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Raptor Breeding Season Report for Pinnacles National Monument – 2008

Natural Resource Technical Report NPS/SFAN/NRTR—2009/192

ON THE COVER
Prairie Falcon Nestling, South Balconies.
Photograph by: Gavin Emmons, San Francisco Bay Area Network Inventory and Monitoring Program.

Raptor Breeding Season Report for Pinnacles National Monument - 2008

Natural Resource Technical Report NPS/SFAN/NRTR—2009/192

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Executive Summary

Pinnacles National Monument ("Pinnacles") provides a diverse habitat for numerous cliff-nesting raptors, including prairie falcons (*Falco mexicanus*), peregrine falcons (*F. peregrinus*) and golden eagles (*Aquila chrysaetos*), as well as a spectacular array of summits and cliff-wall routes for rock-climbers. This monitoring effort was established to determine long-term trends in the number of occupied territories and productivity of nesting prairie falcons. Data on presence and diversity of other nesting raptors are also collected. The effort grew out of a need to reduce potential disturbance that climbers and off-trail hikers may have on cliff-nesting raptors. This report summarizes the results from the 2008 breeding season and represents the 22nd year of monitoring at the monument.

To monitor prairie falcons, field technicians survey potential nest sites three times per breeding season spaced 21-28 days apart. Nests determined to be active were revisited to confirm rearing of nestlings and fledging of young. In 2008, monitoring was conducted from 13 January 2008 until 11 July 2008.

This year represented the 2nd least productive year for prairie falcon nesting in the past 22 years. Twelve territorial falcon pairs were documented this year with 5 pairs actively nesting. Of the 12 observed hatchlings, all were confirmed to have fledged. Breeding productivity during the 2008 breeding season was also low for other raptor species nesting in the monument, with 18 nests representing 9 raptor species. A peregrine falcon pair successfully nested and fledged 3 young in the Hawkins territory, marking the 4th consecutive year that a successful peregrine falcon nesting effort has been documented at Pinnacles in the last 50 years. Two golden eagle nests were observed this year. One known nest in the monument produced 1 egg but failed to produce any hatchlings. A historically documented nest just outside of the monument produced 2 eaglets, with fledging confirmed for 1 young but likely for both. Nests for sensitive California species were recorded this season for long-eared owls (*Asio otus*), Cooper's hawks (*Accipiter cooperii*), and sharp-shinned hawks (*A. striatus*). Two long-eared owl nests were documented. One nest failed due to predation or abandonment, and the other produced 2 hatchlings, with fledging possible but unconfirmed for both. Other nesting raptor species documented in the monument included red-tailed hawks (*Buteo jamaicensis*), red-shouldered hawks (*B. lineatus*), and American kestrels (*Falco sparverius*), with low productivity and numbers of nesting pairs observed for all 3. One non-nesting territorial pair of white-tailed kites (*Elanus leucurus*) was documented in the monument this year.

2008 marked the 5th year that captive-bred California condors (*Gymnogyps californianus*) were active and free-flying at Pinnacles, with up to 37 condors active from Grassy Canyon to the High Peaks, and moving between Pinnacles and Big Sur on the coast throughout the season. Although no condor pairs have bred at Pinnacles, condors were observed displacing golden eagles, turkey vultures, and corvids from the Grassy Canyon condor feeding sites.

Acknowledgements

This program would not be as successful as it is without the eyes and ears of helpful Pinnacles employees. Therefore, I would like to thank the NPS employees for their help, encouragement, and passion for the raptors and wildlife diversity at Pinnacles. The many local climbers involved with Friends of Pinnacles also deserve my thanks for their ongoing support of resource protection and breeding raptors at the park and particularly their efforts to publicize and honor advisories in effect. Additionally, members of Friends of Pinnacles played a key role in shaping the success of the Rockpile Rendezvous centennial event this year. I would also like to extend my appreciation to the monument visitors, for their reports and observations on raptor sightings and for their appreciation and value of the importance of monitoring, managing, and protecting the nesting sites and breeding productivity of raptors in the monument.

I would like to thank Alacia Welch, Jim Petterson, Daniel George, Scott Scherbinski, Paul Johnson, Brent Johnson, Tim and Linda Regan, Christian Hellwig, William Wright, and Keir Morse for contributing valuable observations on raptor territories and pair behavior in the monument. I also thank Erika Williams for her efforts in detailing accurate raptor/climbing advisories and her assistance in organizing and printing raptor monitoring and advisory brochures and bulletin board posters. I am also grateful for Denise Louie's support particularly during Jim Petterson's absence, and her efforts, in tandem with Marcus Koenen as the network I&M Coordinator, to keep the Pinnacles raptor monitoring program funded annually and, as of this year, on a permanent basis. Paul Johnson and Marcus Koenen also served as editors of the 2008 annual report and Amy Fesnock peer-reviewed the report, contributing greatly to a concise and efficient document consistent with I&M standards.

As the network I&M Data Manager, Dave Press deserves my thanks for his ongoing efforts in developing more effective data entry and management models for recording, storing, and archiving raptor monitoring data for Pinnacles. 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 monument, and assisted in the effective management of raptor advisory areas: Brett Hergert, Debbie Simmons, Linda Grant, Leticia Ruiz, Lori Frusetta, Eric Brunnemann, and Albert Faria.

Introduction

Pinnacles National Monument ("Pinnacles") 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 (*F. peregrinus*), and golden eagles (*Aquila chrysaetos*). The dramatic landscapes, extensive trails, arrays of summits, and cliff-wall routes at Pinnacles 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 Pinnacles sensitive to human disturbance include prairie falcons (Fyfe et al. 1976; Ogden and Hornocker 1977; Harmata et al. 1978; Sitter 1983; Steenhof 1998), peregrine falcons (particularly in remote locations: see Hickey 1942; Bond 1946; Hickey 1969; Steenhof 1998), golden eagles (Newton 1979, 1990; Scott 1985; Steidl et al. 1993; Watson 1997; Steenhof et al. 1997; Kochert et al. 1999), 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 Pinnacles, with an average of 9.5 nesting pairs per year documented from 1984-2007 (see Table 4). 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 (USDI 1979), habitat destruction and nest site limitation (Becker and Ball 1981; Steenhof et al. 1997), and proximity to major roadways (Platt 1974; Boyce 1982).

The main sources of human disturbance of nesting raptors at Pinnacles are visitors that are rock-climbing and hiking on- and off-trail in the monument. 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 (Fyfe et al. 1976; Olsen and Olsen 1978; Becker and Ball 1980; Suter and Joness 1981; Porter et al. 1987; Holthuijzen 1990; Cade et al. 1996; White et al. 2002). Therefore, the primary management objective of the Pinnacles raptor monitoring program is to establish climbing/hiking advisories in core areas (high visitor-use areas) each breeding season and monitor prairie falcon population status as a way to protect cliff-nesting raptor species from human disturbance.

