# Yellowstone Bird Program
# 2010 Annual Report

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Front cover: An American white pelican (*Pelecanus erythrorhynchos*) prepares for splashdown at Yellowstone Lake.

Back cover: Bird program staffers L. Henry (left) and L. Baril (right) conduct and record observations from a promontory overlooking Yellowstone Lake.

# Executive Summary

The core bird program at Yellowstone National Park (YNP) is currently divided into three broad classes meant to include species representative of local diversity: the Raptor Monitoring Program, the Wetland Bird Monitoring Program, and the Passerine and Near Passerine Monitoring Program.

## Raptors

From April to July of 2010, we monitored 26 peregrine falcon eyries for evidence of breeding. Of the 26 sites, 20 were occupied by at least one adult. We confirmed nesting at 16 of the 20 occupied sites, 12 of which fledged at least one young (75% success) for a total of 27 young produced in 2010. Six territories were confirmed as unoccupied and only a single male was observed at one of the occupied sites. We monitored three additional potential sites for peregrine activity, but no peregrines were observed at these sites. Productivity and brood size averaged 1.69 and 2.25 respectively. All three measures of reproduction indicate an increasing population that may act as a source for repopulation of other areas. The collection of biological materials (e.g. eggshell fragments, addled eggs and prey remains) from peregrine nest ledges offers unparalleled information on environmental contaminant levels and prey species composition that cannot be obtained via any other method. YNP's peregrine population is an ideal candidate for obtaining baseline measures of eggshell thicknesses to compare to other populations now and in the future because of its protected area status and long history of population monitoring. For the first time, seven peregrine nest ledges were entered during August and September to collect biological materials important to understanding and evaluating the peregrine recovery process. Eggshell fragments were collected from six of the seven ledges entered and prey remains were collected from all seven locations. Eggshell thickness, an indicator of environmental contaminants, averaged 0.27 millimeters without the inner eggshell membrane attached and 0.34 with it attached. These values are within the normal range of healthy peregrine eggs when compared with standard eggshell thicknesses from the Pacific Northwest. The prey remains found in nest ledges reveal the highly varied diet of peregrines and yielded some notable findings such as fish fins, snake remains, and the foot of a pine marten. We also found feathers from Franklin's gull in four of six sites and several other species that do not breed in YNP, but pass through during spring and fall migration. These species tend to go underreported in YNP and their presence in peregrine nest sites may indicate more frequent occurrence than is observed.

Resource management staff monitor an osprey nest.

Bald eagle surveys were conducted via fixed-wing aircraft. Of the 36 territories monitored, 22 were occupied. Eighteen of the 22 occupied sites were considered active. A total of 12 young fledged from nine successful nests (50% nest success). Productivity and brood size averaged 0.67 and 1.33 respectively. While the overall bald eagle population remains stable in YNP, decreased reproductive success has been observed for eagles nesting in the Yellowstone Lake area in recent years, possibly due to reductions in cutthroat trout abundance, human disturbance, climate change, or other unidentified variables. For the Yellowstone Lake population nest success was only 30% compared with 75% in all other areas of YNP. The low nest success in the Yellowstone Lake area significantly influences the overall nest success rate.

Osprey surveys were conducted in conjunction with bald eagle surveys. We monitored 34 territories, 30 of which were active. Sixteen nests were successful (53%) fledging a total of 36 young. Productivity and brood size averaged 1.2 and 2.25 respectively. Reproductive measures for osprey declined throughout Yellowstone from 1987 to 2003; however, osprey reproduction has increased since 2003 parkwide. Only five osprey pairs nested on Yellowstone Lake and none were successful. This year, master's student Anders Søyland from the Institute of Nature Management (INA) of the Norwegian University of Life Science conducted field work on osprey foraging patterns on Yellowstone Lake during June and July. The objective was to determine if osprey foraging success rates had changed on Yellowstone Lake since lake trout introduction during the mid 1980s. During the entire period of observations ospreys were only occasionally observed at the lake, but were never observed foraging or attempting to forage on the lake.

A second study nearing completion is an evaluation of the relationship between cutthroat trout declines since lake trout introduction and rates of bald eagle and osprey reproduction (nest attempts, nest success and productivity) at Yellowstone Lake region compared with reproduction elsewhere in YNP. This is a joint effort between YNP's bird monitoring program, YNP's fisheries program and statistician Dr. Thomas Drummer at Michigan Technological University that will be submitted to a peer-reviewed journal.

This year we began a new inventory and monitoring program on raptors called the Yellowstone Raptor Initiative (YRI). A small grant from the University of Wyoming-National Park Service Research Station launched this initiative, which involves both the Yellowstone Center for Resources (YCR) and the Interpretation Division. Raptors are abundant and widespread in YNP, yet other than peregrine falcons, bald eagles, and ospreys there had been no formal program to monitor them other than bird sighting reports. The purpose of this grant was to enhance public awareness and education and gather better information on the more than 30 raptor species observed here. We conducted a spring training session designed to improve raptor identification skills among park staff and collaborators for dissemination to the public. Additionally, we developed a raptor monitoring form with accompanying identification guidebook and placed these in visitor centers to help park staff and visitors contribute to raptor monitoring and gain a better understanding of raptor distribution in YNP. Finally, we discovered and monitored a raptor migration route through Hayden Valley in the autumn where we documented numerous species, some of which do not

breed in YNP, and hundreds of individuals. We hope to expand the YRI in the future and involve outside collaborators.

## Wetland Birds

Trumpeter swans were monitored in mid-winter and autumn. During the winter survey 18 adults and five cygnets were counted in YNP. During the fall survey three adults and no cygnets were counted. The Riddle Lake pair and another pair that resides primarily in the Bechler area were not observed during the autumn survey despite frequent observation during the breeding season. Neither pair produced young. During the breeding season only one nest attempt was made but later failed during the incubation stage, likely due to early season flooding. Due to the low population and productivity of this species in YNP, areas where swans currently nest or where pairs show future nesting potential early in the breeding season will be closed until August 15.

We surveyed colonial nesting birds on the Molly Islands, including Caspian terns, American white pelicans, double-crested cormorants, and California gulls. The nesting success of double-crested cormorants and American white pelicans appears to be stable despite large year-to-year variability in weather and lake water levels. American white pelicans fledged 87 young from a total of 427 nest attempts, while double-crested cormorants fledged 59 young from 35 nests. However, nest initiation and success by Caspian terns and California gulls are decreasing on the islands, with neither species initiating nests during 2010. No Caspian terns and only one California gull were observed on the Molly Islands. Common loons were surveyed at 11 historically occupied sites during late July and August. We counted 17 adults at nine of the lakes surveyed and three loonlets at three of the lakes. The number of adults observed in YNP remains stable; however, nesting pairs and fledglings have decreased since 1987.

## Passerine/Near Passerine Species

We continued to monitor songbirds via three surveys: breeding bird surveys (BBS), willow transects, and transects through recently burned sites. The BBS survey is an international survey designed to index bird population trends through time and we annually monitor three routes. On these three routes we recorded 75 species and 2,079 individual birds during 2010.

A male Wilson's warbler

We continued a six-year (three years with MSU) field study of willow-songbird relationships initiated by Montana State University (MSU) to establish a long-term songbird dataset and fill a gap in the knowledge of songbird communities in the park. For the first time since the surveys began in 2005, Wilson's warblers were recorded in sites previously unoccupied by this willow-obligate bird species.

We also continued a study initiated during 2009 to monitor the effects of forest fire on the community composition of bird species. Given possible effects of global warming and a drying climate, more frequent forest fires may occur and several species of birds, especially cavity nesters, use burned trees as habitat. To address this change we initiated transects to sample birds in areas three to five years after a burn.

Lastly, we recorded a species list that included all reliable 2010 bird sightings in YNP. Notable sightings from this year included a great egret, pileated woodpecker, black-and-white warbler, and tufted titmouse.

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# 2010 Program Report

## Introduction

More than 300 species of bird have been documented in Yellowstone National Park (YNP) since the park's establishment in 1872. Approximately half of those are regular breeders here. YNP is surprisingly rich in bird diversity given the harsh environmental conditions that characterize the landscape. The variation in elevation and broad array of habitat types found within YNP contribute to the region's relatively high diversity.

The YNP bird program monitors a small portion of its breeding bird species with the broad goal of gathering information (e.g. reproduction, abundance, habitat use) on multiple species from a wide variety of avian taxonomic groups as well as to maintain long-term datasets (>20 years) for several species. Maintenance of long-term monitoring efforts will help inform us of potential shifts in ecosystem function (e.g. climate change effects) for YNP's bird community and may guide future management decisions with the aim of conserving avian resources in the park.

The core bird program is currently divided into three broad classes meant to include species representative of YNP's diversity: the Raptor Monitoring Program, the Wetland Bird Monitoring Program, and the Passerine and Near Passerine Monitoring Program.

Three species, the bald eagle, peregrine falcon and osprey, are monitored under the Raptor Monitoring Program. With the removal of the peregrine falcon and bald eagle from the Federal List of Endangered and Threatened Wildlife and Plants in 1999 and 2007 respectively, there are currently no federally listed bird species in YNP. However, monitoring efforts for these species will continue to contribute to YNP's long-term dataset and to meeting the monitoring obligations outlined in the US Fish and Wildlife Service (USFWS) post-delisting monitoring plans. This year we have expanded our core raptor monitoring program by gathering eggshell fragments and prey remains from seven peregrine nest sites. The cause of extirpation for peregrine falcons in YNP was egg shell thinning due to environmental contaminants. Data gathered on egg shell thickness from recently abandoned nest sites will help us monitor environmental contaminants and serve as a baseline for comparison to other less pristine sites. While at the nest, gathering feathers from consumed prey will help us learn about the diet of peregrines in YNP, another way to assess their condition.

Highlights of 2010 also included the introduction of a promising new program, The Yellowstone Raptor Initiative (YRI), designed to monitor raptors other than peregrine falcons, bald eagles, and osprey, the raptors which have traditionally been monitored by the Yellowstone bird program. Raptors are abundant and widespread in YNP, yet other than bird sighting reports, there exists no formal program to monitor them. This initiative is intended to monitor these other species and this year we obtained a small grant from the University of Wyoming-National Park Service Research Station to help begin this project. Important to this effort is collaboration with the Interpretation Division and outside experts as public outreach and education is an objective of this new monitoring effort. We were successful monitoring other raptors and involving the public and also monitored a migration route through Hayden Valley during the fall.

