



FINAL 2009 ANNUAL REPORT

RAPTOR MONITORING ON THE PINEDALE ANTICLINE PROJECT AREA SUBLETTE COUNTY, WYOMING

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I. INTRODUCTION

Raptor monitoring on the Pinedale Anticline Project Area (PAPA) in Sublette County, Wyoming was initiated 1998 by Archie Reeve of PIC Technologies. Wyoming Wildlife Consultants, LLC (WWC) conducted surveys over the entire PAPA and additional segments of the Green River in 1999 and 2000. In 2001 all wildlife surveys on the PAPA were contracted to TRC Mariah Associates, Inc. , with WWC acting as a sub-contractor and continuing the raptor field work and reporting in 2001 and 2002. Staff biologists with TRC conducted raptor monitoring from 2003 to 2008, but the precise study area was not consistent during this time period. During this ten year span contractors were hired directly by the Operators on the PAPA.

The 2008 Record of Decision for the Supplemental Environmental Impact Statement (SEIS) for the Pinedale Anticline Oil and Gas Exploration and Development Project Sublette County, Wyoming (ROD) established the Pinedale Anticline Project Office (PAPO) to obtain, collect, store, and distribute monitoring information to support adaptive management and analyze mitigation projects. WWC was awarded the 2009 raptor monitoring contract through a competitive bidding process.

The study area for this effort was the PAPA plus a 1.0 mile outside buffer. Portions of the southern boundary of the PAPA share a common boundary with the Jonah II Project Area (JIIPA). The wildlife surveys for the JIIPA incorporate a 3.0 mile buffer, thus involving some overlap for survey areas. To reduce potential impacts to nesting raptors the BLM-PFO decided to eliminate the overlapped survey area from the PAPA raptor monitoring. The project area for the 2009 PAPO Raptor Monitoring effort is illustrated below.

