ADDRESSING FOOD CONDITIONING OF CASCADE RED FOXES IN MOUNT RAINIER NATIONAL PARK, WASHINGTON

by

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ABSTRACT

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The Cascade subspecies of red fox that inhabits Mount Rainier National Park are habituated and food conditioned due to human provisioning by park visitors. My study explores possible options on how to reverse the effects of the habituation and food conditioning to try to restore the foxes to a more natural population. It is believed that a combination of education and consistent enforcement of violations will reduce incidences of human provisioning. Implementation of a management plan that includes successful methods for addressing habituation and food conditioning utilized by other National Parks to discourage visitor feeding will also assist Mount Rainier National Park in resolving the fox feeding problem.

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CHAPTER 1 - INTRODUCTION

Since 1872, when Yellowstone National Park opened its gates as the nation's first national park, people's perceptions about wild animals changed. No longer was wildlife a nuisance or an occasional sighting, now wildlife-watching was a recreational activity and interaction with wild animals was the high point of family vacations. Animals that had previously not known people in their environment had to adjust to the ever-increasing numbers of tourists. Some animals left the area, while others adapted to the human presence, sometimes tolerating humans and other times becoming attracted to humans and human-use areas.

Park manager's attitudes have evolved over the years with changing ideas about wildlife and nature. Yellowstone National Park's early years included a zoo onsite where tourists could get a close-up view of wildlife. Later, while elsewhere in the park, tourists were strongly discouraged from feeding roadside bears, the park was intentionally feeding bears refuse at feeding stations designed and run by the park for tourist entertainment. This act blurred the lines between acceptable bear interaction and unacceptable acts of feeding. Additionally, through the promotion of feeding bears on human refuse, the park linked human feeding to the bears' existence in the minds of the public.

The 1970's ushered in an era of conservation biology and an understanding of ecosystems in their entirety and complexity. This brought with it the desire to withdraw the human presence and return park wildlife to a state as natural as possible. This new idea was contrary to many years of public views and opinion. What was once the norm became an illegal act, albeit minimally enforced. Yellowstone, which had become

synonymous with feeding bears, faced new, scientifically upheld public views about wildlife.

Parks have been trying to find a way to address this issue ever since, as animals still seek human handouts and humans still feed them. This begs the question, "Can a natural environment include human tourists?" In national parks the illusion of natural is emphasized – but the reality is far from natural. Ever since people became part of the landscape in national parks, animals have been adjusting to them. Some animals have come to associate humans with food and therefore spend time in areas of human-use trolling for handouts. Such animals have changed their behavior to best exploit this human factor to their benefit. An exploration of these types of animals and their relationship with national park visitors, staff and human-use areas drives the investigation of this paper.

It is the intention of current policy in national parks that animals live their lives independent of the humans around them and adopts the notion that if humans are sufficiently discouraged from feeding animals, then they will look for food elsewhere. The belief behind this policy is that wildlife will naturally vacate areas where food is not prevalent. So the question must be asked, "Is it enough to discontinue wildlife feeding and expect animals that reside inside a national park to live a truly natural life given the unnatural surroundings that include visitor centers, restaurants and open trash receptacles?" In short, park managers are attempting to remove the human-dependence element from the life of the parks' animal residents without removing the human presence. Perhaps the most natural response by an animal to the humans in their environment is to look at them as a potential food source. In addition to changing animal

behaviors, there are the human behaviors that need to be changed. After years of watching park administration feed animals, and later observing the lax enforcement of the feeding law park visitors are still accustomed to providing food to wildlife. How does the park change public views to get them to coincide with a new management plan?

There are many questions that arise when discussing the issue of human provisioning of wildlife. To address all national parks would be impossible for this thesis. Because of its proximity to The Evergreen State College and its unique red fox situation, Mount Rainier National Park serves as the setting for the following exploration. The overarching guiding question of this research is: "How do the issues of habituation and food conditioning effect the wildlife of national parks?" In particular focus are the foxes of Mount Rainier National Park (MORA). In pursuit of this query, the following questions are also examined: What are some common methods to address habituation and food conditioning issues in wildlife? Which of these methods might be the most successful with the foxes of MORA? How is dealing with these issues in foxes different from dealing with these issues in other animals?

The red fox is among the world's most widely distributed and most thoroughly studied terrestrial carnivores (Lloyd 1980, Voigt 1987). There are 10 red fox subspecies recognized in North America (Hall, 1981, Perrine, 2005) of which the Cascade fox is one of the three recognized subspecies that live only at high elevations in the mountains of the western United States. The three mountain foxes are: the Cascade red fox (*Vulpes vulpes cascadensis*), The Sierra Nevada red fox (*Vulpes vulpes nectar*) and the Rocky Mountain red fox (*Vulpes vulpes macroura*). According to Aubry (1983), the three varieties of mountain foxes are morphologically and ecologically distinct from both the

more common red foxes of the boreal regions and the red foxes of the Eastern United States. It is also believed that the three mountain varieties of red fox originated from the same ancestral population and are probably more closely related to each other than to other red fox subspecies in North America (Roest 1977, Aubry 1983, Perrine 2005).

Two genetically distinct populations of red foxes exist in Washington; one native and one introduced. It is believed that the common lowland red foxes are an introduced form and the rare, high mountain form is the indigenous population (Aubry, 1983). These populations appear to be completely separated with no interbreeding. Considering that their ranges are separated by uninhabited areas of forest and mountains (Aubry, 1983; Roest 1977). Native mountain and exotic lowland red fox populations can be found in the states of Washington, Oregon and Idaho (Aubry 1983).

Mountain fox ecology and distribution has received little study. We know very little about their diet, exact habitat requirements, activity patterns or winter ecology (Aubry 1983; Kamler and Ballard, 2002). We do know that the Cascade fox lives in the sub-alpine zone above 1500 meters elevation especially along ridgelines and at or a little above the tree-line. Sightings of the Cascade fox in the sub-alpine meadows are more numerous in Mount Rainier National Park than any other area of the state (Aubry 1983).

Mount Rainier is the highest mountain in Washington, with an elevation of 14,411 feet at the summit (http://www.mount.rainier.national-park.com/info.htm, 2007; Martin, 2001). Of particular interest to this study, Longmire, a human-use area that includes employee housing, administration buildings, the National Park Inn, a museum and a store, is located at the elevation of 2,761 feet in the Southwest portion of the park. Paradise, a human recreation area consisting of a hotel, visitor's center, gift shop and

restaurant as well as picnic and parking areas, is located at the elevation of 5,400 feet in the central area of the park (www.nps.gov/mora/interp/faq.htm, 2007). The park encompasses 378 square miles with more than 2 million people visiting the park annually, with the highest number of visitors during the months of May through October (http://www.mount.rainier.national-park.com/info.htm, 2007).

The Cascade subspecies of red fox that inhabits Mount Rainier National Park (MORA) has become habituated to people and have become food conditioned due to human provisioning. The foxes are becoming more aggressive in obtaining food from patrons of the park, which has park officials concerned. Aside from direct feeding by humans, the foxes have been observed going into cars to retrieve food items and begging at the roadside. Anecdotal evidence suggests that feeding has been going on through many generations of foxes in the park. Although the begging behavior has been observed throughout the year, the behavior increases during the breeding and rearing season when the adults have the most need for finding food for their kits (Jim Schaberl, 2006: personal communication). It is important to note that although no patrons have been bitten, this would also be predicted to be the time of year that the mother would be most likely to bite if she feels her offspring are threatened.

My study consists of an extensive survey of available literature related to the subject of habituation and food conditioning in wildlife. To my knowledge this is the first study of its kind investigating anthropogenic impacts to foxes in National Parks. This is extremely important as there are foxes in close proximity to humans in many national parks. These animals, like any carnivore, can and will bite if they feel threatened. This poses a danger to both humans, and the foxes. In a bite situation, there is the possibility of

disease transmission, including rabies. Although there has never been a documented case of rabies acquired from a fox in the state of Washington, it has happened in other states, as foxes are known carriers of the virus. If a bite were to occur in MORA, it is likely that the offender would be captured and exterminated so that the rabies test could be run.

There has been no official census taken of the MORA red fox population. Unofficial estimates of the foxes in the Longmire and Paradise areas range between 7 and 20 individuals (Jim Schaberl, 2006: personal communication). With the foxes denning in close proximity to the road, another very real danger is the possibility of being hit by a car. This has happened in the past to several animals in the population. Vehicular traffic in the area of Paradise is high and only expected to increase over the years. This can only mean more danger to a fox population that dens closer and closer to human areas.

Related studies on other habituated animals draw parallels to the situation with the foxes in this study. This study examined how animals are treated in national parks, both currently and historically, as well as attempted to understand the motivation behind human relationships with wildlife in a park setting. It provides a thorough examination of what measures MORA is currently taking and makes suggestions for potential avenues to pursue that might bring about change to the fox situation.

In addition to an extensive literature review, this study was supplemented with observational data that I collected during the summer of 2006 on the fox population that while rearing kits near the Paradise area. First-hand observation yielded visual confirmation of direct feeding by humans. Furthermore, fox-human interactions were captured on video. The depth and breadth of the extent of habituation and food conditioning in these animals is discussed in detail in Chapter 6.

This study explores possible options on how to reverse the effects of habituation and food conditioning to try to restore the foxes in MORA to a more natural population. The results of this study will be submitted to MORA and will not only benefit MORA in addressing the fox issue, but will potentially be useful to other public parks that have issues with habituated and food conditioned animals.

CHAPTER 2 – FOX FACTS

Indigenous and Introduced Foxes

Red foxes reside in nearly every part of the Northern Hemisphere (Henry, 1996). They live in a variety of habitats ranging from sea level to the sub-alpine and alpine zones in the mountains (Larrison, 1970). There are two types of red fox in the western United States, an indigenous red fox and an introduced red fox. These western United States foxes differ in both their morphology and their ecology. Even coat color or pelage, offers clues to various foxes' behavior and living conditions. These distinctions and characteristics are explored and explained in the following chapter.

There are three major color schemes, known as color phases, of red foxes found throughout the world; red, black (or silver) and a cross phase (Bailey 1936, Kamler and Ballard, 2002). A true red color phase is typical of red foxes throughout most of the Old World, while color phases other than red are typical of indigenous red foxes in North America (Kamler and Ballard, 2002). Nearly all Old World and introduced red foxes pelage is a dark red or cherry color, while indigenous foxes that exhibit the red color phase express in a pale red or pale yellowish color (Merriam 1900, Bailey 1936, Aubry 1983).

In the western United States, using color phase to distinguish between indigenous and introduced red foxes can be deceptive. Because indigenous and introduced foxes can have similar pelage, a better method for distinguishing between them is to look at elevational differences (Aubry 1983, Lewis et al. 1999). In Washington, the indigenous form of red fox is usually found in high mountain meadows at or near the timberline in the Cascade Mountains (Lauckhart, 1970). The lowland red fox that occurs at low

elevations is the introduced form. The introduced and indigenous foxes' territorial ranges do not overlap and are separated by large expanses of forested foothills and mountains containing no fox population (Lauckhart, 1970). It is also thought that since lowland foxes do not frequent high mountain habitats and are not found in the sub-alpine meadows of the Cascades that they have not interbred with indigenous foxes. It can be said that Cascade foxes are restricted to the high elevation habitat, while the lowland foxes are restricted to the low elevations and their ranges do not integrate (Aubry, 1983). It is important to note that indigenous red foxes are not distinguished from introduced red foxes in most management programs of government and wildlife agencies. Biologists need to distinguish between indigenous and introduced red foxes in their management plans, especially in a population of indigenous red foxes such as those in Washington that might be endangered and need protection. While popular scientific opinion is that their numbers are low, exact numbers of these foxes are not known (Aubry, 1983). More research is needed to determine if a separate management strategy should be implemented for their protection. At present, only California has a separate management plan for the native mountain red fox population and the introduced lowland red fox (Kamler and Ballard 2002).

