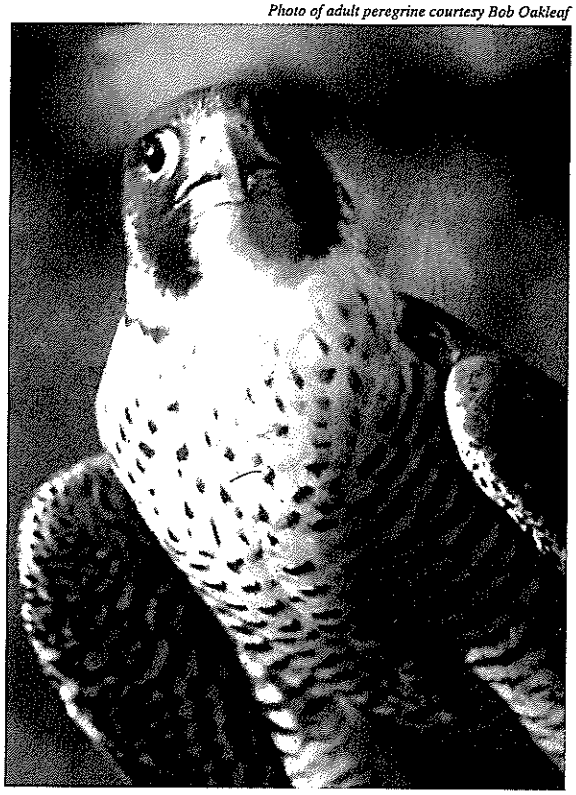
Greater Yellowstone Peregrine Falcons:

Their Trials, Tribulations, and Triumphs

by Terry McEneaney, Bill Heinrich, and Bob Oakleaf

Photo of adult peregrine courtesy Bob Oakleaf



It was a cold, red sunrise in May in the mid-1970s. Snow was still on the ground, especially under the lodgepoles. Yet Pelican Creek was open and teaming with waterfowl. As we stopped the car to observe a blue-winged teal, we rolled down the window to hear the wonderful bell-like call of the drake when, suddenly, the teal was silent, motionless, and alert. Then we heard a far-off sound resembling a jet coming closer. The sound got louder, until the annoying noise, like a race car changing gears, passed over the car leaving a "Doppler effect" in our ears. In a matter of seconds the beautiful teal was airborne, and in a split second there was an apparition of another bird that entered our view. The energetic teal could no longer be seen, but the teal's feathers were drifting in the air not far from where it flushed. When the commotion settled, there remained on the ground the lifeless form of a blue-winged teal that was being eaten by one of the most majestic birds in the world—a peregrine falcon.

Five minutes after the peregrine had begun feeding, another phantom image appeared on the scene. Its entry was announced by the screeching calls of the alert peregrine as it stopped feeding on the teal, and the introductory notes clearly identified the intruder as a common raven. The raven flew into the scene and stole the lifeless teal from the falcon. In retaliation, the peregrine began attacking the intruding raven by reeling in circles, screaming, and dive-bombing. The raven was so alarmed by the airborne falcon that it caused the hackle feathers on the raven's neck to rise. To avoid serious injury from the attacking falcon, the raven dragged the teal from a sandbar through the sedges and eventually under a willow. After ten minutes of attack dives, the peregrine gave up. The sky was soon clear of the peregrine. The raven, due to its size and demeanor, was fortuitous, in this instance, to prevail. But for diminutive birds the size of a teal and smaller, the sky is seldom devoid of peregrines, wandering marauders of the skies. This observation by the senior author and a friend was a rare sighting then, and since peregrines are uncommon even today they largely go unnoticed. But the times have changed, and so have their numbers. The information we present is an update on the history, ecology, and status of the peregrine in greater Yellowstone.

Unique Bird With a Clouded Past

The peregrine falcon (*Falco peregrinus*) has been admired by naturalists and falconers for centuries, due to their marauding habits, swiftness of flight, striking colors, and extensive global distribution. Of all the birdlife on Earth, only the osprey and the common raven rival the peregrine in their global breeding distribution and hence occur on all continents with the exception of Antarctica. The specific name *peregrinus*, or peregrine, is a Latin derivation that means pilgrim or wanderer, in reference to the great wanderings or migrations this bird makes.

The history of the peregrine falcon is clouded with trials and tribulations. Beyond the beauty of the bird, the incredible flight, the sensational action, there crept an insidious problem that affected peregrines that would not be detected for years. It first came to light in Great Britain in the 1950s, when in a short time a high percentage of breeding pairs failed to produce young. A budding biologist by the name of Derek Ratcliffe was beginning a detailed study of the peregrine in Britain and through intensive investigation came up with a remarkable discovery that surfaced around 1962. Ratcliffe observed a high incidence of egg loss during incubation.

In eastern North America, a similar trend was developing—nests were failing and breeding adults were not only declining but disappearing from traditionally known eyries. The alarming movement was so widespread that similar problems were later identified in the western United States by the mid-1960s and in the Arctic by the early 1970s.

Ratcliffe and his British colleagues suspected toxic chemicals when they found high levels of chlorinated hydrocarbons

in the first peregrine egg ever to undergo chemical analysis. Another important event that occurred was the global assemblage of peregrine experts at the International Peregrine Conference held at Madison, Wisconsin, in 1965, hosted by Joseph Hickey and the University of Wisconsin. Evidence presented at this conference pointed to a relationship that corresponded in time with the decline of the peregrine in Britain and the wholesale application of DDT (dichloro-diphenyl-trichloro-ethene) and dieldrin for agricultural purposes.

