YELLOWSTONE BIRD MONITORING REPORT – 2008

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Executive Summary

During 2008, we conducted two survey flights (mid-winter and autumn) for trumpeter swans in Yellowstone National Park, the Paradise Valley, and on Hebgen Lake, and monitored swans during the breeding season. We counted 321 swans total during the mid-winter survey, including 65 adults and seven cygnets in Yellowstone. We counted 28 swans total during the autumn survey, including eight adults and two cygnets in Yellowstone. We found two pairs of nesting swans on Grebe Lake and Riddle Lake, but only the Riddle Lake pair fledged two cygnets. Continued decreases in the abundance of nesting trumpeter swans in Yellowstone are cause for concern and currently under investigation.

Bald eagle surveys were conducted via fixed-wing aircraft and supplemented by ground observations. We found 19 bald eagle nests, 10 of which contained eggs or young and fledged a total of seven eaglets. This contrasts with 34 nesting pairs in 2007 that fledged 26 eaglets. The relatively low number of nests located during 2008 was primarily a result of insufficient documentation of nest locations during previous years. However, decreased reproductive success has been observed in recent years for eagles nesing in the Yellowstone Lake area, possibly due to reductions in cutthroat trout abundance, human disturbance, climate change, or unidentified variables. Weather conditions were also unfavorable for rearing of young as cold, wet conditions persisted into June possibly affecting recruitment.

Osprey surveys were conducted in conjunction with bald eagle surveys. We found a total of 42 osprey nests, 23 of which were active and fledged a total of 17 young. In contrast, 31 active nests were located in 2007 that fledged a total of 25 young. Reproductive measures for osprey continue to decrease throughout Yellowstone, with decreases on Yellowstone Lake being more acute than other areas of the park. The locations of all bald eagle and osprey nests detected in 2008 were recorded with a Global Positioning System (GPS) to minimize search time in 2009.

We searched for nine peregrine falcon eyries, but could only locate three. One eyrie failed, while the other two fledged a total of five young. Field work did not begin until mid-May in 2008, just two weeks prior to incubation, and searching for nest ledges is nearly impossible during this time. Also, there are no photographic or written records of nest ledges located during previous years. Thus, we have started a photographic record of eyrie locations to aid in future searches. Overall, measures of peregrine reproduction are increasing park-wide and higher than the nation's average.

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 13 young, while double-crested cormorants fledged 16 young. However, nest initiation and success by Caspian terns and California gulls are decreasing on the islands, with neither species initiating nests during 2008. The highest lake levels observed since 1997 flooded much of the islands and washed out many of the nests during the height of the breeding season in 2008. High water levels coupled with a late ice-off date created a short nesting season.

We surveyed three routes for the breeding bird survey, which is an international survey designed to index bird population trends over time. We observed 72 species and 4,429 individual birds across the three routes during 2008. We also continued a 3-year field study of willow-songbird relationships initiated by Montana State University to establish a long-term songbird dataset and fill a gap in the knowledge of songbird bird communities in the park.

Recommendations

<u>Trumpeter Swans</u>

- Close the Cascade, Grebe, and Wolf lakes nesting complex from April 1 through July 15.
- Maintain the bear management closure of the Riddle Lake area from April 30th through July 14th.
- Evaluate other nesting complexes for closure if pairs are observed localizing early in the nesting season (April and May).

- Until further analyses are conducted, keep the closures at Trumpeter Lake and 7-Mile Bridge in effect.
- Evaluate changes in wetlands over time using aerial photography and other metrics.
- Pursue a vision and agenda for the cooperative, integrated management of Tri-state trumpeter swans with agencies controlling more productive areas within the Tri-state range.

Bald Eagles and Ospreys

- Continue annual monitoring of bald eagles and ospreys. The post-delisting monitoring plan for bald eagles requires monitoring territories and nests at 5-year intervals beginning in 2013-14.
- Evaluate factors affecting nesting success, especially for the Yellowstone Lake population.
- Conduct an additional flight during April or early May to survey suitable locations in YNP where nests have been found historically, but not during recent years.

Peregrine Falcons

- Develop photographic and written records of nest ledges.
- Begin surveys in late March or early April.
- Coordinate additional staff and/or volunteers to find and monitor nests in Yellowstone. Next year (2009) is the tri-annual peregrine falcon survey administered by U.S. Fish and Wildlife Service as part of the post-delisting monitoring plan. The National Park Service committed to locating 10 and monitoring eyries in Yellowstone for this survey.

Colonial Nesting Birds (Molly Islands)

- Continue to monitor colonial nesting birds in conjunction with eagle and osprey survey flights.

Breeding Bird Surveys

- Continue to monitor the three routes for the breeding bird survey.
- Coordinate with the Inventory and Monitoring Program for the National Park Service to standardize bird surveys within the Greater Yellowstone Network to the extent possible.
- Continue the study of willow-songbird relationships to establish a long-term songbird dataset and fill a gap in the knowledge of songbird bird communities in the park.

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Introduction

The Yellowstone bird program was initiated in 1987 and has been primarily concerned with monitoring species considered threatened, endangered, or of special concern. Raptor monitoring was conducted to collect information on the productivity of bald eagles (*Haliaeetus leucocephalus*), ospreys (*Pandion haliaetus*), and peregrine falcons (*Falco peregrinus*). Information was also collected on colonial-nesting birds on the Molly Islands, including American white pelicans (*Pelecanus erythrorhynchos*), double-crested cormorants (*Phalacrocorax auritus*), Caspian terns (*Sterna caspia*), and California gulls (*Larus californicus*). In addition, nesting pairs of trumpeter swans (*Cygnus buccinators*) and common loons (*Gavia immer*) were monitored, and adult population numbers of Harlequin ducks (*Histrionicus histrionicus*) were opportunistically surveyed. The bird program also conducted breeding bird, Christmas bird, migratory bird, raptor migration, and mid-winter bald eagle surveys in some years.

A subset of the above-mentioned surveys was completed during 2008, including surveys of trumpeter swans, bald eagles, ospreys, peregrine falcons, colonial-nesting birds, and breeding birds. In addition, we continued a 3-year graduate study monitoring songbird responses to increased willow growth in the northern portion of Yellowstone National Park (YNP). This report summarizes results from the 2008 breeding season, interprets these results in the context of historical trends, and provides recommendations for surveys in future years.

Weather during the Bird Breeding Season

The bird breeding season in 2008 began in April with temperatures approximately 2 degrees Celsius cooler than the 30-year average (1970-2000; Figure 1). April precipitation was below average, but snow pack was 114% of average (Figures 2 and 3). Cool April temperatures and higher than average May precipitation, much of it falling as snow, resulted in greater than average (126%) May snow pack. June precipitation was also above average (122%), but May and June temperatures were relatively normal. Snow persisted into middle to late June, even at the lower elevations, and many of the lakes and ponds were frozen late into the season. Ice-off for Yellowstone Lake occurred on June 2, three weeks later than in 2007. July and August were warmer than average and infrequent afternoon thundershowers made for a dry summer with lower than average precipitation (30 and 33% of average).

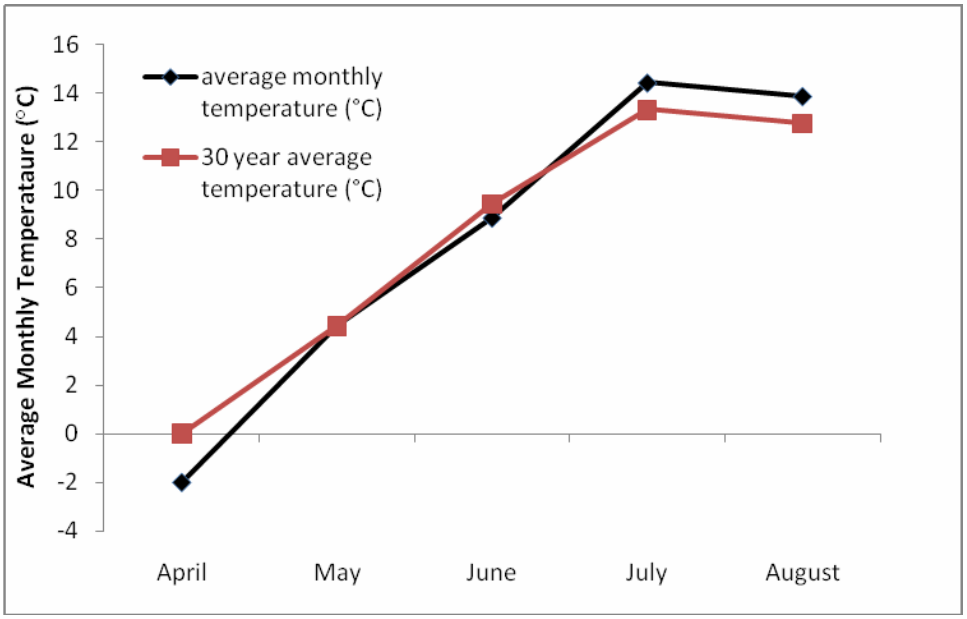

Figure 1. Average monthly temperature (°C) and 30-year average temperature (1970-2000) in YNP during April through August 2008 (data provided by Snowcap Hydrology, Bozeman, Montana).

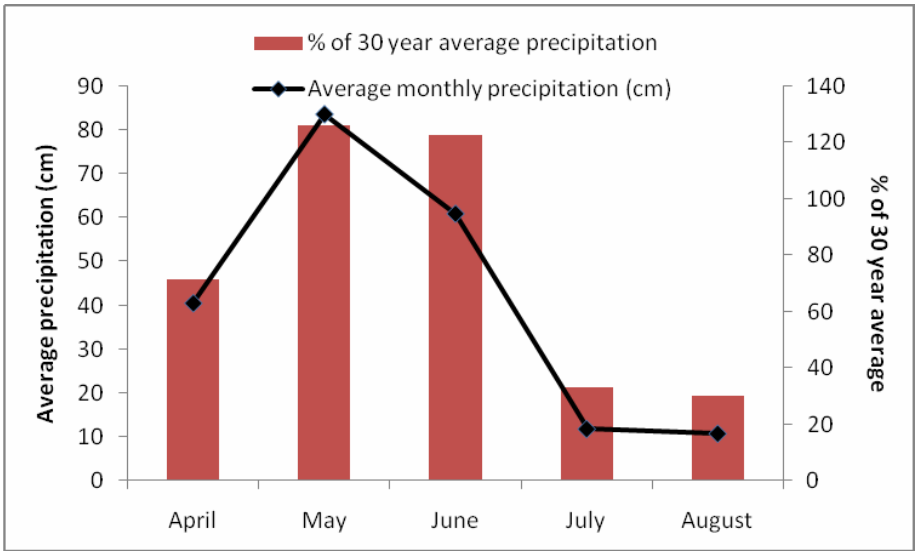

Figure 2. Average monthly precipitation (cm) and 30-year average precipitation (1970-2000) in YNP from April through August 2008 (data provided by Snowcap Hydrology, Bozeman, Montana).

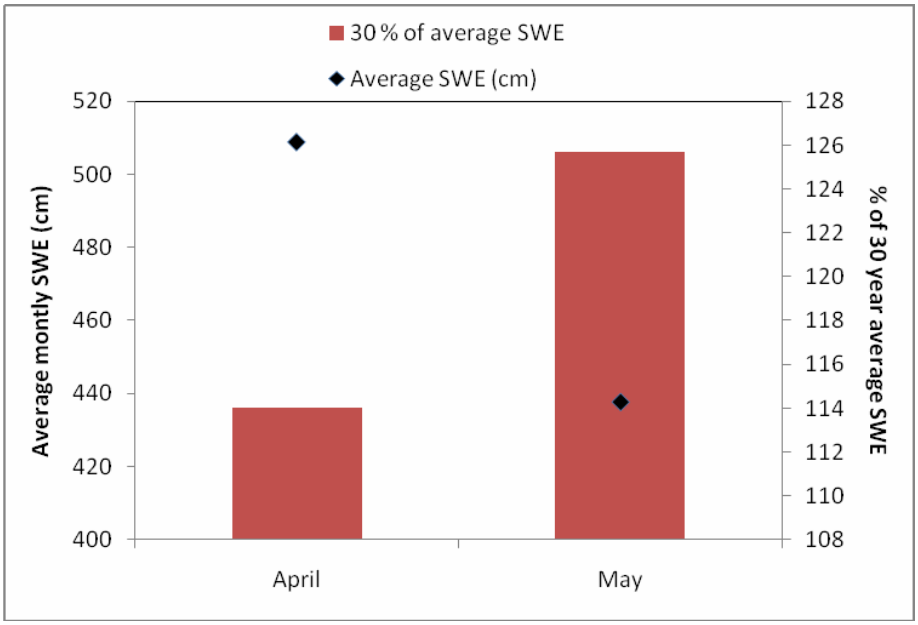

Figure 3. Average monthly snow water equivalent (SWE) and 30-year average SWE in YNP for April and May 2008 (data provided by Snowcap Hydrology, Bozeman, Montana).

Trumpeter Swans

Trumpeter swans in the United States are divided into an Interior, Pacific, and Rocky Mountain population. The Rocky Mountain population extends from western Canada, south to Wyoming and Nevada (U.S. Fish and Wildlife Service (USFWS) 2007). Swans in YNP are part of the tri-state subpopulation located within the Rocky Mountain population in the area surrounding the junction of Idaho, Montana, and Wyoming (Figure 4).

Information on Yellowstone's resident swan and wintering swan population dates back to 1931 and 1971, respectively. These tri-state annual surveys are conducted in September and February as part of an inter-agency effort coordinated by USFWS. The objectives of the September survey are to: 1) estimate

the resident swan population, 2) estimate yearly swan productivity or fledging success and 3) use these data in conjunction with winter swan survey results to estimate the non-resident swan population. The objective of the mid-winter survey in February is to determine the number of migrant swans wintering in the region. Paradise Valley was added to the autumn and mid-winter survey in 1989 and 1999 respectively while Hebgen Lake was added to the autumn and mid-winter count in 2005 and 2000 respectively, however data for previous autumn counts on Hebgen Lake could not be located. In addition YNP has conducted bi-weekly winter ground-based surveys for portions of the Yellowstone and Madison Rivers since 1987. Swans are also monitored during the nesting season in order to determine the number of non-breeders, territory occupancy, nest success (nests hatching young) as opposed to fledging success (cygnets surviving until September) which is accomplished via the autumn surveys.

Monitoring Trumpeter Swans

Trumpeter swans were monitored in 2008 via fixed wing aircraft on February 14 and September 17 as part of the tri-state mid-winter and autumn surveys. Each flight was between 5.5 and 6 hours long. All areas of YNP, the Paradise Valley, and on Hebgen Lake were surveyed during each flight. Swan locations were obtained with a GPS and the numbers of observed adults and cygnets were recorded. During the breeding season (April-August), we surveyed YNP for nesting swans via fixed-wing aircraft (concurrent with surveys of bald eagles and osprey). Information gathered during flights was supplemented with ground observations. We collected information on territory occupancy and nesting status in YNP. Nests were monitored until fledging or failure.

