

# TONTO RIM NORTHERN GOSHAWK INVENTORY PAYSON AND PLEASANT VALLEY RANGER DISTRICTS

Arizona Game and Fish Department  
Heritage Projects  
I93023 and I93024



## FINAL REPORT

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## **DISCLAIMER**

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**Tonto Rim Northern Goshawk Inventory  
Payson and Pleasant Valley Ranger Districts :  
Tonto National Forest Heritage Projects**

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**Introduction**

The northern goshawk (*Accipiter gentilis atricapillus*) was listed as a Sensitive species by the Regional Forester of the Southwestern Region of the Forest Service in 1982 (USDA Forest Service 1991). It is also listed by the Arizona Game and Fish Department (AG&FD) as a Candidate species (1988), and by the USDI Fish and Wildlife Service (FWS) as a Category 2 species under the Endangered Species Act.

These listings have been generally attributed to declines in goshawk populations and goshawk reproduction in the Southwest (Herron et al. 1985, Bloom et al. 1986, Kennedy 1988, Crocker-Bedford 1990). Possible reasons for the declines include tree harvest, toxic chemicals, drought, lack of fire, disease, and changing prey base populations through habitat alterations (Reynolds et al. 1992).

The goshawk is the largest North American member of the genus *Accipiter*, which also includes the sharp-shinned hawk (*A. striatus*) and the Cooper's hawk (*A. cooperii*). The goshawk is holarctic in distribution. In North America it primarily occurs in boreal forests, but is found in montane forests of the western United States and Mexico. The subspecies *Accipiter gentilis atricapillus* and *Accipiter gentilis apache* are found in Arizona. The former is the most common subspecies in the state, occupying pine and mixed conifer forests in the northern half of the state, while the latter is limited to extreme southern portions of Arizona. On the Tonto National Forest, goshawk distribution includes forested habitats associated with the Mogollon Rim and sky-island mountain ranges.

Principal forest types occupied by the goshawk in the Southwestern Region are ponderosa pine (74%), mixed-species (23%), and spruce-fir (3%) (Reynolds et al. 1992). On the Tonto, goshawk territories are dominated by ponderosa pine, but frequently include juniper woodlands and mixed-species. Nest trees are ponderosa pine; nest sites are generally characterized by the largest trees and densest canopy in the general area.

Formal data collection for the Tonto National Forest began in 1990 with surveys for nests in project analysis areas, although incidental observations of goshawks were noted by Forest and District Biologists prior to 1990. Since then, habitat analysis, surveying, and monitoring for goshawks has occurred in all project analysis areas as funding allowed. Inventory for goshawks in non-activity and wilderness areas has generally been a lower priority. Although to a lesser extent, surveys in wilderness areas have been conducted on the Tonto since 1990 and have included the Pinal Mountains (Globe Ranger District), the Mazatzals (Payson District), and the Sierra Anchas (Pleasant Valley District). Six goshawk territories were established on the Tonto prior to the 1994 field season. All but 1 of these 6 territories are located on the Payson and Pleasant Valley Ranger Districts. The other territory is on the Globe Ranger District associated with Madera Peak in the Pinal Mountains. Inventory for northern goshawks has been a low priority on the other districts of the Tonto (Cave Creek and Mesa Ranger Districts) due to the limited amount of potential habitat, isolated nature of most of the potentially suitable areas

(wilderness areas), and limited funding and manpower to access these areas.

The Tonto National Forest received two Heritage Grants (project numbers I93023 and I93024) from the Arizona Game and Fish Department on August 9, 1993 for conducting inventory and monitoring surveys for the northern goshawk on the Payson and Pleasant Valley Ranger Districts. Surveys for goshawks were conducted during the months of April through August in 1994 and May through September in 1995.

## **Methods**

### **Inventory**

USGS 7.5 minute quads were selected as analysis areas. Habitat suitability was assessed within each area by survey crews and district biologists. Areas with the highest potential for goshawk nest stands and post-fledgling family areas (PFA's) were identified on each quad, primarily based on the forest type (ponderosa pine or mixed conifer), canopy closure (> 40%), average tree size (> 12" DBH) and tree densities (> 20 trees/acre). Data sources included stand analysis information, aerial photos, previous surveys, and field visits to potential sites. During the analysis of an area, goshawk sign such as droppings, molted feathers, and prey remains were noted on worksheets. All potential nesting and PFA habitat identified in the analysis areas was broadcast surveyed.

