

American Goshawk Survey Guide

Bighorn National Forest

Prepared for Bighorn Audubon volunteers in cooperation with the Bighorn National Forest
Updated 9/14/25

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Primary sources: segments of Cornell's Lab of Ornithology *Birds of the World*, *All About Birds*,
segments of the 84-page report:
USDA USFS *Northern Goshawk Inventory and Monitoring Technical Guide*, and also part of the
USDA FS *Biological Evaluation - American Goshawk*

For questions or comments, contact bighornaudubon@gmail.com
or visit www.bighornaudubon.com

Compiled by J. Puckett for Bighorn Audubon January, 2025., with updates September, 2025.
Reviewed and edited by B. Allison and T. Pinter.

Purpose and Forest Management Needs for Goshawk Surveys in the Bighorn National Forest

Primary Source: Northern [American] Goshawk Inventory and Monitoring Technical Guide
United States Department of Agriculture Forest Service
Gen. Tech. Report WO-71 July 2006
Brian Woodbridge and Christina D. Hargis

The combined designation of the goshawk as both a sensitive species and a focal species in the Bighorn National Forest has resulted in a need for information on the status and trend of goshawk populations and habitats throughout its range. The 2016 updated monitoring strategy for the Bighorn Forest Plan (Forest Plan Administrative change #4 March 2016) identifies the American goshawk as a focal species. The status of focal species is intended to assess the ecological conditions required to maintain a viable population.

Project surveys typically are employed to address two information needs: location of territory “cores” for long-term habitat management and location of currently active nests for mitigation or avoidance of disturbance.

Habitat management. For projects that involve removal or adverse modification of goshawk nesting habitat, managers are interested in knowing whether the project area contains goshawk nest sites, regardless of whether they are active during the year of project implementation. Survey methods used in this case must be capable of detecting nonbreeding goshawks or signs and unused nests.

Mitigation of disturbance. For projects that do not involve significant modification of goshawk habitat, impacts to goshawks may still occur in the form of disturbance of nesting goshawks. For such projects, managers are often interested in knowing whether goshawks are actually nesting during the year of project implementation, so that seasonal restrictions may be applied to mitigate disturbance. Survey methods used in this case are geared toward efficiently locating currently active nests as early in the breeding season as possible .

Objective information is needed on the status and trend of American Goshawk populations and their habitats to meet a variety of information needs as described below:

The USDA Forest Service needs information on status and trends of goshawk populations and habitats for the following reasons:

- The goshawk is a sensitive species and a focal species for the Bighorn National Forest, and requires forest supervisors to collect information on sensitive species in order to determine when change in management is warranted.
- Habitat and population information is needed by the Bighorn National Forest, and other forests.
- The USFWS may receive new petitions to list the goshawk and will call on the USDA Forest Service again for information on status and trends of populations and habitats.
- Many public entities, including environmental groups and forest product industries, will continue to ask the USDA Forest Service for information on the status of goshawks on National Forest System lands, because this species, along with mature forests, remains a topic of interest.

Goshawk populations experience some level of change in abundance from year to year due to changes in a combination of environmental factors, most notably climate and prey abundance. The USDA Forest Service is specifically interested in population changes that exceed normal fluctuations and that may be due to management-induced habitat changes.

Pre-survey Information for Bighorn Audubon Volunteers

The Forest is most interested in all signs of occupancy and breeding being recorded on the survey sheets (NATIONAL GOSHAWK MONITORING PROTOCOL NEST RECORD FORM page 16). Recording details seen/heard at a nest site are more important than trying to determine the nest status in any given visit.

Equipment and Preparation: Dress for outdoor activities, preparing for swift changes in weather. Check the weather forecast and radar. Keep 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 binoculars, camera or phone for photo, tool (ap) to identify sound and lat/long, notepad, pencils, and survey data sheet. When locating a nest or presence of goshawk, please take photo if possible, and include along with your survey form.

Goshawks are very territorial, even with humans. Please wear a hat, and always have someone accompany you. Have a reliable mapping tool like Avenza.

Before survey familiarize yourself with:

- **Vocalizations:** adult and juvenile. The Merlin application is free and useful sound identifying tool. Note some species mimic goshawks (Canada Jay) or sound similar (Flickers, Cooper's Hawk). Please do not bait goshawks using calls in the field.
- **Appearance:** adult and juvenile, including in flight. Familiarize similar species.
- **Habitat and Nest Appearance**
- **Feathers:** Molting feathers can occasionally be found on the ground, and are a good indication of nest site presence. For feather identification see [The Feather Atlas - Feather Identification and Scans - U.S. Fish and Wildlife Service Forensics Laboratory](#)
- **Plucking Stations, Prey Remains and Whitewash** are all signs of goshawk site occupation. Pellets are often present directly under active nest. Please see page 11.
- **Behavior**

Further reading for each category is in this guide. *Bighorn Audubon*

April: Courtship

May, June, July & August: Nesting activity

Incubation Time: 30-35 days

Time to Fledge: 35-42 days

September– November: Many fledglings remain near the nest and depend on parents for 1-3 months.

