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1993 NORTHERN GOSHAWK INVENTORY ON PORTIONS OF LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NM

Final Report for Subcontract 9 - X - 13 - 590EE - 1

by

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INTRODUCTION

Northern goshawks (*Accipiter gentilis*) (hereafter referred to as goshawk) is a large forest dwelling hawk. They are the largest species of the *Accipiter* genus which also includes sharp-shinned hawks (*A. striatus*) and the Cooper's hawk (*A. cooperii*). The goshawk is holarctic in distribution and nests in coniferous, deciduous, and mixed species forests. In the southwest they primarily nest in ponderosa pine (*Pinus ponderosa*), mixed species, and spruce-fir forests (Reynolds et al 1992).

Goshawks may be declining in population and reproduction in the southwestern United States (Reynolds et al 1992). In 1982 the USDA-Forest Service listed the goshawk as a "sensitive species" (USDA Forest Service 1991) and in 1992 the U.S. Fish and Wildlife Service listed the goshawk as a "Category 2 species" in accordance with the Endangered Species Act. Reasons for the possible decline in goshawk populations include timber harvesting resulting in the loss of nesting habitat, toxic chemicals, and the effects of drought, fire, and disease (Reynolds et al 1992). Thus, there is a need to determine their population status and assess impacts of management activities in potential goshawk habitat.

Inventory for the goshawk was conducted on 2,254 ha of Los Alamos National Laboratory (LANL) to determine the presence of nesting goshawks on LANL lands. This information can be incorporated into LANL's environmental management program. The inventory was conducted by Colorado State University personnel from May 12 to July 30, 1993. This report summarizes the results of this inventory.

METHODS

The area to be inventoried for goshawks was determined by Environmental Management-8 (EM-8), Los Alamos National Laboratory (LANL)(Map 1). Most of this area was inside the perimeter of the cleared area. For that reason and to comply with EM-8's health and safety procedures, an escort was provided by EM-8 to accompany the observer (DTS) during inventory.

Inventory was conducted from May 12 to July 30, 1993. This period coincides with the goshawk incubation stage, the nestling stage, and the fledgling-dependency stage of the goshawk nesting season in the Jemez Mountains (Kennedy 1991). The inventory method was based on the recommended approach detailed in Kennedy and Stahlecker (1993). Because of the steep terrain, inventory routes were conducted along canyon edges and in the bottom of all drainages and side drainages (Map 1). The distance between calling stations was 150 m (during the incubation stage) and 200 m (during early nestling to fledgling-dependency stages). This represents a deviation to the Kennedy and Stahlecker method which recommends a 300-m spacing. Since the incubation stage was not included in the Kennedy and Stahlecker experiment and since raptors are known to be less responsive to broadcast vocalizations during incubation (Rosenfield et al 1988, Fuller and Mosher 1981), a closer spacing between stations was implemented during the incubation stage. Because straight transect lines staggered by 130 m (as recommended in Kennedy and Stahlecker) was not used, the observer reduced the spacing from 300 m to 200 m to insure total coverage during brood rearing. Inter-station distances were measured by pacing.

The broadcast surveys started as early as 07:58 and ended as late as 18:00. A modified Sony *Sport Walkman* (Model # Wm-A53) and a modified Realistic *Musical Powerhorn* (Cat. # 32-2030A) were used to play and amplify conspecific calls of the goshawk. The goshawk alarm call was used throughout the inventory and tapes were made from commercial recordings on compact disc. Recordings of the adult goshawk wail and the juvenile goshawk begging call were not used during the fledgling-dependency period as recommended by Kennedy and Stahlecker because the quality and volume of our recordings of these vocalizations were not suitable for inventory. All raptors detected [excluding turkey vultures (*Cathartes aura*)] during the survey were recorded on field data forms (Figure 1) and included the species, age, sex, detection type, and direction of the detection. All detections were also marked on maps accompanying each field data form.