Red foxes in the Western mountains of the United States are unique among North American populations. These mountain foxes are smaller on average than all other indigenous populations in North America and exist in the sub-alpine meadow and parkland habitats at high elevations (Aubry, 1983). These foxes have been historically difficult to study due to the remoteness of their habitat and their historically low population numbers (Aubry, 1983, Perrine, 2005).

In the Pacific Northwest there were no lowland red foxes until the Eastern red fox began to appear in the Skagit Valley sometime in the 1920's. These foxes were likely brought to the area by hound hunters, or were animals that escaped or were released from private fur farms (Aubry, 1983). Whenever the prices significantly declined and fur farming became unprofitable many ranchers turned their animals loose, rather than continue to incur the expense of supporting them (Aubry, 1983). This could have been an important method of introduction of the lowland red fox. Larrison (1970) assigned the lowland foxes to the subspecies *fulva* from the Eastern United States and listed the Kitsap Peninsula in Puget Sound, farmlands south of the Olympic Peninsula, and the north-eastern Puget Sound region as areas of introduction.

Indigenous foxes are a cold-adapted species that occurs in boreal and mountain habitats, whereas introduced red foxes are a generalist species that occurs in a wider variety of habitats. Introduced foxes descended from European red foxes and are better adapted to living among human activities, in urban areas, and in areas of human disturbance (roads, farms, housing, parking areas, campsites, etc.) (Aubry, 1983; Kamler and Ballard, 2002). Introduced red fox populations can now be found in disturbed habitat at low elevations in the Puget Sound basin of Washington and British Columbia (Aubry, 1983). Introduced foxes do not occur in the dense forests of the Cascades, the Willipa Hills in southwestern Washington, the outer coast zone, or the forests and sub-alpine meadows of the Olympic Mountains (Aubry, 1983). Indigenous foxes prefer the less disturbed meadows and parklands near the Crest of the Cascade Range and the dry open forests on its eastern slope.

Cascade Foxes

The Cascade fox is found most abundantly in the sub-alpine zone above 1,500 meters elevation, in the meadows and parklands near the Cascade Crest and the open forests on the eastern Cascade slope (Aubry, 1983). Very little is known about these unique animals, and aside from this study, only one extensive study has ever been conducted on them. It is clear that further research is needed on these animals. Exact population numbers of Cascade foxes are unknown, but Aubry (1983) believed the population to be in decline and possibly at risk of extinction. Of particular importance to this study, sightings of the Cascade fox in the sub-alpine meadows of MORA are more numerous than any other area in the state (Aubry, 1983). It seems that Cascade foxes have historically been active in the Paradise area, with reports from as early as 1919 of an active den in near Paradise (Aubry, 1983). This study discusses an active breeding pair that dens near Paradise in Mount Rainier National Park.

It is not known whether the pair bond lasts for life or just the duration of one breeding season (Henry, 1996). The monogamous pair bond seems to be the usual relationship but it is not the exclusive condition that has been observed. There is virtually no data on mountain fox reproduction but it appears from the few studies done on them that reproductive habits are very similar to the reproductive habits of red foxes elsewhere. Red foxes generally mate during the mid and late winter, usually in January and February, and birth a litter of up to 12 pups after a gestation period of 52-54 days (Larrison, 1970, Lloyd 1980). Foxes may breed in their first winter (Aubry, 1983). In mountain foxes, while 12 pups are possible, more recent evidence indicates that litters of 2 or 3 kits may be more typical according to studies done by both Perrine (2005) and

Aubry (1983). It was postulated by Perrine (2005) that limited resources may be preventing mountain red foxes from achieving the reproductive output that red foxes generally have in more productive environments. Beginning in May the kits appear above ground. At five weeks of age they get their adult pelage, eat solid food, and begin being weaned. At eight weeks of age the kits are totally weaned. The parents bring food to the kits in the den until they are about 14 weeks old, after which they begin to hunt on their own. The offspring will hunt with their parents until the end of summer when the kits, who are nearly fully grown, disperse out on their own (Larrison, 1970, Henry, 1996). Dispersal begins in September or October with the female pups staying into December. (Henry, 1996) In general, foxes rarely live beyond five years in the wild according to Harris and Smith (1987).

The home range of the red fox is a function of surrounding terrain, complexity of habitat and food supply (Ables, 1975). The fox is a territorial animal with a home range usually covering at least several hectares (Susman, 1994). Foxes tend to return to the same geographic area for multiple seasons, but can shift their den site within the area (Perrine, 2005). They have also been documented using the same den year after year (Henry, 1996). Henry (1996) found that a typical fox family will occupy a range of two to three square miles. Foxes that occupy smaller home ranges are thought to do so because there are abundant resources, while red foxes at high latitudes presumably occupy large home ranges due to reduced habitat productivity and sparse resources (Perrine, 2005). Foxes clearly show a preference for edge environments where the hunting is better, and the vegetation is more dense and diverse in the transition zone between two habitats. The more diverse the area, the better foxes seem to thrive in it (Henry, 1996).

Adaptability

Red foxes are one of the most intelligent and adaptable of the wild canids (Ables, 1975). As a testament to their adaptability, it has been noted repeatedly that red foxes prefer to use railway corridors and roads for traveling between habitats (Saunders et al. 1997). In a study performed by Meek and Saunders (1995), foxes consistently used roads and tracks for access to feeding areas. Ditchkoff et al. (2006), noted that roads not only provide ease of access, but they also provide substantial amounts of food in the forms of trash and road-killed animals. The adaptive nature of the red fox is demonstrated well by its ability to forage on a wide variety of foods. Red foxes eat both invertebrate and vertebrate prey, and utilize carrion, human food offerings, and garbage when it is available (Harris 1981, MacDonald 1987 and Lewis, Sallee, and Golightly, 1993).

When a species is exposed to anthropogenic stresses that differ from the selective pressures under which they evolved, they may modify their behavior, or other life-history traits to be successful (Ditchkoff et al., 2006). Individuals in the population that are the most successful in adapting to the new selective pressures will have the greatest reproductive success, leading to changes in morphological, behavioral and genetic characteristics of the population over time (Ditchkoff et al., 2006). Fitness of a population can be enhanced by amiability to humans and tolerance for human environments.

The omnivorous diet of the fox allows for the exploitation of many human foods when they are available. Foxes are adept scavengers, especially when other food items are scarce, and have been observed scavenging from human-use areas (Bubela, Dickman and Newsome, 1998). Foxes will exploit anthropogenic food sources whenever they are available due to the ease of acquisition of these resources. In a study of urban foxes in

Oxford, England, Doncaster et al. (1990) found that scavenged food made up most of the diet. Human refuse provides a rich food resource for foxes (Bubela, Dickman and Newsome, 1998). Although habituated foxes feed on anthropogenic food, non-habituated foxes will eat human food too (MacDonald, 1979). Evidence of anthropogenic foods have been found in fox scat and most likely comes from scavenging. Intentional feeding by people and scavenging of garbage may contribute to much of the human food remains and food packaging found in scat samples. Opportunistically acquired food is difficult to quantify because it is difficult to discern in scat (Lewis, Sallee, and Golightly, 1993).

The natural, undisturbed behavior of wildlife can only be observed in an animal population that perceives humans as neutral stimuli, evoking neither a positive nor negative conditioned response (Henry, 1996). Wild populations that have adapted to human areas may not exhibit natural behaviors. Management efforts of these habituated animals may not be entirely effective because they may be based upon assumptions of what is or should be normal behavior for a wild animal in a given situation, without taking the habituation aspect into consideration (Ditchkoff et al., 2006). With no system available to measure levels of habituation impact on "natural" animal behaviors, park policies often employ educated speculation.

There are many environmental factors that affect the activity patterns of wild animals. The best subsistence strategy for an animal seems to be one in which the timing of the activity allows the animal to get food efficiently while avoiding predation (Eguchi and Nakazono, 1980). The fox is described as a predominantly nocturnal animal with seasonal variation, such as a shift to diurnal activity when eating diurnal insects (Ables 1975, Blanco 1986). When foxes are nocturnal, activity usually begins an hour before or

after sunset and lasts until two hours after sunrise (Eguchi and Nakazono 1980). Female foxes that are nursing kits can be active in the daytime as well as in the nighttime.

Human activity can influence activity patterns of foxes as well. In a study done by Eguchi and Nakazono (1980) the study population of foxes lived near human habitation, so they were likely affected by human activity. It appeared that the frequent passage of cars in the area suppressed fox activity, as did the presence of humans in the area. Foxes tended to avoid humans and human activity. Perhaps the foxes had been (either directly or indirectly) negatively conditioned to humans and human activity. Ditchkoff, et al. (2006) also found that since human activity is generally greatest during the daylight hours, many species will switch their activity patterns to crepuscular (active at night, but most active around dawn and dusk) or to strictly nocturnal to avoid that activity. This is noteworthy, in that the foxes of MORA, especially in the areas of Longmire and Paradise, appear to have the opposite reaction to the presence of humans. These foxes are attracted to cars and seem to prefer denning in close proximity to the roads. This is probably due to positive food conditioning; the foxes see humans as a potential and probable food source.

Diet

Diet is the most thoroughly studied aspect of fox biology (Henry, 1996). The fox is a skillful hunter as well as an excellent scavenger. Food procured through hunting and scavenging presents the fox with the challenge of an unpredictable food supply. It addresses this issue by caching surplus food and hiding it away for future use. Foxes will eat and store whatever acceptable food is readily available and feeds on a wide variety of foods (Henry, 1996, Larrison, 1970). Rodents and lagomorphs (rabbits, hares and pika)

dominate the diet, with birds, insects, fruit, carrion, garbage and other foods important seasonally (Perrine, 2005, Ables, 1975). Aubry (1983) found that pocket gophers appear to be an important dietary component of the foxes of MORA. He believed that Cascade foxes may have been selectively preying on them, which suggested that they might be specialized predators of pocket gophers.

The diet of Cascade foxes is variable throughout the year and is based on the seasonal availability of potential food items. These findings are consistent with virtually all studies on the food habits of red foxes (Aubry, 1983). In Aubry's study (1983) he found that during the months of January through March, the foxes depended heavily on mammals in their diet but they also scavenged on garbage when food was scarce. During the months of April and May, birds began to appear in low numbers in the scat, and continued at low levels until November. During the months of June and July, insects became a large component of the diet and mammals began declining in importance. In August, the largest component of the diet was fruit and mammals were at the lowest dietary importance. When food was plentiful, scavenged garbage was rarely found. In September and October, fruits and insects decreased and mammals increased in the diet. In the months of November and December fruits declined and birds and insects were absent (Aubry, 1983).

Without a single, naturally available, dietary staple, red foxes may look to other sources of food, especially in the winter (Perrine, 2005). Human foods can help sustain animals during times of scarcity. It seems very unlikely that foxes ever come to rely solely upon anthropogenic food sources. In every documented case of human food in fox scat, evidence of natural foods has been found as well. Along with popcorn and candy bar

wrappers, scat has been known to contain any combination of hairs, bones, feathers and seeds (Perrine, 2005). In a comparison of urban and suburban foxes, Doncaster, et al. (1990) found that scavenged items formed 20-50 percent of the diet of both populations. These findings are consistent with those of other studies. Anthropogenic foods, it can be concluded, are supplemental in the diet of the fox.