Source, in part, CO Parks and Wildlife Raptor Monitoring Volunteer Program Handbook

Where: The Forest biologist, through Bighorn Audubon, will assign your site location. Please do not share exact site locations outside of the survey group without Forest permission, and ask those accompanying you to respect site confidentiality.

Survey Frequency: From early May - September time spent at each site can be anywhere from 10 - 120 minutes, once every 2-3 weeks depending on bird activity and if an active nest is located.

Once an active nest is located, site monitoring should be very brief and from a distance to reduce possibility of female abandoning nest and other disturbances. *Bighorn Audubon*

Survey crews should consist of two people with one person assigned as crew leader. Multiple observers within nesting habitat are likely to cause excessive disturbance to breeding goshawks. The survey crew leader should have field experience with goshawks and knowledge of goshawk vocalizations, signs, and behavior, and the ability to train inexperienced partners. At the completion of each survey visit, data entry forms and maps should be assembled and reviewed. The effectiveness of surveys increases as the breeding season progresses, as nestling goshawks become more vocal, and as whitewash, molted adult feathers, and other signs accumulate in the vicinity of the nest.

Monitoring Technical Guide, USDA FS

Observation categories: Presence

Occupied

Breeding

Survey with No Detection

See pages 14 & 15

Biological Evaluation

Pole Creek Vegetation Management Project Biological Evaluation1 Powder River Ranger District,
Bighorn National Forest 1 Meets the standards for both a Biological Evaluation (FSM 2672.42)
Prepared by: Bonnie Allison 12/31/2023 Wildlife Biologist, PRRD

The American goshawk, *Accipiter atricapillus* was formerly considered a subspecies of the northern goshawk (*Accipiter gentilis*), but recently separated based on vocal and morphological characteristics and differences in mitochondrial DNA. The American Ornithological Society now treats them as two separate species (NatureServe 2023).

This species occurs in boreal and montane forested habitats throughout North America and is present throughout Wyoming as a year-round resident and a short-distance winter migrant (WGFD 2017).

In Wyoming, the goshawk is generally associated with mature montane coniferous forests and adjacent aspen forests during the breeding season. Nests are generally located in mature or old growth forest habitat with high basal area; large, tall trees; high canopy cover; and an open understory. Additionally, nest trees are often located away from forest edges on the lower to middle portions of moderate slopes. Many goshawk territories include more than one nest which may be used alternatively over several years. In Wyoming, most nests have been found in Douglas fir, lodgepole pine, or quaking aspen. After fledging, young stay with the adults in the nest vicinity until they are entirely independent. In winter, they appear to forage in a wider variety of habitats and lower elevations including non-forested, open habitats such as shrublands (WGFD 2017).

Goshawks are an opportunistic predator, hunting from perches at mid-canopy or forest edge and adapted for fast flight through dense tree cover. Prey generally consists of medium-sized mammals and birds including tree and ground squirrels, rabbits and hares, grouse, jays, crows, and woodpeckers. Winter prey consist primarily of rabbits, hares, and squirrels (WGFD 2017).

Site occupancy and breeding success across the species' range have declined, including the Medicine Bow-Route National Forest (WGFD 2017). Inconsistent survey efforts across the State have made it difficult to evaluate abundance and trends in Wyoming. The effects of mountain pine beetle, and forest treatments including forest health and fire reduction treatments on Northern Goshawk nesting and wintering habitat in Wyoming are largely unknown (WGFD 2017).

In addition to being a Region 2 Sensitive Species, goshawks were selected as a Forest Plan focal species to monitor impacts from Forest management to the integrity of the forest habitat ecosystem that provides the variety of forest structure that supports reproductive success of goshawks. For this reason, known goshawk nest site monitoring is an annual endeavor for the Forest wildlife program. Currently, thirty-two individual goshawk nests are intact across the Forest, comprising what is assumed to be 26 active territories. [Note: this was written prior to Elk Fire] Goshawk activity has been observed in 13 additional areas on the Forest considered to be territories. Goshawk surveys were conducted throughout the Pole Creek project area in 2022 and 2023. Known nest site status checks in the project area have been consistent for at least the last 4 years. The project area hosts seven territories for which active nests have been located. An additional two territories with known nest sites are in close proximity north of the project area. Of these nine territories, four have been confirmed active within the last 2 years.

Management recommendations from WGFD 2017 include: • Minimize human disturbance in nesting areas during the breeding season. • Protect traditional or previously used nesting areas. • Maintain an adequate distribution of mature coniferous forest stands across the landscape.

About American Goshawks and Identification

Birds of the World Cornell Lab of Ornithology
pages 5-11 in this guide unless otherwise noted.

Squires, J. R. and R. T. Reynolds (2024). American Goshawk (*Astur atricapillus*), version 1.2. In *Birds of the World* (N. D. Sly, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.norgos.01.2>



Photo by Alvan Buckley,
Macauley Library, Cornell

The American Goshawk is a powerful hunter capable of killing a variety of prey, including tree squirrels, hares, grouse, corvids, woodpeckers, and large passerines such as American Robins. When breeding, the female generally defends the nest while the smaller male provisions the family with food. Foraging males rapidly traverse large home ranges when searching for prey. The American Goshawk is well adapted for hunting in forests but also hunts in open habitats. It is a short duration sit-and-wait predator, perching briefly while searching for prey before changing perches. Its short, powerful wings allow rapid acceleration and its long tail facilitates quick maneuverability in trees. As an aggressive hunting hawk, the American Goshawk eagerly crashes through brush when capturing prey or readily strikes intruders approaching the nest.