The trumpeter swan, common loon, and a number of colony nesting species, including the double-crested cormorant and American white pelican, are included in the Wetland Bird

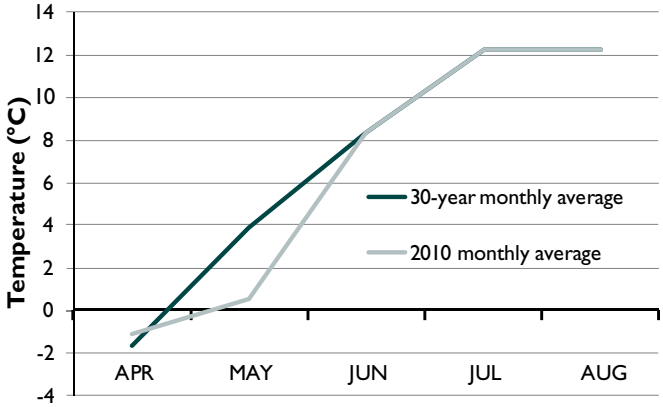


Figure 1. Monthly temperatures for the Lake weather station during the core breeding season, April through August 2010. (Data provided by Snowcap Hydrology, Bozeman, Montana)

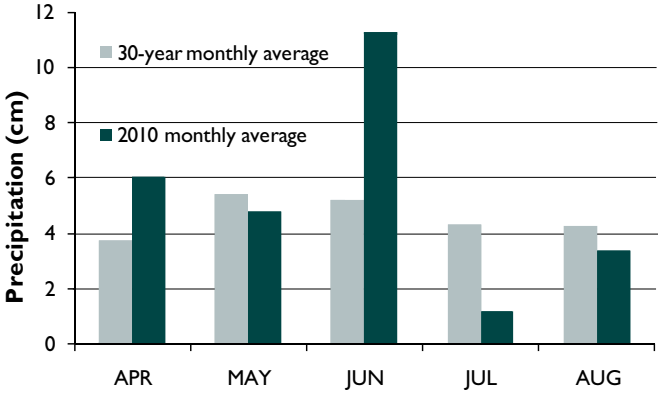


Figure 2. Monthly precipitation for the Lake weather station during the core breeding season (April-August). Data provided by Snowcap Hydrology, Bozeman, Montana.

Monitoring Program. The trumpeter swan is of particular concern in YNP due to a declining population and low reproductive success during the last several decades. This species continues to be studied through collaborative efforts with Montana State University (MSU) and Eastern Kentucky University (EKU) to help establish causal factors for observed declines.

The breeding bird survey (BBS), willow-bird survey, and the newly added forest-burn survey established in 2009 are part of the Passerine and Near Passerine Monitoring Program. This program was recently expanded to fill the gap in knowledge regarding the abundance and habitat use by passerines and closely allied species in YNP. This program is particularly important since species in this group represent the majority of species found within YNP.

More than 3 million visitors are welcomed by YNP every year, many of them avid bird watchers or simply interested in all wildlife. It is our goal to share with the public information on YNP's diversity of bird life and the status of YNP's birds. This report summarizes data gathered for these programs during 2010.

## 2010 Breeding Season Weather

Average monthly temperatures from April through August were consistent with the 30-year average monthly temperatures, except for May when the average temperature was cooler than the 30-year average (Figure 1). Monthly precipitation during April and June was twice the 30-year average while less than half of the 30-year average precipitation fell during July this year (Figure 2). Date of ice break-up on Yellowstone Lake occurred on June 4, more than a week later than the 30-year average date of May 23.

## Climate Change

With rising temperatures and changing weather patterns, variance in the phenology of ecological events is expected. Within YNP however, it is largely unknown how climate change has affected ecosystem processes. In order to protect YNP's resources it is vital to be able to detect changes in ecosystem function so that appropriate management action can be taken.

Birds have been touted as bio-indicators of climate change because of their sensitivity and relatively rapid response to shifts in seasonal weather patterns. For example, climate change has been shown to influence migration patterns, population size and distribution, and the timing of reproduction and nest success (Crick, 2004).

Since 2005, Douglas W. Smith has kept a record of spring arrival dates (migrants) in the Mammoth/Gardiner area for 19 species. It is intended that this dataset will be ongoing to determine if a shift in the mean arrival date is occurring. At present, there is not enough data to detect a change but arrival dates for each year and the six-year mean are given in Appendix A. These efforts represent the observations of one person and will be standardized and expanded in the course of future study.

P.BASE

Incubation exchange at a peregrine nest site

## Core Raptor Monitoring Program

### Peregrine Falcon

Recovery of the peregrine falcon from near extirpation west of the Mississippi River, to re-population throughout North America has been an endangered species success story. Listed as endangered in 1970, drastic measures were taken to save this species from extinction. Captive breeding programs supplied young peregrines that fledged from hack boxes placed in carefully chosen sites within suitable nesting habitat. Yellowstone Park took part in this recovery effort, and beginning in 1983, 36 hatch-year peregrine falcons were released by the National Park Service (NPS), USFWS and state wildlife agencies at several hack sites in and around YNP over a six-year period. Since that time the number of nesting pairs in Yellowstone has steadily increased from one pair in 1984 to 32 pairs in 2007. Because of their strong recovery, peregrines were de-listed in 1999 but continue to be monitored across the country for territory occupancy and reproductive success.

#### *Peregrine Falcon Monitoring*

All monitoring consisted of ground surveys from mid-April through July. To determine peregrine occupancy and reproduction, at least two properly timed visits to known territories are necessary: one to determine occupancy and to identify the nest ledge (and in so doing, confirm a nest attempt) and another to determine nest success and the number of chicks fledged. It is our goal to sample all accessible (i.e. frontcountry) sites every year and survey all backcountry sites on a three-year rotating basis to maintain consistency in the long-term dataset.

#### *Peregrine Falcon Reproduction*

Of the 32 known territories in Yellowstone we monitored 26 plus an additional three potential locations for activity. Of the 26 monitored, 20 were occupied (at one site only a single adult was observed), but there was no evidence of falcon activity at the three potential sites. Despite inclement spring weather, the breeding season for peregrines was consistent with previous years. Of the 20 occupied territories, there were 16 known nest attempts, 12 of which fledged at least one young yielding a 75% nest success rate for 2010 (Figure 3). In total, 27 peregrines fledged in 2010.

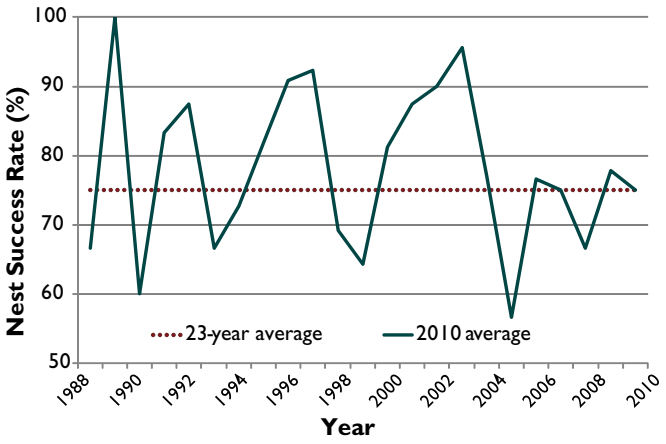


Figure 3. Comparison of 2010 peregrine falcon nest success rate to the 23-year average.


Figure 4. Comparison of 2010 peregrine falcon brood size and productivity to the 23-year average.

Productivity averaged 1.68 and brood size averaged 2.25 (Figure 4). Despite annual fluctuations, nest success, productivity and brood size have remained relatively stable over the 23-year period. We excluded data from the years 1984-1987 since reproductive measures for those years were based on only one nest.

### *Peregrine Falcon Nest Entry*

The collection of biological materials (e.g. eggshell fragments, addled eggs and prey remains) from peregrine nest sites offers unparalleled information on environmental contaminant levels and prey species composition that cannot be obtained via any other method. YNP's peregrine population is an ideal candidate for obtaining baseline measures of eggshell thicknesses to compare to other populations now and in the future because of its protected area status and long history of population monitoring. Eggshell thickness is an indicator of contaminant levels (i.e. thinner eggshells indicate the presence of environmental contaminants). Therefore to further our understanding of peregrine falcon ecology in YNP we collaborated with USFWS raptor ecologist Joel Pagel to collect this information.

Joel Pagel rappels to a peregrine falcon nest ledge.

| Nest ID | No membrane | Membrane |
|---|---|---|
| YNP-E-020A | 0.278 | 0.354 |
| YNP-E-020B | 0.246 | 0.322 |
| YNP-E-007A | 0.260 | 0.336 |
| YNP-E-007B | 0.265 | 0.341 |
| YNP-E-030 | 0.274 | 0.350 |
| YNP-E-015 | 0.281 | 0.357 |
| YNP-E-001A | 0.253 | 0.329 |
| YNP-E-001B | 0.268 | 0.344 |

Table 1. Peregrine falcon eggshell thickness measurements from five peregrine nest sites visited in 2010. Eggshell membrane was attached for most samples. A factor of 0.076 was subtracted from all eggshell thicknesses to estimate thickness without the attached membrane.

From August 2 through 6 and on September 19, Joel Pagel, an experienced bio-climber, entered seven peregrine falcon nest ledges selected for ease of access and limited visibility to visitors. Eggshell fragments were collected from six of the seven ledges with at least three of these containing fragments prior to the 2010 nesting season. Prey remains were collected from all seven ledges. All samples were sent to the Western Foundation of Vertebrate Zoology (WFVZ) in Camarillo, CA for analysis and identification.

Eggshell measurements from YNP were compared with standard eggshell thicknesses from the Pacific Northwest since no known baseline exists for the Rocky Mountain region. YNP peregrine eggshells were found to be within standard eggshell thickness measurements from the Pacific Northwest region indicating little to no contaminant loadings in peregrine eggshells (Lloyd Kiff, personal communication, 2010; Table 1).

Prey remains collected from all seven locations (two ledges at one location) revealed the diversity of a peregrine's diet (Table 2). Notable findings included fish fins, snake remains, and the left front foot of a pine marten found in a single nest. We speculate that because of a sparse food base suitable for peregrines at this site, they obtained

| Species | Found in # of nest ledges |
|---|---|
| American Kestrel | 1 |
| American Robin | 5 |
| Barn Swallow | 2 |
| Brewer's Blackbird | 1 |
| Carpodacus spp. | 1 |
| Clark's Nutcracker | 2 |
| Common Grackle | 1 |
| Dowitcher spp. | 1 |
| Eastern Kingbird | 2 |
| Franklin's Gull | 5 |
| Godwit | 1 |
| Horned Lark | 1 |
| Killdeer | 1 |
| Kingbird spp. | 1 |
| Mountain Bluebird | 2 |
| Northern Flicker | 1 |
| Northern Phalarope | 1 |
| Northern Pintail | 1 |
| Pine Siskin | 1 |
| Red Crossbill | 2 |
| Red-Winged Blackbird | 2 |
| shorebird spp. | 1 |
| swallow spp. | 1 |
| Three-Toed Woodpecker | 1 |
| Thrush spp. (Catharus spp.) | 1 |
| Townsend's Solitaire | 1 |
| Western Meadowlark | 2 |
| Wilson's Phalarope | 2 |
| Woodpecker spp. (Hairy?) | 1 |
| Woodpecker spp. (Williamson's female or three-toed) | 1 |
| Lesser or Greater Yellowlegs | 1 |
| fish spp. (2 sets of pelvic fins) | 1 |
| Pine Marten (foot with attached tibia) | 1 |

Table 2. Prey remains were found in 6 of the 7 peregrine nest ledges visited in 2010.


Prey remains on a peregrine nest ledge. Inset: Pine Marten foot with attached tibia.

the fish from ospreys nesting close by and perhaps stole the other items from eagles. Obtaining a pine marten from a nest ledge is of significant interest since it is the first ever recorded. The feathers of Franklin's gulls were found in four sites. Franklin's gulls migrate through YNP and breed in southern Canada and the northern United States; however, this species rarely occurs in YNP and represents a surprising finding. Other species of note include common grackle, a species of dowitcher and a species of godwit, none of which breed in YNP. Prey remains were identified by N. John Schmitt, a biologist and feather expert with the Western Foundation of Vertebrate Zoology. In 2011 we hope to increase our sampling effort to augment data from the 2010 season.

