National Park Service
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San Francisco Bay Area Network
Inventory and Monitoring Program

Raptor Breeding Season Report for Pinnacles National Monument - 2006

ON THE COVER

Juvenile Prairie Falcon.

Photograph by: Gavin Emmons, San Francisco Bay Area Network Inventory and Monitoring Program.

Raptor Breeding Season Report for Pinnacles National Monument - 2006

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U.S. Department of the Interior
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San Francisco Bay Area Network
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	Report Checklist
X	Cover page lists all authors and addresses.
X	Document has been reviewed for content, spelling and grammar.
X	Abstract and keywords are provided on page four of final report.
X	Body of document includes introduction, description of study area, methods, results, and discussion.
X	Conclusion Section includes Public Interest Highlights.
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X	Tables, figures, maps, and illustrations have descriptive titles and are sequentially numbered.
X	Document is supported by scientific literature.
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ABSTRACT

The 2006 breeding season was the 20th year of raptor monitoring at Pinnacles National Monument. Field observations began 10 January 2006 and ended 8 August 2006.

Pinnacles National Monument (PNM) provides a diverse habitat for numerous cliff-nesting raptors, including sensitive species such as prairie falcons (*Falco mexicanus*) and golden eagles (*Aquila chrysaetos*), as well as a spectacular array of summits and cliff-wall routes for rock-climbers. Therefore, the behavioral and physical effect that climbers and off-trail hikers have on cliff-nesting raptors is studied.

The 2006 raptor-breeding season was successful for prairie falcons. Fifteen territorial falcon pairs were documented this year with 14 pairs actively nesting. Thirty-five prairie falcons hatched, with 30 possible fledglings confirmed. Four nests failed (3 likely due to predation and 1 to eggs failing to hatch) and 1 pair occupied a territory without nesting for the season.

A peregrine falcon (*Falco peregrinus*) pair successfully nested and fledged 3 young in the Hawkins territory, marking the second consecutive year that a successful peregrine falcon nesting effort has been documented at PNM in the last 48 years.

Golden eagles were observed throughout the park. Six nests in 4 known territories in the park were not occupied this year. One known nest in the Eucalyptus Grove territory outside of the park produced 2 eaglets. Fledging was unconfirmed but likely for both.

The 2006 breeding season was particularly successful for additional raptor species nesting in the park, with 60 nests representing 13 raptor species confirmed this year, easily the highest number ever documented in a single season. The first active nests recorded during the raptor monitoring project for long-eared owls (*Asio otus*) and for white-tailed kites (*Elanus leucurus*) were documented this year, and 3 breeding records (including 2 active nests) for turkey vultures (*Cathartes aura*) represented the first confirmed in the park in 22 years. Five long-eared owl breeding records – including 3 nests – produced 13 hatchlings, with 10 fledglings likely and 8 confirmed. Five white-tailed kite nests produced 17 hatchlings and 14 fledglings, with 4 more fledglings documented in 2 additional breeding records. Other nesting raptor species documented in the park included red-tailed hawks (*Buteo jamaicensis*), red-shouldered hawks (*Buteo* lineatus), American kestrels (*Falco sparverius*), Cooper's hawks (*Accipiter cooperii*), sharp-shinned hawks (*Accipiter striatus*), barn owls (*Tyto alba*), and great-horned owls (*Bubo virginianus*).

2006 also marked the third year that captive-bred California condors (*Gymnogyps californianus*) were active and free-flying at PNM, with up to 13 condors active from Grassy Canyon to the High Peaks throughout the season. Condors were aggressively stooped by territorial raptors including peregrine and prairie falcons, on numerous occasions. Condors were also observed displacing turkey vultures, a bald eagle, and corvids from the Grassy Canyon feeding site.

Key Words: raptor ecology, resource management, wildlife conservation, raptor breeding phenology, behavioral ecology, human-raptor interactions

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INTRODUCTION

Pinnacles National Monument is a National Park Service unit located in the Gabilan Mountains of central California, and provides a diverse habitat for cliff-nesting raptor species, including sensitive species such as prairie falcons (*Falco mexicanus*), peregrine falcons (*Falco pergrinus*), and golden eagles (*Aquila chrysaetos*). The dramatic landscapes, extensive trails, arrays of summits, and cliff-wall routes at PNM are also used intensively for recreation by rock-climbers and hikers.

Many scientific studies have documented the negative impacts of human disturbance of raptor nest and roost sites, and the resulting nest failures and territorial abandonment associated with these disturbances. Nesting raptor species at PNM sensitive to human disturbance include prairie falcons (Steenhof 1998, Harmata et. al 1978, Ogden and Hornocker 1977, Sitter 1983, Fyfe and Ollendorf 1976), peregrine falcons (particularly in remote locations: see Steenhof 1998, Hickey 1942, 1969, Bond 1946), golden eagles (Newton 1979, 1990, Kochert et. al 1999, Steenhof et. al 1997, Scott 1985, Steidl et. al 1993, Watson 1997), sharp-shinned hawks (Delannoy and Cruz, 1988), and long-eared owls (Marks 1986, Marti and Marks 1989, Bloom 1994).

Prairie falcons nest in particularly high numbers at PNM, with an average of 9.57 nesting pairs per year documented from 1984-2006 (see Table 3). Studies of prairie falcon nest occupancy and productivity have also shown the species to be especially sensitive to human disturbance from mining (Becker and Ball 1981, Bednarz 1984), recreation (Boyce 1982), agriculture (U.S. Dept. of Interior 1979), habitat destruction and nest site limitation (Becker and Ball 1981, Steenhof et. al 1997), and proximity to major roadways (Boyce 1982, Platt 1974).

The main sources of human disturbance of nesting raptors at PNM are visitors that are rock-climbing and hiking on- and off-trail in the park. Scientific studies have consistently suggested that these recreation activities can be balanced against raptor nesting by establishing closure or advisory areas that act as buffers between human activity and raptor nesting during the breeding season (White et. al 2002, Olsen and Olsen 1978, Cade et. al 1996, Porter et. al 1987, Suter and Joness 1981, Holthuijzen 1990, Becker and Ball 1980, Fyfe and Ollendorf, 1976). Therefore, the primary management objective of the Pinnacles raptor monitoring program is to establish climbing / hiking advisories in high visitor-use areas each breeding season to protect cliff-nesting raptor species, particularly prairie falcons, from human disturbance.

To justify annual climbing / hiking advisories and to statistically measure prairie falcon productivity over time, the raptor monitoring program has two further objectives based on testable hypotheses and variables, detailed below.

Objective #1 – There is no change in average annual prairie falcon (PRFA) productivity over 5-year time intervals.

Variables to be measured:

1. # young of year (YOY) hatched / nesting pair
2. # YOY / pair that reach banding age
3. # YOY fledged / nesting pair

Comparisons – Within core climbing areas vs. outside of core

Objective #2 – There is no change in total numbers of territorial pairs and nesting pairs over 5-year time intervals.

Variables to be measured:

1. # territorial pairs and nesting pairs within core and non-core areas

Comparisons – Within core climbing areas vs. outside of core

Core climbing areas are locations at PNM suitable for prairie falcon cliff-nesting where climbing impacts could occur, based on the presence of historic climbing routes accessible to visitors. Non-core areas refer to all other areas within PNM suitable for cliff-nesting. The core vs. non-core sampling design is detailed further in the Methods section. GIS locations of the core areas are depicted on a map of PNM (see Appendix 7).

A final objective of the raptor monitoring program is to gather as much breeding and productivity data as possible for all other raptor species at PNM, particularly California species of concern that may be impacted by human presence and disturbance in riparian habitats: Cooper's hawks, sharp-shinned hawks, white-tailed kites, and long-eared owls. Although lack of consistent nesting data for these species over the course of the 20-year raptor monitoring program precludes statistical and trend analysis, the presence / absence data nevertheless provides valuable information on the diversity of breeding raptors at PNM, and through inference the quality of their nesting habitats and prey sources.

STUDY AREA AND METHODS

Pinnacles National Monument is located in the Gabilan Mountains of the central Coast Range of California and encompasses 26,426 acres, with elevation ranging from 244 to 982 meters. The climate is Mediterranean with hot, dry summers and cool, damp winters. Temperatures range from a mean of 8.2˚ C in January to 22.6˚ C in July. The majority of the rainfall occurs from November to April with average yearly rainfall of 44 cm (National Oceanic and Atmospheric Administration, NOAA, 1997).

PNM provides a diverse range of habitat types for birds and other species: volcanic rock formations and outcroppings; California mixed chaparral; pine-oak woodlands; grasslands; and riparian habitats.

Survey methods followed the standard operating procedures detailed in the 2004 Raptor Monitoring Protocol for Pinnacles National Monument, California (Emmons et. al 2004). Prairie falcon nest phenology and productivity are emphasized because this is the raptor species most affected by management through climbing advisories and with the most quantifiable and statistical data gathered over the 20 years of the raptor monitoring program. However, all nesting raptor species at PNM are monitored following the same general survey methods, allowing for the different nest phenology patterns and breeding habitats favored by particular species.

Potential and established cliff-nesting raptor territories in high-use climbing areas and remote locations in the park were surveyed using spotting scopes (20-60x) and binoculars (10x42). Observations were made from the locations that provided the best view of an eyrie or territory. A Trimble GeoExplorer 3 GPS unit was used to plot every observation spot. Surveys typically lasted 1.5 to 6 hours, depending upon the raptor behavior and amount of data collection needed. For a survey visit to be classified as “no birds” a minimum watch time of 5 hours was required. Territories were revisited on a 7-21 day schedule based on visitor use, the progress and age of raptors at territories (to obtain the most critical data for each territory for that time period), and the number of territories to be monitored. High visitor use areas were monitored more frequently and during weekend days when climbers were more likely to be present. While other monitoring programs estimate fledging success at 90% fledge age (Anderson et al. 1997, Steenhof et al. 1982, Steenhof 1998), our protocol was to end surveys once all young raptors were confirmed fledged. For a territory to be classified as unoccupied, a minimum of three 4-hour surveys of “no birds” confirmed over three different months were required. Survey duration was ultimately dependent upon visibility. When birds cooperated and the necessary data were collected in short survey duration, nearby territories were visited as well.

Sample Design

Two sample universes are defined for the raptor monitoring program as core areas and non-core areas, each of which has distinct sampling schemes.

Core areas are locations in PNM that can support prairie falcon cliff-nesting, and where climbing impacts can occur based on historic rock-climbing use and access. Core area sampling is conducted through a census, because the area is sufficiently small to allow for complete coverage by raptor monitors.

Non-core areas refer to all other areas within the park that can support prairie falcon cliff-nesting. For 2003-2006, non-core area sampling has also been conducted through a census. This has been possible due to the lead raptor monitor’s experience and capacity in locating and documenting territorial and nesting falcon pairs throughout the park, and the comprehensive, historical data on prairie falcon nest sites gathered over the past 20 years. In the future, non-core areas will be sampled based on probabilistic samples chosen from potential falcon nest sites identified via GIS modeling and historical data.

Monitoring Schedule

In January, late afternoon and evening surveys were conducted to locate territorial prairie falcons. Perching, flying, diving, interacting, and roosting locations were sought as evidence of territorial behaviors and territory establishment. By mid-January climbing advisories went into effect and territories were monitored to record courtship behaviors, territorial disputes, and disturbance. Advisories were used to inform visitors of areas likely to have breeding raptors. Generally these areas were occupied by raptors at least once during the preceding three years. Visitors were advised to avoid these areas but compliance is voluntary. Advisory areas with posted signs included the Balconies, Hawkins, Scout Peak, and Little Pinnacles territories.

Figure 1. Setting up Advisory Sign. ©Gavin Emmons, 2006.

In late winter and early spring, copulation behavior was observed and duration quantified. Food-swapping and eyrie selection were also recorded. Surveys during this period focused on evening and late-afternoon surveys until eyrie selections were made.