Photo by Jerry Liguori,
Macauley Library, Cornell

American Goshawk prefer mature forests with large trees on moderate slopes with open understories [for nesting site]. It nests in either coniferous, deciduous, or mixed-pine forests, depending on availability. Nest trees are usually one of the largest trees in the nest area; most territories contain several alternative nest trees.

A large forest hawk with long, broad wings and long, rounded tail. Upperparts of adult brown-gray to slate gray; head with black cap and pronounced white supercilious line; underparts light gray with fine horizontal vermiculations and fine black vertical streaks. (see page 8 for measurements)

Undertail coverts white and often quite fluffy, especially during courtship or when alarmed. Tail dark gray above with inconspicuous broad, dark bands (3–5); rounded tail tip may have thin white terminal band

(reduced or absent with wear).

Female similar to male but browner above and more coarsely marked below, sometimes appearing barred. Feet, cere, toes, legs, and mouth lining yellow; eye red.

[For juvenile see pages 7 & 8]

Similar Species [adult]:

Among North American raptors formerly in the genus *Accipiter*, American Goshawk is the largest and heaviest bodied, appearing deep-chested with relatively broad wings and relatively short tail; wings appear tapered when soaring and pointed when flapping or stooping.

In the Bighorn Forest, Northern Harriers may be misidentified as American Goshawks. Harriers are known to be in goshawk territories such as Elgin, Muddy Guard, High Park, and Sour Dough areas. Please note Northern Harriers are also considered a sensitive species. Breeding Bird Survey data suggest that Northern Harrier populations in Region 2 states have exhibited long-term declines that substantially exceed nation trends (Slater and Rock, 2005).

B. Allison, Bighorn National Forest



Northern Harrier is a medium size raptor with long ,broad wings, a long tail, and a characteristic white rump patch.

Adult male top left and right.



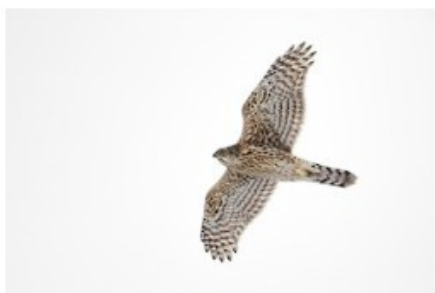
Left: adult female Northern Harrier.
Right: immature

Photos clockwise top left by Tom Reed,
Jerry Liguori, Song Yu, Brian Sullivan.
All from Macauley Library, Cornell.

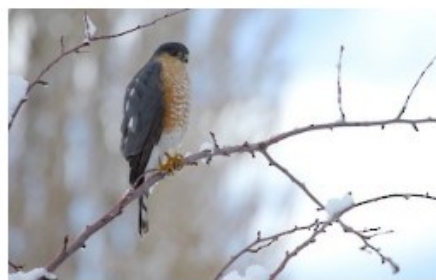


Another similar species to the goshawk is the Sharp-shinned Hawk.

The goshawk is clearly larger than Sharp-shinned Hawk in flight, the head protrudes more on American Goshawk, and the tail is broader and more rounded at the tip.



American Goshawk (subspecies *atricapillus*).



Possible Confusion species: Sharp-shinned Hawk (*Accipiter striatus*).



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Similar Species continued next page

Male American Goshawk may appear similar in size to female Cooper's Hawk, although note differing wing and tail proportions above.



American Goshawk (subspecies *atricapillus*).



Possible confusion species: Cooper's Hawk (*Astur cooperii*).



Possible confusion species: Cooper's Hawk (*Astur cooperii*).

A deep chest and pointed wings, sometimes seen on American Goshawk, may suggest a gray morph Gyrfalcon, which has different flight action (not as rapid) and a two-toned underwing with paler, inconspicuously barred, flight feathers contrasting with darker wing linings. [Gyrfalcons are infrequent visitors to our area, and would be more of a chance during winter months]



American Goshawk (subspecies *atricapillus*).



Possible Confusion species: Gyrfalcon (*Falco rusticolus*).



Possible Confusion species: Gyrfalcon (*Falco rusticolus*).

Juvenile American Goshawk differs from juvenile Cooper's Hawk in having a more conspicuous pale superciliary line, more heavily streaked belly coverts, underwing coverts, and undertail coverts, a slightly wedge-shaped tail, and a tawny bar across the upper wing. There is a subtle pattern of fine white lines outline dark bands on the upper side of the juvenile American Goshawk's tail, which, when spread, shows staggered dark bars in a zigzag pattern rather than the even banding of juvenile Cooper's Hawk. The preceding characteristics are based on Mueller et al., Kaufman, and Wheeler and Clark.

[Juvenile plumage description next page]



American Goshawk (subspecies *atricapillus*).



