1993 ARIZONA BALD EAGLE NESTWATCH PROGRAM SUMMARY REPORT

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

Technical Report 30
Nongame and Endangered Wildlife Program
Program Chief: Terry B. Johnson
Arizona Game and Fish Department
2221 West Greenway Road
Phoenix, Arizona 85023-4312

June 1994

Recommended citation: Beatty, G.L. and J.T. Driscoll 1994. 1993 Arizona bald eagle nestwatch program summary report. Nongame and Endangered Wildlife Program Technical Report 30. Arizona Game and Fish Department, Phoenix, Arizona.

Funding for this project was provided by: the Arizona Game and Fish Department's Heritage Fund; Arizona's Nongame Wildlife Checkoff; U.S. Bureau of Reclamation; Salt River Project; U.S. Forest Service; U.S. Bureau of Land Management; U.S. Fish and Wildlife Service; and Project W-95-M, Jobs 1 and 4, under the Federal Aid in Wildlife Restoration Act (Pittman-Robertson Act).

TABLE OF CONTENTS

LIST OF TABLES

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 5 others. It is not endangered or threatened in Alaska and does not occur in Hawaii. In addition to protection under the Endangered Species Act, the bald eagle is protected by the Migratory Bird Treaty Act and by 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.

The bald eagle was first documented in Arizona by Coues (1866). A breeding attempt was first recorded at Stoneman Lake, southeast of Flagstaff by Mearns (1890). In the 1930s and 1940s, breeding was observed near Saguaro Lake, Bartlett Dam, and in the Salt River Canyon (Phillips et al. 1964). However, permanent records on bald eagle productivity in Arizona were not kept until 1971, when two eaglets fledged from the Breeding Area (BA) at Blue Point (Saguaro Lake).

Most Arizona BAs are subject to human activities that might affect breeding success. Consequently, as the breeding population has become better known, the demand for progressive management has also 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 breeding areas were discovered, interagency coordination has become all the more important. To provide oversight, the Southwestern Bald Eagle Management Committee (SWBEMC) was formed in 1984. It is a cooperative effort among federal, state, and private groups committed to bald eagle conservation. In 1986, on behalf of the SWBEMC, the USFWS assumed coordination responsibility for the ABENWP and expanded its scope. The coordination lead was passed to the Arizona Game and Fish Department (AGFD) in 1991.

The ABENWP has three principal goals: conservation, data collection, and education. Because many Arizona bald eagles nest in areas subject to high levels of human activity, closures surround many nest areas. Nestwatchers interact with people who enter these closures, educate them about bald eagle ecology, distribute pamphlets, and tactfully direct them out of the area. To help agencies make better management decisions, nestwatchers also collect information on eagle ecology, productivity (Tables 33 and 34) and behavior in response to human activity. Even so, the most direct benefit of the ABENWP is observation of problems at nest sites. Every year, nests fail and/or nestlings are found in precarious situations. Constant monitoring by nestwatchers often makes it possible to rescue birds in life threatening situations.

This report summarizes the annual nestwatch reports and major discoveries at each bald eagle area monitored in 1993. Among the topics discussed are length of observation, timing of major eagle events, human activity in the breeding area, wildlife interactions, food habits, management activities completed by agencies and management recommendations by

nestwatchers and the Nongame Branch.

METHODS

Beginning in late summer and early fall, AGFD advertised through the AOU Ornithological Newsletter, the Raptor Research Foundation's newsletter and annual meeting, and job placement services at colleges and universities nationwide for potential nestwatchers. Public discussions, 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 the state.

After selection of personnel, meetings were held the first week in February to orient and educate nestwatchers. On 4 February 1993, we car-pooled to the Bartlett BA to prepare nestwatchers for the field and to explain data forms. We also addressed protocol for bald eagle "emergencies" such as nest failures, eaglets falling out of the nest, and birds getting tangled in monofilament. The following day, a formal orientation meeting hosted by agency contributors discussed Arizona bald eagle history, ecology, and the role nestwatchers play in management of the species. At the end of the meeting, nestwatch partners were selected. After the first ten days in the field, we reconvened to review problems or questions with data forms and the writing of final reports. Additional problems were discussed on an individual basis in the field or at the office. Informal "get-togethers" initiated by nestwatchers also allowed for discussions about the program and other eagle matters. These evening meetings also enhanced teamwork and unity among the nestwatch crew.

Selection of BAs monitored by the ABENWP was essentially based upon the level of human activity near nest sites. All territories in 1993 that were active with legal closures were monitored: Bartlett, Cliff, Ladders, 76, and Lake Pleasant. Other sites with high levels of human activity without closures, such as nests on Native American lands, were also monitored: Fort McDowell, and Orme. We also monitored sites that are fairly accessible and/or have a history of problems such as heat stress, nest parasites, and/or the persistent presence of monofilament (Hunt et al. 1992): Alamo, Ive's Wash (below Alamo Dam), Tonto, Sheep, and Camp Verde. Breeding areas of particular interest to agencies were also watched: Pinto. New breeding areas without closures that appeared to have high recreation or human activity nearby were also monitored: Towers. Due to the request by the White Mountain Apache Indian Reservation that all work on endangered species cease, we were unable to monitor nests on the upper Salt River in 1993.

Field work began the first week of February and continued until the eaglets fledged in May and June. Sites were watched primarily in teams of two. Personnel maintained a ten-day on, four-day off schedule. Each work period included weekends and Fridays, when heavy recreation use tend to impact eagles the most. Half of each ten-day period was devoted to data collection where nests were monitored from dawn-to-dusk. The other half of each ten-day period was spent collecting supplemental eagle data. All data were recorded by observation, opportunistically,

throughout the study period. Territories with constant recreational pressure and special eagle concerns were monitored every day either throughout the season or during peaks of human activity: Ive's Wash (below Alamo Dam), Bartlett, Lake Pleasant, and Tonto. Due to early nesting habits of some eagles, nestwatchers were placed at some BAs prior to the February start-up: Alamo, Bartlett, and Tonto. The Audubon Society assisted in observing the Ladders and Tower breeding areas on nestwatchers' days-off. The four-day off period occurred every other Monday-Thursday.

Data were recorded from distant observation points in the nest areas. Spotting scopes (15-45x, supplied by ABENWP contributors) and binoculars were used to view eagles. Each observation point was selected to provide optimal viewing with the least impact to breeding bald eagles. All observations were recorded in a notebook on field forms. Forms were developed to document human activity in the breeding area, wildlife interactions, prey deliveries, forage events, and wildlife sightings. Nest behavior was recorded each field day and entered on daily summary forms.

Human activity, and the associated eagle behavior, were recorded within a kilometer radius of an eagle or eagle's nest. In addition, all aircraft below the ~600 meter (2000 foot) Federal Aviation Administration (FAA) recommended ceiling within a kilometer of an eagle/nest were also documented. We classified bald eagle behavior in response to human activity into seven categories: none, watched, restless, flushed, left area, unknown, and bird not in area. If eagles performed normal activities without acknowledging a nearby human activity, a "no response" was recorded. If an eagle looked at an activity without displaying any 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 at the nest when an activity occurred.

Nestwatchers also recorded bald eagle interactions with other wildlife, and tried to identify frequency, type and species of prey delivered to the nest. In addition, all observed forage events were recorded. Nest maps with river kilometer designations, nest numbers, and a guide to prey species of fish commonly used by Arizona bald eagles were used (Hunt et al. 1992).

Nestwatchers provided their own transportation, supplies, binoculars, food, and housing on days off. A total of 21 people participated in the ABENWP in 1993.

RESULTS AND DISCUSSION

Program

Data forms were revised in 1993 to reduce the volume of paper and clarify objectives. Daily

summary forms were consolidated into one page representing 25 days versus what was previously one piece of paper per day. Instruction forms, human activity, prey delivery, forage, interaction and wildlife sighting forms were also revised and improved. Because it often takes time to get used to data forms, we sent copies to nestwatchers prior to the beginning of the program.

We also implemented the policy of having nestwatchers turn in copies of their forms after every other ten-day period. It is often difficult to travel to each nestwatch site to examine their understanding of the data forms. This practice helped us monitor each teams work. We also emphasized that each team complete their forms in a timely manner. Turning in their forms periodically helped nestwatchers keep their paperwork current.

In 1993 we required a specific format for individual breeding area reports. Tables summarizing data collected describing human activities, wildlife interactions, prey deliveries and forage success were standardized. The "guide to nestwatch report writing" gave all nestwatchers a clear indication of the types of information that were important. Additionally, the guide assisted in contributing to the consistent methods in which data was collected. We also had the opportunity to edit drafts of each report, insuring that we received the information in the desired format.

Our continued emphasis on improving preparation and understanding of objectives, methods, and forms has paid off in higher quality information and reports. Refining the orientation process has solved many of the inconsistencies in data collection of previous years (Beatty 1993). Yet, the challenge is to duplicate this effort every year, due to the diversity and number of personnel involved in the ABENWP. And certainly, the $45.00/day wage paid to each nestwatcher often limits the experience our crew has, and the number of returning nestwatchers.

Since nestwatchers concentrate their monitoring in the nest area, our results are biased. Observations restricted to the nest area will bias any conclusions such as foraging locations or habitat use over an entire eagle pair's range. But, this information still helps to inform land and wildlife agencies where to focus management activities in the nest area. Since eagles are found perching and roosting most often near the nest during incubation and the early nestling stage, it would be logical to concentrate management most heavily in this location. Certainly though, important eagle foraging areas, perches and roosts away from the immediate nest area should not be ignored.

Management

ABENWP continues to be a vital, successful component of bald eagle management. However, with an expanding Phoenix population, conflicts with bald eagles can be expected. There will be an increased demand for additional recreation and development along the state's central river drainages/lakes. It can be expected that this demand will also begin to spread into more remote places. The lower riverine and lake areas closest to Phoenix have been our most productive sites in the past (Hunt et al. 1992). Additionally, locations where bald eagles can expand within

the presently known breeding range appears to be limited. Thus, the probability of territories or important foraging locations occurring near a proposed development is high. Of course, with these developments comes the required section 7 Endangered Species Act consultations between the U.S. Fish and Wildlife Service and the associated federal land management agency. These consultations often direct the agency to support the ABENWP. However, regardless of a pair of nestwatchers, the future success of bald eagle nests will depend on how we (agencies/public) value, develop and protect existing and potential bald eagle habitat.

The following is a list of currently known or recently completed projects potentially affecting bald eagle territories.

1. Campgrounds are being developed near breeding areas (Tonto and Pinto BAs).
2. Roosevelt Dam and New Waddell Dam have been/are being renovated to increase water storage which will kill nest trees and bring recreation into core nest areas (Lake Pleasant, Tonto, and Pinto BAs).
3. Roads have been/are being paved, improved and built near breeding areas (Tonto, Bartlett, Pinto, and Lake Pleasant BAs).
4. Recreational boating is being considered for the Gila River below Coolidge Dam (Coolidge BA) (B. Brown pers. comm.).
5. Peck's Lake near Tavasci Marsh and the town of Cottonwood is being developed. A golf course and living community is planned (Tower BA).
6. Talkalai Lake is being considered for recreational improvement along with development of a fish hatchery (A potential BA)(Driscoll and Beatty 1994).
7. Agricultural development, open range grazing and unrestricted wood cutting will bring more human activity and degradation to riparian nesting habitat on the lower Verde River (Fort McDowell BA).

The most common management tool for restricting human activity near bald eagle nests has been seasonal closures. As breeding areas are discovered in more populated areas, or as development surrounds existing territories, future closures will need to be as restrictive as existing closures, with more effort in erecting signs/barriers. Current closures are located away from casual human activity and surround the nest with a large area. To be effective, development of future closures in high use, easy access areas (Tonto, Pinto, Pleasant BAs) must be an all out endeavor. It will be necessary for the public to rely on our guidance and education to police themselves. For the public to value and respect these areas, it will be our responsibility to inform them of the success of their efforts in the field and in the mass media.

Protection and management of breeding areas on the lower riverine and lake areas nearest Phoenix must continue for the success of breeding Arizona bald eagles. After examining all known productivity information up to 1990, Hunt (et al. 1992) determined that eagles breeding on the lower riverine areas, including the Salt and Verde river lakes, were more productive than those on the free-flowing rivers (which are in more remote locations). This trend has continued over the past two seasons.

Eagles on the free-flowing remote areas of the upper Salt and Verde rivers, Tonto Creek and Burro Creek (13 BAs) have not been productive compared to eagles breeding near lakes and the lower riverine areas. Over the past two seasons (1992-1993), these 13 BAs were occupied by a pair of eagles on 24 occasions. Out of these 24 occupied nests, 18 clutches of eggs were laid. From these 18 clutches, a minimum of 26 individual eggs were laid and 14 young hatched. From these clutches, 9 attempts failed in the egg stage, 5 nestlings died in the nest and only 9 young fledged. Most of these young (n=7) were produced on the upper Verde River and only 2 birds fledged from the upper Salt River and upper Tonto Creek (Table 1).

Productivity at nests located from the lakes on the Salt and Verde rivers down to their confluence and at Alamo Lake, Lake Pleasant and San Carlos Reservoir (14 BAs) was much higher in comparison. Out of 28 occupied nests, 26 clutches of eggs were laid. A minimum of 43 eggs were laid and 33 nestlings hatched. Six clutches failed during incubation and 7 nestlings died in the nest, but a total of 26 birds fledged (Table 2).

Known bald eagle egg production on the regulated river systems in Central Arizona was almost double (43 to 26) and number of fledglings was nearly triple (27 to 9) compared to breeding areas on free-flowing rivers. Protection and the continued intensive management of these breeding areas associated with high levels of human disturbance must endure for the continued success of this population. Closures, monitoring, contact with the public and rescue efforts (since 1983) annually contributes to help maximize the number of Arizona fledglings. Specifically, intervention when birds are in life threatening situations has resulted in saving approximately 15 percent of all fledglings (Beatty in prep.).

Education and contact of the public at breeding areas has also undoubtedly resulted in reducing harassment and failures due to human activity. But, we are unable translate this educational contact into breeding success or number of birds saved. Should these management efforts decrease (resulting in lowered productivity of regulated river nesting eagles) and productivity continue to be low on the free-flowing rivers, it is unlikely that the more remote breeding areas (nests on free-flowing rivers) could produce enough young to sustain this population.

Intervention

The ABENWP was responsible for identifying significant problems with the nesting effort at Alamo, Bartlett, Fort McDowell, Orme, 76, and Towers breeding areas.

Alamo/Ive's Wash

Nestwatchers were placed on site 5 January 1993 approximately 5 days after the beginning of incubation in nest #2. We received a call on 8 January 1993 from Ken Moore, Army Corp of Engineer Dam Keeper and the nestwatchers informing us that due to heavy run-off from record rainfall, the lake's water level was steadily rising toward the nest at 1 foot an hour. The Corp projected that the nest would be inundated sometime that evening. After quick coordination calls with State Parks for a boat and the Phoenix Zoo for an incubator, AGFD and USFWS personnel

left Phoenix in a vehicle for Alamo. We met State Parks personnel and boated out to the nest which was about 6 feet above water. The eagles left the nest and two eggs were rescued and driven to the Phoenix Zoo and placed in an egg incubator. Nest #2 and #3 were inundated the evening of 10 January. Nest #1 was inundated the evening of 16 January. One egg hatched at the zoo late 3 February or early morning 4 February. The second egg was cracked and believed to not be viable. It could not be determined if the crack occurred naturally or while handling. The eaglet hatched at the zoo was raised to 34 days old in an imprint free environment. It was then flown to Alamo Lake in a Channel 10 helicopter and fostered into the Ive's Wash nest on 9 March. The bird fledged the same day as its foster sibling on 10 May.

Bartlett

Two eaglets hatched at Bartlett in 1993 on approximately 19 February. One eaglet died soon after hatching. The remaining Bartlett eaglet was blown out of the nest or fledged onto a ledge on 29 April at 69 days old. Like previous Bartlett eaglet's (Hunt et al. 1992), this bird apparently landed in a cholla cactus. A cactus spine was observed in the fledgling's left eyelid on 1 May by nestwatchers. The bird was caught on May 2 and the spine was removed. Spines were also removed from its body and leg. Soon afterward, the young bird was observed using the eye normally and was later observed flying in the breeding area on 10 June.

Fort McDowell

Two eaglets hatched between 9-12 March in cottonwood tree nest #12. Nesting great-horned owls fledged two young from a cottonwood nest less then 200 meters downriver from the eagle nest the end of May. One eaglet fledged successfully on 1 June at approximately 82 days old. After the bird was not observed near the nest for a length of time, monitors called AGFD. AGFD instructed nestwatch personnel to inspect the surrounding area for the bird. While inspecting the nest area, the second eaglet fledged flying strongly to the east. Just prior to nightfall, AGFD arrived in the nest area and observed the perched adult eagles watching inquisitively toward the ground below nest. Although the first fledged eaglet was not observed before dark, it was assumed by the adults behavior that the bird was located near the adults.

