

ARIZONA BALD EAGLE NESTWATCH PROGRAM: 1997 SUMMARY REPORT

Gregory L. Beatty, Bald Eagle Management Coordinator
James T. Driscoll, Nongame Bird Biologist
John G. Koloszar, Nongame Bird Biologist
Nongame Branch, Wildlife Management Division



Technical Report 131
Nongame and Endangered Wildlife Program
Program Chief: Terry B. Johnson
Arizona Game and Fish Department
2221 West Greenway Road
Phoenix, Arizona 85023-4399

July 1998

RECOMMENDED CITATION

Beatty, G.L., J.T. Driscoll, and J.G. Koloszar. 1998. Arizona Bald Eagle Nestwatch Program: 1997 Summary Report. Nongame and Endangered Wildlife Program Technical Report Number 131. Arizona Game and Fish Department, Phoenix, Arizona.

ACKNOWLEDGMENTS

Field reports by the following nestwatchers were used to generate this report: Scott Schlossberg and Bill Sobers, Bartlett Breeding Area; Rob Fletcher, Jr. and Wyatt Nimitz, Fort McDowell Breeding Area; Pete Epanchin and Mele Wheaton, Horseshoe Breeding Area; Jason Beason and Kerry Noonan, Ladders Breeding Area; Chris Buelow and Jen Garvey, Luna Breeding Area; Kimberly Berger and Patty Scifres, Pleasant Breeding Area; Beth Cable and Troy Rintz, 76 Breeding Area; Kevin Long and Mike Neal, Sycamore Creek Breeding Area; Liz Carver and Gary Cress, Tonto Breeding Area; Kris Covert, Jennifer Dhundale, and Jennifer Ottinger, Tower Breeding Area; and Laurie Cleary and Mike Edwards, Winkelman Breeding Area.

We acknowledge and appreciate the assistance of the following people: Carvel Bass, Army Corps of Engineers; Amy Heuslein, Bureau of Indian Affairs; Bob Hall, Bureau of Land Management; Henry Messing, Bureau of Reclamation; Marilyn Ethelbah, Clinton Pattea, and Darrel Russell, Fort McDowell Indian Community; Gary Hyduke and Tom Valencia, Maricopa County Parks; Ron Chiago and Ivan Makil, Salt River Pima Indian Community; Teah Anders, Salt River Project; Amanda Moors and Paul Nosie, Jr., San Carlos Apache Game and Fish Department; Tom Gatz and Mary Richardson, U.S. Fish and Wildlife Service; Janey Agyagos, Jerry Bradley, Jim Copeland, Patti Fenner, Terry Myers, Mike Ross, Bob Shields, and Albert Sillas, U.S. Forest Service; Darrel Declay, Joe Jojola, Ronnie Lupe, and Cynthia Westfall, White Mountain Apache Game and Fish Department; Rich Glinski, Dan Groebner, Mike Ingraldi, Terry Johnson, Susi MacVean, and Shelly Shepherd, Arizona Game and Fish Department.

AMERICANS WITH DISABILITIES ACT COMPLIANCE

The Arizona Game and Fish Department complies with all provisions of the Americans with Disabilities Act. This document is available in alternative format by contacting Terry B. Johnson, Nongame Branch, Arizona Game and Fish Department, 2221 West Greenway Road, Phoenix, Arizona 85023-4399 -- (602) 789-3501.

PROJECT FUNDING

Funding for this project was provided by: the Arizona Game and Fish Department's Heritage Fund; Arizona's Nongame Wildlife Checkoff; Fort McDowell Indian Community, Salt River Project; U.S. Bureau of Reclamation #7-FC-32-0090; U.S. Fish and Wildlife Service, Project W-95-M (Jobs 1 and 4) under the Federal Aid in Wildlife Restoration Act (Pittman-Robertson Act), and Project E5 (Job 34) under Title VI of the Endangered Species Act; and U.S. Forest Service, Tonto National Forest #3-92-12-043.

TABLE OF CONTENTS

Introduction.....	1
Study Area	2
Methods.....	2
Results and Discussion.....	4
Program	4
Intervention	5
Box Bar Breeding Area	5
Fort McDowell Breeding Area.....	5
Luna Breeding Area.....	5
Breeding Area Summaries.....	6
Productivity Overview	6
Bartlett Breeding Area	10
Box Bar Breeding Area	13
Fort McDowell Breeding Area.....	16
Horseshoe Breeding Area.....	20
Ladders Breeding Area	22
Luna Breeding Area.....	24
Pleasant Breeding Area.....	27
76 Breeding Area	32
Sycamore Breeding Area.....	34
Tonto Breeding Area	37
Tower Breeding Area.....	39
Winkelman Breeding Area	43
Literature Cited.....	45

LIST OF FIGURES

Figure 1. Location of known Arizona bald eagle breeding areas, 19977

LIST OF TABLES

Table 1. Arizona bald eagle productivity for 19978
Table 2. Arizona bald eagle productivity summary for 19979
Table 3. Observed human activity and bald eagle behavior, Bartlett BA11
Table 4. Observed prey types delivered to nest by bald eagles, Bartlett BA12
Table 5. Observed prey items delivered to the nest by bald eagles, Bartlett BA12
Table 6. Observed human activity and bald eagle behavior, Box Bar BA.....14
Table 7. Vehicle activity along FS Road 160 entering the Box Bar BA15
Table 8. Observed human activity and bald eagle behavior, Ft. McDowell BA17
Table 9. Observed prey types delivered to the nest by bald eagles, Ft. McDowell BA18
Table 10. Observed prey items delivered to the nest by bald eagles, Ft. McDowell BA19
Table 11. Observed human activity and bald eagle behavior, Horseshoe BA21
Table 12. Observed prey types delivered to the nest by bald eagles, Horseshoe BA.....21
Table 13. Observed human activity and bald eagle behavior, Ladders BA23
Table 14. Observed human activity and bald eagle behavior, Luna BA.....25
Table 15. Observed foraging events and success by bald eagles, Luna BA.....25
Table 16. Observed prey types delivered to the nest by bald eagles, Luna BA26
Table 17. Observed human activity and bald eagle behavior, Pleasant BA28
Table 18. Watercraft compliance at southern buoy closure boundary, Pleasant BA.....29
Table 19. Observed foraging events and success by bald eagles, Pleasant BA.....29
Table 20. Observed prey types delivered to the nest by bald eagles, Pleasant BA30
Table 21. Observed prey items delivered to the nest by bald eagles, Pleasant BA30
Table 22. Observed human activity and bald eagle behavior, 76 BA32
Table 23. Observed prey types delivered to the nest by bald eagles, 76 BA.....33
Table 24. Observed human activity and bald eagle behavior, Sycamore BA35
Table 25. Observed foraging events and success by bald eagles, Sycamore BA36
Table 26. Observed human activity and bald eagle behavior, Tonto BA.....38
Table 27. Observed prey types delivered to the nest by bald eagles, Tonto BA38
Table 28. Observed human activity and bald eagle behavior, Tower BA.....40
Table 29. Observed foraging events and success by bald eagles, Tower BA41
Table 30. Observed prey types delivered to the nest by bald eagles, Tower BA41
Table 31. Observed prey items delivered to the nest by bald eagles, Tower BA42
Table 32. Observed human activity and bald eagle behavior, Winkelman BA.....44

ARIZONA BALD EAGLE NESTWATCH PROGRAM: 1997 SUMMARY REPORT

Gregory L. Beatty, James T. Driscoll, and John G. Koloszar

INTRODUCTION

The bald eagle (*Haliaeetus leucocephalus*) was classified by the U.S. Fish and Wildlife Service (USFWS) in 1978 as endangered in 43 states (including Arizona) and threatened in five others. In 1995, the bird was downlisted (USFWS 1995) to threatened in all recovery regions of the lower 48 states. It is not endangered or threatened in Alaska and does not occur in Hawaii. Yet, the bald eagle still retains protection under the Endangered Species Act, the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act. A recovery plan (USFWS 1982) guides management of the southwestern population, which includes Arizona's breeding bald eagles.

Many Arizona bald eagle breeding areas (BA) are subjected to human activities that might affect breeding success. Consequently, as the breeding population became better known, the demand for progressive management increased. Strong protective efforts began in 1978, when the U.S. Forest Service (USFS) and two Maricopa Audubon Society volunteers monitored a nest. Soon the monitoring effort expanded into the Arizona Bald Eagle Nestwatch Program (ABENWP).

As more BAs were discovered, interagency coordination became more important. To provide oversight, the Southwestern Bald Eagle Management Committee (SWBEMC) was formed in 1984. The SWBEMC is a cooperative effort among federal and state agencies, private groups, and Native American Tribes committed to bald eagle conservation. In 1986, on behalf of the SWBEMC, the USFWS assumed coordination responsibilities for the ABENWP and expanded its scope. The lead was passed to the Arizona Game and Fish Department (AGFD) in 1991 (Beatty 1992, Beatty and Driscoll 1994, Beatty et al. 1995a, 1995b, 1997).

The ABENWP has three principal goals: conservation, data collection, and education. Because of the high level of recreation along central Arizona rivers, seasonal closures surround many nest areas. Nestwatchers interact with people who enter these closures, educate them about eagle ecology, distribute pamphlets, and direct them out of the area. To help agencies make better management decisions, nestwatchers also collect information on eagle ecology, productivity, and behavior in response to human activity. The most direct or tangible benefit of the ABENWP is observation of problems at nests. Every year, eagles are found in life threatening situations. Constant monitoring makes it possible to intervene and rescue birds that might otherwise die.

This report summarizes the most significant discoveries at each BA monitored in 1997. Among the topics discussed are length of observation, timing of breeding events, human activity, food habits, and management activities.

STUDY AREA

In 1997, ABENWP personnel monitored bald eagle breeding areas along rivers, creeks, and reservoirs throughout Arizona (Fig. 1). All monitored BAs (except the Luna BA) were in the central part of the state. The most northerly BA was Tower, along the Verde River near Clarkdale. The most southerly BA was Winkelman, along the Gila River. The most westerly BA was Lake Pleasant, along the Agua Fria River, and the most easterly BA was Luna, near the town of Alpine and the New Mexican border. Elevations of the monitored areas ranged from 439 m (1440 ft) at the Sycamore BA to 2409 m (7900 ft) at the Luna BA.

Most Arizona bald eagles breed in the central part of the state, at elevations of 329 m (1080 ft) to 1719 m (5640 ft). This portion of the state is within the Upper and Lower Sonoran Life Zones (Merriam 1898), and includes riparian habitats and transition areas of both zones. Brown (1982) describes the representative vegetation of these zones as including Arizona sycamore (*Platanus wrightii*), blue palo verde (*Cercidium floridum*), cholla (*Opuntia* spp.), Fremont cottonwood (*Populus fremontii*), Goodding willow (*Salix gooddingii*), mesquite (*Prosopis* spp.), saguaro (*Carnegiea gigantea*), and tamarisk or salt cedar (*Tamarix pentandra*; an exotic species). Pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) are found in the transition areas.

The Luna BA is one of only two known Arizona BAs found at high elevation. The BA is within the Montane-Conifer Forest zone characterized by Brown (1982) as having ponderosa pine (*Pinus ponderosa*), white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), and quaking aspen (*Populus tremuloides*).

METHODS

In late summer and early fall 1996, AGFD advertised for nestwatchers through the American Ornithologists Union's Newsletter and job placement services at colleges and universities nationwide. Public discussions, the Internet, word-of-mouth from previous nestwatchers, and the distribution of ABENWP brochures also contributed to the pool of applicants. Nestwatchers were hired as private consultants to AGFD.

After selection of personnel, meetings were held the first week in February 1997 to orient and educate nestwatchers. During a field trip to the Bartlett BA, we prepared nestwatchers for the field and explained data forms. We also explained the protocol for contacting AGFD about nest failures and bald eagle emergencies (eaglets falling out of the nest, birds getting tangled in monofilament, etc.). The following day, agency contributors hosted a formal orientation meeting to discuss Arizona bald eagle history and ecology, and to educate nestwatchers on the role they play in management. At

the end of the meeting, nestwatch partners were selected. After the first three weeks in the field, we answered questions about data forms and the content of final reports. Additional problems were discussed on an individual basis in the field or at the office.