To ensure consistency across the Forest and within the Region, broadcast survey methods developed by Kennedy and Stahlecker (1992 and 1993) were followed (USDA 1993), with one modification, as discussed below. The method uses taped goshawk vocalizations, which are broadcast through a speaker/amplifier during the brood rearing season. Calling stations are placed on a transect 300 meters apart, with transects separated by 260 meters and calling stations staggered about 150 meters from the adjacent transect. The taped alarm call is used during the nestling period and the wailing call is used during the fledgling dependency period. At each station, the call is broadcast for 10 seconds, followed by a listening period of 30 seconds. The process is repeated 120 degrees off the previous direction until two revolutions have been completed. When a response is detected, the observer notes the direction of the response and the age and/or sex of the bird, if possible. When a female or fledgling is detected, the area is searched for a nest. If a male is detected, the surrounding area as a whole is searched more intensively for the female. Once a nest is located or fledglings identified, a PFA and management territory are established.

The protocol was modified on the Tonto in 1994 so that only one revolution was completed at each station. This modification was based on two factors: the need to survey as much suitable habitat as possible, and comments from Richard Reynolds and others that one revolution seemed to be comparable to two revolutions in terms of goshawks detected (USDA 1993.)

In 1994, broadcast surveys were conducted from late May through late August. Surveys were generally conducted in early morning and afternoon. Because survey crews were primarily surveying potential nesting and PFA habitat, the majority of the transects were located along drainages. In addition to goshawks, all surveyors noted any other raptors or sign of raptors in their survey areas. In 1995, inventory surveys were conducted as well, but to a much lesser extent than in 1994. Surveys began in early May and ended in early September and followed the same procedures and protocol as used in the 1994 field season.

### **Monitoring**

The five territories established prior to 1994 on the Payson and Pleasant Valley districts were monitored in 1994. Monitoring consisted of informal walk-throughs (looking and listening for goshawks and looking for nest structures and other sign) in April-May. All territories received multiple visits during this period in an attempt to confirm presence and breeding activity. If breeding activity was confirmed, return visits took place periodically throughout the season until the success of the nest was determined (fledged young). If breeding activity or presence could not be determined by late May, future visits to the area were conducted as time allowed, often using a broadcast call to elicit a response. Monitoring in 1995 was conducted on all previously established territories, including those confirmed in 1994. Data forms used for all inventory and monitoring were supplied by Region 3 of the Forest Service and are included in Appendix I.

## Results

### **Inventory-1994**

Seventeen (17) quads on the Payson and Pleasant Valley Ranger Districts were assessed for habitat suitability. This assessment was done using stand database information, personal knowledge of the area, previous goshawk sightings, and field reconnaissance. This assessment resulted in 354,944 acres inventoried for northern goshawk habitat. From these acres inventoried, 52,442 acres were surveyed using the broadcast calling protocol. These acreage figures were based on the estimate that each calling station covers 19.3 acres. The most suitable habitat was surveyed more than once. The areas surveyed on the quads included activity areas and non-activity areas (Table 1). 1994 transect maps are included in Appendix D.

As a result of surveys in 1994, three new territories were established on the Payson district (120404, 120405, 120406) and one new territory was established on the Pleasant Valley Ranger District (120503). These new territories are briefly discussed below.

**Broad Draw (120404)** was established based on visual observations of one fledgling and one adult in August and is located in the Diamond Point assessment area. A nest was located in a large ponderosa pine (26.5" DBH). The nest stand is classified as a VSS 3B ponderosa pine stand with an understory of juniper. The nest tree is along the Broad Draw drainage and within 100 yards of Forest Development Road (FDR) 65.