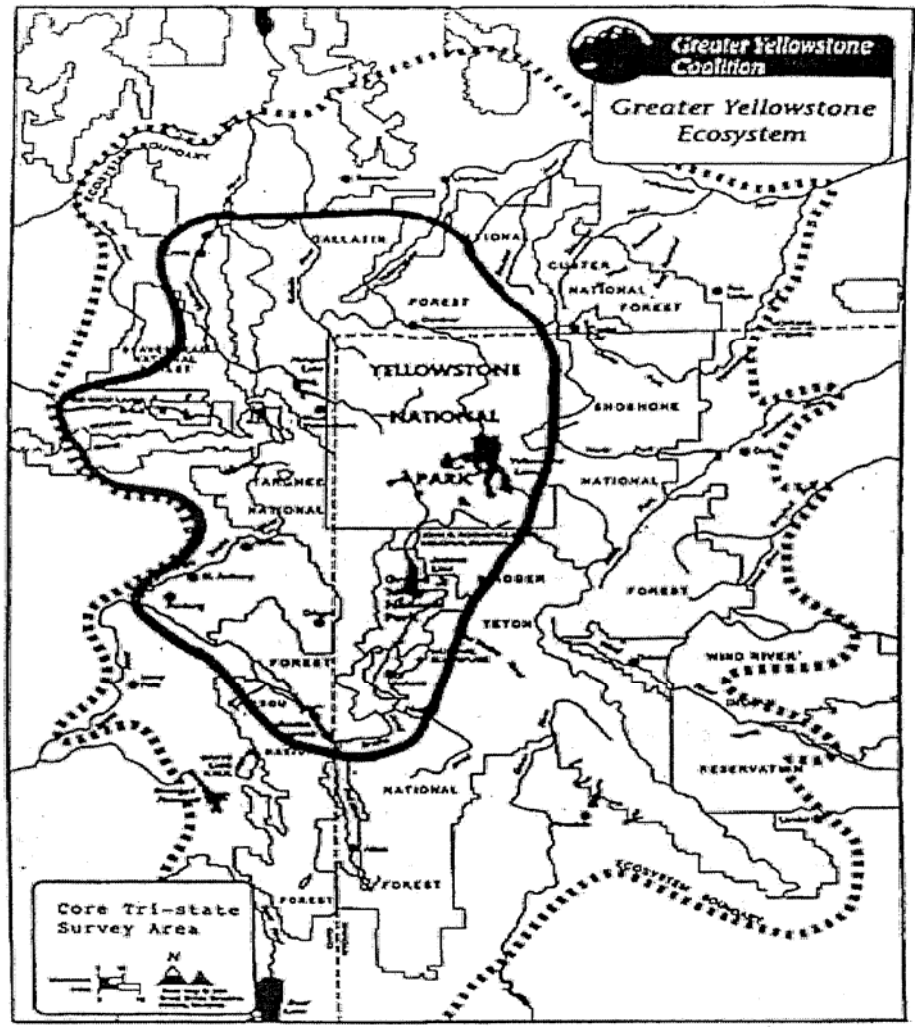

Figure 4. Map showing the core tri-state area trumpeter swan population in southeast Idaho, northwest Wyoming, and southwest Montana within the Rocky Mountain population (provided by the Greater Yellowstone Coalition, Bozeman, Montana).

Winter Count of Trumpeter Swans

Three observers counted a total of 321 swans (293 adults and 28 cygnets) in YNP, the Paradise Valley, and on Hebgen Lake during the aerial mid-winter swan survey on February 14, 2008 (Table 1). Overall, this was the lowest number of swans counted in the YNP area since 2000 and represents a 47% decrease in the 7-year average swan count (excluding 2001; Figure 5). Over the last eight years, the average total number of swans counted was 572 (excluding 2001).

YNP swans accounted for 22% of all swans observed during the survey, a 57% decrease from 2007. The majority of swans (66%) were counted on Hebgen Lake, while the remaining 11% were counted in the Paradise Valley. These three areas are in close proximity and swans likely move from higher elevation sites in Yellowstone to lower elevation sites in Paradise Valley and Hebgen Lake as winter progresses and ice-free lakes and rivers in Yellowstone diminish. Thus, the number of swans observed in Yellowstone is highly dependant on year-to-year variations in winter weather conditions.

Table 1. Results of the mid-winter aerial surveys for trumpeter swans in YNP, the Paradise Valley, and on Hebgen Lake.

Hebgen Lake	**Paradise Valley**	**Yellowstone National Park**
Year **Adults** **Cygnets**	**Year** **Adults** **Cygnets**	**Year** **Adults** **Cygnets**
2000 220 31	2000 16 6	2000 87 13
2001 Not surveyed	2001 28 1	2001 53 11
2002 121 12	2002 17 7	2002 233 35
2003 462 40	2003 23 5	2003 146 34
2004 423 69	2004 35 15	2004 149 33
2005 367 72	2005 18 6	2005 124 30
2006 503 153	2006 29 5	2006 121 14
2007 340 31	2007 41 3	2007 144 25
2008 202 11	2008 26 10	2008 65 7

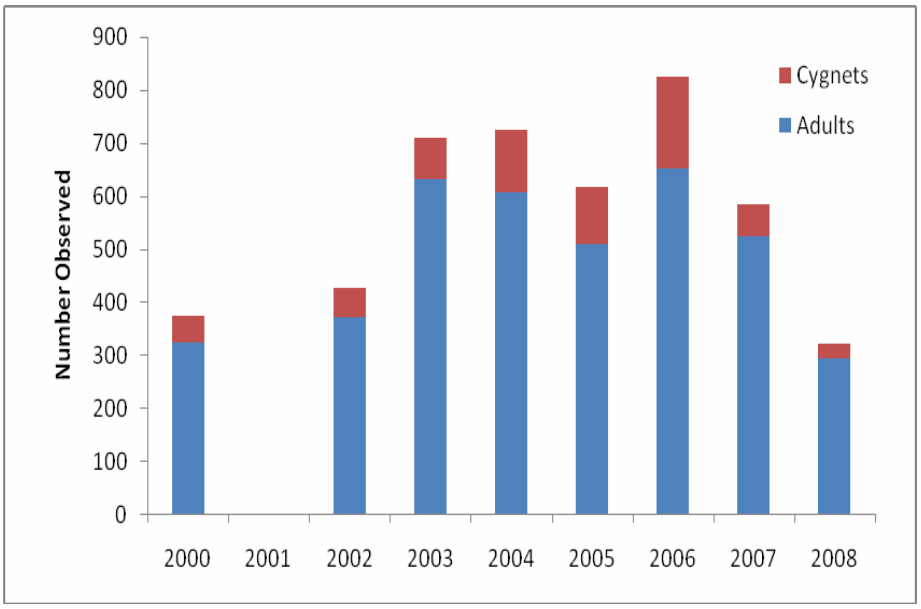

Figure 5. Summary of the total numbers of adult and cygnet trumpeter swans observed during mid-winter, aerial, surveys in YNP, the Paradise Valley, and on Hebgen Lake during 2000-2008. Data from 2001 was censored because Hebgen Lake was not surveyed that year.

Trumpeter Swan Reproduction

During 2008, and for the second year in a row, only two nest attempts were made in YNP, one at Grebe Lake and the other at Riddle Lake. The Grebe Lake pair failed during the incubation stage, while the Riddle Lake pair hatched two cygnets (Figure 6). Overall, the number of nest attempts has decreased since 1987 and ranged from 2-10 with a mean of 5.9 per year. However, nest attempts have not exceeded four per year over the last eight years. The number of successful nests since 1987 has ranged from 0-5, with an average of 1.9 successful nests per year. The majority of nest attempts failing to hatch young in recent decades has been attributed to early season flooding and egg predation (T. McEneaney, National Park Service (retired), unpublished data).

Autumn Survey of Adult and Fledgling Cygnet Trumpeter Swans

All areas in YNP, the Paradise Valley, and on Hebgen Lake were surveyed for trumpeter swans on September 17, 2008. A total of 26 swans were counted (18 adults and 8 cygnets; Table 2). In comparison, 20 adults and 11 cygnets were observed in the Paradise Valley and YNP during 2007, including 10 adults and zero cygnets in YNP (Figures 7 and 8). The population of adult swans in YNP peaked at 69 individuals in 1961 and decreased to a current population of eight resident swans (Figure 7). In 1954, 23 cygnets were counted in YNP, which is the largest cygnet count during the autumn surveys. In contrast, only two cygnets fledged in 2008. Though reasons for this decreased abundance remain uncertain, it is speculated that changing management practices in the Centennial Valley, which is an important recruitment area for swans, has reduced the number of swans available to migrate into YNP (McEneaney 2006). In addition, persistent drought conditions have reduced available nesting and foraging areas in YNP, which along with predation, has contributed to decreases in the number of cygnets fledged per year (T. McEneaney, National Park Service (retired), unpublished data).

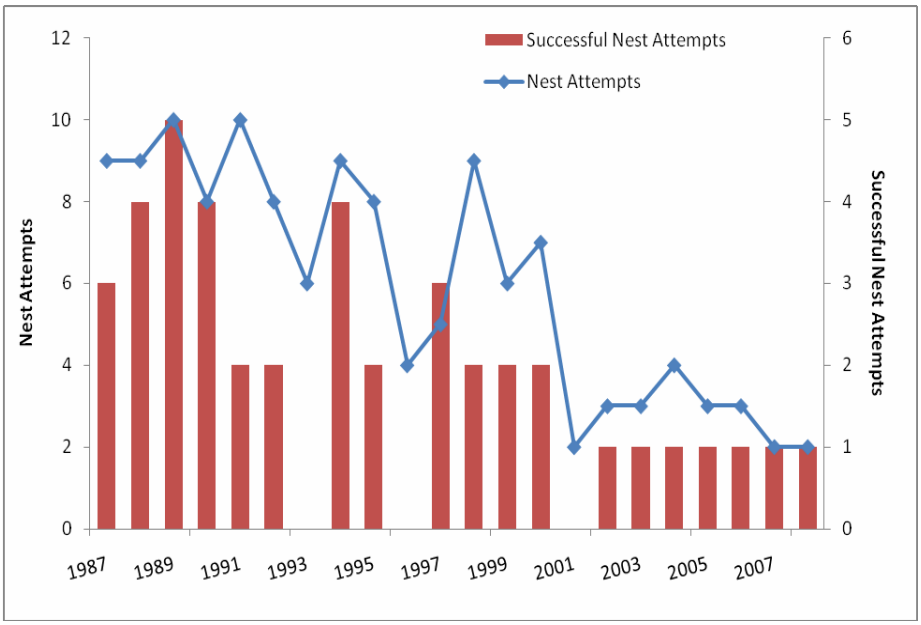

Figure 6. Numbers of nest attempts and successful nests trumpeter swan in YNP during 1987-2008.

Table 2. Autumn 2008 survey results for trumpeter swans in YNP, the Paradise Valley, and on Hebgen Lake in Montana.

Location	**Adults**	**Cygnets**
Paradise Valley	11	6
Yellowstone National Park	6	2
Hebgen Lake Area	1	0
Total	**18**	**8**

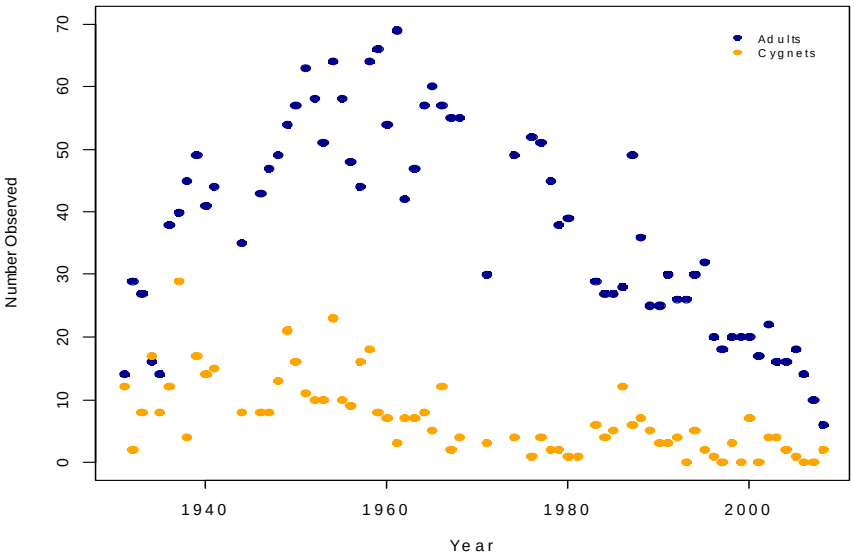

Figure 7. Autumn counts of trumpeter swans in YNP during 1931-2008.

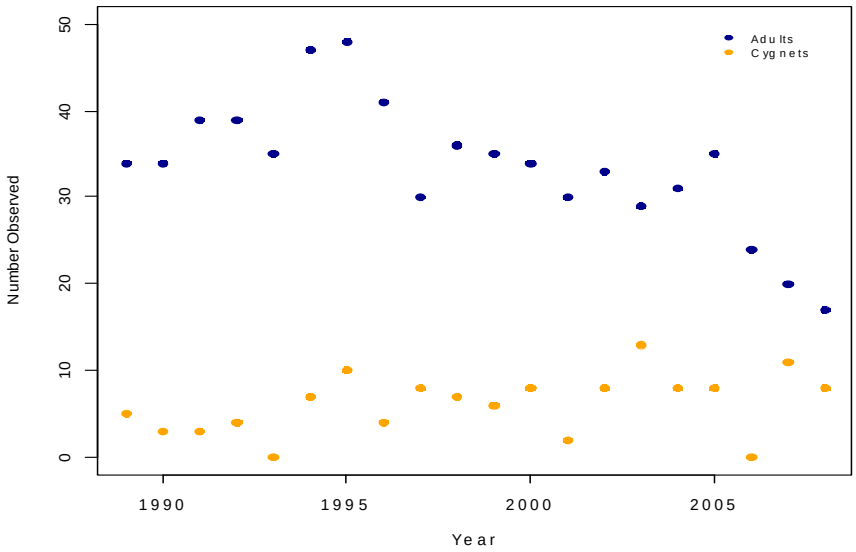

Figure 8. Autumn counts of trumpeter swans in YNP and the Paradise Valley during 1989-2008.

Summary and Recommendations

The swan population in Yellowstone has been decreasing for the last 40 years. Territory occupancy, nesting success, and fledging success have all decreased over this period, raising serious concerns over the viability of the Yellowstone swan population. Wetland area appears to be a key factor in swan productivity in YNP (K. Proffitt, Montana State University, unpublished data). It is speculated that a warmer and drier climate has contributed to decrease in wetlands in YNP. An important next step in evaluating factors responsible for swan decreases is to evaluate change in wetlands over time. Yellowstone has access to a time series of aerial photos starting in the 1960's that cover most of the park. These photos could be used to estimate landscape changes in swan habitat over time. The Grebe Lake pair has nested on nearby Cascade and Wolf Lakes in past years. We recommend closing this wetland complex to human traffic during the swan nesting season because swans may fail to initiate a nest in areas of high human disturbance.

Bald Eagles

The USFWS removed the bald eagle from the List of Endangered and Threatened Wildlife on August 8, 2007 following extensive recovery efforts nation-wide. The post-delisting plan requires the monitoring of nesting territories at 5-year intervals over a 20-year period. The goal of the plan is to detect a 25% change in occupied bald eagle nests. If a decrease is detected, then the USFWS will attempt to determine the cause(s) and implement remedial measures as appropriate. At the end of the 20-year period, the bald eagle population status in the contiguous 48 states will be reevaluated and recommendations will be made based on these results. The first official monitoring year will take place in 2013-14.

YNP collected bald eagle reproduction data in most years since 1960. Since that time 45 bald eagle territories have been identified in YNP. Prior to 1987, data was collected by a number of different observers, which may partly explain the observed high variation in nest attempts. However, this period also coincides with spraying of DDT in the park and surrounding public lands to combat spruce budworm (*Choristoneura fumiferana*) infestations which may have caused variations in nest attempts (Figure 9). Since 1984, the number of nesting pairs in YNP has increased substantially, with 31-34 nest attempts per year since 2001. Thus, the park may have reached saturation in the number of nesting pairs that can be supported (McEneaney 2006).

