Yellowstone National Park
Yellowstone Bird Program 2019
Wyoming, Montana, Idaho

Yellowstone Center for Resources
National Park Service
Department of the Interior

Yellowstone Bird Project Annual Report

2019

Summary

Raptors. In 2019, 19 of 29 monitored peregrine falcon territories were occupied and all 13 attempted nests were successful. In contrast, the nesting success of both bald eagles and osprey was down from the previous several years. In 2019, 23 of 31 monitored bald eagle territories were occupied; 7 of 20 (35%) eagle nests were successful. Twenty-eight of 40 monitored osprey territories were occupied, and 14 of 20 territorial pairs that attempted to nest (70%) were successful. One osprey pair initiated nesting on Yellowstone Lake but was not successful. In 2019, we monitored 22 golden eagle territories; all territories were occupied, nesting success was 28%, and productivity was 0.33 young per occupied territory. During the 2019 fall migration, 376 raptors of 16 species were documented migrating through Yellowstone National Park (YNP) across 15 observation days. During late winter/early spring owl surveys, observers detected 32 individuals belonging to four species.

Waterbirds. Two new pairs of trumpeter swans, located on Swan Lake and in the Bechler region, nested in 2019 and successfully hatched seven cygnets in total. In the fall, 21 adult swans and six cygnets were observed in the park. Four additional cygnets raised in captivity were released on the Yellowstone River. Fifteen pairs of common loons fledged nine young in YNP in 2019. An additional 10 unpaired loons were also observed. Three loonlets were captured and banded in 2019. Three male harlequin ducks, outfitted with satellite transmitters to track their movements in May of 2018, returned to YNP for the 2019 breeding season.

From a small colony on the Molly Islands, American white pelicans fledged 175 young. Sixteen pairs of double-crested cormorants nested, but no California gulls or Caspian terns nested on the islands. The number of pelicans, cormorants, and gulls fledged from the Molly Islands has declined since the early 1990s, and Caspian terns have not nested there since 2005.

Passerines and Near Songbirds. We used five methods to monitor breeding songbirds in YNP in 2018: point counts in willow stands, mature forests, and grassland/sagebrush steppe, a banding station, and the North American Breeding Bird Survey (BBS). We recorded 35 songbird species within three willow growth types and captured 38 species at our banding station in a willow-lined riparian corridor. Observers recorded 26 species in mature forests and 24 species in sagebrush steppe. We also observed 2,285 individuals belonging to 80 species along three BBS routes in YNP. During fall migration, we also monitored migrating songbirds in three habitats (willows, mature forest, and sagebrush steppe) using transect methods and the continued operation of the banding station through late September.

CORE BIRD PROGRAM

Raptor Monitoring Program

Peregrine Falcon. In 2019, the 32nd year of YNP's peregrine falcon (*Falco peregrinus*) monitoring effort, we monitored 29 of 36 known breeding territories from late March through July. Nineteen territories were occupied and 13 of 17 pairs with a known outcome successfully fledged at least 26 young. In 2019, nesting success per occupied territory (76%; figure 1) was, other than in 2018, the highest observed since 2009. Similarly, productivity (1.5 young per occupied territory with known outcome) in 2019 was lower than in the previous year but higher than observed in any other year in YNP since 2012. The average brood size in 2019 was 2.0 young fledged per successful pair.

Bald Eagle. We monitored 31 of the 51 known extant and historical bald eagle (*Haliaeetus leucocephalus*) territories for nesting activity in 2019. Similar to peregrines, not all territories are occupied every year and some have been inactive for years. We confirmed that 23 of the 31 territories were occupied by territorial individuals; two territories were unoccupied, and we were unable to determine occupancy at the remaining six. We determined the breeding season outcome for 22 territorial pairs, 20 of which attempted to breed. Seven nests successfully fledged nine young and nest success (35% nest success per active territory (Figure 1) was the lowest observed since 2006. Bald eagle productivity in 2019 was 0.45 young per active territory and the average brood size was 1.3 young per successful nest. Although productivity and nest success in 2019 were well below the overall respective averages of 0.72 and 51%, the population in YNP generally appears stable. This population stability may be in part due to a notable increase in nesting success around Yellowstone Lake, despite the substantial decrease in Yellowstone cutthroat trout (*Oncorhynchus clarkia bouvieri*; Koel et al. 2005), a historically important eagle prey item (Swenson et al. 1986). Eagles have likely switched to rely more heavily on other prey species, perhaps including the colonial nesting birds on the Molly Islands (pelicans, cormorants, and gulls) and waterfowl (Baril et al. 2013).

Osprey. We monitored 40 of the 56 known osprey (*Pandion haliaetus*) territories from mid-May to mid-August. Of these

(COVER) A Canada goose is protective over three young goslings. NPS Photo.

Bald eagle. NPS Photo.

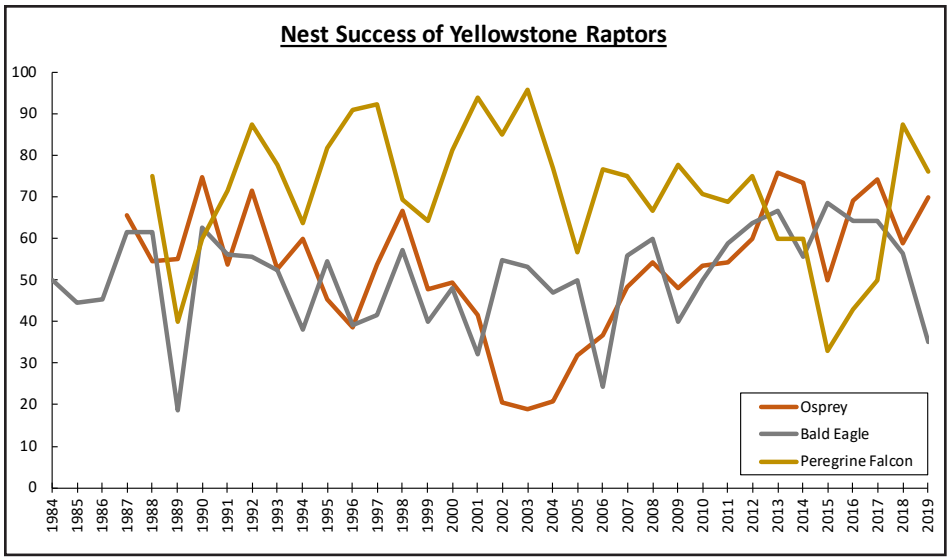


Figure 1. Nest success of three Yellowstone raptor species from 1984 to 2019.

territories, 28 were occupied, 2 were unoccupied, and the occupancy for the remaining 10 could not be determined. Twenty-two territorial pairs attempted to nest and we were able to determine the breeding season outcome in 20 nesting territories. Fourteen pairs were successful and fledged a total of 28 young for a nest success per active territory with known outcome of 70%, well above the 32-year average of 52% (figure 1). In 2019, we calculated a productivity of 1.4 young per active nest; the average brood size was 2.0 young fledged per successful nest.

In 2019, one osprey pair nested on Yellowstone Lake but did not successfully produce young. From 1987 to 2019, numbers breeding on Yellowstone Lake, as well as the local nest success, have declined dramatically (Baril et al. 2013), likely due to declines in their primary prey, the Yellowstone cutthroat trout (Kaeding et al. 1996, Koel et al. 2005). Osprey numbers elsewhere in the park have remained relatively stable.

