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THE RECOVERY OF THE AMERICAN PEREGRINE FALCON IN ALASKA

David C. Payer[1*] *and Melanie J. Flamme*[2*]

[1] *National Park Service, Anchorage, AK, United States*

[2] *Yukon-Charley Rivers National Preserve, Fairbanks, AK, United States*

YOUNG REVIEWERS:

RANJAI
AGE: 12

RANVIR
AGE: 11

SHAHAR
AGE: 12

American Peregrine Falcons nesting along Alaska's upper Yukon River have been studied for nearly 50 years. Peregrine populations decreased in the 1960's because widespread use of the insecticide DDT caused their eggshells to thin. Thin eggshells meant that eggs crushed easily in the nest, which reduced the number of baby birds produced. Eventually, Peregrine Falcons were listed as endangered under the Endangered Species Act in the United States (U.S.). After the U.S. banned the use of DDT, the U.S. Fish and Wildlife Service, National Park Service, and others helped Peregrine Falcons recover. Today, upper Yukon River Peregrine Falcons have rebounded and are thriving. The Peregrine Falcon's recovery in the U.S. is a shining success story of the Endangered Species Act, although climate change and other pollutants create continuing challenges for the species.

Figure 1

Figure 1

(A) An American Peregrine Falcon pair in Yukon-Charley Rivers National Preserve, Alaska (photo credit: Sean Tevebaugh, NPS). **(B)** A perched female American Peregrine Falcon. Note the bright yellow talons (photo credit: Melanie Flamme, NPS).

THE AMERICAN PEREGRINE FALCON

The upper Yukon River in Alaska is home to one of the world's most well-studied populations of American Peregrine Falcons. Peregrine Falcons are large, stocky falcons with dark, slate-colored feathers on their backs, lighter feathers on their stomachs, and distinctive facial markings (Figure 1A). They have bright yellow, clawed feet called talons, used for perching and catching prey (Figure 1B). We monitor these birds along a 265-km (165-mi) section of the Yukon River in Yukon-Charley Rivers National Preserve (Figure 2A), in Alaska, U.S. A preserve is like a national park created to protect wildlife, habitat, and history. The high, steep, golden **bluffs** found here are an important Peregrine Falcon nesting habitat. They provide a safe place to raise young and good viewing to look for prey. Each summer, Peregrine Falcons return to the upper Yukon River from their winter ranges, as far away as Argentina, to mate and raise chicks.

BLUFF

A cliff rising steeply from the banks of a river, typically having a broad flat or rounded front.

Falcons are birds of prey, meaning they hunt other animals for food. Peregrine Falcons are among the fastest birds in the world. Diving from above, they can reach over 322 km/h (200 mi/hr). This helps them catch their favorite meal—other birds. Using their sharp vision, they target prey in mid-air, chase it, and strike with a sharp blow of their talons. Though they are powerful predators, the **species** has faced difficult challenges. As a top predator in the ecosystem, human activities such as pollution and climate change can threaten Peregrine Falcons.

SPECIES

A group of similar organisms that can breed together.

DAMAGE FROM AN INSECTICIDE AND HELP FROM A LAW

Dichloro-diphenyl-trichloroethane, or DDT for short, is an insecticide introduced in the U.S. in 1947. It was used to kill insects that were pests on crops and that caused human diseases. But DDT had other, unintended effects on the environment. When birds ate insects contaminated with DDT, they themselves became contaminated. As Peregrine Falcons fed on contaminated birds, the contamination was passed on to them in ever-increasing amounts. In Peregrine Falcons and other birds, one effect of DDT was to interfere with egg formation,

DICHLORO-DIPHENYL-TRICHLOROETHANE (DDT)

A toxic chemical used to kill insects and crop pests. It caused eggshell thinning in many birds.

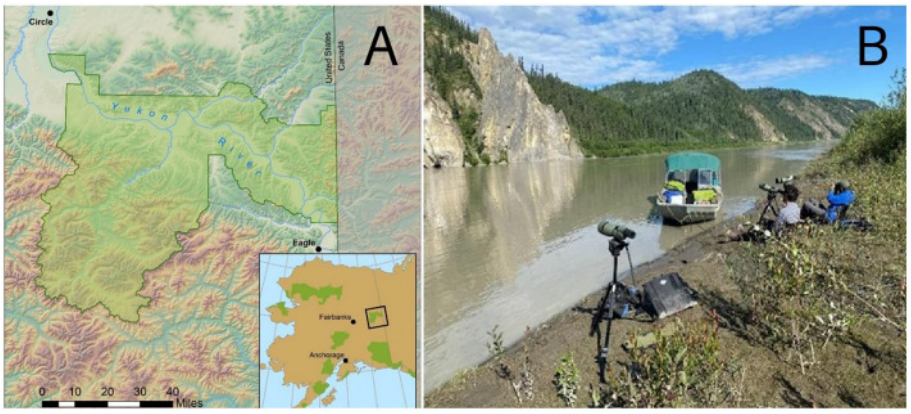

Figure 2

Figure 2

(A) The upper Yukon River flows 266 km (165 miles) between the Canadian border and Circle, Alaska. Yukon-Charley Rivers National Preserve, Alaska, is outlined in green and the straight green line at the right of the map shows the boundary with Canada. Inset shows the location of the preserve in Alaska with national park lands in green. **(B)** Biologists travel by motorboat and use binoculars and spotting scopes from riverbanks to look for Peregrine Falcons on bluffs (photo credit: Josh Spice, NPS).