Table 1. Success of occupied free-flowing river nesting bald eagles in Arizona, 1992-93.

Territory	# eggs laid		# hatched		# young died		# fledged	
	1992	1993	1992	1993	1992	1993	1992	1993
Devil's Post	Occ[2]	-	-	-	-	-	-	-
Table Mountain	1+	2+	0	2	-	0	-	2
East Verde	2+	2+	2	2	1	1	1	1
Ladders*[1]	2+	2+	2	2	0	2	2	0
Camp Verde*	2	Occ	0	-	-	-	-	-
Tower*	Unkn[3]	2	-	1	-	0	-	1
Sheep*	Occ	Occ	-	-	-	-	-	-
76*[1]	1+	2	1	0	0	-	1	-
Redmond	Occ	Occ	-	-	-	-	-	-

Canyon	1+	1+	0	1	-	0	-	1
Cibecue*	1+	1+	1+	0	1+	-	0	-
Cedar Basin	1+	1+	0	0	-	-	-	-
Lone Pine	1+	1+	0	0	-	-	-	-
Totals - 13 sites	12+	14+	6+	8	2	3	4	5

* Sites monitored by ABENWP personnel, [1] Sites with official closures, [2] Occ = occupied site, [3]Unkn = unknown, site not yet rediscovered as occupied

On 2 June, the following morning, monitors were not able to spot either of the fledged eaglets. AGFD returned to the nest area that day and along with the nestwatchers located two large piles of juvenile eagle feathers about 30 meters upriver from the nest. One pile consisted mostly of flight feathers. Many of the large feathers were broken at the base of the quill. The second pile was mainly body/breast feathers. No carcass was found. It is suspected from the presence of the nearby nesting owls and the plucked body feathers that the eaglet was killed by great-horned owls. Great-horned owls were considered the cause of death of older fledglings near migrating age at the Ladders site in 1988 (Hunt et al. 1992). The other Fort McDowell eaglet was found perched a few hundred meters upriver of the nest tree in a large mesquite tree along the river.

Table 2. Success of occupied regulated riverine, lake or lake/riverine nesting bald eagles in Arizona 1992-93.

Territory	# eggs laid		# hatched		# young died		# fledged	
	1992	1993	1992	1993	1992	1993	1992	1993
Ft. McDowell*	1+	2+	1+	2	1+	0	-	2
Bartlett*[1]	1+	2+	1	2	-	1	1	1
Cliff*[1]	1+	Occ.[3]	0	-	-	-	-	-
Horseshoe	1+	Occ.[3]	0	-	-	-	-	-
Orme*	2+	2+	2	2	1	1	1	1
Blue Point	2+	3	2	3	0	1	2	2
Horse Mesa	1+	2+	0	1	-	0	-	1
Pinto*	1+	1+	0	1	-	0	-	1
Pinal	2	3	1	2	1	1	0	1
Tonto*	1	2+	0	2	-	0	-	2
Coolidge*	1+	2	1+	2	0	0	1	2
Lake Pleasant*[1]	1+	1+	0	1	-	0	-	1
Ive's Wash*[2]	2+	1+	2	1	0	0	2	2[2]
Alamo*[2]	2+	3+	2	2[2]	0	0	2	1
Totals - 14 sites	19+	24+	12+	21	3+	4	9	17

* Sites monitored by ABENWP personnel, [1] Sites with official closures, [2] One bird was fostered into the Ive's Wash nest from eggs rescued from Alamo's first clutch, Alamo successfully renested and raised one eaglet from

a second clutch. [3] Occ = Occupied site

Orme
Two eaglets hatched in cliff nest #3 on 15 or 16 March. The birds had grown to 50 days old when a wind storm occurred in the Phoenix area on 5 May. On 6 May, one eaglet was found dead below the nest. Heavy winds more than likely caused this eagle to fall. This was the second bird in two consecutive years to have fallen from a cliff nest on Mount McDowell at Orme and die. In 1990 while climbing up to the newly discovered nest #3, we discovered weathered bones and feathers of a bald eagle nestling. It was concluded from occupancy records and condition of the remains that this bird either fell from the nest in 1989 (status of the site was considered occupied) or prior to our discovery of the site in 1986 (Hunt et al. 1992).

76
Incubation began on 5 or 6 February in nest #3. Activity at the nest remained "normal" until 26 February when the female left the eggs uncovered for 3 hours. On this day she displayed an odd "yawning" behavior. She opened her mouth at regular intervals of 30-35 seconds. She continued to display this odd behavior and left the eggs uncovered on 27 and 28 February for 4.5 hours and 6.3 hours respectively. Rain persisted these final two days of incubation. Nestwatchers were able to contact us through the USFS radio dispatcher. Two eggs were collected for analysis on 28 February. After analysis, it was discovered that the eaglets had developed to about 23 days old in the egg until the nest was abandoned and the embryos died (R. Mesta pers. comm.).

Tower
In late April, a fishing hook was seen attached to the lower bill of the adult female's beak. Connected to the hook was the six-inch monofilament leader which was dangling away from the eagle's head. Nestwatchers were able to observe that the hook and monofilament did not hinder the eagle's ability to feed itself, forage, or feed the eaglet. The bird was later observed in early June without the hook and monofilament.

Breeding Areas
Information collected by nestwatchers from each breeding area along with important events and recommendations are summarized from nestwatch reports written at the end of the season (Bank et al. 1993, Beason and Porter 1993, Bilak and Koloszar 1993, Brownwood et al. 1993a, Brownwood et al. 1993b, Friederici and Ruhser 1993, Juliana and Levine 1993a, Juliana and Levine 1993b, Langridge and Christman 1993, Langridge and Siegel 1993, Lundby and Pausch 1993, Thompson 1993, Waddell and McCoy 1993).

Alamo Breeding Area

Observation period

The Alamo BA was monitored under the normal nestwatch schedule from 5 January to 14 February. Then emphasis changed to Ive's Wash, to collect information on number of nestlings and prey deliveries to determine if Ive's Wash would be suitable for fostering the zoo/Alamo eaglet. Emphasis continued after fostering to monitor the eaglet's progress. The Alamo nest was observed sporadically from mid-February until mid-May. On 23 May, regular monitoring of Alamo began again, until observations terminated on 14 June. The nest was monitored for 51 days, for 359 hours. Nestwatchers spent 170 hours on 21 dawn-to-dusk days watching the site. Observations on dawn-to-dusk days were shortened due to boating and hiking time.

Eagle activity

Incubation began in nest #2 on 31 December 1992 or 1 January 1993. Two eggs were rescued from inundation on 8 January and transported to the Phoenix Zoo for incubation. Nest #2 and #3 were inundated the evening of 10 January. Nest #1 was inundated the evening of 16 January. One egg hatched at the zoo late 3 February or early morning 4 February. The second egg was cracked and not viable. It could not be determined if the crack occurred naturally or while handling. The eaglet (34 days old) hatched at the zoo was fostered into the Ive's Wash nest on 9 March and fledged on 10 May. The Alamo eagles began to build cliff nest #4 on 17 January and laid a second clutch of eggs in it on 14 February. Cliff nest #4 is far more removed from human activity than the previous snag nests near the lake and is on land administered by BLM. Nest #4 also is exposed to sun the entire day and appears to be accessible to ground predators. One eaglet hatched between 20-24 March and fledged on 13 June. This was the first recorded successful nest from the six (Redmond 1987, Ft. McDowell 1988, Bartlett 1990, Horseshoe 1991, Pinto 1992, Alamo 1993) double clutches recorded in Arizona (Hunt et al. 1992, Beatty 1993).

Both breeding birds were in full adult plumage with U.S. Fish and Wildlife Service bands on their right tarsi.

Human activity

Few human activities were recorded at the Alamo Breeding Area in 1993 (Table 3). During January and February, infrequent visitors came to the lake early in the season due to rain, poor access and undesirable fishing conditions. Although observations were limited during the incubation and young nestling stage, little human activities were recorded near nest #4 because it is located greater than 1 kilometer away from the shoreline. Additionally, fewer activities were recorded because previously used snag perches observable by nestwatchers were completely submerged. Eagles were commonly observed flying out-of-view toward shallow water habitat near the confluence of the Santa Maria and Big Sandy rivers.

While boating activities were the most predominant activity observed the past two seasons (Beatty 1993), aircraft (jets, small planes and helicopters) were recorded the most in 1993 (n=17, 50%). Military jets were recorded 11 times flying within 1 kilometer and below the 600 m FAA

advisory minimum ceiling for bald eagle nests. More than 11 jets were observed flying in low level flight over Alamo Lake (see Ive's Wash section), but they were not recorded because eagles were often perched in an unobservable location and the nest was located >1 kilometer from the shoreline. Eagles were observed watching jet overflights three times. Similarly, since the eagle's nest was greater then a kilometer from the lake and previously used snag perches were submerged, only three boating activities were recorded. Additionally, the increased lake size diffused the amount of boaters that would normally concentrate at the north end of the lake at the more commonly maintained elevation. Most responses to human activities were recorded as unknown (n=23, 68%) due to the distance between observers and the nest.

Although nest #4 appears to be vulnerable to heat stress and predation, it is located well away from boat traffic and any future inundations. The fact that eagles were able to successfully raise one eaglet in the heat of Alamo Lake one month later than normal with a small amount of recorded human activity near the nest suggests that this nest may be a good location for the eagles.

Wildlife interactions

The Alamo eagles were observed interacting with 6 species of birds throughout the season: bald eagles, red-tailed hawks, zone-tailed hawks, American white pelicans, unknown falcon species, and turkey vultures.

Due to the inundation of snag perches in Alamo Lake, few interactions (n=22) were observed between the Alamo and Ive's Wash eagles compared to 1991 (n=102) and 1992 (n=173) (Table 4). All observed interactions were while eagles were flying as opposed to previous years where most interactions occurred while perching along the territory boundary (Beatty 1993). The territory boundary previously defined by perches, was defended from the air after all perches went under water.

Table 3. Human activity, Alamo Breeding Area - ABENWP 1993, Arizona.

Type	Eagle behavior toward human activity[1]								
	N	W	R	F	L	B	?	D-D total[2]	Total
Boater	-	-	1	1	-	-	1	2 (16.7%)	3 (8.8%)
Chainsaw	-	-	-	-	-	-	1	1 (8.3%)	1 (2.9%)
Gunshot	-	-	-	-	-	-	4	4 (33.3%)	4 (11.8%)
Picnickers	-	-	-	1	-	-	-	0	1 (2.9%)
Military jet	-	3	-	-	-	-	8	0	11 (32.4%)
Agency personnel	-	-	-	3	-	-	-	0	3 (8.8%)
Helicopter	-	-	-	-	-	-	3	0	3 (8.8%)
Sonic boom	-	-	-	-	-	-	3	0	3 (8.8%)
Small plane	-	-	-	-	-	-	3	3 (25.0%)	3 (8.8%)
ORV	-	2	-	-	-	-	-	2 (16.7%)	2 (5.9%)
Total	0	5	1	5	0	0	23	12 (100%)	34 (100%)

[1]N=None, W=Watched, R=Restless, F=Flushed, L=Left Area, B=eagle not in area, ?=Unknown.
[2]D-D Total=Information collected on dawn-to-dusk observation days.

Table 4. Observed interactions between Alamo and Ive's Wash bald eagles at Alamo Lake, ABENWP 1991-1993, Arizona.

Year	Interaction type[1]					
	Prch-prch	Prch w/ ad	A flight	So together	Contact	Total
1991	70 (69%)	14 (14%)	9 (9%)	8 (8%)	1 (1%)	102 (100%)
1992	130 (75%)	15 (9%)	27 (16%)	1 (<1%)	-	173 (100%)
1993	-	-	10 (91%)	-	1 (9%)	11 (100%)
Total	200 (70%)	29 (10%)	46 (16%)	9 (3%)	2 (<1%)	286 (100%)

[1]Interaction types - Prch-Prch = perch-to-perch, nonaggressive; Prch w/ad = perch-to-perch w/aerial display; A flight = aggressive flight; So together = soaring together; Contact = physical contact.

Food Habits

Increased water elevations at Alamo Lake changed observed foraging locations from prior years. In previous seasons at lake elevations of 1100-1120 feet above sea level, eagles were observed capturing nearly all their food at the north end of the lake. Most of their captures originated from snag trees surrounded by shallow water.

After record rainfall beginning the first week in January, lake elevations climbed to 1165 feet by 22 January and remained near or above that mark until 26 March. At the end of March, lake elevations slowly descended to the 1140-1135 foot elevation. Alamo Lake stayed at this elevation until the eaglet fledged.

Soon after the floods and inundation of common snag perches, eagles were observed using perches and locations uncommon for Alamo eagles. Birds were seen perching on floating driftwood and eating drowned mammals (n=2) (possibly *Neotoma* or *Dipodomys*) discovered on pieces of flotsam. More commonly, eagles were observed flying upriver toward the confluence of the Big Sandy and Santa Maria rivers where they were most likely capturing food in shallower water. Forage events observed in the late spring occurred on the wing. Beginning in late April, early May, the tops of the remaining snags began to appear, but eagles were not frequently observed using these perches for hunting.

Twenty-three forage attempts were observed in 1993 (Table 5), compared to 101 and 107 observed in 1991 and 1992 respectively (Beatty 1993). The male captured 12 items, the female 4, and a resident adult of unknown sex caught 7 items. Fish (n=9) represented 38 percent of the total number of prey types that eagles attempted to capture. Yet, 46 percent (n=11) could not be identified to type. Two American coots were observed being captured by eagles.

Fourteen prey deliveries were observed, 9 (64.3%) by the male, 2 (14.3%) by the female, and 3 by an unknown resident adult (Table 6). The male was observed arriving with six of the eight documented fish brought to the nest. Two largemouth bass and one American coot were the only species identified positively in the nest (Table 7). Two unknown catfish species were also delivered to the eaglets.

Table 5. Observed forage events[1] and success by bald eagles at the Alamo Breeding Area - ABENWP 1993, Arizona.

Sex	Prey types									
	Fish		Birds		Carrion		Unknown		TOTAL	
	E[2]	S-U[3]	E	S-U	E	S-U	E	S-U	E	S-U
Male	4	3 - 1	1	1-0	2	2-0	6	6-0	13	12-1
Female	2	2 - 0	-	-	-	-	2	2-0	4	4-0
Unknown[4]	3	3 - 0	1	1-0	-	-	3	3-0	7	7-0
TOTAL	9	8-1	2	2-0	2	2-0	11	11-0	24	23-1

[1]Each number represents a forage event for a food item not the number of strikes to capture the item
[2]E = Forage events observed
[3]S-U = Successful captures of prey - unsuccessful capture of prey
[4]Unknown - Undetermined sex of resident adult that captured a prey item

Table 6. Prey types delivered to nest by bald eagles at the Alamo Breeding Area - ABENWP 1993, Arizona.

Sex	Prey types				
	Fish	Mammals	Birds	Unknowns	TOTAL
Male	6	0	0	3	9 (64.3%)
Female	1	0	0	1	2 (14.3%)
Unknown[1]	1	1	1	0	3 (21.4%)
TOTAL	8 (57.1%)	1 (7.1%)	1 (7.1%)	4 (28.7%)	14 (100%)

Table 7. Prey species delivered to nest by bald eagles at the Alamo Breeding Area - ABENWP 1993, Arizona.

Sex	Prey types						
	Largemouth bass	Catfish species	Unknown fish	American Coot	Unknown mammal	Unknown	TOTAL
Male	1	1	4	-	-	3	9 (64.3%)
Female	-	1	-	-	-	1	2(14.3%)
Unknown[1]	1	-	-	1	1	-	3 (21.4%)
Total	2 (14.3%)	2 (14.3%)	4 (28.6%)	1 (7.1%)	1 (7.1%)	4 (28.6%)	14 (100%)

[1]Unknown - Undetermined sex of resident adult that delivered a prey item

Management activities

Nestwatchers were placed on site on 5 January, due to early nesting habits of the eagles. Brochures were given to Alamo State Parks office and Wayside Inn for distribution to the public. The ABENWP display was at the Alamo State Park office during January and February. Eggs were rescued from inundation on 8 January by AGFD, USFWS, ACOE, and Alamo State Parks and put in the Phoenix Zoo incubator. Metal signs produce by SRP were placed at Brown's Crossing to inform boaters and hikers of nesting bald eagles. These signs were later swept away by the rising lake.

Management recommendations

1.Continue early nestwatching activities.

2.Continue placing the display and brochures at Alamo to educate park visitors of nesting bald eagles.

