CHAPTER 19

NONGAME BIRDS

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I. INTRODUCTION ï A total of 341 avian species have been documented in Wyoming during different seasons of the year (Orabona et al. 2012). Of these, 272 species are classified as nongame birds for which we can provide management actions, and 56 of these are further classified as Species of Greatest Conservation Need (SGCN; WGFD 2010). Many of these species are limited by the availability and distribution of suitable habitat and habitat loss or degradation due to human activities. Declines in grassland birds have been more precipitous, consistent, and widespread than with any other avian guild (Knopf 1994, Brennan and Kuvlesky 2005). Concern over the status of many populations is likely to increase as new issues arise, such as climate change and wind energy development, and other on-going issues including oil and gas development in key habitats. Moreover, our ability to manage these species is partially limited by incomplete knowledge about their distribution, abundance, and population trends (Oakleaf et al. 1996, WGFD 2010). Consequently, implementation of standardized surveys is necessary to address this shortage of key information. The Wyoming Game and Fish Department ô s (Department) Nongame Program uses survey data for many purposes, including meeting objectives outlined in the State Wildlife Action Plan (WGFD 2010), setting Nongame Program priorities, monitoring populations, providing information through our active participation in regional and national partnerships, supporting Wildlife Environmental Reviews, assisting planning efforts, and responding to potential listings under the Endangered Species Act. All avian observations are useful and should be documented, especially SGCN with a Native Species Status (NSS) of 1-4 or NSS Unknown (Orabona et al. 2012, WGFD 2010). All sightings should be carefully recorded in the Department ô s Wildlife Observation System database, and sightings of those species that require additional documentation should be submitted to the Nongame Bird Biologist on a rare and unusual bird sighting form (Attachment 1).

The intent of this chapter is to provide guidance on common techniques for conducting inventories and monitoring to determine or estimate presence, species richness, occupancy, distribution, relative abundance, population density, and population trends for many nongame bird species (Tables 1 and 2). The chapter is first organized according to overall survey techniques, then taxonomically by species or, where appropriate, major taxonomic group (e.g., colonial waterbirds). Within each section, we present standardized survey techniques that are species- or guild-specific. We also discuss the types of data that should be collected and where information should be distributed. For selected species, we include how to develop a robust study design (e.g., stratified random sample for estimating abundance) and methods for analyzing data collected from these types of projects. To obtain information on data analysis or other information not presented here, contact the Nongame Bird Biologist in the Lander Regional Office.

TABLE 1. Characteristics of methods used to monitor landbird populations. Methods are grouped under survey or demographic levels, and are denoted by ïñ (Modified from Butcher et al. 1992.)

	Survey				Demographic		
Variables Measured	Fixed distance	Spot map	Area search	Variable distance	Mist net	Nest search	Color banding
Index to abundance	+	+	+	+	+/ ï	+/ ï	+
Density	ï	+	ï	+	ï	ï	+
Survivorship (adult)	ï	ï	ï	ï	+	ï	++
Productivity	ï	ï	ï	ï	+	+	+
Recruitment	ï	ï	ï	ï	+	ï	+
Habitat relations	+	+	+	+	+/ ï	+	+/ ï
Nest site characteristics	ï	ï	ï	ï	ï	+	+
Predation/parasitism	ï	ï	ï	ï	ï	+	+
Individuals identified	ï	ï	ï	ï	+	ï	+
Breeding status known	ï	+	ï	ï	+/ ï	+	+
General Characteristics							
Habitat specificity	+	+	+	+	+/ ï	+	+
Rare species measured	+	+/ ï	+	+/ ï	ï	+/ ï	+/ ï
Canopy species measured	+	+	+	+	ï	+/ ï	ï
Area sample known	+	+	+	+	+/ ï	+	+
Large area sampled	+	ï	+	+	+/ ï	ï	ï
Use in non-breeding season	+	+/ ï	+	+	+	ï	+
Cost per data point	Low	High	Low	Low	High	High	High
Applicable scale	Broad	Local	Broad	Broad	Broad	Local	Broad

TABLE 2. Potential objectives of a monitoring program and the minimum number of years needed to achieve results. Actual number of years needed depends on the study design, and will vary considerably depending on sample size (e.g. number of census stations, detection or capture rates, or number of nests found). We assume the priorities of the monitoring program reflect local or site specific needs. (Adapted from Geupel and Warkentin 1995.)

	Method and Years Needed					
Objective	Single point counts[a]	Repeat point counts[b]	Area search[c]	Spot map	Mist nets[d]	Nest monitor[d]
Inventory presence or absence of species	1	1	1	1	1	ï[e]
Inventory rare species	2-3	1-3	1-3	1-3?	1-3	ï
Determine species richness	2-3	1-3	1-3	1-3?	ï	ï
Determine relative abundance	1-2	1-2	1-3?	1-2	3-5	ï
Determine species status and seasonality	ï	1-3?	1-3	1-3	1-3	1-3
Determine population trend	6-10	4-9	10+	4-9	6-10	ï
Determine productivity	ï	ï	ï	ï	1-3	1-2
Determine individual survivorship	ï	ï	ï	3-5[f]	3-5	ï
Identify life history traits	ï	ï	ï	3-5	ï	1-2
Identify habitat associations or preferences	1-2	1-2	1-2	1-3	ï	1-2
Identify habitat features	4-6	3-5	3-5	2-4	10	1-2
Determine cause(s) of change	ï	ï	ï	ï	2-3	2-3

[a] Each point is censused a minimum of 1 time in a season.
[b] Each station is censused a minimum of 3 times in a season.
[c] Each plot is censused a minimum of 3 times in a season.
[d] Most authors/programs recommend this method in conjunction with a census of population size.
[e] A dash (ï) indicates that this is not possible.
[f] Possible when species are individually color banded.

II. INVENTORY, MONITORING, AND CENSUS ï

A. Population Trend Counts ï

1. Roadside Surveys ï

a. Rationale ïRobbins and Van Velzen (1970) evaluated roadside surveys used in the North American Breeding Bird Survey (BBS). Roadside surveys provide population trend data for many species. Standardized methods such as this provide a basis for comparing trends throughout North America. In addition, species composition and relative abundance can be estimated.

b. Application ïFour roadside survey routes have been established in geographic regions delimited by each degree of latitude and longitude in Wyoming. The routes in each latilong (latitudinal and longitudinal degree block) are set up based upon a sampling protocol developed by the BBS office. Maps of routes are kept in files maintained by the Nongame Bird Biologist. The BBS office annually distributes maps, forms, and instructions to persons conducting the surveys. A brief summary of instructions follows:

- ¶ Observer is able to identify all birds in the route area by appearance and vocalizations.
- ¶ Observer is willing to participate at least 2 years.
- ¶ Observer must complete the BBS training program.
- ¶ Each route is 24.5 miles long and includes 50 stops distributed at 0.5 mile intervals.
- ¶ All surveys must be conducted in June or the first week of July.
- ¶ Avoid surveying when rain, fog, or smoke may impair visibility; wind velocity exceeds 12 mph (18 mph in prairie regions); or when cold weather inhibits bird song activity.
- ¶ Begin surveys 30 minutes before sunrise, and complete each route in 4-5 hours.
- ¶ Spend 3 minutes looking and listening for birds at each stop.
- ¶ Record all birds seen within 0.25 mile, or heard from any distance.
- ¶ Transfer data from the field sheet to the summary sheet when each route is completed.

c. Analysis of Data ïThe Nongame Bird Biologist is the state BBS coordinator and works with Nongame Program personnel, the Wildlife Management Coordinator in each region, District Biologists, biologists from other agencies, and volunteers to assign qualified observers to conduct surveys on established routes. The Nongame Bird Biologist forwards data sets on to the BBS office for analysis, and prepares summaries for annual completion reports.

d. Disposition of Data ïSend completed survey forms to the BBS office. Data are: incorporated into Threatened, Endangered, and Nongame Programs

Bird and Mammal Investigations Annual Completion Report; used to update the Wyoming Bird Conservation Plan (Nicholoff 2003), Wyoming State Wildlife Action Plan (WGFD 2010), and wildlife distribution maps; and added to various databases, including the Departmentôs W database and the Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming (Orabona et al. 2012) database.