resulting in eggs with thin shells. The fragile shells made the eggs susceptible to being crushed in the nest. As a result, nesting birds produced fewer chicks. By the 1960's, many species of birds, including Peregrine Falcons, declined across North America because of DDT. Peregrine Falcons disappeared completely from the eastern U.S. at this time.

The U.S. banned the use of DDT in 1972. In 1973, Peregrine Falcons were listed as endangered under the **Endangered Species Act** (ESA). The ESA is the primary U.S. law that protects imperiled species and their habitats. Efforts started soon after to help the species recover, led by the U.S. Fish and Wildlife Service. In Alaska, scientists tracked the number of breeding Peregrine Falcons nesting along the upper Yukon River. They measured the amount and types of toxins in the Peregrine Falcons' feathers and eggs. More needed to be done to protect Peregrine Falcons, however, because they migrate through other countries and needed protection there, too. Joint efforts by many countries and groups helped the species recover. Although DDT is still used in some areas outside of the U.S., its use worldwide has been much reduced. Further, breeding programs helped baby birds survive and Peregrine Falcons were reintroduced into areas where they had disappeared. The recovery of Peregrine Falcons in Alaska occurred naturally, without breeding programs or reintroductions, but such programs were essential to the overall recovery of the species in many areas outside of Alaska where the species had suffered severe declines.

ENDANGERED SPECIES ACT (ESA)

A U.S. law enacted in 1972, designed to protect and conserve threatened and endangered species and their habitats.

OTHER THREATS TO PEREGRINE FALCONS

Impacts from DDT have been reduced and, while that is good news, other forms of pollution can still harm Peregrine Falcons and other birds. Alaska is remote and the environment there is in pretty good shape. But global pollution carried by air currents still finds the falcons. One pollutant, mercury, can be especially toxic to wildlife.

Mercury is an element that occurs in nature. It is released into the air during mining, manufacturing, and the burning of waste. Once released, mercury can be chemically changed into methylmercury by tiny microorganisms in lakes and ponds. When this happens, methylmercury gets into small organisms like insects living in the water. Those insects are then eaten by larger living things, such as fish and birds. Methylmercury is toxic to birds, affecting multiple organs and egg development. Because Peregrine Falcons are at the top of the food web, they are more likely to consume toxins from their prey. Over the birds' lifetimes, these toxins can build up inside their bodies. Unfortunately, the levels of mercury found in Peregrine Falcon eggs along the Yukon River are cause for concern and, if the mercury levels continue to rise, it could cause failure of eggs to hatch.

Climate change is another threat to Peregrine Falcons. Weather patterns and winds are changing, storms are getting stronger and more frequent, and summer air temperatures are warmer, which can stress the birds. Also, some of the Peregrine Falcon's favorite prey species are shifting their distributions or becoming less abundant, making them less available as a meal. All these things can threaten the health of Peregrine Falcons.

HELPING PEREGRINE FALCONS THROUGH LONG-TERM MONITORING

One of the reasons the Yukon-Charley Rivers National Preserve was created was to protect Peregrine Falcons and their nesting habitat. We monitor Peregrine Falcons because they are at the top of the food web and can be indicators of ecosystem health. We track animals and their environments to assess ecosystem health over time.

In the preserve, we monitor Peregrine Falcons twice each year to determine their health and numbers [1]. In May, we make our first trip down the Yukon River to count the number of Peregrine Falcons and record which bluffs are being used for nesting. In July, we return to count the number of fuzzy, white chicks in each nest, which is typically between 0 and 4.

Traveling by motorboat, we search the bluffs along 266 km (165 mi) of the upper Yukon River, from Circle, Alaska to the border with Yukon, Canada and back downriver again (Figure 2A). We count the total number of Peregrine Falcons, both mating pairs and single birds, seen at over 175 bluffs. These high, steep bluffs provide Peregrine Falcons with protection from predators, especially for their nestlings. We find birds by using binoculars and spotting scopes, and we watch from the riverbanks or islands (Figure 2B). We have photographs of all nesting bluffs and mark them with all nests found. Nest sites are called **eyries**. Our photographs help us to quickly find eyries and check for birds

EYRIE

A nesting site of a bird of prey, often found high on bluffs or in trees.

Figure 3

Two American Peregrine Falcon nestlings in an eyrie along the upper Yukon River in Yukon-Charley Rivers National Preserve, Alaska (photo credit: Melanie Flamme, NPS).

in subsequent years because Peregrine Falcons tend to re-use the best sites.