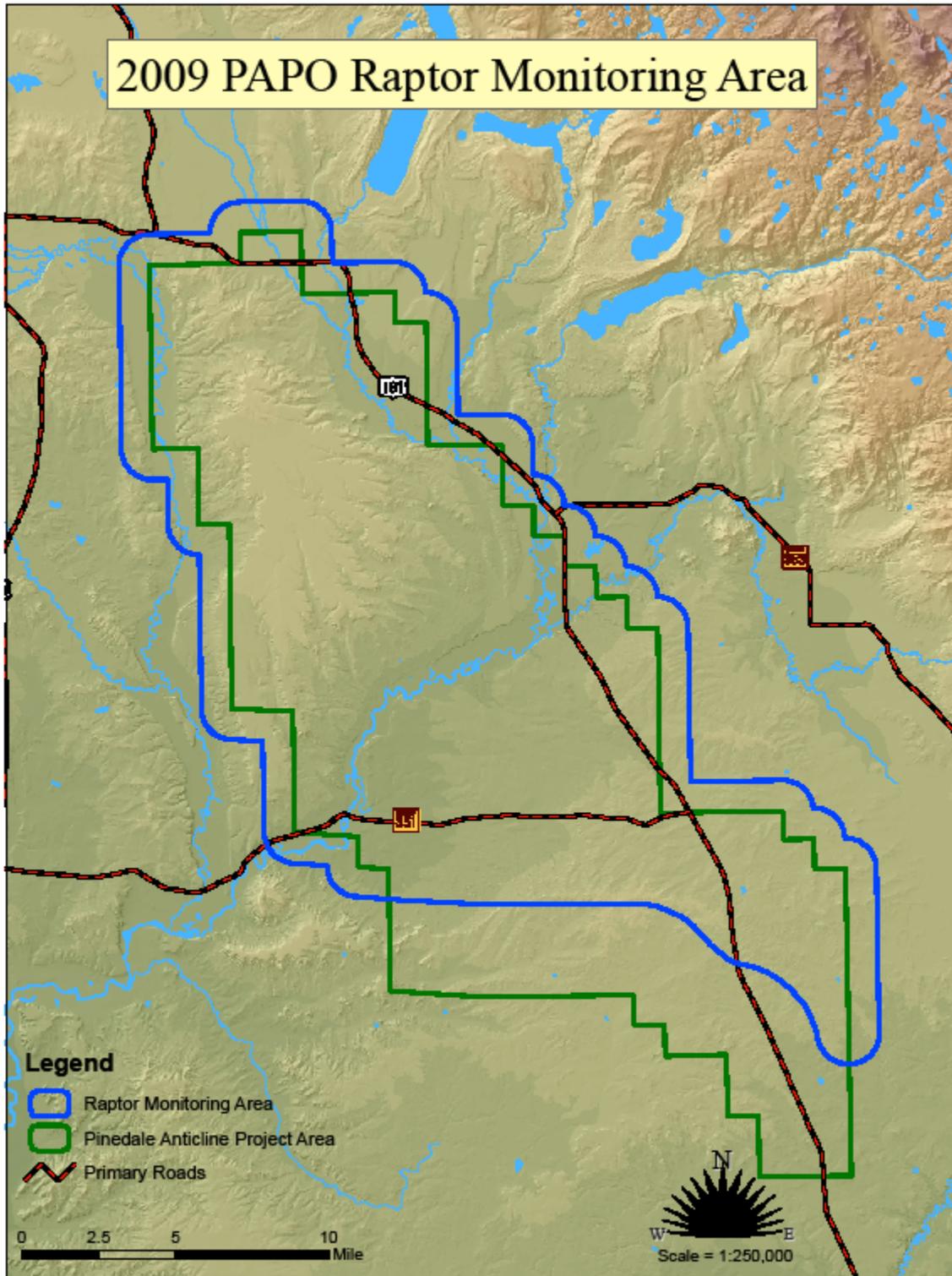
II. METHODS

Protocols for this monitoring effort were provided by the Bureau of Land Management, Pinedale Field Office (BLM-PFO), and were made a part of the contractual agreement between WWC and PAPO. These protocols are attached to this report as Appendices A and B.

Field work on the 2009 Raptor Monitoring was initiated on 23 April 2009; the day after the contract was signed. This is a late date to initiate raptor surveys, with many birds on already on nests. Eagles and horned owls were well into the reproductive cycle, with some nests likely having failed prior to initiation of the contract.

One of the first tasks necessary to fully accomplish the primary project goal of checking all known nests was to notify private landowners of the project and gain permission for on-the-ground nest inspections as necessary. On most nests this was typically required after deciduous leaves had erupted and visibility was limited. It was also needed to fully cover the project area, surveying portions that had not been effectively covered since our work in 2001. Despite numerous attempts, we were unable to directly contact two landowners within the project area. These two particular parcels were relatively small, and the nests located on them could be viewed from other areas. Every landowner contacted granted access to WWC for this project.

Nest searches were conducted by vehicle, foot and boat. No aircraft were used. The riparian areas are most effectively searched by floating the rivers. The constantly changing perspective, with the nests silhouetted against the sky, results in unparalleled coverage. The flood plains with extensive irrigation ditches and some trees were primarily surveyed from various public and private roads with foot travel as needed.



Primary observer for most of the project effort was John Dahlke. Other than 12 ferruginous hawk nests on the east side of Duke's Triangle and the 2008 burrowing owl sites, all known nests were checked by John on the first round of surveys. On the first set of river trips John acted as principal observer, with Gregg Shedd and Matt Holloran assisting. For the second, third and fourth rounds of survey effort John continued as observer, with assistance as necessary. The second round of nest checks on BLM lands (primarily ferruginous hawks) were conducted by Travis Wooten and Randy Everett. Burrowing owl call-back surveys were conducted by Travis Wooten and Randy Everett, with John Dahlke assisting.

All nests were checked at least twice to determine occupancy. Those nests that showed no signs of raptor use after two visits were removed from the field inventory and not formally checked again. Many of these structures were either close to other nests or were observed while enroute to others, resulting in several effective checks; but these additional observations were not entered in to the database.

