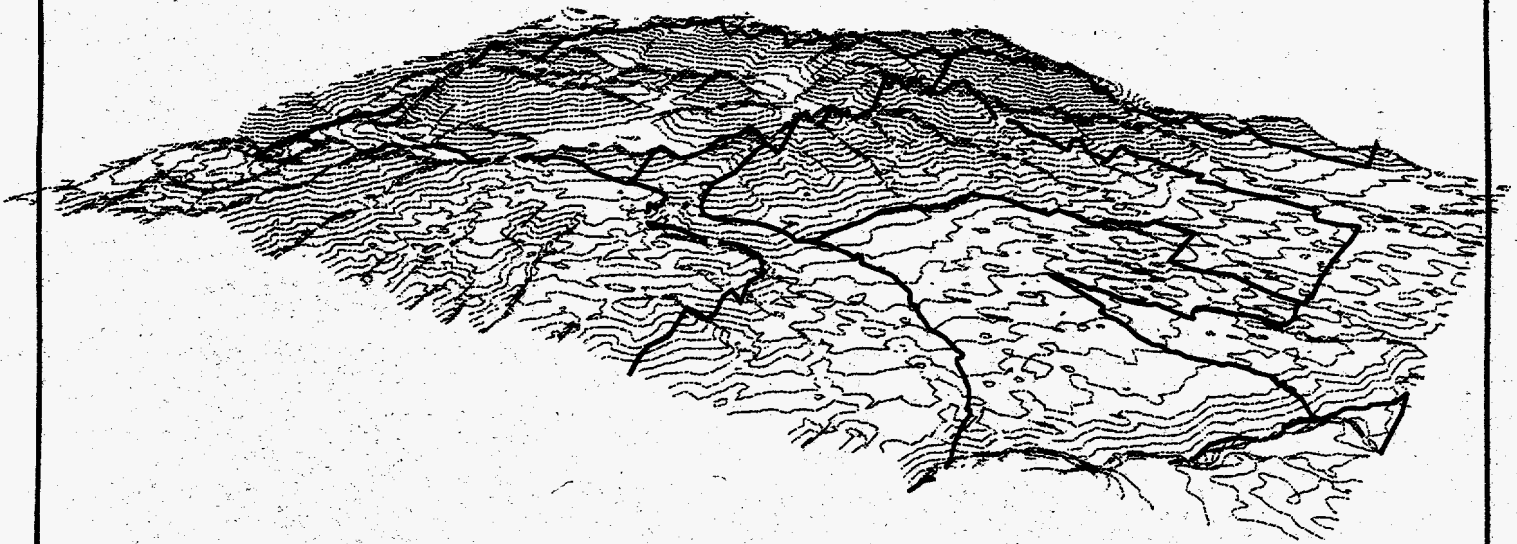


**1994 NORTHERN GOSHAWK INVENTORY ON PORTIONS OF  
LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NM**

Final Report for Subcontract 007AM0014-31



by

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submitted to

Environmental Safety and Health-8  
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## INTRODUCTION

Northern goshawks (*Accipiter gentilis*) (hereafter referred to as goshawk) are large forest dwelling hawks. They are the largest species of the *Accipiter* genus which also includes sharp-shinned hawks (*A. striatus*) and the Cooper's hawk (*A. cooperii*). Goshawks are holarctic in distribution and nest 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" 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.

Goshawk inventory was conducted during the 1993 nesting season with no adult goshawk responses detected within the LANL survey area (Sinton and Kennedy 1993). As noted by Sinton and Kennedy (1993), these results may be interpreted in several ways: 1) no goshawk territory(ies) 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 by the observer. For those

reasons, a goshawk inventory was conducted in 1994. This report summarizes the results of this inventory.

## **METHODS**

The area to be inventoried for goshawks was determined by personnel from Colorado State University (CSU) and Environmental Safety and Health-8 (ESH-8), Los Alamos National Laboratory (LANL) and covered areas of adequate goshawk habitat (Map 1). A total of 745.5 ha were inventoried this year, 33% of the ha inventoried in 1993. The criteria used to decide on the areas of adequate habitat include areas where accipiters were seen in 1993 and areas of dense canopies and tall trees. Most of this area was inside the perimeter of the secured area. For that reason and to comply with ESH-8's health and safety procedures, an escort was provided by ESH-8 to accompany the observer (DTS) during inventory.