Still, definitive evidence connecting toxic substances to unusual breeding declines in peregrines could not be adequately proved. Ratcliffe, through his persistence to get to the bottom of the problem, was instrumental in making one of the great avian scientific discoveries of the twentieth century. His curiosity kept him revisiting his detailed observations of the alarmingly high frequency of broken eggs, of adults digesting eggs, and the inexplicable thinning and weakening of eggshells. By visiting museums and private collections of eggs collected between 1900 and 1967, Ratcliffe was able to measure eggs and pinpoint a remarkably short period, 1945 to 1947, when there was a 20 percent decrease in thickness of peregrine eggshells. This eggshell thinning corresponded precisely to the time of heavy application of DDT and other insecticides on a broad landscape level. This strongly implied that one or more of these chemicals produced physiological complications for egg-laying female peregrines. Ratcliffe's findings were quickly confirmed by biologists in North America conducting similar studies. By 1969, the American peregrine falcon (*Falco peregrinus anatum*) was listed as endangered by the U.S. Fish and Wildlife Service. The supporting evidence over the years has proved that DDT and its breakdown products, most notably DDE (a derivative of DDT), were responsible for eggshell thinning and breakage, and related reproduction and population declines in a wide spectrum of raptorial and piscivorous birds. Rachel Carson, in her monumental 1962 book, *Silent Spring*, brought to light the fact that chlorinated hydrocarbon pesticides not only killed target organisms but disrupted and, in some cases, destroyed food chains and food webs, and negatively influenced ecological processes. The data gathered from other bird studies only strengthened the case of the peregrine, which led to more restricted use and the eventual banning of DDT in Britain and North America by 1972.

Life History of the Peregrine

It is difficult to adequately describe a peregrine in prose, for the bird evokes a different image with different people depending on their degree of experience and exposure with the bird.

Peregrines are slightly larger than an American crow (*Corvus brachyrhynchos*). Adult females (also referred to as falcons) are typically larger than males, weighing on average 30 oz. (850 grams), while males weigh 20 oz. (567 grams). Thus, males are also referred to as tiercels, which means "one-third smaller." From head to toe they are 15 to 20 inches (381 to 508 mm) long. In flight their wings are 40 or more inches (1,106 mm) long, and they are characteristically pointed in appearance. Adults are dark blue or slate-colored, especially on the back, wings, and tail. The cere (fleshy material covering the nostrils) and the feet are yellow to orange in color. Adult peregrines have a black helmet appearance on the head that extends below the eyes, in contrast to a white throat and sides of the neck. The mid- to lower breast is horizontally barred and gray-white, as are the belly, leg feathers, and undertail. Immature birds are similar in size and appearance, but have darker brown feathers in contrast to the gray or slate-color of the adults; immatures have pale gray to yellowish feet and cere and vertical streaking on the breast.

In greater Yellowstone, peregrines nest on cliffs, often overlooking open country. Each nest or eyrie consists of a simple scrape on a gravel ledge. Sometimes they will nest in an abandoned raven or golden eagle nest. They generally lay three to four eggs that are heavily marked with red-brown splotches. Their incubation period is 33 days. These birds can be easily disturbed during incubation, and eggs have been known to roll out of the nest when incubating females are suddenly disturbed. The period from hatching to fledging usually takes 42 days.

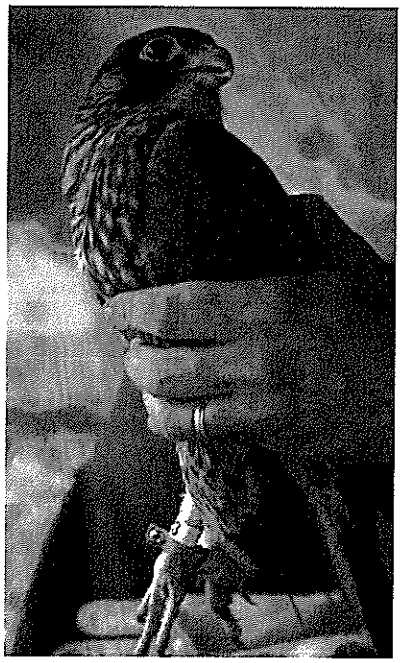
The colorful appearance and demeanor of the peregrine falcon seldom passes unnoticed, but what gets the attention of the field observer is the superb flying ability of this avian marvel. Peregrines hunt either from a perch, while in flight, or employing a combination of the two techniques. By perching on a vantage point, such as a tree or cliff overlooking large expanses of open space, the predator has a commanding view of the area and watches for prey victims that are vulnerable being away from safe cover. Peregrines can directly attack on the wing but have an added advantage if they can get above their victims. The hunting falcon, once maneuvered into position, has the ability to "stoop" or dive at fast speeds, thus overtaking its victims. How fast they travel is open for debate. In level flapping flight they typically travel 40 to 55 miles per hour; however, the terminal velocity of a peregrine in a stoop can be in excess of 200 miles per hour. All prey are disabled by the striking feet. Smaller prey species can be caught and killed in mid-air, whereas larger prey are struck with the feet and disabled or killed outright and retrieved on the ground.

The peregrine falcon is an incredible bird predator. The type of birds a peregrine pursues depends on whether the pursued is another predator, a simple intruder, or vulnerable prey. Male peregrines typically pursue small prey that weigh 0.7 to 7 oz. (20 to 200 grams), whereas females can pursue slightly larger prey ranging from 3 to 35 oz. (100 to 1000 grams). Although these birds have been called "duck hawks" for the way they pursue waterfowl, or "the great-footed falcon" in reference to their large feet used for securing prey, they have the ability to kill a diverse array of birdlife. Some prey species that have been observed taken by peregrine falcons in greater Yellowstone include: yellow warbler, yellow-rumped warbler, western tanager, mountain bluebird, northern flicker, Clark's nutcracker, Wilson's phalarope, common snipe, yellow-headed blackbird, red-winged blackbird, Townsend's solitaire, red crossbill, cliff swallow, tree swallow, green-winged teal, blue-winged teal, cinnamon teal, killdeer, Franklin's gull, eared grebe, Caspian tern,

and black rosy-finch.