BAs selected for monitoring were based upon the level of human activity near the nest area. They included all active BAs with legal closures (Bartlett, Box Bar, Ladders, Lake Pleasant, 76, and Tower), and BAs with high levels of human activity, but which had no closures (Fort McDowell, Horseshoe, Luna, Sycamore Creek, Tonto, and Winkelman).

Field work began the first week of February, immediately after orientation, and continued until the eaglets fledged in May and June. Two person teams maintained a ten-day on, four-day off schedule. Each work period included weekends and Fridays, when heavy recreation may impact eagles. Half of each ten-day period (weekends and every other Friday) was devoted to dawn-to-dusk data collection. The other half was spent collecting supplemental eagle data. A four-day off period occurred every other Monday through Thursday. Breeding areas with constant recreational pressure (Bartlett, Box Bar, Pleasant, and Tower BAs) were monitored everyday during the season with a three to four person team.

All bald eagle data were recorded opportunistically from observation points in the nest area. Observation points were selected to provide optimal viewing with the least impact to eagles. Spotting scopes (15 to 45x) and binoculars were used to view eagles. All observations were recorded on field forms. Forms were developed to record foraging events, human activity, low-flying aircraft, nesting behavior, prey deliveries, wildlife interactions, and wildlife sightings.

Human activities and associated eagle behaviors were recorded within an arbitrary 1.0 km (3300 ft) radius of an eagle or nest. Bald eagle behavior in response to human activity was classified into seven categories: none, watched, restless, flushed, left area, unknown, and bird not in area. If eagles performed their normal activities without acknowledging a nearby human activity, a "no response" was recorded. If an eagle looked at an activity without displaying any other observable reaction, "watched" was marked. If an eagle vocalized, moved noticeably on its perch, or displayed any overt reaction to an activity without leaving its perch, "restless" was recorded. If an eagle left its perch quickly, in response to a human activity, we recorded a "flush." A "left area" response refers to an eagle that became intolerant of an activity and left the immediate area in a less hurried manner than a "flush." We recorded an "unknown" response if we were unable to view an eagle's response and marked "bird not in area" if an eagle was not present when an activity occurred.

In addition, all aircraft below the 600 m (2000 ft) Federal Aviation Administration (FAA) recommended ceiling and within 1.0 km (3300 ft) of an eagle/nest were documented. Elevation of known landmarks (such as the nest or a nearby cliff top) was taken from topographic maps and used to estimate height of aircraft. Eagle responses to aircraft were also recorded. Low-flying aircraft forms, describing identification numbers and flight paths, were turned over to USFWS law enforcement if an aircraft was recorded flying through a BA regularly, at exceedingly low levels (<175 m or 500 ft), and/or caused an eagle to respond significantly.

At the southern end of the Lake Pleasant closure, we documented the amount and type of watercraft activity. We recorded all boats or jet-skis that approached the buoy line and whether they entered the closure or not. If the watercraft entered the closure and were able to get past the nestwatchers, they were recorded as "inside the closure." Conversely, those watercraft which the nestwatchers were able to contact, or approached the buoy line and complied, were considered "at the closure."

Because the southern buoy line at Pleasant was within 1.0 km (3300 ft) of the nest, human activity was recorded differently than other BAs. Due to the constant presence of watercraft within the 1.0 km (3300 ft) radius, only watercraft which bypassed the nestwatchers were recorded on the human activity form. Additionally, some watercraft were recorded twice during the day, once for getting past the nestwatchers and a second time when they returned (hours later) through the closure.

Human activity was also recorded differently at the Luna Lake BA. Due to the constant activity within 1.0 km (3300 ft) of the nest, we were unable to record all activities and an eagle's response to each one. Instead, we recorded only those activities that an eagle reacted to with a significant (restless, flushed, or left area) response.

We recorded all aspects of the bald eagle's natural history. We documented bald eagle interactions with other wildlife, and tried to identify frequency, type, and species of prey delivered to the nest. In addition, all observed foraging events were recorded. Eagle behaviors, such as time spent incubating, attending the nest, and feeding the young, were recorded. In this report, however, we only discuss the eagle's food habits (foraging event and prey deliveries). To record accurate information, we used nest maps with river kilometer designations and a guide to fish species commonly eaten by Arizona bald eagles (Hunt et al. 1992).

Nestwatchers provided their own transportation, gas, supplies, binoculars, and food. Nestwatchers also provided their own housing on days off. A total of 23 nestwatchers participated in the ABENWP in 1997.

RESULTS AND DISCUSSION

PROGRAM

Since monitoring was concentrated in the nest area, this bias must be considered when extrapolating conclusions about foraging locations or habitat use over an entire eagle pair's range. Nevertheless, the information gathered by this focused approach helps inform land and wildlife agencies about the bird's habits, potential conflicts in the BA, and management activities that may be needed. Further, since eagles are most often found perching and roosting near the nest during the breeding season, it is logical to concentrate management most heavily in this area. Certainly though, important eagle foraging areas, perches, and roosts away from the nest should not be ignored.

We monitored 12 BAs in 1997: Bartlett, Box Bar, Fort McDowell, Horseshoe, Ladders, Luna, Pleasant, 76, Sycamore Creek, Tonto, Tower, and Winkelman. Sycamore Creek, a new BA (Driscoll et al. 1997), was monitored for the first time. The final status of the monitored nests, as defined by Postupalsky (1974), were as follows: 5 failed and 7 successful. Eleven young fledged from the seven successful monitored sites.

INTERVENTION

Box Bar Breeding Area

The Box Bar female swallowed fishing line and possibly a hook on March 3 while eating a dead fish. From March 3 to March 6, the eagle periodically shook its head violently, scratched at its mouth, and tried to regurgitate. On one occasion the eagle regurgitated the line, only to re-swallow it moments later. We concluded that the hook was lodged in the crop, not allowing the eagle to expel the material. Believing that the life of the female was in jeopardy, as well as the breeding effort, we attempted to trap the female and remove the fishing line and hook.

From March 7 to March 9 and on March 12 and 13, we tried to capture the female with noosed fish along the river and a noosed carpet in the nest. Initially, noosed fish were placed at advantageous places along the river near the nest. We captured the three year old Box Bar male on March 7. After the noosed fish failed, we decided to more aggressively pursue the female by using a noosed carpet in the nest. On March 9 we climbed into the nest, removed the two eggs, placed fake eggs in the nest, and set the trap. The eagle eggs were immediately transported to an incubator at The Phoenix Zoo. The female returned to the nest about an hour after the trap was set, but did not get snared. She was flushed from the nest and subsequently vocalized, circled the nest, and aborted attempt after attempt to land in the nest. Unfortunately, the female never returned to the nest. As dark ensued, we removed the trap from the nest. Efforts to capture the female with noosed fish along the river on March 12 and 13 were unsuccessful.

The Phoenix Zoo discovered that one egg was viable, while the other was not. The nonviable egg never developed due to a crack that occurred soon after egg laying. The viable egg hatched on March 22 and the eaglet was raised in an imprint free environment to four weeks old. On April 22, we fostered the bird into the San Carlos nest, which already had one eaglet of the same age.

Fort McDowell Breeding Area

Monofilament fishing line entangled the lone eaglet on May 1. On April 30, a 5 to 7 m (15 to 20 ft) piece of monofilament was carried to the nest by an adult eagle. We do not know whether the adult became entangled on the shoreline, brought the line in as nest material, or if the line was attached to a fish. On May 1, the eaglet's talons became entangled in the line, thus tying the bird down to the nest. We climbed the nest and removed the monofilament from the eaglet. No further problems were observed, and the eaglet successfully fledged.

Luna Breeding Area

Fishing line in the eagle's nest was a persistent occurrence/threat throughout the breeding season at the Luna BA. On March 29, fishing line was observed dangling from the nest. Later on April 7, fishing line hung from an eaglet's mouth while it vigorously shook its head. We climbed the nest on April 8 and removed the line from the nest, but were unable to find any line in an eaglet's mouth or around a bird. The next day, while perched along the Luna Lake shoreline, the adult female's talons became entangled in 1 m (2 to 3 ft) of fishing line; however, it was able to remove the fishing line. We climbed into the nest on April 23 to band the smallest eaglet and again removed fishing line from the nest. Finally, on April 25, fishing line was once again found hanging from the nest.

Nestwatchers reported observing other wildlife affected by fishing line. A cormorant was observed flying with a long strand of trailing line. Also, American coots were seen entangled in line. This is not surprising, in 1996 we collected a coot head from the Luna nest which had fishing line tangled inside its mouth. More than likely, the eagles picked up a coot that was either injured, dead, or dying due to fishing line. Because of our close monitoring of Arizona eagles, we have comprehensive information about the negative impacts of fishing line and tackle (Hunt et al. 1992, Beatty 1992, Beatty and Driscoll 1994). However, it is clear that this litter can affect all riparian and aquatic birds.

BREEDING AREA SUMMARIES

Productivity Overview

The 1997 Arizona bald eagle breeding season was the third year in a row that over 20 nestlings fledged. This was the first time this has occurred since we began recording statewide productivity in the early 1970s. A total of 23 bald eagles fledged, and a record 34 BAs were occupied (Tables 1, 2).

Only 13 of the 34 occupied sites were successful in 1997 (Tables 1, 2). This resulted in a rather low overall nest success ($n=0.34$). However, Arizona bald eagles had the highest mean brood size recorded this decade ($n=1.8$). High mean brood size, marked by two successful three chick broods (Blue Point and Luna BAs), helped compensate for failures at other sites.

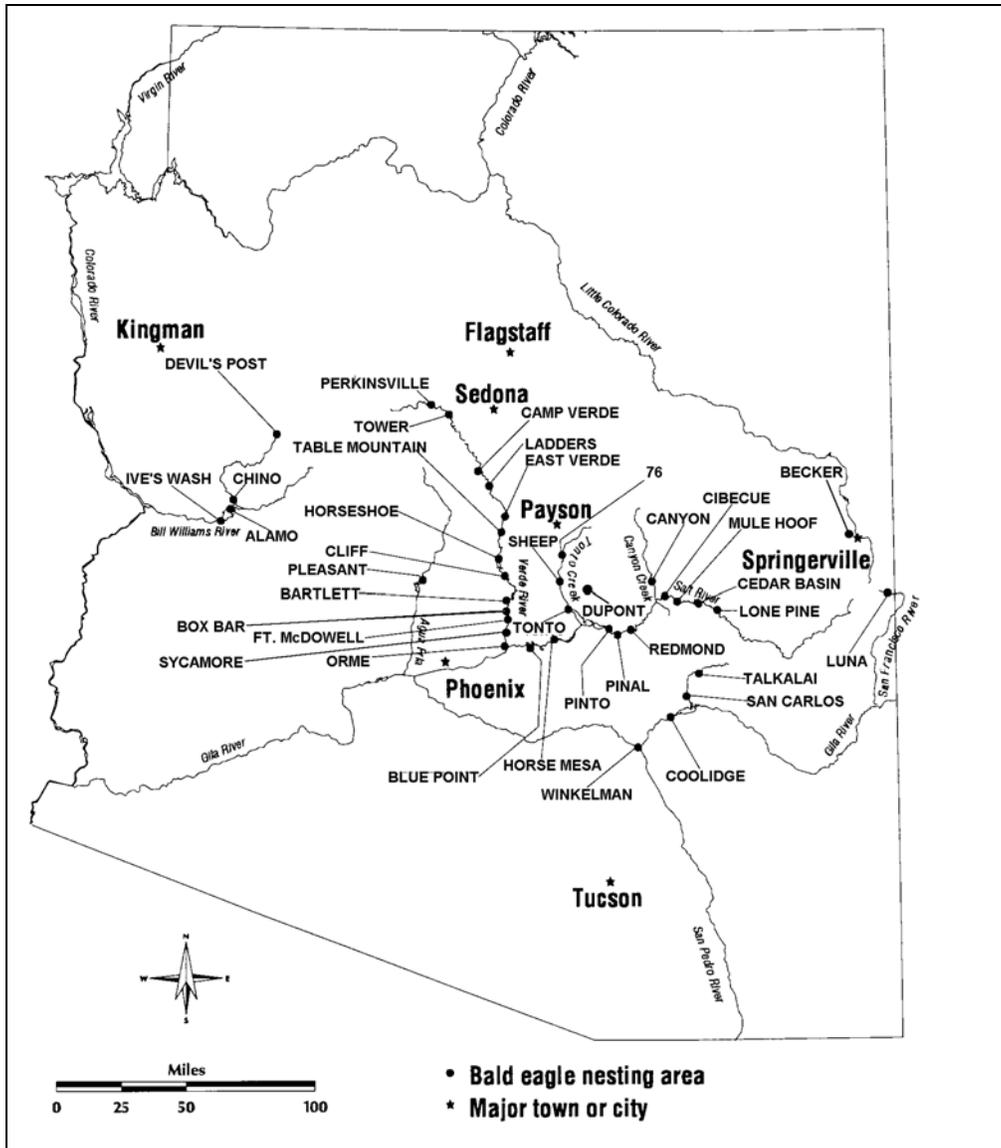


Figure 1. Location of known Arizona bald eagle breeding areas, 1997.