Wetland Bird Monitoring Program

Trumpeter Swan. We observed three territorial trumpeter swan (*Cygnus buccinator*) pairs in YNP during the 2019 breeding season, including one on Grebe Lake and new pairs on Swan Lake and an unnamed pond west of Lilypad Lake in the Bechler region. The pairs in Bechler and on Swan Lake both nested and successfully hatched three and four cygnets respectively; in total, four cygnets likely fledged. Notably, the nest on Swan Lake produced the first documented cygnets on Swan Lake since 1966. The Grebe Lake pair did not attempt to nest in 2019 and the nesting platform on Grebe Lake was instead used by a pair of common loons. A fourth swan pair nested just outside the park, on Junco Lake southeast of Winegar Lake, and hatched at least three cygnets. The relative success of swans observed in 2019 is in contrast to the otherwise declining trend in swan population abundance and breeding success observed in YNP since 1986 (figure 2).

On Riddle Lake, where swans have nested in previous years, only one swan returned in 2019. In addition to this bird and the known territorial pairs, we observed 14 other swans that moved around YNP throughout the summer. A single bird was frequently sighted on the Firehole River, five birds were routinely seen near the confluence of Alum Creek and the Yellowstone River, and eight birds were observed near the southern end of Yellowstone Lake. During our annual fall survey in September, we counted 21 adult trumpeter swans and 6 cygnets within YNP. This represents the highest total swan count and the first documentation of fall cygnets since 2016.

Trumpeter swan pair and three cygnets on Swan Lake in July 2019. NPS Photo, L. Walker.

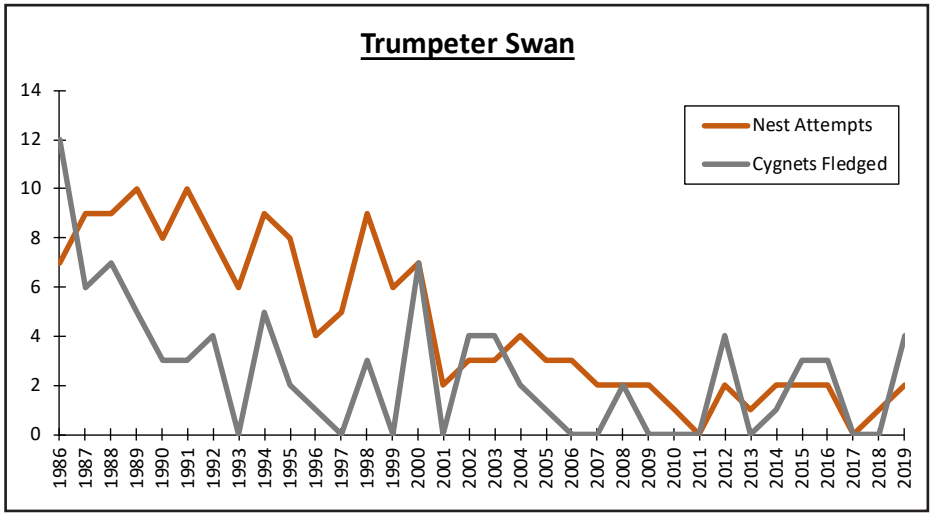


Figure 2. Trumpeter swan breeding pairs and cygnets fledged in Yellowstone from 1986 to 2019.

Breeding success and overall swan numbers in 2019 may mark a turnaround point in a decades-long declining trend. Although the reasons for the decline have been elusive, research by Montana State University graduate student Evan Shields to help identify the cause(s) and develop management recommendations is ongoing. Additionally, since 2013, the YNP bird program has partnered with the Wyoming Wetlands Society (WWS) to increase the number of resident swans in YNP through the release of captive-raised cygnets.

On 10 September 2019, YNP biologists and WWS released four swans on the Yellowstone River in the Hayden Valley, near the confluence with Alum Creek. Including birds released in 2019, the park has released a total of 35 cygnets over the seven-year program.

Colony Nesting Birds. We made three flights over the Molly Islands (comprised of Sandy and Rocky islands) from June to August 2019. From aerial photographs taken during those flights, we observed approximately 613 American

Four young swans are released onto the Yellowstone River in September 2019. NPS Photo, J. Frank.

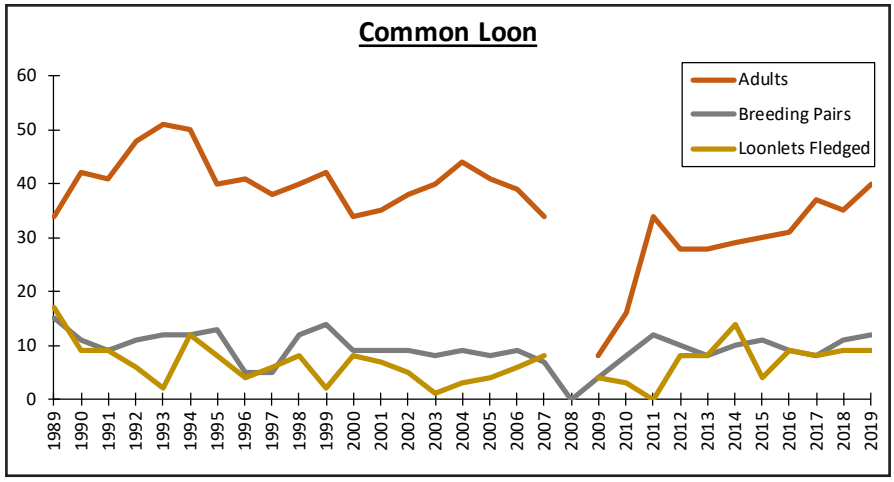


Figure 3. Common loon adults, breeding pairs, and young fledged in Yellowstone from 1989 to 2019.

white pelican (*Pelecanus erythrorhynchos*) nests that fledged an estimated 175 young. We counted 16 nesting double-crested cormorants (*Phalacrocorax auritus*) but did not observe chicks or fledglings. Although we observed several California gulls (*Larus californicus*) perched on the islands, we did not observe any nesting attempts. We did not observe any Caspian terns (*Hydroprogne caspia*) on the Molly Islands in 2019.

To better understand the drivers of colonial waterbird decline, bird program staff conducted ground observations of the Molly Islands on 11 September 2019. Biologists observed signs of predation throughout the colony, including piles of bones and feathers and 17 carcasses of pelican chicks as well as two dead older pelicans. Predation events were attributed to bald eagles; although no eagles were observed during the ground surveys, eagle feathers were found in the colony.

Common Loon. In 2019, the common loon (*Gavia immer*) population within the Greater Yellowstone Ecosystem (GYE) was comprised of 57 total adult birds, including 22 territorial pairs, and 18 nesting pairs. Thirteen nesting pairs successfully fledged 17 young. In YNP, biologists from the Biodiversity Research Institute (BRI), the Ricketts Conservation Fund (RCF), and the park's bird program checked 34 known or historic loon territories.Twenty of the territories were occupied by at least one loon; in total, the park had 40 adult loons and 15 pairs (figure 3). Twelve pairs attempted to nest, and five of those failed. The seven successful pairs produced nine loonlets during 2019 (figure 3) for a productivity of 0.60 chicks per territorial pair. In 2019, bird program staff, biologists from BRI, and graduate student Katie Low from the University of New Hampshire (UNH) also collaborated to capture and band three loon chicks from Tanager and Buela lakes. Blood and feather samples were collected from each captured bird to be tested for mercury contamination. University of New Hampshire graduate work also aimed to assess the overall health of lake communities in the GYE by looking at the accumulation of biotoxins as well as food web dynamics of individual lakes.

