

**The Foraging Behavior
of Ospreys (*Pandion haliaetus*)
in the Black Hills of South Dakota**

**Report for the South Dakota Natural Heritage Program
SD Department of Game, Fish and Parks**

**Conducted and Written
by Jennifer A. Fowler
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Introduction

The goal of my research project was to study the interactions between ospreys and the trout fishery in the Black Hills of western South Dakota. The study was carried out between April 1 and August 23, 2006.

Currently, ospreys are ranked as threatened in South Dakota and are considered a rare and local summer resident in the Black Hills yet their successful breeding is a recent occurrence. In 1990, the first Black Hills breeding pair of osprey was reported at Pactola Lake, Pennington County, with its first successful breeding season in 1991, and the nest is still active today. At least six other osprey nests in the Black Hills have been identified since that initial one. Adult ospreys have been observed in the Black Hills from early April through the end of October. For continued nest success, nesting locations and food supplies need to be available.

In the past, ospreys had fallen to the demise of humans. With increased use of pesticides, habitat destruction, shooting and nest robbing, the once prolific birds were nearly eliminated in prominent portions of their breeding range. Through positive human efforts, as those of Rachel Carson, ospreys can once again be found in growing numbers on all continents beside Antarctica. They are highly adaptive to human structures for building their massive nests of sticks. (Poole, 1989)

Ospreys are considered specialist feeders, as they are solely piscivorous. They can plunge dive feet first into only the top meter of water. This limits them to fish species that either are in shallow waters or occupy the surfaces of deeper waters. They grasp their slippery prey with their specially adapted feet donning small sharp spines, called spicules, on the ventral surface. Ospreys maneuver their fish midair so that it is head first during flight. Their rotating outer toe, semi-zygodactylous as in owls, allows for increased dexterity in handling their fresh caught fish. They are considered an indicator species for healthy fish populations as the fish caught are usually those with higher population numbers. (Poole, 1989)

As trout are the most common species of fish in Black Hills lakes and streams, it is suspected that they are the primary forage fish of the breeding ospreys. Trout never occurred naturally in the Black Hills until the first stocking in 1886. Since then, trout have played a large recreational and economic role in the area. (Erickson & Koth, 2002) Currently, eleven and fifteen inch rainbow trout are stocked in most bodies of water by local hatcheries for angling between April and October. (SD Stocking Schedule, 2006)

The building of impoundments for recreation and water conservation throughout the Hills, have not only increased habitat for a fishery, but also have provided ideal hunting conditions for ospreys. This project researched the impact ospreys have on trout as related to anglers. Since anglers desire to catch large fish, there is the chance that ospreys are feeding on those trophy fish.

There were five objectives for my research during the 2006 osprey breeding season in the Black Hills.

1. What are the feeding habits of osprey through the four phases of the breeding season: courtship, incubation, nestling, and fledgling? Information researched includes the hunting locations, distances of these areas from the nest, fishing/feeding rates during each phase, and diet by noting the species and size of fishes caught when possible.
2. Are ospreys fishing more in lakes or nearby streams? Nest locations where this could be important are Center Lake and Pactola Lake due to the high angling interest in these areas.
3. How many fish per day and fish per stocking period are being taken? Does stream foraging correlate with stocking times and water levels?
4. Are there any other factors besides osprey and anglers influencing fishing pressure on hatchery-stocked trout in lakes/streams?
5. A continuous objective is to monitor the behavior of adult and young osprey throughout the breeding season at each of the nesting locations.

Study Area and Methods

This study was conducted at six osprey nesting locations in the Black Hills of western South Dakota during the summer of 2006. Nests at Pactola Lake, Bismark Lake and Center Lake were the primary locations for my observations. The nest sites were visited between April 1 and August 23 but I focused on June, July and August for feeding observations due to the increase in young and feeding activity. This is the time of the breeding season when most fish are caught yielding the best information on the ospreys feeding habits to support this study. Each of the listed supporting water bodies for the six studied nests receives rainbow trout stocked by SD GF&P. The first five nests are within the ponderosa pine forest whereas the Homestake Road nest is far from the edge of the forest. Details of nest locations were read from the Black Hills National Forest map published by the USFS. The latitude and longitude readings were from a Magellan GPS unit.