2. Riparian Transects ï

a. Rationale ïStreamside shrub and tree communities in Wyoming form narrow, irregular corridors. No other vegetation type in the State is populated by a greater variety or density of birds. A specialized sampling approach is required to survey bird communities in these unique habitats. The line transect method described below has been developed for this purpose. Roadside and line transect surveys yield the same type of data.

b. Application ïRiparian transects are walked on foot, and are only conducted under favorable weather conditions (i.e., no precipitation, no extreme wind). Each transect is completed between 0500 and 0900 hours, and includes 20 stops distributed at 100-meter (328-foot) intervals. Surveyors spend 5 minutes looking and listening for birds at each stop. All birds seen or heard within 50 meters (164 feet) are identified and recorded. Transects may follow an irregular line depending on the extent and density of the vegetation and the nature of the river or stream channel (Diem 1976). However, the 50-meter (164-foot) radius at each stop should not overlap any area counted from adjacent stops. Data are recorded on the standardized Riparian Transect Survey Form (Attachment 2).

c. Analysis of Data ïThe Nongame Bird Biologist works with Nongame Program personnel, the Wildlife Management Coordinator in each region, district biologists, biologists from other agencies, and volunteers to assign locations for these transects and assure the surveys are conducted. The Nongame Bird Biologist compiles data from spring surveys, determines relative abundance of species detected, and prepares summaries for annual completion reports.

d. Disposition of Data ïSend completed survey forms to the Nongame Bird Biologist. Data are: incorporated into Threatened, Nongame I Endangered, and Nongame Bird and Mammal Investigations Annual Completion Report; used to update the Wyoming Bird Conservation Plan, Wyoming State Wildlife Action Plan, and wildlife distribution maps; and added to various databases, including the Departmentôs W Mammals, Amphibians, and Reptiles in Wyoming database.

3. Point Counts ï

a. Rationale ïThe point count is the standard method for monitoring populations of breeding landbirds in many countries. It is probably the most efficient and data-

rich means of surveying bird communities. Data from point counts are used to make annual comparisons of populations at fixed points, determine species composition, and assess abundance patterns among habitats. Counts can be conducted once to obtain information on species presence/absence. Counts can be replicated several times at each point to estimate occupancy by determining the proportion of sample units where a species is present. If the specific distance to each detected bird is also recorded, population density can be estimated. Point counts are not reliable for surveying waterfowl species; however, they are suitable for counting non-secretive species of rails and wading birds. Some landbirds can be disproportionately counted because they are particularly quiet, loud, nocturnal, or gregarious; however, the method can be adjusted to handle detection bias.

b. Application ïPersons conducting point counts must be skillful at bird identification using both visual and auditory methods. Training opportunities are available through the Institute for Bird Populations (www.birdpop.org). Recordings of bird songs and calls can be che Nongame Bird Biologist. Also consult the Handbook of Field Methods for Monitoring Landbirds (Ralph et al. 1993).

Field equipment includes a 1:100,000 or larger scale map, a Geographic Positioning System (GPS) unit, a pencil and notebook, a timer or watch that displays seconds, and binoculars. If specific distance sampling will be incorporated, a laser rangefinder should also be included. The route and observation points should be delineated on a map. A GPS unit is used to locate observation points in the field and to ensure the same points are found each year. The surveyor may travel by foot or vehicle between points. Usually no more than 4 hours are required to complete a route depending on distance between points and the method of travel. All routes should be completed between 5:00 and 9:00 a.m. Surveys should not be conducted when rain or wind interferes with the intensity or audibility of bird songs and calls; when fog, rain, or smoke impair visibility; or when cold weather causes bird song activity to cease.

A comprehensive survey should intersect all habitats within a region, if possible. Use a systematic, rather than random sampling approach. Survey routes can be located along lightly traveled roads or off roads (on trails, if possible, in major habitats not covered by road systems). When survey routes are established along roads, tertiary roads are preferred, then secondary roads. Avoid wide, primary roads. Locate sampling points at regular intervals. Do not stratify sampling effort based on habitat types unless separate estimates are being made. If the goal is to monitor population trends throughout a management unit, then point counts should be spaced evenly throughout the unit or along a road system. Up to 25 point counts can be completed in 1 morning along road routes. Off roads, 1 surveyor can complete between 6 and 12 point counts.

Sampling points are spaced at least 250 meters (820 feet) apart in wooded habitats. Avoid counting individual birds recorded previously at another

sampling point. More than 99% of individuals are detected within 125 meters (410 feet) of the surveyor in most habitats. The minimum distance between sampling points is greater in open environments where birds are more detectable. Sampling points should be at least 500 meters (1,640 feet) apart along roads traveled by vehicle. ñStrip countsò ca
strip count, all birds seen or heard are counted along designated sections of a trail. Segments are uniformly 100 meters (328 feet) or 250 meters (820 feet) long. The surveyor should spend consistent amounts of time covering each [e.g., 100 meters (820 feet) in 10 minutes].

The surveyor should cause the least possible disturbance when approaching each sampling point. Begin counts immediately upon reaching the census point. Expend 5 minutes looking and listening for birds at each point if travel time between points is less than 15 minutes and expend 10 minutes if travel time is greater than 15 minutes. Ten minutes is appropriate when a survey is primarily for baseline inventory. Note separately those individuals seen or heard within the first 3 minutes (for compatibility with Breeding Bird Survey protocol; Robbins and Van Velzen 1970), within the next 3-5 minutes, and within the final 5-10 minutes at each sampling point.

Record the date of the count, identification number of each point, and time. Record species in the order they are detected. Record separately the number of individuals detected within 50 meters (164 feet) of the surveyor, and those detected at 50 meters and beyond (to an unlimited distance). If specific distance sampling is included, record the distance in meters from the sampling point to each bird detected. In noisy environments or dense foliage, use a 25-meter (82 feet) radius as the basis for counting. Record the initial location of each bird; when birds displace in response to the surveyor arrival, record their positions before they move. Record individuals detected flying over the point separately from individuals located within the vegetation, placing them in the appropriate time block. If several males of the same species are present, the surveyor can sketch arrows indicating the directions and distances of each from the count point. Such notations are made in the margins of the survey form. Tally juvenile birds or birds that fledged during the current breeding season separately from adults. If a flock is encountered, the surveyor can follow it after the count period to determine species and numbers; no more than 10 minutes should be taken to do this. The source of an unknown song or call can also be tracked down for confirmation of identity following the count period. However, decoys, calls, or other devices should not be used to attract birds except in some specialized counts targeting specific taxa.

Two types of data are obtained at each sample point: locations and counts. The location of each bird detected is recorded on the Point Count Location Mapping Form (Attachment 3). The circle on the map is the count radius; 4-letter alpha codes are used to designate species; and symbols identify birc
distance sampling is included, the distance in meters to each bird detected is also

recorded. Colored pencils are used to distinguish time periods. Afterward, data are transcribed onto the Point Count Data Form (Attachment 4). Record the information about each census point on the first 3 lines of the Point Count Location and Vegetation Form (Attachment 5).

In general, sample each station once per season. Counts can be replicated if greater precision is desired within specific areas; for example, in marsh or wetland habitats or in defined project boundaries. Routes should be surveyed the same time each year, within 7 days of the date the first count was done. If the season phenology varies, the date can be adjusted. Counts should begin within 30 minutes of the time counts were started the first year. If possible, the same surveyor should conduct the route each year.

c. Analysis of Data ïThe Nongame Bird Biologist works with Nongame Program personnel, the Wildlife Management Coordinator in each region, District Biologists, biologists from other agencies, and volunteers to assign locations for these censuses and assure they are conducted. The Nongame Bird Biologist compiles and analyzes data, and prepares summaries for annual completion reports. Occupancy data are analyzed in Program PRESENCE, which accounts for imperfect detection through multiple surveys at each site (Hines 2006). Density data are analyzed in Program DISTANCE, which corrects for the declining ability to detect a bird the farther it is from the count point (Thomas et al. 2010).

d. Disposition of Data ïSend completed survey forms to the Nongame Bird Biologist. Data are: incorporated into Threatened, Nongame I Endangered, and Nongame Bird and Mammal Investigations Annual Completion Report; used to update the Wyoming Bird Conservation Plan, Wyoming State Wildlife Action Plan, and wildlife distribution maps; and added to various databases, including the Departmentôs W Mammals, Amphibians, and Reptiles in Wyoming database.

