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Natural Resource Stewardship and Science

Prairie Falcon Monitoring Protocol for Pinnacles National Monument: Standard Operating Procedures

Standard Operating Procedures - Version 2.3

Natural Resource Report NPS/SFAN/NRR—2011/467

ON THE COVER
Juvenile prairie falcon.
Photograph by: Gavin Emmons

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SOP 1. Field Methods V1.3

Revision History Log

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #
1.01	06/2005	D. Adams	Removed references to SOP 5, corrected references to SOP 6–11	SOP #5 not needed	1.02
1.02	09/2006	G. Emmons	Revised SOP 1 to include citations, literature references, consistent use of monitoring terminology, updated network links	Needed in response to 2005 peer review comments	1.03
1.03	08/2007	G. Emmons, Marcus Koenen	Included data sheets with field notebooks in review materials; minor editing for consistency	Needed for consistency with revisions to SOP 3	1.04
1.04	5/2008	G. Emmons, J. Petterson and M. Koenen	Remove numbering system. Combined with other short SOPs (2 and 9) to remove redundancy. Added maps and site descriptions	Needed for consistency with revisions to SOP 3	1.2
1.2	7/2009	D. Adams, M. Koenen	Formatting; recombined with training SOP, removed redundancy	Peer review comments	1.3

Overview

This SOP provides a chronological guide through the field season along with detailed instruction for all field activities. Species identification notes are provided along with documentation for watch spots including maps. Additional resources are listed that may be useful to technicians new to raptor monitoring. Detailed methods for documenting field observations are presented in SOP 3: Data Management and safety considerations to be studied before heading out into the field are presented in SOP 8: Safety Procedures.

Field Season Overview

Advisories are established at the beginning of the breeding season. Field work focuses on determining which territories are occupied by single or paired birds. Each territory (see SOP 2: Watchspot Locations) in both the core and non-core areas should be visited at least two to three times to determine occupancy, with each visit in a different month. Advisories are lifted for unused territories. For paired birds, repeated site visits are made to nests to track status of nest. After raptor young hatch, estimate ages of young on at least 3 monitoring visits to accurately estimate fledging dates.

In the sections below, activities are detailed by month.

January Activities

Training Information

The observation and interpretation of raptor behavior and nesting is the most important component of effective raptor monitoring. Correct field identification of species and breeding status will be an essential tool to protect nesting species from human disturbance during the breeding season (Hickey 1942, 1969; Bond 1946; Fyfe and Olendorff 1976; Ogden and Hornocker 1977; Harmata et. al 1978; Newton 1979, 1990; Sitter 1983; Scott 1985; Steidl et. al 1993; Watson 1997; Steenhof et al. 1997; Steenhof 1998; Kochert et. al 1999). At the beginning of the field season, new or returning technicians should review the entire protocol, SOPs, and appendixes.

Other recommended training materials include the following:

- Field Notebooks and Data Sheets: Field notebooks and data sheets from previous surveys provide a framework and a reference for new technicians. Field notes and data sheets are stored by breeding season in folders filed in the “Raptors” cabinet in the RRM Office. Additional information can be found on the park network under the file path, “S:\RM Workgroups\projects\Breeding Raptors\INSTRUCT.”
- Manuals for some of the equipment (e.g., Kestrel weather meter, GPS, two-way radios) are available in the RRM office.
- Testing Requirements: To maintain consistent note taking over the years, the supervisor should test the raptor technician’s note taking abilities. Testing can be done by comparing field notes and discussing discrepancies. This should be repeated as the season progresses and behaviors change from courtship to incubation and to identify nestlings and fledglings. New technicians should maintain 90% accuracy when compared to the supervisor to keep data consistent.

Species Identification

In addition to consulting a field guide (e.g. Dunn 1999, Dunne et al. 1988, Johnsgard 1990, Palmer 1988, Sibley 2000, Wheeler 2003) the following species raptor species have been documented at PINN:

- Prairie falcon: large falconid shape and wings, pale brown-gray above, whitish below; dark "armpits" (coverts & axillaries) in flight; thin "moustache" below eye with white behind eye, white stripe extending from eyebrows around the back of the head, and whitish breast evident, while perched. Stiff "arthritic" flight with wing beats coming primarily from the wrist instead of the shoulder. Deep Kik-Kik call, higher than peregrine.
- Peregrine falcon: large falconid shape and wings, with wingtips more pointed and tail shorter than prairies; slate-colored above (with juveniles dark gray-brown above), underside uniformly spotted or barred, with white throat, in flight; heavy moustache contrasts with white throat, breast and belly heavily marked, head appears hooded, while perched. Flight is fluid, with undulating wing beats rippling down length of wings. Deep Rek-Rek or Kek-Kek call, similar to prairie but lower, more throaty.
- American kestrel: small falconid shape and wings; boldly patterned head with two moustache marks, small beak, small legs, while perched. Males and females dimorphic. Males with blue-gray wings, white pearls along trailing wing edges, solid red tails with thick black band on the margin. Females all rufous with barring on tail. High-pitched Klee-klee call.
- Red-tailed hawk: large buteo shape (stocky body, broad wings, bulging secondaries) with red tail usually distinctive in adults and white/brown banded tail in juveniles. In flight, dark rectangular marking on the underside of the wing's leading edge and patagium. Numerous color morphs, with light morph the most common, rufous morphs less common, and dark morphs the least common. For light morphs, dark head contrasts with pale breast perched and in flight. For rufous morphs, breast is more distinctly rufous / reddish, dark head still distinctive. For dark morphs, dark head blends into color of back, patagial marks, and breast/belly, with flight feathers on underwings pale gray to whitish and contrasting sharply.
- Golden eagle: very large and dark, with long, broad wings, in flight wings look like a 1' x 10' piece of board/lumber, white band on tail base in juveniles, adults with solid dark tail, in flight; golden nape, large beak and feathered legs, large-bodied, while perched. In flight, wing profile is flat. Heavy steady wing beats coming from shoulder, very little wrist movement. Soaring flight is very steady.
- Turkey vulture: long wings, silvery flight feathers contrasting with dark coverts, small, bare head in flight; red head contrasting with brownish body for adults, juveniles' head same as body color, hunched appearance, while perched. In flight, wing profile is "v" shaped (dihedral), flight is very light and wobbly in the air.
- Red-shouldered hawk: medium-small buteo with accipiter-like shape, red-orange shoulders/head distinctive, blackish wings have checkerboard appearance and distinctive windows, and black tail with narrow white bands, in flight and while perched; orangish breast, long legs evident while perched.

- Cooper's hawk: medium accipiter shape, with wings held straight, leading line of wing is very straight, long, rounded tail (scoop-shaped with an obtuse angle), orange-barred breast/underwing coverts in adults, white and brown streaked breast in juveniles. Cooper's appear to have "less" color than sharp-shins. Large head that protudes well in front of wing-leading line, giving these hawks the appearance of a cross in flight; long legs, distinctly larger than jay-sized, while perching. Adults with slate-gray body color, juveniles are brown. Powerful flight that is steady, seldom buffeted by the wind. Cooper's hawks have a shorter wing length as compared to the head-tail length.
- Sharp-shinned hawk: small accipiter shape, with wings swept forward, square tail, angle on tail 90 degrees or less, orange-barred breast/underwing coverts in adults, white and brown streaked breast in juveniles. Sharp-shins appear to have more color than Cooper's hawks; small head barely, if at all, extends past leading edge of wing in flight, giving these hawks the appearance of a "T" while flying; thin legs, jay-sized, while perching. Flight is very light, often appears like a "butterfly" as it is bounced around by the wind. Sharpies have a longer wing length as compared to the head-tail length.
- White-tailed kite: slender raptor with long, pointed wings usually held in dihedral, white plumage and black shoulders / wrist spots very distinctive, neck / head orangish-brown streaked in juveniles. Often hovers / kites in flight while hunting and in courtship. High, thin whistle call. Distinguished from northern harrier male by white head, , breast, belly, and tail.
- Northern harrier: slender raptor with long wings and tail, can be confused with buteo, accipiter, or falconid in flight due to variety of flight shapes, but characteristic flapping punctuates flight regularly. White rump very distinctive and visible in low hunting flights over grassland / marsh habitat. Adult male, female, and juvenile plumages all different and distinctive: adult male has ashy, pale gray back, head, and white underwings contrasting with black wing tips; adult female has brownish back, pale shoulder bars, boldly barred secondaries, and brown-streaked belly / patagial marks' juvenile has dark head and barred secondaries contrasting with orangish breast / belly. All have owlish facial disc and gray / brown barring on tail.
- Barn owl: medium-sized owl with relatively long, pointed wings, distinctive plumage characterized by pale tawny back and white breast, belly, underwings. Facial disc round and heart-shaped, white, contrasting with black eyes; no horns on head. Call is a long hissing shriek, screech, or scream.
- Long-eared owl: medium-sized owl with relatively long and slender wings. Body plumage has dark streaking and barring, with facial disc tawny-orange, characterized by long ear-tufts and dark vertical stripes through yellow-orange eyes. Has superficial resemblance to great-horned owls, but much smaller size, with distinctive facial pattern different and facial disc longer. Call is soft, low, monotonous, a single "hoot" given every 3-5 seconds.
- Great-horned owl: large and bulky owl, rather like red-tailed hawk in flight, with broad body and large head, stout ear tufts. Plumage variable, but with dark, brownish, and orangish streaking all usually evident. Facial disc grayish to orangish, with ear tufts and large yellow eyes evident. No vertical stripes through eyes as in long-eared owl, with face more round than long. Call is a deep, muffled hooting in a rhythmic series, similar to that

of mourning doves. Vocalizations can be quite loud, and often include a repetition of "hoo hoohoo HOOO hoo" with variations common.

- Western screech-owl: small owl with ear tufts sometimes but not always visible. Grayish to brownish streaked plumage, wings broad, eyes yellow, facial disc gray-brownish. Call is distinctive, accelerating series of whistle hoots, rather like a bouncing ball, repeated regularly.
- Northern pygmy-owl: very small owl without ear tufts, relatively long-tailed and short-winged. Plumage brownish overall, with crown / sides spotted white, narrow whie bars on tail, and characteristic false eye-spots on back of head. Eyes yellow. Call is a series of monotonously repeated single or double toots, quite variable, but often incessant for long periods.

Additional species identification resources:

- Birds of North America (BNA) Online accounts for comprehensive and current information on all raptor species at PINN, accessible at http://bna.birds.cornell.edu/BNA/.
- Tapes or CDs of bird songs for raptor species found at PINN, particularly for owl species, as vocalizations are the primary means of identifying owl species, locations, and possible nest sites in the field. These tapes and CDs are produced by Cornell Laboratory of Ornithology's Library of Natural Sounds and may be obtained from State Wildlife Agencies.
- National Audubon Society Interactive CD-ROM Guide to North American Birds. This interactive CD-ROM is an excellent resource for learning calls, site ID and background information on raptor species.
- A slide collection and digital photos of bird species likely to be encountered, available in the RRM office and museum.

Digital Supplemental Training Information

The following information has been assembled to serve as a resource for new technicians. It is all available on the SFAN Intranet:
http://www1.nrintra.nps.gov/im/units/sfan/monitor/raptors/raptors.cfm

- The "ArcGIS Watchspot Maps" folder contains a PDF file with topographic maps that depict all the historical prairie falcon nesting territories and associated observation point features including falcon locations and codes, watch spots that provide good vantage areas from which to make nest observations to document nestlings and fledglings, advisory sign locations, trails used to access watch spots, pig fence boundaries, and area limits of falcon territories. All watchspot maps are projected in NAD 1983 UTM Zone 10N. New watchspots may need to be added if new nests are located. Original maps are available in ARC GIS. See also SOP 1: Field Methods.
- The "Datasheet and Notebook Pages" folder contains examples of datasheets and field notebook pages used by monitors in the field, as well as a blank raptor monitoring datasheet. See also SOP 1.

- The "Raptor Aging Guides" contains 3 folders representing raptor aging guides (no longer available in print), with PDF files covering scanned pages depicting cues for aging raptor nestlings in the field. The aging guides are used by raptor monitors to assist in aging prairie falcons (as well as peregrine falcons which have very similar phenology patterns), golden eagles, and red-tailed hawks (*Buteo jamaicensis*).
- The "Unpublished Raptor Monitoring Documents" folder contains 3 unpublished documents written by past Pinnacles biologists including:
- "Fesnock 1993" details the annual raptor monitoring process
- "Rechtin, Observation Point Directions" provides directions for finding observation points
- "Rechtin 1992" details raptor monitoring efforts for the years from 1987-1992.

Other Supplemental Training Information

The following supplemental information has been assembled by previous staff and is available in the RRM office. Published articles include: Rechtin and Leatherman 1992, Fesnock 1993, and Buranek 1998. Unpublished documents include: "Seasonal Duties of the Raptor Monitoring Technician" and "Raptor observations – technique key." Both are available in the folder titled "Instructions – Raptor Monitoring," filed in the RRM Office cabinet "Raptors," with the former also networked through the file path, "S:\RRM\RRM_Data\RM Workgroups\PROJECTS\Breeding Raptors\INSTRUCT \schedule.doc." Also see Field season notes from previous years (especially 2002-2008). Additional reference guides are available in the RRM office on the shelves designated as "Wildlife" space, and should be carried into the field as quick references in helping to identify unknown birds and behaviors. A park bird checklist is also available online at http://www.nps.gov/archive/pinn/pdffiles/BirdList.pdf.

Other references that may be of interest to staff but have not been cited elsewhere in this document include: Moritsch (1983a, 1983b), Dunne et al. (1988), Preston and Beane (1993), Crocoll (1994), Marks et al. (1994), MacWhirter and Bildstein (1996), Anderson and Squires (1997), Baicich and Harrison (1997), Houston et al. (1998), Kirk and Mossman (1998), Holt and Petersen (2000), Cannings and Angell (2001), Smallwood and Bird (2002), Marti et al. (2005), and Curtis and Rosenfield (2006).

Preparing Field Equipment

Supplies and Equipment: Equipment required to conduct field work is listed in Table 8. The equipment should be organized and made ready for the field season several weeks in advance of the field season. This allows time to make needed repairs and order equipment.

Figure SOP 1. 1. Field equipment list for raptor monitoring work.

Number Required	Field Equipment Description
	Equipment for raptor monitoring
2	Field notebook with Gregg-ruled lines and weather-proof paper
5+ per day	Data sheets with hard copies of digital photos inserted per respective territories to be visited
2+	Catalogued photographs of territories/rocks/nest sites
1	8x40 or 10x42 binoculars
1	20-60x spotting scope
1	Tripod
1	Waterproof / weather-resistant watch
1	Kestrel weather meter (with thermometer and measures of wind speed)
1	Motorola XTS 3000 portable radio for communication with park staff/Sequoia dispatch
1	Battery charger for Motorola XTS 3000
1	Trimble Geo Explorer 3 or Garmin III Plus GPS unit for documenting/navigating to watch spots.
1	Laser rangefinder (for measuring nest distance for end-of-season analysis)
1	Compass (for navigation and describing raptor movement / locations)
1	SLR camera with 24-120mm zoom and 300mm prime lenses (for post-season)
1	Reference guides for bird and rock formation identification
2–3	Ball-point pens
5+	Handouts of raptor closure areas
5+	Natural history field observation cards
	Equipment for general backcountry travel / hiking
1	Internal or external frame backpack (with at least 4000 cubic in. capacity)
1	Pair of sturdy hiking boots / shoes
1	Broad-brimmed hat
2	Pair of wool / synthetic hiking socks
1	Rain pants and jacket
1	Pair of gaiters
1	Sunblock
2–4	1-liter water bottle (more bottles dependent on weather & individual monitors)
1	Topographic map for PINN
1	Headlamp (preferably with L.E.D. lighting)
1	First aid kit

Climbing and Hiking Advisories

- Establish Climbing/Hiking Advisories: Climbing / hiking advisories are essential management tools promoting the protection of sensitive species of cliff-nesting raptors in the core areas of the park, particularly the cliff-nesting California species of concern: prairie falcons, peregrine falcons, and golden eagles.
    - Advisories are put into effect every year from the beginning to the end of the raptor-breeding season (Jan – July/August) to protect raptors from disturbance by climbers and hikers. While advisories are <u>not closures,</u> any visitors found within advisory areas <u>can</u> be cited and fined by park law enforcement staff.
    - Success of the advisories depends largely on the effective dissemination of information to visitors, and park staff who enforce advisories in effect. The communication component includes updating bulletin boards, putting up (and taking down) advisory signs, updating advisory brochures, writing press releases, and e-mailing biweekly raptor updates to park staff.
    - At the beginning of the season, advisories are established for all core area territories occupied by prairie falcon, peregrine falcon, and golden eagle pairs <u>within any of the last 3 years</u>, as well as any territories in visitor use areas with very limited nest site options, including Egg, Teapot Dome, and Citadel, regardless of their use within the last 3 years. Review field notes, data sheets, annual reports, and advisory brochures from the last 3 years, available in the "Raptors" cabinet in the RRM office, for information on which territories have been used in the last 3 years.
- Post Advisories: By the Friday before MLK day, post advisory signs at sensitive areas used by climbers. These include Scout, Hawkins, Frog / Hand, and Little Pinnacles on the east side, and Balconies on the west side.
    - Signs are stored in the Gas House at the end of the Condor Gulch Road.
    - The Scout Peak, Little Pinnacles, and General Balconies signs have metal foundations they should be bolted to. The metal foundation for General Balconies is just below Smiling Simian. The foundation for Little Pinnacles is up the Chalone Peak Trail, just left on the ridge that rises to become the Little Pinnacles cliffs. The foundation for Scout Peak is south uphill from the Scout outhouse on the Rock You're Not Supposed To Be On.
    - The South Balconies, Frog / Hand, and Hawkins signs must be posted in the ground with the use of a shovel or weed tool, available in the Gas House. The Hawkins sign should be placed on the main climber access trail, just beyond a narrow rocky passage before the access trail splits towards the various formations and routes on Hawkins. The Frog / Hand sign should be placed at the SE end of the Reservoir along the climber access route to Frog / Hand. The South Balconies sign should be placed at the saddle up from the climber access route from the Balconies Cliff Trail, near the high base of Tilting Terrace.
    - All sensitive areas have climbing access signs that should be taken down and returned to the Gas House. A socket wrench and vise grips are necessary tools for affixing these signs, and are stored in the RRM office.

  - For site locations, refer to the GPS coordinates listed in the "Advisory Points" table in the "Raptor Monitoring" MS Access Application, and the "advisory points.dbf" file incorporated in the "Raptor Nest Map" ArcMap project (for more details, see SOP 3: Data Management).

- Disseminate advisory information through press releasew and web site: Press releases are used to inform the public about advisories.
  - Review formats for press releases, available at the network path, "S:\RRM\RRM_Data\RM Workgroups\PROJECTS\Breeding Raptors\PRESSREL." These can be reused annually, but make sure they are updated to reflect current advisory information. For example, open "06press1.doc," and edit the release to reflect the current date, advisory areas, phone numbers, etc. For the January press release for 2007, this would be saved as "07press1.doc."
  - Send a copy of the press release to the Public Information Officer in Interpretive Resources for approval of the presentation of information within the release.
  - Mail copies of the press release to climbing shops, newspapers, and Pacific West Region. Mailing addresses are available at the network path, " S:\RRM\RRM_Data\RM Workgroups\PROJECTS\Breeding Raptors\PRESSREL," in the "names and addresses.FP5" database. To print all the addresses on one sheet, make sure the database is in "preview" mode, with the "mail labels" layout. These should be printed on sheets of mailing labels available in the RRM and Administration offices. Include copies of the advisory brochures with the press releases, and mail to the climbing shops only.
  - Post updates on advisories to the park web site and submit to Friends of Pinnacles (FOP) web site (http://www.pinnacles.org/).

Field Work

Schedule: Developing a schedule for site visits will be helpful at the beginning of the field season because there are many potential nesting territories in which to confirm occupancy and raptor nesting during the breeding season. Visit other areas of raptor activity as you can, en route to observation points for target areas, during lulls in activity in the breeding season, and later in the nest season (in March) when you are more likely to see nests and defensive adults active. Adhere to the visit schedule generally, but **change your visit schedule as necessary** to witness important events, such as nest selection, incubation/hatching, and **especially** full fledging of young from nests. Territories can be "bumped up (or down)" in priority if you are expecting a change in breeding phenology (or not). Other factors (e.g., rain, fog, etc.) are likely to change the schedule as well.

Observations: Priorities for field work at the beginning of the season are to visit territories to determine occupancy. Spend 1-4 hours observing at each site before concluding that a territory is unoccupied. Behavior to note include defensive territorial displays, perches and holes used, food exchanges between males and females, use of night roosts.

Site Visits: Site visits during the early part of the breeding season need to be timed late in the day. During daytime, falcons are typically outside of the park to feed. They typically return to

the breeding areas in the park toward dusk. Most observations will take place just before raptors fly into cliff crevices to roost for the night.

When possible, check multiple historical raptor territories during observation periods to make efficient use of visits. For example, when visiting North Balconies from the departure point of Chalone Picnic Area, pay attention to potential raptor activity en route at Guard Rock (at the foot of Pig Canyon), along Old Pinnacles Trail, at the North Wilderness Trail junction, and at Eagle Rock. While observing North Balconies, also pay attention to raptor activity at Crowley, and any activity at Machete, the Balconies Cave Trail junction, etc.

Data Management
Data sheets and notebooks need to be reviewed for completeness each day. Make corrections and make photocopies.

Communication
Write and send first bi-weekly update (see details on updates in SOP 5: Data Analysis and Reporting. Also write the status of raptors by territory on the whiteboard in the conference room, and update the Breeding Raptors Map in the Superintendent's Office to provide staff with another source of information on the raptor monitoring program. Include species, breeding status, and territories for the conference room whiteboard, and raptor specific push pins by territorial location on the Breeding Raptors Map in the Superintendent's Office.

February Activities
Field Work
The best chance of seeing falcons continues to be late in the day as raptors return to roost sites from feeding areas. Continue making raptor monitoring observations to determine occupancy and nesting status. Look for food exchanges between males and females, copulations, inspection of potential nest sites, territorial displays, and territorial defense. Continue to make site visits late in the day in increase chance of seeing prairie falcons.

Data Management
Data sheets and notebooks need to be reviewed for completeness each day. Make corrections and make photocopies.

March Activities
Field Work
The best chance of seeing falcons continues to be late in the day as raptors return to roost sites from feeding areas. Once nests have started, raptors may be found during any time of the day.

- Continue making raptor monitoring observations to determine occupancy and nesting status.
- Look for lethargy of egg-laden females, nest switches, and food exchanges.
- If nests are located, note incubation (usually starting in the middle of the month), and note duration to determine "soft" vs. "hard" incubation.
- Document location of nest and number of eggs.

- Enter data into database.

Data Management
Data sheets and notebooks need to be reviewed for completeness each day. Make corrections and make photocopies.

April Activities
Field Work
Continue making raptor monitoring observations to determine occupancy and nesting status. In addition to previously noted behaviors look for first hatchlings at the end of the month. Enter data into database.

Climbing and Hiking Advisories
As soon as all prairie falcon pairs have chosen nest sites, usually in late March to mid-April, update advisory information, by following the guidelines below:

- Contact rangers with Interpretive Resources, and inform them about updated advisory brochures, notices, and bulletin boards on the east side and west side with additional advisory information, re-openings of unoccupied areas, etc.
- Mail new advisory brochures and notices to climbing shops only; no additional notification is done at this point in the season.

Data Management
Data sheets and notebooks need to be reviewed for completeness each day. Make corrections and make photocopies.

May Activities
Field Work
- Continue making raptor monitoring observations to determine occupancy and nesting status.
- Look for number of nestlings and their ages, food drops and caches from adults.
- Also document possible nest failures or nestling losses. The first fledging may occur at the end of the month.
- Enter data into database.

Data Management
Data sheets and notebooks need to be reviewed for completeness each day. Make corrections and make photocopies.

June–July Activities
Field Work
Continue making raptor monitoring observations to determine nesting status. In addition to previously noted behaviors document number of nestlings and their ages. Consider early morning/later afternoon field work as chick activity is often diminished in the mid-day heat.

Climbing and Hiking Advisories

Remove Climbing/Hiking Advisories: Two weeks after fledging has finished, usually in June or July, lift climbing / hiking advisories at the park, following guidelines listed below:

- Remove and store all advisory signs in the Gas House at the end of the Condor Gulch Road.
- Retrieve climbing access signs from the Gas House and affix them to the metal foundations for Little Pinnacles and General Balconies.
- Update the bulletin boards with the "all is open" signs, with the assistance of Interpretive Resources staff.
- Send press release to advise media of updated advisories.
- Update park web page and contact FOP.

Equipment Maintenance

- Clean and repair all pieces of equipment prior to returning them to their proper storage areas in the Resource Management Office. The Swarovski 20-60x spotting scope and Zeiss 10x42 binoculars are both very expensive, and should be stored securely in the Resource Management Office, ideally in the Resource Chief's office.
- All reference manuals should be re-shelved on their appropriate bookshelves.
- Other reference materials and extra data sheets need to be filed in their appropriate filing cabinets.

Data Management

Data sheets and notebooks need to be reviewed for completeness each day. Make corrections and make photocopies.

- Photographs: Update field photos at the end of the field season of new territories (see for further details see 3: Data Management).
- Annual Report: Write the annual raptor monitoring report as outlined in SOP 5: Data Analysis and Reporting.
- Data Sharing: All applicable breeding raptor records for the season should be sent to the CDFG, California Natural Diversity Database (CNDDB), and the SCPBRG, incorporating PINN records into a regional and nationwide network of raptor monitoring efforts and reports.
    - SCPBRG: Document any peregrine falcon breeding data from the "breedingraptors" database by printing a copy of the "FWS_PEFA_Form.doc," accessed through the network path, "S:\RRM\RRM_Data\RM Workgroups\PROJECTS\Breeding Raptors\database\important database files\SCPBRG Forms." Print a copy of the form for each breeding record.
        - Photocopy each form and file these in the "Raptors" cabinet in the RRM Office.
        - Fill out the SCPBRG forms and mail them to: **Predatory Bird Research Group, Long Marine Lab, Santa Cruz, CA 95060.** For further

information, and to receive forms detailing peregrine falcon nest sites, contact Janet Linthicum (janetl@ucsc.edu).

- CNDDB: Document any records for California species of concern from the "breedingraptors" database by opening the "natspec.pdf" file through the network path, "S:\RRM\RRM_Data\RM Workgroups\PROJECTS\Breeding Raptors\database\important database files\CNDDB Forms." Fill out forms based on data for each breeding record documented in the "breedingraptors" database for the season. Refer to the "fsfinst.pdf" and "CNDDB_GPSInstructions.pdf" files, and the CNDDB website - http://www.dfg.ca.gov/whdab/html/animals.html - for further instructions on how to fill out the "natspec.pdf" form.
    - Print associated topographic maps by opening www.topozone.com and zooming into sections of PINN maps to CNDDB standards, listed in the above PDF files. With red ink or pencils, circle and label watchspots and nest sites documented on the associated "natspec.pdf" form.
    - Photocopy all forms and associated maps, and file these in the "Raptors" cabinet in the RRM Office.
    - Mail all breeding record forms and associated maps to: CNDDB, Department of Fish and Game, 1807 13th Street, Suite 202, Sacramento, CA 95814.

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SOP 2. Watch Spot Locations V1.0

Revision History Log

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #
1.0	6/2009	M Koenen	Initial Draft	Address comments by reviewers	1.0

Overview

This SOP provides detailed directions to watch spots used to monitor historic territories for potential nests. The SOP was based on a document by Julie Rechtin (approximately 1992) and was updated in 2008. Directions are provided for all raptor species including Prairie Falcons. Hard copies of photographs referred to in the directions are available in the metal file box in the RRM Office on the "Wildlife" shelves. Digital copies are on the network drive: S:\RRM\Images\Raptor_DB_Photos\scans.

Site Descriptions

Although this protocol focuses on prairie falcon monitoring, park managers are also interested in identifying nesting activity of other raptor species. Directions to prairie falcon watch spots are presented as suggested routes that also pass along historic territories of other species. These can be easily checked en route to historic prairie falcon sites. Table 6 presents a list of all historic raptor territories at Pinnacles National Monument. Directions to watch spots and accompanying figures are presented below.

While most watch spots are relatively easy to locate, remote territories such as South Wilderness Rock, North Wilderness Rock, Canyon N of Willow Springs, Willow Spring Slide, Narrows, and South Chalone are challenging to find. These sites will require significant off-trail hiking to access, map reading skills, and GPS use. Some general guidelines for backcountry navigation to territories and watch spots include the following:

When navigating to watch spots, take advantage of park geography; use high points and rock outcrops devoid of vegetation to gain visibility and orient to your location within the park. Avoid hiking through virgin chamise and dense chaparral whenever possible, as they limit visibility and significantly increase travel time to observation points
GPS units can also provide points of reference to confirm that you are nearing UTM coordinates of historic observation points, documented in field notes and on certain catalogued photographs. However, GPS units should <u>not</u> be used as the primary navigation tool to observation points; the obstacles of chaparral, rock formations and chaparral will make this nearly impossible.

Table SOP 2. 1. Historic territories for all raptor species at Pinnacles. Prairie falcon territories area noted with (P). Prairie falcon territories in core (C) and non-core (N) areas are identified.

Territories	Abbreviation Codes	Core (C) or Non-Core (N) Area	Route	Figures SOP 2.X
Balconies Cave Trail	BCT	N	1	-
Bench Area	BA	N	10	2, 3
Canyon N of Willow Springs (P)	CNWS	N	5	6, 15
Chalone Picnic Area	CPA	N	1	2
Citadel (P)	CI	C	1	1, 4
Crowley Drainage	CT	C	1	1, 7
Crowley Towers (P)	CD	N	1	1, 7
D. Soto Canyon (P)	DS	N	9	2
Deserted Valley (P)	DV	C	7	11
Discovery Wall (P)	DIS	N	4	10, 11
Double Gates	DG	N	12	-

Territories	Abbreviation Codes	Core (C) or Non-Core (N) Area	Route	Figures SOP 2.X
Drywall (P)	DRY	N	10	3
Eagle Rock	ER	N	1	7, 9, 15
Egg (P)	EGG	C	1, 8	4, 12
Eucalyptus Grove	EG	N	12	-
Frog Canyon (P)	FC	N	2, 10	5
Frog/Hand (P)	FROG/HAND	C	4	11
General Balconies (P)	GB	C	1	1, 7
Goat Rock (P)	GOAT/RW	C	7, 8	11, 12
Grassy Canyon -- Creek Crossing East	GC	N	10	3
Guard Rock -- Foot of Pig Canyon	GR	N	1	2, 9, 14
Hanging Valley (P)	HV	N	2	5
Hawkins Peak (P)	HP	C	6	4, 9, 12
Hippopotamus	HIPPO	N	6	4, 10
Jawbone Canyon	JAW	N	12	-
Juniper Canyon	JC	N	12	-
Kingman Land North - Regan Rd to Highway 25	KLN	N	11	-
Kingman Land South - Pinn CG to Regan Rd	KLS	N	11	-
Little Pinnacles (P)	LP	C	2	5
Lower Bear Gulch	LBG	N	6	2, 10
Lower Condor Gulch	LCG	N	6	10
Machete (P)	MAC	C	1	1
Marion Canyon (P)	MAR	N	5	6
Mating Rocks (P)	MAT	N	1	7, 15
McCabe Canyon	MC	N	11	-
Narrows -- East Fork of Marion Canyon (P)	NARR	N	5	6
NE Sec 15 (P)	NES	N	3	7
Neglected Valley (P)	NV	C	4	11
North Balconies (P)	NB	C	1	1, 7
North Chalone (P)	NC	N	3	8, 13
North Chalone West	NCW	N	3	8
North Wilderness Rock (P)	NWR	N	1	6, 7
North Wilderness Trail	NWT	N	5	6, 15
Old Pinnacles Trail -- Chalone Annex	OPTC	N	5	-
Old Pinnacles Trail -- North Wilderness Junct	OPTN	N	5	-
Peaks View Area	PVA	N	10	-
Pig Canyon (P)	PIG	N	6	9, 14
Pinnacles Campground	PCG	N	11	-
Pipsqueak Pinnacles (P)	PP	C	7	10, 11
Prescribed Burn Cliffs (Gargoyle) (P)	PB	C	4	11, 12
Resurrection Wall (P)	RW	N	7	12
Scout Peak (P)	SP	C	7	11, 12
South Balconies (P)	SB	C	1	1, 7
South Chalone (P)	SC	N	3	13
South Wilderness -- Drift Fence North	SWN	N	10	2, 3, 14
South Wilderness -- South End	SWS	N	10	14
South Wilderness Rock (P)	SWR	N	10	14
South Wilderness Trail	SWT	N	10	3, 14

Territories	Abbreviation Codes	Core (C) or Non-Core (N) Area	Route	Figures SOP 2.X
Teapot Dome (P)	TD	C	7	4, 12
Tugboat (P)	TUG	N	1	1, 7
Tunnel (P)	TU	C	8	4, 12
Upper Bear Gulch -- Moses Spg Trl to Reservoir	UBG	N	4	10
Upper Condor Gulch	UCG	N	6	4, 9
West of Chalone Picnic Area	WCP	N	9	3, 9
West Side Entrance	WSE	N	12	-
Western Front	WF	N	7	12
Willow Springs Slide (P)	WSS	N	5	15

For territories without figures, a park map found in a current park brochure will suffice.

Route 1. Old Pinnacles Trail (Figures SOP 2.1, 2, 4, 6, 7, 9, 12, and 15)

Territories Covered

Chalone Picnic Area (CPA), Guard Rock (GR), Eagle Rock (ER), North Wilderness Rock (NWR), Mating Rocks (MAT), Tugboat (TUG), North Balconies (NB), Crowley Towers (CT), Crowley Drainage (CD), South and General Balconies (SGB), Machete (MAC), Citadel (CI), Egg (EGG) and Balconies Cave Trail (BCT).

Description

Chalone Picnic Area, Guard Rock, Eagle Rock: From the Chalone Housing Area, the live oak groves between the housing and maintenance buildings are known as the Chalone Picnic Area. Leaving the Chalone Housing area, hike down the paved road to the dirt road to the trail. At the trailhead looking north, you can see Guard Rock on the northwest side of Chalone Creek, a large greenish rock mass at the base of Pig Canyon. You will cross one bridge then come to a sign pointing to the North Wilderness Trail. (This is the trail taken for Willow Spring and Canyon North of Willow Spring). Continue down the trail for 200 m, you will see Eagle Rock above and to the left in the distance. Generally, monitors stop here and watch for 10-20 minutes looking for eagles among the rocks and trees in the area.

Continuing on, you will cross the stream once and just before crossing the stream a second time, head up the hill on your right (North). This is the watch spot for Eagle Rock. If you go high on the hill (up about 400 m in elevation) you can see into the Eagle Rocks (ER)-1 and -2 nests.

Mating Rocks, Tugboat, North Wilderness Rock: Go back down the hill, and continue down the trail. You will make several stream crossings. On the east side of Chalone Creek, you will notice a rock mass of cliffs to the west. This is Mating Rocks. Right after the stream crossing, hike uphill off trail to the main Mating Rocks watchspot (Figure 6). If prairie falcons are nesting at Tugboat, hike west uphill of Chalone Creek and just south of the base of Mating Rocks to view Tugboat. The next branch point is for the North Wilderness Rock. As you continue down the trail, you will see a rock that looks like a wave crashing over the stream (on the right or north side). The drainage that precedes this rock is what you hike up (see Figure 1). You will go up the drainage, over two clusters of rock and the follow the ridge among the chamise. En route you can also see Tugboat. The chamise will continue to get shorter and easier to walk through. You will

see North Wilderness Rock on your right (to the Northwest). Hide in the chamise on the south west side of the ridge. The Canyon North of Willow Spring watchspot is also a second watch spot for North Wilderness Rock, but does not provide a direct view into the North Wilderness Rock (NWR)-1 and -2 nest sites.

North Balconies, Crowley Towers, Crowley Drainage: If you don't go to North Wilderness Rock, then you continue down the trail. You will see the only LARGE drainage on the right – Crowley Drainage – and the grass hillside we watch from on the east side of the drainage. This provides the best viewing of North Balconies and Crowley Towers.

When the Crowley Towers birds nest in the Nest Knob, you will need to access the top of the Balconies to get nestling and fledgling counts. You access this area by going to the base of Flimsy Flume (where you would normally start going up the rock) and following the ridge to the right up. Then follow the rock wall to an open moss field. Hike up this field. You will have Crowley on your left (north) and small rock outcroppings on your right. Move towards these outcroppings until you have a good view into the Crowley nests. You will be to the left of the main North Balconies area.

South and General Balconies, Citadel, Machete, Egg, High Peaks: If you are heading to the South Balconies watch spot, continue to the end of the Old Pinnacles Trail. Here you will junction with the Balconies Cliffs and Balconies Caves Trails. Take the cliffs trail to the right and follow it until you reach the climber's access trail for Flimsy Flume (passing the General Balconies advisory sign placement near Smiling Simian). You then take this access trail to the right, follow it until it dead ends at a saddle where the Flimsy Flume is. This is where the South Balconies advisory sign is placed into the ground. From here you will see a 2nd rock mass high point ~80m S. Weave through sparse chamise cover to this high point and watch from there. Note that this watch spot is also reached – and more easily – by hiking from the Chaparral parking area. From the Chaparral parking area, hike past the bathrooms, over 2 bridges on the Balconies Trail. Just after the second bridge, turn left, hike up a small drainage; weave through chamise on a faint climber access trail, then up to the rock mass high point watch spot. You can also see Citadel, Machete, Egg, and some of the Central High Peaks from here.

Balconies Cave Trail: On occasion, the prairie falcons nest on ledges in the General Balconies area. To observe these you will need to be on the hillside just east of Machete. This is accessed from the Balconies Caves Trail. At the cliffs and caves junction, go left toward the caves. Continue to follow the trail up and down until you come to the first set of concrete and rock stairs (small set). At this point you want to cross the stream to the left and travel up the hill following deer and social trails. You will need to get quite high to see the nests. There is no 'right' spot, only spots that you can (or cannot) see.

Route 2. Little Pinnacles (Figure SOP 2.5)

Territories Covered

Hanging Valley (HV), Little Pinnacles (LP) and Frog Canyon (FC).

Description

Little Pinnacles: Hike the Moses Springs Trail to the Reservoir. Continue on the Chalone Peak Trail. This takes you around the Five Sisters and up Hanging Valley. Historical nest sites for

Hanging Valley can be seen clearly from the Chalone Peak Trail. To access Little Pinnacles watcspots, continue on Chalone Peak Trail, and make several turns. The first major turn (hairpin) to the right that leads the trail south is where we diverge. Instead of following the trail, follow the deer/social trail on the left that leads to an open space. This is where we put the Little Pinnacles advisory sign. From this point there are three ways to go, two are to general watch spots and one is a specific nest watch spot. For the specific nest watch spot, continue up the hill heading north until you crest out. You can watch the Little Pinnacles nest sites from this spot or anywhere along this ridge. This spot is not good for general observation though because you can't see the main cliffs very well from here.

For the two general spots, at the big open space where the sign is put, go down slope to you right. For the first spot about half way down the slope skirt to the left and contour your way around the hill. Eventually you will have a good view of the main cliffs and a few rock outcrops in front of you. Sit among the distinct orange-red rock outcrop for good visibility of the entire wall of Little Pinnacles. This is also a good vantage for the canyon walls of Frog Canyon north of Little Pinnacles and in the Mt. Defiance area to the east.

For the second general spot, continue contouring at the half way point, then down the slope until you hit the stream. Climb up the west side of Mt. Defiance until you can see clearly see the Little Pinnacles cliffs. This area provides the best view into the Little Pinnacles.

Route 3. North and South Chalone Peaks (Figures SOP2.8 and 13)

Territories Covered

NE Section 15 (NES), North Chalone (NC), North Chalone West NCW) and South Chalone (SC).

Description

NE Section 15, North Chalone: Follow the Chalone Peak Trail towards the tower. The trail will pass through the pig fence gate, then continue on a gravel road up towards the North Chalone tower. Right after the trail joins the road, it veers right and starts climbing. A small access path to the left leads to the main NE Section 15 watch spot. Follow the access trail to the pig fence, climb over it, and walk to the edge of a north-facing rocky bluff. From here the NE Section 15 rocks / cliffs can be seen clearly.

To continue up to North Chalone Peak, stay on the gravel road. The road comes to a pig fence gate crossing. There is a trail that branches to the right next to the pig fence gate. Follow this trail down. There will be a point along the trail where you see the 'knee' of Chalone branching south, with the pig fence between you and ridge. If you want to watch for golden eagles in the North Chalone West area, you will follow this ridge out to the point and then down the ridge about 300m.

If instead you are looking for prairie falcons, continue down the trail. It will level at the saddle between North and South Chalone Peaks. From here there are two general watchspots for North Chalone Peak (see Figure 32). For the first, continue from the saddle ~120m east up South Chalone along the pig fence, stopping when both the general North Chalone cliffs are in view. For the second watchspot, continue on the Chalone Peak Trail from the saddle, As you follow the trail around to the north, there will be several spots you can stop and see the cliffs.

There is a third spot to watch the North Chalone cliffs, straight down from the outhouse near the lookout tower. Bushwhack down until you have a good view of the cliffs - there is no right spot. This is the best spot for watching additional North Chalone sites.

South Chalone: For watching golden eagles or prairie falcons at South Chalone Peak, continue from the second North Chalone watchspot on the Chalone Peak Trail, up and around the north side of South Chalone. You will come to the pig fence. Follow the fence right (west) ~50-70m to a large juniper just south over the pig fence. Cross south over the fence and descend down the grass gulch, then contour west and downslope to a rocky ridge. This is the best watchspot for the South Chalone site to the southeast. Prairie falcons may also be active further downslope so continue down the rocky ridge until you can see the nest sites clearly.

Route 4. Bear Creek Drainage (Figures SOP 2.10, 11, and 12)

Territories Covered

Upper Bear Gulch (UBG), Discovery Wall (DIS), Frog (FROG), Hand (HAND), Neglected Valley (NV), and Prescribed Burn Cliffs (PB).

Description

Upper Bear Gulch and Discovery Wall: Hike up the Moses Springs Trail towards the reservoir. From the Moses Spring Parking Lot up towards Monolith, the riparian corridor is called Upper Bear Gulch. Check archived photos and base survey points on recent raptor nest activity in this area.

From the south end of the tunnel on Moses Spring Trail, the historical Discovery Wall prairie falcon territories are just visible. For a clearer view of Discovery Wall, continue up the Moses Spring Trail, passing the north side of Monolith and the middle trail junction for the Bear Gulch caves. Soon after, veer up off trail and onto the base of Lava Flow, and hike north until the entirety of Discovery Wall is visible.

Frog and Hand: Continue hiking up to the reservoir. Start on the trail to North Chalone. When you are next to the Five Sisters - look to the right (west). There is a trail that leads down the red rock and into the chaparral on the other side. Follow this trail; weave through the brush on a climber access trail towards Frog and Hand. You will parallel the Reservoir about 30m above the water line. Continue to the creek inlet to the Reservoir.

From the creek inlet, go down slope and cross the stream and hike up the slope on the other side. Follow the deer/social trails contouring around the hillside to the west. These will lead to an old CCC road bed. To watch the Frog and Hand area, continue to parallel Upper Bear Creek, hiking upstream on a faint access trail, weaving through chamise. Frog and Hand will become evident on your left. Before reaching a small outcrop of pinnacles in front (south) of you, turn right and hike ~30m uphill to a watchspot with clear views into the Hand-1 site.

An alternate watchspot for Frog is along the Chalone Peak Trail. Hike until you are standing trailside at the top of Teeth and have a clear view of Frog and Hand down west. This is a good watchspot for confirming activity at the Frog site.

Prescribed Burn Cliffs and Neglected Valley: If you are headed to Prescribed Burn Cliffs and Neglected Valley instead, continue to follow the creek to the west boundary. Just after passing a rock mass on your left with a pooling of the creek water, then a small group of pinnacles on your right, hike gradually upslope on the west side of the creek along a faint access trail. You will come to an open field and a gray pine growing on a rock mass. Hike up the open field then follow the ridgeline up from the pine. Weave your way through the chamise towards a large rock aptly named Square Rock, and set up your watch spot at the base of it. From the Square Rock watch spot, Neglected Valley includes the rock formations just right (north and east), and Prescribed Burn Cliffs includes the rock cliffs to the left (northwest). Use archived photos to determine historical nest sites

Route 5. Willow Spring Slide and Beyond (Figures SOP 2.6 and 15)

Territories Covered

Old Pinnacles Trail (OPTC and OPTN), North Wilderness Trail (NWT), Willow Spring Slide (WSS), Canyon North of Willow Spring (CNWS), Marion Canyon (MAR), and Narrows (NARR).

Description

Old Pinnacles Trail, North Wilderness Trail: Take the Old Pinnacles Trail to the North Wilderness Junction. You will go through one spring - big pool- and continue to follow the trail. You will then cross through a second spring - very thorny and full of poison oak. When you get out of the spring area you will see the North Wilderness Trail (NWT) area, turn to you right, climb/hike uphill 20m then contour to the right along this hillside following a deer trail. The trail will take you over a blue oak hillside, then next to an old fence line near Willow Spring (covered with ferns). You will then hike up a steep chamise slope next to the Willow Spring drainage, and Willow Spring Slide will come into view. Set up a watch spot here. A second watch spot for Willow Spring Slide can be accessed by parking at the roadside space near the east side entrance booth weather station. From here, walk east next to the paved road, then follow a fire break uphill to the pig fence. Follow the pig fence north until you come to the south end summit of Willow Spring Slide. This is the best watch spot for monitoring the Willow Springs Slide (WSS) nests.

Canyon North of Willow Spring: For Canyon North of Willow Spring instead of going up the slope after the second spring, continue to flow the North Wilderness Trail. You will travel for approximately 1,600m. You will see a stake next to an oak tree cluster. Go to this stake, make a sharp right and go through the bushes. You will hike up this valley. There are several branches of deer trails, if you follow these rules you will be okay:

1. If you have the option - follow the creek bed first
2. If choosing between a left or right fork (North or South), choose the left (North) 95% of the time.
3. Stay in the bottom of the valley; do not venture into the hillsides: yucky bush whacking!!!

When you first see the cliffs move to the left side of the canyon and up onto the slope. There is a pine tree near the base of the slope. Climb up this slope along the ridgeline, weaving through chamise, until you come to a rounded red-orange rock. This is a good watch spot for the Canyon North of Willow Spring.

Marion Canyon, Narrows: For the Marion Canyon / Narrows area, continue on the North Wilderness Trail from the Canyon north of Willow Spring junction, past a view of North Wilderness Rock to the left. Cross a creek that flows most of the year, continue on trail for ~ 40m then turn left onto a faint access trail. This will lead up along the creek through Marion Canyon. Follow the access trail until you reach the pig fence, then turn right and walk along the pig fence on a dirt road. The road crosses through the pig fence; cross over the fence, turn right, and descend down into the northeast fork of Marion Canyon, following this fork upstream. Eventually you will reach a narrowing of rock walls marking the beginning of the Narrows section; use archived photos to confirm the area. This provides the best watch spot for the Narrows sites. Continue upstream, turning left at the first canyon junction, then right at the second canyon junction, to approach the base of the Narrows site. Past a single, small valley oak the creek bed, climb right upslope 20m to the best watchspot for Narrows.

Route 6. Condor Gulch Trail (Figures SOP 2.2, 4, 9, 10, 12, and 15)

Territories Covered

Lower Bear Gulch (LBG), Lower Condor Gulch (LCG), Hippopotamus (HIPPO), Upper Condor Gulch (UCG), Hawkins Peak (HP), Pig Canyon (PIG).

Description

- Lower Bear Gulch: From the Bear Gulch Nature Center, hike down Bear Gulch past administrative buildings and along the trail. There is no “correct” watch spot along the riparian corridor; any raptor activity / nesting will dictate appropriate watch spots.
- Lower Condor Gulch: Start at the Bear Gulch Nature Center, hiking up the Condor Gulch Trail. About 100 m past the weather station, you will have the best view of the Lower Condor Gulch. To watch this area, hike up the hill on the east side (behind you and to the right) until you have a good view into the nest.
- Hippopotamus and Upper Condor Gulch: Continuing up the trail you will pass Hippopotamus Rock on your left. The HIPPO-2 site is best seen from Pipsqueak Pinnacles accessed from the High Peaks Trail. The Hippopotamus site can also be watched from the Condor Gulch Trail; use archived photos to confirm the site location. From Hippopotamus also scan the Upper Condor Gulch area up towards the base of Hawkins Peak for raptor activity.
- Hawkins Peak: As you continue up the trail, you will next come to the Condor Gulch Overlook. Past this the trail will make a sharp right hand hairpin turn. This is the point that you have your first good view of Hawkins Peak. We sometimes watch Hawkins from this spot in order to see birds flying between Hawkins and Tunnel areas. However, the best/more commonly used watch spot is further up the trail. Also from this sharp hairpin turn you have Casino Rock, Doodlin’ Doody, et al. on your right.
    - You will continue hiking up the trail about 1500 m and will reach a leveling in the trail off to you left is Hawkins Peak. Among the rocks on the left, there are good views of Hawkins - search around for your best view.
    - If the birds nest in the Hawkins Peak, you will have one more observation spot. It will be located on the High Peaks Trail up from the Condor Gulch Trail junction.

You will be sitting on the left side of the trail among the shrubs. See archived photos for the view you are attempting.