Pactola Lake Nest:

T001N R005E Sec 2 (44°04.462N, 103°29.035W)

This location is within the Black Hills National Forest, ten miles north of Hill City. This nest is located on a power structure in the basin below Pactola Lake Dam. The damming of Rapid Creek formed the lake, which has seven hundred eighty-five surface acres. This is the primary fishing location for this nest pair, and contains species including rainbow trout, lake trout, and splake, which is a hybrid between brook and lake trout. Rapid Creek, below the dam, is a catch and release fishery with artificial lure use only. The two young from the first successful nesting in 1991 were banded. (Nest used 1990-present)

Bismark Lake Nest:

T003S R005E Sec22 (43°46.692N,103°31.096W)

The nest is located on a ponderosa pine snag on the northwest shore of Bismark Lake that has twenty-five surface acres of water. It is within the French Creek watershed with Stockade Lake downstream. All portions of Stockade Lake are within one mile of this nest, and is a productive warm water fishery. Bismark Lake is managed by the Black Hills National Forest and is 3.5 miles east of the city of Custer. (Minimum years nest used 2002-present)

Center Lake Nest:

T003S R006E Sec9 (43°47.935N, 103°25.053W)

The nest is located on a ponderosa pine snag, on the southwest shore of Center Lake, with twenty-five surface acres to the lake. The lake and its drainage, Grace Coolidge Creek, are within the Battle Creek watershed. In the first three miles of Grace Coolidge Creek below the Center Lake dam, several small stock dams have been built. They are stocked with trout and have suckers in them as well. They always have water in them even when the creek levels are low. This location is within Custer State Park.

Hill City Nest:

T001S R005E Sec30 (43°55.907N, 103°33.475W)

This nest is located in Hill City adjacent to the city sewage lagoons, and was recently relocated from a nearby power structure. Nearby water bodies include Major Lake with four surface acres and Mitchell Lake with six surface acres and are part of the Spring Creek watershed. These support species including rainbow trout, yellow perch and sucker sp.

Pilot Knob Nest:

T002N R005E Sec7 (44°08.969N, 103°33.441W)

This nest is located .75 miles NE of Merritt and .33 miles northwest of the Pilot Knob trailhead of the Centennial Trail and can be seen from the Sugar Shack Restaurant parking lot. Nearby water bodies include Trout Haven that has less than one surface acre, Roubaix Lake with five surface acres, and Box Elder Creek. Staff at Roubaix Lake have witnessed osprey feeding this season. (1997-present)

Homestake Road Nest:

T006N R001E Sec6 (44°31.052N, 104°03.358W)

This nest is located less than twenty feet inside the South Dakota border with Wyoming. In March 2006, Black Hills Power relocated the nest to a pole platform to decrease the risk of bird fatality due to the 230 kV power line. Nearby water bodies include McNenny Fish Hatchery, Mirror Lake #1 with five surface acres and Mirror Lake #2 with four surface acres. Coxes Lakes has eight surface acres. Sand Creek in Wyoming is 1.2 miles from the nest. Nest blew down in 2005 killing all chicks. (Minimum years nest used 2003-present)

Nesting sites at Pactola Lake, Bismark Lake, and Center Lake were observed for over 90 total hours at 6-hour intervals. Other nests and potential sites were visited several times although not observed consistently throughout the field season. All observations were recorded in the same manner as the three primary nesting sites for data comparisons.

Each of the five project objectives had specific methods to accomplish each.

1. Methods for Objective #1: Foraging locations of osprey were monitored. The location of a successful catch from the nest was recorded, and prey species was recorded with aid of binoculars and spotting scope. Approximate length was also recorded for each fish caught. Other variables that were noted each field day include water clarity, cloud cover, weather, and stream velocity.

Foraging rates were calculated for each nest during the nestling and fledgling phases. The number of fish caught/hour/osprey, fish/day/osprey, and total fish/phase were projected. These were calculated for all fish caught, not segregating the species, and then for trout species only. Fish/hour was determined by knowing how many fish were observed being caught during the length of each daily observation. A sunrise-sunset table was utilized to determine the number of daylight hours during each day of the study period to estimate the number of fish caught in a day. The percent of fish caught from a lake versus a creek was also calculated. The percent trout for each nest area was calculated. The projected number of all species and trout for each young phase was determined by taking the average fish/day for the three main nests and multiplying it by the number of days in the nestling phase and the fledgling phase. If then multiplied by six, the total fish taken by all six known nests in the Hills can be estimated for each phase, then ultimately for the entire breeding season.