4. Spot Mapping ï

a. Rationale ïSpot mapping is based on the territorial behavior of birds. This method enables investigators to estimate the density of birds. However, spot mapping is not suitable for broad-scale monitoring because it requires more intensive fieldwork than point counts and line transects. The method is appropriate when managers seek fairly precise information about pair numbers and the distribution of territories in small study areas or patchy habitats. The standard mapping technique is less suitable for colonial species, non-territorial species, or species with large territories.

b. Application ïPersonnel assigned to conduct surveys must possess good identification skills, including knowledge of the songs and calls of birds. Contact the Institute for Bird Populations (www.birdpop.org) for training opportunities.

The Department ô s Nongame Biologist records of bird songs and calls. Review details of this technique in the Handbook of Field Methods for Monitoring Landbirds (Ralph et. al 1993).

Census equipment includes 30 to 40 copies of a detailed map, preferably 1:2000 scale (in open areas, 1:3000 scale may be acceptable), a pencil, a compass, a GPS unit, and fluorescent flagging. The time required depends on the size and topography of the area being surveyed and the density of birds (more individuals must be mapped at higher densities). In wooded areas, about 10-30 hectares (25-75 acres) can be surveyed in 1 morning; in open areas 50-100 hectares (125-250 acres) can reasonably be surveyed. Up to 25 hours may be required to mark the plot, 40 hours to prepare the species maps, and 5-10 hours to analyze them.

Boundaries of the survey area should be round or square to minimize border length (territories along edges are difficult to analyze). A detailed map, known as a visit map, is constructed (recommended scale is 1:2000) based on the survey area map (1:20,000); GPS coordinates of the border; and field locations of habitat features. Map the boundaries of the survey area and the locations of habitat edges, streams, roads, paths, buildings, large rocks, trees, and other features. If natural landmarks are absent, establish a grid of 50-meter (164-foot) squares. The grid is drawn to scale on the map and marked on the ground, using GPS coordinates and fluorescent flags to designate corners. Coordinates should be written on each flag.

Because phenology of arrival and nesting varies, the visits should cover a period long enough to assure each species is easily observable on at least 3 visits. A standard mapping of forest birds requires 10 visits. If the bird density is high and the nesting season is long, 12 visits are recommended. The visits should be evenly distributed over the census period. Fewer visits can suffice in open habitats, where bird densities are usually lower, or where the nesting season is short (e.g., tundra or alpine grasslands).

Censuses should generally be conducted between 5:00 and 10:00 a.m. when birds sing most actively. Counting can be delayed following an abnormally cold night. During very warm weather, counting should not be prolonged because birds become less active. Two evening visits should also be planned: the first in the beginning of the census period (to count thrushes) and the second about 2 or 3 weeks later (to count nocturnal singers). If species active at night or dusk breed in the area, 2 censuses targeting these periods should be added to the 10 morning visits. In northern temperate zones, extra visits in March and April may be needed to census owls, woodpeckers, and crossbills, which breed early.

A clean map is used to record bird locations during each visit. The route followed should cover the census area as evenly as possible. The route should lie within 25 meters (82 feet) of all points in areas of dense vegetation or high bird densities, within 50 meters (164 feet) of all points in areas of sparse vegetation or few birds,

or within 100 meters (328 feet) of all points in open habitats. The units of the grid on which the route is plotted should be twice the above distances [e.g., 50 meters (164 feet) in dense habitat]. The route must intersect all cells of the grid. Successive visits should begin at different points, especially if a portion of the area is receiving disproportionate attention. Multiple singing males of the same species must always be recorded carefully so the birds can be distinguished from neighboring males after they have moved. Walk at a moderate pace and record birds as they are encountered. Stop frequently to look and listen for birds, particularly multiple individuals of the same species, and mark birds on the map. In open areas, search for birds with binoculars. Normally, a surveyor can census 5 to 6 hectares (12 to 15 acres) per hour. If bird density is high, census speed may slow to 3 to 4 hectares (7 to 10 acres) per hour. In areas of low bird density, spend at least 8 minutes per hectare (3 minutes per acre). Thorough methodical censusing enables the surveyor to simultaneously detect several birds by following their territorial movements. Be particularly vigilant looking for species that are difficult to detect, search for nests, and check those found earlier. Locations of all observations must be accurately transcribed from the field maps to individual species maps (a separate map should be kept for each species).

c. Analysis of Data ï The Nongame Bird Biologist works with Nongame Program personnel, the Wildlife Management Coordinator in each region, District Biologists, biologists from other agencies, and volunteers to assign locations for these censuses and assure they are conducted. The Nongame Bird Biologist compiles and analyzes data, and prepares summaries for annual completion reports.

d. Disposition of Data ï Maps and data are sent to the Nongame Bird Biologist. Data are: incorporated into the Threatened, Endangered, and Nongame Bird and Mammal Investigations Annual Completion Report; used to update the Wyoming Bird Conservation Plan, Wyoming State Wildlife Action Plan, and wildlife distribution maps; and added to various databases, including the Department's database and the Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming database.

5. Area Search ï

a. Rationale ï Area searches incorporate a series of 3 20-minute point counts during which the surveyor can move around in a somewhat restricted area. This limited mobility enables surveyors to track down unfamiliar birds and increases the likelihood of detecting quiet species. Inexperienced personnel can walk plots with other knowledgeable surveyors prior to the survey to improve their efficiency.

b. Application ï Personnel who conduct area searches must possess good identification skills, including knowledge of the songs and calls of birds. Contact the Institute for Bird Populations (www.birdpop.org) for training opportunities.

The Department's Nongame Bird Biologist recordings of bird songs and calls. Review details of this technique in the Handbook of Field Methods for Monitoring Landbirds (Ralph et al. 1993).

In forested habitats, the plot should be sufficiently large to provide 3 separate search areas, about 3 hectares (7 acres) each. Larger search areas of 10 hectares (25 acres) or more can be set up in more open habitats. In dense forest, smaller search areas of 1-2 hectares (2.5-5 acres) may be necessary. The search areas can adjoin or they can be separated within the plot. It is acceptable to establish more than 3search areas, but the same areas must be searched on each visit.

Area searches are intensive and can extend later into the morning than other methods. However, these searches should not continue beyond 5 hours after dawn. The surveyor should spend exactly 20 minutes in each search area, stopping or moving to investigate sightings or calls as appropriate. Record numbers of birds of each species seen or heard during this time. Birds detected outside the search area can be recorded separately. However, the surveyor must concentrate on finding as many birds as possible within the plot. Detections can be dictated onto a cassette tape to facilitate data recording during the survey, and transferred onto data sheets soon afterward. A second person can also accompany the surveyor and serve as a recorder.

Record the following data: plot location, including directions to the plot and GPS coordinates; plot size; date and time of survey; names of the surveyor and assistant; weather conditions; general habitat in each plot and search area; species detected; and the number of individuals of each species, both on and off the search areas. A separate record is maintained for each search area.

c. Analysis of Data ï The Nongame Bird Biologist works with Nongame Program personnel, the Wildlife Management Coordinator in each region, District Biologists, biologists from other agencies, and volunteers to assign locations for these searches and assure they are conducted. The Nongame Bird Biologist compiles and analyzes data, and prepares summaries for annual completion reports.

d. Disposition of Data ï Records are sent to the Nongame Bird Biologist. Data are incorporated into The Threatened, Endangered, and Nongame Program's Bird and Mammal Investigations Annual Completion Report; are used to update the Wyoming Bird Conservation Plan, Wyoming State Wildlife Action Plan, and wildlife distribution maps; and are added to various databases, including the Department's WOS database and the Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming database.

B. Trumpeter Swan Surveys ï

1. Rationale ïTrumpeter swans were once abundant and widely distributed in North America. By the turn of the 20th century, excessive commercial hunting and habitat loss nearly caused their extinction (Banko 1960). Swans in Wyoming are part of the Rocky Mountain Population (RMP), which consists of swans nesting in the interior western U.S. and interior Canada (Pacific Flyway Council 1998, 2002). The portion of the RMP that nests in the U.S. (Idaho, Montana, and Wyoming) is known as the Tri-state Flock. Although the Canadian segment of the RMP has increased steadily since the 1980s, the U.S. portion declined sharply in the early 1990s. Since then, it has remained below historic highs achieved in the 1950s and 1980s. The decline coincided with the termination of winter feeding at Red Rock Lakes NWR in Montana. The theory that the current population level may be limited by the availability of suitable natural habitats continues to be debated.