Inventory was conducted from 6 - 8 June, 1994. This period coincides with the goshawk nestling stage of the goshawk nesting season in the Jemez Mountains (Kennedy 1991) as determined by observations of nearby active goshawk nests. 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 rims and bottoms (Map 1). The distance between calling stations was 200 m. Because of the rough terrain, straight transect lines (as recommended in Kennedy and Stahlecker 1993) were not used and the observer reduced the spacing from 300 m to 200 m to insure total coverage. Inter-station distances were measured by pacing.

The broadcast surveys started as early as 08:30 and ended as late as 17:30 (Table 1). 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. 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 accipiters to the taped calls (including Cooper's hawks and sharp-shinned hawks) led to an intensive nest search (Reynolds 1982) in the response area. The search area would cover approximately 2,500 m<sup>2</sup> (radius = 800 m from the area of most aggressiveness) 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 was 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 21 hours were spent inventorying 93 stations on 745.5 ha (Table 1). This includes time spent during breaks, lunch stops, moving from location to location and waiting out rain. It does not include administrative time, training time, or time spent accessing the area.

No goshawk responses were detected during inventory (Table 2). One Cooper's hawk response was observed mobbing a great-horned owl (*Bubo virginianus*) but, after a 90-minute nest search, no nest was found (Map 2).

## **CONCLUSIONS**

Since this is the second year of inventory with negative results, the probability of nesting goshawks within the survey area is low. We do not recommend additional goshawk inventory. 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.

## **MANAGEMENT RECOMMENDATIONS**

Two goshawk nests have been found near the LANL inventory area on SFNF (Map 3). Both territories were occupied in 1993 and 1994 but only one territory produced young in 1993 and neither territory produced young in 1994 (Kennedy, unpubl. data). 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 371.4 ha (15.5% of the total foraging area). The foraging area of a goshawk territory in Water Canyon overlaps LANL by 187.3 ha (7.8% of the total foraging area). Both of these territories are found on the Española Ranger District of SFNF. The USDA, Forest Service has published recommendations for management of the goshawk in the southwestern United States (Reynolds et al. 1992).

These management guidelines should be implemented on these areas within LANL. These guidelines are summarized below. 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)<sup>a</sup> — are managed in goshawk home ranges.

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.

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<sup>a</sup> 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.)



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 et al. In press) 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  $\leq 0.8$  ha are required for regeneration. If openings are  $\geq 0.2$  ha then large, mature reserve trees should be left to regenerate the openings; openings  $\leq 0.2$  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.

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.

## **ACKNOWLEDGMENTS**

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Figure 1. Inventory data sheet used during accipiter inventory on Los Alamos National Laboratory in 1994.

Inventory Data Sheet

Date \_\_\_\_\_ Observer: \_\_\_\_\_ Time Start: \_\_\_\_\_ Time End: \_\_\_\_\_  
Survey Area: \_\_\_\_\_  
Quad Name: \_\_\_\_\_ Tape: \_\_\_\_\_ Intervals \_\_\_\_\_ m

Trans	Sta.	Species	Sex/ Age	Resp	Time	Nest Search	Nest Found	Comments

- NOGO--Northern Goshawk
- COHA--Cooper's Hawk
- SSHA--Sharp-shinned Hawk
- UNAC--Unknown Accipiter
- STJA--Stellar's Jay
- RTHA--Red-tailed Hawk
- UNRA--Unknown Raptor

- F--Female
- M--Male
- A--Adult
- Y--Young
- U--Unknown

- 0--None
- 1--Vocal
  - a)Wail
  - b)Kek
  - c)Beg
- 2--Visual (Silent)
- 3--Vocal, then Visual
- 4--Visual, then Vocal
- 5--Mimic
- 6--Other

**Table 1. Summary of the 1994 northern goshawk inventory effort on Los Alamos National Laboratory.**

Date	Time (Military)			Total Sta.	Total Ha <sup>a</sup>
	Start	End	Total (Hr)		
6 June 94	0840	1730	8.8	23	259.9
7 June 94	0831	1352	5.4	33	209.0
8 June 94	0852	1538	6.8	37	276.6
<b>Total</b>			21.0	93	745.5
<b>Average</b>			7.0	31	248.5

<sup>a</sup>Hectares calculated using Arc/Info (Environmental Systems Research Institute 1991).

