Golden Eagle and Peregrine Falcon

Raptor Survey Guide

for Bighorn Audubon Volunteers

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Purpose: To survey raptors in the Bighorn National Forest, with a focus during breeding and fledgling seasons. Raptors of special interest are Golden Eagles (GOEA), Peregrine Falcons (PEFA) and American Goshawks (AGOS). Surveys for GOEA and PEFA are conducted primarily in canyons and view of cliff face. Further information is included in this guide. AGOS information is in a separate guide.

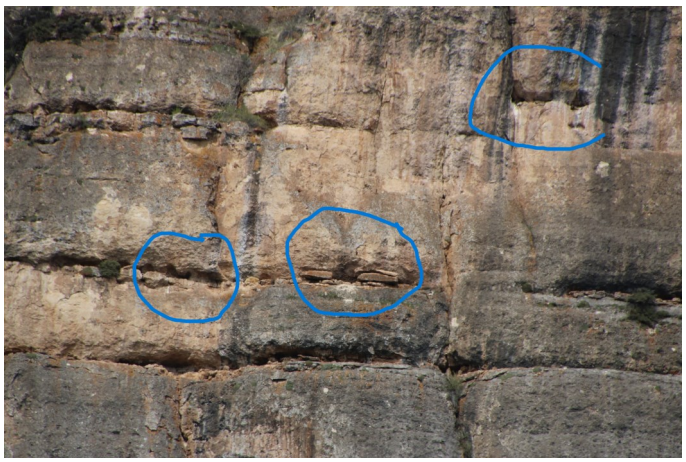
Equipment and Preparation:
Dress for outdoor activities, preparing for swift changes in weather. Check the weather forecast and radar.
Keep plenty of water and blankets in your vehicle in case of emergency.
Gas up!
Cell coverage is very limited in the Forest. Before going on a survey, please inform a friend or family member of your general location.
Bring good binoculars, a scope and/or camera with long lens, notepad, pencils, and survey data sheet.
Phone photos are good for showing landscape of area where raptors were observed. Circle the location on photo and include along with data sheet. Zoomed photos with a camera of raptors observed and eyrie (nest site) locations are very helpful

Sound Familiarization: Learn the different calls each species can make. The Merlin application is free and very useful for learning sounds (and for visual guidance). Please do not bait raptors with calls.

Visual Familiarization: Learn the appearance, including in fight, of the species. Identification details are in this guide.

How and Where to Look: Each route will likely have point stops. Points are predetermined stopping survey locations along a route. At each point, first scan the sky and cliffs for any movement with naked eye, 360 degrees. If a raptor is seen immediately, try to get a better look through binoculars and take photos. After scanning with naked eye, scan the cliff face, ridge top, trees, and sky with your binoculars 360 degrees. Time spent at each point stop is anywhere from 20 minutes to 90 minutes – depending on bird activity.
Record raptors' behaviors and location, or no raptors seen.

White-wash (bird droppings) on cliff face is a good indicator of an eyrie or vicinity. Look closely at those areas. Please note, after a lot of rain, white-wash may not be as visible. "White-wash" from bats may also be visible, but these will be seen as though coming from no apparent hole in cliff or cliff ledge.
See examples below of Tensleep Canyon PEFA perching sites with white-wash



Behavior: Pay special attention to raptors exhibiting breeding behavior – such as flying in a pair, carrying nesting material, or carrying food – as this will assist you in locating active nests. Record the length of time your observation on the data sheet. [2]

Raptors often disappear into the cliff face or spend time along the cliff face. Please pay close attention to this behavior as this may indicate an eyrie. If a raptor disappears into the cliff – keep a good long focus on that location, and please note location and behavior on data sheet, along with photo if possible.

Golden Eagle nest, Tensleep Canyon, Observation Point 4

PEFAs and GOEAs may build multiple nests and select just one. They will abandon an active nest if there is too much human disturbance. They may then choose another site, but brood success will be greatly diminished depending on timing.

Nest sites may be difficult to see, especially those of PEFA. PEFA may also cache food, usually close by their eyrie especially during incubation and hatchlings. PEFA females stay on the nest but may occasionally leave to retrieve food from a close by caching site. The male will also bring her food and resupply cache sites.
Male GOEA will bring female food during incubation and hatchling season. Females will leave the nest for short distances. It is believed females do all nocturnal incubation and 83% of diurnal incubation.[3] Observations to date suggest that the male almost never broods, and the female broods and shades young from hatching to about 45 days of age.[3]

Time of Day to Survey: Early to mid-spring begin survey mid to late morning. Late spring and into summer months earlier may be best for observing, especially for food delivery to females and hatchlings. However, any time during daylight there is a likelihood of spotting raptors. Patience, perseverance, and luck are key.