   The trumpeter swan is a high interest species because of its public appeal, conservation history, association with shallow wetland habitats, sensitivity to disturbance, and restricted breeding distribution in Wyoming. A small resident flock nests in traditional sites that are reoccupied annually in northwest and southwest Wyoming. A majority of those swans remain in Wyoming year-round. Swans that nest in Canada migrate to the Tri-state Region each winter. The number of swans in western Wyoming increases 5- to 7-fold from November through mid-March each year. The status of the Tri-state Flock is closely monitored because of its comparatively small size, habitat concerns, and potential competition with wintering Canadian swans.

2. Application ïEfforts to monitor swans are coordinated with Montana and Idaho through the Greater Yellowstone Trumpeter Swan Working Group (GYTSWG), the Pacific Flyway Council, and the U.S. Fish and Wildlife Serviceôs (FW Migratory Bird Management (DMBM). During the breeding season, at least 3 surveys are conducted to monitor known nesting areas. Accessible sites are monitored from the ground and inaccessible sites are monitored using an aircraft. Surveys are conducted in mid- to late May to determine nest occupancy/incubation and in late June through early July to determine nest success and number of young hatched. An aerial survey is flown in early September to assess productivity and number of mature young. An aerial survey is also conducted in February to count the wintering population of swans. The September and February surveys are coordinated so all three states in the Tri-state Area are surveyed during the same 1-week window. Observers must be comfortable with flying, able to distinguish cygnets (young of the year) from adult swans, and know the specific locations where swans nest and winter. Flight schedules should be coordinated with other agency personnel before surveys are conducted. New observers flying their initial survey should accompany more experienced personnel, or at least fly with pilots who have conducted the surveys in prior years. Observers conducting ground surveys should be familiar with swan behavior to avoid disturbing nesting pairs and their young, or flushing wintering birds from secure habitat. When possible, all reports of dead swans should be investigated

and carcasses collected for laboratory analysis. Statewide press releases are issued at least twice a year in summer and winter to: 1) solicit observations from the public that will help document expansion of swan distribution within the state, and 2) document swan mortalities, especially in remote areas or on private land. Mortalities are most frequently reported in March after snow and ice melt, exposing carcasses of swans that died over winter. Physical and biological measurements of habitat, including submersed vegetation, should be collected periodically at nesting and wintering sites, especially if a traditional site remains unoccupied for more than a few years. Partnerships are developed with private landowners, land management agencies, and non-government organizations to restore or create additional shallow wetland habitats for nesting and wintering swans.

3. Analysis of Data ïThe Nongame Biologist in the Jackson/Pinedale Region collects and compiles data from official surveys and is also responsible for consolidating data and observations reported by Department district personnel, other agency biologists, and the public. Production data and estimates of summer/winter flock sizes are published in annual completion reports, along with a 10-year summary of this information. Additional data summaries are prepared for the annual GYTSWG meeting held in late October. Cooperating agencies attend the meeting to share data and coordinate planning and management strategies for the Tri-state Flock.

   The FWS DMBM in Denver compiles data from the September and February aerial surveys and publishes 2 reports annually, in which the total numbers of resident swans (fall report) and Canadian swans (winter survey total minus the resident birds counted the previous fall) are estimated.

4. Disposition of Data ïData are: sent to the Jackson/Pinedale Nongame Biologist. Data are incorporated into Threatened, Endangered, and Nongame Bird and Mammal Investigations Annual Completion Report; used to update the Wyoming State Wildlife Action Plan and wildlife distribution maps; and added to various databases, including the Program of Birds, Mammals, Amphibians, and Reptiles in Wyoming database. The GYTSWG publishes a summary of data from Tri-state Area Flocks in its annual meeting minutes. The FWS DMBM in Lakewood, Colorado, publishes annual reports in fall (Trumpeter Swan Survey of the Rocky Mountain Population, U.S. Breeding Segment) and winter (Trumpeter Swan Survey of the Rocky Mountain Population). Every 5 years, the FWS drafts a status report of Rocky Mountain, Pacific, and Interior populations of trumpeter swans (U.S. Fish and Wildlife Service 2012).

C. Common Loon Surveys ï

1. Rationale ïThe common loon is a high interest species because of its public appeal, sensitivity to disturbance, and restricted breeding distribution in Wyoming. Loons can be observed statewide during spring and fall migration, and non-breeding loons can be found throughout the State during summer; however, suitable breeding habitat is limited to northwest Wyoming. Much of the common loon breeding in Wyoming

is within backcountry recreation areas. Excessive human activity has the potential to disturb breeding loons and impact their habitat. Surveys are conducted in preferred loon habitat to document additional loon breeding sites.

Suitable loon breeding habitat has the following characteristics: lakes substantially secluded from human activity; surface area of 10 acres or greater, elevation less than 8,000 feet (typically between 6,000 and 8,000 feet); water clarity of 3 feet or greater for visual detection of prey; islands or protected shore areas for nesting and raising young; abundant populations of small to mid-sized fish; water depth greater than 6 feet to prevent winter kill of fish; and an ice-free period lasting at least 4 months to allow young loons to fledge.

2. Application ïIn areas where common loons are known to nest, 3 surveys are conducted each year. Nest occupancy surveys are completed in early to mid-June, production surveys in early to mid-July, and young survival surveys in early to mid-August. Surveys to locate new or previously unknown breeding sites should be conducted in early to mid-June. If common loons are observed, production and young survival surveys should follow. If common loons are not observed but the habitat is suitable for nesting loons, a follow-up survey should be conducted in mid- to late July.

   The best times to observe loon broods are early morning and early evening. The observer(s) should sit quietly at a vantage point and glass the lake for activity. Loons may be quite visible or they may be feeding or loafing in emergent vegetation where they are more difficult to see. A sufficient amount of effort should be consistently expended glassing each lake to ensure that loons are detected if they are present. We suggest 45 minutes to 1 hour. If loons are observed sooner, glassing can be terminated when the observer is confident all loons have been counted.

   Record the number of adult and young loons observed and behavioral activities, such as diving, hunting, feeding self or young, calling, flying, or loafing. If the lake has not been previously surveyed, obtain a photograph of the lake (e.g., download from Google Earth) or use the back of the survey form to sketch the shape of the lake. Note where the loons were observed and all important habitat features, such as islands and grassy shorelines. Other comments (e.g., degree of human activity, locations of roads and trails, type and distribution of shoreline habitat) are helpful for determining the overall suitability of the area for nesting loons. Data are recorded on the standardized Common Loon Nesting Survey and Habitat Description Form (Attachment 6).

3. Analysis of Data ïThe Jackson/Pinedale Nongame Biologist works with Nongame Program personnel, the Wildlife Management Coordinator in each region, District Biologists, biologists from other agencies, and volunteers to assign locations for these surveys and assure they are conducted. The Nongame Biologist compiles and analyzes data, and prepares summaries for annual completion reports. Data are also forwarded to cooperating agencies.

4. Disposition of Data ï Send completed survey forms to the Jackson/Pinedale Nongame Biologist. Data are: incorporated into the Nongam Threatened, Endangered, and Nongame Bird and Mammal Investigations Annual Completion Report; used to update the Wyoming Bird Conservation Plan, Wyoming State Wildlife Action Plan, and wildlife distribution maps; and added to various databases, including the Departmentôs WOS Mammals, Amphibians, and Reptiles in Wyoming database.

D. Secretive Marsh Bird Surveys ï

1. Rationale ï Some species of colonial or semi-colonial nesting marsh birds (e.g., American bittern) are secretive by nature and cannot be surveyed adequately by methods used for colonial waterbird surveys described in the next section (Section II.E.). In 1999, the National Marsh Bird Monitoring Program was created to identify and standardize marsh bird survey protocols across the nation, enabling a variety of parameters to be evaluated and compared acr (Conway 2009). species ô The protocol below is adapted from this monitoring program.

2. Application ï The objectives of these surveys are to: 1) document the presence or distribution of secretive marsh birds within a defined area; 2) estimate the density of secretive marsh bird species within a defined area, or compare species density among defined areas; 3) estimate secretive marsh bird population trends at local or regional scales; 4) evaluate the effects of management actions on secretive marsh birds; and 5) document habitat types or wetland conditions that influence secretive marsh bird abundance or site occupancy.

   Twenty-six species are listed as focal marsh birds in the national monitoring program. The American bittern is the only nongame secretive marsh bird that is a Species of Greatest Conservation Need in Wyoming; therefore, the survey application will focus on this species only. Consult Conway (2009) to obtain additional information regarding survey methods applicable to other focal marsh bird species.