The various routes developed to check occupied nests were repeated on generally a monthly rotation. In an effort to reduce observer impacts, whenever possible nesting activity was confirmed using a spotting scope from a distance. Often this took only a few seconds. When necessary we approached the nest on foot close enough to gain an observation. The later stages of nesting activity would have been nearly impossible to document without the level of landowner cooperation we received.

Burrowing owls were surveyed using the separate protocols required by the BLM-PFO and are attached below as Appendix B. As suggested in the RFQ, we contacted David Klute, All-bird Conservation Coordinator, Colorado Division of Wildlife, 6060 Broadway, Denver, CO 80216 to obtain specific call-back tapes used in Colorado. We also consulted with him on methodologies and equipment specifications. For this survey, we purchased the same equipment used by Dr. Klute. This equipment was obtained using WWC company funds, and was not purchased by PAPO funds.

All mapped prairie dog colonies were surveyed for burrowing owls using the protocol. We also searched for burrowing owls in 28 new locations. These areas were in unmapped prairie dog colonies, along pipelines, or other open areas where habitat was suitable. We checked an additional 5 points provided by the BLM-PFO where owls had been seen during prairie dog mapping efforts.

The call-back tapes were played from 59 locations at or near points determined by GIS to provide acoustical coverage of the prairie dog towns. The biologist conducting the survey had some latitude to adjust the points for optimum visibility. While playing the call-back tapes the biologist scanned the area for owls. The call-back protocol was used at one additional point not in a prairie dog colony. This point was targeted to cover an active burrowing owl nest from the 2008 nest year that was located on a small reservoir. All points were surveyed three times, approximately one month apart.

Known owl nesting burrows were not approached on foot until after the areas had been checked twice using the required protocol with no positive results. Subsequent to the second survey employing the call-back methodology, we inspected the burrows occupied in the 2008 season for field sign.

New nests of ravens and crows were documented using the data sheets required for raptors, but these nests were not further monitored. Since many raptors and corvids use or modify existing stick nests, these nests are now in the database for future use with the species of origin, instead of using the unknown raptor prefix.

Canada geese appropriate a substantial number of large stick nests for their own use, but cannot build stick nests. They arrive in the Pinedale area before ospreys, and customarily use several osprey nest platforms. Stick nests constructed by bald eagles, red-tailed and Swainson's hawks are also used by geese.

III. Results

All 551 nests within the project area on the database provided by the PAPO were individually inspected and occupancy determined. An additional 56 new nests were located. Nest-specific data is presented in the attached Excel table WWC_2009_Raptor_Act. Information on new nests is presented in the table WWC_2009_New_Nest_Act and the associated shapefile. Burrowing owl call-back survey location information is separately presented in table WWC_2009_BO_Raptor_Act for survey effort in mapped prairie dog colonies, and WWC_2009_New_BO_Raptor_Act for call-back point locations in areas not in mapped prairie dog colonies. The name of the point is inserted into the TEMP_ID column in both tables. UTM locations for these points are in the associated shapefiles of the same names found in the Spatial Data folder.

IV. Discussion

The contract for the 2009 PAPO raptor monitoring does not include any analysis. Further, a very late start driven by the date of contract signing yielded initial observations which were well into the breeding season for most raptors, including bald and golden eagles, great horned owls and red-tailed hawks, precluding data on nest initiation. Typical raptor analyses are generally based on initiation rates, or for a more complete picture, territory occupancy. Neither of these are available for the primary species in this project year.

The burrowing owl call-back methodology demonstrated limited usefulness. We discussed this issue with the PAPO on several e-mails and telephone calls during the nesting season. Burrowing owls have been increasing on the study area for the last ten years, and with 7 nests active in 2008, several nests were expected. Throughout the first two rounds of survey effort, only one burrowing owl was observed using the required protocol. As per protocols, we did not visit potentially active nests on foot. Subsequent to using the call-back survey methodology on the first two survey efforts, we physically visited each of the previously known burrowing owl sites to inspect the burrows for field sign. No owls, molted feathers or field sign indicating their presence was found at these previously active sites. Positive burrowing owl locations are presented in the attached Excel tables.