Many raptors exhibit activity patterns where they are more active, away from cover, or more vocal during some times during the day than others. For example, in the temperate zone, soaring raptors may not leave roosts until mid-morning, when thermals form. Similarly, raptors may be detected with higher probability at some times of the year, or even within the same season, than at other times.[1]

Weather of course is a factor – wind, rain, snow, and heat will affect behavior and observations.
Sun's position on cloudless or partially cloudy days may interfere with observations. Be mindful of this when a set location (N, S, W, or E) is your focus.

Residents and Migration: GOEAs in the Bighorn Forest may be year-round residents, migrating short distances to lower elevations in winter conditions depending on prey availability. Migrating populations are in early spring and late fall. It is unknown if breeding pairs are migrants.
PEFAs arrive around mid-April (see following chart) and populations in the Forest include breeding and migrating populations.

Survey Forms and eBird: At the end of each survey, a Raptor Survey Form needs to be submitted via email to Bighorn Audubon and the Bighorn National Forest biologist.
Please include other bird species seen during your survey in the form notes and/or on eBird.
If you need further help with the form or eBird, please contact Bighorn Audubon at bighornaudubon@gmail.com.

From Colorado Parks and Wildlife Raptor Monitoring Volunteer Program Handbook

Table 1. Breeding seasons for each species

X = Nesting activity occurs, known and former nests should be observed

C = Courtship occurs, make notes of behavior and follow pairs to locate nests [2]

	Month											
Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
American Kestrel			C	C	X	X	X					
Bald Eagle	C	C	X	X	X	X	X					
Boreal Owl		C	C	C	X	X	X					
Burrowing Owl			C	C	X	X	X	X	X			
Common Barn Owl			C	X	X	X	X	X	X			
Cooper's Hawk			C	C	X	X	X					
E. Screech Owl			C	X	X	X	X					
Ferruginous Hawk				X	X	X	X					
Flammulated Owl				C	X	X	X	X				
Golden Eagle	C	X	X	X	X	X	X					
Great Horned Owl	C	X	X	X	X	X	X					C
Long-eared Owl		C	X	X	X	X	X					
Mississippi Kite					X	X	X	X				
Northern Goshawk				C	X	X	X	X				
Northern Harrier				X	X	X	X	X				
N. Pygmy Owl				X	X	X	X	X				
N. Saw-whet Owl			C	C	X	X	X					
Osprey				X	X	X	X	X	X			
Peregrine Falcon				X	X	X	X					
Prairie Falcon				X	X	X	X					
Red-tailed Hawk			C	X	X	X	X					
Sharp-shinned Hawk			C	C	X	X	X					
Short-eared Owl		C	C	X	X	X	X					
Spotted Owl		C	X	X	X	X						
Swainson's Hawk				X	X	X	X	X				
Turkey Vulture			X	X	X	X						
W. Screech Owl			C	X	X	X	X					

From Colorado Parks and Wildlife Raptor Monitoring Volunteer Program Handbook

Table 2. Site fidelity and nesting duration for each species. Note many fledglings remain near the nest and depend on parents for 1-3 months.

Nest Fidelity: H = high M = medium L = low

Species	Territory Fidelity	Nest Fidelity	Incubation Time (days)	Time to Fledge (days)
American Kestrel	Y	M	26-32	27-31
Bald Eagle	Y	H	34-38	70-84
Boreal Owl	Y	M	26-32	28-36
Burrowing Owl	Y	H	27-30	40-45
Common Barn Owl	Y	H	26-32	56-62
Cooper's Hawk	Y	L	30	27-30
E. Screech Owl	Y		27-34	28
Ferruginous Hawk	Y	M	30-34	38-50
Flammulated Owl	Y	H	21-24	
Golden Eagle	Y	M	41-45	72-84
Great Horned Owl	Y	L	32-35	45
Long-eared Owl		L	25-35	30-40
Mississippi Kite	Y	L	29-32	25-30
Northern Goshawk	Y	L	30-35	35-42
Northern Harrier	Y	L	29-31	30-40
N. Pygmy Owl			28	23
N. Saw-whet Owl		L	27-29	
Osprey	Y	H	34-40	50-60
Peregrine Falcon	Y	H	30	35-42
Prairie Falcon	Y	H	30	40
Red-tailed Hawk	Y	H	28-32	44-46
Sharp-shinned Hawk	Y	L	30	21-27
Short-eared Owl		L	24-29	27
Spotted Owl	Y		28-32	32-36
Swainson's Hawk	Y	H	33-36	38-46
Turkey Vulture	Y		28-40	70-80
W. Screech Owl		H	26-34	

Golden Eagle adult, photo courtesy of Bighorn Audubon JP

ABOUT GOLDEN EAGLES
From *All About Birds*, Cornell Lab of Ornithology

Basic Description
The Golden Eagle is one of the largest, fastest, nimblest raptors in North America. Lustrous gold feathers gleam on the back of its head and neck; a powerful beak and talons advertise its hunting prowess. You're most likely to see this eagle in western North America, soaring on steady wings or diving in pursuit of the jackrabbits and other small mammals that are its main prey. Sometimes seen attacking large mammals, or fighting off coyotes or bears in defense of its prey and young, the Golden Eagle has long inspired both reverence and fear.