Incubation of nesting prairie falcons was determined by female prairie falcons (and to a lesser extent male falcons during nest switches) flying into a nest hole and not reappearing for extended periods of time. Attempts to count eggs were made by surveying when the best light was available for visibility, and when the incubating falcons temporarily left the nest during food drops and nest switches. Soft incubation – the onset of incubation - was determined by a small number of eggs laid and the female incubating for short durations (15-75 minutes). Hard incubation was characterized by the adult falcons – primarily the females – incubating a full clutch of eggs for hours in duration. Surveys were done in early morning and late evening hours to catch periods of greatest raptor activity, such as food drops, and to have a maximum amount of time for observation.

Hatched young prairie falcons were aged by physical features using an aging guide (Moritsch 1983). Hatch dates were determined by counting backwards from at least two – and preferably three or more - independent agings. Nestlings were observed from late spring to early summer, primarily during early morning and evening hours when they were most active, but observation periods at midday provided further data on nestling activity while prairie falcon adults were hunting for prey away from the nest sites. From early to mid summer, prairie falcon young were observed primarily in early to mid morning hours, when they were nearing fledging and most actively exercise flapping. Full fledging of falcon young was confirmed by all young being seen perched and / or in flight away from the nest site, with fledging dates determined by the coordination and strength of flight, the size of perches, and the amount of vocalization during flight.

Weather was always an important factor. During temperature extremes, heavy fog, or rain, most birds of prey were not active and therefore monitoring was not done during these periods.

RESULTS

Prairie Falcons, *Falco mexicanus*

The first prairie falcon pairs were observed at Teapot Dome and Goat Rock / Resurrection Wall on 11 January 2006. Through the 2006 season, 14 nesting pairs and 1 non-nesting pair of falcons were confirmed at PNM. The Pipsqueak Pinnacles territory was new and previously undocumented. The Pipsqueak Pinnacles prairie falcon pair was originally observed on 28 February 2006 in Hanging Valley, inspecting a cavity site, but moved to Pipsqueak Pinnacles to begin focused nesting efforts by 6 March 2006. The Pipsqueak Pinnacles prairie falcon pair also defended the Hanging Valley and Scout Peak territories throughout the breeding season. All other territories have been used historically by prairie falcons. Additionally, 11 of the 14 eyries chosen by prairie falcons were used in previous years. However, two of these eyries were new prairie falcon nest sites: the Mating Rocks nest site was used once previously as a non-nesting roost by a prairie falcon pair in 1993, and the South Chalone nest was last used as a golden eagle nest in 1990. The last confirmed nesting pair was confirmed on 13 May 2006 in the Citadel territory, though the falcon pair was observed defending the Machete territory as early as 4 March 2006. Prairie falcon nest details are listed in Table 1 below. Numbers in the "Closest Climb" column refer to climbing route numbers listed in the Climber's Guide to Pinnacles National Monument, 2nd Edition, by David Rubine (1995).

Territory	**Nest Used/ Last Year Used**	**Sensitivity to Visitor Disturbance**	**Height (ft) From Ground**	**Height (ft) From Top**	**Closest Climb**	**Aspect**
Drywall	DRY-10/ NEW	Low	40	5	none	N
D. Soto Canyon	DS-1/ 2004	Medium				SE
Canyon N of Willow Springs	CNWS-2/ 2003	Low				NW
Narrows	NARR-1/ 2003	Low				S
Pig Canyon	PIG-8/ NEW	Low	50	15	none	NE
Pipsqueak Pinnacles	PP-1/ NEW	High	25	5	#225	SE
Resurrection Wall	RW-1/ 1995	High				E
Teapot Dome	TD-1/ 2004	High				SE
Citadel	CI-1/ 2003 (by RTHA)	High				SW
Mating Rocks	MAT-1/ 1990 (non-nest roost)	Low				W
Crowley Towers	CT-4/ 2002	High				SE
South Balconies	SGB-2/ 1993	High				SSE
North Chalone	NC-1/ 2004	Low				E
South Chalone	SC-1/ 1993 (by GOEA)	Low				WNW

Table 1: 2006 Prairie Falcon Nests

One prairie falcon pair did not nest or produce young this year. The Little Pinnacles prairie falcon pair actively perched, courted, copulated, and inspected historic nest sites early in the breeding season, but no nest attempts were confirmed.

Incubation was first observed at Teapot Dome on 17 March 2006. The first hatching occurred between 7-9 April 2006 at D. Soto Canyon. The first fledging took place from 16-17 May 2006, also at D. Soto Canyon. The last young to fledge were 3 young falcons at Citadel, from 20-21 June 2006. Thirty-five nestlings were produced with 30 confirmed fledging. Eggs were counted this season at 7 of the 14 prairie falcon nests. Eggs could not be observed at the other falcon nest sites this year, due to nest site locations and egg placement within the nest sites during incubation. Nestlings were successfully counted at 12 territories with a mean of 3.5 nestlings per eyrie and 3 fledglings per eyrie. (See Table 2 below for the 2006 summary of prairie falcon nesting at the park.)

Territory	**Nest Used/ Last Year Used**	**# Eggs Laid**	**# Young Hatched**	**# Young Known/ Possibly Fledged**
Drywall	DRY-10/ NEW	2	2	2/ 2
D. Soto Canyon	DS-1/ 2004	5	4	4/ 4
Canyon N of Willow Springs	CNWS-2/ 2003	3	3	3/ 3
Narrows	NARR-1/ 2003	3.		0 Note: Nest failed, likely due to predation
Pig Canyon	PIG-8/ NEW	Unknown	3	0 Note: Nest failed, likely due to predation
Pipsqueak Pinnacles	PP-1/ NEW	Unknown	2	2/ 2
Resurrection Wall	RW-1/ 1995	4	3	3/ 3
Teapot Dome	TD-1/ 2004	4	2	0 Note: Nest failed due to abandonment.
Citadel	CI-1/ 2003 (by RTHA)	Unknown	3	3/ 3
Mating Rocks	MAT-1/ 1990 (non-nest roost)	Unknown	2	2/ 2
Crowley Towers	CT-4/ 2002	Unknown	3	3/ 3
South Balconies	SGB-2/ 1993	Unknown	4	4/ 4
North Chalone	NC-1/ 2004	Unknown	4	4/ 4
South Chalone	SC-1/ 1993 (by GOEA)	3		0 Note: Nest failed, eggs failed to hatch

Table 2: 2006 PNM Prairie Falcon Breeding Summary

For the 2006 season prairie falcon nest productivity – including core and non-core areas – was generally consistent with the productivity averages for the prior 19 years of monitoring data (Table 3). Fifteen territorial pairs and 14 nesting pairs of prairie falcons were documented in 2006, both above average numbers, and the highest documented over the 20-year study. The remaining statistics gathered for 2006 are more consistent with the 20-year averages, due to 4 nest

failures (likely resulting from predation for three and egg failure for one) through the course of the breeding season. There were 10 successful nests in 2006 versus the 7.9 average; 30 falcon fledglings in 2006 versus the 26.6 average; and 3.0 fledglings / nest versus the 3.2 average. The consistency between the 2006 season numbers and 20-year averages suggests that the 2006 season was a typical year for nesting prairie falcons throughout the park.

Year	Territorial Pairs	Nesting Pairs	Successful Nests	# Possible Fledglings	# Fledglings / Nest
1984	9	8	8	27	3.4
1987	6	4	4	10	2.5
1988	12	9	8	24	3
1989	11	10	8	19	2.4
1990	14	11	10	35	3.5
1991	14	11	10	32	3.2
1992	13	11	10	34	3.4
1993	13	12	10	35	3.5
1994	13	12	12	42	3.5
1995	13	11	8	24	3
1996	10	10	9	34	3.8
1997	12	8	6	26	4.3
1998	10	7	0	0	0
1999	10	8	6	27	4.5
2000	8	8	7	22	3.1
2001	10	9	7	24	3.4
2002	11	8	7	22	3.1
2003	12	9	8	32	4
2004	12	11	9	33	3.7
2005	13	10	9	27	3
2006	15	14	10	30	3
Averages (1984-2006)	**11.5**	**9.6**	**7.9**	**26.6**	**3.2**

Table 3: 1984-2006 Prairie Falcon Nesting Productivity – Core and Non-Core Areas

Prairie falcon nest productivity in the core areas was also consistent with the 20-year averages for falcon productivity in the park (Table 4). There were 7 territorial pairs of prairie falcons in 2006 versus the 7.5 average; 6 nesting pairs versus the 6.5 average; 5 successful nests versus the 5.5 average; 15 possible fledglings versus the 18.7 average; and 3 fledglings per nest versus the 3.3 average. In general, the consistency between the 2006 season numbers and 20-year averages for core areas suggests that the 2006 season was a typical year for nesting prairie falcons. However, it is worth noting in the context of the 20-year span of the raptor monitoring program that productivity numbers during the 1999-2006 years – particularly the successful nest and possible fledgling numbers – are noticeably lower than the 1990-1996 years. This trend is not as noticeable when non-core numbers are also included, suggesting that prairie falcon pairs may be moving away from core areas to nest, or non-core areas may have been more effectively surveyed in the past 8 years, masking the core area declines. (See Discussion section for further details.)

Year	Territorial Pairs	Nesting Pairs	Successful Nests	# Possible Fledglings	# Fledglings / Nest
1984	7	6	6	20	3.3
1987	5	4	4	10	2.5
1988	8	6	5	18	3.6
1989	8	7	6	16	2.7
1990	9	7	6	25	4.2
1991	9	8	8	31	3.9
1992	9	7	7	27	3.9
1993	10	10	9	30	3.3
1994	11	10	10	35	3.5
1995	10	9	7	21	3
1996	9	7	6	24	4
1997	8	6	4	17	4.3
1998	7	5	0	0	0
1999	6	6	4	13	3.3
2000	5	5	4	15	3.8
2001	7	6	5	12	2.4
2002	5	5	4	12	3
2003	5	5	5	22	4.4
2004	7	7	5	18	3.6
2005	5	4	4	11	2.8
2006	7	6	5	15	3
Averages (1984-2006)	**7.5**	**6.5**	**5.4**	**18.7**	**3.3**

Table 4: 1984-2006 Prairie Falcon Nesting Productivity – Core Areas

California Condors, *Gymnogyps californianus*

Figure 2. Juvenile California condor #307 balancing on net mesh of Grassy Canyon facility. ©Gavin Emmons, 2006.

2006 marked the 3rd year that captive-bred California condors were free-flying and monitored by park biologists at PNM, with up to 13 juvenile condors flying actively in the park. From January through March, the condors were active and flying between the holding facility and feeding site in Grassy Canyon, and the central High Peaks. In early to mid-April, the condors collectively traveled south of Monterey, but did not have confirmed contact with condors from the Big Sur population monitored by the Ventana Wilderness Society. After returning to Pinnacles through May, condors from the juvenile population at PNM traveled west again and had confirmed contact with condors from the Big Sur population for the first time during the 3 years of the condor project at Pinnacles. In general, the Pinnacles condors have continued to explore further afield, reaching distances of 50 miles west to

Big Sur, 35 miles north to San Luis Reservoir, 55 miles southeast to Coalinga, and 60 miles south to San Miguel. On 11 June 2006, Pinnacles condors were observed feeding on ground squirrel carcasses that had been shot with lead ammunition, and 13 were trapped up at the Grassy Canyon facility by late June. After conducting blood tests to measure lead levels in the 13 birds, it was determined that the condors had elevated blood lead levels, one of which was sufficiently high that it required immediate chelation treatments. After a holding period that demonstrated dropping lead levels, all the birds were released by early July. Later in July 2006, 3 Big Sur condors – #318, #301, and #278 (the latter a previous Pinnacles bird) –visited PNM on numerous occasions, interacting with Pinnacles condors before returning to Big Sur.