## Bald Eagle

### *Bald Eagle Monitoring*

Bald eagle nests were located and monitored via fixed-wing aircraft from April through June of 2010. Each of the three flights averaged approximately 4-5 hours; however, flight time was also devoted to osprey, trumpeter swan and common loon monitoring. We monitored 36 bald eagle territories, 14 of which were unoccupied (i.e. no evidence of bald eagles during visits). There were 22 occupied sites, 18 of which were active (i.e. evidence of nesting).

### *Bald Eagle Reproduction*

Of the 18 active nests, nine (50%) were successful. (Figure 5) Productivity across all active nests averaged 0.67 and brood size over all successful nests averaged 1.33 young (Figure 6). These results are consistent with the previous 27 years.

Overall, bald eagle reproduction parkwide remains stable; however there are significant differences in bald eagle reproduction for the Yellowstone Lake region versus all other regions of YNP. Nest success for Yellowstone Lake was 30% (n=10) in 2010 compared with 75% (n=8) for the non-lake region. Productivity was also lower for the Yellowstone Lake region (0.40) compared with the non-lake region (1.00), but brood size was similar (1.33) for both populations.

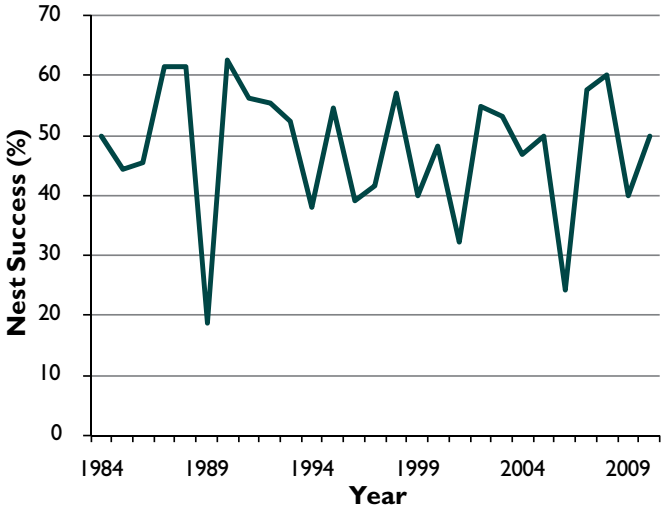


Figure 5. Bald eagle nest success in YNP (1984-2010)

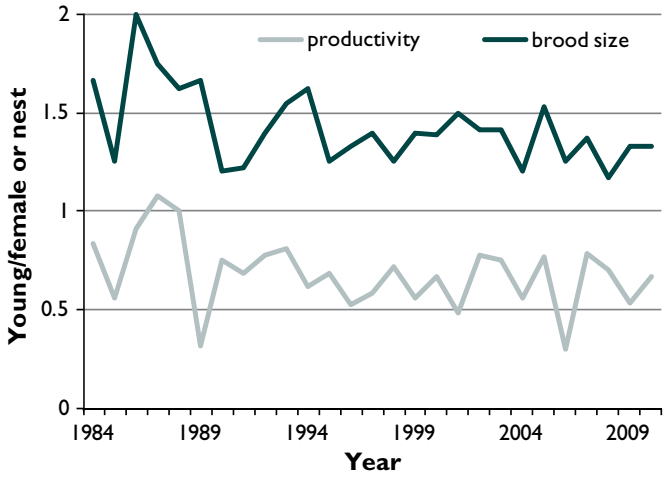


Figure 6. Bald eagle productivity and brood size in YNP (1984-2010).

## Osprey

### *Osprey Monitoring*

We monitored activity in 34 osprey territories from mid-May through mid-August. The majority of osprey nests were monitored via fixed-wing aircraft from May through August. Each of four flights averaged approximately 4-5 hours; however, flight time was also devoted to bald eagle, trumpeter swan and common loon monitoring. Early season flights (May and June) were used to determine territory occupancy and nest activity while later season flights (July and August) were used to determine fledging success. (See Appendix B: Glossary of terms).

### *Osprey Reproduction*

Of the 35 territories checked, five were determined to be unoccupied. One of the unoccupied nests was taken over by a pair of bald eagles. The remaining nests had either fallen down and were not rebuilt or were present, but unoccupied. Of the 30 active nests, 16 (53%) were successful fledging a total of 36 young this year. Nest success was highly variable from 1987 through 1998 with subsequent substantial declines, however nest success

An osprey pair on the nest. The female (right) incubates the eggs, while the male (left) grooms himself.

has increased parkwide since 2003 (Figure 7). Osprey productivity averaged 1.2 young per nesting female and brood size averaged 2.25 young per successful nest during 2010. Since 1987 brood size has been relatively stable, but greater than average during the past two years (Figure 8). Similar to the long-term pattern observed for nest success, productivity was highly variable during earlier years with gradual declines to the lowest level observed over the 24-year period in 2003. Since 2003, however, productivity has increased to levels comparable with earlier years. Significant differences between the reproductive success of ospreys nesting at Yellowstone Lake versus those nesting in all other areas of Yellowstone are still apparent. Of the five active nests on the shores of Yellowstone Lake none were successful, yet 64% of non-lake nests were successful. This disparity is cause for serious concern.

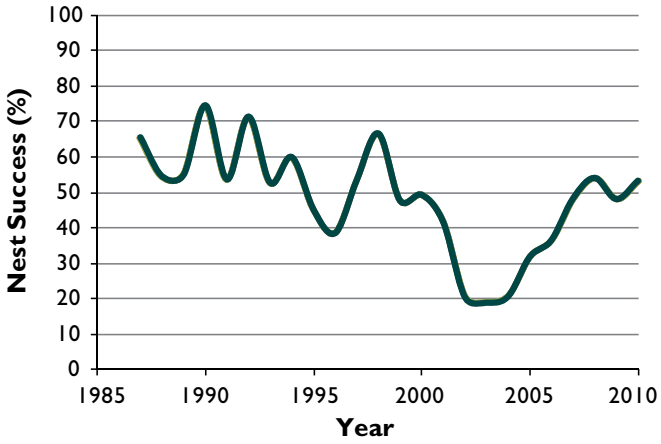


Figure 7. Osprey nest success in Yellowstone 1987-2010.

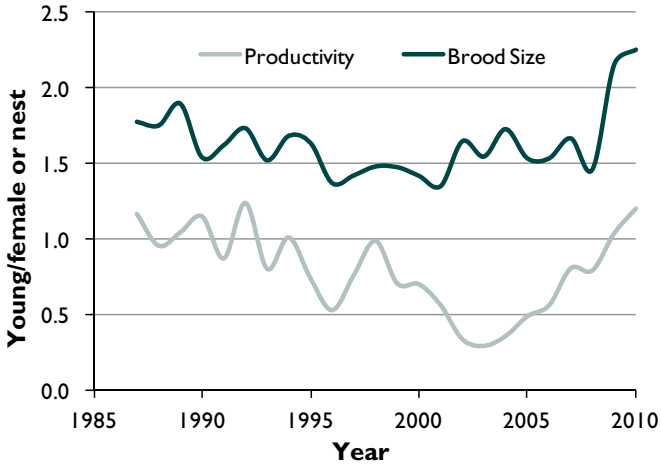


Figure 8. Osprey productivity and brood size in Yellowstone National Park (1987-2010).

## Bald Eagle and Osprey Research

### *Cutthroat Trout Declines Influence Raptor Reproduction*

In a joint effort between YNP's bird monitoring program, YNP's fisheries program, and statistician Dr. Thomas Drummer at Michigan Technological University, we are evaluating the relationship between cutthroat trout declines since lake trout introduction on the rate of reproduction (nest attempts, nest success and productivity) of bald eagles and ospreys nesting in the Yellowstone Lake region and then comparing these results to reproduction in the non-lake region. Preliminary results indicate that declines in cutthroat trout in Yellowstone Lake significantly reduced raptor reproduction resulting in fewer nest attempts, reduced nest success and lower rates of productivity. A white-paper addressing this issue is currently being drafted for submission to a peer-reviewed journal for 2010-2011.

### *Osprey Foraging Patterns on Yellowstone Lake*

This year, master's student Anders Søyland from the Institute of Nature Management (INA) of the Norwegian University of Life Science conducted field work on osprey foraging patterns on Yellowstone Lake during June and July. The objective was to determine if osprey foraging success rates had changed on Yellowstone Lake since lake trout introduction during the mid 1980s. These data would be compared with similar data collected during the 1970s (prior to lake trout invasion) by Søyland's advisor, Jon Swenson, Ph.D. The majority of observations (65 hours) were done from points located near the road on the west shore of the lake. Shoreline observations were supplemented by Yellowstone Lake Rangers Robert Elliot and Kyle McDowle as part of normal lake patrols.

During the entire period of observations, ospreys were observed only occasionally at the lake, and were never observed foraging or attempting to forage on the lake. All birds observed were detected near Bridge Bay and West Thumb. On these occasions birds were observed hovering over the bay for some time before disappearing out of sight. Fisheries biologists and rangers patrolling

The Raptor Initiative will provide data on more of Yellowstone's 30 raptor species, including red-tailed hawks.

the lake several times a week during the summer months confirm that ospreys have been a rare sight on the lake during the last few years (pers com.: Doepke 2010; Elliot 2010; McDowell 2010). Doepke (2010) says he has never seen an osprey foraging on the lake in the seven years he has been working as a fisheries biologist at the lake. He also reports that bald eagles are regularly observed on the lake and that they occasionally are observed foraging on the fish disposal from the Lake Trout Removal Program's gillnetting boats.

Other observations on the lake focused on two nests located in the West Thumb area. The nests were monitored for several hours to determine direction of flight to and from the nest. These data would provide supporting evidence useful in determining osprey foraging patterns on the lake. Birds were observed flying away from the lake or arriving at the nest from a direction other than the lake, except for one occasion when an individual was observed flying toward the lake. It crossed the bay then disappeared out of sight without making a foraging attempt. Activity was also observed in the southern nest in West Thumb, but no individuals from this nest were seen flying toward the lake. There were no observations of fish being brought back to the nest. Both nests ultimately failed.

Based on these observations and reports by rangers and fisheries biologists, it appears that ospreys are no longer utilizing the lake for foraging. This is a cause for concern since Yellowstone Lake has traditionally supported the greatest density of nesting ospreys in all of YNP.

## Raptor Initiative

This year we obtained a $5000 grant from the University of Wyoming-National Park Service Research Station to begin a new program to inventory and monitor raptors other than the three species (bald eagles, osprey, and peregrine falcon) currently tracked.

In addition to improving our knowledge on other raptors, another objective of the program was to improve public outreach and visitor education about aerial predators. In keeping with that objective, the project is inter-divisional between the Yellowstone Center for Resources (YCR) and the Division of Interpretation. YNP has over 30 raptor species yet quantitative data exist on only three, and a full survey of what species are present needs to be conducted. The project is designed to fulfill that need and is designed to last five years, focusing on diurnal raptors for the first two years and on nocturnal raptors (owls) in year three.