3.Coordinate a December meeting with State Parks, BLM, USFWS and AGFD personnel to work on logistics for ABENWP monitors.

4.Continue to place signs at strategic locations to inform boaters and hikers of nesting bald eagles.

5.Manage for regeneration of cottonwoods and willows from the north end of the lake to the confluence of the Santa Maria and Big Sandy rivers. Consider a cottonwood/willow pole planting project and/or a strategy to promote growth of existing young trees. In either situation, competition by salt cedar must be considered (i.e. possible control or eradication of this non-native species). Yet it must also be pointed out that these salt cedar plants guard nest snags from terrestrial disturbances.

Some biologists believe a limited, diminishing number of available nest trees close to the lake warrants construction of artificial nest structures. This may be moot, now. With construction of cliff nest #4, the eagles have a nest in a relatively permanent location, free of many management concerns for human activity. However, construction of this nest does not reduce the need to improve riparian health at the north end and upriver of Alamo Lake.

6.Develop a plan to close an area surrounding any future Alamo nest tree that becomes accessible by boat. Prior to the January floods, all but one (nest #3) nest tree was guarded rather thoroughly from terrestrial visitors by thick "jungles" of salt cedar, but once the lake rises these nests are easily approached by boats.

7.Develop additional funding from the ACOE for monitoring of Alamo Lake to fulfill section 7 obligations for potential inundation of future nests.

8.Work with Luke Air Force Base to redirect low-level military jet flights away from Alamo Lake.

9.Lake elevations were maintained throughout the 1993 breeding season at 15-65 feet above normal operating levels (1100-1120). Although we were unable to observe where the eagles commonly foraged, it was obvious from the three nestlings which Alamo and Ive's Wash produced that both pairs were able to capture enough food. All of this was accomplished without the hunting snags that had been commonly used by both pairs of eagles for hunting, territory defense and loafing. Instead, the higher water levels greatly increased the surface area of the lake, likely creating more opportunities to find food. Additionally, the floods probably produced abundant fish, mammal and herptile carrion during January and February.

As the lake recedes to more commonly maintained levels and drowned snags begin to fall, the lack of hunting perches may become limiting to eagle success on Alamo Lake. Both the Ive's Wash and the Alamo eagles use the small northeastern/upper section of the lake for foraging at the regularly maintained lake levels. When the drowned cottonwood snags fall, the upper end of the lake may become too small for two pairs of eagles to partition the resource. Because these perches have proven to be a integral component of the eagle's success at normal operating lake levels, it may be prudent to place artificial perches in or around the lake. Before all snags fall, a possible strategy would be to experiment and place a few poles at a time to determine effectiveness.

Bartlett Breeding Area

Observation period
Nestwatchers arrived on site 4 January. A second team arrived in order to monitor the nest daily on 25 March. Observation was terminated on 9 May. The site was watched for a total of 105 days, 47 of those being dawn-to-dusk days. A total of 807 hours were spent observing the nest on dawn-to-dusk days.

Eagle activity
Eagles laid eggs between 11-15 January 1993. At least two young hatched on about 19 January. One newly hatched eaglet died between 20 and 23 January. The eaglet fledged on 29 April and apparently landed in a cholla cactus. A cactus spine was observed in the fledgling's left eyelid on 1 May. The bird was caught on May 2 and the spine was removed from its left eyelid. Spines were also removed from its body and leg. Soon afterward, the young bird was observed using the eye normally and was later observed flying in the breeding area on 10 June. The breeding eagles were both in adult plumage and unbanded.

Human activity
A total of 449 human activities were observed throughout the breeding season (Table 8). Small planes were recorded the most (n=289, 64.4%), followed by helicopters (n=62, 13.8%), gunshots (n=28, 6.2%), and ORV's (n=12, 2.7%).

Aircraft (small planes, helicopters, ultralights) represented 78 percent (n=352) of all recorded activities, but only caused an eagle to significantly respond once (restless). This plane traveled north flying at approximately 100 feet above the river when it banked, turned and headed south. All remaining planes recorded maintained at least a 150 m (~500 feet) above ground level.

Like many other breeding areas in 1993, terrestrial activity was limited early in the season due to heavy rain and poor road conditions. In January, entrance to Bartlett Lake was blocked due to running washes and ruined roads. Later, as paved roads were repaired, access to the nest area on unmaintained dirt roads was hindered by sand pits in wash crossings and rough conditions.

These damaged and difficult road conditions persisted throughout the season and seemed to affect the number of terrestrial visitors to the Bartlett Breeding Area in 1993. In 1992, the breeding area was visited by 440 terrestrial activities from 14 different types of activities (Beatty 1993). In 1993, only 73 activities took place from a similar 13 types. Aircraft activity, although reduced by poor weather, remained high in 1993 (n=289).

Table 8. Human activity, Bartlett Breeding Area - ABENWP 1993, Arizona.

Type	Eagle behavior toward human activity[1]								
	N	W	R	F	L	B	?	D-D total[2]	Total
Small plane	138	110	1	-	-	-	49	199 (66.6%)	298 (64.4%)
Campers	1	2	-	-	-	-	-	3 (1.0%)	3 (0.7%)
Helicopters	24	21	-	-	-	1	16	31 (10.4%)	62 (13.8%)
Gunshots	16	7	1	-	-	1	3	22 (7.4%)	28 (6.2%)
Anglers	3	3	-	1	-	-	-	6 (2.0%)	7 (1.6%)
Picnickers	1	-	-	-	-	-	-	1 (0.3%)	1 (0.2%)
Canoes	-	5	-	-	-	-	1	6 (2.0%)	6 (1.3%)
Birders	1	-	-	-	-	-	1	2 (0.7%)	2 (0.4%)
Hunters	-	1	-	-	-	-	1	2 (0.7%)	2 (0.4%)
Hikers	1	-	-	-	-	-	-	1 (0.3%)	1 (0.2%)
ORV's	5	4	-	1	1	1	-	10 (3.3%)	12 (2.7%)
Rafters	-	2	-	-	-	-	-	2 (0.7%)	2 (0.4%)
Shooters	1	1	-	-	-	-	1	3 (1.0%)	3 (0.7%)
Cyclists	1	-	-	-	-	-	-	1 (0.3%)	1 (0.2%)
Agency workers	3	4	-	-	-	-	1	3 (1.0%)	8 (1.7%)
Ultralights	-	1	-	-	-	-	-	0	1 (0.2%)
Researchers	-	4	1	-	2	-	-	5 (1.7%)	7 (1.6%)
Drivers	2	-	-	-	-	-	-	1 (0.3%)	2 (0.4%)
Photographer	-	3	-	-	-	-	-	1 (0.3%)	3 (0.7%)
Total	197	168	3	2	3	3	73	299 (100%)	449 (100%)

[1]N=None, W=Watched, R=Restless, F=Flushed, L=Left Area, B=eagle not in area, ?=Unknown.
[2]D-D Total=Information collected on dawn-to-dusk observation days.

Wildlife interactions

Bartlett eagles were observed interacting with common ravens, bald eagles, golden eagles, red-tailed hawks, turkey vultures, great blue herons, American kestrels, violet green-swallows, canyon wrens, and unknown eagles and birds. One subadult bald eagle (estimated to be 2 years old) observed in the area was wearing a blue VID band.

Food habits

All but 2 of the 30 observed forage attempts occurred along the river below the nest cliff. The adult male captured 13 items in 16 attempts and the female captured 7 items in 11 attempts (Table 9). The only observed forage attempt outside the nest area occurred at Needle Rock where the adult male captured a flathead catfish. An eagle was also observed pirating a fish from a great blue heron about 1 kilometer upriver from the gauging station near the nestwatchers camp. Additional foraging most likely took place at Needle Rock and on Bartlett Lake as indicated by the direction eagle's flew from the nest and returned with fish.

A total of 45 prey deliveries were recorded throughout the season (Table 10). Compared to the view of nest #2, prey deliveries and species identification were more difficult at nest #1 due to the increased distance of observation. The adult male arrived with 30 items and the female delivered 13 items. Species types identified were sunfish, suckers, unknown bass, and unknown catfish (Table 11).

Table 9. Observed forage events[1] and success by bald eagles at the Bartlett Breeding Area - ABENWP 1993, Arizona.

Sex	Prey types					
	Fish		Unknown		TOTAL	
	E[2]	S-U[3]	E	S-U	E	S-U
Male	14	12 - 2	2	1-1	16	13-3
Female	7	5 - 2	4	2-2	11	7-4
Unknown[4]	3	1 - 2	-	0-0	3	1-2
TOTAL	24	18-6	6	3-3	30	21-9

[1]Each number represents a forage event for a food item not the number of strikes to capture the item
[2]E = Forage events observed
[3]S-U = Successful captures of prey - unsuccessful capture of prey
[4]Unknown - Undetermined sex of resident adult that captured a prey item

Management activities

Early nestwatchers were put into place prior to incubation and full-time monitoring of nestwatchers began with a second team later in the season in anticipation of increased recreational activity.

Nestwatchers noticed a cactus spine in the eaglet's eye soon after fledging. The young bird was captured on the ground and the spine was removed. The bird was later observed using its eye normally.

Table 10. Prey types delivered to nest by bald eagles at the Bartlett Breeding Area - ABENWP 1993, Arizona.

Sex	Prey types					
	Fish	Mammals	Birds	Herps	Unknown	TOTAL
Male	20	2	2	1	5	30 (66.7%)
Female	11	0	1	0	1	13 (28.9%)
Unknown[1]	2	0	0	0	0	2 (4.4%)
TOTAL	33 (71.7%)	2 (4.3%)	3 (6.5%)	1 (2.2%)	6 (13.0%)	45 (100%)

Table 11. Prey species delivered to nest by bald eagles at the Bartlett Breeding Area - ABENWP 1993, Arizona.

Sex	Prey types[2]									
	Fish					Mammals	Birds	Herptile	Unknown	TOTAL
	SUN	BAS	SKR	CAT	FSH	MAM	BRD	HRP	UNK	
Male	-	2	2	0	16	2	2	1	5	30 (66.7%)
Female	1	2	1	2	5	-	1	-	1	13 (28.9%)
Unknown[1]	1	-	-	-	1	-	-	-	-	2 (4.4%)
TOTAL	2	4	3	2	22	2	3	1	6	45 (100%))

[1]Unknown - Undetermined sex of resident adult that delivered a prey item
[2]Prey types = SUN=sunfish sp., BAS=bass sp., SKR=sucker sp., CAT=catfish sp., FSH=fish sp., MAM=mammal sp., BRD=bird sp., HRP=herptile, UNK=unknown.

Management recommendations

1.Replace the signs identifying the terrestrial boundary at the north end of the closure and the riverside "no stop zone" below the gaging station. An additional sign should be placed along the river's edge below nest #'s 1 and 2 indicating that the closure is still in effect and another sign indicating the closure's end.

2.At the gate blocking off road access to the north end of the closure, post closure orders and construct boxes to place bald eagle brochures.

3.Needle Rock recreation area is a source of off-road vehicles entering the closure from its

southern boundary. In the past, blockades have been vandalized and swept away by high river flows. Smaller signs with boxes to hold informational brochures may be an inexpensive but effective way of educating and reducing activity that enters the closure if they are placed at advantageous spots.

Camp Verde Breeding Area

Observation period

The Camp Verde Breeding Area was observed from 5 February to 14 February. The site was observed for 30 hours and 51 minutes. Monitoring was limited by heavy rainfall and searches for alternate nests.

Table 12. Human activity, Camp Verde Breeding Area-ABENWP 1993, Arizona.

Type	Eagle behavior toward human activity[1]								
	N	W	R	F	L	B	?	D-D total[2]	Total
Boater	-	-	-	-	-	7	-	7 (38.9%)	7 (31.8%)
Construction	-	-	-	-	-	3	-	1 (5.6%)	3 (13.6%)
Hikers	-	-	-	-	-	2	-	2 (11.1%)	2 (9.1%)
ORV	-	-	-	-	-	2	-	2 (11.1%)	2 (9.1%)
Dogs	-	-	-	-	-	2	-	1 (5.6%)	2 (9.1%)
Picnickers	-	-	-	-	-	3	-	3 (16.7%)	3 (13.6%)
Gunshots	-	-	-	-	-	1	-	1 (5.6%)	1 (4.5%)
Vehicles	-	-	-	-	-	2	-	1 (5.6%)	2 (9.1%)
Total	0	0	0	0	0	22	0	18 (100%)	22 (100%)

[1]N=None, W=Watched, R=Restless, F=Flushed, L=Left Area, B=eagle not in area, ?=Unknown.
[2]D-D Total=Information collected on dawn-to-dusk observation days.

Eagle activity

No bald eagles were observed in the nest area. Earlier, on 11 September 1992, three eagles were observed flying in the nest area over West Clear Creek by AGFD personnel. During the summer of 1992, a local resident observed an eagle perched on a snag approximately 1 kilometer downriver from the nest. We observed new nest construction on an Occupancy and Reproduction Assessment (ORA) flight on 2 February 1993. Further searches by nestwatchers, ORA flights, and AGFD personnel (Driscoll et al. in prep) produced no eagle sightings or alternate nests in the immediate nest area or along West Clear Creek.

After heavy rains in January caused high water flows in the river, extensive scouring had occurred at the base the nest tree and adjacent trees had fallen. Later on 21-22 February, heavy rainfall and the ensuing river flows toppled the nest tree.

Human activity

Although no eagles were observed in the nest area, we continued to record human activity in the area (Table 12). Boaters and associated vehicles at a nearby pull-out represented 9 (40.9%) of the 22 recorded activities. Construction activities (chainsaw, bulldozer and backhoe) repairing an irrigation ditch near Salt Mine Road persisted in the nest area for three days encroaching within 150 meters of the nest.

Management recommendations

1.Continue to search along the Verde River and West Clear Creek for nesting bald eagles.

2.If eagles are found breeding, monitor the site with nestwatchers and:
a.Use Audubon Society volunteers during nestwatchers' days off.
b.Inform local residents of eagles.
c.Sign, if possible, the surrounding area to minimize activity near the nest.

Cliff Breeding Area

Observation period
The Cliff Breeding Area was monitored for 11 days from 5 February to 14 February and 21-22 February. A total of 99 hours were spent observing the site, 58 hours of observation were on 5 dawn-to-dusk days. Observations were interrupted on 9 February due to high water releases from Horseshoe Dam and from heavy rain. We intended to monitor the site during the month of January, but due to poor road conditions opted to monitor the Tonto Breeding Area.

Eagle activity
The Cliff eagles did not lay eggs in 1993. Observations were concentrated at nest #4. Two adult bald eagles were observed perched together in the breeding area on 11 January during a 1993 winter count helicopter flight (Beatty and Driscoll in prep). After nestwatchers arrived on 5 February, only the adult male eagle was observed. Throughout the monitoring period, this adult was observed perching and interacting with at least two different eagles: a 3-year old bird with a blue VID band and an unbanded 4-year old eagle.

The adult eagle was a male bird identified by the black VID band on its left tarsus, silver USFWS band on the right tarsus and a radiotelemetry backpack.

Human activity
Little human activity was recorded during the short time the site was monitored. Ten (71.4%) of the 14 activities that were recorded were aircraft (small planes, helicopters and military jets) (Table 13). Terrestrial activity was minimal due to muddy road conditions and poor weather.

Eagles were not in the area to record a response for 9 (64.2%) of the 14 activities observed. The only significant response was from a perched eagle that left the area after a plane flew approximately 100 feet above it.

Wildlife interactions
The Cliff male was observed interacting with common ravens, red-tailed hawks, and a 3-year old and 4-year old bald eagle.

The adult male interacted one time with a three-year old bald eagle and twice with a four-year old bald eagle. The three-year-old bird was observed alone in the breeding area on 5 and 13 February. On 14 February, the adult male pursued the subadult until they both perched in a cottonwood tree 0.3 kilometers downriver from the nest. The adult male then stooped on the subadult, causing it to flush from the tree until they again both perched in the same tree. The subadult eventually left the breeding area on its own. The entire interaction lasted 21 minutes. The subadult returned 37 minutes later and perched within 0.2 kilometers from the male for 1 hour before flying out-of-view. A near-adult eagle flew into nest #4 and began arranging sticks on 12 February. Four minutes later, the adult male stooped twice on the bird and then flew out-of-view. The near-adult stayed in the nest for the next 30-minutes and then flew away downriver. On

13 February, the near-adult was again spotted in the nest and proceeded to forage twice in the river below the nest. The adult male flew into the nest area and interacted briefly with the near-adult. The adult male perched in tree and the near-adult flew to the nest. The near-adult left the area 1 hour and 39 minutes after it had arrived.