We have witnessed a variety of encounters, most typically in pursuit of other peregrines for territorial defense, but golden eagles are also highly feared by peregrine falcons. Encounters with intruders such as common ravens and prairie falcons are quite common. More unusual sightings documented in greater Yellowstone include encounters with a rufous hummingbird in the Thorofare, chasing trumpeter swans out of a nesting territory in the Centennial Mountains, and a similar encounter with American white pelicans over Yellowstone Lake. Other oddities observed have been a medium-sized fish brought into an eyrie in the Grand Canyon of the Yellowstone, and a small fingerling caught by a peregrine in Hayden Valley.

The breeding range of the peregrine encompasses approximately one-half of the North American continent and includes the following areas: northern Alaska, northern Mackenzie, Banks, Victoria, southern Melville, Somerset, and northern Baffin islands, and Labrador south to southern Baja, California, the coast of Sonora, Mexico, southern Arizona, New Mexico, western and central Texas, and Colorado. Less frequent numbers occur in the Sierra Madre Occidental of northern Mexico, and at least formerly ranged to Kansas, Arkansas, northern Louisiana, Tennessee, northern Alabama, and northwest Georgia. Generally speaking, the northernmost populations migrate most often to tropical regions, while populations in warmer climates are relatively sedentary and either don't migrate at all or migrate short distances.



Band returns confirm that Mexico is a stronghold for wintering peregrines.

Photos courtesy Bob Oakleaf

Biologists Heinrich, Oakleaf and attendents, who access cliffs by hiking and climbing, prepare to place young peregrines in a hack box.

Spring migration ends with the arrival of adult peregrines in Yellowstone, between late March and early April. They usually depart this area in October, with late departures extending into November. Although wintering data is weak and incomplete, we do have some information worth sharing. Two band returns from peregrines banded in greater Yellowstone shed some light as to where peregrines spend the winter. One came from the state of Sinaloa and the other was from the state of Jalisco in western Mexico. Jim Enderson, a Colorado College biologist who has spent a lifetime studying peregrines, suspects their primary winter range to be Mexico and northern Central America. These band returns confirm that western Mexico is a stronghold for wintering peregrines. Both coastal and interior areas are equally important, since they attract large concentrations of shorebirds and waterfowl and large flocks of passerines such as common grackles, brown-headed cowbirds, Brewer's blackbirds, yellow-headed blackbirds, and red-winged blackbirds.

Peregrine History and Recovery in Greater Yellowstone

Yellowstone is unique in that it has a rich historical record documenting the existence of this species as early as 1914. Milton Skinner was the first to record the status of the peregrine in the park, but the information was so vague that it provided little value regarding populations. In 1924 and 1938, Edward Sawyer (a naturalist for the park) provided more meaningful data, giving us some reference as to the existence and location of nesting peregrines. In the 1960s, Jay Sumner, John Craighead, Jim Enderson, Bryan Harry, and a few others provided important pieces of information that contributed to the construction of the peregrine puzzle. Enderson kept a few records of nesting peregrines in the 1960s, while Sumner kept intermittent track of several known historically occupied sites from the 1970s through the early 1980s. The Wyoming Game and Fish Department monitoring some traditional eyries in the late 1970s and early 1980s and found the sites to be unoccupied by peregrines. However, due to the fragmented nature of the Yellowstone peregrine information up until the 1980s, we never knew the total number of peregrine eyries that historically occurred in and around the park. Due to the era and the technology of the time, this information just wasn't available. But the informa-

tion still proved to be extremely important, especially when assessing the status of peregrines in the greater Yellowstone.

The road to recovery for the peregrine started with the restricted use of DDT in Canada in 1969 and a total ban of this pesticide in the United States in 1972. Coupled with this major breakthrough was the establishment of The Peregrine Fund, by Tom Cade at Cornell University, in 1970, whose goal was to ensure the survival of the species. Three regional facilities (in New York, Colorado, and California) were responsible for the captive breeding of peregrine falcons. Later, the New York and Colorado facilities would be merged into one, called the World Center for Birds of Prey located in Boise, Idaho, under the superb direction of Bill Burnham. Today, the center has a mission to restore many species of environmentally threatened birds into the wild, but the emphasis is more global in scope. Since the 1970s, over 3,900 peregrines have been released into the wild in 29 states.

The first release of captive-raised peregrines in greater Yellowstone occurred in 1990. A total of 11 young were released at three different sites in the Jackson Hole area of Wyoming. First efforts in Montana occurred in 1981 when four young were released from one site in the Centennial Valley. Idaho followed suit in 1982 when eight young were released from two sites on the western edge of greater Yellowstone. And in 1983, four captive-raised young peregrines were released from one site in Yellowstone National Park. Releases were run by the Wyoming Game and Fish Department, with financing by them, other federal agencies, and The Peregrine Fund.

While reintroduction efforts continued, a major milestone was reached in 1984, when two pairs of breeding peregrines were discovered in two different areas of greater Yellowstone. One pair was found on a historically occupied site in the Grand Canyon in Yellowstone National Park, and the other on a cliff in the Centennial Valley of Montana. Needless to say, it didn't take us long to crack open the champagne and beer.

Searching for peregrines is best done from the ground. It requires supreme patience and is very time-consuming. Collecting occupancy and production data requires a minimum of three and up to six visits per nest site. Site visits often require monitoring a cliff for an entire eight-hour day. Monitoring requires countless hours of expertise; subtle peregrine behavioral clues and keen observational notes determine the status of an eyrie. This involves using binoculars, high-quality spotting scopes, an attentive ear, and a sharp eye. Grizzlies are always a concern, so observers are constantly looking behind themselves as well as at the peregrines.

In the earlier stages of the peregrine falcon reintroduction effort, nearly all adults found occupying sites were banded, indicating that these birds were originally released from hack boxes. In 1985, for example, both the male and the female in the Grand Canyon of the Yellowstone were marked. The male was banded and released from a site on the Targhee National Forest in Idaho; the female was from a Jackson Hole hack site. Over the years, fewer banded adults were observed at traditional eyries, suggesting that recruitment was becoming more dependent on natural production as compared to initial recruitment from artificial release sites.