Any vocal or aggressive response from an accipiter to the taped calls (including Cooper's hawks and sharp-shinned hawks) would have led to an intensive nest search (Reynolds 1982) in the response area. The search area would cover approximately 2,500 m² (radius = 800 m) and would vary in shape according to terrain and vegetation. Each tree in the immediate area would be scanned using binoculars for an active nest until the nest is located. The observer would also search for the plucked remains of prey, feces, molted feathers, and inactive stick nests. If no nest was found, additional calling would have been conducted to gain more information about the possible nest location. or any additional reason for the response.

RESULTS

A total of 43.9 hours were spent inventorying 304 stations on 2,254 ha (Table 1). This includes time spent during breaks, lunch stops, and waiting out rain, hail, and lightning storms and does not include administrative time or time spent accessing the area. On July 30, an area was re-inventoried because of a sighting of an unidentified accipiter on May 21. The unidentified immature accipiter (either a goshawk or a Cooper's hawk) was observed in a side drainage to Cañon de Valle (Table 2 and Map 2). It was not observed again during the repeat inventory. Inside the inventory area no additional potential goshawk responses were detected. In Two-Mile Canyon a Cooper's hawk was seen flying overhead at a great distance (Table 2 and Map 2) and a red-tailed hawk (*Buteo jamacensis*) nest with three nestlings was found. Red-tailed hawks were seen on three other occasions. A great horned owl (*Bubo virginensis*) was seen on one occasion and a vacant great horned owl nest was located in Pajarito Canyon.

The results of this survey can be interpreted in several ways: 1) no goshawk territories occur in the inventoried area; 2) goshawk territory(ies) exist but have failed prior to the survey and thus were not detected; or 3) territory(ies) exist and were successful but the goshawks did not respond to tapes or their responses were undetected. To evaluate these alternatives more thoroughly, we recommend a minimum of one more year of inventory be conducted during the 1994 field season on portions of the area covered in 1993. This is consistent with Kennedy and Stahlecker (1993) who recommend an area should be surveyed a minimum of two consecutive nesting seasons to minimize the number of unsuccessful territories missed during a survey. The focus of the

1994 inventory should be restricted to areas of suitable goshawk nesting habitat.

MANAGEMENT IMPLICATIONS

Two goshawk nests have been found near the LANL inventory area on SFNF (Map 3). Both territories were occupied in 1993 but only one territory produced young (Kennedy, unpubl. data). Portions of the goshawk home ranges for these territories cross LANL boundaries (Map 3). These areas are potential foraging areas for the nesting goshawks.

The USDA, Forest Service has published recommendations for management of the goshawk in the southwestern United States (Reynolds et al. 1992).

According to Reynolds et al. (1992), there are two possible reasons for goshawk population limits: 1) prey availability, and 2) nesting habitat availability. Prey availability can be enhanced by managing for the habitat of important prey species which include squirrels, chipmunks, woodpeckers, jays, and rabbits. These prey species require a variety of habitat characteristics. According to Reynolds et al. (1992) abundant populations of the dominant prey species in the goshawk diet will be present if these characteristics—including snags, downed logs, woody debris, large trees, herbaceous and shrubby underbrush, and a mixture of various forest vegetative structural stages (VSS)^a—are managed in goshawk home ranges. These guidelines should be implemented

^a Vegetative Structural Stage is a description of forests based on the diameter distribution of the majority of trees in a stand. The diameter range and description for the vegetative structural stages are as follows: VSS 1 = 0-1 in. DBH (Grass, Forb, Shrub); VSS 2 = 1-5 in. DBH (Seedling/Sapling); VSS 3 = 5-12 in. DBH (Young Forest); VSS 4 = 12-18 in. DBH (Mid-Age Forest); VSS 5 = 18-24 in. DBH (Mature Forest); VSS 6 = 24+ in. DBH (Old Forest). DBH = Diameter at Breast Height (4.5 ft.)

on LANL to enhance goshawk habitat. The management guidelines are summarized below.