V. Third Party Observations

Several nests had 2009 observations made by other parties that are not included in this report. The only exception is bald eagle nest BE10. Aircraft nest surveys for bald eagles are conducted each spring by Susan Patla, Non-game Biologist for the Wyoming Game and Fish Department. She documented bald eagles using and laying eggs in a new nest also found by WWC, which we labeled PUN7. This nest failed by the time this project was initiated. PUN7 is a small nest, in an isolated tree. The bald eagle pair using this territory had used BE10 in 2008, which is located within a cottonwood grove providing numerous perches and shade. On our first river survey one of the eagles was in a crouched position on this nest, with the second adult perched within ten feet. We interpreted this scenario as the pair using this nest, and brooding young. We have not modified the database to include this information, since WWC did not make the observations. The full information on dates and times is available from the WGFD.

VI. Appendix A – Raptor Monitoring Protocols

RAPTOR SURVEY PROTOCOL

Bureau of Land Management Pinedale Field Office Raptor Nest Survey Procedures and Data Standards
These survey procedures and data standards may be changed at any time at the discretion of the BLM.

SURVEY PROCEDURES: Recommended protocol based on peer reviewed publications.

1. In general, surveys should be conducted in all suitable habitats document nest activity during April 15 to June 15, it is recommended for early nesting species such as eagles and great-horned owls that this survey be conducted as early as possible in the survey window, while late nesting species could be conducted later in the survey window.
2. Surveys for nest sites between February 1 and April 15 shall be avoided to protect this sensitive breeding and nesting period. Surveys during this period for early nesting species may be authorized by a BLM biologist on a nest/site specific basis, assuring that the activity will not disturb nesting raptors.
3. In order to document raptor nesting, at least two surveys are required April 15 – June 15, with one month between survey dates. Subsequent surveys outside of this window may be authorized by the BLM to determine productivity. NOTE: Burrowing owls will be surveyed outside these dates as per the separate burrowing owl protocol. The data collected for burrowing owls remains the same as for other raptors (see data standards below).
4. If the nest status is determined as active [ACTI], the surveyor should continue monthly monitoring to determine nest productivity (failed or successful). Extreme caution should be given to make sure the nesting raptors are not disturbed during these follow-up surveys. Continued monitoring should be conducted from the farthest distance possible that allows the surveyor to see the activity using a spotting scope. Nests will not be approached on foot.
5. Surveys should be done in important raptor habitat including: rock outcrops, cliffs, ridges, knolls, stream banks, conifer, and cottonwood trees. Nest locations should be recorded in Universal Transverse Mercator (UTM) coordinates using North American Datum 1983 (NAD83) datum.
6. Optimum weather conditions for surveys are clear, calm days. Nests should be approached cautiously to avoid flushing the adult, and the nest status (i.e., number of nestling) will be determined from a distance with a spotting scope.
7. Nests will not be visited during adverse weather conditions (e.g. extreme cold, precipitation events, windy periods or during the hottest part of the day). Visits will be as brief as possible.
8. Photograph the nest from a distance to help aid in relocation and condition. See attached nest photographs for assistance in determining nest condition. Record the UTM of photo spot.
9. Data should be recorded on the standardized form, and summarized for project reports in a table format; data should be provided to the BLM PFO in a digital format with appropriate field names and entries as indicated in the BLM PFO data standards.

Data Standards

All raptor survey data collected by BLM employees, contractors, or other state or federal agencies meant for incorporation into the BLM PFO corporate GIS data and/or for use when determining exceptions must follow these data standards.

The fields and associated entries listed below should be included in all databases, with all data for required fields entered. The required field names are indicated by bracketed text [FIELDNAME] for each piece of data. Additional fields may be added to the data for individual use, but this additional data will not be incorporated into the BLM PFO raptor corporate database.

All survey data for the year must be submitted in the format provided by BLM.

Data is broken into nest location and nest activity information.