Monitoring efforts began initially to establish annual climbing/hiking advisories in core areas. The program established two long-term monitoring objectives to:

- Track changes in the total numbers of territorial prairie falcon pairs in core areas and non-core areas.

- Track changes in average annual productivity (young of year hatched/pair, young of year at banding age/pair, young of year fledged/pair) in core areas and non-core areas.

Core areas are locations at Pinnacles 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 Pinnacles suitable for cliff-nesting. The core vs. non-core sampling design is detailed further in the Methods section. Locations of the core areas are depicted on a map of Pinnacles (see Figure 1).

A side benefit of the monitoring program is that a substantial amount of information can also be gathered on other raptor species at Pinnacles, particularly sensitive California species that may be impacted by human presence and disturbance in riparian habitats: Cooper's hawks (*Accipiter cooperii*), sharp-shinned hawks (*A. striatus*), white-tailed kites (*Elanus leucurus*), and long-eared owls (*Asio otus*). Although lack of consistent nesting data for these species over the course of the 22-year raptor monitoring program precludes statistical and trend analysis, the presence data nevertheless provide valuable information on the diversity and location of breeding raptors at Pinnacles. This has been used for planning purposes relating to the revision of the General Management Plan (GMP), and for guiding timing of routine maintenance activities.

Study Area and Field Methods

Pinnacles is located in the Gabilan Mountains of the central Coast Range of California and encompasses 10,694 hectares 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 (NOAA 1997).

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

Sample Design

The prairie falcon monitoring focuses on core areas and non-core areas. Core areas (Figure 1) are locations in Pinnacles that can support prairie falcon cliff-nesting, and where impacts to raptors due to rock climbing activities 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.

Non-core areas refer to all other areas within the monument that can support prairie falcon cliff-nesting. For 2003-2008, non-core area sampling has also been conducted through a census. This has been possible because of comprehensive historical data on prairie falcon nest sites gathered over the past 22 years. In addition, GIS modeling completed in 2008 confirmed that all potential prairie falcon nesting areas in the monument have been surveyed during the past 5 years.

Field Methods

Survey methods followed the standard operating procedures detailed in the 2008 Raptor Monitoring Protocol for Pinnacles National Monument, California (Emmons et al. 2009). While the protocol focuses on monitoring population and productivity trends of prairie falcons, the park is also interested in presence and productivity data for 14 other cliff- and riparian-nesting raptor species. Many of these species are considered “species at risk” but do not currently have official federal or state protection status (CDFG 2008).

Cliff-nesting Raptors

Besides prairie falcons, peregrine falcons are the other obligate cliff-nesting “species at risk” at Pinnacles. Potential and established cliff-nesting raptor territories in core and non-core areas 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 a territory. A Magellan Triton 500 GPS unit was used to plot every observation point. Field data were documented with standardized datasheets and field notebooks (Appendix 4).

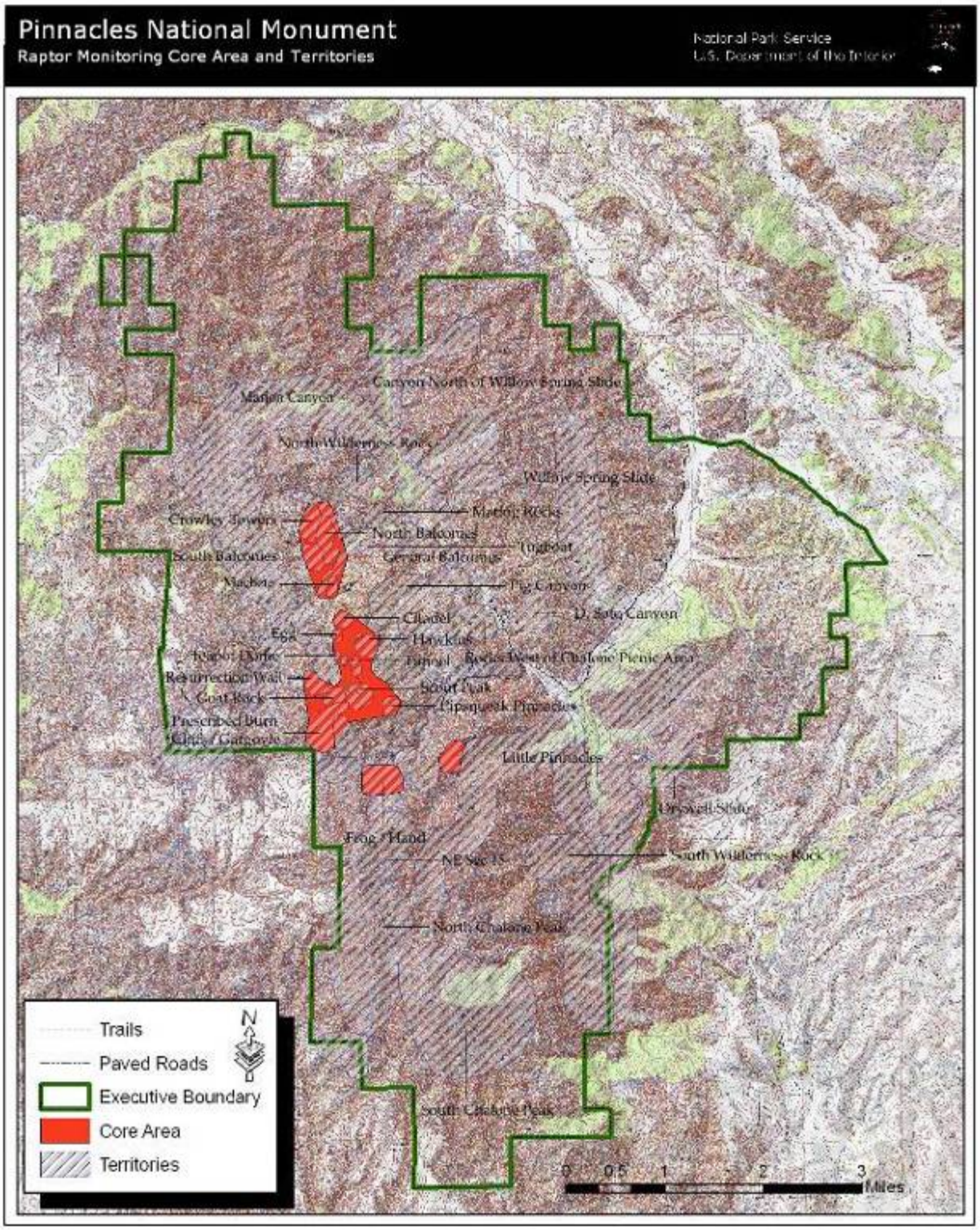

Figure 1. Core and non-core areas at Pinnacles National Monument.

