

**Turkey Vultures: An Observational Study on the
Social and Roosting Behavior in Makoshika
State Park, Montana**

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Table of Contents

List of Figures.....	i
Abstract.....	ii
Introduction.....	1
Makoshika State Park: Geography and Habitat.....	1
Methods.....	3
Home Range and Flying Pattern.....	7
Experiment to Observe Feeding Behavior.....	8
Territorial Perching and Aggressive Responses on Tower.....	9
Observed Roosting on Primary Tower.....	11
Time Occurrences.....	12
Observations on Secondary Tower.....	16
Sightings Away from Towers.....	17
Behavior on Buzzard Ridge.....	18
Roosting on Buzzard Ridge.....	19
Nesting on Buzzard Ridge.....	20
Conclusion.....	22

List of Figures

Figure 1. Map of Makoshika State Park.....	6
Figure 2. The total number of days per month that <i>Cathartes aura</i> were observed.....	14
Figure 3. The total number hours per month that <i>Cathartes aura</i> were observed.....	15

Abstract

I observed the behavior of Turkey Vultures (*Cathartes aura*) roosting in Makoshika State Park in Glendive, Montana for a total of 37 days. I saw as many as 24 birds, and as few as 2 in a day. These birds maintained a distinct home range circuit around the radio towers distributed throughout the park. Two towers in particular, the Primary Tower termed so because of the birds preference for it, and the Secondary Tower, which the vultures landed on but in fewer numbers, were the primary locations that the birds were observed. The Turkey vultures in Makoshika maintain a communal relationship. Positions on the towers were strictly enforced and maintained with a territorial perching response. Other behaviors observed include: aggressive behavior, preening, sleeping and cooling off. I also attempted to observe feeding behavior by supplying decayed meat. I also investigated a possible nesting site in the park, Buzzard Ridge, and these results are discussed.

Introduction

Makoshika State Park officials, in Glendive, Montana have reported that Turkey Vultures are commonly seen at Buzzard Ridge located about 1 1/2 miles from Radio Hill Junction (Makoshika State Park, no date & C. Lorentz, personal communication, May 21st, 2000). Buzzard Ridge itself is a steep, rugged bluff covered with ponderosa pine, and Rocky Mountain juniper (McEneaney 1993). The birds were seen by local residents as well as park officials nesting near the trees. The birds had selected one pine in particular as their nesting site. This tree fell down in 1998, and no one was sure where the vultures currently nest (B. Russell, personal communication, July 12th, 2000). Thus, the original focus of this study was to locate the new nesting and roosting site of the vultures, and to observe and record their communal behavior at that location.

Radio Hill Junction, is located about 3.5 miles from the park entrance, and it is distinguished by numerous radio towers, where vultures frequently perch (Montana Fish, Wildlife & Parks [MFWP] 1996). The largest tower, situated on a hilly incline northeast of the junction, is the spot where the Turkey Vultures are seen by most visitors and park rangers. The birds land on this tower and others located at the junction, as well as ride the thermals in the vicinity. These towers became the first locations for observations followed by other sites.

Makoshika State Park: Geography and Habitat

Makoshika State Park is located 1.5 miles southeast of Glendive, Montana, and three miles from Interstate 94 (McEneaney 1993). The park is 10,900 acres, (47.10639 [degrees latitude] -104.7108 [degrees longitude]) . The name

Makoshika (Ma-Ko'-shi-ka) is a variant spelling of a Lakota phrase meaning land of bad spirits or badlands. The park consists of over 8,900 acres of land, (2,000 more have been acquired in the summer of 2000), under various ownerships and it is part of 56,000 acres of badlands (MFWP 1996).

The Park is primarily badlands. The soils support grasses, forbes, shrubs, and are limited for use as range. The badlands are composed mainly of steep, nearly barren areas, and are represented by vertical escarpments, narrow ridges, isolated buttes, and deeply entrenched coulees. These lands were formed by the active geologic erosion of soft, multicolored sedimentary beds of loamy sand, sandy loam, silt loam, clay loam, and silty clay. Slopes range from 15 to more than 100 percent (Holder and Pescador 1976).

Most of the strata found in Makoshika are the brownish-gray sediments of the Hell Creek Formation, which dates back 65 million years, when the Rocky Mountains were rising in the west. At that time, the area was similar to the present southeastern United States which had a sub-tropical climate maintaining rivers and floodplains. This was the "Age of the Reptiles," which was the Cretaceous Period. Above the Hell Creek Formation and visible in the highest areas of the park are yellowish sediments of the Fort Union Formation. These Paleocene age strata mark the beginning of the "Age of Mammals, that began 64 million years from the present" (MFWP, no date).