**Upper Tonto Creek (120405)**, in the Promontory Butte assessment area, was established based on adults seen on the nest in late May. Based on return monitoring visits to this nest stand, it was apparent that the nest failed. No sign of adult activity or young was seen at the nest or in the area after its establishment. The nest tree was located on a side-slope above an unnamed tributary of Tonto Creek and near the Upper Tonto Creek Campground. The dominant understory species were oak and juniper.

**Erosion Tank (120406)** was established based on the confirmation of a fledgling in August in the Kehl Ridge assessment area. A nest was located in a 19" DBH ponderosa pine, in a VSS 3 ponderosa pine stand. The understory is juniper, Arizona white oak and emory oak. Like 120404, this nest was also located in close proximity to a road, although this road (FDR 438) is a much smaller and less-used two-track road.

**Salt Log Canyon (120503)** was established based on the confirmation of one fledgling in July in the Copper Mountain Assessment Area. No nest structure was confirmed for this territory, but band-tailed pigeon remains and what appeared to be an older stick-nest structure were documented. Habitat in this area is primarily ponderosa pine stringers (VSS 3B to VSS 3C) surrounded by juniper and oak woodland stands.

**Table 1. 1994 Northern Goshawk Inventory Survey Results**

<b>Assessment Area</b>	<b>Acres Assessed</b>	<b>Acres Surveyed</b>	<b>Results</b>
Aztec Peak	14,580	1,563	V
Buckhead Mesa	29,200	280	
Buzzard R1 Mesa	16,000	444	
Copper Mountain	23,040	2,470	Flg, PP
Diamond Point	33,480	2,799	2N w/flg, V
Kehl Ridge	16,040	5,491	N w/flg, V
McFadden Peak	22,240	1,853	
Payson North	28,444	1,139	
Pine	12,690	2,799	2V
Promontory Bu.	23,970	8,415	P, NF
Strawberry	9,700	1,505	V
Woods Cyn SE	9,300	3,069	
Woods Cyn SW	16,080	5,039	2V, N w/flg
Young NE	24,950	11,175	V
Young NW	34,050	2,934	
Young SE	19,500	1,351	
Young SW	21,680	116	
<b>TOTAL</b>	<b>354,944</b>	<b>52,442</b>	

N=nest located NF=nest failed flg=fledgling(s) P=pair located PP=plucking posts located  
V=visual of goshawk

Although only four new territories and nesting areas could be established based on surveys in 1994, other visual observations of goshawks were obtained on both districts (Table 1). Observations in 4 different areas on the Payson district (Diamond Point, Pine, Kehl Ridge, and Strawberry), and observations in 2 areas on the Pleasant Valley district (Aztec Peak and Young NE) were documented in 1994. These results indicate that at least 6 additional territories could be established with additional visits to the areas to confirm breeding activity in the future.

Records were kept regarding other raptors heard or seen during surveys. Data regarding responses from other raptors were collected in the same format as goshawk responses. A total of 37 other observations were documented in 1994. Of these, 2 were black hawks, 3 were zone-tailed hawks, 13 were red-tailed hawks, 14 were Cooper's hawks, 4 were sharp-shinned hawks, 1 was a great-horned owl, and 1 was a golden eagle. Jays, common ravens, and turkey vultures

were also documented answering or flying into the broadcast calls. Of these documented sightings, four Cooper's hawk nests were confirmed and two nests were possible, two sharp-shinned hawk nests (one with three fledglings) were confirmed; one great-horned owl nest with at least one fledgling was confirmed, and two black hawk nests were confirmed. Table 2 displays these confirmed nest sites by assessment area for 1994 and 1995 combined.

No inventory surveys for goshawks were conducted on the Tonto Basin, Globe, Mesa, or Cave Creek Districts during 1994.