Possible confusion species: Cooper's Hawk (*Astur cooperii*).



Possible confusion species: Cooper's Hawk (*Astur cooperii*).

Natal Down

Short, white natal down at hatch; often slightly grayish on head and back. From approximately 7–16 days of age, long dense second down that is grayish dorsally and white ventrally replaces natal down.

Juvenile Plumage

Upperparts, including wings, dark brown to brown-black, with buff white and cinnamon streaks; tail dark brown with wavy, dark brown bands with thin whitish borders forming a zigzag pattern; back coverts and upper wing coverts brown with extensive tawny and white mottling. Underparts, including wing linings, buff white with thick cinnamon to blackish brown streaks on throat. Undertail coverts usually streaked and not fluffy. Head is brown and usually has a pale whitish superciliary stripe.



Juvenile frontal view (subspecies *atricapillus*).



Juvenile dorsal view (subspecies *atricapillus*).



Juvenile ventral view (subspecies *atricapillus*).

Basic I Plumage

Sexes similar. Similar to Definitive Basic plumage by second winter but browner; ventral markings coarser with more streaking and some barring. Upperwing coverts, back, and breast may retain a few Juvenile brown feathers until following year (age 2). High degree of individual variation may lead to similarity between Basic I and Definitive Basic plumages.

Definitive Basic Plumage

Male. Upperparts, including back coverts and upper wing coverts, vary from dark gray, brown-gray, slate gray to bluish, becoming darker on the nape and crown; top of head dark slate to slate black; nape and side of crown have heavy white mottling so appearance is whitish rather than slate. Has an obvious white superciliary line. Underparts including breast and abdomen are white to pale gray with fine gray vermiculation and fine blackish streaks. Upper-tail coverts and rump are like back. Undertail coverts whitish and fluffy. Tail is dark gray above and paler gray below, long and straight, with the tip slightly to moderately rounded and crossed by 3–5 broad, blackish bands, which may be indistinct or much reduced on some individuals; ventrally at least 4 dark transverse bands narrower than the lighter intervening spaces. Tail narrowly tipped with white (reduced or absent with wear). Primaries and secondaries dark gray with cream barring; tertials dark gray. Underwings two-toned; whitish with dark gray barring on coverts contrast with dark flight feathers. Flight feathers lightly barred below; 5 outermost primaries emarginated on inner webs. Underwing coverts white with dark gray barring.

Female. Similar to adult male but usually slightly more brown above and more coarsely marked with dark gray below. Females may have coarser, darker barring, and more vertical black streaking.

Measurements: Average length of American Goshawk: 56 cm (53–58.5 cm), for males; 61 cm (57.5–64 cm), females. Total mass ranges between 677–1010 g for males, and 758–1,210 g for females. Wingspan ranges between 89–122 cm Female 11–28% larger and 50–90% heavier than male depending on subspecies.

Behavior

Source: *Birds of the World* unless otherwise noted.

Flight: Soars occasionally during migration and during courtship over nest stands. Highly agile when chasing prey; speed of flight through forests is astonishing, given the large size of this species.

Secretive throughout the year; often extremely aggressive when defending nests from intruders. High-circling displays; neighboring pairs may circle together above their territories without apparent hostility. Soaring occurs throughout breeding season but especially common during incubation in mid-to-late mornings. Adjacent territorial males soar above territories and approach one another mid-way between nests; soaring may function as territorial display.

Territorial Behavior: Territorial against raptors, including other American Goshawk, during nesting. Postfledging area may represent defended portion of territory, which includes approximately 170 ha surrounding the nest. Can strike and draw blood from persons approaching nests; attacks on a single person are usually more severe than those on two or more persons.

No data concerning winter territoriality.



Adult appears light when soaring. Photo Macauley Library (anonymous photographer)

Degree of Sociality: Solitary outside the breeding season. Pair members winter separately. After fledging, siblings of both sexes remain together as cohesive group near the nest until dispersal.

Play: Young birds appear to play by "attacking" leaves, sticks, pebbles, and perches.

Predation: Will attack Red-tailed Hawk, Short-eared Owl, and Great Horned Owl when near nests. Raptors killed by Goshawks include Long-eared Owl, other Goshawks, and Red-tailed Hawks.

Causes of Mortality: Few natural predators. Great Horned Owl kill adults and nestlings; predation on nestlings may increase during periods of low food availability. Owls often eat entire broods over several consecutive nights, especially when prey availability is low. Eagles kill wintering birds. A marten stalked and killed a female American Goshawk while perched approximately 20 cm above snow and dragged the carcass approximately 0.5 km before dismembering it under the snow.

Siblicide and cannibalism occurs, especially during periods of food deprivation. Older nestlings may attack younger birds with aggressive strikes to head and eyes. (Kenward et al.) documented 2 instances of 10-day-old chicks found with head injuries consistent with pecking by siblings and another bird with probable claw wound in cranium. At hatch, sex ratio was 1:1 but females predominated in broods that lost most offspring, an outcome suggesting siblicidal interactions favor the larger females.

Nests

Source: *Birds of the World* unless otherwise noted.