The progress we have seen in greater Yellowstone and in particular Yellowstone National Park (YNP) epitomizes the success of the peregrine reintroduction effort. In 1984, the one YNP pair that was found produced three young. As the population increased, reintroduction efforts slowed and were terminated in the park following the summer of 1988. As of 1997, we were proud to report that 13 pairs of peregrines produced 25 young (Figs. 2 and 3). Significant gains have been made in all three states adjoining the park (Figs. 4 and 5), with a large percentage of the population increases having

Falcons and Fire

The 1988 wildfires had no effect on peregrine falcon occupancy or production. Although some cliffs became unstable following the cataclysmic events, the senior author was in Yellowstone monitoring birds throughout the summer of fire, and observed that some birds had to move to other cliffs. But the overall outcome had no effect on peregrines or their offspring. In fact, due to the increasing trend in peregrine numbers, the last hacking effort in the park occurred in 1988 (Fig. 1).

Figure 1.

Peregrine Falcons in Yellowstone National Park

Total Young Placed in Hack Boxes by The Peregrine Fund

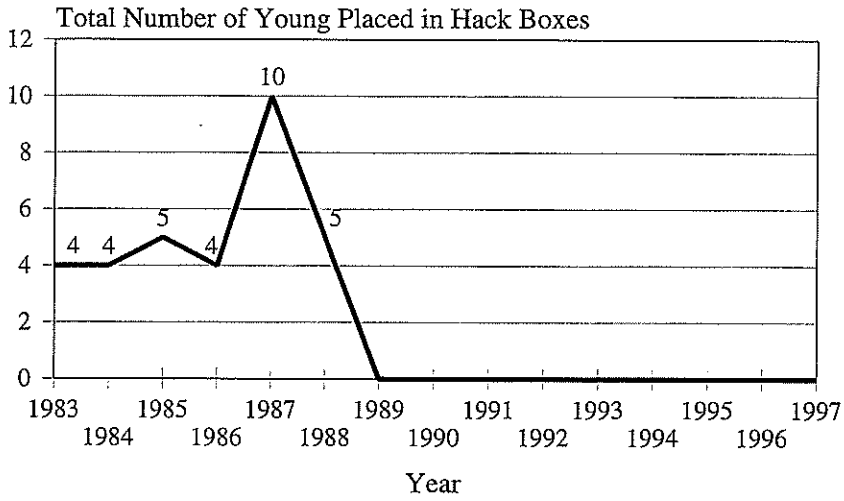


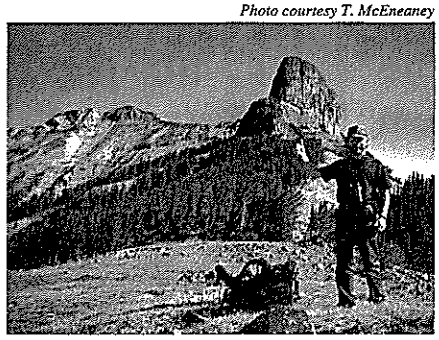
Figure 2.

Figure 3.

occurred in greater Yellowstone. Reintroduction efforts ceased in Idaho in 1994, in Wyoming in 1995, and in 1997 in Montana. Even though not all of the traditional eyries in greater Yellowstone are currently occupied, we have located many eyries that were previously unknown. Also, we thought we understood the habitat requirements of the species. But the discovery of an eyrie at 10,220 feet on Colter Peak only emphasizes the wide variation of nest sites available for peregrines. This site is the highest known peregrine eyrie in North America at this latitude. Latitude plays a big role in plant and wildlife distribution; treeline in Glacier National Park is at 7600 feet elevation, but is at 10,000 feet in Yellowstone and even higher still in Colorado. Eyries are lower in the more northerly latitudes. For an eyrie to be this high this far north is remarkable.

Idaho, Montana, and Wyoming have benefitted from The Peregrine Fund's

Photo courtesy T. McEneaney



Biologist Terry McEneaney below the 10,220 ft. eyrie on Colter Peak, Yellowstone National Park.

reintroduction program as evidenced by the 1997 results. The greater Yellowstone proved to be an important area for peregrine establishment in the northern Rockies and is expected to play a significant role as they pioneer other areas of Wyoming, Montana, and Idaho. In 1986, a greater Yellowstone working group set a goal of 30 peregrine pairs in the tri-state area by 1990; the goal was met in 1989. Then Wyoming added its own goal of having 30 pairs in northwest Wyoming by 1996, and achieved this by 1994.

Looking Toward the Future

The future of the peregrine falcon in greater Yellowstone looks very promising. By delving into the past we found that even though greater Yellowstone is perceived to be a pristine environment, DDT was sprayed in and around the park in the 1950s to combat spruce budworm infestations. The result of this effort contributed to the demise of the peregrine and other top food chain consumers in this unique ecological area.

The banning of DDT in 1972, coupled with the superb effort by The Peregrine Fund and their associates to restore peregrines in the wild, changed the status of the peregrine in a relatively short time. We are in consensus that the peregrine is ecologically recovered in greater Yellowstone and other areas of its former range in North America. It is just a matter of time before the U.S. Fish and Wildlife Service will reclassify the peregrine falcon as a recovered species no longer needing special protection under the Endangered Species Act. Once the species is officially delisted, efforts will be made to allow designated public viewing areas

Figure 4.