Nest location information must be collected on all new raptor nests and this data should remain unchanged unless the surveyor is able to collect better location information after the nesting season, e.g., surveyor can now collect a GPS point below the nest, rather than 100 yards away, when the nest is unoccupied or such activity will not disturb the raptor. The estimate for the new locations should be report in the monthly results (the month required to report the new location depends on when nest is found), so the new location is known as soon as possible.

Nests on private property may be digitized but collaboration with the landowners should be pursued to allow access to new locations.

Nest activity information must be collected on all surveys and must reference a previously documented raptor nest ID or be assigned a new temporary raptor nest ID if the nest was not previously documented. This data is not spatial and should be submitted in associated spreadsheet with all required attributes and fields.

In every report submitted, the completed survey summary form is required. An excel file with UTM's or shapefile is required with all of the attributes listed completed, and in the order that they are listed.

Raptor Survey Key and Codes

NEST ACTIVITY: This data does not need to be recorded spatially. Only the data recorded for the nest location (attributes above for nest data) needs to be spatial. Record this nest data in associated spreadsheet/datasheet only.

Species and Species Code [SPECIES, SPP_CODE] (*required fields*) – Record the common name for species and the species code based on the American Ornithologist's Union (AOU) designation, a four letter code based on the common name. Some non-raptor species are included because they have been known to take over a raptor nest. Following is a list of raptor species, and their associated codes, that are common within the BLM PFO.

American Crow = AMCR	Northern Goshawk = NOGO
American Kestrel = AMKE	Northern Harrier = NOHA
Bald Eagle = BAEA	Osprey = OSPR
Burrowing Owl = BUOW	Prairie Falcon = PRFA
Canada Goose = CAGO	Red-tailed Hawk = RTHA
Common Raven = CORA	Short-eared Owl = SEOW
Cooper's Hawk = COHA	Swainson's Hawk = SWHA
Ferruginous Hawk = FEHA	Unknown Accipiter = UA
Golden Eagle = GOEA	Unknown Buteo = UB
Great Horned Owl = GHOW	Unknown Owl = UO
Merlin = MERL	Unknown Raptor = UR

Survey Date and Time [DATE, TIME] (*required fields*) – The date and time that the field survey was conducted. i.e., 6/7/2004, 0700 (military time)

Year [YEAR] (*required field*) – The four digit year in which the field survey was conducted

Source [SOURCE] (*required field*) – The agency name (BLM, WGFD, TRC Mariah, etc...) that conducted the survey

Observer [OBSERVER] (*required field*) – The first initial and last name of the individual that conducted the survey

Data Correction [DATA_CORR] (*required field*) – The type of correction that was performed on the data.

REALTIME – real time correction only (e.g. Garmin)

POST_PROC – post processing correction (e.g. Trimble)

Comments [COMMENTS] (*required field*) – Any unique features, physical relationships to other nests, proximity to human disturbances, other pertinent observations or any other comments about the nest or observation that the observer feels are appropriate should be entered into comments. If the nest location was re-GPS'd, please state this in comments.

Occupancy [OCCUPANCY] (*required field*): Record one of four occupancy codes.

Occupied (OCCU) – At least one of the following applies:

1. A pair of adult birds are present in a breeding area/territory/nest during a breeding season
2. Fresh nest lining material
3. Adult presence at or near the nest
4. Recent and well-used perch site near the nest

Unoccupied (UNOC) – A habitat that exhibits no evidence of the presence of a breeding pair during the breeding season. If any birds are seen during the survey, please note this in comments

Did Not Locate (DNLO) – Surveyor searched but was unable to locate the nest. This does not necessarily mean that the nest is gone or destroyed, but merely that the surveyor was unable to find the nest. The area needs to be resurveyed in order to try and locate the nest.

Undetermined (UNDT) – Surveyor/Observer was unable to determine whether birds were occupying an area and/or was unable to determine the activity at a nest site. E.g., When surveying a nest midday early in the season, you notice whitewash and feathers on/around the nest, but no bird(s). Since it has not rained for 3 months, the evidence could be from earlier in the year. You will need to resurvey at a later date to make an occupancy determination.