Size & Shape
Golden Eagles are one of the largest birds in North America. The wings are broad like a Red-tailed Hawk's, but longer. At distance, the head is relatively small and the tail is long, projecting farther behind than the head sticks out in front
Measurements
Both Sexes
Length: 27.6-33.1 in (70-84 cm)
Weight: 105.8-216.1 oz (3000-6125 g)
Wingspan: 72.8-86.6 in (185-220 cm)

Golden Eagle adult, photo courtesy of Bryan Calk, Macaulay Library, Cornell

Color Pattern
Adult Golden Eagles are dark brown with a golden sheen on the back of the head and neck. For their first several years of life, young birds have neatly defined white patches at the base of the tail and in the wings.

Golden Eagle immature, photo courtesy of Bradley Hacker, Macaulay Library

Behavior
Usually found alone or in pairs, Golden Eagles typically soar or glide with wings lifted into a slight “V” and the wingtip feathers spread like fingers. They capture prey on or near the ground, locating it by soaring, flying low over the ground, or hunting from a perch.

Habitat
Golden Eagles favor partially or completely open country, especially around mountains, hills, and cliffs. They use a variety of habitats ranging from arctic to desert, including tundra, shrublands, grasslands, coniferous forests, farmland, and areas along rivers and streams. Found mostly in the western half of the U.S., they are rare in eastern states. They avoid developed areas and uninterrupted stretches of forest. They are found primarily in mountains up to 12,000 feet, canyonlands, rimrock terrain, and riverside cliffs and bluffs. Golden Eagles nest on cliffs and steep escarpments in grassland, chapparal, shrubland, forest, and other vegetated areas.

Food
Golden Eagles prey mainly on small to medium-sized mammals, including hares, rabbits, ground squirrels, prairie dogs, and marmots. Black-tailed jackrabbits are a key prey species throughout much of their range. These eagles are also capable of taking larger bird and mammal prey, including cranes, swans, deer, and domestic livestock. They have even been observed killing seals, mountain goats, bighorn sheep, pronghorn, coyotes, badgers, and bobcats. In addition to live prey, Golden Eagles often feed on carrion, following crows and other scavengers to a meal. They also catch fish, rob nests, and steal food from other birds.

Nest Description

Golden Eagles usually nest on cliffs.

Starting 1–3 months before egg-laying, a Golden Eagle pair builds a nest of sticks and vegetation—sometimes also including bones, antlers, and human-made objects such as wire and fence posts. They line the nest with locally available vegetation, such as yucca, grasses, bark, leaves, mosses and lichens, or conifer boughs. They often include aromatic leaves, possibly to keep insect pests at bay. Resident birds continue adding nest material year-round, reusing the same nest for multiple seasons and sometimes alternating between two nests. Nests are huge, averaging some 5-6 feet wide, and 2 feet high, enclosing a bowl about 3 feet by 2 feet deep. The largest Golden Eagle nest on record was 20 feet tall, 8.5 feet wide.

NESTING FACTS	
Clutch Size:	1-3 eggs
Number of Broods:	1 brood
Egg Length:	2.7-3.4 in (6.8-8.6 cm)
Egg Width:	1.9-2.5 in (4.9-6.4 cm)
Incubation Period:	41-45 days
Nestling Period:	45-81 days
Egg Description:	White to cream or pale pink, usually with small brown blotches.
Condition at Hatching:	Weak, weighing about 3 oz; partially covered with grayish-white down; eyes partially open.

Behavior

Golden Eagles possess astonishing speed and maneuverability for their size. Diving from great heights, they have been clocked at close to 200 miles per hour. In an undulating territorial and courtship display known as "sky-dancing," a Golden Eagle performs a rapid series of up to 20 steep dives and upward swoops, beating its wings three or four times at the top of each rise. In "pendulum flight," the eagle dives and rises, then turns over to retrace its path. Single birds and pairs engage in aerial play with objects such as sticks or dead prey, carrying these items high into the sky, then dropping and retrieving them. In addition to attacking prey from the air, Golden Eagles sometimes hunt on the ground, wildly flapping as they run. Mated pairs hunt jackrabbits cooperatively during breeding season—one eagle diverting the animal's attention while the second makes the kill.

Noteworthy: The Rough-legged Hawk, the Ferruginous Hawk, and the Golden Eagle are the only American raptors to have legs feathered all the way to the toes.

The oldest recorded Golden Eagle was at least 31 years, 8 months old, when it was found in 2012 in Utah. It was banded in the same state in 1980.