Erosional influences continue to effect the shape of the badlands that make up Makoshika, leaving remnants of upland prairie, coulees, ridges and mesas of ponderosa pine. Southward facing slopes are dry and sun-baked, with little vegetation, however, northward facing slopes are cooler and are more adapted at retaining moisture to support trees and shrubs. Cottonwood and willow are found in the bottom of coulees and higher

elevations have Rocky Mountain juniper and ponderosa pine, along with rabbitbrush, sagebrush, and yucca (McEneaney 1993). These and other plants are interlaced throughout the park. In the rugged topography of Makoshika with little level ground and rapid slope inclines, microclimates and soils vary considerably. Silty clay soils, which form the largest expanse of upland prairie in the park, and some of the following grass communities are found: blue grama, needle-and-thread, western wheat grass, prairie June grass, and thread leaf sedge. Prevalent forbes include Hood's phlox, textile onion, and scarlet globe mallow (MFWP 1996).

One of the most common plant species in Makoshika State Park, as well as the West, is sagebrush. Two types are found in the park: big sagebrush and sliver sagebrush. The diversification of animal species among sagebrush, grasses, and forbes is greater than on grasslands alone. Birds nest in sagebrush, in particular the Brewer's Sparrow, and deer and antelope are frequently seen grazing on the leaves. Other commonly seen animals in the park are rabbits which burrow under the sagebrush, coyotes, numerous insects, small lizards, snakes and rodents (MFWP 1996). Birds are especially diverse and include: Turkey Vultures, Red-tailed Hawks, Golden Eagles, American Kestrels, Prairie Falcons, Horned Larks, Mountain Bluebirds, Rock Wrens, Yellow-rumped Warblers, Chipping, Brewer's, Vesper, and Lark Sparrows, and Western Meadow larks (McEneaney 1993).

Methods

Access to the park is limited to vehicles because there are only 12 miles of roadway and only half of that is an all-weather surface. My observations began on May 21, 2000 and ended on August 24, 2000. Total observation time occurred over 37 days, but did not take place consecutively.

The camera I used was a Cannon AE-1 with a standard 50mm lens, a 135mm lens, and a zoom lens 70-210mm, and my binoculars had a 10x25mm field of view.

When I began my investigations, I choose to explore the 12 mile stretch of road and get a general idea of where the Turkey Vultures could be found. I recorded the time and location of every sighting of vulture(s) and what they were doing. June 2, 2000, I noticed one bird was flying off the main road on the right over a section of rugged buttes heading back in the direction of the visitor's center. I stopped the car and climbed out and sat on a cap rock, a flat rock which rested on a projecting butte. Then I noticed that the area the Turkey Vulture had been flying over was directly below Radio Hill Junction which I later called the Primary Tower.

The Primary Tower is one of the tallest towers in the park standing over 300 feet. The spacings between the uprights are 36-42 inches wide. (Tab Electric Inc., personal communication, January 2, 2000). Next to the Primary tower is a tall narrow tower, and on only one occasion did I see a bird land on it. The activities that the Turkey Vultures performed were always the same on the days that I watched them.

Beginning on June 2, 2000 the vultures started to express curiosity about me. The birds were not interested in other animals in the area. Buzzard Ridge, the vultures possible nesting location, was close to a pair of American Kestrels, that were very disturbed by my presence, but were unaffected by the vultures, and the vultures were unaffected by them. Other birds that flew past the towers during the day did not receive a glance from the Turkey Vultures.

Late in the afternoon at the Primary Tower, 11 birds flew directly over my head and my car, leaving droppings on the hood. That day I observed circuit flying where the birds flew from the Primary Tower to the towers directly across the way, those I called the Secondary Towers, and then headed over to another outcropping with towers and a forest of dead trees. From there, they flew over to the A-Frame at the Lion's Camp. The Secondary Towers are 0.2 miles from the junction and the Primary Tower is about 0.21 miles from the junction. The Dead tree Towers (as I call them) are 0.3 miles from the Valley View Loop Drive turnoff and the A-frame is 0.6 mile from Valley View Loop junction (MFWP, 1996, refer to map, figure 1)

Home Range and Flying Pattern

Throughout all my observations the vultures maintained this circuit where they flew around the towers and then flew to the area that lead them to the next set of towers, and then looped back again. This I found was their established home range. They also maintained a distinct posture when they came to landing. In the majority of the cases, especially around the Primary Tower, the vultures would circle and soar above the tower for at least 2 revolutions and then land on the tower uprights themselves. On July 5, 2000, July 13, 2000 and July 14, 2000, I found that the vultures were quite consistent in this flying pattern.

The Turkey Vultures at Makoshika, appeared to act and maintain a communal relationship. When one bird flew off the uprights of a tower, another bird would follow. This action would become the catalyst for more than 20 birds flying around a tower. One bird had instigated the actions of an entire group. The vultures also sunned themselves together as well as preened together. The radio towers could possibly serve as communal centers giving the birds an opportunity to get together and relay information.