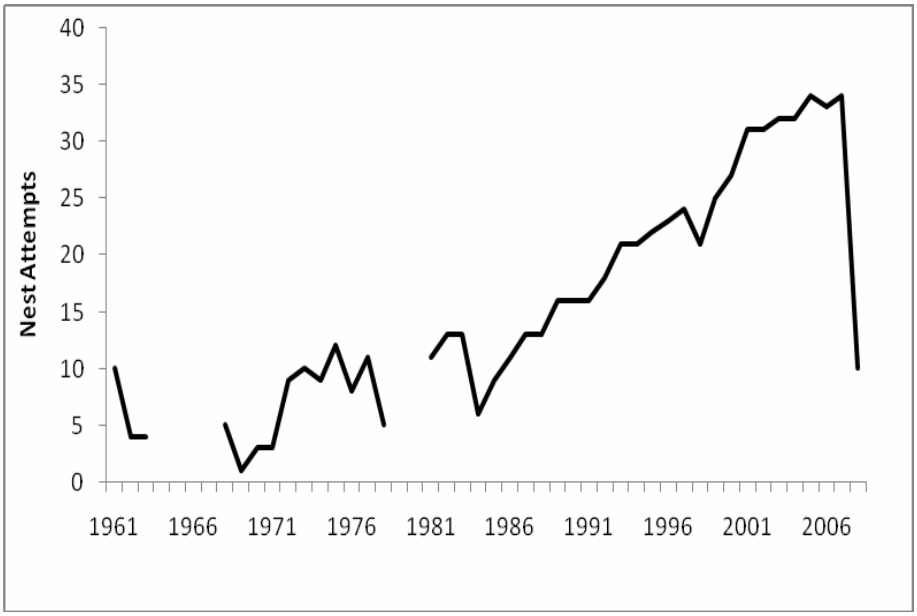

Figure 9. Total bald eagle nest attempts observed per year in YNP during 1961-2008

Monitoring Bald Eagles and Ospreys

We censused bald eagles and osprey via aerial surveys. Three flights focused primarily on nest searches, but some searches were combined with flights conducted by the wolf project. These combined flights totaled approximately 20 hours. Bird survey flights took place on May 16, June 19, and June 28 of 2008. Where possible, we also made ground checks to determine status. Since exact locations of nest sites were not previously documented, we flew over territories where bald eagles have nested in the past based on site names given by T. McEneaney (National Park Service, retired) and the memory of the pilot (R. Stradley, Gallatin Flying Service, Belgrade, Montana) that has traditionally flown these surveys. Once a nest was located, it's coordinates were recorded using a GPS, and the nest was identified as active, occupied, or unoccupied based on definitions outlined in the 2007 USFWS draft post-delisting monitoring plan. Active nests were considered occupied except when the only behaviors observed were a pair at the nest and/or evidence of nest repair (i.e., the pair may not have actually laid eggs). An unoccupied nest was one in which none of the criteria diagnostic of an occupied nest were observed (note: nests must have been previously identified as active to be labeled unoccupied; see Appendix B for a complete list of nesting terminology).

Active nests were assigned a unique nest identification number. We did not give inactive or unoccupied nests a nest identification number. All territories that were active in 2007 were visited at least once in an attempt to locate nests during the 2008 breeding season. GPS coordinate locations collected during flights were digitized and separated into shapefiles of active nests and inactive nests. A third shapefile with the general locations of historic nesting territories was also constructed to guide future observers to zones requiring area searches for active nests.

Bald Eagle Reproduction

We found and mapped 19 bald eagle nests in YNP during 2008 (Figure 10), 10 of which were active when discovered. Another five nests contained recently added green plant material and were categorized as occupied, but not active, because no eggs or young were seen in the nest during the breeding season. These nests may have been active, but failed early in the breeding season prior to our surveys. A nest designated as occupied south of Columbine Creek blew down later in the season and one nest at Terrace Point on Yellowstone Lake blew down over the winter. The remaining four nests were inactive and could be alternate nests. Bald eagles often build alternate nests within their breeding territory to reduce exposure to parasites, advertise territoriality, or as a safeguard if the primary nest is destroyed early

enough in the season to allow for re-nesting. At least one mature eagle was observed near or at three of four inactive nests (i.e., Goose Lake, Alum Creek, and Snake River), indicating territory occupancy. No eagles were observed at the fourth nest located eight miles east of West Yellowstone along the Madison River, indicating an unoccupied territory. However, this nest was apparently active during the previous four years. Of the 10 active nests, four failed to produce young and six successfully produced a total of seven eaglets (Table 3).

Two major reasons may account for the low number of active nests observed this year. The first is that this was the first year in 20 that surveys were conducted by new observers. Given that nests prior to this year were not marked using a GPS, nests were difficult to relocate and many were missed. This is being remedied by constructing a geo-database of all nests located and linking the location when possible to historical data on nest productivity but will likely take at least 2 additional seasons before all nests can be successfully located and monitored. Second, adverse weather conditions early in the season likely caused many nest failures before nesting activity could be determined. Bald eagles begin egg laying as early as late February in the lower elevations and the first aerial survey typically takes place during the last week in April, however the first survey did not take place until May 16 this year. As a result nests failing early in the season would have been mistaken for occupied nests when they were actually active. If this is the case then the number of active and failed nests would increase to 15 and 9 respectively. Still, this represents very low numbers compared with past years. In 2007, there were 34 nesting pairs fledging 26 young and in 2006 there were 33 nesting pairs fledging only 10 young primarily as a consequence of adverse weather conditions.

Madison Nest Closure

Since 2002, a bald eagle pair has nested in a burned snag located approximately six miles east of West Yellowstone and less than 60 meters from the road. This tree blew down in a storm during 2007, and the eagles chose to rebuild their nest in an adjacent tree closer to the road. Such proximity to the road afforded the opportunity to the large number of visitors entering and exiting YNP via the west entrance to view nesting bald eagles and their eaglets. Despite the number of visitors and traffic issues, this pair managed to fledge nine young over the past seven years, with only one weather related nesting failure in 2004.

Traditionally a closure has been placed around the nest and staff have controlled traffic. However, limited personnel did not allow for staffing at the nest site in 2008. Instead, a closure was placed on all areas around the nest and a “no stopping zone” was designated along a 0.25-mile stretch of road on either side of the nest. The majority of visitors obeyed the no stopping rule and observed the nest from a distance. The nest caused some traffic issues which were resolved as they occurred. The 6-mile pair fledged one eaglet this year.

Trends in Bald Eagle Reproduction

We looked for trends over time in bald eagle nesting success, productivity, and brood size during 1987-2008. We then tested the assumption that the Yellowstone Lake subpopulation (hereafter referred to as the Lake subpopulation) exhibited different trends in reproduction than nests in all other areas of the park (hereafter referred to as the non-Lake subpopulation). Nest success was defined as the percentage of all nesting attempts that fledged at least one young in a given year. Productivity was defined as the average number of young produced per nesting female, and brood size was defined as the average number of young fledged per successful nest.

We expected high year-to-year variability in reproductive parameters, which are largely a reflection of stochastic weather events. Thus, we ignored year-to-year fluctuations and examined overall trends in reproductive parameters to gain a better understanding how the bald eagle population is changing over time. Though information on bald eagle reproduction exists prior to 1987, differences in data collection methods may confuse trends over time. Thus, we excluded those years for the purposes of the analyses.

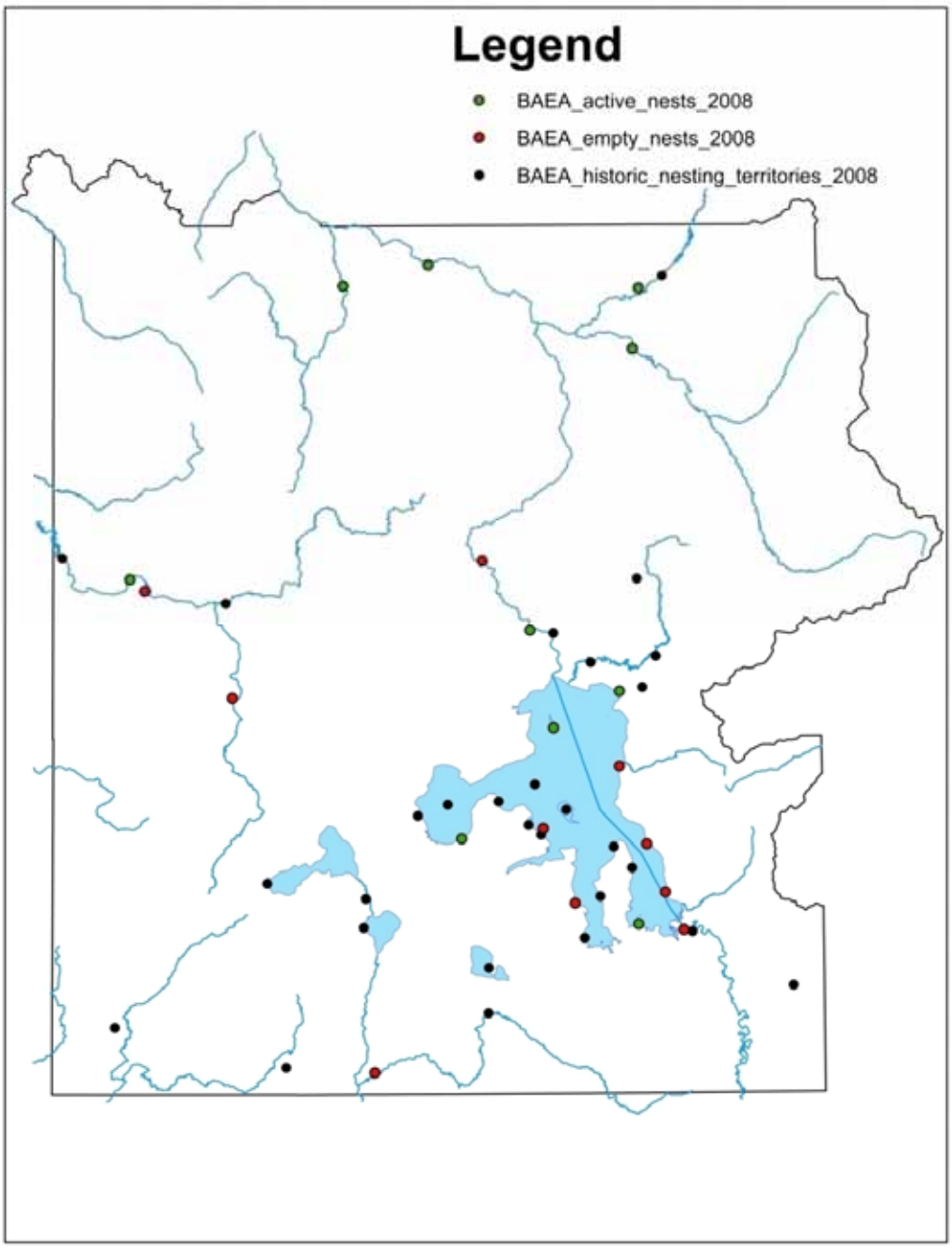

Figure 10. Bald eagle nests located in YNP during aerial and ground surveys during 2008, with historic nesting territories requiring area searches in 2009.

Table 3. Bald eagle nest status in YNP during 2008.

Site Name	Nest Results	Nest Status
Black	1	Active
Stevenson Island	Failed	Active
Mary Bay/Beach	Failed	Active

Trail Creek/S.E. Arm	Failed	Active
6-mile Madison	1	Active
Steam Vent/Mud	Failed	Active
Gardner River	2	Active
S. end of W. Thumb	1	Active
McBride Lake	1	Active
Lamar	1	Active
Elk Point	NA	Occupied
Columbine Creek	NA	Occupied
Yellowstone Delta	NA	Occupied
Mid S. Arm	NA	Occupied
Snipe Point	NA	Occupied
Alum Creek	NA	Unoccupied
Snake River	NA	Unoccupied
Goose Lake	NA	Unoccupied
8-mile Madison	NA	Unnocupied
Park-wide	**7 fledglings**	

Bald Eagle Nest Success

From 1987-2008, park-wide nesting success averaged 48% and ranged from 19-63%. Average nesting success for the Lake and non-Lake subpopulations was 44% and 53%, respectively. Trends in nesting success park-wide have not changed significantly since 1987 ($F = 0.37$, $p = 0.55$; Figure 11). However, there was a significant difference in the degree of change over time between the Lake and non-Lake subpopulations, indicating that these two populations should be examined separately ($F = 3.82$, $p = 0.016$). Nest successing on Yellowstone Lake decreased significantly ($F = 20.99$, $p = 0.00$), while nesting success in the non-Lake subpopulation remained relatively stable ($F = 0.68$, $p = 0.42$; Figure 12). Nesting success on the Yellowstone Lake is decreasing at a rate of 1.8% per year.

Bald Eagle Productivity

Since 1987, bald eagle productivity across YNP has been relatively stable ($F = 2.05$, $p = 0.17$; Figure 13). Park-wide, bald eagle productivity averaged 0.68 young per nesting female and ranged from 0.30-1.08 over the total period. Productivity on Yellowstone Lake was significantly different than elsewhere in the park ($F = 4.07$, $p = 0.01$). Productivity for nests on Yellowstone Lake decreased significantly since 1987 ($F = 15.91$, $p = 0.00$), but was stable for the non-Lake subpopulation ($F = 1.04$, $p = 0.32$; Figure 14). Productivity on Lake averaged 0.61, slightly lower than for the YNP average, while productivity in the non-Lake subpopulation averaged slightly higher than the YNP average at 0.72. Since 2001, the average number of young produced per female was only 0.31 on Yellowstone Lake, but was 0.84 for all other regions of Yellowstone. The average number of young produced per female has been increasing for the non-Lake subpopulation in recent years, while the Lake subpopulation continues to decrease at a rate of 0.03 young per female per year.

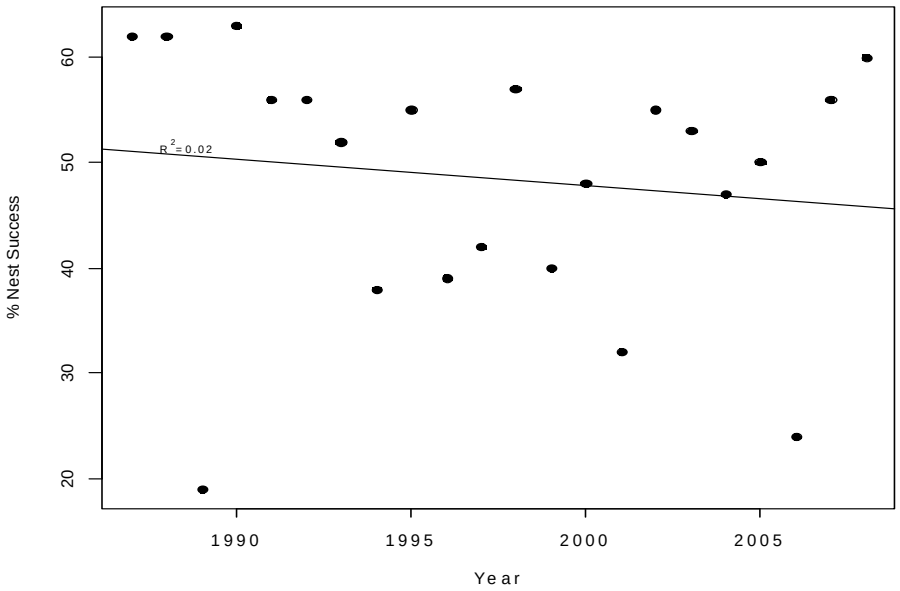

Figure 11. Bald eagle nesting success in YNP during 1987-2008.

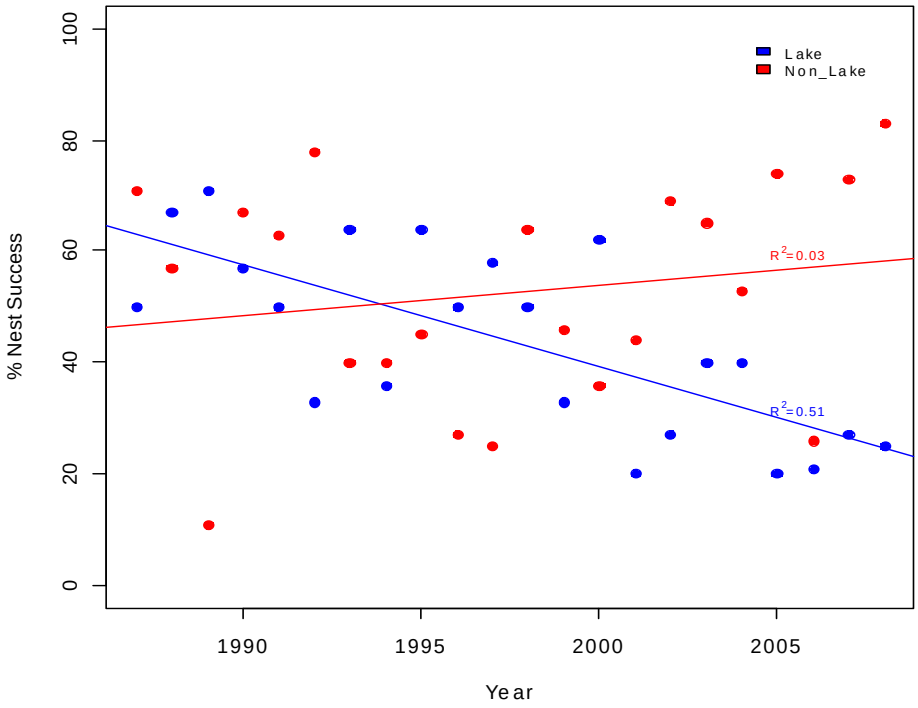

Figure 12. Bald eagle nesting success for nests on Yellowstone Lake and elsewhere in YNP during 1987-2008.