The ecological contribution of predators such as grizzly bears, wolves, and coyotes has long been recognized in YNP; however, the aerial niche has been far less investigated. Common species such as red-tailed hawks may provide indicators of environmental change, yet we have no accurate population estimates or documented trends to support this. Golden eagles may be declining across

A pair of great horned owl chicks in a nest near the Mammoth Hot Springs Visitor Center.

the west and even though YNP has a low-density population, the status of golden eagles in YNP is unknown and the park may serve as a protected reservoir. What are the ecological affects of apex predatory birds? Potentially these birds structure the avian system serving as trophic triggers similar to terrestrial predators (Paine et al. 1990, Anthony et al. 2008, Sergio and Hiraldo 2008), thus increased effort on this group of birds is warranted. Specifically our goals are as follows:

- Train YNP interpreters and partners/collaborators on raptor ecology and biology for dissemination to the public
- Develop a parkwide sighting record and concurrent Arc GIS database of all reported raptor observations
- Develop a pilot autumn raptor monitoring sampling strategy
- Develop a pilot annual census of random-stratified blocks of habitat within the park to gain a statistically valid metric of raptor nesting occupancy
- Prepare a synopsis of recommended approaches to develop a YNP Raptor Program which may be instituted within five years or less

| Raptor Species | Abundance |
|---|---|
| Red-Tailed Hawk | 73 |
| Swainson's Hawk | 526 |
| Ferruginous Hawk | 4 |
| Unidentified Buteo | 78 |
| Golden Eagle | 0 |
| Bald Eagle | 3 |
| Unidentified Eagle | 2 |
| Sharp-Shinned Hawk | 0 |
| Cooper's Hawk | 13 |
| Northern Goshawk | 2 |
| unidentified Accipiter | 5 |
| Osprey | 0 |
| Northern Harrier | 10 |
| American Kestrel | 16 |
| Prairie Falcon | 1 |
| Peregrine Falcon | 1 |
| unidentified Falcon | 1 |
| unidentified Raptor | 2 |
| **Total** | **737** |

Table 3. Hayden Valley raptor migration study results

J. PAGEL

Bird Program staffers K. Duffy and L. Henry during the week of peregrine falcon nest entries.

## Accomplishments

This spring Katy Duffy, lead interpreter for the South District, held a raptor training session for YNP staff and collaborators to increase awareness and aid in the identification of YNP's raptor community. Participants in this training session are responsible for the majority of visitor contacts in YNP and therefore have a unique opportunity to share information on YNP's raptors with the public. We also created a raptor monitoring form that was distributed to all visitors' centers in YNP, allowing both staff and visitors to contribute to an ArcGIS database on the distribution of YNP's raptors (Appendix C). A raptor identification guidebook, developed by Katy Duffy, was developed to assist visitors and park personnel with identification. In response to these efforts we received nearly 200 raptor sightings from visitors and park staff, all of which were mapped using ArcGIS. In total, 341 raptor detections across 22 species were recorded using the raptor observation form in addition to 13 detections included from 2008-2009. Red-tailed hawks were the most commonly reported species. We also received several reports on less commonly observed species, including long-eared owl, boreal owl, ferruginous hawk and merlin. Continuation of the raptor sightings program may help fill some of the gaps in our knowledge regarding the distribution and abundance of YNP's raptors while serving as a starting point for future raptor studies.

C. SLEMMONS/UNIV. OF MAINE

During the week of September 12–19 we conducted a pilot study on raptor migration in YNP and identified a potentially important migratory pathway in Hayden Valley. During the 20 hours of observations made by five total observers we counted 737 migrating raptors in Hayden Valley, with the majority of those birds identified as Swainson's hawks (Table 3). In general, raptor migration begins in September and continues through November; however, there are variations in the timing for groups of species. For example, accipiters (Cooper's, sharp-shinned and northern goshawks) tend to migrate early in the season, buteos (red-tailed and Swainson's) during mid-season, and golden eagles towards the end of the season. In order to survey the full complement of migrating raptors we hope to expand our efforts in future years to include the full length of the migration season.

On September 18, Katy Duffy hosted a raptor migration hawk-watch program that involved 60 people. The day began with a trip to the Fishing Bridge museum for a discussion on raptor ecology followed by a field trip to the south end of Hayden Valley for hawk watching and field identification. These programs have helped raise awareness of raptors in YNP while contributing to the larger goal of increased knowledge regarding these species.

Finally, both Baril and Smith attended the annual raptor research conference in Fort Collins, CO to present information on Yellowstone raptors, interact with other researchers, and learn census techniques potentially usable in YNP.

# Wetland Bird Monitoring Program

## Trumpeter Swans

### *Monitoring Trumpeter Swans*

Trumpeter swans were monitored in 2010 via fixed wing aircraft on February 3 and September 14 as part of the tri-state midwinter and autumn surveys. Each flight was between 5.5 and 6 hours long. All areas of YNP, the Paradise Valley, and Hebgen Lake were surveyed during each flight. Swan locations were obtained with a global positioning system (GPS) and the numbers of observed adults and cygnets were recorded. During the breeding season (May–August), we surveyed YNP for nesting swans and territory occupancy via fixed-wing aircraft concurrent with surveys of bald eagles and osprey. Information gathered during flights was supplemented with ground observations. Nests were monitored until fledging or failure.

### *Winter Count of Trumpeter Swans*

One observer counted a total of 173 swans (136 adults and 37 cygnets) in YNP, the Paradise Valley, and on Hebgen Lake during the aerial midwinter swan survey on February 3, 2010 (Table 4). Although this represents a slight increase over the previous year, the trumpeter swan population remains low for the region (Figure 9). The average

| | Hebgen Lake | | Paradise Valley | | YNP | |
|---|---|---|---|---|---|---|
| Year | Adults | Cygnets | Adults | Cygnets | Adults | Cygnets |
| 2000 | 220 | 31 | 16 | 6 | 87 | 13 |
| 2001 | Not Surveyed | | 28 | 1 | 53 | 11 |
| 2002 | 121 | 12 | 17 | 7 | 233 | 35 |
| 2003 | 462 | 40 | 23 | 5 | 146 | 34 |
| 2004 | 423 | 69 | 35 | 15 | 149 | 33 |
| 2005 | 367 | 72 | 18 | 6 | 124 | 30 |
| 2006 | 503 | 153 | 29 | 5 | 121 | 14 |
| 2007 | 340 | 31 | 41 | 3 | 144 | 25 |
| 2008 | 202 | 11 | 26 | 10 | 65 | 7 |
| 2009 | 4 | 0 | 38 | 12 | 88 | 2 |
| 2010 | 87 | 17 | 31 | 15 | 18 | 5 |

Table 4. Results of the mid-winter aerial surveys for trumpeter swans on Hebgen Lake, in Paradise Valley and iin YNP (2000-2010)

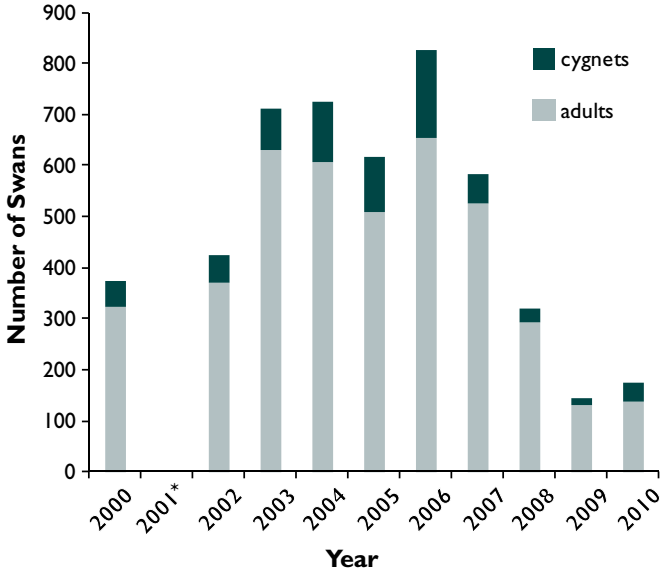


Figure 9. Trumpeter swans observed during the mid-winter aerial survey 2000–2010. * No data collected for 2001.

total number of swans counted over the last nine years was 489 (excluding 2001). YNP swans accounted for just 13% of all swans observed during the survey as opposed to 62% in 2009. Hebgen Lake swans accounted for the majority (60%) of swans in 2010 compared with only 3% in 2009. The remaining 27% were observed in the Paradise Valley. These three areas are in close proximity and likely represent a single wintering population. As winter progresses and ice-free lakes and rivers in YNP diminish, swans likely move from higher elevation sites in Yellowstone to lower elevation sites in Paradise Valley and Hebgen Lake. Thus, the number of swans observed in YNP is highly dependent on year-to-year variations in winter weather conditions.

### *Trumpeter Swan Reproduction*

During the 2010 breeding season only one nest attempt (Riddle Lake) was made in YNP although three areas were occupied. The nest attempt failed during the incubation stage, probably as a result of flooding, so no cygnets were produced this year. This pair made a new nest in another location on the lake and although two eggs were visible in the nest, no swans were observed incubating.

There was no evidence of breeding behavior observed at Grebe Lake, an occupied site in 2010. As was the case in 2009, a pair of adult swans was observed moving between Beula Lake, Tern Lake, and the wetlands between Delusion Lake and Flat Mountain Arm (all historic nesting locations) several times throughout the breeding season; however, the pair did not attempt to breed. Trumpeter swans often establish pair bonds several years prior to breeding and this pair may attempt to breed in the future once a suitable territory has been selected.

Overall nest attempts in YNP have declined from 1987 through 2010, ranging from one to10 per year. Since 2001 however, nest attempts have not exceeded four per year. The majority (68%) of these nests failed to hatch young, largely as a result of early season flooding and egg predation (Proffitt, 2008).

### *Autumn Trumpeter Swan Count*

The annual autumn trumpeter swan count was conducted on September 14 via fixed-wing aircraft. The survey area included the Paradise Valley, YNP, and Hebgen Lake. Twenty-seven adults and 11 cygnets were observed in the survey area (Table 5). Most swans were observed in Paradise Valley and only two swans were counted on Hebgen Lake. In YNP we counted three swans, one pair on Grebe Lake and a single swan on the Madison River. The Riddle Lake pair and the pair typically found in the Bechler region were absent. The trumpeter swan count in YNP during the 2010 survey represents the lowest swan count since surveys began in 1931 (Figure 10).

### *Trumpeter Swan Management*

Trumpeter swans are particularly sensitive to human disturbance. Given the low population and reproductive success observed in YNP in recent years, all measures will be taken to protect nesting areas and occupied territories (potential nesting locations occupied by a pair of swans).

| Location | Adults | Cygnets |
|---|---|---|
| Paradise Valley | 22 | 11 |
| Yellowstone NP | 3 | 0 |
| Hebgen Lake | 2 | 0 |
| **Total** | **27** | **11** |

Table 5. Autumn 2010 survey results for trumpeter swans.

A trumpeter swan nest site.