Table 13. Human activity, Cliff Breeding Area - ABENWP 1993, Arizona.									
Type	Eagle behavior toward human activity[1]								
	N	W	R	F	L	B	?	D-D total[2]	Total
Small planes	-	1	-	-	1	3	-	4 (44.4%)	5 (35.7%)
Helicopters	1	1	-	-	-	2	-	1 (11.1%)	4 (28.6%)
Hikers	-	-	-	-	-	1	-	1 (11.1%)	1 (7.1%)
ORV	-	-	-	-	-	1	-	1 (11.1%)	1 (7.1%)
Hunters	1	-	-	-	-	-	-	1 (11.1%)	1 (7.1%)
Boater	-	-	-	-	-	1	-	1 (11.1%)	1 (7.1%)
Military jets	-	-	-	-	-	1	-	-	1 (7.1%)
Total	2	2	0	0	1	9	0	9 (100%)	14 (100%)

[1]N=None, W=Watched, R=Restless, F=Flushed, L=Left Area, B=eagle not in area, ?=Unknown.
[2]D-D Total=Information collected on dawn-to-dusk observation days.

Food habits

The adult male was successful on 8 of 11 forage attempts in a 0.5 kilometer stretch of river below the nest (Table 14). The near-adult eagle observed in the area also successfully foraged two times from the nest pinnacle.

Water fluctuations may have affected the eagles foraging success along the stretch of river below the nest. Four successful attempts occurred in a large pool at river kilometer 65.4. After heavy water releases from Horseshoe Dam, the pools disappeared and the male was twice unsuccessful in capturing fish. Water releases ceased and gravel bars began to reappear as the river receded. The adult male was then observed feeding on carrion washed up on the gravel bars.

Table 14. Observed forage events[1] and success by bald eagles at the Cliff Breeding Area - ABENWP 1993, Arizona.

Sex	Prey types					
	Fish		Carrion		TOTAL	
	E[2]	S-U[3]	E	S-U	E	S-U
Male	10	8 - 2	1	1-0	11	9-2
Near-adult	2	2 - 0	-	-	2	2-0
TOTAL	9	8-1	2	2-0	13	11-2

[1]Each number represents a forage event for a food item not the number of strikes to capture the item
[2]E = Forage events observed
[3]S-U = Successful captures of prey - unsuccessful capture of prey

Management activities
Plans to place early season monitors on site were changed due to weather and extremely muddy road conditions.

Cave Creek Ranger District of the Tonto National Forest received a grant from the Heritage Fund (project # I92049) to enhance the Cliff closure. The Nongame Branch met with the Ranger District and discussed wording and placement of signs. We also discussed adding a place on the sign for bald eagle brochures and closure maps. The timely nature of this proposal became more significant as flood waters tore down the existing fence and sent a large 3x4 foot sign floating downriver.

Management recommendations
1.Continue nestwatch activities.

2.Reconstruct fence, gate and sign at north end of closure.

Fort McDowell Breeding Area

Observation period
Monitoring Fort McDowell began on 6 February 1993 and continued until 6 June 1993. A total of 90 days and 932 hours were spent observing the site, 41 days and 537 hours were on dawn-to-dusk days. Five nestwatchers throughout the season were stationed at Fort McDowell.

Eagle activity
Incubation began in nest #12 between 2-5 February 1993. This nest was rebuilt by Robert Mesta of the USFWS in 1987 after it fell in 1986. This year is the first season the nest has been used since it was rebuilt. Two eaglets hatched between 9-12 March. Both eaglets fledged on 1 June. Two large piles of feathers from one eaglet were discovered on 2 June about 30 meters upriver from the nest. One pile consisted mostly of flight feathers, many of the large feathers were broken at the base of the quill. The second pile was mainly body/breast feathers. No carcass was found. It is suspected from the presence of plucked body feathers that this bird was killed by great-horned owls. A family of owls raised two young 100-200 meters downriver from the eagle's nest.

Both adult eagles were unbanded birds in full adult plumage.

Human activity
A total of 246 human activities were recorded at Fort McDowell in 1993, the most predominant activity being aircraft (small plane, helicopter) (n=135,54.9%) (Table 15). Aircraft elicited a significant response from eagles on 12 (4.9%) different occasions. One-hundred five times (77.8%) the eagles did not respond.

Many of the activities recorded were terrestrial oriented because of easy access to the area and the large recreation area (beach) at the river. Soon after the weather improved and a fee was charged to enter the Salt River recreation area south of Highway 87, public users consistently turned to the Fort McDowell area to spend their day. Vehicles would drive to the river and activities such as picnicking, hiking, fishing (at river kilometers 20.5-20.8), birding, swimming, and shooting would occur.

Surprisingly, only nine "unofficial" (non-agency related) terrestrial activities caused an eagle to significantly respond. Certainly, the most odd activity was a French crew filming a country-western video. Additionally, gunshots, vehicles, photographers, and rafting caused an eagle to flush from its perch. Hikers (n=3), one swimmer, and a rancher all approached within 25 meters of the nest and caused an eagle to circle and vocalize.

Nestwatchers were able to contact 35 different groups as they entered the breeding area. These 35 groups represent a significant percentage (43%) of the unofficial activities recorded in the area (n=81) and were most likely the reason why few activities approached the eagles. Nearly all parties contacted were reported to respond in a positive and friendly manner.

Table 15. Human activity, Fort McDowell Breeding Area - ABENWP 1993, Arizona.

Type	Eagle behavior toward human activity[1]								
	N	W	R	F	L	X	?	D-D total[2]	Total
Small plane	85	3	2	5	2	-	10	70 (44.6%)	107 (43.7%)
Campers	1	-	-	-	-	-	-	1 (0.6%)	1 (0.4%)
Helicopters	20	1	1	2	-	-	4	12 (7.6%)	28 (11.4%)
Gunshots	3	-	-	1	-	-	-	1 (0.6%)	4 (1.6%)
Anglers	11	2	-	-	-	-	-	9 (5.7%)	13 (5.3%)
Picnickers	20	1	-	-	-	-	1	18 (11.5%)	22 (9.0%)
Canoes/Kayaks	12	-	-	-	-	-	-	10 (6.4%)	12 (4.9%)
Birders	1	-	-	-	-	-	-	1 (0.6%)	1 (0.4%)
ORV's	14	1	-	1	-	-	3	12 (7.6%)	19 (7.8%)
Boaters	2	-	-	-	-	-	-	1 (0.6%)	2 (0.8%)
Rafters	4	-	-	1	-	-	1	4 (2.5%)	6 (2.4%)
Ranchers	-	-	-	-	-	1	-	1 (0.6%)	1 (0.4%)
Shooters	-	-	1	-	-	-	-	1 (0.6%)	1 (0.4%)
Horse riders	2	-	-	-	-	-	1	2 (1.3%)	3 (1.2%)
Agency worker	2	-	-	1	1	4	-	3 (1.9%)	8 (3.3%)
Researcher	-	-	-	-	-	1	-	1 (0.6%)	1 (0.4%)
Swimmer	2	-	-	-	-	1	-	1 (0.6%)	3 (1.2%)
Photographing	2	-	-	1	-	-	-	2 (1.3%)	3 (1.2%)
Hiker	1	2	-	-	-	3	2	6 (3.8%)	8 (3.3%)
Total	182	10	4	12	3	10	22	157 (100%)	243 (100%)

[1]N=None, W=Watched, R=Restless, F=Flushed, L=Left Area, B=eagle not in area, ?=Unknown.
[2]D-D Total=Information collected on dawn-to-dusk observation days.

Wildlife interactions

Fort McDowell eagles were observed interacting with golden eagles, common ravens, turkey vultures, red-tailed hawks, great blue herons, osprey, bald eagles and an unknown bird.

Significant observations involved a near-adult bald eagle, osprey, and golden eagle. A near-adult bald eagle entered the area on 23 May from upriver of the nest and was pursued and escorted out of the area downriver. An osprey drove an eagle to perch on the ground on 19 April while the osprey was searching for fish in the nest area. While the bald eagles were incubating on 12 February, a golden eagle landed and perched in the nest tree for 10 minutes without a response from the resident eagles.

Food habits

Eight forage attempts were observed in 1993 at Fort McDowell. All attempts occurred within a 2-kilometer stretch of river in front of the nest with a minimum of human activity in the area (only nestwatchers). No forage attempts were observed while other recreational activities were present in the nest area. Six successful attempts by the male eagle were observed, and by an unknown resident eagle. Forage events observed began with eagles perched on mesquite trees along the east bank and catching fish in runs located at river kilometers 20.5-20.8 and 19.7-19.9.

Thirty-two prey deliveries were recorded in 1993 (Table 16). Difficulty in observing the nest due to the tree's dense foliage limited identification of prey items. An unknown resident eagle delivered 20 items (62.5%), the male arrived with 9 items (28.1%) and the female with 3 deliveries (9.4%). A total of 20 items were described as fish (62.5%), the remaining 12 deliveries were of unknown type (37.5%). Eagles were observed delivering prey from both upstream and downstream of the nest.

Table 16. Prey species delivered to nest by bald eagles at the Fort McDowell Breeding Area - ABENWP 1993, Arizona.

Sex	Prey types		
	Unknown fish	Unknown	TOTAL
Male	9	-	9 (28.1%)
Female	2	1	3 (9.4%)
Unknown[1]	9	11	20 (62.5%)
TOTAL	20 (62.5%)	12 (37.5%)	32 (100%)

[1]Unknown - Undetermined sex of resident adult that delivered a prey item

Management activities

A talk was presented to the children of Fort McDowell at the Tribe's library. A copy of the ABENWP video was given to the library for future use.

The branch that supported nest #11 broke prior to the 1993 breeding season. Sticks from this nest were collected from the ground and reconstructed into a nest by AGFD and high school students for display at the Wildlife Building at the State Fair.

Section 7 consultation of the Endangered Species Act over the establishment of upland agricultural fields with the USFWS, the BR and the Fort McDowell Indian Community was completed with a management plan to set aside eagle nesting and foraging areas.

Management recommendations

1.All nests remaining on the reservation (#12 and #14) are easily accessed by foot.
a.Restrict road access into the immediate nest area.
b.Restrict fuelwood cutting near existing nests.
1.Thick stands of mesquite protect small growing cottonwoods from cattle.
2.Mesquite stabilizes banks from erosion.
3.Fuelwood cutting during breeding season near nests may cause eagles to abandon eggs.

2.Promote growth of cottonwood trees at Fort McDowell by managing for existing trees and/or planting new trees and poles (protection from beaver predation should be implemented).

3.Sign nest areas with signs produced by SRP to help reduce disturbing activities near nests.

4.Continue to work with Fort McDowell on educating Tribal members on eagle ecology and carrying out management activities outlined by the USFWS for the current agricultural development funded in part by the BR.

5.Continue nestwatch activities.

Ive's Wash Breeding Area

Observation period
Nestwatchers arrived at Alamo Lake on 5 January 1993. The Ive's Wash nest was occasionally watched until 12 February when consistent monitoring began. Everyday monitoring by two teams of nestwatchers began on 12 February and continued until 22 May. After 22 May, the site was spot-checked until nestwatchers left the lake on 14 June. The nest was monitored for 94 days totaling 1030 hours, 367 hours of observation were spent on 32 dawn-to-dusk days. River flows greater than 200 cubic feet per second (cfs) made it necessary to travel over the desert to an observation point instead of an easier rivers edge route. The 1.5 hour hike reduced the amount of observation time on dawn-to-dusk days.

Eagle activity
Incubation began in nest #3 between 30 December 1992 and 11 January 1993. At least one eaglet hatched between 5-12 February. Nestwatchers initially observed adult eagles feeding in two places when eaglets were not visible, indicating that two young may have hatched. On 21 February, only one eaglet became visible in the nest. On 9 March, the Alamo eaglet was fostered into the nest with the Ive's Wash eaglet. Both eaglets fledged successfully on 10 May and later were observed in the nest area on 2 June.

The Ive's Wash snag nest in Woody's Cove was inundated along with the all Alamo snag nests.

Both adult eagles were unbanded birds in adult plumage.

Human activity
Aircraft (military jets, small planes, helicopters, sonic boom) represented 124 (99.2%) of the 125 human activities recorded (Table 17). Military jets (n=107) represented an overwhelming percentage (86.3%) of the total activities recorded. The few amount of jets recorded on dawn-to-dusk days reflects the military's lack of flying during weekends. The most common response by the eagles to the flying activities was to "watch" (n=62, 49.6%). Eagles were recorded as being "restless" on six occasions when jets passed overhead. Restless behaviors recorded were adults being interrupted while feeding (n=3) and eaglets ducking during overflights (n=2). Soon after we placed the 4.5 week old eaglet from the zoo into the nest a group of jets passed through the canyon. The eaglet which had hatched in the nest sat motionless as jets flew by, but the "fostered" eaglet ducked and flattened itself against the nest. Other than flying through and over the canyon below the dam, six F-16 jets on 6 May were observed releasing flares in a mock dog-fight over the breeding area. Although this occurred at an elevation greater than 600 meters (2000 foot FAA advisory), it does reflect the extensive airspace use of the Alamo/Ive's Wash breeding areas.

Table 17. Human activity, Ive's Wash Breeding Area - ABENWP 1993, Arizona.

Type	Eagle behavior toward human activity[1]								
	N	W	R	F	L	B	?	D-D total[2]	Total
Military jets	34	51	6	-	-	-	16	12 (63.2%)	107 (85.6%)
Small planes	2	5	-	-	-	-	1	3 (15.8%)	8 (6.4%)
Military helicopters	-	6	2	-	-	1	-	4 (21.0%)	8 (6.4%)
Sonic boom	-	-	-	-	-	-	1	0	1 (0.8%)
Agency workers	-	-	-	1	-	-	-	0	1 (0.8%)
Total	36	62	8	1	0	1	18	19 (100%)	125 (100%)

[1]N=None, W=Watched, R=Restless, F=Flushed, L=Left Area, B=eagle not in area, ?=Unknown.
[2]D-D Total=Information collected on dawn-to-dusk observation days.

Wildlife interactions

The Ive's Wash eagles were observed interacting with common ravens, red-tailed hawks, turkey vultures, peregrine falcons, subadult bald eagles, great blue herons, and a raccoon. Observation of interactions with the Alamo eagles are described in the Alamo Breeding Area section.

Nearby nesting common ravens, red-tailed hawks and peregrine falcons were the most active species interacting with the bald eagles. Peregrine falcons were observed interacting with the eagles on 11 April and 6 May. Observations of peregrines continued to occur in late May, but no further interactions were recorded. The timing of the peregrine interactions strongly suggests that falcons are breeding downriver of the eagle nests in the Bill Williams canyon.

Food habits

Although no captures of prey were observed, eagles were commonly observed flying from the lake and over Alamo Dam with food in their talons. Consistent with previous years, foraging most likely took place at the lake (Hunt et al. 1992, Beatty 1993). But due to the inundation of hunting perches on the north end of the lake, specific locations of the Ive's Wash success was unknown.

Releases of water from Alamo Dam ranging from 200-7,000 cfs caused the Bill Williams river to flow fast and turbid. Successful forages for live fish below the dam were not observed and probably did not occur often, yet fish or mammals killed from the high flows were likely picked up by the eagles.

A total of 86 prey deliveries were observed by the Ive's Wash eagles: 59 (69%) by the male, 10 (12%) by the female, and 17 (20%) by an unknown resident adult (Table 18). The predominant prey type observed was fish (n=52, 60%). Mammals (n=5, 6%) and birds (n=8, 9%) were also observed in the nest. Species identified in the nest were largemouth bass, unknown catfish species, carp, suckers, kangaroo rat, American coot, and unknown grebe species (Table 19).

Table 18. Prey types delivered to nest by bald eagles at the Ive's Wash Breeding Area - ABENWP 1993, Arizona.

Sex	Prey types				
	Fish	Mammals	Birds	Unknowns	TOTAL
Male	38	3	8	10	59 (68.6%)
Female	8	-	-	2	10 (11.6%)
Unknown[1]	6	2	-	9	17 (19.8%)
TOTAL	52 (60.5%)	5 (5.8%)	8 (9.3%)	21 (24.4%)	86 (100%)

Table 19. Prey species delivered to nest by bald eagles at the Ive's Wash Breeding Area - ABENWP 1993, Arizona.

Sex	Prey types[2]											
	Fish					Mammals		Birds			?	TOTAL
	LMB	CRP	SKR	CAT	FSH	KRT	MAM	ACT	GRB	BRD	UNK	
Male	8	1	1	5	23	1	2	3	1	4	10	59 (68.6%)
Female	1	-	-	1	6	-	-	-	-	-	2	10 (11.6%)
Unknown[1]	1	-	-	1	4	-	2	-	-	-	9	17 (19.8%)
TOTAL	10	1	1	7	33	1	4	3	1	4	21	86 (100%)

[1]Unknown - Undetermined sex of resident adult that delivered a prey item
[2]Prey types = LMB = largemouth bass, CRP= carp, SKR=sucker sp., CAT=catfish sp., FSH=fish sp., KRT=kangaroo rat sp., MAM=mammal sp., ACT=American coot, GRB=grebe sp., BRD=bird sp., UNK=unknown.