Territorial interactions between condors and other raptors were observed. Immature and adult bald eagles were observed at the Grassy Canyon feeding site early in the year, and were repeatedly flushed from cattle carcasses by condors in the area until the eagles left the area. In the High Peaks, falcon species – particularly the Hawkins peregrine falcon pair – stooped condors on numerous occasions, flushing them from near the HP-1 nest site and out of the Hawkins territory. Prairie falcons and American kestrels were also observed stooping on condors in the High Peaks. Despite these physical interactions, no lasting physical injuries to the attacked condors were observed. The juvenile condors were also observed feeding with turkey vultures in Grassy Canyon, and roosting with them in the High Peaks and in Lower Condor Gulch.

Species	Territorial Pairs	Nesting Pairs	Successful Nests	# Possible Fledglings	# Fledglings / Nest
Peregrine Falcon ☼	1	1	1	3	3
Turkey Vulture	3	3	3	7	2.333333333
Golden Eagle ☼	1	1	1	2	2
Red-tailed Hawk	7	7	7	19	2.714285714
American Kestrel	18	12	11	23	2.090909091
Red-shouldered Hawk	5	5	5	15	3
Cooper's Hawk ☼	8	8	5	12	2.4
Sharp-shinned hawk ☼	2	2	1	2	2
White-tailed Kite ☼	7	6	6	18	3
Long-eared Owl ☼	5	5	4	10	2.5
Barn Owl	4	3	3	7	2.3333333333
Great-horned Owl	7	2	2	7	3.5

Table 5: 2006 Breeding Raptors Nesting Productivity (not including Prairie Falcons)
(**NOTE:** ☼ = California Species of Concern)

In the 2006 season, 68 breeding records and 60 active nests were documented for 13 raptor species, the highest numbers ever recorded during the 20 years of the raptor monitoring program. Breeding and phenology data are detailed by species below. Refer to Table 5 above, and Appendices 3-6, for summary information of raptor productivity throughout the 2006 season.

Peregrine Falcons, *Falco peregrinus*

A peregrine falcon pair occupied and successfully nested in the Hawkins territory, marking the second consecutive year in the past 48 years that a peregrine pair nested and produced fledglings in the park. The peregrine falcon pair was first observed by the raptor monitor perching near the historic HP-3 nest and soaring near Hawkins Peak on 10 January 2006. However, additional Pinnacles employees confirmed observations of the peregrine falcon pair in October and December 2005, suggesting the falcons were residents at the park through the 2005 winter season. Through mid-March, the peregrine falcon pair copulated often, inspected historic nest sites at Hawkins regularly, and actively stooped other raptors in the Hawkins territory. The peregrine falcon pair began incubating 3 eggs at the HP-1 site (used for nesting by the peregrine falcon pair in 2005), on 12-23 March, with all the eggs successfully hatching on 25-27 April. The 3 peregrine falcon young fledged on 6-8 June 2006.

Figure 3. Juvenile Peregrine Falcon. ©Gavin Emmons, 2005.

Turkey Vultures, *Cathartes aura*

Of particular significance, 3 breeding records were confirmed for turkey vultures at PNM in 2006, including 2 previously undocumented nest sites. Due to the cryptic behavior and remote nest locations of turkey vultures, confirmed breeding records have been rare at Pinnacles, with the last nest record confirmed in 1984. The first turkey vulture nest was confirmed on 3 June 2006 on the south side of Mt. Defiance, with the second nest confirmed on 14 June 2006 on the northwest side summit of South Chalone Peak. Two nestlings hatched at the Mt. Defiance nest from 7-14 May, and 2 vulture young hatched at the South Chalone nest from 28 May to 4 June. Full fledging was unconfirmed but highly likely at both sites; vulture young were observed just prior to fledging at 9 weeks of age at both sites. The third vulture breeding record was confirmed at Hawkins Peak. Three very recent turkey vulture fledglings were observed on the north side of Hawkins, between the HP-1 and HP-3 historic falcon nest sites, on 8 August 2006. All young had full juvenile plumage with minimal down still visible, and were capable of short flapping flights.

Figure 4. Turkey vulture nestlings at the Mt. Defiance nest. ©Gavin Emmons, 2006.

Golden Eagles, *Aquila chrysaetos*

Golden eagles were observed nesting at the Eucalyptus Grove outside of PNM's West Side, but no active golden eagle nesting was confirmed within park boundaries. Golden eagle adults and juveniles were active throughout the park, but no territorial occupation within the park was confirmed. Historic nest sites in 5 territories – Frog Canyon, North Chalone Peak, South Chalone Peak, and Eagle Rock – contained 7 former nest sites observed in mid-winter through late spring, with no new greenery added to any of the nests.

Golden eagle nesting was confirmed at the Eucalyptus Grove. The nest site at the Eucalyptus Grove was used the past 3 years by a nesting eagle pair. The golden eagle pair was first observed at the Eucalyptus Grove on 21 January 2006, with incubation confirmed by 4 February. Two eaglets hatched at the Eucalyptus Grove nest on 12-20 March. Both eaglets were observed at the nest site very close to fledging (at 9 weeks old) on 13 May, with full fledge unconfirmed but highly likely by 22 May 2006. Eagles were occasionally seen off the monument.

Red-tailed Hawks, *Buteo jamaicensis*

Seven red-tailed hawk nesting pairs were documented this year – a new record for confirmed red-tailed hawk nests at the park – at historic nest sites at Hippo, Hand, the Western Front, the North Wilderness Trail, and at 3 previously undocumented territories: South Wilderness (North End), Crowley Drainage, and Eagle Rock. Stick nests at the South Wilderness (North End) and Eagle Rock territories were built in gray pines. The stick nest at Crowley Drainage was built on a cliff ledge. Incubation was first observed at the South Wilderness (North End) nest site on 13 March 2006. The earliest hatching of nestlings occurred at the Western Front nest from 6-8 April 2006, with the latest hatching of the season estimated at 5-9 May 2006 at the Hand site. Nineteen nestlings were observed at all 7 nest sites, with 2 young each in the North Wilderness Trail and Eagle Rock sites, and 3 young each in the remaining nest sites. Fledging of all 19 red-tailed hawk young was likely, but full fledge was confirmed only at the Lower Condor Gulch territory. Partial fledging of young was confirmed at all nest sites, except the North Wilderness Trail nest, where full fledge was likely but not observed. Fledging was confirmed first at the Western Front nest on 25-27 May 2006, and last at the Hand nest on 16-18 June 2006.

Figure 5. Juvenile Red-tailed Hawk. ©Gavin Emmons, 2005.

American Kestrels, *Falco sparverius*

Kestrels were observed occupying 18 territories in and just outside of the park this year, with evidence of breeding observed in 12 of the territories. New nest sites were documented at 7 territories: South Wilderness (North End), Kingman Land South, Prescribed Burn Cliffs, South Balconies, North Chalone Peak (two nests), and South Chalone Peak. Nine active nest sites were documented, with 6 in cliff cavities, 2 in oak tree cavities, and 1 in an old yellow-billed magpie stick construct. Nest incubation was first confirmed at the Kingman Land South territory on 13 April 2006. Hatching was confirmed at nest sites in 4 territories: South Chalone Peak (on 30 May 2006), Drywall (on 2 June), North Chalone Peak (7 June), and Prescribed Burn Cliffs (on 11 June). Eleven fledglings were confirmed for nest sites in 4 territories: South Wilderness (North

End), Kingman Land South, North Chalone Peak, and South Chalone Peak. Six fledglings were observed just after fledging in 3 territories: Marion Canyon, Goat Rock / Resurrection Wall, and Mating Rocks. Including confirmed fledglings detailed above, breeding kestrel pairs likely fledged 23 young from 11 nest sites. Other kestrel pairs not confirmed nesting occupied the following territories: South Wilderness Trail (two pairs), Fire Wayside, North Wilderness Trail, Machete, and the Eucalyptus Grove.

Red-shouldered Hawks, *Buteo lineatus*

Five active red-shouldered hawk nests were documented in the park this year, in the following territories: South Wilderness Trail, Bench Area, Pinnacles Campground, McCabe Canyon, and Kingman Land South. The 5 nest sites were all previously undocumented stick constructs, and represent a record high for documented red-shouldered hawk nests in a breeding season. All the constructs were built along riparian corridors, with 2 nests (in the Pinnacles Campground and Kingman Land South territories) on valley oaks, the Bench Area nest on a live oak, the South Wilderness Trail nest on a sycamore, and the McCabe Canyon nest on a gray pine. The first territorial red-shouldered hawk pair was observed at the Pinnacles Campground on 21 January 2006, and nest incubation was first confirmed at the Pinnacles Campground on 13 March 2006. All 5 nests hatched 3 nestlings each. The earliest hatching of young occurred at the South Wilderness Trail, Bench Area, and Kingman Land South nests, all on 9-12 April. At least partial fledge was confirmed at all 5 nests, with full fledge confirmed at the South Wilderness Trail, Bench Area, and Kingman Land South nests. Although not confirmed, full fledge of the 15 hawk nestlings was very likely, given observations of full fledge at 3 nests and partial fledge at 2 nests. The South Wilderness Trail nest fledged young on 19 May 2006. The latest fledge of young was observed late in the breeding season at the McCabe Canyon nest on 9-11 June 2006.

Cooper's Hawks, *Accipiter cooperii*

Eight breeding records were confirmed for Cooper's hawks at PNM in 2006, including 7 active nests, record highs for the species within one season. All the stick nest constructs were built on live oaks along riparian corridors, in the following territories: South Wilderness (South End), South Wilderness Trail, South Wilderness (North End), Grassy Canyon, Kingman Land South, North Wilderness Trail, and Guard Rock. The first Cooper's hawk pair was observed defending the South Wilderness Trail territory on 16 February 2006. Nest incubation was first confirmed at the North Wilderness Trail nest on 25 April. Five of the 7 Cooper's hawk nests hatched 13 nestlings, with the 2 remaining nests – at South Wilderness Trail and Guard Rock – failing due to abandonment prior to hatching eggs. The South Wilderness (South End) nest produced the earliest hatchlings of the season on 16-20 May. Fledging of 11 young was confirmed at 4 nests, with full fledge confirmed at 3 nests: South Wilderness (South End), South Wilderness (North End), and Grassy Canyon. Partial fledge was confirmed at the Kingman Land South nest, though full fledge was highly likely, given observations of all young at the nest just prior to fledging. The remaining nest – at the North Wilderness Trail territory – failed to fledge 2 young, likely due to predation. An additional breeding record was confirmed in the Kingman Land North territory, where a recent Cooper's hawk fledgling was observed on 20 June, but no nest site was confirmed. An additional nest construct was discovered on 22 June along the North Wilderness Trail near Black Canyon. The construct was a likely Cooper's hawk nest by the size of the stick nest and the amount of fresh whitewash and nestling down covering it, but no fledglings were observed in the area to confirm the status of the site. Of the 3 nest failures, the 2 abandoned nests (at South Wilderness Trail and Guard Rock) were constructed and incubated by pairs containing adult females and immature males.

Sharp-shinned Hawks, *Accipiter striatus*

Two sharp-shinned hawk nests were confirmed late in the breeding season at PNM. Nesting pairs occupied territories at Upper Bear Gulch (near the Moses Spring trailhead) and along Chalone

Creek southwest of the Chalone Housing Area (previously the Chalone Picnic Area and still referred to by this territory name). The Upper Bear Gulch nest was discovered just prior to fledging, with 2 young estimated hatching on 22-23 June 2006, and fledging on 13-14 July 2006. The Chalone Creek nest was discovered after likely nest failure, on 18 July 2006, with a male / female pair of yearling hawks aggressively defending the territory and very likely responsible for the nest site. Although nesting yearling pairs are fairly uncommon, they have been documented in monitoring studies before (see Bent 1937, R.G. Clarke 1984, D. Fischer 1984, and Palmer 1988). Both nests were stick constructs, conspicuously covered in feather down and whitewash, with the Upper Bear Gulch nest located on a live oak, and the Chalone Creek nest located on a holly-leaf cherry surrounded by California buckeyes. Both nests were well-concealed in relatively dense, wooded groves along riparian corridors. Sharp-shinned hawk adults were also observed near the North Wilderness Trail junction along Old Pinnacles Trail, in Lower Bear Gulch, and in Lower Condor Gulch.