Peregrine Falcons make nests in the eyries by scraping the ground with their bellies. They lay up to four rusty-brown eggs. The nestlings are fragile for their first 2 weeks of life (Figure 3). They can easily overheat or get too cold. Both parents work hard to continuously protect their chicks. They take turns hunting, feeding, shading, warming, and protecting them. After 30 days, the young falcons have grown from fluffy white cotton balls to hulking, black-and-white teenagers. By fall, they have learned to fly and they leave the nest to migrate south.

Nearly 50 years of monitoring shows that the number of Peregrine Falcons in the preserve has increased and is now leveling off. Our study tracked the natural recovery of an endangered species from a population crash to healthier levels. We looked at the Peregrine Falcon recovery from 1977 to 2015, to see how many falcons were occupying each bluff and how many nestlings were produced. We observed 1,602 occupied territories and 2,349 nestlings over those years. The fastest increase in Peregrine Falcon numbers was in the 1970's and 1980's. The increase slowed in the 1990's and 2000's. As the number of occupied bluffs grew, the distance between them got smaller and Peregrine Falcon territories got closer together. Bluffs got more crowded as birds competed for good nest sites. With closer neighbors, the numbers of nestlings dropped. This is probably because pairs were competing for food to feed their young and were spending more time defending their territories from other birds. In recent years, the Peregrine Falcon population has remained fairly steady, which suggests the habitat along the river may now be fully occupied [2].

It took nearly 50 years for Peregrine Falcons to recover from the damage caused by DDT. The Peregrine Falcon population along the

upper Yukon River has grown from 12 breeding pairs in 1975 to over 60 pairs today. This is a shining example of the power of international teamwork, long-term monitoring, and effective environmental laws. We will continue to monitor and protect the Peregrine Falcons in the preserve as they face new threats from pollutants and climate change. We hope these continued efforts will help Peregrine Falcons endure future challenges[1].

[1] For more on these falcons, see the video: The American Peregrine Falcon of Yukon-Charley Rivers National Preserve: https://www.nps.gov/media/video/view.htm?id=58132444-1DD8-B71B-0BC14692FB439ECD

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REFERENCES

1. Ambrose, S., Guldager, N., Daw, S., Beer, M., Flamme, M. J., MacCluskie, M., et al. 2018. *American Peregrine Falcon Monitoring Protocol for the Central Alaska Network: Protocol Narrative, Version 2.0. Natural Resource Report NPS/CAKN/NRR—2018/1747*. Fort Collins, CO: National Park Service. Available online at: `https://irma.nps.gov/DataStore/DownloadFile/608645` (accessed March 23, 2022).
2. Ambrose, S., Florian, C., Ritchie, R. J., Payer, D., and O'Brien, R. M. 2016, Recovery of American peregrine falcons along the upper Yukon River, Alaska. *J. Wildlife Manag.* 80:609–20. doi: 10.1002/jwmg.1058

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CONFLICT OF INTEREST: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

YOUNG REVIEWERS

RANJAI, AGE: 12

I like space, fungi, rocks, chemistry, architecture, biology, physics, fortnite, NASA, space telescopes, Rockets, pizza, pasta, chicken (fried, smoked, etc.), sea creatures, Dude perfect, Brave wilderness, history, geography, Rick Riordan books, weapons, archery, Cobra Kai, Beyblade burst, Jurassic park: Camp Cretaceous, Teen titans, Arrow, The Flash, DC, Marvel, Botany, MCU, Dinosaurs, Alan Walker songs, and debating.

RANVIR, AGE: 11

My name is Ranvir and I am in class 7. As hobby I catch snakes to learn about herpetology. I started doing that when I was 8. I used to catch skinks, but I got bored doing that, so I learned a few things about herpetology and went out with some of my friends. After some time, we found our first Microhylid frog. And after half a year we also found our first snake, a *Lycodon capucinus*! Besides herpetology, I also like doing origami. I also like reading Greek mythology.

SHAHAR, AGE: 12

Hi! I am Shahar, I am 12 years old and live in Israel. I love art, music, reading fantasy books like Harry Potter and Lord of the Rings. I love learning about all things related to science and technology, and especially about math and astrophysics. I enjoy very much reviewing articles at frontiers, as I get to deeply understand a topic and express my thoughts about it.

AUTHORS

DAVID C. PAYER

Dr. David Payer is the regional wildlife biologist for the National Park Service in Alaska. His research interests include determining the effects of human activities, pollution, and climate change on wildlife in parks, and developing ways to minimize adverse effects. He often consults with parks throughout the U.S. on wildlife-management practices that will preserve healthy animal populations and provide opportunities for people to enjoy observing wildlife in its native habitats. *david_payer@nps.gov

MELANIE J. FLAMME

Melanie Flamme is a wildlife biologist for the National Park Service at Yukon-Charley Rivers National Preserve. Her research interests include studying songbirds, loons, Peregrine Falcons, and small mammals, like voles and mice. She also helps youth learn about science in the parks to develop the next generation of park scientists. *melanie_flamme@nps.gov