Number of Broods: One brood. Hatchlings usually 1-2 (*BAS*)

Nest Site Selection: At the scale of nest-site selection, goshawks nest in the densest stands available, given the capability of the forest type; relatively high canopy closure also appears to be a uniformly important habitat characteristic across the range of the species (Hayward and Escano 1989). The size of forest patches used for nesting and the degree of forest heterogeneity within occupied landscapes appear to be highly variable across the species' range. Nevertheless, numerous habitat studies and modeling efforts have found nest sites to be associated with similar factors, including proximity to water or meadow habitat, forest openings, level terrain or 'benches' of gentle slope, northerly aspects, and patches of larger, denser trees.

Early nest building: During courtship and early nest building, goshawks will add fresh material to multiple nests before settling on a single nest for the breeding effort. Dawn courtship vocalizations may occur at these extra nests, although the active nest may be hundreds of meters' distance. Detection of nests built-up with new sticks and green sprigs, in combination with other signs such as molted feathers and whitewash, indicates an occupied territory. Such nests are frequently misclassified as abandoned or failed nests during survey and monitoring efforts.

Nest Construction: Few observations of nest building. Female begins repairing old nests (or builds new structure) during courtship. Gathers sticks from forest floor or breaks them from trees. Deliberate when selecting sticks, at times taking > 5 min making a choice. Sticks carried in the beak; nest building in the morning lasts about 1 hr. Additional nesting material added throughout incubation. Male occasionally assists in nest building

Greenery, usually conifer sprigs, are placed by female on nest throughout nestling stage. Female pulls at the base of a live sprig, breaking it off, using a technique similar to tearing prey. Sprigs then dropped on the nest, but usually not incorporated into the structure. Amount of visible greenery varies.



Nest with hatchlings. Photos Bighorn Audubon, JP

Structure and Composition

Nest constructed of thin sticks (< 2.5 cm diameter); "bowl" lined with tree bark and greenery. Trees with forked (deciduous) or whorled (conifer) branching generally used. Nests typically built on large horizontal limbs against the trunk, or occasionally on large limbs away from the bole

Finished nests measure 3–4 feet long, 1.6–2.2 feet wide, and nearly 2 feet high. The interior cup of the nest is about 9 inches in diameter and 3 inches deep. *Source: All About Birds*



Maintenance or Reuse Of Nests; Alternate Nests: Maintains 1 to 8 alternate nests within a nest area. One nest may be used in sequential years, but often an alternate is selected. Importance of alternate nests is unknown; nest switching may reduce exposure to disease and parasites.

Squirrel Nests: Familiarize with squirrel nests which typically are a rounded mass constructed largely of smaller sticks, leaves and needles, and usually high in the tree. *B. Allison, Bighorn National Forest*

Diet, Foraging, and Feeding

Source *Birds of the World* unless otherwise noted.

Main Foods Taken: Opportunist; kills a wide diversity of prey, depending on region, season, vulnerability, and availability. Main foods include ground and tree squirrels, rabbits and hares, large passerines, woodpeckers, game birds, and corvids; occasionally reptiles and insects.

Foraging Behavior: Foraging individuals travel through the forest in a series of short flights, punctuated with brief periods of prey searching from elevated hunting perches (short duration sit-and-wait predatory movements).

Food Capture And Consumption: Occasionally, American Goshawk hunt by flying rapidly along forest edges, across openings, and through dense vegetation to surprise prey ; also attack prey in flight. May stalk prey on foot, using vegetation and topography for concealment or may capture prey through dogged persistence.

Brooding: Mostly by female, but male occasionally broods young . Female broods almost continually from hatch to 9–14 days. Brooding at night ceases by 24 days of age except during wet, cold weather. Females brooding young may raise slightly, allowing the nestling to move more freely. She may continue brooding without changing positions for up to 3 hrs. After hatch, she mainly broods and feeds young, excavates the nest bowl, decorates nest with sprigs, and defends nest site.

Feeding: Female provisioned almost exclusively by male from courtship through early-nestling stage. Some females begin hunting during the late-nestling period; others depend on the male until fledging. Females will kill prey that pass beneath their nests. If male delivers prey while female is gone from the nest stand, he will deliver prey directly to nest and occasionally feeds nestlings. Females provide approx. 8-15% of food delivered to nest during nestling period (11–28 days). Prey were delivered by females even though males had already delivered prey to nest. Female generally feeds nestlings until they are approximately 25 days of age. When male transfers prey, female usually waits for the male to leave before eating. Male apparently stimulated to leave nest area by sight of female or by her Dismissal call. Female holds prey with inner toes as she tears small pieces with beak; piece is offered to nestlings who strike at adult's beak. Smallest nestlings may receive less food than larger siblings. Feedings average 4.4 - 11.5 minutes in length, can be 15 sec to 60 min.

Prey delivered throughout the day one item at a time, but peak delivery periods include early morning (0600–0700 h), midmorning, and late afternoon and evening (1600–2000 h). Prey delivery rate and timing varies according to brood size, stage of nestling development, and prey type, but these relationships have not been studied. A pair supporting three nestlings brought 34.8 kg of prey during the first 53 days after hatch, or approximately 11.5 kg per nestling. Two nestlings consumed an estimated 13 kg during 49 days of development.