**Table 2. Confirmed Nest Locations for Other Raptor Species -1994 and 1995**

Assessment Area	BUVI	ACST	ACCO	BUAN	BUJA
Aztec Peak		O-3Y	O-2Y		
Copper Mt			O-N		
Diamond Pt			O-N O-2Y O-3Y		
Kehl Ridge			O-3Y O-1Y O-2Y O-1Y		
McFadden P			O-3Y		
Payson N			O-1Y		
Payson S			O-N O-3Y		
Pine				O-N	
Promontory		O-N		O-1Y	O-2Y
Young NE	O-1Y	O-N			
Young SE			O-3Y		
Young SW			O-N		
<b>Total Nests</b>	<b>1</b>	<b>3</b>	<b>15</b>	<b>2</b>	<b>1</b>

### Inventory-1995

No additional areas were assessed for goshawk habitat suitability in 1995. All areas surveyed were those areas determined in 1994 to have the highest potential for goshawks. This potential was based on the vegetative structure of the stands and previous goshawk detections. This resulted in a total of 11,583 acres surveyed using the broadcast calling protocol during the 1995 field season. No new territories were confirmed as a result of these surveys and no goshawks were detected. Table 3 lists the assessment areas surveyed and the corresponding acreages for

1995.

Records were kept regarding other raptor species detected during goshawk surveys and were recorded in the same format as goshawk responses. A total of 10 active Cooper's hawk nests were documented on six different quads in 1995. Table 4 displays all confirmed nest locations for other raptor species for both 1994 and 1995.

Inventory surveys were conducted on the Globe Ranger District during 1995 in the Pinal Mountains and the Timber Camp area. There is the potential for an additional 2 or 3 territories to be established in these areas based on goshawk detections during 1995.

**Table 3. 1995 Northern Goshawk Survey Results**

<b>Assessment Area</b>	<b>Acres Surveyed</b>
Aztec Peak	174
Buzzard Roost	174
Copper Mt	1,351
Dane Canyon	58
Diamond Point	2,123
Kehl Ridge	3,185
McFadden Peak	290
Payson North	290
Pine	1,023
Promontory Bt	579
Strawberry	232
Woods Cyn SW	251
Young NE	1,351
Young SE	270
Young SW	232
<b>Total</b>	<b>11,583</b>

### **Monitoring-1994 and 1995**

Prior to 1994 the Tonto had established six (6) goshawk territories. The five territories on the Payson and Pleasant Valley districts were checked with informal walk-throughs (looking and listening for goshawks and looking for potential nest structures or other sign) and with broadcast calling in 1994. All territories were checked early in the season (April-May) and mid-season (June-July), and some were checked late-season (August-September), as time allowed. In 1995, all territories, including those established in 1994, were monitored. The results of monitoring for each territory are discussed below.

**Robert's Draw: 120401**

New nests were located in Robert's Draw in the vicinity of the first confirmed nest in the territory in 1994 and 1995. The 1994 nest was located at the top of a ponderosa pine tree. It is interesting to note that the nest was fully visible on all sides, including from the top due to its location at the tree crown. The shape of this abnormally growing tree was such that the crown of the tree provided a platform and the branches extended out laterally with a stick nest constructed on top of this "platform." All three fledglings were banded in 1994 by Michael Ingraldi of the Arizona Game and Fish Department as part of an on-going demography study. The study has concentrated efforts in the Apache-Sitgreaves Forest on the Colorado Plateau above the Mogollon Rim. However, Michael has intentions of expanding the study to goshawks below, but in association with the Mogollon Rim. The fledglings at the Robert's Draw territory were the only birds banded by AG&FD in 1994 on the Tonto. Upon further monitoring visits to the Robert's Draw territory, one fledgling was found dead on the ground near the nest tree. In 1995, another active nest within this territory was located within about 1/8 mile of the 1994 nest. In June, 1995, 2 fledglings were confirmed in this nest stand.

**Pine Canyon: 120402**

Monitoring visits to the Pine Canyon territory in 1994 resulted in only one visual observation of an adult male in May. Further visits did not locate any goshawks, but an immature Cooper's hawk was documented. No goshawks were detected in this territory during visits in 1995. This territory was established based on a nest with 2 fledglings located in this area in 1991. Since that time, goshawks have not been observed in the area.

**Hunter Creek: 120403**

Adult goshawks were observed on three different visits in June 1994, within the vicinity of the established PFA of the Hunter Creek territory. All observations were of single adults (sex not differentiated), so pair confirmation or breeding status was unknown. However, in 1995 nesting activity was confirmed in early May in the vicinity of previous year's locations. Unfortunately, by June, it was obvious that this nest had failed and no goshawks were detected during future visits to the site. This territory was originally established based on observations of an adult and a confirmed nest in 1991. A single adult was again observed in 1992, but no nesting activity could be determined. No monitoring was conducted at this territory in 1993.