Yellowstone National Park provides the majority of loon breeding habitat in the GYE; in 2019, the park had 70% of the area's total loon population and 67% of the breeding pairs. Furthermore, loons in the park produced 53% of the GYE's fledged chicks, highlighting the park's important role in population stability and persistence. In 2019, two loons were killed by gill nets in Yellowstone Lake, one on 11 June (on the east end of West Thumb) and one on 19 September, off of Carrington Island. Although the September capture may have been a migrant, the loon netted in June was likely a resident. RCF biologists conducted a detailed review of Yellowstone's gillnetting records in the fall of 2018 to better assess patterns in gillnetting mortalities and, from their analyses, have reported management suggestions to minimize risk of gillnetting to avian bycatch, including loons.

Biologists conduct common loon surveys on Heart Lake. Photo © M. Albrechtsen.

Songbirds and Near-Passerine Monitoring

Willow Point Count Surveys. The YNP bird program has monitored willow-songbird communities in the park for over 10 years, utilizing point count survey techniques that record all bird detections within 40 m (see Baril et al. 2011 for detailed methods). In most years, three types of willow stands were surveyed for breeding passerines: tall, suppressed, and released (or formerly height-suppressed). In 2019, we recorded 35 songbird species across this range of willow growth conditions. Both species richness (figure 4) and average songbird abundance was highest in tall willows. Yellow warblers (*Setophaga petechia*) were the most abundant songbird observed in 2019 and, although they were most abundant in taller willow stand types, were relatively common in all stands. Wilson's warblers (*Cardellina pusilla*), willow specialists, were most abundant in tall willows (table 1). In contrast, song sparrows (*Melospiza melodia*) were most common in released willow stands with the shrub cover necessary for ground and low nesting species. For other species, such as American robin (*Turdus migratorius*), gray catbird (*Dumetella carolinensis*), and willow flycatcher (*Empidonax traillii*), released and tall willows supported similar numbers of individuals. Suppressed willows appear to provide habitat for generalist and grassland species and we documented brown-headed cowbirds (*Molothrus ater*) and Lincoln's sparrows (*M. lincolnii*) most commonly in suppressed willows. Brewer's blackbirds (*Euphagus cyanocephalus*), European starlings (*Sturnus vulgaris*), and green-tailed towhees (*Pipilo chlorurus*) were only observed in this stand type. Common yellowthroats (*Geothlypis trichas*) and white-crowned sparrows (*Zonotrichia leucophrys*) were similarly abundant across all three willow stand types.

In many places, released willows today exhibit similar structural characteristics to both previously tall and suppressed willows (i.e., tall but dispersed willow shrubs), which contributes to songbird species overlap. In fact, the similarities in songbird distribution across willow stand types highlights the recovery of willows since these surveys were initiated, first by a graduate student in 2005 (Baril et al. 2009, 2011) and then by the bird program in 2008. Between 2005 and 2007, Wilson's warblers were found solely in previously tall willow stands, while gray catbirds were only observed in small numbers in released and previously tall willows. Other songbirds that are broadly abundant today, including yellow warblers, willow flycatchers, and song sparrows, were not observed in suppressed willow stands at all 12 years ago.

Mature Forest Point Count Surveys. The bird program conducts point count surveys (mimicking willow survey techniques described above) of three mature forest stands that varied in forest structure and tree species composition: mid-successional to climax lodgepole pine (*Pinus contorta*), mixed late-successional lodgepole pine and Engelmann spruce (*Picea engelmannii*), and mixed climax Engelmann spruce and Douglas-fir (*Pseudotsuga menziesii*).

We observed at least 26 songbird species in the three mature forest study areas (table 2) and, in general, the most abundant species were yellow-rumped warblers, dark-eyed juncos (*Junco hyemalis*), mountain chickadee (*Poecile gambeli*), and American robins. Species richness increased with forest complexity from 15 species in lodgepole-dominated and mixed lodgepole-spruce forests to 20 species in Douglas-fir and spruce.

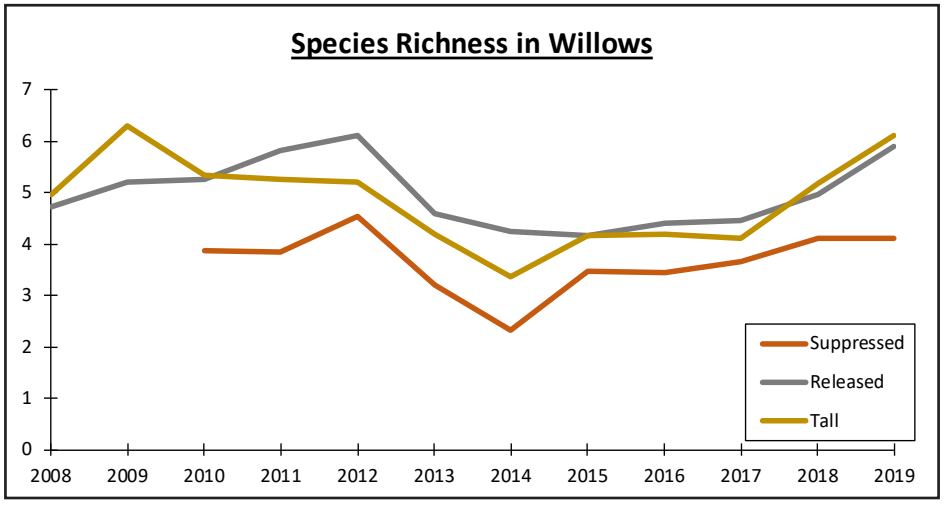


Figure 4. Species richness observed in three willow stand types in 2019. Note: Calculations for average species richness were changed slightly from 2018. Although numbers have been adjusted, overall trends and relative trends between stand types remain similar.

Table 1. Average abundance (individuals per survey per plot) of songbird species observed in suppressed, released, and tall willow stands in 2019.

Species	Suppressed	Released	Tall
American Robin	0.21	0.63	0.59
Black-billed Magpie	--	0.03	0.06
Brown-headed Cowbird	0.39	0.09	0.28
Brewer's Blackbird	0.37	--	--
Cedar Waxwing	--	0.06	--
Chipping Sparrow	--	--	0.03
Cliff Swallow	0.13	0.06	0.38
Common Raven	0.05	--	0.09
Common Yellowthroat	0.32	0.47	0.66
Dark-eyed Junco	0.03	0.06	0.06
Dusky Flycatcher	0.03	0.09	--
European Starling	0.03	--	--
Fox Sparrow	--	0.19	1.03
Gray Catbird	0.08	0.28	0.38
Green-tailed Towhee	0.03	--	--
Lincoln's Sparrow	1.39	0.81	0.88
Marsh Wren	--	--	0.31
MacGillivray's Warbler	--	0.13	0.19
Northern Rough-winged Swallow	--	--	0.03
Pine Siskin	0.26	0.81	0.25
Ruby-crowned Kinglet	--	--	0.06
Red-winged Blackbird	0.11	0.03	0.03
Savannah Sparrow	0.87	0.56	--
Song Sparrow	0.34	0.81	0.47
Tree Swallow	0.11	0.09	0.09
Unknown Flycatcher	0.03	--	0.03
Unknown Hummingbird	0.03	--	--
Unknown Sparrow	--	--	0.06
Unknown Warbler	--	--	0.03
Vesper Sparrow	0.11	0.03	--
Violet-green Swallow	0.16		0.03
Warbling Vireo	--	0.09	0.13
White-crowned Sparrow	0.11	0.19	0.09
Western Meadowlark	--	0.06	--
Western Tanager	0.05	--	--
Willow Flycatcher	0.24	0.75	0.66
Wilson's Warbler	0.05	0.22	0.94
Yellow Warbler	1.08	1.97	2.16
Yellow-rumped Warbler	--	0.19	0.03
	6.58	**8.71**	**10.03**


Common raven. NPS Photo.