Table 1. Arizona bald eagle productivity for 1997.								
Breeding Area	B.A. Status ¹	Nest # ²	Incubation Date	# Eggs	Hatch Date	# Young	# Fledged	Fledge Date
Alamo	F	4	1/12-2/3	1+	Empty nest found 3/14 - failed 2/21-3/14			
Bartlett*	F	2	1/19-2/5	1+	3/1	1	0	Blown from nest, drowned 4/25
Blue Point	S	7	1/9-2/4	3+	<3/14	3	3	5/14-23
Becker	O							
Box Bar*	F	2	2/3-26	2	3/22	1	Hatched in Zoo, fostered into San Carlos nest 4/22.	
Camp Verde	U							
Canyon	O							
Cedar Basin	F	3	<3/21	1+	Empty nest found 4/18 - failed 3/21-4/18			
Chino	U							
Cibecue	O							
Cliff	O							
Coolidge	S	2	1/23-2/4	2+	<3/21	2	2	5/14-6/5
Devil's Post	U							
Dupont Canyon	F	2	1/7-2/4	1+	Failed 3/21-4/18, incubated a minimum of 10 days past hatch date			
East Verde	F	6	<1/7	1+	Empty nest found 3/14 - failed 2/3-3/14			
Ft. McDowell*	S	16	1/7-2/3	2+	2/26	2	1	1 nestling disappeared 4/17, fledged 5/17
Horse Mesa	S	4	1/9-2/4	1+	<3/14	1	1	5/14-6/9
Horseshoe*	S	11	1/30-2/3	2	3/10-11	2	2	5/26-30
Ive's Wash	F	3	2/3-21	1	Empty nest found 3/21 - failed 3/14-21			
Ladders*	F	3	2/17	3	3/23-25	2	Eaglets died 4/1-4	
Lone Pine	F	2	<3/21	1+	Empty nest found 5/16, failed 4/18-5/16			
Luna*	S	1	<2/5	3+	<3/17	3	3	5/22-26, 5/26-29, 5/29-6/25
Mule Hoof	U							
Orme	S	1	1/9-2/3	2+	2/25-3/14	2	2	5/14-23
Perkinsville	O	Two adults at new nest #3 found on 3/14						
Pinal	F	3	<3/14	1+	Empty nest found 3/27 - failed 3/21-27			
Pinto	F	3	1/9-29	2+	Empty nest found 3/14 - failed 1/29 to 3/14			

Table 1. Continued.								
Breeding Area	B.A. Status ¹	Nest # ²	Incubation Date	# Eggs	Hatch Date	# Young	# Fledged	Fledge Date
Pleasant*	S	2	1/7-30	2+	2/26-28	2	2	5/18
Redmond	F	5	1/9-2/4	2	<3/14	1+	Failed between 3/14-21	
San Carlos	F	1	<1/9	1	Branch broke and nest fell 1/9-21, egg broke.			
San Carlos(2)	S	2	<3/21	1+	3/21-4/18	1	1	Fostered Box Bar eaglet fledged 5/14-6/5. San Carlos eaglet fell out-died.
Sycamore*	F	1	<2/3	1	Nonviable egg removed 3/19 - incubated 44 days.			
76*	S	3	1/28-2/7	2+	3/8	2	2	5/14-6/9
Sheep	O							
Table Mountain	S	4	1/7-2/3	2+	2/19-3/14	2	1	5/14-6/5, eaglet died <10 days old
Talkalai	O							
Tonto*	S	2	1/9-2/4	2+	2/23	2	2	5/6 and 5/11
Tower*	S	8	1/7-29	2+	3/3-6	1	1	5/27-6/9
Winkelman*	F	1	2/9	1	Egg broke in nest during 1st night of incubation			

¹Breeding area status codes (Postapulsky 1974) - U=unoccupied, O=occupied, S=successful, F=failed.

²Nest numbers are from Hunt et al. 1992 and SRP's bald eagle nesting areas in Arizona atlas.

*= Sites monitored by 1997 Arizona Bald Eagle Nestwatch Program.

Table 2. Arizona bald eagle productivity summary for 1997.			
Number of Breeding Areas	38	Number of Active Breeding Areas	27
Number of Occupied Breeding Areas	34	Number of Failed Nests	15 ^{1,2}
Number of Eggs	46+	Number of Successful Nests	13
Nest Success = 13/34 = 0.38		Number of Young Hatched	30+
Mean Brood Size = 23/13 = 1.8		Number of Young Fledged	23
Productivity = 0.38 x 1.8 = 0.68			

¹ Box Bar BA considered a failure - eggs taken from nest, hatched in zoo, and fostered into San Carlos nest..

² San Carlos eagles double clutched, failed in first attempt.

Bartlett Breeding Area

Observation period

Observation dates	February 7 to April 25
Dawn-to-dusk days/hours	30 days/271 hours
Total monitoring days/hours	66 days/636 hours

Eagle identification

Male	Unbanded eagle in adult plumage.
Female	Unbanded eagle in near-adult plumage.

Breeding activity

Nest	Nest #2
Begin incubation	January 19 to February 5
Hatched	March 1
Young	1
Fledged	Eaglet fell out of nest and died on April 25
Fledge date	N/A

On April 25, while feeding on a fish, the lone eaglet (8 weeks old) was blown out of the nest by a gust of wind. At the time of the gust, the eaglet was observed, for the first time, feeding by itself. It is probable that the eaglet was standing on top of the fish and not grabbing a stick in the nest. If so, this (combined with its awkwardness) likely contributed to the bird being blown out of the nest. The bird was found dead downriver of the nest at the edge of the river.

Human activity

A total of 211 human activities was recorded; 77.3 percent (n=161) occurred on weekends (Table 3). Aircraft (small planes and helicopters) represented 66.8 percent of all human activities recorded. Gunshots were the second most frequent activity (n=37, 17.5%). However, beginning in 1997, it was illegal to target shoot along the lower Verde River. The remaining 13 activity types only comprised 15.7 percent (n=33) of the recorded activity.

Eagles behaved with a significant response to seven activities. Gunshots caused eagles to be restless twice and flush three times. Canoes floating through the nest area caused eagles to be restless on two occasions. On April 3, five people traveling upriver from the Needle Rock area were observed shooting into the river and at the cliffs in the nest area. Law enforcement from the USFS was contacted, but the shooters left the area before assistance arrived.

Nestwatchers contacted about 30 people in the BA throughout the season. Most people were cooperative. One person contacted AGFD after an encounter with what he described was a belligerent nestwatcher. He claimed he was quail hunting and was told to "get the hell out of here" by nestwatchers. After talking with nestwatchers, it was clear there were some inconsistencies with his story. According to the nestwatchers, the man was fishing along the river and shooting into the river near the closure's boundary. As they approached, the man took his .22 rifle and placed it into a bag. The nestwatchers described their conversation as relatively calm (informing him of the eagles

and restrictions in the area). After talking to the man and the nestwatchers, it became obvious the man was simply angry because he could not go into the closed area.

Table 3. Observed human activity and bald eagle behavior, Bartlett BA, AZ, 1997.								
Type	Eagle Behavior Toward Human Activity ¹						D-D total ²	Total
	N	W	R	F	?			
Small plane	86	16	-	-	4	84 (52.2%)	106 (50.2%)	
Gunshot	27	4	2	3	1	32 (19.9%)	37 (17.5%)	
Helicopter	25	10	-	-	-	19 (11.8%)	35 (16.6%)	
Canoe	6	2	2	-	1	9 (5.6%)	11 (5.2%)	
Hiker	5	-	-	-	-	5 (3.1%)	5 (2.4%)	
Rafter	1	1	-	-	1	2 (1.2%)	3 (1.4%)	
ORV	2	1	-	-	-	3 (1.9%)	3 (1.4%)	
Shooter	1	1	-	-	-	1 (0.6%)	2 (0.9%)	
Angler	2	-	-	-	-	2 (1.2%)	2 (0.9%)	
Jet	1	-	-	-	-	0	1 (0.5%)	
Driver	-	1	-	-	-	1 (0.6%)	1 (0.5%)	
Tuber	1	-	-	-	-	1 (0.6%)	1 (0.5%)	
Hunter	1	-	-	-	-	1 (0.6%)	1 (0.5%)	
Sonic boom	-	1	-	-	-	0	1 (0.5%)	
Agency worker	1	-	-	-	-	0	1 (0.5%)	
Camper	1	-	-	-	-	1 (0.6%)	1 (0.5%)	
Total	160	37	4	3	7	161 (100%)	211 (100%)	

¹Eagle behavior, N=none, W=watched, R= restless, F=flushed, ?=unknown.

²D-D total=Observations on dawn-to-dusk days.

Food habits

Three foraging attempts by the male were observed in the immediate nest area. One attempt occurred in a riffle, while the other two occurred in runs. All three attempts were for fish. One channel catfish was positively identified.

A total of 51 prey deliveries was recorded, 45 by the male and 6 by the female (Table 4). Fish

accounted for 47 of the prey deliveries. Fish identified in the nest were suckers (n=14), largemouth bass (n=6), bluegill (n=4), carp (n=3), channel catfish (n=3), flathead catfish (n=2), unknown catfish (n=2), and black crappie (n=1) (Table 5).

Table 4. Observed prey types delivered to nest by bald eagles, Bartlett BA, AZ, 1997.					
Sex	Prey types				
	Fish	Mammals	Birds	Unknown	Total
Male	41	2	1	1	45 (88.2%)
Female	6	-	-	-	6 (11.8%)
Total	47 (92.2%)	2 (3.9%)	1 (2.0%)	1 (2.0%)	51 (100%)

Table 5. Observed prey items delivered to the nest by bald eagles, Bartlett BA, AZ, 1997.													
Sex	Prey items ¹												
	Fish									Birds	Mammals	Unknown	Total
	LB	BC	BG	S	C	CC	FC	UC	UF	UB	UM	Unknown	
Male	5	1	4	12	2	3	2	-	12	1	2	1	45
Female	1	-	-	2	1	-	-	2	-	-	-	-	6
Total	6	1	4	14	3	3	2	2	12	1	2	1	51

¹Prey items, LB= largemouth bass, BC=black crappie, BG=bluegill, S=suckers, C=carp, CC=channel catfish, FC=flathead catfish, UC=unknown catfish, UF=unknown fish, UB=unknown birds, UM=unknown mammals.

Management activities

Two teams of nestwatchers were stationed at Bartlett to monitor the site daily during the end of the season when recreation tends to increase.

A USFS closure surrounded the nest area on the Tonto National Forest.

Box Bar Breeding Area

Observation period

Observation dates	February 28 to March 16
Dawn-to-dusk days/hours	8 days/101 hours
Total monitoring days/hours	17 days/188 hours

Eagle identification

Male	Blue VID band left leg - USFWS band right, subadult plumage.
Female	Blue VID band left leg - USFWS band right, adult plumage.