**Table 2. Raptor responses and observations detected during the northern goshawk inventory on Los Alamos National Laboratory land in 1994.**

Date	Species <sup>a</sup>	Area	Comments
6 June 94	UNAC	Water Canyon	Either a Cooper's Hawk or a Sharp-shinned Hawk silently flew by very quickly.
6 June 94	GHOW	Water Canyon	We found a GHOW nest or roost. There was a lot of mute and owl feathers.
6 June 94	AMKE	Water Canyon	Male perched nearby
6 June 94	RTHA	Water Canyon	Silent fly over.
7 June 94	GHOW	Cañon de Valle	Found an owl pellet.
8 June 94	COHA	Pajarito Canyon	Female Cooper's hawk observed mobbing a Great-horned owl. We followed the two birds over a ridge and conducted a nest search for 90 min. but did not find additional signs of nesting activity.

<sup>a</sup>UNAC = Unknown Accipiter; GHOW = Great-horned Owl; AMKE = American Kestrel; RTHA = Red-tailed Hawk; COHA = Cooper's Hawk

**Table 3. Summary of desired forest conditions in three forest types for sustaining northern goshawks in the southwestern United States.<sup>a</sup>**

Attribute	Home Range Components						
	Suitable Nest Area <sup>b</sup>	Post Family-fledgling Area			Foraging Area		
		Ponderosa Pine	Mixed-Species	Spruce-Fir	Ponderosa Pine	Mixed Species	Spruce-Fir
<b>VSS Distribution %<sup>c</sup></b>							
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
<b>Canopy Cover %</b>							
VSS 4	NA <sup>d</sup>	1/3 60+ <sup>e</sup> 1/3 40+	60+	60+	40+	1/3 60+ <sup>e</sup> 2/3 40+	1/3 60+ <sup>e</sup> 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
<b>Openings</b>							
W/ Reserve trees (Ac) <sup>f</sup>	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
<b>Reserve Trees</b>							
Number (per group)	NA	3-5	6	6	3-5	6	6
Number of Groups	A <sup>g</sup>	1	1	2	1	1	2
Snags (Ac)	NR <sup>h</sup>	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

<sup>a</sup> Source of Table: Reynolds et al 1992.

<sup>b</sup> Suitable nest area (capable of having nesting goshawks) attributes apply to all forest types.

<sup>c</sup> 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.).

<sup>d</sup> NA: Not applicable.

<sup>e</sup> Proportion of home range component.

<sup>f</sup> Reserve trees: Standing trees left after harvesting that will be allowed to become snags and downed logs.

<sup>g</sup> A: Applicable, clumpiness or groups of large trees is also desirable.

<sup>h</sup> NR: Not Required, but presence of these features are not detrimental.