The Riddle Lake nesting area is part of a bear management area closed April 30–July 14. We will extend this closure until August 15 if this pair hatches young during the 2011 nesting season. Additionally, after August 15 we recommend restricting off-trail access at the lake (i.e. visitors would be able to access the lake via the trail, but not walk around it). A similar restriction would be placed at the Grebe Lake nesting site. Additionally, YNP is hosting a trumpeter swan conference for spring 2011 to evaluate management alternatives YNP may implement to augment the local trumpeter swan population. This conference will include members of the trumpeter swan working group in addition to local experts on swan ecology and management in the region.

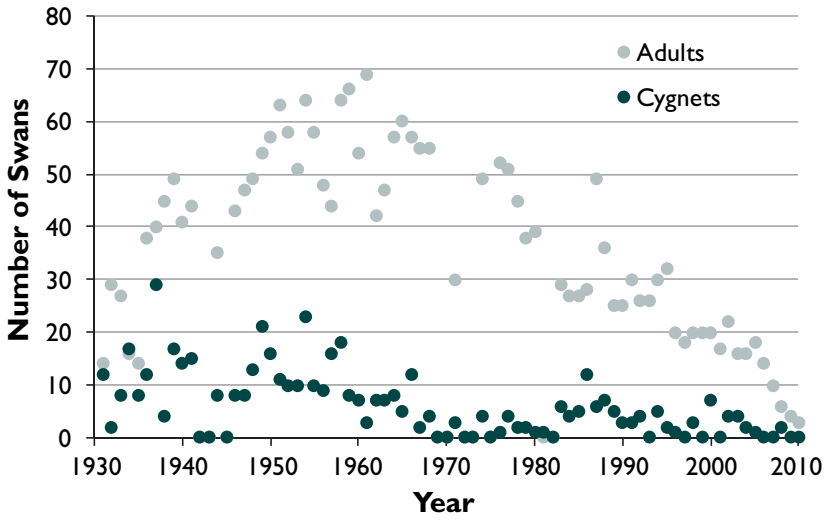


Figure 10. Autumn counts of trumpeter swans, 1931-2010.

### *Trumpeter Swan Research*

Habitat suitability is an important aspect of territory occupancy and nesting success for trumpeter swans, and wetland area, in particular, appears to be a key factor in swan productivity in YNP (Proffitt, 2008). It is speculated that a warmer, drier climate has reduced the quality and quantity of suitable wetlands in the region but the extent of these changes has not been quantified. In 2009, YNP began funding an Eastern Kentucky University masters student, Laura Cockrell, who is examining factors influencing territory occupancy and nesting success in YNP over a two-year period (2009–2010). Her objective is to produce a habitat model using historic and current swan nesting locations to predict potential quality habitat in and around YNP, incorporating Landsat satellite imagery, GIS, and field measurements of habitat quality. During June and July 2009 Cockrell sampled 16 lakes in YNP where she collected vegetation, soil, and water quality samples. During 2010 Cockrell sampled an additional 20 historic swan nesting sites. This study will improve our understanding of the reasons behind the declining swan population in YNP and may inform future management decisions in the region.

## Colony Nesting Birds

The Molly Islands in the southeastern arm of Yellowstone Lake provide nesting habitat for four species: American white pelicans, double-crested cormorants, Caspian terns and California gulls (the latter two species have not nested on these islands since 2007). High-resolution digital photographs of the islands were collected by fixed-wing aircraft over five visits from May through August 2010 to determine the number of nests and fledged young per species.

Through photographic interpretation we observed approximately 428 American white pelican nests that fledged an estimated 184 young. We counted 35 nesting double-crested cormorants that fledged an estimated 59 young. None of the five photosets show Caspian terns and in only one was a California gull present, however it was not nesting.

American white pelicans and double-crested cormorants nest on the Molly Islands.

## Common Loon

Loons are surveyed opportunistically, primarily via fixed-wing aircraft in conjunction with other surveys. In addition we rely on information submitted by park staff and visitors.

Of the 11 sites checked for loons in 2010 nine were reported as occupied, one by a single adult loon and eight that were each occupied by a pair. However, only three of those sites fledged young (Table 6).

In future years, we hope to expand our loon monitoring effort by initiating a citizen science project whereby volunteers are able to experience the backcountry of YNP while contributing to our understanding of loon ecology in Yellowstone.

| Site Name | Adults | Loonlets |
|---|---|---|
| Cygnet Lakes | 2 | 1 |
| SE arm Yell Lake | 2 | 0 |
| Mary's Bay | 2 | 0 |
| Heart Lake | 2 | 0 |
| Peale Island | 2 | 0 |
| Beula Lake | 2 | 1 |
| Winnegar Lake | 2 | 0 |
| Wolf Lake | 2 | 1 |
| Lake of the Woods | 0 | 0 |
| Ranger Lake | 0 | 0 |
| Cascade Lake | 1 | 0 |
| **Total** | **17** | **3** |

Table 6. Summary of 2010 common loon observations.

# Passerine and Near Passerine Surveys

## Willow-Songbird Surveys

### *Willow-Songbird Monitoring*

This year was the sixth year of monitoring willow-songbird communities in YNP. The first three years (2005-2008) involved a collaborative study between Montana State University and the National Park Service to determine songbird response to change in willow habitat. (For details of protocol and sample plots, refer to the YNP 2009 Annual Bird Report.)

Subsequent years have been dedicated to a continuation of that study, using a subset of the total number of point-count stations established. In all years, three types of willows were surveyed for breeding passerines: previously tall (averaging >1.5 meters in height and experiencing little browsing); suppressed (generally <1 meter and experiencing heavy browsing); and released (formerly height-suppressed, now similar in height to the previously tall group but with lower overall canopy cover). Previously tall point-count stations were located in Willow Park (n=16), suppressed plots were located at two sites along Soda Butte Creek (n=19), and released plots were located along upper Slough Creek (n=9) and Blacktail Deer Creek (n=8) for a total of 52 point-counts.

Our objective was to determine presence and abundance of breeding birds in these three

Common loons on Yellowstone Lake.

willow-growth conditions. Waterfowl and shorebirds were excluded in the final analysis since point-counts are not designed to adequately sample these species. We also excluded fledglings or any birds flying over the point-count but not landing within the 40-meter radius.

Two rounds of counts were completed for each point-count station and results were averaged between visits, although nine points (four at Soda Butte and five at Slough Creek) could only be sampled once because of time constraints imposed by weather and wildlife. Richness and abundance averages were calculated for each point and then averaged over all point-counts per growth condition.

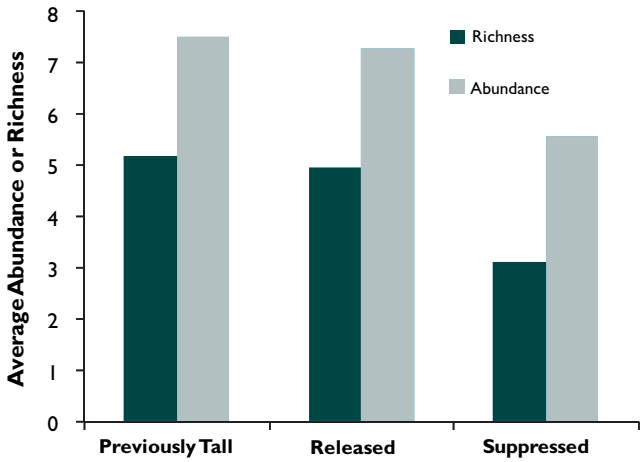


Figure 11. Average richness and abundance of previously tall, released and suppressed willow growth conditions.

| Species | Previously Tall | Released | Suppressed |
|---|---|---|---|
| American Robin | 0.53 | 0.5 | 0.13 |
| Bank Swallow | X | X | 0.03 |
| Black-billed Magpie | X | 0.6 | X |
| Brown-headed Cowbird | 0.09 | 0.09 | 0.03 |
| Brewer's Blackbird | 0.06 | 0.12 | 0.37 |
| Common Yellowthroat | 1.03 | 0.91 | 0.39 |
| Fox Sparrow | 0.28 | X | X |
| Gray Catbird | X | 0.26 | X |
| Lincoln's Sparrow | 1.5 | 1.62 | 1.58 |
| Mountain Bluebird | X | X | 0.03 |
| Pine Siskin | X | X | 0.03 |
| Red-winged Blackbird | 0.09 | 0.26 | 0.21 |
| Savannah Sparrow | 0.44 | 0.62 | 1.42 |
| Song Sparrow | 0.28 | 0.62 | 0.55 |
| Vesper Sparrow | X | X | 0.03 |
| Warbling Vireo | 0.22 | 0.24 | X |
| White-crowned Sparrow | 0.78 | 0.24 | 0.13 |
| Western Meadowlark | X | 0.03 | 0.18 |
| Willow Flycatcher | 0.53 | 0.47 | X |
| Wilson's Warbler | 0.47 | 0.15 | X |
| Yellow Warbler | 1.19 | 1.09 | 0.47 |

X-not observed

Table 7. Mean abundance for each species observed in protected, suppressed, and released willow growth conditions in 2010.

### *Results*

A total of 21 species were observed in the three types of willow habitat. Lincoln's sparrow was the most abundant bird in all growth conditions (Table 7). Average abundance and richness were highest in the previously tall and released conditions and lowest in the suppressed condition (Figure 11).

An especially notable observation this year was the presence of four Wilson's warblers in the Slough Creek sample plots (released). This is the first time during the six-year study that these warblers have been recorded in any of the released plots. Wilson's warblers are obligate willow specialists requiring high horizontal cover and tall willows, and their appearance may indicate that the structure of these willows is changing. Last year, one male Wilson's warbler was observed just outside the study area and it was noted that it could be the beginning of colonization or re-colonization there. This year's data supports that theory and also underscores the importance of long-term monitoring.

## Forest Burn Surveys

The persistence of cavity-nesting birds in YNP is dependent on patterns of fire across the landscape. Variation in burn severity, time since burn, and post-burn forest structure create a mosaic of different aged and structured stands that different species specialize on (Saab et al. 2007). For example, black-backed, American three-toed, and hairy woodpeckers are associated with recently (two to four years), low- to moderate-severity burned forests (Saab et al. 2007) while northern flickers are associated with three-year-old, high-severity burns (Smucker et al. 2005). Standing dead trees left behind after a fire attract bark and wood-boring beetles—primary prey for woodpeckers (Saab et al. 2007). Woodpeckers excavate nest holes in standing dead trees, many of which have been softened by fungus making excavation easier. Nest cavities created by woodpeckers are also used by a host of secondary cavity nesters such as chickadees, nuthatches, and bluebirds. Fire frequency in Yellowstone is expected to increase as our climate becomes warmer and drier (Westerling et al. 2006); however, it is not clear how changes in fire regimes will affect cavity-nesting and fire-dependent bird species in the region. Therefore, we initiated a monitoring program in 2009 to evaluate the presence and abundance of post-fire adapted bird species. This year we expanded our efforts and modified our sampling strategy based on pilot study data collected during the previous year.