Many birds roost communally, and three major advantages have been proposed. Browner (1965), Chaplin (1982), and Williams et al. (1991), stated that there are energy savings through improved thermoregulation, while Lack (1968) and Gad Gil (1972) proposed that the risk of predation was reduced (as cited in Buckley 1998). Ward and Zahavi (1973), Rabenold (1983, 1987), Marzluff et Al. (1996), and Buckley (1997) maintained that communal roosts enhanced foraging success, because the roosts served as information centers (as cited in Buckley 1998). Evans (1982) and Buckley (1996) proposed

that communal roosts serve as assembly points for groups of foraging birds (as cited in Buckley 1998). All of these possible benefits are balanced by a number of equally likely costs. Costs include increased exposure to parasites and diseases (Lack 1968), plumage damage caused by the droppings of birds roosting above (Yom-Tov et Al. 1979), and the energetic costs between feeding locations and communal roosts (as cited in Buckley 1998).

Experiment to Observe Feeding Behavior

In order to examine the behavioral habits of communal roosting, I made an attempt to get the birds to eat food that I provided for them. I was also curious if the birds would eat food that was processed and not found in nature. I also wondered whether exposure to humans would effect consumption. On June 9, 2000, a local rancher, Amy Myran and her husband, gave me one of their baby lambs that had died that day. I transported the lamb up to the Primary Tower and placed it to the right of the service road to the tower. On June 10, 2000, I checked the lamb at 7:30 AM and it had not been touched. I then checked it at 3 PM with the same results. June 12, 2000, I checked the lamb again at 2:40 PM and insides had been opened and the eyes were missing. After this date the lamb continued to decompose, but I noticed no new parts missing. I did not see the vultures eat the lamb, and it could easily have been other animals in the park that ate it, such as a coyote. I suspected it could be the birds because Turkey Vultures prefer smaller carcasses. They do not like to share their meal with other scavengers and the first organs they eat are the eyes and the internal organs of the dead animal.

Since the results of the baby lamb were inconclusive, I tried something a little different. I put out aged (3 days in backyard) lamb burger, game hens and

bacon strips by the Primary Tower at 5 PM on August 11, 2000. Along with the meat, I also put out a bird created by an artist that was made with Turkey Vulture feathers and had a papermache body. At 5:07 PM, 6 birds were circling the meat (at 4:50 PM 13 were on Primary Tower), and at 5:18 PM 9 birds were circling. The birds were very curious about the "fake bird," but because I was in the area and they could see me they did not land. August 14, 2000 at 9:20 AM, I put the same meat out (I collected it from the previous time, to make sure that just the vultures would eat it) and I stood 46 feet away. Within 5 minutes a bird approached and flew by the Primary Tower, and then within 15 minutes 3 flew very low over the meat, but none landed, then or later. The last day August 15, 2000, I put meat out next to the Bowman Archery range (refer to map figure 1), 92 paces away from the metal shed by the radio tower. I put the meat out at 7 PM and saw one Turkey Vulture within 2 minutes of putting out the meat, however, no birds landed.

Territorial Perching and Aggressive Responses on Tower

The Turkey Vultures did not just fly haphazardly around the Primary or Secondary Towers and then land. Each bird landed on a particular spot on the uprights. Each bird appeared to have their own place on the tower, and I found that when another bird attempted to move to a new position either a higher or a lower position, one of the Turkey Vultures already present would lunge at them with spread wings. This territorial perching response only happened when one of the birds, landed in a place where a previous bird had been roosting. For example, on July 13, 2000, there were two occasions in which this happened. On nearly every observed occasion, Turkey Vultures flew

and soared around the Primary Tower, and on almost every occasion flew with another bird. So, two birds would fly in circles around the Primary Tower and then land next to each other. Since Turkey Vultures are monogamous these were probably mated pairs. When one of these pairs would fly off of the tower's uprights, the second bird would often follow and the two would fly off together, with one flying in front of the other.

On the two occasions on July 13, 2000, just one of the pair that I observed flying together got up off the uprights on the Primary Tower and flew away. A third bird soaring around the tower tried to land next to the other vulture, in the vacated position, and this action was met with a lunge and spread wings, and appeared to be a form of aggression. Most pairs landed next to each other and flew with each other. Sometimes, just one of the pair would fly around the tower, and the other would preen, rest or sun themselves while the other flew around. Then a bird would land back next to the bird and an aggressive stance was taken. I was not able to tell if the Turkey Vulture that landed was a member of the pair, because on the majority of occasions that I watched the vultures there were at least 2 other birds present flying or landing. In spite of this, on July 13, 2000 at 5:45 PM, I saw one of a pair land right back into the same spot that was vacated. Placement within a roost vary in value because locations differ in degree of exposure to the elements and the level of protection offered against predators.