Three- to five-hour observation periods are commonly recommended to document territory occupancy of peregrine falcons and prairie falcons (USFWS 1984; Cade et al. 1996; Smith et al. 2006). Steenhof et al. (1999) employed 2-hour observation periods during point surveys to document territory occupancy of prairie falcons in the Snake River region of Idaho. For a potential prairie falcon territory to be classified as unoccupied at Pinnacles, we adopted a conservative standard of visiting potential nest sites at least three times per breeding season spaced 21-28 days apart to confirm territorial occupancy, courtship, and incubation of eggs within a breeding season (Fuller et al. 1981; Fraser et al. 1983; Steenhof 1987). Survey duration was ultimately dependent upon visibility but at least three 4-hour surveys (12 hours total) were required to verify that "no birds" were present. Nests determined to be active were revisited to confirm rearing of nestlings and fledging of young. Nests in core areas were monitored more frequently and during weekend days when climbers were more likely to be present. While other monitoring programs infer fledging success at 90% fledge age (Steenhof and Kochert 1982; Anderson and Squires 1997; Steenhof 1998), our protocol was to continue surveys until all young raptors were confirmed as fledged.

During the prairie falcon breeding season status was asserted as follows:

Territories: Territorial behavior included perching, flying, territorial disputes and defense, stooping and scold calling, and roosting locations.

Courtship: Courtship behavior included copulation, food drops and swapping, and potential nest site inspections and preparation.

Incubation: Incubation status was determined by observing prairie falcons flying into a nest hole and not re-emerging for extended periods of time. During this time, egg counts were made whenever possible (e.g. when lighting conditions allowed and when incubating falcons temporarily left the nest during food drops and/or 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 of incubation and 20 minutes or more not incubating the eggs). Hard incubation was characterized by the adult falcons – primarily the females – incubating a full clutch of eggs for hours in duration.

Hatchlings: 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 (preferably three or more) independent agings.

Fledging: Fledging was confirmed by seeing young perched and/or in flight away from the nest site. Fledging dates were estimated by the coordination and strength of flight, the size of perches, and the amount of vocalization during flight.

Riparian-nesting Raptors

Riparian-nesting raptor activity was documented en route to observation points for cliff-nesting raptor monitoring. Additionally, historical riparian raptor nest sites were

monitored for raptor presence, and Pinnacles staff/visitor observations of breeding raptor activity were checked for confirmation of raptor presence.

Potential and established riparian-nesting raptor territories were surveyed using spotting scopes (20-60x) and binoculars (10x42). Observations were made from locations where breeding raptor activity was documented and raptor nest sites were most visible. A Magellan Triton 500 GPS unit was used to plot observation points.

For each riparian-nesting raptor species all historical nest sites and potential nest habitats were visited at least 2 times per breeding season spaced 21-28 days apart. Visits were scheduled to correspond with general phenology patterns for egg incubation and nesting per species to allow for the highest possibility of confirming territorial occupancy and active nesting of raptor species. Active nest sites were revisited every 28 days to document rearing of nestlings and fledging of young.

Monitoring Schedule

The monitoring season started on 13 January and continued through the end of the nesting season, 11 July (Table 1).

Table 1. Timing of netting behavior of prairie falcons at Pinnacles National Monument.

Behavior	January	February	March	April	May	June	July
Territorial Falcons							
Courtship Behavior							
Nesting							
Fledging							

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.

Data Management

Data are entered into a MS Access database. Original data sheets are archived with Pinnacles Resource Management. Nest data are also submitted to the CDFG California National Diversity Database, and the Santa Cruz Predatory Bird Research Group.

Figure 2. Setting up advisory sign. ©Gavin Emmons, 2006.

Climbing Advisories

Climbing advisories went into effect by mid-January. Informational signs were established near territories occupied by prairie falcons at least once during the preceding three years. Visitors were advised to avoid these areas but compliance was voluntary. Advisory areas with posted signs (Figure 2) included the Balconies, Hawkins, Scout Peak, Frog/Hand, and Little Pinnacles territories.

Results and Discussion

During the 2008 field season, Pinnacles staff spent 765 hours in the field to make raptor observations. Volunteers contributed 60 hours of time in the field to make observations. Observers documented 11 territorial raptor species at Pinnacles. Of these, nine species were documented as breeding at Pinnacles (Table 2) including seven species of concern tracked by the California Natural Diversity Database (CDFG 2008). For all breeding raptor species, nine previously undocumented nest sites were confirmed, representing half of all nest sites recorded in the 2008 breeding season.

Table 2. 2008 Pinnacles breeding raptor nesting productivity.

Species	Territorial Pairs	Nesting Pairs	Successful Nests	# Fledglings	# Fledglings / Nest
Prairie Falcon *	12	5	4	12	3
Peregrine Falcon *	1	1	1	3	3
Golden Eagle *	3	2	1	2	2
Red-tailed Hawk	11	2	1	1	1
American Kestrel	7	2	2	4	2
Red-shouldered Hawk	5	2	2	4	2
Cooper's Hawk *	8	2	2	8	4
Sharp-shinned Hawk *	3	1	1	3	3
White-tailed Kite *	1	0	0	0	0
Long-eared Owl *	2	2	1	2	2
Great-horned Owl	2	0	0	0	0

* Species of Concern tracked by California Natural Diversity Database.

Prairie Falcons

Occupied Territories

Through the 2008 season 12 territorial pairs of prairie falcons were confirmed over the course of the breeding season (Table 3). This is comparable to the average territorial occupancy of 11.6 territories from 1984-2008. Of these, seven pairs did not nest or produce young this year. The Pipsqueak Pinnacles/Scout Peak pair actively perched, courted, and defended both territories early in the breeding season, but abandoned both

areas by the middle of March. The other six non-nesting pairs – at Machete/Citadel, Crowley Towers, Egg/Teapot Dome/Tunnel, NE Sec 15/North Chalone Peak, South Chalone Peak, and Willow Spring Slide/Canyon North of Willow Spring – occupied respective territories throughout the breeding season, engaged in courtship displays and potential nest site inspections, but did not lay, incubate, or hatch eggs.

Core Area: In 2008 there were seven territories within the core area. This is similar to the number of territories occupied in the core area over the last four years.

Table 3. 1984-2008 Pinnacles prairie falcon nesting productivity – core and non-core areas combined.

Year	Territorial Pairs	Nesting Pairs	Successful Nests	# 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
2007	14	12	9	33	3.7
2008	12	5	4	12	3
Averages (1984-2007)	11.6	9.5	7.7	26.2	3.2

Table 4. 2008 Pinnacles prairie falcon breeding summary.

Territory	Nest Used/ Last Year Used	# Eggs Laid	# Young Hatched	# Young Known/ Fledged
Drywall	DRY-2/2007	Unknown	4	4/ 4
Little Pinnacles*	LP-10/NEW	Unknown	2	2/ 2
Pig Canyon	PIG-9/NEW	Unknown	4	4/ 4
Resurrection Wall*	RW-6/NEW	Unknown	0	0 Note: Nest failed due to abandonment.
South Balconies*	SGB-16/NEW	4	2	2/ 2

* nests within the core area.