- Pig Canyon: At the end of Condor Gulch Trail, where it junctions with High Peaks Trail is Pig Canyon. The common watch spot is just down (North) from the trail on the open slope. Maneuver to the east a little to get the best view with as little tree blocking as possible. See archived photos for important observation areas.
    - If the birds nest in the Pig Canyon sites you will have a second observation point. It is located by going down the High Peaks Trail towards the Chalone Housing Area. Continue down trail until a broad, open blue oak slope is on your left. Hike downhill through the blue oaks to the base of several gray pines. This is a distant but very comfortable watch spot for the Pig sites.

Route 7. High Peaks Trail - South (Figures SOP 2.4, 10, 11, and 12)

Territories Covered

Scout Peak (SP), Pipsqueak Pinnacle (PP), Deserted Valley (DV), Goat Rock (GOAT), Resurrection Wall (RW), Teapot Dome (TD), and Western Front (WF).

Description

Scout Peak, Pipsqueak Pinnacle, Deserted Valley: This trail starts off the Moses Springs Trail a short ways up. You will hike about 1,600m just past Anvil until you have a general view of Scout Peak from Beak Peak north to Salathe's Sliver. Turning right on the trail, you will see the Pipsqueak Pinnacles area. Continue on trail, then continue hiking straight for ~20m rather than veering left on the High Peaks Trail, until you come to a rocky high point; this is a good watch spot for the Pipsqueak Pinnacle site. At this point you will hike about 100m more to the top of a mini ridge that separates Deserted Valley from Condor Gulch West Fork. From here the trail will be heading west, up a slight grade. This is a good watch spot that allows you to see the entire Scout Peak Area, Deserted Valley for the most part and Condor Gulch a little. The Scout Peak area has several other watch spots depending upon which nest is used. For the one Scout Peak nest you would continue up the trail about 100m until you have a good view of Salathe's Sliver to the Northeast. For another you hike up Bear Gulch Creek to the Prescribed Burn Cliffs watch spot at the base of Square Block.

Goat Rock, Resurrection Wall, Teapot Dome, Western Front: A final watch spot for Scout Peak is on top of Full Moon Party Rock, the high point to the right of the Scout Peak bench, up an access trail just right of the Steep and Narrow Trail. Hike to the very top of this rock for the best watch spot. This is also the best initial watch spot for Goat Rock/Resurrection Wall, and Teapot Dome.

For an alternate watch spot for Resurrection Wall, begin at the Scout Peak outhouse, hike up towards Scout Peak, along the ridge on top of Goat Rock, and look down. This is also the best watch spot for Western Front.

Route 8. High Peaks Trail – North (Figures SOP 2.4, 11, and 12)

Territories Covered

Tunnel (TU), Egg (EGG), Goat Rock (GOAT), and Resurrection Wall (RW).

Description

Tunnel, Egg, Goat Rock, Resurrection Wall: Normally, start out on the Condor Gulch Trail junction with High Peaks Trail. Turn left onto the High Peaks Trail. You will see the junction to the Tunnel Trail, down and to the right after about 1,600m. Go past this junction about 30m. The trail will continue to the left and on your right and below you is a gully. This gully is where you want to go down and under the oak tree. You will then veer left and see a narrow gully between two rocks - it is very steep. Go down this gully - it looks scarier than it is. You will have a 2-3m high rock in front of you. This is the rock you sit on top of; access it from the left side. As you are sitting on top of this rock, you will be able to watch Tunnel and Egg primarily and Goat Rock and Resurrection Wall secondarily.

There are two other watch spots off this trail (Pig Canyon and Hawkins Peak) covered in the Condor Gulch section.

Route 9. High Peaks Trail (Figures SOP 2.2 and 9)

Territories Covered

West of Chalone Picnic Area (WCP), D. Soto Canyon (DS).

Description

West of Chalone Picnic Area: From Chalone Housing, the West of Chalone Picnic Area is visible as a collection of rock pinnacles along the High Peaks Trail just west of housing, rising up from the Bench Trail junction. Sitting anywhere near and just south of the housing area provides a good watch spot.

D. Soto Canyon: To access the main watch spot for D. Soto Canyon, hike up the service road east behind the dorm housing near to the water tank, then veer left up the fire managed chamise slope 20m, turn left, and the D. Soto Canyon cliffs will be evident. This is the best initial watch spot for the D. Soto Canyon sites. Another watch spot, follow the directions for the upper Willow Spring Slide watch spot, stopping when the D. Soto Canyon area is in view (see archived photos).

Route 10. Peaks View Area to Drywall and South Wilderness Trail to South Wilderness Rock (Figures SOP 2.2, 3, 5, and 14)

Territories Covered

Peaks View Area (PVA), Frog Canyon (FC), Bench Area (BA), Grassy Canyon (GC), Drywall (DRY), South Wilderness Trail (SWT), South Wilderness Drift Fence North (SWN), South Wilderness South End and South Wilderness Rock (SWR).

Description

Peaks View Area, Frog Canyon, Bench Area, Grassy Canyon, Drywall: Park at the Peaks View Parking Area. To access the Peaks View Area territories, hike from the parking area west across Chalone Creek to the live oak grove at the base of a small gulch. Return to the Bench Trail and continue south. From the service road from the green gate located 100m east of the entrance station booth, hike north to access the Bench Area nests along the trail. To continue towards Drywall, continue on the service road, crossing through Sandy Creek. You will pass through the pig fence gate and begin to hike up Grassy Canyon, eventually coming to a Y in the road. The

historical nest sites in Grassy Canyon are visible along this route. To continue up to Drywall, follow the right branch of this y. As you continue to follow the road, you will see the slides to the east. Get to the top of the knoll, and instead of following the road down hill, turn 90 degrees to the left and hike up the hill a ways until you have a good view of Drywall and the slides to the north (see archived photos).

South Wilderness Trail and South Wilderness Rock: South Wilderness Trail is accessed from the same road that you travel down to Drywall. A short way after the first green gate, you will see a trail branching to the right that has green stakes marking the path. Follow these green stakes. You will cross the creek once in the beginning of the trail and then two more times. To access the base of Frog Canyon, veer off trail right after the first creek crossing and hike up through the sycamore/oak riparian corridor of lower Frog Canyon. Continue down on the South Wilderness Trail, stay on the trail. After the third water crossing, follow the trail past a sycamore grove – where South Wilderness Trail is located - veer right, and the trail will have a long straight stretch. From here you will see a ridge extending east on the horizon with a live oak grove near its base. Follow the trail towards this grove then veer right off-trail to the grove, where another South Wilderness trail site is located. From here, continue back along the South Wilderness Trail south towards a small cottonwood grove, then along a straight stretch towards a shallow rise. The area north towards the service road that is off trail from South Wilderness Trail is called South Wilderness Drift Fence North. The area off trail south of this area to the park boundary is South Wilderness South End. To access the South Wilderness Rock watch spot, hike up the steep slope west along a grassy ridgeline. Continue right on the ridgeline until you can clearly see South Wilderness Rock (see archived photos).

Route 11. Pinnacles Campground and Bottomlands

Territories Covered

Pinnacles Campground (PCG), McCabe Canyon (MC), Kingman Land South (KLS), Kingman Land North (KLN).

Description

Pinnacles Campground and McCabe Canyon: From the Pinnacles Visitor Center, walk through the Pinnacles Campground and check historical sites for activity. Use archived photos with GPS coordinates for guidance. The blue oak woodland slopes just west of the campground and Highway 146 also provide a good vantage point for scanning for activity.

From the Visitor Center, hike along Highway 146 to the gated road veering northwest up McCabe Canyon. Climb over the gate and continue up the canyon, following the road and the canyon as dictated by observed raptor activity and archived photos.

Kingman Land South: Drive from the Visitor Center north to the first paved road junction with a wooden road gate. Park here and check the roadside and interior live oak corridors for raptor activity as dictated by observations and archived photos. Kingman Land South refers to the general bottomlands habitat from near the Bacon homestead north to the Regan Ranch road.

Kingman Land North: Continue driving north on Highway 146 to a gravel pullout next to a green gate. Climb over the gate and hike along the bottomlands portion of the Regan Road. From here the northern bottomlands can be accessed, including wooded side canyons and the Butterfield

Canyon up east from the historic Butterfield barn. Use archived photos to determine appropriate watch spots.

Route 12. To Chaparral Parking Area via Highway 25 South

Territories Covered

Eucalyptus Grove (EG), West Side Entrance (WSE), Jawbone Canyon (JAW), Double Gates (DG), Juniper Canyon (JC).

Description

Eucalyptus Grove: Drive west from the Pinnacles Visitor Center via Highway 146, Highway 25 S, and back onto Highway 146 entering towards the west side of Pinnacles National Monument. About 2.5-3 miles along Highway 146, pull over next to the road when a eucalyptus grove comes into view. This is the Eucalyptus Grove and a historical golden eagle nesting area.

West Side Entrance: Continue driving on Highway 146 and enter the west side of the park. Park next to the Pinnacles entrance sign and hike west uphill along the pig fence through open blue oak woodland. Check the West Side Entrance for nesting raptors (see archived photos).

Jawbone Canyon: From the west side of the Pinnacles entrance sign, hike east through an open meadow towards the head of a blue oak riparian corridor. This is the beginning of Jawbone Canyon. Continue hiking along the corridor into another open meadow to check historical sites for raptor activity.

Double Gates: Continue driving on the park road downhill through a few turns. At a sharp right turn, park at the gates with the gravel pullout. This is the beginning of the Double Gates area. Climb over the gates and continue north along the pig fence, checking historical raptor sites for nest activity (see archived photos).

Juniper Canyon: Continue driving until you reach the Chaparral Parking Area. From here hike up towards the High Peaks via Juniper Canyon to check the live oak / juniper riparian corridor for raptor nest activity. Alternatively, continue on the Balconies Trail to access the main watch spot for South Balconies, Machete, and Citadel (see Route 1).

The following maps were developed to take into the field and use in conjunction with territory descriptions presented above. Each map has multiple territories. Digital GIS maps are also available on the network drive: S:\RRM\RRM_Data\RM Workgroups\PROJECTS\Breeding Raptors\database.

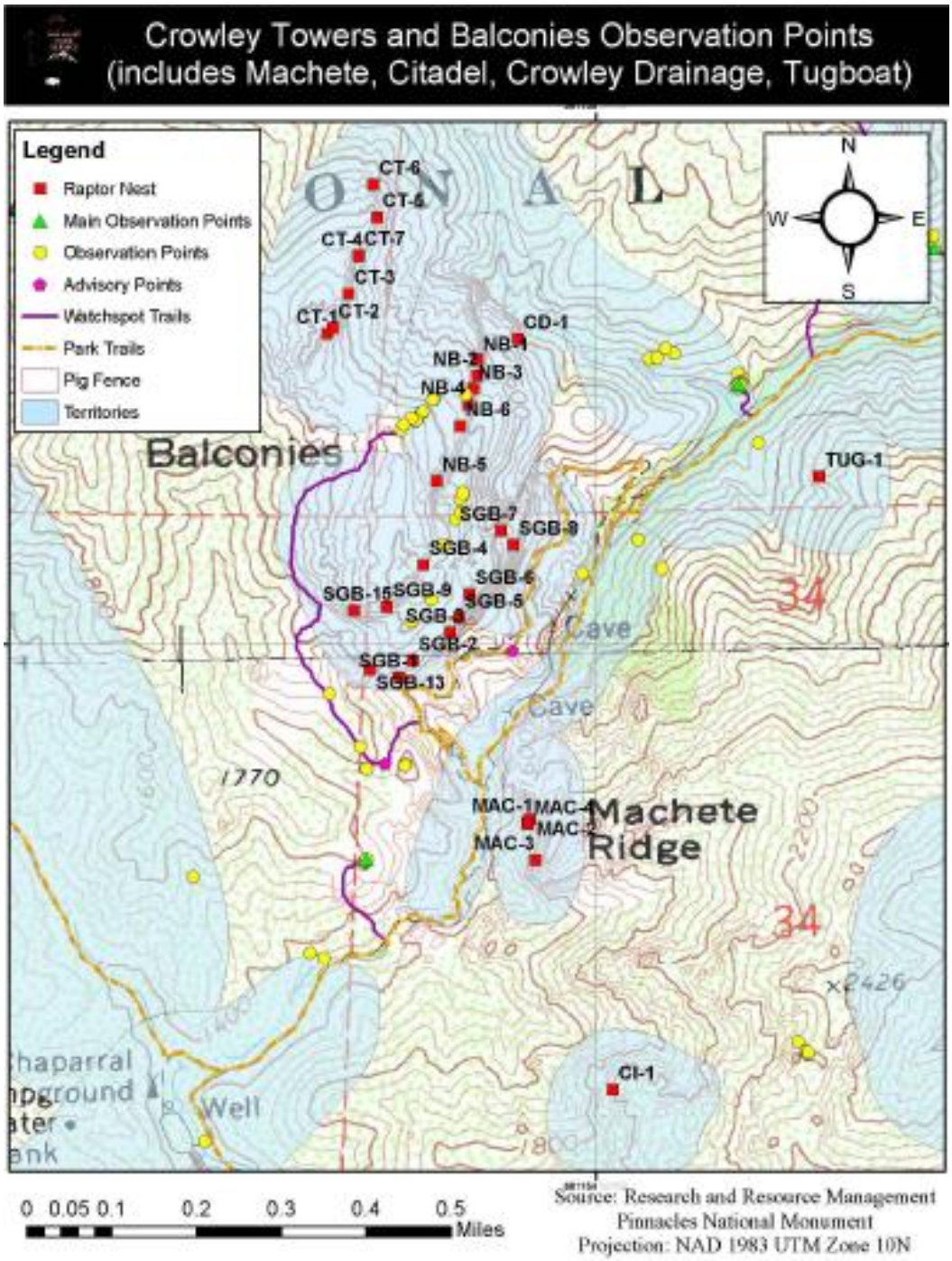


Figure SOP 2. 1. Territory map for Citadel (CI), Crowley Drainage (CD), Crowley Towers (CT), Machete (MAC), North Balconies (NB), South and General Balconies (SGB), and Tugboat (TUG).

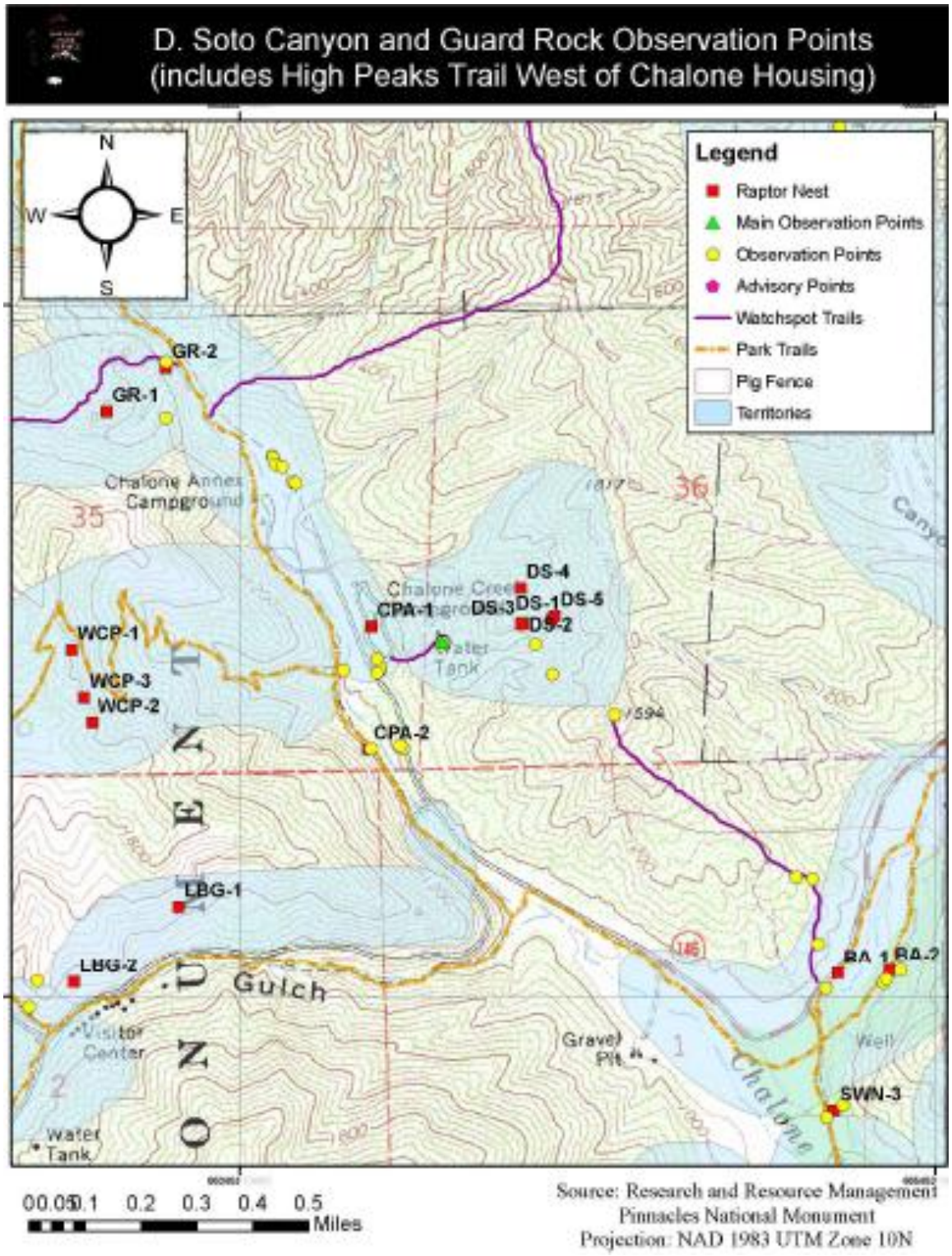


Figure SOP 2. 2. Territory map for Bench Area (BA), Chalone Picnic Area (CPA), D. Soto Canyon (DS), Guard Rock (GR), Lower Bear Gulch (LBG), South Wilderness–Drift Fence North (SWN), and West of Chalone Picnic Area (WCP).

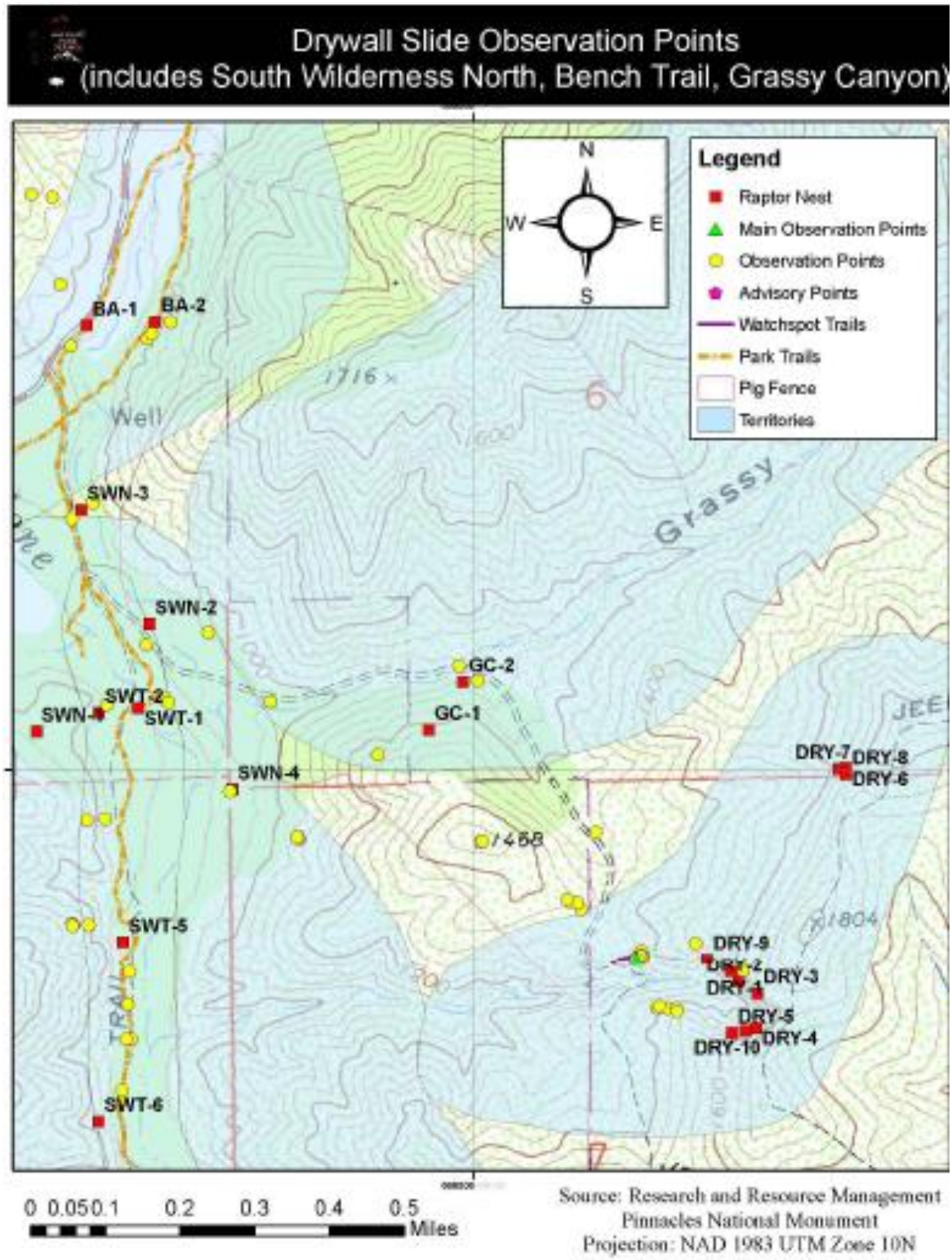


Figure SOP 2. 3. Territory map for Bench Area (BA), Chalone Picnic Area (CPA), D. Soto Canyon (DS), Guard Rock (GR), Lower Bear Gulch (LBG), South Wilderness–Drift Fence North (SWN), and West of Chalone Picnic Area (WCP).

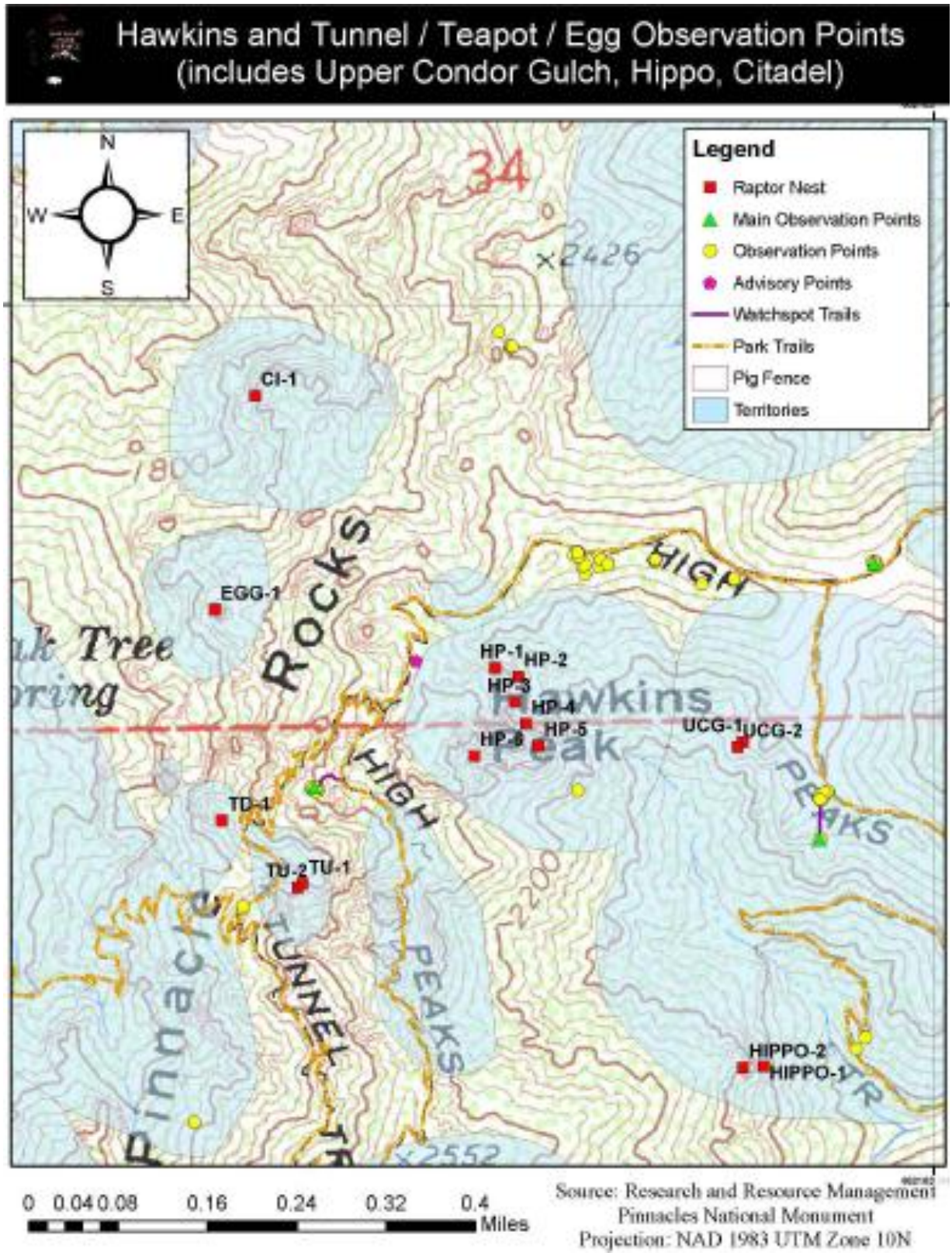


Figure SOP 2. 4. Territory map for Citadel (CI), Egg (EGG), Hawkins Peak (HP), Hippopotamus (HIPPO), Teapot Dome (TD), Tunnel (TU), and Upper Condor Gulch (UCG).

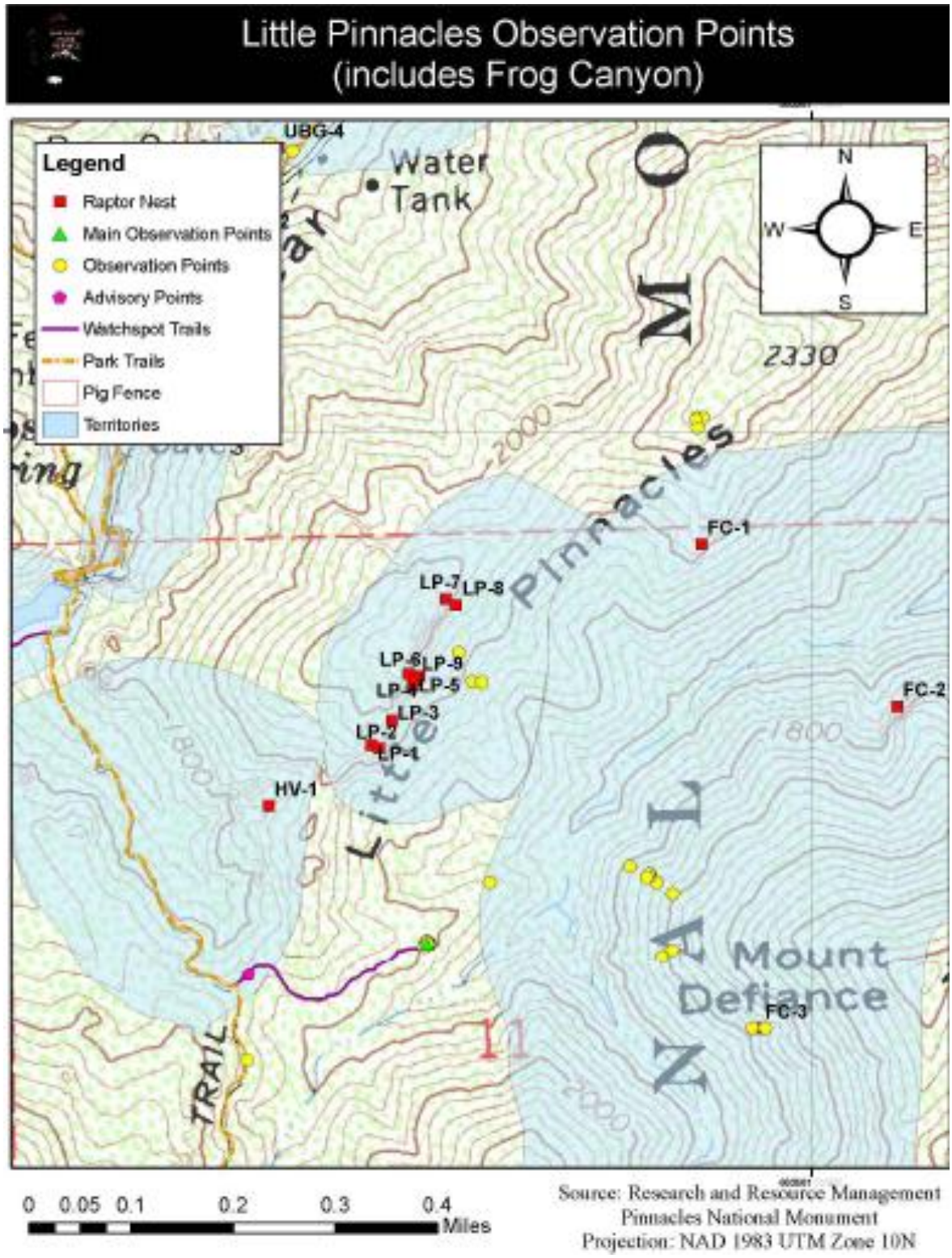


Figure SOP 2. 5. Territory map for Frog Canyon (FC), Hanging Valley (HV), and Little Pinnacles (LP).

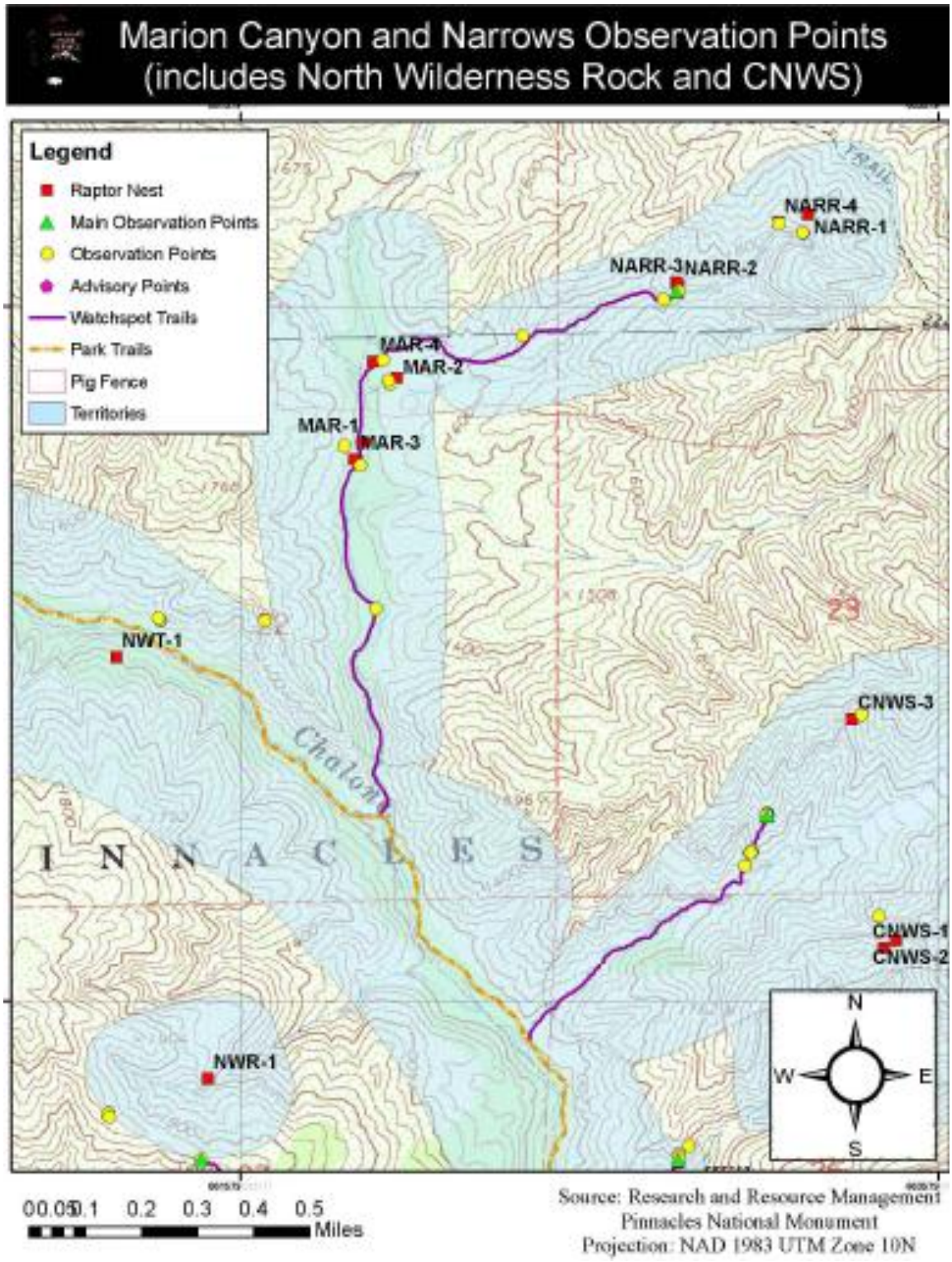


Figure SOP 2. 6. Territory map for Canyon N of Willow Spring (CNWS), Marion Canyon (MAR), Narrows (NARR), and North Wilderness Rock (NWR), and North Wilderness Trail (NWT).

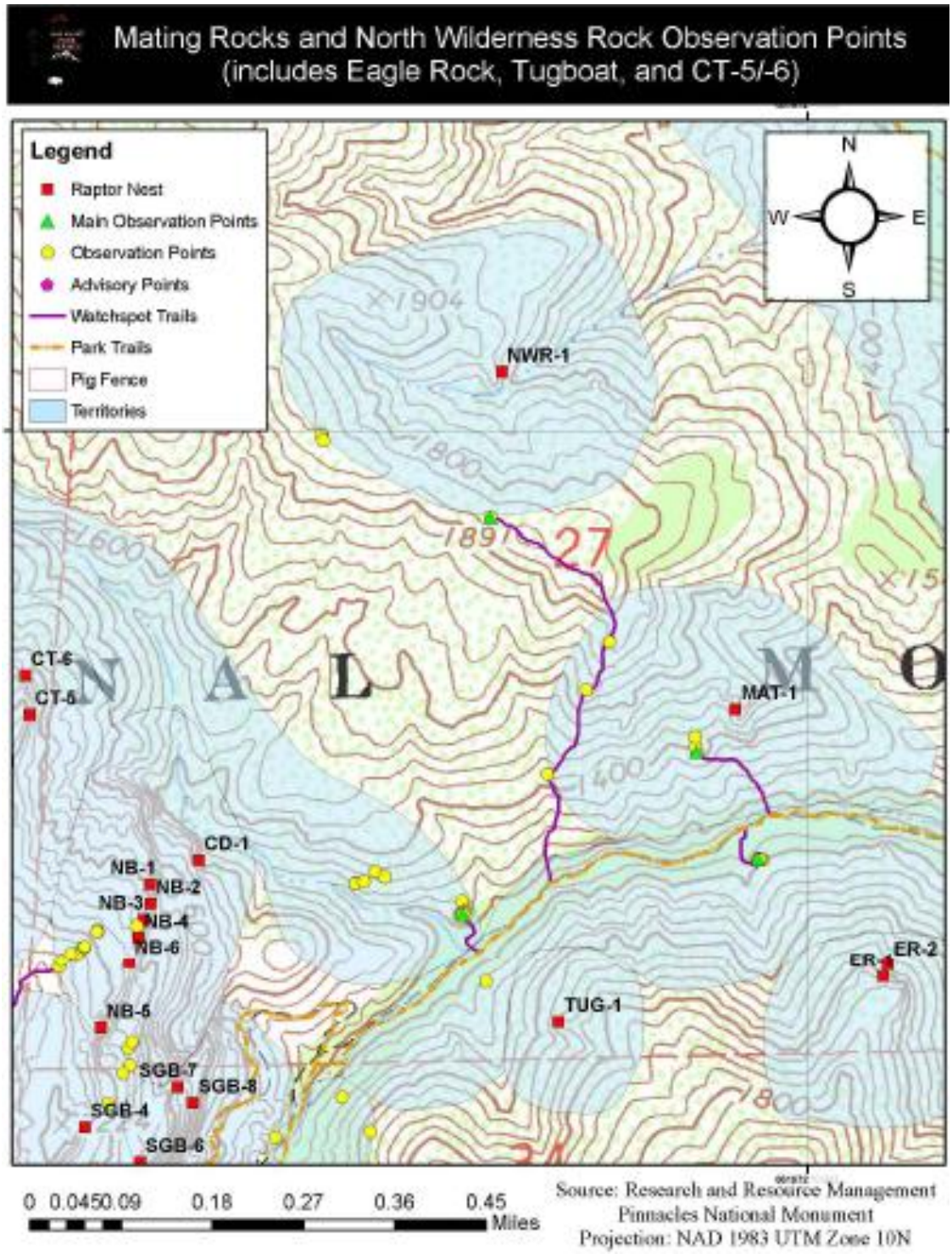


Figure SOP 2. 7. Territory map for Crowley Drainage (CD), Crowley Towers (CT), Eagle Rock (ER), Mating Rocks (MAT), North Balconies (NB), North Wilderness Rock (NWR), South and General Balconies (SGB), and Tugboat (TUG).

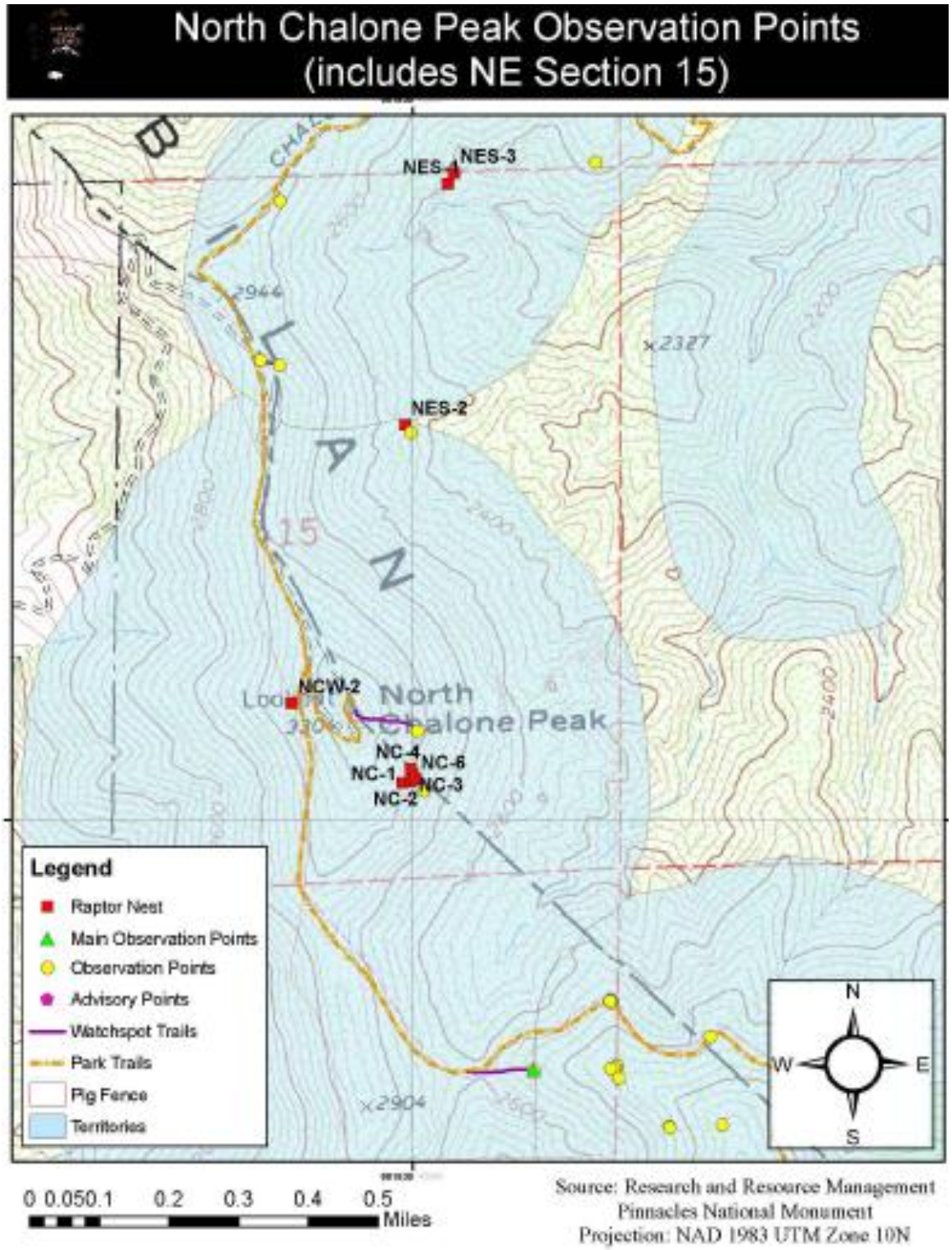


Figure SOP 2. 8. Territory map for North Chalone (NC), North Chalone West (NCW), and NE Section 15 (NES).

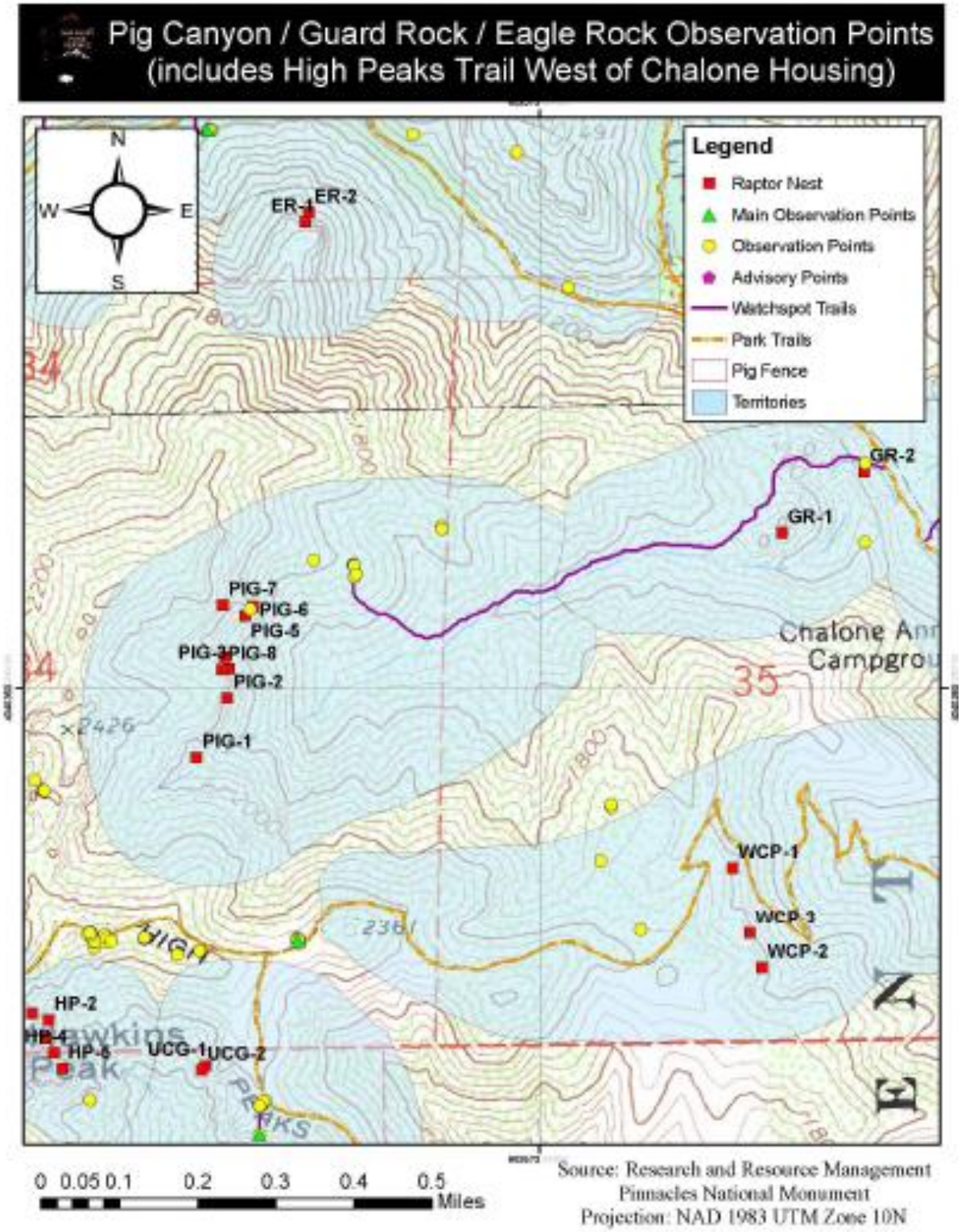


Figure SOP 2. 9. Territory map for Eagle Rock (ER), Guard Rock (GR), Hawkins Peak (HP), Pig Canyon (PIG), Upper Condor Gulch (UCG), and West of Chalone Picnic Area (WCP).

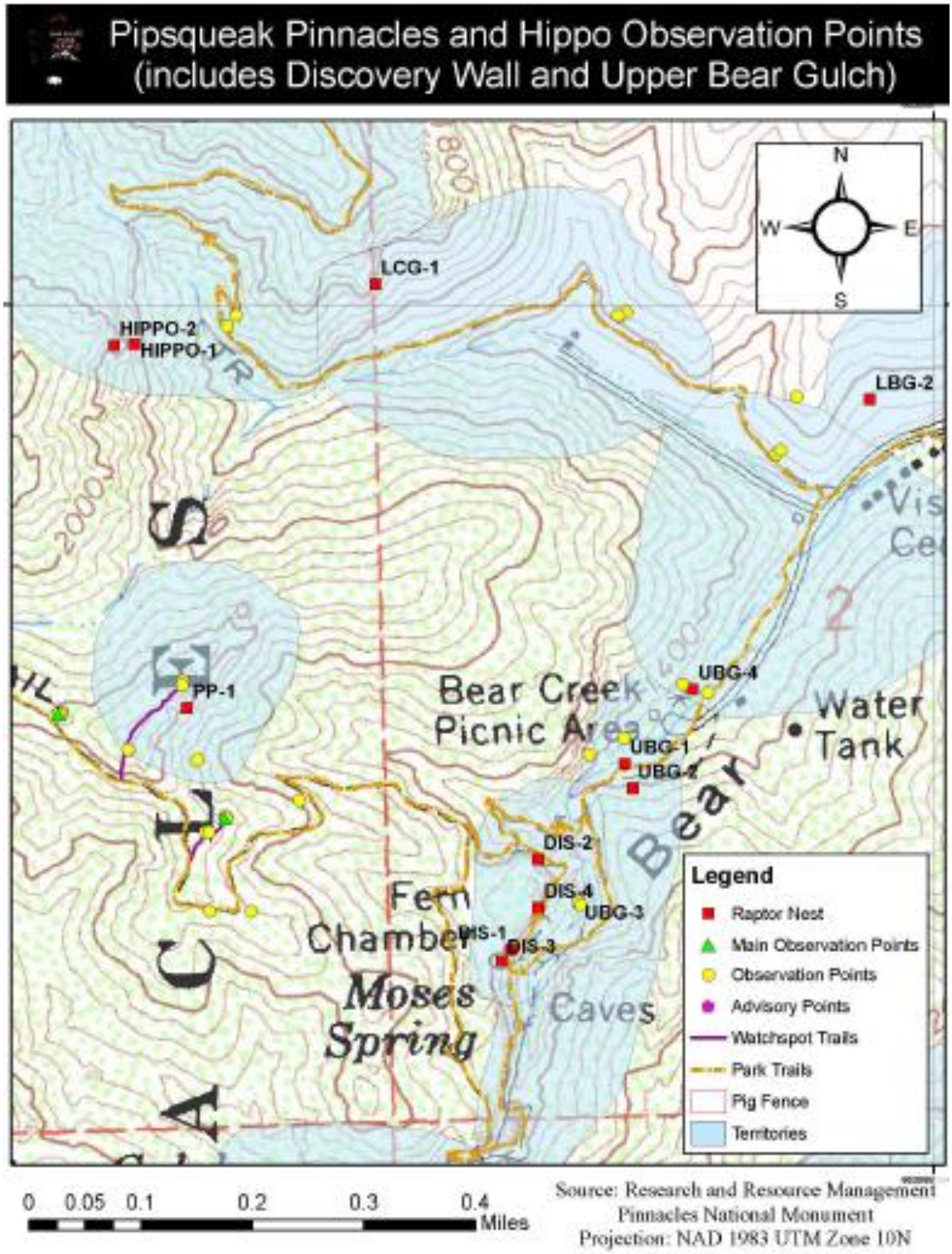


Figure SOP 2. 10. Territory map of Discovery Wall (DIS), Hippopotamus (HIPPO), Lower Bear Gulch (LBG), Lower Condor Gulch (LCG), Pipsqueak Pinnacle (PP), and Upper Bear Gulch (UBG).