Evidence that lower status birds are driven to occupy lower or inferior positions within communal roosts has been shown for Red-winged Blackbirds (*Ageless finesses*; Featherhead and Husk 1984), Rooks (*Corvus frugilegus*; Swingland 1977), and Bramblings (*Fringilla montifringilla*; Jenni 1993); (as cited in Buckley 1998). Buckley (1998), observed Turkey Vultures

and Black Vultures roosting on electricity pylons. He found that the vultures did not distribute themselves randomly on the pylons, and when there was little competition for a position, most of the birds roosted on the upper middle section of the pylon. However, when he saw large numbers of vultures, the competition level increased, especially when there were more Turkey Vultures than Black Vultures. He concluded that the observed differences between the species when there were large numbers present could be a consequence of the aggressiveness between the two species. Black Vultures are considered to be more aggressive, particularly when they are interacting with another species near a carcass; and Turkey Vultures are less aggressive (Stewart 1978, Wallace and Temple 1987, Houston 1988, Buckley 1996, as cited in Buckley 1998).

Observed Roosting Behavior on Primary Tower

On June 23, 2000, I found another communal pattern, in addition to what I observed in tower placement. At 1:45 PM, I arrived at the Primary Tower and saw 2 vultures roosting. One of the birds was preening and the other was sleeping with head nestled in the back between the wings. At 1:55 PM, a third Turkey Vulture appeared and landed next to the sleepy one. The third bird immediately began to cool itself and fan with wings spread. The sleepy vulture saw this and then did the same. At 1:58 PM, when the newcomer stopped the sleepy bird did the same. On the days when I observed smaller numbers of vultures on the towers, in particular the Primary Tower, outbursts of aggression were nonexistent, and the upper middle of the tower was filled, rarely the lower sections. Rarely did a bird land on the lower uprights, and this only occurred twice, when one vulture

moved lower to observe me. However, when I saw larger numbers, the placement of newcomers to the tower appeared to be strictly enforced. Newcomers were only allowed to land on a higher position if they had been there previously. This was not easy to determine, however, because all birds look alike. It was harder to tell in all observed instances if the newcomer had perched on a certain position before. I only saw displays of aggression when larger numbers were present.

Buckley (1998) gives other reasons that the upper levels of pylons are preferred. Turkey Vultures attempt to conserve energy while they are roosting. Vultures allow their body temperature to fall by up to 4 degrees C at night to reduce heat loss (Heath 1962 as cited in Buckley 1998). Separation of branches in trees decreases heat loss, however, this is not true for pylons. The pylons help conserve heat, because the birds are pressed closely together. This could also apply to the radio towers, and explains why I saw the vultures with their wings spread, exposing their dark feathers so that they can absorb the heat of the mid-day sun. On most observances I saw the birds alert and watching the traffic on the main road, but their attention was mostly spent watching me as I watched them. The most Turkey Vultures that I saw on the towers and flying was 24 on August 11, 2000.

Time Occurrences

The times that I was able to get out and observe the birds varied greatly, but most of the time I went out in the early part of the afternoon around 1 PM. I rarely saw birds on the towers before then and I had more trouble finding them in the early beginning of summer, but as it became hotter earlier in the day the more I saw them. On a few occasion I had brief sightings in the morning

and on both occasions June 2, 2000 and June 3, 2000, I saw just one bird at 9:23 AM. Usually the numbers of birds began to increase after 3 PM and continued to grow until early evening. When dusk came, the birds one at a time flew away and headed in the direction of the A-Frame (Lion's Youth Camp) and disappeared from view.

On August 11th, the day I saw 24 birds, all birds had left and flown in the direction of the A-Frame and Buzzard Ridge at 6:15 PM. On June 5th, I went out at 9 PM and left at 9:45 PM and I saw no vultures. On August 4, 2000, I went out to the park around 7:30 PM and left at 9 PM and I saw no birds, but on the 6th, I did see one bird over Buzzard Ridge at 7:30 PM. The only other time I saw any birds in the park after 7:30 PM, was at 8 PM on June 2nd. On this occasion I saw just one bird that hovered over the Primary Tower area and then disappeared. The Following figures (2 &3) depict the total number of hours, and the total number of days, of the entire observation over the course of the summer of 2000.

Figure 2

Note: Figure 2 depicts the total number of days each month, that *Cathartes aura* were observed in the summer of 2000.