Table 5. 1984-2008 Pinnacles prairie falcon nesting productivity – core areas only.

Year	Territorial Pairs	Nesting Pairs	Successful Nests	# 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	3.0
1996	9	7	6	24	4.0
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	3.0
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	3.0
2007	6	6	6	26	4.3
2008	7	3	2	4	2
Averages (1984-2007)	7.4	6.3	5.3	18.3	3.2

Annual Productivity

Only five of the 12 pairs nested. Twelve nestlings fledged from the four successful nests (Tables 3, 4). The number of fledglings was lower only in 1987 and 1998 (Table 3,

Figures 3, 4). Low numbers documented in 1987 may have been partly due to limited staff available for monitoring during the breeding season. The 1998 season was characterized by heavy precipitation and major flooding throughout the raptor breeding season which contributed to nest failures for the entire breeding population of prairie falcons (Imberski 1998). Neither of these conditions was present in 2008: rainfall was below normal and monitoring efforts were on par with historical levels.

From the 4 successful nest sites, 12 total possible fledglings were produced. Nesting falcon pairs and nest productivity within core areas were likewise below the 22-year average this season. Two successful nest sites produced 4 total fledglings and 2 fledglings per nest, compared to the 22-year averages of 5.3 successful nests, 18.3 total fledglings, and 3.2 fledglings per nest (Table 5).

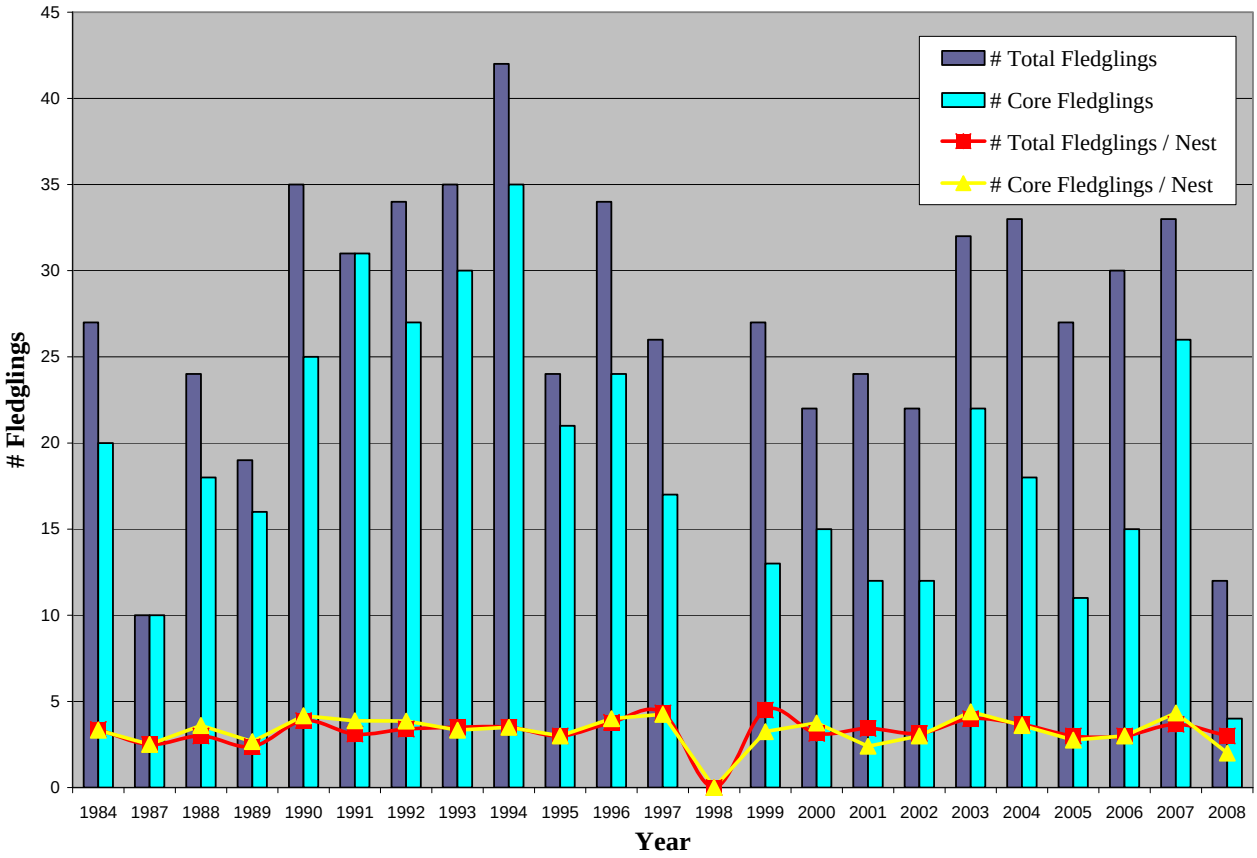

Figure 3. Total vs. Core Pinnacles PRFA Fledgling Productivity, 1984-2008.

Core Area: Of the seven territories in the core area in 2008, only two nested successfully, producing an average of two fledglings per nest (Table 5). This is below the 1984-2008 average of 3.2 fledglings per nest. These numbers represented the 2nd lowest rates for core area nests on record.

Phenology

The first prairie falcon pairs were observed at Crowley Towers, South Balconies, and Machete Ridge on 17 January 2008 (Appendix 1). Incubation was first observed at Pig Canyon on 14 April. The first hatching occurred between 8-9 May at Little Pinnacles. The first fledging took place from 19-20 June, also at Little Pinnacles. The last fledging took place at South Balconies on 2 July when two young fledged prematurely, likely due to disturbance at the nest site, but were still seen flying in the territory a week later.

Figure 4. Prairie Falcon fledgling at South Balconies. ©Gavin Emmons, 2006.

Other Notes

One of the five eyries chosen by prairie falcons was used in previous years. The other eyries were within historical territories, but the nest sites were previously undocumented. Two territories occupied by prairie falcon pairs for at least the past five years – D. Soto Canyon and Narrows/Marion Canyon – were vacant this year.

Other Species

Throughout the season data were collected on other raptor species nesting at Pinnacles. Notes are presented below. See Appendices 2-3 for further phenology and breeding data.

Peregrine Falcon (Falco peregrinus)

A peregrine falcon (Figure 5) pair occupied and successfully nested in the Hawkins territory, marking the 4th consecutive year in the past 50 years that a peregrine pair nested and produced fledglings in the monument. The pair was first observed circling near the central High Peaks on 13 January 2008, and chasing a prairie falcon female out of the Hawkins territory on 28 January. The pair was previously observed October through December 2007, suggesting the falcons were resident at the monument through the winter season. Through mid-March, the peregrine falcon pair copulated often, inspected historical nest sites at Hawkins regularly, and actively stooped other raptors in the Hawkins territory. The peregrine falcon pair laid and hatched three eggs, and fledged all three young by late June.

Figure 5. Juvenile Peregrine Falcon. ©Gavin Emmons, 2005.