2. Methods for Objective #2: Foraging rates and successes were calculated for comparison between lake hunts and stream hunts for those nests with both possibilities. The percent of lake and stream hunts was determined by visual observations using the direction and height of travel by the adult osprey carrying a fish.
3. Methods for Objective #3: Fluctuations in fishing rates and locations were compared to the rainbow trout stocking dates to determine if there was a correlation. The South Dakota Stocking Schedule offers dates of high rainbow trout availability to the osprey during 2006 due to the stocking efforts.
4. Methods for Objective #4: Field observations were made to identify or rule out factors for potential decrease of trout populations in lakes and streams. Creel survey data was obtained from GF&P staff for comparisons.

5. Methods for Objective #5: Time budgets were completed for the nesting pair and young during each field day. All behaviors of each individual were noted every five minutes with extra field notes made of notable behaviors. A spotting scope and stopwatch were utilized to fulfill this objective. Additional noteworthy information was added to the field notes.

Results

Objective #1:

What are the feeding habits of osprey through the four phases of the breeding season: courtship, incubation, nestling, and fledgling? Information researched includes the hunting locations, distances of these areas from the nest, fishing/feeding rates during each phase, and diet by noting the species and size of fishes caught when possible.

Foraging location information can be found in Table 4. Fishing rates are found in Tables 7, 8, 9, and 10. Species of fish by lake are in Table 5 and 6. Sizes of fish caught are in Table 3. Details of results for this objective are listed below. Information for the other nests can be found in the attached data tables.

Pactola Lake Nest: The ospreys at the Pactola Lake nest were observed fishing only in Pactola Lake during the nestling and fledgling phases. The minimum percent of fish from the lake is 83.33% because the locations of two fish brought to the nest were unknown. The birds were not seen catching fish from Rapid Creek in the basin, although they were observed perched above the creek several weeks after fledging. Trout were observed in the creek throughout the breeding season. The Pactola Lake feeding locations were all within one mile of the nest site. 100% of the identified species of fish were trout species, but 4 of the 12 total fish were unknowns yielding 66.67% trout (Table 5). Two of the unknowns were not trout, so if the other two of the twelve were trout, that would increase the percentage trout to 83.33% (Table 6). All trout caught 12 inches long or less. The average observed daily fish/hour was .42 and 6.18 projected fish/day. Separated, the projected fish/day during the nestling phase was 6.33 and for the fledgling phase 5.89 fish/day.

Bismark Lake Nest: The Bismark Lake ospreys were observed feeding in Bismark Lake and Stockade Lake. The minimum percent of fish from the lakes was 76.92% because the locations of three of the fish were unknown. There is not a fishable creek nearby for them to utilize. All feeding locations within the two lakes are less than one mile from the nest site. The Bismark male caught the highest diversity of fish species with four identified species, and still managed to catch a minimum of 61.54% trout (Table 5). If the one unknown was a trout, there would have been 69.23% trout caught (Table 6). The average observed daily fish/hour caught was .38 and 6.32 projected fish/day. Separated, the projected fish/day during the nestling phase was 5.08 and 7.15 for the fledgling phase (Table 7).

Center Lake Nest: The ospreys at the Center Lake nest were most diverse in their fishing locations. Only 44% of the fish were caught in the lake as four fish came from the ponds along Grace Coolidge Creek and six were of unknown locations. The farthest pond on Grace Coolidge Creek from the nest site is three miles downstream. The male was seen bringing fish back from high above the lake and from the north. Options include Lakota Lake that is three miles north, and Legion Lake that is four miles south, or the osprey just looped around at a high height from the ponds. 68% of the fish caught at Center Lake were trout with up to 77% trout if two of the unknowns were indeed trout. Suckers were caught in the ponds along the creek and a yellow perch was also brought to the nest (Table 5 & 6). The average observed daily fish/hour caught was .50 and 7.39 projected fish/day. Separated, the projected fish/day during the nestling phase was 6.93 and 8.32 for the fledgling phase (Table 7).