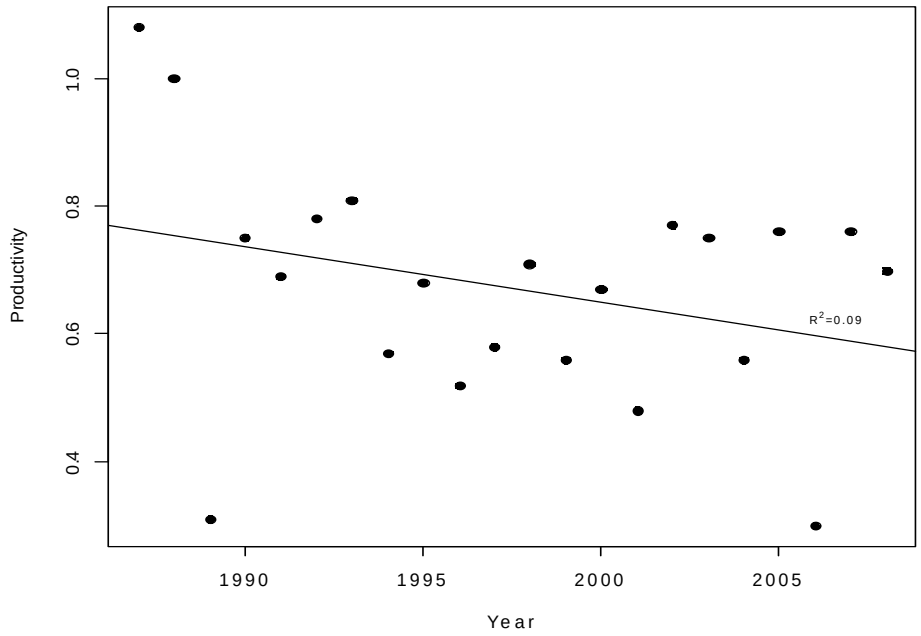

Figure 13. Mean annual bald eagle productivity for all active nests in YNP during 1987-2008.

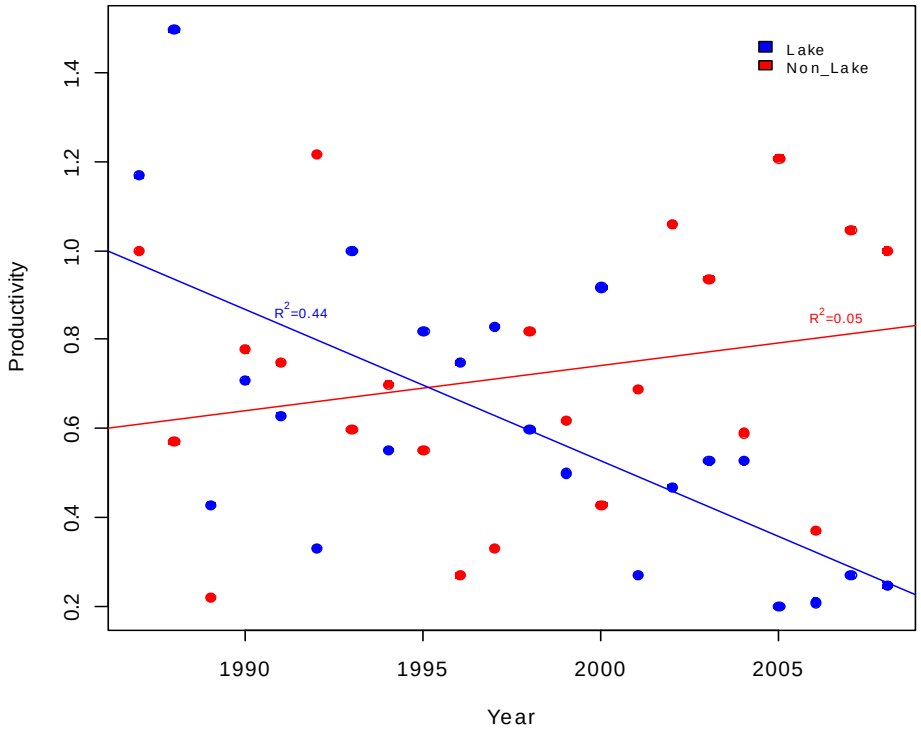

Figure 14. Bald eagle productivity for nests occurring on Yellowstone Lake and nests in all other areas of YNP from 1987 to 2008.

Bald Eagle Brood Size

Trends in bald eagle brood size were not different between Yellowstone Lake and all other areas in YNP ($F = 4.07$, $p = 0.07$). Average brood size for the pooled data was 1.42 young per active nest park-wide and ranged from 1.17 to 2 young per active nest (Figure 15). It is not surprising that brood size has not changed significantly over time. Bald eagles typically lay two eggs per nest and usually only one chick will fledge successfully, so variation over time is small.

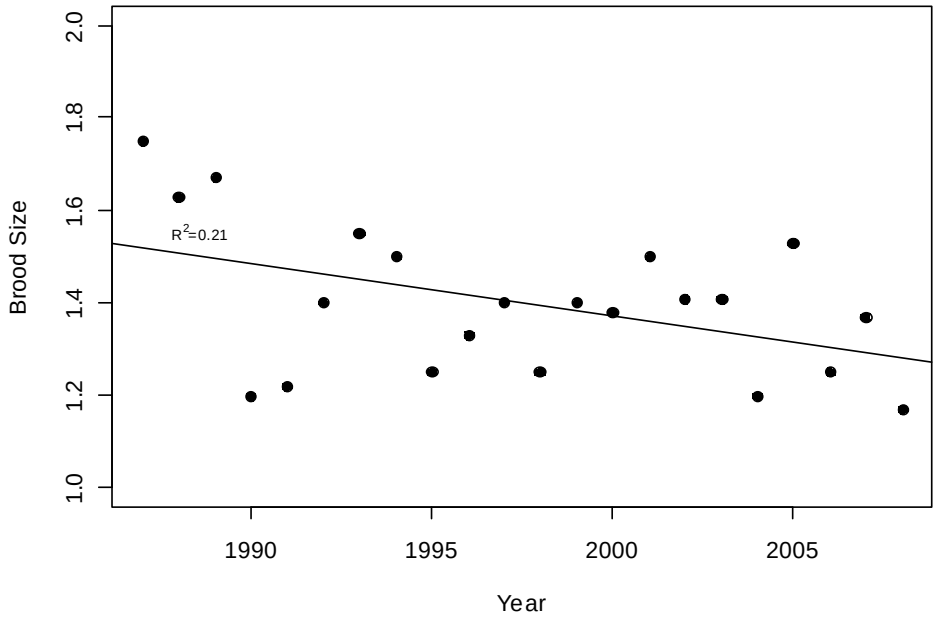

Figure 15. Bald eagle brood size in YNP during 1987-2008.

Conclusions and Recommendations

Reasons for decreases in nesting success and productivity on Yellowstone Lake are unclear. One possibility is that decreases in Yellowstone cutthroat trout in the lake have reduced the amount of food available to nesting eagles and, as a consequence, nest failures are increasing. While a decrease in the abundance of cutthroat trout is likely a contributing factor, it is probably not the primary cause of nest failures for bald eagles because a previous study showed that cutthroat trout constituted 23% of eagle diets in YNP, while the majority of their diet was non-piscivorous birds (Swenson et al. 1986). In other words, bald eagles are not reliant on fish, nor do the waterfowl they consume rely on a fish diet. Rather, bald eagles are dietary generalists and will take a variety of prey items.

An alternate explanation is that increasing average spring temperatures could be causing earlier nest initiation dates. If bald eagles are initiating nests earlier in the season, then variability in spring weather conditions could be contributing to increased nest failures on Yellowstone Lake. Nests on Yellowstone Lake average higher in elevation than nests occurring in other regions of YNP and would be affected more severely by spring storms than nests at lower elevations. Another possibility is that recreational use on Yellowstone Lake is affecting bald eagle reproduction, especially if activities have increased over time. One study concluded that lower reproduction on Yellowstone Lake compared to other areas in YNP was due to human recreation (Swenson 1979). However, after campsites around Yellowstone Lake were closed, measures of reproduction were comparable to other areas in YNP. Yet another possibility is that fires have reduced the availability of suitable nesting trees, and nest failures are primarily the result of toppling trees during the breeding season. However, since the number of nest attempts has increased over time it is unlikely this is a significant cause for decreases in eagle reproduction. Attempting to explain

decreases in reproductive parameters on Yellowstone Lake will be important to advance our understanding of the Yellowstone ecosystem and in guiding future management decisions.

Surveying bald eagles by air is the most efficient method to locate and monitor nests. Traditionally, there have been two flights per season, including one in late April to determine nest activity and one in late June to determine productivity. We recommend an additional flight during late April or early May to survey suitable locations where nests have been found historically, but not during recent years. The third flight in June would revisit all known active nests located by the first two flights to determine final productivity. Locating as many nests as possible early in the season increases accuracy in estimates of reproduction. Nests failing early in the season, but not found until later in the season, will not be counted in final estimates of reproduction, while nests found late in the season are likely to fledge successfully and inflate estimates of reproduction. The additional flight would only need to be done for the next 2-3 seasons or until most of the nests in historical territories have been relocated.

Due to limited funds and staff, the bird program should solicit help from backcountry rangers and other park staff who frequently use the backcountry, especially in remote areas where territories are known to occur, but nests have not yet been found. This should be streamlined to make it as easy as possible for others to submit data and will require some education on bald eagle identification and behavior. To maintain consistency across agencies, it is important to adopt standard terminology developed by the USFWS for describing bald eagle nesting status (Appendix B). The first year of formal monitoring for bald eagles under the post-delisting plan developed by USFWS will take place in 2013-14. In the interim, YNP staff should become familiar with protocols and allocate appropriate funds to complete these additional surveys when the time comes. We recommend annual monitoring because this will enhance the accuracy of the required 5-year counts and, given recent decreases in nest success and productivity of Yellowstone Lake eagles, intensive monitoring of bald eagles is justified.

Ospreys

The number of nesting attempts by ospreys in YNP has decreased since 2001 (range = 22-100), with a mean of 70 nesting attempts per year (Figure 16). During 2008, a total of 42 osprey nests were located and mapped park-wide via ground and aerial surveys (Figure 17). Twenty-three of these nests were active, but we were unable to revisit one remote nest to determine final productivity. Fifty-five percent of the remaining 22 active nests were successful fledging a total of 17 young (Table 4). Ospreys often build alternate nests, especially following an unsuccessful nest attempt, but will sometimes build new nests even after a successful breeding attempt. It is likely that several of the inactive nests, especially those in close proximity to active nests, were alternate nests of the actively breeding pair. Eight fewer active nests were found in 2008 than in 2007. Because of the large number of total nests found regardless of activity, the lower number of nests found during 2008 was likely due to decreased attempts.

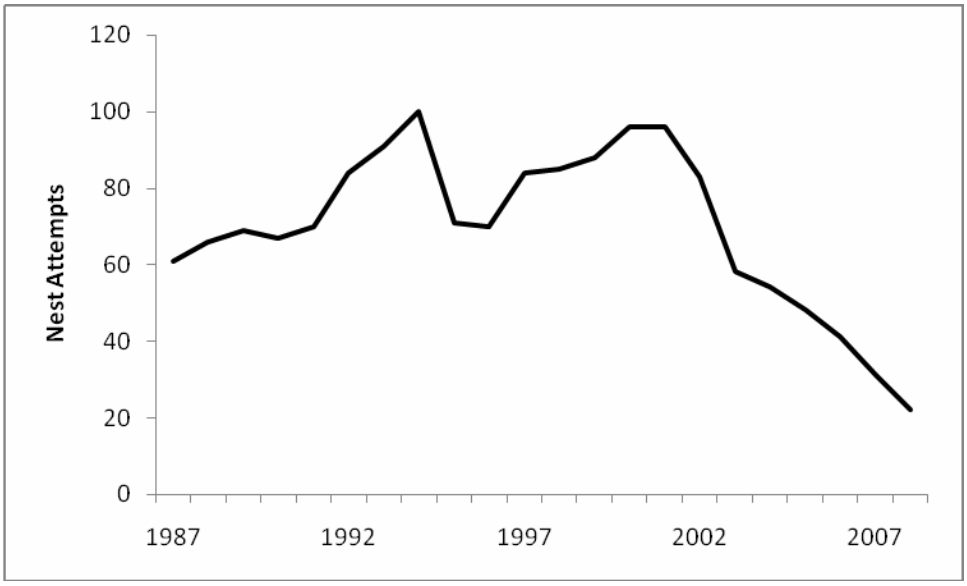

Figure 16. Osprey nesting attempts in YNP during 1987-2008.

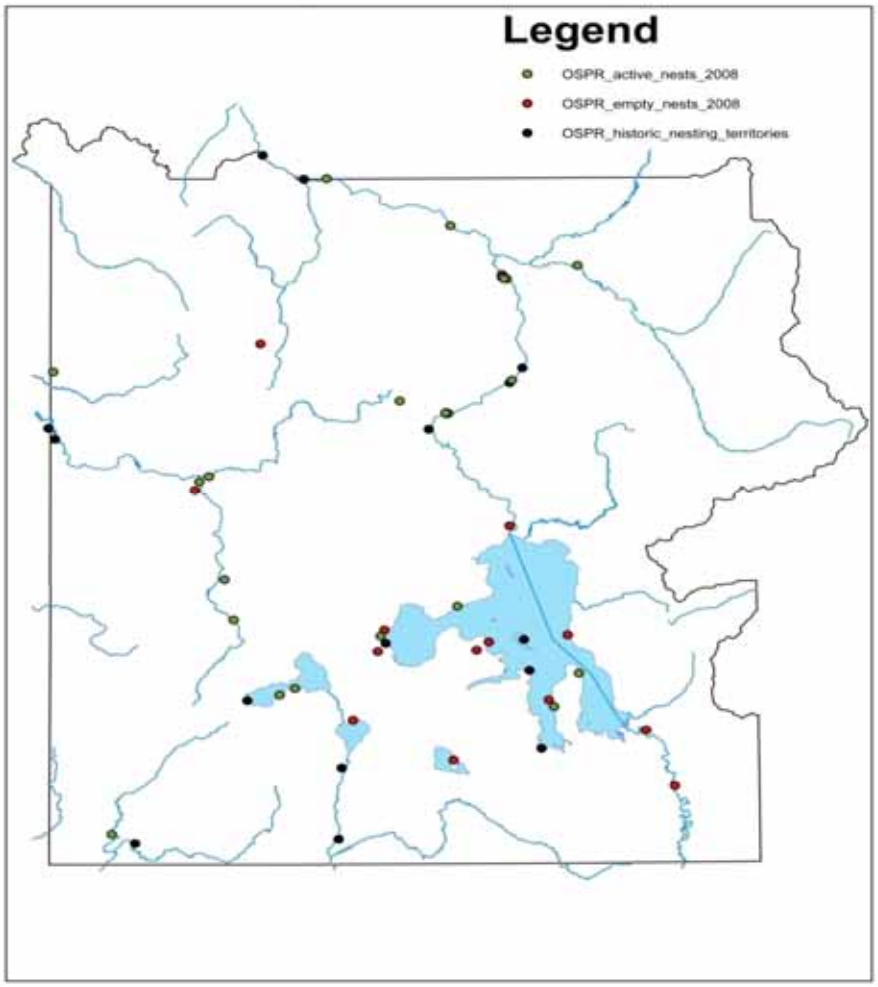

Figure 17. Osprey nests in YNP located during flight and ground surveys in 2008 and historic nesting territories requiring area searches in 2009.

Table 4. Osprey productivity during 2008. Nineteen unoccupied nests are not included in this table.