Breeding activity

Nest	Nest #2
Begin incubation	February 3 to 26
Hatched	Phoenix Zoo, March 22
Young	1
Fledged	Fostered into San Carlos nest April 22
Fledge date	Fledged from San Carlos nest, May 15 to June 5

Human activity

During the short amount of time the BA was monitored, a large (n=199) and diverse (14 activity types) amount of activity occurred in the core nest area (Table 6). Small planes (n=50), horseback riders (n=26), drivers (n=26), anglers (n=24), helicopters (n=17), gunshot events (n=15), and hikers (n=11) made up 85 percent of all recorded activities. Activity was concentrated on weekends; 71 percent (n=141) occurred on Fridays, Saturdays, and Sundays.

The eagles were observed significantly responding to six human activities. Eagles flushed due to small planes (n=1), horseback riders (n=1), researchers (n=2), picnickers (n=1), and agency workers (n=1). Yet, it needs to be emphasized that the heaviest recreation period of the season had not yet occurred. During 55 human activities, there was no eagle present to record any behavior (after the eggs were removed, the eagles spent little time in the nest area).

There was a noticeable difference between the number of gunshot events recorded in 1996 and 1997. Although 1997's monitoring was limited to the relatively mild recreational portion of the year, only 15 gunshot events were recorded. In 1996 thousands of gunshots were recorded (Beatty et al. 1997). The reduction in gunshots was likely due to the Tonto National Forest's new shooting restrictions along the lower Verde River.

Even with the new shooting restrictions and existing closure, the density of people and diversity of activities in the nest area will continue to challenge the eagle's ability to reproduce successfully. In only 44.5 hours over 5 days, we contacted 218 vehicles along FS Road 160 heading toward the nest area (not all vehicles were recorded as a human activity due to our contact point being greater than 1 km from the nest and the drivers' activities changing once they parked) (Table 7). Each vehicle held one to six people (489 total). If these numbers are extrapolated through an entire breeding season (4 months), theoretically, over 800 vehicles with about 1600 passengers could have entered the core

nest area. By just their presence in the immediate nest area, the high number of people and diversity of activities can alter an eagle's normal activity (McGarigal et al. 1991). Without continued and strengthened management, we should not be surprised to find human activity negatively impacting the eagle's reproductive success.

Type	Eagle Behavior Toward Human Activity ¹							D-D total ²	Total
	N	W	F	B	?	X			
Small plane	37	2	1	10	-	-	30 (21.3%)	50 (25.1%)	
Horseback rider	20	4	-	2	-	-	15 (10.6%)	26 (13.1%)	
Driver	11	2	1	8	4	-	24 (17.0%)	26 (13.1%)	
Angler	13	2	-	9	-	-	17 (12.1%)	24 (12.1%)	
Helicopter	10	1	-	6	-	-	11 (7.8%)	17 (8.5%)	
Gunshot	9	-	-	4	2	-	13 (9.2%)	15 (7.5%)	
Hiker	4	-	-	7	-	-	9 (6.4%)	11 (5.5%)	
Researcher	2	1	2	3	1	-	4 (2.8%)	9 (4.5%)	
ORV	4	-	-	3	-	-	5 (3.6%)	7 (3.5%)	
Canoe/kayak	4	-	-	1	-	-	4 (2.8%)	5 (2.5%)	
Picnicker	1	1	1	1	-	-	4 (2.8%)	4 (2.0%)	
Camper	-	1	-	1	-	-	2 (1.4%)	2 (1.0%)	
Agency worker	-	-	1	-	-	1	2 (1.4%)	2 (1.0%)	
Tuber	1	-	-	-	-	-	1 (0.7%)	1 (0.5%)	
Total	116	14	6	55	7	1	141 (100%)	199 (100%)	

¹Eagle behavior, N=none, W=watched, F=flushed, B=birds not in area, ?=unknown, X=eagle trapped.

²D-D total=Observations on dawn-to-dusk days.

Food habits

Four foraging attempts (all successful) were observed in the immediate nest area. The female successfully captured two fish (one had fishing line and possibly a hook attached), while the male caught one fish and a bird. Since the breeding attempt ended during incubation (see intervention section), no prey deliveries were observed.

Table 7. Vehicle activity along FS Road 160 entering the Box Bar BA, AZ, 1997.			
Date	Hours monitoring	Vehicles	People
March 1, 1997	0700 hrs. to 1900 hrs.	40	88
March 2, 1997	0830 hrs. to 1800 hrs.	50	113
March 14, 1997	1520 hrs. to 1820 hrs.	8	16
March 15, 1997	0800 hrs. to 1830 hrs.	48	122
March 16, 1997	0830 hrs. to 1800 hrs.	72	150
5 days	44.5 hours monitoring	218 vehicles	489 people

Management activities

The USFS, Cave Creek Ranger District, enlarged the closure around the nest area to the north.

We attempted to capture the adult female after she swallowed fishing line and possibly a hook (see intervention section). Because our attempts to catch the female failed, we removed the two eggs and took them to The Phoenix Zoo. One egg was viable and hatched successfully. The eaglet was raised to four weeks old and fostered into the San Carlos nest.

Nestwatchers were extremely active in educating and managing people at the Box Bar BA. They contacted people along FS Road 160 prior to entering the nest area and along the river. They also educated the local horseback tours and numerous visitors from the local Rio Verde community.

Due to heavy recreation at the site, two teams of nestwatchers were used at Box Bar to monitor the site daily.

We enlisted the support of the Rio Verde Ranch to allow nestwatchers to camp and monitor the eagles from their property.

Fort McDowell Breeding Area

Observation period

Observation dates	February 7 to May 17
Dawn-to-dusk days/hours	36 days/497 hours
Total monitoring days/hours	85 days/845 hours

Eagle identification

Male	Blue VID band left leg - USFWS band right, near-adult plumage.
Female	Unbanded eagle in adult plumage.

Breeding activity

Nest	Nest #16
Begin incubation	January 7 to February 3
Hatched	February 26
Young	2
Fledged	1
Fledge date	May 17

One eaglet disappeared from the Ft. McDowell nest on April 17. The prior evening, two eaglets were observed in the nest near dusk. But when observation began the morning of the 17th, one eaglet was gone. We searched the ground in the nest area, but there were no signs of the bird (feathers, body parts, etc.). On the 18th, we climbed into the eagle nest and a nearby great horned owl nest to look for the eaglet. Great horned owls have been responsible for the death of Arizona eaglets in the past (Hunt et al. 1992, Beatty and Driscoll 1994). However, there was no evidence of the eaglet in either nest.

Following our unsuccessful search for the missing eaglet on the ground, in nest #16, and a nearby great horned owl nest, we concluded that the eaglet most likely fell from the nest into the river. The tree holding nest #16 is about 8 m (25 ft) from the river's edge. The eaglet could have easily fallen, landed in the water, and been washed downstream. We also speculated that the fallen eaglet was retrieved by a nocturnal predator/scavenger and removed from the area. Yet, in the past, whether predated by a bird or canine, we have always found some sign of the eaglet very near the nest. In this instance, not even a feather was found.

Human activity

The Fort McDowell BA received a diverse (18 activity types) and high amount (n=722) of human activity (Table 8). Small planes (n=433) made up 60 percent of all activity recorded. Additionally, gunshots (n=88), drivers (n=84), helicopters (n=59), and anglers (n=21) contributed the greatest amount of activity.

Table 8. Observed human activity and bald eagle behavior, Ft. McDowell BA, AZ, 1997.										
Type	Eagle Behavior Toward Human Activity ¹								D-D total ²	Total
	N	W	R	F	L	B	X	?		
Small planes	311	117	2	1	-	-	-	2	291 (56.6%)	433 (60.0%)
Gunshots	57	27	1	-	2	-	1	-	74 (14.4%)	88 (12.2%)
Drivers	30	33	-	14	3	1	2	1	75 (14.6%)	84 (11.6%)
Helicopters	30	29	-	-	-	-	-	-	30 (5.8%)	59 (8.2%)
Anglers	4	7	-	9	1	-	-	-	19 (3.7%)	21 (2.9%)
ORVs	6	4	-	1	-	-	-	-	9 (1.8%)	11 (1.5%)
Agency workers	-	-	-	5	-	-	-	-	1 (0.2%)	5 (0.7%)
Jets	2	2	-	-	-	-	-	-	2 (0.4%)	4 (0.6%)
Explosions	2	2	-	-	-	-	-	-	3 (0.6%)	4 (0.6%)
Shooters	2	-	-	-	1	-	-	-	2 (0.4%)	3 (0.4%)
Hikers	1	1	-	-	-	-	-	-	2 (0.4%)	2 (0.3%)
Picnickers	1	-	-	1	-	-	-	-	1 (0.2%)	2 (0.3%)
Sirens	1	-	-	-	-	-	-	-	1 (0.2%)	1 (0.1%)
Birder	1	-	-	-	-	-	-	-	1 (0.2%)	1 (0.1%)
Rafter	1	-	-	-	-	-	-	-	1 (0.2%)	1 (0.1%)
Woodcutter	1	-	-	-	-	-	-	-	1 (0.2%)	1 (0.1%)
Cattle	1	-	-	1	-	-	-	-	1 (0.2%)	1 (0.1%)
Horseback rider	1	-	-	-	-	-	-	-	1 (0.2%)	1 (0.1%)
Total	451	222	3	32	7	1	3	3	514 (100%)	722 (100%)

¹Eagle behavior, N=none, W=watched, L=left area, B=birds not in area.

²D-D total=Observations on dawn-to-dusk days.

Eagles behaved with a significant response (restless, flushed, left area) to six percent (n=42) of all recorded activities. Over half (n=27, 64%) of all significant responses were attributed to drivers (n=17) and anglers (n=10). All drivers and anglers approaching within 100 m (300 ft) of the nest caused the eagles to respond. Although aircraft (small planes, helicopters, and jets) represented an overwhelming amount of the total activity (n=496, 68%), eagles only responded significantly three times.

To help alleviate the breeding eagles from the pressure of recreation, nestwatchers contacted people just prior to entering the nest area. Since no closure restricts entry, nestwatchers informed people of the eagles and good places to recreate without disturbing the birds. Over 150 groups of people were contacted. Although nestwatchers commented that most people were agreeable, some ignored their suggestions. These instances often resulted in a significant response by the eagles.

Eighty-eight recreational shooting events (1584 individual gunshots) were recorded. Partially due to the shooting data recorded in 1996 (Beatty et al. 1997) at the Box Bar BA (only 4.5 km/3 miles upriver), recreational shooting along the lower Verde River was restricted on land managed by the USFS. Gunshots recorded at Fort McDowell were surprising due to the fact that shooting is also restricted on Tribal Land. However, the gunfire at Fort McDowell may have been related to the new restrictions on USFS land, which caused people to seek an alternative location.

One particular shooting event illustrates the negligent behavior of some people and the need for stricter shooting regulations where people congregate. Early one evening, three men began shooting into the river about 30 m (100 ft) downriver of the nestwatcher's camp. Because trees and brush separated the two groups from seeing each other, the nestwatchers made themselves known by saying "Hey!" The men responded by firing in the direction of the nestwatcher's camp. After saying "Hey!" one more time, the group of men fired again in the direction of the nestwatcher's camp. For their own safety, the nestwatchers packed up and left the area.

Food habits

A total of 133 prey deliveries to the nest was recorded (Table 9). The male delivered 51.1 percent (n=68) and the female 48.9 percent (n=65) of the food. Fish represented the prey type most often delivered to the nest (n=111, 83.5%), but birds, mammals, and unknowns were also observed. Suckers (n=33), carp (n=4), channel catfish (n=4), largemouth bass (n=3) and American coots (n=1) were prey identified in the nest (Table 10). No foraging attempts were witnessed.