CHAPTER 3 – HABITUATION AND FOOD CONDITIONING

Habituation is a behavioral response to repeated stimulus that results in a waning of reaction resulting in the loss of a fear response (Sinha, 2001). Animals that are repeatedly exposed to a neutral situation, such as a person observing them from a close distance, conserve their energy by muting their reaction. Animals can habituate to a variety of cues directly associated with people such as our scent, what we look like, and the sounds of our voices. They also habituate to items associated with humans such as cars, roads and buildings (Herrero et al. 2005). Foxes in the Bremner-Harrison, et al. study (2004) saw vehicles at the breeding center and became habituated to the sight and sound of vehicles in their environment, causing them to no longer fear them. In Yellowstone National Park, some brown bears learned to tolerate people at roadsides because of the absence of negative experiences for the bears. They also did this because by tolerating people they were able to access resources that might not be available otherwise (Herrero et al. 2005).

"Habituation" refers to wildlife becoming acclimated to the presence of people. It is a common technique utilized by wildlife researchers to gradually acclimatize a study population to the human presence so that data can be gathered with little disturbance to the population. In contrast "food conditioning" is the process by which food rewards may encourage undesirable wildlife behaviors such as exploring campgrounds or begging. Habituation also differs from negative conditioning, in which unpleasant stimuli are used to discourage the use of a site or situation (Herrero et al. 2005).

Conditioning is learning that involves receiving a reward (positive effects) or punishment (negative effects) for a response to a stimulus. Whether in laboratory trials or

in the wild, animals come to associate reward or punishment with a stimulus and will repeat the behavior if it is rewarded or refrain from the behavior if it is punished. Food conditioning occurs when an animal receives a food reward and associates the positive effects with the person or place where it was received. The animal then returns to the person or place expecting to receive another food reward (McCullough, 1982). Many animals residing within national parks become food conditioned due to access to garbage, campsites and curious humans, all of which provide the positive food reward that reinforces the food conditioned response. Foxes are especially prone to food conditioning due to the fact that they are opportunistic feeders that take any edible food that is available (Ables 1975).

Negative conditioning has been used as a way to discourage food conditioned animals from continuing to seek food from humans. One method of negative conditioning is known as conditioned taste aversion (CTA), where an animal associates the taste of a food with feeling ill, and subsequently develops an aversion to that food. It can be done by adding an undetectable, illness-generating chemical to the food (Herrero et al. 2005). CTA chemicals should ideally be tasteless and odorless, physically stable at ambient conditions. They should induce temporary nausea shortly after ingestion (Massei et al, 2003). Previous studies found that animals that ingest food treated with an illness inducing chemical quickly learn to avoid that food even when the chemical is not added to it (Massei et al, 2003). CTA has been successfully used to modify fox behavior, from preventing foxes from preying on domestic animals to aiding in shaping natural behaviors of reintroduced populations. A study utilizing a chemical called levamisole indicated that foxes suffered only a mild, transitory malaise after ingestion. Therefore, levamisole-

treated foods could be safely used to manage problems posed by foxes (Massei et al, 2003).

Although there have been positive results utilizing CTA, this technique is often expensive and most of the results have been inconclusive (Hunt et al. 1988). While CTA is a viable option when the fox is preying selectively on one food, it is not logistically viable in a national park where a wide range of human food is available to the animal. For example, researchers might successfully achieve a taste aversion response for hot dogs, but the conditioned taste aversion does not transfer to, say, hamburgers or candy bars. It would be impossible to try to treat every food that the animal might come in contact with through scavenging, begging or dumpster diving.

While animals that are food conditioned have learned to identify humans or human-use areas as sources of food due to a prior food reward, habituated animals have learned to tolerate people, vehicles, and human structures at close distances (Gunther, 1994). In essence, habituated animals become desensitized to human presence. Habituation is more difficult to manage than food conditioning, because habituation involves factors that are harder to control, rather than simply restricting human food availability (Mattson and Reid, 1991). Habituation itself is not necessarily a problem and can actually allow visitors to view naturally reclusive animals in places like national parks. In an area that receives a large number of visitors, habituation to the human presence seems inevitable, due to the sharing of natural spaces by both animals and humans. Although habituation certainly facilitates food conditioning, this connection is not inevitable and can be controlled with careful management while reducing the risks of danger to both animals and human visitors. Understanding habituation and food

conditioning is central to making informed decisions for the management of both wildlife and people.

CHAPTER 4 – HABITUATION AND FOOD CONDITIONING IN NATIONAL PARKS

Of all of the resources contained within the United States national park system, wild animals are indisputably among the most important, both to visitors and park managers, and are as a consequence a dominant management concern (Wright, 1999). Animals such as the foxes of MORA are a highly visible part of the fauna of the park. Congress has mandated that national parks should be managed for both preservation and recreational use (Biel, 2006). This can at times cause a conflict of interests, when preservation means to support an intact wilderness environment, and the creation of recreational sites allows humans into the landscape. Human-use areas inherently cause some type of damage to wild environments. Management of intact ecosystems can be problematic because the ecosystems themselves are dynamic. There is no original condition for an ecosystem, fixed at one specific point in time, and daily activities can affect the future integrity of the whole ecosystem (Higgs, 1999).

Is a national park ecosystem a natural environment, and what does that mean in terms of management decisions? Wright (1999) contends that parks are certainly more "natural" than the managed landscapes common throughout the rest of the country. Still, to what degree can a national park that receives millions of visitors every year be natural or wild? Furthermore, what do our conclusions tell us about the behavior of animals, and their management in such an environment?

Animals that reside within national parks, like animals that exist in other human-use areas, learn to adapt to the human presence in their environment, and may even become attracted to humans and human-use areas. In turn, humans learn to adapt to the presence of wildlife in our environment. To some, wildlife can seem tame or even pet-

like. This perspective is reinforced by both the domestication and anthropomorphication of wildlife shown in films and the media, and the perception of meaning behind behavioral responses of food conditioned and habituated animals (Mitman, 1999). One thing is for certain, when it comes to management, adverse impacts of interactions between wildlife and tourists should be minimized (Sinha, 2001).

Humans are part of the wilderness experience in national parks whether we realize it or not. The animals in national parks and other wildlife areas do not live in a vacuum, free from human influence. Managers should be encouraged to integrate the human element into their existing management views because they are part of the system. Habituation and food conditioning are behavioral responses to the human influence in the wilderness environment. Anthropogenic impacts on wildlife have been occurring ever since humans entered the wild realm. There have been many studies done in many places to determine the extent and effects of the human presence on wildlife, but no place so starkly highlights anthropogenic impacts in national parks than the bear-human interactions in Yellowstone National Park. A historical examination of management efforts within Yellowstone illustrates missteps as well as triumphs, and can teach us about future management efforts.

Wright (1999) referred to the first national parks in the United States as "novel experiments built on an uncertain foundation." It was a time when park managers had very little understanding of how parks should function and what they should look like. In the beginning, parks were managed so that the existing natural systems could be maintained or enhanced through protection of the resources. It was during these early

years that Yellowstone National Park was established. It is clear that there were many management mistakes made during that time.

Ever since Yellowstone National Park was established in 1872, the park has had a documented history of bear-human interactions (Gunther, 1994). In the early years, the park operated a zoo within its boundaries that allowed park visitors an up close view of wildlife. This zoo was eventually closed due to the poor living conditions of the animals (Biel, 2006). The mere existence of a zoo within the park was the first step in blurring the lines between tame and wild animals at Yellowstone. Also, in the early years, the park established bear feeding areas where the public could come and watch wild bears feed on the park's garbage. In the mind of the public, this established a link between human food and the survival of the wild bears within the park. Yellowstone condoned the regulated feeding of bears at these "lunch counters," and tacitly gave patrons permission to feed bears themselves. Many park visitors read between the lines and began feeding bears on their own at the roadsides in the park, falsely assuming that it was alright to do so. It was a short leap from tourists' watching bears being fed to tourists habitually feeding bears themselves (Biel, 2006).

In 1910, the first reports of black bears begging for human handouts along roadsides were recorded. By the 1920s, roadside begging by black bears for human food and handouts was a common sight (Gunther, 1994). Roadside feeding transformed passive spectators into active participants and allowed the park visitor an opportunity for interaction with park wildlife. These visitors became shapers of bears' lives and behavior (Biel, 2006). As park visitation increased, so did the number of bear-human conflicts and injuries, causing concern for the park management. Where park management was mostly

informal from the park's inception through the 1950s, it soon became apparent the policies had to change to address the new dangers and issues (Gunther, 1994). In 1960, a management program was implemented in an attempt to remedy the problem. This program initiated expanded efforts to educate visitors about bear behavior, methods for reducing bear-human conflicts, and proper storage of food, garbage, and other bear attractants. Management also decided upon stricter enforcement of regulations that prohibited the feeding of bears. In 1970, a management strategy of even more intensive bear management efforts strictly prohibited the feeding of bears were developed alongside regulations that required human foods be kept secured from bears (Gunther, 1994). Of course, policy is one thing and enforcement is another. Given the decades of subtle encouragement of bear feeding through lax enforcement, the 1970 changes were difficult to implement (Biel, 2006).

It was also in the early 1970s that the bear feeding grounds or "dumps" were finally closed. The dumps were an important food source for the bears and their closure ultimately contributed to a dramatic decline in the Yellowstone grizzly bear population (Mattson and Reid, 1991, Craighead and Craighead 1972). While the closure of the dumps was a huge step in changing the public's view of human feeding of wild bears, the many years of lax enforcement of public feeding at roadsides coupled with the idea that feeding a bear had become part of the "Yellowstone experience" made changing visitor behavior increasingly difficult (Biel, 2006). Additionally, food conditioning had become part of normal bear behavior – so even if people ceased feeding – bears would still seek food from humans. Once established, feeding habits proved hard to break. Visitors

continued to illegally feed the bears despite major changes in National Park Service thought and policy (Biel, 2006).

A successful return of the wildlife to its most natural state required change to more than policies and regulations; it required a change in the way people viewed bears. Before park managers could change the behavior of visitors they had to convince their own staff that a more "natural" Yellowstone bear was a more desirable Yellowstone bear. This meant that they had to hold everyone to the same regulatory standard, visitor and staff alike (Biel, 2006). Biel (2006) postulated that park managers were reluctant to implement change for fear of alienating park visitors through strict enforcement and fines, as well as scaring visitors away because they were afraid of the "dangerous" animals. Park managers also may have worried that the lack of a bear encounter would make Yellowstone National Park a less attractive destination. Law enforcement coupled with relocation efforts of "problem bears" did result in bears being more difficult to see in the park. Despite the many reasons for the limited enforcement of regulations, it was eventually decided that strict enforcement was in the best interest of all those involved.

Enforcement of the no feeding rules was a key component of Yellowstone's program to recreate a natural bear population. It became clear to park staff that people are more likely to ignore signs than to ignore people in uniform, so Yellowstone's managers finally resorted to crowd management. Park staff patrol the areas where feeding is most likely to occur and strictly enforce the laws that are designed to keep bears and humans apart (Biel, 2006). Park staff also use aversive conditioning to scare the bears away from human use areas. After several instances of aversive conditioning, bears will learn to recognize trucks and uniforms of the hazers and will simply move out of the way when

they see the rangers coming (Gunther and Hoekstra, 1998). As a side note, the foxes in the Paradise area of MORA who have been subjected to aversive conditioning have also learned to identify rangers by their trucks and uniforms and will react in a similar manner. Although people seem generally aware, at this point, of some of the reasons not to feed, continued vigilance and education efforts will always be necessary. There will never be a shortage of new visitors to national parks, so there will always be a continued need for education and enforcement to ensure the well being of both humans and animals (Biel, 2006).