Activity Status [ACTIVITY] (*required field*): Enter an activity status code. Note: “delist” should not be used as an activity status. ***This activity information should be collected in a manner causing the least disturbance to the individuals. An entry as „Unknown“ is acceptable if nest is difficult to evaluate. When in doubt, avoid excessive disturbance to prevent harassment to the nest.

Active (ACTI) – Defined by the presence of an incubating adult, eggs or young in the current year. A nest in which a breeding attempt was made as indicated by:

1. Eggs in nest
2. Young in nest
3. Fledged young near nest
4. Incubating/brooding adult
5. Adults courting in a territory, though they may not necessarily have been seen on a nest

Inactive (INAC) – No sign of the presence of an incubating adult, eggs or young in the current year. A nest with no apparent recent use or adult presence at the time of observation, but in good condition.

Inactive Alternate – (INAL): An inactive nest within a territory that contains an active nest.

Inactive Dilapidated – (INDI): An inactive nest in a state of ruin due to weather, natural aging and/or neglect.

Unknown (UNK) – It is unknown whether there are nesting or incubating adults in the area.

Historic (HIST) – Nest historically existed at a particular location but is now gone

Nest Productivity Status [PRODUCTIVE]: If a nest was active, then the user would enter data into the nest status field, if such data were available.

Failed – The site or pair had no young produced to a hatchling/fledgling.

Successful – The site or pair has produced at least one young to a hatchling/fledgling.

Number Juveniles, Number Adults [NUM_JUV, NUM_ADS]: numerical field of number seen. All single values are acceptable, no ranges. If number is unsure, use the number seen with a + (i.e. 2+).

Nest Condition [CONDITION] – Record the observed nest condition. If unsure of condition, refer to attached nest photographs to determine the condition.

1. **Gone** – There may or may not be evidence of where the nest was, but it is no longer there.
2. **Remnants** – Scant material remaining and not usable unless fully rebuilt.
3. **Poor** – Nest is dilapidated, in need of major repair to be used.
4. **Fair** – Nest is not dilapidated, but needs significant repair in order to be used. Material is slumping or sliding. Nest in disrepair.
5. **Good** – Nest is in need of only minor attention in order for it to be used. Apparently maintained within past year.
6. **Excellent** – Nest is able to be used with little or no attention or maintenance needed. Bowl intact and nest is in usable condition. Recently maintained or repaired.

7. **Unknown** – The nest is obviously present (i.e. a tree cavity, rock cavity), but because of its location, a condition determination can't be made.

Comments [COMMENTS]– Any unique features, physical relationships to other nests, proximity to human disturbances, other pertinent observations or any other comments about the visit or observation that the observer feels are appropriate should be entered into comments.

NEST LOCATION: Only recorded for new nest locations.

Temporary Raptor Nest ID [TEMP_ID]

New nests will be identified with a temporary identification code at the discretion of the agency collecting the data and may follow the method previously used for naming nests. Final nest identification [NEST_ID] will be made at the discretion of the BLM. This ID will consist of the township number (2 digit), range number (3 digit), section number (2 digit), and identifier number (2 digit - in order by the date first observed and entered into the database) to eliminate duplication of data for the same nest. Final nest ID assignments will be provided by the BLM to biological consulting agencies at the end of the field season. Future survey(s) or references to the nest will include this officially assigned 9 digit numeric code. Any survey(s) or reference to previously documented raptor nests will reference the original raptor ID (e.g. FH25) and the BLM PFO documented raptor nest ID in order to avoid confusion and duplication.

Township, Range, Section [TWNShp, RANGE, SECTION]

The public land survey information does not necessarily have to be determined in the field if other more accurate location information, such as UTM coordinates, is collected and the township, range, and section can be easily determined from this other location information.

Northing and Easting [NORTHING, EASTING]

Nest locations will be collected using UTM coordinates in NAD 83. Record the Northing UTM Coordinates (7 characters) and Easting UTM Coordinates (6 characters).