White-tailed Kites, *Elanus caeruleus*

During the 2006 season, 7 breeding records were confirmed for white-tailed kites, including 5 active nests. The 5 nest sites were all stick constructs, and represent the first white-tailed kite nests confirmed at Pinnacles during the 20 years of the raptor monitoring program, with a visitor last reporting an active nest site in 1984. Stick nests were constructed on live oaks in 4 territories: McCabe Canyon, Marion Canyon, Jawbone Canyon, and Double Gates. The remaining nest – in the South Wilderness Trail territory – was constructed on a blue oak. All the nest sites were built in open riparian habitats in close proximity to exposed meadows and grasslands. Territorial occupation by a white-tailed kite pair was first confirmed in the North Wilderness Trail territory (2 miles northwest of the Chaparral Ranger Station), but breeding was not confirmed for this kite pair. Nest incubation was first confirmed at the McCabe Canyon nest on 14 April 2006. The earliest hatching of nestlings occurred at the McCabe Canyon nest from 8-10 May 2006, with the latest hatching of the season estimated at 29 June-3 July 2006 at the South Wilderness Trail site. Seventeen nestlings were observed at all 5 nest sites, with 4 young each in the Marion Canyon and Double Gates nests, and 3 young each in the other 3 nests. Fledging of 14 nestlings from 4 of the nest sites was likely, with full fledge confirmed at the McCabe Canyon, Jawbone Canyon, and Double Gates nests, and partial fledge confirmed at the Marion Canyon nest. The South Wilderness Trail kite pair likely double-clutched this season; one of the adults was seen in a food exchange with 2 kite post-fledglings while the other adult prepared and sat at the confirmed nest site late in the breeding season. The South Wilderness Trail nest failed on 22-25 July, likely due to the nestlings and adults being exposed to extreme temperatures for the previous week (averaging over 40.6° C for each day throughout the week). An additional breeding record was confirmed when 2 recent white-tailed kite fledglings were observed flying and calling over the oak / pine woodlands on the east edge of the large meadow next to Highway 146 in the Kingman Land North territory.

Long-eared Owls, *Asio otus*

There were 5 breeding records for long-eared owls at PNM this season, including 3 confirmed nests in the following territories: South Wilderness (North End), Chalone Picnic Area, and Marion Canyon. These active nests represent the first ever documented during the raptor monitoring program, and the first confirmed at PNM since 1964. All the nest sites were stick constructs, with the South Wilderness (North End) nest on a blue oak and the remaining 2 nests on live oaks. The South Wilderness (North End) nest was built and used in 2005 by a sharp-shinned hawk pair. The original occupants of the Marion Canyon and Chalone Picnic Area nests are not known, though the latter was discovered in a live oak above the Chalone restrooms in the 2005 season. Territorial occupation by an adult long-eared owl pair was first confirmed in the Chalone Picnic Area on 18 February 2006, with the adult pair hooting together regularly between dorm housing and the Trails building. Nest incubation was first confirmed at the Chalone Picnic Area nest on 1-5 March 2006. The earliest hatching of nestlings was estimated at 4-11 April at the Marion Canyon nest. Two nestlings each were observed at the Marion Canyon and Chalone Picnic Area nests. The South Wilderness (North End) nest was discovered soon after the nest failed, likely due to predation, with 3 long-eared owl nestlings found dead at the base of the nest tree, and with feather down and whitewash evident at the site. Full fledging of the owl nestlings from the Chalone Picnic Area nest was confirmed by 10 May, with the young owls observed perching together in the live oak canopy over 50 meters north of the nest site, between the Trails building and the Gym. Fledging of the nestlings from the Marion Canyon nest was not confirmed but was likely given the continuing defensive presence of long-eared owl adults in the area. Six additional long-eared owl young were observed just after fledging, 3 each in the Grassy Canyon and Kingman Land South territories, but nest sites were not confirmed at either location. All the long-eared owl young had minimal body down still visible and were capable of short flights.

Figure 6. Long-eared owl adult near Chalone housing area. ©Gavin Emmons, 2006.

Barn Owls, *Tyto alba*

Three barn owl nests were confirmed in 2006, at the following territories: D. Soto Canyon, Discovery Wall, and High Peaks Trail West of Chalone Picnic Area (WCP). The barn owl pair at Discovery Wall began occupying the territory by 11 January 2006. Nest incubation was first observed at the D. Soto Canyon nest site on 7 March 2006, with hatching of nestlings confirmed on 15 April. Seven nestlings were confirmed at the 3 nest sites. Partial fledging of nestlings was confirmed at the Discovery Wall nest,

Figure 7. Barn owl nestlings in Discovery Wall nest. ©Gavin Emmons, 2006.

with a recent fledgling observed flushing from Discovery Wall on 11 May. Full fledging of young from the Discovery Wall nest was likely, with all 3 young observed at the nest site just prior to fledging. Fledging was not confirmed at the D. Soto Canyon and WCP nest sites, but at least 1 nestling was observed at the D. Soto Canyon site close to fledging. A barn owl was also observed occupying the North Chalone Peak territory and roosting in the lookout tower on the peak through the breeding season.

Great Horned Owls, *Bubo virginianus*

Two great horned owl nests were confirmed during the 2006 season, in the South Wilderness Trail and West Side Entrance territories. These nests mark the first confirmed for the species since 1996. The South Wilderness Trail nest was a stick construct built on a sycamore, used in 2005 by a nesting red-shouldered hawk pair. The West Side Entrance nest was a stick construct built on a gray pine, used in the 2005 nesting season by a red-tailed hawk pair. Territorial occupation by a great horned owl pair was first confirmed in the South Wilderness Trail territory on 13 February 2006, with nest incubation confirmed at the territory on 16 February. Hatching of young was confirmed at both nests, with the South Wilderness Trail nest producing 3 young and the West Side Entrance hatching 4 nestlings by 8-23 March. Full fledging of nestlings from the South Wilderness Trail nest was confirmed by 1 May 2006, and 3 of the 4 owl young from the West Side Entrance nest were confirmed fledged on 5-19 June, with full fledge of all 4 young highly likely.

Other Raptors

Northern harriers (*Circus cyaneus*) were observed soaring along the base of the cliffs at Little Pinnacles and North Chalone Peak through April and May.

Adult and immature bald eagles (*Haliaeetus leucocephalus*) were seen in Grassy Canyon on 5 March and 8 April, the first perching with condors on a roost tree, then flushed by juveniles from the area, the latter repeatedly flushed by juvenile California condors and prevented from approaching the Grassy Canyon feeding site. A sub-adult bald eagle was also observed in the High Peaks on 25 February, flushing a California condor east towards the Reservoir.

A merlin (*Falco columbarius*) was seen in the Pinnacles Campground from January to March, soaring and perching, and regularly stooped by ravens and magpies. A pair of merlins was also seen through April, hunting and perching just east of the Regan road separating the north and south sections of the Kingman Land territories.

Northern pygmy-owls (*Glaucidium gnoma*) were heard hooting in the Bench Area, Pinnacles Campground, Fire Wayside, and Chaparral Picnic Area from January to April. Western screech-owls (*Megascops kennicottii*) were seen and heard hooting, particularly near the Bear Gulch Visitor Center and in Upper Bear Gulch, beginning in January and with a roosting screech-owl observed near the Condor Gulch restrooms as late as early August.

Climbing Management Actions

Climbing advisories were put in place in January, and revised in March to reflect territories in which prairie and peregrine falcon pairs were nesting. The advisories were put in place in areas with known climber usage to protect nesting raptors from disturbance. Signs detailing climbing advisories were posted at Little Pinnacles, Balconies, Hawkins, Scout Peak, and Frog / Hand territories. GPS data and digital photographs were recorded for the locations of all the advisory signs, for inclusion in the raptor monitoring ArcMap and MS Access databases. Other climbing advisory areas – detailed in press releases, trailhead signs, and pamphlets at the Bear Gulch Visitor Center – included Crowley Towers, Egg, Tunnel, Teapot Dome, Pipsqueak Pinnacles, and Goat Rock / Resurrection Wall territories. All of the above territories – except the Frog / Hand territory – were actively used and occupied by nesting falcon pairs.

Human Interactions

In general, climbers and hikers did an excellent job of heeding climbing advisories this year. More securely affixed advisory signs were posted in the Scout Peak and South Balconies areas, and an additional advisory sign was posted en route to the Frog / Hand territory, to address off-trail hiking, backcountry climbing, and BASE jumping incidents documented in advisory areas in 2005. In 2006, five incidents of off-trail hikers in advisory areas were documented, but no significant defensive falcon behavior was observed. No climbers were observed in advisory areas in 2006, suggesting that climbers visiting the monument are adhering to advisories posted on signs, bulletin boards, and in press releases.

Prairie and peregrine falcon adults in the Goat, Crowley, Hawkins, and Balconies territories did respond to the presence of hikers and raptor monitors by circling and wailing above their respective territories, but did not otherwise display significant and prolonged disturbance behavior threatening nest productivity and survivorship. When visitors adhere to them, the advisory signs for raptor area closures and postings at climbing accesses seem to be effective, given full fledging this year in all advisory territories except Teapot Dome, where predation of the nest site was likely.

International Migratory Bird Day (13 May 2006) was celebrated at PNM with interpretation of raptor behavior at two watchspots in the park. Planned activities for International Migratory Bird Day were not as extensive or effective in 2006 as in previous years, largely due to the overlap of a Soledad community outreach day, also scheduled for 13 May at the Chaparral Parking Area. Raptor Monitor Gavin Emmons interpreted raptor behavior for visitors along the Balconies Trail between the Chaparral Ranger Station and the Balconies Cliff Trail junction, and Biologist Alacia Welch interpreted peregrine falcon activity and nesting to visitors along the High Peaks Trail near Hawkins. Throughout the season, Gavin Emmons also met with and interpreted falcon activity for local birding groups and for hawkwatch volunteers from Golden Gate Raptor Observatory.