Golden Eagle (Aquila chrysaetos)

Golden eagles were observed nesting on the west side of North Chalone Peak in Pinnacles and at the Eucalyptus Grove outside of the west entrance of Pinnacles. Golden eagle adults and juveniles were active throughout the monument, and although a golden eagle pair occupied the Drywall territory, no breeding activity was confirmed. Historical nest sites in three territories – Frog Canyon, South Chalone Peak, and Eagle Rock – contain five 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 North Chalone and the Eucalyptus Grove. The nest site at the Eucalyptus Grove was used the past four years by a nesting eagle pair. The North Chalone nest was documented as an active golden eagle nest in 2007. The golden eagle pairs were first observed at the Eucalyptus Grove on 20 January 2008 and at North Chalone on 17 February. Two eaglets hatched at the Eucalyptus Grove nest. The North Chalone nest produced one egg but failed due to abandonment by the adults. The North Chalone pair appeared to be rebuilding a nest construct in late April but did not nest again. Full fledging at the Eucalyptus Grove nest was highly likely but only one eaglet was confirmed fledged.

Red-tailed Hawk (Buteo jamaicensis)

Although 11 red-tailed hawk (Figure 6) pairs occupied territories at Pinnacles this year, only two nesting pairs were confirmed. Nine historical nest sites at the Western Front, Hand/Prescribed Burn Cliffs, South Wilderness (North End)/Grassy Canyon, Eagle Rock, Crowley Drainage/North Balconies, Guard Rock, and Kingman Land North were not used this year despite territorial occupation by red-tailed hawk pairs in all of these areas. The two active red-tailed hawk nests were stick nests at Lower Condor Gulch and Kingman Land North, both used by breeding pairs in 2007. Each nest produced one nestling, but the Kingman Land North nest failed likely due to predation or the nestling falling out of the nest site. The nestling at the Lower Condor Gulch nest fledged prematurely and actively took short flights near the nest site.

Figure 6. Juvenile Red-tailed Hawk. ©Gavin Emmons, 2005.

American Kestrel (Falco sparverius)

Seven territorial pairs and two breeding records were confirmed this year. Breeding pairs were observed at Kingman Land North and Prescribed Burn Cliffs. The Prescribed Burn Cliffs kestrel pair nested in a cliff cavity last used in 2001. Nest incubation and hatching dates were not confirmed at either site. Two fledglings were confirmed from each breeding pair, with two males at Prescribed Burn Cliffs and a male and female at Kingman Land North. The young kestrels at Kingman Land North were observed soon after fledging, with a likely but unconfirmed live oak tree cavity nest located in the vicinity of the fledglings. Other kestrel pairs for which nesting was not confirmed occupied the following territories: D. Soto Canyon, Discovery Wall, Drywall, Eucalyptus Grove, Mating Rocks, Resurrection Wall, South Balconies, South Chalone Peak, and Teapot Dome.

Red-shouldered Hawk (Buteo lineatus)

Five territorial red-shouldered hawk pairs were documented in the monument this year, in the following territories: Bench Area, Pinnacles Campground, McCabe Canyon, Regan Ranch Canyon, and Kingman Land South. (Although Regan Ranch Canyon is a private

inholding, it is surrounded by NPS property on three sides and is within the congressionally designated boundary of the monument). Only two red-shouldered hawk pairs nested successfully this year. The Pinnacles Campground nest was last used in 2006, and the Bench Area nest was previously undocumented. Both nest constructs were built along riparian corridors, with the Pinnacles Campground nest built on a valley oak and the Bench Area nest on a gray pine. Red-shouldered hawk pairs at Kingman Land South and McCabe Canyon added fresh material to historical nest sites used in 2007, but neither pair laid or incubated eggs. The first territorial red-shouldered hawk pair was observed at the Pinnacles Campground on 29 January 2008. Both confirmed red-shouldered hawk nests hatched two young each. Full fledge was confirmed at both nests.

Cooper's Hawk (Accipiter cooperii)

Two active nests were confirmed for Cooper's hawks (Figure 7) at Pinnacles in 2008. Both stick nest constructs were built on gray pines along riparian corridors in the Marion Canyon and Kingman Land North territories. The Marion Canyon nest was last used in 2007, and the Kingman Land North nest was previously undocumented. Both of the Cooper's hawk nests hatched four nestlings each. Full fledge was confirmed at the Kingman Land North nest. Three of four young were confirmed fledged at the Marion Canyon nest, though full fledge was highly likely given the remaining nestling's advanced development.

Non-nesting Cooper's hawk pairs were confirmed occupying six additional territories: Drywall/Grassy Canyon, Fire Wayside, Guard Rock, Kingman Land South, Peaks View Area, and Pinnacles Campground. Fourteen historical nest sites in 12 territories were not active this year.

Figure 7. Cooper's hawk nestling in Marion Canyon nest. ©Gavin Emmons, 2008.

Sharp-shinned Hawk (Accipiter striatus)

One sharp-shinned hawk (Figure 8) nest was confirmed at Pinnacles in 2008. The nesting pair was first documented incubating eggs in the Peaks View Area territory west across Chalone Creek from the parking area on 18 May 2008. Three nestlings were observed at the nest site, and full fledging was confirmed by mid-July. The nest, located on a live oak, was a stick construct conspicuously covered in feather down and whitewash. The nest site was well-concealed in a small but relatively dense, wooded grove at the base of a shallow canyon next to Chalone Creek. Sharp-shinned hawk pairs were also observed occupying the Frog Canyon and Upper Bear Gulch territories, but active nesting was not confirmed. Sharp-shinned hawks were also active near the North Wilderness Trail junction along Old Pinnacles Trail, in Lower Bear Gulch, in Lower Condor Gulch, near Willow Spring, along the South Wilderness Trail, and in the Pinnacles Campground.

Figure 8. Juvenile sharp-shinned hawk. ©Gavin Emmons, 2003.

Long-eared Owl (Asio otus)

There were two nesting records for long-eared owls (Figure 9) at Pinnacles this season at the Kingman Land North and Regan Ranch Canyon territories. Both nests were previously undocumented stick nests on live oaks in wooded groves, representing only the 5th and 6th long-eared owl nests confirmed during the raptor monitoring program. By appearance
and construction, the stick nests appeared to be a Cooper's hawk construct (for the Kingman Land North site) and a red-shouldered hawk construct (for the Regan Ranch Canyon site). The long-eared owl pair in Regan Ranch Canyon successfully produced two nestlings, but the Kingman Land North nest was abandoned after early season incubation efforts. Territorial occupation by an adult long-eared owl pair was first confirmed at the Kingman Land North territory on 2 May 2008, with an adult observed sitting low on a stick nest in a live oak and very likely incubating eggs. However, the nest failed due to abandonment. Two nestlings were confirmed at the Regan Ranch Canyon nest Fledging for both owlets was unconfirmed but possible and projected for late May.

