption in testing during the 2020-21 season due to the pandemic introduced a higher degree of uncertainty as to the spread of Pd in the state, necessitating greater care in adherence to decontamination measures and increasing the need for widespread Pd surveillance. In light of this uncertainty, increased coordination among partners has led to the increased regionalization of sampling efforts within the state, which is helpful in ensuring that researchers are not acting as a vector for the disease.

WINTER ACOUSTIC MONITORING TO LOCATE LITTLE BROWN MYOTIS HIBERNACULA

While bats in the eastern US hibernate in subterranean structures in large numbers, far fewer large hibernacula have been found in the West, which tend to host smaller groups of bats (Weller 2018). In Wyoming, few hibernacula are known that host more than five observable myotis of any species (WGFD, unpublished data). As WNS spreads across the country and the state, it is increasingly important to understand where little brown myotis (myotis lucifugus, MYLU), one of the most widespread and historically abundant bats in the country, hibernate, as they are evidently not using cavernous hibernacula in large numbers in Wyoming. Researchers in other western states such as Alaska and Colorado have found MYLU hibernating in non-cavernous rocky habitat, which prompted Game and Fish to start a project designed to track the species to fall and winter roosts (Blejwas 2021, Neubaum 2015).

In 2019 we tracked bats captured at a maternity roost on the Sweetwater River in Central Wyoming and in the surrounding landscape to attempt to locate hibernacula. Though no hibernacula were confirmed in 2019, we located transitional rock roosts in the rocky hills (inselbergs) surrounding the maternity roost. As handling was suspended during the fall of 2020,

we established acoustic monitoring sites in locations with similar rock features to those found in 2019 by tracking, to attempt to establish whether bats are active in the winter in the rocky habitat surrounding a known maternity roost. Bats are unlikely to travel far from roosts in winter, so if bat activity is detected in an area, it is likely that a hibernaculum is nearby. Acoustic monitoring sites were established on the river-adjacent side and the offside (the side furthest from the river) of 4 inselbergs adjacent to the river. We set up an additional site near a transitional roost found in 2019 that we suspected of being a hibernaculum based on the late date of its use. Each site consisted of a Pettersson D500x bat detector set to record from 15 minutes before sunset to 15 minutes after sunrise, and three iButtons that record temperature. These buttons were attached to the microphone case to record ambient temperature and inserted in one vertical and one horizontal crack to a depth of 0.5-1.0 m, 10 – 30 m from the detector where possible, and crack characteristics were recorded. A game camera was positioned at each site to record snow cover daily, as well as for detector security. Detectors were maintained through the winter to determine if there is bat activity in the area. MYLU calls at all detectors ceased in September and resumed in May. There were some gaps in recording, but most detectors remained functional throughout the winter, and other bat species were recorded during this time, including other myotis species. The lack of MYLU calls could indicate that MYLU leave the area to hibernate, but could also be due to limited arousals or the specific positioning of the detectors, and this question requires further investigation.

In the fall of 2021, we were able to resume tracking of little brown bats from maternity roosts on the Sweetwater River in Central Wyoming. We radio tagged 26 bats and located 7 transitional roosts used by 6 different bats. As we were unable to maintain contact with bats until hibernation was likely to start (based on daily temperature and date), we do not assume that any roost located in 2021 was a hibernaculum. All roosts located in both 2019 and 2021 were in crevices

Bat in a transitional rock crevice roost. Photo: WGFD

in granite outcrops. These transitional roosts differ from those in other portions of this species' range, where individuals often seek out trees to roost in during the transitional period. It is possible that these transitional crevice roosts forecast the type of roosts used in hibernation, but more work in on this topic is needed.

Prepared by: Laura Beard, Bat Biologist
Funding sources: US Fish and Wildlife Service Competetive State Wildlife Grant, US Fish and Wildlife Service WNS Grants to States, Wyoming Governor's Endangered Species Account Fund, Wyoming Game and Fish Commission