Total Number of Wild Peregrine Pairs

Wyoming, Montana, Idaho

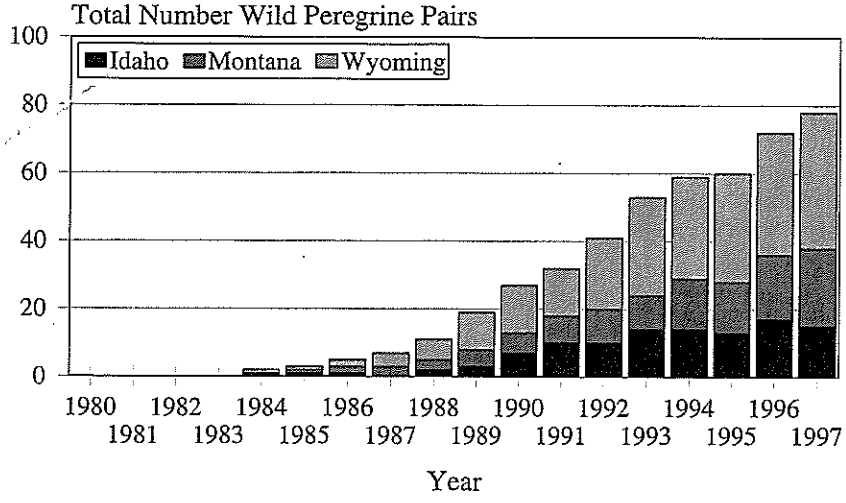
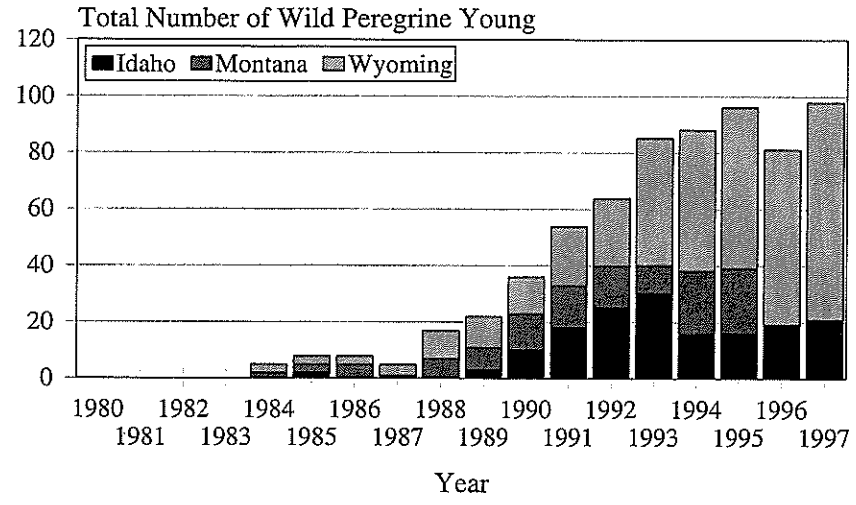


Figure 5.

Total Number of Wild Peregrine Young

Wyoming, Montana, Idaho



in places like Yellowstone. But monitoring efforts need to continue to ensure the survival of this remarkable species. This will require a long-term commitment by state and federal land management agencies.

Although the peregrine had its share of trials and tribulations, triumphs came from the partnerships that were formed between individuals working for a common cause. The success of the peregrine falcon recovery program in the greater Yellowstone required teamwork. The primary credit needs to go to The Peregrine Fund and its staff. Although not everyone can be mentioned, key people that quickly come to mind for their hard work and dedication include: Barb Franklin, Ed Levine, Brian Mutch, Dale Mutch, Dan O'Brien, Dan Stevenson, Jim Willmarth, and the countless number of hack sites attendants. It was also gratifying to find state and federal and nonprofit organizations working together for a common conservation cause. The achievement is a testament to the dedication of concerned organizations, agencies, and individuals.

But the ultimate triumph was the success of this grand experiment of reestablishing peregrine falcons into one of the wildest places in the lower 48 states. The peregrine falcon will go down on record as one of the great symbols of environmental conservation in North America and in greater Yellowstone. We are proud to have played a part in it. ✺

Terry McEneaney is the staff ornithologist for Yellowstone National Park. Bill Heinrich is the species restoration manager for The Peregrine Fund's World Center for Birds of Prey in Boise, Idaho. Bob Oakleaf heads the non-game program for the Wyoming Game and Fish Department. These and many other biologists and cooperators formed a cohesive team to help bring back the peregrine to greater Yellowstone.

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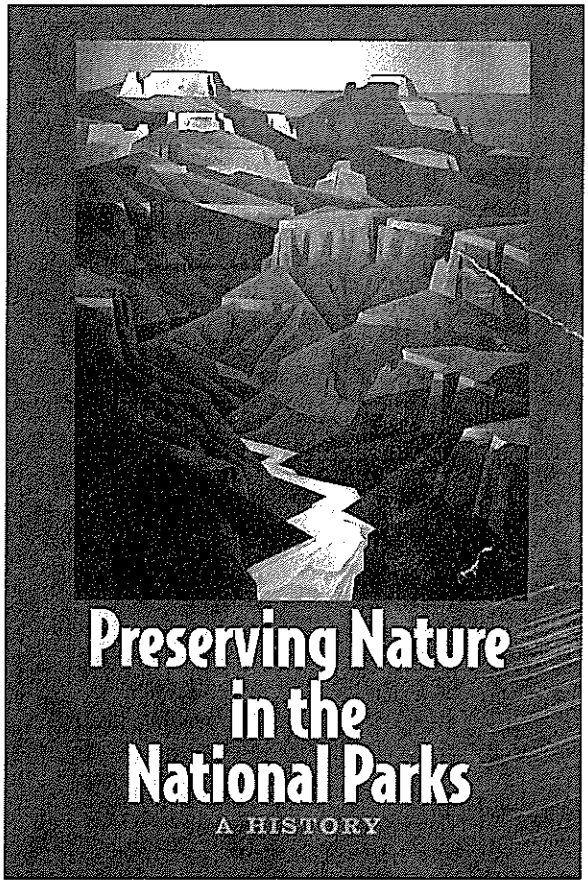
Book Review

Preserving Nature in the National Parks: A History *by Richard West Sellars. Yale University Press, New Haven, Connecticut, 1997, 364 pages. $35.00 (hardcover).*

Ever since the National Park Service (NPS) was established in 1916 there has been a constant debate over which component of the mission should be dominant—preservation or public enjoyment and use. In *Preserving Nature in the National Parks*, Richard Sellars immerses the reader in the history of National Park Service management and how, more often than not, development for ever-increasing visitor use has won out over the preservation of natural systems.