Excerpts from *Birds of the World,* Cornell Lab of Ornithology

Todd E. Katzner, Michael N. Kochert, Karen Steenhof, Carol L. McIntyre, Erica H. Craig, and Tricia A. Miller

Flight – Fledglings: Eagles generally lack the strength to use sustained powered flight until several days after they fledge. The flight skills of eagles improve quickly within a month of fledging.

Despite the presence of terrestrial mammalian predators, recently fledged Golden Eagles commonly spend several days on the ground after leaving the nest. That they often survive is likely due to their parent's defense behaviors and possibly aggressive displays by the young eagles.

Once past the first month out of the nest, the Golden Eagle is an extremely efficient flier. They use multiple types of atmospheric updraft to their advantage and they soar and glide for extended periods of time, using very little energy to stay aloft or to travel great distances.

Eagles exhibit a variety of flight behaviors throughout the year including soaring, gliding, flapping, diving or stooping, kiting, and parachuting. They regularly alter their flight behavior in response to variable aerial environments and the purpose of their flight (e.g., traveling, migrating, hunting, transporting prey or nesting materials. Soaring flight is used when hunting, traveling, performing displays, or when flying without any obvious intent.

Territorial: Aggressive attacks on non-territorial eagles by territorial eagles during the nesting season are common in some areas. In contrast, territorial adults often react passively to non-territorial subadults near nests during the nesting season. Older individuals seem to tolerate younger, non-breeding eagles in their territories at many times of the year.

Golden Eagles aggressively defend occupied nests against potential nestling predators including Gyrfalcon, Great Horned Owl, and Common Raven. Territory defense is accomplished by displays such as undulating flight, high soaring flight, occasional chases, display of talons, and conspicuous perching. Golden Eagle also may perch conspicuously, presumably to exhibit territoriality.

Territorial eagles may spend long periods of the day perched on prominent outcrops or ridgelines in their territories during the nesting season.

Reports are that some Golden Eagle nestlings could be killed by Common Raven.

Play: It is difficult to interpret play by eagles. Both adults and young carry sticks, drop them, and then retrieve them while in flight, O'Toole et al. observed three different sibling pairs catching and plucking prey together. Adults on breeding grounds sometimes repeatedly carry moss, a clod of dirt, or dead prey to a great height, drop it, then dive after and catch it. These behaviors were originally interpreted as play, but they also could be courtship.

Mobbing and Harassment: Many species of birds harass or mob Golden Eagle. Known are, Prairie Falcon, Peregrine Falcon, Black-billed Magpie, Common Raven, American Kestrel, Prairie Falcon, Northern Harrier, and other Golden Eagles, Short-eared Owl, Gyrfalcon, and Merlin. Bald Eagle sometimes attacks Golden Eagle. Occasionally Prairie Falcon, Peregrine Falcon, and Gyrfalcon drive eagles to the ground. This can result in injury or death to the eagle.

Non-aggressive Behavior: Golden Eagle often ignores smaller avian and mammalian species, including some that are taken as prey, that visit or live near their occupied nests.

Breeding and Nesting: The Golden Eagle is generally monogamous and slowly reproducing (i.e., *k*-selected). Nests, which are on cliffs, in trees, or on the ground, are frequently reused, from year to year, and pair bonds can be maintained across many years. The time from egg-laying until fledging can last 100 days. However, territoriality can start long before egg-laying, and post-fledging dependence can last long after fledging.

Non-migratory adults add material to nests and may build new nests at any time of the year. However, they frequently begin refurbishing nests in autumn, with activity peaking from late January to early March.

It is not known how eagles select their nest site, nor which sex is responsible for this selection. Early accounts suggested that females select nest sites. . Many territories have multiple nests and it is not known why one nest is chosen for use in any given year.

Despite the lack of knowledge about how nests are selected, there are patterns reported in locations of eagle nests. Local geography is clearly one important determinant. Many nests have a wide view of the surrounding area or are on prominent escarpments that provide updraft to subsidize flight. Proximity to hunting grounds is probably an important factor in nest-site selection. Finally, protection from predators is also likely relevant.

Nest site exposure may be a factor in nest-site selection. Eagles nesting at higher latitudes tend to use south-facing locations.

Adults build new nests and refurbish and reuse existing nests within their nesting territory. Occasionally eagles build new nests on or near sites of nests that had been destroyed or had fallen off the cliff.

Nest Size: In its first year of use, a Golden Eagle nest is about a meter [3.28 feet] in diameter and less than a meter deep. After many years of reuse, each of which involves addition of nest material, a nest can be very large. A wide range of nest sizes is reported in the literature. A nest near Rock Springs, Wyoming was 6.0 m tall, and a nest in Sun River, Montana, was 7.0 m tall and 2.6 m wide.