Nest Sanitation: Nestlings defecate over nest rim by 4 days old. Uneaten portions of prey removed when nestlings are small; after approximately 30 days, remains are left in nest until finished. Few data regarding invertebrates in nest other than observations of flies and dermestid beetles associated with prey remains

Fledging Rate: Male goshawks may leave the nest up to 10 days earlier than females, and fledglings may or may not return to the nest to roost and feed. Recently fledged goshawks are often lost to predation and are likely to be overlooked in fledgling counts. Simple counts of late-stage nestlings (28 to 34 days old) have the potential to miss early-fledging males or individuals laying down low in the nest cup, especially in larger broods.

Monitoring Technical Guide, *USDA FS*

Water: Although water sources are often associated with nests, use of water for drinking by the American Goshawk is unknown.

Caching, Plucking Perches, Molting, Whitewash, Pellets, and Egg Shell

Cached prey are placed on a branch near the tree trunk or wedged in a crotch between branches. American Goshawk cache food primarily when nestlings are small and need frequent feedings; caching may cease when young are > 1 mo. old. Most cached items are fed to young the same day, but some at least 32 hours after a kill. *Birds of the World*

Plucking Perches: Some perches near nests are used repeatedly for plucking prey. Plucking perches may be downed logs, stumps, or old nests; preferred perches are low (usually < 1 m), bent-over trees or saplings. Plucking perches are usually located in denser portions of the secondary canopy and are often up-slope and fairly close to the nest. Known distances to plucking perches may be biased because observers often search only near nests or have difficulty locating distant sites. *Birds of the World*

Following from the Monitoring Technical Guide USDA FS. unless otherwise noted
Plucking Posts (perches): Remains of prey items are another important source of signs used in goshawk surveys. Goshawks frequently pluck or dismantle their prey on exposed sites such as downed logs, stumps, or snags, leaving patches of feathers and fur. These sites, known as “plucking posts,” can be scattered throughout the territory, but a few typically occur near nest areas, often upslope from the nest or in an adjacent opening. Detection of patches of feather or fur pulled from medium- to large-sized prey species such as squirrels, hares, grouse, woodpeckers, and jays is highly suggestive of goshawk presence, and such areas deserve focused surveys.

Molting: Female goshawks begin molting primaries and secondaries during incubation; males molt later in the summer (Henny et al. 1985). Molting results in scattered feathers that are visible on the ground in the immediate vicinity of active nests or roost areas beginning in May and increasing through the breeding season. Detection of multiple feathers from an adult female goshawk is strongly indicative of an active nest site nearby. Molted feathers of male goshawks tend to be more widely scattered. Because female goshawks molt during incubation and nest attendance, their molted flight feathers are typically found in the immediate vicinity of occupied nests. Male goshawks molt later in the season, and their feathers may be found over a larger area. Detection of goshawk feathers triggers “occupied status” and follow up surveys of the suitable habitat surrounding the site (min. 300-m radius) to locate the active nest.

For feather identification, please see: www.fws.gov/lab/featheratlas/

Whitewash: Goshawks forcefully eject their feces, resulting in long white streaks (“whitewash”) on the forest floor and downed trees near favored perch sites and active nests. While these deposits are not reliably diagnostic of occupancy by goshawks, they do indicate regular presence of a large raptor and areas deserving focused searches. During incubation, female goshawks defecate from perch sites away from the nest; detectable accumulations of whitewash do not occur at the nest until the nestlings are about 10 days old and begin defecating over the nest edge (typically late May to early June).

Pellets are typically found under active nests especially when young have fledged. They differ from owl pellets in that they have fewer bones. Sometimes they contain claws or jawbones. They are regurgitated similar to other raptors. Photo near right.

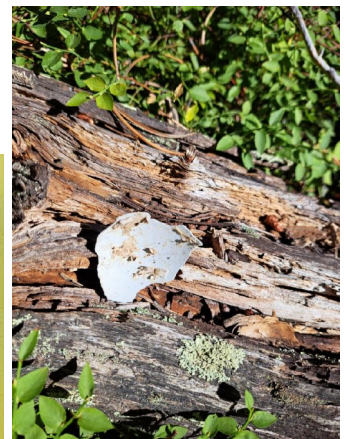
Egg Shell Fragments are sometimes present under active nests. They are fairly large and have a bluish tint. Photo far right. *B. Allison, Bighorn National Forest*



Above: feather at nest site.

Below “whitewash”

Photos Bighorn Audubon, JP



Vocalizations

*Following from the Monitoring Technical Guide
USDA FS*

Although notorious for their aggressive defense of nest sites, breeding goshawks are typically secretive and nest sites are often difficult to locate. At specific times, goshawks can be quite vocal in the vicinity of active nests.

Direct visual and auditory detectability of goshawks varies during the reproductive cycle. Before egg laying begins, detectability is high due to courtship vocalizations and over-canopy flights. During incubation and the early nestling stage, however, adult females are often unresponsive and detectability is very low. Defensive behavior by adult goshawks increases later in the nestling stage and throughout the fledgling stage, resulting in increased detectability. As fledglings reach 2 to 3 weeks of age, they begin to respond to food-begging calls, and their highly vocal responses account for most detections late in the season (July to August) (USDA Forest Service 2000). Survey methods also depend on indirect detection of goshawks through signs such as old nest structures, molted feathers, feces, and remains of prey. Abundance of signs tends to increase steadily throughout the breeding season, and signs may be detected at territories occupied by nonbreeding goshawks.