Yellow-rumped warbler. NPS Photo.


Green-tailed towhee. NPS Photo.


Western tanager. NPS Photo.


Cliff swallows. NPS Photo.

Sagebrush Steppe Point Count Surveys. In 2019, bird program staff and volunteers surveyed songbirds in sagebrush steppe and grassland plots using point count surveys, a change in methodology from 2018 to be consistent with willow and mature forest survey techniques (see above). We surveyed five areas that represent a range of bison grazing intensity as well as invasive and native plant species components: the Gardiner Basin, the Lamar Valley, along Slough Creek south of the Elk Tongue cabin, the Blacktail Deer plateau, and along Crystal Creek at the west end of the Lamar Canyon.

We observed 24 species of songbird in grasslands and sagebrush steppe in 2019. Species richness was greatest at the Elk Tongue site (n = 13 species) and least in the Lamar Valley and along Crystal Creek, where only 6 species were detected within 40 m of survey locations (table 3). In areas with high intensity of grazing and abundant non-natives, the most abundant species were horned lark (*Eremophila alpestris*), Brewer's blackbird, and western meadowlark (*Sturnella neglecta*). At other sites, species diversity varied significantly, although Brewer's sparrow (*Spizella breweri*), vesper sparrow (*Pooecetes gramineus*), and savannah sparrow (*Passerculus sandwichensis*) were all common.

North American Breeding Bird Surveys (BBS). In YNP, three BBS routes have been monitored during most summer breeding seasons since the mid-1980s: Mammoth, Northeast Entrance, and Yellowstone. In 2019, we observed 2,285 individual birds and a total of 80 species across all three routes. The greatest species diversity and individual bird abundance were both observed along the Yellowstone route (figure 5), which extends from Dunraven Pass southeast to Mary Bay. The number of Canada geese (*Branta canadensis*) throughout the park, but particularly in Hayden Valley, has increased dramatically in recent years, boosting the total count along the Yellowstone route and compensating for decreases in observations of other waterbird species, including lesser scaup (*Aythya affinis*) and Barrow's goldeneye (*Bucephala islandica*).

Bird Banding Station. For the second year, the bird program operated a banding station in 2019 in a willow-lined riparian corridor on the northern range. During the breeding season, we operated the station in accordance with MAPS (Monitoring Avian Productivity and Survivorship) protocol (DeSante et al. 2018), setting up mist nets and banding songbirds and other near-passerines (e.g., woodpeckers) once every ten-day period throughout the summer. To help assess use of riparian habitats by juvenile and migrating songbirds, we also continued once-weekly banding operations into the fall, through the end of September.

Horned lark. Photo © G. Albrechtsen.

During the breeding season, we captured 163 individuals belonging to at least 28 different species (table 4). Most captured individuals were adults and the most commonly captured species were yellow warbler (n = 27) and warbling vireo (*Vireo gilvus*; n = 20). We also captured 11 songbird species in the breeding season that were not identified during point count surveys of the same area. In late summer and early fall, we captured and banded an additional 310 birds of 31 species. Most fall captures were hatch year birds and the most commonly captured bird in the fall was a hatch year Wilson's warbler (n = 43). In total, we captured 38 species utilizing this willow corridor, including several species considered rare or uncommon in YNP: American redstart (*Setophaga ruticilla*), black and white warbler (*Mniotilta varia*), northern waterthrush (*Parkesia noveboracensis*), Cassin's vireo (*Vireo cassinii*), clay-colored sparrow (*Spizella pallida*), spotted towhee (*Pipilo maculatus*), and chestnut-sided warbler (*Setophaga pensylvanica*).

Fall Migration. Between 3 and 26 September 2019, we surveyed 10 line transects through three habitat types (willows, grasslands, and mature forest) for migrant (breeds in YNP or passes through during migration, but does not stay year-round) and resident songbirds (species is present in the park throughout the year). These categories apply to the species as a whole but individual birds encountered may be either local breeders or birds that recently arrived during fall migration. For example, Wilson's warblers are classified as migrants but there is no way to determine if the birds we see during fall migration are local breeders that haven't left yet or if they are birds that bred farther north that have

Table 2. Average abundance of songbird species observed in mature forests in 2019.

Species	Lodgepole	Pine/Spruce Mix	Douglas-Fir/Spruce Mix
American Robin	--	1.63	1.38
Brown-headed Cowbird	--	--	0.06
Brown Creeper	0.25	--	0.06
Cassin's Finch	0.06	--	0.31
Canada Jay	0.19	--	--
Chipping Sparrow	0.13	0.38	0.06
Clark's Nutcracker	0.13	--	--
Common Raven	0.06	--	0.06
Dark-eyed Junco	0.44	1.06	1.25
Golden-crowned Kinglet	--	0.31	--
Hammond's Flycatcher	--	--	0.06
Hermit Thrush	0.25	--	--
Lincoln's Sparrow	0.06	0.06	0.25
MacGillivray's Warbler	--	--	0.06
Mountain Bluebird	--	--	0.06
Mountain Chickadee	0.94	1.31	1.50
Pine Siskin	--	0.25	0.38
Red-breasted Nuthatch	0.31	0.06	0.25
Ruby-crowned Kinglet	0.75	1.06	1.00
Red Crossbill	0.38	0.13	--
Steller's Jay	--	0.06	--
Swainson's Thrush	--	0.38	0.06
Townsend's Solitaire	0.06	0.06	--
Unknown Flycatcher	--	--	0.06
Warbling Vireo	--	--	0.13
Western Tanager	--	0.75	0.25
Yellow-rumped Warbler	0.69	2.00	2.06

Pine siskin. NPS Photo.

Brown creeper. NPS Photo.

Red-breasted nuthatch. NPS Photo.

Steller's jay. NPS Photo.

Brown-headed cowbird. NPS Photo.

Chipping sparrow. NPS Photo.

Figure 5. Number of total individuals observed during three Breeding Bird Survey routes from 1987 to 2019.