Status of Golden Eagles **-** University of Wyoming News – 11/28/23

While bald eagles are one of the best conservation success stories in the United States, golden eagle populations continue to struggle in the West. Scientists at the University of Wyoming and elsewhere working to help eagles have identified key eagle habitats and created a free, online tool to help direct conservation efforts.

Teton Raptor Center has announced the official launch of RaptorMapper.com, which maps critical habitats and calculates the conservation values of land parcels for golden eagles across Wyoming.

Golden eagles are of significant conservation concern due to increasing threats to their populations from factors such as increasing wind energy development, lead poisoning, habitat loss and declining prey populations.

Wyoming is a key area for nesting golden eagles in the West. Additionally, the state has some of the best wintering habitat and important migration corridors for golden eagles that spend the breeding season in Canada and Alaska. The state also has some of the best wind resources and fastest-growing renewable wind energy development in the country.

Golden Eaglet, photo courtesy of Bighorn Audubon JP

Golden Eagle perched circled in blue, and possible nest site circled in red.
Tensleep Canyon, Observation Point 4.
Photo courtesy of Bighorn Audubon, JP

ABOUT PEREGRINE FALCONS
From *All About Birds*, Cornell Lab of Ornithology

Basic Description: Powerful and fast-flying, the Peregrine Falcon hunts medium-sized birds, dropping down on them from high above in a spectacular stoop. They were virtually eradicated from eastern North America by pesticide poisoning in the middle 20th century. After significant recovery efforts, Peregrine Falcons have made an incredible rebound and are now regularly seen in many large cities and coastal areas.
Measurements
Both Sexes
Length: 14.2-19.3 in (36-49 cm)
Weight: 18.7-56.4 oz (530-1600 g)
Wingspan: 39.4-43.3 in (100-110 cm)

Size & Shape: Peregrine Falcons are the largest falcon over most of the continent, with long, pointed wings and a long tail. Be sure to look at shape as well as size—long primary feathers give the Peregrine a long-winged shape. As with most raptors, males are smaller than females.

Color Pattern: Adults are blue-gray above with barred underparts and a dark head with thick sideburns. Juveniles are heavily marked, with vertical streaks instead of horizontal bars on the breast. Despite considerable age-related and geographic variation, an overall steely, barred look remains.

Peregrine Falcon adult, photo by Francesc Jutglar, Birds of the World

Peregrine Falcon adult, photo courtesy of Joshua Stacy, Macaulay Library, Cornell

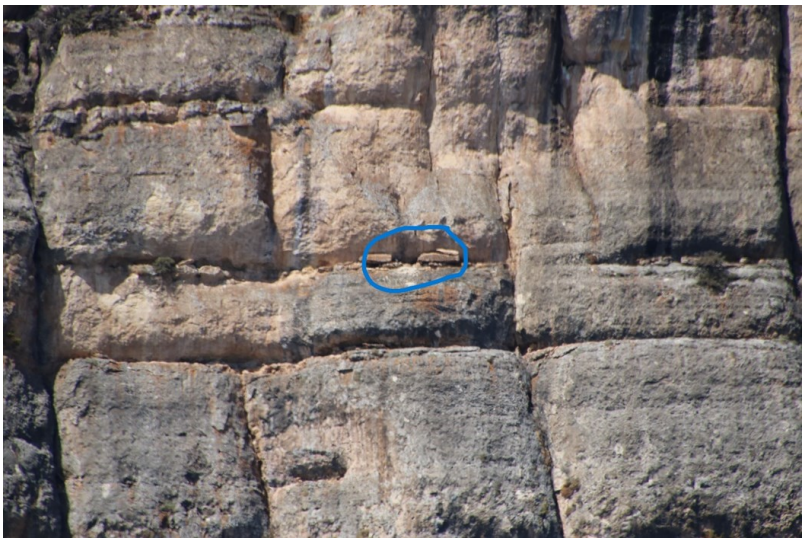
Behavior: Peregrine Falcons catch medium-sized birds in the air with swift, spectacular dives, called stoops.

Food: Peregrine Falcons eat mostly birds, of an enormous variety—450 North American species have been documented as prey, and the number worldwide may be as many as 2,000 species. They have been observed killing birds as large as a Sandhill Crane, as small as a hummingbird, and as elusive as a White-throated Swift. Typical prey include shorebirds, ptarmigan, ducks, grebes, gulls, storm-petrels, pigeons, and songbirds including jays, thrushes, longspurs, buntings, larks, waxwings, and starlings. Peregrine Falcons also eat substantial numbers of bats. They occasionally pirate prey, including fish and rodents, from other raptors.