Sex	Prey types				Total
	Fish	Birds	Mammals	Unknown	
Male	53	4	1	10	68 (51.1%)
Female	58	0	2	5	65 (48.9%)
Total	111 (83.5%)	4 (3.0%)	3 (2.3%)	15 (11.3%)	133 (100%)

Table 10. Observed prey items delivered to the nest by bald eagles, Ft. McDowell BA, AZ, 1997.										
Sex	Prey items ¹									
	Fish					Birds		Mammals	Unknowns	Total
	S	CP	CC	LB	UF	AC	UB	UM	Unknowns	
Male	15	1	2	2	33	1	3	1	10	68 (51.1%)
Female	18	3	2	1	34	-	-	2	5	65 (48.9%)
Total	33	4	4	3	38	1	3	3	15	133 (100%)

¹Prey items, S=suckers, CP=carp, CC=channel catfish, LB=largemouth bass, UF=unknown fish, AC=American coot, UB=unknown birds, UM=unknown mammals.

Horseshoe Breeding Area

Observation period

Observation dates	February 7 to June 1
Dawn-to-dusk days/hours	39 days/468 hours
Total monitoring days/hours	80 days/704 hours

Eagle identification

Male	Unbanded eagle in adult plumage.
Female	USFWS band right leg, adult plumage.

Breeding activity

Nest	Nest #11
Begin incubation	January 30 to February 3
Hatched	March 10 to 11
Young	2
Fledged	2
Fledge date	May 26 to 30

Human activity

A total of 905 human activities was recorded at the Horseshoe BA (Table 11). Drivers on FS Road 269 represented 54 percent (n=489) of all activity recorded. Small planes (n=180), ORVs (n=118), canoe/kayaks (n=57), helicopters (n=23), and military jets (n=22) represented 44.1 percent of all activity. The remaining eight activity types comprised 1.6 percent of all activity.

Although there were high amounts of human activity recorded, few people approached the immediate nest area and caused the eagles to significantly respond. Drivers heading to Sheep Bridge along FS Road 269 were over 500 m (1600 ft) from the nest and only caused the eagles to watch (9.2% of the time). ORVs also drove along FS Road 269, and while they did not elicit a significant response, eagles watched them more often than vehicles (50% of the time). Javelina hunters along Tangle Creek caused the eagles to flush twice during the breeding season. Eagles remained off the nest for 13 and 20 minutes respectively before returning to incubate.

Food habits

A total of 55 prey deliveries to the nest was observed (Table 12). The male delivered 30 prey items (54.5%), while the female brought 20 items to the nest (36.4%). Fish represented the most common prey type (61.8%), but eagles also brought a bird (n=1), snake (n=1), and a small mammal (n=1) to the nest. No prey items were identified to species.

Only one foraging attempt near the Tangle Creek/Verde River confluence was observed; however eagles were observed arriving from the south 27 times when delivering prey to the nest. Horseshoe Lake is approximately 6 kms (4 miles) south of the nest and is a known foraging location (Hunt et al. 1992).

Table 11. Observed human activity and bald eagle behavior, Horseshoe BA, AZ 1997.								
Type	Eagle Behavior Toward Human Activity ¹						D-D total ²	Total
	N	W	R	F	U			
Driver	418	45	-	-	26	422 (57.9%)	489 (54.0%)	
Small plane	141	27	-	-	12	134 (18.4%)	180 (19.9%)	
ORV	49	59	-	-	10	111 (15.2%)	118 (13.0%)	
Canoe/Kayak	57	-	-	-	-	39 (5.3%)	57 (6.3%)	
Helicopter	12	1	-	-	10	10 (1.4%)	23 (2.5%)	
Jet (military)	2	5	1	-	14	3 (0.4%)	22 (2.4%)	
Rafter	4	-	-	-	-	3 (0.4%)	4 (0.4%)	
Hiker	4	-	-	-	-	2 (0.3%)	4 (0.4%)	
Camper	2	-	-	-	-	2 (0.3%)	2 (0.2%)	
Hunter	-	-	-	2	-	2 (0.3%)	2 (0.2%)	
Angler	-	-	-	-	1	1 (0.1%)	1 (0.1%)	
Researcher	-	1	-	-	-	0	1 (0.1%)	
Sonic boom	-	-	-	-	1	0	1 (0.1%)	
Agency worker	-	-	-	1	-	0	1 (0.1%)	
Total	689	138	1	3	74	729 (100%)	905 (100%)	

¹Eagle behavior, N=none, W=watched, B=bird not in area, ?=unknown.

²D-D total=Observations on dawn-to-dusk days.

Table 12. Observed prey types delivered to the nest by bald eagles, Horseshoe BA, AZ, 1997.						
Sex	Prey types					Total
	Fish	Birds	Mammal	Reptile	Unknown	
Male	20	1	1	-	8	8 (66.6%)
Female	10	-	-	1	9	2 (16.7%)
Unknown	4	-	-	-	1	2 (16.7%)
Total	34 (61.8%)	1 (1.8%)	1 (1.8%)	1 (1.8%)	18 (32.7%)	12 (100%)

Ladders Breeding Area

Observation period

Observation dates	February 7 to April 5
Dawn-to-dusk days/hours	18 days/216 hours
Total monitoring days/hours	41 days/345 hours

Eagle identification

Male	Unbanded eagle in adult plumage.
Female	Unbanded eagle in adult plumage.

Breeding activity

Nest	Nest #3
Begin incubation	February 17
Hatched	March 24
Young	2
Fledged	Eaglets died between April 1 and 4
Fledge date	N/A

The eaglets died during the nestwatcher's days off, between April 1 and 4. The breeding attempt progressed normally through incubation, hatching, and the early nestling stage. Food was delivered to the nest, and the eaglets were observed eating (200 minutes of feeding).

Eaglets have died at the Ladders BA due to a variety of causes. Great horned owls have predated upon nestlings (Hunt et al. 1992), and an intruder eagle contributed to the death of two eaglets (Beatty and Driscoll 1994). Blood sucking ectoparasites (Mexican chicken bugs) also have been implicated in causing the death of eaglets, especially when nest #3 has been used (Hunt et al. 1992, Beatty and Driscoll 1994). In this instance, there were no bugs in the nest, and both eaglets had no overt signs of injury.

We have difficulty explaining the cause of the two eaglets' deaths. A rainstorm between March 31 and April 4 possibly made it difficult for the adult eagles to capture fish in a murky and turbid river. As a result, there may have been no prey deliveries to the nest, causing the eaglets to starve. Although this is plausible, no other breeding attempts upriver or downriver of the Ladders BA suffered the same consequences. Unfortunately, the eaglets died during the nestwatcher's days off, and the necropsy's results were inconclusive due to the carcasses advanced state of decomposition.

Human activity

A total of 168 human activities were recorded (Table 13). Watercraft (rafts, canoes, kayaks) (n=79) and aircraft (small planes, helicopters) (n=81) comprised 95.3 percent all activity. Within the boating parties, there were 215 individual boats that traveled past the nest. The remaining six activity types comprised 4.8 percent of all recorded activity.

Only two human activities caused the eagles to respond significantly. During the first day of incubation, a helicopter landed across from the nest on the canyon's rim. The incubating female

flushed when the helicopter approached within 50 m (150 ft) of the nest. The eagles also reacted strongly when we climbed into the nest to retrieve the dead eaglets.

The eagles were not recorded responding significantly to boating activity. The closure's boundary is well signed, but 19 groups of boats stopped within the closure (24% of all groups recorded). Twelve groups stopped upriver and downriver of the nest, while seven groups stopped right at the nest. The eagles watched the boaters on four occasions.

Table 13. Observed human activity and bald eagle behavior, Ladders BA, AZ, 1997.						
Type	Eagle Behavior Toward Human Activity ¹					
	N	W	F	B	D-D total ²	Total
Watercraft	72	4	-	3	57 (46.0%)	79 (47.0%)
Small plane	64	1	-	8	55 (44.4%)	73 (43.5%)
Helicopter	5	2	1	-	6 (4.8%)	8 (4.8%)
Agency worker	-	1	1	-	1 (0.8%)	2 (1.2%)
Gunshot	2	-	-	-	2 (1.6%)	2 (1.2%)
Hunter	-	-	-	1	1 (0.8%)	1 (0.6%)
Hiker	1	-	-	-	1 (0.8%)	1 (0.6%)
Researcher	-	1	-	-	1 (0.8%)	1 (0.6%)
Camper	1	-	-	-	0	1 (0.6%)
Total	145	9	2	12	124 (100%)	168 (100%)

¹Eagle behavior, N=none, W=watched, R=restless, F=flushed, B=bird not in area.

²D-D total=Observations on dawn-to-dusk days.

Food habits

Five prey deliveries to the nest were observed prior to the nest failing. Three prey items were fish, and the other two were unidentified. The male brought all five items to the nest. When retrieving the eaglets, a dead rabbit was found in the nest. No foraging attempts were witnessed.

Management activities

A USFS closure surrounded the nest area on the Prescott and Coconino National Forest.

Luna Breeding Area

Observation period

Observation dates	March 22 to May 18
Dawn-to-dusk days/hours	20 days/296 hours
Total monitoring days/hours	51 days/395 hours

Eagle identification

Male	Black VID band left leg - USFWS band right leg, adult plumage.
Female	Black VID band left leg - USFWS band right leg, adult plumage.

Breeding activity

Nest	Nest #1
Begin incubation	<February 5
Hatched	<March 17
Young	3
Fledged	3
Fledge date	May 22 to 26, May 26 to 29, May 29 to June 25

We were able to document the slow development of the youngest and smallest eaglet. On April 8, we entered the nest because an eaglet had fishing line in its mouth. Since we had to climb into the nest, we banded the eaglets. The oldest eaglets were just large enough to band (about four to five weeks old), but the youngest was half the size of its siblings and too small to band. We returned two weeks later, and although the eaglet was big enough to band, it was still about three weeks behind the development of its siblings. The larger two eaglets were covered in dark black and brown feathers, while the smallest still had its gray wooly down. The bird's development continued to fall behind its siblings until the larger birds fledged. With its siblings out of the nest, it was the first to eat when prey arrived. Eventually, it fledged successfully, almost a month after its siblings.

Human activity

Due to the constant presence of human activity at Luna Lake, we could not record all activities and the eagle's associated behavior. It was difficult, with sometimes over 10 human activities occurring at once, to follow each activity throughout the day. Categories for the bird's behavior such as "none" or "watched" were not usable. The eagles were "watching" all the time, and at such a small lake, we could not determine those activities that the eagles did and did not watch. Instead, we recorded only those activities which an eagle responded to significantly (restless, flushed, left area).

There were only five activities where the eagles were seen responding significantly to human activity (Table 14). Four responses were due to AGFD and USFS activities. Twice, eagles flushed when we climbed the nest to band the eaglets and remove fishing line from the nest. USFS personnel working on a water valve along the north shoreline also caused the eagles to flush and leave the area. Eagles were also "restless" due to a gunshot.

Table 14. Observed human activity and bald eagle behavior, Luna BA, AZ, 1997.					
Type	Eagle Behavior Toward Human Activity ¹				
	R	F	L	D-D total ²	Total
AGFD workers	-	2	-	0	2 (50.0%)
USFS workers	-	1	1	0	1 (25.0%)
Gunshot	1	-	-	0	1 (25.0%)
Total	1	3	1	0	4 (100%)

¹Eagle behavior, R=restless, F=flushed, L=left area.

²D-D total=Observations on dawn-to-dusk days.

Food habits

The male attempted 30 of the 31 foraging attempts observed at Luna Lake (Table 15). Eagles tried to catch 26 American coots (successful 13 times). There were only five foraging attempts for fish, mammals, or unknowns.

The 31 foraging attempts observed in 1997 was considerably less than the 93 and 125 attempts observed in 1994 and 1995, respectively (Beatty et al. 1995a, 1995b). Foraging attempts for fish were rarely observed in 1997. In 1994 and 1995, there was an average of 45 foraging attempts for fish per year, where only three were seen in 1997.

We believe the eagles were traveling elsewhere to capture food. In May, eagles were commonly away from the nest area for nearly the entire day. They were observed leaving to the west and returning from the north and west. Although unconfirmed, Nelson Reservoir (about 20 km to the northwest) could be a foraging location.