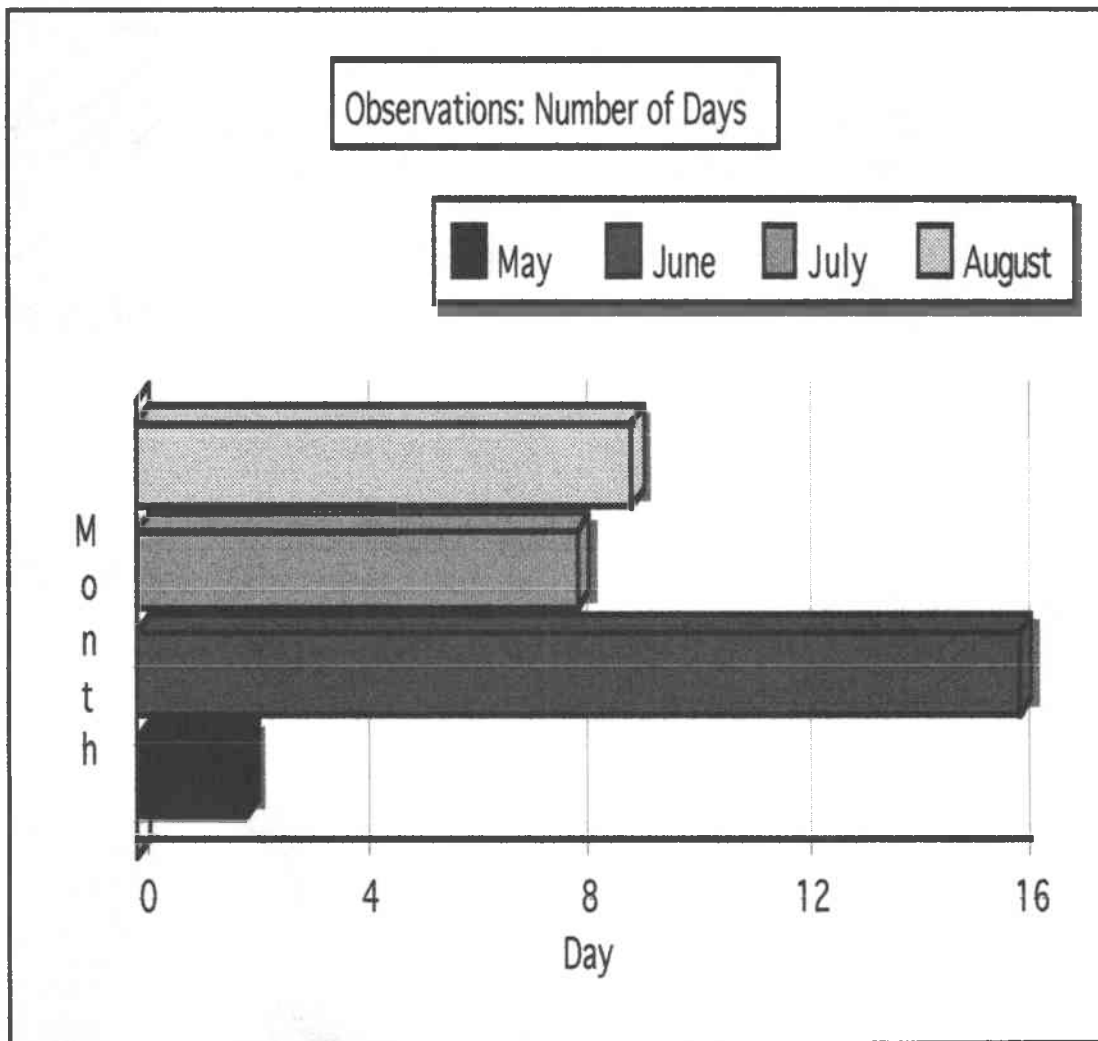
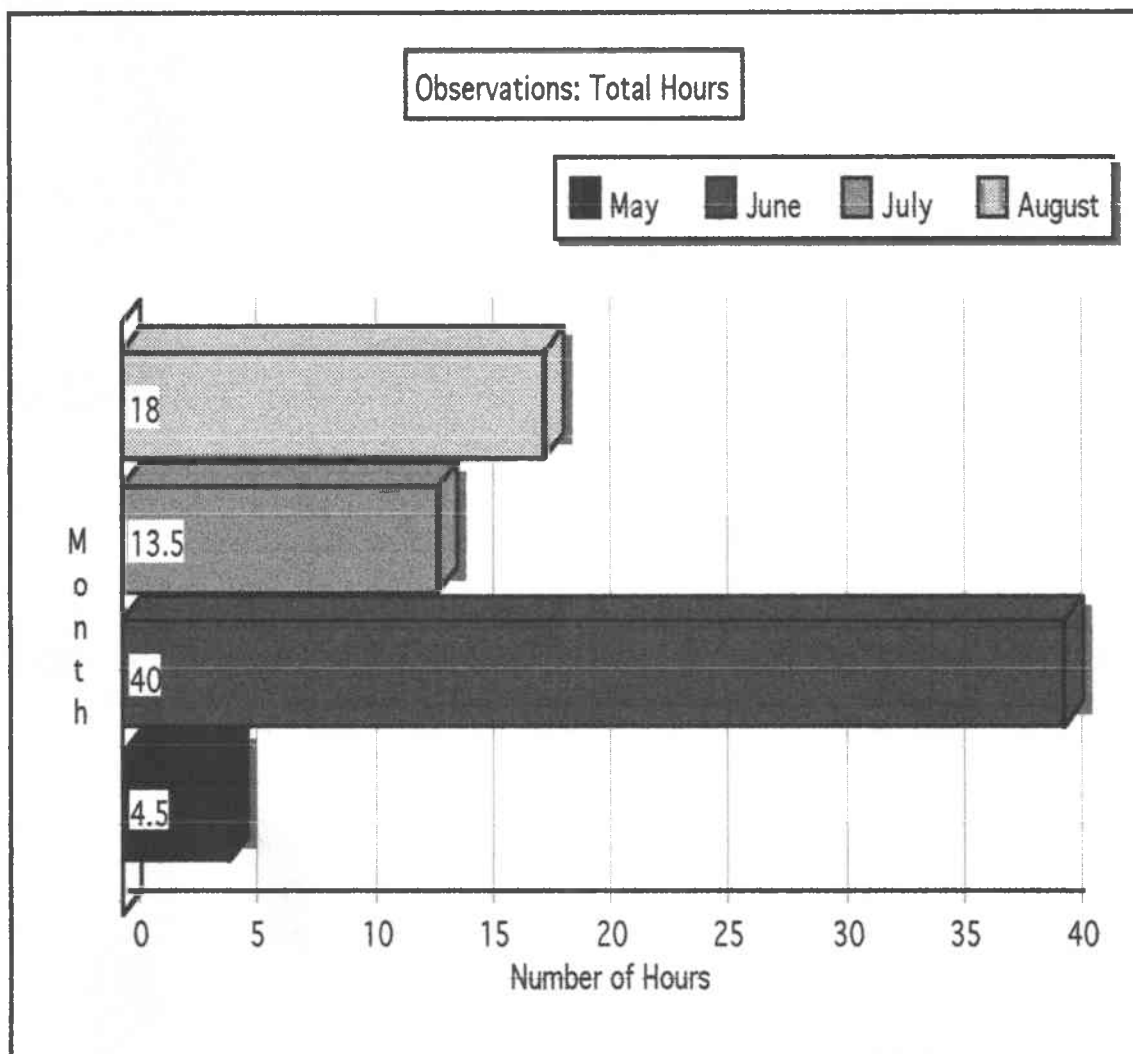