Figure 9. Long-eared owl adult near Chalone housing area. ©Gavin Emmons, 2006.

White-tailed Kite (Elanus leucurus)

One territorial white-tailed kites pair was observed in mid-May briefly occupying the Kingman Land South area. Five other historical kite territories – Double Gates, Jawbone Canyon, Marion Canyon, McCabe Canyon, and South Wilderness (North End) – were unoccupied this year, and no other white-tailed kites were documented occupying territories at Pinnacles.

Barn Owl (Tyto alba)

Territorial barn owl pairs were not documented at Pinnacles in 2008, in contrast to territorial and nesting barn owl pairs confirmed at D. Soto Canyon and Drywall in 2005-2007.

Great-horned Owl (Bubo virginianus)

Great horned owl pairs were documented occupying territories in Lower Condor Gulch and Crowley Drainage, but no nests were confirmed for the species in 2008. A single great horned owl was also observed occupying the blue oak slopes between the Bear Gulch Nature Center and Frog Canyon. Great horned owl vocalizations were not documented in historical nesting and territorial locations including Hanging Valley/Reservoir, Machete, Upper Condor Gulch, Pinnacles Campground or South Wilderness (North End).

Western Screech Owls (Megascops kennicottii)

Screech owls were seen and heard hooting, particularly near the Bear Gulch Visitor Center and in the Chalone housing area, beginning in January. They were also heard hooting regularly in the Pinnacles Campground.

Osprey (Pandion haliaetus)

An osprey was observed soaring over the High Peaks in late March.

Bald Eagle (Haliaeetus leucocephalus)

Bald eagles were observed in and near the monument through late spring, with immature and sub-adult eagles observed feeding sporadically at the Grassy Canyon condor feeding site through spring.

Northern Harriers (Circus cyaneus)

A pair of northern harriers was observed in the Kingman Land North area at the base of the Regan Ranch Canyon and just north in late winter and early spring, but was not confirmed nesting in the monument. Harriers were also occasionally observed hunting near the monument boundaries through late spring.

Climbing Management Actions

Climbing advisories were put in place in January in areas with known climber usage to protect nesting raptors from disturbance. In March and April advisories were updated and lifted in territories that were confirmed unoccupied by prairie and peregrine falcon pairs. Signs detailing climbing advisories were posted at Little Pinnacles, Balconies, Hawkins, Scout Peak, Frog/Hand territories, Crowley Towers, Egg, Tunnel, Teapot Dome, Pipsqueak Pinnacles, and Goat Rock/Resurrection Wall territories.

Prairie falcons were confirmed occupying the Machete territory in March and April, though they did not nest in 2008. Due to the large size of Machete Ridge, a partial advisory was instituted at this territory, covering the south half of the cliffs where the falcon pair focused their territorial efforts and potential nest site inspections.

This year vandals moved the Frog/Hand and the Hawkins advisory signs. As a result, all signs were affixed to metal brackets and cement foundations to prevent any future theft.

In 2008, nine incidents of off-trail hikers in advisory areas were documented. In two cases climbers did not know about advisories and in one case, climbers had received inaccurate information from park staff.

Prairie and peregrine falcon adults in the Goat/Resurrection, Crowley, Hawkins, Machete, and Balconies territories were agitated by on-trail hikers and raptor biologists by circling and wailing above their respective territories.

Education Opportunities

Throughout the year, the raptor biologist and park staff participated in public outreach opportunities to inform visitors about raptor conservation. Educational opportunities included participation in formal events (e.g. International Migratory Bird Day – May 10; Rockpile Rendezvous 7 June) and informal events (e.g. visitor contact in high-use areas such as High Peaks, Balconies Cliff Trail, and the Bear Gulch Reservoir).

Summary

The nine breeding raptor species and 18 nest sites documented at Pinnacles in 2008 were fewer than recorded in the past five years. The number of prairie falcon nests and productivity this year were among the lowest on record and were below the running average rates of nesting pairs, successful nests, and total fledglings produced. Only five falcon pairs attempted to nest this year, and only four nests were successful, compared to 22-year averages of 9.5 nesting pairs and 7.7 successful nests (Table 4).

Public Interest Highlights

The 2008 breeding season was the 22nd year of raptor monitoring at Pinnacles. Field observations began 13 January 2008 and ended 11 July 2008, with a total of over 120 possible and active nest sites monitored during 825 observation hours. Climbing advisories were put into effect in January to reduce nest disturbance by visitors, updated to reflect unoccupied territories in March, and lifted in July at the end of the raptor breeding season.

- Nine breeding raptor species and 18 nests were confirmed in the monument.
- Six sensitive species were confirmed breeding this year: prairie falcon, peregrine falcon, golden eagle, Cooper's hawk, sharp-shinned hawk, and long-eared owl.
- For the 4th consecutive year in 50 years, a peregrine falcon pair was documented successfully nesting at the monument, producing 3 fledglings.
- Accipiter species were confirmed nesting in the monument, with only the 7th sharp-shinned hawk nest documented.
- Two long-eared owl nests represented the 5th and 6th nests documented for the species in the monument since 1964.
- Twenty 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).
- An ArcMap project was updated to visually display GPS and GIS information relating to the raptor monitoring program, including historical nest sites,

monitoring watch spots, nest distribution by geologic and habitat layers, and locations of advisory signs posted at Pinnacles.

- GIS modeling based on 30-40° slopes was performed to identify all possible prairie falcon cliff-nesting sites at Pinnacles, and to provide evidence for full censusing of prairie falcon nesting habitat at the monument.

- All raptor advisory signs were affixed to metal brackets in cement foundations with the assistance of Pinnacles trail crew staff to make the signs more secure and to prevent their theft and movement.

- The Rockpile Rendezvous – a centennial event to emphasize climber contributions, history, and management at Pinnacles over the past 60 years – was organized by the raptor biologist and other monument staff, drawing in the local climbing community and providing visitors with information on historical resource and recreation management at the monument.

- A 4-piece photographic article on Pinnacles was published in Nature Photographer Magazine, including the Summer issue focusing on raptor monitoring and condor management at the monument. The raptor biologist also provided photography for a wildlife piece in the California, Oregon, and Mountain West editions of Via Magazine, emphasizing California condor presence and management at Pinnacles.

- A PowerPoint presentation on the raptor monitoring program, its objectives, and trend results over the past 21 years was given by the raptor biologist and the supervisory Pinnacles wildlife biologist during the 5-Year Review of the SFAN Inventory and Monitoring Program at Fort Cronkhite.

- The revised 2008 Raptor Monitoring Protocol was completed in June and sent in for peer review, with updates including a more cohesive Narrative, more focused objectives, and statistical and trend analyses performed by San Francisco State University statisticians.

Management Recommendations

- Continue to establish climbing/hiking advisories in core areas (high visitor-use areas) each breeding season to protect cliff-nesting raptor species from human disturbance.