Location [LOCATION]

This field is a general location for the nest, such as Mesa or New Fork River. Organization Code [ORG_CODE] Record the organization code for the agency and office which manages the land upon which the nest is located. BLM Pinedale Field Office WY100 BLM Rock Springs Field Office WY040 BLM Kemmerer Field Office WY090 Bridger-Teton National Forest BTNF State of Wyoming Land STATE Privately Owned Land PRIVATE

Nest Substrate –

There will be two substrate fields, general and specific. General substrate must be designated by one of twelve categories while specific substrate should be a descriptive entry, possibly with tree species information if applicable.

General Substrate [SUBSTR_GEN] (*required field*) – Record one of twelve general category codes. For evergreen, deciduous, or shrub, place a **D** in front of the category code if the tree or shrub is dead.

1. Evergreen (**EVG**) or dead evergreen (**DEVG**)

2. Deciduous (**DEC**) or dead deciduous (**DDEC**)
3. Shrub (**SHB**) or dead shrub (**DSHB**)
4. Artificial Nesting Structure (**ANS**) (e.g., nest box or pole structure)
5. Manmade Structure (**MMS**) (e.g., telephone or power pole, old barns, bridges)
6. Natural Gas Structure (**NGS**) (e.g., condensate tank – distinct from a manmade structure due to maintenance on a regular basis)
7. Underground (**UNG**)
8. Cliff (rock) (**CLF**)
9. Rock Feature (**ROK**) (e.g., rock outcropping, rock pillar)
10. Erosional (**ERR**) (e.g., Badland type feature – prone to filling with sediment or washing away)
11. Ground Hillside (**GHS**)
12. Creek Bank (**CKB**)

Specific Substrate [SUBSTR_SP] – Enter species information or more descriptive information about substrate. 100 characters max.

Height of Substrate [SUBSTR_HT] – Record in feet the total height of substrate upon/in which the nest is located, e.g., height of cliff or tree above the surrounding terrain

Nest Height [NEST_HT] – Record in feet the height of the nest on/in the substrate (i.e. height of tree nest above the ground; height of cliff nest on cliff; height of pillar nest above the surrounding terrain)

Aspect of Substrate [ASPECT] – Enter compass direction (N, NE, E, SE, S, SW, W, NW, OPEN). Any more detailed aspect should be entered in comments

Exposure of Nest [EXPOSURE] – Record the general direction of nest exposure as a compass direction or open - to designate no definitive exposure direction, e.g., a stick nest built on a hillock on open ground (N, NE, E, SE, S, SW, W, NW, OPEN). Any more detailed exposure information should be entered in comments

Nest Type/Structure [TYPE] – One type code should be entered. Includes six categories:

1. Burrow (**B**)
2. Cavity (**C**)
3. Ledge (**L**)
4. Open Stick (**OS**)
5. Domed Stick (**DS**)

6. Other (OT) – must enter comments for this type

Nest Photo [PHOTO] – Pictures must be taken from a landscape view in order to aid in relocation of the nest only. Do not approach nests on foot during nesting season. Label photos: (NEST_ID)_YEAR(a, b, c, etc). For example, a Golden Eagle nest in 30N, Range 110W, Section 12 with raptor nest ID 3011012_02 in 2008 and takes three pictures of this nest. The photo IDs for these photos are: 3011012_02_2008a, 3011012_02_2008b, and 3011012_02_2008c. Digital picture files submitted should be named accordingly on the disk. Record the UTM of the photo location to aid in relocation of nest.

VII. Appendix B – Burrowing Owl Survey Protocols

BURROWING OWL SURVEY PROTOCOL

Adapted from: Recommended survey protocol and actions to protect nesting Burrowing Owls, State of Colorado Department of Natural Resources, Division of Wildlife. March 2007.

These survey procedures and data standards may be changed at any time at the discretion of the BLM.

Western Burrowing Owls (*Athene cunicularia hypugaea*) are commonly found in prairie dog towns throughout Wyoming. Burrowing Owls require prairie dog or other suitable burrows (e.g. badger) for nesting and roosting. Burrowing Owls are migratory, breeding throughout the United States, southern Canada, and northern Mexico and wintering in the southern United States and throughout Mexico.