Far left: Peregrine Falcon juvenile, photo courtesy of Historical Middleton Island Data, Macaulay Library, Cornell

Near left: Peregrine Falcon adult, photo courtesy of Samuel Galick, Macaulay Library, Cornell

Nesting: Typically, Peregrine Falcons nest on cliffs from about 25–1,300 feet high (and higher, including on the rim of the Grand Canyon). On these cliffs they choose a ledge that is typically around a third of the way down the cliff face. Other sites include electricity transmission towers, quarries, silos, skyscrapers, churches, and bridges. In places without cliffs, Peregrines may use abandoned Common Raven, Bald Eagle, Osprey, Red-tailed Hawk, or cormorant nests. In the Pacific Northwest they may nest among or under Sitka spruce tree roots on steep slopes.



Eyrie (nest) site at Observation Point 1, Tensleep Canyon, 4 28 2023, photo courtesy of Bighorn Audubon, JP

Nest Description: Males typically select a few possible nest ledges at the beginning of each season and the female chooses from these. The birds do no nest building beyond a ritualized scraping of the nest ledge to create a depression in the sand, gravel or other substrate of the nest site. Scrapes are about 9 inches in diameter and 2 inches deep.

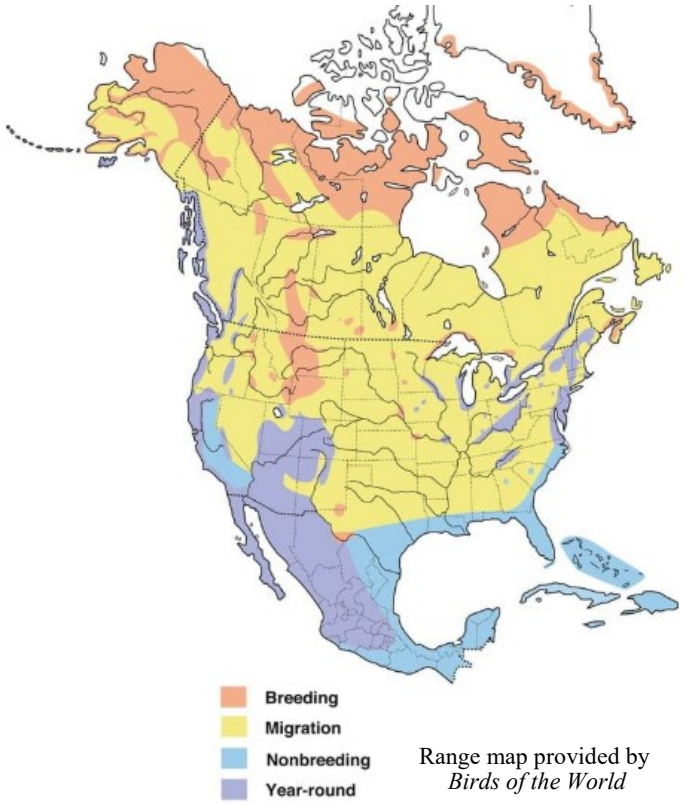
Nestling. Photo: Jim Verhagen/Audubon Photography Awards

Clutch and Egg Sizes

Clutch Size:	2-5 eggs
Number of Broods:	1 brood
Egg Length:	2.0-2.0 in (5-5.2 cm)
Egg Width:	1.6-1.9 in (4-4.7 cm)
Incubation Period:	29-32 days
Nestling Period:	35-42 days
Egg Description:	Pale creamy to brownish, dotted or blotched with brown, red, or purple.
Condition at Hatching:	Helpless, covered in whitish down, with eyes closed, weighing about 1.5 ounces.

Excerpts from *Birds of the World,* Cornel Lab of Ornithology
Peregrine Falcons
By Clayton M. White, Nancy J. Clum, Tom J. Cade, and W. Grainger Hunt

The name Peregrine means "wanderer," and northern-nesting Peregrines are among North America's long-distance migratory species, some moving 25,000 kilometers annually. Several western fossil sites containing
Peregrines date from about 40,000 to 29,700 ybp



Range map provided by *Birds of the World*

Walking, Hopping, Climbing, Etc
Will walk on ground to approach prey, although most common in young birds. Will walk or run briefly on nest ledge to displace another bird. Incubating adults have trouble walking around eggs or nestlings because feet instinctively ball up as in incubating condition. Male has high-stepping walk used during ledge displays. Up to 1 wk prior to fledging, young may wander on foot to 50 m from nest ledge, walking, hopping, or climbing along cliff face. Young also Hop-Run, alternating 2 or 3 steps with a hop during play, or Run-Flap, when encountering obstacles, chasing siblings, or approaching adults (Sherrod 1983).

Flight
(female wingspan = 99.7 ± 4.8 cm, wing width = 16.9 ± 0.6 cm [*n* =14]; male wingspan = 87.1 ± 5.5 cm, male wing width = 14.3 ± 0.7 cm [*n* =11];
High-intensity flight first observed 2–3 wk after fledging; in young, used almost exclusively to pursue adults (Sherrod 1983).