In this exhaustively researched and annotated book, Sellars takes us on a roughly chronological journey through the history of the Park Service, each chapter covering a block of years, each block with a theme that was particularly prominent during that time in history. The book could almost stand alone as a fairly complete historical account of the National Park Service, but that's not really its purpose; rather, I think it is designed to teach us a lesson: while Park Service management has always had good intentions, nature has often suffered due to ecologically poorly informed decisions.

Before reading the book, I thought I had a pretty good basic understanding of NPS history. What surprised me was how strongly ingrained the priority of public use and enjoyment was in the early years of the Service, especially for Stephen Mather and Horace Albright, the founders and first directors of the Park Service. Even after Albright left the government to spend the rest of his career in private industry, he would continue to be actively involved in furthering his ideas—one of which was the manipulation or ignorance of ecosystems to (as he saw it) benefit the visiting public. However, when one looks back at the philosophy toward nature at the beginning of the century, it isn't surprising that the young science of ecology took a while to become accepted by park managers. Even today, we see staunch opposition to many ecologically sound management practices such as wolf restoration and free ranging bison.



Nevertheless, in the early 1930s there were many vocal wildlife biologists urging the Park Service to start changing some policies for the benefit of wildlife and ecosystems, instead of merely "preserving the scene" or manipulating nature for the amusement of visitors. In 1933, three NPS wildlife biologists published a report that became known as *Fauna #1*. This document, which became official policy, "proposed a truly radical departure from earlier practices." Among other recommendations, the authors proposed restoring extirpated species to parks, restoring seriously altered habitats, and spoke of the need to expand boundaries to include year-round habitats for migrating wildlife. Unfortunately, this visionary document was never thoroughly implemented and often given only lip service until eventually superseded by other directives and policies in the 1960s and 1970s.

When one looks back at some of the early manipulative management actions of the Park Service (feeding bears, keeping bison on display as in a zoo), it is gratifying to see how far the Park Service has come in its views toward nature, at least as an institution. But at the same time, it's humbling to realize that, in many ways, we still have a long way to go. The current philosophy on fishing in national parks, for instance, is not substantially different from the early 1930s. Sellars notes, "So deeply entrenched was the tradition of fishing national park rivers and lakes that the wildlife biologists themselves seemed ambivalent and did not seek to discontinue this activity," even though David H. Madsen, a Bureau of Fisheries biologist detailed to the NPS, observed that the Park Service's fish management was "entirely inconsistent" with other wildlife policies. Today, the recreational fishing tradition continues to be deeply entrenched, and we see exotic species being protected in national parks for the amusement of visitors, a strong departure from the more ecologically oriented management that, fortunately, is becoming the norm.

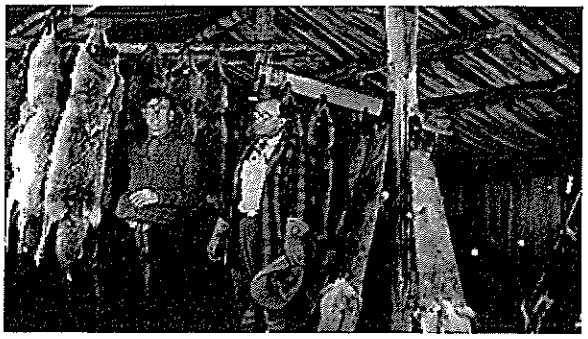
As might be expected in any history of the National Park Service, Yellowstone figures prominently in the book. The role of fire, the grizzly bear management controversy, the development of tourist facilities, and the extirpation and restoration of wolves are all discussed extensively and accurately. As might be expected, early views on predator control and then the long-standing advocacy many scientists for the artificial culling of ungulates appears again and again, giving us a thorough historic background leading up to the natural regulation policies of today. Early Yellowstone history makes up a good share of the first two chapters, due to the park being one of the few in existence during its first 50 years and because of its notoriety as the first national park. Many new policies were tried out in Yellowstone in the early years of the Service due to Horace Albright's strong influence on the Directorate dur-

ing his superintendency here.

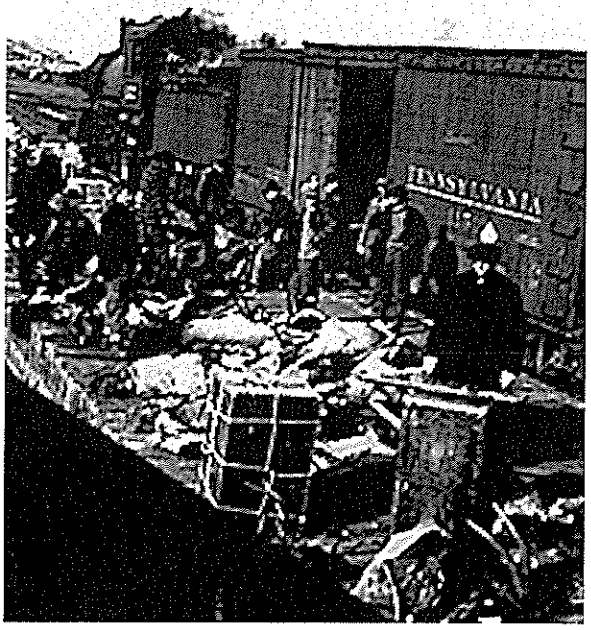
Perhaps a better title for the book would have been, "Preserving Nature *Through Science* in the National Parks." There is no question that management decisions should always have scientific backing and justification. It is also clear that the NPS has often ignored or even suppressed ecological principles in carrying out park management. Yet, somehow our natural national parks have been preserved remarkably well over a substantial period of time, considering some of the enormous pressure for one kind of development or another. Sellars concentrates almost entirely on science, or lack thereof, affecting management decisions that leave us where we are today. He seems to regard interpretation and law enforcement as purely visitor service activities, and not resource management or nature preservation activities. Left out of most of his discussions are protection and interpretive rangers who, from the start of the Service, have directly protected and preserved nature in the parks.