Management activities

Buoys were placed in a semi-circle at a distance of 100 m around the Ive's Wash snag nest #2 in Woody's Cove on 30 December 1992. Buoys had the international symbol for "No Entry" and the words "No Entry" on them.

A "No Entry" sign and blockade was placed at the road leading to Woody's Cove.

Signs were placed at Alamo Dam and upriver and downriver of nest #1 to restrict discharge of firearms on 30 December 1992.

Signs were placed at boat ramps informing boaters of buoyed wildlife closure areas on the lake.

Maps of the closed and restricted firearms area were posted and copied for distribution at Alamo State Parks office and Wayside Inn.

Bald eagle brochures were given for distribution to Alamo State Parks office and Wayside Inn.

The ABENWP display was presented at Alamo Lake for the months of January and February 1993.

Cooperation between the Phoenix Zoo, AGFD, USFWS and helicopter support from Channel 10, allowed us to successfully foster the "zoo" eaglet from the Alamo nest into the Ive's Wash nest.

Management recommendations

1.The Ive's Wash snag nest in Woody's Cove was inundated. Periodic visits to the lake from September-December to determine if the nest is still standing or if the eagles are building a new nest on the lake will be necessary.

2.If a new nest is built or if the Woody's Cove nest is still standing, buoy a semi-circled area around the nest tree consistent with buoy placement and scheduling from 1991-1993.

3.Continue to restrict firearm discharges below the dam, place signs at boat ramps, place signs along the Bill Williams River, block off the road to Woody's Cove, and distribute brochures at visited places on the lake.

4.Coordinate a December meeting with State Parks, BLM, USFWS and AGFD personnel to work on logistics for ABENWP monitors.

5.Develop additional funding from the ACOE for monitoring of Alamo Lake to fulfill section 7 obligations for potential inundation of future nests.

6.Work with Luke Air Force Base to redirect low-level military jet flights away from Alamo Lake.

7.Continue nestwatch activities.

Ladders Breeding Area

Observation period
The Ladders Breeding Area was observed from 6 February to 21 March. A total of 209 hours over 34 days occurred throughout the monitoring period; 16 days were dawn-to-dusk days.

Eagle activity
Incubation began in nest #3 between 30 January and 1 February. Two eaglets hatched between 8-10 March. Nestwatchers left the site for their days off on Monday, 15 March. When they returned on 19 March both adult eagles were observed, but no eaglets were in the nest. Audubon Society volunteers watched the site on Wednesday, 17 March and did not observe any eaglets but did record an aggressive interaction at the nest between two adults. The observation point across Chasm Creek provides a good view into the nest from above. The Audubon volunteer's observation narrows the time of the eaglets' death between the afternoon of 15 March and the early morning of 17 March.

The nest was climbed on 21 March and approximately 40 Mexican chicken bugs were observed. It is likely that because these bugs are very small (an individual bug is about the size of a pin-head) many more existed in the nest. These blood-sucking ectoparasites (from the family Cimicidae), were initially documented in Arizona bald eagle nests by Grubb (1986) and linked to the deaths of 7 nestling Arizona bald eagles from 1987-1989 (Hunt et al. 1992). Nest #3 most recently contained chicken bugs the last two times it was used (1987 and 1989). Two nestlings fledged from both of these attempts. Nest #4, located 1 kilometer upriver of nest #3 has never been observed to contain chicken bugs. Initially, our belief was that chicken bugs were responsible for the death of the Ladders eaglets.

Observations of an interaction at the nest made by Audubon Society volunteer Jim Powers on 17 March, caused us to consider additional causes (than solely chicken bugs) for the death of the Ladders eaglets. Powers, after not observing any eaglets for 4 hours, observed two adult eagles interacting in the nest at 1229 pm. The following is an excerpt from Powers field notes: "*Second adult...flies down to nest. Both adults get into a fight. Using talons and beaks they confront each other and literally roll off nest in a tussle. Then the second adult flies behind cliff and is not seen.*"

Intruding bald eagles have been observed in Arizona (Hunt et al. 1992, Carroll and Housser in prep.) aggressively interacting with breeding resident bald eagles and their offspring. An incident observed at the Cibecue Breeding Area in 1987 shares many of the components observed at Ladders this year. At Cibecue, the resident female was last observed being chased by an intruder near-adult male. The resident male was then left to defend the nest when the intruder male was observed entering the nest and attacking and killing the five-week old eaglet. The resident male drove the intruder away. Similar to Ladders in 1993, after the eaglet was discovered dead, the nest was climbed and heavy infestations of chicken bugs were observed.

The interaction that Powers observed is clearly atypical for a mated pair of eagles. With previous documentation of aggressive interactions with intruder bald eagles (Hunt et al. 1992) and the quick disappearance of the eaglets it would be safe to speculate that the intruder eagle was responsible for the death of the two Ladders eaglets. Quite possibly though, Mexican chicken bugs contributed by causing the adults to spend more time away from the nest, thus leaving the small young more vulnerable to predators.

Human activity

A total of 164 activities were observed at the Ladders BA in 1993. The most common activities observed were aircraft and watercraft (Table 20). A total of 77 small planes and 3 helicopters represented 46.4 percent of the total activities recorded. Canoes, rafters and boaters (n=80) represented 48.2 percent of the total activities recorded.

The recorded number of 80 boat parties consisted of 271 individual boats over two months time. This surpasses the total of number of individual boats recorded in 1992 (n=250) in four months (Beatty 1993). Most certainly, the high water flows resulted in prime river running conditions bringing out a large number of boaters.

Few significant responses were recorded from watercraft and aircraft. Yet, 16 groups of boaters disembarked within the closed area. Two groups exited at the Chasm Creek confluence where the nest is located. One stopped for lunch, the other tried to climb the "ladders" and cliff to the top of the canyon. Both groups did not realize they were within a closure and left after being contacted by nestwatchers. More positively, as nestwatchers walked along the river after approaching hikers within the closure, a group of boaters informed the nestwatchers that they were within an eagle closure.

The most unusual activity occurred on 10 March when a funeral group of 28 people walked to the cliff edge approximately 0.1 km from the nest. The group held a short funeral memorial and tossed the deceased's ashes into the canyon.

The USGS gauging station located below nest #4 was broken during heavy river flows. Fixing this station was postponed in late January due to the incubating eagles. Later, as rain continued to fall, concern grew over not knowing the amount of water entering Horseshoe Reservoir. The station was fixed during incubation on 22 February. The nestwatchers were made aware and were instructed to monitor the eagles activities. The incubating eagles were attentive to the activity, but did not flush or display any overt restless behavior.

Wildlife interactions

The eagles were observed interacting with common ravens, red-tailed hawks, American kestrels, bald eagles and river otters. Eagles were observed watching otters and foraging on a soft-shelled turtle left on shore by the otter. Described in detail above in the "Eagle activity" section, Audubon volunteers observed an intruder eagle interact with a resident adult at the nest.

Table 20. Human activity, Ladders Breeding Area - ABENWP 1993, Arizona.

Type	Eagle behavior toward human activity[1]								
	N	W	R	F	L	B	?	D-D total[2]	Total
Small plane	63	6	8	-	-	3	-	55 (40.4%)	80 (46.5%)
Helicopters	1	1	1	-	-	-	-	3 (2.2%)	3 (1.7%)
Canoes	26	9	-	1	1	8	-	39 (28.7%)	45 (26.2%)
Hikers	4	1	-	-	-	-	-	3 (2.2%)	5 (2.9%)
Boaters	18	2	2	-	-	-	-	21 (15.4%)	22 (12.8%)
Rafters	11	1	-	-	-	1	-	11 (8.1%)	13 (7.6%)
Agency workers	-	-	-	-	-	-	1	1 (0.7%)	1 (0.6%)
Researchers	-	-	-	-	-	-	1	1 (0.7%)	1 (0.6%)
Dogs	2	-	-	-	-	-	-	2 (1.5%)	2 (1.2%)
Total	125	20	11	1	1	12	2	136 (100%)	172 (100%)

[1]N=None, W=Watched, R=Restless, F=Flushed, L=Left Area, B=eagle not in area, ?=Unknown.
[2]D-D Total=Information collected on dawn-to-dusk observation days.

Food habits

Due to the death of the eaglets at a young age, few forage attempts and prey deliveries were recorded in 1993 (Tables 21 and 22). The male was observed flying to the cliff across from the nest and catching a rock squirrel and flying to the shoreline to capture a shorebird.

Management activities

Audubon volunteers monitored the nest on the nestwatchers days-off.

The USGS worked with the USFWS and AGFD in their efforts to fix the gauging station without disrupting the eagles activities.

Table 21. Observed forage events[1] and success by bald eagles at the Ladders Breeding Area - ABENWP 1993, Arizona.

Sex	Prey types				
	Fish	Birds	Mammals	Carrion	TOTAL

	E[2]	S-U[3]	E	S-U	E	S-U	E	S-U	E	S-U
Male	-	-	1	1-0	2	1-1	1	1-0	4	3-1
Female	-	-	-	-			1	1-0	1	1-0
TOTAL	-	-	1	1-0	2	1-1	2	2-0	5	4-1

[1]Each number represents a forage event for a food item not the number of strikes to capture the item
[2]E = Forage events observed
[3]S-U = Successful captures of prey - unsuccessful capture of prey

Table 22. Prey types delivered to nest by bald eagles at the Ladders Breeding Area - ABENWP 1993, Arizona.

Sex	Prey types				
	Fish	Mammals	Birds	Unknowns	TOTAL
Male	3	1	1	1	6 (66.6%)
Female	1	-	-	2	3 (33.3%)
TOTAL	4 (44.4%)	1 (11.1%)	1 (11.1%)	3 (33.3%)	9 (100%)

Management recommendations

1.Signs were washed away during the high river flows in 1993. Replacing these signs will be necessary before the 1994 breeding season. Due to the number of boat parties that disembarked within the closure it would be prudent to sign the closure's boundary and place `signs at common take-out spots. This would effectively inform boaters that they are still inside a closure and reduce unnecessary disturbance to nesting eagles. Common take-out locations are the Chasm Creek confluence downriver to the southern end of the closure's boundary.

2.The Audubon Society volunteers are an excellent way to monitor the nest during the nestwatcher's days-off. But, if care is not taken in Audubon's monitoring, potentially, more harm than good could occur. Over the past two seasons, Audubon volunteers have traveled too closely to the eagles during incubation and monitored an alternate inactive nest.

The Verde Ranger District of the USFS has done an excellent job of coordinating this additional effort from Audubon. However, to prevent misunderstandings and increase effectiveness, it is recommended that Audubon volunteers meet with nestwatchers in the field to go over "do's and don'ts" and eagle emergency protocol.

3.Continue nestwatch activities.

Lake Pleasant Breeding Area

Observation period
Observation began on 5 February 1993. A second team of nestwatchers arrived on 6 March and the site was monitored daily until 18 May. The site was monitored a total of 908 hours over 90 days of observation.

Eagle activity
Incubation began in nest #2 between 11-18 January 1993. At least one young hatched between 20-23 February. Adult eagles were observed feeding in two places soon after eggs hatched, but only one eaglet (first observed on 12 March) was ever seen. The eaglet fledged between 30 May and 5 June. This was the first recorded eaglet that hatched and fledged from the Pleasant BA.

The adult male eagle was in its sixth year and banded with a blue visual identification band (VID) engraved with a "W" on the left tarsus and a silver USFWS band on the right. This blue VID band was placed on the bird as a nestling at the Horse Mesa BA (Hunt et. al 1992). The female eagle was an unbanded bird in adult plumage.

Human activity
A total of 306 human activities were observed throughout the breeding season (Table 23). Small planes were recorded the most (n=128, 41.8%), followed by boaters (n=94, 30.7%), military jets (n=36, 11.8%), and helicopters (n=29, 9.5%).

Low-flying aircraft (small planes, helicopters, military jets, and ultralights) was the most predominant group recorded (n=195, 63.7%). Eagles were observed behaving in a restless manner 37 times, representing 14% of the recorded responses (n=264). Twenty of 128 small planes, 5 of 29 helicopters, and 10 of 36 military jets caused eagles to be restless. Although only three ultralights were observed, two caused eagles to be restless. Most (72%) aircraft were recorded on weekends. The proximity of Deer Valley and Falcon Field airports and curiosity to view the "new" lake size were likely contributors to the large amount of aircraft flying over Lake Pleasant.

Motorized boats represented the second largest group recorded in the breeding area (n=94, 30.7%). However, only 35 (37.2%) of these boats were unofficial boats, the other 59 (62.8%) boats were park ranger, sheriff, and AGFD patrol boats inspecting the closed area for violations and other official business. Thirteen boats (13.9%) caused eagles to respond significantly: eagles were restless 9 times, left the area 3 times, and were interrupted once during a forage attempt.

Vehicles (3 vehicles and 1 ORV) were nearly absent in the data set for 1993. The long 15 mile trip through two creeks, some tricky turns, and abundant closure signs probably kept most people from finding their way to the north end of the lake. But, as people begin to explore the new lake and further paving occurs west of the lake, management of vehicle traffic will have to be more aggressive.

1993 was the first season that nestwatchers monitored the Lake Pleasant BA for an entire season. It was also the first season of the higher lake levels (~70 feet). In previous years, access to the nest area by boat was severely limited. Boating represented a management challenge not previously encountered at Pleasant. The recorded activity in 1993 indicates that the public responded well to the buoyed closure at the entrance to the Agua Fria arm of the lake. Compared to a buoyed closure at Alamo Lake in 1992 where 180 boats entered the area (Beatty 1993), only 35 "unofficial" boats were recorded entering the Pleasant closure. Reasons for the remarkable compliance were consistent nestwatch and enforcement presence, radio communication between nestwatchers and park enforcement, informational hand-outs at the park entrance, press releases and newspaper articles, radio programs and interviews, and television coverage.

Table 23. Human activity, Lake Pleasant Breeding Area - ABENWP 1993, Arizona.

Type	Eagle behavior toward human activity[1]									
	N	W	R	F	L	B	X	?	D-D total[2]	Total
Small planes	12	76	20	-	-	-	-	20	100 (46.7%)	128 (41.8%)
Helicopters	1	21	5	-	-	-	-	2	18 (8.4%)	29 (9.5%)
Gunshots	1	-	-	-	-	-	-	-	1 (0.4%)	1 (0.3%)
Kayaks	1	-	-	-	-	-	-	-	1 (0.4%)	1 (0.3%)
ORV	-	-	-	-	-	-	-	1	1 (0.4%)	1 (0.3%)
Boaters	21	47	9	-	3	-	1	13	62 (29.0%)	94 (30.7%)
Military jets	6	14	10	-	-	-	-	6	21 (9.8%)	36 (11.8%)
Agency worker	-	2	-	2	-	-	-	-	3 (1.4%)	4 (1.3%)
Ultralights	-	1	2	-	-	-	-	-	2 (0.9%)	3 (1.0%)
Vehicle	1	2	-	-	-	-	-	-	2 (0.9%)	3 (1.0%)
Jet Ski	1	3	-	-	-	-	-	-	2 (0.9%)	4 (1.3%)
Rock slides	-	-	2	-	-	-	-	-	2 (0.9%)	2 (0.7%)
Total	44	166	48	2	3	-	1	42	214 (100%)	306 (100%)

[1]N=None, W=Watched, R=Restless, F=Flushed, L=Left Area, B=eagle not in area, X= other, ?=Unknown.
[2]D-D Total=Information collected on dawn-to-dusk observation days.

Wildlife interactions

The Lake Pleasant eagles were observed interacting with bald eagles, ospreys, peregrine falcons, prairie falcons, American kestrels, red-tailed hawks, turkey vultures, common ravens, American crows, great blue herons, black-crowned night herons, hummingbird species, gull sp., flycatcher sp., and burros.

Nesting prairie falcons on a nearby cliff west of the eagle's nest were the source of most interactions. Nesting great blue and black-crowned night herons also interacted often with the eagles. Certainly, the most odd interaction occurred when an eagle perched above the nest was flushed after two burros approached within 4 meters of the bird. Peregrine falcons pursued the eagles twice in March.

Food habits

Eagles were recorded attempting to forage on 14 separate instances in the 1.2 kilometer observable stretch of lake in front of the nest cliff (Table 24). One forage attempt for a white bass was successful. Eagles attempted to capture birds on 8 occasions, but were unsuccessful each time.