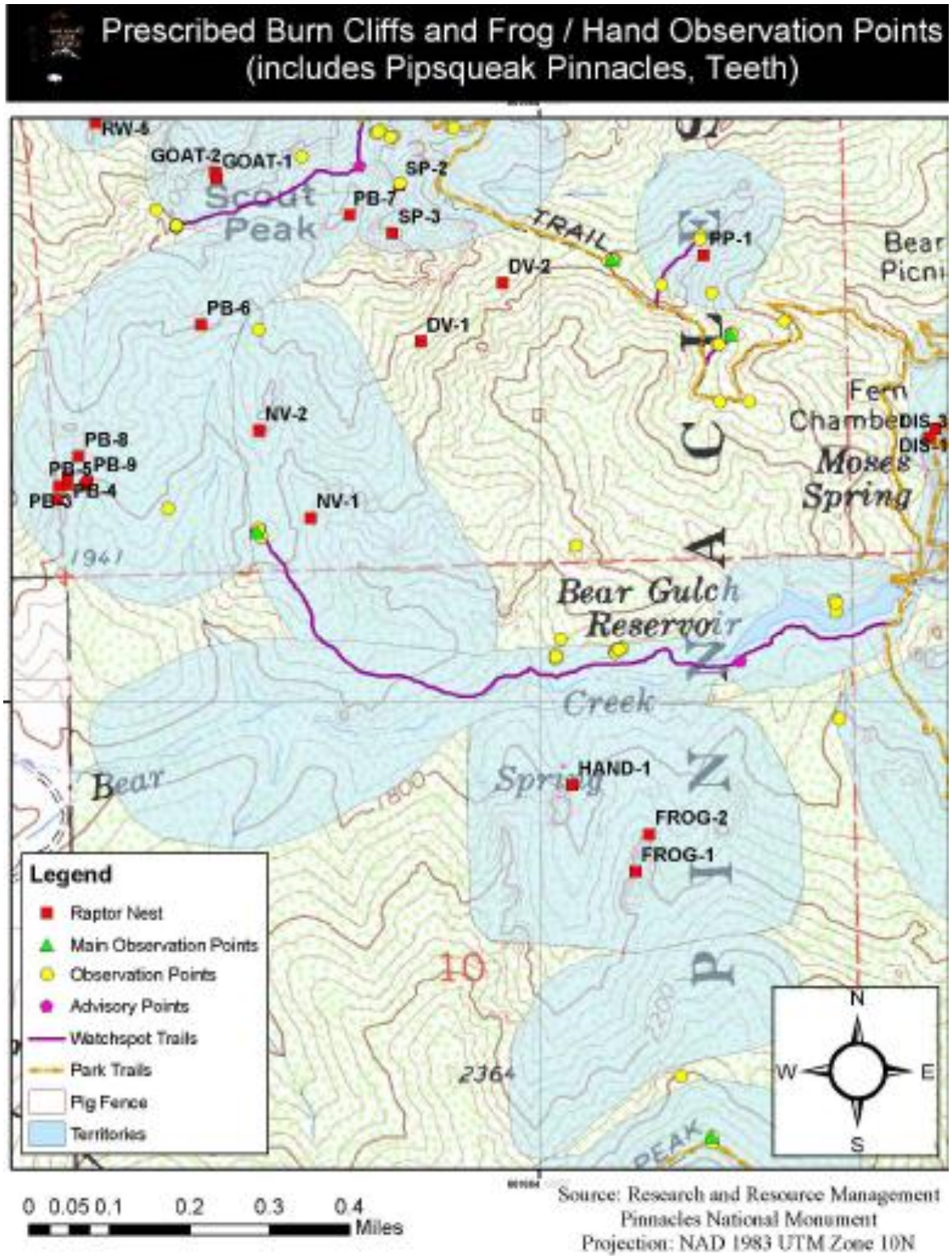


Figure SOP 2. 11. Territory map of Frog (FROG), Goat Rock (GOAT), Deserted Valley (DV), Discovery (DIS), Hand (HAND), Neglected Valley (NV), Pipsqueak Pinnacles (PP), Prescribed Burn Cliffs (PB), and Scout Peak (SP).

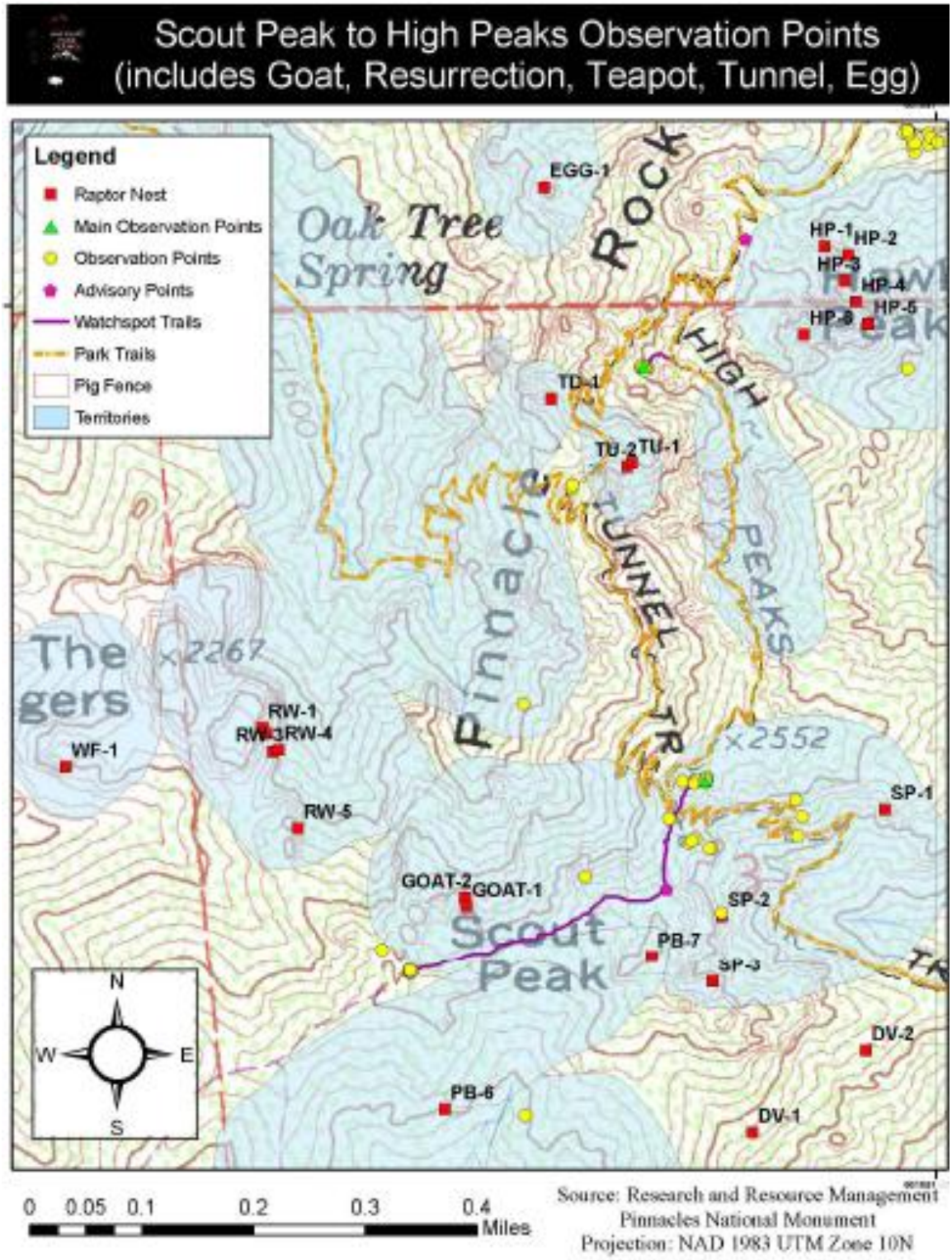


Figure SOP 2. 12. Territory map for (EGG), Goat Rock (GOAT), Hawkins Peak (HP), Prescribed Burn Cliffs (PB), Resurrection Wall (RW), Scout Peak (SP), Teapot Dome (TD), Tunnel (TU), and Western Front (WF).

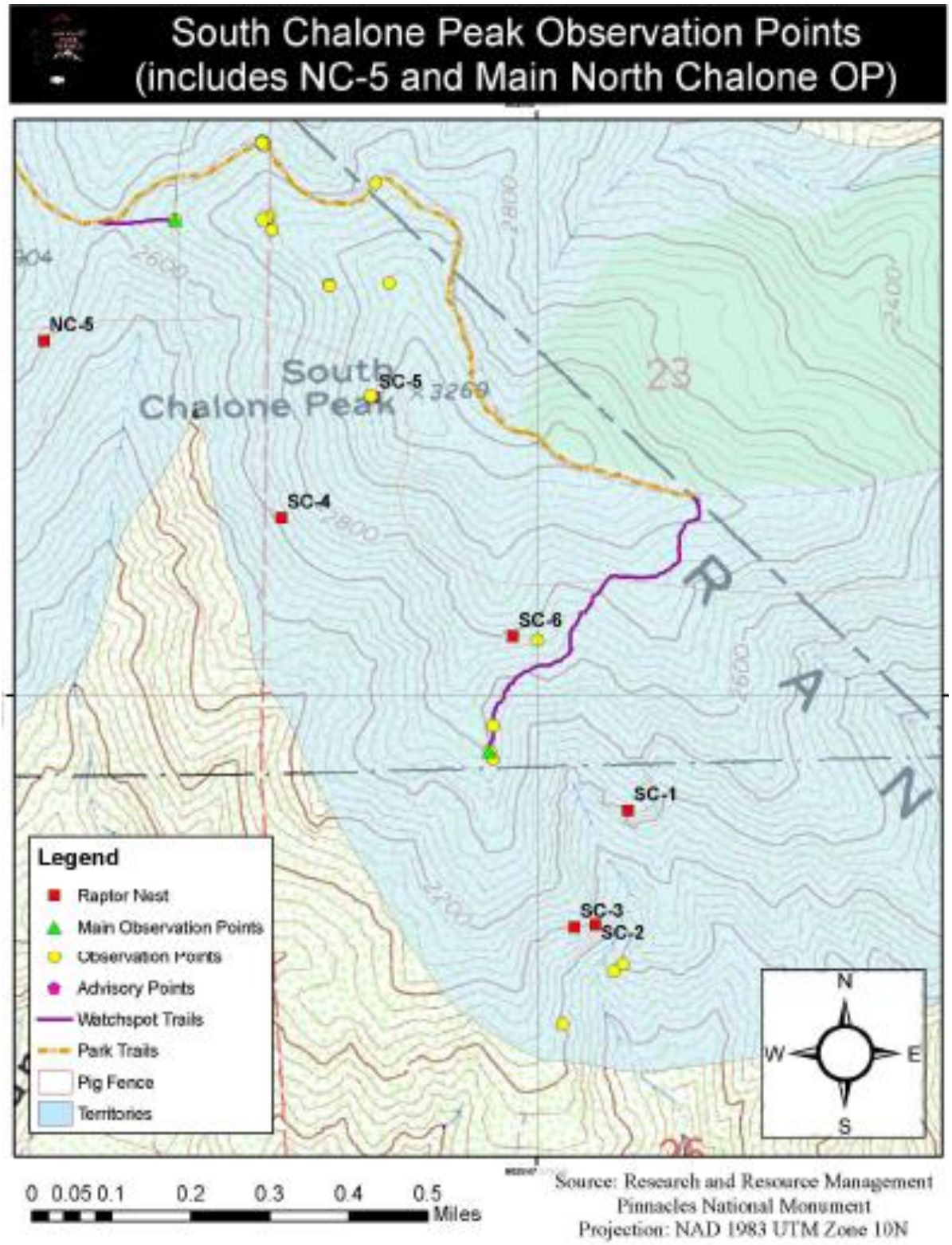


Figure SOP 2. 13. Territory map for North Chalone (NC) and South Chalone (SC).

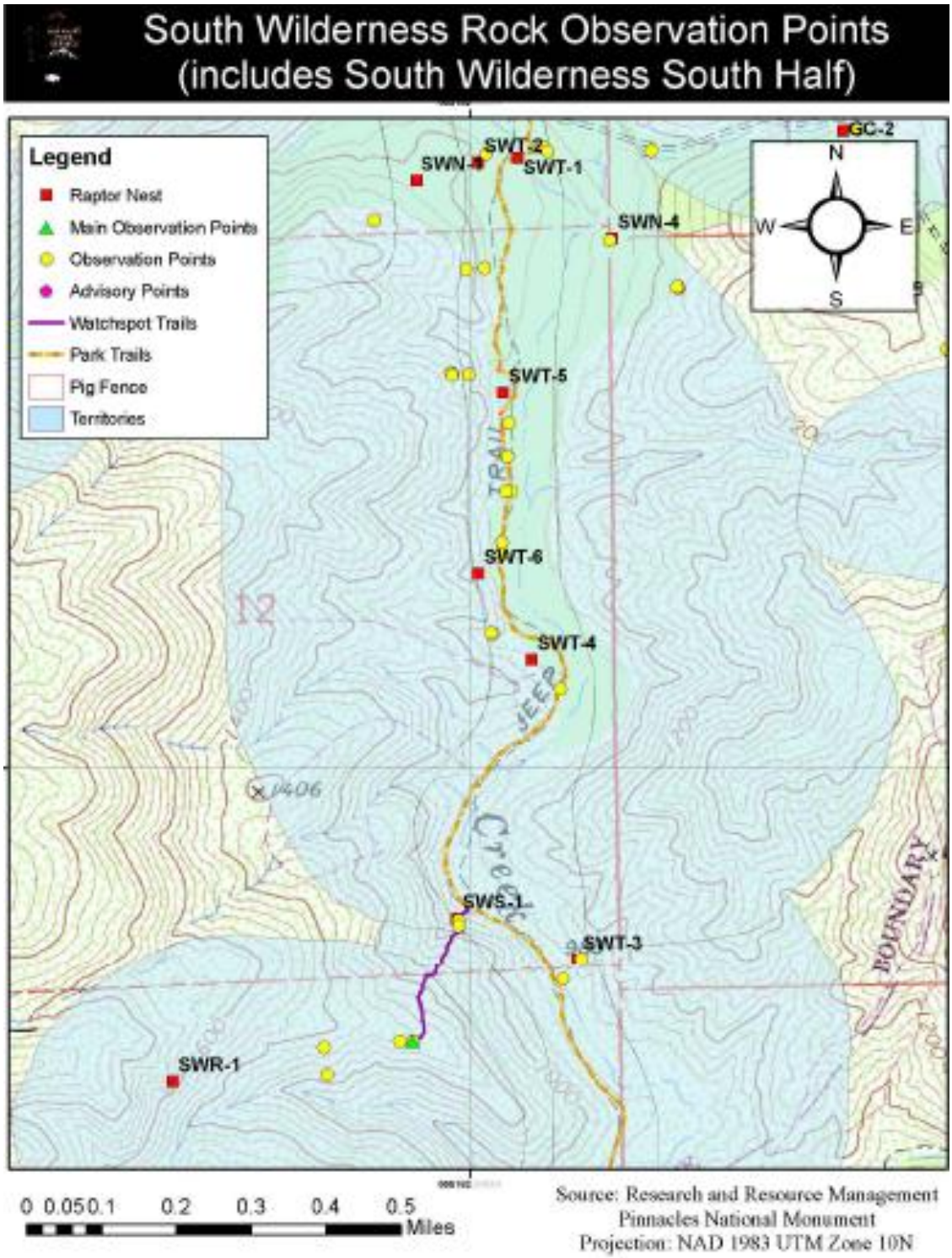


Figure SOP 2. 14. Territory map for South Wilderness Rock (SWR), South Wilderness – North End (SWN), South Wilderness – South End (SWS), and South Wilderness Trail (SWT).

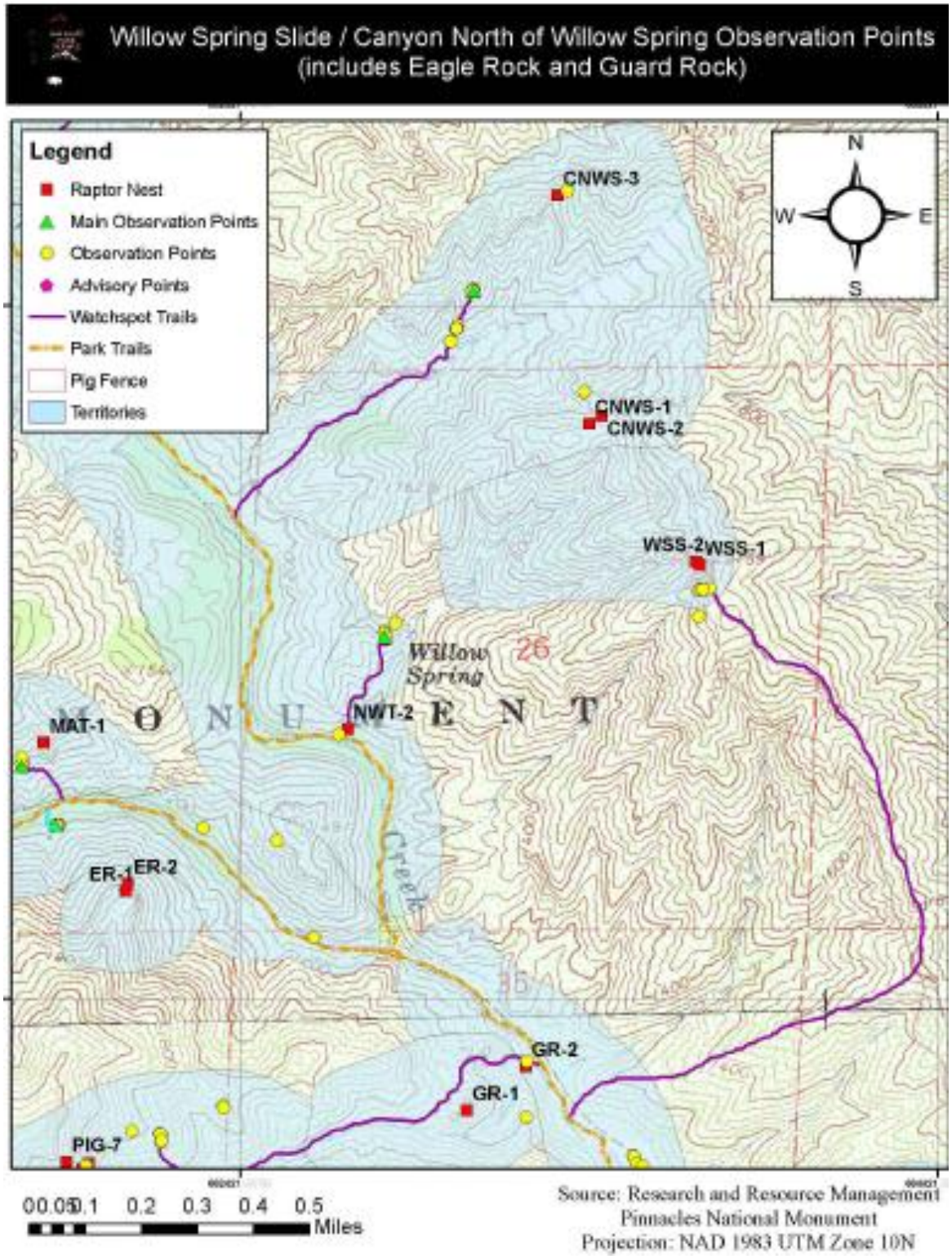


Figure SOP 2. 15. Territory map for Canyon N of Willow Spring (CNWS), Eagle Rock (ER), Guard Rock (GR), Mating Rocks (MAT), North Wilderness Trail (NWT), Pig Canyon (PIG), Willow Spring Slide (WSS).

SOP 3. Data Management V 3.3

Revision History Log:

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #
2.0	3/2008	D. Press; G. Emmons; M. Koenen	Updated	Updated descriptions to meet to new MS Access database; general editing	3.0
3.0	5/2008	D. Press	Added figures, general editing, appendix	SOP completion	3.1
3.1	3/2010	D. Adams, M. Koenen, D. Press	Formatting. Add data dictionary.	Peer review comments	3.2
3.2	06/2011	D. Adams	Replicate title change from raptor to prairie falcon	Per request for update by P. Latham	3.3

Overview

Two critical long-term goals of the SFAN I&M Program are to:

- integrate natural resource inventory and monitoring information into National Park Service planning, management, and decision making
- share National Park Service accomplishments and information with other natural resource organizations and form partnerships for attaining common goals and objectives

In order for the raptor monitoring program to meet I&M program goals, a detailed data management plan is needed to ensure data quality, interpretability, security, longevity and availability. This Standard Operating Procedure describes how the SFAN prairie falcon monitoring protocol meets these data management objectives through data entry specifications, database design, quality assurance and control measures, metadata development, data maintenance, data storage and archiving, and data distribution. The SOP describes the procedures all raptor monitoring technicians must follow to learn how to enter, update, and manage data for 1) the Microsoft Access Raptor Monitoring Database; 2) the cataloging of photographs; 3) the GIS database; and 4) the field notes, annual reports, and photos.

Data Management: Overview

Data management is an essential component of the raptor monitoring process. The effectiveness of the raptor monitoring study at PINN over the past 21 years lies not only in the field work – the raptor observations, the field notes, and the management of climbing advisory areas – but also in the documentation of the field work within tabular and geographic projects in the office. Data entry is a time-consuming task that requires skill, patience, and a keen attention to detail, but it also provides a long-term record of raptor monitoring at the park, what was accomplished from year to year by time and location. As such, data management has enormous potential in effecting resource management at the park, and provides powerful evidence supporting the continuing need for the protection of sensitive species of breeding raptors at the park. Procedures for data management tasks are detailed below, covering the use of tabular and geographic databases related to raptor monitoring, and guidelines for data entry. Data management includes the biweekly summaries of raptor status detailed in raptor updates, and requires use of LotusNotes, but these are covered in depth in SOP 5: Data Analysis and Reporting.

Microsoft Access Raptor Monitoring Database

Database Model Overview: The SFAN staff has developed a relational Microsoft (MS) Access XP database for the raptor monitoring program at Pinnacles National Monument compliant with the Natural Resource Database Template (NRDT) Version 3.1, an application developed by the NPS Natural Resource Inventory and Monitoring Program. The data are organized around survey events from fixed observation points, which are described and geographically defined in a locations table. Besides actual raptor observations, copulation, and feeding events, the database is used to maintain records of data history, field personnel, photo records, and media contact addresses. Table relationships for related tables only (not stand alone tables) are displayed in Figure SOP 3.1 and a complete data dictionary is included as Appendix SOP 3A. The raptor database has a separate front-end (user interface) and back-end (data tables). The user interface for the database is modeled after the NRDT Front-end Application Builder (FAB) Version 1.0, an MS Access user-interface template designed by the NPS Natural Resource GIS Program.

Back-End Data Tables

The primary raptor monitoring events table, tbl_Events, is linked to tbl_Event_Details in a one-to-one relationship via an EventID Globally Unique Identifier (GUID) (Figure SOP 3.1). Whereas, tbl_Events is a standardized table that simply stores event location, date, and time values, tbl_Event_Details stores data values specific to the raptor monitoring events, such as weather details. Tbl_Events is linked to three tables by one-to-many relationships (Figure SOP 3.1). Tbl_Raptor_Observations can store several raptor observations during a single monitoring event. The species, time of the observation, and territory in which the raptor(s) was observed are stored in this table. Tbl_DataHistory records any data verification, validation, or editing procedures associated with the monitoring event and related data. Finally, xref_Event_Contacts is a cross-reference table linked to tlu_Contacts which documents the field personnel that collected the raptor data.

Two sub-tables related to tbl_Raptor_Observations store raptor copulation and feeding data. The Raptor_ID GUID links tbl_Raptor_Observations to related records in tbl_Raptor_Copulation and tbl_Raptor_Feeding (Figure SOP 3.1). Details such as time of activity, prey type, and display degree are entered into the feeding and copulation tables.

At the end of the field season, after all field notes observations have been documented and entered into the raptor monitoring database and the database has been through QA/QC, breeding raptor summary data is compiled for each nesting or territorial pair. This summary data is entered and stored in tbl_Breeding_Raptors.

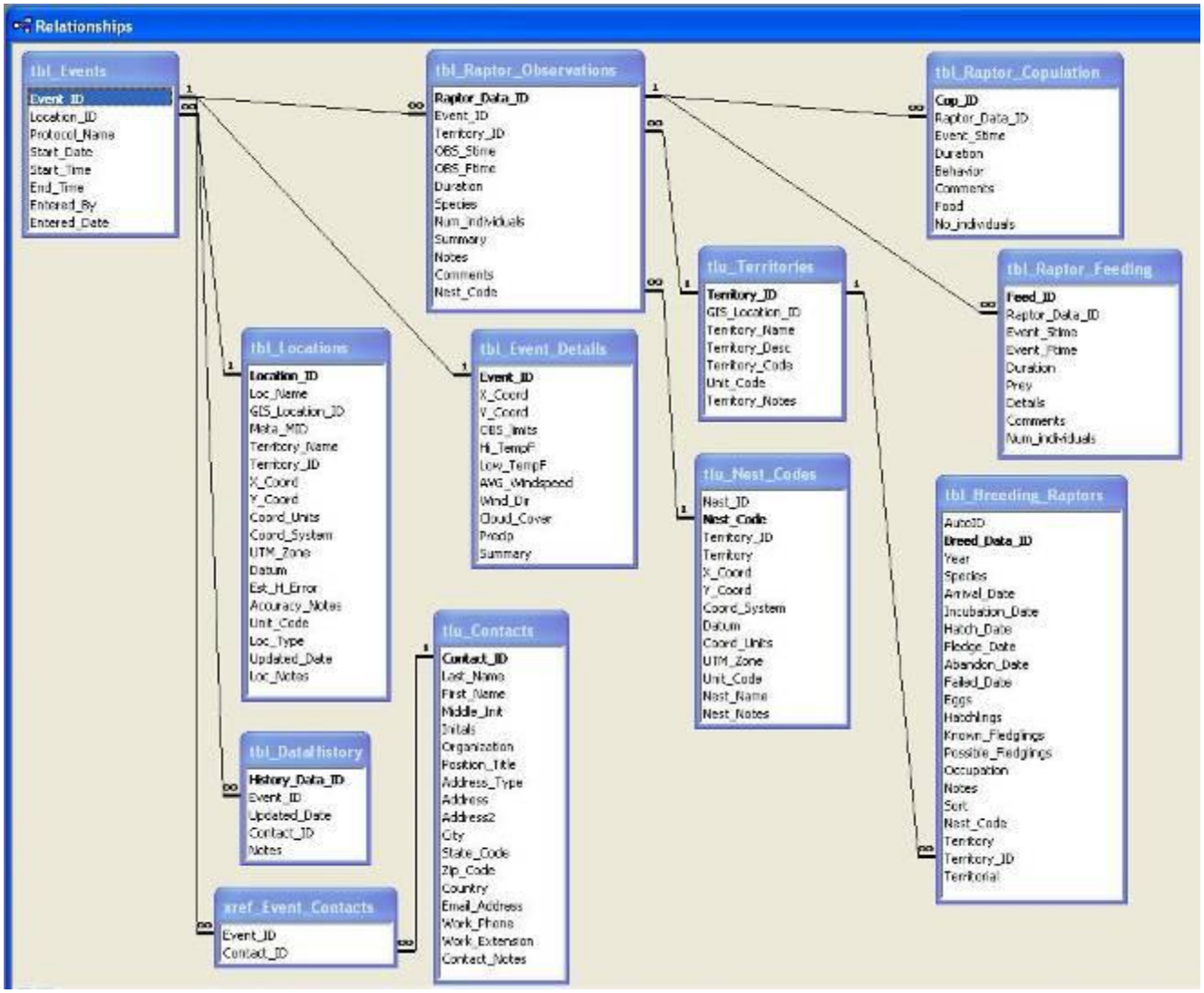


Figure SOP 3. 1. Table relationships in the raptor monitoring database.

Photographs of raptor nests and territories provide an essential tool to effectively find and observe historic nest sites and territories. Careful cataloging of the photographs allows incoming technicians to easily find and identify sites, and provides a historical context in which the photos can be linked to their dates of exposure and storage locations in the archives. Photo records are stored in tbl_Photo_Log grouped by territory and field season.

Mailing addresses for press releases and climbing advisories sent to newspapers, climbing shops, or the NPS Pacific West Region are organized in tbl_Media_Addresses. For more details on this process, wee SOP 5: Data Analysis and Reporting.

Database User Interface

Use of the database is facilitated by a complete user interface which links to the back-end data tables modeled after the NRDT Version 3.1. The user interface is adopted from the NRDT Front-

End Application Builder Version 1.0 and is designed to aid with data entry, data extraction, and database documentation. Command buttons and code driven text boxes are used to navigate to forms, add data records, locate and edit data records, and print reports. Where possible, default values are set and combo boxes with fixed values are used to reduce data entry errors. For example, all fields that identify project personnel are set as combo boxes which link to the look-up table tlu_Contacts. Key features of the user interface are described below.

frm_Switchboard
This startup form is the entry point for the application, and therefore the first thing users will usually see when opening the application (Figure SOP 3.2).

Double-clicking the unit name at the top left of the form will open the web site for that particular unit. Double-clicking the NPS Arrowhead or the title National Park Service at the top right of the form will open a browser and navigate to the National Park Service web site (www.nps.gov).

At the top right of the form is an exit button which can be used to close the application.

A tabbed menu resides at the lower left corner of the form. It contains tabs for the main menu, application defaults, and information about the application. Each of these features will be examined in more detail in the sections that follow.

At the bottom center-right of the form is a box that displays the current location of the data file to which the application is linked.

frm_Connect_Tables
As previously described, the raptor monitoring database application has separate front-end (user interface) and back-end (data tables) files. In order for the application to work properly, the front-end file must be connected to the correct back-end file.

On opening, if the database can not establish a path to the back-end file, an error message appears which gives the user the option of fixing the connection. Choosing to do so opens frm_Connect_Tables (Figure SOP 3.2), the data table connections form, which can be used to establish or correct the link from the front-end to the back-end. Alternatively, clicking the "Connect data tables" button on the database switchboard's "Main Menu" also opens the data table connections form.

The name, path, and file name of the current back-end file are displayed in the data table connections form. To change the back-end file connection, click the "Browse" button, select a new back-end file, and click the "Open" button. You will be returned to the data table connections form and the "New file" and "Path" text boxes will be filled in. To make the new connection, click the "Update links" button. If the connection is made, a success message will be shown and you will be returned to the database switchboard. As long as the connection

Figure SOP 3. 2. Database switchboard - main screen of the user interface, viewed at startup.

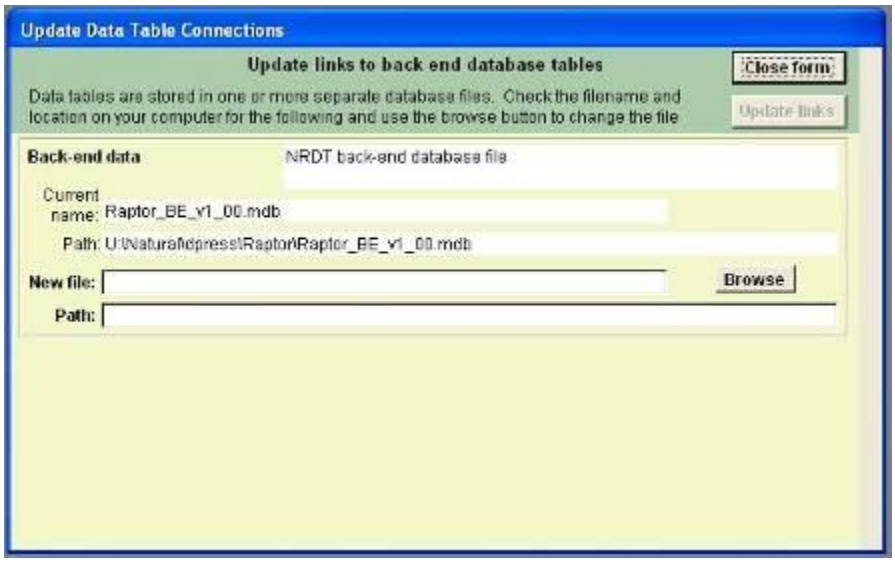


Figure SOP 3. 3. Table connections form used to link to the back-end data tables.

remains valid, the user does not need to re-establish the link to the back-end file each time the database is opened.

frm_Set_Defaults

Clicking the "Enter / Edit Data" button on the "Main Menu" tab of frm_Switchboard will open frm_Set_Defaults, the application defaults form (Figure SOP 3.4). The form is used to set default values which will be applied to new records and to determine which records are initially visible on the data gateway form. Each value can be selected from a drop-down list. If you are unable to find a user, click the "New user" button to add a new one to the contacts table (tlu_Contacts). Current default values can be viewed from frm_Switchboard under the "Defaults" tab. Clicking the "Change" button on the "Defaults" tab will also open the defaults form. The control source for frm_Set_Defaults is the hidden systems table tsys_App_Defaults.

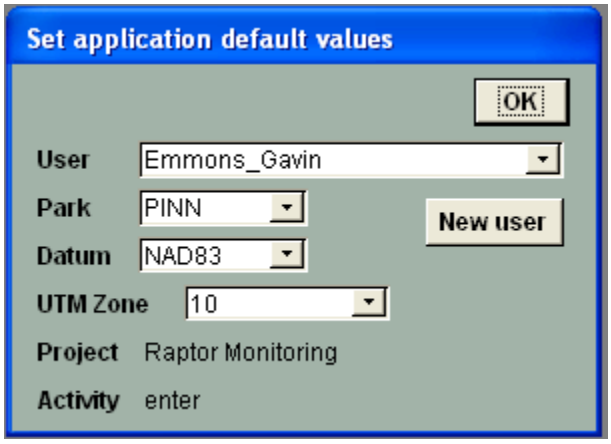


Figure SOP 3. 4. Form for setting application default values.

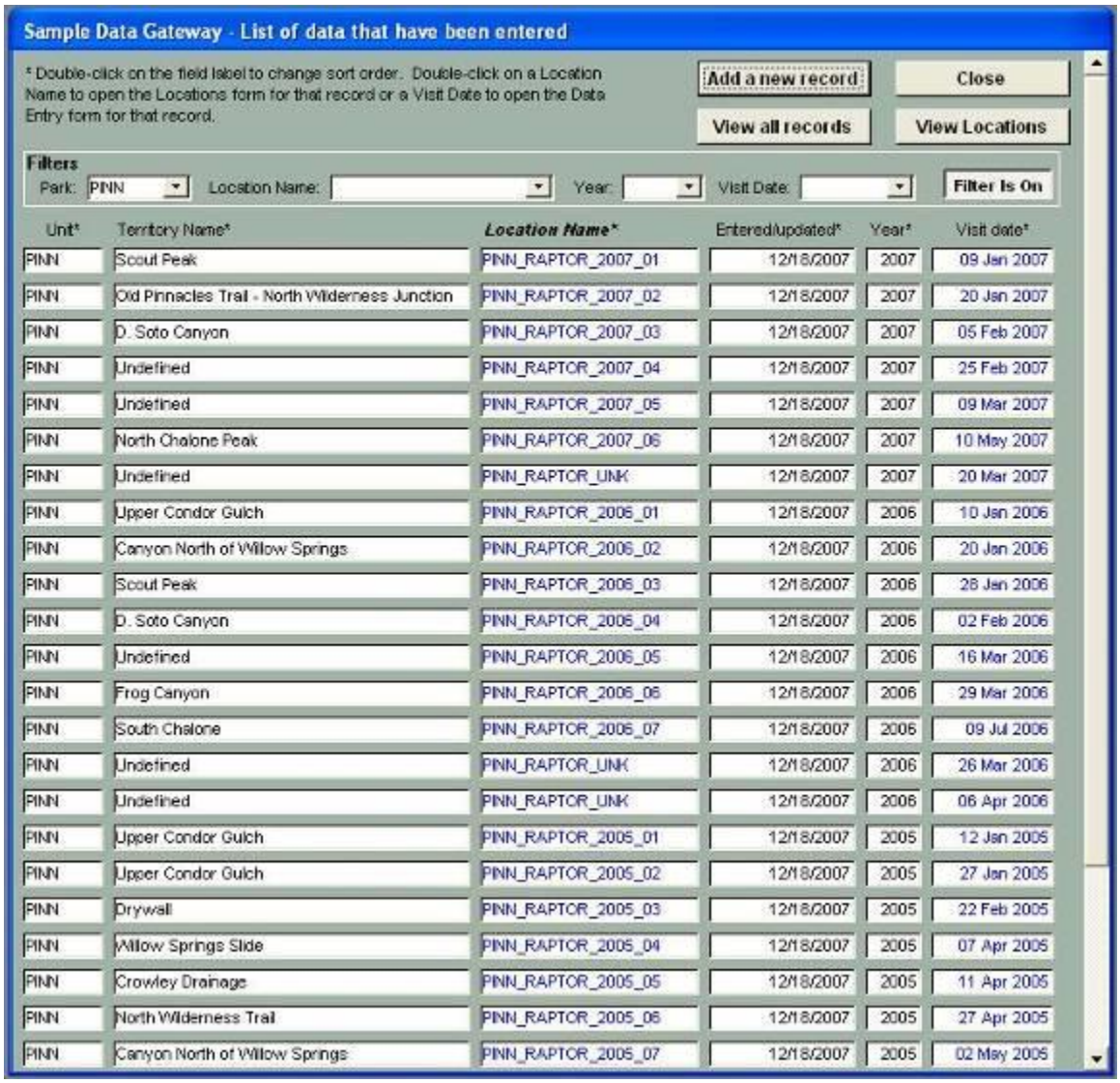
frm_Data_Gateway

Once the defaults form is completed, frm_Data_Gateway (Figure SOP 3.5), the data gateway form, will be displayed. This form displays location and event information for each raptor survey record currently in the database, and is designed to help the user determine which record to edit/view. By default, the data gateway form starts off with a filter for the default park that was selected on the defaults form, which at this time is restricted to PINN. The control source for frm_Data_Gateway is the query qfrm_Data_Gateway.

Additional filters for Location Name (observation point), Year, and Visit Date can be set by selecting from the drop-down lists at the top of the form in the Filters box. Filters can be removed by clicking the toggle button that says "Filter Is On". It will toggle up and say "Filter Is Off" when the filter is removed. When the filter is removed, all records will again be displayed. Optionally, a specific filter can be removed by deleting the text that is currently displayed in one of the filter controls.

In addition to filters, there are sorting options for the records on the data gateway form. Double-clicking any of the column headings will cause the records to be sorted in ascending order by

that column value. The column heading will change to a bold italic format to indicate that it is the column being used to determine sort order. If the same column is double-clicked a second time, the records will be sorted in descending order by that column value.



Unit*	Territory Name*	Location Name*	Entered/updated*	Year*	Visit date*
PINN	Scout Peak	PINN_RAPTOR_2007_01	12/18/2007	2007	09 Jan 2007
PINN	Old Pinnacles Trail - North Wilderness Junction	PINN_RAPTOR_2007_02	12/18/2007	2007	20 Jan 2007
PINN	D. Soto Canyon	PINN_RAPTOR_2007_03	12/18/2007	2007	05 Feb 2007
PINN	Undefined	PINN_RAPTOR_2007_04	12/18/2007	2007	25 Feb 2007
PINN	Undefined	PINN_RAPTOR_2007_05	12/18/2007	2007	09 Mar 2007
PINN	North Chalone Peak	PINN_RAPTOR_2007_06	12/18/2007	2007	10 May 2007
PINN	Undefined	PINN_RAPTOR_UNK	12/18/2007	2007	20 Mar 2007
PINN	Upper Condor Gulch	PINN_RAPTOR_2006_01	12/18/2007	2006	10 Jan 2006
PINN	Canyon North of Willow Springs	PINN_RAPTOR_2006_02	12/18/2007	2006	20 Jan 2006
PINN	Scout Peak	PINN_RAPTOR_2006_03	12/18/2007	2006	28 Jan 2006
PINN	D. Soto Canyon	PINN_RAPTOR_2006_04	12/18/2007	2006	02 Feb 2006
PINN	Undefined	PINN_RAPTOR_2006_05	12/18/2007	2006	16 Mar 2006
PINN	Frog Canyon	PINN_RAPTOR_2006_06	12/18/2007	2006	29 Mar 2006
PINN	South Chalone	PINN_RAPTOR_2006_07	12/18/2007	2006	09 Jul 2006
PINN	Undefined	PINN_RAPTOR_UNK	12/18/2007	2006	26 Mar 2006
PINN	Undefined	PINN_RAPTOR_UNK	12/18/2007	2006	06 Apr 2006
PINN	Upper Condor Gulch	PINN_RAPTOR_2005_01	12/18/2007	2005	12 Jan 2005
PINN	Upper Condor Gulch	PINN_RAPTOR_2005_02	12/18/2007	2005	27 Jan 2005
PINN	Drywall	PINN_RAPTOR_2005_03	12/18/2007	2005	22 Feb 2005
PINN	Willow Springs Slide	PINN_RAPTOR_2005_04	12/18/2007	2005	07 Apr 2005
PINN	Crowley Drainage	PINN_RAPTOR_2005_05	12/18/2007	2005	11 Apr 2005
PINN	North Wilderness Trail	PINN_RAPTOR_2005_06	12/18/2007	2005	27 Apr 2005
PINN	Canyon North of Willow Springs	PINN_RAPTOR_2005_07	12/18/2007	2005	02 May 2005

Figure SOP 3. 5. Gateway to the data entry screens, for browsing and selecting from data that have already been entered.

Double-clicking a “Location Name” value will open the locations form for that particular record (see the locations form section that follows). Double-clicking a “Visit Date” will open the data entry form for that particular record. If a raptor survey record has not been added for a particular location, when that blank “Visit Date” is double-clicked, a new data entry record will be opened.

To add a new data entry record, click the “Add a new record” button at the top of the data gateway form. To view all raptor records in sequential order by date, select the “View all records” button.

frm_Data_Entry

The data entry form (Figure SOP 3.6), frm_Data_Entry, is used to edit an existing record or to add new raptor survey records. The control source for the form is the query qfrm_DataEntry, which passes data through to tbl_Events and tbl_Event_Details. The form can be accessed from the data gateway by selecting an already existing record or by clicking the “Add a new record” button. The data entry form contains three subforms to enter the survey observer(s), raptor observations, and any pertinent data history.

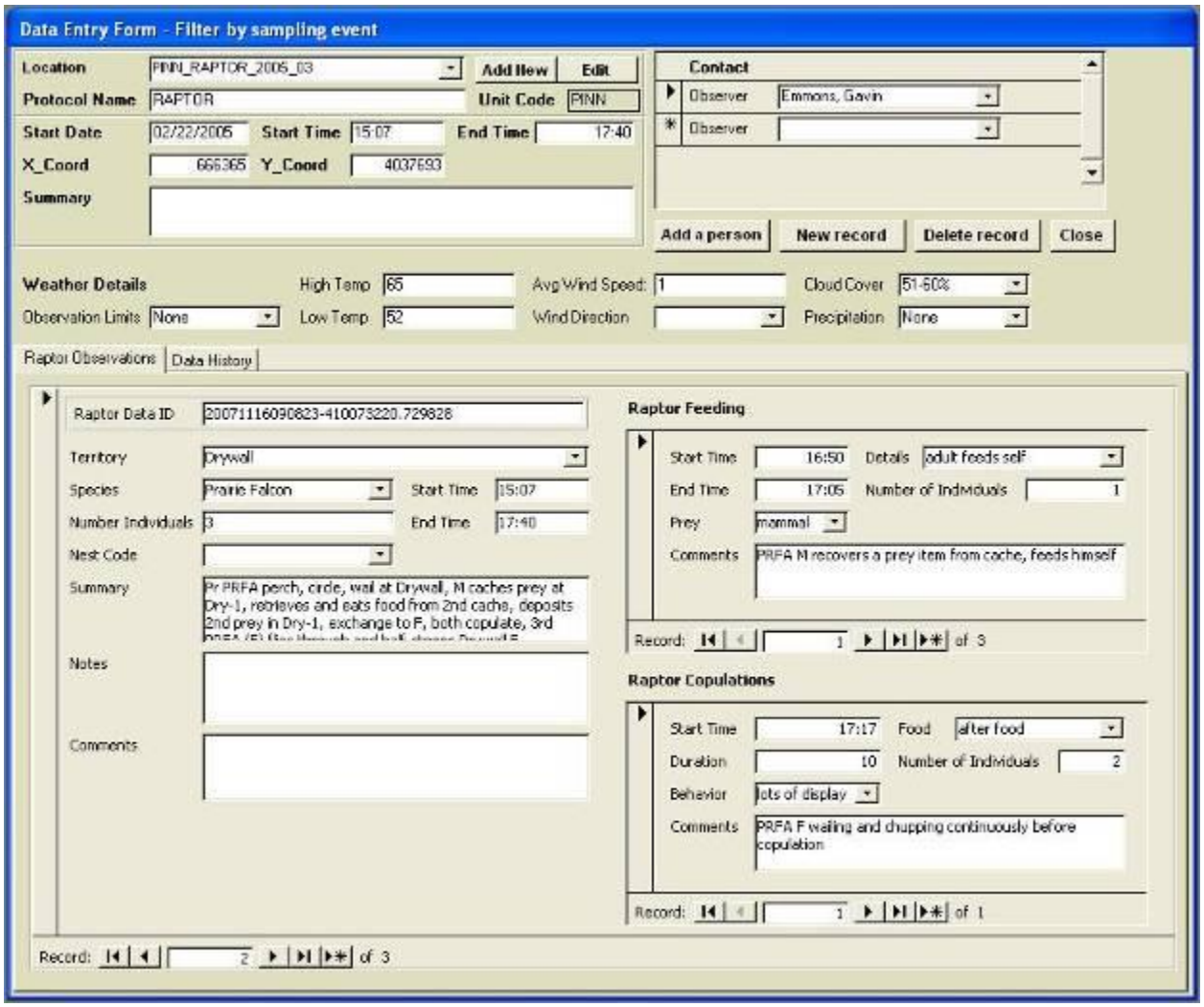


Figure SOP 3. 6. Primary field data entry form, displaying the observer and raptor observation, feeding, and copulation subforms.

fsub_Observers
The name(s) of people who collected data for the raptor survey event can be entered in the observer sub-form (Figure SOP 3.6), fsub_Observers, at the top right of the data entry form. The control source for the sub-form is the table xref_Event_Contacts. Contacts can be selected from the "Contact" drop-down list. If a new contact needs to be entered, click the "Add a person" button to open the contacts form.

fsub_Raptor_Observations
From a single observation point on a given survey, multiple raptor observations may be recorded. The observations may be of different species and could be located in more than one territory visible from the observation point. All of this data is entered into the raptor observation subform (Figure SOP 3.6), fsub_Raptor_Observations, found under the "Raptor Observations" tab on the lower portion of the data entry form, frm_Data_Entry. Record selectors at the bottom of the subform allow the user to scroll to the first, last, previous, and next records or add a new record.

Associated with a single raptor observation may be one or many copulation or feeding events. Raptor feeding events are entered into fsub_Raptor_Feeding (Figure SOP 3.6), located in the top right of the raptor observation subform. The control source for the raptor feeding subform is tbl_Raptor_Feeding. Raptor copulation events are entered into fsub_Raptor_Copulations (Figure SOP 3.6), located in the bottom right of the raptor observation subform. The control source for the raptor copulation subform is tbl_Raptor_Copulations. The two subforms contain the same record selectors as the parent raptor observation subform.

fsub_DataHistory
The data history subform (Figure SOP 3.7) is located under the "Data History" tab on the lower portion of the data entry form, frm_Data_Entry. The control source for the subform is tbl_DataHistory. Located at the top of the subform are the "Entered By" and "Entered Date" fields, which are stored in tbl_Events. The database populates these two fields automatically, using the default settings at the time of data entry to assign the "Entered By" contact name. Following initial data entry, the data history subform is intended to track when the parent raptor survey record is error-checked or edited.

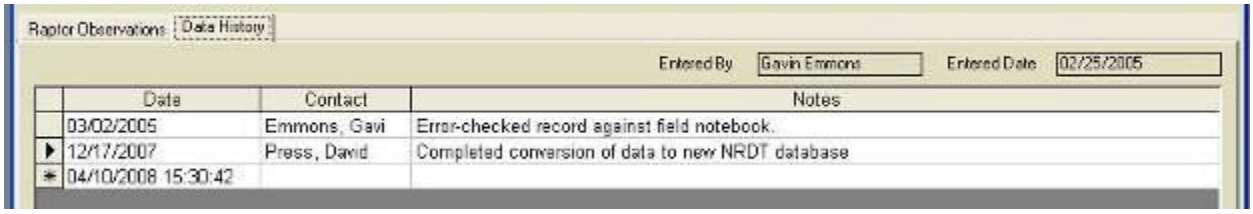


Figure SOP 3. 7. Subform for entering data history records events associated with raptor surveys.

frm_Data_Entry_All_Records
This alternative view of frm_Data_Entry was designed for quick data reference purposes and allows the database user to scroll through all of the raptor survey and observation data (Figure SOP 3.8). New database records can not be added from frm_Data_Entry_All_Records. The control source for the form is the query qfrm_DataEntry, which passes data through to

tbl_Events and tbl_Event_Details. The form can be accessed from the data gateway by clicking the “View all records” button. Unlike frm_Data_Entry, raptor copulation and feeding events are not displayed, and the raptor observation sub-records are displayed in a spreadsheet view. This allows for all of the raptor observations for one survey to be displayed at once in the database window.