Nest-ID	Site Name	Nest Results
OSPR-01	Grand Canyon	1
OSPR-02	Bechler	unknown
OSPR-03	Madison Junction	2
OSPR-04	Duck Creek	failed
OSPR-05	Calcite	2
OSPR-06	Calcite	failed
OSPR-07	Lamar Canyon	failed
OSPR-08	Firehole Drive	1
OSPR-10	Alder Lake	failed
OSPR-11	Breeze Pt.	failed
OSPR-12	Kepler Cascade	1
OSPR-13	Grand Canyon Proper	2
OSPR-14	Hellroaring/Yell. R.	1
OSPR-15	Calcite	1
OSPR-16	W. side of W. Thumb	failed
OSPR-17	S. shore Shoshone Lake	failed
OSPR-18	Canyon Proper	1
OSPR-19	Canyon Proper	failed
OSPR-20	Promontory	failed
OSPR-21	Grebe Lake	1
OSPR-22	Yellowstone River	2
OSPR-23	Mallard Lake	2
OSPR-24	S. Shore Shoshone Lake	failed
Total	**Park-wide**	**17 fledglings**

Osprey Nesting Success

Since 1987, osprey nesting success has decreased significantly park-wide ($F = 13.00$, $p = 0.00$; Figure 18). Mean nesting success was 49% over the 21-year period, and ranged from a high of 87% in 1990 to a low of 19% 2003. Differences in nesting success between Yellowstone Lake and ospreys nesting elsewhere in YNP were significant ($F = 18.01$, $p = 0.00$; Figure 19) and averaged 42% on Yellowstone Lake and 52% elsewhere. Nesting success has decreased significantly for ospreys nesting on Yellowstone Lake ($F = 40.44$, $p = 0.00$) and elsewhere in YNP ($F = 4.54$, $p = 0.04$). However, nesting success for ospreys not nesting at Yellowstone Lake has increased over the last six years from a low of a 20% in 2003 to 67% nest success in 2008. This is the highest nest success rate observed since 1990.

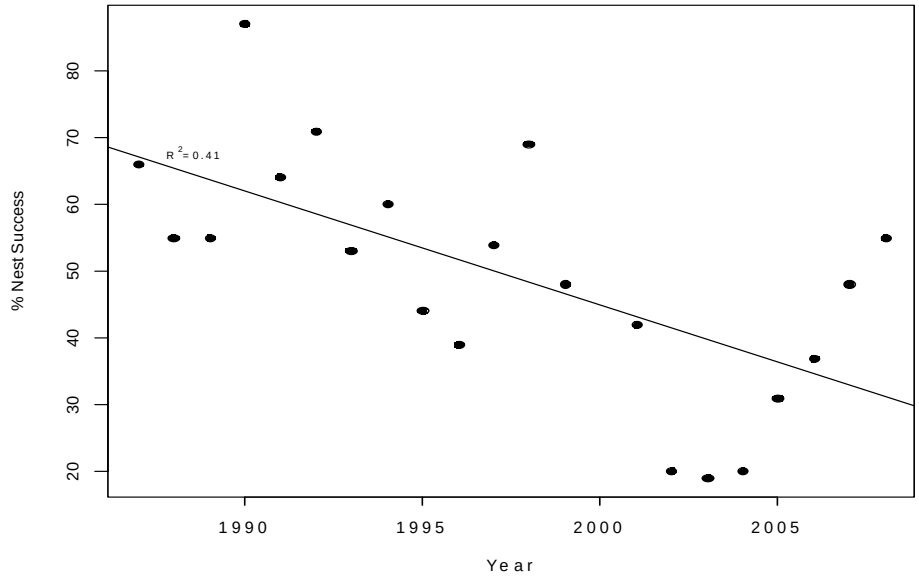

Figure 18. Osprey nesting success across YNP during 1987 to 2008.

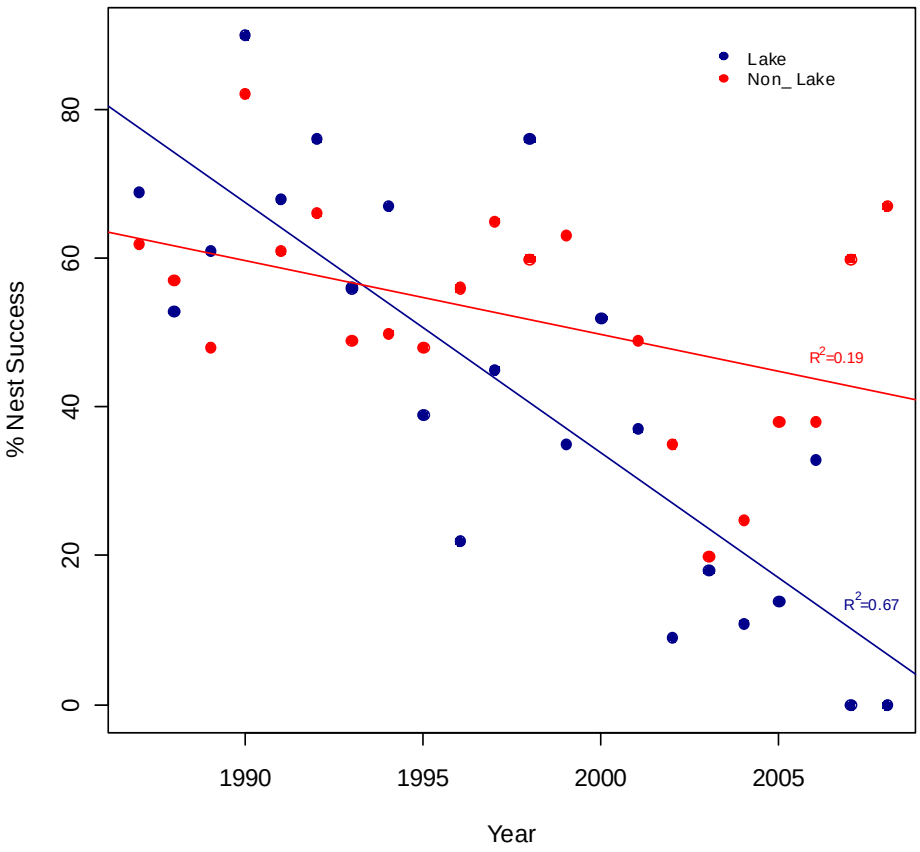

Figure 19. Osprey nesting success at Yellowstone Lake and elsewhere in YNP during 1987-2008.

Osprey Productivity

Osprey productivity has been decreasing park-wide since 1987 ($F = 21.75$, $p = 0.00$). Values ranged from 0.29 young per female in 2003 to 1.16 young per female in 1987, with a mean of 0.76 (Figure 20). There were significant differences in productivity between ospreys nesting at Yellowstone Lake and those nesting elsewhere in YNP ($F = 34.94$, $p = 0.00$). The rate of decrease ($F = 67.72$, $p = 0.00$) in osprey productivity was higher at Yellowstone Lake compared to elsewhere in the park ($F = 10.24$, $p = 0.00$; Figure 21). Similar to nesting success, productivity has also increased from a low of 0.37 in 2003 to 0.94 in 2008 for ospreys not nesting at Yellowstone Lake.

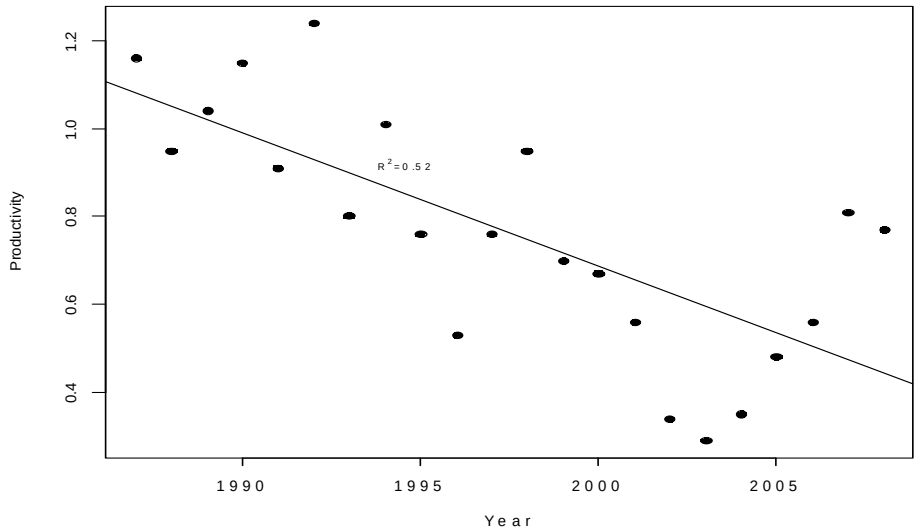

Figure 20. Osprey productivity across YNP during 1987-2008.

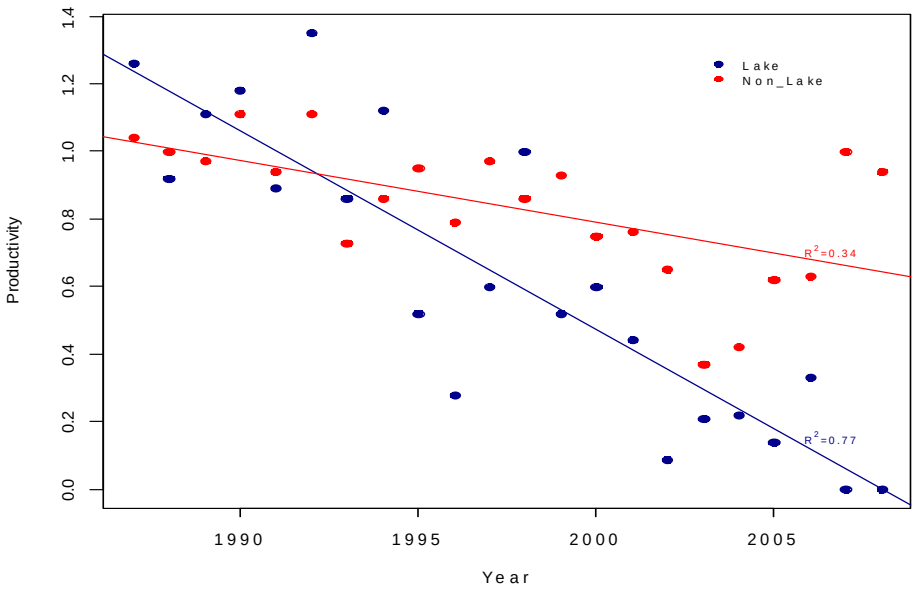

Figure 21. Osprey productivity for Yellowstone Lake and ospreys nesting elsewhere in YNP during 1987-2008.

Osprey Brood Size

Brood size has not significantly changed park-wide since 1987 ($F = 1.48$, $p = 0.23$; Figure 22), but there were significant differences in brood size between ospreys that nested at Yellowstone Lake and elsewhere in YNP ($F = 34.94$; $p = 0.00$). Brood size for ospreys nesting at Yellowstone Lake decreased significantly ($F = 18.94$, $p = 0.00$; Figure 23), while average brood size did not change for non-Yellowstone Lake nests ($F = 0.22$, $p = 0.64$). Average brood size park-wide was 1.57, including 1.28 for nests at Yellowstone Lake and 1.64 for nests elsewhere in YNP. Osprey nest success and productivity is decreasing on Yellowstone Lake, and successful nests are producing fewer young. Data from 2007 and 2008 were not included in these analyses because none of the nests we monitored on Yellowstone Lake were successful.

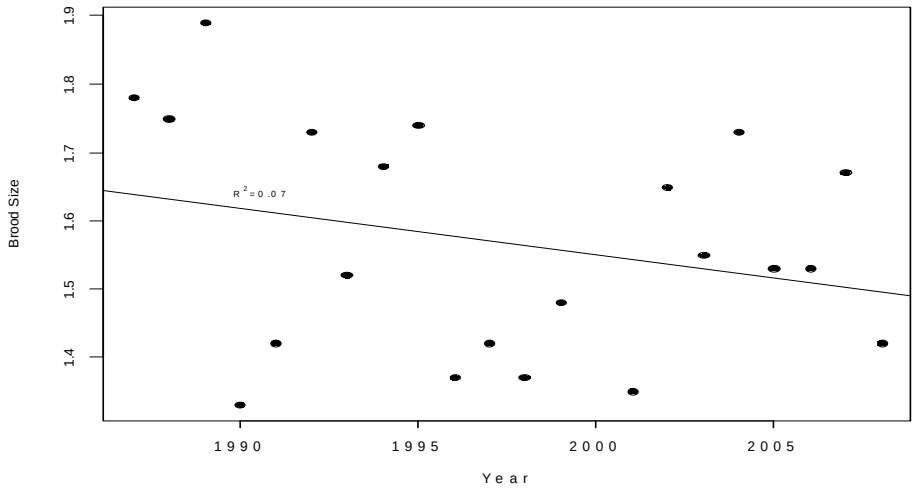

Figure 22. Osprey brood size across YNP during 1987-2008.

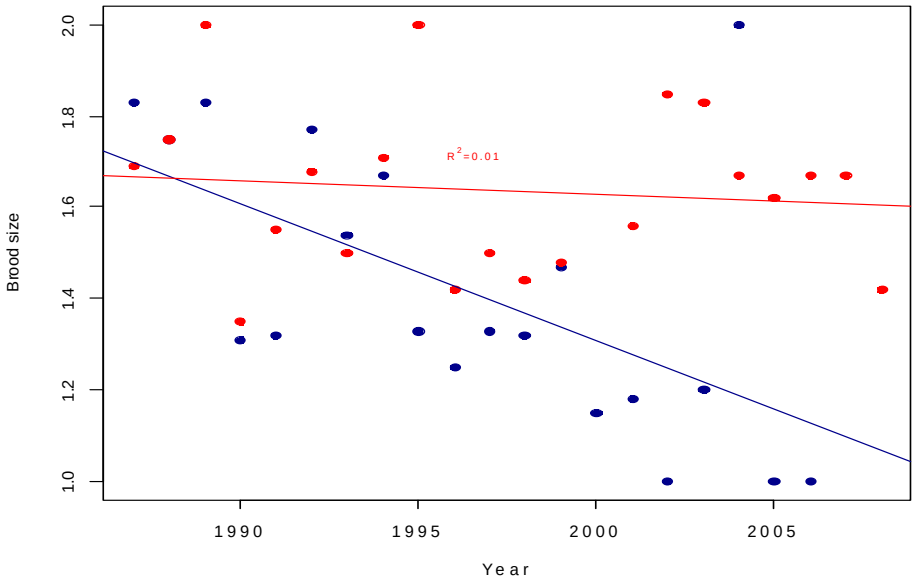

Figure 23. Osprey brood size for nests at Yellowstone Lake and elsewhere in YNP during 1987-2008.

Conclusions and Recommendations

The osprey population in YNP has significantly decreased in all reproductive measures since 1987. However, these decreases have been more acute for ospreys nesting at Yellowstone Lake compared to elsewhere in YNP since 2003. Reductions in the abundance of native cutthroat trout in Yellowstone Lake due to non-native lake trout predation have likely contributed to decreases in osprey reproduction parameters. Osprey fecal samples show that 93% of their diet consists of cutthroat trout (Swenson 1978). While this explanation is plausible for Yellowstone Lake, it does not explain decreases elsewhere in the park or the recent increases since 2003.

In addition to trout density, osprey nest success may also be affected by human disturbance. Nests in close proximity to campsites on Yellowstone Lake failed more frequently than nests further from campsites (Swenson 1979). Also, differences in nesting success, productivity, and brood size were found between ospreys nesting at Yellowstone Lake and elsewhere in the park. Nests in other areas of the park are generally located in inaccessible areas (e.g., Grand Canyon, Tower Falls) and, as a result, are protected from human disturbance. We recommend continued monitoring of breeding osprey to maintain the integrity of the long-term dataset, track patterns of reproduction, and evaluate potential factors leading to decreases in osprey productivity, especially for birds nesting at Yellowstone Lake.