The goshawk nesting habitat which includes the nest area, the post-fledgling family area (PFA) and foraging areas can be enhanced by certain management techniques. Reynolds et al. (1992) recommend a synthesis of habitats within goshawk home ranges that contain important prey species requirements and other goshawk nesting habitat requirements. Since goshawks are found primarily in ponderosa pine, mixed-species, and spruce-fir forest types and their prey items do not occur in all of the forest types, management guidelines for each of the forest types were analyzed separately.

The nest areas are occupied by breeding adults and are the center of nesting activity. They are characterized by stands of mature and old trees and dense forest canopies (VSS 5 and 6). Three suitable nest areas and three alternate nest areas should be maintained within each home range. Each nest area should be 13.4 ha in size (Table 3).

A post-fledgling family area (PFA) surrounds the nest area and is used by the goshawk family after the young have fledged and while they are still dependent on their parents for food (up to two months) (Reynolds et al. 1992). The PFA is important to the fledglings for hiding cover and for the development of their hunting skills (Reynolds et al. 1992). PFAs range from 121 to 243 ha and average 168 ha (Kennedy 1990) while the guidelines suggest managing for a PFA of 187.5 ha (Reynolds et al. 1992). The attributes of the PFA contain a variety of forest conditions (Table 3) interspersed with small openings. Snags, downed logs, and woody debris are important features of the PFA because they

provide foraging habitat and cover for prey species used by juveniles during the fledgling-dependency period.

Foraging areas comprise the largest component of a territory and are estimated to average 2,411 ha. Goshawks forage in a variety of habitats and not much is known about how goshawks use foraging areas (Reynolds et al. 1992).

However Reynolds et al. (1992) surmise that goshawks use a variety of forest types of different structural stages for hunting. Important components of foraging areas include snags, downed logs, woody debris, openings, large trees, herbaceous and shrubby understories, and interspersed forest age classes (Reynolds et al. 1992). These are important habitat characteristics of their dominant prey species. A more open canopy cover is preferred than the PFA because the assumption is that goshawks need a more open forest for greater maneuverability to hunt (Reynolds et al. 1992) (Table 3).

The guidelines (Reynolds et al. 1992) have the following recommendations for managing goshawk foraging areas (Table 4). Forest regeneration is required every 20-30 years in small areas to maintain the desired canopy cover.

Openings of ≤ 0.8 ha are required for regeneration. If openings are ≥ 0.2 ha then large, mature reserve trees should be left to regenerate the openings; openings ≤ 0.2 ha will be regenerated by surrounding trees. Planting of ponderosa pine as well as encouraging aspen and oak regeneration in ponderosa pine and mixed species forests will improve goshawk habitat.

Prescribed fire is the suggested technique for maintaining adequate woody debris. Understory thinning with non-uniform spacing and prescribed burning is preferred for maintaining desired forest structure and will develop groups of

trees with interlocking crowns. Road densities should be minimized. Forage utilization should be $\leq 20\%$ to maintain grass, forb, and shrub layers.

The foraging areas of two known goshawk nesting territories overlap on LANL land (Map 3). The foraging area of a goshawk territory in Pajarito canyon overlaps LANL by 100.8 ha (4.2% of the total foraging area). The foraging area of a goshawk territory in Water Canyon overlaps LANL by 172.8 ha (7.2% of the total foraging area). Both of these territories are found on the Española Ranger District of SFNF. The management guidelines (Reynolds et al 1992) should be implemented on these foraging areas within LANL.

By managing for goshawks in the southwest additional benefits occur including higher soil productivity, reduced risk of catastrophic fires, increased woody debris, large diameter snags, and downed logs are additional gains. In addition, suitable habitat will be provided for a diversity of mammals and birds that are prey species of the goshawk and other predators.

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Figure 1. Inventory data sheet used during accipiter inventory on Los Alamos National Laboratory in 1993.