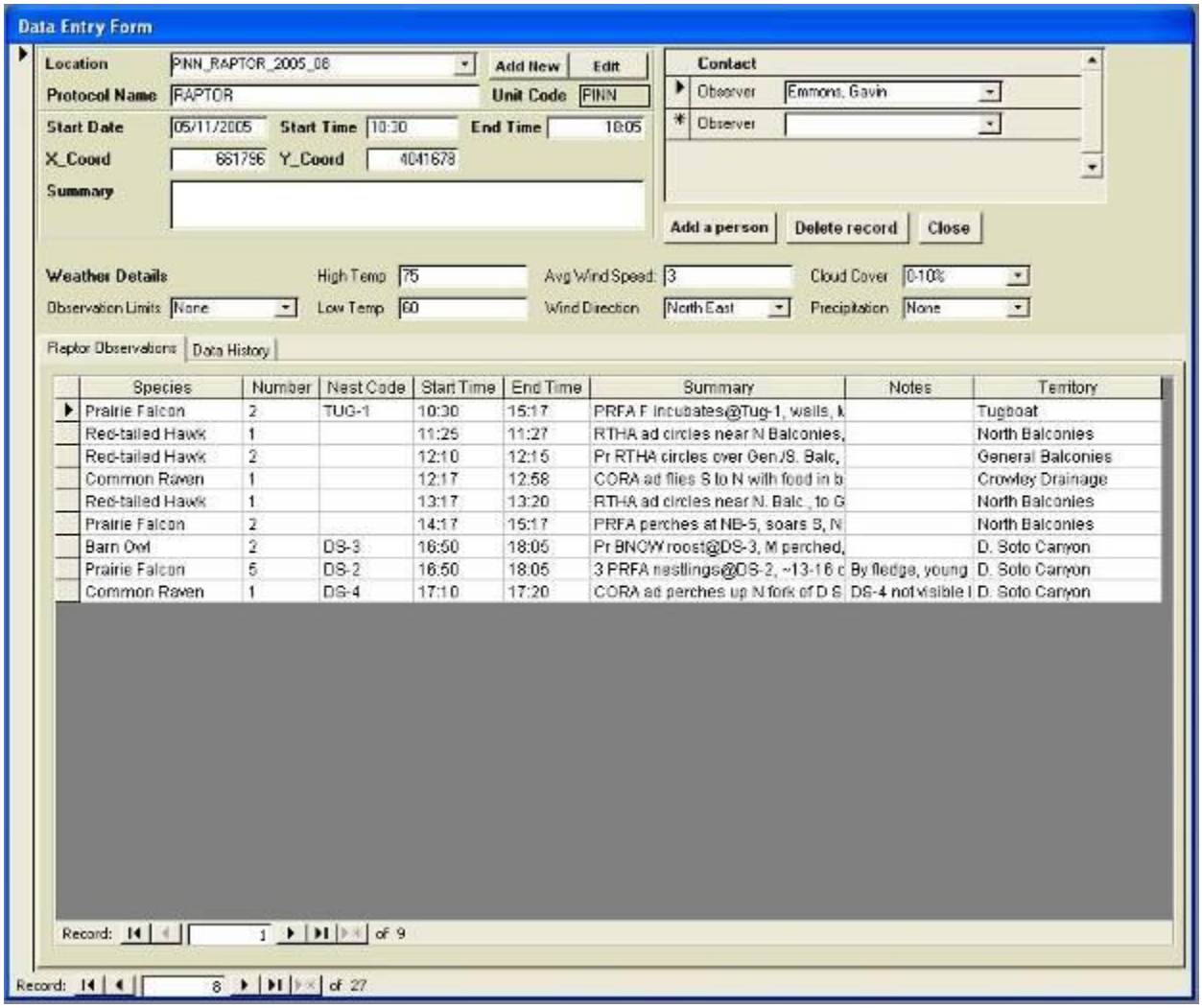


Figure SOP 3. 8. Data form for reviewing all raptor survey and observation records.

frm_Locations

The locations form allows the user to enter or edit information, including geographic UTM coordinates, for raptor observation points or watch spots (Figure SOP 3.9). The Location ID value, which uniquely identifies an observation point, is automatically generated by the database. The control source for the form is tbl_Locations. Frm_Locations can be accessed from the data gateway form or from the data entry form, both previously described.

frm_Contacts

The contact information form (Figure SOP 3.10), frm_Contacts, is used to enter details about individuals who participate in data gathering for the prairie falcon monitoring protocol and who enter information in the database. The control source is tlu_Contacts. The contact information form can be accessed from clicking the "New user" button on the defaults form or the "Add a person" button on the data entry form.

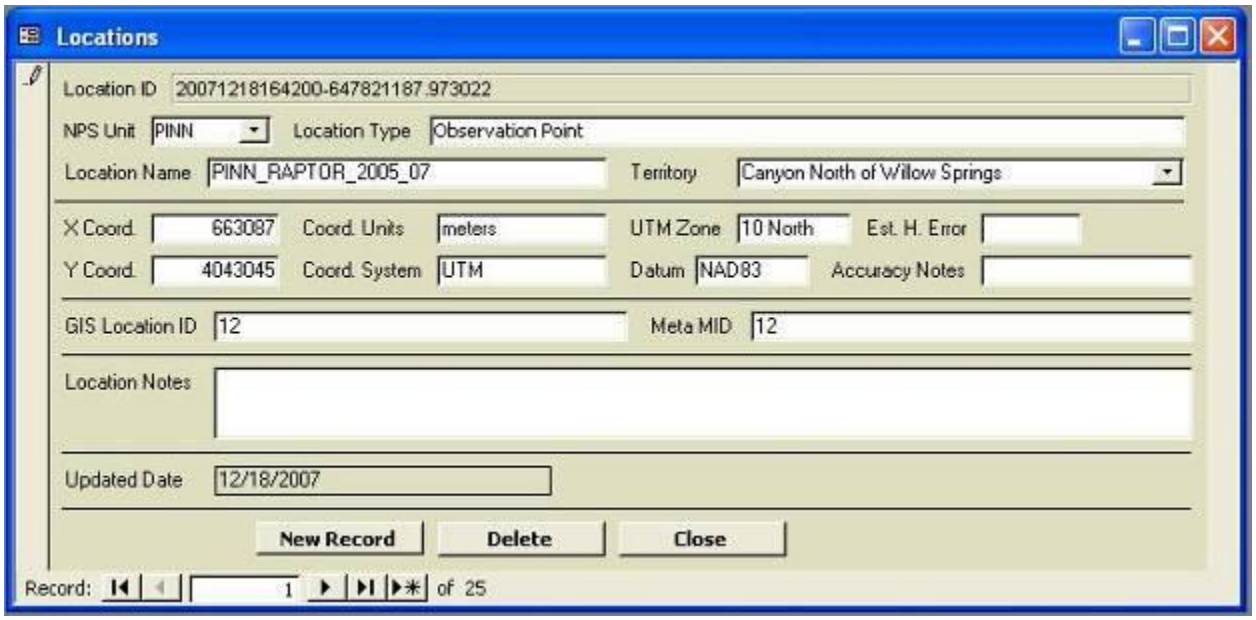


Figure SOP 3. 9. Form for entering and editing project location information.

Figure SOP 3. 10. Form to view and edit contact information, displayed in view mode. Values entered in the form include name, organization, position, work phone, email address, and mailing address. Previously entered addresses can be selected from the Address 1 drop-down list, and the associated Street Address, City, State, Zip, and Country values will automatically be filled in. The Organization and Position/Title drop-down lists will also allow selection from previously entered values or new entries. The Contact ID value, which uniquely identifies a contact, is automatically generated by the application.

When the contact information form is in view mode, noted by a blue-grey color background, individual contacts can be shown by selecting from the “Search” drop-down list at the top right of the form. All contact records can be displayed by clicking the “Filter” toggle button to “View all contacts”. In order to re-activate the “Search” drop-down list, the toggle button must be set back to “Filter by search”.

In view mode, records can only be read, not edited. To enable editing for a record, click the Edit record button. The form can also be set to edit mode, noted by a haystack color background, by clicking the “New record” button. Once you have completed entering data, click the “Done’ button to return the form to edit mode and view all records. Alternatively, you may cancel your edits or additions at any time when in edit mode by clicking the “Undo” button.

frm_Media

Mailing addresses for press releases and advisories can be entered and edited in the media address form (Figure SOP 3.11), frm_Media. The control source for the form is tbl_Media_Addresses, and the form can be accessed by clicking the “Media Addresses” button from the “Main Menu” tab of the database switchboard. The form design is modeled after the previously described contact information form (frm_Contacts), and therefore retains the same view and edit modes of the form, filter capabilities, and command buttons.

Three command buttons at the bottom of the form allow the user to open pre-formatted reports used to print mailing addresses for all the address records (rpt_All_Labels), just those on the press release list (rpt_PressRelease_Labels), or just those on the advisory list

(rpt_Advisory_Labels). All three reports are designed for Avery 5960 labels (1" x 2 5/8"). In order to use a different label type, the reports will have to be re-created using the built-in Microsoft Access Report Label Wizard.

frm_Photo_Log

During the course of the field season, multiple photos of nests and territories are taken. Prior to FY10, film rolls were grouped according to photo series and entered into the photo log form (Figure SOP 3.12), frm_Photo_Log. Starting FY10, digital photos are taken and also entered into the same log. The control source for the form is tbl_Photo_Log, and the form can be accessed by clicking the "Photo Log" button from the "Main Menu" tab of the database switchboard. The form design is modeled after the previously described contact information form (frm_Contacts), and therefore retains the same view and edit modes of the form, filter capabilities, and command buttons. In this case the form is designed to filter records according to unique combinations of the territory, year, and photo code. The user can locate specific records and filter the form using the "Search" drop-down menu. Specific instructions for cataloging and archiving digital photographs are detailed later in this document.

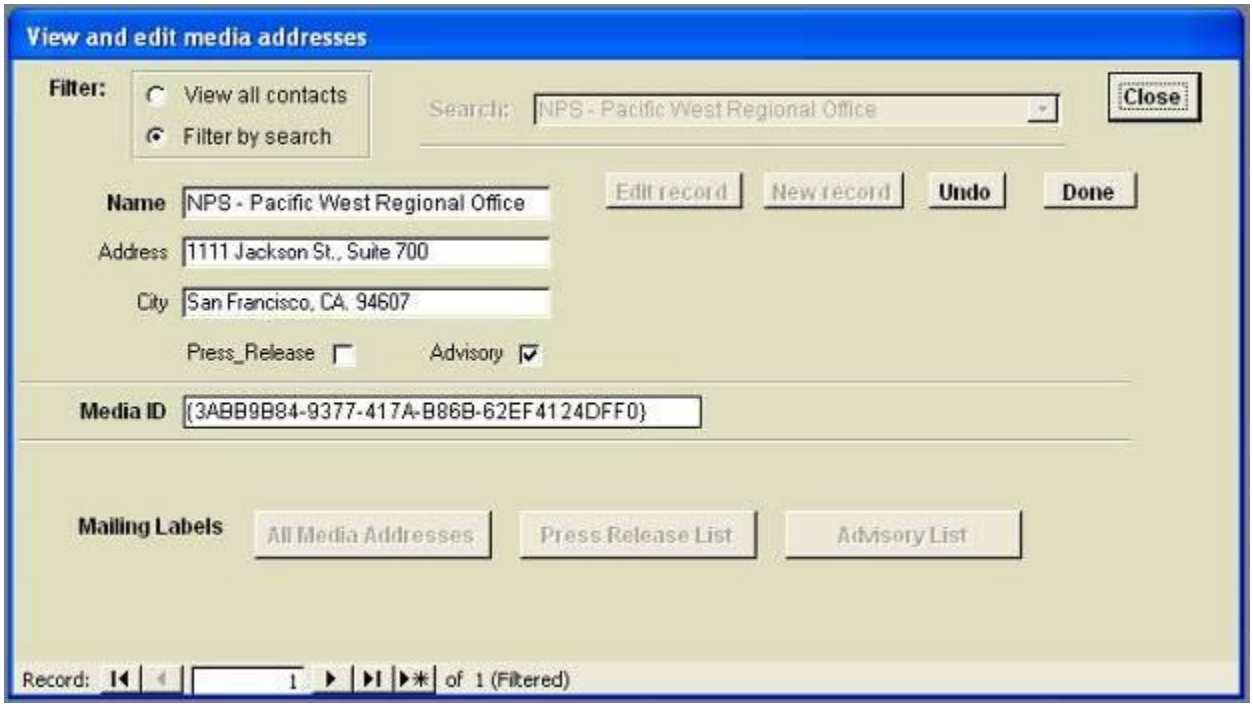


Figure SOP 3. 11. Form to view and edit media contact information, displayed in edit mode.

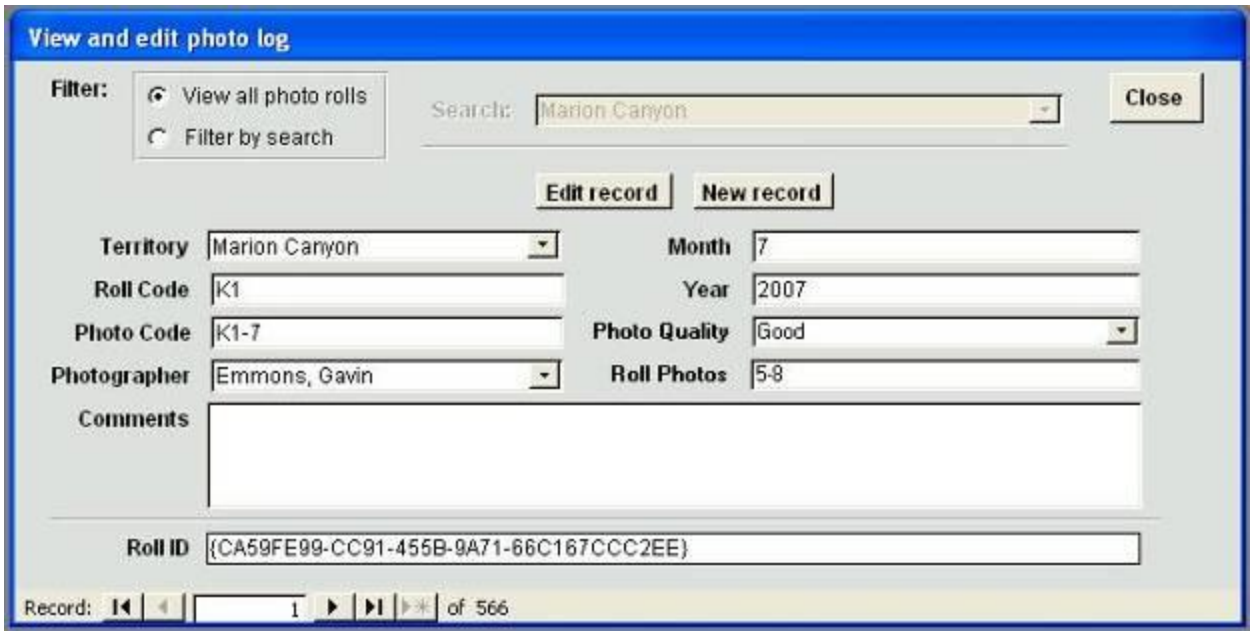


Figure SOP 3. 12. Form to view and edit photo log records, displayed in view mode.

frm_Breeding_Raptors

At the end of the field season, after all field notes and observations have been documented and entered into the raptor monitoring database and the records have been error-checked, data for each of the raptor pairs followed during the season is reviewed and a breeding summary record is entered into the breeding raptor form(Figure SOP 3.13), frm_Breeding_Raptors. The control source for the form is tbl_Breeding_Raptors, and the form can be accessed by clicking the "Breeding Summary" button from the "Main Menu" tab of the database switchboard. Data entry fields include estimated arrival and hatching dates, number of eggs, hatchlings, and fledglings. The form design is modeled after the previously described contact information form (frm_Contacts), and therefore retains the same view and edit modes of the form, filter capabilities, and command buttons. In this case the form is designed to filter records according to territory, which can result in several records from different survey years and raptor species. The user can scroll through the filtered records using the record selectors at the bottom of the form. Two command buttons at the bottom of the form allow the user to open pre-formatted reports that summarize the breeding raptor data by species or by territory and year. Click the "Report By Species" button to open rpt_Breeding_Raptors_Species or the "Report by Territory, Year" button to open rpt_Breeding_Raptors_Territories_Year.

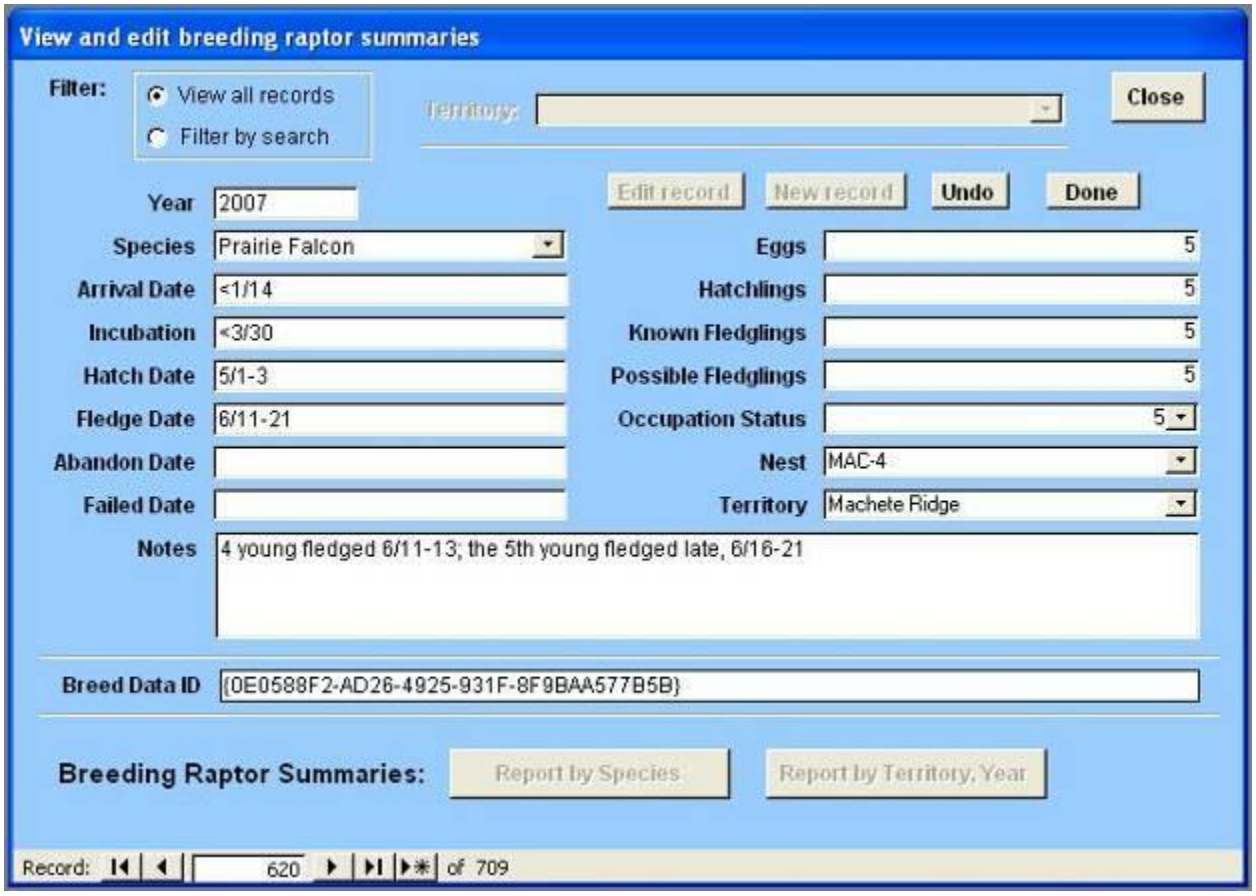
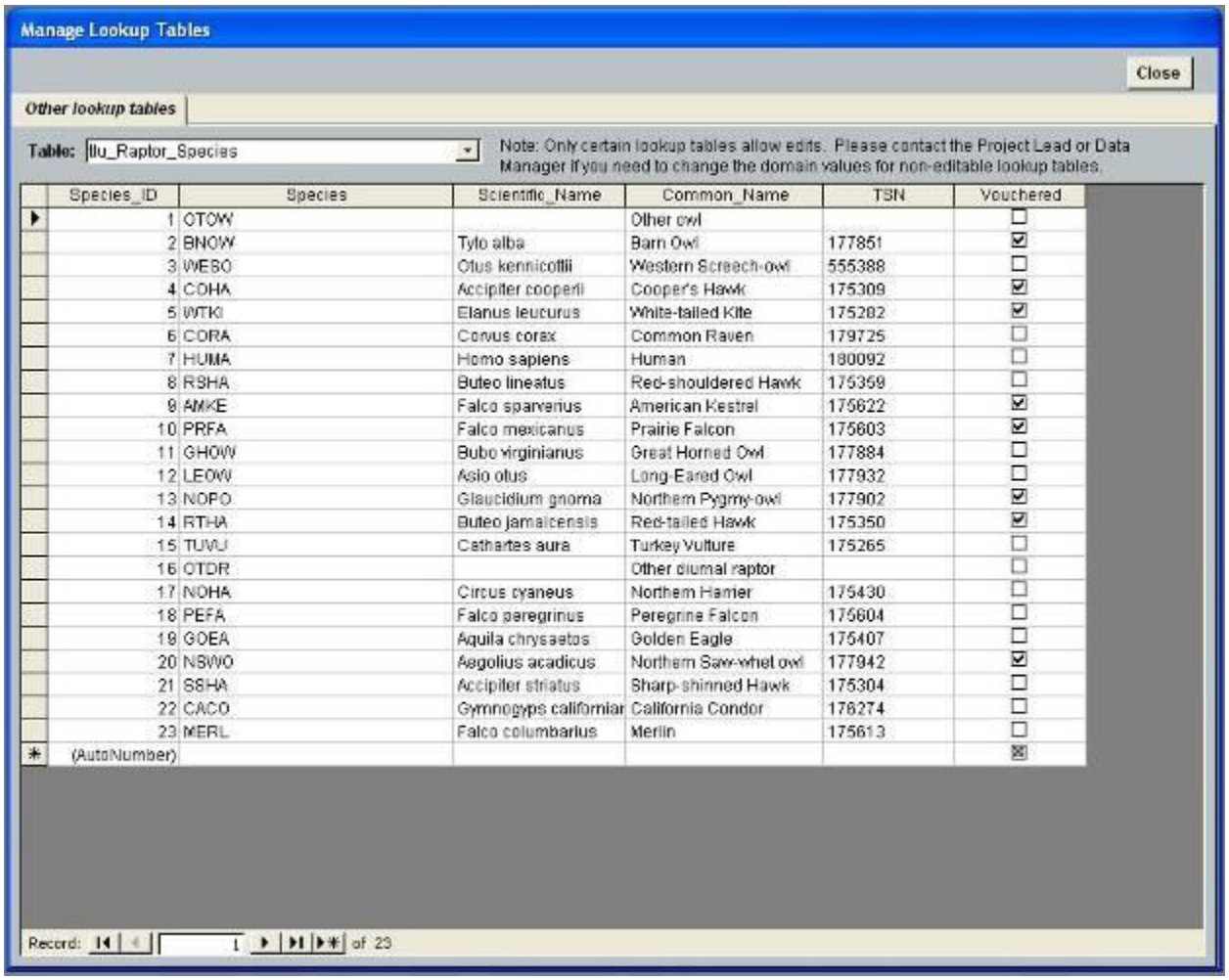


Figure SOP 3. 13. Form to view and edit breeding raptor summary records, displayed in edit mode.

frm_Lookups

Clicking the “Lookup Tables” button on the database switchboard’s “Main Menu” tab will open frm_Lookups (Figure SOP 3.14), the form for managing lookup tables. On the “Other lookup tables” tab, lookup tables can be selected from the “Table” drop-down list. The values in the lookup table will be displayed in a datasheet view below the drop-down list. If the table is listed as “Editable” in the drop-down list, then records can be edited, deleted, or added in the datasheet view. Look-up tables currently editable from the lookup table manager store values for cloud cover, copulation behavior, copulation food, feeding details, feeding prey, nest codes, observation limits, precipitation, raptor species, territories, and wind direction.

Additional tabs for frm_Lookups are being designed to better manage the nest and territory look-up tables, tlu_Nest_Codes and tlu_Territories respectively. The tabs will allow users to edit location and description data for nest and territories and will contain sub-forms that display associated digital images of the nests and territories.



Species_ID	Species	Scientific_Name	Common_Name	TSN	Vouchered
1	OTOW		Other owl		☐
2	BNOW	Tyto alba	Barn Owl	177851	☑
3	WESO	Otus kennicottii	Western Screech-owl	555388	☐
4	COHA	Accipiter cooperii	Cooper's Hawk	175309	☑
5	WTKI	Elanus leucurus	White-tailed Kite	175282	☑
6	CORA	Corvus corax	Common Raven	179725	☐
7	HUMA	Homo sapiens	Human	180092	☐
8	RSHA	Buteo lineatus	Red-shouldered Hawk	175359	☐
9	AMKE	Falco sparverius	American Kestrel	175622	☑
10	PRFA	Falco mexicanus	Prairie Falcon	175603	☑
11	GHOW	Bubo virginianus	Great Horned Owl	177884	☐
12	LEOW	Asio otus	Long-Eared Owl	177932	☐
13	NOPO	Glaucidium gnoma	Northern Pygmy-owl	177902	☑
14	RTHA	Buteo jamaicensis	Red-tailed Hawk	175350	☑
15	TUVU	Cathartes aura	Turkey Vulture	175265	☐
16	OTDR		Other diurnal raptor		☐
17	NOHA	Circus cyaneus	Northern Harrier	175430	☐
18	PEFA	Falco peregrinus	Peregrine Falcon	175604	☐
19	GOEA	Aquila chrysaetos	Golden Eagle	175407	☐
20	NSWO	Aegolius acadicus	Northern Saw-whet owl	177942	☑
21	SSHA	Accipiter striatus	Sharp-shinned Hawk	175304	☐
22	CACO	Gymnogyps californiar	California Condor	176274	☐
23	MERL	Falco columbarius	Merlin	175613	☐
(AutoNumber)					☒

Figure SOP 3. 14. Form to manage look-up table values, showing the raptor species look-up table as an example.

Database Metadata, Version Control Guidelines, Release and Revision Documentation

Several elements within the Raptor Monitoring Database help to document database metadata, release and revision history. First, the database retains two tables (tbl_Db_Meta and tbl_Db_Revisions) from the NRDT Version 3.1 for capturing metadata that are maintained by the SFAN Data Manager. The table tbl_Db_Meta is designed to facilitate metadata creation and integration with I&M metadata systems. At the time of this documentation, elements of this table are under review by the NPS I&M Program. The field Db_Meta_ID is the primary key for tbl_Db_Meta and provides the link to revision history records in tbl_Db_Revisions. The Db_Desc field is a memo field for describing the purpose of the database application. When metadata for the NRDT database is uploaded to the NPS Data Store, the Meta_MID field stores the metadata master ID generated upon upload. When metadata for the database is created using the I&M Dataset Catalog desktop metadata application, the globally unique record ID generated by the Dataset Catalog should be copied to the DSC_GUID field. The table tbl_Db_Revisions stores the application revision history. Linking tbl_Db_Revisions to tbl_Db_Meta using Db_Meta_ID facilitates accessing the revision history for inclusion in each metadata record.

The hidden systems table tsys_App_Releases is used to document release information for all versions of the database application. It is filled in by the SFAN Data Manager before the application is distributed. Included in tsys_App_Releases are the title, version, release date, and information about the author of the application. Associated with tsys_App_Releases is tsys_Bug_Reports, where the SFAN Data Manager can report any known bugs, such as non-working or dysfunctional features of the database. The table includes details of the problem and when / how it was fixed. The form frm_App_Releases (Figure SOP 3.15) allows the database user to view the release history and known bug information in a read-only format. The form can be accessed from the “About” tab on the database switchboard.

Significant database re-design may require approval by the project manager and review by other data management staff. Following completion of a new database version, metadata records and online postings will be updated.

With proper controls and communication, versioning ensures that only the most current database version is used for queries and analyses. Version control guidelines for the MS Access raptor monitoring database will follow those presented in the SFAN’s Data Management Plan (Press 2005). Prior to any major changes to the database design, a back-up copy of the database should be made. Once the database design changes are complete, the database should be assigned the next incremental version number. Version numbers should increase incrementally by hundredths (e.g., version 1_01, version 1_02…etc.) for minor changes. Major revisions should be designated with the next whole number (e.g., version 2_0, 3_0, 4_0 …). The front-end and back-end databases should be titled with the same version number, regardless of in which database file modifications are made.

The final copy of the previous database version should be archived by the Network Data Manager with the version closing date incorporated into the database title. The files will be placed in the “IM_Archive” directory on the GOGA Marin Headlands server. See *Data Storage and Archival Procedures* for more information.

File Naming Convention, File Locations, Database Back-Ups

The Raptor Monitoring Database is currently in Version 1.00, with the front-end application named Raptor_FE_v1_00.mdb and the back-end file named Raptor_BE_v1_00.mdb. The database is stored in the "Shared Data" directory (S:\ Drive) on the Inppinn001 server at Pinnacles National Monument in the raptor data directory following the file path: S:\RRM\RRM_Data\RM Workgroups\PROJECTS\Breeding Raptors\database\ Access_Raptor_Database

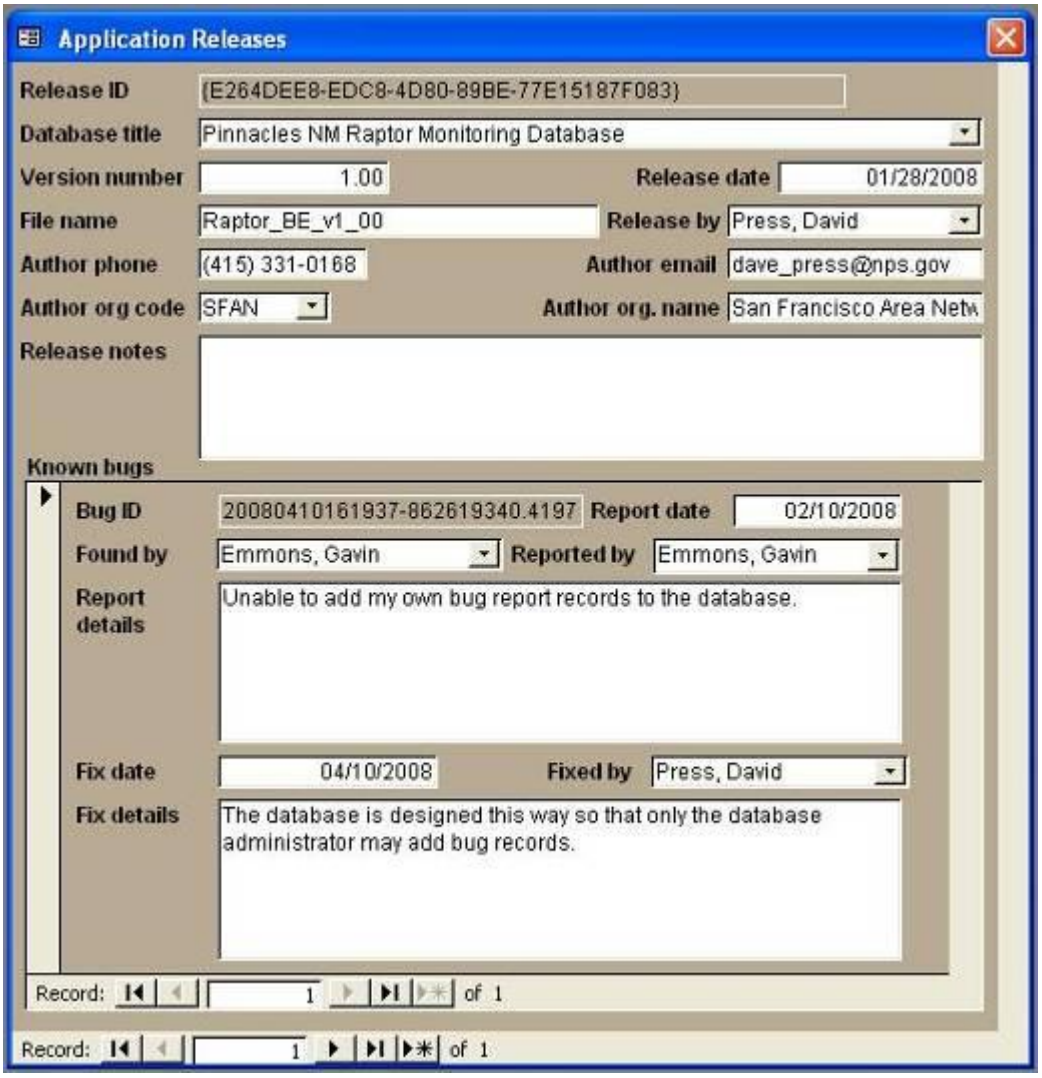


Figure SOP 3. 15. Form for viewing and entering release information with a subform for known bug descriptions.

Within this folder is an additional "Back-Up" folder, which stores back-up copies of the active database. Back-up copies of the active back-end database can be made from the "Main Menu" tab on the database switchboard. Alternatively, if the back-up options are checked under the "Defaults" tab, the database will prompt the user to back-up the database on start-up or exit. The

back-up feature of the database stores a copy of the back-end database in the "Access_Raptor_Database" folder with a default name based on the original file name and the date/time that the back-up was made. The default format for the file name is:

[Original file name]_yyyymmdd_hhmmss.mdb

An example of a back-up file name is: Raptor__BE_v1_00_20070323_133107. Back-up copies of the database can then be moved to the "Back-Up" folder.

Data Entry Procedures

Raptor Survey Events:

To begin data entry of a new survey record, click the "Enter / Edit Data" on the database switchboard, set the user default settings, and click the "Add a new record" button from the data gateway form. If you are already working in the data entry form and you wish to begin a new record, you can click the "New record" button.

Before entering <u>any</u> data, you should know what the fields in the database represent and what they are used for. These are detailed in Appendix SOP 3A of this document. In addition, descriptions of each data entry field are displayed in the status bar at the bottom left of the MS Access window.

Enter the **Location** (observation point or watch spot), from where the raptor data was collected. If you need to document a new location, click the "Add new" button and enter the location name, UTM coordinates, and other data into the locations form. When you return to the data entry form, the new location will be available in the location drop-down menu.

- Enter the date in the **Start Date** field, using mm/dd/yyyy.
- Enter the **Start Time** and **End Times** for each raptor survey period, in 4-number, 24-hour codes. Please note that if you leave an area for an hour or more, a new survey record should be generated. The observation start time is when the first observation of the individual (or pair or family) is seen and the last is when the last observation is made or the monitor leaves the site with the bird still in view.
- You may optionally enter the **X_Coord** (easting**)** and the **Y_Coord** (northing) of the observation point collected in the field by GPS on the day of the survey. The coordinates must use the North American Datum 1983, UTM Zone 10 North. The easting will be the 6 digit meter number, and the northing will be the 7 digit meter number. Alternatively, default UTM coordinates for each observation point are stored in the locations table.
- Define any observational limits from the value list of the **Observation Limits** box**.**
- Enter the **High Temp** and **Low Temp** in degrees Fahrenheit.
- Enter the **Avg Wind Speed** in miles per hour.
- Add the **Wind Direction** and **Cloud Cover** information from the value lists if the data were recorded.
- Enter any other information or additional conditions pertinent to the entire survey in the **Summary** text box.
- Enter the name of the **Observer** who recorded the field notes and all others present during the survey in the contacts sub-form. You can add a new contact to the database by

clicking the "Add a person" button and entering the new contact information into the contacts form. When you return to the data entry form, the new name will be available in the drop-down menu.

Raptor Observations – Subform:
Multiple raptor observations may be made during a single survey period. The navigation buttons on the bottom of the sub-form bring you (in order from left to right) to the first, previous, next and last raptor observation records for the survey. At the far right, the navigation button with the asterisk, allows you to begin a new raptor observation record.

Individual raptor observations are recorded only if the individual seen is not known to be the same one seen previously. For example, at 14:00 a red-tailed hawk is seen flying through and at 15:50 another (possibly a different RTHA) is seen flying through – two entries are made. But if you are watching a PRFA territory and you see one at 15:00, then lose it, regain one at 15:30, watch the pair court and then go to bed at 17:30, you would record that as 15:00-17:30.

- Enter the **Territory** from the value list. If you observe a raptor in flight, use the territory in the value list that the raptor flies to.
- Enter the name of the raptor **Species** observed in the event from the value list (Figure SOP 3.16).
- Enter the number of individuals witnessed during the observation in the **Number Individuals** field.
- Enter the **Nest Code** that pertains to the area in which you observed the raptors from the drop-down menu. In order to enter a new nest into the database, you need to access the nest look-up table data entry view by clicking the "Lookup Tables" button on the database switchboard.
- In the **Summary** field, enter additional information about the raptor observation. These are the most important fields in the raptor observation sub-form. Data entry requires attention to detail and the ability to paraphrase raptor observations and the most significant activities occurring in a territory on a given date.

Enter data as described below to keep data entries uniform.

- Use abbreviations where appropriate, such as 4-letter bird codes (listed in Figure SOP 3.16 in this SOP). Other important, standard abbreviations are listed in Table 7.
- Entries should be in the present tense.
- For nest-related activities observed, always use nest codes in the index entries. These are very important, as they let you and future raptor monitors know which nest sites are being used by territorial pairs. Nest codes are 2- to 5- letter codes for territories followed by the number for the historic nest site (e.g., SP-2 for the #2 Scout Peak nest site, GOAT-1 for the #1 Goat Peak nest site). Codes for territories are provided in SOP 2: Watch Spot Locations and can also be referenced on the backs of photos for nest/territory sites.
- State how many birds of the indexed species were observed (e.g., PRFA for a single prairie falcons, pr PRFA for a pair, 3 PRFA for three, pr + 1 PRFA for a pair interacting with a single, etc.).

- State "?" if the observation is uncertain.
- To ease in reading the data entry, keep items separate. For example: 2 f PRFA (for 2 female prairie falcons) instead of 2fAMKE or 2 fAMKE. Exceptions for this are the "@" symbol and "d." For example, you can say 3 PRFA young@25d. (young at 25 days old).

Table SOP 3. 1. Index abbreviations and definitions.

Abbreviations	Definitions	Abbreviations	Definitions
M	male	juv	juvenile
F	female	incub	incubation
ad	Adult	xchange	exchange
pr	Pair	2nd, 3rd	second, third
d.	days (i.e., 2d., 3d.)	x	times (i.e., 2x, 3x)
fledg	Fledgling	@	at

Include the most significant activities observed! Keep the information concise! Use the following guidelines to aid in this process:

- **Record only the most important activities.** If a PRFA pair are observed flying, perching, feeding, calling, and mating during an observation period, you need only record the most important activities, e.g., PRFA pr feed, mate. If all of the activities will fit on one line, include them! If the most significant activities require two lines, go ahead and use them, just limit the majority of the entries to one line.
- **If activities have not been observed before, include them as significant activities.** If a PRFA pair has not been seen in a territory in an observation season, then perching and flying are important to record in the summary. However, if it is the middle of the season and a PRFA pair has an established nest, flying and perching are not as important to note as activities like feeding young, nest switches, and number of nestlings. See SOP 1: Field Methods for raptor activities and behaviors to look for by month, and to prioritize index entries by.
- **If activities change the status of the territory, they should always be noted.** Examples of this are the first time incubation is confirmed, and the first time food is taken into the nest (confirming the hatching of eggs).The number of eggs and chicks, and the age (in days) of chicks, should always be included if observed.
- **To say that an area has "no birds," the observation must be at least 1 hour long and ideally 4 hours long.** Remember: the observational start time is when the observed raptor arrived at the site, and the observational end time is when the observed raptor left the site.

For the **Notes** field, enter any supplemental information that is important to mention but not significant enough to mention in the **Summary** field. This includes the following:

- Any unconfirmed guesses you make based on observations (possible nest failures, unobserved fledgings, etc.).

- Observation entry revisions based on original misidentification (of chick ages, numbers, etc.) in field notes.
- Additional details from field notes that support observations – or lack thereof –such as confirmation of chicks in a nest site but not numbers of chicks, due to lack of visibility).
- Any useful details of raptors observed, such as identifying marks, developmental differences in chicks, or a nest that is newly discovered in a territory.

Raptor Feeding Observations – Subform:
Zero or multiple raptor feeding events may occur for a single raptor observation record. The navigation buttons on the bottom of the sub-form bring you (in order from left to right) to the first, previous, next, and last raptor feeding records. At the far right, the navigation button with the asterisk, allows you to begin a new raptor feeding record.

- Enter the beginning time of the feeding behavior in the **Start Time** field.
- Enter the time when the feeding behavior finishes in the **End Time** field.
- Enter the prey type from the value list in the **Prey** field. If you are not sure, click on "unknown."
- In the **Details** field, enter the type of feeding behavior from the value list.
- In the **Number of Individuals** field, enter the total number of individuals observed during the event.
- In the **Comments** field, enter any additional details worth noting, including: species of prey (if confirmed); and additional aspects of feeding behavior (e.g., any chicks that were more aggressive in feeding).If several types of feeding behavior occur in succession, include each in separate entries, e.g., food drop by male, female feeding young, female feeding self, female caching the rest of the prey.

Raptor Copulation Observations – Subform:
Zero or multiple raptor copulation events may occur for a single raptor observation record. The navigation buttons on the bottom of the sub-form bring you (in order from left to right) to the first, previous, next, and last raptor copulation records. At the far right, the navigation button with the asterisk, allows you to begin a new raptor copulation record.

- Enter the beginning time of the copulation event in the **Start Time** field.
- Enter total copulation time in seconds into the **Duration** field.
- Enter the amount of display during copulation from the value list in the **Behavior** field.
- In the **Food** field, record whether a food exchange occurred before or after copulation, using the value list provided.
- In the **Number of Individuals** field, enter the total number of individuals observed during the event.
- In the **Comments** field, enter any additional details.

Annual Breeding Raptor Summary:
At the end of the field season, after all field notes and observations have been documented and entered into the raptor monitoring database and the database has been through QA/QC, annual breeding raptor summaries are entered into the database.

- Open the breeding raptor form by clicking the "Breeding Summary" button from the database switchboard. To add a record, click the "New record" button.
- Before entering <u>any</u> data, you should know what the fields in the database represent and what they are used for. These are detailed in Appendix SOP 3A of this document. In addition, descriptions of each data entry field are displayed in the status bar at the bottom left of the MS Access window.
- Enter the year in the **Year** field, using yyyy. The year <u>must</u> be 4 digits, or it will not be accessible when using the Search mode.
- Enter the species from the value list provided in the **Species** field.

The next 6 fields are the most challenging for data entry within the breeding raptors form. Ideally, specific dates should be entered in each field. However, given the reality of checking raptor territories every 1 to 4 weeks, this is not always possible. For the **Arrival Date**, **Incubation**, **Abandon Date**, and **Failed Date** fields, follow the guidelines listed below:

- If you observe a change of territorial / breeding status **from one day to the next**, enter the specific date as m/dd.
- If you observe a change of territorial / breeding status **within two weeks**, enter the range of dates as m/dd-m/dd.
- If you observe a change of territorial / breeding status **in over two weeks**, enter either <m/dd, >m/dd, or leave the field blank. Data entry here will depend on the circumstances of the observation. For example, for the Arrival Date field, if you see a raptor occupying a territory for the first time on January 24, enter <1/24 to signify that the raptor arrived before (i.e., less than) January 24th, the first time you observed the territory. Observations over two weeks apart in the Incubation, Abandon Date, and Failed Date fields will generally follow this pattern. However, if a nest is found late in the season, just before fledge, the Incubation and Arrival Date fields should be left blank because there is not enough monitoring information to determine specific dates or date ranges. DO NOT try counting backward to get these dates. Occasionally, >m/dd will be necessary for data entry. For example, if incubation could not be confirmed due to lack of visibility into a nest site, but hatch date could be determined from later nestling agings as 4/30-5/2, and raptor pair courtship was observed until March 16th, the Incubation field could be assigned an entry of >3/16.
- For the Abandon Date and Failed Date fields, keep in mind that "failed" refers to failed nests, and "abandoned" refers to occupied territories being abandoned. Territories can have nest failures with or without territorial abandonment, and territories may be abandoned without nesting. Enter data into these fields, or leave them blank, as dictated by the occupation status and observations collected.
- If non-nesting raptors occupy territories, leave the Incubation, Abandon Date, and Failed Date fields empty; enter >m/dd for Abandon Date if territories are abandoned after observations of territories being occupied.

For the **Hatch Date** and **Fledge Date** fields, data entry will depend on accurate aging of nestlings, fledglings, and confirmation of fledging of young from nest sites. Refer to SOP 5: Data Analysis and Reporting for more information on monitoring raptor nestlings and fledglings. If you do not document the exact dates of hatching and fledging of young, you should monitor and age nestlings at a given nest on **3 visits** to narrow the range of hatching and fledge dates to 3 days, if possible. Additionally, follow the guidelines listed below:

- If you observe hatching or fledging of young **on a particular day or from one day to the next**, enter the specific date as m/dd.
- Monitor and age nestlings on **at least 3 visits**, and determine fledge dates by confirming full fledge of young from nest sites. If confirmation of full fledge is not possible, confirm that nest sites are empty, and try to confirm at least partial fledge of young.
- Enter **hatch** and **fledge** date ranges based on the total aging and fledging observations gathered for a particular nest site. Aging observations should be consistent. If not, determine and edit inconsistencies in nestling / fledgling again before entering hatch and fledge date ranges.
- If you are not able to monitor nestlings on at least 3 visits to a nest site – if you discover a nest very late in the season, for example – try to at least determine fledging dates, as described above. If data is lacking to confirm hatching dates, leave the **Hatch Date** field blank.
- If you discover young fledglings in a specific **territory** – such as American kestrel young perched near S. Balconies – late in the breeding season, leave all 6 fields from Arrival Date to Failed Date blank, but record numbers of young in the Known Fledglings through Occupation Status fields.
- If a territory is occupied by non-nesting raptors, leave the **Hatch Date** and **Fledge Date** fields blank.
- In the **Eggs** field, enter the number of eggs observed in a nest site prior to hatching. Often, observations of egg numbers can be difficult. If you are not able to see eggs – due to lack of visibility in nest site, for example – leave this field blank.
- For the **Hatchlings** and **Known Fledglings** fields, enter the maximum number of hatchlings and fledglings confirmed through observations.
- For the **Possible Fledglings** field, enter the maximum number of likely fledglings based on the maximum number of nestlings observed prior to fledge.

For the **Occupation Status** field, enter the appropriate occupation status from the drop-down list based on your observations of a given territory throughout the season. Use the guidelines listed below:

- Enter the number of possible fledglings if a territory had a nest site that successfully produced fledglings.
- Enter “Occupied” if non-nesting raptors occupied a territory, **OR** if a raptor pair that nested in a territory – entered in a separate database record – also defended additional

territories, a common occurrence in N./S. Balconies, and in the High Peaks area. In this latter case of a nesting raptor pair defending additional territories, fill in the Year, Territory, Species, Arrival Date, and Occupation Status fields for the additional territories occupied, and leave the other fields blank. For additional information, see SOP 5: Data Analysis and Reporting.

- Enter "Occupied/Moved" only if a non-nesting raptor pair occupied a territory, and you confirmed that the pair abandoned the territory and moved to a new territory. If you did not confirm this, document two territories being occupied in separate database records, with the first being abandoned.
- Enter "Failed" if a nesting raptor pair failed to fledge young, etc.
- Enter "Failed/Moved" only if a nesting raptor pair with a nest failure was confirmed moving to a new territory. As with the "Occupied/Moved" option, if you did not confirm this, enter two database records.
- Enter "Not Occupied" only for territories not occupied by prairie falcons, as this information is compiled into the breeding phenology chart at the end of the annual report (fore more information, see below, and in SOP 5: Data Analysis and Reporting). To be classified as "Not Occupied," there must be at least 3 observations (each in a different month) with "No Birds" being detected for a minimum of 3 hours per visit. (With those visits being at "appropriate" times to see birds – i.e., not during the middle of the day.)
- Enter "Unknown" only if you are not certain as to the occupational status of a raptor pair within a given territory (rarely necessary). This status code is mostly used to identify territories that due to logistical constraints were not observed a minimum of 3 times during the season to be able to classify them as Unoccupied.
- For the **Notes** field, enter any unusual or noteworthy observations, such as premature fledge from a nest site, first recorded nest sites or territorial occupation by species, etc.
- For the **Nest** field, enter the nest code from the value list for actively used nests in the season (for nest codes, see SOP 2: Watch Spot Locations).
- Enter the territory from the value list provided in the **Territory** field.

As discussed in SOP 5, the concept of "territories" can be challenging. At PINN, there are several areas in the park – the Balconies, the High Peaks, etc. – where territories are concentrated enough that prairie falcons and other raptors may nest within one territory but defend additional surrounding territories. The confusion here lies in the fact that our human perspective on the division of raptor territories does not necessarily correspond from year to year with the perspective that the raptors have on territories. As a result, a nesting falcon pair at North Balconies often includes South Balconies as part of their nesting territory, but occasionally two falcon pairs will respectively nest in North and South Balconies as separate territories. Likewise, a falcon pair at Hawkins will defend just Hawkins Peak as a territory on certain years, and will include the Tunnel, Teapot, and/or Egg areas in their territorial defense in other years. Other examples of territorial complexes that can also be separate territories include Goat / Scout Peak, Willow Springs Slide / Canyon North of Willows Springs, and Citadel included in the mix of Egg / Tunnel / Teapot / Hawkins. Ultimately, determining territorial boundaries and divisions in

a given year depends on the careful behavioral observations of the raptor monitors throughout the breeding season. For further details, see SOP 5.