Soaring . From Sherrod 1983, except as noted. Static soaring observed in young within 2 d of fledgling. Wings held open and motionless, tail open or closed. Movement is parallel to length of cliff face, within 3–100 m above edge. Duration of several minutes early in fledging period to more than 1–2 h later in dependency. Static soaring on thermals observed in young within 1–2 wk of fledging and intermittently by adults (typically only for minutes at a time) when searching for prey at altitudes of 130–330 m above ground (White and Nelson 1991).

Daily Time Budget
Data from Carlier (Carlier 1993) on *F. p. brookei* show that during courtship female spent 85% of time in nest's vicinity compared to 65% for male. Only 15 and 5%, respectively, spent at nest ledge itself. Female attendance to site during incubation remains about the same, but up to 70% spent at nest ledge in association with incubation duties. Male spends comparatively less time in vicinity of nest during incubation (55%) but more time at nest ledge (30%). When eggs pipped, female increased attendance at area (100%) and ledge (90%), whereas male decreased attendance (20 and 10%, respectively), possibly because female excludes him (Nelson 1970b, Treleaven 1977). Male attendance in vicinity remained constant until young about 40 d, while female attendance to site decreased steadily to about 35% during same period (Carlier 1993). Female attendance at ledge dropped precipitously after 10 d (from 70 to 20% in a 10-d period); after 40 d, she spent almost no time at the ledge. Female attendance to the nest site continued to decrease steadily until about 70 d, when she was present <5% of the time. Male stopped attending ledge sooner (at 20 d) but abandoned area about same time as female (70 d).

Physical Interactions

Peregrines attack and strike or grapple each other much same way they attack prey. Aerial fights involve stoops, tail-chases, strikes, and rollovers with presentation of talons to attacker; sometimes 2 birds hold onto each other's feet and cartwheel through air, infrequently falling to ground still bound together (A. Nye in **Peterson 1948**). On ground, attacker charges in running and flapping and grabs opponent by legs and feet; usually both birds manage to grab hold of each other in some way. Locked together, they jab and bite with bills, directing attack to each other's head and neck. Vicious and prolonged fights, sometimes lasting hours and resulting in fatal injuries if one bird does not break away soon enough. Occurs most often at eyrie when intruder attempts to replace a breeding bird (**Tordoff and Redig 1999b**, T. French pers. comm.; see website http://falconcam.apk.net). Such fights also occur during territorial boundary disputes and in squabbles over prey when one falcon attempts to steal food from another. Most fights involving physical contact occur between individuals of same sex; males, smaller than females, generally avoid grappling with them. When female fights at eyrie, resident male does not come to aid his mate.

Interactions With Members of Other Species

Peregrine seldom nests on same cliff with Golden Eagle but will use abandoned eagle nests; Where Prairie Falcon moves into habitat suitable for Peregrine, latter sometimes usurps Prairie Falcon eyries, and vigorously attacks Prairie Falcons passing near eyrie, sometimes killing them.

Relations with Great Horned Owl are inconsistent and puzzling: Some pairs nest close to owls with little conflict; others harass owls at every opportunity and occasionally kill them; but many pairs of owls dominate and drive off or kill neighboring Peregrines, adults and young.

Peregrine has similar but less threatening relationship with Common Raven. Interactions between close nesting pairs can be disruptive to successful breeding; but ravens also provide nests that Peregrines use.

Dominance Hierarchies. Not known to occur, but female appears dominant over male (Cade **Cade 1960**, **Cade 1982b**), and adults may displace immatures. Sometimes immature birds fledged from different eyries tolerated near nesting pairs (B. Walton pers. comm.).

Individual Distance

Pair members often sit side by side. Breeding pairs soaring (even above their eyries) may be joined by another falcon, often coming within 5–10 m of pair. First-year young maintain social groups up to 2–3 mo after nest departure and may start migration together (**Cade 1960**).

Play

Most complete description of play behaviors found in Sherrod 1993. Play occurs mainly in young. Immatures Peregrines will pursue adults, siblings, prey (both appropriate [vertebrate] and inappropriate [invertebrate]), and attack inanimate objects. Playful pursuit of siblings begins 2–3 d after first flight, mock combat between siblings begins 4–5 d after. Mock combat progresses from flying parallel and occasionally rolling to extend feet toward siblings, to making short darting dives and grappling in the air, to using air currents to make vertical stoops. Latter develops within 3 wk of flying.

Kinds Of Predators

Adults usually killed only by large avian predators such as eagles, Gyrfalcons, or, at night, Great Horned Owls. Nestlings and immatures subjected to greater array of predators, including other Peregrines. Great Horned Owls and Golden Eagles principal predators on young during reintroduction efforts (**Cade et al. 1988**, **Palmer 1988c**, **Bird et al. 1996**); in ne. U.S., owls caused >25% of total mortality (**Barclay and Cade 1983**).