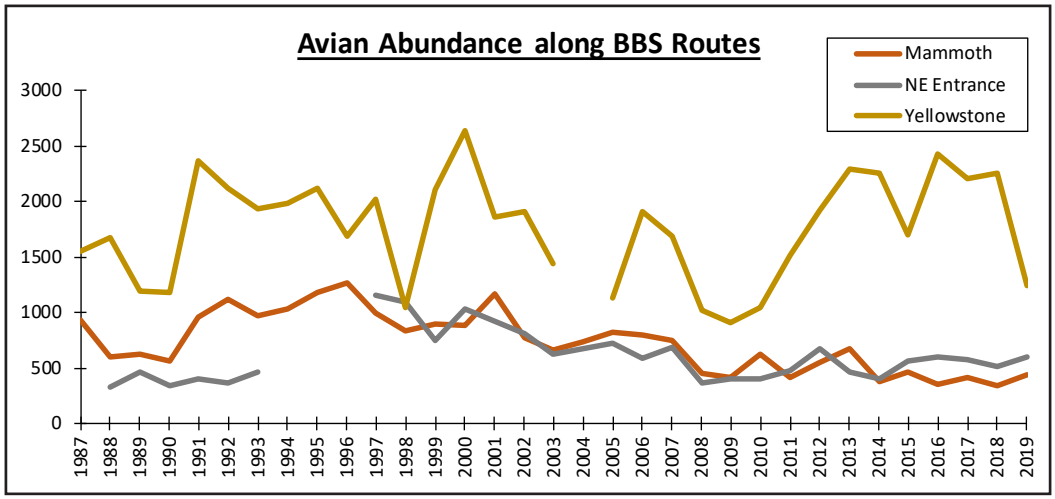


Table 3. Average abundance of songbird species observed across five grasslands and sagebrush steppe sites in 2019.

Species	Gardiner	Lamar	Elk Tongue	Blacktail Plateau	Crystal
American Robin	0.1	--	0.4	--	--
Brown-headed Cowbird	--	--	--	--	0.1
Brewer's Blackbird	1.9	--	0.4	--	--
Brewer's Sparrow	--	--	--	1.6	0.1
Chipping Sparrow	--	--	--	0.1	--
Cliff Swallow	--	0.1	0.1	--	--
Common Raven	--	--	--	0.3	--
Common Yellowthroat	--	--	0.7	--	--
European Starling	--	--	--	--	0.2
Green-tailed Towhee	--	--	--	0.1	--
Horned Lark	2.2	--	--	--	--
Lincoln's Sparrow	--	--	0.5	--	--
Northern Rough-winged Swallow	--	--	0.1	--	--
Pine Siskin	0.3	0.4	0.6	1	--
Red-winged Blackbird	--	--	0.3	--	--
Savannah Sparrow	--	3	2	0.1	0.1
Tree Swallow	0.1	0.1	--	0.1	--
Vesper Sparrow	0.3	0.9	0.8	0.5	0.1
Violet-green Swallow	--	--	--	0.1	0.1
Western Meadowlark	1.2	2.3	--	0.1	--
Willow Flycatcher	--	--	0.3	--	--
Wilson's Snipe	--	--	0.1	--	--
Yellow Warbler	--	--	0.2	--	--
Yellow-rumped Warbler	0.1	--	--	--	--

Table 4. Passerine and near-passerines identified at the Yellowstone banding station in 2019.

	Breeding Season			Post-breeding/Fall Migration			Total
	Adult	Hatch Year	Unknown	Adult	Hatch Year	Unknown	
American Redstart	--	--	--	1	--	--	1
American Robin	8	1	--	--	1	--	10
Black and White Warbler	1	--	--	--	--	--	1
Brown-headed Cowbird	1	--	--	--	--	--	1
Brewer's Sparrow	4	--	--	2	4	--	10
Calliope Hummingbird	2	--	--	--	--	--	2
Cassin's Vireo	--	--	--	--	--	1	1
Clay-colored Sparrow	--	--	--	--	1	--	1
Cedar Waxwing	2	--	--	--	--	--	2
Chipping Sparrow	2	1	--	4	--	--	7
Common Yellowthroat	4	--	--	1	4	--	9
Chestnut-sided Warbler	--	--	--	--	1	--	1
Dark-eyed Junco	3	--	2	2	1	--	8
Dusky Flycatcher	2	--	--	1	6	--	9
Gray Catbird	9	3	--	1	2	--	15
Green-tailed Towhee	1	--	--	2	2	--	5
House Wren	--	--	--	--	--	3	3
Lincoln's Sparrow	6	3	1	2	16	1	29
MacGillivray's Warbler	12	--	--	6	4	2	24
Mountain Chickadee	2	--	--	4	1	1	8
Northern Waterthrush	--	--	--	--	2	--	2
Orange-crowned Warbler	3	--	--	8	1	1	13
Pine Siskin	--	--	--	6	6	--	12
Ruby-crowned Kinglet	2	1	--	7	13	1	24
Red-naped Sapsucker	4	--	--	--	5	--	9
Rufous Hummingbird	--	--	--	1	--	--	1
Song Sparrow	4	--	1	1	11	--	17
Spotted Towhee	--	--	--	--	1	--	1
Swainson's Thrush	3	1	--	--	--	--	4
Vesper Sparrow	5	--	--	--	--	--	5
Warbling Vireo	20	--	2	--	2	--	24
White-crowned Sparrow	6	--	--	3	9	--	18
Western Tanager	--	--	--	--	--	1	1
Western Wood-pewee	1	--	--	--	--	--	1
Willow Flycatcher	5	--	--	1	9	--	15
Wilson's Warbler	6	--	--	35	43	7	91
Yellow Warbler	24	2	1	10	16	--	53
Yellow-rumped Warbler	2	--	--	16	8	9	35
Total Number of Individuals	144	12	7	114	169	27	473
Total Number of Species	**28**	**7**	**5**	**21**	**25**	**10**	**38**

already started migration and are moving through. Similarly, dark-eyed juncos are present in YNP year-round and are considered a resident species but the juncos we see in the fall could be local breeders or birds that have moved south from northern breeding locations to winter in the park.

Songbirds, particularly migrants, were most diverse and most abundant in willows in the fall. Per survey kilometer (km), per visit, we observed 36 migrant songbirds belonging to 20 species and 16 residents belonging to 6 species in willows. In mature forests, we observed 4 migrants of only 3 species and 18 residents belonging to 7 species per km, per survey. Dark-eyed juncos (*Junco hyemalis*) were the most abundant species observed in the fall both in willow stands and in mature forests. Grasslands and sagebrush steppe provided habitat for an average of 16 migrant songbirds belonging to 4 species and 10 resident birds of 3 species per km, per visit. Brewer's blackbirds, a migrant species, were the most abundant songbird observed in sagebrush steppe in the fall.

ADDITIONAL PROJECTS

Arrival of Spring Migrants. Since 2005, D.W. Smith and bird program staff and volunteers have recorded the spring arrival dates in the northern range of YNP for many common migrant species. In 2012, we expanded the scope of this project by encouraging park staff to submit their first arrival sightings. In one notable 2019 observation, a red-winged blackbird (*Agelaius phoeniceus*) was reported on 2 March, one of the earliest first detections of this species since 2005 (table 5). The arrival of the yellow warbler, consistently reported from a single location since the initiation of this project, was detected first on 15 May 2019, largely consistent with previous spring arrivals (table 5). For two species, American robins and red-tailed hawks, the first arrival date has become significantly earlier over the past 15 years.

Bald Eagle Population Genetics and Connectivity. Complementing early banding efforts going back to the 1980s, researchers from the Teton Raptor Center (TRC) are currently collaborating to band nestling bald eagles throughout the GYE. On 03 July, 2019, TRC banded and collected feather and blood samples from two nestlings from a single nest located on Yellowstone Lake (PHOTO). Both young successfully fledged from the nest several weeks later.