DISCUSSION

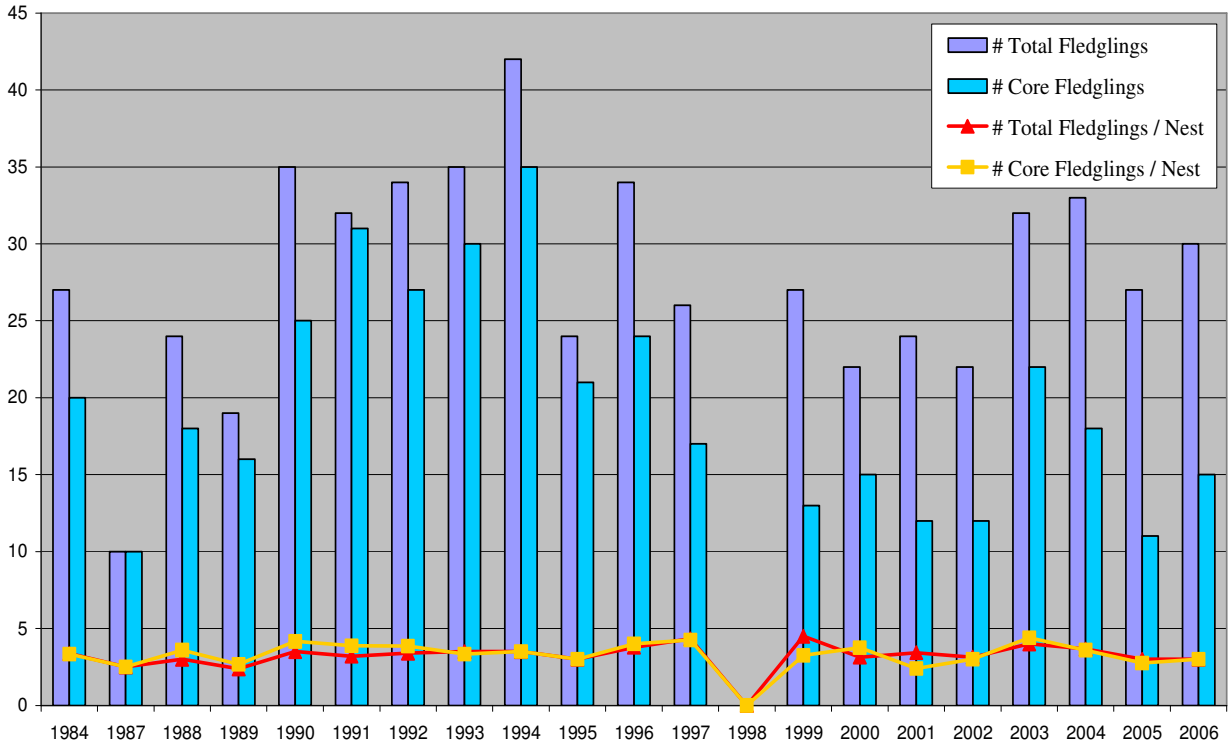
Through the 2006 breeding season, prairie falcon nest phenology in core and non-core areas followed the average rates documented through the previous 19 years of monitoring. The earliest hatch date range for this year was early April (7-9 April 2006 at D. Soto Canyon), and the latest falcon fledge date was in mid June (20-21 June 2006 at Citadel). Prairie falcon nesting this year also followed established success rates of fledglings produced per nest. From 10 nest sites, the average rate of fledglings produced was 3.0, slightly lower than the 20-year average of 3.207. Three nest sites – at D. Soto Canyon, South Balconies, and North Chalone Peak – produced 4 fledglings, with 3 further nests – at Drywall, Pipsqueak Pinnacles, and Mating Rocks – producing 2 fledglings each. Two nests (at Pig Canyon and Teapot Dome) failed to fledge any hatchlings, and 2 of the nest attempts – at the Narrows and South Chalone Peak sites – failed to hatch eggs. Given the lack of data on environmental variables outside of park boundaries – including pesticide and rodenticide use, prey availability, effects of urban sprawl, and habitat degradation on agricultural lands – it is difficult to determine specific factors leading to the rate of falcon breeding success and to falcon nest phenology this year in general. Unusually high rates of precipitation in 2005, and in January through April 2006 may have resulted in increased prey availability, providing falcons with greater food resources for nestlings, helping to explain the 100% fledge rate of successful prairie falcon nests. However, effects of prey availability may have been offset by extreme temperature shifts during the breeding season, including days of snowfall in early to mid-March, and prolonged timing and intensity of precipitation through the breeding season. It is likely that high precipitation this year – particularly during periods of falcon egg incubation – contributed to average numbers of eggs and nestlings this year, with no nest site producing more than 4 fledglings. The deleterious effects of prolonged precipitation may have have been particularly acute for the eroded slide territories at Drywall (where only 2 nestlings were produced) and the Narrows (where the clutch of 3 eggs failed to hatch), where historic nest sites are more exposed to the elements than typical nest cavities on rock cliffs. Four nest failures were also recorded this year, representing over 25% of all prairie falcon nest attempts at Pinnacles this year. The Narrows and South Chalone Peak nests failed prior to hatching eggs, while the Pig Canyon and Teapot Dome nests failed after hatching young. The latter 2 nests likely failed to nest predation. The South Chalone nest likely failed due to a combination of poor nest placement – on a very exposed, historic golden eagle site – and lack of experience on the part of the adult pair, given the failure of all the eggs to hatch. (See Appendix 3: 2006 Nest Phenology and Success – Falconids, for more details.)

Although 2006 productivity numbers were consistent with 20-year averages for total and core areas at Pinnacles (see Results: Prairie Falcons), these numbers do not address general productivity trends over this time period. Comparing statistical data from 1984-2006 on prairie falcon breeding and productivity for total, parkwide nesting efforts (Table 3) and specifically for core areas (Table 4) reveals important trends in prairie falcon productivity at PNM over the course of the 20-year program. This data is shown below in Figure 4. With the exception of the 1998 season – characterized by heavy precipitation and major flooding throughout the raptor breeding season, and nest failures for the entire breeding population of prairie falcons at Pinnacles for the year – the averages for total fledglings / nest (3.2) and core fledglings / nest (3.3) have remained constant throughout the past twenty years, strongly suggesting that these numbers represent a stable and typical rate of fledglings produced from a given prairie falcon nest site in the park.

However, the total and core fledgling numbers for prairie falcons appear to show more distinct trends over the 20 years of raptor monitoring at the park. Because no power analyses have been performed on the 20 years of prairie falcon productivity data, it is not possible at present to make any statistical conclusions about the data. Therefore the following observations on the 20 years of prairie falcon productivity data are meant primarily as a potential interpretation of the data, and underscore the need for more strict statistical analyses.

The years from 1990-1996 were much more productive for nesting prairie falcons than the years from 2000-2006. This is evident for total prairie falcon productivity during these periods, and particularly for productivity in the core areas. Because no quantitative data exist for many risk factors that could potentially threaten prairie falcon productivity – including rodenticide and pesticide use outside of the park, alteration of prey habitat, falcon collisions with buildings or cars, and shooting of adult falcons – it is difficult to explain the causes of these productivity trends. The high core productivity from 1990-1996 followed by lower productivity from 2000-2006 may be the result of nesting falcon pairs focusing on more non-core nesting locations in recent years, or it may reveal that the breeding population of prairie falcons at PNM has declined in recent years. The higher non-core productivity observed from 1999-2006 may also be the result of raptor monitors more effectively documenting falcon nesting efforts in non-core and remote locations in the park. Continuing to monitor these productivity trends over time will help to reveal whether they represent normal population fluctuations, or an ongoing productivity decline.

Figure 8: Total vs. Core PRFA Productivity Data, 1984-2006



Park visitors generally adhering to raptor advisories and not disturbing nest sites in 2006 likely supported the fledgling success rates as well, allowing adults to focus on feeding and rearing of young rather than responding to human disturbances of nest sites. Although four prairie falcon nest sites failed this season, there was no evidence suggesting that any of the failures were the result of direct human disturbance. The single nest failure in a core area – at Teapot Dome – successfully hatched nestlings before failing, strongly suggesting predation rather than climber or hiker disturbance as the cause. The territorial pair of prairie falcons at Little Pinnacles displayed courtship and nest inspection early in the breeding season but did not nest in 2006. Although it is possible that human disturbance in this core area was a factor in preventing the falcon pair from nesting, there was no evidence to support this during the season. However, off-trail hikers in advisory areas may have provided additional pressures discouraging prairie falcons from defense and feeding at certain territories. A stricter adherence to park resource protection policies by law enforcement rangers in particular and park staff in general, would help ensure the reproduction of wild raptor species in the park. Increased interpretation of raptor sensitivity to disturbance by rangers and more consistent law enforcement patrol near advisory areas would also help impress upon visitors their responsibilities at the park and provide education tools for respecting park

goals and policies. Posting of more permanent signs at Scout Peak and South Balconies in 2006, as well as the posting of a temporary advisory sign in the Frog / Hand area, were positive steps implemented during the breeding season that encouraged visitor awareness of raptor nesting in the park, and helped to ensure nest productivity during the breeding season.

For the 2nd consecutive year in 48 years, a peregrine falcon pair successfully nested – at the Hawkins territory – and produced 3 fledglings. A non-nesting peregrine falcon pair occupied the Hawkins territory in the 2004 breeding season, and it is likely that this pair overwintered at PNM – based on park staff observations of peregrine falcons in the High Peaks during the 2004 and 2005 winter seasons – returning to nest successfully in 2005 and 2006. The adult male and female peregrine falcons were first observed this year in early January, and actively defended the Hawkins territory by stooping on condors, turkey vultures, and prairie falcons in the High Peaks. The peregrine falcon pair was observed this year copulating, inspecting historic nest sites at Hawkins, and finally settling in to incubate 3 eggs at the nest site used by the pair in 2005. The peregrine falcon breeding phenology patterns this year were consistent with those of the prairie falcon pairs, with hatching in late April (25-27 April 2006) and fledging of young in early June (6-8 June 2006). The nesting success of the peregrine pair provides continuing evidence of the recovery and return of the species to PNM, and hopefully the peregrine falcons will continue to nest at the park in the future.

This year also marked the 3rd year that captive-bred California condors have been free-flying and monitored at PNM, with up to 13 juvenile females and males flying in and near the park from January through the breeding season of nesting raptors. In 1982, the federally endangered California condor was represented by only 22 individuals. In 2003-2004, PNM became the most recent condor release site, as a part of a national recovery effort attempting to restore free-flying condor numbers throughout the United States. As juvenile females and males, the condors monitored at PNM were not potential breeders, but were often visible in the High Peaks and over Grassy Canyon, circling and perching. Several raptor species, including prairie and peregrine falcons, displayed territorial aggression by stooping condors flying near nest sites or in occupied territories, but no injuries were sustained to the condors.

The 2006 nesting season at PNM was characterized by an exceptionally high number of breeding raptor species and nest sites documented, including nest records for 3 species not confirmed in the park in over 20 years: turkey vultures, white-tailed kites, and long-eared owls. Additionally, nest records were confirmed for Cooper's and sharp-shinned hawks, red-tailed and red-shouldered hawks, American kestrels, great-horned owls, and barn owls. As white-tailed kites, long-eared owls, sharp-shinned hawks, and Cooper's hawks are considered California Species of Concern (California Department of Fish and Game (CDFG) 2006) the confirmed nest and breeding records represent important baseline data which have been incorporated into the Resource Management archives at PNM and CDFG records in the California National Diversity Database.

In 2006 a very high number of new and historic nest sites were documented, for falcons as well as all other documented raptor species. Over the course of the breeding season, 14 nesting pairs of prairie falcons were active, with 5 nest sites previously undocumented for prairie falcon use. Record highs for the number of nesting territories in one season were confirmed for 10 other raptor species: American kestrels, red-tailed hawks, red-shouldered hawks, Cooper's hawks, sharp-shinned hawks, white-tailed kites, turkey vultures, barn owls, long-eared owls, and great-horned owls. For these raptor species, 34 previously undocumented nest sites were confirmed, also a record high for one breeding season.

Thirteen species of breeding raptors and 60 active nests (in addition to 7 active common raven nests) were confirmed in or near the park this year, a marked rise over the usual 4 to 5 species of raptor species observed nesting in a given year, and the highest nesting species diversity on record for the 20-year raptor monitoring program. Although certain factors, such as prey availability, lack of human disturbance, and high precipitation in 2005 and 2006 were likely

significant in determining the high number of nesting raptor species and sites documented this year, I believe that the experience, training, and efforts of the raptor monitor and of other park staff played more essential roles. The survey protocols in place at PNM worked well and provided the raptor monitor with a comprehensive framework for documenting the priority raptor species – prairie falcons, peregrine falcons, and golden eagles – as well as "non-target" species such as kites, accipiters, and owls. Park staff conducting fieldwork in the backcountry of PNM, including the pig eradication crew, exotic plant management crew, interpretive rangers, and biological technicians, also provided essential reports on raptor activity and nesting that allowed for the documentation of new nest sites and territories, and the more effective monitoring of non-sensitive raptor species including red-tailed hawks, red-shouldered hawks, and turkey vultures, throughout the breeding season.