Figure 3

Note: Figure 3 depicts the total number of hours each month during the summer of 2000, in which *Cathartes aura* were observed.



Observations on Secondary Towers

On numerous occurrences, I saw no more 4 birds on the Secondary Tower. On June 22, 2000, I saw just 2 birds on the tower. I propose that the vultures maintained a hierarchical system. When vultures of a lower status try to land on positions higher on the tower, especially when the numbers of birds are greater, they are not allowed. This would explain the distribution of the birds on the tower I observed. This hierarchical system affected the arrangement of birds on the Secondary Tower. There were never more than 4 birds on the Secondary Tower. If these birds were lower in status this would explain their isolation. These birds always occupied the upper middle section of the Secondary Tower. Perhaps these birds are outcasts in the group, or lower in the dominance hierarchy. Such a relationship exists in Bison. Old bulls are outcasts of the main herd, yet they still follow and maintain a distant relationship within the group (McHugh 1972).

The outcasts might maintain ties to the rest of the roost, because roosting separately from the main rookery is not as beneficial to survival against predation. Reports of predation or attempted predation on vultures are rare (Coleman and Fraser 1986, Stolen 1996 as cited in Buckley 1998), but the possible risk from predators such as Barred Owls (*Strix varia*), and Great Horned Owls (*Bubo Virginians*) both of which occur on the refuge, may be sufficient to induce communal roosting. Outcasts may be young birds who have yet to find their place in the rookery. Young juveniles have a black head while adults have a red head. I saw no juveniles, but the birds I saw may have been young adults not yet mature enough to maintain the hierarchy status placement, or their status in the hierarchy was low.

These birds spent the majority of their time doing the same things

that the others did on the Primary Tower, but rarely did these birds fly over and land on the uprights of the Primary Tower. The Turkey Vultures also filled the top uprights of the towers first, and then the lower uprights would be filled. This was not as apparent when I observed only 2 or 3 birds roosting on the tower. Their placement appeared to be random, however, when more birds came, the positions were filled top to bottom and the flying birds would land next to another as if they were together.