Three nest average and seasonal projections: Pactola, Bismark, and Center Lakes were the focal nests of this study. With the overall goal of knowing how many fish were being removed by the ospreys, I choose to average the fish/hour and fish/day numbers to gain a more accurate representation of what was occurring (Table 8). The average projected total fish/day was 6.63 fish/day for one nest. I then multiplied it by 6, representing the six known active nests in the Hills. The projected total fish/day for all six nests would be 39.78 fish/day (Figure 4). If we multiply this number by the average % trout, then we will know projected # trout/day which is 4.36 trout/day for one nest and 26.13 trout/day for six nests (Table 9). To calculate how many fish are being taken by one nest during the phases with chick feeding, we need to know how many days each phase lasts. Since the nestling phase lasts 49-56 days (Stokes, 1989), I multiplied 49 by the average # fish/day and 56 by the average # fish/day to obtain a high and a low number of fish taken during that phase. So, for one nest, there will be between 498.75 and 740.88 fish taken during the duration of the nestling phase and between 199.36 and 398.72 during the fledgling phase. When both phases added together and then multiplied by 6 to represent all the nests, up to 4500 fish could be taken in just the two young feeding phases, nearly 3000 of them being trout! (Table 10) This original three nest average is based on three nests with a total of six young. If there was a good hatch year of osprey, the number of total fish would be expected to be higher.

Objective #2:

Are ospreys fishing more in lakes or nearby streams? Nest locations where this could be important are Center Lake and Pactola Lake due to the high angling interest in these areas.

Contradicting the prediction, the Pactola ospreys were not observed along Rapid Creek below the dam until August. The family was found perched along the stilling pond and again near the stream monitoring station, but no fishing attempts observed. All observed fish caught (10 of 12) were from Pactola Lake and usually flown in directly over the dam face, and two were from an unknown location.

The Center Lake ospreys brought trout and suckers back from the Grace Coolidge Ponds below the dam as well as Center Lake itself. Of 18 observed fish caught, 8 were from the lake, and 4 were from the ponds along Grace Coolidge Creek. The water level in Grace Coolidge Creek was too low for them to forage in throughout the breeding season. Two fish of unknown location were brought in high from the north.

The Bismark Lake ospreys do not have a creek to forage in, but did prefer Stockade Lake over Bismark during the nestling stage.

Objective #3:

How many fish per day and fish per stocking period are being taken? Does stream foraging correlate with stocking times and water levels?

Black Hills lakes and creeks are primarily stocked with eleven and fifteen inch rainbow trout. The last stocking for the breeding season occurred on June 28 at Pactola and Bismark, on June 14 at Center, and the Grace Coolidge ponds received fish June 21, July 21, and August 16. In these waters, there are stockings scheduled for September and October. This means there were no fish stocked in the lakes during the times with the greatest fishing pressure by the ospreys, in July and August, although the birds were able to continue catching trout throughout this time period. This study showed no correlation between stocking and catching trout during the times of high fish needs. The projected total for the average number of all species of fish for the three main nest sites was 6.63 fish/day. The projected total for the average number of trout caught for the three main nest sites was 4.36 trout/day. These numbers were projected from the observed number of fish/hour during field observations.

Grace Coolidge Creek water levels were low all season due to drought conditions, but the ponds remained fishable for the Center Lake ospreys. The Rapid Creek levels, however, remained high to provide water to the Rapid City area and for irrigation.

Objective #4:

Are there any other factors besides osprey and anglers influencing fishing pressure on hatchery-stocked trout in lakes/streams?

Great blue herons, bald eagles, and mink have been seen preying on rainbow trout in the study area. Fish mortality from general die off after stocking or a fish kill due to high water temperature and low oxygen levels would affect the fishing success with less fish available to catch. The shallower the water is in creeks due to low release or drought, the higher the water temperatures and therefore the decrease in oxygen concentration. The supply of fish at Trout Haven takes the pressure off lakes and creeks near the Pilot Knob nest. Staff there have observed an osprey remove two fish daily between operation hours of 8am and 8pm. I have seen an osprey take a fish from the Trout Haven pond before 8am, so I predict more fish are taken than the owner suspects. I did not observe a variation in water turbidity at any of the sites.

Objective # 5:

A continuous objective is to monitor the behavior of adult and young osprey throughout the breeding season at each of the nesting locations.

Thirteen total ospreys fledged from the six nests in this study during the 2006 breeding season. (Pactola Lake = 1, Center Lake = 3, Bismark Lake = 2, Hill City = 3, Pilot Knob = 1, Homestake Rd = 3) These six nests are the only known active nests in the Hills during 2006 according to staff at USFS, GF&P, Black Hills Power, and Black Hills Electric Co-Op based on personal communications. The Pactola nest had three young after hatching, but only one survived to fledge. The Pilot Knob and Pactola nests were the first occupied in April but each with one chick fledged.