Golden Eagle Monitoring. We monitored 22 golden eagle (*Aquila chrysaetos*) territories in 2019, all of which were occupied. We determined the breeding season outcome for 18 territories. Eight pairs nested and eight were confirmed as non-breeders. For the remaining territories, we were unable to confirm if nesting was initiated, but we did determine no young fledged. Five of eight nesting pairs were successful and fledged a total of six young. Nest success in 2019 was 28% per occupied territory with known outcome, slightly below the average success rate since 2011 (30%; figure 6). Average productivity in 2019 was 0.33 young per occupied territory with known outcome, only slightly below the nine-year average of 0.35.

To gain further insight into golden eagle habitat use in northern Yellowstone, the bird program is collaborating with University of Montana graduate student Dave Haines. The ongoing project involves trapping and attaching transmitters to golden eagles across the northern range; final results are expected in 2020.

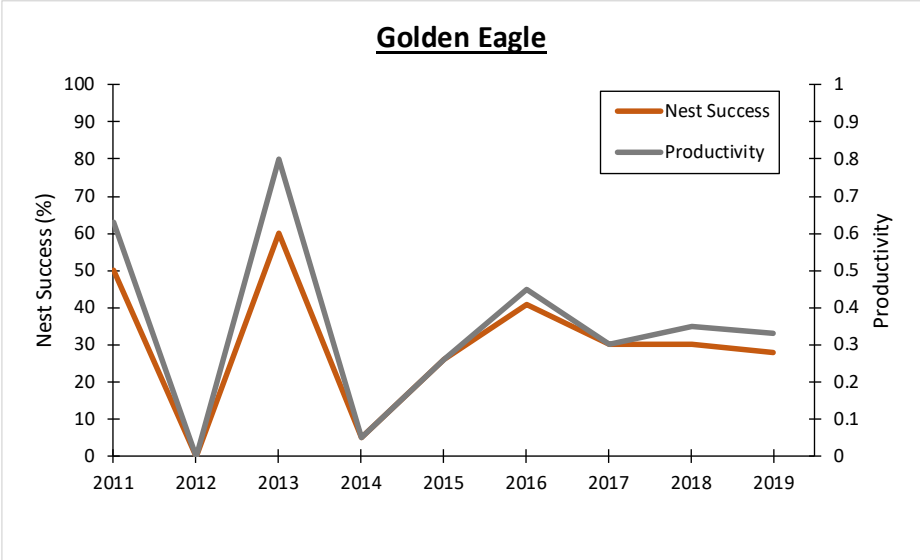
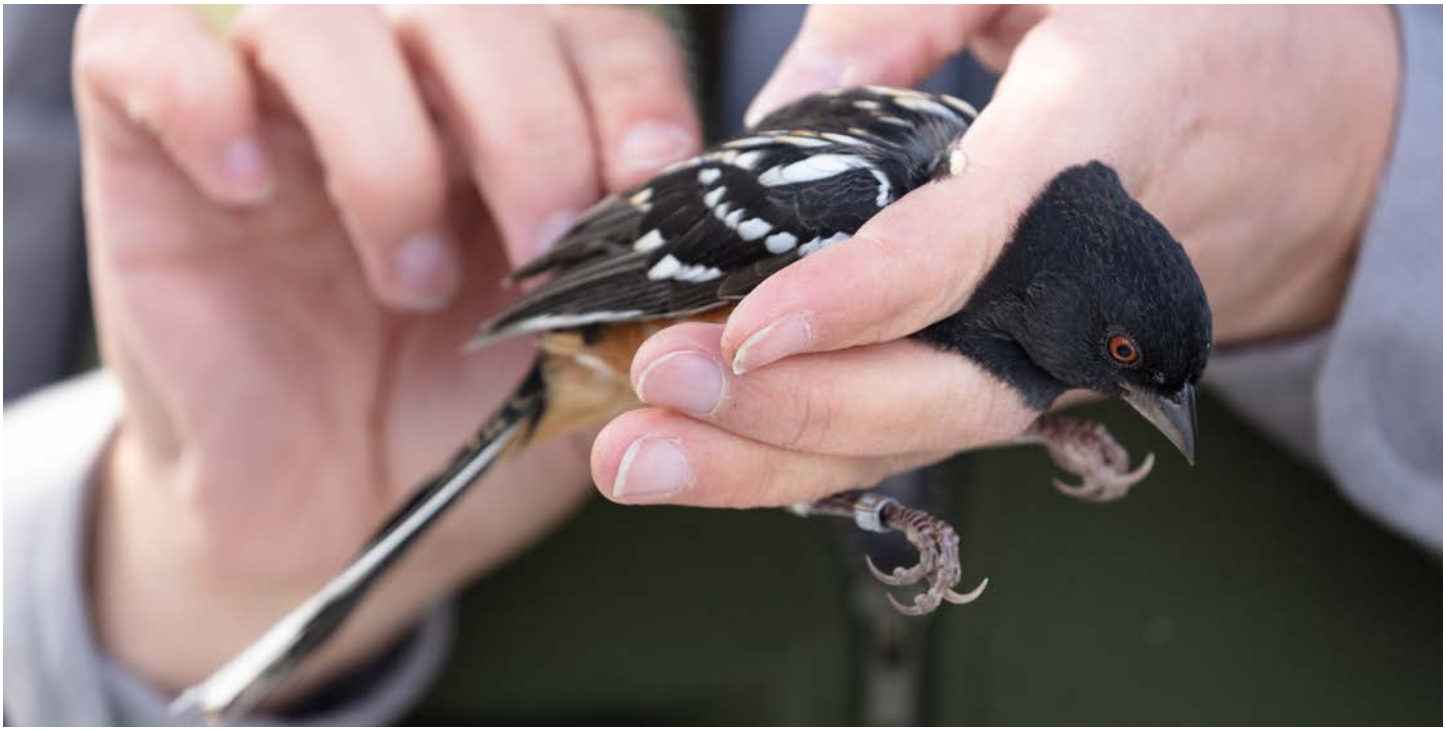


Figure 6. Golden eagle nest success and productivity in Yellowstone from 2011 to 2019.

Table 5. Spring arrival dates for common bird species in the northern range of Yellowstone National Park from 2005 to 2019.

Species	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
American Kestrel		4/4	4/12	4/14	4/30	4/17	4/18	4/16	4/6	4/5		4/12		4/17	4/9[a]
American Robin	3/20	4/14	3/17	3/28	3/21	3/18	3/25	2/18	3/6	3/1	3/10	2/8		3/11	3/7
Mountain Bluebird	3/8	3/4	3/18	3/29	3/12	3/25	3/17	3/7	3/9	2/28	3/10	3/7	3/12	3/11	3/19
Osprey		4/6		4/8	4/19	4/12	4/7	4/5	4/4	4/6		4/11	4/5	4/10	4/9
Red-tailed Hawk		4/4	3/23	4/3		3/17	3/18	3/19	3/9	3/21		3/12	3/6	3/11	
Red-winged Blackbird	3/10	3/16	3/18	4/8	3/17	3/29	3/21	3/5	3/10	3/3	3/11	2/28	3/6	3/22	3/2
Ruby-crowned Kinglet		4/28	4/29	4/21	5/3	4/17	5/10	4/9	4/17	4/11	4/12	4/13			5/2
Tree Swallow		4/28	4/8	4/13	5/2	4/24	5/11	4/22	4/25	4/27		4/12	4/27	4/18	
Vesper Sparrow		5/3	5/13	5/4	5/6	5/7			5/9				5/9	5/2	5/7
Western Meadowlark		4/3	4/5	4/14	4/8	4/1		3/31	4/8	3/16	3/12	3/20		4/4	4/5
White-crowned Sparrow				5/1	5/1	5/7		5/26				3/21	5/6		4/29
Yellow Warbler	5/18	5/12	5/13	5/19	5/17	5/18	5/21	5/8		6/4		5/13	5/19	5/13	5/15
Yellow-rumped Warbler		4/28	4/29	4/20	5/9	4/17		5/7	5/6	5/16		4/13			

[a]Observation from Paradise Valley



A biologist inspects, bands, and measures a spotted towhee captured at the banding station before release. NPS Photo, J. Frank.