On days when I saw a large number of vultures, these few that were separated from the others on the Primary Tower, would fly over and circle and soar around, but after they had flown for a while they would return to the uprights of the Secondary Tower. The Turkey Vultures, who were separated on the Secondary Tower, just landed on the highest places. As the birds began to recognize me and accept my presence, they became bolder and would fly around both the Primary and Secondary Towers much lower than they did in the beginning. Days when I saw less than 10 birds, they expressed even greater curiosity about me and things around them. In the final days of my observations, one bird would leave a higher perch on the uprights and land on a lower upright to observe me more closely. These last few occasions enabled me to photograph the birds and see them in greater detail. The Turkey Vultures expressed more and more acceptance of my presence by flying lower and lower around me, including four from the Secondary Tower.

Sightings Away From the Towers

There were two instances when I saw birds roosting far from the towers. June 7, 2000, I saw a single bird roosting on a butte as I was driving up the switch backs around 2.5 miles from the entrance of the park. The bird was

sleeping with head buried in the back between the two wings. When I got out and watched, the vulture looked up and then went back to sleep. This took place at 3:27 PM and I watched until 4 PM. In all my observations I only saw this occur one other time, on June 14, 2000. I was driving down the Sand creek Overlook road and only got about .7 of a mile when I glanced over to the right and saw on a large flat cap rock one single Turkey Vulture. I was able to get within three yards of the bird before the bird flew over to a nearby outcropping. As I approached the bird turned it's head and watched me, and did not appear to be frightened by the clicking of my camera. On June 11, 2000, I drove down the main road heading in the direction of the A-Frame, when I saw 2 birds land on a butte close to the A-Frame. A total of 9 Turkey Vultures landed and made a circle flapping and jumping up a few feet from the ground. This display lasted 5 minutes and the total 9 birds got up and left flying down the ridge line heading past the A-Frame.

Behavior on Buzzard Ridge

Beginning on June 21, 2000, I observed for the first time vultures soaring over Buzzard Ridge. At 4:31 PM, I spotted one Turkey Vulture flying over the ridge and then I watched as the bird glided and coasted down following the tree line. From there the vulture headed toward the trees closest to the Primary Tower and at 4:34 PM the bird was still in the area. The vultures seemed to continue the circuit flying that I observed before. When they headed towards the A-Frame, they stopped off and spent some time soaring around and in between the trees and ridge line on Buzzard Ridge. June 22, 2000, I spotted 3 birds near the A-Frame and as I traveled back down the main road, I saw 4 vultures flying by Buzzard Ridge. The numbers increased to 7 total birds in the

area, and then dropped to 4 as I lost sight of 3 in the trees on the ridge. I was finally able to locate them when I watched one Turkey Vulture land on a tree on Buzzard Ridge, and another landed but immediately took off again. The trees that the vultures landed on, were easily seen in daylight, because they were directly across from the Buzzard Ridge sign posted on a pole. The sign was on a cleared area on the flattest part of a butte. This was created so people visiting the park would be able to see the birds more clearly around Buzzard Ridge. The first tree which I called the Secondary Tree, or Dead Tree was growing on an incline on the ridge, and was easily recognized by the dead spindly branches at it's top. Lying diagonally across from this tree were several dead tree branches, and these branches were visible because they were laying on the silty incline with no other trees on it. The Primary Tree, is actually higher up the ridge and is a taller tree. I named the trees secondary and primary as a result of how often I observed birds in them.

Roosting on Buzzard Ridge

On June 22, 2000, the birds would land, and one would leave and another would shortly join in flying and coasting around the ridge. This event was usually instigated when a new bird flew into the vicinity. This pattern continued on all the days that I saw the birds in this area. I saw more birds flying over and around the ridge, than I actually saw in the trees roosting.

Patricia Rabenold, a vulture researcher at Ohio State University, has found that vultures have a distinct roosting, flight and feeding pattern. Turkey Vultures eat primarily during the morning and spend the afternoon circling the thermals in search of the next days meal. Turkey Vultures usually leave the roost to search for food individually, about 2 hours after sunrise, and in the late afternoon

return to the roosting site to rest (Grady 1997). Kohlmoos (2000), has stated that vultures may wander up to 200 miles away, visiting different roosts each night, and then return to their home roost a week or two later. The birds I observed may have been traveling through the park by day and then returning to their true home roosting site, or nesting site, somewhere else outside of the park, or traveling through the area and heading somewhere else.