Pactola Lake Nest: The one young at this nest was the first to fledge in the Black Hills on July 26. I was able to read the first three and the last three numbers off the adult female's leg band. I was not able to read the middle numbers even after several attempts so we cannot send in for information. This adult male often brought the fish directly to the nest. Once he was the one to break it into pieces for the chicks and even fed the female! He would take frequent bites as well.

Bismark Lake Nest: The young of this nest fledged the week of August 1. On June 29, the male osprey chased off two great blue herons that flew over the lake calling. On other occasions, the female will also chase intruders especially turkey vultures. The adults will also call to the young "telling" them to duck down into the nest and hide when danger is flying over or near the nest.

Center Lake Nest: The adults at this nest worked overtime during August to attempt repairs on their wind and hail damaged nest. I witnessed the falling of the nest and one young went down with it and recovered with its first flight when it was half way to the ground. After back on top of the snag the remaining handful of sticks fell and this time could not recover and stayed on the ground for several hours. When I returned four days later, it was back up on the snag. Their official fledge date was August 10 for two of the young.

Hill City Nest: The young at this nest were developmentally the youngest of all the nests, yet caught up to the second youngest Center Lake young. Both nests' young fledged nearly the same time. All three young flying on August 15, but may have fledged a day or two earlier.

Pilot Knob Nest: This single young osprey was close in age to the Pactola young. For a close view of this nest, I hiked up within 100 feet of the nest to see the baby and I was excited to hear the call I had read about; the call given by the adults when on high alert and sounds very unlike any bird sound. The female made it as she flew overhead, luckily I was in the trees as I had read stories of people being attacked by ospreys.

Discussion

During April, the ospreys were not observed feeding near nests so I did not continue conducting feeding observations during this month. As I checked the Pactola Lake nest, the adults were not found in the basin; perhaps they were at the lake or retrieving nest materials. May is the month of incubation by the female. In the time I stopped by to check the status of the Pactola nest, the time between feedings was too long to observe in a six-hour period. The male was not found near the nest with a fish during this time. June, July and August proved to be the best months for observations of osprey feeding behaviors as the chicks required more feeding trips by the male. August did pose some observation challenges with the dispersal of fledged young.

There was no feeding competition between ospreys in the Black Hills since there is only one nest at each of the major bodies of water. If the Pilot Knob birds visit Pactola Lake for fish, they would not likely encounter each other due to the size of the lake and the large amount of time between fishing.

It was found that the projected fledgling # fish/day increased by approximately one extra fish for each additional young in the nest. This was not seen during the nestling phase for several reasons. The Bismark Lake male caught a large northern pike that counted only as one fish, therefore decreased the number of fish brought to the nest during my observation hours. Another reason is that at Center Lake, there were fish that were caught in low light just before my arrival and I did not count them since I set the parameters of only counting fish I saw actually caught while I was there. If those fish that I saw being eaten as I arrived were added to the total fish while I was there, the numbers would be larger indicating more fish eaten each day and increasing the number of trout consumed each day.

Since all the trout caught were estimated to be 12 inches or less in length, I believe the ospreys are not catching the “trophy fish”, but instead catching the stocked trout that spend their time near the surfaces of the lakes.

Pactola Lake Nest: The fledgling phase should have had the higher # fish/day, but on July 28, there was only one fish caught in the first six hours of light. There may have been one caught before my arrival that would have decreased the #fish for that field day. Another variable is that the hours of available daylight decreased, so the projected # fish/day decreased in my calculations. Pactola Lake is a very deep lake with steeply sloping sides, which may be the cause of decreased diversity of fish species compared to Stockade Lake with shallow areas containing vegetation.

Bismark Lake Nest: During the nestling phase at Bismark Lake, I only observed two fish caught per 6-hour observation. The June 29 field day was conducted later in the day and I realized that the ospreys are less active between 10am and 2pm so the number of fish observed was lower than if I had started at sunrise. Although I was able to fish Bismark Lake and catch fish, the ospreys still choose to catch some of their fish at Stockade. It may be because there is a larger surface area so that there is a greater chance of finding a trout in the upper few feet of the lake. When trout were caught at Bismark, they were in the shallows near the inlet.