CONCLUSION / RECOMMENDATIONS

Public Interest Highlights

- The 2006 breeding season was the 20th year of raptor monitoring at PINN. Field observations began 10 January 2006 and ended 8 August 2006, with a total of over 100 sites monitored during 1027 observation hours.
- Climbing advisories were put into effect in January, updated according to active raptor nest sites in March, and ended in July to reflect the end of the raptor breeding season, protecting nesting raptors from visitor disturbance. Advisory areas impact visiting climbers and hikers, and have been put into effect for the past 20 years.
- For the second consecutive year in 48 years, a peregrine falcon pair was documented successfully nesting at the park, producing 3 fledglings.
- Accipiter species were confirmed nesting in the park, with only the 4th and 5th sharp-shinned hawk nest records ever documented in the park confirmed in 2006.
- 3 breeding records – including 2 nests – confirmed for turkey vultures in 2006 were the first documented in the park for the species in 22 years.
- Long-eared owl nesting was confirmed in the park for the first time since 1964, with 8 fledglings from 3 nest locations observed.
- White-tailed kites were confirmed nesting in the park for the first time since 1984, with 18 fledglings from 6 nest locations observed.
- 13 breeding raptor species and 60 nests – the highest numbers ever recorded in a season – were confirmed in the park in 2006.
- 7 sensitive species of concern were confirmed breeding this year: prairie falcons, peregrine falcons, golden eagles, Cooper's hawks, sharp-shinned hawks, white-tailed kites, and long-eared owls.
- An ArcMap project was updated to visually display GPS and GIS information relating to the raptor monitoring program, including historic nest sites, monitoring watch spots, nest distribution by geologic and habitat layers, and locations of advisory signs posted at PNM.
- 34 breeding records for raptor species at Pinnacles were reported to the Santa Cruz Predatory Bird Research Group and the California Natural Diversity Database (through the California Department of Fish and Game).

Management Recommendations

The primary management objective for the raptor monitoring program is to establish climbing / hiking advisories in high visitor-use areas each breeding season that promote the protection of cliff-nesting raptor species (particularly prairie falcons) from human disturbance (see Introduction for further details). Based on prairie and peregrine falcon phenology and productivity data collected in 2006 and lack of observed disturbances by climbers and hikers (see Results section for prairie falcons, peregrine falcons, and human interactions), the advisory signs seem to be successful in balancing the reproductive needs of nesting raptor species with the recreational activities enjoyed by visitors to PNM. The effectiveness of advisories has also been made

possible by additional efforts that should continue to be employed in future seasons: sending press releases on advisories to all local climbing gyms, organizations, and newspapers; interpreting raptor nesting and climbing advisories for visitors at park trailheads; and emailing bi-weekly raptor monitoring updates to all park staff and any interested local organizations (including Friends of Pinnacles, local Audubon Society groups, etc.). The lead raptor monitor for the past 4 years also rock-climbs regularly at PNM, and this allows for additional lines of communication, unofficial interpretation of raptor nesting, and justifications for climbing advisories at the park.

Much of the success of compliance with voluntary measures to restrict use can be attributed to the fact that the climbing community understands that the advisories are based on actual raptor monitoring data. By using current data, park management is able to restrict use only to areas absolutely necessary for raptor nesting, with other areas not used for nesting remaining open for climbing. As a result, the local climbing community feels that park management is making good-faith efforts to balance visitor use with protection of park resources. An absence of current monitoring data would require park management to close a much larger area of the park to protect nesting raptors, potentially causing the climbing community to litigate this action, as was the case in 1986. In essence, this provided the catalyst for beginning the raptor monitoring program in 1987 and 1988. The local climbing community's adherence to the climbing advisories has been cultivated over the 20 years of the raptor monitoring program, and every effort should be made to keep the climbing community updated on the most recent advisory conditions at PNM.

The detailed and accurate raptor monitoring data gathered throughout the breeding season also provide the justification necessary to continue setting up advisories in future years, and should be emphasized here. The raptor monitor returned for a 4th consecutive season this year, and his past experience as a monitor and prior knowledge of raptor territories and watchspots was no doubt reflected in the unprecedented number and diversity of breeding raptor species and nests documented at the park in 2006. The importance of having an experienced raptor monitor over multiple seasons cannot be stressed enough, and can significantly broaden the scope of nesting species and sites recorded within a particular breeding season. Creating a permanent raptor monitoring position at the park, or at least a secure term position with housing available within the park, would provide a strong impetus for wildlife technicians to return to the position from year to year. Given the 20 consecutive years of data collected for the program, and the priority that the park and Resource Management department have placed on the program, such a position seems justified. Given the inevitability of changing raptor monitors in certain years, having access to an experienced or prior raptor monitor – on staff as a half-time position through the first half of the breeding season – would help to orient the current raptor monitor to the specifics of the program that cannot be easily conveyed through the Raptor Monitoring Protocol and existing database resources.

The raptor monitor was also assisted regularly in the field by Biologist Alacia Welch, after she was trained in the 2004-2005 seasons in the standardized procedures for raptor monitoring field work. This assistance helped significantly to alleviate the time constraints necessitated by the park management focus on prairie falcons and golden eagles, and the high-use, raptor advisory areas, and allowed for more detailed coverage of "non-target" raptor species in the park. Continuing to have a resource staff "half-position," trained and supervised directly by the raptor monitor, would allow for consistent monitoring data, adherence to survey protocols, and greater coverage of nesting raptors in the park. Additionally, I would offer the following recommendations for incoming raptor monitors.

Continuing to make use of the efforts and enthusiasm of staff and visitors observing raptor activity in the field will allow for the broader documentation of nesting raptor species and nests seen this year. This can be achieved through regular communication with park staff and visitors, bi-weekly monitoring updates on raptor status at the park, and reminders on filling out wildlife observation cards. More detailed training and information on accipiters, red-shouldered hawks,

kites, owls, and kestrels should be made available to raptor monitors and other park staff. Literature on nesting habits, observation methodologies, and nesting phenology for these species would be beneficial, and would be most easily addressed through a park subscription to the Birds of North America Online site (http://bna.birds.cornell.edu/BNA/). Raptor monitors should also make use of historic raptor monitoring field notes, cataloged photographs, and GPSed watchspots for these species. Finally, monitors should be very familiar with the standardized written set of raptor protocols, and these should be revised and edited on a regular basis. In particular, incoming monitors should thoroughly review the following: raptor monitoring techniques; raptor identification skills; navigation and orientation in the park backcountry; appropriate use of GPS and monitoring equipment; backcountry safety skills; management of raptor advisory areas; raptor monitoring ArcMap projects and geographic locations of nest sites and watchspots; and guidelines for database management of field notes, wildlife observation cards, and archived nest site photographs, for both confirmed and possible nest sites.

In regards to effective monitoring and a standardized set of protocols, two key aspects of raptor monitoring deserve further discussion because they are difficult to quantify but are essential for providing the monitor with successful data on nesting phenology – timing of raptor observations, and ideal locations for watching nests. Both factors vary as the breeding season proceeds and ultimately require self-motivation, adaptability, and a sensitivity to gaining effective data on the part of the raptor monitor. For the 2005 and 2006 prairie falcon breeding seasons, I found that afternoon and evening surveys were ideal in winter when determining where falcons would roost for the night, and in locating potential eyries. The falcons were most active about 2 to 3 hours before sunset, and circled and perched visibly – occasionally inspecting potential nest sites – in their respective territories before retreating to sleeping roosts for the night. Evening surveys also had the benefit of providing initial data on locations of vocalizing owls within the park. As the season proceeded, I found that it was useful to check on nest sites in specific territories at different times of the day. Nestlings seemed most active near sunrise and sunset, but even observations during the high temperatures of midday provided useful data on nestling numbers while adults were out hunting. Near fledging, falcon and other raptor young seemed most active from sunrise to 1000 hours, when they were most consistently practice-flapping and later flying and perching near the nest sites. Depending on the aspect of nest sites, morning and evening lighting provided varying levels of visibility into the nests, as well. As stated above, my recommendation would be that raptor monitors cultivate a philosophy and work attitude of adaptability to the timing of observations, observing raptor activity in response to the particular physical and behavioral conditions at a given nest territory.

The same general recommendations would apply to locating effective observation points for monitoring raptor territories and nest sites; remaining attentive to the behavior and movement of falcons and other raptors within given territories, raptor monitors should be adaptable to moving to different vantage points within nesting territories to most effectively observe raptor behavior and nesting phenology. Based on 20 years of data, the raptor monitoring protocol, photo points, and GPS coordinates for watch spots over the past 4 years, raptor monitors should have the basic framework necessary to set up observation points as dictated by the behavior and nest selection of given raptor pairs and young in nest sites. This standardized framework, in combination with flexibility to the physical and behavioral conditions within a specific nest territory, should allow the raptor monitor to consistently and effectively observe raptor nesting throughout the breeding season.

A final management recommendation relates to the management of raptor monitoring databases in the park. From 2004-2006, Jason Herynk served as the Inventory & Monitoring (I&M) Database Manager stationed at PNM. His efforts were critical in converting many of the raptor monitoring databases from FileMaker Pro to MS Access and in managing ArcMap and GIS layers for the program. Jason's position was terminated in early 2006, leaving the raptor monitoring program without access to the expertise necessary to effectively manage existing raptor databases. Given the ongoing accumulation of raptor monitoring data and the FileMaker Pro

databases for the program that were not converted to MS Access (including those related to photodocumentation of raptor nests and monitor watchspots), I would strongly recommend the renewal of an I&M database manager position, to assist in the management, organization, and archiving of raptor monitoring data at the park. This will help ensure that the accumulated wealth of raptor monitoring data is stored appropriately and made accessible for park managers and raptor monitors in the field.

Research Recommendations

In regards to raptor monitoring research needs at the park, I would offer several further recommendations. Historically, the raptor monitoring program has focused on managing for the protection of cliff-nesting raptors, particularly prairie falcons and golden eagles, because they are species of concern in California and are directly impacted by climbing advisories in the park. The standardization of raptor monitoring procedures and raptor advisories, and effective communication with hikers and climbers at the park, has helped to ensure the continuing breeding success of prairie falcons and golden eagles, and the return of breeding peregrine falcons to the park. However, 4 sensitive species of concern in California – Cooper's hawks, sharp-shinned hawks, white-tailed kites, and long-eared owls – have received little monitoring attention historically, despite the confirmation of active nesting for all of these species in the park this year and in the past. These 4 raptor species all tend to reproduce along riparian corridors where many of the park trails are located and potential disturbance of nest sites by visitors should be studied further. As the staff at PNM prepare for the management of the Pinnacles Ranch and Kingman property land extending out to Highway 25, the need for further monitoring of forest and woodland nesting raptors becomes even more important, because much of this new park property contains riparian corridors and oak/pine woodlands suitable for accipiter, kite, and long-eared owl nesting habitat. Allocating funds for an additional raptor monitoring position focused on accipiter, kite, and long-eared owl monitoring would allow the visitor impacts on these species to be documented more clearly, and would help justify seasonal closures of riparian and woodland areas determined to be essential nesting habitat for the accipiters, kites, and owls.

The recent acquisition of the Kingman property may provide the park with nesting habitat for another raptor species: burrowing owls. This owl species is also listed as a sensitive species of concern in many western states including California (Martell 1990, James 1992, Haug et. al 1993), with local populations in California – particularly near the San Francisco Bay and the Central Valley – declining steeply in recent years (Johnson 1992). Burrowing owls may inhabit the rangeland and fields between the Pinnacles Campground and Highway 25, and this property should be inventoried for their presence prior to the implementation of management decisions for the acquired land. The nest burrows for this species are visible, with prey matter, feathers, and cow manure decorating the entrances to active burrows clearly. I would recommend funding for a biological science technician position to document for presence of active burrowing owl burrows in acquired rangeland habitat. Alternatively, the raptor monitor's position could be extended through September or October, as active burrows will likely produce fledgling owls in July, which should perch very visibly near burrows. This would at least provide preliminary evidence of burrowing owl presence or absence in the park.