Education

Visitors to national parks have to be educated to appreciate the value of wildlife according to the principles of nature (Mitman, 1999). Public education and general awareness about biodiversity conservation is a valuable tool to reduce tourism impacts. However, changing attitudes toward wildlife is not an easy task (Sinha, 2001). National parks attempt to educate their visitors with a variety of methods including brochures, signs, and visitor center programs. All of these methods carry in their text ways to educate people to minimize and accept the risks of being around wildlife. These efforts appear to be inadequate. There is still a large gap between real and perceived risks from wildlife (Mattson and Reid, 1991).

In regards to signage, current managers feel the simpler the better, and that the best signs consistently remind people to be alert and aware and perhaps seek more information from a ranger if they have any questions. Signs are found everywhere within parks, on campsite receipts, flyers, campground bulletin boards, in the newspaper, on

maps, in restrooms, on picnic tables and in any other informational literature available to the public (Biel, 2006). Signage is a useful tool, but does not seem to be effective on its own (Biel, 2006, Mattson and Reid, 1991). Another important component is enforcement. Only when messages in the literature and signage are accompanied by logical, palpable, consequences, most often in the form of removal of actual money from people's wallets as punishment for their actions, do visitors begin to change their behavior (Biel, 2006).

Harold Werner (personal communication, 2006) said that the public needs to know what to do, and park officials need to give them the tools (educational materials and animal-proof facilities) and the motivation (citations) for success. It is clear that visitors need to be provided a clear message about the dangers of feeding wildlife, the laws and consequences associated with feeding and expectations of a visitor to the park. Park signage and literature should include the dollar amount of a feeding citation. Consistent enforcement should always follow every instance that a visitor is caught feeding.

Brochure Comparison Study

Park literature can be a very useful educational tool to inform the public about park features, rules and policies. These publications should be simple, straight forward and appeal to a large demographic of park users. The writing should be large enough to be read easily and the wording should not be too crowded, so as not to lose the message in a deluge of information. Each visitor is provided the park literature when they enter the park with the ultimate goal that the information the literature provides is utilized by the visitor during their stay.

There is an extensive effort on the part of the management of MORA to discourage visitors from feeding the park's wildlife. There is signage at all picnic areas within the park and signage posted on every door of the visitor center discouraging feeding (Appendix, Example 10). Signage is prominently displayed in areas of high traffic feeding, but feeding also occurs outside of these areas within the park.

Signage within MORA does specifically address the issues associated with feeding wildlife. A review of the literature handed out to visitors entering MORA reveals very little mention of feeding the park's wildlife. Currently, this literature includes a sentence on the bottom of the back of the map of the park that says "Keep wildlife wild. Do not feed or harass wildlife, including birds" (Appendix, Example 5). This sentence is buried in the middle of the section titled "Regulations" (Appendix, Example 5). This section is printed in about a 7 point font (example). This paper is printed in a 12 point font, by comparison. Interestingly, the section of the same map titled "Wildlife", which also has a color drawing of animals next to it, mentions the types of wildlife that can be seen in the park but neglects to mention any repercussions for feeding or interacting with them (Appendix, Example 6).

MORA's newspaper is also given out to visitors at the gate. On the third page of the paper there are a few references to animals: "Do not feed or disturb the wildlife," "Never feed a black bear, either intentionally or by leaving food unsecured," and "respect wildlife" (Appendix, Example 7 and Example 9).

Personal Reflections on Park Literature and Education

Given the pervasive problem of food-conditioned wildlife within MORA, and the efforts of park management to stop feeding, the following changes could help improve park literature to convey the message that wildlife feeding is illegal, dangerous and harmful to the animals. The process of revising MORA's literature begins with a comparison study of other national park's literature. A sample was taken of other national parks to see how they addressed the issue of feeding and if one or more of them could serve as a model to improve upon MORA's materials. Materials related to feeding animals were collected from 30 national parks within the United States and Canada. Lassen Volcanic National Park in California and Prince Edward Island National Park in Canada both have known problems with food-conditioned foxes. Of the remaining 14 responses to the original solicitation, the rest of the parks were chosen at random. The 15 responses (14 from the United States and one from Canada) contained all of the materials that are distributed to every visitor at the entrance gates.

Although all of the park materials came from national parks, the messages that they conveyed about human-wildlife interactions (including anthropogenic feeding,) varied widely. Messages ranged from a single sentence six pages into the park newspaper asking not to feed the animals, to several pieces of literature given at once that clearly stated that feeding the animals in the park is illegal and detailed why it was harmful for both humans and animals.

A further examination of MORA's materials, shows no discussion of consequences of feeding. Risks to the animal and to the human participating in the feeding are absent. It is very important that in addition to stating people should not feed

wildlife, the literature and signage should explain why visitors should not feed the animals. This will aid park-goers in their understanding and allow them to make informed decisions about their actions based on an understanding of the consequences.

I believe that the literature at some of the parks I surveyed might serve as a guide to improve on MORA's current literature. The best model to follow comes from Lassen Volcanic National Park (LVNP) in California. LVNP has a similar situation with the foxes in its park and has opted to be more direct with park literature as part of a deterrent program (Appendix, Example 1 and Example 2). One flyer (Appendix, Example 2) clearly states not to feed the foxes specifically. Bold red type and a picture of the fox is useful in grabbing the visitor's attention, while the wording is clear and concise and conveys the message efficiently. The message in the middle of the flyer states that human actions can have fatal consequences for wildlife. The other flyer (Appendix, Example 1) also utilizes bold red type and color pictures of wildlife to convey the message. This flyer details how feeding wildlife is potentially harmful to humans and wildlife. Keeping each section to four bullet points, utilizing clear and concise sentences, ensures that the flyer will be read and understood easily.

LVNP appears to be successful in its multi-layered methods. A combination of visitor education, consistent enforcement and aversive conditioning (using "Super Soaker" water pistols on foxes that approach humans for food) has proven to work. Whether it is educating the public utilizing literature, strict enforcement or the methods being used to deter foxes from seeking anthropogenic food, or a combination of the three, The strategy undertaken by Lassen Volcanic National Park seems to be working, as the

foxes are now less inclined to approach visitors in an attempt to procure food (John Perrine, 2006 : personal communication).

The flyer from Crater Lake National Park might also serve as a good model for MORA (Appendix, Example 3 and Example 4). The fact that feeding wildlife is illegal is printed in large letters at the top of the flyer. The fine for breaking this law is expressed in unmistakable wording. An awareness of the fine amount acts as a deterrent to feeding when park visitors are approached by a food-conditioned animal. This flyer outlines why feeding is illegal, and discusses the potential dangers to humans such as fleas and ticks that are carried on the animals. The font size could be larger and the wording is a little crowded, but on the whole, this flyer serves as a useful model.

Park literature is only educational and informative if people read it. Therefore, it should be the goal of the national park to make the materials as user-friendly as possible. MORA should continue to distribute the current materials to visitors, but could include a few quick-read flyers that convey primary messages clearly, concisely, and that are easy to understand at a glance.

Another point of consideration in designing park materials, is the fact that many park visitors may not be able to speak or read English, small print or may not understand the written materials handled to them. The lack of non-English signage and literature suggests that parks are not concerned about reaching foreign-language speakers. Just as national parks had to adjust practices and policies in light of increased ecological awareness, today's parks need to adjust to an increasingly multi-cultural America. This adjustment need not be one of cumbersome, text heavy, multilingual literature. Simple, iconic signage and handouts could effectively convey the parks rules.

Elderly visitors with poor eyesight, non-English speakers and those who can't read English may not be able to understand the rules about feeding. The park should create an insert for the literature that conveys all important messages through images, such as a hand feeding a fox with a big red circle with a line through it over it, in the style of Big Bend National Park or Olympic National Park (Appendix, Example 8 and Example 11). A simple flyer that graphically displays that feeding is not allowed will go a long way toward solving the feeding problem. It is also advisable to have these flyers made into signage and placed in high traffic areas.

The simple addition of quick-read flyers, such as LVNP provides, to the existing literature handed out to visitors could be extremely useful in discouraging people from feeding foxes and other wildlife. User-friendly literature coupled with consistent enforcement through fines, and aversive conditioning such as the usage of water guns could help return the foxes on MORA to a more normal way of life. Foxes by their nature exploit any available food source, and will exploit the source that is the easiest to get. Given the prevalence of humans in their environment, there is probably no way to completely stop them from seeking human foods. The park's goal should be to minimize feeding as much as possible for the health and safety of both the foxes and human visitors.

Signs of Success

Research has shown that many safety concerns related to bear populations during the 1960s-1980s have been all but eliminated by not allowing bears access to people's food or garbage. Preventing access to anthropogenic foods keeps bears from being

positively rewarded for close association with people (Herrero et al. 2005). As a testament to the success of this idea, most bear-human conflicts prior to 1983 involved food-conditioned bears aggressively seeking human foods. From 1983 - 1993 most bear-human conflicts involved habituated, not food conditioned bears seeking natural foods within developed areas and along roadsides (Gunther, 1994). This shows that the combined efforts utilizing aversive conditioning, education and enforcement was working. Today, habituated, but not food-conditioned, bears are now the cause of most bear-human conflicts occurring within Yellowstone National Park (Gunther, 1994).

Public education programs and programs designed to prevent wildlife from obtaining human foods must remain a permanent management priority within the national parks. Recognizing the importance of enforcement and consequences in changing visitor behavior toward wildlife should also be a priority. We can learn a lot from a brief examination of bear-human conflicts in Yellowstone National Park that can be applied to wildlife-human conflicts in other national parks around the country. Management decisions over the years within Yellowstone National Park can also illustrate that we can never know what is best for a wild system. We only can look back after management has been done to see if it was beneficial or not, and then redirect our efforts and policies to fit our new ideas.

CHAPTER 5 – HUMAN MOTIVATION AND DANGERS OF FEEDING

Human Motivation

The feeding of wildlife has long been a popular way for tourists and tourism operators to facilitate close observation and interaction with wildlife in the wild. It must be pointed out that tourists are not the only people who feed wildlife. Researchers have utilized food provisioning as a means to obtain reliable behavioral data on species that would be difficult to observe otherwise (Orams, 2002). Conservation programs also utilize supplemental feeding in declining and endangered populations to assist them in their survival. Deliberate feeding to aid in the rehabilitation of injured or sick animals and the use of supplemental feeding to aid the recovery of an endangered species are the only reasons wildlife should ever be fed deliberately (Orams, 2002). Food conditioned animals lose their fear of humans and associate humans with food, which can be dangerous to both animals and humans. Deliberate feeding is detrimental to wildlife and alters natural behavior patterns and population levels (Orams, 2002). Where food is limited, supplemental feeding may increase local carrying capacity, and conversely, a population crash can happen when the supplemental feeding is reduced or ceased (Lewis, Sallee, and Golightly, 1993). Long term effects have population implications both for predator and prey species where there can be changes in density, structure and distribution (Sinha, 2001). Supplemental feeding of predators will decrease the predation pressure on their natural prey. This can result in artificially inflated populations of certain prey species which may upset the delicate ecological balance for specific species in certain areas (Orams, 2002). It can be an event from which an ecological community may never recover. Still, when a species is in danger of elimination, responsible ecological

management efforts might need to include the feeding of animals by qualified biologists. The most common approach for managing wildlife feeding in national parks and other public areas is to prohibit such practices. These bans on feeding have proven to be extremely difficult to enforce and often have low levels of compliance (Orams, 2002).