Photos: Capturing, Cataloging, and Archiving

Photographs of raptor nests and territories provide an essential tool to effectively find and observe historic nest sites and territories. Throughout the field season, technicians should take pictures of territories and nests. Photos should be framed to include all relevant nest sites – in relation to historic nest sites, if contained within or near to existing nest sites – and landmarks en route to territory watchspots, if new nest sites and raptor territories are difficult to find.

Through FY09, film and hard copies of photos were archived in the RM Office. Starting FY10, digital photos will be taken to document all work. Digital photos should be taken using the highest resolution possible in TIF format. TIF does not compress images and are better suited for long-term storage and reproduction.

- For photos taken, record GPS coordinates in UTMs with a Garmin III Plus GPS unit. If the nest can be seen from different watch spots, take photos from each watch spot. Take photos at different zoom settings, wide angles to get other reference points in the photo frame and then close-ups to help in pulling detail out when looking in a spotting scope. Err on the side of taking too many photos. Take photos when the lighting is best illuminating the nest ledge – morning light for east facing rocks, evening light for west facing rocks. Try to avoid heavy shadowing on the nest ledge.
- Information about photos is documented in the Photo.Log table in the raptor database. To enter data, begin by adding a record into the Photo Log form by opening the raptor database front-end through the network path: S:\RRM\RRM_Data\RM Workgroups\PROJECTS\Breeding Raptors\database\ Access_Raptor_Database. Open the photo log form from the database switchboard by selecting the “Photo Log” button. Add a new photo log record by selecting the “New record” button. Type in the territory, roll code (if applicable), photo code, month and year the photo was taken, the photographer, photo quality, and exposures in the photo roll that include images of the same territory; follow previous entries as examples. When the record is complete, select the “Done” button.

Procedures for Documenting Digital Photos

Once photos are entered into the photo log table, copies of digital photos can be made. Using Photo shop or other photo software, circles or arrows can be placed around nest sites. Copies of photos can then be printed out and placed into plastic sleeves and put into a binder that can be taken into the field.

Procedures for Documenting Film Photos

This information is provided to understand procedures used for documenting film and hard copy photos. For photos that were taken through FY09, additional information was written on the back of the field and archival copies. Information included photo code in the lower left-hand corner of the print. This photo code was a combination of the film roll number, described above, and the negative number that the print corresponds to, such as Y-14 for Roll Y and #14 listed on the side

of the negative. Sometimes the negatives correspond to the half way point between the numbers – they are given the “14A” code – the number that is closest to the beginning of the negative.

Additional information provided on the back of the prints included: GPS coordinates in UTMs (NAD 1983 UTM Zone 10 North) in the lower left-hand corner (above the photo code), the photographer’s name and photo date in the lower right-hand corner, and the title of the print on the top of the photograph, indicating territory name and watchspot location and the direction the photo was taken (i.e., looking west) relative to the new territories / nest sites. Descriptive location information was also provided on the back of prints. Photos also had tape arrows pointing **precisely** at the new nest sites. See Figure SOP 3.16 for an example.

South Chalone – S side rocks (prior BLM, now park prop.)

SC-1 GOEA nest – ’90 (aban.), ‘93
SC-2 GOEA nest – ’92 (aban.)
SC-3 PRFA roost (lower crev.) – ’03 (non-nest.)

GPS: 10 S 0663004, 4032754
Photo Z-3 G. Emmons 6/03

Figure SOP 3. 16. Example of photo data placement on the back of a field/archived photograph.

Once prints are notated, store as described below.

- For new territories, take 4" x 6" notecards from the “Raptor Nest Site Photo Negatives” binder, and write the names of the new territories across the top of the notecards, then place these cards with respective new photo prints into the field and archival photo boxes. Make sure the territory notecards and photo prints are entered in alphabetical order in the photo boxes.
- Store the field copies photo box in the Raptor shelves in the Resources Office, and the archival copies photo box and negatives binder in the fire-proof metal file cabinet in the RRM Office near the front entrance.
- If a photo is lost, a duplicate is made from the negative and the data is transferred from the archival photograph to the new “field” photograph. Archival photos NEVER go out into the field.

Spatial Data Management

The raptor program makes extensive use of spatial data to supplement data sheets and to inform staff and the public about raptor nest activities. Nest information is stored in the raptor database in the table tlu_Nest_Codes, with associated UTM coordinates. These records may be displayed in ArcMap by following these procedures:

- Open ArcMap and begin a new empty map.
- Select the Add XY Data option under the Tools menu, navigate to the Raptor_NRDT_BE (back-end) database and select the table tlu_Nest_Codes.

- In the Add XY Data window, choose X_Coord for the X field and Y_Coord for the Y field.
- Set the coordinate system (Projected Coordinate Systems>UTM>NAD 1983>NAD 1983 UTM Zone 10N.prj), and select OK. The table will now appear as a data source in the map.
- To create a new shapefile from the imported table, right click on the nest data layer in the display window. Select Data>Export data. In the Saving Data window, keep the default options, select a location for the shapefile, and rename the file (e.g., raptor_nests_2007.shp).
- To determine UTM coordinates for new raptor nests, raptor technicians should first use topographic and aerial photo GIS themes to pinpoint nest site locations in ArcMap. Once the UTMs have been determined, new nest records should be added into the raptor monitoring database from frm_Lookups (Figure SOP 3.14), the form for managing database lookup tables. The form is accessible by clicking the "Lookup Tables" button on the database switchboard's "Main Menu" tab. Use the table drop-down menu to select tlu_Nest_Codes to add or edit raptor nest records. Because nest UTM coordinates are <u>not</u> generated from GPS data, raptor technicians must be <u>very</u> careful in transcribing nest locations into the raptor database.
- Any additions or changes made to tlu_Nest_Codes will be reflected when you re-open any ArcMap projects in which you have imported the nest records from the database. This serves as a good method to double-check edits made to the nest location data in the database. Remember, however, that any shape files created with the nest data are static and will not reflect edits made in the database.
- The above guidance is applicable to raptor observation or watch spots as well, with location records stored in the raptor database in the table tbl_Locations.

Quality Assurance and Quality Control

Data must meet certain QA/QC standards in order to ensure that the data are consistent, repeatable and reliable, and so that the data stand up to external review. QA ensures that data meet defined standards of quality with a stated level of confidence. QA refers to the overall management system, which includes the organization, planning, data collection, documentation, metadata, evaluation, and reporting activities of the program. QC refers to the technical procedures involved in controlling errors, such as personnel training, calibration of equipment, repeated measuring to determine differences among observers and the repeatability of measurements by the same person, and exercises to identify the level of error during data recording and data entry.

QA/QC measures built into raptor monitoring data collection include:

- Training of interns and staff. Refer to SOP 1: Field Methods.
- Consistency of data sheets and procedures. Data sheets and procedures for documenting observations through field notes are consistent over years. Minor improving changes are occasionally made, with date on the bottom of each form representing versioning changes.

- Proofing of data. Before the seasonal raptor data is considered final, the handling of the data follow a rigorous process, established and refined over many years at PINN. The data entry and proofing process, described below, follows guidelines outlined in the SFAN Data Management Plan (Press 2005).

Data entry is best performed by a person who is familiar with the data and ideally takes place as soon as data collection is complete. The single goal of data entry is the transcription of the data from paper records into the computer with 100% accuracy. However, because transcription errors are virtually unavoidable during data entry, they will have to be corrected during the data verification process. Observation of certain data entry guidelines, however, will minimize verification work. The SFAN Data Manager, in conjunction with the PINN Wildlife Biologist, should provide training in the use of the database to all data entry technicians and any other users. The Wildlife Biologist will ensure that data entry technicians understand how to enter data and that they follow the protocol.

The most robust QA/QC measures for data entry are built into the raptor database design. Several additional QA/QC procedures must be followed by the database user:

- Have a familiarity with the database software, database structure, and any standard codes for data entry that have been developed.
- Enter data in a timely manner. All data should be entered into the project database as soon as possible, preferably no less than once a week.
- Enter the data, one logical "set" at a time. Record in your notebook errors you know you've made or any questions that arise about the data content; these will be useful during data verification. Initial and date each paper form as it is completed to avoid confusion about what has been entered and what has not with a different color then the data.
- Interrupt your data entry only at logical stopping points. If you reach stopping points, make a working backup copy of the data for safety's sake if your software does not do so automatically.

Manual effort is generally required to get data into electronic format. Any typographical errors made will accumulate in the permanent database unless the data are verified and the errors detected. By implementing data verification procedures, these errors can be reduced, if not eliminated. Data verification immediately follows data entry and involves checking the accuracy of computerized records against the original source, usually hard copy field records, and identifying and correcting any errors. When the computerized data are verified as accurately reflecting the original field data, the paper forms can be archived and most data manipulation can be done on the computer.

The prairie falcon monitoring program utilizes visual and audio review after data entry for data verification. Visual review after data entry requires two people. One person sits with the field datasheets in hand while the other sits at the computer with the database open. As data sheets are read aloud, the database record is followed and analyzed for data entry errors. Errors are corrected as they are discovered. Verified data sheets should be dated and initialed.

Metadata Procedures

The NPS GIS Committee recently required all NPS GIS data layers be described with the NPS Metadata Profile, which combines the FGDC standard, elements of the ESRI metadata profile, the Biological Data Profile, and NPS-specific elements. Although no standard has been applied to natural resource databases, the SFAN will complete the NPS Metadata Profile to the greatest extent possible to document databases developed for the SFAN I&M program.

A complete metadata record for the raptor monitoring MS Access database will be generated in compliance with current NPS standards by the SFAN data manager. The metadata record will initially be developed in Dataset Catalog v3.0, an MS Access metadata development and catalog tool developed by the NPS I&M Program. Dataset Catalog is currently the preferred tool to begin metadata records for MS Access databases because of its ability to harvest entity and attribute information from this database format.

The metadata record will be exported from Dataset Catalog as an XML file and completed in NPS Metadata Tools and Editor v1.1, thus allowing for all NPS-specific elements in the metadata record to be completed. When completed, the metadata record, but not the data themselves, will be posted to the NPS Data Store for public discovery and consumption. Contact information within the metadata record will direct interested parties to the Network Data Manager for further inquiries. The metadata record posted to the NPS Data Store will be updated annually after the annual data has been entered and error-checked or following database revision to a new version whole number (i.e., v1_3 to v2_0, but not v2_0 to v2_1).

The location data for this project is stored as UTM coordinates within the MS Access master database. Because GIS spatial data layers are generated from the database for internal use only, only simplified metadata records will be developed for these data layers using ArcCatalog and the NPS MTE. The metadata records will be saved as XML files and should be stored with the spatial data files.

Data Storage and Archival Procedures

Each season, once data entries have been entered and proofed, the physical documents, including datasheets, field notebooks, printouts of end-of-season reports, nest data forms for CDFG and the SCPBRG, are all kept in the RRM office, in a fire-proof cabinet in folders, each marked by subject and year. The archived photo negatives and photo prints are also kept in the RRM office in another fire-proof cabinet as detailed in the photo management section above.

All digital documents and data related to the raptor monitoring program are stored on the “SharedData” drive on the PINN file server Inppinn001. The PINN server is physically located at the NPS Denver Service Center, where the server is maintained and backed up on a daily basis beginning at about 5 pm PST. Within the “SharedData” directory, which is mapped to the S:\ drive, the file pathway to all stored data related to the raptor monitoring program is: S:\RRM\RRM_Data\RM Workgroups\PROJECTS\Breeding Raptors

Within the “Breeding Raptors” folder are folders related to reports, advisories, the database, and more. Digital and scanned photographs related to the raptor monitoring program are kept at:

S:\RRM\Images\Raptor_DB_Photos. Scans of historical raptor nest / territory photos are kept in the "scans" folder, organized by territory folders, with front and back sides of each print scanned.

At the SFAN offices at GOGA, copies of all final documents and data relating to the raptor monitoring program are archived on the Marin Headlands server at: Inpgogamahe1\Divisons\Network I&M\IM_Archive\VS_Indicators\Raptors

Data and documents are stored in separate folders. The raptor database will be copied and archived here annually after that year's field data has been entered and error-checked. All final documents relating to the raptor monitoring program, including the protocol and all annual reports, will also be stored in the raptor archive directory. All files in the archive directory are stored in read-only format.

NPS Information Technology specialists keep the server at GOGA locked and secure, perform regular server maintenance and upgrades, and ensure that frequent server back-up procedures are functioning properly with weekly off-site storage.

Data Distribution

In order for the raptor monitoring program to inform park management and to share its information with other organizations and the general public, guidance documents, reports, and data must be easily discoverable and obtainable. The main mechanism for distribution of the raptor monitoring documents and data will be the Internet. The raptor monitoring protocol, accompanying SOPs, and all annual reports will be made available for download at the SFAN website: http://www1.nature.nps.gov/im/units/sfan/index.htm .

Although the raptor monitoring database will not be posted for public download, as previously mentioned, a metadata record for the database will be maintained at the NPS Data Store. The metadata records will direct interested parties to the SFAN lead data manager for further inquiries.

In addition to the NPS Data Store, the NPS I&M Program staff maintains an on-line natural resource bibliographic database known as NatureBib. NatureBib records will be created for all of the raptor monitoring documents, including the protocol, annual reports, and any resulting publications. The public version of NatureBib is in development by the NPS I&M program.

Appendix SOP 3A. Pinnacles National Monument Raptor Monitoring Data Dictionary

TABLE NAME: **tbl_Events**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Sampling events - raptor surveys.
FORMAT: Microsoft Access
NO. OF FIELDS: 9

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Event_ID	dbText	50	Event identifier.
Location_ID	dbText	50	Unique identifier for each sample location. Link to tbl_Locations.
Protocol_Name	dbText	100	The name or code of the protocol governing the event.
Survey_Purpose	dbText	20	Purpose of survey (occupancy, reproduction, nestlings, etc)
Start_Date	dbDate	8	Starting date for the event.
Start_Time	dbDate	8	Starting time for the event.
End_Time	dbDate	8	Ending time for the event.
Entered_By	dbText	50	Database user at data entry.
Entered_Date	dbText	50	Date of data entry.

TABLE NAME: **tbl_Event_Details**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Sampling event details.
FORMAT: Microsoft Access
NO. OF FIELDS: 11

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Event_ID	dbText	50	Event identifier. Link to tbl_Events.
X_Coord	dbDouble	8	X coordinate of observation point.
Y_Coord	dbDouble	8	Y coordinate of observation point.
OBS_limits	dbText	50	Visibility conditions present. Link to tlu_Observation_Limits.
Hi_TempF	dbText	50	High temperature condition.
Low_TempF	dbText	50	Low temperature condition.
AVG_Windspeed	dbText	50	Average wind speed.
Wind_Dir	dbText	50	Wind direction. Link to tlu_Wind_Direction.
Cloud_Cover	dbText	50	Cloud coverage condition. Link to tlu_Cloud_Cover.
Precip	dbText	50	Precipitation type present. Link to tlu_Precipitation.
Summary	dbText	255	Summary of the observation session.

TABLE NAME: **tbl_Raptor_Observations**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Raptor observation records collected during unique survey events.
FORMAT: Microsoft Access
NO. OF FIELDS: 21

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION

Raptor_Data_ID	dbText	50	Raptor observation record ID.
Event_ID	dbText	50	Event identifier. Link to tbl_Events.
Territory_ID	dbText	50	ID of raptor territory. Link to tlu_Territories.
Survey_Purpose	dbText	50	Purpose of surveying territory.
Detection_Purpose	dbText	50	What was observer trying to detect during survey?
Detect_Intent_Result	dbText	50	Were the detection intentions successful?
PRFA_Detected	dbText	50	Were PRFA detected during the survey.
OBS_Stime	dbDate	8	Beginning of observation entered as 4-number code (24-hour).
OBS_Ftime	dbDate	8	End of observation entered as 4-number code (24-hour).
Duration	dbDate	8	Departure time (-) arrival time.
Species	dbText	255	Raptor species (common name). Link to tlu_Species.
Num_Adults	dbByte	1	Number of Adults detected
Num_Fledglings	dbByte	1	Number of Fledglings detected
Num_Nestlings	dbByte	1	Number of Nesltings detected
Num_OtherAge	dbByte	1	Number of individuals witnessed for which an age either could not be determined or falls into another category such as subadult (e.g. condors, eagles)
Age	dbText	10	Descriptor of age category not reflected in the three choices adult, fledglings, nestlings - also use "unknown" here for brief observations of fly-bys, etc.
Territorial_Behav	dbText	50	Was territorial behavior observed?
Summary	dbText	255	Summary of the raptor observation event.
Notes	dbText	255	Additional information important to note about the raptor observations.
Comments	dbText	255	Additional notes on feeding and associated activities.
Nest_Code	dbText	50	Nest code for active nest. Link to tlu_Nests_Codes.

TABLE NAME: **tbl_Raptor_Copulation**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Raptor copulation events associated with raptor observations.
FORMAT: Microsoft Access
NO. OF FIELDS: 8

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Cop_ID	dbLong	4	Raptor copulation record ID.
Raptor_Data_ID	dbText	50	Raptor observation ID. Link to tbl_Raptor_Observations.
Event_Stime	dbDate	8	Beginning of copulation event entered as 4-number code (24-hour)
Duration	dbText	255	Duration of copulation event in seconds.
Behavior	dbText	255	Summary of most significant copulation

behavior. Link to tlu_CopBehavior.			
Comments copulation event.	dbText	255	Additional notes or comments about
Food tlu_CopFood.	dbText	255	Summary of food exchange. Link to
No_individuals copulation event.	dbByte	1	Number of raptor individuals related to

TABLE NAME: **tbl_Raptor_Feeding**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Raptor feeding events associated with raptor observations.
FORMAT: Microsoft Access
NO. OF FIELDS: 9

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Feed_ID	dbLong	4	Raptor feeding record ID.
Raptor_Data_ID tbl_Raptor_Observations.	dbText	50	Raptor observation ID. Link to
Event_Stime 4-number code (24-hour)	dbDate	8	Beginning of feeding event entered as
Event_Ftime number code (24-hour)	dbDate	8	End of feeding event entered as 4-
Duration	dbText	255	End time (-) beginning time.
Prey	dbText	255	Raptor prey. Link to tlu_FeedPrey.
Details tlu_FeedDetails.	dbText	255	Feeding event summary. Link to
Comments feeding event.	dbText	255	Additional notes or comments about
Num_individuals feeding event.	dbDouble	8	Number of raptor individuals related to

TABLE NAME: **xref_Event_Contacts**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Cross-reference table between events and contacts.
FORMAT: Microsoft Access
NO. OF FIELDS: 2

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Event_ID	dbText	50	Event identifier. Link to tbl_Events.
Contact_ID	dbText	50	Field observer. Link to tlu_Contacts.

TABLE NAME: **tbl_DataHistory**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Details of data verification and editing of raptor survey event records.
FORMAT: Microsoft Access
NO. OF FIELDS: 5

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
History_Data_ID	dbLong	4	Data history record ID.
Event_ID	dbText	50	Event identifier. Link to tbl_Events.
Updated_Date last change.	dbText	50	Date of data verification, validation, or
Contact_ID tlu_Contacts.	dbText	50	Database user at data entry. Link to
Notes	dbText	50	Specific description of data history

record (error-checking, data fields edited, etc)

TABLE NAME: **tbl_Breeding_Raptors**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: End-of-season occupancy summary information and breeding phenology data collated from raptor surveys and observations.
FORMAT: Microsoft Access
NO. OF FIELDS: 22

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
AutoID	dbLong	4	Autonumber ID. To assist with sorting records.
Breed_Data_ID	dbText	50	Raptor breeding record ID.
Year	dbText	50	Year of observation, entered as yyyy.
Species	dbText	255	Raptor species (common name).
Arrival_Date	dbText	255	Arrival date of territorial raptors, entered as m/dd.
Incubation_Date	dbText	255	Beginning date of nest incubation, entered as m/dd.
Hatch_Date	dbText	255	Hatching date(s) of young in nest.
Fledge_Date	dbText	255	Fledging date(s) of young from nest.
Abandon_Date	dbText	255	Date of abandonment by territorial raptors.
Failed_Date	dbText	255	Date of nest failure (due to predation, etc.).
Eggs	dbText	255	Number of eggs observed in the nest site.
Hatchlings	dbDouble	8	Number of hatchlings observed in the nest site.
Known_Fledglings	dbDouble	8	Number of young confirmed fledged by observation.
Possible_Fledglings	dbDouble	8	Number of possible / likely young fledged from the nest site.
Occupation	dbText	255	Final occupational status of raptors within the territory.
Occupancy_Date	dbDate	8	Date that occupancy was determined.
Notes	dbText	255	Additional notes / observations for breeding record.
Sort	dbDouble	8	Sorting code for territories; entered automatically.
Nest_Code	dbText	255	Nest code for active nest. Link to tlu_Nests_Codes.
Territory_Name	dbText	50	Name of raptor territory.
Territory_ID	dbText	50	ID of raptor territory. Link to tlu_Territories.
Territorial	dbText	50	Additional territories in which raptors were territorial.

TABLE NAME: **tbl_Photo_Log**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Catalog of raptor nest and territory photographs.
FORMAT: Microsoft Access
NO. OF FIELDS: 13

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Roll_ID	dbText	50	Roll code record ID.
Territory_ID	dbText	50	ID of raptor territory. Link to tlu_Territories.
Territory	dbText	255	Name of raptor territory.
Roll_Code	dbText	255	Alpha-numeric roll code unique to the season.
Photo_Code	dbText	255	Alpha-numeric photo code based on roll code and negative number.
Photographer	dbText	50	Name of photographer.
Contact_ID	dbText	50	Photographer. Link to tlu_Contacts.
Month	dbDouble	8	Month the photos were taken.
Year	dbDouble	8	Year the photos were taken.
Photo_Quality	dbText	255	Photo quality rating: good, average, poor.
Roll_Photos	dbText	255	Exposures in the photo roll that contain images of the same territory.
Sort	dbDouble	8	Sort order for records based on territory.
Roll_Comments	dbText	255	Additional photo roll comments.

TABLE NAME: tbl_Locations
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Raptor observation locations - watch spots or observation points.
FORMAT: Microsoft Access
NO. OF FIELDS: 19

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Location_ID	dbText	50	Location identifier.
Loc_Name	dbText	100	Name of the location.
GIS_Location_ID	dbText	50	Link to GIS feature, equivalent to NPS_Location_ID.
Meta_MID	dbText	50	Link to NR-GIS Metadata Database.
Territory_Name	dbText	50	Name of raptor territory.
Territory_ID	dbText	50	ID of raptor territory. Link to tlu_Territories.
UTM_Zone	dbText	50	UTM Zone.
X_Coord	dbDouble	8	X coordinate.
Y_Coord	dbDouble	8	Y coordinate.
Datum	dbText	5	Datum of mapping ellipsoid.
Coord_Units	dbText	50	Coordinate distance units.
Coord_System	dbText	50	Coordinate system.
Coord_Method	dbText	50	identify the way in which the coordinates were determined, e.g. Garmin eTrex, Trimble with BOB; USGS Quad, etc.
Est_H_Error	dbSingle	4	Estimated horizontal accuracy.
Accuracy_Notes	dbText	255	Positional accuracy notes.
Unit_Code	dbText	12	Park, Monument or Network code.
Loc_Type	dbText	25	Location type category.
Updated_Date	dbText	50	Date of entry or last change.
Loc_Notes	dbMemo	0	General notes on the location.

TABLE NAME: **tbl_Media_Addresses**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Media, business, and organization addresses for press releases and advisories.
FORMAT: Microsoft Access
NO. OF FIELDS: 6

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Media_ID	dbText	50	Media address record ID.
Name	dbText	255	Name of business, organization, or media outlet.
Address	dbText	255	Street number or PO box.
City_State_Zip	dbText	255	City, state, and zip code.
Press_Release	dbBoolean	1	Send a press release (yes/no).
Advisory	dbBoolean	1	Send an advisory (yes/no).

TABLE NAME: **tbl_Db_Meta**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Database description and links to I&M metadata tools.
FORMAT: Microsoft Access
NO. OF FIELDS: 4

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Db_Meta_ID	dbText	50	Local primary key.
Db_Desc	dbMemo	0	Description of the database purpose.
Meta_MID	dbText	50	Link to NR-GIS Metadata Database.
DSC_GUID	dbText	50	Link to I&M Dataset Catalog desktop metadata tool.

TABLE NAME: **tbl_Db_Revisions**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Database revision history data.
FORMAT: Microsoft Access
NO. OF FIELDS: 6

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Revision_ID	dbText	50	Database revision (version) number or code.
Revision_Contact_ID	dbText	50	Link to tlu_Contacts.
Db_Meta_ID	dbText	50	Link to tbl_DB_Meta.
Revision_Date	dbDate	8	Database revision date.
Revision_Reason	dbMemo	0	Reason for the database revision.
Revision_Desc	dbMemo	0	Revision description.

TABLE NAME: **tlu_Cloud_Cover**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Look-up table of cloud cover percent ratings.
FORMAT: Microsoft Access
NO. OF FIELDS: 2

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
CC_ID	dbLong	4	Cloud cover ID.
Cloud_cover	dbText	50	Cloud cover condition.

TABLE NAME: **tlu_Contacts**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Contact data for project-related personnel.
FORMAT: Microsoft Access
NO. OF FIELDS: 18

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Contact_ID	dbText	50	Contact identifier.
Last_Name	dbText	50	Last name.
First_Name	dbText	50	First name.
Middle_Init	dbText	4	Middle initial.
Initals	dbText	255	First letter, Last letter
Organization	dbText	50	Organization or employer.
Position_Title	dbText	50	Title or position description.
Address_Type	dbText	50	Address (mailing, physical, both) type.
Address	dbText	50	Street address.
Address2	dbText	50	Address line 2, suite, apartment number.
City	dbText	50	City or town.
State_Code	dbText	8	State or province.
Zip_Code	dbText	50	Zip code.
Country	dbText	50	Country.
Email_Address	dbText	50	E-mail address.
Work_Phone	dbText	50	Phone number.
Work_Extension	dbText	50	Phone extension.
Contact_Notes	dbMemo	0	Contact notes.

TABLE NAME: **tlu_CopBehavior**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Look-up table of copulation behavior (display) values.
FORMAT: Microsoft Access
NO. OF FIELDS: 2

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
CopBehav_ID	dbLong	4	Copulation behavior record ID.
CopBehavior	dbText	50	Copulation behavior observed.

TABLE NAME: **tlu_CopFood**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Look-up table of copulation food exchange values.
FORMAT: Microsoft Access
NO. OF FIELDS: 2

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
CopFood_ID	dbLong	4	Copulation food record ID.
CopFood	dbText	50	Food exchange description.

TABLE NAME: **tlu_FeedDetails**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Look-up table of feeding description values.
FORMAT: Microsoft Access

NO. OF FIELDS: 2

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Details_ID	dbLong	4	Food details record ID.
Details	dbText	50	Feeding event summary.

TABLE NAME: tlu_FeedPrey
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Look-up table of food prey items.
FORMAT: Microsoft Access
NO. OF FIELDS: 2

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Prey_ID	dbLong	4	Prey record ID.
Prey	dbText	50	Raptor prey.

TABLE NAME: tlu_Nest_Codes
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Look-up table of raptor nests and locations.
FORMAT: Microsoft Access
NO. OF FIELDS: 13

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Nest_ID	dbLong	4	Nest code record ID.
Nest_Code	dbText	7	Nest code for active nest.
Territory_ID	dbText	50	ID of raptor territory. Link to tlu_Territories.
Territory	dbText	50	Name of raptor territory.
X_Coord	dbText	15	X coordinate.
Y_Coord	dbText	15	Y coordinate.
Coord_System	dbText	50	Coordinate system.
Datum	dbText	50	Datum of mapping ellipsoid.
Coord_Units	dbText	50	Coordinate distance units.
UTM_Zone	dbText	50	UTM Zone.
Unit_Code	dbText	12	Park, Monument or Network code
Nest_Name	dbText	50	Name or description of the nest.
Nest_Notes	dbMemo	0	General notes on the nest.

TABLE NAME: tlu_Observation_Limits
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Look-up table of observation limit values.
FORMAT: Microsoft Access
NO. OF FIELDS: 2

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Limit_ID	dbLong	4	Observation limit record ID.
obslimits	dbText	50	Visibility conditions present.

TABLE NAME: tlu_Precipitation
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Look-up table of precipitation values.
FORMAT: Microsoft Access
NO. OF FIELDS: 2

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Precip_ID	dbLong	4	Precipitation record ID.

Precip	dbText	50	Precipitation type present.

TABLE NAME: **tlu_Raptor_Species**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Look-up table of raptor species.
FORMAT: Microsoft Access
NO. OF FIELDS: 6

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Species_ID	dbLong	4	Raptor species record ID.
Species	dbText	4	Four letter species code.
Scientific_Name	dbText	50	Raptor species (scientific name).
Common_Name	dbText	50	Raptor species (common name).
TSN	dbText	50	ITIS Taxonomic Serial Number.
Vouchered	dbBoolean	1	Vouchered (yes/no).

TABLE NAME: **tlu_Territories**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Look-up table of raptor territories with link to GIS.
FORMAT: Microsoft Access
NO. OF FIELDS: 9

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Territory_ID	dbText	50	Territory identifier.
GIS_Location_ID	dbText	50	Link to GIS feature, equivalent to NPS_Location_ID.
Territory_Name	dbText	100	Unique territory name.
Territory_Desc	dbText	255	Description for the territory.
Territory_Code	dbText	50	Text code abbreviation of the territory.
Unit_Code	dbText	12	Park, Monument or Network code.
Territory_Notes	dbMemo	0	General notes on the territory.
LocationType	dbText	50	"Territory" = an area in which raptors have historical nested and therefore is used for intensive monitoring. "Survey Area" designates larger areas used for casual searches, especially for non-target species, e.g. North Wilderness Trail.
Core	dbText	50	Identifies territory in the core area.

TABLE NAME: **tlu_Wind_direction**
FILENAME: Raptor_NRDT_BE.mdb
DESCRIPTION: Look-up table of wind direction values.
FORMAT: Microsoft Access
NO. OF FIELDS: 2

FIELD NAME	FIELD TYPE	FIELD WIDTH	FIELD DESCRIPTION
Wind_ID	dbLong	4	Wind direction record ID.
Wind_dir	dbText	50	Wind direction.

SOP 4. Protocol Revision and Review V 2.2

Revision History Log

Prev Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #
1.01	06/05/05	Dawn Adams	Completed Data Management and Reporting Sections using SOP information. Added Revision History Log. Removed SOP 5: Raptor Monitoring because it was not yet written and information was provided in SOP 1–4. Renumbered all other SOPs in narrative.	Needed to complete protocol for peer review	1.02
1.02	09/2006	Gavin Emmons, Jim Petterson	Updated / revised narrative to include citations, consistent use of terminology, revised hypotheses, measurable variables / objectives, management objectives, rewritten sections on sampling, data analysis, and new section on triggers for management actions	Needed in response to 2005 peer review comments	1.03
1.03	10/4/06; 9/6/07	Marcus Koenen	Reformatted. Various sections edited including sections on budget, personnel, reporting.	To meet national guidelines: http://nature.nps.gov/publications/NRPM/	1.04
1.04	3/15/08	Gavin Emmons, Jim Petterson, Marcus Koenen	More re-formatting, added citations, produced maps. Removed and combined SOP to reduce overall redundancy. Added executive summary. Added more information about sampling design including power analyses.	To address comments made by reviewers. Incorporate results of power analyses and other suggestions from Connor and LeBuhn.	1.1

1.1	7/2009	D. Adams, J. Petterson, G. Emmons, M. Koenen	Reformatting based on peer review comments	To address peer review comments and further suggestion from LeBuhn and Connor.	2.0
2.0	1/2010	M. Koenen	Address final comments on sample design.	Incorporate new power analysis by Starcevich and Steinhorst.	2.1
2.1	06/2011	D. Adams	Replicate title change in SOP.	Per Latham request	2.2

Overview

This SOP explains how to make changes to the Prairie Falcon Monitoring Protocol Narrative and accompanying SOPs, and tracking these changes. Observers asked to edit the Protocol Narrative or any one of the SOPs need to follow this outlined procedure in order to eliminate confusion in how data is collected and analyzed. All observers should be familiar with this SOP in order to identify and use the most current methodologies.

This SOP also contains a table listing the most current version of the protocol narrative and each of the SOPs. Table 8 will provide a single reference for ensuring that the most current documents are being used.

Also included in this SOP are comments from protocol reviewer, responses to those comments, and approvals.

Protocol Revision Procedures

The PINN Prairie Falcon Monitoring Protocol Narrative and accompanying SOPs has attempted to incorporate the most sound methodologies for collecting and analyzing raptor breeding data. However, all protocols regardless of how sound require editing as new and different information becomes available. Required edits should be made in a timely manner and appropriate reviews undertaken.

All edits require review for clarity and technical soundness. Small changes or additions to existing methods will be reviewed in-house by the SFAN staff. However, if a complete change in methods is sought, an outside review is required. Regional and national NPS staff with familiarity in avian research and data analysis may also be utilized as reviewers. Also, experts in avian research and statistical methodologies outside of the Park Service will be utilized in the review process.

Document edits and protocol versioning in the Revision History Log that accompanies the Protocol Narrative and each SOP. Log changes in the Protocol Narrative or SOP being edited only. Version numbers increase incrementally by hundredths (e.g., version 1.01, version 1.02, etc.) for minor changes. Major revisions should be designated with the next whole number (e.g., version 2.0, 3.0, 4.0…). Record the previous version number, date of revision, author of the revision, identify paragraphs and pages where changes are made, and the reason for making the changes along with the new version number.

Inform the Data Manager about changes to the Protocol Narrative or SOP so the new version number can be incorporated in the Metadata of the project database. The database may have to be edited by the Data Manager to accompany changes in the Protocol Narrative and SOPs.
Post new versions on the internet and forward copies to all individuals with a previous version of the effected Protocol Narrative or SOP.

Table SOP 4. 1. Current versions and version dates for PINN Prairie Falcon Monitoring Protocol narrative and SOPs.

Document Name	Current Version	Version Date
Prairie Falcon Monitoring Protocol for Pinnacles National Monument.	2.3	06/2011
SOP 1: Field Methods	1.3	1/20/10
SOP 2: Site Descriptions	1.0	1/20/10
SOP 3: Data Management	3.3	06/2011
SOP 4: Protocol Revision and Review	2.2	06/2011
SOP 5: Data Analysis and Reporting	1.1	1/20/10
SOP 6: Using Portable Radios	1.1	1/20/10
SOP 7: Using GPS	1.1	1/20/10
SOP 8: Safety Procedures	1.1	1/20/10

Protocol Reviews (2005/2008)

Reviewer comments received during the 2005 and 2008 reviews are presented below along with our italicized responses. Initials of responder are also presented (MK: Marcus Koenen; DA: Dawn Adams).

2005/2006 Peer Review Comments

Review coordinated by Dr. James Agee:

December 22, 2005

The scientific review for "Raptor Monitoring Protocol for Pinnacles National Monument, California" is complete. The protocol receives the following decision:

Unacceptable in Present Form

This letter summarizes the scientific review of the raptor protocol at Pinnacles National Monument. Attached to this letter are several review documents: (1) a PWR Protocol Review Checklist. Each question is addressed in the left column; if scientific, it is addressed by me and the word is in bold, and if administrative is addressed by Dr. Penelope Latham in normal font, as a "yes", "no", "in part", or N.A. [not applicable]. (2) The individual reviews are included with author's names erased, and reviewers are identified as #1, #2, or #3. The park did request Dr. Karen Steenhof as a reviewer, and her review is one of the three, although not specifically identified. One of the reviews is actually a combined review by two experts, so we had a total of four functional reviewers for this protocol. (3) The marked-up copies of the review drafts are enclosed, labeled similarly as #1, #2, or #3, although most of the relevant comments are in the written reviews submitted. The reviews are self-explanatory, but what I attempt to do here is place them in an integrated context beyond the abbreviated response in the PWR Protocol Review Checklist. MK: *The original marked up documents are on file at the SFAN I&M Office at GOGA in Sausalito, California.*

The reviewers were very impressed with the detail and extent of the monitoring plan, and the authors did an excellent job of documenting those. But this attention to detail did not obscure deficiencies with the broader, overall objectives of the monitoring plan. The primary rationale for defining and tracking "vital signs" is essentially to monitor the health of park ecosystems. Not only is it important to select important variables, but park staff must be able to track the trends in the "vital signs" -- otherwise the monitoring, although perhaps interesting, is not very relevant to park decision makers. In the raptor protocol here, the objectives are not well defined, the measures for objective 2 (relating visitation to raptors) was not addressed at all, and analysis techniques to measure trends, and the thresholds for identifying a problem given that a trend might appear, are not addressed, either. While there are a lot of other comments that will be summarized later in this letter, they pale in comparison to these deficiencies. In a resubmission, you must define testable hypotheses, the variables that will be used to test those hypotheses, how those data will be collected (where most of the current effort is placed), how it will be analyzed to suggest things are "normal" or not, and what the threshold of deviation is that will trigger management concern. Those are basic standards for acceptability for a NPS vital signs protocol. MK: *Objectives have been revised. Analyses have been conducted to determine the power to detect trends.*

Introduction. A broader introduction to the issue at hand would be helpful (Reviewers #1 and #2). Reviewer #3 suggests more literature citation. What do we know from previous monitoring that might inform the monitoring plan being proposed? MK: *The introduction was expanded and additional literature was cited.*

Objectives. There are two objectives, summarized broadly as: (1) determining annual nesting success, and (2) improving understanding of human-raptor interactions. Reviewer #3 notes that the plan would be strengthened if testable hypotheses were introduced. For objective 1, Reviewer 1 notes that it is pretty narrowly focused: wouldn't you be interested in trend data, suggesting a time variable be added? Reviewer 2 notes that it could be written as a testable hypothesis: "there is no change in the population (which parameter?) <u>over time</u> (my underline)". Objective 2 is unmeasurable, according to Reviewer #1. Reviewer #2 rewrites the objective as "seasonal fitness of prairie falcons decreases with increasing recreational use…". Reviewer #3 notes there are no analytical techniques described for objective 2, likely because it is untestable as written. On the top of Reviewer #3's second page, a list of possible more specific hypotheses is listed, each of which would shape the type of monitoring data that would be collected. So the first priority is to review and rewrite the objectives. They should imply possibilities of testing within the framework of trend analysis mentioned above. It appears that only one raptor is present in high enough numbers to present quantifiable data, so the hypotheses should be specific about prairie falcons (see reviewer #2, objective 2 above). While the other species can be recorded and monitored, it seems apparent that those species are not considered vitals signs because their "pulse" is not strong enough to provide enough data for analysis. Yet the prairie falcon seem to be treated with the others as "raptors" when it is really the only species about which anything can likely be said over time. As reviewer #2 notes, is it worth the effort to collect data on all species if there is no possibility of change detection? MK: *The monitoring objectives were completely rewritten to address these comments. Hypotheses are generally not a part of monitoring objectives because we are not proving or disproving a hypothesis. We are only interested in*

tracking change over time. However, the analysis section has presented an analysis to be performed to test the hypothesis idea.

Terms and Definitions. Each of the reviewers suggested changes in the way terms were used. Reviewer #1 has almost an entire page of suggested changes and definitions. While this reviewer suggests avoiding the word "chick", the word is used twice in the suggested definition of "occupied territory". I can't offer clarification here, but suggest you be as specific as possible: "young", "post-fledgling", etc. Reviewer #2 notes a glossary would be helpful. MK: *A glossary was added to ensure consistent use of definitions throughout the document.*

Sampling. There is some concern by Reviewers (#1 and #2) that the field component is a sample, not a census (complete inventory). If you do not measure all the potential areas in the park, rather than an *a priori* prioritization of where to look, then the procedure appears to be a sample, not an entire population. Reviewer #1 notes this in the mention of SOP 4. Reviewer #2 notes that the number of variables actually measured is not specified and some may be less valuable than others (direction of flight from nest, reviewer #2, actual fledging dates, reviewer #1). Reviewer #3 also notes that the Grinellian approach may be too loose ("no systematic constraints" in the words of Reviewer #3) to produce replicated data. There are not standardized data forms where the same data will be recorded at each visit. MK: *A data sheet was developed to standardize data collection. This will be field tested in 2008 and will supplement the Grinnelian approach.*

There are no protocols for sampling or handling captured birds, yet these are mentioned as activities that might be undertaken. Procedures should be summarized.

Reviewer #3 notes that sampling (or censusing) activity at different rates in different parts of the park will result in different quality databases that will not be comparable within or between years. What is the implication of this for data analysis?

For objective 2, Reviewer #2 questions the feasibility of associating recreation (however measured) to counts of young due to accuracy limitations in the young falcon count. How would you separate out other factors influencing broods? They suggest radiocollaring individuals (it appears they mean falcons, not visitors) to assess spatio-temporal patterns of raptor use vs. visitor use. Until objective 2 is better defined, more comment on sampling is not useful.
MK: This aspect of the protocol has been removed and may be identified as a research objective in the future. Capturing and handling raptors has been removed from the protocol.

Field procedures. Generally the reviewers were impressed with the detail and thoroughness of the field procedures. Digital photography is suggested (all Reviewers) rather than black and white film. Given past experience with unstable color on negatives, black and white was preferable, but with digital archives, fading is not a problem. Perhaps this is an NPS standard, but it seems archaic in relation to current technology. You might raise this issue internally within NPS if black and white is required. MK: *Up through FY09, we were still using film that was digitally scanned. This has worked well so far and was the preference of the technician who is also a fine arts photographer who preferred to use film over digital cameras. Starting next year, all photography will be with digital format cameras. The SOP has been updated accordingly.*

Analysis. The Z-test explanation is not described well enough to understand how it would work, although it is described briefly in SOP 9. As I understand how it would work, one would take the previous data (and each year add one more observation), and either use it or some transformed value to create a mean and variance (after all, the data do assume a normal distribution, but this needs to be verified before analysis). Any new value could then be compared within that distribution at some computed probability. This technique raises several issues: (1) it assumes that the previous data used came from a stable, statistically normal population so that deviations from the mean over time did not show a trend - do we know that? (2) It has a level of Type I error defined, but no Type II error (accepting a false hypothesis). (3) No level of Z is defined that creates a finding that the current year sample is not "normal". Is it at the 90% probability level, or 95%, or 99%? Some level has to trigger an action. As multiple variables might be tested in a given year, there is some increasing probability as the number of tests increase that one or more might by random by judged significant, and therefore Type I error increases (Reviewers 1 and #3). Where else has this technique been used, and how successful has it been (Reviewer #3) in achieving the objective of detecting change and power (we know it cannot deal with power)? Recommendations of reviewers to seek some statistical help are well-taken. MK: *In addition to supporting the sampling design section and conducting power analyses, statisticians at San Francisco State University made suggestions for long-term analyses. These analyses, however, have not yet been conducted and developing a long-term trend report employing the suggested analyses is a high priority for the network.*

Data Archiving. It appears that this protocol was first drafted when Filemaker Pro 5 was the technology in use. However, a switch to MS Access was expected to be complete in 2005. Reference to the old technology is now out-of-date, except to note that the older data is being converted to be consistent with the new (Reviewer #1). The discussion on metadata is not well developed (Reviewer #2). If NPS prohibits use of MS Excel files, its use in Protocol #8 may need to be revisited. *MK: The database and SOP describing it has been completely revised to meet NPS standards. The database is in MS Access.*

Other comments:
Pagination: sometimes the pages are numbered in order and sometimes not. The narrative, for example, has page 10 of 9, and SOP 4 has page 7 of 6.

SOP #2 and #5. A raptor advisory is never well-defined for the reader. It is defined as a "policy", as an "area" (raptor advisory areas).

SOP #3. References to Richton et al. 1992, Buranek 1998, and Fesnock 1993 not in the literature cited section.

MK: These have been fixed.

Given the amount of reformulation of the basic questions being posed by this protocol, and how analysis will tease out the trends, a second full review is likely needed. While I may overrule this decision upon resubmission, I would recommend planning for another full review. I'll try to

arrange for the same reviewers but at this time cannot promise they will be the same folks. I wish you much success in the revision.

Sincerely,

James K. Agee
Virginia and Prentice Bloedel Professor of Forest Ecology

Attachments: PWR Protocol Review Checklist, Reviewer comments, Review drafts

PWR PROTOCOL REVIEW CHECKLIST

Protocol Name: Raptor Monitoring Protocol for Pinnacles National Monument, California
Reviewer's name and date: James K. Agee (Sci - bold) and Penelope Latham (Admin)

Sci/**Admin**	Overall Organization and Presentation of Protocol Narrative
Yes	1. Is the overall monitoring protocol well-organized with sections clearly delineated?
Yes	2. Does the protocol have a title page with authors' names, protocol version number and date? (Protocol version numbers should be constructed to allow for both major and minor changes.) Is there a Table of Contents, abstract, and the three basic sections: 1-Narrative, 2-Standard Operating Procedures (SOPs), and 3-Supplementary Materials or Appendices recommended in the NPS standards published by Oakley et al. 2003 (http://science.nature.nps.gov/im/monitor/protocols/ProtocolGuidelines.pdf).
In part. *Yes.*	3. Is there a complete and accurate table of contents with page numbers? (Chapters should be paginated consecutively, i.e. Chap. 1 (pp. 1-20), Chap. 2 (pp. 21-28), Chap. 3 (pp. 29-44), etc. to allow for modular updates.)
Yes	4. Are the tables and figures clearly labeled and understandable?
N/A	5. Is the protocol bound so that it lies flat, preferably in a 3-ring binder?
Section 1	A. Background and Objectives (Chapter 1)
No Yes, this section was expanded and literature support provided	1. Does the protocol narrative provide a rationale or justification for why a particular resource or resource issue was selected for monitoring? Is the history and background for this resource issue well-referenced with supporting literature cited?
No	2. Does the protocol narrative discuss the linkages between this and other monitoring projects?
No Yes. Management objectives were clarified.	3. Does the protocol narrative describe how monitoring results will inform management decisions?

No *Yes.*	4. Does the protocol narrative contain careful documentation of the monitoring objectives or monitoring questions being asked?
No. Yes, management thresholds/triggers are identified.	5. Does the protocol narrative identify specific measurable objectives such as thresholds or trigger points for management actions?
Section 1	B. Sampling Design (Chapter 2)
No. This section has been augmented along with a clear distinction between work conducted for long-term monitoring versus work conducted to meet management objectives.	1. Is there a clear and logical rationale for selecting the sampling design over others?
In part	2a. Were the criteria for site selection clearly discussed including stratification, spatial design, and whether this monitoring will be co-located and/or integrated with other VS monitoring protocols? (See Checklist, Section 1A2.)
No	2b. Has the target population or "sampling frame", and the sampling units, been identified? In other words, is the desired level of inference clear?
Yes	3. Is the sampling frequency and replication identified?
Yes	4. Is the timing of sampling defined?
Yes	5. Are the location of sampling sites clearly identified?
No	6. Is the level of change that can be detected for the amount or type of sampling being instituted identified? (See Checklist, Section 1A5.)
Section 1	C. Field Methods (Chapter 3)
Mostly. No permits needed for this protocol.	1. Are preparations for the field season and equipment setup included? Are requirements for permitting and compliance discussed?
No, Yes. Data sheets now available.	2. Does the protocol include clear and detailed information on taking measurements with example survey forms included? (Protocol variables and measurements may be discussed in detail in a SOP. A complete set of forms should be included in either the supplementary materials or a SOP.)
Yes	3. Is the method of access for sampling sites provided?
N.A.	4. Is there an overview of procedures for establishing, monumenting, and maintenance of plots discussed in one or more SOPs?
N.A.	5. Does the protocol include details for the post-collection processing of samples or vouchers?
Yes	6. Does the protocol include procedures to be followed at the end of the field season?
Section 1	D. Data Handling, Analysis and Reporting (Chapter 4)

In part	1. Does the protocol provide an *overview* of the process for entering, editing, and storing data, identification of database software, and whether the database is consistent with the recommended I&M database template structure? (For water quality protocols, see specific water quality guidance in Part B or WRD's General Comments 15, and checklist items in Section 2, items 8-10, below.)
No	2. Are quality assurance (QA) and quality control (QC) procedures presented for the various levels of data collection and analysis? (See water quality Part B guidance or General Comments 15 as appropriate.)
No	3. Is the data structure clearly presented and sufficient to capture the required information to meet the stated goal? Is there an overview of the database design?
No	4. Are there recommendations for routine data summaries and statistical analysis to detect change?
Yes	5. Is there a recommended reporting schedule?
No. Yes. All reports follow NRTR format. Examples are cited. Examples of summary tables provided.	6. Is there a recommended report format with examples of summary tables and figures?
No	7. Is there a recommendation for long-term trend analysis (e.g. every 5 or 10 years)?
In part	8. Does the protocol narrative include an adequate description of metadata and data archival procedures?
No	9. Does the protocol narrative describe the frequency of testing and review of protocol effectiveness?
Section 1	E. Personnel Requirements and Training (Chapter 5)
Yes	1. Does the narrative include a listing of the personnel and describe their roles and responsibilities, and qualifications?
Yes	2. Does the protocol include a discussion of training procedures for personnel?
Section 1	F. Operational Requirements (Chapter 6)
Yes	1. Are facility, vehicle and equipment needs identified?
No. PINN contributions listed in budget and discussed. No other specific cooperative agreements relevant at this time.	2. Is there a summary of key partnerships with agencies, organizations and individuals that are part of the monitoring program and a description of their contribution? Is there a list of relevant cooperative agreements and other partnership agreements, if applicable?
Yes	3. Is a schedule for the annual fieldwork and administrative needs required to implement this protocol included?