A total of 99 prey deliveries were observed (Table 25). The male arrived with 64 (65%) items and the female brought in 35 (35%) items. Fish were recorded arriving 35 times to the nest followed by 6 birds, 4 mammals and 54 unknowns. Species identified in the nest were flathead catfish, carp, black crappie, white bass, largemouth bass, and American coot (Table 26). Additional species observed in prey remains collected were feathers from Gambel's quail, woodpecker sp., dove sp., duck sp. and wren sp.

Lake elevations ranged from 1593.0 feet on 7 January to 1665.8 feet on 1 June. This level is still shy of the projected high of 1702 feet expected in the winter of 1994. In 1993, eagles were observed near the dam and also flying up the Agua Fria arm. Important forage locations for these eagles are unknown, but it is safe to speculate that prey was acquired both on the lake and the "river" upstream of the nest. It is also assumed that because of the increased lake elevation, eagles will have more locations to find fish. Yet, in future seasons, Lake Pleasant's elevations are projected to fluctuate from 1640 feet to 1685 feet for storage and release back into the Hayden-Rhodes Aqueduct of the Central Arizona Project canal. Whether this change in elevation will have an affect the fisheries or the eagle's ability to acquire food is unknown.

Table 24. Observed forage events[1] and success by bald eagles at the Lake Pleasant Breeding Area - ABENWP 1993, Arizona.

Sex	Prey types					
	Fish		Birds		TOTAL	
	E[2]	S-U[3]	E	S-U	E	S-U
Male	2	1 - 1	4	0 - 4	6	1-5
Female	8	0 - 8	-	-	8	0-8
TOTAL	10	1 - 9	4	0 - 4	14	1-13

[1]Each number represents a forage event for a food item not the number of strikes to capture the item
[2]E = Forage events observed
[3]S-U = Successful captures of prey - unsuccessful capture of prey

Table 25. Prey types delivered to nest by bald eagles at the Lake Pleasant Breeding Area - ABENWP 1993, Arizona.

Sex	Prey types				
	Fish	Mammals	Birds	Unknowns	TOTAL
Male	27	3	3	31	64 (64.6%)
Female	8	1	3	23	35 (35.4%)
TOTAL	35 (35.4%)	4 (4.0%)	6 (6.1%)	54 (54.5%)	99 (100%)

Table 26. Prey species delivered to nest by bald eagles at the Lake Pleasant Breeding Area - ABENWP 1993, Arizona.

Sex	Prey types[1]										
	Fish						Mammals	Birds		Unknown	TOTAL
	FCT	CRP	BCP	WBS	LMB	FSH	MAM	ACT	BRD	UNK	
Male	1	1	1	5	1	18	3	2	1	31	64 (64.6%)
Female	-	-	3	-	-	5	1	-	3	23	35 (35.4%)

TOTAL	1	1	4	5	1	23	4	2	4	54	99 (100%)

Prey types = FCT=flathead catfish, CRP= carp, BCP=black crappie, WBS=white bass, LMB = largemouth bass, FSH=fish sp., MAM=mammal sp., ACT=American coot, BRD=bird sp., UNK=unknown.

Management activities

1.Buoys blocking off the Agua Fria arm were set in January and removed in mid-July.

2.Signs were in place along the road into the eagle area informing the public that the road was closed for breeding bald eagles.

3.Informational fliers presenting Arizona and Lake Pleasant eagle facts and a map of the closure were given to the Park to hand-out to each boater entering the lake.

4.Television news segments, radio interviews and programs, and newspaper articles described the Pleasant bald eagles and the closed area.

5.Cactus salvaging activities by the BR were not conducted in the eagle area for logistical and safety reasons and to reduce disturbance to the eagles.

Management recommendations

1.Continue to place buoys blocking off the Agua Fria arm. The high amount of recreation that Lake Pleasant receives due to its proximity to Phoenix threatens the success of this nest. Boaters in 1993 were very responsive to the buoys. As the Lake Pleasant's facilities improve to accommodate more people (boat ramps, roads, campgrounds) and the lake level rises higher boating may grow to be a larger problem should eagles remain using nest #2.

a.As water elevations reach Pleasant's maximum of 1702 feet, boaters will be able to access the nest area from the north. A channel is supposed to develop allowing access to the Agua Fria north of the nest cliff. Buoying off this access area in addition to the area that was buoyed in 1993 will be necessary.

2.Continue to aggressively educate the public about the closure and bald eagles at Pleasant. Fliers with Arizona eagle facts and a map of the closure were given to the park to distribute to each boater as they entered the park. The fliers were not consistently handed out by park personnel, yet were still available at the ranger station. Make these fliers available at boat ramps and to every boater entering the lake. This can potentially be the best way to educate the public on Arizona's eagle population. Continue to:

a.Distribute pamphlets.
b.Distribute information through radio, television and print media.
c.Sign boat ramps.

3.Vehicles entering the breeding area were not a problem in 1993. Automobiles may become more of a management difficulty in the future as the west side of the park gets paved and the public begins to explore the north end of the lake. Continue to:

a.Sign the road closed entering the nest area.
b.Enhance the closure with a fence or blockade to emphasize that the road is closed to the public during the breeding season.

4.Continue to monitor the site with nestwatchers and supply them with radios to communicate with park enforcement.

5.Provide a thank you flier and press release to Pleasant recreationists for their contribution toward bald eagle management.

Orme Breeding Area

Observation period
A total of 646 hours over 71 days were spent observing the Orme BA from 19 February to 23 May. The nest was watched for 426 hours over the dawn-to-dusk days.

Eagle activity
Eagles laid eggs in cliff nest #3 on Mount McDowell between 1-7 February. Two eggs were observed in the nest on 13 March. Both eggs hatched near 15 or 16 March. Nestlings were first observed on 19 March. One eaglet fell from the nest and died about 5 May. The bird was found dead on 6 May. Heavy winds more than likely caused this eagle to fall. This was the second bird in two consecutive years to have fallen from a cliff nest at Orme and die. One eaglet fledged between 31 May and 6 June. A fire burned through the breeding area between Mount McDowell and Arizona Dam Butte in July 1993. Similar to the fire that occurred on Mount McDowell in 1990, no nests were reached by the flames.

Both resident eagles were unbanded birds in full adult plumage.

Human activity
A total of 254 human activities were recorded near the nest at Orme in 1993. Aircraft (small planes, helicopters) represented 92 percent (n=234) of all activities recorded. The remaining 8 percent (n=20) were hikers climbing near or on Mount McDowell (Table 27). Hiking activity decreased as the outdoor temperatures increased toward the end of the nesting cycle. All but one group of hikers were encountered on weekends. The nest area, located approximately 1.5 kilometers from the Salt River, was not affected by casual human activity from river oriented recreation. Yet, the effects of human activity along the river on the eagle's foraging grounds is unknown.

Aircraft use is common near the Orme BA. The proximity of Falcon Field, Scottsdale and Deer Valley airports are the main source of private plane owners. McDonnell Douglas Helicopter Company, Maricopa County Sheriffs Office, and other Phoenix based helicopter use has been observed flying near the Orme BA. Certainly, the close proximity of Phoenix and the notoriety of Mount McDowell attracts aircraft closer to the mountain than they would normally approach. Evidence for this were the five helicopters that were recorded landing on top of the mountain. Twice, perched eagles flushed and did not return until the helicopters left. On all five occasions, helicopters spent fewer than 15 minutes on top of the mountain.

Wildlife interactions
Similar to previous seasons (Hunt et al. 1992, Beatty 1993) when eagles nested on Mount McDowell (1990, 1992) eagles commonly pursued and were pursued by nesting prairie falcons and common ravens. Eagles were also observed interacting with turkey vultures and red-tailed hawks.

Table 27. Human activity, Orme Breeding Area - ABENWP 1993, Arizona.									
Type	Eagle behavior toward human activity[1]								
	N	W	R	F	L	B	?	D-D total[2]	Total
Small Plane	57	56	4	-	-	1	53	129 (74.6%)	171 (66.8%)
Helicopter	9	28	4	2	-	-	22	26 (15.0%)	65 (25.4%)
Hikers	9	1	3	1	1	-	5	18 (10.4%)	20 (7.8%)
Total	75	85	11	3	1	1	80	173 (100%)	256 (100%)

[1]N=None, W=Watched, R=Restless, F=Flushed, L=Left Area, B=eagle not in area, ?=Unknown.

[2]D-D Total=Information collected on dawn-to-dusk observation days.

Five interactions with intruder bald eagles were observed in 1993. Near-adult bald eagles were observed four times interacting with the resident eagles. On 6 and 7 March a near-adult missing primary feathers from its left wing was escorted from the breeding area by the adult male. On 11 March a near-adult was observed in a talon-lock and barrel roll three times during an interaction with the resident male. On 12 March, another near-adult was pursued and escorted from the area by the resident male. On 23 April, an unknown adult was pursued from the area by both resident adults.

Table 28. Prey types delivered to nest by bald eagles at the Orme Breeding Area - ABENWP 1993, Arizona.				
Sex	Prey types			
	Fish	Mammals	Unknowns	TOTAL
Male	14	3	7	24 (48.0%)
Female	18	2	4	24 (48.0%)
Unknown[1]	1	1	-	2 (4.0%)
TOTAL	33 (66.0%)	6 (12.0%)	11 (22.0%)	50 (100%)

[1]Unknown - Undetermined sex of resident adult that delivered a prey item

Food habits

A total of 50 prey deliveries were recorded entering the Orme nest in 1993. Both the male and the female delivered 24 items apiece. An unknown resident adult arrived with two. Thirty-three (66%) fish were delivered to the nest. Mammals (n=6, 12%) and unknown items (n=11, 22%) were also delivered. Species identified in the nest were channel catfish, carp, black crappie, unknown bass, desert cottontail and a wood rat. Due to the great distance that the nest area is from the river, no forage attempts were observed.

Management activities

The Salt River Pima Indian Tribe installed a road closure, prohibiting vehicles to travel up the jeep trail between Mount McDowell and Arizona Dam Butte.

Management recommendations

1. Continue Arizona Bald Eagle Nestwatch monitoring.

2. The road closure to Mount McDowell has helped reduce foot traffic in the nest area. Continue implementing this seasonal closure.

3. Nestwatchers have discovered that unauthorized hikers are approaching Mount McDowell from dirt road that originates from a turn-off of a canal road west of Mount McDowell. This road terminates at the base of the mountain on the southwestern side. Often nestwatchers observe people already on the mountain that have ascended from the blind side. Closing this road would help stop these unauthorized hikers.

4. Distribute more information to local airports to help reduce air traffic near Orme nests.

Pinto Breeding Area

Observation period
The Pinto BA was observed between 15 March and 12 April. A total of 17 days were spent at the site totaling 174 hours. Every day of monitoring was from dawn-to-dusk. All monitoring days were weekends and every other Friday. Pinto nest watchers split time between Pinto and Tonto due to the heavy recreational pressure near Tonto.

Eagle activity
Eagles were first observed incubating in nest #3 between 21 January and 8 February. Hatching of one eaglet occurred prior to 18 March and fledging near 10 June.

The Pinto BA was successful for the first time since the site's discovery in 1988. Prior to 1993, the Pinto female was in a polygynous relationship with the Pinal eagles (Hunt et al. 1992, Beatty 1993). The Pinto female would lay eggs after copulating with the Pinal male, but would fail soon after because it could not incubate the eggs alone.

The 1993 season was the first year the Pinto female occupied the territory with her own male. The male was in adult plumage and wore a silver USFWS band on the left leg. The Pinto female is in adult plumage and has a black VID band on its left leg and a silver USFWS band on its right. This bird also wears a radiotelemetry backpack from BSAI's study (Hunt et al. 1992).

Human activity
A total of 18 human activities were observed at the Pinto BA during the 17 days of monitoring. Anglers (n=3), boaters (n=4), and ORV's (n=4) represented the bulk of the activities recorded. Jet ski's (n=2) were also observed in the Salt River near the nest (Table 29).

Due to the distance the water was from the nest in 1993, the recorded river traffic (n=9) did not appear to affect the eagles. Yet, when the levels of Roosevelt Lake rise in 1996, watercraft activities will more than likely increase. The increase in boating activity and easy access to the nest will require more intensive management.

Terrestrial activity was also minimal over the 17 days of monitoring. Off-road vehicles were recorded 4 times and gunshots were heard twice. A variety of dirt roads exist in and about the nest area's grove of cottonwood trees. But fortunately for the eagles, the immediate nest area is protected by thick jungles of salt cedar and mesquite. It is unknown how terrestrial activity will change once the lake levels rise.

Wildlife interactions
The eagles were observed chasing a raven from the nest area on one occasion.

Table 29. Human activity, Pinto Breeding Area - ABENWP 1993, Arizona.

Type	Eagle behavior toward human activity[1]								
	N	W	R	F	L	B	?	D-D total[2]	Total
Anglers	3	-	-	-	-	-	-	3 (17.6%)	3 (17.6%)
ORV	2	2	-	-	-	-	-	4 (23.5%)	4 (23.5%)
Jet ski	2	-	-	-	-	-	-	2 (11.8%)	2 (11.8%)
Boaters	2	2	-	-	-	-	-	4 (23.5%)	4 (23.5%)
Gunshots	-	2	-	-	-	-	-	2 (11.8%)	2 (11.8%)
Agency workers	-	-	-	1	-	-	-	1 (5.9%)	1 (5.9%)
Small plane	-	1	-	-	-	-	-	1 (5.9%)	1 (5.9%)
Total	9	7	0	1	-	-	-	17 (100%)	17 (100%)

[1]N=None, W=Watched, R=Restless, F=Flushed, L=Left Area, B=eagle not in area, ?=Unknown.
[2]D-D Total=Information collected on dawn-to-dusk observation days.

Food habits

No forage attempts were observed, yet eagles were frequently seen flying to and from the direction of Roosevelt Lake where they were most likely acquiring food.

Six prey deliveries were observed. All were brought to the nest by the adult male eagle. Five items were identified as unknown fish and one was unknown to type.

Management activities

Archaeological activities were postponed at Meddler Point by the BR until eagles had successfully raised the young.

Management recommendations

1.Prior to the rising of Roosevelt Lake in 1996, the Pinto Breeding Area will most likely need few management activities other than:

a.Restricting access to roads leading to the nest area.
b.Continue nestwatch activities.

2.Once the lake rises more extensive monitoring and management will be needed.

a.Buoys or floating berms will need to restrict boat access to the nest area.
b.Nestwatchers will need a boat to contact boaters near the nest area.
c.Campgrounds have become more developed near areas of the Salt River inflow to Roosevelt. Education and signs near these areas will be necessary in order to inform and educate

recreationists.

d. The increased lake level will eventually kill the live Pinto nest trees. Because eagles in Arizona do nest in snags, should these trees/snags remain standing, eagles will probably continue to use them as nests. However, unlike the Alamo BA that also uses snags, it appears that there is no immediate alternative nest tree for these birds once the trees/snags fall.

1. It may be prudent to plant cottonwood trees in a future conservation area set aside from recreation areas.

2. Although artificial nest structures are discouraged because they do not solve the bigger problem of habitat degradation, the Pinto BA may be one site that there is few alternatives.

Sheep Breeding Area

Observation period
The Sheep Breeding Area was monitored for the first time by the ABENWP since 1988. From 6 February 1993 to 14 March 1993, a total of 26 days and 239 hours were spent monitoring the area. Fifteen days consisting of 167 hours of observation were spent monitoring from dawn-to-dusk.

Eagle activity
The Sheep eagles did not lay eggs in 1993, yet we have progressively observed more eagle activity over the past three seasons. In 1991, the site was consistently checked throughout the breeding season, but no eagles were observed. The following year, observations of a near-adult female with a green VID band, USFWS band, and telemetry backpack paired with an unbanded male adult eagle were made in the area. Throughout the 1992 breeding season, the BR (H. Messing pers. comm.) reported observations of perched eagles in the Punkin Center area. Although we observed eagles in the nest area in 1992, a family of great-horned owls successfully raised three young in nest #1. In 1993, what appeared to be the same pair of eagles were observed perched in the nest area prior to the arrival of monitors.

Although eagles were regularly seen in the area, the birds were first observed perched together in the nest on 24 February. At this time, both eagles began to renovate nest #1 daily for 1-3 hours until 6 March when nest repair ceased. Afterwards, the birds were not observed working on the nest again and were seen less than 2 hours a day in the nest area until nestwatchers left the site.

The female was banded with a green VID band on the left leg, USFWS band on the right, and a telemetry backpack. The symbol engraved on the VID band was a "C" inside a circle indicating that this bird hatched from the 76 Breeding Area in 1988. The male was an unbanded eagle in adult plumage.

Human activity
Heavy rain and flooding of Tonto Creek and minimal observation time were likely contributors to the small amount of human activity recorded in the Sheep Breeding Area in 1993. A total of 11 activities in 6 different categories were recorded (Table 30). Seven (63.6%) of the activities occurred when a bird was not in the nest area.