INVENTORY DATA SHEET

Page ____ of ____

Date: _____ Observer: _____ Time Start: _____ End: _____

Survey Area _____

Quad Name _____ Starting Point: T____, R____, Sec____, ____ 1/4, ____ 1/4

Drainage	Station	Species	Sex/Age	Response	Time	Comments
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[illegible]

Species:

Sex/Age:

Response:

NOGO—NorthernGoshawk

F—Female

0—None

COHA—Cooper's Hawk

M—Male

1—Vocal:

SSHA—Sharp-Shinned

A—Adult

a) wail

UNAC—Unknown Accipiter

Y—Young

b) kekk

STJA—Steller's Jay

U—Unknown

c) beg

RTHA—Red Tailed Hawk

d) other/unknown

UNRA—Unknown Raptor

2—Visual (Silent)

3—Vocal then Visual

4—Visual then Vocal

5—Mimic

6—Other

Table 1. Summary of the 1993 northern goshawk inventory effort on Los Alamos National Laboratory.

Date	Time (Military)			Total Stations
	Start	End	Total	
5/12/93	13:58	18:00	4.0	33
5/13/93	09:27	17:03	7.6	39
5/19/93	08:40	16:45	8.1	54
5/20/93	09:49	12:30	2.7	17
5/21/93	08:20	15:24	7.1	63
6/4/93	07:58	13:16	5.3	38
6/11/93	08:44	15:10	6.4	34
7/30/93 ^a	08:05	10:47	2.7	26
Total			43.9 Hours	304 Stations
Average				6.9 Sta/Hr

^a Inventory on this area repeats coverage of an inventory area conducted on May 21, 1993 because of a sighting of an unknown (either Cooper's hawk or goshawk) immature accipiter.

Table 2. Raptor responses and observations detected during the northern goshawk inventory on Los Alamos National Laboratory land in 1993.

Date	Species ^a	Area	Comments
12-May	RTHA	Two-Mile Canyon	First mimics were heard, then aggressive response.
13-May	RTHA	Two-Mile Canyon	RTHA nest found with 3 nestlings. Nest is in a white fir at bottom of drainage.
13-May	UNRA	Two-Mile Canyon	An owl roost found with pellets under it. Pellets seemed too small to be great-horned owl pellets. Spotted owl pellets? They were collected to be analyzed later by LANL.
13-May	COHA	Two-Mile Canyon	Flew to the west. Probably not responding to tape.
19-May	UNRA (?)	Pajarito Canyon	An empty nest was found about Cooper's hawk size.
21-May	UNAC	Cañon de Valle	An immature Cooper's hawk or a goshawk responded to a broadcast. The bird circled & then flew out of area.
21-May	GHOW	Cañon de Valle	A great horned owl responded to the broadcast and then flew down hill.
4-Jun	GHOW (?)	Water Canyon	A large gray bird flew from a roost beneath us toward main canyon. Probably a great horned owl. Found an owl roost (great horned owl?) with 3+ pellets. Also found a great horned owl feather.
4-Jun	RTHA	Water Canyon	Flew over head. Primary on left wing is broken and falling off.
11-Jun	RTHA	Cañon de Valle	Soaring off in the distance.
11-Jun	GHOW	Pajarito	Found a great-horned owl nest. Pellets everywhere but no mute. Nest is in drainage.
30-Jul	RTHA	Cañon de Valle	Vocalizations.
30-Jul	GHOW (?)	Cañon de Valle	Found a fresh moist cast, probably GHOW.

^a COHA = Cooper's Hawk; GHOW = Great-horned owl; RTHA = Red-tailed Hawk; UNAC = Unknown Accipiter; UNRA = Unknown Raptor.

Table 3. Summary of desired forest conditions in three forest types for sustaining northern goshawks in the southwestern United States.^a