Response To Predators
Difficult to give hierarchy of aggression toward other species, but during breeding season, eagles, other Peregrines, Gyrfalcons, Prairie Falcons, and Great Horned Owls are or may be attacked with equal vigor depending on stage of breeding cycle or individual differences in falcons; even herons, large gulls, and jaegers often attacked (**Palmer 1988c**, **Bird and Aubry 1982**, T. Swem pers. comm., CMW).
Golden Eagles attacked [Peregrines] at greater distances than falcons or owls:
Species usually given greater tolerance are Common Ravens, Barn Owls, Rough-legged and Red-tailed hawks, but first 2 have been killed by Peregrine (**Cade 1960**, CMW). Both have nested successfully as close as 100 m and 10 m, respectively, although not in direct sight of falcon's eyrie.

Kleptoparasitism by Golden and Bald eagles, Rough-legged Hawks, Red-tailed Hawks, Northern Harriers, Gyrfalcons, Common Ravens, and large gulls occurs (**Dekker 1995**, TJC, CMW) and vice versa. Prairie Falcon fledgling has entered Peregrine eyrie to pirate food (**Ellis and Groat 1982**), and Great Horned Owl has taken food from hack site without molesting young falcons (H. B. Tordoff pers. comm.).

Nest-Building
No nest built per se. Scraping in substrate begins early in courtship and continues until egg-laying; depending on latitude, 2 wk–2 mo (Nelson 1970b).
Only one brood per season.

Nest Site

Selection Process
In some migrants, male appears to arrive at nesting ledge first. Male explores many ledges unless choices limited; then simply makes scrapes on ledge previously used. Usually makes several scrapes, female then selects one for egg-laying (**Nelson 1977b**, **Ponton 1983**).

Construction Process
On ledges, nest consists of scraping bowl in substrate, frequently initiated by male, but by both male and female. Falcon lies on breast and pushes feet backward to produce depression (see Fig. 18 in **Nelson 1970b**).
Substrate consists of dirt, sand, fine gravel, or sometimes decomposed fecal material or decomposed lining materials of old stick nest. Male may construct several scrapes on same ledge or on different ledges. No material deliberately added, but bones and other debris may be pulled around sitting bird to form circle of material around edge of scrape.

Dimensions
Substrate for scrape extremely variable, from small 30-×-30-cm spot on ridge in Arctic to potholes to large 4-×-4-m cavelike structures. Scrape (nest bowl) typically 17–22 cm in diameter and 3–5 cm deep; long-used sites have wider and deeper scrapes than newly formed ones.

Maintenance Or Reuse Of Nests, Alternate Nests
Considerable attachment to one nest location, but alternates frequently selected on same cliff or within a few kilometers (TJC, WGH, CMW).

BRIEF OVERVIEW of GOEA and PEFA
from *Colorado Parks and Wildlife Raptor Monitoring Volunteer Program Handbook* Public Version

Golden Eagle *Aquila chrysaetos* GOEA
1. Identification Perching: Large, dark raptor with large beak and golden neck feathers. Immatures (less than 5 years old) have a prominent white stripe at base of tail. Flying: Dark brown underneath. Dark tail unbanded to faintly banded. Long straight wings with long "fingers" (primaries); "lazy" soaring flight. Immatures show white tail stripe and white underwing spots at the wrists.
2. Nesting Habitat Cliffs or trees, generally in open country. Nesting cliffs are usually sheer and often several hundred feet high. Cliffs often contain several stick nests, 3-10' wide; a single pair will move from one nest to another on the same cliff face from year to year
3. Nesting Dates Courtship: January to May Incubation: late February to June Dependent nestlings: early April to mid-July Incubation period is 41-45 days. Young fledge 72-84 days after hatching but remain dependent on parents for several months after fledging. [2]

Peregrine Falcon *Falco peregrinus* PEFA
1. Identification Perching: Medium-sized raptor with short beak, cream to brown-colored breast and abdomen with light to heavy streaking, dark back. Head has distinctive black "helmet" and wide, dark mustache mark. Flying: Narrow, pointed wings, rapid wing beats; no dark axillaries ("armpits") on underwings, which usually exhibit a checkered pattern of black on white.
2. Nesting Habitat Ledges of high cliffs, usually remote areas in foothills and mountains, sometimes near wetlands. They advertise their nesting territory with a sky dance and high circling display. They vocalize frequently, making a loud screaming sound audible 1-2 km away. Nesting cliffs usually show extensive patches of whitewash. Their nest sites are not distinguishable from those of prairie falcons.
3. Nesting Dates Courtship: late March to late May Incubation: late April to late June Dependent nestlings: early May to late July Incubation of 3-4 eggs requires around 30 days. Young fledge 35-42 days after hatching. [2]

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