### *Forest Burn Monitoring Strategy*

During our pilot study year (2009) we used line transects to sample birds; however this method proved to be somewhat challenging given the abundance of fallen logs requiring observers to maneuver over a difficult landscape while surveying birds. In response, we implemented the point-count method as described for the willow-bird surveys. Four sample areas were included in the study, one more than in 2009. Two of the 2010 sites were located in the East Fire district (n=16) where 7,000 hectares on the east side of Yellowstone Lake burned in 2003. The third was located within the Le Hardy Fire area (n=4) where 3,887 hectares north of Yellowstone Lake burned in 2008, and the fourth was located in the Arnica Fire area, (n=8) where 4,314 hectares burned in 2009. Overall, this provided a total of 28 point-count locations (Appendix C.). Each of the 28 locations were sampled twice, except for one point in the LeHardy burn which was only sampled once. The LeHardy and Arnica sample plots were categorized under recent fires (2008–09) while the East fire sample plots were categorized as early fires (2003). Total richness and abundance also were calculated for each of the two fire categories.

Tree swallows nest in a tree burned during in the East Fire.

### *Results*

In the early burn plots, observers detected 27 species compared to 23 in the recent burn plots (Table 8). Twelve (34%) of the 35 total species observed are obligate cavity-nesters. This is consistent with 2009 results, when this nesting guild made up 33% of all species detected. American three-toed woodpeckers and black-backed woodpeckers were only observed in the recent fire category. Because of the sampling techniques used, some counts included a mosaic of burned areas and meadow habitat. Consequently, some species recorded may not actually have been utilizing post-fire habitat. However, this study is a new study and will be adapted in the future to account for this.

| Species | Early/ 2003 | Recent/ 2008-09 | Nesting Guild |
|---|---|---|---|
| American Robin | 31 (0.97) | 41 (1.83) | OP |
| American Three-Toed Woodpecker | 0 | 4 (0.17) | CA |
| Black-Backed Woodpecker | 0 | 3 (0.25) | CA |
| Brown-Headed Cowbird | 9 (0.28) | 0 | PA |
| Brewer's Blackbird | 1 (0.03) | 0 | OP |
| Brown Creeper | 1 (0.03) | 0 | OP* |
| Cassin's Finch | 4 (0.13) | 3 (0.13) | OP |
| Chipping Sparrow | 2 (0.06) | 3 (0.13) | OP |
| Clark's Nutcracker | 2 (0.06) | 10 (0.58) | OP |
| Common Raven | 0 | 1 (0.04) | OP |
| Dark-Eyed Junco | 19 (0.59) | 23 (0.96) | OP |
| Downy Woodpecker | 2 (0.06) | 0 | CA |
| Gray Jay | 1 (0.03) | 13 (0.63) | OP |
| Hammond's Flycatcher | 5 (0.16) | 0 | OP |
| Hairy Woodpecker | 1 (0.03) | 6 (0.25) | CA |
| Hermit Thrush | 0 | 3 (0.13) | OP |
| House Wren | 3 (0.09) | 0 | CA |
| Lincoln's Sparrow | 16 (0.5) | 0 | OP |
| Mountain Bluebird | 7 (0.22) | 1 (0.04) | CA |
| Mountain Chickadee | 1 (0.03) | 16 (0.67) | CA |
| Mourning Dove | 0 | 1 (0.04) | OP |
| Northern Flicker | 8 (0.25) | 3 (0.13) | CA |
| Pine Grosbeak | 0 | 2 (0.08) | OP |
| Pine Siskin | 1 (0.03) | 0 | OP |
| Red-Breasted Nuthatch | 2 (0.06) | 8 (0.33) | CA |
| Ruby-Crowned Kinglet | 1 (0.03) | 23 (0.96) | PE |
| Red Crossbill | 0 | 2 (0.08) | OP |
| Song Sparrow | 5 (0.16) | 0 | OP |
| Sharp-Shinned Hawk | 1 (0.03) | 0 | OP |
| Tree Swallow | 28 (0.88) | 1 (0.04) | CA |
| White-Breasted Nuthatch | 0 | 1 (0.04) | CA |
| White-Crowned Sparrow | 26 (0.81) | 0 | OP |
| Western Wood-Pewee | 26 (0.81) | 2 (0.13) | OP |
| Willamson's Sapsucker | 1 (0.03) | 0 | CA |
| Yellow-Rumped Warbler | 6 (0.19) | 22 (0.96) | OP |
| **Total Richness** | **27** | **23** | |

* nests under bark,
CA=cavity, OP=open, PA=nest parasite, PE=pendant)

Table 8. Total abundance (relative abundance) of species in early and recent successional burns. Relative abundance=sum of total abundance for each point/# visits/# points.

## Breeding Bird Surveys

Breeding bird surveys (BBS) are a nationwide monitoring effort coordinated by the US Geological Survey and the Canadian Wildlife Service's Research Center since 1966. The surveys are road-based with the registered observer recording all birds seen and heard within a ¼ mile radius with points occurring every ½ mile. YNP has participated in this survey since 1982 and has three established routes: Mammoth area (Obsidian Creek campground to Elk Creek), Northeast Entrance area (Tower to Baronnette Peak), and the Yellowstone interior (Dunraven Pass through Hayden Valley and Yellowstone Lake). Each route traverses slightly different habitat with some overlapping types. The Mammoth route passes through big sagebrush/Idaho fescue and Douglas fir forest, as well as small areas of sedge bogs. The majority of habitat on the Northeast entrance route is big sagebrush/Idaho fescue, with lesser amounts of subalpine fir and tufted hairgrass/sedge meadows. The Yellowstone route consists of mostly subalpine fir, interspersed with areas of silver sage, big sagebrush and Idaho fescue. Figure 12 shows the location of each route. Current and past data are available on the BBS website at: *www.pwrc.usgs.gov/bbs/.*

### *Results*

Dates of the surveys were as follows: Mammoth–June 10, Yellowstone–June 14, and the Northeast Entrance–June 9. Along these three routes we recorded 2079 individuals of 75 different species. The Mammoth route had the highest diversity of species, while the Yellowstone route had the highest number of individuals counted (Figure 13). The Northeast entrance route had both the lowest diversity of species and lowest number of individuals counted. This year was the lowest total individuals. Trends over time in the total number of species per route

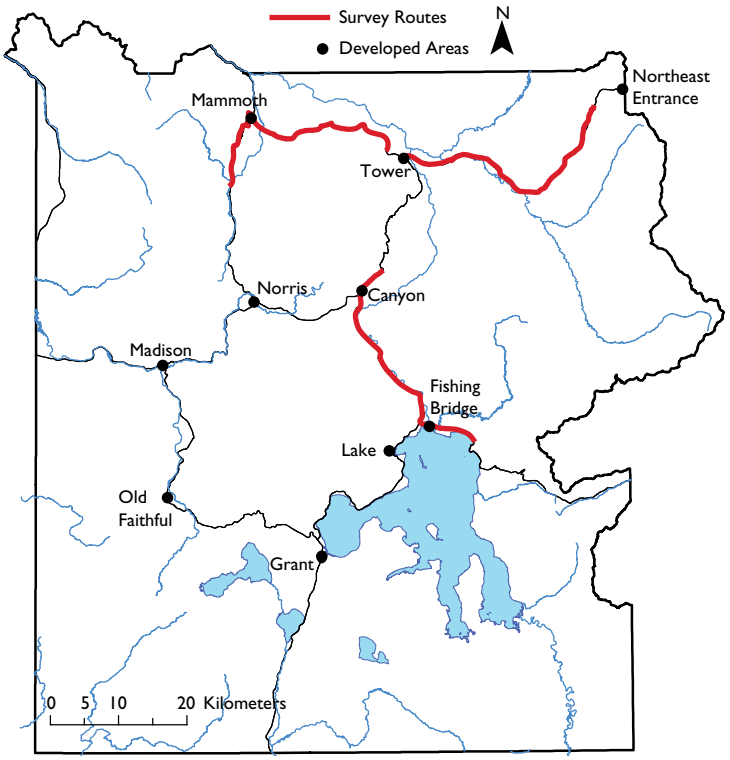


Figure 12. Breeding Bird Survey routes.

A flock of Canada geese.

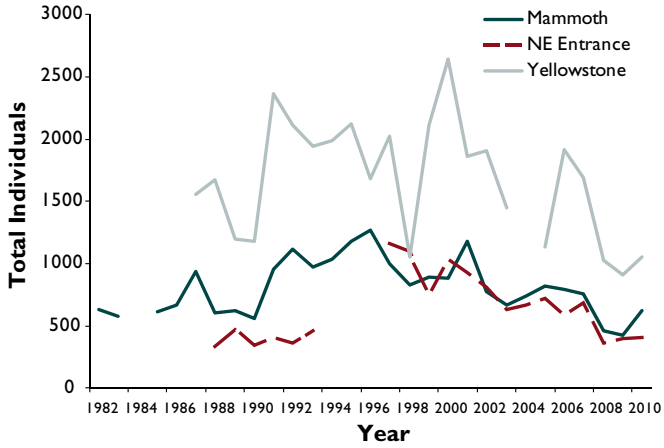


Figure 13. Number of individuals observed during the survey, by location.

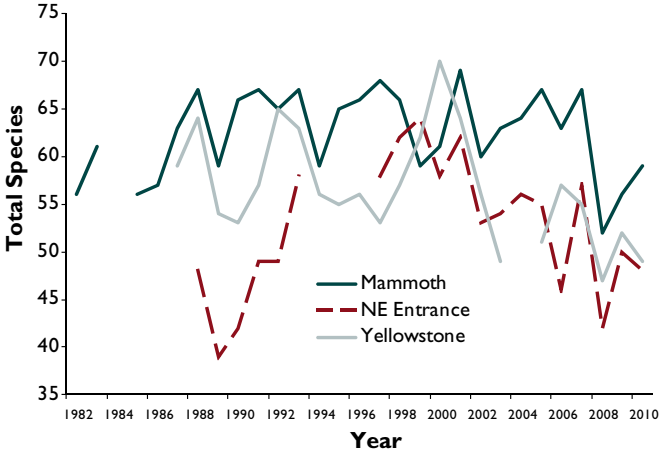


Figure 14. Number of species identified during the survey, by location.

appear stable (Appendix B.). The number of individuals observed per route is highly variable over time particularly for the Yellowstone route which may be attributed to variation in the number of Canada geese occurring on the Yellowstone River. The Mammoth and Northeast entrance routes appear more stable, but show slight declines in total abundance since 2001 and 2000 respectively. It is unclear whether these represent actual declines or natural variation in abundance. In the future we plan to examine these data on a species level basis to determine population trends for select species.

## 2010 Noteworthy Birds

Every year unusual birds are sighted in YNP, particularly during spring and fall migration, and 2010 was no exception. On May 28, a great egret was spotted foraging along the margin of South Twin Lake by YNP bird staff. The bird remained in the area for more than a week. A lark sparrow was spotted by K. Duffy on June 19 near the Buffalo Ranch in Lamar Valley and another by D. Smith in late May by the Arch Park in Gardiner (but in YNP), MT. We also received several reports of pinyon jays, white-faced ibis, a greater scaup and long-eared owl. A black-and-white

warbler was observed by a park visitor on May 27 foraging in a flock of chipping sparrows in the Old Faithful area. Black-and-white warblers are typically found in the eastern U.S. during the breeding season; however their migration route can take them as far west as eastern Montana on their way to breeding grounds in Alberta, Saskatchewan and northern Canada. A tufted titmouse was also reported in YNP. This species is typically non-migratory and restricted to the eastern and mid-western states. Park staff could not confirm this sighting. Also of note was a May 6 report of a juvenile dark-morph broad-winged hawk near Lamar River footbridge. Lastly, a YNP employee, John Parker, reported for the third consecutive year seeing a pileated woodpecker along the Beaver Ponds Trail in the Mammoth area. It is unknown whether this bird has a mate and is breeding in the area, but if so would be a Yellowstone first. We appreciate all those who reported bird sightings in YNP and welcome future observations.