Fall Raptor Migration. By monitoring raptors migrating through YNP, the bird program aims to establish baseline information on the abundance, diversity, and timing of raptor migration. In 2019, we conducted 15 raptor migration counts in the Rescue Creek area, north of Mammoth Hot Springs. At least two people counted on all but one survey day and counts lasted 4.4 hours on average. Across all observation days, we counted 376 raptors of at least 16 species (table 6). The highest daily count of 71 raptors was recorded on 2 October and we observed the fewest migrating raptors (1 individual) during the first count of the season, on 15 September. As expected from previous seasons of raptor migration observation (Baril et al. 2017a,b), red-tailed hawks were a common migrating raptor and accounted for 17% of our observations (64 individuals). Similar to observations from 2018 at Rescue Creek, but contrary to patterns observed in Hayden Valley during previous migration seasons, golden eagles were recorded 102 times (27% of total observations). Golden eagles were recorded on 12 of 15 observation days and were the most frequently observed migrating raptor in 2019.

Table 6. Migrating raptors observed from the Rescue Creek count location in Yellowstone across 15 observation days in 2019.

Species	Individuals Observed	Observation Days with Detections
American Kestrel	13	7
Bald Eagle	18	8
Broad-winged Hawk	1	1
Cooper's Hawk	34	9
Ferruginous Hawk	2	2
Golden Eagle	102	12
Merlin	7	4
Northern Goshawk	4	4
Northern Harrier	10	4
Osprey	4	3
Peregrine Falcon	7	5
Prairie Falcon	2	2
Red-tailed Hawk	64	11
Sharp-shinned Hawk	28	7
Swainson's Hawk	2	1
Turkey Vulture	59	6
Unknown Accipiter	5	4
Unknown Falcon	3	2
Unknown Raptor	11	7
Total	**376**	**99**

Mid-Winter Bald and Golden Eagle Survey. The mid-winter bald and golden eagle survey was initiated by the National Wildlife Federation in 1979, but has been organized by the U.S. Geological Survey since 1992. YNP has participated in the mid-winter count since at least 1987. Nine volunteers participated in the mid-winter eagle survey on 11 January 2020. Observers recorded seven adult bald eagles, 1 immature bald eagle, and 2 adult golden eagles.

Harlequin Ducks. As part of a broad-scale effort to better understand the breeding and wintering habits of harlequin ducks across the west, researchers from BRI and Wyoming Game and Fish (WYGF) caught and banded seven harlequin ducks, four males and three females in YNP in May 2018. All four male harlequin ducks were outfitted with satellite transmitters, enabling researchers to track their movements in real time. Although one male appears to have died during its 2018 fall migration, the remaining three males returned to Yellowstone in 2019. All three have since returned to their wintering grounds in the Strait of Juan de Fuca (n = 2) and off the north end of Vancouver Island (n = 1).

Owls. We conducted nocturnal surveys for owls from February through May in the northern portion of YNP using passive listening, call playback, and observations of perched owls. Owl surveys are conducted by volunteers, enabling them to continue after the completion of the YRI in 2015. Surveys are designed to provide an index of sites that attract advertising males of several northern forest owl species. In 2019, observers detected individuals of four owl species (table 7): boreal owl (*Aegolius funereus*; n = 10), great horned owl (*Bubo virginianus*; n = 5), northern saw-whet owl (*A. acadicus*; n = 16), and northern pygmy-owl (*Glaucidium gnoma*; n = 1). Although owl species diversity was lower than in previous years (table 7), owl observations in 2019 represent high total owl abundance (n = 32) and the greatest abundance of northern saw-whet owls since surveys were initiated in 2013.

Common Ravens. To investigate how ravens forage and utilize their environment across seasons and across the park, researchers from the University of Washington and the Max Planck Institute are collaborating with bird program biologists to capture and attach transmitters to ravens throughout the park. Capture and tracking efforts were initiated in 2019 and will continue in 2020.

Clark's Nutcrackers. Clark's nutcrackers (*Nucifraga columbiana*) are important seed dispersers for many western conifers but have a close, mutualistic relationship with the whitebark pine (*Pinus albicaulis*), a species declining throughout the west. In 2019, researchers from the University of Colorado and RCF began monitoring nutcrackers

Two nestling bald eagles are banded and returned to their nest on Yellowstone Lake. Photo © Teton Raptor Center, N. Hough.

across a range of conifer habitats within the park to track how nutcrackers respond to changing conifer availability. Graduate student Thomas McLaren is conducting point counts for nutcrackers and, in 2020, will initiate efforts to capture birds and track their movements using transmitters.

Public Outreach and Education. Two groups from a MSU undergraduate field ornithology class visited the banding station in 2019 to learn about capture and banding methodology, as well as the importance of migration habitat for fall migrant songbirds. Biologist Lauren Walker also met

Table 7. Owl detections during nocturnal surveys in Yellowstone in the late winter-early spring from 2013 to 2019.

Species	2013	2014	2015	2016	2017	2018	2019
Boreal Owl	8	5	8	12		6	10
Northern Saw-whet Owl	3	1	3	7	9	6	16
Northern Pygmy Owl	1	1	3	6	2	2	1
Great-horned Owl	12	8	7	6	4	8	5
Long-eared Owl				1		1	
Great Gray Owl		3				1	
Total Owl Abundance	24	18	21	32	15	24	32
Owl Species Richness	4	5	4	5	3	6	4

with a class from the Yellowstone Forever Institute to lead a discussion of bird monitoring and research in the park.

Retired education ranger Katy Duffy led multiple bird classes and talks throughout 2019. Duffy taught two classes for the Yellowstone Forever Institute, an owl ecology and identification class in early June at the Lamar Buffalo Ranch and a raptor ecology and identification course in September. Twenty-nine visitors met at the Fishing Bridge Visitor Center to learn about raptor ecology and identification using mounts of raptors. The talk was followed by a field trip to Hayden Valley, where poor weather limited public participation to 25 visitors who were able to observe migrating raptors, discuss identification tips, and learn about the ecology of raptor migration. Finally, Duffy also presented four talks on owls for the Yellowstone Co-op Employee Recreation Program throughout the summer.

Noteworthy and Rare Bird Sightings. Reports of rare or unexpected birds provide important information regarding distribution, occurrence, and breeding status of species for which we have little information or for which population distributions are changing. We encourage park staff and visitors to submit all raptor sightings and observations of rare or unusual birds to yell_bird_observations@nps.gov or at www.nps.gov/yell/naturescience/wildlife-sightings.htm.