Protection rangers are included mainly in discussions of how the NPS culture evolved, and interpretive rangers are almost ignored completely, other than some early references to the naturalists in explaining organizational structure. The role of the naturalist is finally touched on in the last chapter, except it is implied that, in general, NPS interpretive programs have little substance, aren't science based, and mainly impart only aesthetic appreciation, thereby indirectly helping to attain preservation. Yet from early on, interpretive rangers' programs in the parks were usually science based, and often included a park preservation message; certainly that is strongly the case today. Likewise, both ranger divisions have always directly protected and preserved park resources on a daily basis. Although these activities aren't as obvious in the historical record as policy decisions, high-level memos, or director's orders, they probably had a substantial affect on management decisions and definitely swayed public opinion about the parks.

In spite of that one shortcoming, I found the book to be fascinating, as I think it would be for any student of the NPS or American conservation history. It is a valuable volume to have on the shelves of every park in the system, regardless of the type of park—for it imparts an understanding of NPS culture, how it evolved over time, and how important that culture and tradition was and still is in decision making. Sellars shows us how public opinion and institutional tradition are incredibly powerful forces which are very hard to change, even in the face of clear scientific evidence. Toward the end of the book he states, "the National Park Service remains a house divided—pressured from within and without to become a more scientifically informed and ecologically aware manager of public lands, yet remaining profoundly loyal to its traditions." The Service has been slowly but steadily improving its management practices through the use of scientific knowledge and education of the public. What will the priorities of the next century be? The Park Service has done a wonderful job of providing commercial services for its visitors, and "selling" the national park idea to the public. Let's hope the Service will now continue to develop the foresight, dedication to scientific principles, and the strong will needed to preserve nature in (and around) the national parks. ✹



Park rangers with predator hides during National Park Service predator control era in the 1920s. Photo NPS archives.



Hunters loading elk at the Gardiner (Montana) depot in 1919. Once they were protected by Yellowstone National Park game laws, migrating members of the northern Yellowstone elk herd supported an important sport hunt in southeastern Montana. Photos NPS archives.

Brian Suderman has been Mammoth District Ranger-Naturalist for Yellowstone National Park since 1996, having previously worked at Apostle Islands National Lakeshore, Organ Pipe Cactus National Monument, and Glacier Bay National Park. He has a bachelor of science degree in Environmental Studies from Northland College.

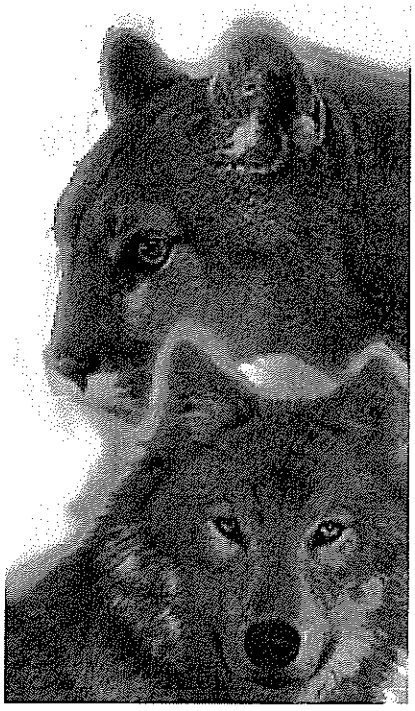
Lynx to be Listed Under Endangered Species Act

As part of a proposed settlement over a lawsuit filed by the Defenders of Wildlife and 14 other organizations, the U.S. Fish and Wildlife Service (USFWS) recently proposed to take action to list the Canada lynx (*Lynx canadensis*) under the Endangered Species Act. A series of legal actions regarding the lynx have been pending since 1991. The USFWS determined that lynx were historically resident in 16 of the contiguous United States, and that they currently occur at low levels in Montana, Washington, and Maine. They are rare in Idaho, Wyoming, Oregon, Michigan, Minnesota, Wisconsin, Utah, Colorado, Vermont, and New Hampshire; the USFWS believes they have been extirpated from New York, Pennsylvania, and Massachusetts.

Publication of a proposed rule in the Federal Register is planned for the summer of 1998, followed by a public comment period to actively solicit new information about the status of lynx and related threats, and ongoing conservation activities. Lynx are believed to have ranged historically in Yellowstone and may still remain, although reliable information on their past and present status is scant.

Experts Discuss New Zealand Mud Snails

On March 16, 1998, Yellowstone sponsored a mini-conference of visiting experts on the exotic New Zealand mud snail (*Potamopyrgus antipodarium*). The mud snail, first documented in North America in Idaho's Middle Snake River in 1987, is of growing interest to biologists and managers. This invader can be rapidly distributed by floating algae, boats, fish, anglers, birds, pump irrigation, and other means. Dr. Peter Bowler (University of California, Irvine) and Dr. Terrance Frest (Deixis consultants, Seattle) found it in the Madison River in and outside Yellowstone in 1995. Subsequent surveys also discovered the snails in the Firehole and Gibbon rivers and in Nez Perce Creek. Dr. Michael Gangloff (Montana State Univiversity) and others are continuing to study the distribution and effects of the mud snails in the ecosystem. Biologists express concern that mud snails could be outcompeting native gastropods for food and habitat, such as moist refugia during water-level fluctuations. The experts shared their views on ecological impacts of the invader, research needs, and potential ways to control its spread in the park.