Table 15. Observed foraging events and success by bald eagles, Luna BA, AZ, 1997.										
Sex	Prey types									
	Birds		Fish		Mammals		Unknown		Total	
	E ¹	S-U ²	E	S-U	E	S-U	E	S-U	E	S-U
Male	25	12-13	3	3-0	1	1-0	1	1-0	30	17-13
Female	1	1-0	-	-	-	-	-	-	1	1-0
Total	26	13-13	3	3-0	1	1-0	1	1-0	31	18-13

¹E= A single foraging event for a food item, not the amount of strikes to capture an item.

²S-U=Successful - unsuccessful captures of prey.

Table 16. Observed prey types delivered to the nest by bald eagles, Luna BA, AZ, 1997.					
Sex	Prey types				
	Birds	Fish	Mammals	Unknown	Total
Male	9	5	1	2	17 (85.0%)
Female	2	1	-	-	3 (15.0%)
Total	11 (55.0%)	6 (30.0%)	1 (5.0%)	2 (10.0%)	20 (100%)

Unfortunately, the small number of prey deliveries observed could not tell us much about where the eagles were foraging (away from Luna Lake) and what they were capturing (Table 16). Only 20 prey deliveries were recorded. Eleven birds, six fish, and one mammal were the prey types identified in the nest. Six fish were delivered compared to only three fish that were observed being captured at Luna Lake. Thus, eagles were likely capturing fish at an alternative foraging location away from Luna Lake.

Management activities

Fliers indicating the sensitive nature of nesting eagles and how the public can help the eagles were posted throughout the Luna Lake campground, and given to campground hosts and the Alpine Ranger District. Nestwatchers also gave these fliers to visitors at their observation point.

Signs informing the public that their presence could affect the eagles were posted along a fence separating the campground from the nest area.

Fishing line in the nest and around entangled eagles was monitored. Line was removed from the nest on two occasions.

Nestwatchers were very active in educating Luna Lake visitors. Their observation point was located at the parking lot near the boat ramp so they could inform the public about the eagles.

The USFS, Alpine Ranger District, closed access to Group Site A at the Luna Lake campground until after the eaglets fledged.

Pleasant Breeding Area

Observation period

Observation dates	February 8 to May 23
Dawn-to-dusk days/hours	33 days/427 hours
Total monitoring days/hours	77 days/757 hours

Eagle identification

Male	Blue VID band left leg - USFWS band right leg, adult plumage.
Female	Unbanded eagle in adult plumage.

Breeding activity

Nest	Nest #2
Begin incubation	January 7 to 30
Hatched	February 26 to 28
Young	2
Fledged	2
Fledge date	May 18

Human activity

A total of 487 human activities was recorded at the Lake Pleasant BA (Table 17). Watercraft (boats, agency boats, and jet skis) and aircraft (small planes, helicopters, military jets, and sonic booms) comprised 99 percent (n=482) of all recorded activities. Terrestrial activities (ORVs, hikers, and agency workers) represented only 1 percent (n=5) of all activities.

There were 10 activities that caused the eagles to significantly respond. Boats caused eagles to flush on five occasions and leave the area once. Also, a jet-ski caused an eagle to be restless. Just prior to two flushes, eagles were perched at the very west end of the nest cliff only a few feet above the water's surface. A helicopter shuttling people to and from a location about 1 km (3300 ft) east of the nest caused the eagle to leave the area after its fourth pass. Additionally, a sonic boom made an eagle restless.

Although only a "watched" response was recorded, it is important to note that boating activity caused eagles to alter their feeding behavior. There were 11 instances where a boat passing in front of the nest caused an adult eagle to stop feeding and watch. There were an additional 11 times when a boat passed by a feeding eagle and the bird did not respond.

We documented the number of watercraft (boats and jet-skis) that approached the southern boundary and their compliance to the buoys (Table 18). A total of 3928 boats (n=3506) and jet-skis (n=422) were recorded approaching the closure's boundary. Nearly 12 percent of all watercraft entered the closure (418 boats, 64 jet-skis). Although most people were interested in the eagles and apologetic when contacted, there were a few that were not so kind. One person hollered, "I wish someone would kill those "explicative" eagles."

Watercraft failed to comply with the closure's southern boundary in 1997 twice as often as the

average non-compliance from 1994 to 1996. During the first three years of monitoring, non-compliance averaged 5 percent per year (Beatty et al. 1995a, 1995b, 1997), whereas, in 1997 it increased to 12 percent. Since 1994, signs have been posted at the boat ramps, and brochures have been available at the Lake Pleasant office and the park's main entrance. Additionally, television news segments have been broadcast every year since 1994. Our belief was that most people recreating at Pleasant are repeat visitors. We hoped that with persistent education, compliance would increase. But instead, it seems little learning has occurred and people refuse to pay attention to the buoys.

Table 17. Observed human activity and bald eagle behavior, Pleasant BA, AZ, 1997.									
Type	Eagle Behavior Toward Human Activity ¹							D-D total ²	Total
	N	W	R	F	L	?			
Boat	61	138	-	3	-	40	181 (48.5%)	241 (49.5%)	
Small plane	38	37	-	-	-	16	72 (19.0%)	92 (18.9%)	
Agency boats	12	62	-	2	1	11	73 (19.6%)	88 (18.1%)	
Jet-ski	10	15	1	-	-	5	24 (6.4%)	31 (6.4%)	
Helicopter	7	9	-	-	1	-	14 (3.7%)	17 (3.5%)	
Jet (military)	2	9	-	-	-	1	7 (1.9%)	12 (2.4%)	
ORV	1	2	-	-	-	-	2 (0.5%)	3 (0.6%)	
Hiker	1	-	-	-	-	-	0	1 (0.2%)	
Sonic boom	-	-	1	-	-	-	1 (0.3%)	1 (0.2%)	
Agency worker	-	-	-	1	-	-	0	1 (0.2%)	
Total	132	272	2	6	2	73	373 (100%)	487 (100%)	

¹Eagle behavior, N=none, W=watched, R=restless, F=flushed, L=left area, ?=unknown.

²D-D total=Observations on dawn-to-dusk days.

Food habits

The eagles were successful in 10 of 27 observed foraging attempts (Table 19). The male tried to forage 21 times, while the female attempted 6 prey captures. The eagles were seen trying to capture fish (n=11) and birds (American coots, grebes, ducks, and a loon) (n=8). One forage occurred upriver of the nest at kilometer 64.0, but the remaining attempts were observed in the immediate nest area between river kilometers 67.7 and 69.1. No successful attempts for birds were recorded. Eagles were observed returning from both the main body of the lake (downriver) and further up the Agua Fria River (upriver) with prey.

Date	BAC ¹	BIC ¹	JAC ¹	JIC ¹	Total
February 9 to 16	298	36	21	2	357
Feb. 21 to Mar. 2	345	57	8	5	415
March 7 to 16	653	126	53	9	841
March 21 to 30	714	85	92	16	907
April 4 to 13	225	16	42	1	284
April 18 to 27	312	37	35	8	392
May 2 to 11	541	46	107	18	712
May 16 to 20	?	15	?	5	20
Total	3088	418	358	64	3928

¹BAC=boats at closure, BIC=boats inside closure, JAC=jet-skis at closure, JIC=jet-skis inside closure.
 ?= Nestwatchers did monitor from buoy line/unable to see approaching boats.

The eagles were observed arriving at the nest with 74 prey items (Table 20). The male arrived with 51 items, the female 22. The sex of one adult delivering prey could not be determined. Fish were brought to the nest 49 times (66.2%), but birds (n=5), mammals (n=4), and unknowns (n=16) also were observed. Prey identified in the nest were largemouth bass (n=8), channel catfish (n=2), carp (n=2), grebes (n=2), American coots (n=1), and a rabbit (n=1) (Table 21).

Sex	Prey types							
	Fish		Birds		Unknown		Total	
	E ¹	S-U ²	E	S-U	E	S-U	E	S-U
Male	8	6-2	6	0-6	7	2-5	21	8-13
Female	3	2-1	2	0-2	1	0-1	6	2-4
Total	11	8-3	8	0-8	8	2-6	27	10-17

¹E=A single foraging event for a food item, not the amount of strikes to capture an item.
²S-U=Successful - unsuccessful captures of prey.

Table 20. Observed prey types delivered to the nest by bald eagles, Pleasant BA, AZ, 1997.					
Sex	Prey types				
	Fish	Birds	Mammals	Unknown	Total
Male	31	5	4	11	51 (68.9%)
Female	18	0	0	4	22 (29.7%)
Unknown	0	0	0	1	1 (1.4%)
Total	49 (66.2%)	5 (6.8%)	4 (5.4%)	16 (21.6%)	74 (100%)

Table 21. Observed prey items delivered to the nest by bald eagles, Pleasant BA, AZ, 1997.											
Sex	Prey items ¹										
	Fish				Birds			Mammals		Unknowns	Total
	LB	CC	CP	UF	GB	CT	UB	RB	UM	Unknowns	
Male	4	2	-	25	2	1	2	3	1	11	51 (68.9%)
Female	4	-	1	13	-	-	-	-	-	4	22 (29.7%)
Unknown	-	-	-	-	-	-	-	-	-	1	1 (1.4%)
Total	8	2	1	38	2	1	2	3	1	16	74 (100%)

¹Prey items, LB=largemouth bass, CC=channel catfish, CP=carp, UF=unknown fish, GB=grebe sp., CT=American coot, UB=unknown birds, RB=rabbit sp., UM=unknown mammals.

Management activities

Closure signs developed by Nongame Branch and purchased with Heritage Funds were placed at boat ramps around the lake and at roads entering the nest area.

Maricopa County Parks and Recreation marked the closure with buoys at the northern and southern boundaries.

Arizona bald eagle management fliers were printed and distributed to Maricopa Parks and Recreation at Lake Pleasant for distribution to people entering the park.

Nestwatchers were placed at the closure's southern buoy boundary on weekends and every other Friday to educate recreationists about eagles and contact violators entering the closure's boundary.

Logistical support from the Bureau of Reclamation and coordination among Maricopa County Parks and Recreation at Lake Pleasant, Maricopa County Sheriff's Office, AGFD, and the nestwatchers helped improve the closure's effectiveness.

A television news segment was broadcast to help educate the public about the eagles at Lake Pleasant and the closure at the Agua Fria Arm.

76 Breeding Area

Observation period

Observation dates February 8 to May 11
 Dawn-to-dusk days/hours 36 days/421 hours
 Total monitoring days/hours 64 days/647 hours

Eagle identification

Male USFWS band on left leg, adult plumage.
 Female Unbanded eagle in adult plumage.

Breeding activity

Nest Nest #3
 Begin incubation January 28 to February 7
 Hatched March 8
 Young 2
 Fledged 2
 Fledge date May 14 to June 9

Human activity

There were few human activities recorded at the 76 BA (Table 22). Military jets were the most common activity (n=15). However, eagles only watched the jets on four occasions. The only significant response recorded was when the adult eagles flushed while we banded the nestlings.

Table 22. Observed human activity and bald eagle behavior, 76 BA, AZ, 1997.					
Type	Eagle Behavior Toward Human Activity ¹				
	N	W	F	D-D total ²	Total
Jet (military)	11	4	-	5 (45.5%)	15 (62.5%)
Small plane	2	1	-	2 (18.2%)	3 (12.5%)
Horseback rider	3	-	-	2 (18.2%)	3 (12.5%)
Hiker	1	-	-	1 (9.1%)	1 (4.2%)
Agency workers	-	-	1	1 (9.1%)	1 (4.2%)
Helicopter	-	1	-	0	1 (4.2%)
Total	17	6	1	11 (100%)	24 (100%)

¹Eagle behavior, N=none, W=watched, F=flushed.

²D-D total=Observations on dawn-to-dusk days.

Food habits

Three foraging attempts were observed in the nest area. The male retrieved unidentified carrion from a gravel bar just upriver of the nest at kilometer 55.7. The other two forages were unsuccessful attempts for fish downriver of the nest at kilometer 54.3.

The eagles were recorded arriving at the nest 29 times with prey (Table 23). The male delivered 69 percent (n=20) of all the observed prey. Fish comprised 41.4 percent of the prey types, followed by birds (3.4%), mammals (3.4%), and unknowns (51.7%). No prey was identified to species.