Peregrine Falcons

The peregrine falcon was removed from the List of Endangered and Threatened Wildlife and Plants on August 25, 1999 due to its recovery following restrictions on organochlorine pesticides in the United States and Canada, and implementation of various management actions, including the release of approximately 6,000 captive-reared falcons. Subsequent to delisting, the USFWS drafted a post-delisting monitoring plan to ensure the peregrine falcon maintains its recovered status (USFWS 2003). The goals of the post-delisting monitoring plan are to gather information on territory occupancy, nesting success, and productivity at 3-year intervals during 2003 through 2015 (Appendix C). Data from each official monitoring year will be analyzed and combined with previous data to determine trends in these parameters and inform management decisions regarding peregrine falcon recovery.

Wyoming Game and Fish has traditionally contacted YNP with a list of 10 randomly selected eyrie locations to monitor within park boundaries each year, though in most years all known territories were monitored and an effort to locate new eyries was made. Continuing to monitor as many eyries as possible every year will increase the chance of success in finding eyries during official, post-delisting, monitoring years. Also, these data will contribute to YNP's long-term dataset for this sensitive species.

Beginning in 1983, 36 peregrine falcons were released in several hack sites in and around YNP over a 5-year period. Since that time the number of nesting pairs has steadily increased from one pair in 1984 to 32 pairs in 2007 (Figure 24). The number of peregrines fledged from active eyries has also risen, with 50 peregrines fledged from 30 eyries in 2006.

Monitoring Peregrine Falcons

Two observers spent a total of 70 hours searching for peregrine eyries in nine different territories. Territories were observed for 1-12 hours per visit. Information on adults observed, evidence of breeding behavior, numbers of chicks, and numbers of fledglings were recorded. Active eyries were observed until fledging or failing. If no evidence of breeding or occupancy were observed for a given territory, then these sites were not revisited. We photographed all active nest ledges to establish a record of nest locations and reduce nest searching time in the future.

Peregrine Falcon Reproduction

Five of the nine eyries observed were designated as occupied (i.e., a pair observed or evidence of breeding behavior). Three eyries in occupied territories were located and monitored in 2008 (Table 5). Two of the eyries fledged a total of five young, while the third eyrie failed to produce any young. Four territories were considered unoccupied, but one peregrine was observed briefly at the Hellroaring site.

While no peregrines were observed at the Black Sands and Fairy Falls sites, observer time was minimal (less than 2 hours) and peregrines may have been missed.

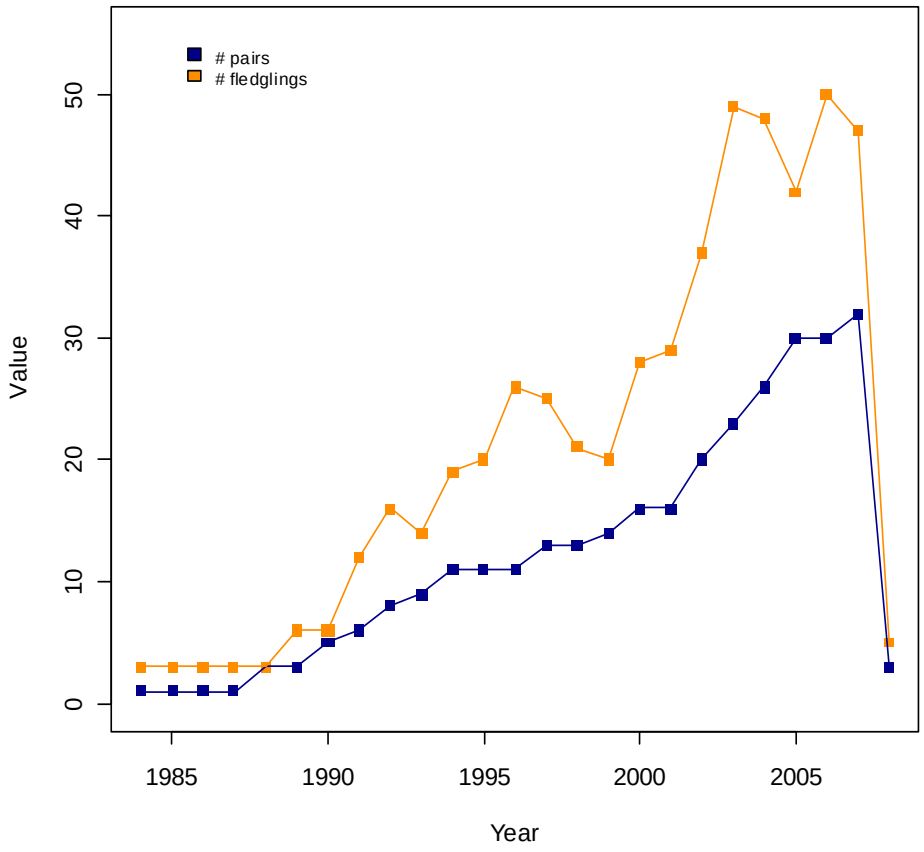

Figure 24. Peregrine falcon nesting pairs and fledglings in YNP during 1984-2008.

Table 5. Peregrine falcon eyries monitored and nest results during 2008.

Eyrie name	Nest results	Observer Hours	Territory
Tower	Failed	8	Occupied
Firehole	3	25.5	Occupied
Soda Butte	2	7	Occupied
Osprey Falls	NA	8	Occupied
Grand	NA	11	Occupied
Black Sands	NA	1.6	Unoccupied
Fairy Falls	NA	1.1	Unoccupied
Bunsen Peak	NA	4.5	Unoccupied
Hellroaring	NA	4	Unoccupied
Total	**5**	**70.7**	

Trends in Peregrine Falcon Productivity

Territory occupancy was not calculated because it is unclear from the data which territories were unoccupied versus unchecked for occupancy in past years. Average peregrine nest success since 1984 was 82%, but this value is misleading because during the first four years of monitoring there was only one eyrie that fledged successfully each year; thereby negatively skewing trends in nesting success. When these four data points were censored, nesting success was relatively constant across years and averaged 78% (range = 57-100; Figure 25). Nesting success in YNP over the 20-year period averaged greater than the 74% and 71% nest success for region 6 and for the nation, respectively, during the 2003 monitoring year.

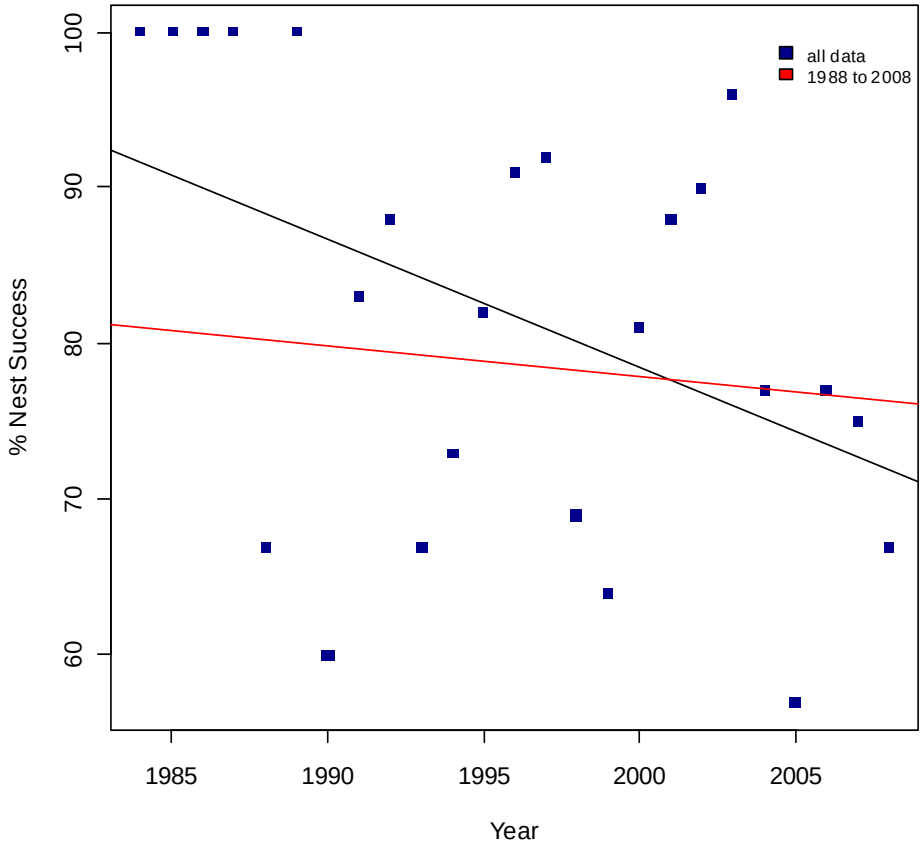

Figure 25. Peregrine falcon nesting success in YNP during 1984-2008.

Annual productivity ranged from 1 to 3 young produced per female, with a mean of 1.93 over the 24-year period (Figure 26). However, only one eyrie was monitored during the first four years of monitoring. When these four years are censored, average productivity was 1.72 young fledged per female (range = 1-2.36) and remained relatively constant across years. Productivity in YNP over the 20-year period was greater than for region 6 (1.49) and the nation (1.64) for the 2003 monitoring year.

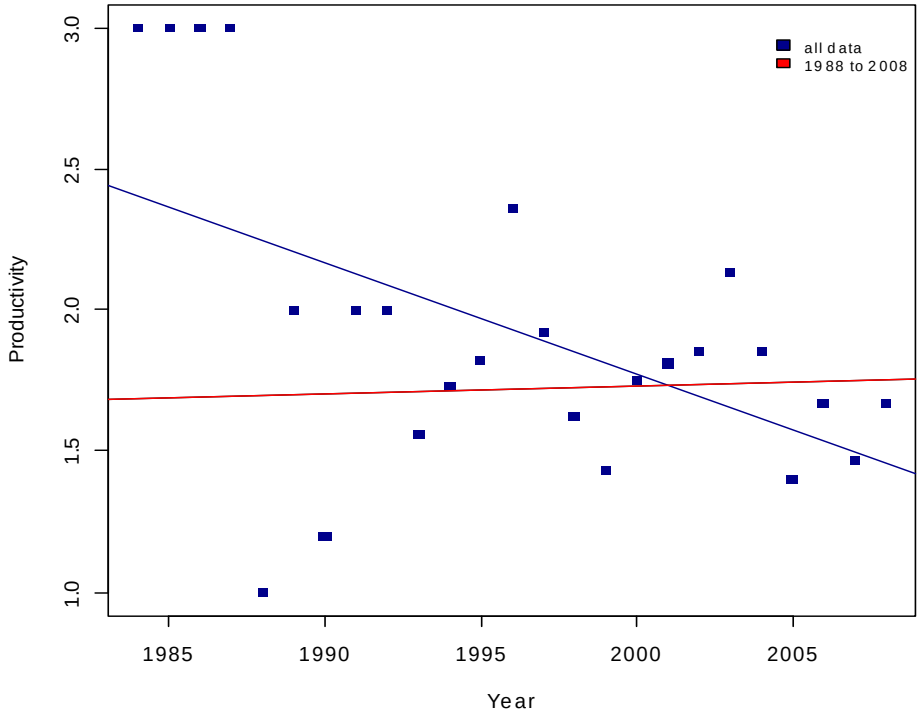

Figure 26. Peregrine falcon productivity in YNP during 1984-2008.

Conclusions and Recommendations

Peregrine falcon recovery in YNP has been extremely successful, with population parameters on nest success and productivity at or above the nation's average. Peregrine falcons should continue to be monitored on a yearly basis to maintain the integrity of the 24-year dataset. Next year (2009) is the third official, post-delisting monitoring year to gather data on territory occupancy, nesting success, and productivity. YNP has committed to monitoring 10 peregrine territories within the park in collaboration with the Wyoming Game and Fish Department. Efforts during 2008 were hampered by a lack of specific information on nesting ledge locations. Peregrines often return to the same nest ledge year after year, especially if they have been successful. The lack of this type of information significantly increased observer time spent in any given location because eyries are extremely difficult to locate.

Additional staff are needed to successfully complete peregrine falcon surveys during 2009. We recommend a total of four individuals (or volunteers) be hired for peregrine monitoring beginning April 1 and ending July 31. This will allow two teams of two individuals to monitor eyries. Peregrines begin arriving on breeding grounds in late March or early April and shortly thereafter commence courtship. Determination of territory occupancy and nest ledges should occur in April and May and productivity visits should be made in June and July. Careful documentation, including photographs of nest ledge locations, should be recorded for each eyrie and archived.

Colonial Nesting Birds

The Molly Islands collectively refer to two small islands (i.e., Rocky, Sandy) located in the southeast arm of Yellowstone Lake. Annual surveys of colonial nesting birds on these islands have been conducted since 1977. However, the data goes back as far as 1890 for some years for some species. Species nesting

on the Molly Islands include American white pelican, double crested cormorant, California gull, and Caspian tern.

Monitoring Colonial Nesting Birds

In 2008, the Molly Islands were censused four times during mid-May through mid-September via fixed-wing aircraft. To survey the islands effectively, we used aerial photos from each survey period to later count the number of nests and chicks on the islands.

Colonial Nesting Birds Reproduction

Productivity by colonial nesting birds on the Molly Islands was low (Table 6). No California gulls nested and, for the third year in a row, Caspian terns did not nest on either island. American white pelicans managed to fledge only 13 chicks, while double crested cormorants fledged 16 chicks.

Table 6. Number of chicks of colonial-nesting birds fledged on the Molly Islands during 1989-2008.

Year	California gull	American white pelican	Caspian tern	Double-crested cormorant
1989	270	535	25	20
1990	295	572	28	203
1991	51	466	10	156
1992	70	522	0	210
1993	141	344	9	141
1994	240	210	22	240
1995	220	265	14	298
1996	0	3	0	61
1997	0	42	0	140
1998	21	295	3	147
1999	90	102	2	225
2000	255	584	0	152
2001	95	105	3	75
2002	65	180	3	280
2003	77	328	6	214
2004	207	237	3	154
2005	58	234	0	86
2006	81	362	0	261
2007	No data	No data	0	No data
2008	0	13	0	16

Conclusions and Recommendations

Maximum lake water level during 2008 occurred on July 6 and was 20% higher than the 30-year average (1970-2000). This high water nearly covered both islands and washed out many of the nests early in the season, resulting in very low fledging success. In addition, ice-off on Yellowstone Lake occurred three weeks later than last year on June 6, 2008; thereby delaying nest initiation and available forage for adult birds. We recommend continued monitoring of the Molly Islands because data can be efficiently and safely gathered in conjunction with bald eagle and osprey surveys.

Breeding Bird Surveys

The breeding bird survey was established in 1966 as a joint effort between the Patuxent Wildlife Research Center of the U.S. Geological Survey and the Canadian Wildlife Service's Research Center to monitor the status and trends of breeding birds throughout North America. All breeding bird survey data is available to the public at <http://www.pwrc.usgs.gov/bbs/>. Yellowstone has maintained three survey routes (Mammoth, Yellowstone, Northeast entrance) since 1982 (Figure 27). The Mammoth route goes 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.

Conducting the Breeding Bird Survey

The Mammoth, Yellowstone, and the Northeast entrance routes were surveyed on June 16, June 17, and June 23, 2008, respectively. One observer spent approximately 20 hours surveying and driving the routes. An additional 20 hours was spent scouting the route and updating GPS coordinates before the actual survey. Data was entered in the online breeding bird survey database and later reviewed for accuracy (<http://www.pwrc.usgs.gov/bbs/dataentry/>).

Breeding Bird Survey Results

We observed 4,429 individuals of 72 species along the three survey routes during 2008. The Mammoth route was the most diverse route with 52 species observed. However, both the Yellowstone and Northeast entrance routes were only slightly lower in total species observed (Figure 28). The Yellowstone route exhibited the highest number of individuals, mostly as a result of large flocks of Canada geese on the Yellowstone River. A complete list of birds seen on the breeding bird surveys and YNP in general is provided in Appendix E.

In total, 360 species and over 72,000 individual birds have been counted across the three breeding bird survey routes since 1982 (Table 7). The Mammoth route has been the most diverse, while the Yellowstone route contains the highest number of individual birds with just three species (Canada goose, cliff swallow, bank swallow) accounting for 48% of all individuals seen.

Conclusions and Recommendations

Overall, bird abundance and species observed during 2008 were consistent with past years. The breeding bird survey provides a gross index of songbird trends over time, which is valuable to the national dataset and YNP. We recommend the breeding bird survey be continued because it is the only long-term dataset of songbirds in YNP.