   Surveys are conducted 3 times during the American bittern breeding season between 1 May and 15 June in the lower elevations of north-central and eastern Wyoming, and between 15 May and 30 June in the remainder of the State, with a minimum of 2 weeks between each replicate. At least 3 surveys are needed to confirm seasonal marsh bird presence/absence in a wetland with 90% certainty (Gibbs and Melvin 1993). Surveys can be conducted in the morning from 30 minutes before sunrise to 2-3 hours after sunrise, or the evening from 2 hours before sunset to 30 minutes after sunset. If bitterns are heard calling earlier or later than these time frames, survey hours can be adjusted accordingly. Once a morning or evening time period has been chosen for a particular route, it cannot be changed.

   Survey points are spaced 400 meters (1,312 feet) apart along each route to avoid the risk of double counting individual birds and to increase the total area covered by

monitoring efforts. A unique identification number is assigned to each survey point on each route, and NAD 83 UTM coordinates are recorded. Start time, temperature, sky condition, Beaufort wind speed, salinity (if applicable), and background noise are recorded at each stop. Surveys should not be conducted if wind speed exceeds 20 km/hour (12 miles/hour) or during periods of sustained rain or heavy fog. If possible, surveyors should place 1 or more water level gauges in permanent locations at points that have the same daily and annual water level fluctuations as the target area, and record water depth during each survey. Water levels can influence the abundance and distribution of marsh birds, and can help explain spatial and temporal changes in marsh bird abundance.

At each point, the survey begins with an initial 5-minute passive listening period. All American bitterns heard or seen during this time are recorded on the data sheet. Place a ñ1ò in the proper detection column(s) i the individual is detected visually (including flying overhead), and a ñ1Sò if t individual is both heard and seen. Recording whether each individual is or is not detected during each 1-minute segment permits the use of removal models in the analysis to estimate detection probability (Farnsworth et al. 2002). If the bittern was heard, record the call type given. Determine the distance to each bittern upon first detection and note the type of distance aide used. This enables the use of distance sampling to estimate density of individual species in a specific habitat (Buckland et al. 2001). Approximate the direction of the bird from north by placing a tick mark in the circle provided (a compass can also be used). Note whether the individual is in the target survey area, and if it was detected at a previous count point. Each new individual detected is recorded on a new row of the data sheet using the same notations as above. Note other species heard or observed in the comments column using the appropriate 4-letter species code. After the passive listening period, call-broadcast is used to elicit vocalizations because American bitterns (and many other marsh bird species) are secretive, seldom observed, and vocalize infrequently (Gibbs and Melvin 1993, Conway and Gibbs 2005). Place the call-broadcast unit on the ground with the speaker pointing toward the marsh. Do not rotate the unit during the count. Play the -erAhuerkiòcamatbeitattetrmacñtpiuomnp/t call for 30 seconds at 80-90 dB while standing 2 meters (6.5 feet) from the call-broadcast unit. If bitterns are detected, follow the recording protocol above. If a pair is detected, record each individual on a separate line on the data sheet and write ñpairò in the comments column for both bi bird s ò ispeciestolumn. If the surveyor is unsure of the species detected, write ñunknownò in the specieizationcinthecommentsand descr column. Data are recorded on the standardized Secretive Marsh Bird Survey Form (Attachment 7).

3. Analysis of Data ïThe Nongame Bird Biologist (in conjunction with the Wildlife Management Coordinator in each region, District Biologists, biologists from other agencies, and volunteers) assigns locations for these surveys and assures they are conducted. The Nongame Bird Biologist enters survey data into the National Marsh Bird database (http://www.pwrc.usgs.gov/point/mb/) for analysis and comparison

with similar species data from other locales, downloads analyses from the database, and prepares summaries for annual completion reports.

4. Disposition of Data ï Send completed survey forms to the Nongame Bird Biologist. Data are: incorporated into The Threatened, Endangered, and Nongame Bird and Mammal Investigations Annual Completion Report; used to update the Wyoming Bird Conservation Plan, Wyoming State Wildlife Action Plan, and wildlife distribution maps; and added to various databases, including the Department ô s Wildlife Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming database.

E. Colonial Waterbird Surveys ï

1. Rationale ï In Wyoming, secure breeding sites for colonial waterbirds are limited and their availability is uncertain from year to year due to fluctuating water conditions and land use changes. The sites with the most consistently ideal habitats are monitored every 3 years, at a minimum. We also encourage periodic monitoring at sites with immature but developing marsh habitat, and inventory of sites with potential habitat.

2. Application ï The primary goal of this survey is to document species composition and presence/absence at traditional nesting sites of colonial nesting waterbirds that are listed as Species of Greatest Conservation Need (Orabona et al. 2012, WGFD 2010). These include the black-crowned night-heron, snowy egret, white-faced ibis, Caspian tern, Forsterô s tern, black tern, gull. Nesting American white pelicans, double-crested cormorants, and great blue herons are also documented. A secondary goal is to record active nests of these species; however, numbers of active nests are estimated rather than counted. Presence of other species is also noted. A key to identifying eggs of marsh birds and associated species is provided in Attachment 8. Survey data are recorded on the standardized Wyoming Colonial Waterbird Colony Description and Survey Form (Attachment 9). We recommend taking photographs of each colony site, if possible.

   Colonial waterbird surveys are conducted in areas of suitable nesting habitat. Any large reservoir with islands may be suitable for nesting if foraging habitat is available nearby and human activity is not excessive. Caspian terns and American white pelicans will fly up to 20 and 45 miles, respectively, between nesting colonies and foraging areas. Smaller reservoirs, ponds, and lakes may be suitable for nesting if they contain an island or peninsula, or a wide fringe of bulrushes or cattails extending at least 720 feet from shore. In Wyoming, colonial nesting sites of species other than Caspian terns or pelicans tend to be located near irrigated pasture or cropland where birds forage. Most sites are within 5 miles of irrigated pasture or cropland; however, birds may forage up to 20 miles or more. Several wetlands or reservoirs within 20 miles may provide suitable alternative foraging habitat. An isolated pond more than 20 miles from foraging habitat is unlikely to be used. The presence of gull nesting colonies is a good indication that other colonial nesting species may be present.

Surveys are timed to coincide with late incubation/early hatching. If a colony is surveyed too early, the number of active nests will be underestimated because not all birds will have arrived at the colony. If a colony is surveyed late, active nests can also be underestimated because failed nests are missed. The dates we recommend for surveying colonial waterbirds are approximate. Survey timing may require some adjustment from year to year, depending on weather conditions, water levels, human disturbance, or other factors. Also, birds in small colonies often nest later than birds in larger colonies within the same general area. Nest initiation dates also vary with latitude. Typically, colonial waterbird surveys should be conducted the last 2 weeks of June through the first week of July. This appears to be the best time to document nesting. Survey dates should be delayed to the last week in June through the first 12 days of July when spring weather is abnormally cold and wet. However, those later dates may not be ideal to accurately estimate numbers of active nests, so observers should note possible limitations of data collected during years in which surveys are delayed.

Surveys are conducted in early morning to reduce the potential for heat stress on young birds. Also, if chicks are flushed from their nests and get wet, ample time remains for them to dry before temperatures cool in the evening. Avoid surveying colonies on unseasonably cold or rainy days. As a rule, do not conduct surveys when the temperature is below 65° F.

Aerial surveys are an effective means to search large areas to locate nesting colonies. Although nests of most colonial waterbirds cannot be accurately counted from the air, sites worth visiting can be surveyed from the ground. Nests of some colonial species that nest in treetops or in the open on islands (e.g., great blue herons, American white pelicans, and double-crested cormorants) can be counted during aerial surveys. Either count the nests from the air, or take digital photographs to later estimate the number of nesting birds.

Before proceeding with a survey, assess each marsh and island site to determine if it is suitable habitat for colonial nesting waterbirds. Sites with appropriate characteristics are surveyed an hour or longer in the evening or early morning (start before sunrise). Approach the area inconspicuously, if possible, to avoid flushing birds prematurely. In habitats where secretive marsh birds, such as American bitterns, may nest, a specific call broadcast survey should be conducted to determine if they are present (see next section). The following behaviors may indicate presence of an active colony:

- Adults in breeding plumage persistently flying around one location. Birds are repeatedly observed entering and leaving the same spot.
- Adults persistently cluster in one place above the high water mark.
- Adults in breeding plumage are observed carrying food or nest material to one location.
- Courtship behavior, displays, or copulations are observed in a small area.