Table 23. Observed prey types delivered to the nest by bald eagles, 76 BA, AZ, 1997.					
Sex	Prey types				
	Fish	Birds	Mammals	Unknown	Total
Male	6	1	1	12	20 (69.0%)
Female	6	-	-	3	9 (31.0%)
Total	12 (44.1%)	1 (3.4%)	1 (3.4%)	15 (51.7%)	29 (100%)

Management activities

A USFS closure surrounded the nest area on the Tonto National Forest.

Sycamore Breeding Area

Observation period

Observation dates	February 8 to March 16
Dawn-to-dusk days/hours	15 days/177 hours
Total monitoring days/hours	29 days/279 hours

Eagle identification

Male	Blue VID band left leg - USFWS band right, adult plumage.
Female	Blue VID band left leg - USFWS band right, adult plumage.

Breeding activity

Nest	Nest #1
Begin incubation	<January 3
Hatched	0
Young	0
Fledged	0
Fledge date	N/A

This was the first breeding season and attempt by the Sycamore eagles. In the middle of March, the eagles began to spend longer periods of time off the eggs. It became clear that the birds were beginning to abandon incubation duties, and the eggs were not going to hatch. On March 16, at a minimum of 44 days into incubation, the single egg was removed from the nest. A bucket truck, provided by SRP, hoisted a biologist to the nest due to its precarious position on top of a dead branch.

Human activity

Similar to other BAs along the lower Verde River (Bartlett, Box Bar, and Fort McDowell) there was a high amount of human activity (n=398) surrounding the Sycamore nest area (Table 24). Although aircraft (small planes, helicopters, and sonic booms) comprised 61.3 percent of all activity recorded, there were 14 other activity types representing the remaining 38.7 percent. The diverse amount of human activity proved that this is a popular recreation area, easily accessible to the public. Photographers, (illegal) woodcutters, commercial rafters, horseback riders, anglers, gunshots, hikers, birders, picnickers, and ranchers were examples of the diversity of activity.

Horseback tours traveling below the nest were stopped early in the breeding season. Because this was the first time the Sycamore BA was monitored, we were unfamiliar with the types of human activity in the nest area. Very quickly, we discovered that the nearby Cowboy Adventures were guiding tours through the nest area. Sometimes they traveled underneath the nest causing clouds of dirt to rise toward the incubating eagles. Guides were observed pointing the eagles out to their patrons, and the voices of the riders could be heard from the observation point. After talking with Fort McDowell, the tours were swiftly diverted away from the immediate nest area.

Table 24. Observed human activity and bald eagle behavior, Sycamore BA, AZ, 1997.									
Type	Eagle Behavior Toward Human Activity ¹							D-D total ²	Total
	N	W	R	F	L	?			
Small plane	126	62	6	-	1	12	148 (53.8%)	207 (52.0%)	
Vehicle	24	22	-	2	6	13	42 (15.3%)	67 (16.8%)	
Helicopter	8	22	1	-	-	4	18 (6.5%)	35 (8.8%)	
ORV	11	6	1	-	-	2	12 (4.4%)	20 (5.0%)	
Rafter	5	4	1	-	2	2	8 (2.9%)	14 (3.5%)	
Horseback rider	10	3	-	-	-	1	14 (5.1%)	14 (3.5%)	
Angler	2	5	-	-	1	1	8 (2.9%)	9 (2.3%)	
Picnicker	1	4	-	-	-	3	8 (2.9%)	8 (2.0%)	
Canoe	5	-	-	-	-	-	3 (1.1%)	5 (1.3%)	
Loud music	2	1	-	-	-	1	2 (0.7%)	4 (1.0%)	
Hiker	-	1	-	-	1	1	2 (0.7%)	3 (0.8%)	
Gunshot	2	1	-	-	-	-	3 (1.1%)	3 (0.8%)	
Rancher	-	2	-	-	-	-	1 (0.4%)	2 (0.5%)	
Sonic Boom	-	-	2	-	-	-	1 (0.4%)	2 (0.5%)	
Birder	1	1	-	-	-	-	2 (0.7%)	2 (0.5%)	
Photographer	1	-	-	1	-	-	2 (0.7%)	2 (0.5%)	
Woodcutter	-	-	-	1	-	-	1 (0.4%)	1 (0.3%)	
Total	198	134	11	4	11	40	275 (100%)	398 (100%)	

¹Eagle behavior, N=none, W=watched, R=restless, F=flushed, L=left area, ?=unknown.

²D-D total=Observations on dawn-to-dusk days.

An open, "beach" portion of the river, just over 1 km (3300 ft) north of the nest, was where most activity was concentrated. The area attracted a variety of recreationists, such as anglers, drivers, picnickers, and rafting tours. Commercial rafters (n=20) were observed staging their boats in this area. Preparation, launching, and floating through the area took about three hours (normally between 1000 hrs and 1300 hrs). While the eagles were never observed flushing, they did leave the area twice in response to the rafting activity, and were likely deterred from hunting or foraging when rafting was present.

Eagles were observed significantly responding (restless, flushed, left area) to 26 activities. Vehicles caused the most disturbance to the eagles (n=8). Most vehicles seemed to be either heading to the "beach area" or just exploring. A myriad of dirt roads, two-track roads, and trails exist in the floodplain near the nest. As a result, eagles were flushed from the nest on two occasions and also from other loafing or hunting perches. There was no main access point for nestwatchers to contact all vehicles entering the area. Vehicles were difficult to see due to high vegetation and would suddenly be noticed in the immediate nest area. However, when the drivers of vehicles were contacted, nestwatchers described their behavior as less than supportive. Profanities were yelled often, while others refused to stop or even roll down their windows when nestwatchers attempted to inform them about the eagles.

Food habits

A total of eight foraging attempts were witnessed (Table 25). The eagles attempted to pirate fish from osprey (n=2) and great blue herons (n=4). Six foraging attempts (including pirate attempts) occurred just upriver from the nest, between river kilometers 10.5 and 10.7.

Table 25. Observed foraging events and success by bald eagles, Sycamore BA, AZ, 1997.								
Sex	Prey types							
	Fish		Pirated Fish		Unknown		Total	
	E ¹	S-U ²	E	S-U	E	S-U	E	S-U
Female	0	0-0	5	5-0	1	1-0	6	6-0
Male	1	1-0	1	0-1	0	0-0	2	1-1
Total	1	1-0	6	5-1	1	1-0	8	7-1

¹E=A single foraging event for a food item, not the amount of strikes to capture an item.

²S-U=Successful - unsuccessful captures of prey.

Management activities

After discovering that horseback tours were being led underneath the nest, the Fort McDowell Indian Community contacted the operators. The tours were diverted away from the immediate nest area.

Nestwatchers were very active in trying to contact recreationists. They took the initiative to talk to vehicle owners, local Cowboy Adventure tours, and the nearby Pira del Sol recreation area.

Tonto Breeding Area

Observation period

Observation dates	February 8 to May 11
Dawn-to-dusk days/hours	36 days/454 hours
Total monitoring days/hours	70 days/691 hours

Eagle identification

Male	Blue VID band left leg - USFWS band right, adult plumage.
Female	Blue VID band left leg - USFWS band right, adult plumage.

Breeding activity

Nest	Nest #2
Begin incubation	January 9 to February 4
Hatched	February 23
Young	2
Fledged	2
Fledge date	May 6 and May 11

Human activity

There were 138 human activities recorded; 117 (84.8%) occurred on weekends (Table 26). Aircraft (small planes, helicopters, jets, and sonic booms) represented 66.7 percent (n=92) of all activities. ORVs, ranchers, and gunshots comprised the bulk of the remaining activities.

Campground and boat ramp construction at Indian Point and vehicles along FS road 661 were present throughout the season, but were not recorded by nestwatchers. Development of Indian Point campground (2 km/6600 ft away from the nest) occurred on weekdays throughout the season. At its closest, heavy equipment and private vehicles on FS Road 661 were 300 m (1000 ft) away from the nest, but could not be observed by the nestwatchers. While at the nest, the eagles did not appear to be disturbed by the traffic.

Eagles responded significantly to 13 activities. Seven flushes were due to banding and monitoring the location of the fledged eaglets. A rancher removing cattle from underneath the nest also caused eagles to flush. Aircraft caused eagles to be restless four times. A group of four military jets flying over the nest under 100 m (300 ft) in altitude caused an eagle to be restless. The bird raised its wings and flapped almost flushing from the nest.

Food habits

Four foraging attempts by the eagles were observed. Twice, spawning carp were captured 600 m (2000 ft) downriver of the nest. Eagles also tried to pirate fish from osprey on two occasions (one time successful). After an eagle flushed an osprey from a perch and stooped at it several times, the osprey dropped its fish. The eagle caught the fish in mid-air and delivered it to the nest.

A total of 50 prey deliveries was recorded (Table 27). The male delivered 62 percent (n=31) of the prey to the nest. Prey types identified in the nest were fish (n=21), birds (n=6), and mammals (n=2). No species were identified, but prey remains found in the nest indicated that the eagles captured largemouth bass, black crappie, catfish, a duck, and a desert cottontail.

Table 26. Observed human activity and bald eagle behavior, Tonto BA, AZ, 1997.							
Type	Eagle Behavior Toward Human Activity ¹						Total
	N	W	R	F	?	D-D total ²	
Small plane	52	16	2	-	1	68 (58.1%)	71 (51.4%)
Helicopter	12	4	1	-	1	14 (12.0%)	18 (13.0%)
ORV	12	1	-	-	1	12 (10.3%)	14 (10.1%)
Researcher	1	1	-	7	-	2 (1.7%)	9 (6.5%)
Rancher	5	-	-	1	2	7 (6.0%)	8 (5.8%)
Gunshot	6	-	-	-	1	7 (6.0%)	7 (5.1%)
Horseback rider	3	-	-	1	-	2 (1.7%)	4 (2.9%)
Jet (military)	-	1	1	-	-	1 (0.9%)	2 (1.4%)
Dog	1	1	-	-	-	2 (1.7%)	2 (1.4%)
Sonic Boom	-	-	-	-	1	1 (0.9%)	1 (0.7%)
Angler	1	-	-	-	-	1 (0.9%)	1 (0.7%)
Camper	1	-	-	-	0	0	1 (0.7%)
Total	94	24	4	9	7	117 (100%)	138 (100%)

¹Eagle behavior, N=none, W=watched, R=restless, F=flushed, ?=unknown.

²D-D total=Observations on dawn-to-dusk days.

Table 27. Observed prey types delivered to the nest by bald eagles, Tonto BA, AZ, 1997.					
Sex	Prey types				Total
	Fish	Birds	Mammals	Unknown	
Male	13	1	1	16	31 (62.0%)
Female	6	4	-	3	13 (26.0%)
Unknown	2	1	-	3	6 (12.0%)
Total	21 (42.0%)	6 (12.0%)	1 (2.0%)	22 (44.0%)	50 (100%)

Tower Breeding Area

Observation period

Observation dates	February 7 to May 25
Dawn-to-dusk days/hours	36 days/383 hours
Total monitoring days/hours	71 days/616 hours

Eagle identification

Male	Purple VID band left leg - USFWS band right, adult plumage.
Female	Unbanded eagle in adult plumage.

Breeding activity

Nest	Nest #8
Begin incubation	January 7 to 29
Hatched	March 3 to 6
Young	1
Fledged	1
Fledge date	May 27 to June 9

Human activity

A large and diverse number of human activities was recorded at the Tower BA (Table 28). Aircraft (n=283) (small planes, helicopters, and military jets) and railroad activity (n=248) (tourist trains, RR maintenance vehicles, cargo trains, and RR workers) represented 89.4 percent of all recorded human activity. The remaining 63 human activities fell into 14 activity types. Unlike many BAs where 70 to 90 percent of the activity was recorded on weekends, only 58.2 percent of the recorded activity occurred on weekends.