**Map 1. Northern Goshawk Inventory Routes on Los Alamos National Laboratory, Los Alamos, NM in 1994**



Inventory Routes



NM Highways



Paved Roads



Streams

Contour Interval = 20 m

August 1994

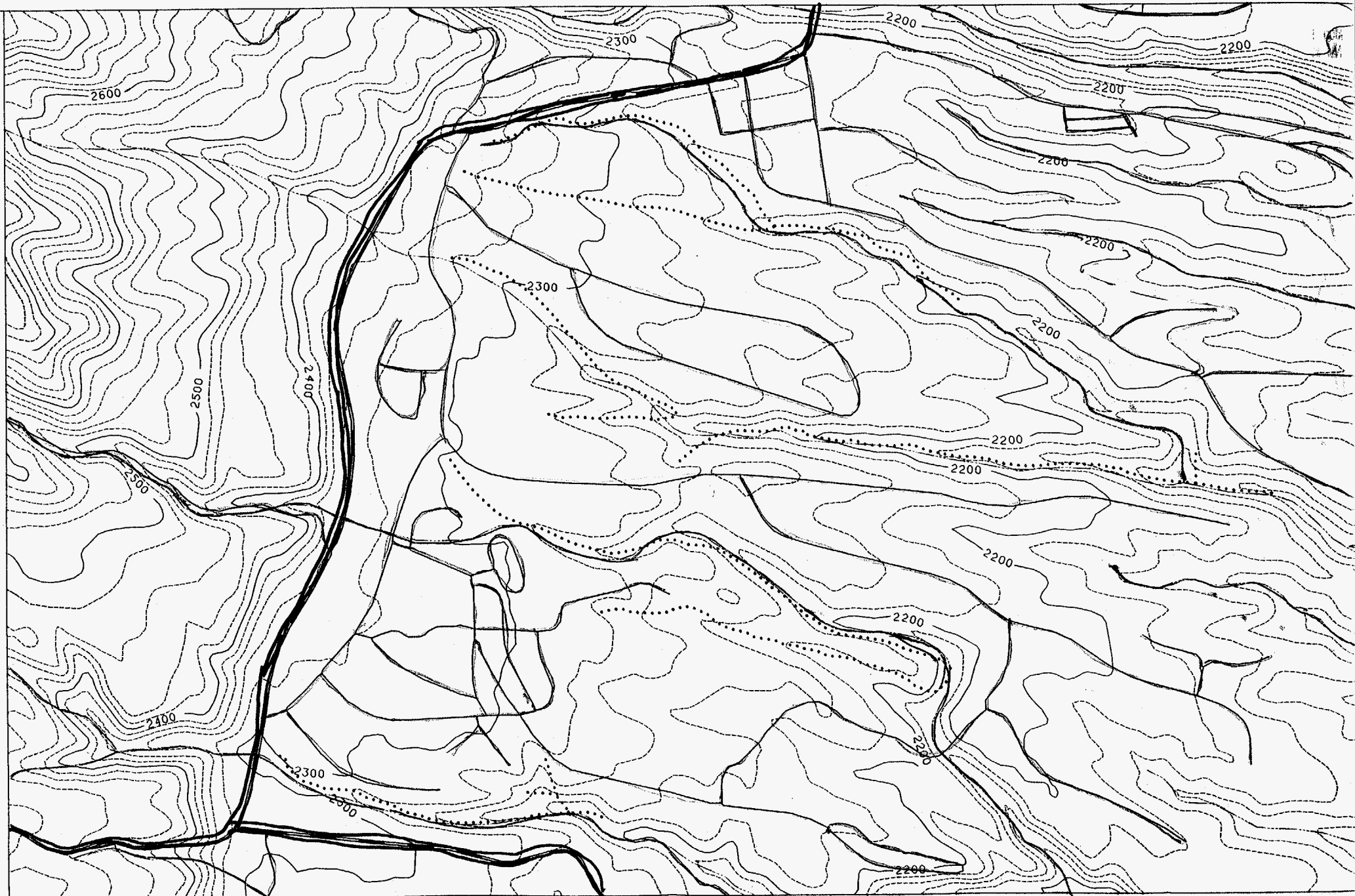
North American Datum 1927

Projection UTM-Zone 13

Prepared by DTS

SCALE 1: 24 000



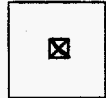


# Map 2. Raptor sightings during the 1994 goshawk inventory on Los Alamos National Laboratory, Los Alamos, NM

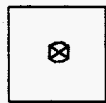


Nest

COHA = Coopers Hawk  
UNAC = Unknown Accipiter  
GHOW = Great-Horned Owl  
RTHA = Red-tailed Hawk  
AMKE = American Kestrel



Visual



Vocal



Great-horned Owl Pellet



NM Highways



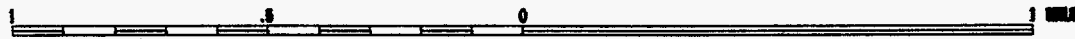
Paved Roads



Streams

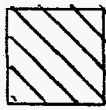
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August 1994  
North American Datum 1927  
Projection UTM-Zone 13  
Prepared by DTS

SCALE 1: 24 000





**Map 3. Foraging Area boundaries of northern goshawks on the Santa Fe National Forest that overlap Los Alamos National Laboratory.**