¶ Birds roost at night in one location. This location is especially evident among herons and ibises.
¶ Adults engage in nest defense behavior when people or animals enter specific areas.
¶ Clusters of regularly spaced adults are observed on the ground (terns and gulls) or in trees and shrubs (herons and ibises), especially at times other than dusk.
¶ Excrements produce whitewashed or odorous areas, suggestions of nests or nest ñscoopsò are present, or the area is de
¶ Clusters of adults on the ground or in trees and shrubs allow unusually close approach before flushing, and then return to the same spots.

Contact the Nongame Bird Biologist for specific information on actual or potential colonial waterbird nesting sites.

a. Marsh surveys ï Begin by observing the site quietly for several minutes. Then make a loud abrupt noise, such as slamming a vehicle door, firing a shotgun into the air, or discharging an M-80. This will flush birds off nests, revealing the location that needs to be searched and the species present.

   Determine the species and number of adult colonial nesting waterbirds and estimate the number of active nests. A canoe or kayak is very effective for conducting this type of survey. Launch the canoe or kayak away from the nesting colony, paddle quietly to a vantage point at the edge of emergent vegetation near the colony, create a loud disturbance to flush birds, and count adults and young of each species. (If more than one observer is present, decide beforehand which species each observer will count). This method enables observers to count flushed birds quickly and efficiently without entering the colony or creating trails through vegetation that may attract predators. A direct count of nests can be made, if necessary, once the colony has been located.

   If counts of nests, eggs, or young are required, observers may need to wade through the marsh to obtain these. Such counts should be done in the morning well before midday heat. In larger marshes, observers may need to quarter back and forth and mark nests as they are encountered. A second observer should assist if the marsh is large enough that a single observer cannot complete the survey within 2 hours. The second observer helps to record data and navigate transects, and increases safety. Count all nests of waterbirds listed as Species of Greatest Conservation Need and estimate how many nests of other colonial species are present. Note the numbers of eggs, nest type(s), and nest material. Count the young that are nearly fledged when this can be done without excessive disturbance. Note other species observed during the surveys. A key to the eggs of marsh bird species is provided in Attachment 8.

b. Island surveys ï Use a spotting scope to obtain as complete a count of adults and nests as possible, then approach by boat and watch for birds flushing from nests (this may happen while you are a few hundred yards away). While adults are off

the nests, eggs and young are extremely vulnerable to predation, especially if gulls are in the area. Count nests and record all species quickly, preferably in less than 20 minutes, and then leave directly. Do not enter colonies of more than 20 pelican nests; notify the Nongame Bird Biologist promptly so an aerial survey can be scheduled.

3. Analysis of Data ï The Nongame Bird Biologist (in conjunction with the Wildlife Management Coordinator in each region, District Biologists, biologists from other agencies, and volunteers) assigns locations for these surveys and assures they are conducted. The Nongame Bird Biologist compiles and analyzes data, and prepares summaries for annual completion reports. After several years of records are accumulated, trends in breeding populations can be examined.

4. Disposition of Data ï Send completed survey forms and photographs to the Nongame Bird Biologist. Data are: incorporated into Threatened, Nongame Endangered, and Nongame Bird and Mammal Investigations Annual Completion Report; used to update the Wyoming Bird Conservation Plan, Wyoming State Wildlife Action Plan, and wildlife distribution maps; and added to various databases, including the Department ôs Birds, Mammals, WGFS database a Amphibians, and Reptiles in Wyoming database.

F. Raptor Nesting Surveys ï

1. Rationale ï Raptors are culturally and ecologically significant species. Many are sensitive to disturbance. Several species are also harvested for falconry purposes. Therefore, it is important to monitor populations. Raptors are most effectively surveyed during the nesting season. Several species use traditional nest sites in consecutive years. During other seasons, raptor densities and distribution are influenced by local fluctuations in prey and weather, and may not represent valid population trends. Nesting surveys not only provide data relevant to population trends, but also enable managers to identify key nesting habitats that warrant special attention.

2. Application ï Persons who conduct breeding raptor surveys should be familiar with nesting habits and territorial behavior. Nest searches should concentrate in likely habitats depending on species potentially present. From a distance, carefully glass cliff and rimrock faces, bluffs, outcrops, knolls, trees, snags, cavities, and other likely habitats or features. Pay particular attention to substrate, aspect or exposure, height, and other characteristics of sites typically selected for nesting. Look for nests, telltale ñwhitewashò streaks, returning or circlin substitute for experience in conducting such searches. Use a GPS unit to record coordinates of all nests. Also describe landmarks and identifying features that will assist in relocating the nest in subsequent years. Determine the status and success (unoccupied, occupied active, incubating, fledglings present, etc.) from the greatest distance possible, using existing terrain and vegetation as a screen where feasible. Follow-up visits will be necessary if data on nest success and production are to be

collected. Adhere to recommendations of Fyfe and Olendorff (1976) to minimize stress and disturbances to nesting raptors. The following parameters are useful for monitoring trends:

a. The number of breeding pairs that can be annually located in a study area.

b. The percentage of traditional nesting territories that are occupied from one year to the next. This index is limited to species that use highly traditional nest sites. These percentages may vary depending on objectives of a specific study.

c. Annual production measured as nest success, brood size, and productivity (i.e., number of young fledged from the nest).

Raptors are monitored over large areas (e.g., latilong blocks or statewide) based predominantly on the latter 2 parameters (b and c). Density data (parameter a) can be periodically obtained from scattered study areas. Baseline data used to evaluate proposed projects or land use changes should include all 3 parameters.

3. Analysis of Data ïRaptor research has been hampered by inconsistent use of terms, calculations, and data interpretation (Postupalsky 1974). Until terminology is standardized nationwide, the following terms and definitions, similar to those recommended by Postupalsky (1974), will be used in Wyoming:

Breeding territory or site: An area containing 1 or more nests within the range of 1 mated pair of birds.

Occupied territory or site: Any territory or site at which one of the following activity patterns has been observed during a breeding season:
i. Young were raised.
ii. Eggs were laid.
iii. One adult was observed sitting low in the nest, presumably incubating.
iv. Two adults were present on or near the nest, provided there was no reason to suspect the pair had already been counted elsewhere.
v. One adult was observed frequenting the site or maintaining a territory.
vi. Fresh sticks (unweathered breaks) or boughs indicate the nest has been recently repaired.

Unoccupied territory or site: None of the above conditions are met.

Occupied active nest: A nest or ledge in which eggs have been laid. At least 1 of the activity patterns (i, ii, or iii) must be documented.

Inactive nest: Not an acceptable term; see occupied or unoccupied definitions.

Productive or successful nest: An occupied active nest or ledge from which at least 1 young fledged or was raised to an advanced stage of development.

Alternate nest: One of several nests within the breeding territory of 1 pair of birds.

Frustration nest: An alternate nest built, repaired, or frequented by a pair of birds after another nest has failed during the same breeding season.

Surveys should be designed to support the following calculations:

Density: Number of occupied nests per square kilometer or mile.

Historical occupancy rate: The percentage of known breeding territories that were occupied in any particular year. The breeding territories used in this calculation must have been documented at least 1 year prior. Dates during which occupancy data were gathered must be specified. Occupancy rates estimated from surveys late in the nesting season are often biased low because failed nests may not be detected.

Percentage of occupied active nests: The number of occupied active nests divided by the number of sites occupied early in the nesting. Nests of unknown status are not counted in this calculation.

Nest success: The proportion of occupied or occupied active breeding territories in which at least 1 young is fledged. Nest success and productivity should be calculated on the basis of both occupied and occupied active nests. Occupied or occupied active status must be determined prior to hatching.

Brood size: The number of young per successful nest.

Productivity: The number of young raised to an advanced stage of development per occupied or occupied active nest. Occupied or occupied active status must be documented before hatching. Specify whether the index was based on young per occupied nest or young per occupied active nest.

4. Disposition of Data ïNesting data are often summarized in inconsistent formats because individual biologists may favor use of different indices. Table 3 is a format recommended to provide more comparable data summaries in the future. Investigators may not collect data to support calculations of all statistics. However, the format should be followed and statistics for which data are lacking should be noted.

TABLE 3. Suggested format for reporting raptor nest data (example).