In part. *Yes.*	4. Is there an overall budget that summarizes the annual and periodic costs of implementation of the protocol? Does it seem reasonable?
No. Yes. Data management listed in budget directly. Also conducted by Raptor Technician to meet 30% recommendation.	5. Does the staffing plan and budget demonstrate that adequate resources have been allocated to data management, analysis, and reporting activities (ca. 30% are recommended)?
Section 1	G. Literature Cited (Chapter 7)
No. *Yes*	1. Are the literature citations relevant, sufficient and consistently formatted?
Section 2	Standard Operating Procedures (Selected essential SOPs in addition to those mentioned in the narrative outline are identified in the checklist below. For Water Quality protocols, Part B Guidance or WRD's General Comments 15 should be consulted when developing SOPs.)
N/A *Yes*	1. Is there a table of contents for the SOPs?
Yes	2. Are changes to each SOP clearly identified with a title, version number **or** revision date, and page numbers? Changes to protocol modules (Chapters or SOPs) should be reflected in the overall protocol version number and protocol revision history log either through a minor or major revision; however, you may also wish to develop a numbering scheme for SOPs, e.g. SOP 1.00, 1.01…
Yes	3. Is there a SOP with instructions for revising the protocol and a revision history log?
Yes	4. Is there a SOP with instructions for preparation before the field season? Is there a SOP with instructions for procedures and equipment storage during and after the field season? (Also see numbers 10 and 11 below.)
Yes	5. Is there a SOP for training field personnel?
No Yes	6. Is there a SOP that clearly defines protocol variables and how to measure them? (See Checklist, Section 1C2.)
Yes	7. Are there clear and detailed driving and other navigational instructions to sampling sites?
Yes	8. Are the details of Data Management identified in one or more SOPs? Topics to be included are at minimum identified in Section 1D and may include customized data management routines. Specifically for water quality monitoring data, does the SOP specify how data will be reported to WRD for entry into the Environmental Protection Agency's STORET database?

N.A. SOP 2 also highlights training needs to ensure consistent data collection.	9. For water quality monitoring and other monitoring as appropriate, is there a quality control SOP associated with each protocol that adequately documents QC objectives for measurement sensitivity (detection limits), measurement precision, measurement systematic error (bias as percent recovery), data completeness (including adequacy of planned sample sizes and statistical power – this topic may be in the SOP on Sampling Design), and (if applicable for lab measurements only) blank control? Are instrument calibration details included either in the QC SOP or in a separate calibration SOP?
N.A.	10. For water quality protocols, is there a SOP that includes an explanation of how data comparability (a quality assurance basic) was considered in choosing which protocols and chemical labs to utilize? Do protocol SOPs contain enough field and lab method details to allow others to determine if data produced is comparable enough to other regional data sets to be considered credible by regulatory agencies interested in the data?
N.A.	11. Do aquatic protocol SOPs adequately describe the details of all Sampling Protocols (Field and Laboratory), as well as equipment needs and operation, sampling techniques, sample preservation and handling and logistics?
In part. All major procedures accounted for.	12. Are all major procedures required for the protocol sufficiently explained? Are any SOPs missing?
No *Yes.*	13. Are the literature citations with the SOP relevant, sufficient and consistently formatted?
Section 3	Supplementary Materials or Appendices
N/A. All appendices and SOP listed in table of content.	1. Is there a table of contents with Section 3 – Supplementary Materials that clearly identifies the materials provided in this section of the protocol?
No. *Yes*	2. Are the supplementary materials relevant, sufficient and consistently presented? Consistent formatting is desirable, but not always possible.
No. *Yes*	3. Are data collection forms provided either in this section or in an SOP?
No. Yes, in each SOP and details with this SOP.	4. Is there a section for the Administrative Record that provides the history of protocol development and refinement? A summary event table is highly recommended in addition to the supporting materials required in the Protocol Review File Checklist, e.g. the initial study plan or protocol development summary, the results of protocol development studies, peer review comments and responses during the development phase, and/or any published protocol on which a major portion of the methodology included in this protocol is based. (The published protocol may be presented either in Section 2 or Section 3 depending upon its contribution to the current protocol.)

Additional Other Comments by Penelope Latham, PWR I&M Regional Coordinator, January 24, 2006

SECTION 1. Narrative
Overall Organization and Presentation of Protocol Narrative

1) Is the overall monitoring protocol well-organized with sections clearly delineated?

Yes, however as the SOPs do not have consecutive page numbers that are continuous with the narrative, it would be helpful if dividers were provided. Without dividers, it might help to put your page numbers at the bottom, away from the header and develop an easily comprehended numbering convention including SOP # and page number that would help if you were flipping through the document to find a specific SOP.

2) Does the protocol have a title page with author's names, protocol version number and date? Is there a Table of Contents, abstract, and the three basic sections recommended by Oakley et al. 2003?

The protocol title page has all the required information and in addition lists the SOPs. I would suggest moving the listing of SOPs to the Table of Contents. An abstract page is not included. This would be very helpful.

The protocol has two of the three recommended sections (Narrative and SOPs) however it does not identify them as such due to the fact that the SOPs are listed on the title page and the sections of the narrative are listed on the Table of Contents page. There is no section provided for supplemental materials. I think the protocol could benefit tremendously from the addition of this section. I would strongly recommend that the authors create a CD for distribution with the hard copy of the protocol that has (in addition to a digital copy of the protocol itself) a well-organized directory for all of the reference materials that are identified in this document with the exception of books and other similar media.

Once peer reviewed and approved, we will distribute the narrative, SOP, and any other supplementary material electronically only. The protocol will not be bound.

5) Is the protocol bound so it lies flat, preferably in a 3-ring binder?

No, it was presented in draft form so it is not clear how it will be bound.

Section C. Field Methods

1) Are preparations for the field season and equipment setup included? Are requirements for permitting and compliance discussed.

There is a very short summary in the narrative under Field Methods that does not present much of an overview of what the pre-season tasks are, how long they might take, or who is responsible for different aspects of preparation. For example, from the SOP it appears that the Wildlife Biologist is responsible for pre-season training. Isn't some training also needed for data management, safety training, etc? It is not clear how many people are involved in this effort (and

consequently need training) until section VII. Operational Requirements where it seems there is only one raptor monitor. If so, why is the raptor monitoring schedule dependent upon staff workloads (in addition to unpredictable weather)? If at least one person is dedicated to this monitoring, that should be their priority. There was no discussion related to compliance or permitting. Is this something you have to do in conjunction with this protocol? *MK: There is a balance of trying to present some broad overview in the narrative and save the details for the SOP. The section now clarifies priorities. An annual schedule (including field components) is presented in the protocol. Compliance and permitting is addressed in the protocol.*

Section E. Personnel Requirements and Training

1) Does the narrative include a listing of the personnel and describe their roles and responsibilities, and qualifications?

Yes, however, the wildlife biologist might benefit from some data management assistance when training the raptor monitor. Also there seems to be several components of the training schedule from self-help to hands-on training.

Section F. Operational Requirements

1) Are facility, vehicle and equipment needs identified? *Yes.*

2) Is there a summary of key partnerships with agencies, organizations and individuals that are part of the monitoring program and a description of their contribution? Is there a list of relevant cooperative agreements and other partnership agreements, if applicable?

None are mentioned and it appears that this is not applicable to current monitoring efforts. The narrative indicates that there may be some in place for California condors (not discussed), but condors are not currently part of this monitoring protocol.

3) Is a schedule for the annual fieldwork and administrative needs required to implement this protocol included?

Yes, there are schedules. However, the rationale behind the fieldwork schedule was not clear to all reviewers.

5) Does the staffing plan and budget demonstrate that adequate resources have been allocated to data management, analysis, and reporting activities?

No budget is provided with this protocol. The staffing plan is listed in the narrative but it does not list any assistance by a data manager. I wonder if this is a good idea. Also, see comment below. *MK: Budget is provided. Budget includes time from data manager, and PINN contribution to this project.*

SECTION 2. SOPs

1) Is there a table of contents for the SOPs?

No. None are complex enough to need one. *MK: SOP are in the TOC. Each has a TOC as well.*

2) Are changes to each SOP clearly identified with a title, version number or revision date and page numbers?

Yes. Page numbers are not provided but, more importantly, the changes are identified.

3) Is there a SOP with instructions for revising the protocol and a revision history log? *Yes.*

4) Is there a SOP with instructions for preparation before the field season? Is there a SOP with instructions for procedures and equipment storage during and after the field season? (Also see numbers 10 and 11 below.)

Pre-field season activities are discussed in great detail, however, it would be helpful to the raptor monitor (and reviewers of this protocol) if the reference materials suggested were all collated for ease of access. See suggestion below under Supplementary Materials.

7) Are there clear and detailed driving and other navigational instructions to sampling sites?

No. This information should be available somewhere – either in an SOP or in the supplemental materials. It would be very helpful if a map of historical sites, potential sites, and monitored sites (if these are different) were available. *MK: This is now available in a separate SOP.*

SECTION 3. Supplementary Materials

1) Is there a table of contents with Section 3 that clearly identifies the materials provided?
N/A

2) Are the supplementary materials relevant, sufficient and consistently presented?
N/A

3) Are data collection forms provided either in this section or in an SOP?

There do not seem to be any structured data collection forms. It is hard to imagine all the data being collected as natural history observations. I think data forms would greatly improve the consistency of information collected. *MK: A standard form has been created. It will be used in FY08 for field testing.*

4) Is there a section for the Administrative Record that provides the history of protocol development and refinement? At a minimum, this should include the Protocol Development Summary and/or any protocols upon which this protocol is based.

No. This should be provided. *MK: It is included with this SOP.*

Additional Comments:
It is hard to determine what species this protocol focuses on. The only species in any number seem to be prairie falcons. Lists of species included are found in different places in the protocol and should be clearly listed in the narrative. *MK: This has been clarified with the objectives. The focus is on prairie falcons.*

Given that prairie falcons are the only species of any significant size, it is not clear how much effort is being expended on prairie falcons vs. other occasionally observed species and of what value the additional monitoring of other species is.
One of the objectives is to assess human impacts but there is no monitoring of visitor use. *MK*: *No longer an objective. This may be research objective with separate funding in the future.*

If the purpose is to locate raptors and there is a concern that visitors disturb raptors, it is not clear to me why more time is spent monitoring raptors in high visitor use areas than in low visitor use areas. *MK: Raptors are monitored in high and low use areas. More monitoring occurs in high use areas to meet management objectives.*

Although the z-test was described in statistical texts that I had available (though not under that name), I question the validity of a z-test on any population of the size that appears to be found at Pinnacles including for prairie falcons. Approximate population sizes by species are never identified. I agree with other reviewers in strongly recommending statistical assistance. *MK: Section on types of analyes for annual and long-term trend reports has been significantly revised to address this.*

The protocol could be simplified if the text related to advising and admonishing the reader (presumably the raptor monitor) to care, etc. were significantly reduced. One would hope that any competent biologist would be aware of the importance of these admonitions. In addition, they can be conveyed by the wildlife biologist during training. *MK: Much of this was removed.*

I had the impression that this protocol was underfunded, that a revision of the monitoring plan with identified objectives, a sampling plan and more time allocated to a key number of sites could produce more useful information than the current plan. The current protocol seems more suitable to an earlier stage of natural history (observational) monitoring to gain better understanding of raptor biology and help to pose monitoring questions. *MK: There are several points in this bullet. The program's funding is based on previous years. It appears to be adequately funded. The objectives have been clarified to show that our interest is in tracking long term changes in the population and productivity.*

If the data management plan for this protocol is currently under revision, I would suggest waiting until the network has obtained statistical assistance in revising their sampling plan, and then developing the new database based on that plan. Under DM discuss the new ACCESS database and the conversion of old data to the new format but do not spend a lot of time discussing the Filemaker database format. A database structure diagram showing linkages among all database elements is very important in helping the reader and new raptor monitors understand how everything fits together. *MK: Data management has been revised and updated to meet current NPS standards.*

The relationship of raptor advisories to the monitoring protocol is unclear. They seem to be interwoven with monitoring. Are raptor advisories the result of monitoring activities (to meet the objectives of the protocol) or are they based on other objectives? I think it's critical to separate and clarify this. *MK: This monitoring effort started out to meet management objectives. Over time, it has evolved to also evaluate population trends. The protocol clearly states what the management and monitoring objectives are. Management is interested in the protecting nesting raptors from human disturbance during the breeding season. Monitoring is intended to track trends in occupancy and fecundity over time. Of course, tracking trends also informs management whose goal is to make sure populations remain stable or increase.*

SOP #2 refers to Appendix B. There aren't any appendices. *MK: This reference has been removed.*

In SOP #2, there is a long list of identifying characteristics by species. I would put information like this in a table or a side bar so that the information is more visible rather than having it be part of the regular text.

Reviewer 1.

The following bullets summarize comments from anonymous reviewers that were not already addressed above.

Nest success is best assessed at the time that young reach 80% of fledging age (Steenhof 1987) which can be thought of as "banding age"…Young are difficult to locate after they have left the nest. Counts after young leave the nest tend to "miss" birds…. **Counts of young at nests should be considered valid only at nests where all young were counted in the nest at or after banding age**. *MK: We collect data in a way to allow us to make comparisons to other studies where fledglings are counted at banding age. However, we take it one step further because impacts can occur all the way up to and including actual fledging. We are able to determine the numbers of young that have fledged b/c in most cases they are still visible at the nest from our watch spots. Again, we can report our data so it's consistent with other studies, but can also talk about fledging success.*

I question whether it is possible to determine sex of PF nestlings accurately using remote locations.

Reviewer 2.

Consider the strategy of searching a sample of areas for nesting birds (then gathering the demographic data) rather than monitoring a fixed number of known nests. *MK: The sampling design has been revised.*

Focus on attaining seasonal fitness per nest (ie. Did a territory successfully produce young in a certain age range, rather than collecting costly potentially inaccurate and very time consuming nestling and fledgling counts.

Reviewer 3.

Need to explain and justify why you spend anywhere from 1-2 hours to as much as 8-9 hours making observations. *MK: This is clarified and cited in the text.*

Shorten the protocol. *MK:* The protocol was greatly shortened by removing much of the redundancy. However, some sections as noted previously were expanded.

2008 Peer Review Comments

UNIVERSITY OF WASHINGTON
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November 25, 2008

The second scientific review for "Raptor Monitoring Protocol" for the San Francisco Area Network Inventory and Monitoring Program is complete. The protocol receives the following decision:

Possibly Acceptable with Major Revision

Attached to this letter are review and informational documents: (1) a PWR Protocol Review Checklist. Each question is addressed in the left column; if scientific, it is addressed by me and the word is in bold, and if administrative is addressed in normal font, as a "yes", "no", "in part", or N.A. [not applicable]. Extended administrative review comments follow the checklist. (2) The individual reviews are included with author's names erased, and reviewers are identified as R1 or R2; my comments are identified as PRC. The reviews are self-explanatory, but what I attempt to do here is place them in an integrated context beyond the abbreviated response in the PWR Protocol Review Checklist.

Overall, the protocol has much more substance than when it was reviewed in the first round (some of the same reviewers were used, and generally seemed pleased with the improvement on the technical side). There are still substantive technical issues to address, but the real issue in this draft of the protocol is style. The extended administrative comments and the PRC review, as well as the two peer reviewers, highlight these deficiencies. On the plus side, they are relatively easy to fix by someone with attention to detail, but on the minus side there are so many of them that it really detracts from the substance of the protocol.

The major comments can be summarized as:

Formatting is problematical. It would be best to provide continuous pagination and non-repetitive numbering of tables, figures, and appendices. It's quite laborious to scroll through the document and understand where one is. Some tables are missing or repetitive. Literature cited is inconsistent. As noted in the extended administrative review, "**The network needs to do a better job of editorial review**", and the bold font is clearly warranted.

Triggers for management imply a 5% per year decline is the management trigger, but the power analyses appear to be built around other thresholds. As R1, R2, and PRC suggest, the authors need to "close that loop".

Long term analyses are presented in too vague a manner (R1, R2). R2 provides some references to help here. A definitive procedure must be included (although it could be changed at the initiation of the data analysis if warranted)

SOP #5 was submitted in incomplete status. Please complete it.

Reviewers have identified a large number of other concerns. In your response, please provide a detailed list of how you addressed each review comment. The response made to the last draft of the protocol is not sufficient for this purpose. If this response is comprehensive, it is likely that the protocol will not require a second peer review. If there are questions remaining on the technical side, it will be sent out again to at least one reviewer. However, it will definitely be subject to another administrative review because of the major revision required.

I look forward to receiving your response.

Sincerely,

James K. Agee
Emeritus Professor of Forest Ecology
PWR Protocol Review Coordinator

Attachments: PWR Protocol Review Checklist, Reviewer comments

PWR PROTOCOL REVIEW CHECKLIST
Protocol Name: PINN Raptors (Resubmission)
Science Reviewer: J.K. Agee Admin. Reviewer: Penelope Latham, 11/18/2008.

Response indicated by initials of author (MK for Marcus Koenen; DBA for Dawn Adams) and text in italics.

	Overall Organization and Presentation of Protocol Narrative
Partly – Needs Improvement	1. Is the overall monitoring protocol well-organized with sections clearly delineated?
Yes	2. Does the protocol have a title page with authors' names, protocol version number and date? (Protocol version numbers should be constructed to allow for both major and minor changes.) Is there a Table of Contents, abstract, and the three basic sections: 1-Narrative, 2-Standard Operating Procedures (SOPs), and 3-Supplementary Materials or Appendices recommended in the NPS standards published by Oakley et al. 2003 (http://science.nature.nps.gov/im/monitor/protocols/ProtocolGuidelines.pdf).
No	3. Is there a complete and accurate table of contents with page numbers? (Chapters should be paginated consecutively, i.e. Chap. 1 (pp. 1-20), Chap. 2 (pp. 21-28), Chap. 3 (pp. 29-44), etc. to allow for modular updates.). **MK:** *Table of content has been added.*
No	4. Are the tables and figures clearly labeled and understandable? (See Admin comments below.)
Yes – but not clear how it will be bound when final.	5. Is the protocol bound so that it lies flat, preferably in a 3-ring binder? **MK:** *Protocol will be printed in 3-ring binder. Distribution will be electronically by posting to the web.*
Section 1	A. Background and Objectives (Chapter 1)
Yes	1. Does the protocol narrative provide a rationale or justification for why a particular resource or resource issue was selected for monitoring? Is the history and background for this resource issue well-referenced with supporting literature cited?
N/A	2. Does the protocol narrative discuss the linkages between this and other monitoring projects?
Yes	3. Does the protocol narrative describe how monitoring results will inform management decisions?
Yes	4. Does the protocol narrative contain careful documentation of the monitoring objectives or monitoring questions being asked?
In part	5. Does the protocol narrative identify specific measurable objectives such as thresholds or trigger points for management actions? **MK:** *language added to identify assessment points that are congruent with detectable trends.*
Section 1	B. Sampling Design (Chapter 2)
Yes	1. Is there a clear and logical rationale for selecting the sampling design over others?

Yes	2a. Were the criteria for site selection clearly discussed including stratification, spatial design, and whether this monitoring will be co-located and/or integrated with other VS monitoring protocols? (See Checklist, Section 1A2.)
Yes	2b. Has the target population or "sampling frame", and the sampling units, been identified? In other words, is the desired level of inference clear?
Yes	3. Is the sampling frequency and replication identified?
Yes	4. Is the timing of sampling defined?
Yes	5. Are the location of sampling sites clearly identified?
Yes	6. Is the level of change that can be detected for the amount or type of sampling being instituted identified? (See Checklist, Section 1A5.)
Section 1	C. Field Methods (Chapter 3)
In Part	1. Are preparations for the field season and equipment setup included? Are requirements for permitting and compliance discussed?
Yes	2. Does the protocol include clear and detailed information on taking measurements with example survey forms included? (Protocol variables and measurements may be discussed in detail in a SOP. A complete set of forms should be included in either the supplementary materials or a SOP.) (See Section 3, #2)
Yes	3. Is the method of access for sampling sites provided?
N.A.	4. Is there an overview of procedures for establishing, monumenting, and maintenance of plots discussed in one or more SOPs?
N.A.	5. Does the protocol include details for the post-collection processing of samples or vouchers?
Yes	6. Does the protocol include procedures to be followed at the end of the field season? (Readers are primarily directed to the appropriate SOP.)
Section 1	D. Data Handling, Analysis and Reporting (Chapter 4)
Yes	1. Does the protocol provide an *overview* of the process for entering, editing, and storing data, identification of database software, and whether the database is consistent with the recommended I&M database template structure? (For water quality protocols, see specific water quality guidance in Part B or WRD's General Comments 15, and checklist items in Section 2, items 8-10, below.)
N.A.	2. Are quality assurance (QA) and quality control (QC) procedures presented for the various levels of data collection and analysis? (See water quality Part B guidance or General Comments 15 as appropriate.)
Yes	3. Is the data structure clearly presented and sufficient to capture the required information to meet the stated goal? Is there an overview of the database design?
Yes	4. Are there recommendations for routine data summaries and statistical analysis to detect change?
Yes	5. Is there a recommended reporting schedule?
In Part	6. Is there a recommended report format with examples of summary tables and figures? **MK:** *Additional language was inserted to describe annual report content including format. Details are provided in SOP 5.*
Too vague	7. Is there a recommendation for long-term trend analysis (e.g. every 5 or 10 years)? **MK:** *Additional information was inserted to describe analyses for long-term trends. Details are provided in SOP 5.*
Yes	8. Does the protocol narrative include an adequate description of metadata and

	data archival procedures?
Yes	9. Does the protocol narrative describe the frequency of testing and review of protocol effectiveness?
Section 1	E. Personnel Requirements and Training (Chapter 5)
Yes	1. Does the narrative include a listing of the personnel and describe their roles and responsibilities, and qualifications?
Yes	2. Does the protocol include a discussion of training procedures for personnel?
Section 1	F. Operational Requirements (Chapter 6)
Yes	1. Are facility, vehicle and equipment needs identified? (Some of this information is by way of the budget table.)
N/A	2. Is there a summary of key partnerships with agencies, organizations and individuals that are part of the monitoring program and a description of their contribution? Is there a list of relevant cooperative agreements and other partnership agreements, if applicable?
In Part	3. Is a schedule for the annual fieldwork and administrative needs required to implement this protocol included?
Yes, but see 1F5	4. Is there an overall budget that summarizes the annual and periodic costs of implementation of the protocol? Does it seem reasonable?
No	5. Does the staffing plan and budget demonstrate that adequate resources have been allocated to data management, analysis, and reporting activities (ca. 30% are recommended)? **MK:** *Data management are aspects of various staff including field staff. We estimate that approximately 30% of budget goes toward data management and reporting.*
Section 1	G. Literature Cited (Chapter 7)
No	1. Are the literature citations relevant, sufficient and consistently formatted? (See Admin Comment below.)
Section 2	Standard Operating Procedures (Selected essential SOPs in addition to those mentioned in the narrative outline are identified in the checklist below. For Water Quality protocols, Part B Guidance or WRD's General Comments 15 should be consulted when developing SOPs.)
Yes	1. Is there a table of contents for the SOPs? (See Admin Comment below.)
Yes	2. Are changes to each SOP clearly identified with a title, version number **or** revision date, and page numbers? Changes to protocol modules (Chapters or SOPs) should be reflected in the overall protocol version number and protocol revision history log either through a minor or major revision; however, you may also wish to develop a numbering scheme for SOPs, e.g. SOP 1.00, 1.01…
In Part	3. Is there a SOP with instructions for revising the protocol and a revision history log? **MK:** *Comments and detailed responses from 2008 review have been added to the SOP*.
Yes	4. Is there a SOP with instructions for preparation before the field season? Is there a SOP with instructions for procedures and equipment storage during and after the field season? (Also see numbers 10 and 11 below.)
Yes	5. Is there a SOP for training field personnel?
Yes	6. Is there a SOP that clearly defines protocol variables and how to measure them? (See Checklist, Section 1C2.)
Yes	7. Are there clear and detailed driving and other navigational instructions to

	sampling sites? (See Admin Comment below.)
Yes	8. Are the details of Data Management identified in one or more SOPs? Topics to be included are at minimum identified in Section 1D and may include customized data management routines. Specifically for water quality monitoring data, does the SOP specify how data will be reported to WRD for entry into the Environmental Protection Agency's STORET database?
N.A.	9. For water quality monitoring and other monitoring as appropriate, is there a quality control SOP associated with each protocol that adequately documents QC objectives for measurement sensitivity (detection limits), measurement precision, measurement systematic error (bias as percent recovery), data completeness (including adequacy of planned sample sizes and statistical power – this topic may be in the SOP on Sampling Design), and (if applicable for lab measurements only) blank control? Are instrument calibration details included either in the QC SOP or in a separate calibration SOP?
N.A.	10. For water quality protocols, is there a SOP that includes an explanation of how data comparability (a quality assurance basic) was considered in choosing which protocols and chemical labs to utilize? Do protocol SOPs contain enough field and lab method details to allow others to determine if data produced is comparable enough to other regional data sets to be considered credible by regulatory agencies interested in the data?
N.A.	11. Do aquatic protocol SOPs adequately describe the details of all Sampling Protocols (Field and Laboratory), as well as equipment needs and operation, sampling techniques, sample preservation and handling and logistics?
Yes and Yes, SOP #10	12. Are all major procedures required for the protocol sufficiently explained? Are any SOPs missing?
No	13. Are the literature citations with the SOP relevant, sufficient and consistently formatted?
Section 3	Supplementary Materials or Appendices
No	1. Is there a table of contents with Section 3 – Supplementary Materials that clearly identifies the materials provided in this section of the protocol? (See Admin Comment below.)
Yes	2. Are the supplementary materials relevant, sufficient and consistently presented? Consistent formatting is desirable, but not always possible.
Yes – On CD	3. Are data collection forms provided either in this section or in an SOP?
Yes	4. Is there a section for the Administrative Record that provides the history of protocol development and refinement? A summary event table is highly recommended in addition to the supporting materials required in the Protocol Review File Checklist, e.g. the initial study plan or protocol development summary, the results of protocol development studies, peer review comments and responses during the development phase, and/or any published protocol on which a major portion of the methodology included in this protocol is based. (The published protocol may be presented either in Section 2 or Section 3 depending upon its contribution to the current protocol.)

Extended Administrative Review Comments:

Overall Organization and Presentation

1. Is the overall monitoring protocol well-organized with sections clearly delineated?

The protocol has been reformatted to comply with the NRRS guidance and the text is mostly well-written and procedures are very thoroughly described; however, the document still needs a good review for typographical errors and there is considerable confusion regarding the numbering of tables and SOPs. The CD provided with supplementary material and the Appendix describing the contents were helpful. Except for rare exceptions, I have not commented on typographical errors.

It's not very clear how you ultimately intend to organize this document. One volume or two? The SOPs should be published with the narrative either all in one document or in two volumes. Currently the narrative has a back cover at page 49 (no page numbers on covers please). There are no covers that surround the SOPs and the pagination starts over for each SOP. Identification of Tables and Figures is confusing when they are in a different sections or SOPs as the numbering of them starts over and they aren't always adequately identified. The First Order Heading guidance is not consistently followed and the pagination should be continuous throughout the document and all the sections including SOPs. SOPs should have page numbers in the Table of Contents. The Executive Summary is out of order. It should come after the TOC. **MK:** *The protocol has been reformatted by Kris Freeman to meet the current NRR Guidance. Additional formatting review will be completed once the peer review has been completed.*

Protocol revision logs appear in two separate places, at the beginning of the document and then again in SOP 4. I would combine these to avoid confusion into SOP 4. **DBA:** *The logs apply to different sections of protocol so both seem necessary.*

Consider moving the paragraph defining Core Areas on pg. 3 to pg. 1 where you first introduce the concept of core areas. **DBA:** *Moved the definition to glossary per Rev#2 recommendation.*

The names of SOPs in different places throughout the document are not consistent. Suggest searching for each SOP and ensuring that the name is correct. For example, SOP 5 is often referred to as Data Analysis and Reporting in addition to variations of that. The actual SOP is titled "Reporting" which should probably be changed to include Data Analysis. SOP 8 is referred to as "Safety" when it is "Safety Procedures", etc. **MK:** *Document has been reviewed and edited to make sure consistent SOP names are used throughout.*

SOP 5 appears incomplete and will need to be finished before the protocol is approved. **MK**: *Its unclear from this comment what reviewer wanted to be added. Perhaps the reviewer wanted data to be presented in the sample table that was presented. We have added some data and hope that addresses this comment.*

2. Is there a complete and accurate table of contents with page numbers?

Please recheck the page numbering convention for pages that are numbered with Roman numerals. Page ii should be the page that explains about the Natural Resource Report Series. It is currently numbered "iii". Pagination needs to be carefully checked. The reference on this page to the Natural Resource Publications Management website is followed by a link to the SFAN website. Correct the link to the NRPM website and add your own website if you would like.

I would suggest only including TOCs for the longest SOPs. Several of the SOPs are short and do not need them. Or eliminate the additional TOCs altogether and have one main TOC in a separate volume.

Tables are incorrectly numbered or at least do not coincide with their numbers in the text. For example, Table 1 in the TOC is listed on pg. 22. (On pg. 1 you refer to Table 1 for numbers of nesting pairs per year, but Table 1 is actually detection probabilities.) On pg. 22, the table is identified as Table 2. All references to Table numbers, SOPs and Appendixes should be closely checked. I will not list all instances where errors were found but the items below are a sampling.
Pg. 1, last paragraph. Neither Table 1 nor Table 2 occur as described. Table 1 is discussed above. Table 2 appears to be missing. Table 2 is a summary of reporting and communication needs. In addition, there is no section titled "Measurable Objectives."
On pg. 3, there are two references to Figure 1 but the second is probably a reference to Figure 2.
On pg. 21, you indicate that a summary of reports is provided in Table (needs capitalization) 5.1. but the table appears to be Table 2 on pg. 22.
On pg. 26, the budget table is referred to as Table 6.1; however, this table is found on the following page and is Table 3.
Not all Tables are listed in the TOC, e.g. Table 4 is missing.
Table 4 is incorrectly referenced as Table 6.2 on pg. 27.
In SOP 3, pg. 23 there is a reference to Appendix 1 that should be Appendix A.
Pg. 32 of SOP 3 refers to SOP 10 but there isn't any SOP 10.
SOP 3, pg. 33 refers to Table 4 but doesn't say where. I assume in the Narrative? There are only 2 tables in SOP 3. This is an issue for some other references as well. Advise following NRRS guidance to consecutively number everything. **DBA:** *All of these typos or other issues with tables have been fixed.*

3. Are the tables and figures clearly labeled and understandable?
Table and figure formats mostly adhere to NRRS guidance. I will not comment on finer details of formatting related to the NRRS. Refer to NRRS guidance for how to deal with tables that continue onto multiple pages and additional guidance related to placement of captions. It would help to give your graphs a more consistent look

Fig. 1. There are 3 additional areas shown on this map over those described in the Glossary. Were they overlooked?
Table 2. What does the Water Quality Steering Committee and Water Resource Division have to do with the Raptor protocol? On pg. 23 there is an incomplete sentence in the summary column for Vital Sign Report Card. I would delete some of the information in the summary column for photos if this information is in the SOP.

Table 4. Why is there so much room in the header row of this table? Why is there no information for months Aug. through Dec.? Why include them? Also there is no information for any of the row items beyond the first 2. It seems like you might present this information more efficiently. Pg. 17 refers to Tables 1 and 2 below and a spreadsheet but there aren't any. **MK:** *All of these issues with tables have been fixed.*

Tables in SOP 5: See below for additional discussion but I had a great deal of difficulty with the concept of "Possible fledglings". **MK.** *We changed possible fledglings to fledglings.*

Tables 2 and 3 in this SOP are identical. **MK:** *Table 3 was removed.*

Organization: SOPs

Most of the SOPs have literature citations incorporated into the text but there are no Literature Cited sections included in the SOPs although some have extensive lists of references or further reading suggestions. **MK:** *Before they were all listed at the end of the protocol. We changed it so that a reference list is provided at the end of each SOPs.*

SOP 1:
I would suggest rethinking your Table of Contents plan (see comments above) but the organization of this TOC is somewhat confusing as well. There is a list of Figures that one would assume would be in the main body of the SOP yet all of these figures appear in Appendix B which does not list them.
The organization of SOP 1 is a little awkward. By having separate month activities as First Order Headings you end up with a lot of empty space and extra pages. I would suggest a First Order Heading titled "Monthly Activities" followed by Second Order Headings for each month – unless you really intend to have them on separate pages that can be printed out.
Pg. 4 refers to SOP 3 as Field Notes. SOP 3 is Data Management.
Pg. 4 refers to Tables 1-3 for target areas. Only Table 1 seems appropriate and it is does not refer to "target areas". **MK:** *Headings were changed around.* **DBA:** *SOP names were corrected to be more consistent.*

The figures in SOP 1 could use some additional identifying information to help orient people not familiar with the areas. I found it very difficult to compare the access descriptions to the maps. I'd also suggest enlarging the maps and centering them. **MK:** *Site descriptions and figures were revised to reduce confusion. A table was added to correlate territory to site description and figures.*

SOP 3:
Remove underline from TOC
Pg. 5. Reference to SOP 6 seems to infer that this is the Data Management SOP.
Pg. 6, 23. Appendix 1 is actually Appendix A.
Pg. 7, Figure 1: Several tables seem to be missing from your ERD, e.g. Photo_Log, Media_Addresses, DB_Meta, Db_Revisions and Cloud Cover.
Pg. 11. Consider repositioning Figure 5 after the paragraph instead of in the middle of it.

Pg. 24 references 4-letter bird codes found in SOP 3. This is SOP 3 and there aren't any bird codes. There are territory codes in Table 2. Tables 3 and 4 (See pg. 33) are missing.
Pg. 28, refers to SOP 4 for raptor activities by month. SOP 4 is revising the protocol.
Pg. 32. Refers to non-existent SOP 10.
Pg. 35. Refers to non-existent SOP 9.
Pgs. 36-37. The list of photo instructions skips #10. **DBA:** *All of these typos, issues were fixed.*

SOP 4:
Remove underline from under Table 1 caption. **DBA:** *Underlining was removed.*

SOP 5:
In the TOC this SOP is called Data Analysis and Reporting. Its only "Reporting" in the SOP itself. Also see general comment above.
This SOP is incomplete and will need to be finished before it is approved.
Pg. 2. Change AAWRP to AARWP.
Pg. 6 refers to #6 above. There isn't a #6.
Tables 2 and 3 are the same. **MK:** *Much of this was fixed. Again it is unclear what was meant by the SOP not being finished.*

SOP 6:
The first major paragraph references SOP 5 for more information on how radios are used. SOP 5 is about reporting not field methods. **DBA:** *The reference was removed.*

SOP 7:
The first major paragraph references a non-existent SOP 9. **DBA:** *Paragraph was revised to match SOP 1 text., reference changed to SOP 1 and SOP 3.*

SOP 8:
Pg. 2 refers to the pinniped monitoring program. Is this supposed to be raptors? **MK:** *The reference was corrected.*

The network needs to do a better job of editorial review. A document like this is very difficult to review and the reviews are frustrating for both the reviewer and the author alike. It reflects poorly on the scientific rigor of the protocol.

Section 1A. Background and Objectives. Define base jumping or put in glossary. **MK:** *A definition has been added.*

Page 3 states that there are two measurable objectives but 3 are listed. **MK:** *There were three objectives but objectives 2 and 3 have been combined to reduce confusion. There are now two objections. .*

Section 1C. Field Methods
This section begins on pg. 14. A blank page should be inserted as each Major Heading is supposed to start on an odd-numbered (right-hand) page. **MK:** *The entire report was reformatted to meet the current NRR guidelines.*

There is still no discussion of compliance but I assume this is because none is needed. **MK:** *That is correct. There are no permit requirements imposed by PINN.*

Suggest adding a sentence to direct the reader to the appendixes where instructions and maps for locating sites are found.
Also suggest directing reader to field forms on CD. **MK:** *Directions and maps are now a separate SOP. Blank data sheet and sample data sheet are Appendices B and C.*

Section 1D. Data Handling…..
It's not clear why data summarizing the results of monitoring are kept in a separate spreadsheet instead of the database. It seems that a query could be constructed to extract this information in whatever form is needed and thus avoid the possibility of the spreadsheet data becoming corrupted. **MK:** *A spreadsheet had been used in the past. Currently, all data reside in the Raptor Monitoring Database. Simple queries are included that allow annual data summaries.*

Please check that all acronyms are defined either in the text or Glossary.
Table 2. Remove underline from 3-5 years. Unclear why reference to WRD occurs here. Close open paren on pg. 23. Delete "Provides.." or complete sentence. **MK:** *Acronyms were checked. WRD was removed.*

There is no reference to or discussion of a draft report format in the narrative. There is some discussion of reporting in SOP 5 where some examples of graphs and summary tables are displayed. The network appears to be waiting for additional information on trend analysis from the cooperator to add to this section.
MK: *Format follows NRTR. The SOP also cites that past annual reports provide a template for future annual reports. In particular the most recent annual reports from 2006 and 2008. The 2008 report has gone through peer review, and through the PWR Peer Review Official. All annual reports are posted to the network website:*
http://science.nature.nps.gov/im/units/sfan/vital_signs/Raptors/raptors_condors.cfm. Additional language about content for the analysis and synthesis reports including analytical techniques in R code are presented.

Section 1F. Operational Requirements
There is a budget, tasks by employee, and a partially completed annual schedule, but taken together, they do not give the impression that at least 30% of the effort is going toward data management. **MK:** *Language was added to the narrative above the table to assert that 30% of the budget goes to data management and reporting. It is, of course, impossible to say exactly how much goes to data management but given the amount of time that is spent on data entry, conducting qa/qc, and writing reports, this seems reasonable.*

Section 1G. Literature Cited
I recommend that you obtain a copy of the Literature Cited section from Ecology as a template for citations. Several of the citations need editing. One common error is to have two periods after the initial of the first name of a single author. Only one is needed. Commas aren't needed before "and" for two authors. "And" should be used before the last author on a multiple author citation.

In-text citations should only use “and Others” or “et al.” for more than 2 authors. Two authors should show both authors names followed by the year. There are many 2 author in-text citations that use et al.
Reverse the chronological order of the two LeBuhn and Connor citations. Same for Emmons, G. and Steenhof, K. Please check the citations in this section against those in the text. I counted 38 that I couldn’t find in the text itself. I may have missed some and some may be in SOPs (?) but 38 is a lot to be missing.
Abramsky citation says 2002 in the text and 1996 in this section.
Pg. 1: Steenhof et al. (notice spelling of et al.) 1998 – There is a Steenhof 1998 in the Lit Cited section but it is not et al.
Pg. 1: Millenium Ecosystem Services 2005 should be …Assessment 2005.
Pg. 2: Becker et al. 1980 citation is missing in Lit Cited although there is a 2-author citation in 1981.
Pg. 7: Marzluff et al. 1992 – There is a 1997 and a 1994 in the Lit Cited but no 1992.
Pg. 21: Press 2005 citation is missing in Lit Cited. **MK:** *All citations were checked and corrected.*

Section 2

1. Table of Contents for SOPs
There may be some confusion about the intent of this question. This form was developed before the NRRS format became standard so it does not necessarily apply now. You do not need to have a TOC for every SOP but you should have a TOC that includes the SOPs somewhere. **MK:** *The TOC was revised and TOCs were removed from short SOP.*

3. SOP for Revising the Protocol

Protocol revision logs appear in two separate places, at the beginning of the document and then again in SOP 4. I would combine these to avoid confusion into SOP 4. **MK:** *Previously addressed above. The logs are different.*

7. Detailed driving and other navigational instructions

There are very detailed hiking and navigating instructions to the sites but no driving directions. However, the maps should be useful in discovering how to get to the trailheads. **MK:** *Driving direction seemed unnecessary since it is a small park in a rural setting. There are only two roads in the park. The maps are more than adequate to find trailheads and territories.*

12. Are all major procedures explained?
If pinnipeds were used as a template for the JHA in SOP 8, are you likely to encounter the same types of hazards for pinnipeds and raptors? **MK:** *Hazards presented in the JHA are related to raptors. Sea level rise will have to be pretty significant before the pinnipeds hazards become an issue but we’ll revise the protocol when that time comes.*

Section 3

1. There isn't a table of contents but the supplemental materials on the CD are well organized.

PRC Comments

The style of this protocol is quite sloppy. As others note, it will need a serious edit in order to pass muster. Typos, missing tables, consecutive tables with the exact same data in them, extraneous literature, miscited literature, etc. etc. My review comments mirror those of the other reviewers:

Narrative:

Page 1 introduces a lot of literature cited with an incredible number of errors. First, "et al." is consistently presented backwards as "et. al". Second, the "et al." is used for many citations where there are only two authors, and it is in reality reserved for three or more authors only (Lundberg et al 2005, Mazur et al. 2000, Squires et al. 1997, Fife et al. 1976, Ogden et al. 1977, Delanoy et al.1988, Marti et al. 1989, Becker et al. 1981) . Sometimes citations should be "et al." (e.g., three or more authors) but are presented a single author publications (Croll 2005, Parrish 2001, Roemer 2002). Some are missing (Abramsky et al. 2002, Steenhof et al. 1998). Some are authored by the same person in the same year and need to be labeled "a" or "b" (Sekercioglu 2006). Some are misspelled (Millenium Ecosystem ~~Services~~ Assessment). This is just page 1!! These errors continue through the narrative although I have only identified those on page 1 -- but there are further issues in the literature cited section as noted below. **MK:** *All of these errors have been corrected.*

In addition (still on page 1), the Latin name for the peregrine falcon is misspelled, Table 1 does not show nesting pairs over time, Table 2 is missing, and appendix 1 is actually labeled appendix A. And we have not gotten to page 2 yet. **MK:** *Latin names, formatting and consistency issues have been corrected throughout the document.*

Page 3. Line 2 says two measurable objectives, but three are listed. The first sentence of the last paragraph is not a complete sentence**.** **MK:** *There are three measurable objectives. The sentence has been rewritten.*

Page 4. The copy of figure 1 I have is very hard to read - it would be improved with color. I see three patterns on the map but only two on the legend. **MK:** *Figure 1 was redone*.

Page 5. R1 also notes the confusion about the management trigger - what is "consistent", and is this 5% per year - and can the sampling design actually measure this? **MK:** *Management triggers have been revises and are in line with our ability to detect trends per the power analysis (50% decline over 10 years). Assessment points are used to trigger review of the data and evaluate cause and effect. Management actions can then be identified if cause of declines are well understood. If not, additional research may be required before specific actions can be taken.*

Page 6 and later. Please take out all the blank pages, they are a waste of paper and a distraction. **MK:** *I agree but blank pages are an unfortunate artifact of our formatting requirement.*

Page 8. figure 2 in my copy is unreadable. **MK**: *Figures 1 and 2 were combined and redone.*

Page 9. maximum is misspelled on line 1. **DBA**: *Spelling was corrected.*

What constitutes a year of low probability? **MK:** *Low detection probability occurs during years of low or no reproductive activity (e.g. 1998 or 2001). This makes documenting territories very difficult.*

Page 10. If the management trigger is 5% decline per year (see comment on page 5), then isn't the 5% decline power curve the relevant one to use. Other reviewers have similar concerns. **MK:** *Management triggers have been revised as stated above.*

Also, is it reasonable to assume that the sample size will remain constant over time (no new territories, no loss of existing, so n=15 over time in core and noncore areas? I am not an expert here, but thought that this should be more explicitly defined). **MK:** *All territories in the core area will be censused, and the remaining non-core territories will be visited in a panel design. The number of territories in this area has been stable over the last 10-15 years so it is reasonable to assume that they will remain stable. If a territory is no longer used for nesting, then this monitoring approach will detect that local extinction. Given our knowledge of the surrounding areas and the specific needs for prairie falcon nesting, we feel that colonization of other territories is highly unlikely. Therefore, survey resources will not be used outside this set of core and non-core areas. We plan consistent annual sampling effort across years.*

Page 12. Figure 4 did not show up well in B/W. **MK:** *Figure was redone.*

See comments on pages 5 and 10 about relevant power. **MK:** *Power analysis was redone.*

Page 13, Avoid the use of "You can see…". It's not good style, and in reality, no one can "see" because the data are not presented. **MK:** *All you can sees have been removed.*

Page 19. The first review asked about digital photography, and there is mention of this now, but the SOPs still have direction to the nearest B/W photo developing lab. **MK:** *The technician on the project is also a fine arts photographer who has published his work. Until this year, he has used a film camera. We have now removed archiving procedures for film photos and inserted language about digital cameras.*

Page 21. Table 5.1 is really Table 2 (and not the missing Table 2 from page 1)? Press (2005) not in lit cit. **MK:** *Tables and figures were corrected throughout the document. Press added to literature cited.*

Page 22. The water folks are probably not part of the "audience" here. **MK:** *That is correct. Reference to them was removed.*

Page 23. Photo specs here imply digital photos but do not mandate them (see comments page 19): **MK**: *The protocol now uses digital photos.*

Page 47. Is Rechtin 1992 the Rechtin and Leatherman 1992 in the lit cit? If so it should be cited here. **MK**: *No, it's a separate citation that is in the Literature section.*

Page 37. I found 45 citations here that were not cited in the text (at least I did not find them): Abramsky et al., Anderson and Squires, Baicich and Harrison, Bent, CDFG, Cannings and Angell, Clarke, Crocoll, Curtis and Rosenfield, Dunn, Dunne et al., Elzinga et al., Emmons (2), Emmons and Fesnock, Fischer, Haug et al., Herman, Hintze, Holt and Petersen, Holthuijzen et al., Houston et al., Janes, Johnsgard, Johnson, Kirk and Mossman, Lundberg and Moberg, MacWhirter and Bildstein, Marks et al., Martell, Marti et al., Marzluff et al., Moritsch (2), NOAA, Palmer, Preston and Beane, Roemer et al,, Sekercioglu (once cited but two 2006 refs), Sibley, Smallwood and Bird, Steenhof and Kochert, Suter and Joness (really 2 s's?), Wheeler. Remove them. **If they refer to SOP's then cite them there**. Order of citations is not always correct. Correct order is: Emmons 2006 precedes Emmons 2008, LeBuhn and Connor 2007 precede their 2008 paper, Marshall precedes Martell, Roemer precedes Rubine, Steenhof 1987 precedes 1998. Admin review identifies other formatting issues with the lit cit section. **MK:** *These citations were not cited in the protocol. They were listed, however, because previous technicians thought that future staff might be interested. We cited them as useful resources in the text and then added them to the list of references to avoid confusion.*

SOP #3

Page 34. Print copies and negatives imply digital imagery will not be adopted. **MK:** *Digital imagery has been adopted. Discussion of film, negatives, and archival procedures have been kept in only to provide background on previous procedures.*

Page 44. One whole page is devoted to a header labeled appendix A, but the next page says appendix 1?
Page 20 of appendix 1: the pages I have are punched so the page number is now on the right side of the page rather than the left. **MK:** *Appendices have been relabeled. Not sure I understand the problem with the page numbers but I think reformatting has fixed the issue.*

SOP#4

These are punched backwards so that page 1 is the back side of a blank page.
Appendix A is not needed. Prior review comments are not that newsworthy for the next version of the protocol, and the "responses" are rather incomplete. There are punching problems with this appendix, too - half of it is inserted upside down and backward. **MK**: *We decided to retain previous comments. We believe that the intent of the SOP on Protocol Revision and Review was to track changes to the protocol. Significant changes have been made that are worth noting especially since changes were made while monitoring continued. If the changes were made to the protocol before monitoring began, then we would agree that it does not make sense to keep them. I am not sure what you mean by punching problems.*

SOP #5. This SOP is incomplete, and needs to be completed. **MK:** *Not sure what the reviewer thought was missing. Changes have been made and we hope that the reviewer's concerns have been addressed.*

SOP #8. On page 2, extreme heat is defines as "<100°F" -- is ">100°F" meant? How would a rodent infestation occur - back in the office? **MK:** *Yes, >100 degrees was meant.*

Reviewer #1 Pinnacles Raptors

Below are my comments based on review of the documents entitled "Raptor Monitoring Protocol for Pinnacles National Monument." I found the monitoring protocol to be comprehensive and in general well put-together – it could still use some tightening up in a number of sections. I am comfortable that the proposed monitoring scheme will be effective to record data relevant to prairie falcon occupancy and nesting success (productivity) in the national park and to accurately and adequately archive the data. The only potential concern that remains for me is that the report contains references to power analyses conducted on previously collected data, but I was left uncertain how those analyses related to the current recommendations for triggers for management. Triggers for management mentioned were a consistent 25% decrease in occupancy based on five-year analyses or two breeding seasons without successful reproduction. These seem reasonable enough in and of themselves, but it is unclear how they were derived based on the power analyses discussed (if they were at all). It would be helpful if the authors could close that loop, as reiterated below. From my reading of the power analysis results and based upon what is stated on p. 10 and in figure 3, holding alpha at 0.20, there is an approximately 65% chance of detecting a 10% decline. How does this compare to detecting a 25% decrease, which is stated as the trigger for management? I am confident that with the help of the biometrician, this can be worked out, but I do not see this clarified in the current report.