Wildlife interactions
The Sheep eagles were observed interacting with subadult bald eagles, common ravens, red-tailed hawks, great blue herons, and a great-horned owl. All four interactions with a subadult bald eagles occurred from 20-24 March.

Food habits

Three forage attempts were made from a cottonwood perch 1.4 river kilometers downriver from the nest (Table 31). An unsuccessful attempt was made for a common merganser and unknown fish species.

Table 30. Human activity, Sheep Breeding Area - ABENWP 1993, Arizona.

Type	Eagle behavior toward human activity[1]								
	N	W	R	F	L	B	?	D-D total[2]	Total
Helicopters	-	-	-	1	-	1	-	1 (16.7%)	2 (18.2%)
ORV	-	-	-	-	1	-	-	1 (16.7%)	1 (9.1%)
Small planes	-	-	-	-	-	1	-	1 (16.7%)	1 (9.1%)
Shooters	1	-	-	-	-	3	-	1 (16.7%)	4 (36.4%)
Hikers	-	-	-	-	-	2	-	2 (33.3%)	2 (18.2%)
Hunters	1	-	-	-	-	-	-	0	1 (9.1%)
Total	2	0	0	1	1	7	-	6 (100%)	11 (100%)

[1]N=None, W=Watched, R=Restless, F=Flushed, L=Left Area, B=eagle not in area, ?=Unknown.
[2]D-D Total=Information collected on dawn-to-dusk observation days.

Table 31. Observed forage events[1] and success by bald eagles at the Sheep Breeding Area - ABENWP 1993, Arizona.

Sex	Prey types					
	Fish		Birds		TOTAL	
	E[2]	S-U[3]	E	S-U	E	S-U
Male	1	0 - 1	1	0 - 1	2	0-2
Female	1	1 - 0	-	-	1	1-0
TOTAL	1	1-1	1	1-0	3	1-2

[1]Each number represents a forage event for a food item not the number of strikes to capture the item
[2]E = Forage events observed
[3]S-U = Successful captures of prey - unsuccessful capture of prey

Management activities

In January we noticed that a large branch had fallen onto nest #1. The tree was climbed, but because the branch was much larger than we had estimated, it could not be moved. Fortunately, most of the nest was not obstructed by this branch.

To help protect the Sheep bald eagles and promote riparian growth along Tonto Creek, the BR purchased a 160 acre piece of land downriver of nest #1 that was proposed for a sand and gravel operation.

Management recommendations

1. The Sheep Breeding Area, unlike other Arizona bald eagle breeding areas, is severely limited by the number of potential nest sites. Few large trees in typical locations and no nearby cliffs exist to place a nest. Although the Tonto Creek Riparian Unit (TCRU) developed by the BR and the USFS encompasses the Sheep site, the present nest tree is dying and growth of new trees to nesting size will not exist for decades. An artificial nest and a cottonwood pole planting project may help replace loss of existing trees and speed up the cottonwood regeneration process. If an artificial nest is constructed in this area, it may be beneficial to either build a large nest in an existing tree or to build a nest tower and platform inside the protection of an existing large tree.

2. Increased observations of eagle activity at this breeding area indicates that a future nesting attempt is likely. It would be prudent to inspect the area for new nests in December and January. Should either a new nest or increased eagle activity be observed early, it would be best to station early nest monitors at this site and watch the site daily throughout the season.

3. There exists the possibility of a great deal of human activity in this breeding area due to its close proximity to the highway and the Punkin Center/Jake's Corner/Tonto Creek/Roosevelt communities. Although a closure would be in the best interest of the eagles, the topography does not lend itself to focused access points. Thus, enforcement would be difficult. Continued monitoring by the ABENWP may be the best way to protect these eagles from human activity.

76 Breeding Area

Observation period
Observation of the 76 Breeding Area began on 6 February 1993 and ended on 28 February 1993. The site was monitored for a total of 18 days, totaling 145 hours. Over 10 dawn-to-dusk days the site was watched for 105 hours.

Eagle activity
Incubation began on 5 or 6 February in nest #3. Activity at the nest remained "normal" until 26 February when the female left the eggs uncovered for 3 hours. On this day she displayed an odd "yawning" behavior. She opened her mouth at regular intervals of 30-35 seconds. She continued to display this odd behavior and left the eggs uncovered on 27 and 28 February for 4.5 hours and 6.3 hours respectively. Rain persisted these final two days of incubation and two eggs were collected for analysis on 28 February.

The female was an unbanded bird in adult plumage. The male is in adult plumage and had a silver USFWS band on the left tarsus. We made a mistake in the 1991-1992 ABENWP summary report (Beatty 1993) stating that the male had a band on its right tarsi. The male has been banded on its left tarsi at the 76 Breeding Area since 1988.

Human activity
Heavy rain, poor road conditions were likely contributors to the few amount of human activities recorded in 1993. A total of 5 activities were recorded (Table 32).

Table 32. Human activity, 76 Breeding Area - ABENWP 1993, Arizona.

Type	Eagle behavior toward human activity[1]								
	N	W	R	F	L	B	?	D-D total[2]	Total
Canoes	1	-	-	-	-	-	-	1 (25.0%)	1 (20.0%)
Horse-riders	2	-	-	-	-	-	-	1 (25.0%)	2 (40.0%)
Hunters	1	-	-	-	-	-	-	1 (25.0%)	1 (20.0%)
Agency workers	-	-	-	1	-	-	-	1 (25.0%)	1 (20.0%)
Total	4	0	0	1	0	0	0	4 (100%)	5 (100%)

[1]N=None, W=Watched, R=Restless, F=Flushed, L=Left Area, B=eagle not in area, ?=Unknown.
[2]D-D Total=Information collected on dawn-to-dusk observation days.

Wildlife interactions
One interaction with a red-tailed hawk was observed.

Food habits

One successful forage attempt was observed approximately 100 m downriver from the nest tree. Perched on the river bank, the female hopped into the water and caught a fish. After eating part of the fish on a log, two ravens flew to the fish and finished the remains.

Management recommendations

1. The 76 Breeding Area is situated between the Gisela and Jake's Corner communities. Although access to the site is difficult, visitors have entered at unmarked areas of the closure. It may be useful to place signs along barbed wire fences near the closures boundary and at other advantageous locations.

2. Jake's Corner and Punkin Center are stopping points for many residents and recreationists along Tonto Creek. Arizona bald eagle and ABENWP brochures displayed at these locations will help to educate the public.

3. Similar to the two other breeding areas (Sheep, Tonto) on Tonto Creek, cottonwood trees appear to be the only location to place nests in the presently known nest areas. As a result, the health of the riparian system along this drainage is vital for the continued existence of bald eagles. The grazing of cattle appears to represent the greatest threat. When grazing permits are renewed, the condition of the riparian habitat and timing of livestock round-up activities near nests during sensitive times of the birds breeding cycle must be considered.

4. Continue nestwatch activities.

Tonto Breeding Area

Observation period
The Tonto site was monitored sporadically toward the end of January by a roving team of nestwatchers. Daily monitoring began on 5 February 1993 as the Sheep nestwatchers monitored the site on the Tonto nestwatchers days-off. The site was watched for 918 hours over 90 days. Dawn-to-dusk observations were made over 45 days totaling 545 hours.

Eagle activity
Incubation began 2-5 February in new cottonwood tree nest #2. Hatching of two eaglets occurred near 11 March. One eaglet fledged on 29 May and the other took its first flight on 4 June.

The 1993 Tonto female was mistaken in 1992 as the adult male. It hatched in 1987 at the Horseshoe BA and was banded with a blue VID band on its right leg and a USFWS band on the left. The symbol on this female's band is a "G."

The 1993 Tonto male replaced the 1992 four-year old unbanded near-adult male (mistaken for the female). Hatching from the Pinal Breeding Area in 1987, the male also wore a blue VID band on its right leg and a silver USFWS band on its left. The symbol read on the band was a backwards "3."

Therefore, two blue VID banded eagles were breeding at the Tonto Breeding Area in 1993. The female (hatched from the Horseshoe BA in 1987) first arrived in 1992 and was unsuccessful in hatching eggs with an unbanded near-adult male. The 1992 unbanded near-adult male was replaced in 1993 with a blue VID banded male that hatched from the Pinal BA in 1987.

Human activity
Few human activities were recorded at the Tonto BA in 1993. High river flows of Tonto Creek reduced the amount of human activity that could get to the north bank near the eagle's nest. Access to the north end of the creek occurs mainly from A-Cross Road (a low river crossing ford) which could not be crossed until the middle of April. Once vehicles were able to cross the creek, terrestrial activity seemed to be mostly restricted to an undeveloped Indian Point Campground.

In addition to high river flows restricting human activity, the location of nest #2 appears to have fewer opportunities for casual disturbance than nest #1. Almost twice as many activities were recorded in 1992 (n=81) (Beatty 1993) when the Tonto eagles used nest #1 versus the 1993 effort (n=45) in nest #2. In 1992, the small bay at the confluence at Tonto Creek and Roosevelt Lake was responsible for a minimum of 30 percent of all activities (anglers, jet skiers, boaters) (Beatty 1993). Since nest #2 is located further upriver, activities associated with this bay were not recorded. Nest #2 is also located away from the easy access of the highway and Orange Peel Campground reducing the diversity of activities. Twenty different types of activities were recorded in 1992 versus only eight in 1993 (Table 33).

Presently, the USFS with funding assistance by the BR is proposing to develop a campground at the north end of Tonto Creek at the confluence of the creek and Roosevelt Lake. The recreational development is associated with the increased lake levels due to the raising of Roosevelt Dam (CAP Plan 6). The proposed development will involve paving of FS road 661, and the development of Cline Terrace Archaeological Site and Indian Point Campground. Indian Point has been projected for a 6-lane boat ramp and 200 unit camping area. In conjunction with this proposed project, the USFS is also considering building a bridge over Tonto Creek where A Cross road presently exists to enhance access to the campground. As of 30 September 1993, the project has been scaled down to a low grade river crossing and a more primitive campground near 100 units (D. Roy, USFS pers. comm.). Cline Terrace is intended to be within a 1/4 mile from nest #2 and 1/2 mile from nest #1. Indian Point Campground, which will be approximately 1 mile long, will be located approximately 1/2 mile from nest #2 and 3/4 of a mile from nest #1. Three jeep trails now exist near both nests. Destruction of one road and a gate were constructed by the USFS near nest #1 in 1992. Nest #2 has two mapped jeep trails nearby, one within 100 yards and another within 1/4 mile.

Without intensive management and education, this development, combined with the higher lake levels, will most likely bring an intolerable amount of human activity into the Tonto BA leading to either reduced productivity or abandonment. Highway 188 now lies within 1/4 mile of nest #1 and 3/4 of a mile to nest #2, but this activity is constant and does not tend to be intrusive or stagnant. Yet, unlike any other bald eagle area in Arizona, Highway 188 brings an unrestricted amount recreational activity very close to the breeding area. With the development of these recreational facilities and the associated road and bridge, the breeding area would be surrounded by roads. The proposed roads will be closest to nest #2 and will be an intrusive presence. People will drive slowly and have easy access on foot to the nest. Additionally, higher water levels will allow boaters to access both nests. Clearly, a six-lane boat ramp within a mile will bring many boaters into the nest area. Even with a scaled down facility, activity will still be able to access the nest area easily. Unlike a similar situation at Alamo Lake, there is no protection of the Tonto nests from hikers or boaters encroaching too close by "jungles" of salt cedar. Also, both Tonto nest trees will eventually die from water inundation leaving the nests in snags exposed to the public and more susceptible to heat stress.

It is likely that the new shallow water habitat in the nest area combined with cottonwood snags will provide abundant fish and perches for eagles. But, again, the same concerns expressed above over bringing more activity into the nest area is echoed for bald eagle foraging areas. Too many boaters, anglers, hikers, and shoreline campers in a relatively small area will likely keep bald eagles from acquiring food by being a constant presence.

Wildlife interactions

The Tonto bald eagles were observed interacting with other bald eagles, common ravens, American crows, great blue herons, golden eagles, ospreys, turkey vultures, peregrine falcons, and a rough-legged hawk.

One notable interaction occurred with a peregrine falcon on 7 April. A falcon flew near the nest when an eagle left its perch and headed toward the peregrine. The falcon soared above the eagle and began to stoop on the eagle. The eagle avoided the falcon and escorted the peregrine out of the area.

Table 33. Human activity, Tonto Breeding Area - ABENWP 1993, Arizona.

Type	Eagle behavior toward human activity[1]								
	N	W	R	F	L	B	?	D-D total[2]	Total
Small plane	11	3	-	-	-	-	6	14 (50.0%)	20 (44.4%)
Helicopters	-	2	-	-	-	-	6	4 (14.3%)	8 (17.8%)
Agency workers	-	4	-	-	3	-	-	3 (10.7%)	7 (15.5%)
ORV	-	3	-	-	-	-	-	3 (10.7%)	3 (6.6%)
Rancher	1	-	-	-	1	-	-	1 (3.6%)	2 (4.4%)
Archaeologists	2	-	-	-	-	-	-	0	2 (4.4%)
Canoes/kayaks	-	1	-	-	-	-	1	2 (7.1%)	2 (4.4%)
Hiker	-	1	-	-	-	-	-	1 (3.6%)	1 (2.2%)
Total	14	14	0	0	4	0	13	28 (100%)	45 (100%)

[1]N=None, W=Watched, R=Restless, F=Flushed, L=Left Area, B=eagle not in area, ?=Unknown.
[2]D-D Total=Information collected on dawn-to-dusk observation days.

Food habits

Two forage attempts were observed at the Tonto Breeding Area in 1993. A perched eagle was observed attempting to capture prey near the nest tree. Another instance observed was an eagle that dove from the air into the water 200-300 feet from the shoreline near Orange Peel Campground. The attempt was unsuccessful.

A total of 48 prey deliveries were recorded at Tonto in 1993. Twenty-six (54.2%) items were fish and the other 22 (45.8%) were unknown to type. The male arrived at the nest with 20 (41.7%) items. The female brought 15 (31.3%) prey items and an unidentified adult arrived with food 13 times (Table 34).

Only five prey items were identified to species: 1 channel catfish, 1 sucker, and 3 carp. The thick foliage around the nest and distance from the observation point made identification of a prey type and/or species at the nest difficult (Table 35).

Table 34. Prey types delivered to nest by bald eagles at the Tonto Breeding Area - ABENWP 1993, Arizona.			
Sex	Prey types		
	Fish	Unknowns	TOTAL
Male	10	10	20 (41.7%)
Female	11	4	15 (31.3%)
Unknown[1]	5	8	13 (27.0%)
TOTAL	26 (54.2%)	22 (45.8%)	48 (100%)

Table 35. Prey species delivered to nest by bald eagles at the Tonto Breeding Area - ABENWP 1993, Arizona.						
Sex	Prey types[2]					
	CC	S	CP	UF	?	TOTAL
Male	-	-	-	10	10	20 (41.7%)
Female	-	-	3	8	4	15 (31.3%)
Unknown[1]	1	1	-	3	8	13 (27.0%)
TOTAL	1	1	3	21	22	48 (100%)

[1]Unknown - Undetermined sex of resident adult that delivered a prey item
[2]Prey types - CC=Channel catfish, S=Sucker, CP=Carp, UF=Unidentified fish, ?=Unknown

Management activities

Two teams of nestwatchers working on staggered schedules monitored the site daily throughout the nesting cycle.

Section 7 consultation between the BR and USFWS was completed 21 January 1993. The USFWS found that the proposed A-Cross Road, Indian Point Campground, Cline Terrace Archaeological Site and Roosevelt Lake operating levels are not likely to jeopardize the continued existence of the southwestern population of the bald eagle. Following the opinion, coordination meetings between the USFS, BR, USFWS and AGFD examined management strategies for the area.

The TCRU (from Gun Creek to Roosevelt Lake) was developed by the BR and USFS to promote

riparian vegetation by intensive management and rotation of grazing livestock.

Management recommendations

1.Should the proposed developments described above in the "human activities" section occur, strict management procedures should be enacted.

a.Indian Point Campground and Cline Terrace Archaeological Site should be closed throughout the breeding season.

b.Tonto Creek, between A-Cross road and the lake, should be closed to all boating activity when the water level is high enough for boats to approach close to the nest. A solid floating berm would be the best choice of obstacles.

c.If these recreational facilities are constructed, a public viewing station for people to watch the eagles may be a beneficial management tool. This area would be heavily promoted and signed and would hopefully allow people to understand the benefits of the eagles and the closure.

1.The station should be able to operate without agency personnel's presence.

2.Special programs could be given at the station educating the public on bald eagles and other wildlife.

3."Pay-per-view" scopes could be placed with the money distributed to the ABENWP and other wildlife programs.