Seasonal Timing

Burrowing owls typically start building nests in Wyoming mid April to late May. However, active nesting and fledging has been recorded and may be expected from April through early August. Adults and young may remain at prairie dog towns until migrating to wintering grounds in late summer or early autumn. Surveys should be conducted during times when Burrowing Owls may be present on prairie dog towns. Surveys should be conducted in the Pinedale Field Office for any activities occurring between **1 May and 31 October**. No Burrowing Owls are expected to be present between early November and late March.

Daily Timing

Burrowing Owls are active throughout the day; however, peaks in activity in the morning and evening make these the best times for conducting surveys (Conway and Simon 2003). Surveys should be conducted in the early morning (0.5 hours before sunrise until 2 hours after sunrise) and early evening (2 hours before sunset until 0.5 hours after sunset).

Data Collection

All burrowing owl survey data will follow the data standards for the collection of raptor data (see raptor survey field summary form).

Number and locations of survey points

Burrowing owls are most frequently located visually, thus obtaining a clear view of the entire prairie dog town is necessary. For small prairie dog towns that can be adequately viewed in their entirety from a single location, only one survey point is necessary. The survey point should be selected to provide unobstructed views (with binoculars if necessary) of the entire prairie dog town (burrow mounds and open areas between) and all nearby structures that may provide perches (e.g. fences, utility poles, etc.). For prairie dog towns that cannot be entirely viewed from a single location because of terrain or size, enough survey points should be established to provide unobstructed views of the entire prairie dog town and nearby structures that may provide perches. Survey locations should be separated by approximately 800 m (0.5 mi), though this value may be adjusted as necessary to account for project size and topography.

Number of surveys to conduct

Detection of Burrowing Owls can be highly variable and multiple visits to each site should be conducted to maximize the likelihood of detecting owls if they are present. At least three surveys should be conducted at each survey point. When conducting standard monitoring surveys, surveys should commence no earlier than 1 May. There should be three consecutive surveys conducted no less than one month apart to determine if Burrowing owls inhabit a particular area. When surveying an area for an exception, the three surveys may be conducted one week apart; however, they must still occur after 1 May.

Conducting the survey

Weather Considerations Because poor weather conditions may impact the ability to detect Burrowing Owls, surveys should only be conducted on days with little or no wind and no precipitation.

Passive Surveys Most Burrowing Owls are detected visually. At each survey location, the observer should visually scan the area to detect any owls that are present. Some Burrowing Owls may be detected by their call, so observers should also listen for Burrowing Owl while conducting the survey. Burrowing Owls are frequently detected soon after initiating a survey (Conway and Simon 2003). However, some Burrowing owls may not be detected immediately because they are inconspicuous, are inside of burrows, or are not present on the site when the survey is initiated. We recommend that surveys be conducted for 10 minutes at each survey location.

Call-broadcast surveys To increase the likelihood of detecting Burrowing owls, if present, we recommend incorporating call-broadcast methods into Burrowing owl surveys. Conway and Simon (2003) detected 22% more Burrowing owls at point-count locations by broadcasting the primary male (*coo-coo*) and alarm (*quick-quick-quick*) calls during surveys. Although call-broadcast may increase the probability of detecting Burrowing owls, most owls will still be detected visually. We recommend the following 10 minute timeline for incorporating call-broadcast methods (Conway and Simon 2003, C. Conway pers. Commun.). The observer should scan the area for Burrowing Owls during the entire survey period.

- 3 minutes of silence
- 30 seconds call-broadcast of primary call (*coo-coo*)
- 30 seconds silence
- 30 seconds call-broadcast of primary call (*coo-coo*)
- 30 seconds silence
- 30 seconds call-broadcast of primary call (*quick-quick-quick*)
- 30 seconds silence
- 4 minutes of silence

Calls can be broadcast from a “boom box” or a portable CD player attached to amplified speakers. Calls should be broadcast loudly but without distortion.