Largely silent outside of the breeding season, goshawks become quite vocal during courtship and nesting. At least four distinct vocalizations may be detected during goshawk surveys. • Alarm call—a harsh kak-kak-kak repeated many times, typically directed toward intruders near the nest but occasionally used between pair members. • Wail call—a loud, plaintive, drawn-out call used in communication between pair members. During nesting, female goshawks often wail from the nest, possibly a form of food begging. • Food begging call—a thin, plaintive wail given by nestling and fledgling goshawks to solicit food delivery or express hunger.

Food delivery call—a short, guttural kuk, usually given singly or widely spaced, given by the male goshawk upon entering the nest area with prey. This call typically elicits wailing and frantic begging from the female goshawk and older nestlings and from fledglings during the post fledgling dependency period.

Calls: Adult goshawks give a rapid-fire ki-ki-ki-ki alarm call repeated 10–20 times in response to threats or when chasing prey. They sometimes precede the call with a drawn-out kreey-a. When defending the nest, the female's call can intensify to a constant scream. Both males and females also use three variations of a wailing kree-ah: members of a pair call to each other when the male enters the territory (often announcing himself with a single-note call), and the female gives a shorter version of the wail when her partner brings food to the nest. Once he delivers the prey, she gives a slower, clipped kree-ah and continues calling until he leaves the area.

All About Birds

To hear vocalizations visit *All About Birds* website:

https://www.allaboutbirds.org/guide/American_Goshawk/sounds

Or use the Merlin Phone Application, Sound Identification (free ap).

Both courtesy of Cornell Lab of Ornithology

Presence / Occupancy / Breeding / “Survey with No Detection”

The Forest is most interested in all signs of occupancy and breeding being recorded on the survey sheets (NATIONAL GOSHAWK MONITORING PROTOCOL NEST RECORD FORM page 16). Making sure that all details seen/heard at a nest site are recorded is more important than trying to determine the nest status in any given visit.

Following from Monitoring Technical Guide, USDA FS

Presence: Presence is one criterion used to establish territory occupancy, but presence can also represent subadult or nonterritorial goshawks (“floaters”). The following types of evidence are used to determine presence:

- Goshawks seen or heard in the survey area.
- Presence of goshawk molts (feathers) in the survey area.

Occupancy: Occupancy is defined by the presence of territorial adult goshawks within a nesting area, regardless of reproductive status. Types of evidence used to determine occupancy are similar to those used for presence/absence, except that more evidence of consistent use is required to determine territorial occupancy. For demographic studies, Reynolds and Joy (2006) defined an occupied territory as:

- (1) a territory in which goshawks were observed on two or more occasions or
- (2) a single observation of an adult goshawk combined with the presence of molted feathers, feces, and new nest construction in a season.

These criteria are applied annually to survey results obtained at goshawk territories with a previous history of occupancy.

In areas without a previous history of goshawk occupancy, however, determination of occupancy should include evidence that goshawks detected are in fact within a territory and did not originate outside of the survey area. The following types of evidence indicate occupancy:

- Goshawks exhibiting defensive behavior in the survey area.
- Goshawks seen or heard in the survey area.
- Presence of goshawk molts in the survey area.
- New construction (greenery) and/or down on nest structure.
- Goshawk feces in the survey area.
- Presence of prey remains in the survey area.

Determination of confirmed occupancy requires at least one of the following:

- Detection of adult goshawks exhibiting defensive behavior (alarm calls, approaching observer while vocalizing).
- Any combination of three of the six evidence types listed above in the survey area.
- Combination of visual/auditory detection and molted feathers, visual/auditory detection and new nest construction, or molted feathers and new nest construction observed in the survey area.

Determination of possible occupancy requires at least one of the following:

- Location/observation of a visual/auditory detection, molted feathers, or new nest construction.
- Combination of prey remains and feces in the survey area.

Breeding and “Survey with No Detection” continued next page.

Breeding

Breeding status is indicated by a nest that has supported a reproductive attempt in the current breeding year. Nonreproducing goshawks may reconstruct or add greenery to one or more nests during the courtship period; therefore, a determination of breeding requires evidence of egg laying.

Direct evidence of egg laying includes observation of the following:

- Nestlings.
- Fledglings in the nest tree or nest area.

Indirect evidence of egg laying includes the following:

- Observation of adult female in incubation posture (sitting low on the nest, often barely visible) on 2 or more separate days.
- Presence of eggshell fragments below nest or near nest tree (fragments may be from failed eggs as well as after hatching).
- Presence of dime-sized nestling feces below the nest tree (typically found when nestlings are more than 4 days old).

Successful Nest: Active nests are considered successful if one or more fledglings survive to the branching or fledging stage (more than 34 days old).