**Broad Draw: 120404**

No goshawks were detected in this territory during monitoring visits in May, June, July and August of 1995. Cooper's hawk juveniles were documented within the territory in August and goshawk responses from the near-by Robert's Draw territory were noted in August, but there were no goshawk responses from within this territory.

**Upper Tonto Creek: 120405**

In early May, it was obvious that the 1994 nest was not being used this year. During visits in May, June and August, only vocal responses from a goshawk could be detected and no visual confirmation of adults or juveniles was obtained during the 1995 field season.

**Erosion Tank: 120406**

In early May, what appeared to be white feathers (tail feathers?) within the 1994 nest structure were noted. White wash was apparent around the tree as well. However, upon further visits to this nest in May, no goshawks were detected and no activity was obvious at the nest tree. Monitoring visits continued in June, July and August and no goshawks were detected. Because the evidence during the first visit was not conclusive enough to confirm a female on the nest, and no future visits revealed presence of goshawks in this territory, we concluded absence for the 1995 season at Erosion Tank.

**Jim Sam Butte: 120501**

The Jim Sam Butte territory was monitored in May and June of 1994 and August of 1995 and no goshawks were observed. The habitat in this area appears marginal for goshawks; it is primarily juniper and oak woodland. The territory was established in 1992 based on visual observation of two fledglings. No visits to this site occurred in 1993.

**Colcord Estates: 120502**

The Colcord Estates territory was checked with monitoring visits in April and May and with broadcast calling surveys in June and July, 1994. Two fledglings were confirmed in July although no nest structure could be determined. In 1995, a nest structure was located and confirmed with at least 1 nestling observed in the nest. The nest tree was a ponderosa pine. This territory was established in 1992 based on visual observation of an adult male and an audio detection of a female during Mexican Spotted owl daytime surveys. No formal visits were conducted at this territory in 1993, but a visual observation in the general area was reported by the local AG&FD Wildlife Manager. The location of the fledglings in 1994 and the nest in 1995 is in the same general area as the observation in 1992.

**Salt Log Canyon: 120503**

Monitoring visits in May, June, July and August of 1995 did not detect any goshawks within this territory. The drainages surrounding the location of the goshawk fledgling in 1994 were checked thoroughly both with walk-throughs and broadcast calling with no goshawks heard or seen.

The Ellison Creek area near FDR 198 has been considered a possible PFA and territory since 1993, based on visual observations of adults by district personnel, AG&FD personnel, and reports from local summer home residents. No confirmed pair occupancy or nest sites have been confirmed and, therefore, it has not been officially designated as a territory. It is uncertain whether goshawks observed here are in a distinct territory or if these birds may be nesting in the nearby Robert's Draw or Broad Draw territories. In 1994, a visual observation was obtained on a subadult goshawk in April and May within suitable nesting habitat. In 1995, although surveyed repeatedly, no goshawks were detected.

Historic visual observations have been documented in the vicinity of Reynolds Creek in the Sierra Ancha Mountains on the Pleasant Valley district. Although broadcast surveys have been conducted periodically since 1990 in this area, no nests or pair occupancy has been confirmed, but presence has been indicated. Surveys in 1994 near Reynolds Creek did not result in any detections. However, a visual observation was obtained on a goshawk on Aztec Peak. It is uncertain whether this bird could be associated with sightings along Reynolds Creek (approximately 3 miles northwest) or if this sighting would constitute a new territory. Suitable goshawk nesting habitat is prevalent in the Sierra Anchas.

Interestingly, monitoring in 1995 of the 4 territories established in 1994 resulted in only the presence of goshawks at Upper Tonto Creek, with no confirmation of pair occupancy or nesting activity. Although all 9 territories on the Payson and Pleasant Valley Ranger Districts were visited repeatedly throughout the summer, goshawk pair occupancy could only be confirmed at three and presence of goshawks could only be inferred at one territory.