To create the best possible (most comprehensive) policies and deter visitors from feeding animals, we need to find out why people continue to feed the wildlife, despite the fact that is against the rules. There are a wide variety of reasons that people feed. In general, people feel that feeding wild animals allows them to get closer to and commune with nature, and brings wildlife closer so that they can see animals that might otherwise be impossible to see (Orams, 2002; Smith, 1998). Biel (2006) recounts interviews with park-goers in which people did it because it was "fun" and they did it for the stories they could later tell their friends and family. In a study of human provisioning of mountain sheep by tourists at Mount Evans in Colorado, Lott (1988) addressed the motivation behind people choosing to feed the wildlife. Like Orams, Smith and Biel, Lott found that people often stated they did it to get closer to nature and to bring the animal closer to them so they could observe or photograph it. A few people reported that they did it to do something nice for the animal. Interestingly, Lott found that one important reason why people hand feed is to have the animal take food from their hand to show that it trusted them. This is because many people believe that animals are better judges of people than people, and that if a wild animal demonstrated that they trusted them it would reflect favorably on the person. It made people feel better about themselves to have an animal take food from their hand (Lott, 1988).

Dangers of Feeding

It seems clear that many people have a very limited understanding of the dangers associated with feeding a wild animal. Visitors seem to think that wild animals somehow become "tame" when they venture into human landscapes, and that these habituated and/or food-conditioned animals somehow bridge the gap between wild and tame. By feeding the animals, visitors feel more at home in nature while at the same time get a taste of the "wild" in their interactions (Biel, 2006). There are very real dangers to both humans and wildlife when feeding occurs. Below is a thorough examination of the dangers associated with anthropogenic provisioning of wildlife, and why feeding should be discouraged.

First and foremost, it must be stressed that park animals are wild animals that will behave unpredictably if threatened or frightened. Intra-species and inter-species aggression has also occurred where wildlife, in their efforts to obtain food, have harmed one another and harmed tourists (Orams, 2002). As an illustration of the dangers of food-conditioning, two dingoes mauled a nine-year-old boy to death and bit his seven-year-old brother at a popular Australian holiday spot. Locals blamed tourists for feeding scraps of food to the dingoes, many of which roam freely on the island and have been known to attack humans (Orams, 2002). Most animal-related injuries to park visitors occur when people attempt to feed or approach animals that are begging for human food (Orams, 2002). There are numerous cases in which wildlife fed by humans have become brazenly aggressive toward humans. Large mammals such as bears, kangaroos, dogs, raccoons and possums have become aggressive as a result of regular feeding (Orams, 2002). Attacks on tourists have occurred in some situations when tourists underestimate the potential danger

of wild species, even though they are already habituated to humans. Tourists may believe that an animal as small as a fox or a possum is too small to inflict any real harm. Unfortunately, that is not the case. Attacks on humans usually occur during nursing season when parental instinct to protect their young is at its highest level. (Sinha, 2001) Likewise, in MORA, food demand is highest for the foxes during the rearing season which also coincides with the period that they are most visible in human areas begging for handouts. Foxes are about Jack Russell Terrier size, or about 15 – 20 pounds. Behaviorally, they are not like a pet dog, they are wild animals and can be very unpredictable. The potential for an attack is high with a protective mother, inexperienced kits and humans that are unaware of the dangers involved. There is always an element of risk to the visitor who enters another species' environment and interacts with its members (Fa, 1992).

There are many potential health and safety risk to the public. Transmission of diseases from humans to wildlife and vise versa, is a major problem associated with close contact, including feeding (Sinha, 2001). More bites are recorded in the summer because of higher visitor numbers and may result from lack of visitor supervision (Fa, 1992). The possibility of disease transmission between park visitors and the foxes of MORA dominates the rest of this discussion.

Of all diseases deadly to foxes, rabies is the most widely known (Ables, 1975). Although there have been no documented cases of rabies in the foxes of Washington state, the disease does exist in other animal populations and could present itself anytime in a fox population, as they are known carriers of the virus. Rabies can apparently be latent in skunks, some species of bats, and possibly foxes until some unknown

mechanism triggers an outbreak (Ables, 1975). This fact has enormous implications for the perceived risk of rabies in foxes and the actual danger associated with fox encounters. Domestic canine diseases such as parvovirus, distemper and canine hepatitis can be transmitted through direct contact with visitors and affected pets, or indirectly if brought into the habitat by unsuspecting visitors. These diseases have significant impacts on fox populations (Ables, 1975). There are no data on the impact of rabies, canine distemper or other diseases upon mountain red fox in North America, but these diseases are known to have significant impacts on other red fox populations (Voigt 1987).

Aside from disease transmission, there are other health risks to humans who associate with foxes. Foxes can also be infected with parasites such as the mange mite (*Sacoptes scabei*) and intestinal worms (Ables, 1975). One species of trematode (*Alaria parcianae*) and three species of cestodes (*Mesocestoides sp., Dyplidium caninus and Taenia sp.*) are found in Cascade foxes. These species of parasites utilize either small mammals or fleas and lice as intermediate hosts (Aubry, 1983). Humans who come within close proximity to a fox are at a high risk of transmission of parasites or disease from an infected fox.

The danger is not confined to human visitors, as there are many dangers associated with human provisioning to foxes as well. Effects from consumption of human foods can range from mortality, depleted nutrition, fluctuation in population density, structure and distribution, abandonment of young and dramatic changes in behavior including aggression, energy depletion, and disease transmission (Sinha, 2001). Feeding foxes can ruin their natural foraging instincts and introduce other problems. Additionally, feeding foxes in the present can adversely affect foraging and hunting instincts for

generations to come, causing them to become dependent on people. This can be a significant problem during the winter months when there are fewer visitors. Silva, et al, (2005) demonstrated that the feeding of red foxes in Prince Edward Island National Park has negatively affected the normal behavior and activities of these foxes. Anthropogenic feeding not only compromises the safety of the human visitors to national parks but also the safety of the animal residents (Smith, 1998).

Vehicular traffic, as common as it is to people poses a catastrophic threat to MORA's foxes. Animals that are accustomed to receiving food from people will frequent areas where there is a lot of human activity. Begging behavior in these areas can increase the risk of injury or death due to vehicle strikes (Perrine, 2005). Red foxes that are fed on roadsides become habituated to humans and vehicles, which increases the dangers associated with the situation (Silva et. al., 2005). Speed is a also a factor in dangers associated with vehicle strikes. Visitors driving too fast is a perpetual problem in national parks and animals suffer the consequences (Biel, 2006). Animals that become habituated to human contact and learn to associate human activity with food are at greater risk of injury as a result of their close relationship with humans than those that do not (Orams, 2002).

Even in seemingly incident-free interactions, park visitors may be adversely affecting fox health through malnutrition. When people feed foxes, they might get plenty of calories, but they may not be meeting their nutritional needs (Smith, 1998). When foxes eat whole mammals, bones and all, they are getting needed calcium. Animals that are not accustomed to eating processed food can suffer from severe health problems (Orams, 2002). The feeding of "junk" food, which is highly palatable to the animals, and

may contain food coloring, hydrogenated oils, trans-fatty acids, preservatives, and artificial sweeteners, which could cause indigestion, diarrhea, illness, etc. In addition to the impact supplemental feeding has on nutrition, it also has a significant impact on foraging and behavior. It can also result in the contraction of the animal's home range to the area where the visitors are (Fa, 1992). Human provisioning can also exacerbate aggressive interactions among members of a provisioned species causing social stress, especially to the subordinate animals, and might decrease the stability of groups (Lott, 1988).

The life of all predatory animals is a constant balancing act of energy spent for food caught. Wolves and bears use this method to expend the least amount of energy to gain the food source. Wolves do this by targeting the ill and elderly elk and the bear does this by standing in the river and letting the salmon come to her. Foxes are no different and will utilize similar methods to limit their energy expenditure in the search for food. Supplemental feeding of wild animals often results in a major change in the amount of time and effort directed by the provisioned animal in obtaining food. Supplemental food sources require less effort on the part of the animal to obtain. It quickly becomes the more attractive option, causing the animal to lose the ability and skills needed to forage for itself as it becomes dependent upon human handouts (Orams, 2002). Food-conditioned animals become less efficient at hunting and foraging. Offspring learn skills for obtaining food from their parents. In extreme cases, offspring of human-dependent parents may never acquire the skills to feed for themselves (Orams, 2002; Martin, 2001).

National parks are valuable because they protect wildlife populations and their habitat and play a crucial role in wildlife conservation. (Henry, 1996) Parks allow

opportunities for humans to observe wildlife in its natural surroundings. It should be the goal of park managers to manage visitor impacts and to stop supplemental feeding of wildlife with anthropogenic food. There are many real dangers to both the human visitor and the wildlife involved. If feeding encounters are prohibited and enforced these dangers can be significantly minimized or eliminated.

CHAPTER 6 – THE FOXES OF MOUNT RAINIER NATIONAL PARK

Study population

Maintaining safe environments for wildlife and visitors in a national park requires active management by park officials (Herrero et al., 2005). It is the responsibility of park officials to actively enforce rules and educate visitors to protect the safety of people and wildlife. This chapter includes personal observations from the summer of 2006 of the foxes in the Paradise area of MORA.

The study population of foxes in the Paradise area of MORA consisted of five foxes. A large black phase fox who is presumed to be male and the father of the kits, is known as "(M1)" in this study. (M1) was seen in public use areas tolerating humans in his proximity, but did not appear to be very habituated due to the fact that he always kept his distance and did not approach humans during these observations. There was one strawberry blonde phase fox who is presumed to be female and the mother of the kits, known as "(F1)" in this study. (F1) was mostly seen around the den site area. She fled at the sight of people, suggesting that she was not habituated – or simply protective of her young. There were two kits during the summer of 2006, presumed to be approximately 10 weeks of age at the first time of observation. Both kits were cross phase in coloring and were distinguishable from each other by eye color. One kit had light brown eyes and the other kit had dark brown eyes. The kits are known in this study as "LEK" and "DEK". The kits were both habituated and extremely attracted to human presence. There is one pale yellowish blonde fox, presumed to be female, known as "Limpy" for this study due to a pronounced limp in its left hind leg. Limpy has been a habitual beggar in the Paradise area for several years and is very habituated to humans. Determination of sex and

relationship is based upon my own observations and is supported by observations of park staff. Further study is needed to be done to confirm sex and relationship between the individuals in this population.

Habituated and food conditioned wildlife tend to center their activity around human use areas, since it is in these areas that they can readily and easily locate food. Aside from direct feeding by visitors, another source of anthropogenic food is indirect feeding. This occurs when visitors aren't careful about food storage or disposal. The control of human refuse should be central to any fox management strategy (Bubela, Dickman and Newsome, 1998). While performing observations around the Jackson Visitor's Center at Paradise on MORA, I counted five open top garbage cans around the Center. This allows easy access to garbage for an animal adept at retrieving it. Red foxes are intelligent and adaptable and will utilize human garbage if it is available. An interesting side note from my observations is that the air outside the Visitor's Center often smelled of food from the grill inside. It is easy to imagine how the aroma of hamburgers might attract omnivores like foxes to the area and increase the incidence of begging behaviors and human provisioning.

In terms of behavioral changes brought about by human provisioning, it is clear that foxes can change from day to night activity depending on availability of food. With the case of park beggar foxes, they appear to be most active when people are around, thereby maximizing the possibility of obtaining food. Unlike many wild fox populations that have a nocturnal or crepuscular activity pattern, the foxes of Mount Rainier are active when people are around. They tend to be the most active in the early mornings and evenings a few hours before dusk, but have been seen at all times during the day. This

activity appears to be a response to the availability of food that is associated with park visitors and the ease of foraging in the dusk hours after visitor activity has slowed down.