Statistics[a]	**Year ï2011**
A. Historic nest sites checked[b]	24
B. Occupied nests	22
C. Number of occupied nests that were adequately observed to determine if eggs were laid	20
D. Occupied active nests	16
E. Successful nests	16
F. Number of young fledged	30
Indices	
Occupancy rate (historic sites): B/A	91.7%
Nest success (occupied sites): E/B	72.7%
Average brood size: F/E	1.88
Productivity (occupied sites): F/B	1.36
Productivity (occupied active sites): F/D	1.88

[a] Terminology as defined previously.
[b] Includes only sites that were checked thoroughly enough to determine occupied/ unoccupied status. Alternate nest sites must also be thoroughly covered

Data gathered during raptor surveys are recorded on the following forms:

Raptor Nest Report Form (Attachment 10): This form is used to record nest occupancy status and production data, and should be filed with the Raptor Nesting Survey Summary Form (Attachment 11) completed for each nest. Raptor Nest Report Forms are organized based on species, latilong number, site name, and site number. The site name is assigned based on the location of the nest (e.g., Clear Creek nest, Hawk Springs Reservoir nest, Thompson Ranch nest). The site number is a 7-digit number comprised of Township, Range, and Section (e.g. T6N, R147W, Sec. 5 would be recorded as Site Number 0614705). If 2 or more nest sites of a single species are located in the same section, a decimal point is added to identify quarter section locations. The quarter section and digits 1-4 correspond to the coding system used in System (i.e., 1=NE, progressing counter clockwise). Raptor data are entered into the Wildlife Observation System database. However, nest locations are sensitive information so specific location coordinates are not generally recorded. Raptor nest locations are entered into a Raptor Nest Database and plotted on maps maintained by the Nongame Bird Biologist.

Raptor Nesting Survey Summary Form (Attachment 11): Data are recorded on the raptor nesting survey summary form when a nest is located for the first time. This form provides a good synopsis of baseline data available for each raptor nest and should be sufficiently detailed to enable a person unfamiliar with the site to locate the exact nest structure in the field. Data on the exact locations of nesting sites used by the same species in successive years are especially important. Investigators are encouraged to submit any nesting information that may have been obtained on these species in the past. Investigators are also encouraged to fill out the forms as completely as possible; however, forms that give only the species observed nesting and a description of the location are still valuable and will be used. Any information that is approximated should be noted as such. If no birds were observed and the nest was identified by characteristics of the nest or sign, the word ñpotentialò should be wr are recorded to aid in follow-up work and to give an idea of the portion of the nesting habitat that is being utilized. Only those investigators who have experience with raptor nesting habitats should record potential sites. Investigators are encouraged to attach maps and photographs indicating the location of nests. When providing information on dominant habitat of the area, the habitat categories used for the Wildlife Observation Form are preferable. A description of the specific habitat at the nest should be as detailed as possible. Alternate nests should be recorded under the additional remarks section and plotted on the associated map.

Wildlife Observation Form (Appendix I): Record miscellaneous observations of nest sites on a Wildlife Observation Form. Carefully follow instructions for recording raptor nest observations so production indices may be accurately calculated. Forward completed forms to the Nongame Bird Biologist immediately following the nesting season.

Raptor nest locations are sensitive information and should be kept confidential. Exact locations of nests should not be provided to anyone who is not immediately involved in an approved study or management program. Reports intended for public distribution can include data summaries, but not location information.

G. Mountain Plover Surveys ï

1. Rationale ïMountain plover surveys are recommended throughout the species ô breeding range in Wyoming to determine presence/ absence, better define nesting and brood rearing areas, minimize potential negative impacts to nesting and brood rearing habitat in areas planned for development, estimate abundance in breeding concentration areas, and track population trends over time. During the breeding season, mountain plovers use shortgrass and mixed grass prairies, shrub-steppe landscapes, prairie dog colonies, and agricultural lands. They typically nest on sites with sparse vegetation that is less than 4 inches (10 cm) tall, slope less than 5%, and a bare ground component. Within the shrub-steppe landscape, nest sites are also

limited to areas of little to no vegetation surrounded by areas visually dominated by shrubs. Nest sites within shrub-steppe habitats are often in active prairie dog towns. Nests can also be found on bare ground created by livestock grazing and activities associated with oil and gas development, and on dryland, cultivated agricultural lands.

The U.S. Fish and Wildlife Service biologists (USFWS 2002) and Dr. Fritz Knopf (USGS-BRD) developed early guidelines for mountain plover surveys when the species was previously proposed for listing under the Endangered Species Act. Those guidelines have been updated and adapted by the Nongame Program to apply specifically to Wyoming conditions.

2. Application ïThe following survey guidelines were developed to determine presence/absence of plovers during the nesting season in locations where permanent and short-term projects were being proposed, and to estimate plover occupancy and population trends within breeding areas.

Survey Protocol

Surveys for mountain plovers are conducted during the period when most plovers are either: 1) tending nests; or 2) raising chicks. Through breeding range, these dates generally occur from mid-April through July. In Wyoming, the best dates for surveying nesting plovers are from the last 10 days in May through the first week in June, and the best dates for surveying plovers with chicks are from the last 10 days in June through the first week in July. However, seasonal restrictions on ground disturbing activities in suitable mountain plover habitats often extend outside the survey dates. The earlier seasonal restrictions allow for protection of sites during courtship and early nesting. Restrictions are typically not necessary after mid-July since all birds will either be tending the mobile chicks or have left the breeding area. Specific nesting dates across the breeding range of the plover vary according to latitude, elevation, and local weather; thus, the project proponent or land management agency should contact the Department to determine what seasonal restrictions apply for specific projects.

Two types of surveys may be conducted: 1) surveys to determine the presence/ absence of breeding plovers (e.g., displaying males or foraging adults), and 2) surveys to estimate plover abundance and population trends. The survey type chosen for a project and the extent of the survey area [i.e., beyond the edge of the construction or operational right-of-way (ROW)] will depend on the type of project activity being analyzed (e.g., construction vs. operatio

Techniques Common to Each Survey Method

¶ Conduct surveys during the courtship and nesting phase, or the pre-fledging and brood-rearing phase. In Wyoming, the best dates are from the last 10 days in May

through the first week in June for the nesting phase, and from the last 10 days in June through the first week in July for the brood-rearing phase.

- ¶ Conduct surveys between local sunrise and 1000 and from 1730 to sunset (periods of horizontal light to facilitate spotting the white breast of adult plovers) during the nesting period. Surveys during the brood-rearing period can be conducted all day, as plovers with chicks are more animated and become easier to detect in this latter period. Keep in mind, however, that the bi-modal approach may still work best for locating plovers due to more conducive lighting and a lack of heat waves during the early morning and evening hours.
- ¶ Drive transects within the project area to minimize early flushing. Flushing distances for mountain plovers may be within 10 feet (3 meters) from vehicles, but plovers on nests often calmly sneak away undetected at distances greater than 650 feet (200 meters) when approached by humans on foot. Mountain plovers cannot be effectively surveyed by a walking observer.
- ¶ Use of a vehicle is preferable where allowed. Use of an all-terrain vehicle (ATV) has proven highly successful in observing and recording displaying males. (Always seek guidance from land management agencies regarding use of vehicles on public lands, and always obtain permission of private landowners before entering their lands).
- ¶ During the nesting phase surveys, stop the vehicle, walk out 20 feet (6 meters) and around the vehicle, and then get back inside (or on the ATV). The walking phase will alert plovers to the observer and cause them to get off nests (often undetected). Once the observer is back inside the vehicle or on the ATV, plovers will start moving (usually foraging) and will eventually return to their nests. Plovers are not afraid of vehicles (e.g., ATVs, pickup trucks, tractors). Use binoculars to scan for plovers in a 360 degree circumference around the vehicle for 3 minutes, and record those detected.
- ¶ Detection rates are reduced when surveys are conducted during inclement weather (i.e., high wind, precipitation, etc.), especially from ATVs and during the earlier nesting phase surveys. The reduced detection is attributed more to the impaired abilities and comfort of biologists conducting the scanning than to the behavior of the plovers.
- ¶ Within areas where birds were observed during the nesting phase, conduct additional on-site surveys immediately (<72 hours) prior to construction activities to search for active nest sites.
- ¶ If an active nest is located, an appropriate buffer area should be established to prevent direct loss of the nest or indirect impacts from human-related disturbance. The appropriate buffer distance will vary depending on topography, type of activity proposed, and duration of the disturbance. For disturbances including pedestrian foot traffic, a 0.25 mile (0.4 kilometer) buffer is recommended.
- ¶ Surveys conducted during the brood-rearing phase will detect both adult and juvenile plovers, as adults with chicks are very active and easily detected. Such observations would indicate successful reproduction. Thus, this is not a survey to locate a breeding population, but rather a survey of a successfully breeding population.