- Increase information opportunities for visitor use assistants and park rangers to educate park visitors about advisories. In past years, the park made more attempts than this year to speak with climbers and hikers at trailheads, and to regularly rove on trails to provide interpretation and enforcement of resources.

- Enforce advisories with law enforcement rangers. Although advisories are voluntary, disturbing wildlife is a citable offense that law enforcement rangers should employ to discourage visitors from willfully threatening nesting efforts of breeding raptors at Pinnacles.

- Increase field staff. While the monitoring program focuses on the status and trends of prairie falcons, the park is interested in additional data on non-target species. In order to monitor non-target species adequately, at least 1 other 0.5 FTE field technician is needed during the breeding season.

- Increase use of staff and visitors observing raptor activity in the field. This can be achieved through regular communication with NPS staff and visitors, bi-weekly monitoring updates on raptor status at the monument, and reminders about filling out wildlife observation cards.

- Provide housing to field technicians. The closest housing available to the park staff is 40-50 minutes away. To fulfill the current duties the raptor biologist works very early and late hours throughout the raptor breeding season with long breaks during the day. In addition the raptor biologist works around inclement weather and raptor behavior. Safety and effective monitoring would be enhanced if an exception can be made from the usual policy of permanent employees living outside the monument for field staff.

Research and Monitoring 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 monument. The standardization of raptor monitoring procedures and raptor advisories, and effective communication with hikers and climbers at the monument, has helped to ensure the continuing breeding success of prairie falcons and golden eagles, and the return of breeding peregrine falcons to the monument. However, four 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. These four raptor species tend to reproduce along riparian corridors where many of the trails are located and potential disturbance of nest sites by visitors should be studied further. Fletcher (2003) conducted graduate-level fieldwork on accipiter nest site selection and recreational trail use at Pinnacles in 1999-2001, documented 20 nests and two nest failures along trails in the monument, and recommended further studies to determine the effects of visitor disturbance on accipiter breeding in the monument.

As the staff at Pinnacles continue to transition into managing the Pinnacles Ranch and former Kingman property extending out to Highway 25, the need for further monitoring

of forest and woodland nesting raptors becomes even more important. Much of this new monument property contains riparian corridors and oak/pine woodlands suitable for accipiter, kite, and long-eared owl nesting habitat. Recommendations for monitoring of riparian-nesting raptor species include:

- Inventory nest sites for species of concern in riparian habitats in the monument.
- Determine what percentage of riparian raptor nests occur along trails and in high-use visitor areas relative to low-use areas, and how breeding behavior and productivity rates compare in high- and low-use areas.
- Recommend that new trails, buildings, and visitor use areas avoid documented nest sites and likely nest habitat for riparian raptor species, based on results from inventory and research data above.

Without this baseline information, it may be necessary for resource managers at Pinnacles to enforce seasonal closures of these new developments in order to protect these species from disturbance.

Other recommendations for monitoring and research:

- Conduct an inventory of burrowing owls on recently acquired Pinnacles Ranch property. This owl 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). The first record for burrowing owls in the monument was documented in October 2006 on the western boundary near the Bear Gulch Headwaters. These owls may also inhabit the rangeland and fields between the Pinnacles Campground and Highway 25. Field work could be done by a biological science technician or by the extending the raptor biologist through September or October.

- Determine potential threats to prairie falcons nesting at Pinnacles. Radio telemetry studies conducted from 2002-2005 revealed important preliminary data about the prairie falcon population at Pinnacles: the population is resident in or near the monument throughout the year, and all radio-tracked falcons fed primarily on prey items just south and west of the monument boundaries, with no evidence of adult falcons feeding north or east of the monument (Buranek 2006). This information suggests that alteration of habitat south and west of the monument boundaries, especially near the town of Soledad, could have significant negative consequences for a viable, long-term population of prairie falcons at Pinnacles. In addition, the effects of pesticide (e.g. rodenticide) in the area are poorly understood.

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Appendix A. 2008 nest phenology and success for prairie & peregrine falcons and eagles.

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	Cyn N of Willow Spgs	*WSS	<2/2										Occupied
PRFA	Citadel	*MAC	1/21-2/4										Occupied
PRFA	Crowley		<1/17										Occupied
PRFA	D. Soto Canyon												Not Occ.
PRFA	Drywall	DRY-2	1/30-2/26	<4/17	5/8-10	6/19-21				4	4	4	4
PRFA	Egg	*TD/TU	<1/20										Occupied
PRFA	Frog / Hand												Not Occ.
PRFA	Goat / Resurrection	RW-6	<1/21	<4/21				4/22-5/11					Failed
PRFA	Hanging Valley												Not Occ.
PRFA	Hawkins												Not Occ.
PRFA	High Pks Trl W of CPA												Not Occ.
PRFA	Little Pinnacles	LP-10	<1/19	<4/23	5/8-9	6/19-20				2	2	2	2
PRFA	Machete	*CI	1/21-2/4										Occupied
PRFA	Marion Canyon												Not Occ.
PRFA	Mating Rocks												Not Occ.
PRFA	Narrows												Not Occ.
PRFA	NE Sec 15	*NC	2/9-3/7										Occupied
PRFA	North Balconies	*SGB	<1/17										Occupied
PRFA	North Chalone	*NES	2/9-3/7										Occupied
PRFA	North Wilderness Rock												Not Occ.
PRFA	Pig Canyon	PIG-9	<1/26	<4/14	5/15-19	6/26-30				4	4	4	4
PRFA	Pipsqueak Pinnacles	*SP	1/22-2/5				2/16-28						Abandon
PRFA	Prescribed Burn Cliffs												Not Occ.
PRFA	Scout Peak	*PP	<1/24				2/16-28						Abandon
PRFA	South Balconies	SGB-16	<1/17	<5/12	5/26-28	7/2			4	2	2	2	2
PRFA	South Chalone		<5/4										Occupied
PRFA	South Wilderness Rock												Not Occ.
PRFA	Teapot Dome	*EGG/TU	<1/20										Occupied
PRFA	Tugboat												Not Occ.
PRFA	Tunnel	*EGG/TD	<1/20										Occupied
PRFA	Willow Spring Slide	*CNWS	<2/2										Occupied
PEFA	Hawkins	HP-1	1/16-28	<4/14	5/7-10	6/18-21				3	3	3	3
GOEA	Eucalyptus Grove	EG-3	<1/20	<2/17	4/8-13	6/10-15				2	1	2	2
GOEA	North Chalone West	NCW-1	<2/17	<3/17					1	0	0	0	Failed

(Note: for the "Occup. Status" column, # refers to possible fledglings, "Occupied" = territorial occupation, "Not Occ." = no occupation, "Failed" = failed nest, "Abandon" = territory abandoned after confirmed occupancy, "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 1 territory.)