A great egret spotted at South Twin Lake.

## 2010 Lectures and Conferences

- "A Historical Perspective of Peregrine Falcons (*Falco peregrinus*) in Yellowstone National Park: From Theodore Roosevelt to Present." Raptor Research Foundation Conference. Fort Collins, CO. September 2010.
- "Piscivorous Raptors in Yellowstone National Park: Are declines in cutthroat trout related to reduced reproductive success of bald eagles and ospreys on Yellowstone Lake?" Raptor Research Foundation Conference. Fort Collins, CO. September 2010.
- "Yellowstone Raptor Initiative: An Open Call for Cooperators in the Shadow of Theodore Roosevelt" Raptor Research Foundation Conference. Fort Collins, CO. September 2010.
- "A Historical Perspective of Peregrine Falcons (*Falco peregrinus*) in Yellowstone National Park: From Theodore Roosevelt to Present." Xanterra Parks and Resorts Evening Lecture Series. Old Faithful, WY. August 2010.

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# Appendix A. Spring Arrival Dates

Spring arrival dates for common species in the Mammoth-Gardiner area from 2005-2010.

| Species | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 6 yr mean |
|---|---|---|---|---|---|---|---|
| Osprey | | 6-Apr | | 8-Apr | 19-Apr | 12-Apr | 11-Apr |
| Red-tailed Hawk | | 4-Apr | 23-Mar | 3-Apr | | 20-Mar* | 28-Mar |
| American Kestrel | | 4-Apr | 12-Apr | 14-Apr | 30-Apr | 17-Apr | 15-Apr |
| Sandhill Crane | | 4-Apr | | 13-Apr | | | 8-Apr |
| Killdeer | | 2-Apr | | | | | 2-Apr |
| Belted Kingfisher | | | 2-Mar | | 17-Apr | | 25-Mar |
| Violet-green Swallow | | 14-May | 13-May | | | | 14-May |
| Tree Swallow | | 28-Apr | 8-Apr | 13-Apr | 2-May | 24-Apr | 21-Apr |
| Ruby-crowned Kinglet | | 28-Apr | 29-Apr | 21-Apr | 3-May | 17-Apr | 26-Apr |
| Mountain Bluebird | 8-Mar | 4-Mar | 18-Mar | 29-Mar | 12-Mar | 25-Mar | 16-Mar |
| American Robin | 20-Mar | 14-Apr | 17-Mar | 28-Mar | 21-Mar | 18-Mar | 25-Mar |
| Swainson's Thrush | | | | 12-May | | 22-May | 17-May |
| Gray Catbird | | | | | | 29-May | 29-May |
| Yellow Warbler | 18-May | 12-May | 13-May | 19-May | 17-May | 18-May | 16-May |
| Yellow-rumped Warbler | | 28-Apr | 29-Apr | 20-Apr | 9-May | 17-Apr | 27-Apr |
| Wilson's Warbler | | | | | | 29-May | 29-May |
| Vesper Sparrow | | 3-May | 13-May | 4-May | 6-May | 7-May | 7-May |
| White-crowned Sparrow | | | | 1-May | 1-May | 7-May | 3-May |
| Song Sparrow | | 20-Apr | 24-Mar | | | 27-Apr | 13-Apr |
| Western Meadow Lark | | 3-Apr | 5-Apr | 14-Apr | 8-Apr | 1-Apr | 6-Apr |
| Lazuli Bunting | | | | | | 22-May | 22-May |
| Red-winged Blackbird | 10-Mar | 16-Mar | 18-Mar | 8-Apr | 17-Mar | 29-Mar | 22-Mar |

* indicates estimated from arrival at Paradise Valley (24-Mar) and Phantom Lake (17-Mar)

# Appendix B. Glossary

## General Terminology

*Occupied Territory:* A territory where a pair of birds is present, or there is evidence of reproduction (e.g., one adult is observed sitting low in the nest, eggs or young are seen, or food is delivered into the eyrie). Occupancy in a peregrine territory is established when birds are observed during at least one of two, 4-hour site visits. Occupancy for bald eagles and osprey territories are determined when they are observed during two or three survey flights. Occupancy within a region is the number of occupied territories divided by the number of territories that were checked for occupancy.

*Nest Success:* The proportion of active nests in a monitoring region where we observe one or more young of advanced age, where fledging success is highly likely (Cade et al. 1996).

*Productivity:* The number of fledged young per nesting female, averaged across a monitoring region. Typically productivity is determined when nestlings have reached at least 80% of a species' average age of fledging (Steenhof 1987), e.g. 34 days for peregrines, which fledge about 43 days after hatching. This definition of productivity allows that some young might not be observed during the final nest visit, resulting in an underestimate of productivity. Nonetheless, productivity defined in this way remains a more informative index of breeding performance than nest success alone.

*Brood Size:* The average number of young fledged per successful nest. Typically productivity is determined when nestlings have reached at least 80% of a species' average age of fledging (Steenhof 1987).

## Bald Eagle/Osprey Terminology

*Breeding Area*: Also Nesting/Breeding Territory/Site. An area that contains or was previously known to contain one or more nests within the territorial range of a mated pair of eagles or ospreys.

*Active Nest*: A nest where eggs have been laid. Activity patterns are diagnostic of breeding eagles or ospreys. This category excludes non-nesting territorial pairs or eagles that may go through the early motions of nest building and mating, but without laying eggs. From egg-laying to hatching, incubation typically lasts 35 days.

*Alternate Nest:* One of several nest structures within the breeding area of one mated pair of eagles or ospreys. Alternate nests may be found on adjacent trees, snags, man-made towers, or on the same or adjacent cliffs. Depending on the size of the breeding territory, some alternate nests can be a few miles away.

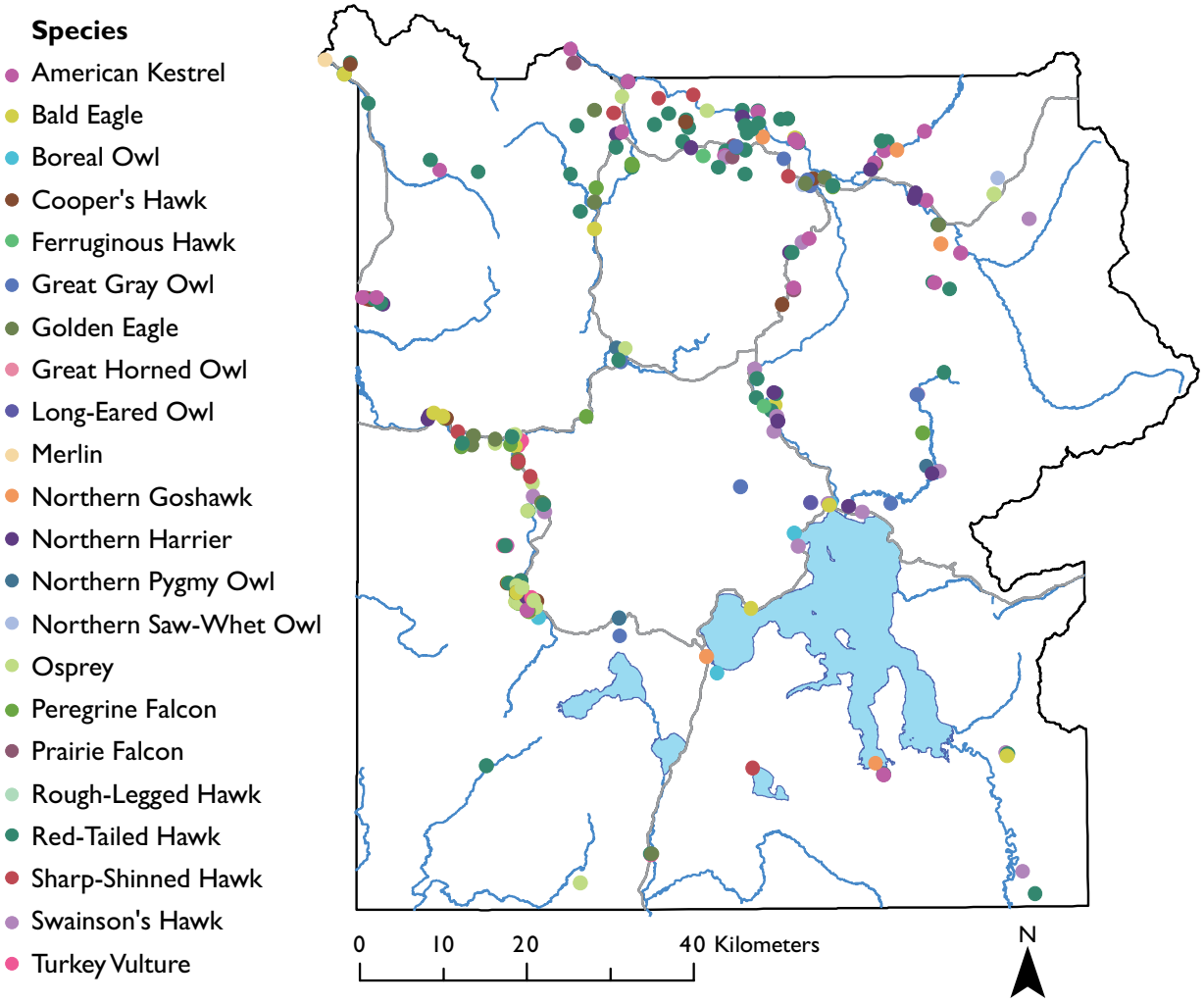
*Occupied Nest:* Any nest where at least one of the following activity patterns was observed during the breeding season:

- a recently repaired nest with fresh sticks or fresh boughs on top,
- one or two adults present on or near the nest,
- one adult sitting low in the nest, apparently incubating,
- one adult and one bird in immature plumage at or near a nest,
- mating behavior observed (display flights, nest repair, coition),
- eggs were laid (detection of eggs or eggshell fragments),
- any field sign that indicate eggs were laid, nestlings hatched, or young were raised.