On June 27, 2000, I noticed that the primary tree the Turkey Vultures roosted on had a large vertical strip of bark missing off the trunk. I had observed this strip of missing bark before on June 22, but on the 27th the strip had lengthened. That same day I was able to watch a vulture perching on the Dead Tree, directly across from my observation post on the opposite butte. The vulture was roosting midway up the tree on a branch with pine needles growing on just the left side. When I started watching (4:59 PM), the bird was sleeping with the head back between the wings. After this the vulture lifted up the head and looked forward and at 5:12 PM the bird scratched the head with the left foot and then the right foot. At 5:16 PM, this Turkey Vulture left the perch and a second bird appeared flying over the ridge. On July 5, 2000, I saw a total of 10 birds in the trees: 6 were on the Primary Tree and 4 in the Secondary Tree, and by the end of my observations 14 birds were in the trees (5:40 PM).

Nesting Behavior on Buzzard Ridge

On July 28, 2000, I climbed down to Buzzard Ridge to see if this location where the birds were roosting was still the nesting site chosen by the Turkey Vultures. I went down at 2:00 PM and got back at 3:00 PM. Along the ridge line I had to cross a fence, and then I walked down and dodged trees until I found the two trees where the vultures roosted. On this ridge line, I found evidence of

the birds presence by numerous droppings on the small rocks on the ridge edges. When I got there there were no birds on the trees or in the area. Down the incline by the Secondary Tree there were several dead tree branches.

I found no evidence of nesting on Buzzard Ridge. Turkey Vultures usually produce offspring every second year (Rourke1998), and they may breed the following year. The birds may have nested somewhere else, but, I saw no young with their parents learning to fly and forage. Turkey Vultures usually lay their eggs in April, I began my observations in late May, so the young birds would have been at least 6 weeks old and would have been with their parents, socializing and learning to forage (Grady 1997 & Rourke 1998). This site may not have served as a nesting location, but rather as another roosting site.

I climbed above them and in the silty soil I found various bones, that appeared to have been tossed down from the Secondary and Primary Trees above. Around the trees themselves I found many feathers, including primary flight feathers. The bones I found were directly below the Primary and Secondary trees. Turkey Vultures swallow large quantities of food and the things that they are not able to digest come out in the form of pellets. Feathers, fur and other nonnutritive objects form the pellets and are coughed up usually within 24 hours of a feeding. These pellets are often found below the roosts (Hendrickson 1992). The bones I found could have come from a Turkey Vulture pellet, and by the time I found them the fur, feathers etc. could have disintegrated.

I also explored the areas behind the trees that the birds were roosting on, and in a grove of pine I found a pine cone on the ground with globs of animal fat on it. Besides the fat on the pine cone in the grove, I found 3 other locations, where fatty globs of animal fat were found on the trees themselves. I searched

the small crevices under the Primary and Secondary Trees looking for remains of nesting, and I found no evidence of any nesting activity. I also searched the area where the animal fat was found, and I did not find anything there either. I found feathers in the same locations as I did on the 28th, but I saw no animal fat and I found only one bone. The bones I found on both occasions were large bones and could have been from a cow or a deer.

Conclusion

The Turkey Vultures at Makoshika State Park lived in and regulated a communal environment, in which the positions of all of the members was strictly enforced. These birds, particularly in pairs, flew in a flight pattern consistent with an established home range, as well as displaying a territorial perching response when one of the pair's perching positions was violated by another bird.

Positions of birds on the towers appears to be quite deliberate. The vultures usually land on the highest uprights of the tower before landing on the lower ones. Tree placement on Buzzard Ridge is not as apparent as on the towers, but the birds seemed to maintain the same patterns. Most of the birds landed on the Primary Tower, while only a few birds landed on the Secondary Tower. Possible reasons for this occurrence could be that the birds were outcasts or (lower in status) from the communal group or they were young adult birds that had yet to become incorporated in to the rest of the group.

I conducted a simple experiment to to see if the vultures could eat processed food provided for them without having to forage. The food was placed in designated locations near the towers throughout the park. The results were inconclusive, however it did appear that the birds preferred carrion they

could find elsewhere. On Buzzard Ridge, there was evidence of feeding and roosting. The bones and the leftover fat gobbles support the usage of the ridge for a home roost, although I never saw the birds roosting late in the evening. This suggests that the Turkey Vultures may have had another home roost in their home range that they visited more frequently. Nesting on the ridge was also nonexistent, and could have been related to the year, and the birds may have produced viable young the previous year, as Turkey Vultures nest every other year.

Due to the vast acreage, division of the park land into individual sections each monitored at specific times, would provide more substantial answers as to whether the birds forage and eat in the park. When I put out the samples of processed food, I watched the birds in plain view as there was no means to hide myself. In order to see if it truly was the food the vultures did not like, the distance should be increased between the observer and the birds. Analysis of the birds splay (dejecta, excrement) should also be performed to discover what composes the main source of their diet, and the percentages of vegetative matter as well as carrion. Tagging the birds with radio collars although expensive and awkward, would be useful to find out where the birds go after they leave the park. These birds are lively, curious creatures and more research needs to be done to understand the way they behave in the wild as well as in captivity.

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