In 2019, the bird program received reports of a red-eyed vireo (*Vireo olivaceus*) along the Gardiner River in June and of a small group of black terns observed at the southern end of the southeast arm of Yellowstone Lake in mid-September. At the songbird banding station, the bird program also documented a clay-colored sparrow in August and, in September, a chestnut-sided warbler and Cassin's vireo.

Other notable bird sightings from 2019 included a nesting pair of long-billed curlews in the Lamar Valley, two long-billed dowitchers in early October, two western kingbirds near Goose Lake in early September, numerous American avocets, and, on one day in May, approximately 100 red-necked phalaropes in the Lamar Valley. Several additional unusual species for Yellowstone were also observed at the (see Bird Banding Station above).

Conclusions

Long-term monitoring has led to the initiation of several important management actions. The placement and regular maintenance of nesting platforms on several lakes has positively benefitted reproductive success in both trumpeter swans and common loons. For swans, biologists believe the release of captive-raised cygnets into the park may protect Yellowstone swans from extirpation. Further, an NPS grant allowed for additional staffing and monitoring which gave us information to implement and manage closures protecting both swans and loons from human disturbance. Human disturbance has emerged as a critical issue for these birds that nest on water bodies that attract human use and will require annual attention. Both swans and loons benefit from collaborations between park biologists and regional working groups. Our increased loon monitoring and public/private partnerships have led to greater coordination with the Native Fish Conservation program in YNP regarding the placement and timing of lake trout gillnetting, leading to reduced loon mortality.

Previously unmonitored, the recent park effort to track golden eagles has led to greater attention and regional awareness of the population's status. Currently a species of conservation concern across the western United States, data from YNP is now part of regional planning and the development of population models leading to policy and management action. YNP staff helped start the Wyoming Golden Eagle Working Group.

Lastly, the YNP Bird Program has greatly expanded songbird monitoring. This is partly in response to continent-wide

population declines of three billion birds since 1970, and because songbirds are considered environmental indicators. Since 2008, we have added more songbird surveys in various habitats (riparian, grassland, old growth forest, recently burned) and initiated a MAPS (Monitoring Avian Productivity and Survivorship) mist-netting station with the Institute for Bird Populations. This increased sampling will feed into databases across North America helping to formulate policy and regulations pertaining to the conservation of songbirds as YNP is considered an ecological baseline for our region (northern Rocky Mountains).

ACKNOWLEDGMENTS

We would like to thank all volunteers who helped us complete our field data collection in 2019, including Greg Albrechtsen, Grace Smith, Logan Route, Nikki Tatton, Maddy Jackson, Zach Fogel, Angela Stewart, Alice de Anguera, Jennifer Brown, Brian and Keri Thorpe, Kira Cassidy, Brenna Cassidy, Connor Meyers, and Annie Carlson. In particular, our work this summer could not have been completed without Dylan Sanborn and Student Conservation Association interns Sarah Lindsay, Julia Nelson, Micaela Pineda, and Spencer Alascio. We also thank Joshua Theurer, Garrett Tovey, and Yellowstone Forever, who led the red-tailed hawk citizen science project. Matt Ohlen and the YCC also helped collect data regarding red-tailed hawks. We thank Bill Long, Carl Brown, Emerald Gustowt, and Cory Abrams from the Wyoming Wetlands Society for their expertise and guidance with Trumpeter Swan activities; David Evers and Chris Persico from the Biodiversity Research Institute, Walter Wehtje from the Ricketts Conservation Fund, and Vincent Spagnuolo, Katie Low, and Arcata Leavitt for their support and work with common loons; and John Parker for assistance with BBS surveys. We are grateful to the numerous YNP rangers who helped with field logistics, especially Tim Townsend, Jacquelyn Sene, Michael Curtis, Kevin Dooley, Brian Helms, and Brad Ross, and our pilot Mark Packila, without which much of our waterbird and raptor data could not have been collected. We also thank visitors and staff who submitted rare bird sightings. Finally, we thank our funders: Bob and Annie Graham, Scott and Carolyn Heppel, the Meg and Bert Raynes Wildlife Fund, Yellowstone Forever, and Yellowstone National Park.

LITERATURE CITED

Baril, L.M., A.J. Hansen, R. Renkin, and R. Lawrence. 2011. Songbird response to increased willow (Salix spp.) growth in Yellowstone's northern range. Ecological Applications 21:2283-2296.

Baril, L.M., D.W. Smith, T. Drummer, and T.M. Koel. 2013. Implications for cutthroat trout declines for breeding ospreys and bald eagles at Yellowstone Lake. Journal of Raptor Research 47:234-245.

Baril, L.M., D.B. Haines, L.E. Walker, and D.W. Smith. 2017a. Autumn raptor migration in Yellowstone National Park, 2011-2015. Canadian Field Naturalist.

Baril, L.M., D.W. Smith, D.B. Haines, L.E. Walker, and K. Duffy. 2017b. Yellowstone raptor initiative (2011-2015) final report. YCR-2017-04. National Park Service, Yellowstone Center for Resources, Yellowstone National Park, Wyoming, USA.

DeSante, D.F., K.M. Burton, P. Velez, D. Froehlich, D. Kaschube, and S. Albert. 2018. MAPS manual 2018 protocol. Institute for Bird Populations, Point Reyes Station, California, USA.

Kaeding, L.R., G.D. Boltz, and D.G. Carty. 1996. Lake trout discovered in Yellowstone Lake threaten native cutthroat trout. Fisheries 21:16-20.

Koel, T.M., P.E. Bigelow, P.D. Doepke, B.D. Ertel, and D.L. Mahony. 2005. Nonnative lake trout result in Yellowstone cutthroat trout decline and impacts to bears and anglers. Fisheries 30:10–19.

Nichols, J.D., J.E. Hines, J.R. Sauer, F.W. Fallon, J.E. Fallon, and P.J. Heglund. 2000. A double-observer approach for estimating detection probability and abundance from point counts. The Auk 117:393-408.

Postupalsky, S. 1974. Raptor reproductive success: some problems with methods, criteria, and terminology. Proceedings of the conference on raptor conservation techniques, Raptor Research Foundation, Fort Collins, Colorado, USA.

Reynolds, H.V. 1969. Population status of the golden eagle in south-central Montana. Thesis. University of Montana, Missoula, Montana, USA.

Steenhof, K., and I. Newton. 2007. Assessing nesting success and productivity. Pages 181-192 in D.M. Bird and K.L. Bildstein, editors, Raptor research and management techniques. Hancock House Publishers, Blaine, Washington, USA.

Swenson, J.E., K.L. Alt, and R.L. Eng. 1986. Ecology of bald eagles in the Greater Yellowstone Ecosystem. Wildlife Monographs 95:3-46.

(BACK COVER) Bird Program staff wrap up another successful survey season. Photo © D. Sanborn.

For a complete list of our publications, please visit: go.nps.gov/yellbirds

Suggested citation: Walker, L.E., D.W. Smith, M.B. Albrechtsen, H. Weinberg, K. Burke, and K. Duffy. 2020. Yellowstone Bird Program 2019 Annual Report. National Park Service, Yellowstone Center for Resources, Yellowstone National Park, Wyoming, USA. YCR-2020-02.