Attribute	Home Range Components						
	Suitable Nest Area ^b	Post Family-fledgling Area			Foraging Area		
		Ponderosa Pine	Mixed-Species	Spruce-Fir	Ponderosa Pine	Mixed Species	Spruce-Fir
VSS Distribution % ^c							
VSS 1 grass/forb/shrub	0	10	10	10	10	10	10
VSS 2 seedling-sapling	0	10	10	10	10	10	10
VSS 3 young forest	0	20	20	20	20	20	20
VSS 4 mid-aged forest	0	20	20	20	20	20	20
VSS 5 mature forest	100	20	20	20	20	20	20
VSS 6 old growth		20	20	20	20	20	20
Canopy Cover %							
VSS 4	NA ^d	1/3 60+ ^e 1/3 40+	60+	60+	40+	1/3 60+ ^e 2/3 40+	1/3 60+ ^e 2/3 40+
VSS 5	50+	50+	60+	70+	40+	50+	60+
VSS 6	50+	50+	60+	70+	40+	60+	60+
Years to reach VSS 6	200-300	200-250	200-300	200-300	200-250	200-300	200-300
Openings							
W/ Reserve trees (Ac) ^f	0	2	2	1	4	4	1
WO/ Reserve trees (Ac)	0	1/2	1/3	1/3	1/2	1/3	1/3
Width (ft)	NA	200	150	125	200	200	125
Reserve Trees							
Number (per group)	NA	3-5	6	6	3-5	6	6
Number of Groups	A ^g	1	1	2	1	1	2
Snags (Ac)	NR ^h	2	3	3	2	3	3
Downed logs (Ac)	NR	3	5	5	3	5	5
Woody debris (Tons/Ac)	NR	5-7	10-15	10-15	5-7	10-15	10-15

^a Source of Table: Reynolds et al 1992.

^b Suitable nest area (capable of having nesting goshawks) attributes apply to all forest types.

^c VSS: Vegetative structural stages, a description of forests based on the location of the majority of the trees in the diameter distribution of a stand. For example, if the majority of the stems of a stand (based on basal area) were located in the 12-18 inch diameter class, the stand would be classified as a VSS 4. General diameter limits are: VSS 1=0-1" DBH, VSS 2=1-5" DBH, VSS 3=5-12" DBH, VSS 4=12-18" DBH, VSS 5=18-24" DBH, VSS 6=24"+ DBH. DBH=Diameter at Breast Height (4.5 ft.).

^d NA: Not applicable.

^e Proportion of home range component.

^f Reserve trees: Standing trees left after harvesting that will be allowed to become snags and downed logs.

^g A: Applicable, clumpiness or groups of large trees is also desirable.

^h NR: Not Required, but presence of these features are not detrimental.

Table 4. Summary of management recommendations for producing and maintaining northern goshawk habitat in the southwestern United States.^a

Attribute	Home Range Component		
	Nest Area ^b	PFA	Foraging Area
Number	6	1	1
Suitable	3	NA	NA
Replacement	3	NA	NA
Size (Ac)	30	420	5,400
Management Season	Oct-Apr	Oct-Apr	Year-Long
Regeneration			
Conifer	None	Yes	Yes
Aspen & Oak ^c	None	Yes	Yes
Planting	None	Yes	Yes
Thinning from Below	Non-Uniform Spacing	Non-Uniform Spacing	Non-Uniform Spacing
Roads			
System	Minimum Density	Minimum Density	Minimum Spacing
Skid	Permenant	Permenant	Permanent
Forage Utilization (%)	20	20	20
Woody Debris Treatment	In Order of Preference		
Prescribed Burning ^d	1	1	1
Lopping & Scattering	2	2	2
Hand Piling	3	3	3
Machine Grapple Piling	None	3	3
Dozer	None	4	4

^a Table Source: Reynolds 1992.

^b Nest areas may be made up of one or more forest types.

^c Oak not applicable in the spruce-fir forest type.

^d Not applicable in spruce-fir forest type.

Map 1. Northern goshawk inventory routes on Los Alamos National Laboratory, Los Alamos, NM in 1993.

Border of Inventory Area
Routes

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

35°52'30"

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68

67

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66

T 19 N

T 18 N

65

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Map 2. Raptor sightings during 1993 northern goshawk inventory on Los Alamos National Laboratory.

"70"

Map 3. Post-fledgling Family Area and Foraging Area boundaries of northern goshawks on Santa Fe National Forest that overlap Los Alamos National Laboratory.

- LANL Border
- - - - Foraging Area Boundary

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

"6

50

"66

T 19 N

T 18 N

"65

DATE

FILMED

7/12/94

END