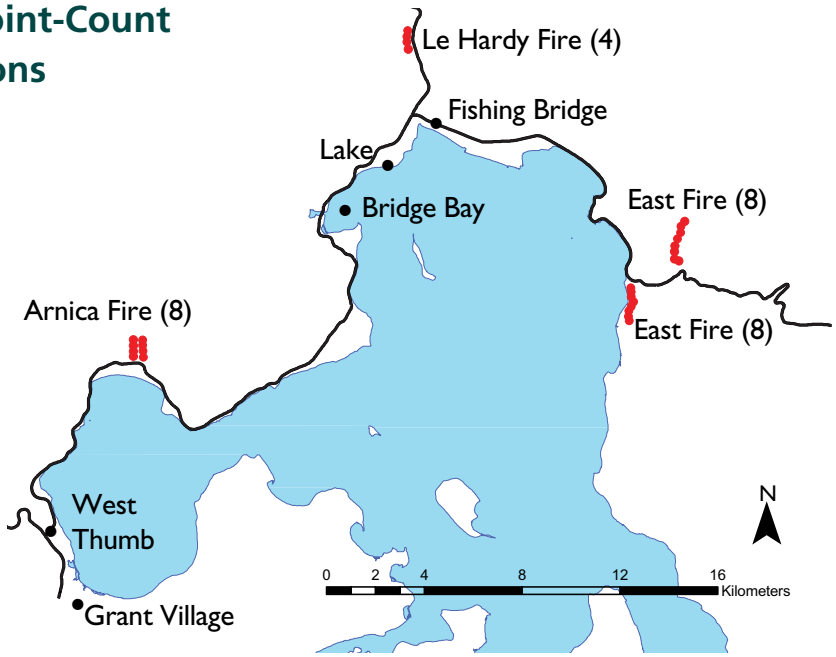
*Unoccupied Breeding Area*: A nest or group of alternate nests at which none of the activity patterns diagnostic of an occupied nest were observed in a given breeding season. Breeding areas must be previously determined to be occupied before they can be recognized and classified as unoccupied.

# Appendix C. Sighting and Survey Maps

## Parkwide Raptor Sightings




## Forest Burn Point-Count Survey Locations



# Appendix D. Birds Observed

| Common Name | *Latin Name* |
|---|---|
| Canada Goose | *Branta canadensis* |
| Cackling Goose | *Branta hutchinsonii* |
| Trumpeter Swan | *Cygnus buccinator* |
| Wood Duck | *Aix sponsa* |
| Gadwall | *Anas strepera* |
| American Wigeon | *Anas americana* |
| Mallard | *Anas platyrhynchos* |
| Blue-winged Teal | *Anas discors* |
| Cinnamon Teal | *Anas cyanoptera* |
| Northern Shoveler | *Anas clypeata* |
| Northern Pintail | *Anas acuta* |
| Green-winged Teal | *Anas crecca* |
| Canvasback | *Aythya valisineria* |
| Redhead | *Aythya americana* |
| Ring-necked Duck | *Aythya collaris* |
| Greater Scaup | *Aythya marila* |
| Lesser Scaup | *Aythya affinis* |
| Harlequin Duck | *Histrionicus histrionicus* |
| Bufflehead | *Bucephala albeola* |
| Barrow's Goldeneye | *Bucephala islandica* |
| Common Merganser | *Mergus merganser* |
| Ruddy Duck | *Oxyura jamaicensis* |
| Gray Partridge | *Perdix perdix* |
| Ruffed Grouse | *Bonasa umbellus* |
| Dusky Grouse | *Dendragapus obscurus,* |
| Common Loon | *Gavia immer* |
| Pied-billed Grebe | *Podilymbus podiceps* |
| Red-necked Grebe | *Podiceps grisegena* |
| Eared Grebe | *Podiceps nigricollis* |
| Western Grebe | *Aechmophorus occidentalis* |
| Clark's Grebe | *Aechmophorus clarkii* |
| American White Pelican | *Pelecanus erythrorhynchos* |
| Double-crested Cormorant | *Phalacrocorax auritus* |
| American Bittern | *Botaurus lentiginosus* |
| Great Blue Heron | *Ardea herodias* |
| Great Egret | *Ardea alba* |
| White-faced Ibis | *Plegadis chihi* |
| Turkey Vulture | *Cathartes aura* |
| Osprey | *Pandion haliaetus* |
| Bald Eagle | *Haliaeetus leucocephalus* |
| Northern Harrier | *Circus cyaneus* |
| Sharp-shinned Hawk | *Accipiter striatus* |
| Cooper's Hawk | *Accipiter cooperii* |

| Common Name | *Latin Name* |
|---|---|
| Northern Goshawk | *Accipiter gentilis* |
| Broad-winged Hawk | *Buteo platypterus* |
| Swainson's Hawk | *Buteo swainsoni* |
| Red-tailed Hawk | *Buteo jamaicensis* |
| Ferruginous Hawk | *Buteo regalis* |
| Rough-legged Hawk | *Buteo lagopus* |
| Golden Eagle | *Aquila chrysaetos* |
| American Kestrel | *Falco sparverius* |
| Merlin | *Falco columbarius* |
| Peregrine Falcon | *Falco peregrinus* |
| Prairie Falcon | *Falco mexicanus* |
| Virginia Rail | *Rallus limicola* |
| Sora | *Porzana carolina* |
| American Coot | *Fulica americana* |
| Sandhill Crane | *Grus canadensis* |
| Killdeer | *Charadrius vociferus* |
| American Avocet | *Recurvirostra americana* |
| Spotted Sandpiper | *Actitis macularia* |
| Wilson's Snipe | *Gallinago delicata* |
| Wilson's Phalarope | *Phalaropus tricolor* |
| Red-necked Phalarope | *Phalaropus lobatus* |
| Franklin's Gull | *Larus pipixcan* |
| California Gull | *Larus californicus* |
| Caspian Tern | *Sterna caspia* |
| Rock Pigeon | *Columba livia* |
| Mourning Dove | *Zenaida macroura* |
| Great Horned Owl | *Bubo virginianus* |
| Northern Pygmy-Owl | *Glaucidium gnoma* |
| Great Gray Owl | *Strix nebulosa* |
| Long-eared Owl | *Asio otus* |
| Short-eared Owl | *Asio flammeus* |
| Boreal Owl | *Aegolius funereus* |
| Northern Saw-whet Owl | *Aegolius acadicus* |
| Common Nighthawk | *Chordeiles minor* |
| White-throated Swift | *Aeronautes saxatalis* |
| Rufous Hummingbird | *Selasphorus rufus* |
| Belted Kingfisher | *Ceryle alcyon* |
| Wiliamson's Sapsucker | *Sphyrapicus thyroideus* |
| Red-naped Sapsucker | *Sphyrapicus nuchalis* |
| Downy Woodpecker | *Picoides pubescens* |
| Hairy Woodpecker | *Picoides villosus* |
| American 3-toed Woodpecker | *Picoides dorsalis* |
| Black-backed Woodpecker | *Picoides arcticus* |

# Appendix D. 2010 Birds Observed *(continued)*

| Common Name | *Latin Name* |
|---|---|
| Northern Flicker | *Colaptes auratus* |
| Pileated Woodpecker | *Dryocopus pileatus* |
| Olive-sided Flycatcher | *Contopus cooperi* |
| Western Wood-Pewee | *Contopus sordidulus* |
| Willow Flycatcher | *Empidonax traillii* |
| Hammond's Flycatcher | *Empidonax hammondii* |
| Dusky Flycatcher | *Empidonax oberholseri* |
| Eastern Kingbird | *Tyrannus tyrannus* |
| Northern Shrike | *Lanius excubitor* |
| Warbling Vireo | *Vireo gilvus* |
| Gray Jay | *Perisoreus canadensis* |
| Steller's Jay | *Cyanocitta stelleri* |
| Pinyon Jay | *Gymnorhinus cyanocephalus* |
| Clark's Nutcracker | *Nucifraga columbiana* |
| Black-billed Magpie | *Pica hudsonia* |
| American Crow | *Corvus brachyrhynchos* |
| Common Raven | *Corvus corax* |
| Horned Lark | *Eremophila alpestris* |
| Tree Swallow | *Tachycineta bicolor* |
| Violet-green Swallow | *Tachycineta thalassina* |
| Northern Rough-winged Swallow | *Stelgidopteryx serripennis* |
| Bank Swallow | *Riparia riparia* |
| Cliff Swallow | *Petrochelidon pyrrhonota* |
| Barn Swallow | *Hirundo rustica* |
| Black-capped Chickadee | *Poecile atricapillus* |
| Mountain Chickadee | *Poecile gambeli* |
| Red-breasted Nuthatch | *Sitta canadensis* |
| White-breasted Nuthatch | *Sitta carolinensis* |
| Brown Creeper | *Certhia americana* |
| Rock Wren | *Salpinctes obsoletus* |
| House Wren | *Troglodytes aedon* |
| American Dipper | *Cinclus mexicanus* |
| Golden-crowned Kinglet | *Regulus satrapa* |
| Ruby-crowned Kinglet | *Regulus calendula* |
| Mountain Bluebird | *Sialia currucoides* |
| Townsend's Solitaire | *Myadestes townsendi* |
| Swainson's Thrush | *Catharus ustulatus* |
| Hermit Thrush | *Catharus guttatus* |
| American Robin | *Turdus migratorius* |
| Gray Catbird | *Dumetella carolinensis* |
| Sage Thrasher | *Orescoptes montanus* |

| Common Name | *Latin Name* |
|---|---|
| European Starling | *Sturnus vulgaris* |
| American Pipit | *Anthus rubescens* |
| Bohemian Waxwing | *Bombycilla garrulous* |
| Cedar Waxwing | *Bombycilla cedrorum* |
| Orange-crowned Warbler | *Vermivora celata* |
| Yellow Warbler | *Dendroica petechia* |
| Magnolia Warbler | *Dendroica magnolia* |
| Yellow-rumped Warbler | *Dendroica coronata* |
| Black-and-white Warbler | *Mniotilta varia* |
| MacGillivray's Warbler | *Oporonis tolmiei* |
| Common Yellowthroat | *Geothlypis trichas* |
| Wilson's Warbler | *Wilsonia pusilla* |
| Western Tanager | *Piranga ludoviciana* |
| Green-tailed Towhee | *Pipilo chlorurus* |
| Spotted Towhee | *Pipilo maculatus* |
| Chipping Sparrow | *Spizella passerine* |
| Brewer's Sparrow | *Spizella breweri* |
| Vesper Sparrow | *Pooecetes gramineus* |
| Lark Sparrow | *Chondestes grammacus* |
| Savannah Sparrow | *Passerculus sandwichensis* |
| Fox Sparrow | *Passerella iliaca* |
| Song Sparrow | *Melospiza melodia* |
| Lincoln's Sparrow | *Melospiza lincolnii* |
| Harris's Sparrow | *Zonotrichia querula* |
| White-crowned Sparrow | *Zonotrichia leucophrys* |
| Dark-eyed Junco | *Junco hyemalis* |
| Snow Bunting | *Plectrophenax nivalis* |
| Lazuli Bunting | *Passerina amoena* |
| Red-Winged Blackbird | *Agelaius phoeniceus* |
| Western Meadowlark | *Sturnella neglecta* |
| Yellow-headed Blackbird | *Xanthocephalus xanthocephalus* |
| Brewer's Blackbird | *Euphagus cyanocephalus* |
| Brown-headed Cowbird | *Molothrus ater* |
| Gray-crowned Rosy-Finch | *Leucosticte tephrocotis* |
| Black Rosy-Finch | *Leucosticte atrata* |
| Pine Grosbeak | *Pinicola enucleator* |
| Cassin's Finch | *Carpodacus cassinii* |
| House Finch | *Carpodacus mexicanus* |
| Red Crossbill | *Loxia curvirostra* |
| White-winged Crossbill | *Loxia leucoptera* |
| Pine Siskin | *Carduelis pinus* |
| House Sparrow | *Passer domesticus* |

# Yellowstone Bird Program 2011 Annual Report

National Park Service
Yellowstone Center for Resources
Yellowstone National Park, Wyoming
YCR-2011-04