Tables 4 and 5 display occupancy and reproductive results from 1990 through 1995 for goshawks on the Tonto National Forest.

**Table 4. Goshawk Territory Occupancy on the Tonto.**

<b>Results</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>
presence		2	1	2	2	1

pair	1	1	4		6	3
absence			1		1	5
no info				4	1	1
total #	1	3	6	6	10	10

**Table 5. Goshawk Reproduction on the Tonto.**

Results	1990	1991	1992	1993	1994	1995
pairs	1	1	4	-	6	3
active nests	1	1	3	-	6	2
inactive nests	-	1	1	1	2	1
pairs w/ young	1	1	3	-	4	2
young produced	2	2	5	-	8	5
young/repro.pr	2	2	1.7	-	1.3	1.0
young/pairs with young	2	2	1.7	-	1.6	2.5
#young (range)	2	2	1-2	-	1-3	2-3

repro.pr = reproductive pair = total number of pairs minus pairs with nesting status undetermined.

Note: increased occupancy and decreased production are likely an artifact of increased effort over the last 6 years.

Determining reproductive success for each territory is an objective for monitoring. Forty percent of the known territories on the Tonto (4 of 10) were known to have produced young in 1994. In 1995, reproductive success dropped to only 20% (2 of 10). The four nests in 1994 produced a total eight young, while just the two nests confirmed in 1995 produced five young. Only one territory out of the ten established on the Forest was not monitored in 1994 or 1995. Table 6 displays a breakdown of each territory by acres in nest stands, PFA, and Foraging Areas. Appendix A displays a goshawk territory reproductive history since 1990.

**Table 6. Acreages of Goshawk Territories on the Tonto.**

Territory Number	Territory Name	Nest stands	PFA	Foraging Area	Total
------------------	----------------	-------------	-----	---------------	-------

120201	Madera Peak				
120401	Robert's Draw	180	625	5,207	6,012
120402	Pine Creek	180	470	5,370	6,020
120403	Hunter Creek	180	480	5,490	6,150
120404	Broad Draw	190	500	5,410	6,100
120405	Upper Tonto Creek	180	440	5,460	6,080
120406	Erosion Tank	180	470	5,400	6,050
120501	Jim Sam Butte		650		650
120502	Colcord Estates	180	520	5,300	6,000
120503	Salt Log Canyon	180	480	5,390	6,050

Data such as nest tree species, tree DBH and height, slope and aspect of the nest tree and descriptive characteristics of the nest stand used by goshawks are collected when these sites are found. A breakdown of these characteristics for goshawk nests located during the 1994 and 1995 seasons is displayed in Appendix B

## Conclusion

The inventory effort undertaken with the Tonto Rim Northern Goshawk Inventory-Payson Ranger District and the Tonto Rim Northern Goshawk Inventory-Pleasant Valley Ranger District was a significant step toward managing goshawks and their habitat on the Tonto National Forest. The surveys provided valuable and needed information on goshawk distribution across the Forest. Results included surveys of large areas of potential goshawk habitat below the Mogollon Rim; an area of Arizona where information about goshawk distribution and abundance is largely unknown. The 1994 and 1995 field seasons resulted in the confirmation of new nest locations and reproductive information for the Northern Goshawk and other forest raptor species, like Cooper's hawks and sharp-shinned hawks. Although occurrence of goshawks and reproductive success were less than expected during the course of these projects, these results were in keeping with similar inventory and monitoring projects throughout the southwest that noted lower detection rates and reproductive success for goshawks in 1994 and 1995. It is possible that these seasons represented a "bad year" for goshawk reproduction and only continued surveys will be able to determine if the Tonto has a low density of goshawks compared to other Forests, or if goshawks were simply more difficult to survey based on lower reproductive activity.

Future projects on the Tonto will include monitoring of goshawk territories and additional goshawk inventory. Future research opportunities and field studies to continue to collect information on goshawk distribution and habitat requirements in pine forests below the Mogollon rim are many, and the Tonto will continue to look for partnerships with agencies and other groups to attempt to answer these questions.

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