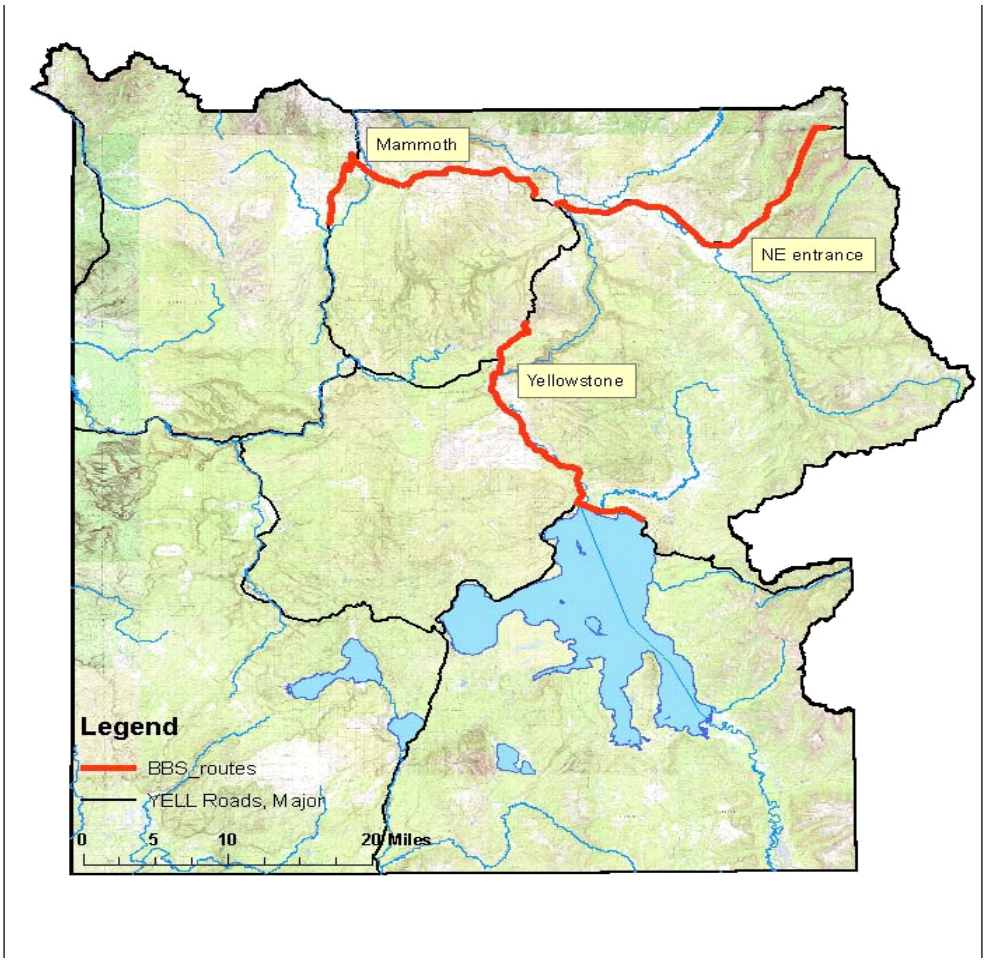

Figure 27. Breeding bird survey routes in YNP.

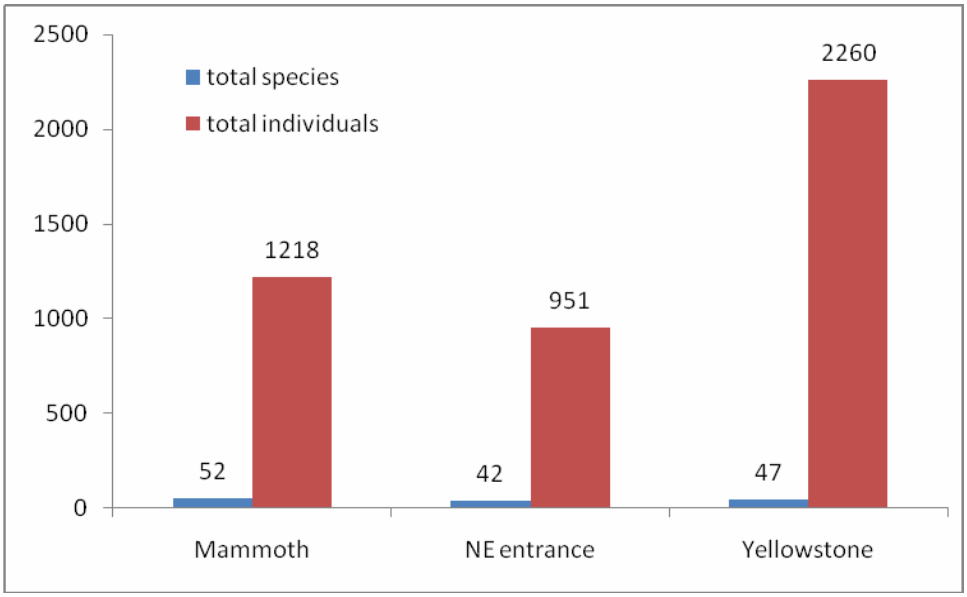

Figure 28. Summary of 2008 breeding bird survey data in YNP.

Table 7. Summary of breeding bird survey data in YNP during 1982-2008.

Route	Total Species	Total Individuals
Mammoth	127	22,534
NE Entrance	117	12,900
Yellowstone	115	36,634
Total	**360**	**72,068**

Willow Songbird Study

In response to several studies indicating that willow (*Salix* spp.) has increased in height in some locations across the northern portion of YNP (Ripple and Beschta 2003, Groshong 2004), Montana State University began a 3-year (2005-2008) collaboration with the National Park Service to examine songbird responses to increases in willow across this area (L. Baril and A. Hansen, unpublished data). Increased willow could have important consequences for bird diversity in this portion of the park because willow communities are a rare, but extremely important habitat type for several bird species in the region. Also, songbirds are often indicators of climate change effects.

Willow-Songbird Monitoring

Songbirds were sampled in three willow communities during 2005-2008: 1) unsuppressed, tall stands; 2) recently released stands; and 3) short, suppressed stands. Unsuppressed stands generally average >1.5 meters tall and experience little browsing. Unsuppressed stands were located in Willow Park, an exclosure near Mammoth, and an exclosure in the Lamar Valley. Released stands are those that were formerly height suppressed. Released stands are similar in height to unsuppressed stands, but are generally less dense with lower overall canopy cover. Released stands were located along Blacktail Deer Creek, upper Slough Creek, and portions of the Lamar River. Suppressed stands experience heavy browsing and <1 meter tall. Suppressed willows were located along portions of the Lamar River and Soda Butte Creek. In 2008, a subset of the willow stands surveyed in past years was sampled to establish a long-term dataset and monitor trends over time (Table 8). Unsuppressed stands formed the basis of comparison for bird responses to released willow stands, so we restricted our sampling to these stand types. We sampled 12 plots in Willow Park, nine plots along Slough Creek, eight plots along Blacktail Deer Creek, and four plots along the Lamar River. Actual survey time was 5.5 hours, but travel time increased the total to approximately 40 hours.

Table 8: Summary of willow stands surveyed in YNP

Stand Type	No. sample plots established by Montana State University	No. plots surveyed by YNP in 2008
Unsuppressed	17	12
Released	25	21
Suppressed	23	0
Total	**65**	**33**

Two rounds of point counts were conducted for each sample plot from June 7 through July 17, 2008, beginning at 0530 and ending at 1000 hours. Each count lasted 10 minutes and observed birds were identified to species. We also recorded information on distance from the observer, time observed, sex, and behavior (e.g., singing, carrying food or nesting material). We used richness and abundance indices to examine differences in birds between stand types. Richness is the average number of species observed per stand type, while abundance is the average number of individuals seen per stand type. We also calculated average abundance per species per stand type.

Willow-Songbird Monitoring Results

A total of 20 species were detected across released and unsuppressed stands. Nineteen species occurred in released stands, while 16 species were found in unsuppressed stands (Table 9). Average bird abundance was greater in released stands than in unsuppressed stands, while species richness was slightly greater in unsuppressed stands. Fox sparrows were only observed in unsuppressed stands, while brown-headed cowbirds, Brewer's blackbirds, gray catbirds, northern flickers and red-naped sapsuckers were only observed in released stands. The following species are considered willow-riparian specialists in the region and were the focus of this study. Abundances for song sparrow, warbling vireo, Wilson's warbler, and yellow warbler were greater in unsuppressed stands than in released stands, while abundances for common yellowthroat, Lincoln's sparrow, and willow flycatcher were greater in unsuppressed willow stands.

Table 9. Summary of mean abundance for each species observed in unsuppressed and released willow stands in YNP during 2008 (see Appendix E for scientific names).

Species	Unsuppressed	Released
American robin	0.42	0.40
Brown-headed cowbird	0	0.05
Brewer's blackbird	0.04	0.17
Common yellowthroat	0.88	0.95
Fox sparrow	0.33	0
Gray catbird	0	0.12
Lincoln's sparrow	1.25	1.29
Northern flicker	0	0.24
Red-naped sapsucker	0	0.02
Red-winged blackbird	0.04	0.71
Savannah sparrow	0.33	0.64
Sora	0.08	0.12
Song sparrow	0.25	0.14
Spotted sandpiper	0.58	0.14
Warbling vireo	0.17	0.12
White-crowned sparrow	0.08	0.10
Willow flycatcher	0.38	0.55
Wilson's snipe	0.17	0.52
Wilson's warbler	0.54	0.10
Yellow warbler	1.46	1.43
Average abundance	**9.22**	**10.20**
Average richness	**5.27**	**5.19**

Conclusions and Recommendations

The bird program to date has done little songbird or, more accurately, Passeriformes monitoring, even though these birds constitute the majority of species breeding in YNP. Establishing a new monitoring program such as this one will fill a gap in our knowledge of songbird communities of YNP, even though this survey only covers one habitat type.

In future years, we recommend sampling all unsuppressed and released stands twice between June 1 and mid-July. In alternate years, suppressed stands should be added to the surveys, if time allows, to observe potential changes in bird community structure as related to willow structure, especially if signs of increased willow growth are observed in these stands. Vegetation measurements should be redone at 5-

year intervals to assess changes in willow structure with the first year of measurements beginning in 2012. Two seasons and two people per season will be needed to complete all vegetation measurements.

Bird Area Closures

The following closure descriptions were written by T. McEneaney, National Park Service (retired). We have added our recommendations regarding whether or not the closures should be maintained.

Frank Island Closure

"At one time (1994) there were as many as 25 active osprey nests on Frank Island alone. In the late 1980's Frank Island was declared by Sup't Barbee an "osprey management area" through the recommendation of the staff ornithologist. People were becoming a problem on the island, landing boats almost anywhere and traversing the island, so the public was restricted to extreme southwest corner of the island. And the site became basically a day-use area. This assured osprey productivity on the island was natural and not human influenced. A wildfire later changed the complexion of the island in addition to whirling disease and lake trout decimating the cutthroat on the lake. And the osprey productivity plummeted as did the number of nesting pairs. But the island should remain partially closed just so no new variables are added into the Yellowstone Lake equation for analytical purposes. Boat users need to be aware of this area closure." (T. McEneaney, Memorandum: Justification for Bird Area Closures in Yellowstone, 27 September 2007).

Recommendation: In 2003 a wildfire burned through Frank Island, but since that time two oOsprey nests were initiated there. Though both nests failed, the fact that nests attempts were made argues for continuing the closure. Ospreys frequently build nests in burned snags and will certainly find suitable trees to build nests in the future. Given the low nest success on Yellowstone Lake, any protections to nesting ospreys are worthwhile.

Six-Mile Bald Eagle Nesting Closure

"The area 6 miles east of West Yellowstone is known as the 6 Mile Bald Eagle nest. In past years the closure has been in effect normally from Feb.1 through early July. The closed area was 200 meters long along the road accompanied by traffic cones and signs indicating "area closure, no stopping" on both the east and the west end of the closure along with a ranger patrol presence to ensure compliance." (T. McEneaney, Memorandum: Justification for Bird Area Closures in Yellowstone, 27 September 2007).

Recommendation: Due to limited staff in 2008, a ranger or volunteer was not stationed at the closure. However, the "no stopping zone" was expanded to include an additional 200 meters of road for a total of 400 meters (i.e., 200 meters on either side of the nest) and extending back 400 meters on both the west and east sides of the closure. Signs indicating "no stopping or standing" were placed along the closure, along with a map of the area. The nest was successful this year, indicating that the closure was effective. Thus, we recommend that the closure be maintained while the eagles return to the area. These recommendations are consistent with the National Bald Eagle Management Guidelines (USFWS 2007).

Molly Islands

"These islands in the Southeast Arm of Yellowstone Lake have been closed since 1960, since this is a significant nesting area for colonial birds in Yellowstone. Although the original closure entailed a ¼ mile buffer zone around the islands, a ½ mile buffer zone has been enforced due to difficulty in visitors judging distance on water. This means canoeists cannot travel between Rocky and Sandy Island to cut paddling distances. Any type of human disturbance like this, including visits by park staff or visiting researchers may affect overall colonial bird production. There are no signs in the area indicating this closure, but boat users and campers should be notified when registering their boat or when applying for a campsite permit." (T. McEneaney, Memorandum: Justification for Bird Area Closures in Yellowstone, 27 September 2007).

Recommendation: No changes are recommended.

Blacktail Ponds

"This area has been closed from May 1 until the Saturday before 4th of July weekend since the mid-1990's. Signs are usually in place by early May. The reason for the established closure is that a study conducted by McEneaney clearly showed waterfowl production was being severely affected by people (namely anglers). The presence of large numbers of humans kept many birds off nests. In addition, predation of waterfowl nests by ravens and coyotes was the indirect result of humans being present near the ponds during the nesting season. Nearly the entire waterfowl production on these ponds failed annually due to high human presence and/or scent. Also the closure allows many more visitors the opportunity to watch birds from the road or pullout that would otherwise be flushed away from the area if the closure was not in place." (T. McEneaney, Memorandum: Justification for Bird Area Closures in Yellowstone, 27 September 2007).

Recommendation: Disturbance from visitors in the area would likely cause increased nest failures. Given that wetlands are a rare habitat type in Yellowstone, we recommend the closure remain in effect. As T. McEneaney mentioned, the closure would increase opportunities for visitors to view wildlife from the road. We did not observe signs posted this year.

Floating Island Lake

"Floating Island Lake, located 4 miles west of Tower Junction, has traditionally been an important lake for bird production. Visitors walking the edge of this lake caused excessive disturbance, and resulted in failed waterfowl, coot, grebe, and sometimes sandhill crane production. In recent years, photographic tour groups began walking the edge of the lake, which resulted in very low bird productivity. Therefore a voluntary area closure has been in effect, warning visitors via signs that the presence of their scent near a nest can result in nest failure. Also the closure allows many more visitors the opportunity to watch birds from the road or pullout. Signs in the area explain the reason for the voluntary closure." (T. McEneaney, Memorandum: Justification for Bird Area Closures in Yellowstone, 27 September 2007).

Recommendation: No changes are recommended.

Trumpeter Lake

"The Trumpeter Lake closure has been in effect since the late 1980's. The purpose of this closure is to protect nesting Trumpeter Swans from human disturbance, and to provide a safe haven for swans during the flightless molting period. This closure has been very effective in protecting swans in the area from human disturbance. The closure normally goes in effect on May 1 and is lifted by August 15 to ensure ample time for swans to molt, grow back new feathers, and provide a disturbance-free area free of humans." (T. McEneaney, Memorandum: Justification for Bird Area Closures in Yellowstone, 27 September 2007).

Recommendation: This area is a historic nesting area and we recommend it remain closed even though swans have not nested there since 1995. Low water levels and lack of submerged vegetation observed on aerial surveys are not sufficient to support nesting swans, though a single adult was observed on the lake in early spring in 2008. T. McEneaney did not provide recommendations regarding how large the buffer zone around the lakes should be, but Red Rock Lakes NWR keeps visitors 0.25 mile away from nesting territories. It is unclear how large the closure is currently.