2.Similar to the Pinto BA at the inflow of the Salt River to Roosevelt, the Tonto nest trees will die from the increased lake levels. The TCRU will help the existing trees grow to nesting height. The dilemma is that there may not exist adequate nesting trees before the present nest trees fall. In the interim, artificial nest structures may be an alternative. But it must be stressed that we do not encourage artificial platforms in lieu of paying attention to the bigger problem of habitat degradation.

3.Continue nestwatch activities and everyday monitoring of the Tonto Breeding Area.

Tower Breeding Area

Observation period
The Tower BA was monitored briefly in 1993. From 7 May to 14 May, the site was monitored for 73 hours. The nest was watched on two dawn-to-dusk days totaling 26 hours. The site was monitored sporadically by Audubon Society volunteers and visited briefly by the USFS and AGFD until fledging. The Verde River Train also checked the area during their tours.

Eagle activity
The Tower Breeding Area was a historic breeding area observed by Floyd Thompson of the USFWS from 1966-1968. Thompson's observations were documented by Forbis (documentation of a telephone interview, July 1984). The presence of adult birds in 1993 was first reported by Kelly Kishpaugh of the Verde River Train on 26 April. On 29 April, bald eagle nest surveyors (Driscoll and Beatty 1994) confirmed the presence of new nest # 6 and a 5-week old nestling.

Incubation began near the last week of February and hatching occurred the last week in March. The eaglet fledged the end of June prior to the 28th.

A fishing hook was seen connected to the lower mandible of the female's beak. Hanging from the hook was a six-inch piece of monofilament leader, knot and hoop. Fortunately, the hook and monofilament did not hinder the eagle's ability to feed itself, forage, or feed the eaglet. The bird was later observed in early June without the hook and monofilament.

The female was in adult plumage without and leg bands. The male was a four-year-old bird in near-adult plumage wearing a purple VID band on its left leg and a silver USFWS band on its right. The symbol of the adult male's band was not read during the 1993 breeding season.

Human activity
During the 8 days that the site was observed, 31 human activities were recorded. Nest #6 is situated on a small overhung cliff ledge above the railroad tracks of the Verde River Train. As a result, the train was recorded (n=11) traveling through the nest area on 5 of the 8 observation days. Occasional yelling was heard from the open railroad cars that caused the eaglet to be aware and look down toward the train. In addition, service vehicles (n=4) were observed traveling on the tracks. On one occasion a service vehicle was observed spraying an herbicide on the tracks to control weeds (Table 36).

Although the train may initially appear to be a source of disturbance, the regularity and continuous aspect of this activity more than likely renders it benign. Unlike hiking or fishing that can remain stagnant and more disruptive, the train moves through the breeding area quickly at an even pace. Certainly, the eagles seem to be acclimated as the nest is located directly above the tracks. The train also serves as an educational tool and viewing opportunity for the public. The operators of the railroad stress the importance of remaining quiet and have had our eagle fliers available to the passengers.

Additional activities recorded were anglers (n=3), shooters (n=2), ranchers (n=2), helicopters (n=1), agency personnel (n=2) and small planes (n=10). The most disruptive of the nonofficial activities occurred when a pair of anglers drove their vehicle down to the river across from the nest. The adult female flushed from the nest, circled and vocalized. The bird then perched and continued to watch the anglers activities for the next 30 minutes. Agency personnel flushed an eagle from a tree perch along the river below the nest while examining the breeding area.

Table 36. Human activity, Tower Breeding Area - ABENWP 1993, Arizona.

Type	Eagle behavior toward human activity[1]							
	N	W	R	F	L	B	?	Total
Small plane	9	1	-	-	-	-	-	10 (30.3%)
Helicopters	1	-	-	-	-	-	-	1 (3.0%)
Agency workers	-	-	-	2	-	-	-	2 (6.1%)
Angler	-	-	-	1	-	-	-	1 (3.0%)
Shooters	2	-	-	-	-	-	-	2 (6.1%)
Rancher	1	-	-	-	1	-	-	2 (6.1%)
Railroad train	9	2	-	-	-	-	-	11 (33.3%)
Railroad vehicles	4	-	-	-	-	-	-	4 (12.1%)
Total	26	3	0	3	1	0	0	33 (100%)

[1]N=None, W=Watched, R=Restless, F=Flushed, L=Left Area, B=eagle not in area, ?=Unknown.

Wildlife interactions

The eagles were observed diving at a bobcat in the nest area until the bobcat left. Common-black hawks were observed perching and nesting in the immediate area, but no interactions were observed.

Food habits

No forages or prey deliveries were recorded. Yet, a black crappie found in the prey remains indicate that these eagles are likely traveling to Peck's Lake to forage.

Management activities

Nestwatchers were placed on site soon after the discovery of the eagles. Agency personnel, Audubon volunteers and the Verde River Train personnel monitored the eagle's progress.

Management recommendations

1. Little information on human activity has been gathered from this site. Yet, the small amount that we have acquired indicates that human activity may significantly impact this breeding area. A local resident and angler mentioned to the nestwatchers that the area is heavily fished and vehicles often drive down to the river. Our observations of the fishing hook attached to the adult female and an automobile disturbing the eagles supports this contention. It would be beneficial to the eagles to construct a seasonal closure and not allow access to river from the road directly across from the nest. AGFD has contacted the USFS and proposed that a seasonal closure go into effect for the 1994 breeding season.

2. Continue nestwatch activities with support from Audubon volunteers.

PROGRAM RECOMMENDATIONS

1. Maintain the current strategy of monitoring sites near high levels of human activity.
2. Continue to monitor early nesting eagles in January prior to the "regular" February beginning of the program.
3. Continue to monitor areas in especially high use areas at least everyday throughout incubation and the early nestling stage.
4. With the discovery of nesting eagles in high use areas on the Coconino and Prescott National Forests, seek out additional funding from those forests to monitor those sites.
5. Higher lake levels and projected nearby recreational facilities at Roosevelt Lake projected for 1996, will bring added human activity to the Tonto and Pinto BAs. Daily monitoring would appear to be required as will boats to effectively contact the public and protect the eagles. Seek out additional funding from the Tonto National Forest to monitor these sites adequately in addition to the other sensitive eagle areas on the forest (76, Bartlett, Cliff, Sheep, Horseshoe, Redmond).
6. Extend present day cooperative agreements for funding of the ABENWP through the 1997 field season.

Table 37. 1993 Arizona bald eagle productivity. *= Sites monitored by 1993 Arizona Bald Eagle Nestwatch Program

Breeding Area	B.A. Status[1]	Nest #[2]	Incu Date	# Eggs	Hatch Date	# Young	# Fledged	Fledge Date
Alamo*	S	2	12/31-1/1	2	2/3-4	1	fostered - Ive's Wash	
Alamo* (2nd clutch)	S	4	2/14	1+	3/20-24	1	1	6/13
Ash	U							
Bartlett*	S	1	1/11-15	2+	~2/19	2	1	4/29
Blue Point	S	7	<2/25	3+	<3/12	3	2	<6/10
Camp Verde*	O							
Canyon	S	6	<4/2	1+	<4/2	1	1	<6/10
Cedar Basin	F	3	<4/2	1+			failed <5/3	
Chino	?							
Cibecue	F	1	<3/9	1+	failed prior to <4/2 - 3/9 status per USGS			
Cliff*	O	% seen with 3 year old with a blue VID band and near-adult female						
Coolidge	S	2	<2/12	2+	<3/12	2	2	<6/10
Devil's Post	U							
East Verde	S	6	<1/11 ?	2+	<3/12	2	1	<6/10
Ft. McDowell*	S	12	2/2-5	2+	3/9-12	2	2	6/1
Horse Mesa	S	2	<2/12	2+	<4/2	1	1	6/10-24
Horseshoe	O	New % hatched from Ladders nest - 1988, replaced bird shot in October 1992						
Ive's Wash*	S	3	12/30-1/11	1+[3]	<2/12	1+[3]	2	5/10
Ladders*	F	3	1/30-2/1	2+	3/7-8	2	chicken bugs, interaction with intruder eagle	
Lone Pine	F	1	<4/2	1+			failed <5/3	
Mule Hoof	U							
Orme*	S	3	2/1-7	2	<3/19	2	1	5/31-6/6
Perkinsville	U							
Pinal	S	3	<2/12	3+	<4/2	2	1	<6/10
Pinto*	S	3	1/21 -2/8	1+	<3/18	1	1	<6/10
Pleasant*	S	2	1/11-19	1+[3]	2/20-24	1+[3]	1	5/30-6/5
Redmond	O							
76*	F	3	2/5-6	2	& abandoned incubation 2/27-28			
Sheep*	O				& from 76 nest - 1988, arrived at site -1992			

Table Mountain	S	4	<3/12	2+	<4/2	2	2	6/10-17
Tonto*	S	2	2/2-5	2+	~3/11	2	2	5/29&6/3
Tower*	S	6	<4/29	2	<4/29	1	1	<6/28

[1]Breeding area status codes (Postapulsky 1974) - U=unoccupied, O=occupied, A=active (eggs or young present), S=successful, F=failed, ?=unknown

[2]Nest numbers are from Ecology of Bald Eagle in Arizona (Hunt et al. 1992)

[3]Ive's Wash and Pleasant nestwatchers described birds feeding in two places when eaglets were not visible-possibly 2 young?

Table 38. 1993 Arizona bald eagle productivity summary.			
Number of Breeding Areas	31[1]	Number of Active Nests	21
Number of Occupied Breeding Areas	27[2]	Number of Failed Nests	5
Number of Eggs	38+	Number of Successful Nests	16
Nest Success = 16 = 0.59 27		Number of Young Hatched	29+[3]
Mean Brood Size = 22 = 1.375 16		Number of Young Fledged	22
		Productivity = 0.59 x 1.375 = 0.81	

[1] May be 2 more breeding areas, "Coldwater" on Upper Verde and "Talkalai Lake" on San Carlos Reservation.
[2] Chino site not checked in 1993, most likely unoccupied - nestwatchers did **not** observe extra pair of eagles at Alamo.
[3] Nestwatchers at Lake Pleasant and Ive's Wash described adults feeding in two places when eaglets were not visible - possibly more than one young hatched.

ACKNOWLEDGEMENTS

The success of the ABENWP lies in the cooperation and assistance from a wide variety of agency and private contributors. We'd like to mention a few:

Bruce Ellis, Sandy Eto, Marty Jaekel, Tom Gatz, Henry Messing, Mark Santee, Ken Kloppel - U.S. Bureau of Reclamation, Bob Hall, Gene Dahlem, Tim Hughes - Bureau of Land Management, Mike Ross, Patti Fenner, Albert Sillas, Doug MacFee, Delvin Lopez, Don Pollack, Dennis Roy - U.S. Forest Service, Tim Tibbitts, Sam Spiller, Robert Mesta - U.S. Fish and Wildife Service, Amy Heuslein - Bureau of Indian Affairs, Teah Nobel, Marcie Greenberg, Doug Blakely, Dave Sultana - Salt River Project, Tedd Carr, Ken Moore, Carvel Bass - Army Corp of Engineers, Dave LaPointe, Bill Ballinger, Bruce Edinger - Arizona State Parks, Bob Herring, Mark Lansing - Maricopa County Parks, Ronnie Lupe, John Caid, Joe Jojola, Phil Stago - White Mountain Apache Tribe, Harold Nofchussey, San Carlos Apache Tribe, Stephanie Ostrom, Clinton Pattea - Fort McDowell Indian Community, Officer Darren Norton, Terry Leonard, Ivan Makil - Salt River Pima Indian Reservation and Police, Megan Mosby, Jan and Joe Miller, Kathy Ingram, Jean Marie - Liberty Wildlife Rehabilitation Center, Reg Hoyt, Lane Seyler - Phoenix Zoo, Prescott and Northern Arizona Audubon Society, Grainger Hunt, Ron Jackman, Trish Carroll - BioSystems Analysis Incorporated, and Troy Corman, Laurie Ward, Susan Sferra, Kim Kime, Rich Glinski, Terry Johnson, Bill Van Pelt, Debbie West, Cindy England, Stewart Kohnke, Larry Voyles, Jim Glass, Ken Branson, Tom Hildebrandt, Dave Belitsky, Jon Hanna, Charone Monday, Rory Aikens - Arizona Game and Fish Department.

LITERATURE CITED

Beason, J. and T. Porter III. 1993. 1993 Bartlett breeding area, Arizona bald eagle nestwatch report. Arizona Game and Fish Department, Phoenix, Arizona.

Beatty, G.L., 1993. Arizona Bald Eagle Nestwatch Program summary report 1991-1992. Nongame Threatened and Endangered Wildlife Program Technical Report, Arizona Game and Fish Department, Phoenix, Arizona.

Beatty, G.L. and J.T. Driscoll. in prep. Identity of breeding bald eagles in Arizona 1991-1992. Nongame Threatened and Endangered Wildlife Program Technical Report, Arizona Game and Fish Department, Phoenix, Arizona.

Bilak, K. and J. Koloszar. 1993. 1993 Ladders breeding area, Arizona bald eagle nestwatch report. Arizona Game and Fish Department, Phoenix, Arizona.

Brownwood, S., G. Cress, P. Friederici, and J. Ruhser. 1993a. 1993 Alamo breeding area, Arizona bald eagle nestwatch report. Arizona Game and Fish Department, Phoenix, Arizona.

Brownwood, S., G. Cress, P. Friederici, and J. Ruhser. 1993b. 1993 Ive's Wash breeding area, Arizona bald eagle nestwatch report. Arizona Game and Fish Department, Phoenix, Arizona.

Coues, E. 1866. Prodrome of a work on the ornithology of the Arizona Territory. Merrihew and Sons, Philadelphia.

Driscoll, J.T. and G.L. Beatty. 1994. 1993 Arizona bald eagle nest survey report and recommendations. Nongame Threatened and Endangered Wildlife Program Technical Report, Arizona Game and Fish Department, Phoenix, Arizona.

Forbis, L. 1984. Documentation of a telephone interview with Floyd Thompson. U.S. Forest Service, Tonto National Forest, Phoenix, Arizona.

Friederici, P. and J. Ruhser 1993. 1993 Camp Verde breeding area, Arizona bald eagle nestwatch report. Arizona Game and Fish Department, Phoenix, Arizona.

Grubb, T.G. 1986. *Haematosiphon inodorus* (Hemiptera: Cimicidae) in a nest of a bald eagle (*Haliaeetus leucocephalus*) in Arizona. J. of Wildlife Diseases, 22(1):125-127.

Hunt, W.G., D.E. Driscoll, E.W. Bianchi and R.E. Jackman. 1992, Ecology of breeding bald eagles in Arizona. Parts A-F. Report to the U.S. Bureau of Reclamation, Contract N.6-CS-30-04470. BioSystems Analysis Inc., Santa Cruz, California.

Juliana, J. and P. Levine. 1993a. 1993 Pinto breeding area, Arizona bald eagle nestwatch report.

Arizona Game and Fish Department, Phoenix, Arizona.

Juliana, J. and P. Levine 1993b. 1993 Sheep breeding area, Arizona bald eagle nestwatch report. Arizona Game and Fish Department, Phoenix, Arizona.

Langridge, S. and B. Christman. 1993. 1993 Cliff breeding area, Arizona bald eagle nestwatch report. Arizona Game and Fish Department, Phoenix, Arizona.

Langridge, S, and R. Siegel. 1993. 1993 Orme breeding area, Arizona bald eagle nestwatch report. Arizona Game and Fish Department, Phoenix, Arizona.

Lundby, L. and E. Pausch. 1993. 1993 Lake Pleasant breeding area, Arizona bald eagle nestwatch report. Arizona Game and Fish Department, Phoenix, Arizona.

Mearns, E.A. 1890. Observations on the avifauna of portions of Arizona. Auk 7 (1):45-55.

Papouchis, C., Bank M., and J. Beason 1993. 1993 Tonto breeding area, Arizona bald eagle nestwatch report. Arizona Game and Fish Department, Phoenix, Arizona.

Phillips, A., J. Marshall, and G. Monson. 1964. The Birds of Arizona. University of Arizona Press, Tucson, Arizona.

Postapulsky, 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 of Raptor Conservation techniques. Raptor Research Report 2:21-31.

Stalmaster, M. V. 1987. The bald eagle. Universe Books, New York, New York.

Thompson, C. 1993. 1993 Fort McDowell breeding area, Arizona bald eagle nestwatch report. Arizona Game and Fish Department, Phoenix, Arizona.

U.S. Fish and Wildlife Service. 1982. Bald eagle recovery plan (southwestern population). U.S. Fish and Wildlife Service, Phoenix, Arizona.

Waddell, J. and V. McCoy. 1993. 1993 76 breeding area, Arizona bald eagle nestwatch report. Arizona Game and Fish Department, Phoenix, Arizona.