I would also recommend the color banding and GPS tagging of the entire prairie falcon population as a possibility. Radio telemetry studies conducted from 2002-2005 revealed important preliminary data about the prairie falcon population at PNM never confirmed before: the population is resident in or near the park throughout the year, and all radio-tracked falcons fed primarily on prey items just south and west of the park boundaries, with no evidence of adult falcons feeding north or east of the park boundaries (Buranek 2006). This information suggests that alteration of habitat south and west of the park boundaries, near the town of Soledad, could have significant negative consequences for a viable, long-term population of prairie falcons at PNM. Color banding and GPS tagging of falcons in the park would build upon these results and provide much more extensive information on the raptors, including individual movements of

single and paired falcons within breeding seasons and from year to year, rates on short- and long-term pair bonds, rates of birds returning to nest in the park annually, loyalty of individual falcons to specific territories, and fledgling survivorship and dispersal. Additionally, GPS tagging would reveal more conclusively where the falcon population resides near the park during non-breeding seasons, and any potential threats to prairie falcon productivity in their feeding ranges, including rodenticide, pesticide, and land development pressures. Color banding and GPS tagging could provide valuable tools for continuing to broaden our experience and understanding of the prairie falcons as a sensitive species, a management concern for the park and surrounding region, and an amazing bird of prey that returns to breed at the park annually.

ACKNOWLEDGEMENTS

This program would not be as successful as it is without the eyes and ears of helpful PNM employees. Therefore, I would like to thank the park employees for their help, encouragement, and passion for the raptors and wildlife diversity at PNM. I would also like to extend my appreciation to the park visitors, for their reports and observations on raptor sightings in the park, and for their appreciation and value of the importance of monitoring, managing, and protecting the nesting sites and breeding productivity of raptors in the park.

In particular, I would like to thank Erik Temple, Brendan Lukas, and Ben Nugent for finding the first confirmed turkey vulture nests in the park in over 20 years, David Soto for his observations of white-tailed kite activity in Jawbone Canyon that led me to discovering an active kite nest in the area, and George Frusetta for his timely observation of long-eared owl fledglings in the Kingman Land South territory. Scott Scherbinski, Brian Hess, Rebecca Leonard, Rob Saulino, and Jennifer Tiehm also contributed valuable observations on raptor territories and pair behavior in the park. I would also like to thank Jason Herynk for his time and effort in managing the raptor monitoring databases and GIS data, and Jim Petterson for his consistent support of and trust in my work as a raptor monitor. I also thank Erika Williams for her efforts in detailing accurate raptor / climbing advisories and the organization of the park bird checklist, and Lisa Smith for promptly setting a more secure base and bolted fixture for the advisory sign in the Scout Peak area. The following staff shared their experience, excitement, and observations of raptors with me throughout the season, granting me a more complete picture of raptor breeding and diversity at the park, and assisted in the effective management of raptor advisory areas: David Soto, Scott Scherbinski, Brian Hess, Rebecca Leonard, Linda Regan, Lori Frusetta, Court Van Tassel, Jennifer Tiehm, Alacia Welch, Lisa Smith, and Wendy Artz.

Biologist Alacia Welch also deserves my sincere thanks and gratitude for assisting me regularly in observations of raptor territories, finding previously undocumented raptor nest territories, her skill in seeing and hearing raptor breeding behavior in falcon, accipiter, red-tailed hawk, and red-shouldered hawk territories, and her help in confirming occupation and fledging status of territories through individual and team monitoring efforts.

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APPENDIX 1

This season's full-time Raptor Monitor was Gavin Emmons, assisted by Biological Technician Alacia Welch. Park employee volunteers and staff assisted me in the field as needed, and forwarded observations of raptors to me through wildlife observation cards and personal communications.

The total number of observation hours by staff was 954 hours. Volunteers' observation hours totaled 73. Total time in the field was 1027 hours.

APPENDIX 2

Through the course of the 2006 season, several changes were made to raptor monitoring databases, and relevant sections in the Raptor Monitoring Protocol will be revised accordingly. Primarily these changes were put in place to address the transfer of all Research and Resource Management (RRM) data from terastations in the RRM office to a networked system used by the whole park unit. These are listed here as general raptor monitoring metadata, as "works in progress" that have not been finalized.

The "raptorindex.FP5" database was completely transferred to MS Access format in 2005. Fundamentally, the data entry form records the same information as was collected in the FileMaker Pro database, but with the addition of certain fields, including observation limits, precipitation, cloud cover percentage, wind speed, high / low temperatures, etc. New tables for raptor watchspots, possible but unconfirmed nest sites, and advisory sign locations have also been incorporated into the "switchboard" for the database, and are titled "obs pts for possible nests," "observation points, and "advisory signs." The transfer process from FileMaker to Access will be detailed further in revised data management sections of SOP #9 in the Raptor Monitoring Protocol. A Word document, "metadata_raptorindex," was created to detail missing records or information in the "raptorindex" database, and to describe some of the conversion changes to MS Access format.

A subfolder in the "database folder" titled "important data files" was created to provide a central location for some of the most important files not attached directly to theme folders in the Breeding Raptors folder. The "metadata_raptorindex" document described above is contained in this folder. The "photolog.FP5" database (detailed below) and two Excel spreadsheets – "raptor summary data with graphs" and "Raptor Nests" – are also in this folder. The former spreadsheet contains a summary table of all statistical data related to prairie falcon breeding at Pinnacles over the 20-year monitoring program, as well as statistical data specifically for core nesting areas affected by climbing advisories and high visitor use. The latter spreadsheet is a summary of all active raptor nests listed by year, species, and nest codes.

Traditionally, photo documentation of Pinnacles territories has been archived in the "photolog" and "divlog" Word documents. Because the photo information is most conducive to a database structure, the information in these files was transferred fully into a FileMaker database, "Photolog.FP5," in 2005 and is contained in the "important data files" folder in the "databases" folder, described above. The "Photolog.FP5" database will be converted to MS Access format in the future and incorporated into the existing "Breeding Raptors" Access database, after transfer errors from FileMaker Pro to MS Access have been addressed.

The "breedingraptors.FP5" database was exported into MS Access format in 2005-06, to link this database with the MS Access "raptorindex" database, and SOP #9 will be revised accordingly to track these changes.

The sections on GPS and GIS layers in SOP #9 will be revised in the future to reflect a more standardized approach to information that is currently being developed. In particular, the section on the "raptornest.apr" ArcView project will be revised to reflect conversion from ArcView to ArcMap software in the park. With the transfer of RRM data to the parkwide network, shapefile and imagery data relevant to the ArcMap project have been consolidated into the "arcview files" folder contained within the "databases" folder, and linked directly to the ArcMap project. Three datasets – "Obs Points_Possible Nests.dbf," "Obs Points.dbf," and "Advisory Signs.dbf" – have been converted from MS Access tables with the same names in the Breeding Raptors database. These changes will be detailed in a revision of SOP #9. Off-trail routes to remote watchspots and advisory sign locations have been GPSed, and unique identifier codes for watchspots are being developed.

APPENDIX 3: 2006 Nest Phenology and Success – Falconids (Prairie Falcons and Peregrine Falcons)

Nest Species	Territory Occupied	Nest Code	Arrival Date	Begin Incub.	Hatch Date	Fledge Date	Abandon Date	Failed Date	# of Eggs	# of Nestlings	Known Fledglings	Possible Fledglings	Occup. Status
PRFA	Drywall	DRY-10	<1/18	<4/5	4/18-19	5/30-31			2	2	2	2	2
PRFA	D. Soto Canyon	DS-1	<1/23	<3/24	4/7-9	5/16-17			5	4	4	4	4
PRFA	Willow Springs Slide	*CNWS	<1/20										Occupied
PRFA	Cyn N of Willow Spgs	CNWS-2	<1/20	<4/1	4/25-26	6/6-7			3	3	3	3	3
PRFA	Narrows	NARR-1	<2/21	<3/31				<4/25	3				Failed
PRFA	Pig Canyon	PIG-8	<1/15	<3/25	4/12-13			<5/25		3			Failed
PRFA	Little Pinnacles		<1/12										Occupied
PRFA	Frog / Hand												Not Occ.
PRFA	Prescribed Burn Cliffs												Not Occ.
PRFA	Pipsqueak Pinnacles	PP-1	<2/28	3/23-4/8	5/6-8	6/17-19				2	2	2	2
PRFA	Hanging Valley	*PP/SP	<2/28										Occupied
PRFA	Scout Peak	*PP/HV	<2/28										Occupied
PRFA	Goat / Resurrection	RW-1	<1/11	4/2-15	5/2-3	6/13-14			4	3	3	3	3
PRFA	Teapot Dome	TD-1	<1/11	<3/17	4/22-24			<5/6	4	2			Failed
PRFA	Hawkins												Not Occ.
PRFA	Egg	*TD	<1/11										Occupied
PRFA	Citadel	CI-1	<3/4	>3/4	5/9-10	6/20-21				3	3	3	3
PRFA	Tugboat	*MAT/NWR	<1/20										Occupied
PRFA	Mating Rocks	MAT-1	<1/20	<4/8	5/1-3	6/12-14				2	2	2	2
PRFA	North Wilderness Rock	*MAT/TUG	<1/20										Occupied
PRFA	Crowley	CT-4	<1/13	<3/25	4/23-24	6/4-5				3	3	3	3
PRFA	North Balconies	*SGB	<1/21										Occupied
PRFA	South Balconies	SGB-2	<1/21	3/4-18	4/27-28	6/8				4	4	4	4
PRFA	Machete	*CI	<3/4										Occupied
PRFA	North Chalone	NC-1	<1/23	<3/26	4/25-26	6/6-7				4	4	4	4
PRFA	South Chalone	SC-1	<4/19	<4/19				<5/30	3				Failed
PEFA	Hawkins	HP-1	<1/10	3/12-23	4/25-27	6/6-8			3	3	3	3	3

(Note: for the **"Occup. Status"** column, # refers to possible fledglings, "Occupied" = territorial occupation, "Not Occ." = no occupation, "Failed" = failed nest, "Unknown" = breeding confirmed (see nest code) or likely, but nest status unknown. For the **"Nest Code"** column, * refers to territorial links for raptor pairs occupying more than one territory.)

APPENDIX 4: 2006 Nest Phenology and Success – Falconids (American Kestrels), Eagles, Buteos

Nest Species	Territory Occupied	Nest Code	Arrival Date	Begin Incub.	Hatch Date	Fledge Date	Abandon Date	Failed Date	# of Eggs	# of Nestlings	Known Fledglings	Possible Fledglings	Occup. Status
AMKE	South Wilderness Trail		<2/18										Occupied
AMKE	South Wilderness Trail		<3/13										Occupied
AMKE	S Wilderness – N End	SWN-4	<2/9	<4/15		<6/6				3	3	4	4
AMKE	Drywall	DRY-3	<1/18		<6/2					1		1	1
AMKE	Kingman Land South	KLS-2	<4/13	<4/13		>5/25					2	2	2
AMKE	Fire Wayside		<3/19										Occupied
AMKE	Marion Canyon		<2/15			<6/7				3	3	3	3
AMKE	North Wilderness Trail		<3/31										Occupied
AMKE	Prescribed Burn Cliffs	PB-9	<3/25	<5/22	<6/11					1		1	1
AMKE	Neglected Valley	NV-2	<1/22	<5/22						1		1	1
AMKE	Goat / Resurrection		<2/4			<6/16					1	2	2
AMKE	South Balconies	SGB-14	<1/13	<4/30									Unknown
AMKE	Machete		<3/18										Occupied
AMKE	Mating Rocks		<1/29			<6/13					2	2	2
AMKE	North Chalone	NCW-2	<3/26			<6/7				4	4	4	4
AMKE	North Chalone	NC-6	<2/28		<6/7					1		1	1
AMKE	South Chalone	SC-6			<5/30	<6/7				2	2	2	2
AMKE	Eucalyptus Grove		<2/4										Occupied
GOEA	Eucalyptus Grove	EG-3	<1/21	<2/4	3/12-20	5/14-22				2		2	2
RTHA	S Wilderness – N End	SWN-2	<1/18	<3/13	4/7-8	5/26-27				3	2	3	3
RTHA	Grassy Canyon	*SWN	<1/18										Occupied
RTHA	North Wilderness Trail	NWT-1	<1/13	<3/31	4/19-21	6/14-16				2		2	2
RTHA	Frog / Hand	HAND-1	<1/16	3/8-23	5/5-9	6/16-18				3	1	3	3
RTHA	Western Front	WF-1	<1/11	3/7-21	4/6-8	5/25-27				3	1	3	3
RTHA	Lower Condor Gulch	LCG-1	<2/6		4/22	6/7-8				3	3	3	3
RTHA	Crowley Drainage	CD-1	<3/4	<3/25	4/10-12	5/29-6/1				3	1	3	3
RTHA	Eagle Rock	ER-2	<4/9	<4/9	4/26-28	6/13-15				2	1	2	2
RSHA	South Wilderness Trail	SWT-4	<2/13		4/9-13	5/19				3	3	3	3
RSHA	Bench Area	BA-2	<1/26	<3/20	4/9-12	5/22-24				3	3	3	3
RSHA	Pinnacles Campground	PCG-1	<1/21	<3/13	4/12-16	5/26-6/1				3	1	3	3
RSHA	McCabe Canyon	MC-2	<3/21		4/24-27	6/9-11				3	2	3	3
RSHA	Kingman Land South	KLS-1	<4/6	<4/6	4/9-12	5/20-24				3	3	3	3