It has been documented in both LVNP and MORA that red fox core areas tend to center upon campgrounds and parking lots, in both the summer and the winter (Perrine, 2005). The range of reliance on human use areas by foxes for food is variable and is dependent on location and rule enforcement. In isolated areas and where feeding red foxes is more restricted, a fox may exhibit more "wild" characteristics, relying less on human food (Silva et al., 2005). In other situations where visitors readily feed foxes and human refuse is available, foxes may rely more heavily on the anthropogenic food source for their sustenance. In a study by Silva, et al. (2005), the foxes of Prince Edward Island National Park showed an obvious preference for human use areas, with one group in the study, relying more heavily on human use areas than the other groups to acquire their food resources.

Like foxes in other studies, the foxes of Paradise in MORA have varied tolerances in the presence of humans. Limpy and the two kits seem to be incredibly tolerant of humans, while (M1) and (F1) are not habituated to people, are more weary and will keep their distance or flee when approached.

Some of the foxes (M01, F01 and F02) in Perrine's study were bold beggars who often approached humans and vehicles during the day. One fox (M01) became such a pest at the Southwest campground that a part time ranger was tasked with shooing him away in the evenings. On several occasions, foxes entered tents, buildings and vehicles in search of handouts and unguarded food (Perrine and Arnold, 2001).

Begging

Begging behavior is not uncommon in wildlife and has been documented in many studies concerning foxes. Like MORA, LVNP's records indicate that scavenging and begging foxes have been a periodic problem, especially at high elevations. In both parks, there are many reports of foxes approaching people or vehicles to obtain food (Perrine, 2005). If anthropogenic food is made available, it is easy to understand how an animal as smart and adaptable as a fox can learn that begging is a profitable way of life. Perrine postulated that begging foxes may be more common in mountainous regions where natural productivity is low and winter food is scarce (Perrine, 2005).

Bubela, Dickman and Newsome (1998) stated that it is probable that anthropogenic food will support a higher density fox population than would occur in its absence. While this appears to be true, it also seems that MORA's foxes are not relying exclusively on anthropogenic foods for their survival, and it is instead more supplemental in nature. In Perrine's study (2005) diet content analysis and nightly telemetry locations indicated that even the begging foxes utilized natural food resources and foraged outside of the range of the campgrounds. He concluded that they were not dependent upon anthropogenic food for their survival. Doncaster, et al. (1990) observed that scavenging foxes were highly selective, discarding some edible scavenged items in favor of others. It is difficult to quantify the amount of human associated food in scat due to the fact that most human foods are completely digested with few indigestible remains showing up in scat analysis (Perrine, 2005).

One example of a human food item fed to a fox that would have been completely digested and would not show up in scat analysis, comes from a personal observation of a

feeding incident involving Limpy and a family of visitors in the Jackson Visitor Center Parking lot. The incident occurred on 6/28/06 at approximately 7:00 pm. Limpy approached from the visitor center into the top parking area with a pronounced limp toward a family of visitors. The presumed father of the family initiated feeding by tossing Limpy a piece of red licorice. Children followed suit by tossing Limpy additional pieces of licorice. Limpy utilized the approach and retreat method to retrieve items and appeared to be skittish and unpredictable. The feeding lasted approximately three minutes after which the family continued on with their walk and Limpy moved around the cars in the top parking area sniffing, presumably for food, and eating whatever could be found then continued this behavior in the bottom parking area. The family continued to call to Limpy to follow them up the trail. Limpy ignored their invitation. The fox finished its rounds of the parking area and exited into the woods around the back of the visitor center.

There are many problems associated with scavenging and begging foxes. Begging behavior can affect resource use by red foxes, as well as their management. Human provisioning may contribute to the maintenance of small territories that support artificially large groups that die off when the anthropogenic food source is removed (MacDonald and Voigt, 1984). Other problems associated with begging behaviors include increased mortality, poor nutrition, increased exposure to disease and a false perception of an abundant population density due to a few highly visible animals (Perrine, 2005).

Roads and "Helper Behavior"

I observed the kits (LEK) and (DEK), at the den site at approximately 6:00 pm on 7/9/06. The den site is located in the rocks by the road on the way up to Paradise. While videotaping a fox trail leading from the roadside down to the den I was approached from behind by (LEK) who crossed in front of me and into the brush. Shortly thereafter (DEK) crossed from the other side of the road to the den side of the road in front of me. The kits traveled a short distance down the trail toward the den and then stopped. They took turns approaching me as I stood and video taped them. Both kits were extremely habituated to the human presence, coming within a foot of me several times. They appeared to be comfortable by my presence and spent the majority of the observation watching me intently. At one point in the observation both kits disappeared from my view only to return with one kit chasing the other. The chasee, who was carrying something in its mouth, ran up and over the road, and was almost hit by a car at one point. (Upon later examination, I found that a vertebrae, possibly from a fawn, was the item being carried by the kit during the chase game.) The kits returned to the den side of the road with (LEK) remaining at the top of the trail with me and (DEK) sitting slightly lower on the trail and almost out of sight. It was at this time that I noticed (F1), the presumed mother, approximately 200 feet up the road looking in my direction. She did not approach any closer, but instead made a loud call toward the kits. The kits quickly responded by running to her. This behavior suggests that (F1's) call was some kind of warning or reprimand. The kits and (F1) trotted off in the direction of the picnic area.

It was clear from many separate observations that roads play a large part in the lives of the foxes in the Paradise area. They habitually choose to locate their dens directly

adjacent to roads, they utilize roads for ease of travel and at no time did they show any fear of being in the road or being hit by a car. The utilization of roads by foxes is not unique to the MORA population.

Meek and Saunders (1995, 2000) and Perrine (2005) noted in their studies that red foxes living at high elevations often use roads because it makes travel easier, allowing them to avoid walking through dense vegetation. The use of roads by foxes may also assist them with foraging success, and allow them access to road-killed wildlife for sustenance (Meek and Saunders, 1995). With only five foxes observed in the Paradise area during the period between the end of May and the middle of July, one misstep with a speeding car could reduce this group's population by 20%. This fact was clear in an observation on 7/10/06 at approximately 4:00 pm at the den site. Limpy approached the den site from the brush on the den side of the road carrying what appeared to be an uneaten banana due to its color, size and shape. Limpy crossed to the opposite side of the road and cached the "banana", moving out of view to presumably dig up a cached item. When Limpy returned to view about one minute later, it was carrying what appeared to be a dead meadow vole. Limpy crossed the road directly in front of a car and was almost hit. Once across the road, Limpy went directly to the den.

It is important to note that Limpy engaged in what I believe to be a "helper" behavior at this point. Limpy stood on the road side about 12 feet directly above the den site, set down the vole and chortled toward the den. She waited about 30 seconds and chortled toward the den again. After another 30 seconds with no response, she picked up the vole and exited the area the way she came. "Helper" females have been documented in fox society by several researchers, but is an area of study that could use more research.

A “helper” female is defined as a fox that assists in the rearing of the kits of another female. Cavallini (1996) found that barren or lactating females will feed the young of dominant females, and non-breeding females may adopt young on the death of the mother. It was MacDonald (1979) who referred to these females as “helpers,” and it has been found that there is a definite dominance hierarchy in the family group, wherein the “helpers” are subordinate to the breeding female (Susman, 1994). MacDonald and Voigt (1984) found that occasionally females will occupy adjacent ranges and share an area of range overlap.

Henry (1996) found a “helper” that was a daughter from the previous year’s litter. She did not disperse from the family territory and had not given birth to kits of her own. By helping with the rearing, she assisted in the survival of the genetics of her family, while gaining experience to be used when she eventually had her own kits to raise. It has been hypothesized that this behavior developed because of scarcity of food. Logically speaking, if food is abundant the “helper” would otherwise support her own kits. This would be an interesting future study for the foxes of MORA. There was no indication either way during the current study as to the amount of food availability in the park. An abundance of food resources could enable the male fox to breed with both females and both will raise litters in family territory (Henry, 1996). Field observations performed by Henry appear to support the idea of abundance and scarcity behaviors as related to the helper females. More data is needed on the MORA population before any definitive conclusions can be drawn about Limpy’s behavior.

CHAPTER 7 – CONCLUSION

By examining attempts made at other national parks we can assess which successes may be applicable to MORA's fox issue. It is against the law to feed wildlife in a national park and a person caught feeding wildlife (including foxes) can be charged. Although park officials have the ability to charge and fine someone, they generally seek compliance through education and passive law enforcement when and where feeding is identified and encountered (Kirby Tulk, personal communication, 2006). Fa (1992) noted that finding optimal ways of combining education with keeping animals in natural conditions and giving people the pleasure of meeting them can be a challenge. There are many components to a successful plan to address habituation and food conditioning issues.

MORA should follow LVNP's example and utilize "Super Soaker" water guns as part of an aversive conditioning deterance plan to discourage foxes from begging behaviors. Attempting to teach bold foxes to become generally wary is likely to be difficult, therefore conditioning should aim to result in aversion to specific threats, such as vehicles, humans and human use areas (Bremner-Harrison, et al. 2004). Leung and Marion (2000) suggest that the modification of visitor behavior through educational and regulatory actions is a frequently applied strategy that works. Behavioral change, in both foxes and humans, can only be accomplished with consistent reinforcement. Both species need to be discouraged from interaction through feeding. One successful means for discouraging foxes from seeking human foods has been utilized by the staff at LVNP and involves the use of "Super Soaker" water guns. A few park rangers began carrying

heavy-duty squirt guns to drive the foxes away from campgrounds without harming them; this approach was surprisingly effective (Perrine, 2005).

Addressing the need for changing human's behavior toward the feeding of wildlife is more complex. Education is a crucial component in addressing the issue of human provisioning of wildlife. Simply making a commitment to informing the public of the illegality and subsequent fines resulting from feeding will go a long way. As stated earlier in this document, signage and literature should be clear, concise and easy to understand. They should convey their message to the visitor as quickly as possible. In the case of the foxes of MORA, it would be advisable to emphasize the danger to this small population of foxes as well as the uniqueness of the species in an attempt to include visitors as stewards for their protection. Herrero, et al. (2005), suggests that in interior locations of parks, such as Yellowstone and MORA where there are a large number of unsupervised visitors, it is much harder to monitor and control people's behavior around habituated animals. It is therefore important to educate visitors so that they know how to behave around wildlife and do not put themselves or habituated animals at risk.

Harold Werner of Sequoia Kings Canyon National Park (personal communication, 2006) stated that management should never assume that people will read the brochures and signs and do the right thing. People generally do not want to waste vacation time reading over rules and regulations. The goal of management should be to make it as easy as possible for visitors to learn the rules and the consequences associated with breaking them. Visitors need a clear message about the dangers, laws and expectations of visitors. Signage should include the fine amount incurred if caught feeding, leaving no question of consequences. Still, that message is useless unless it is

upheld by consistent enforcement. As was the case with Yellowstone's bears, confusion was evident. Continued contradictions between official park regulations and their lax enforcement resulted in a confused and mostly ignorant public. Impacts from visitors who knowingly engage in illegal actions require a law enforcement response (Leung and Marion, 2000).

National parks have a long history of portraying confusing messages to the public and inconsistently enforcing the law when individuals are caught in violation. During the early years of the National Park Service, management provided conflicting messages to Yellowstone visitors. One example where this confusion is evident included a park pamphlet that was handed to visitors upon entry to the park that stated feeding wildlife was against the law. On the front of this same flyer there was a picture of a person hand feeding a bear (Biel, 2006).