Center Lake Nest: The small dams along Grace Coolidge Creek offer the Center Lake birds an additional food source, but I am not certain why they were fishing there. As 8" suckers were brought from below the dam, trout were indeed rising in the lake indicating that the trout were within striking distance for the ospreys. The ponds were shallow so perhaps the suckers were easier since they could not escape to the deeper waters upon the ospreys approach. Although the suckers were smaller, the energy expended may have been less than the repeated efforts of fishing for the trout in the lake. The time that the male flew in high from the north could have been from Lakota Lake, but I do not know why it would fish there over Center and the fish was not a trout or a perch, the species was unknown. The osprey may have looped around from the ponds as well. The projected fish/hour for the nestling and fledgling phases was the highest for the three main nests and is likely correlated with the idea that more fish are caught when there are more chicks to feed.

Hill City Nest: It is a challenge to conduct feeding studies at Hill City since the feeding grounds cannot be seen while observing the nest. I tried on occasion to follow the male to Mitchell Lake in anticipation of his catching a fish there, but within the drive time, he had caught a fish and made it back to the nest making identification of species and size nearly impossible unless the ospreys hold the fish up during the feeding process. I did not see any action at the platform at Major Lake although there had been a few sticks placed on it.

Pilot Knob Nest: This nest site is exciting because of the feeding location. I have often seen male ospreys catch three fish before 8am at other nest sites. During the fledgling phase, I went to Trout Haven to observe the time of the first fish of the day; one was caught around 6:30am. As I had found out, the ospreys feeding schedule is more regular when the young are still in the nest. Because of this, I would imagine that there are more fish taken from Trout Haven than the staff realize.

Homestake Road Nest: This nest is in a great location although the Sand Creek is over a mile away and McNenny Fish Hatchery is more than three miles away. The day I observed this nest, fish were both brought in from the direction of the creek and the hatchery. One of the fish was a large brown trout that can be found in Crow Creek downstream of the hatchery.

Three nest average and seasonal projections: The results of my calculations are supported by the work by osprey researcher Alan Poole (1989). He states that the ospreys catch 6-8 fish/day for a family during the breeding season and my average projected fish/day was 6.63 (Table 8). If we then look at the total fish taken by one nest during the combined nestling and fledgling phases there is a range of 498.75 to 740.88 fish/nest (Table 10). If we multiply by three representing three osprey nests, our new range of total fish is 1496.25 to 2222.64 fish /three nests over approximately three months of young feeding time. Poole states that in three months of fishing, three nests of ospreys could easily consume 1800 fish during the nestling and fledgling phases. His nests were observed for 30 hours each as were mine, so I feel that my numbers are valid and reliable to use in regards to the feeding behavior of ospreys in the Black Hills.

Additional Historical or Potential Nest Locations in South Dakota:

Four additional osprey nesting records from the South Dakota Natural Heritage Database have not been recently active. The Lawrence County nest was reported by staff from Black Hills Power after completing a helicopter survey of the lines, but it has not been located and verified from the ground.

Pennington County, 2 miles E and 2 miles N of Silver City, May 1994, pair building nest (not located as I searched the power lines within that area)

Pennington County, $\frac{3}{4}$ mile SSW of Signal Knob, 3 miles E of Deerfield Lake, nest on power pole (I could not locate it in Summer 2006, but there were adults feeding at Deerfield Lake and taking fish high and away from the lake. I scanned the entire lakeshore and below the dam for a nest; one was not found. Recent reports of a nest on the line has been made so further investigation is needed.)

Lawrence County, N of Nemo Road, E of Hwy 385. Black Hills Power staff mentioned that they found a nest on a power structure in the Windy Flats area. I walked and drove between poles #025 and #045 and no nest found.

Custer County, Stockade Lake, 2001, nest in large pine on small island near dam, 2 adults, 1 nestling (not currently active, the island was occupied by Great Blue Heron nests.)

Clay County, Vermillion River, in 1883, osprey breeding in large elm overhanging the river (not currently active).

Anecdotal Osprey Behavior:

I made the following interesting observations during the 2006 breeding season and several are characteristic osprey behavior that I was able to verify in literature regarding ospreys.

Ospreys have a rotating outer toe. I saw this with the female adult at Pactola as she was perched on the power line having three toes front and one back then switching to two front and two back.

After catching a fish, they shake water off their body in midair even while holding fish.