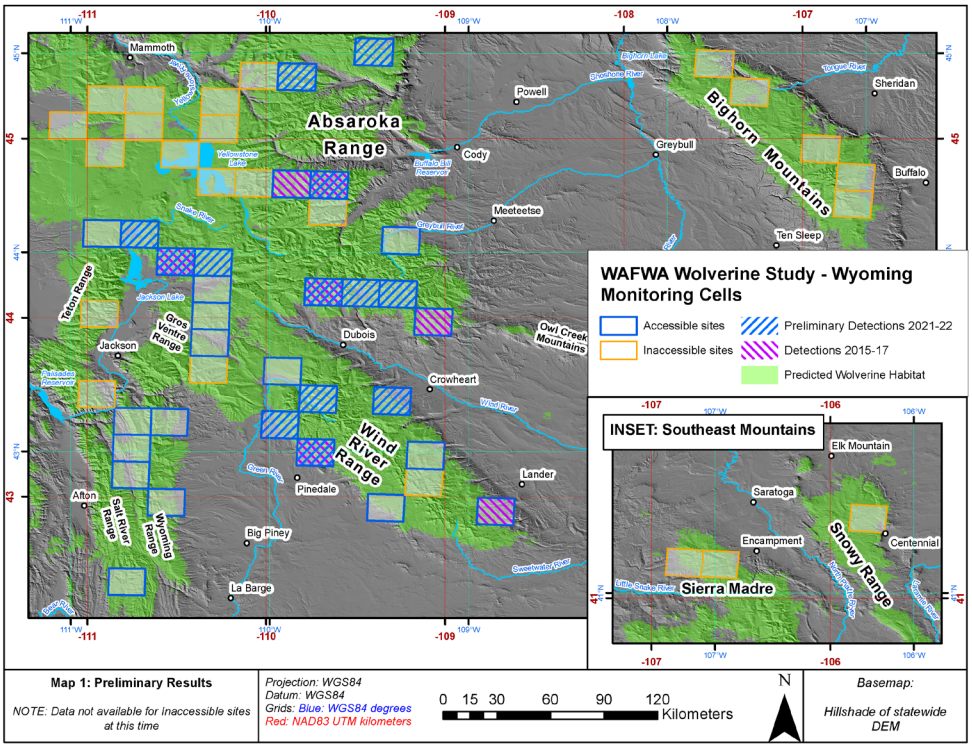
WOLVERINE OCCUPANCY SURVEYS IN WYOMING: 2021-2022 UPDATE

Wolverines (Gulo gulo) are the largest members of the weasel family and are found throughout the northern latitudes of North America, Europe and Asia. After being nearly eliminated from the contiguous US in the early 1900s due to unregulated harvest, habitat loss and broad-scale carnivore poisoning, individuals have been re-colonizing their former range. The southern extent of reoccupation by resident breeding wolverines is uncertain, but is thought to be within Wyoming. In the contiguous US, wolverines are preferably found in high-elevation (generally >2,600 m) coniferous forests and alpine habitats with thick snowpacks, persistent spring snow cover and high topographic ruggedness. Snow cover, particularly spring snow for denning, is generally considered important for resident populations by providing thermal and predatory protection for cubs. Weighing 8 to 18 kg, their large feet relative to their body size is an adaptation to snowy terrain that allows for traveling long distances as they hunt and scavenge for food. They disperse an average maximum distance of 102 km for males and 57 km for females from their mother's home range (Inman, 2013), although much larger dispersal events have been documented, including a male traveling >1,300 km from Wyoming to Colorado and then North Dakota (Packila et al., 2017). Home range areas are extensive, averaging 797 km2 to 303 km2 for males and females, respectively (Inman, 2013), which generally results in low population densities. The wolverine's preference for high elevations, rugged terrain and deep persistent snowpacks, as well as the low population density, inhibits the study of

Wolverines' preference for rugged terrain and snowy environments provides for challenging fieldwork, including long snowmobile and ski approaches, and the occasional winter

these elusive creatures, and relatively little is known about wolverine populations in Wyoming, including population status, distribution, densities, and trends.

To better understand the extent of and trends in wolverine populations, the Western Association of Fish and Wildlife Agencies (WAFWA) developed a statistically-defensible field study procedure to be conducted simultaneously across participating states and repeated every 5 years. Wyoming participated in this study first during a pilot project in the winter of 2014-15, then during the full-scale study conducted in phases in the winters of 2015-16 and 2016-17. The current study revisited stations from previous monitoring, with the addition of some sites along the Wyoming-Colorado border. In this effort, 51 previous stations were monitored with an additional 3 new stations located in the Sierra Madre (2) and Snowy Range (1), for a total of 54 stations. Cameras stations were installed in October-November of 2021, with a formal data collection period of December 1, 2021, through March 31, 2022. Many camera stations were recovered throughout the month of April, but some will be recovered during the summer of 2022 based on access.



Preliminary results show that at least 13 camera stations observed wolverines in the Wind River and Absaroka Ranges and the Beartooth Mountains. While this represents an increase in the number of stations observing wolverines as compared to the 2015-17 survey, the number of unique individuals observed at these stations is not at this time known. Based on fur patterns, at least 5 camera stations observed more than 1 distinct wolverine at the station. However, the sexes of these individuals are unknown at this time.

Data collected will be combined with data from neighboring states to develop multi-state occupancy models and inform wildlife management decisions. Conservation objectives include promoting long-term viability, supporting expansion into suitable habitat, and management of wolverines as a protected species.

As of the time of this report's submission, not all cameras had been recovered and not all data analyzed. In particular, inaccessible site data has not been completely analyzed, and no DNA samples have had results returned. Final results will be provided in subsequent reports when these become available.

Prepared by: James Houston Thompson, Colin Cikoski, Autumn Ruskell, and Owen Kantor, Wolverine Technicians
Funding sources: United States Fish and Wildlife Service and the Wyoming Game and Fish Commission

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