Adding to the difficulties of conveying message that feeding is illegal is the fact that in many parts of the world feeding is allowed with supervision, or promoted where no management system exists (Orams, 2002). As stated earlier, it is suspected that some feeding at MORA is being done by non-English speaking tourists, possibly from countries where the feeding of animals is condoned. Following the earlier suggestion of creating a flyer and signage that conveys the message through iconic, globally understood imagery rather than a certain language might assist in addressing that problem.

Above all, the lack of consistent enforcement appears to be the main hurdle in addressing the feeding issue. It is often confusing for tourists when a prohibition has variable enforcement. Such situations lend themselves to a sense of permissiveness on the

part of park patrons. Contradiction is prevalent, often leaving visitors unsure of what kind of behavior is expected of them, and what to think of the park's wildlife.

Mixed messages are given to tourists when, despite management agency prohibitions they see the feeding of wildlife occurring around them during their visit, but see no repercussions to the feeder. Every person that sees a person feed without any action taken against the offender can be assumed to be under the impression that feeding is permitted. This is particularly a problem in a focal area such as the visitor center in Paradise. Enforcement must be done consistently in high-traffic areas to stop human feeding. The visitor center is full of staff, and if feeding is going on in the parking lot, the perception of the tolerance of the activity is that it is condoned by park staff. It is therefore suggested that in high traffic areas of known begging activity, that a ranger be stationed who is specifically there to discourage feeding through enforcement, including writing citations. Herrero, et. al. (2005), suggests that successful management involves having a ranger present instead of only loosely managing within the area where fox-human interactions frequently occur. Bella (1987) noted that inadequate staffing leads to lax supervision which then leads to policies intended to control park use not being implemented. As often is the case, a park may not have enough man power available to stop every instance of feeding. Park management are aware of the problem areas within the park where feeding occurs and the times of day where the highest likelihood of feeding is happening. The suggestion that a few strategically placed rangers handing out tickets in full view of the public will get the message across with minimal manpower.

Like MORA, LVNP has a problem with park employees feeding the wildlife. In an email discussion with John Perrine I was told that he had seen pictures taken by a road

maintenance worker that had fed a radio-collared fox a plate of spaghetti (personal communication, 2006). Yellowstone had to uniformly punish employees who broke the no-feeding rules to assist in the ceasing of feeding activity (Biel, 2006). Jim Schaberl, (personal communication, 2006) stated that it is well known among the staff of MORA that a person on staff openly feeds foxes from the back door of his park housing. This housing is in the Longmire area and in close proximity to public areas. This staff member is reluctantly allowed to feed the foxes, due to his many years of working for the park service. This type of behavior should be strongly discouraged by writing this employee a citation and holding him accountable for his actions. Only by subjecting employees to the same consistent enforcement as that for visitors, will parks be able to comprehensively eradicate the feeding problem. It is clear that many employees of the national park system believe they are exempt from the rules that prohibit feeding animals. To get visitors to respect the rules that they are required to adhere to, that park employees must be held to the same standards including the same penalties for break the rules. Visitors look to park personnel for guidance, and if they see the personnel feeding an animal, it is a clear message to the visitor that feeding is condoned, even though the park signage and literature clearly states that it is not. All anthropogenic feeding must stop to successfully change the animal behavior.

Methods for Addressing Feeding

Sequoia Kings Canyon National Park has an issue with human provisioning of bears. The park uses all of the same tools that MORA uses to discourage visitors from feeding wildlife. Harold Werner (personal communication, 2006) said that they get the

best response from person-to-person contact with the visitors, constant patrolling of the campgrounds and picnic areas for violations, adequate bear-proof facilities for food storage and garbage disposal, and a willingness of the rangers to write citations for clear violations. He also pointed out that the program requires "buy in" by all of the park staff. Perrine (personal communication, 2005) at LVNP has found that a combination of visitor education and the "super soaker" water guns has helped reduce begging in the park by foxes. In the most extreme cases relocation of offending animals can be an option. This method was utilized by Prince Edward Island National Park to relocate a family of problem foxes. In 2005, a family of four foxes that were harassing people (stealing food, clothing and footwear, etc.) were relocated to a provincial property (Kirby Tulk, personal communication, 2006).

These methods that have been successful in other national parks can serve as a basis for designing a management plan. This plan, as outlined in this conclusion, is fully applicable to the food conditioned fox problem at MORA. Suggestions include a change in park signage so that the "no-feed" message is easy to understand and conveys not only the consequences of feeding to the visitor (fines), but to the animal (health, mortality) as well. Another suggestion includes the utilization of "Super Soaker" water pistols as a fox deterrent, a method that has shown promise in changing fox behavior. The key to this method is consistency over a long period of time that will reinforce the change of behavior by making the current behavior unpleasant. It is also suggested that consistent unilateral enforcement of violators will bring about change. Whatever method the park decides to implement, it is undeniable that the problem needs to be addressed before an incident happens that puts human visitors or the fox population at risk. The cycle needs to

be broken and new behaviors need to be learned to discourage foxes from obtaining their food from humans.

Human provisioning of wildlife has historically been a problem in national parks, and remains a problem to this day. New strategies need to be developed to help to solve the problem. This study suggests several methods that might assist MORA to design a management plan that addresses the issues of food conditioning and habituation within the park. The principal goal of a management plan should be to avoid impacts that are avoidable and to minimize those that are not. To achieve this goal, a combination of education and enforcement must be utilized to minimize visitor impacts to wildlife within the national park system.

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APPENDIX

Example 1

DO NOT FEED WILDLIFE

Bad for you:

- Small rodents can and will bite the hand that feeds them, transmitting a variety of diseases.
- Animals may carry rabies and you will have to get 8 nasty shots if bitten.
- Fed animals loose their wariness of people and become aggressive. Larger animals, such as deer, have been known to buck or kick suddenly and cause serious injuries.
- Wildlife may carry diseases that your pets are not protected from.

Bad for wildlife:

- Wildlife will become dependent on people (they're wild animals!) and they will forget how to forage for food on their own.
- Wild animals can become unhealthy or die from eating human food instead of their natural food.
- Fed animals hang around parking lots and roads and could be hit and killed by cars.
- Animals that are fed can become nuisances and may have to be destroyed.

Example 2

FOXES IN THE LASSEN AREA

Sierra Nevada Red Foxes are listed as Threatened in the state of California and are protected by State and Federal law. Research is currently being conducted to learn more about these beautiful animals. Being fed by humans has habituated some of them, changing their natural behaviors and putting them in danger.

YOU COULD KILL THIS FOX

IF YOU FEED FOXES:

- You will make them dependent on people (they are wild animals, not pets!)
- You could expose yourself, your children and your pets to parasites and diseases.
- If you get bitten we will have to kill this fox for rabies testing.

Please do not leave pet food or scraps outside where they will draw foxes and other wildlife.

If a fox approaches you, please shoo it away and notify a Ranger, or call John Perrine at the Lassen Carnivore Research Project: (530) 595-4444 extension 5216.

PLEASE DO NOT FEED FOXES

Example 3

Please don't feed the animals!

More than fifty mammals make their home at Crater Lake National Park, ranging in size from the little brown bat to the Roosevelt elk. While most visitors to the park hope to see a bear or an elk, you're more likely to encounter birds, chipmunks, and ground squirrels. These animals live in a harsh volcanic landscape that is buried by snow eight months of the year. Be a gracious guest during your visit—enjoy watching the wild animals, but do not feed them! No matter how much they may beg or plead for your food, feeding animals is not permitted. Here's why:

It's bad for the animals

Animals that learn to depend on human handouts lose their instinctive abilities to find food for themselves. Even a single potato chip is bad for wild animals—potato chips do not naturally occur in their diet. Neither do cheese curls, candy, sandwiches, or even peanuts or raisins. Animals quickly come to recognize humans as a source of food, and may forget their natural food seeking skills. When winter comes, the easy food supply they've come to depend on disappears. They may now starve because they have lost their self-sufficiency.

Wild animals that are fed by humans are soon no longer "wild." They lose their natural fear of humans and become vulnerable to other animals that would harm them. Increased territorial behavior and fighting may occur when many animals are crowded into small areas competing for the same food.

Crater Lake National Park receives half a million visitors per year. If each person feeds just one animal just one treat, that still equals half a million instances of feeding every year!

It's bad for the ecosystem

Every creature plays an important role in natural ecological cycles. Disrupting these cycles may have dramatic consequences.

Wild animals seem to face difficult challenges for survival. It's natural to want to "help out." However, this is the life for which they are designed and adapted. Even with good intentions, we may easily disrupt natural processes. Consider the following example:

Feeding birds and squirrels is a common practice. However, without our snacks, these animals would be collecting pine seeds to eat now and to store in winter caches. These caches are also an important food source for larger animals, such as bears. Many of the stored seeds may germinate. They have, in effect, been "planted." Research indicates that small mammals or birds plant most of the whitebark pines which cling to the rim of the caldera. When these animals rely on us for food and stop gathering pine seeds, whitebark pines cease to be planted. Whitebark pine roots, in turn, play a role in stabilizing the rim of the caldera. The chain has been broken.

It's dangerous for you

All of the animals in the park are wild. Wild animals do, indeed, often bite the hand that feeds them. Wild animals—and the ticks, fleas, and lice they carry—may also harbor diseases, which may be transmitted to you through contact with them or their feces.

But I didn't hand it any food!

If you are a messy camper or a litterbug, you are, in effect, feeding the wildlife. "Feeding" may result not only from giving food to an animal but also from leaving food out at your campsite or allowing food scraps to remain at your picnic site. These actions are in fact unlawful in national parks and are punishable by a citation and a fine. We take feeding park wildlife seriously!

How can I help?

Glad you asked! Make sure that you leave a clean camp or picnic site. Leave no trace of your visit—not even an apple core. If you see other visitors feeding wildlife, ask them to stop. Enjoy Crater Lake and all its inhabitants in their wild and natural state.

Example 4

Crater Lake

National Park Service
U.S. Department of the Interior

Crater Lake National Park

Did You Know That Feeding Park Wildlife is Unlawful?

Feeding the wildlife can be harmful to you because:

- *the animals can bite as do the ticks, fleas and lice found on them;*
- *squirrels and chipmunks harbor fleas which can carry Lyme's Disease, Bubonic Plague and Rocky Mountin Spotted Fever;*
- *some people get so involved in feeding the animals that they venture into dangerous places and fatalities occur;*
- *and, there is a $50 fine for violations!*

When animal populations rise above normal levels due to artificial feeding, habitat destruction can occur:

- *erosion increases from concentrated burrowing in small areas and large numbers of animals scrambling on unstable cliffs;*
- *reseeding of natural vegetation decreases in localized areas because animals no longer collect and bury seeds. White-bark pine trees do not grow from peanuts!*

Gray Jay

Clark's Nutcracker

Animal behavior can be affected by artificial feeding:

- *increased territorial behavior and fighting may occur when many animals are crowded into small areas competing for the same food;*
- *human food will rot sooner than natural foods and could wipe out an animal's entire stock of stored winter food;*
- *animals lose their natural fear of humans and could become more vulnerable to pets and humans who would harm them;*
- *wildlife is no longer "wild" when fed.*

Please do not feed the wildlife for their sake, yours and the parks.

EXPERIENCE YOUR AMERICA

Rev. 07/2005 clp

Example 5

rvices, and Regulations

Access Limited facilities and trails are accessible for people with disabilities. Ask for information. TDD: 360-569-2177.

Winter Weather permitting, the road from Nisqually entrance to Paradise is open year-round. Driving to Paradise in midwinter offers you a chance to experience a landscape that is shaped by tremendous snowfall. You can snowshoe, cross-country ski, and tube around Paradise—in the designated snowplay area only. Extra preparedness is essential. Carry chains, drive carefully, and obey all traffic directions. The road to Paradise closes for the night at dusk in winter; check the closure time before leaving to ski or snowshoe. The visitor center at Paradise is open and staffed only on weekends and holidays from mid-October until early May.