Most often, the ospreys carry fish with two feet, but one osprey carries a six-inch fish with only one foot.

If the fish are squirming, the male will often take the fish to the nest for the female to see that he did indeed fill her request, and then take the fish to a perch to eat the head of the fish, killing it. Then it would be taken back to the nest for the female to feed the chicks.

When an osprey is eating a fish, it will always start at the head end. The ospreys twist their head side to side to tear off pieces. They eat the entire fish unless something falls to the ground. All bones including the operculum get devoured! I have seen the birds duck their head in a swooping motion to help themselves swallow challenging pieces. When they finish eating, they twist their opened bill on the point of a stick to remove chunks of the fish that are stuck on the upper surface of their mandible.

By 9am, there can be three fish already caught, so the field days needed to be set earlier to have usable data.

I have seen the adults bathe on the surface of a lake and in the shallow spillway of Center Lake Dam. In the lakes, they will slowly land on the surface of the water, feet down and wings out, much slower than when catching a fish. They will lay there for several seconds with their wings splayed out to the side, and then lift their wings straight up beating hard, then lift out of the water shaking as they go. In the Center Lake spillway, it was standing in four inches of water ducking its head under the water and lifting it, letting the water roll off his back.

I saw the adult female at Pactola drinking out of the pond on a 100-degree day. That was a one-time observation.

The adult males and female continue nest building throughout the breeding season. On quiet mornings lakeside, I could hear the dead branch snapped off a ponderosa pine as an osprey grabs it on a flyby. There is no hesitation as they grab for it! They also bring clumps of dead pine needles to “soften” the nest.

The iris of the adult’s eye is yellow, but is orange in the young! The color is retained through the fledgling phase.

Before fledging, young hop and flap at nest edge, practicing, often gaining lift directly above the nest. They begin this as soon as the winds pick up in the morning. During this process, clouds of white fluffy down blows from their wings as if it were snowing.

After young fledge, they continue to return to the nest for feeding. They often go back before the adults and begin calling for food as queue to bring them food.

The young are great mimics of their parents. They assist with the moving of sticks in the nest, clean their beaks in the same manner, and play with the same wire loops on the power poles as they adults do.

The vocalizations of the young are raspier than the adults, so the trained ear can identify who is calling which is very helpful after fledging since the birds are often out of sight.

The fledged young will practice diving at the surface of the water even if the adults are not near the nest. Perhaps supervision would have kept the Hill City young from practicing in the sewage lagoons.

Ospreys are tolerant of minimal disturbances as those from people near and below nest, small birds, and vehicles in Pactola basin and Homestake Road, and canoes at Center Lake and Bismark Lake.

I believe there is sexual dimorphism in the young although I could not find this in any literature...I could identify individual young by the breast streaking, some darker like adult females and some barely streaked by adult males. The three young at Center Lake each had distinctive brown patterning on the breast.

Future Project Ideas:

1. Obtain exact arrival dates for each nest.
2. Obtain exact incubation, hatch, and fledge dates for each nest
3. Compare feeding rates for first and last six hours of daylight.
4. Do a full day survey, sunrise to sunset. Some research papers conduct several consecutive 4-hour observations with different observers to ensure coverage.
5. Have more people in the field observing to visit each nest more frequently.
6. Include more time to search and survey potential and reported nesting sites.

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Table 5. Species and totals of fish caught at each nest location

	Pactola	Bismark	Center	totals
trout sp.	8	8	13	29
yellow perch	0	2	1	3
sucker sp.	0	0	2	2
northern pike	0	1	0	1
largemouth bass	0	1	0	1
unknown	4	1	3	8
total fish/lake	12	13	19	44

graphs below made with top data table
(actual observed numbers)
(all data in this report derived from Table 5 not 6)

Minimum % trout ε 66.67 61.54 68.42 65.91

Table 6. Potential % trout with five unknowns as trout

	Pactola	Bismark	Center	totals
trout sp.	10	9	15	34
yellow perch	0	2	1	3
sucker sp.	0	0	2	2
northern pike	0	1	0	1
largemouth bass	0	1	0	1
unknown	2	0	1	3
total fish/lake	12	13	19	44

2 unknowns at Pactola were not trout
1 unknown at Center was not trout
(therefore 5 of the unknowns could be trout)
(see lower data table with potential trout %)

Potential % trout 83.33 69.23 78.95 77.27