Background and Objectives: What are the monitoring questions proposed?
This section is well justified. There is clear information about background and the history of the natural resource issue being addressed. The monitoring questions are relevant and well described. The cliffs upon which raptors nest have been of interest since the inception of the park. These cliffs also are of value to recreationists. Monitoring populations of cliff-nesting raptors is the primary objective, but management of potential conflicts with climbers and other park users remains important.

Specific objectives relate to monitoring prairie falcons, the most abundant cliff-nesting raptor in the park, in both core and non-core areas. Core areas are those areas where climbing potentially impacts cliff-nesting raptors because these areas are easily accessible to park visitors. Non-core areas are all other areas within the park suitable for cliff-nesting raptors. Monitoring is aimed at tracking changes in number of prairie falcon territories (Objective #1), and tracking changes in nesting success as determined by number of young per nest that fledge in core and non-core area nests (Objectives #2 and #3).

The middle paragraph in the section on Trigger for Management Activity (p. 5) is unclear. First, is the statement "in the core areas or the core and non-core areas" the intended one? Should this be a reduction in either the core or non-core area that triggers a possible management action, i.e., would a 25% reduction in the non-core area alone be of sufficient concern to trigger management? Second, and more important, it is stated that "if a 5-year analysis documents a consistent 25% decrease….", then management will be considered. It is not clear (1) what a five-year analysis is, and (2) what "consistent" means. Is a five-year analysis one that examines the current year in relation to the last five years, or one that takes the current five years and compares them to historical data in some fashion? Or, is it an analysis that occurs only once every five years? This is not clear here or in later portions of the protocol document. Moreover,

does the use of the term consistent mean that # of nests declines by 25% in each year, or something else? Can the authors please clarify these issues in this paragraph as well as throughout the report?

What is the sampling design chosen?
Sampling in this case is somewhat simplified because monitoring constitutes almost a complete census of prairie falcon territories in the park. The entire core area is searched and monitored each year, as are all of the appropriate nesting cliffs in the non-core areas. Occasionally new territories arise so the authors suggest periodic extensions of searches into areas not previously identified as territories.

Can the authors please provide a definition for territory? Are they discussing nesting territories, feeding territories, all inclusive territories, or what? Is 'nest site' synonymous with 'territory' in the description of Study Area on p. 7? **MK:** *A definition already exists in the glossary. Additional wording has been added to emphasize that feeding territories are not the focus of the protocol and that the "territory" is not synonymous with "nest site". Additional language in the text should clarify what is meant by territory.*

Study Area: p. 7 and fig. 2. Text indicates 30-40 degree slopes, but figure legend mentions 40 degree slopes only. The statement "The resulting map demonstrated that all expected nest sites had been previously searched and could reliably be discounted as nest sites" is a bit confusing. Could expected be replaced by potential and discounted be replaced by unlikely or something else to help clarify (if I am following this correctly)? **DBA:** *The text was clarified.*

Sampling frequency (p. 9) - the first sentence mentions occupancy as presence of at least one prairie falcon, whereas the sentence under Table 1 mentions that "pair presence in any of the three surveys confirms occupancy…" Is a site occupied if at least one falcon is present, or does it take a pair before it is considered occupied? The glossary includes a description of 'occupied territory' that mentions one or more birds. **MK.** *Occupancy is defined by the presence and territorial behavior of at least 1 bird. Territorial occupancy is defined by presence and territorial behavior of a pair of falcons Table 1 was clarified.*

The sampling frequency data in Table 1 (p. 9) clearly indicate that three site visits is suitable to assess occupancy with a 96% or greater chance of detection. This seems well justified.

Length of Site Visit: p. 9. I'm sorry, but the last two sentences on this page do not make sense. How can lack of occupancy be determined from observations of bird behavior and verification of the phenology stage, and how can this determine the duration of a site visit? **MK:** *Occupancy is determined when a variety of territorial behaviors are noted (e.g. defensive/aggressive behavior, food exchanges, copulation, etc). As it states in the text, if some of these behaviors are observed within an hour, the technician can move on. If however, the behaviors are not noted, at technician may have to stay longer, up to 4 hours. Lack of these behaviors within the 4 hour suggest that the territory is not occupied and a repeat visit will have to be scheduled. Perhaps only a fly-by was noted. We removed reference to phenology in case that caused further confusion.*

Are the methods proposed within that design appropriate?
Details about taking measurements. The addition of field forms seems to be an improvement over notebooks alone. Testing of the field forms prior to formal adoption seems like a reasonable approach, but their incorporation into the study design is a must. **MK:** *I agree that this is a must. The reason we stated that we were testing the forms was more about testing the design of the form, not testing whether or not to use. We will be using a field form. It is attached as Appendix A and a sample filled out form is Appendix B.*

There does not appear to be adoption of digital photography despite that being an issue raised by earlier reviews of the protocol, or did I miss this? **MK:** *Digital photography will be used starting FY10.*

What analytical techniques will be applied to the data, and how often? **MK:** *SOP 5 describes data summaries that are part of annual reports. The SOP also outlines the types of trend analyses that will be completed every 3-5 years in future Analysis and Synthesis reports.*

Procedures for data entry, validation and archiving appear well described and suitable. Perhaps there will be a future role for electronic archival of original materials as compared to storage in a fire-proof cabinet alone.

As the entire population of prairie falcons (or close to it) will be under study, there is not substantial need to justify sampling procedures in relation to the proportion of the population that will be monitored. Thus, a focus on the procedures to detect change are probably most important. The description of the power analysis and error calculation based on LeBuhn and Conner (2007, 2008) adds to the background for the monitoring protocol. However, a direct connection of the discussion on pp. 10-13 with the recommendation on p. 5 about a 25% consistent reduction based on a five year analysis is a little difficult to see in the current report, if it exists at all. Can the authors please close this loop and use the section on pp. 10-12 to justify the recommendation for this trigger for management? Moreover, the description on p. 13 of using fecundity data in a broad context where a reproductive failure for two years, or if in a single year there were failure and no significant establishment of nests in subsequent years, sounds reasonable, but can this also be a highlighted approach on p. 5? How is this related to the statement on p. 5 about productivity dropping by 25% triggering management? While the recommendation for management activity if there is a 25% reduction in occupied territories or if there is reproductive failure for two years seems reasonable, my point is that I do not see if and how the analyses by LeBuhn and Conner (2007, 2008) lead one to these specific recommendations.
MK: *Management triggers were revised to be consistent with our ability to detect trends of 50% declines over 10 years. This includes declines in occupancy or fecundity. Assessment points at 5 and 7 years are a reminder to review data and determine if declines appear to be occurring and if additional research or management activities should be considered.*

Other issues that I noted as I read: et al. is incorrectly written throughout the report as et. al
the scientific name for peregrine falcons is misspelled on p. 1
DBA: These typos have been fixed.

scientific names for species mentioned in para. 3, p. 1 should probably be provided, e.g., long-eared owls and sharp-shinned hawks. In general, it would be useful to provide sci. name for a species the first time it is mentioned and then no need thereafter. **DBA:** *This has been corrected.*

P. 5, last sentence; can the authors add 14 other "species of" raptors? **DBA:** *This has been corrected.*

Table 1 and Table 2 mentioned on p. 1 seem to be incorrect, i.e., Tables 1 and 2 do not contain this information in the printed copy that I received. **DBA:** *This has been corrected.*

A few typos on p. 3: chicks/nest rather than chick/nest?; objectives is misspelled in para. 3; the first sentence of the last paragraph is a fragment (does it need an "are" after data and before collected?). **DBA:** *This has been corrected.*

Figure 1 – I had a note asking if "territories" in the legend of this figure can be defined or clarified, i.e., are these defended areas around nests, or do they just refer to nest sites rather than territories? **MK:** *Figures 1 and 2 were combined to show historical nest sites in the core and non-core area. Also potential nesting areas based on slope. There is no mention of territories to avoid confusion.*

Scientific names in the first para. of p. 5 would be helpful here. **DBA:** *This has been added.*

I could not read the legend on Figure 2 contained within the map on my copy of the report. Can it be enlarged where necessary which allows it to come through clearly in reproductions? **MK:** *Legend was enlarged.*

P. 7, last sentence; Does the statement about a complete census of the non-core areas need a qualification about funding, as earlier in the report? **MK:** *The earlier qualification noted that monitoring would not take place in the non-core area if funding became an limited. It is also stated with the budget and does not need to be addressed again. .*

Maximum is misspelled on the top of p. 9 **DBA:** *This has been corrected.*

top of p. 9; I'm not certain, but I think historical nesting area is a better description than 'historic.' Can the authors consider a change here and elsewhere in the report where historic is used? **DBA:** *All references changed to historical.*

13) p. 9; Is occupancy defined as 'at least one prairie falcon' as in the first sentence, or 'pair presence' as in the first sentence below table 1? Does lack of presence of a pair or an individual confirm lack of occupancy (relating to statement below table 1)? [PRC note: I couldn't get a clean transfer from pfd file to Word, so that's why there are 2 number "13"'s]. **MK:** Occupied *territories (occupancy) is defined as presence of at least one prairie falcon as stated in the glossary. So lack of the presence of an individual confirms lack of occupancy.*

P. 13, end of last paragraph; there is a close quote but no start quote that I can find. Who is quoting whom here? Are these the recommendations from the data analysts or from the authors of this report? How do these recommendations relate to those on p. 5 of the report that mentions 25% decline in occupancy or productivity rates? **MK:** *As noted above, management triggers were revised. Quote was removed.*

P. 14 – first para. states field visits starting in Feb.; I am not sure – did I recall reading that visits start in March earlier in the report? Moreover, I saw on p.7 that sampling is limited to the raptor-breeding season, and the dates are shown as Jan-Jul, so does this indicate sampling may be as early as Jan.? These are perhaps very minor inconsistencies in the report that could be clarified if necessary. **DBA:** *Sampling does begin in January and this was corrected.*

P. 14 – I thought I recalled reading earlier in the report that 2006 was the year for breeding for peregrine falcon nesting at PINN, rather than breeding records from 2005 as reported here? **DBA:** *2005 is the correct year.*

P. 17, first paragr.; This section says that data are used by biometricians working with park service staff to determine trends over 5-year intervals, "as described further in the Data Summaries and Analysis section below." P. 23, bottom paragr., says that SOP 5: Analysis and Reports contains details on the analyses and reports. P. 14 of SOP 5 states that trends will be reported on occupancy and fecundity, by "comparing averages for most recent 5 years to previous 10 year or longer periods" but it is not clear how this would be done. The same is true for the fecundity data. I guess my question is, what type of statistical test is planned here, such that a p-value is generated and compared to 0.05? Is this the same z-test approach that the original report included? The last paragraph mentions MANCOVA when apparently speaking of MANOVA, or is there some covariate that will be included if a multivariate approach including the two response variables (occupancy and fecundity) are included? Incidentally, I am having a difficult time imagining how a MANOVA on these two variables can be performed, because occupancy is yes or no response at a given site, and MANOVA dependent variables are to be continuous responses. What is the experimental unit being considered here (a given nest site, or the entire suite of possible sites in a given year)? Can the authors give an example of the analyses they envision, as I am having difficulty pulling it together based on what is written currently? **MK***: Based on recommendations from a different statistical consulting team, we plan to analyze trends in occupancy and fecundity using zero-inflated binomial models and a likelihood ratio test. We no longer plan to use MANOVA for these analyses.*

P. 32 glossary – where is the definition for fecundity? Is fecundity synonymous with productivity? Note that the latter is usually defined as the number of offspring produced whereas it is not hard to find dictionary definitions referring to fecundity as the "capacity to produce offspring". Maybe a definition would be useful in the current report if this term is going to be used. **MK***: Yes, fecundity is synonymous with productivity. We added it to the glossary and linked it to productivity.*

Should it be "juvenal" feathers rather than "juvenile" feathers – not sure? **MK:** *consensus is juvenal.*

Figure 3 legend. I was uncertain what SFAN stood for here and elsewhere in the protocol. Should this be PINN? Perhaps Park Service personnel all know SFAN, so there is no need to define in the report?? **MK:** *It is defined the first time it is used.*

Table 2, p. 23, Last column under summary for Vital Sign Report Card the term "Provides" is dangling. This occurs in other tables as well. **DBA:** *Corrected.*

SOP #5, p. 1 says that "This section is pending input from SFSU". Is that still the case??? Perhaps this is not the final SOP for review? Hopefully, SFSU will provide the statistical approach to assessing trends in occupancy and fecundity for use here. **DBA:** *were waiting for SFSU but had intended to take this comment out before submitting. The statement is now removed.*

Tables 2 and 3 in SOP #5 contain the same data as far as I can tell. **MK:** *Table 3 was removed.*

The literature cited section on pp. 37-45 could use quite a bit of editing to tighten it up related to consistency, punctuation, accuracy and format. **DBA:** *This was reviewed.*

Reviewer #2 Pinnacles Raptors

I reviewed the monitoring protocol following the review questions outlined in the guidelines provided to the reviewers. In addition, I added a general and a minor comment section, summarizing stylistic and grammatical comments, at the end of this document. Below is a summary of the major findings of my review:

I thought that the PINN raptor monitoring protocol has vastly improved over the version I first reviewed; quite an accomplishment. Comments from my previous review have been addressed. The authors improved the sampling design section and added power analyses. Authors also added a Glossary.

I disagree that objective 3 should be dropped when funding is limited. If nesting success Prairie Falcons is only measured in core areas, then any decrease in core nesting success cannot be attributed to visitor disturbance. The non-core area nesting success estimates provided vital information on the variation of nesting success in relation to factors other than visitor disturbance, such as climate. If objective 3 cannot be accomplished on an annual basis, I suggest that objective 2 should also be dropped and funding should be carried-over to the next fiscal year to allow temporal overlap of nesting success assessments in and outside of core areas. **MK:** *We acknowledge that dropping an objective is not ideal and only considered if there are serious funding shortfalls.. However, we also note that measuring visitor disturbance is not a monitoring objective of this protocol any more (it was in an earlier version). Dropping objective 3 is an simply a money saving feature while still continue monitoring in the area where it is critical for the park to have nesting activity data that support management activities. Dropping objective 2 would provide additional savings but it would not give the park information it needs to lift advisories. Also, given the way our budget works, it is not easy to carry over funds into another fiscal year.*

Why does detection probability differ among years? Please explain! Is detection probability influenced by observers, weather, or annual fluctuations in Prairie Falcon densities? How are differences in detection probability incorporated into the analyses? **MK:** *Low detection probabilities occur in years when you have low or no reproduction. That makes finding active territories very difficult. For example, 1998 or 2001 were years of low reproductive success and also have low detection probabilities. Additional explanation was provided in the text.*

The analyses section needs further expansion. Approaches to analyze long-term trends need to be developed in more detail, explicitly outlining which statistical analyses are employed for which data set. **MK:** *This section has been expanded to more explicitly address analysis and hypotheis testing approaches.*

BACKGROUND AND OBJECTIVES: WHAT ARE THE MONITORING QUESTIONS PROPOSED?
a. Background and history: describe the resource issue being addressed
The Pinnacles National Monument harbors a variety of breeding raptor species, the most common of which is the Prairie Falcon. Other less common species include the Golden Eagle, Red-tailed Hawk, Red-shouldered Hawk, Northern Harrier, Peregrine Falcon (recently established), American Kestrel, Cooper's Hawk, and Sharp-shinned Hawk. Realizing the uniqueness of The Pinnacles National Monument in providing breeding habitat for raptors, particularly for the Prairie Falcon, Golden Eagle, and Peregrine Falcon, naturalists have surveyed raptors since 1910. The Pinnacles National Monument is also famous for its rock climbing and recreation opportunities; rock climbing potentially interferes with breeding raptor species, such as the Prairie Falcon. Recognizing the potential interference of rock climbing with breeding raptors, the National Monument initiated a study in 1982 under the auspice of the Santa Cruz Predatory Bird Research Group. This study recommended monitoring breeding success of raptors. As a result, the National Monument established a monitoring protocol in 1986, which was implemented in 1987 and has been used since that time (from previous review).

b. What is the rational for selecting this resource to monitor?
According to authors, raptor species, being a top food chain predator, are indicator species of the overall rock/cliff ecosystem and the surrounding agricultural areas and management of rock climbing activities. Moreover, raptors are charismatic species highly valued by park visitors (from previous review).

My comments have been addressed.

c. What are the measurable objectives?
The objectives of this monitoring plan are:
1. " Track changes in total numbers of prairie falcon territories occupied in a.) the core climbing areas and b). non-core areas."
2. "Track changes in prairie falcon nesting success as measured by number of chick/nest produced and number of chicks/nests fledged in core climbing areas."
3. "Track changes in prairie falcon nesting success as measured by number of chick/nest produced and number of chicks/nests fledged in non-core climbing areas."

WHAT IS THE SAMPLING DESIGN CHOSEN?
a. The rational for the design and site selection, and replication in space and time, must be addressed.
Compared to the previous version, I found the rational of the monitoring design to be well developed. The new monitoring plan now focuses only on Prairie Falcons, the most common species. However, per my previous comment, PINN should consider developing spatial models of habitat use for Prairie Falcons and visitor use.
With regard to productivity estimates, I still think that given the budgetary constraints, the monitoring plan should focus on attaining seasonal fitness per nest, i.e., did a territory successfully produce young in a certain age range, rather than collecting costly potentially inaccurate and very time consuming nestling and fledgling counts. Brood reduction cannot be solely attributed to recreational activities; there are many other factors that will influence brood size reduction, such as food availability, siblicide, and degree of parasite infestation (see Birds of North America Account of prairie falcons by Karen Steenhof). By sampling seasonal fitness, a less-costly sampling approach, funding could be invested developing visitor-use spatial surfaces.

b. Site selection
(1) Criteria for site selection: Well defined.

(2) Procedures selecting sampling locations; stratification, spatial design.
Seems fine.

c. Sampling frequency and replication.
Seems fine.

d. Recommended number and location.
Seems fine.

e. Recommended frequency and timing of sampling.
Seems applicable.

f. Level of change that can be detected for the amount/type of sampling being instituted.
This section has vastly improved compared to the previous version. Authors implemented power analyses to detected predetermined changes in number territories and fecundity. Power analyses suggest that sampling design is sufficient to detect a 10% annual decline in number of territories and 15% annual decline over 10-years in fecundity.

ARE THE METHODS PROPOSED WITHIN THAT DESIGN APPROPRIATE?
a. Describe the details of taking measurements, with example field forms.
Authors did a great job describing how behavioral observations are cataloged. Example field forms were also provided.

WHAT ANALYTICAL TECHNIQUES WILL BE APPLIED TO THE DATA, AND HOW OFTEN?
a. Describe metadata procedures.
Well developed and discussed; this section has vastly improved.

b. Provide an overview of database design.
Database design seems appropriate.

c. Describe procedures for data entry, verification, and editing.
Data verification and editing are well outlined in SOP and seem appropriate.

d. Describe routine data summary procedures and statistical analyses to detect change.
This section has much improved.

e. Describe methods for long-term trend analysis (e.g. over 5-10yrs).
This is the weakest section of the monitoring plan. Authors need to explicitly outline how long-term data sets are analyzed and which statistical tests are going to be employed. Several approaches are available, generalized additive models may be a good start because they allow the inclusion of covariates such as number of park visitors and climbing activity. Please refer to Fewster et al. for an excellent discussion on the analyses of long-term data and associated potential biases (Fewster, R. M., S. T. Buckland, G. M. Siriwardena, S. R. Bailie, and J. D. Wilson. 2000. Analysis of population trends for farmland birds using generalized additive models. Ecology **81**:1970-1984). Associated small sample size biases in long-term analyses need to be discussed. **MK**: *Because we are assuming imperfect detection of prairie falcons, zero-inflated binomial models will be used (MacKenzie, et al., 2006). This approach allows the inclusion of covariates collected at the site, year, site-by-year, and visit levels. Trend is estimated by including a year term in the occupancy model for occupancy monitoring and in the binomial probability model for hatchlings/fledglings for fecundity monitoring. Power analyses of the likelihood ratio test for the linear trend coefficient indicate that samples of 27 to 30 territories for occupancy monitoring and 10 occupied territories for fecundity monitoring provides an adequate basis to detect a 50% decrease after 10 consecutive survey years***.**

ADDITIONAL COMMENTS

RAPTOR MONITORING PROTOCOL
General Comments:
Table 1 is either missing or numbering of Tables is incorrect. However, if numbering of Tables is incorrect, reference to Table 1 (now Table 2) on page 1 does not make sense. **DBA:** *Table 1 was corrected.*
Terms are inconsistently defined throughout the text. Some are defined within the text whereas others are defined in the Glossary only.
The monitoring plan needs careful editing (see Minor Comments below).
Consistently use PINN throughout the text. I found deviations from PINN such as “At Pinnacles”. **DBA:** Inconsistencies were found and corrected.
Pg 13, last paragraph: Authors state that “…fecundity is most likely to be one of the most sensitive indicators of threat”. Threat to what? Fecundity is also very sensitive to climate change

and annual fluctuations in prey densities. This underlines that fecundity needs to be measured in core and non-core areas simultaneously to preclude false conclusions that visitor activities cause a decline in fecundity. **MK:** *While fecundity is a sensitive indicator, we acknowledge that by simply finding a decline, we will not necessarily know the cause of the decline. It could be related to visitor effects, and it may not be. The objective of our monitoring is to inform us about status and trends. The concern that by not monitoring non-core areas during years of funding shortfalls we would not be able to make conclusions about the visitor effects is valid and we do not intend to make them.*

I checked citations against Literature Cited sporadically but authors need to do a thorough check of citations. **DBA:** *As noted previously this has been checked and corrected.*

Minor Comments:
Pg. vi, 4th paragraph: Change "focuses" to focused **DBA**: *This was fixed.*
Pg. vi: Combine objectives 2 and 3 into one, following outline of objective 1. **MK:** *We left them as separate simply to clarify what would get dropped in case of budget shortfalls.*

Pg. 1, paragraph 4, line: Table 1 not included in review package.
Pg. 1, last paragraph: I cannot find "Measurable Objectives and Appendix 1" in Table of Contents nor in my review package. Should Appendix 1 read Appendix A? **DBA:** *These issues were fixed. Yes, Appendix 1 was Appendix A.*

Pg 3: Objectives. Same comment as comment 2. **MK:** *Left separate*.

Pg 3: Why are "core" and "non-core areas" defined here when they were introduced in previous pages. To keep consistency, I would add the definition for core and non-core areas to the Glossary. Other terms are not defined in the text, so why then define core vs. non-core area in the text?
Pg 3, last paragraph: First sentence does not make sense and needs to be rewritten.
Pg 3, last paragraph: Change "This data is.." to "These data are …"
Pg 5, first paragraph: Change "In Pinnacles" to "PINN".
Pg 5, first paragraph: 'from this list" from which list?
Pg 5, first paragraph: remove "statistical"; trend analyses will suffice.
Pg 6: Empty page?
Pg 7, line 9: Add "of breeding pairs" after "….presence/absence"
Pg 9, third paragraph: Replace "." after "Fecundity" with ":" to keep consistent. **DBA**: *definitions were moved to the glossary as suggested. Other typos and issues were fixed.*

Pg 9, third paragraph: "Fecundity" not defined in Glossary. **MK:** *Definition has been added.*

Pg 10, line 18: "…data collected to date does…" replace with "data collected to date do."
Pg. 10, line 22: Punctuation is incorrect.
Pg. 11, Fig. 3: Alpha 0.05 not shown in Fig. yet referred in text. In Fig. legend define SFAN and where it first mentioned in the text (pg 17 ?).
Pg 13, last paragraph: Very confusing to read. I omitted editing paragraph because it needs to be completely re-written (omit "you").

Pg. 16: Empty page!
Pg. 17, line 6: "…Table 1 and 2 below…"? Where below???
Pg. 18: Bulleted statements are instructions in some sentences but not others. Change to statements (Omit "You").
Pg. 18, 4th paragraph: Define "FDGC".
Pg. 20: Empty page!
Pg 23: Add "Table 2 continued" on top of table
Pg 24: Empty page!
Pg. 27, 2nd paragraph: "…(Table 6.2)…" Where is this Table???
Pg. 27: Should read Table 2 not 3 ?
Pg. 28: Should read Table 3 not 4? Row headings are difficult to discern.
Pg. 30: Empty page!
Pg 33: Change "Observatio" to "Observation"
Pg 36: Empty page!
Pg 46: Empty page!
Pg 48: Empty page! **DBA:** *Typos were fixed. Empty pages are part of our formatting requirement.*

STANDING OPERATING PROCEDURES (SOP) 1

General comments
Many empty pages throughout SOP. **DBA:** *This is part of our required format.*

Minor Comments
Pg. 4, 3rd bullet: Table 1-3? Where is Table 3? Provide page number
Pg. 6 & 7: Add Table 1 Continued to top of Table.
DBA: *Typos were fixed.*

STANDING OPERATING PROCEDURES (SOP) 2-6, Appendix A

Briefly reviewed with no comments. Protocols are well established.

SOP 5. Data Analysis and Reporting V 1.1

Revision History Log

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #
1.0 August 2004	10/5/06	Marcus Koenen	Added most recent guidance on formatting.	New guidance	1.01
1.01	3/2008	J. Petterson, M. Koenen	Remove numbering system. Add details for annual reports and long-term analyses.	Maintain consistency	1.02
1.02	3/2010	D. Adams, M. Koenen	Formatting. Added analytical techniques and r-code provided by Leigh Ann Starcevich.	Peer review comments	1.1

Overview

This SOP describes the procedures all monitors must follow to report how the raptor monitoring season progressed and concluded. This SOP discusses the within-season updates, the post-season summary report, and the 3-5 year analysis and synthesis report.

Reporting is an essential component of the raptor monitoring process. The effectiveness of the raptor monitoring study at PINN over the past 20 years lies not only in the field work and data management, but also in how the information is gathered and shared with all levels of park management including planning, interpretation, maintenance, and law enforcement. An overall communication and outreach strategy is being developed for the SFANand that document will contribute to future revisions of this monitoring protocol.

The overall strategy provides detailed information about required reports including 1) annual reports and 2) analysis and synthesis reports. Suggested formats are documented in the SFAN Data Management Plan – Appendix C (Press 2005)

In order to complete the annual report, the SFAN Data Management Team will work with the raptor technician to summarize data. Management recommendations, along with recommendations for revising the protocol (changing monitoring intervals and timing, moving/adding sites, etc.) will also be proposed. These annual reports will also be provided to the SFAN parks annually. The raptor technician will be responsible for contributing to the AARWP required by each network along with additional outreach products summarized in Table 9.

A comprehensive data analysis and synthesis will be written every few years in addition to more simplified, general annual summaries. Having this extra time allows for more thorough data analysis and review of protocols and may give greater opportunity for adaptive management.

Table SOP 5. 1. Summary of reporting and communication products.

Communication Product	Lead	Audience	Schedule	Summary
Annual Report	Raptor Technician	Park Resource Managers	Annually	Formatting follows the Natural Resource Technical Report Series. http://www.nature.nps.gov/ publications/nrpm/ • Archive data and document monitoring activities • Describe current condition of the resources • Document changes in the monitoring protocol • Increase communication within the park and network
Analysis and Synthesis Report	PINN Wildlife Biologist	Park Resource Managers	3-5 years	Formatting follows the Natural Resource Technical Report Series. http://www.nature.nps.gov/ publications/nrpm/ • Determine patterns and trends • Discover correlations among resources being monitored • Analyze data to determine the level of change that can be detected using the existing sampling scheme • Provide context, interpret data for the park within a multi-park, regional, or national context • Recommend changes to management practices
Program and Protocol Reviews	Network Coordinator	Program Lead, I&M Technical Steering Committee	5 years	• Periodic formal reviews of operations and results • Review of protocol design and product to determine if changes are needed • Part of the quality assurance–peer review process
Executive Briefing	Raptor Technician	Program Managers, Superintendents, Front line interpretation staff	Annually (upon completion of annual report)	Two-page summary that lists monitoring objectives and questions, discusses annual results, and provides a regional context.

Communication Product	Lead	Audience	Schedule	Summary
Vital Sign Report Card	Network Coordinator	Program Managers, Superintendents, Front line interpretation staff	3-5 years (upon completion of Analysis and Synthesis Report	Two-page summary that aggregates trend data into an index. Provides
Web Site Intranet	Raptor Technician	Park Staff	Annually or as needed	Post all completed reports
Web Site Internet	Raptor Technician	Park Staff, General Public	Annually or as needed	Post all Executive Briefings, Report Cards,
Park Presentations	Raptor Technician	Park Staff	Annually	Provide a presentation to park staff during senior staff, all employee, or division meetings at each park upon request. Gives staff an opportunity to ask questions about the program.
Bi-weekly Update	Raptor Technician	Park Staff	Bi-Weekly during the field season.	Brief update listing species and names of active territories. Highlights areas where advisories are in effect.
Quarterly IM Update	Raptor Technician	Park Staff	Quarterly	This one-page monthly e-mail provides park staff with a short update on vital signs projects. Text should be no more than one paragraph.
Press Release	Raptor Technician and Park Information Officer	Public, media, friends groups	January, April, June	Provides updates to public about climbing/hiking advisories.
Photos	Raptor Technician	For all reports and publication	Continuous	High quality publication quality photo are needed to support all communication products. For digital photos that means 300 pixels per inch resolution in a plain or compressed TIF format. Specialist should make every effort to document ongoing work, special incidents, site visits for communication purposes.

Bi-Weekly Updates

One of the critical components of communicating on-going efforts of each season's raptor program is the Bi-Weekly Updates. These informal updates are critical because of the frequent questions to all park staff about the status of climbing advisories. The updates allow for information gathered to be transferred quickly to Law Enforcement and Interpretation Rangers for the most effective internal support of the project. It also allows visitors to understand now the NPS is going about protecting its resources.

Bi-weekly updates include the following information:

- number of territories occupied and by what species
- which territories are occupied and what status the territory is in (e.g., establishment, incubation, chicks including number and age).
- when and where advisories have been put in place, and when they are removed
- notes on unique or noteworthy observations (new territories or nests, unusual raptor sightings, etc.)
- names of individuals, especially park employee or volunteers, who made important observations

Annual Report

The post-season annual report provides a concise summary of data collected throughout the season, highlights significant findings, and discusses management recommendations. Before 2006, the annual report followed the Manuscript Guidelines for the Journal of Wildlife Management (Ratti and Smith 1997). In 2006, the annual report format was changed to meet the guidelines by the Natural Resource Publications Management (NRPM; http://nature.nps.gov/publications/NRPM).

In general, content follow that of most scientific journals. See examples from previous years, in particular Emmons (2006) and (2008) posted to the network website: http://science.nature.nps.gov/im/units/sfan/vital_signs/Raptors/raptors_condors.cfm. Included in the report are cover page, abstract, introduction, study area, methods. These sections can be copied year to year. The results and discussion section, however, may vary year to year.

Results

The results section can be broken up into subsections based on species of interest:

- prairie falcons
- observations of breeding species (e.g., golden eagles, red-tailed hawks, American kestrels, red-shouldered hawks, sharp-shinned hawks, Cooper's hawks, white-tailed kites, peregrine falcons and owls).
- observations of non-Breeding species (e.g., California condor, bald eagles, merlins, Swainson's hawks, and other non-breeding raptors seen during the season).

Prairie Falcon Results: This section of the report summarizes effort (hours of observations), lists status (occupancy and fecundity) of each territory monitored, phenology, and notes any human disturbances that were noted during the season.

1. Effort: Hours of observations are calculated from the time the technician steps on the trail and begins the journey to the observation point to the time the technician returns from the field (it included the hiking time, not just the time at the watch spot). It is calculated for all paid staff and for volunteers (separate categories). Information should also be presented about how many volunteers and hours volunteer time supported the season's monitoring.

2. Prairie Falcon Status (Table SOP 5.2):
   - List status of each territory monitored and number of territories occupied (by singles and pairs).
   - Indicate dates for arrivals, incubation, hatch, and fledging. Table identifies if new territories were occupied. For territories occupied but not producing a nest, report whether it was occupied by a single or pair and if they were territorial throughout the season. If any of the nests failed, indicate which ones, when the failure occurred and if the cause of failure is known.

3. Fecundity (Tables SOP 5.3-5, Figure SOP 5.1-2):
   - The *number of territorial pairs* refers to the number of pairs that were documented to show territorial behavior (e.g. territorial defense, food exchanges, copulating, etc.)
   - The term *number of successful nests* is defined has having at least one chick fledge.
   - The term *average fecundity* is calculated as a. number of chicks per nest and b. number of chicks per nest fledged. Include standard error for all years.
   - To meet park managers concerns, fecundity is also presented as average fecundity for core and non-core areas. Include standard error for all years. Discussion highlights any interesting or unusual incidences.

4. Phenology (Table SOP 5.6):
   - List first arrivals, hatch dates, fledging dates for each year.

5. Human Interactions: To address management concerns, the results section also includes a human interactions section. In this section information is provided about non-compliance observations made during monitoring surveys. Notes should include which territories may have been affected by visitors and if any actions were taken by staff. Additionally, notes about any visitor contacts including interpretive programs are presented (e.g., activities surrounding Migratory Bird Day, nest viewing opportunities, etc.)

6. Discussion: The discussion section provides a context for each year's result in comparison to other years. A sub-section should highlight recommendations on management, research, and protocol changes.

The draft annual report should be reviewed by the PINN Wildlife Biologist and/or network coordinator. Once approved, it can be submitted for publication according to NRPM guidelines.

Table SOP 5. 2. 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	# Fledglings	Occup. Status
PRFA	Drywall	DRY-10	<1/18	<4/5	4/18-19	5/30-31			2	2	2	2
PRFA	D. Soto Canyon	DS-1	<1/23	<3/24	4/7-9	5/16-17			5	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
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				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
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
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
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
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
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
PRFA	Machete	*CI	<3/4									Occupied
PRFA	North Chalone	NC-1	<1/23	<3/26	4/25–26	6/6–7				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
Total	27								>27	38	33	24

(Note: PRFA = prairie falcon, PEFA = peregrine falcon, 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. See Glossary for further terminology definitions.)

Table SOP 5. 3. Sample table covering 1984–2009 prairie falcon nesting productivity for all territories.

Year	Territorial Pairs	Nesting Pairs	# Nests Succeed	# Nest-lings	# Nestlings/ Nest	SE	# Fledge	# Fledge/ Nest	SE
1984	10	9	8	30	3.8	0.25	27	3.4	0.32
1985	NA								
1986	NA								
1987	6	4	4	13	3.2	0.75	20	2.5	0.87
1988	12	9	8	24	3.0	0.42	24	3.0	0.42
1989	12	12	9	24	2.7	0.37	21	2.3	0.37
1990	14	10	8	31	3.4	0.34	29	3.2	0.94
1991	14	11	10	36	3.6	0.31	34	3.4	0.40
1992	13	11	10	38	3.8	0.49	34	3.4	0.48
1993	13	12	10	39	3.5	0.34	35	3.2	0.44
1994	13	13	12	45	3.7	0.25	42	3.5	0.31
1995	13	11	8	24	3.0	0.19	23	3.0	0.19
1996	12	10	9	35	3.8	0.35	34	3.8	0.32
1997	12	8	6	26	4.3	0.33	26	4.3	0.33
1998	10	7	0	0	0	-	0	0	-
1999	10	8	6	25	4.2	0.31	25	4.2	0.31
2000	8	8	7	22	3.1	0.50	22	3.1	0.50
2001	10	10	7	24	3.4	0.43	24	3.4	0.43
2002	11	9	7	26	3.2	0.36	26	3.3	0.37
2003	12	9	8	33	3.7	0.42	32	3.6	0.56
2004	12	11	9	36	3.6	0.40	33	3.3	0.60
2005	13	10	9	29	3.2	0.40	24	2.7	0.37
2006	15	14	10	35	2.9	0.23	30	2.5	0.40
2007	14	12	9	35	3.9	0.31	33	3.7	0.44
2008	12	5	4	12	3.0	0.57	12	3.0	0.57
2009	12	11	10	41	4.1	0.35	37	3.7	0.49
Total/ Averages (1984–2009)	283/11.8	234/9.8	188/7.8	686/28.5	3.5	0.78	647/26.9	3.1	0.09

Table SOP 5. 4. Sample table covering 1984–2009 prairie falcon nesting productivity–core areas.

Year	Territorial Pairs	Nesting Pairs	# Nests Succeed	# Nest-lings	# Nestlings/ Nest	SE	# Fledge	# Fledge/ Nest	SE
1984	7	6	6	22	3.7	0.37	20	3.3	0.51
1985	NA								
1986	NA								
1987	5	4	4	13	3.3	0.75	10	2.5	0.87
1988	8	6	5	14	2.8	0.58	14	2.8	0.58
1989	8	8	6	16	2.7	0.60	16	2.7	0.60
1990	9	7	6	23	3.8	0.40	23	3.8	0.40
1991	9	8	8	31	3.9	0.29	31	3.9	0.34
1992	9	7	7	29	4.1	0.65	27	3.8	0.60
1993	10	9	8	34	4.3	0.30	30	3.8	0.53
1994	10	10	10	38	3.8	0.22	37	3.7	0.34
1995	10	9	7	21	3.0	0.26	21	3.0	0.26
1996	9	8	7	28	4.0	0.37	24	3.4	0.31
1997	8	6	4	16	4.0	0.33	16	4.0	0.33
1998	7	5	0	0	0	-	0	0	-
1999	6	5	3	13	4.3	0.00	13	4.3	0.50
2000	5	5	4	15	3.8	0.67	15	3.8	0.67
2001	7	6	4	12	3.0	0.67	12	3.0	0.67
2002	5	5	4	12	3.0	0.67	12	3.0	0.67
2003	5	5	5	22	4.4	0.48	22	4.4	0.48
2004	7	7	5	21	4.2	0.74	18	3.6	1.03
2005	5	4	4	12	3.0	0.58	11	2.8	0.88
2006	7	6	5	17	3.4	0.48	15	3.0	0.85
2007	6	6	6	26	4.3	0.29	26	4.3	0.29
2008	7	3	2	4	2.0	0.00	4	2.0	0.00
2009	7	7	6	24	4.0	0.75	20	3.3	0.85
Total/ Averages (1984–2009)	176/7.3	152/6.3	126/5.3	463/19.3	3.6	0.11	437/18.2	78/3.3	0.13

Table SOP 5. 5. Sample table covering 1984–2009 prairie falcon nesting productivity for non-core territories.

Year	Territorial Pairs	Nesting Pairs	# Nests Succeed	# Nest-lings	# Nestlings/ Nest	SE	# Fledge	# Fledge/ Nest	SE
1984	3	3	2	8	4.0	0.33	10	3.3	0.33
1985	NA								
1986	NA								
1987	1	0	0	0	0	-	-	-	-
1988	4	3	3	10	3.3	0.67	10	3.3	0.67
1989	4	4	3	8	2.7	0.48	5	1.7	0.41
1990	5	3	2	8	4	0.33	6	3	1.00
1991	4	3	2	3	1.5	0.58	3	1.5	0.88
1992	4	4	3	9	3	0.75	7	2.3	0.75
1993	3	3	2	5	2.5	0.88	5	2.5	0.88
1994	3	3	2	7	3.5	0.82	5	2.5	0.88
1995	3	2	1	3	3	0.00	3	3	0.00
1996	3	2	2	7	3.5	0.88	10	5	0.88
1997	4	2	2	10	5	0.67	10	5	0.67
1998	3	2	0	0	0	-	0	0	-
1999	4	3	3	12	4	0.41	12	4	0.41
2000	3	3	3	7	2.3	0.63	7	2.3	0.63
2001	3	4	3	12	4	0.65	12	4	0.65
2002	6	4	3	14	4.7	0.49	10	3.3	0.49
2003	7	4	3	11	3.7	0.74	10	3.3	0.89
2004	5	4	4	15	3.8	0.32	15	3.8	0.32
2005	8	6	5	17	3.4	0.56	13	2.6	0.42
2006	8	8	5	18	3.6	0.27	15	3	0.46
2007	8	8	3	9	3	0.40	7	2.3	0.63
2008	5	2	2	8	4	0.00	8	4	0.00
2009	5	4	4	17	4.3	0.33	17	4.3	0.33
Total/ Averages (1984–2009)	106/4.4	84/3.5	62/2.6	218/9.1	3.2	0.12	200/8.6	70/3.0	0.14

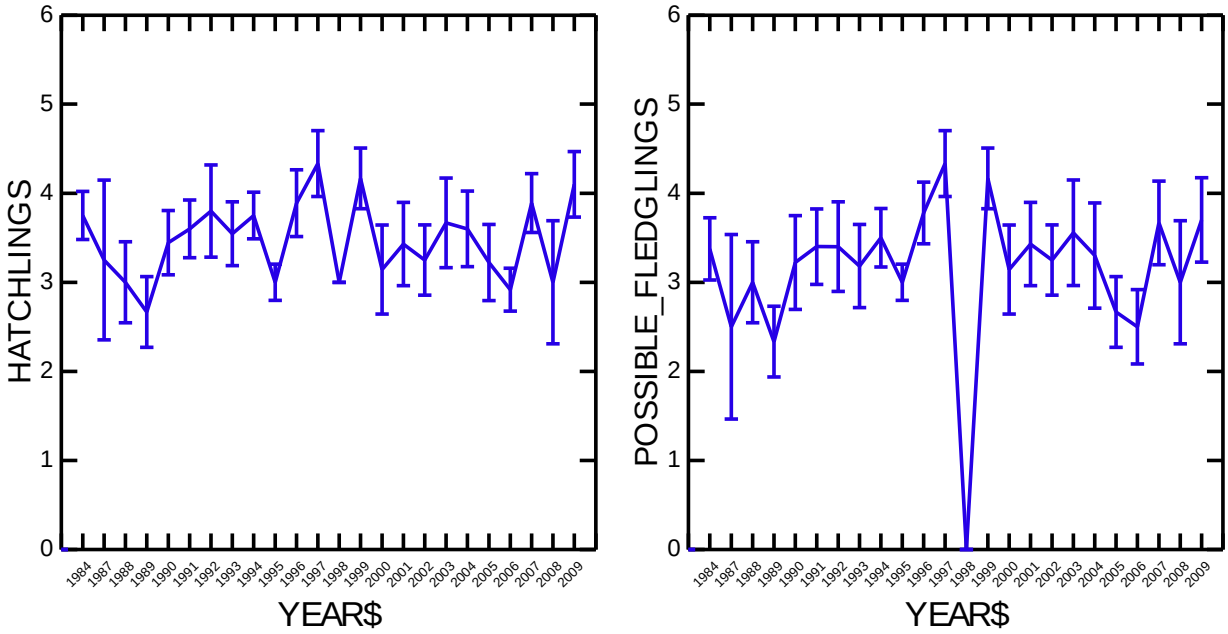

Figure SOP 5. 1. Sample line graphs depicting average annual number of hatchlings (left) and average annual number of fledglings (right) with standard error bars, 1984–2009.

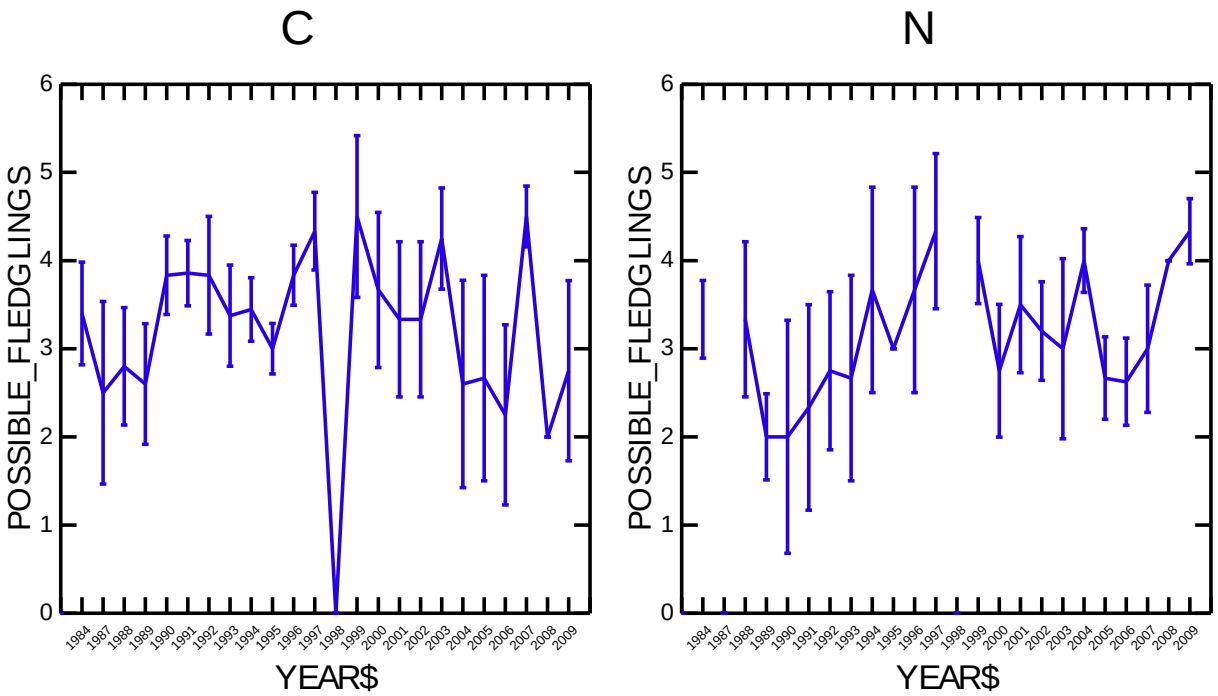

Figure SOP 5. 2. Sample line graphs depicting average annual number of fledglings in the Core (left) and Non-Core (right) areas, 1984–2009.

Table SOP 5. 6 Prairie falcon breeding phenology table (early arrival, incubation, hatching, and fledging dates) for 1999–2006.

Year	Arrival Date	Beginning of Incubation Date	Hatching Date	Fledging Date
1999	1/6/99	3/5/99	4/10/99	5/25/99
2000	<1/5/00	<3/11/00	4/21/00	5/31/00
2001	<1/16/01	3/11/01	4/17/01	5/25/01
2002	<1/11/02	3/1/02	4/7/02	5/16/02
2003	<1/7/03	<3/21/03	<4/21/03	6/7/03
2004	<1/7/04	<3/14/04	4/24/04	6/3/04
2005	<1/12/05	3/18/05	4/19/05	5/31/05
2006	<1/11/06	<3/17/06	4/7/06	5/16/06

Other Species Results: Because observations of other species are also of interest to the park, this section, lists and discusses notable observations of any other raptor species confirmed to nest in the park. In past reports, this section has been organized by species. This data will not be interpreted for trends.

Analysis and Synthesis Report

An analysis and synthesis report is to be completed every 3 to 5 years by the PINN Wildlife Biologist and the purpose of the report is to place the last several years of data into a broader, long-term context. While the annual report provides information on prairie falcons and other raptor species, the analysis and synthesis report only tracks trends of prairie falcons. In general, contents follow those of most scientific journals. The report includes cover page, abstract, introduction, study area, methods, results, and discussion. The main focus of this report will be to try to assess whether the data from the last several years falls within the historical "natural range of variability" for the occupancy and fecundity being measured.

The goals of this report are to:

- Determine patterns and trends of prairie falcon population change and nesting success.
- Review the level of fecundity and population change that can be detected using the existing sampling scheme.
- Discover correlations among resources being monitored.
- Provide context and interpret data for the park within a multi-park, regional, or national context.
- Determine long-term changes in nesting phenology.
- Recommend any changes to management practices.

Occupancy

Occupancy estimates will be obtained annually and will provide measures of status. When more than three years of monitoring data are available, linear trends in the logged odds of occupancy may be estimated and tested for significance. The number of detections is modeled as a zero-inflated binomial random variable (MacKenzie et al. 2006). Let y_{ijk} be the outcome for site *i*, year *j*, and visit *k*, and let y_{ijk} take a value of 1 if a prairie falcon is detected and 0 otherwise. Since the outcome is either 0 or 1, the outcome actually has a zero-inflated Bernoulli distribution. Let y_{ijk} be the number of detections made at site *i* and year *j* during the kth visit. The zero-inflated Bernoulli distribution is expressed as:

$$P\left(Y = y_{ij}\right) = \pi_j p_{ij}^{\,y_{ij}} \left(1 - p_{ij}\right)^{1-y_{ij}} + \left(1 - \pi_j\right) I\left(y_{ij} = 0\right),$$

where π_j is the occupancy rate in year *j* and p_{ij} is the detection rate for site *i* and year *j*. There are *S* sites; *T* years, and *K* visits to a site each year. Define the indicator function as $I\left(y_{ij} = 0\right)$ as 1 when $y_{ij} = 0$ and 0 otherwise. This model assumes an equal number of visits to a site within a year, but *K* can vary among sites and/or years.

Occupancy (π) is modeled with logistic regression as a function of related covariates:

$$\log\left(\frac{\pi_{ij}}{1 - \pi_{ij}}\right) = \gamma_0 + \gamma_1 x_{ij}.$$

To test for linear trend in the logged odds of occupancy, the year covariate, x_j, should be included as a predictor in the occupancy model. The likelihood ratio test is used to assess the significance of the trend coefficient.

The probability of zero inflation (p) is simultaneously estimated by logistic regression:

$$\log\left(\frac{p_{ij}}{1 - p_{ij}}\right) = \beta_0 + \beta'_1 x_{ij}.$$

Maximum likelihood is used to estimate the parameter values from the models for occupancy and detection rates and the zero-inflated Bernouilli distribution. Occupancy can be modeled at the site-by-year level so predictors should be collected at the site level, year level, or site-by-year level. Detection probabilities are allowed to vary at each visit for each site and year, so covariates are often environmental covariates that vary from visit to visit (MacKenzie et al. 2006). However, if detection rates are also changing over time, a model that includes a year covariate may be needed for accurate occupancy estimation.