Direct evidence of fledged young includes the following:

- Observation of one or more young goshawks judged to be at least 34 days old on nest or within the nest area.
- Auditory detection of more than one goshawk giving begging calls near a nest with signs of recent fledging (copious feces on ground, down on nest) after the usual fledging date (early July to August).

Indirect evidence of fledged young includes the following:

- Observation of an active nest with signs of recent fledging (copious feces on ground, down on nest, molted feathers, prey remains).
- Observation of remains of predated fledglings (more than 34 days old based on length of primary or tail feathers) in the nest area.

If nest checks are made while nestlings are younger than 34 days old, the nest may be classified as “active with young,” but nest success remains unknown.

Surveyed with no detection: Assignment of “nonoccupied” status to a survey area is problematic because of the intensive effort required to support this determination. If survey results are not compelling, it is preferable to categorize areas without detections as “**surveyed with no detection.**”

Visual or auditory detection of a goshawk made during a survey, but with no signs encountered in the stand, suggests that a nesting area may be located adjacent to the area searched.

Again, **the Forest is most interested** in all signs of occupancy and breeding being recorded on the survey sheets. Making sure that all details seen/heard at a nest site are recorded is more important than trying to determine the nest status in any given visit.

NATIONAL GOSHAWK MONITORING PROTOCOL NEST RECORD FORM

☐ NEW DISCOVERY or ☐ RE-VISIT

Observer(s) _____ Time: ____ : ____ Date ____ / ____ / ____

Job Title(s) _____ Affiliation: ☐ FS ☐ BLM

☐ USFWS ☐ State Agency ☐ Other: _____

Contact Information: _____

INSTRUCTIONS: This data form is separated into 4 parts; nest location, bird observations and nest use, general habitat description and nest tree description. If this form is used to record a newly discovered nest, check the "new discovery" box above and complete the entire form (all data fields that apply). If this form is being used to document a return visit to a previously identified (known) nest, check the "re-visit" box above and complete all fields in **bold** print and optionally complete other fields as needed. Attach this form to a 1:24,000 scale map showing the nest location.

• NEST LOCATION

Nesting Territory (Site) Name (One name should be used for either a single nest or several nests located closely to each other.): _____

State/County: _____

UTM Coordinates: Zone ____ Northing _____ Easting _____ NAD _____

Legal Description: T. ____ N./S., R. ____ W., Sec. ____, ____ 1/4 Elevation (may be range): _____

7.5' USGS Quadrangle Name: _____ Quadcode # (if known): _____

Land Administrator/Owner: ☐ FS ☐ BLM ☐ STATE ☐ Private: _____

National Forest Name (if applicable): _____

• BIRD OBSERVATIONS AND NEST USE

Goshawks Present? ☐ Yes ☐ No **Nest in Use** (or used this breeding season)?: ☐ Yes ☐ No ☐ Unk

This Nest: ☐ is fully intact/in good condition ☐ is dilapidated/falling apart ☐ was not located

Evidence of Nest Use: ☐ whitewash ☐ eggshell fragment(s) ☐ down ☐ feather(s) ☐ pellet(s)

(check one: ☐ current ☐ past) ☐ prey remains ☐ other: _____

Number Seen: ♂ Adult ____ ♀ Adult ____ Unk Adult(s) ____ Nestling(s) ____

Fledgling(s) ____

Number Heard: ♂ Adult ____ ♀ Adult ____ Unk Adult(s) ____ Nestling(s) ____

Fledgling(s) ____

Behavior(s) Observed: ☐ incubating ☐ brooding ☐ feeding ☐ defensive ☐ other: _____

• GENERAL HABITAT DESCRIPTION (in close proximity to nest tree)

Overstory Trees Present: ☐ lodgepole pine ☐ limber pine ☐ ponderosa pine ☐ subalpine fir
☐ Douglas-fir ☐ Engelmann spruce ☐ quaking aspen ☐ cottonwood
☐ Colorado blue spruce ☐ Other: _____

Overstory Canopy Closure: ☐ 0 – 40% ☐ 40 – 70% ☐ 70 – 100% Slope Aspect: _____ degrees

Slope Angle (to nearest 10 percent): _____ Slope Position: ☐ Upper 1/3 ☐ Middle 1/3 ☐ Lower 1/3

Has Timber Cutting Occurred Previously (in the stand)?: ☐ Yes ☐ No Stumps: ☐ <10 in. ☐ >10 in.

Live Stream Nearby (w/in 330 ft.): ☐ Yes ☐ No Stream Name?: _____ ☐ None

• NEST TREE DESCRIPTION

Nest Tree Species: ☐ lodgepole pine ☐ quaking aspen ☐ Engelmann spruce ☐ Other: _____

NT Alive?: ☐ Yes ☐ No The following are: ☐ estimates ☐ obtained w/measuring instruments

NT Diameter at Breast Height: ____ in. Nest Height: ____ (nearest ft.)

NT Total Height: ____ (nearest ft.) Height to first live limb: ____ (nearest ft.)

Classification of the Tree Structure Supporting the Nest:

☐ candelabra top ☐ forked trunk ☐ branch whorl ☐ mistletoe limb or other "witches broom"

☐ Other: _____