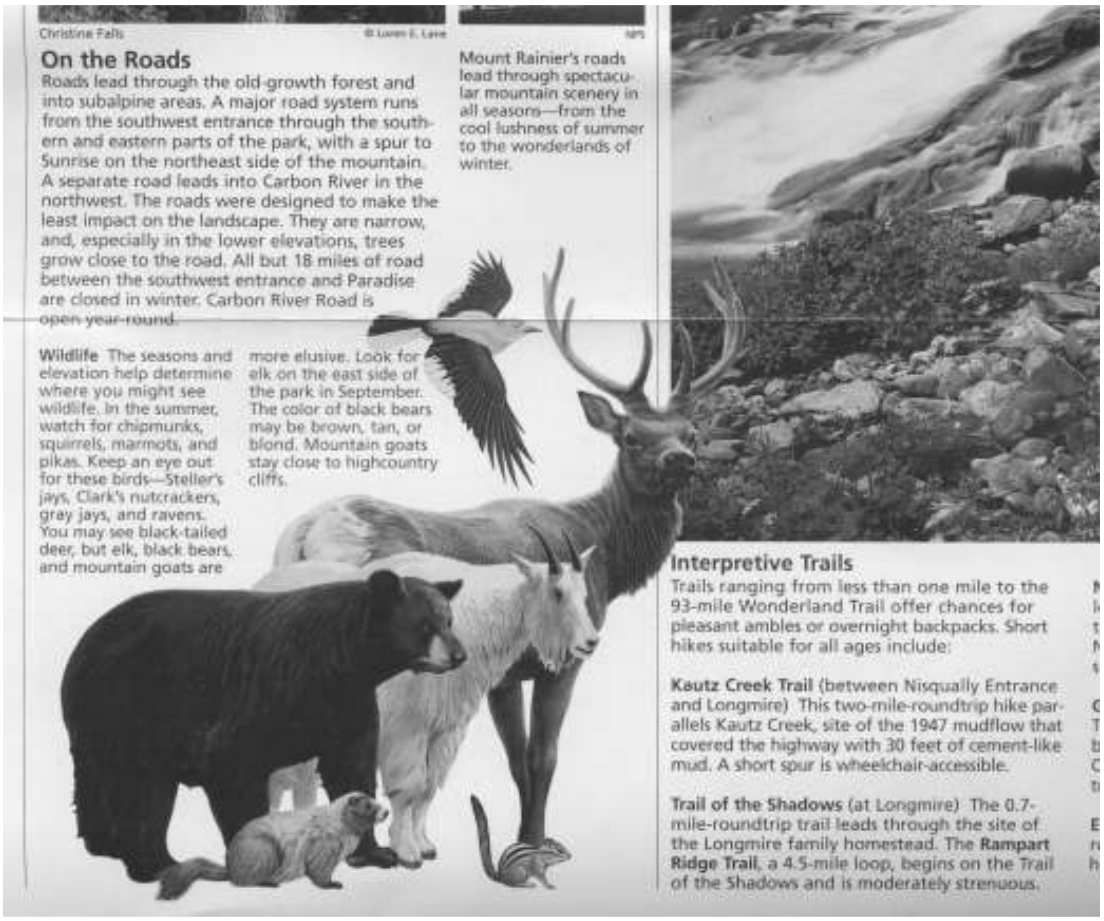
Regulations • Pets must be on a leash when not in your vehicle. Pets are not permitted on trails, on the snow, or in the wilderness. • Collecting plants, dead plant materials, firewood, rocks, and historic or cultural items is illegal. Leave all wildflowers for everyone to enjoy. • Keep wildlife wild. Do not feed or harass wildlife, including birds. • Permits are required for all overnight stays in the wilderness. • Climbing permits are required for all climbs above 10,000 feet and for all glacier travel. • No hunting is permitted. Firearms must be unloaded, broken down, cased, and stored in your vehicle; they are not permitted in the wilderness. • Do not drive or park off roads. • Fishing requires no license or permit, but certain waters are closed or open to fly fishing only.

More Information
Mount Rainier National Park
Ashford, WA 98304
360-569-2211
TDD 360-569-2177
www.nps.gov/mora

Cougar Rock Campground	200	●	●	●	14	●	●	●				●	●
Cougar Rock Group Camp	5		●	●	14	●	●						
Ipsut Creek Campground	29	●	●	●	14								
Ipsut Group Camp	2		●	●	14								
Jackson Memorial Visitor Center						●	●		●		●		
Mowich Lake Campground (walk-in only)	30		●		14								
National Park Inn (Longmire)	25			●		●	●		●	●	●	●	●
Ohanapecosh Campground	205	●	●	●	14	●	●	●				●	●
Paradise Inn	126			●		●	●		●		●	●	●
Sunrise Day Lodge						●	●		●	●	●		
Sunshine Point Campground	18	●	●	●	14	●							●
White River Campground	112	●	●	●	14	●	●						

Summer campground reservations:
www.nps.gov/mora/recreation/camping.htm

Example 6



Christine Falls © Loren E. Lave

NPS

On the Roads

Roads lead through the old-growth forest and into subalpine areas. A major road system runs from the southwest entrance through the southern and eastern parts of the park, with a spur to Sunrise on the northeast side of the mountain. A separate road leads into Carbon River in the northwest. The roads were designed to make the least impact on the landscape. They are narrow, and, especially in the lower elevations, trees grow close to the road. All but 18 miles of road between the southwest entrance and Paradise are closed in winter. Carbon River Road is open year-round.

Mount Rainier's roads lead through spectacular mountain scenery in all seasons—from the cool lushness of summer to the wonderlands of winter.

Wildlife The seasons and elevation help determine where you might see wildlife. In the summer, watch for chipmunks, squirrels, marmots, and pikas. Keep an eye out for these birds—Steller's jays, Clark's nutcrackers, gray jays, and ravens. You may see black-tailed deer, but elk, black bears, and mountain goats are more elusive. Look for elk on the east side of the park in September. The color of black bears may be brown, tan, or blond. Mountain goats stay close to highcountry cliffs.

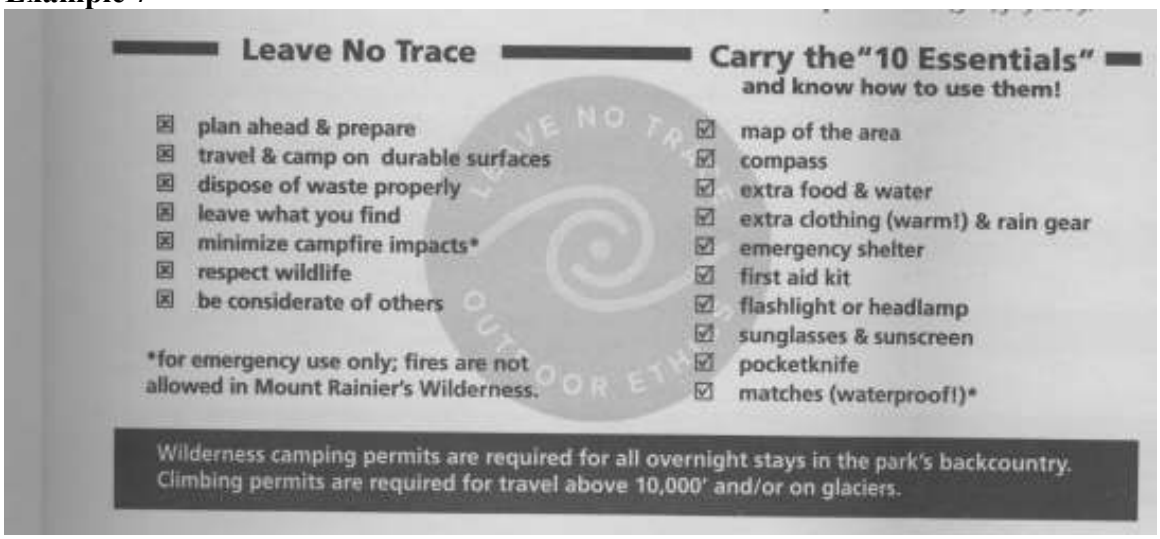
Interpretive Trails

Trails ranging from less than one mile to the 93-mile Wonderland Trail offer chances for pleasant ambles or overnight backpacks. Short hikes suitable for all ages include:

Kautz Creek Trail (between Nisqually Entrance and Longmire) This two-mile-roundtrip hike parallels Kautz Creek, site of the 1947 mudflow that covered the highway with 30 feet of cement-like mud. A short spur is wheelchair-accessible.

Trail of the Shadows (at Longmire) The 0.7-mile-roundtrip trail leads through the site of the Longmire family homestead. The **Rampart Ridge Trail**, a 4.5-mile loop, begins on the Trail of the Shadows and is moderately strenuous.

Example 7



Example 8

Example 9

Animal Encounters

Black bear
(Ursus americanus)

The beauty and wonder of Mount Rainier National Park doesn't just come from the scenic grandeur of a single, towering mountain. The presence of wild creatures remains an essential part of the experience of wilderness. Being in the home of large creatures like black bear and mountain lion (cougar) can make Mount Rainier an exciting – and sometimes scary – place to visit. Though you are not likely to see them, if you do meet one of these larger mammals, learning more about them serves as your best defense – and theirs!

Black Bear Sense

- Never feed a black bear, either intentionally or by leaving food unsecured
- Do NOT approach bears or cubs
- If a black bear approaches **you**, try to scare it away by shouting and making noise
- If attacked, fight back aggressively
- Report all sightings to the nearest ranger station or call (360) 569-2211 ext. 3373 or ext. 2334

Avoiding Mountain Lions

- Hike in a group rather than alone. Avoid running – don't look like prey
- Keep children close to you – preferably in view just ahead of you
- Never approach cougar kittens – leave the area immediately
- Follow the rules regarding pets in the park – don't take your pet on trails or in the backcountry and never leave it unattended at the campground – you could lose it!

Mountain lion (Felis concolor)

Close Encounters With Mountain Lions

- DON'T RUN! Stand still and face the lion with your companions
- Immediately pick up and hold small children
- Stand upright to make yourself appear larger – wave your arms and make a noisy commotion if the animal moves toward you
- Back away **slowly** while facing the animal
- If attacked, fight back aggressively
- Report all sightings at the nearest ranger station or call (360) 569-2211 ext. 3373 or ext. 2334

Example 10

Mount Rainier National Park

NOTICE

Do Not Feed Foxes or Other Wildlife

You may think you are doing wildlife a favor, but feeding them can result in harm to yourself and the animal because:

- Wildlife can lose their natural fear of humans. This can create a situation where animals bite or attack. If this happens the animal may have to be destroyed.
- It attracts animals to roadways and parking lots where deadly and dangerous accidents can occur.
- Mammals and birds can carry diseases that are sometimes fatal to humans.
- Human food affects their immune and digestive systems leading to premature death.

There is plenty of natural food in the park.

Help prevent additional problems by:

- Never leaving food unattended, even for a short while.
- Properly storing food and disposing of garbage in garbage cans.

Feeding wildlife is a violation of park regulations (36 CFR 2.2 a2)

Example 11


Feeding, touching, or enticing any wildlife is illegal and subject to a $100 fine.
Attracting them with food or outstretched hands can kill animals by bringing them close to roads and antifreeze spills.
Our food is unhealthy for wildlife and can interfere with their normal diet.
People have been injured by deer and bitten by chipmunks that come too close.
Keep your distance, and help keep wildlife wild!
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