The implicit occupancy model is assumed for this analysis. In contrast to the explicit dynamics model, estimates of colonization and local extinction are not explicitly measured in the implicit

dynamics model (MacKenzie et al. 2006). The net effect of extinction and colonization rates on occupancy is monitored rather than estimating the parameters separately since monitoring net change over time is the primary goal.

Model selection is conducted using the Akaike Information Criterion (AIC). Model output is examined to be certain that valid variance estimates are obtained. When valid estimates of the variance cannot be acquired for the model with the lowest AIC, then the model with the lowest AIC and valid variance is used.

For the 2008 and 2009 pilot data, the occupancy model selected by AIC included a site-level covariate (an indicator for core area) and the survey year. Possible detection models were based on covariates collected within each site and year such as month, high temperature, low temperature, average wind speed, cloud cover, and level of precipitation. The three detection models with the lowest AIC are given in Table 3.1. The lowest detection probabilities from the first model were obtained for the relatively-few PRFA surveys conducted when precipitation was present. Because the AIC for the month-only detection model is only slightly larger, this more parsimonious model is used for model stability.

Table SOP 5. 7: Best detection models from 2008-2009 pilot data

Detection model variables	AIC	Range of estimated detection rates	2008 estimated occupancy rate (SE)	2009 estimated occupancy rate (SE)
Hi_TempF, CCPct, Precip_Code	518.31	0.3011 – 0.6965	0.9271 (0.1020)	1.0000 (0.0031)
Month, Precip_Code	519.84	0.3281 – 0.6511	0.8788 (0.0957)	1.0000 (0.0016)
Month	520.27	0.3305 – 0.6513	0.8787 (0.0956)	1.0000 (0.0010)

Plotting the estimated detection probabilities against the month predictor (Figure SOP 5.3), one may observe that detection probabilities for PRFA are highest later in the season. A *t*-test of the two-sided hypothesis that the mean detection rate is equal to 1 is highly significant (p-value < 0.0001). There is no evidence that PRFA detection probabilities are so high as to warrant conducting a trend analysis that assumes perfect detectability. Therefore, the zero-inflated Bernoulli distribution is assumed.

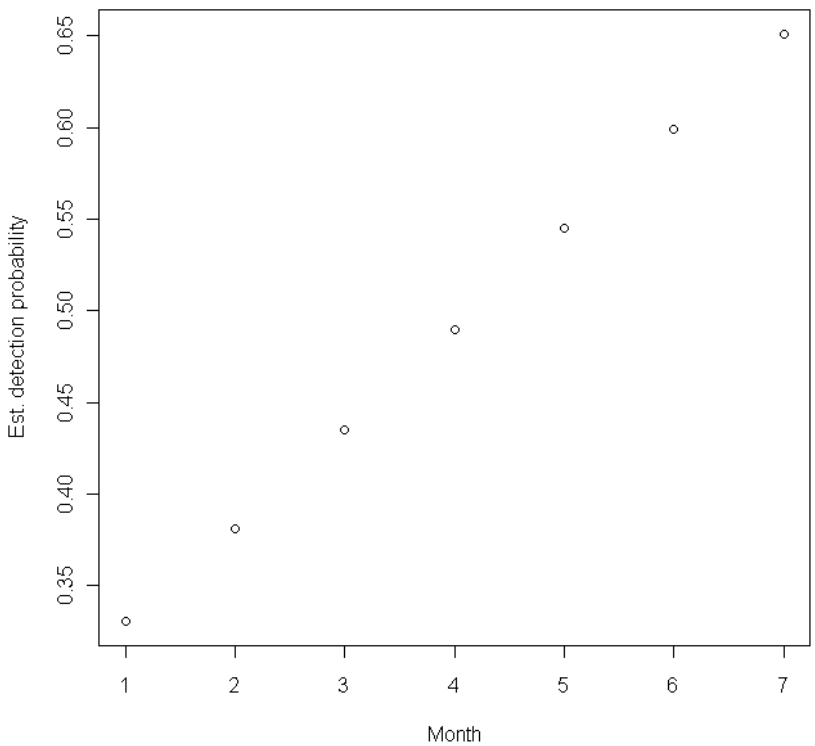

Figure SOP 5. 3. Estimated detection probabilities by month

Fecundity

Let y_{ij} be the number of hatchlings or fledglings detected in occupied site *i* and year *j*. Let *n* be the number of occupied sites and *T* be the number of years monitored for fecundity. The probability mass function of *Y* is:

$$P\left(Y = y_{ij}\right) = \pi_j \binom{M}{y_{ij}} p_{ij}^{\,y_{ij}} \left(1 - p_{ij}\right)^{M - y_{ij}} + \left(1 - \pi_j\right) I\left(y_{ij} = 0\right),$$

where π_j is the probability that an extra 0 is **not** observed in year *j*, p_{ij} is the probability of a hatchling/fledgling at site *i* in year *j*, *M* is the maximum number of hatchlings/fledglings seen in any nest, and $I(y_{ij} = 0)$ is 1 when $y_{ij} = 0$ and is 0 otherwise. Similarly to the occupancy analysis, the parameters, π_{ij} and p_{ij}, are estimated with maximum likelihood estimation. To test for trend in fecundity, the year covariate is included as a predictor in the binomial probability model and then tested for significance with a likelihood ratio test. In contrast to the occupancy analysis, fecundity inference is made on the change in p_{ij} over time. We assume that *M* is 5 based on historical data and recommendations from the SFAN ecologists.

Analysis code for trend analysis of occupancy and fecundity rates is provided in SOP 5 Appendix A, and pilot data are provided in SOP 5 Appendix B. Instructions are given for the VGAM package of the R Project for Statistical Computing. The VGAM package is used for obtaining maximum likelihood estimates from zero-inflated mixture distributions.

Histograms of prairie falcon hatchlings and fledglings per nest from data pooled over the years 2002 to 2009 indicate a large number of zeroes in each outcome (Figures SOP 5.4 and 5.5, respectively). The additional zeroes may be a result of mechanisms such as imperfect detection rates, predation, or environmental factors and are accounted for using a zero-inflated binomial model.

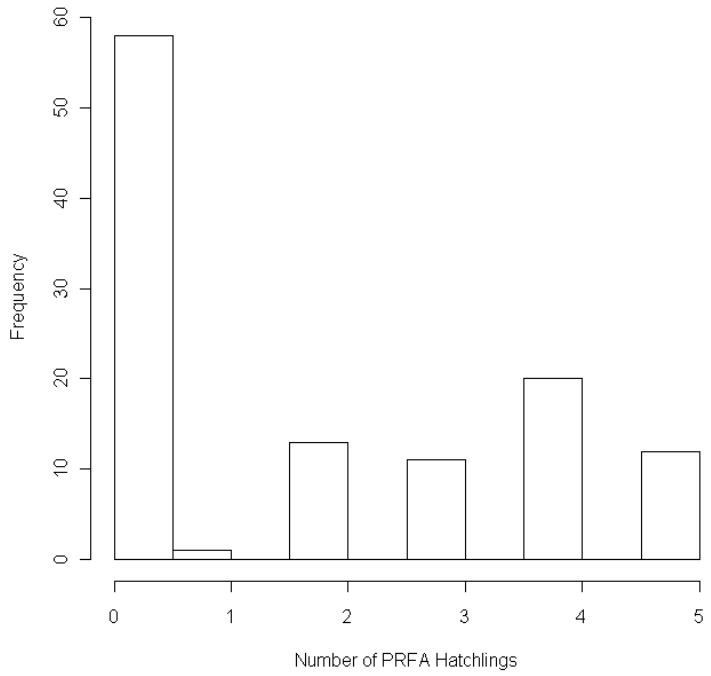

Figure SOP 5. 4. Histogram of hatchlings across years, 2002 - 2009

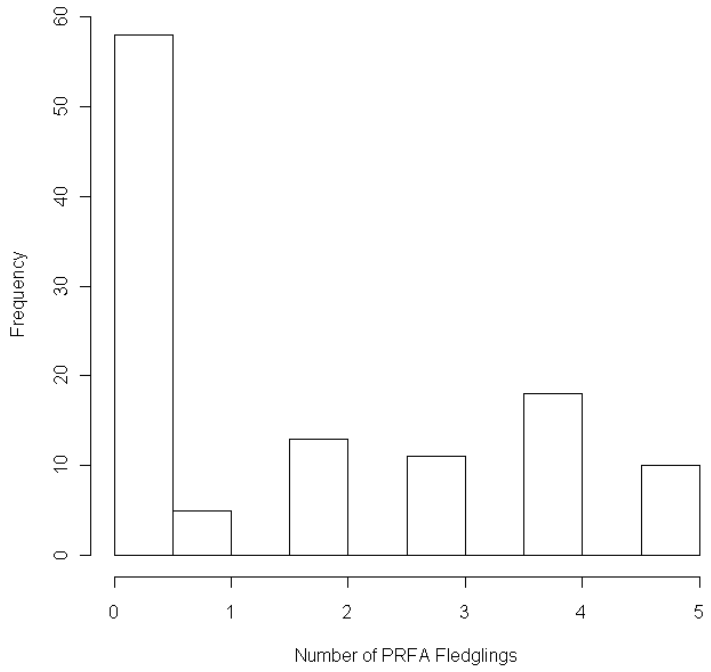

Figure SOP 5. 5. Histogram of fledglings across years, 2002 - 2009

References

Emmons, G. 2006. Raptor breeding season report for Pinnacles National Monument – 2006. Unpublished report. National Park Service, San Francisco Bay Area Network Inventory and Monitoring Program, San Francisco, CA.

Emmons, G. 2008. Raptor breeding season report for Pinnacles National Monument - 2007. Natural Resource Technical Report NPS/SFAN/NRTR—2008/087. National Park Service, Fort Collins, Colorado.

MacKenzie, D. I., J. D. Nichols, J. A. Royle, K. H. Pollock, L. L. Bailey, J. E. Hines. 2006. Occupancy Estimation and Modeling: Inferring Patterns and Dynamics of Species Occurrence. Elsevier Academic Press. Burlington.

Ratti, J. T., and L. M. Smith. 1998. Manuscript guidelines for The Journal of Wildlife Management. Journal of Wildlife Management 62:1, supplement.

Appendix A: R code for occupancy and fecundity estimation and trend analysis

i. Download and open R.

Use R Version 2.10.1 or higher. Go to http://www.r-project.org/ and click on "CRAN" in the left-hand menu. Choose a CRAN mirror site. Under "Download and Install R," select the appropriate platform then click on "base." From here, the installation files may be downloaded and run.

Open R and install the VGAM package. Click on the menu item "Package" then select "Install package(s)." Select a CRAN mirror site then scroll to the bottom of the drop-down list and select VGAM. Load the package by typing "library(VGAM)" (without the quotes) at the R prompt. After an R package is installed, it must be loaded every time it is used in a new R session.

ii. Read the data file.

For this example, the pilot data for the occupancy and fecundity analyses are provided in Appendix B. Data in Appendix B are result of a data dump and can be pasted into the R Command line. Follow by typing in “PRFA0809” and “PRFAFec” to format data. Typically, the data should be saved as a tab-delimited text file with a header in the first row to read a data file into R. First change the working directory to the directory in which the data are stored by selecting "File\Change dir…" and selecting the appropriate directory. Then use the following command to load the data:

```
PRFA0809<- read.table("PRFA0809.txt", header=TRUE, sep = "\t")
```

For this example, the pilot data for the occupancy and fecundity analyses are provided in Appendix B. Copy and paste the two commands into R to obtain the pilot data.

iii. Obtain models for occupancy and detection.

Model selection is conducted using AIC as the selection criterion. Use site-level, year-level, and site-by-year level predictors for the occupancy model and use variables measured at the visit level for detection models. Compare each pair of occupancy and detection models and obtain the set that provides the lowest AIC value. The R code provided in the next step may serve as a template for coding occupancy and detection models for the VGAM package. AIC values may be obtained with the following function call for a model names "fit": `AICvlm(fit)`.

If a fit generates a warning message like the following, then a regularity condition has been violated and the standard errors may be calculated in error:

```
Warning messages:
1: In checkwz(wz, M = M, trace = trace, wzeps = control$wzepsilon) :
213 elements replaced by 1.819e-12
```

The standard errors of the predicted values may be quite large, which can be checked by examining the output of the `predict.vglm` function. If this warning message is obtained, this model may produce erroneous standard errors. Select a different model that meets regularity conditions.

iv. Estimate occupancy and obtain confidence intervals.

The VGAM package allows the separate modeling for occupancy and detection rates. A list of matrices, denoted as H, is used to indicate in which model each term occurs. An intercept falls into both the occupancy and the detection model, so the H matrix for the intercept term is a 2x2 matrix with rows indicating regression terms and columns indicating occupancy and detection model inclusion, respectively. The Year and Core terms were included in the occupancy model only and the Month term was used to predict detection rates, so each of these terms includes only one column. For more help with model specification in VGAM, use `help(constraints)` or see the following link:

http://www.stat.auckland.ac.nz/~yee/VGAM/doc/VGAM.pdf.

Create "H" matrices to indicate which terms belong in the occupancy model and
which belong in the detection model:

```
H1<-matrix(c(1,0,0,1),2,2)  # Intercept terms
H2<-matrix(c(1,0),2,1)      # Year or Core term
H3<-matrix(c(0,1),2,1)      # Month term
Hlist<-list("(Intercept)"=H1, Year=H2, Core= H2, Month=H3)
```

Copy and paste these general functions into R for summarizing results:

```
expit<-function(x) ifelse(x>700,1,exp(x)/(1+exp(x)))
logit<-function(x) log(x/(1-x))
```

Obtain the occupancy and detection models:

```
fit.full = vgam(PA ~ Year+ Core+ Month, zibinomial(zero=NULL),
constraints=Hlist, data= PRFA0809, maxit=1000)
```

Examine the fitted values of occupancy and detection rates for each row:

```
cbind(1-expit(predict(fit.full))[,1], expit(predict(fit.full))[,2])
```

Estimate of linear trend of log-odds of occupancy:

```
Coefs<-Coef(fit.full)            # Regression coefficient estimates
Coefs
```

Obtain estimated occupancy probabilities and CI's using the invariance property of
MLEs. Account for the fact that VGAM predicts the probability that site is
unoccupied:

```
Ests<-predict.vglm(fit.full, se.fit=TRUE)
alpha<-0.20
Z.alpha<- qnorm(1-alpha/2)
OccCILow.Untrans<-Ests$fitted.values[,1]- Z.alpha* Ests$ se.fit[,1]
OccCIHigh.Untrans<-Ests$fitted.values[,1]+ Z.alpha* Ests$ se.fit[,1]
OccCILow <-1-expit(OccCIHigh.Untrans)     # CI low of prob occupied
OccCIHigh <-1-expit(OccCILow.Untrans)     # CI low of prob occupied
Occ.Ests<-data.frame(round(cbind(Year=PRFA0809$Year+2008,
Month=PRFA0809$Month, Core=PRFA0809$Core, pihat=1-
expit(Ests$fitted.values[,1]), pihat.CI.Low =OccCILow, pihat.CI.High
=OccCIHigh),6))
unique(Occ.Ests[order(Occ.Ests$Year, Occ.Ests$Month, Occ.Ests$Core),])
```

v. Test for decreasing trend in occupancy.

To conduct the likelihood ratio test for trend, a reduced model that excludes the
year term in the occupancy model is fit and compared to the full model to
determine if the year coefficient is significantly smaller than zero:

```
H1<-matrix(c(1,0,0,1),2,2)      # Intercept terms
H2y<-matrix(c(0,0),2,1)  # Year term
H2<-matrix(c(1,0),2,1)   # Core term
H3<-matrix(c(0,1),2,1)   # Month term
Hlist2<-list("(Intercept)"=H1, Year=H2y, Core=H2,Month =H3)
fit.red = vgam(PA ~ Core+ Month, zibinomial(zero=NULL),
constraints=Hlist2, data= PRFA0809, maxit=1000)
```

Note that the reduced model may not have a positive-definite Hessian matrix,
but that will not affect the results of the likelihood ratio test. Obtain the
likelihood ratio test statistic:

```
chisq.test<- -2*(logLik(fit.red)- logLik(fit.full))
p.value<-pchisq(chisq.test, 1, lower.tail=FALSE)
c(chisq.test, p.value)
```

We reject null hypothesis of a one-sided test of decreasing trend if the p-value is
greater alpha and if the coefficient for the trend from the full fit is negative.
Here we are testing at the 0.20 level so this p-value of 0.2270 indicates that
there is no significant decline in the occupancy trend.

vi. Estimate detection rates and obtain confidence intervals.

```
DetCILow.Untrans<-Ests$fitted.values[,2]- Z.alpha* Ests$ se.fit[,2]
DetCIHigh.Untrans<-Ests$fitted.values[,2]+ Z.alpha* Ests$ se.fit[,2]
DetCILow <-expit(DetCILow.Untrans)
```

```
DetCIHigh <-expit(DetCIHigh.Untrans)
Det.Ests<-data.frame(round(cbind(Year=PRFA0809$Year+2008,
Month=PRFA0809$Month, Core=PRFA0809$Core,
phat=expit(Ests$fitted.values[,2]), phat.CI.Low=DetCILow,
phat.CI.High=DetCIHigh),6))
unique(Det.Ests[order(Det.Ests$Year, Det.Ests$Month, Det.Ests$Core),])
```

vii. Estimate fecundity and obtain confidence intervals.

Remove rows with NA's for the outcome of interest:

```
PRFAFec<- PRFAFec[(!is.na(PRFAFec$ Known_Fledglings))&(!is.na(PRFAFec$
Hatchlings)),]
```

Create "H" matrices to specify the models for fecundity rate and the probability
of not obtaining a zero:

```
H1<-matrix(c(1,0,0,1),2,2)      # Intercept terms
H2<-matrix(c(0,1),2,1)          # Core or Year term
Hlist<-list("(Intercept)"=H1, Year=H2, Core =H2)
fit.full = vgam(Hatchlings/5 ~ Year+ Core, zibinomial(zero=NULL),
constraints=Hlist, data= PRFAFec, maxit=1000,
weight=rep(5,dim(PRFAFec)[1]))
```

Obtain the estimates of the regression coefficients:

```
Coefs<-Coef(fit.full)
Coefs
```

Obtain estimates of the hatchling fecundity rate:

```
Fec.Ests<-predict.vglm(fit.full, se.fit=TRUE)
alpha<-0.20
Z.alpha<- qnorm(1-alpha/2)
FecCILow.Untrans<-Fec.Ests$fitted.values[,2]- Z.alpha* Fec.Ests$ se.fit[,2]
FecCIHigh.Untrans<-Fec.Ests$fitted.values[,2]+ Z.alpha* Fec.Ests$
se.fit[,2]
FecCILow <-expit(FecCILow.Untrans)        # CI low
FecCIHigh <-expit(FecCIHigh.Untrans)      # CI high
Fec.Ests.CI<-data.frame(round(cbind(Year=PRFAFec$Year+2002,
Core=PRFAFec$Core, phat=expit(Fec.Ests$fitted.values[,2]), phat.CI.Low
=FecCILow, phat.CI.High =FecCIHigh),6))
unique(Fec.Ests.CI[order(Fec.Ests.CI$Year, Fec.Ests.CI$Core),])
```

Obtain estimates of the probability of not observing an extra zero:

```
ProbZero<-1-expit(Coefs[1])
ProbZero.CILow.Untrans<- Fec.Ests$fitted.values[,1]- Z.alpha* Fec.Ests$
se.fit[,1]
ProbZero.CIHigh.Untrans <-Fec.Ests$fitted.values[,1]+ Z.alpha* Fec.Ests$
se.fit[,1]
ProbZero.CILow <-expit(ProbZero.CILow.Untrans)
ProbZero.CIHigh <-expit(ProbZero.CIHigh.Untrans)
```

```
unique(round(cbind(ProbZero, CILow=ProbZero.CILow,
CIHigh=ProbZero.CIHigh),4))
```

viii. Test for decreasing trend in fecundity.

Compute the likelihood ratio test for trend:

```
H1<-matrix(c(1,0,0,1),2,2)      # Intercept terms
H2<-matrix(c(0,0),2,1)   # Year term - excluded
H3<-matrix(c(0,1),2,1)   # Core term
Hlist2<-list("(Intercept)"=H1, Year=H2, Core =H3)
fit.red = vgam(Hatchlings/5 ~ Year+ Core, zibinomial(zero=NULL),
constraints=Hlist2, data= PRFAFec, maxit=1000,
weight=rep(5,dim(PRFAFec)[1]))
```

Compute the p-value for LRT statistic:

```
chisq.test<- -2*(logLik(fit.red)- logLik(fit.full))
p.value<-pchisq(chisq.test, 1, lower.tail=FALSE)
c(chisq.test, p.value)
```

Reject null hypothesis of a one-sided test of decreasing trend if p-value < alpha
= 0.2 and if the coefficient for the trend is negative. Here we fail to reject the
null hypothesis with a p-value of 0.2831.

APPENDIX B: Pilot data for occupancy and fecundity analysis examples

Occupancy data

```
# pilot data: year variable begins at 0
PRFA0809 <-
structure(list(PA = c(1L, 0L, 0L, 0L, 1L, 1L, 1L, 0L, 0L, 0L,
0L, 0L, 0L, 0L, 0L, 0L, 0L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L,
1L, 1L, 0L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 0L, 0L, 0L,
0L, 0L, 1L, 0L, 0L, 0L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L,
1L, 1L, 1L, 1L, 1L, 1L, 1L, 0L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L,
1L, 0L, 1L, 1L, 1L, 0L, 0L, 0L, 0L, 1L, 1L, 0L, 1L, 0L, 0L, 0L,
0L, 1L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 1L, 0L, 0L, 0L, 0L, 0L,
0L, 0L, 0L, 1L, 1L, 1L, 1L, 0L, 1L, 1L, 0L, 1L, 1L, 1L, 1L, 0L,
1L, 0L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 0L, 0L, 0L, 0L, 0L, 0L,
0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L,
0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 1L, 1L, 0L, 1L, 0L, 0L, 0L, 0L,
0L, 0L, 0L, 0L, 0L, 1L, 1L, 1L, 1L, 1L, 0L, 1L, 1L, 1L, 1L, 1L,
1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 0L, 1L, 1L, 1L, 1L, 1L,
1L, 1L, 1L, 0L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 0L, 0L, 0L, 0L,
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0L, 0L, 1L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 1L, 0L, 0L, 0L,
0L, 0L, 0L, 1L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 1L, 0L, 1L, 0L, 1L,
1L, 0L, 0L, 0L, 1L, 1L, 0L, 1L, 0L, 0L, 0L, 0L, 1L, 1L, 0L, 0L,
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1L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L,
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0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 0L, 1L, 0L, 0L, 0L, 0L, 0L, 0L,
0L, 1L, 0L, 1L, 0L, 0L, 1L, 1L, 0L, 1L, 0L, 0L, 0L, 0L, 0L),
    Year = c(0, 1, 1, 1, 0, 0, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1,
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    0, 1, 1, 1, 0, 1, 0, 0, 0, 0, 1, 0, 0, 1, 1, 0, 0, 0, 1,
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    1, 1, 0, 1, 1, 0, 1, 0, 1, 0, 1, 0, 1, 1, 0, 0, 0, 0, 1,
    1, 1, 0, 1, 1, 1, 0, 1, 0, 1, 0, 0, 0, 1, 0, 1, 0, 0, 0,
    0, 1, 0, 0, 1, 0, 0, 1, 1, 0, 1, 0, 1, 0, 1, 0, 0, 1, 1,
    1, 0, 1, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 0, 0, 1, 0, 0, 1,
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    1, 0, 1, 0, 1, 1, 0, 0, 1, 1, 0, 1, 1, 1, 0, 0, 0, 1, 1,
    0, 1, 1, 0, 1, 1, 1, 0, 0, 1, 0, 0, 1, 1, 1, 0, 0, 0, 1,
    1, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 1, 0, 1, 0, 1, 0, 1, 1,
    1, 1, 1, 1, 1, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1, 1, 0, 0,
    0, 1, 1, 1, 1, 0, 1, 0, 0, 0, 1, 1, 1, 0, 1, 0, 0, 0, 1,
    1, 1, 1, 0, 0, 0, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0,
    0, 1, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 1, 1,
    0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 1, 1, 0, 0, 0, 0, 0, 1,
    0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 1, 1, 0, 0,
    0, 0, 1, 0, 1, 1, 1, 0, 1, 0, 0, 1, 1, 1, 0, 1, 1, 0, 0,
    0, 1, 1, 1, 0, 0, 1, 1, 0, 0, 0, 1, 1, 1, 0, 1, 0, 0, 0,
    0, 0, 0, 0, 0, 1, 1, 0, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 0,
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    0, 1, 0, 0), Core = c(0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1,
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    1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
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```

```
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    0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1,
    1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0,
    0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
    1, 0, 0, 0, 0, 0, 0, 0), Month = c(4L, 1L, 3L, 2L, 2L, 3L,
    2L, 3L, 5L, 4L, 3L, 2L, 4L, 2L, 1L, 3L, 2L, 1L, 5L, 6L, 5L,
    5L, 3L, 5L, 4L, 3L, 3L, 1L, 4L, 2L, 1L, 2L, 2L, 1L, 2L, 2L,
    6L, 4L, 3L, 2L, 1L, 2L, 1L, 1L, 3L, 2L, 3L, 4L, 5L, 5L, 4L,
    5L, 4L, 6L, 6L, 6L, 6L, 5L, 5L, 4L, 3L, 5L, 5L, 2L, 1L, 1L,
    3L, 3L, 1L, 1L, 4L, 1L, 5L, 2L, 3L, 3L, 5L, 4L, 6L, 4L, 4L,
    3L, 1L, 4L, 4L, 1L, 4L, 2L, 4L, 2L, 2L, 1L, 4L, 3L, 1L, 1L,
    2L, 2L, 1L, 2L, 6L, 3L, 5L, 3L, 1L, 2L, 2L, 4L, 1L, 6L, 3L,
    6L, 5L, 3L, 3L, 6L, 4L, 5L, 5L, 6L, 1L, 2L, 2L, 1L, 4L, 4L,
    3L, 2L, 2L, 4L, 2L, 2L, 6L, 6L, 3L, 5L, 5L, 6L, 6L, 5L, 4L,
    4L, 3L, 3L, 3L, 4L, 4L, 2L, 3L, 4L, 2L, 2L, 2L, 1L, 2L, 2L,
    1L, 2L, 1L, 2L, 2L, 3L, 1L, 1L, 5L, 1L, 3L, 1L, 2L, 1L, 1L,
    2L, 3L, 4L, 2L, 6L, 7L, 5L, 6L, 4L, 7L, 4L, 6L, 6L, 5L, 3L,
    4L, 1L, 4L, 2L, 1L, 2L, 1L, 2L, 3L, 3L, 4L, 3L, 6L, 4L, 3L,
    5L, 5L, 4L, 3L, 1L, 4L, 2L, 3L, 2L, 1L, 2L, 4L, 4L, 6L, 5L,
    6L, 6L, 6L, 3L, 3L, 2L, 4L, 1L, 2L, 2L, 6L, 5L, 6L, 6L, 4L,
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    2L, 3L, 1L, 2L, 4L, 5L, 4L, 4L, 5L, 4L, 3L, 2L, 2L, 3L, 6L,
    6L, 6L, 5L, 6L, 5L, 6L, 6L, 6L, 4L, 4L, 4L, 6L, 3L, 3L, 1L,
    3L, 3L, 2L, 1L, 2L, 3L, 2L, 4L, 5L, 3L, 5L, 3L, 2L, 2L, 1L,
    2L, 2L, 2L, 1L, 2L, 4L, 3L, 2L, 2L, 3L, 2L, 5L, 3L, 3L, 5L,
    6L, 1L, 2L, 4L, 2L, 3L, 5L, 3L, 4L, 5L, 1L, 2L, 2L, 2L, 1L,
    2L, 4L, 3L, 2L, 3L, 5L, 3L, 2L, 1L, 2L, 2L, 4L, 2L, 3L, 2L,
    2L, 2L, 1L, 2L, 7L, 4L, 3L, 3L, 5L, 4L, 3L, 1L, 5L, 4L, 2L,
    1L, 3L, 2L, 2L, 2L, 4L, 6L, 4L, 6L, 3L, 5L, 4L, 5L, 5L, 2L,
    3L, 2L, 1L, 4L, 4L, 4L, 1L, 2L, 1L, 3L, 3L, 3L, 3L, 1L, 5L,
    3L, 4L, 4L, 4L, 1L, 2L, 4L, 3L, 2L, 2L, 1L, 2L, 6L, 5L, 3L,
    3L, 1L, 2L, 1L, 4L, 1L, 2L, 2L, 2L, 3L, 4L, 4L, 4L, 4L, 1L,
    4L, 1L, 1L, 2L, 4L, 2L, 2L, 2L, 4L, 1L, 2L, 3L, 2L, 2L, 2L,
    3L)), .Names = c("PA", "Year", "Core", "Month"), row.names = c(NA,
-457L), class = "data.frame")
```

Fecundity data

```
PRFAFec <-
structure(list(Species = structure(c(1L, 1L, 1L, 1L, 1L, 1L,
1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L,
1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L,
1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L,
1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L,
1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L,
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1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L, 1L), .Label = "Prairie Falcon", class =
"factor"),
    Year = c(7, 4, 6, 1, 2, 3, 4, 6, 7, 0, 1, 2, 3, 4, 6, 7,
    7, 0, 1, 2, 3, 4, 6, 7, 2, 3, 4, 7, 2, 3, 4, 6, 7, 7, 2,
    1, 3, 4, 4, 6, 7, 0, 1, 2, 3, 4, 0, 1, 3, 4, 6, 7, 3, 4,
    6, 7, 3, 4, 1, 2, 3, 0, 1, 2, 3, 4, 6, 0, 2, 3, 4, 6, 7,
    6, 0, 4, 1, 0, 1, 2, 3, 6, 7, 4, 7, 1, 3, 6, 1, 2, 3, 4,
    6, 0, 1, 2, 3, 4, 7, 2, 3, 6, 7, 2, 6, 7, 4, 1, 7, 0, 1,
    2, 3, 4, 6), Eggs = c(NA, NA, NA, NA, NA, NA, 3L, NA, NA,
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    NA, NA, 4L, NA, NA, NA, NA, 2L, NA, NA, NA, NA, NA, NA, NA,
    NA, NA, NA, NA, NA, 4L, 5L, NA, NA, NA, NA, NA, NA, 4L, NA,
    NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA,
    NA, NA, NA, NA, NA, NA, NA, NA, 4L, NA, NA, NA, NA, NA, NA,
    NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, 4L, NA, 4L, NA, NA,
    NA), Hatchlings = c(NA, 3L, NA, 2L, 0L, 0L, 3L, NA, NA, 2L,
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    ), Known_Fledglings = c(NA, 3L, NA, 2L, 0L, 0L, 3L, NA, NA,
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    NA), Possible_Fledglings = c(NA, 3L, NA, 2L, NA, NA, 3L,
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    NA, NA, NA, 3L, NA, 2L, 4L, 4L, 4L, 4L, NA, 2L, NA, NA, NA,
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    19L, 19L, 19L, 20L, 21L, 21L, 22L, 23L, 23L, 23L, 23L, 23L,
    23L, 24L, 25L, 26L, 26L, 26L, 27L, 27L, 27L, 27L, 27L, 28L,
    28L, 28L, 28L, 28L, 28L, 30L, 30L, 30L, 30L, 31L, 31L, 31L,
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    "ball", "ci", "cnws", "ct", "dis", "dry", "ds", "egg", "fc",
    "frog/hand", "goat/rw", "hp", "hv", "lp", "mac", "mat", "nb",
    "nc", "nes", "nwr", "pb", "pig", "pp", "rw", "sc", "sgb",
    "sp", "swr", "td", "tu", "tug", "wcp", "wss"), class = "factor"),
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SOP 6. Using Portable Radios V 1.1

Revision History Log

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #
	9/2003	G. Emmons	Initial Draft		1.00
1.0	3/2008	J. Petterson	Remove numbering system, other minor edits	Maintain consistency with other SOPs	1.01
1.01	7/2009	D. Adams	Formatting	Peer review comments	1.1

Overview

This SOP describes the procedures all technicians should follow to learn how to use the Motorola XTS 3000 portable radios in the field.

The most important thing that technicians should know about the Motorola XTS 3000 radio is that it is a communication tool that helps to ensure the safety of technicians in the field. The portable radios allow other staff in the park to know the location and status of raptor technicians in the field. Because technicians often work off-trail in the park backcountry, and hike over uneven ground, slopes, and near cliff edges, the radios are especially important as a means of communication in the event of injuries that technicians might incur in the field. During team watches of raptor territories, the radios also provide an invaluable tool for communicating raptor observations between technicians, and confirming territorial boundaries and use by one or more pairs of breeding raptors within a given area. Raptor technicians should have a working knowledge of the protocols for communicating with the radios, and a basic understanding of how to use them. Procedures for using radios effectively and appropriately are listed below.

Procedures

Read and review the "Digital XTS 3000 Basic Model" user's guide, filed in the "Radios" folder in the "Equipment" cabinet in the RRM office. The manual provides a good introduction to the terminology and use of the XTS 3000 model. Also review the section on radio call numbers and radio channels in the "Panic File" binder; technicians should know the call numbers and the park staff they refer to, especially for law enforcement personnel. The radio call number for the raptor technician is 821. If necessary, technicians should photocopy the list of radio call numbers and take it in the field as a reference.

Whenever the portable radio is not in use, make sure that the unit is turned off (with the on/off volume control dial turned as far counterclockwise as possible) and charging in a Motorola battery charger. Personal chargers are available in the RRM office, and should be assigned to raptor technicians at the beginning of the season.

Before going out into the field, take an extra battery from the general charging unit in the RRM office, in the event that the battery already attached to the XTS 3000 radio loses its charge while in use. Make sure that the extra battery fits the XTS 3000 unit; although the HT 1000 (also used by RRM staff) and XTS 3000 units have similar functions and capacities, the two radios require 7.5 nickel-cadmium batteries with different shapes.

Before travelling into the field, you must call Sequoia Dispatch – the dispatch station through which all travel plans in the park should be documented – and let them know your plans in the field, and your estimated time of arrival (ETA) back at your departure point (such as Bear Gulch Visitor Center, Chalone housing area, etc.). This is important because it provides Sequoia Dispatch with your general location in the field in the event of an emergency. Follow the procedures listed below:

- Turn on the radio by turning the on/off volume control dial clockwise, until it is facing about 11 o'clock. The LED indicator should show a green light, indicating that the battery is charged and the unit is on.

- Move the channel selector dial to "1" (for the North Chalone repeater). This channel should work for radio communications in most parts of the park, but if it does not, turn the channel selector dial to "2" (for the Scout Peak repeater).
- Make sure the three-position ABC toggle switch is on the "A" setting, for normal communications.
- Make sure the ring at the base of the channel selector dial is pointed towards the open circle; the ring should not be pointed towards the crossed circle, as this is meant for programming channels for the radio to scan for.
- Press and firmly hold down the push-to-talk (PTT) switch, and speak into the microphone. The LED indicator will show a red light, indicating that your communications are being broadcast through the radio.
- Tell Sequoia Dispatch your travel plans and ETA back at your departure point (see radio protocol section under #10 below).

During your time in the field, keep the radio on with the volume loud enough that you can hear and respond to any communications directed at your radio call number (821).
In most situations, you will not need to communicate with anyone while you are monitoring raptors in the field. If you will be arriving off-trail later than your previously stated ETA, let Sequoia Dispatch know your revised ETA. **This is important:** Sequoia Dispatch will begin contacting law enforcement personnel if they do not hear back from you 30 minutes after your stated ETA!

If you are conducting a team watch with another technician that requires you to be separated by physical distance, keep the channel selector dial turned to channel "1," until you arrive at your respective watch spots. Then, turn the channel selector dial to "4." This is a special use channel (as shown in the "Panic File" binder) that allows technicians to communicate raptor observations to each other, while leaving the regular airwaves of channels 1 and 2 open for park-wide use. Return to using channels 1 or 2 when team watches are over.

When you return from the field, contact Sequoia Dispatch again, and let them know that you are safe, by stating the time you arrive off-trail: "Sequoia Dispatch, 821 off-trail at 2100 hours."

After signing off with Sequoia Dispatch, return the portable unit to your personal charger, and make sure that the radio is turned off while it is charging. Return the extra battery to the general charger in the RRM office.

Follow the protocols listed below as general guidelines for appropriate use of the radios:

- When communicating with the radio, always begin by stating the call number you are trying to reach, followed by your own. For example, state: "505, 821." For Sequoia Dispatch, you can simply say, "Sequoia Dispatch, 821."
- Be brief and concise when communicating with the radio; this keeps the airwaves clear on a given channel and saves battery power.
- Speak clearly into the radio's microphone, and press the PTT button firmly while speaking.

- Although channels 1 and 2 provide good radio coverage for most of the park, certain locations (e.g., next to cliffs, in slot canyons, outside of the park) may not allow for effective communication on the radio. If you get no response for a specific call number, try again with, “505 (for example), 821, do you copy?” If you still get no response, conclude with, “No (or negative) contact, 821 clear.” If the message is important, try different call numbers in the park, or move to a more open location (e.g., a hilltop or summit).

SOP 7. Using GPS V 1.1

Revision History Log:

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #
	9/2003	G. Emmons	Initial Draft		1.0
1.0	3/2008	J. Petterson	Remove numbering system	Maintain consistency with other SOPs	1.01
1.01	7/09	D. Adams	Formatting	Peer review comments	1.1

Overview

This SOP describes procedures observers should follow to learn how to use the Garmin III Plus GPS unit to document UTM (Universal Transverse Mercator) coordinates at raptor monitoring watch spots in the field.

The Garmin III Plus GPS unit is a general tool for documenting the UTM coordinates of observation points. The most important thing to know about the Garmin III Plus GPS unit is that it does **not** have sub-meter accuracy, and for the purposes of raptor monitoring at PINN, it does not need to. This GPS unit should not be used to navigate to watch spots for nest sites; rock formations, thick chaparral, and twisting canyons in the park make this impossible. The GPS unit is only necessary for documenting the general locations of raptor monitoring watch spots, which are later entered into the "observationpoints" table located in the "Raptor Monitoring" MS Access Application (for details, see SOP 3: Data Management). The file, along with "obs pts for possible nests" is imported into ArcView to create spatial maps for use as updated thematic data in the "Raptor Nest Map" ArcMap project (for details see SOP 3 and SOP 7. Using GPS).

Monitors should begin by reviewing the "GPS III Plus Owner's Manual & Reference," stored in the "Radio Equipment, etc." cabinet in the RRM office, below the radio chargers, for information on the basic functions of the GPS unit. For the purposes of raptor monitoring, procedures listed below will focus on what is needed to record UTM coordinates in the field.

Procedures

Before going into the field, check the battery level of the GPS unit by pushing the Power/Backlight Key (with the red light bulb icon on the keypad) until the unit turns on. The GPS unit will automatically transfer to the Satellite Status Page; the battery level is illustrated on the left side of the screen. If the battery level is less than two-thirds full, take an extra set of 4 AA batteries into the field with you. The battery door is on the side of the unit opposite the keypad, with proper installation of batteries illustrated on the compartment door. Turn the unit off by pressing the Power/Backlight Key until the unit turns off.

- For every raptor observation, including observations en route and at watch spots, take GPS coordinates to document the location from which you observed the raptor activity. Repeat this process for every raptor observation.
- Turn on the GPS unit by pressing the Power/Backlight Key until the unit turns on. A "warning" page will appear, letting you know that the unit is for general navigation use only. Ignore the page and it will disappear after 10 seconds, transferring to the Satellite Status Page. The Satellite Status Page depicts satellites (numbered 1 through 32) on the left side of the screen, with bars numbered by satellite on the right side.
- Raise the antenna on the unit so that it is straight up, giving the best possible satellite reading to the unit. Above the left side of the screen will read, "Acquiring Sats," until 3 or more satellite signals are acquired (illustrated by dark bars on the right side above satellite numbers).
- After 3 or more satellite signals are acquired, the unit automatically transfers to the "Map Page." Ignore this page, and press the Page Key on the keypad 4 times until you return to the Satellite Status Page. Wait until you see at least 4 satellite signals received on the unit, depicted as 4 dark bars with satellite numbers beneath them. The message on the

upper left of the screen should change from “2D Navigation” to “3D Navigation,” allowing for better satellite coverage and more specific UTM coordinates of the observation site for raptor monitoring. Press the Page Key once more, and you will see the Position Page.

- For the purposes of raptor monitoring, focus only on the current position coordinates in the lower, left-hand corner of the screen. These will be depicted in UTM coordinates, such as, “10 S 0661707, 4037812.”
- Record these coordinates in your field notes; these will be transferred to the raptor database.
- Turn off the GPS unit by pressing the Power/Backlight Key until the power is off (i.e. empty screen).

A few notes on the Garmin III Plus GPS unit (Figure SOP 7.1):

- Always turn off the unit after you finish documenting UTM coordinates for a given watch spot; the unit does automatically turn off after several minutes without use, but turning it off immediately after use will further conserve battery power.
- Store the unit with a protective cover; even a handkerchief or plastic bag around it will be useful. Also, do not leave the unit exposed to rain or extreme heat!
- Use the unit in an open area, to allow for greater satellite coverage. Most watch spots in the park are very open and this condition is easily met. One exception is the Narrows territory, a slot canyon up the east fork of Marion Canyon. Documenting UTM coordinates for observation points should still be possible, but may take longer than in open areas.

Figure SOP 7. 1. Garmin III Plus GPS unit.

SOP 8. Safety Procedures V 1.1

Revision History Log

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #
	10/2007	M Koenen	Initial Draft	Address comments by reviewers	1.0
1.0	7/2009	M. Koenen	Added JHA	Address comments by reviewers	1.1

Overview

This SOP provides safety information related to monitoring prairie falcons at PINN.

Also see SFAN Field Safety SOP maintained on the GOGA network drive: X:\Shared\Standard Operating Procedures\SFAN Field SOPs\Standard Operating Procedures for information on:

- Emergency Procedures
- Emergency Contacts for PINN
- Vehicle Safety
- Air Quality Guidelines
- Slippery Substrates
- Mandatory Safety Equipment
- Recommended Personal Gear

Communication

Raptor technicians should communicate their monitoring destinations to other staff, document them on the white board at the RM office entrance, and use two-way radios to communicate their travel plans to park law enforcement and Sequoia Dispatch (see SOP 6. Using Portable Radios).

Reporting Non-Compliance

Anytime that non-compliance is noted, technicians should not confront are visitors. Instead, technicians should report non-compliant activities to law enforcement rangers. Field notes including time, location, description of people, and non-compliance activities seen will be helpful. This is especially true for non-compliance relating to species of concern in cliff-nesting areas: primarily prairie falcons, peregrine falcons, and golden eagles.

Weather and Field Attire

Summer conditions can be extremely hot (>100°F) and it is important to dress for and be ready for these weather conditions. Because of the possibility of encountering poison oak and general uneven terrain encountered off-trail, field personnel should wear long pants and high topped hiking boots. Leg gaiters are also recommended to reduce the exposure to poison oak and the risk of tick bites during surveys. Since surveys can last longer than anticipated, field personnel are encouraged to take extra food and drinking water into the field.

Field Hazards

Biting or stinging invertebrates (wasps, spiders, ticks) may be encountered. The bites or stings from these animals can be painful, but usually not fatal. If bitten or stung and painful swelling or an allergic reaction occurs, seek medical attention immediately. Check your clothing and exposed skins frequently when in the field for ticks and upon returning from the field, do a more thorough body search for ticks.

Poison oak is found in the study area. Before doing any fieldwork personnel should become familiar with the dangers associated with exposure to this native plant. If exposure occurs wash thoroughly with soap and rinse with plenty of water upon returning from the field and then apply

Tecnu® ointment (provided at headquarters). If a strong reaction occurs, seek medical attention and alert your supervisor as soon as possible.

Job Hazard Analysis (JHA)

The following table is excerpted from the Job Hazard Analysis for raptor monitoring activities at Pinnacles National Monument.

Work Activities	Potential Hazards	Safe Behaviors
Office Work- Computer use for email and data entry.	Muscle and eye strain, repetitive stress injury.	Proper posture and use of ergonomic furniture.
		Take breaks every hour.
Travel to Field Locations in Vehicle.	Driving hazards such as accident.	Use defensive driving techniques.
		Expect oncoming traffic on one-lane roads in park.
		Be alert for foggy conditions.
		Watch for deer, elk and other wildlife, and adjust speeds to safely operate around areas of high use.
`		Obey traffic laws and wear seatbelt at all times.
		Do not drive when fatigued, be familiar with route or prepare for unknown route.
		Do not talk on radio or cell phone while driving.
		Do not put hot drinks on your lap.
		Be familiar with the vehicle and its operation.
		Check gauges, tires, wipers, fluids and replace when necessary.
		Check vehicle has spare tires, jumper cable and jack with all parts.
Hiking to work areas on trails, routes or off trail navigation.	Getting lost.	Have map, compass, gps and other navigational aids and know how to use them.
	Losing a crew member/volunteer.	Travel together when off-trail.
		Make sure both members of the team are aware of location, and can find route out if they are separated.
		When trail hiking, plan stops at trail junctions to regroup.
		Arrange meeting places and times -- all crewmembers must wear a watch.

	Have a travel plan for each day and make sure it is understood by all crewmembers.
	Stay in communication via radio or stay in sight.
	Cell phone and/or radio and spare batteries.
	If lost or disorientated, stay calm, assess location by consulting map and landmarks, and proceed to nearest road or trail.
	Do not panic -- Have a mental plan for what to do if lost.
	If injured, stay put and radio dispatch.
Loose footing	When traveling in areas with steep or unstable terrain, stagger your positions so that you are not immediately below someone, yell "rock" if you dislodge one.
Lightning storms	In the event of a lightning storm, turn your radio off, if near a vehicle, get entirely inside. If in the out of doors try to do the following: separate the group, get off ridge tops and away from trees, get as low as possible and if possible lie on non-conductive material.
Wind storms	If it is windy enough to blow small twigs and branches out of the trees, try to get out of the woods or find an area away from hazard trees.
Exposure to cold, wet conditions	Wear proper equipment- and bring extra layers.
	Recognize the signs of hypothermia in yourself and others.
	Carry and eat high-calorie foods, stay well-hydrated.
Exposure to heat and sun	Have hat, sunscreen and sunglasses.
Overexertion and dehydration	Recognize the signs of dehydration.
	Take frequent rest stops (15 min per every 2 hours) and stay hydrated.
Injuries due to hiking (aches, sprains and blisters)	Pay attention to footing- plan ahead for the route to avoid steep, unstable terrain.
	Use appropriate footwear, boots and socks.
	Prevent blisters and have blister treatments (moleskin, tape etc) accessible.

	Injuries due to falling (lacerations, broken bones, head injuries)	Pay particular attention to traveling on steep slopes, unstable terrain, through dense vegetation, and in foggy conditions. Practice fall- arrest techniques (roll on to stomach, dig elbow, feet and knees in).
		Have first aid kit, stabilize injured person, treat for shock and know how to initiate rescue via radio.
	Injuries due to carrying a heavy pack	Reduce pack weights when possible.
		Pay attention to how you put your pack on (avoid twisting motions- get help or place pack on surface or against tree).
		Make sure your pack is properly fitted and balanced.
Hiking to work areas- Stream and river crossings	Exposure, sprains, broken bones, drowning	Avoid swift or deep water crossings by using foot or automobile bridges.
		Be careful on slippery logs and watch footing on either side of stream crossing.
Working in the outdoors	Exposure to allergy-causing plants and insects	Alert crew members to possible problems with allergens. Be alert for toxic plants and alert to common bee and wasp nesting habitat and activity-especially the person in front.
		Carry Benadryl, epi-pen or other antihistamine
	Exposure to toxic plants	Avoid poison oak when possible. Wear long-sleeved shirts, long pants, and hiking boots. Wash skin exposed to poison oak with Tecnu or other appropriate cleaner and change clothes if necessary at end of day/survey.
		Do not eat any fungus or plant unless you are 100% sure it is edible.
	Exposure to ticks	Wear proper attire (long-sleeved shirts and long pants) and do frequent tick checks. If bitten by black legged tick, properly remove tick and monitor general health condition.
	Exposure to giardia, E. coli and other pathogens	Do not drink any water unless it has been filtered, boiled or treated in some fashion.
		Do not create more contaminated areas- urinate away from streams and water, dig a cathole for solid waste and bury toilet paper.

		Wash hands when possible and carry hand cleaner.
	Improper nutrition due to inappropriate food choices	Bring a variety of healthy, nutritious food that will give you good energy during travel and work. Do not rely on sugar snacks.
	Loss of food to ravens, raccoons, small animals	Prevent animals from getting into your food by not leaving you backpack open or accessible to animals.
	Cougar attack	If approached by cougar make yourself large and noisy, wave arms, yell, grab a stick. Back away from cougars but do not turn and run, ever. If attacked, fight back.
	Strange or aggressive human interactions	Terminate contact with visitor and leave the area, contact dispatch (GOGA: 415-561-5656; PORE: 415-464-5170 or emergency numbers (911).
Field work	Eye strain from looking through binoculars	Take breaks from looking through binoculars. Do not look into the sun; be aware of sun when scoping for raptors. Use focus appropriately.
	Back strain from sitting	Sit on an even surface; use “crazy creek chair”. Take breaks to stand up and stretch.

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U.S. Department of the Interior

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