Seven-Mile Bridge

"Seven miles east of West Yellowstone along the Madison River is a traditional nesting area for Trumpeter Swans. This area has been closed to the public since the 1980's. It has been a traditional area in the park to view Yellowstone trumpeter swans without disturbing them. Although in recent years, swans are not found in the area, it is important this year-round closure remains in effect in case new recruit swans end up in the park and need a safe haven from people. Maintaining the signs in this area is

also an important part of management." (T. McEneaney, Memorandum: Justification for Bird Area Closures in Yellowstone, 27 September 2007).

Recommendation: T. McEneaney did not recommend closure dates, but in keeping with recommendations for the Trumpeter Lakes closure, we recommend the area be closed from May 1 through August 15. For comparison, Red Rock Lakes limits human activities in the main nesting area until September 15, but opens up their lower swan density areas on July 15. Basically, when cygnets are about 45 to 50 days old restrictions can be lifted to some degree (usually mid to late July in YNP). T. McEneaney did not provide recommendations regarding buffer zones, but a potential closure area could include a 0.25-mile stretch of road along the 7-mile bridge road area and extending down to the river. To minimize the time this area is closed, one possibility is to establish a closure based on occupancy to be determined on a yearly basis. For example, in May and early June 2008 one swan was observed in the area. However, the swan did not stay and the area has not been occupied since 1994 when five cygnets fledged from the area. We did not see signs posted in the area this year.

Stevenson Island

"The south half of this island has been closed to the public since the late 1980's to protect nesting Bald Eagles. Closed signs are apparent on land at the halfway point of the island. The island is closed indefinitely, and the closure helps not only the nesting Bald Eagles, but also the concessions lake tour and visitors with private watercraft. YNP has had excellent visitor compliance at this site." (T. McEneaney, Memorandum: Justification for Bird Area Closures in Yellowstone, 27 September 2007).

Recommendation: Since 1984 a pair of bald eagles has nested on the island. Unfortunately, the nest was successful in only five of the last 29 years. We recommend the area still remain closed to limit human disturbance.

Data Management

All data is kept in the YCR drive under the "bird_data_restricted" folder. We have begun organizing the data files into a more manageable format, but not all folders are complete. Each species has its own folder named by the 4-letter alpha code of that species. Projects monitoring more than one species were placed into folders according to the project name (e.g., Molly Islands). Additional data not yet examined can be found in the folder labeled "McEneaneyT", but these files still need to be organized. The "TRUS" folder in the main folder is only partially organized and many swan data files exists in the "McEneaneyT" folder. There are many files with overlapping information with several inconsistencies (e.g., different information for the same year of data). When looking through the files, one should look at data in all other files to see if it matches. We found that it sometimes does not. When this occurred (especially for bald eagles), we marked the lines of data that did not match.

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Literature Cited

Groshong, L.C. 2004. Mapping riparian vegetation change in Yellowstone's Northern Range using high spatial resolution imagery. Dissertation, University of Oregon, Eugene, Oregon.

Houston, D.B. 1982. The northern Yellowstone elk: ecology and management. Macmillan, New York, New York.

Ripple, W.J., and R.L. Beschta. 2006. Linking wolves to willows via risk-sensitive foraging by ungulates in the northern range Yellowstone ecosystem. Forest Ecology and Management 230:96-106.

Swenson, J.E. 1978. Prey and foraging behavior of ospreys on Yellowstone Lake. Journal of Wildlife Management 42:87-90.
Swenson, J.E. 1979. Factors affecting status and reproduction of ospreys in Yellowstone National Park. Journal of Wildlife Management: 43:595-601.
U.S. Fish and Wildlife Service. 2003. Monitoring plan for the American Peregrine falcon, a species recovered under the Endangered Species Act. U.S. Fish and Wildlife Service, Divisions of Endangered Species and Migratory Birds and State Programs, Pacific Region, Portland, Oregon.
U.S. Fish and Wildlife Service. 2007. National bald eagle management guidelines. <http://www.fws.gov/migratorybirds/issues/BaldEagle/NationalBaldEagleManagementGuidelines.pdf> Accessed on November 17, 2008.
U.S. Fish and Wildlife Service. 2007. Draft Post-delisting monitoring plan for the bald eagle (*Haliaeetus leucocephalus*). http://www.itcaonline.com/baldeagle/PostDelistingMonPlan.pdf Accessed on November 17, 2008.
U.S. Fish and Wildlife Service. 2007. Trumpeter swan survey of the Rocky Mountain population, U.S. breeding segment, fall 2007. Migratory Birds and State Programs, Denver, Colorado.

Appendix A. Contact Information for Cooperators.

Bald Eagles

Bob Oakleaf (send year-end data on bald eagle reproduction)
Non-game biologist
Wyoming Game and Fish Department
260 Buena Vista, Lander, Wyoming 82520
307-332-2688; bob.oakleaf@wgf.state.wy.us

Dan Mulhern
Region 6 Coordinator, Kansas Ecological Services Field Office
2609 Anderson Avenue, Manhattan, Kansas 66502
785-539-3474 (ext. 109); Dan_Mulhern@FWS.gov

Trumpeter Swans

Susan Patla (send nesting season data)
Non-game biologist, Wyoming Game and Fish Department
Co-chair of the Greater Trumpeter Swan working group
P.O. Box 67, Jackson, WY 83001
307-733-2383 (ext. 229); susan.patla@wgf.state.wy.us

Jeff Warren (send results of autumn and winter surveys)
Wildlife Biologist, Red Rock Lakes
Lima, Montana 59739
406-267-3536; Jeffrey_Warren@fws.gov

James Dubovsky (send results of autumn and winter surveys)
Chief, Division of Migratory Bird Management
Mountain Prairie Region, U.S. Fish and Wildlife Service
P.O. Box 25486-DFC, Denver, CO 80225
303-236- 4403; james_dubovsky@fws.gov

Caspian Terns

Nanette W. H. Soto (send Caspian tern information)
USFWS – Migratory birds and habitat programs
911 NE 11th Avenue, Portland, Oregon 97232
503-231-6164; nanette_soto@fws.gov

Appendix B. Bald Eagle Nesting Terminology (also applies to Osprey)

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

Nest: A structure, composed largely of sticks, built by bald eagles for breeding.

Active Nest (Breeding): A nest where eggs have been laid. Activity patterns are diagnostic of breeding eagles (or those with an "active" nest). 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 a breeding area of one pair of eagles. 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, if mating behavior (display flights, nest repair, coition) was observed;
- eggs were laid (detection of eggs or eggshell fragments);
- any field sign that indicate eggs were laid or nestlings hatched;
- young were raised.

Unoccupied Breeding Area/Territory/Nest: 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. Peregrine Falcon Nesting Terminology

Occupied Territory - a territory where either a pair of Peregrines is present (two adults or an adult/subadult mixed pair), 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 eyrie (nest site)]. Occupancy for a territory must be established for at least one of two, and possibly more, 4-hour site visits. Occupancy within a region is the number of occupied territories divided by the number of territories that were checked for cccupancy.

Nest Success - the proportion of occupied territories in a monitoring region in which one or more young ≥ 28 days old is observed, with age determined following guidelines in Cade et al. (1996).

Productivity - the number of young observed at $ 28 days old per occupied territory, averaged across a monitoring region. Typically productivity is determined when nestlings have reached at least 80% of average age of fledging (Steenhof 1987) – 34 days in the case of Peregrines, which fledge about 43 days after hatching. Determining the number of young in a nest with absolute certainty is often difficult unless observers actually visit the eyrie (e.g., when banding young). Thus, for measuring productivity, this plan encourages observers to spend the time necessary to count as many young as possible. 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. We will 8 continue to use all three measures, territory occupancy, nest success, and productivity to assess population health.

Appendix D. 2008 Bird Observations

Species	Latin Name	Species	Latin Name
Canada goose	*Branta canadensis*	Killdeer	*Charadrius vociferus*
Trumpeter swan	*Cygnus buccinator*	Black-necked stilt	*Himantopus mexicanus*
Gadwall	*Anas strepera*	American avocet	*Recurvirostra americana*
American wigeon	*Anas americana*	Spotted sandpiper	*Actitis macularia*
Mallard	*Anas platyrhynchos*	Willet	*Tringa semipalmata*
Blue-winged teal	*Anas discors*	Long-billed curlew	*Numenius americanus*
Cinnamon teal	*Anas cyanoptera*	Marbled godwit	*Limosa fedoa*
Northern shoveler	*Anas clypeata*	Wilson's snipe	*Gallinago delicata*
Northern pintail	*Anas acuta*	Wilson's phalarope	*Phalaropus tricolor*
Green-winged teal	*Anas crecca*	California gull	*Larus californicus*
Canvasback	*Aythya valisineria*	Caspian tern	*Sterna caspia*
Redhead	*Aythya americana*	Rock pigeon	*Columba livia*
Ring-necked duck	*Aythya collaris*	Great horned owl	*Bubo virginianus*
Lesser scaup	*Aythya affinis*	Great gray owl	*Strix nebulosa*
Harlequin duck	*Histrionicus histrionicus*	Long-eared owl	*Asio otus*
Bufflehead	*Bucephala albeola*	Common nighthawk	*Chordeiles minor*
Barrow's goldeneye	*Bucephala islandica*	Calliope hummingbird	*Stellula calliope*
Common merganser	*Mergus merganser*	Rufous hummingbird	*Selasphorus rufus*
Ruddy duck	*Oxyura jamaicensis*	Belted kingfisher	*Ceryle alcyon*
Wild turkey	*Meleagris gallopavo*	Lewis's woodpecker	*Melanerpes lewis*
Ruffed grouse	*Bonasa umbellus*	Williamson's sapsucker	*Sphyrapicus thyroideus*
Blue grouse	*Dendragapus obscurus*	Red-naped sapsucker	*Sphyrapicus nuchalis*
Common loon	*Gavia immer*	Downy woodpecker	*Picoides pubescens*
Western grebe	*Aechmophorus occidentalis*	Hairy woodpecker	*Picoides villosus*
Pied-billed grebe	*Podilymbus podiceps*	American three-toed woodpecker	*Picoides dorsalis*
Eared grebe	*Podiceps nigricollis*	Black-backed woodpecker	*Picoides arcticus*
American white pelican	*Pelecanus erythrorhynchos*	Northern flicker	*Colaptes auratus*
Double-crested cormorant	*Phalacrocorax auritus*	Olive-sided flycatcher	*Contopus cooperi*
Great blue heron	*Ardea herodias*	Western wood-pewee	*Contopus sordidulus*
White-faced ibis	*Plegadis chihi*	Willow flycatcher	*Empidonax traillii*
Osprey	*Pandion haliaetus*	Hammond's flycatcher	*Empidonax hammondii*
Bald eagle	*Haliaeetus leucocephalus*	Gray flycatcher	*Empidonax wrightii*
Northern harrier	*Circus cyaneus*	Dusky flycatcher	*Empidonax oberholseri*
Sharp-shinned hawk	*Accipiter striatus*	Loggerhead shrike	*Lanius ludovicianus*
Cooper's hawk	*Accipiter cooperii*	Warbling vireo	*Vireo gilvus*
Ferruginous hawk	*Buteo regalis*	Gray jay	*Perisoreus canadensis*
Rough-legged hawk	*Buteo lagopus*	Steller's jay	*Cyanocitta stelleri*
Northern goshawk	*Accipiter gentilis*	Clark's nutcracker	*Nucifraga columbiana*
Swainson's hawk	*Buteo swainsoni*	American magpie	*Pica hudsonia*

Red-tailed hawk	*Buteo jamaicensis*	American crow	*Corvus brachyrhynchos*
Golden eagle	*Aquila chrysaetos*	Common raven	*Corvus corax*
American kestrel	*Falco sparverius*	Horned lark	*Eremophila alpestris*
Peregrine falcon	*Falco peregrinus*	Tree swallow	*Tachycineta bicolor*
Prairie Falcon	*Falco mexicanus*	Violet-green Swallow	*Tachycineta thalassina*
Sora	*Porzana carolina*	Northern Rough-winged	*Stelgidopteryx serripennis*
American Coot	*Fulica americana*	Bank Swallow	*Riparia riparia*
Sandhill Crane	*Grus canadensis*	Cliff Swallow	*Petrochelidon pyrrhonota*
Barn Swallow	*Hirundo rustica*	Western Tanager	*Piranga ludoviciana*
Black-capped Chickadee	*Poecile atricapillus*	Green-tailed Towhee	*Pipilo chlorurus*
Mountain Chickadee	*Poecile gambeli*	Chipping Sparrow	*Spizella passerina*
Red-breasted Nuthatch	*Sitta canadensis*	Brewer's Sparrow	*Spizella breweri*
White-breasted Nuthatch	*Sitta carolinensis*	Vesper Sparrow	*Pooecetes gramineus*
Brown Creeper	*Certhia americana*	Savannah Sparrow	*Passerculus sandwichensis*
Rock Wren	*Salpinctes obsoletus*	Fox Sparrow	*Passerella iliaca*
House Wren	*Troglodytes aedon*	Song Sparrow	*Melospiza melodia*
American Dipper	*Cinclus mexicanus*	Lincoln's Sparrow	*Melospiza lincolnii*
Golden-crowned Kinglet	*Regulus satrapa*	White-crowned Sparrow	*Zonotrichia leucophrys*
Ruby-crowned Kinglet	*Regulus calendula*	Dark-eyed Junco	*Junco hyemalis*
Mountain Bluebird	*Sialia currucoides*	Snow bunting	*Plectrophenax nivalis*
Townsend's Solitaire	*Myadestes townsendi*	Lazuli Bunting	*Passerina amoena*
Swainson's Thrush	*Catharus ustulatus*	Red-winged Blackbird	*Agelaius phoeniceus*
Hermit Thrush	*Catharus guttatus*	Western Meadowlark	*Sturnella neglecta*
American Robin	*Turdus migratorius*	Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Sage Thrasher	*Oreoscoptes montanus*	Brewer's Blackbird	*Euphagus cyanocephalus*
European Starling	*Sturnus vulgaris*	Brown-headed Cowbird	*Molothrus ater*
American Pipit	*Anthus rubescens*	Black Rosy-Finch	*Leucosticte atrata*
Cedar Waxwing	*Bombycilla cedrorum*	Pine Grosbeak	*Pinicola enucleator*
Yellow Warbler	*Dendroica petechia*	Cassin's Finch	*Carpodacus cassinii*
Yellow-rumped Warbler	*Dendroica coronata*	House Finch	*Carpodacus mexicanus*
MacGillivray's Warbler	*Oporornis tolmiei*	Red Crossbill	*Loxia curvirostra*
Common Yellowthroat	*Geothlypis trichas*	White-winged Crossbill	*Loxia leucoptera*
Wilson's Warbler	*Wilsonia pusilla*	Pine Siskin	*Carduelis pinus*
		House Sparrow	*Passer domesticus*

Appendix E: General Bird Monitoring Schedule

January

February
Trumpeter swans – 1st week (aerial; YNP, Hebgen, Paradise Valley) – migrants
Bald eagles – 3rd week (ground; YNP) – nests near roads

March
Peregrine falcons – latter part of March (ground; YNP) – nest site locations

April
Peregrine falcons – all month (ground; YNP) – nest site locations
Bald eagles – last week (aerial; YNP) – nest site locations

May
International Migratory Bird Day Count – 2nd Saturday (ground; YNP→ Shields Valley
Trumpeter swans – 3rd week (aerial; YNP, Paradise Valley) – nesting status
Ospreys – 3rd week (aerial; YNP) – nesting status

June
Peregrine falcons – all month (ground; YNP) – presence/number of young
Colonial nesting birds – 1st and 4th weeks (aerial; Yellowstone Lake) – nesting
Breeding Bird Survey – 2nd week (ground; YNP) – long-term trends
Bald eagles – 3rd week (aerial; YNP) – fledglings
Ospreys – 4th week (aerial; YNP) – fledglings
Trumpeter swans – 4th week (aerial/ground; YNP, Paradise Valley) – productivity

July
Peregrine falcons – late June-early August (ground; YNP) – fledglings

August
Colonial nesting birds – 2nd and 4th weeks (aerial; Yellowstone Lake) – fledgling

September
Trumpeter swans – mid-September (aerial; YNP, Paradise Valley) – residents/fledglings

October

November

December
Christmas Bird Count – Sunday before Christmas (ground; YNP)