The eagles behaved with a significant response to 16 activities (1 restless, 10 flushed, 5 left area). Railroad traffic caused eagles to respond eight times. Eagles only responded (flushed or left the area) to railroad activity when they were perched on the cliffs below the train tracks. Various other activities, such as canoers, anglers, photographers, cattle, and agency workers, also elicited a significant response from the eagles.

Nestwatchers contacted 28 groups of people throughout the season. Most of these people were classified as "sightseers." People's behavior when informed of the eagles and the closure was categorized as positive (n=18), neutral (n=8), or negative (n=2). Many people drove to the end of the road at the nestwatcher's camp. A nestwatcher was stationed there during weekends to intercept people before they hiked down the river. Anglers walking along the river past closure signs were also a common occurrence.

Table 28. Observed human activity and bald eagle behavior, Tower BA, AZ, 1997.									
Type	Eagle Behavior Toward Human Activity ¹							D-D total ²	Total
	N	W	R	F	L	?			
Small plane	257	1	-	-	-	2	125 (36.1%)	260 (43.8%)	
Tourist train	118	2	-	5	1	-	93 (26.9%)	126 (21.2%)	
RR maintenance vehicle	96	1	-	1	1	-	59 (17.1%)	99 (16.7%)	
Sightseer	26	-	-	-	-	-	21 (6.1%)	26 (4.4%)	
Helicopter	19	-	-	1	-	-	15 (4.3%)	20 (3.4%)	
Cargo train	17	2	-	-	-	-	4 (1.2%)	19 (3.2%)	
Photographer	7	-	1	1	-	-	7 (2.0%)	9 (1.5%)	
Angler	4	1	-	-	2	-	6 (1.7%)	7 (1.2%)	
Canoe	2	2	-	-	1	-	4 (1.2%)	5 (0.8%)	
RR worker	3	1	-	-	-	-	1 (0.3%)	4 (0.7%)	
Agency worker	3	-	-	1	-	-	1 (0.3%)	4 (0.7%)	
Jet	3	-	-	-	-	-	1 (0.3%)	3 (0.5%)	
Gunshot	2	-	-	-	-	-	1 (0.3%)	2 (0.3%)	
Cattle	1	-	-	1	-	-	1 (0.3%)	2 (0.3%)	
ORV	2	-	-	-	-	-	2 (0.6%)	2 (0.3%)	
Tuber	-	1	-	-	-	-	1 (0.3%)	1 (0.2%)	
Construction	1	-	-	-	-	-	1 (0.3%)	1 (0.2%)	
Picnicker	1	-	-	-	-	-	1 (0.3%)	1 (0.2%)	
Camper	1	-	-	-	-	-	1 (0.3%)	1 (0.2%)	
Rafter	-	1	-	-	-	-	1 (0.3%)	1 (0.2%)	
Hiker	1	-	-	-	-	-	0	1 (0.2%)	
Total	564	12	1	10	5	2	346 (100%)	594 (100%)	

¹Eagle behavior, N=none, W=watched, R=restless, F=flushed, L=left area, ?=unknown.

²D-D total=Observations on dawn-to-dusk days.

Food habits

Eagles were recorded foraging 25 times in the nest area between river kilometers 247 and 249 (Table 29). The eagles were successful 20 times. Fish was the primary prey type (n=24). Before foraging, the male spotted prey while flying on 12 occasions (70.6%). Conversely, the female spotted prey from a perch seven times (87.5%) before trying to forage. The difference in methods may be partially due to the female's predominant role of attending the nest. Thus, the female was more opportunistic in capturing prey rather than actively searching for food.

There were 73 prey deliveries recorded throughout the season (Table 30). Fish comprised 94.5 percent (n=69) of the food, while the remaining (n=4) prey types were unknown. The male delivered 74 percent (n=54) of all the prey. Fish identified in the nest were suckers (n=30), carp (n=2), channel catfish (n=2), and rainbow trout (n=10) (Table 31). Other than one catfish, suckers were the only prey type delivered early in the season (until March 25). This is consistent with Arizona eagles' foraging strategy in many places where suckers exist. Eagles forage heavily for suckers once they become easily accessible during spawning (Hunt et al. 1992).

Sex	Prey types							
	Fish			Unknown		Total		
	E ¹	S-U ²	? ³	E	S-U	E	S-U	?
Male	16	12-3	1	1	1-0	17	13-3	1
Female	8	7-1	-	-	-	8	7-1	-
Total	24	19-4	1	1	1-0	25	20-4	1

¹E=A single foraging event for a food item, not the amount of strikes to capture an item.

²S-U=Successful - unsuccessful captures of prey.

³?=Unknown outcome of a foraging event.

Sex	Prey types		
	Fish	Unknown	Total
Male	53	1	54 (74.0%)
Female	16	3	19 (26.0%)
Total	69 (94.5%)	4 (5.5%)	73 (100%)

Table 31. Observed prey items delivered to the nest by bald eagles, Tower BA, AZ, 1997.							
Sex	Prey items ¹						
	Fish					Unknown	Total
	S	C	CC	RT	UF	Unknown	
Male	25	1	1	6	20	1	54 (74.0%)
Female	5	1	1	4	5	3	19 (26.0%)
Total	30	2	2	10	25	4	73 (100%)

¹Prey items, S=suckers, C=carp, CC=channel catfish, RT=rainbow trout, UF=unknown fish.

Management activities

A USFS closure surrounded the nest area on the Coconino National Forest.

The USFS posted signs along the river and gates were locked at access points along the closure's boundary.

During high recreation days, nestwatchers positioned themselves in advantageous locations to intercept recreationists who might enter the closure.

Renowned photographer, Pat Leeson, took pictures of the Tower birds for an upcoming book on bald eagles. It was made clear to Ms. Leeson that she was not going to be allowed close to the nest, and that she would be escorted by nestwatchers. If the nestwatchers believed that the picture taking process was disturbing the eagles, then she would have to leave. This proved to not be a dilemma as Ms. Leeson was more interested in taking pictures which typified the desert environment where eagle's nest. As a result, Ms. Leeson was able to take pictures across the canyon from the nest with little impact to the birds.

Winkelman Breeding Area

Observation period

Observation date	February 8 to 24
Dawn-to-dusk days/hours	6 days/73 hours
Total monitoring days/hours	13 days/117 hours

Eagle identification

Male	Blue VID band left leg - USFWS band right, near-adult plumage.
Female	Blue VID band left leg - USFWS band right, adult plumage.

Breeding activity

Nest	Nest #1
Begin incubation	February 9
Hatched	Failed on February 10
Young	0
Fledged	0
Fledge date	N/A

The bald eagles only incubated for one day before the nest failed. At 0110 hrs on February 10, the eagles were heard vocalizing. Again at 0700 hrs, the eagles were heard vocalizing, but were not observed incubating. The nest was climbed on February 24 and eggshell fragments were found in the nest. It is likely that the egg broke the first night of incubation due to an unknown event.

The eagles were seen on February 11 building on top the remnants of a hawk nest within 2 km (6600 ft) of nest #1. Initially, few large sticks existed, but later in the season, the nest had become more "eagle-sized." The birds were rarely seen over the next ten days. On February 22 they were observed copulating near nest #1. However, the eagles never laid a second clutch.

Human activity

Other than vehicles driving along the San Pedro Road (paralleling the San Pedro River), there were few human activities recorded during the 13 days of observation (Table 32). Nestwatchers tallied all vehicles (n=198) driving along the road, but did not record whether the eagles were present or not during each incident. The most common activities were the local landowner driving to his property (n=4) and railroad activity (n=5).

The eagles were only recorded responding to one activity. A train flushed a perched eagle near the railroad tracks. The eagles never responded (n=1) or were not present (n=3) when the landowner drove within 60 m (200 ft) of the nest and a common perch. The eagle's presence or behavior was not recorded when vehicles traveled along San Pedro Road. Not considering the vehicles along San Pedro Road, 12 of 19 activities occurred without an eagle present. This was due to the eagles failing on the first day of incubation and spending little time in the nest area.

Table 32. Observed human activity and bald eagle behavior, Winkelman BA, AZ, 1997.					
Type	Eagle Behavior Toward Human Activity ¹				
	N ²	W	F	B	Total
Drivers	199	-	-	3 ²	202 (93.1%)
Train	-	1	1	3	5 (2.3%)
Shooter	1	-	-	3	4 (1.8%)
ORV	-	-	-	2	2 (0.9%)
Horseback rider	-	-	-	1	1 (0.5%)
Bicycle	1	-	-	-	1 (0.5%)
Small plane	1	-	-	-	1 (0.5%)
Helicopter	1	-	-	-	1 (0.5%)
Total	203	1	1	12	217 (100%)

¹Eagle behavior, N=none, W=watched, F=flushed, B=birds not in area.

²None=It was not noted whether eagles were present or not during 198 driving incidents.

Food habits

No foraging attempts or prey deliveries were observed due the eagles failing on the first day of incubation and then spending little time in the nest area.

Management activities

We employed the assistance of local land owners, Raymond Garcia Sr., Joe Kerlock, Tony and Lupe Monroy, and Manuel Ochoa. Word of mouth from these gentlemen will hopefully inform, educate, and convey positive attitudes about the eagles to local residents.

Raymond Garcia Sr. was a great benefit, allowing us to camp on his property and monitor the eagles from his ranch.

LITERATURE CITED

- Beatty, G.L. 1992. Arizona Bald Eagle Nestwatch Program Summary Report 1991-1992. Nongame and Endangered Wildlife Program Technical Report, Arizona Game and Fish Department, Phoenix, Arizona.
- Beatty, G.L. and J.T. Driscoll. 1994. 1993 Arizona Bald Eagle Nestwatch Program Summary Report. Nongame and Endangered Wildlife Program Technical Report, Arizona Game and Fish Department, Phoenix, Arizona.
- Beatty, G.L., J.T. Driscoll, and J.G. Koloszar. 1995b. Arizona Bald Eagle Nestwatch Program: 1995 summary report. Nongame and Endangered Wildlife Program Technical Report Number 85. Arizona Game and Fish Department, Phoenix, Arizona.
- Beatty, G.L., J.T. Driscoll, and J.G. Koloszar. 1997. Arizona Bald Eagle Nestwatch Program: 1996 summary report. Nongame and Endangered Wildlife Program Technical Report Number 117. Arizona Game and Fish Department, Phoenix, Arizona.
- Beatty, G. L., J.T. Driscoll and M.C. Siemens. 1995a. Arizona Bald Eagle Nestwatch Program: 1994 Summary Report. Nongame and Endangered Wildlife Program Technical Report, Arizona Game and Fish Department, Phoenix, Arizona.
- Brown D.E. (ed.). 1982. Biotic communities of the American Southwest - United States and Mexico. University of Arizona. Desert Plants 4:1-342.
- Driscoll, J.T., G.L. Beatty, and J.G. Koloszar. 1997. Arizona bald eagle 1997 nest search. Nongame and Endangered Wildlife Program Technical Report Number 127. Arizona Game and Fish Department, Phoenix, Arizona.
- Hunt, W.G., D.E. Driscoll, E.W. Bianchi, and R.E. Jackman. 1992. Ecology of bald eagles in Arizona. Volumes A-F. Report to U.S. Bureau of Reclamation, Contract 6-CS-30-04470. Biosystems Analysis, Inc., Santa Cruz, California.
- McGarigal, K., R.G. Anthony, and F.B. Isaacs. 1991. Interactions of humans and bald eagles on the Columbia River estuary. Wildl. Monogr. 115.
- Merriam, C.H. 1898. Life-zones and crop-zones of the United States. USDA, Division of Biological Survey.

Postupalsky, S. 1974. Raptor reproductive success: some problems with methods, criteria and terminology. *in* F.N. Hammerstrom, B.E. Harrell and R.R. Olendorff, eds. Management of Raptors. Proceedings of the Conference on Raptor Conservation Techniques. Raptor Research Report 2:21-31.

U.S. Fish and Wildlife Service. 1982. Bald eagle recovery plan (southwestern population). U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

U.S. Fish and Wildlife Service. 1995. Endangered and Threatened Species: Bald Eagle Reclassification; Final Rule. Federal Register. Volume 60, No. 133. Department of the Interior, Washington, D.C.