Researchers to Study Cougar-Wolf Interactions

The Hornocker Wildlife Institute (HWI) of Moscow, Idaho, recently received a permit to continue studying cougars in northern Yellowstone National Park. Researchers from HWI initiated the first study of the park's big cats in 1987 (see volumes 2(3) and 2(4) of *Yellowstone Science*) and now plan a multi-year investigation of the interactions between lions and wolves and their combined effects on ungulate populations. From 1987 to 1996 HWI scientists captured, radiocollared, and monitored 84 cougars and documented their home ranges, social behavior, and predatory habits. The primary goals of the new study are to assess the effects of wolves on the cougar population and to assess cougar-prey relationships by comparing new data with information collected on cougars prior to wolf restoration.

Anglers Satisfied with Fishing Experience

Since 1973, Yellowstone has used a Volunteer Angler Report (VAR) system to annually monitor parkwide angling in Yellowstone. Data is obtained from a VAR card attached to each fishing permit sold to a park visitor. Nearly 2.9 million people visited Yellowstone in 1997. The park issued approximately 67,900 fishing permits in 1997, and anglers returned 3,666 usable VAR cards (5.4% of those issued). Parkwide angler use (angler fishing days) and effort (hours spent fishing) were 240,141 angler days and 587,781 hours, respectively. Although angler use in terms of days fished increased 3% over levels seen in 1996, the amount of fishing effort per day decreased from 631,700 hours in 1996. Anglers landed 558,121 fish and creeled about 32,120 in 1997, releasing approximately 94% of all fish landed. The average angler fished 2.5 days, 1.4 different waters/day, and 2.5 hours/day. Mean annual landing creel rates were 0.95 and 0.05 fish/hour, respectively. Nearly 78% of single-day angles landed one or more fish. An estimated 83% of park anglers reported being satisfied with their fishing experience.

El Niño Makes for Dry Snow Year

Phil Farnes of Snowcap Hydrology in Bozeman, Montana graciously provided the following report; What a difference a year can make! In 1997, snows came early and heavy in the Yellowstone area. Most measurements of snow-water equivalent (SWE) were at or near record levels. In contrast, during 1998—considered to be an El Niño year—the SWE was well below average on January 1, although it was nearly to average levels in the higher elevations by February 1. In all areas, it took until at least March 1 before SWE approached the levels recorded on January 1, 1997 (see Table at right). Additional information on snowpack can be obtained from the Natural Resources and the Conservation Service (NRCS) Snow Survey offices in Bozeman, Montana or in Casper, Wyoming.

		JANUARY 1			FEBRUARY 1			MARCH 1		
SITE NAME	ELEV(ft)	1997	1998	AVG.	1997	1998	AVG.	1997	1998	AVG.
Aster Creek	7,750	28.2	7.9	12.8	38.4	20.2	20.0	44.0	24.1	25.3
Black Bear*	7,950	38.6	12.7	15.6	48.9	26.5	24.5	51.2	31.4	31.7
Canyon*	8,090	14.4	4.5	5.3	19.0	9.5	8.3	21.4	10.7	10.7
Crevice Mtn.	8,400	-	-	-	-	9.5	7.0	14.5	9.9	9.0
Fisher Creek*	9,100	34.2	12.9	15.6	43.8	23.1	24.2	49.2	25.6	30.3
Grassy Lake*	7,270	26.8	12.0	14.3	37.2	23.9	23.0	40.4	26.7	29.6
Lake Camp	7,780	9.9	3.0	3.8	14.4	6.1	6.1	16.4	7.2	8.2
Lewis Lake Divide*	7,850	31.3	10.2	13.8	11.9	21.0	22.8	48.0	24.0	29.5
Lupine Creek	7,380	9.6	2.2	4.3	11.4	5.6	6.9	14.0	7.8	8.9
Madison Plateau*	7,750	24.1	6.5	10.1	31.9	13.9	16.1	36.4	17.0	20.6
Norris Basin	7,500	9.8	2.2	5.0	11.9	5.2	8.0	12.3	5.4	9.9
NE Entrance*	7,350	6.9	2.3	4.0	9.3	5.4	6.4	11.3	6.2	8.1
Old Faithful	7,400	15.4	3.4	6.4	19.4	8.9	10.8	23.9	11.0	13.7
Parker Peak*	9,400	18.4	8.2	10.6	24.5	13.7	14.3	28.0	14.9	18.0
Snake River Station	6,920	16.2	6.3	8.8	22.0	14.1	14.0	28.6	15.8	18.2
Sylvan Lake*	8,420	17.3	7.1	10.8	24.8	11.9	14.9	28.0	13.6	18.5
Sylvan Road*	7,120	11.5	3.7	5.8	16.5	7.8	8.5	18.7	8.4	11.2
Thumb Divide*	7,980	18.9	5.1	7.2	26.0	11.2	11.4	28.6	13.1	14.3
Twenty-One Mile	7,150	14.0	4.2	7.3	20.6	9.4	11.7	23.7	11.2	14.9
Two Ocean*	9,240	26.4	11.0	12.6	35.7	20.1	18.3	39.1	22.4	22.2
West Yellowstone	6,700	11.4	2.6	4.8	12.5	6.4	7.8	15.6	8.7	10.3
Whiskey Creek*	6,800	15.0	4.1	7.0	19.7	9.5	11.2	22.3	11.7	14.5
White Mill*	8,700	23.3	10.4	11.4	30.1	17.5	16.8	33.6	19.1	21.2
Younts Peak*	8,350	15.0	6.6	8.9	18.5	11.6	12.2	20.6	12.5	14.8
Parkwide % Average		212	72		183	95		162	87	

Note: SWE's are in inches. Average is for 30-year period 1961 to 1990.
* Date from snow pillows at automated SNOTEL sites. Other measurements are from snow cources where SWE is measured manually near the first of the month.
Compiled from data collected by the National Park Service, U.S. Forest Service, Bureau of Reclamation and Natural Resources and the Conservation Service.