(Note: for the **"Occup. Status"** column, # refers to possible fledglings, "Occupied" = territorial occupation, "Not Occ." = no occupation, "Failed" = failed nest, "Unknown" = breeding confirmed (see nest code) or likely, but nest status unknown. For the **"Nest Code"** column, * refers to territorial links for raptor pairs occupying more than one territory.)

APPENDIX 5: 2006 Nest Phenology and Success – Accipiters, Kites, Owls (Barn Owls, Long-eared owls, and Great-horned Owls)

Nest Species	Territory Occupied	Nest Code	Arrival Date	Begin Incub.	Hatch Date	Fledge Date	Abandon Date	Failed Date	# of Eggs	# of Nestlings	Known Fledglings	Possible Fledglings	Occup. Status
COHA	S Wilderness – S End	SWS-1		<5/24	5/16-20	6/17-18				3	3	3	3
COHA	South Wilderness Trail	SWT-5	<2/16	<5/4				<5/24					Failed
COHA	S Wilderness – N End	SWN-3	<3/13	<5/4	6/8-12	7/6-10				2	2	2	2
COHA	Grassy Canyon	GC-2	<3/28	<4/21	5/24-30	6/24-27				3	3	3	3
COHA	Kingman Land South	KLS-3	<4/6	<5/10	5/22-27	6/21-24				3	2	3	3
COHA	Kingman Land North					<6/20					1	1	1
COHA	North Wilderness Trail	NWT-2	<4/1	<4/25	5/24-31			6/8-22		2			Failed
COHA	Guard Rock	GR-2		<5/25				6/28-7/6					Failed
SSHA	Chalone Picnic Area	CPA-2						<7/18					Failed
SSHA	Upper Bear Gulch	UBG-2			6/22-23	7/13-14				2	2	2	2
WTKI	South Wilderness Trail		<1/26			<5/24					2	2	2
WTKI	South Wilderness Trail	SWT-6	<1/26	<6/6	6/29-7/3			7/22-25		3			Failed
WTKI	McCabe Canyon	MC-1	<1/20	<4/14	5/8-10	6/2-5				3	3	3	3
WTKI	Kingman Land North					<6/20					2	2	2
WTKI	Marion Canyon	MAR-1	<2/15	<4/25	5/9-13	6/3-7				4	3	4	4
WTKI	North Wilderness Trail		<1/13										Occupied
WTKI	Jawbone Canyon	JAW-1	<1/21	4/3-17	5/30-6/2	6/22-23				3	3	3	3
WTKI	Double Gates	DG-2	<4/17	6/1-5	6/24-26					4	4	4	4
BAOW	D. Soto Canyon	DS-3	<2/2	<3/7	<4/15					2		2	2
BAOW	High Pks Trl W of CPA	WCP-3		<4/29	>4/29					2		2	2
BAOW	Discovery Wall	DIS-3	<1/11			>5/11				3	1	3	3
BAOW	North Chalone		<6/14										Occupied
LEOW	S Wilderness – N End	SWN-1						<5/19		3			Failed
LEOW	Grassy Canyon					<5/12					3	3	3
LEOW	Kingman Land South					<5/10					3	3	3
LEOW	Chalone Picnic Area	CPA-1	<2/18	3/1-5	<4/25	<5/10				2	2	2	2
LEOW	Marion Canyon	MAR-1			4/4-11					2		2	2
GHOW	South Wilderness Trail	SWT-1	<2/13	<2/16		<5/1				3	3	3	3
GHOW	Hanging Valley		<1/12										Occupied
GHOW	Upper Condor Gulch		<2/6										Occupied
GHOW	Pig Canyon		<1/27										Occupied
GHOW	West Side Entrance	WSE-1			3/8-23	6/5-19				4	3	4	4
GHOW	Machete		<2/4										Occupied
GHOW	North Balconies		<1/21										Occupied

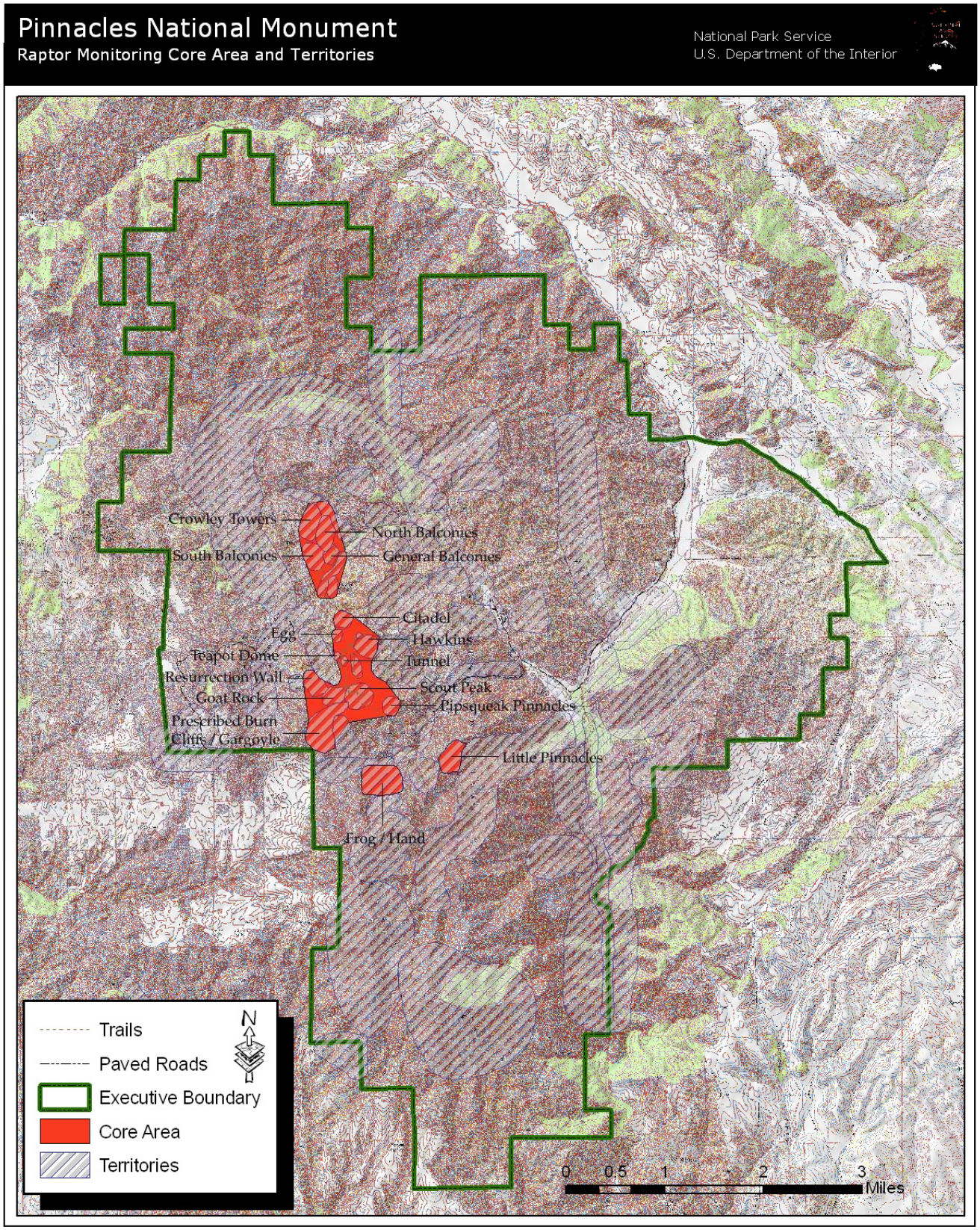
(Note: for the **"Occup. Status"** column, # refers to possible fledglings, "Occupied" = territorial occupation, "Not Occ." = no occupation, "Failed" = failed nest, "Unknown" = breeding confirmed (see nest code) or likely, but nest status unknown. For the **"Nest Code"** column, * refers to territorial links for raptor pairs occupying more than one territory.)

APPENDIX 6: 2006 Nest Phenology and Success – Owls (Northern Pygmy-owls and Western Screech-owls), Cathartids, Corvids

Nest Species	Territory Occupied	Nest Code	Arrival Date	Begin Incub.	Hatch Date	Fledge Date	Abandon Date	Failed Date	# of Eggs	# of Nestlings	Known Fledglings	Possible Fledglings	Occup. Status
NOPO	Bench Area		<2/8										Occupied
NOPO	Fire Wayside		<1/24										Occupied
NOPO	Chaparral Picnic Area		<1/21										Occupied
WESO	Upper Bear Gulch		<2/28										Occupied
WESO	Headquarters		<2/5										Occupied
TUVU	Frog Canyon	FC-3			5/28-6/4	7/30-8/6				2		2	2
TUVU	South Chalone	SC-5			5/7-14	7/0-17				2		2	2
TUVU	Hawkins					<8/8					3	3	3
CORA	Drywall	DRY-9	<1/18		<4/5	<6/2				3	3	3	3
CORA	D. Soto Canyon	DS-4	<2/23										Unknown
CORA	Prescribed Burn Cliffs	PB-9	<1/22	<5/22									Unknown
CORA	Crowley	CT-6		<5/7				5/7-20					Failed
CORA	Machete	MAC-2		<4/2		5/29-31				2	2	2	2
CORA	Jawbone Canyon		<4/17										Unknown
CORA	Double Gates	DG-1	<4/17			>5/22				3		3	3
CORA	NE Sec 15	NES-1	<2/28	<4/19									Unknown

(Note: for the **"Occup. Status"** column, # refers to possible fledglings, "Occupied" = territorial occupation, "Not Occ." = no occupation, "Failed" = failed nest, "Unknown" = breeding confirmed (see nest code) or likely, but nest status unknown. For the **"Nest Code"** column, * refers to territorial links for raptor pairs occupying more than one territory.)

APPENDIX 7: PRFA Core Area and Parkwide Raptor Territories at Pinnacles National Monument


Pinnacles National Monument
Raptor Monitoring Core Area and Territories
National Park Service
U.S. Department of the Interior
Crowley Towers
North Balconies
South Balconies
General Balconies
Citadel
Egg
Hawkins
Teapot Dome
Tunnel
Resurrection Wall
Scout Peak
Goat Rock
Pipsqueak Pinnacles
Prescribed Burn
Cliffs / Gargoyle
Little Pinnacles
Frog / Hand
Trails
Paved Roads
Executive Boundary
Core Area
Territories
N
0
0.5
1
2
3
Miles

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September, 2006

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