Appendix B. 2008 nest phenology and success for American kestrels and 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	D. Soto Canyon												Not Occ.
AMKE	Discovery Wall												Not Occ.
AMKE	Drywall												Not Occ.
AMKE	Eucalyptus Grove		<4/24										Occupied
AMKE	Kingman Land North					6/4-6					2	2	2
AMKE	Mating Rocks												Not Occ.
AMKE	Prescribed Burn Cliffs	PB-4	<2/9			6/12-16				2	2	2	2
AMKE	Resurrection Wall		<2/28										Occupied
AMKE	South Balconies		<1/20										Occupied
AMKE	South Chalone		<5/4										Occupied
AMKE	Teapot Dome		<1/15										Occupied
RTHA	Crowley Drainage	*NB	<1/17										Occupied
RTHA	Eagle Rock		<3/15										Occupied
RTHA	Frog / Hand	*PB	<1/30										Occupied
RTHA	Grassy Canyon	*SWN	<1/29										Occupied
RTHA	Kingman Land North	KLN-4		<4/17	5/10-12			<5/17		1	0	0	Failed
RTHA	Kingman Land North		<3/24										Occupied
RTHA	Kingman Land North		<5/17										Occupied
RTHA	Lower Condor Gulch	LCG-1	<1/15	<4/14	5/11-16	6/20-21			1	1	1	1	1
RTHA	North Balconies	*CD	<1/17										Occupied
RTHA	Prescribed Burn Cliffs	*HAND	<1/30										Occupied
RTHA	S Wilderness – N End	*GC	<1/29										Occupied
RTHA	Upper Condor Gulch	*LCG	<1/15										Occupied
RTHA	Western Front		<2/5										Occupied
RSHA	Kingman Land South		<4/17										Occupied
RSHA	McCabe Canyon		<4/5										Occupied
RSHA	Pinnacles Campground	PCG-1	<1/29	<4/17	5/14-15	6/28-29				2	2	2	2
RSHA	Bench Trail	BA-3			5/4-6	6/18-20				2	2	2	2
RSHA	Regan Ranch Canyon		<5/2										Occupied
RSHA	South Wilderness Trail												Not Occ.

(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 1 territory.)

Appendix C. 2008 nest phenology and success – accipiters, kites, and owls (barn owls, long-eared owls, great-horned owls, and Western screech-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	Drywall		<1/29										Occupied
COHA	Fire Wayside		<3/11										Occupied
COHA	Kingman Land North	KLN-11	<3/20	<5/17	5/26-29	6/27-29				4	4	4	4
COHA	Kingman Land South		<5/31										Occupied
COHA	Marion Canyon	MAR-4		<5/8	5/26-30	6/27-30				4	3	4	4
COHA	Peaks View Area		<4/23										Occupied
COHA	Pinnacles Campground		<6/11										Occupied
SSHA	Frog Canyon		<5/18										Occupied
SSHA	Peaks View Area	PVA-1		<5/18	6/18-19	7/9-11				3	3	3	3
SSHA	Upper Bear Gulch		<6/20										Occupied
WTKI	Double Gates												Not Occ.
WTKI	Jawbone Canyon												Not Occ.
WTKI	Kingman Land North												Not Occ.
WTKI	Kingman Land South		<5/10										Occupied
WTKI	Marion Canyon												Not Occ.
WTKI	McCabe Canyon												Not Occ.
WTKI	S Wilderness – N End												Not Occ.
BNOW	D. Soto Canyon												Not Occ.
BNOW	Discovery Wall												Not Occ.
LEOW	Kingman Land North	KLN-8		<5/2									Failed
LEOW	Regan Ranch Canyon	RR-2			5/7-15	5/29-30				2	0	2	2
GHOW	Crowley Drainage		<1/17										Occupied
GHOW	Lower Condor Gulch		<4/3										Occupied
WESO	Chalone Picnic Area		<2/7										Occupied
WESO	Headquarters		<3/29										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 1 territory.)

Appendix D. Documentation of Changes in Data Collection Methods.

Through the course of the 2008 season, several changes were made to procedures for collecting field data and entering observations into raptor monitoring databases, and relevant sections in the Raptor Monitoring Protocol will be revised accordingly. Primarily these changes were put in place to address Inventory & Monitoring standards for data management and storage, the need for a standardized means of collecting raptor observations in the field, and the development of a more efficient workflow and structuring of existing MS Access databases.

Through the 2008 season raptor observations and breeding summaries were entered into the new "Breeding Raptors" Access raptor database, after development was finalized. This created a more efficient workflow in entering raptor observations and a more effective means of storing and archiving past years of monitoring data. SOP #8 in the Raptor Monitoring Protocol was also revised to reflect these changes and to address I&M standards for scientific rigor and data management. Additionally, Daniel George is finalizing the process for importing the 21-year legacy dataset into the current Access database design.

To provide a more standardized approach to data collection, a datasheet was created in late 2007 – an MS Word document called "Raptor Datasheet" – that was used throughout the 2008 season in tandem with field notebooks when recording raptor observations. The datasheet acts as a distillation of observations documented in field notebooks, and generally follows the data entry format contained within the "Breeding Raptors" Access database, creating a more efficient workflow for office data entry. The datasheet is electronically stored in the "important data files" folder (see below), and guidelines for using the datasheet have been added to the SOP #3 in the Raptor Monitoring Protocol, with relevant sections in other SOPs also updated.

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 folder contains a subfolder titled "PRFA Occupancy Data" that includes an Access database called "Fecundity," as well as MS Excel spreadsheets detailing prairie falcon occupancy by territory, season, and day for the 2002-2008 seasons. The Access database details breeding summary data for prairie falcon pairs for each season over the 22-year period of the program. These data were compiled to provide for statistical analyses currently being finalized by staff at San Francisco State University. The "important data files" folder also contains a subfolder titled "CNDDB" that stores electronic copies of the data sheets printed and mailed to the California Department of Fish and Game California Natural Diversity Database for the 2007 and 2008 seasons. The "RaptorPoster" Adobe Illustrator file is also contained in the "important data files" folder, and is an electronic copy of the printed poster that was presented at the ESA/SER Joint meeting in San Jose in 2007. Two Excel spreadsheets – "raptor summary data with graphs" and "Raptor Nests" – are also in this folder. The

Appendix D. Documentation of Changes in Data Collection Methods (Continued).

former spreadsheet contains a summary table of all statistical data related to prairie falcon breeding at Pinnacles over the 22-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.

The GIS layers and ArcMap project – "Raptor Nest Map" – pertaining to the raptor monitoring program are also stored in the "important data files" folder. GIS layers were updated to include GIS modeling of the monument created by Stephen Skartvedt, a GIS specialist at Golden Gate NRA, and to include current off-trail routes used to access raptor monitoring observation points at Pinnacles.

The 2008 Raptor Monitoring Protocol was finalized in June 2008 and sent to experts in the San Francisco Bay Area Network for peer review. The Protocol Narrative was updated to emphasize program objectives more clearly, citations on censusing and sampling frequency were clarified, and statistical and trend analyses from SFSU statisticians were used to justify monitoring frequency and number of visits to raptor territories to confirm occupancy.

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