Area of Goshawk Foraging Areas that overlap Los Alamos National Laboratory



Goshawk Foraging Area Boundaries



NM Highways



Paved Roads

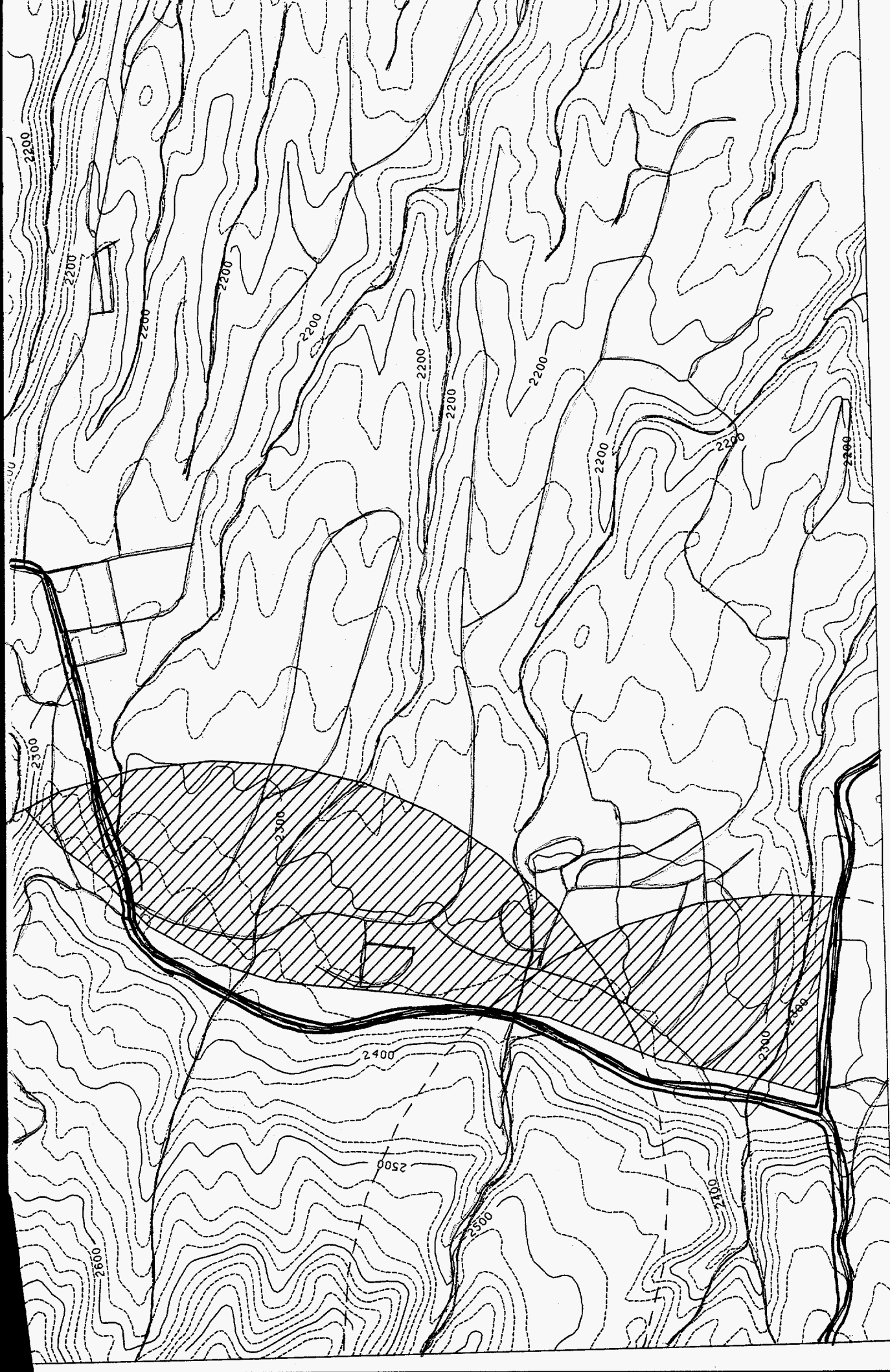


Streams

Contour Interval = 20 m  
August 1994  
North American Datum 1927  
Projection UTM-Zone 13  
Prepared by DTS

SCALE 1: 24 000





**Table 4. Summary of management recommendations for producing and maintaining northern goshawk habitat in the southwestern United States.<sup>a</sup>**

Attribute	Home Range Component		
	Nest Area <sup>b</sup>	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 <sup>c</sup>	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 <sup>d</sup>	1	1	1
Lopping & Scattering	2	2	2
Hand Piling	3	3	3
Machine Grapple Piling	None	3	3
Dozer	None	4	4

<sup>a</sup> Table Source: Reynolds 1992.

<sup>b</sup> Nest areas may be made up of one or more forest types.

<sup>c</sup> Oak not applicable in the spruce-fir forest type.

<sup>d</sup> Not applicable in spruce-fir forest type.