¶ At each point, stop the vehicle, walk out 20 feet (6 meters) and around the vehicle, and then walk back to the vehicle. Plovers with chicks will become agitated during the walking phase. Use binoculars to scan for plovers in a 360 degree circumference around the vehicle for 3 minutes. Scanning may be done from either outside or inside the vehicle.

¶ Use the standard mountain plover data sheet (Attachment 12) to record the number of adults detected and to indicate the presence of chicks. Information on the number of chicks cannot be interpreted because not all chicks will survive to fledge.

Surveys to Determine Presence/Absence

a. Short-term projects: Many projects have minimal impact on mountain plover nesting habitat, and these projects may only be present in suitable habitat for a day or less. The following guidelines were developed to address project proponents ô concerns about potential delays resulting from mountain plover surveys. However, project proponents are encouraged to plan these projects so that all work occurs outside the plover nesting season, approximately August through March.

   Short-term projects are defined as projects that are in or move through an area within the course of a few days and result in no permanent habitat (vegetation/topographic) changes. Short-term projects may include activities such as cattle water tank installation/maintenance, pipeline or fiber optic cable maintenance efforts, and seismic exploration. For these projects, all ROW surveying/staking activities should be completed before 1 April to avoid discouraging plovers from nesting in suitable habitat. If ROW surveying cannot be completed before 1 April, surveyors will need to coordinate with the lead wildlife and land management agencies before entering these areas, and a plover survey will be required prior to ROW demarcation if potential habitat is present. For these projects, the presence/absence guidelines above should adhere to the dates below.

   ¶ Mid April through mid June ï a plover survey will need to be completed 1-3 days prior to any activity, including initial brush clearing, to avoid direct take of mountain plovers. The survey should include the route and a 0.25 mile (0.4 kilometer) buffer on either side of the project corridor. If there is a break of more than 3 days in construction activities within these areas (e.g., between pipe stringing, trenching, or welding), an additional plover survey is necessary before construction activity can resume after the break. Generally, mountain plovers are establishing territories or starting nests in April, and young chicks commonly freeze in place to avoid detection in early/mid-June, which increases their vulnerability to accidental take. After the third week of June, mountain plover chicks are sufficiently mobile to reduce the risk of direct take.

   ¶ If an active nest is found in the survey area, the planned activity should be

delayed 37 days, or 7 days if small chicks are found.

b. Larger scale/longer term projects: These surveys are designed to monitor mountain plover population trends over time. The counts should be conducted at precisely the same point and, ideally, by the same personnel annually. Every attempt should be made to minimize personnel turnover among years.

- ¶ Conduct surveys between the last 10 days in May through the first week in June.
- ¶ All plovers located should be observed long enough to determine if a nest is present. These observations should be made from within a stationary vehicle, as plovers are not wary of vehicles. Once spotted from a vehicle, a plover that is nesting will likely forage, generally by moving laterally back and forth. If it moves directly away from the vehicle (the observer sees mostly the back), the probability of a nest is much reduced. If the plover occasion body (often called a óhead bobô) then in the vicinity. This behavior also continues for about a week after the eggs hatch; at that time the plover will also give a soft vocalization that phonetically sounds like ñwhirt!ò. Th stay hidden. Once a plover has been detected, backing the vehicle up about 325 feet (100 meters) encourages the plover to return to the nest/chicks sooner and expedites the survey.
- ¶ Record the UTM coordinates of adult mountain plovers detected and plot the locations on a map of at least 1:24,000 scale map and on a ROW diagram or site grid. The ROW diagram should depict the location of breeding birds (and possible nest sites) relative to the ROW centerline, construction boundary, and applicable access roads.
- ¶ Because this survey is used to determine presence/absence only, and not to calculate density, there is no standardized distance interval for stopping the vehicle to scan for birds. Obviously, numerous stops will be required to conduct a thorough survey, but the number of stops should be determined on a project- and site-specific basis. Within landscapes suitable for plovers, stops should not exceed 0.25 mile (400 meters) apart.
- ¶ A site must be surveyed 3 times during the survey window, with each survey preferably separated by 5-7 days. Three surveys are needed to span the entire nesting period to avoid concluding the site is not plover nesting habitat based on absence of nesting birds during a single survey.
- ¶ Project initiation should occur as near to completion of the survey as possible. For example, seismic exploration should begin within 3 days of survey completion.
- ¶ If an active plover nest is found in the survey area, the proposed activity should be delayed 37 days, or 7 days post-hatching. If a brood of very small (ñbumble beeò looking) chicks is obser least 7 days. If the adult is seen with chicks actively moving, no delay is necessary. The adult will move these older chicks away from any disturbance.

Estimating Density of Mountain Plovers

Intensive studies, such as those to obtain a regional or statewide population estimate or to evaluate proposed project impacts upon mountain plover populations, often benefit from some estimate of the actual number of birds that are occupying a specific area. Whereas obtaining density estimates is both more time consuming and costly, such surveys are usually conducted as part of a larger effort within a focused research project. Density estimates are generally time-specific over a 1-3 year period and are too costly to be included in a long-term, annual survey protocol.

By definition, population density is the number of individuals per unit area. Populations are usually sampled in a portion of the available habitat and then the calculated density is applied to the larger area of concern to generate an estimated population in that area of interest. Once a density estimate (with confidence interval) is available, its validity in extrapolation to the larger area to estimate the total population is also dependent upon the precision when defining available habitat within that larger area.

There are two general approaches to quantifying density. First, is to conduct a series of surveys that record the distance to each bird detected, and then calculate the effective area surveyed. This is generally referred to as transect (line or point) sampling and yields true population density estimates as calculated using program DISTANCE (Buckland et al. 2001). Second, is to establish a series of plots in the habitat area and determine how many of those plots are occupied. This approach does not calculate an actual density, but uses patch-occupancy sampling to provide a relative density (ñabundanceò) comparison been used in mountain plover studies.

a. Transect Sampling for Density Estimates

Transect sampling involves recording birds observed along a moving transect or at a series of points along a transect line where the observer stops and scans at a point. The difference between transect surveys and the protocol described for the trend surveys is that the observer records not only the number of birds, but also the distance to each bird where it was first seen. In the case of line transects, the recording is that actual (measured) distance perpendicular to the line. In the case of point surveys, it is the measured distance from the point.

A moving observer will likely miss most plovers and valid density estimates will require many miles of transects to obtain adequate detections (>40 birds) to provide confidence intervals on the estimate. Thus, a line transect should record plover detections from the vehicle, stopping only to record the distance to each bird detected (preferably without leaving the vehicle). This approach has been applied successfully to provide an estimate of plovers in South Park, Colorado (Wunder et al. 2003).

A point survey, where the observer drives to a specific point, stops, and records

distances to birds observed, is preferable for plovers. However, the observer needs to exit the vehicle as previously described for surveys, and then return and conduct the scan. In addition, a variation on the point survey can include using a second observer during the surveys. The second observer conducts the same survey as the first observer (traveling together) but neither communicates on their observations for each point. Such enables one to replicate a survey and improve precision in the density estimate. This double-observer approach was used to generate the current minimum population estimate for Wyoming (Plumb et al. 2005).

Establishing transects:

¶ Identify appropriate plover habitat within the geographic areas of interest.
¶ Upon arriving in appropriate habitat, drive to a previously determined random starting point.
¶ For subsequent points, drive a previously determined distance of 0.2-0.5 miles (0.3-0.8 kilometers). Either a 0.25 mile (0.4 kilometer) or 0.5 mile (0.8 kilometer) distance between points is recommended to standardize with the Breeding Bird Survey protocol (Robbins and Van Velzen 1970).

Conducting the Point Counts

¶ Conduct counts during the nesting phase (22 May-7 June) to survey the breeding population, or the brood-rearing phase (21 June-7 July) to survey the successful breeding population.
¶ Use either 1 or 2 observers as per published examples above.
¶ Scan from the vehicle for the breeding population survey, and from either inside/on or close to the vehicle for the successful breeding population survey.
¶ Conduct counts for as long as necessary to assure observer that a plover has not been missed within 650 feet (200 meters).
¶ Measure the distance (in meters) to all mountain plovers detected. The method used should be noted (e.g., laser rangefinder, paced, measured with a tape measure).
¶ If a mountain plover is disturbed while approaching the point, measure the distance from the point center to the spot from which the bird was flushed.
¶ Use the standardized mountain plover data sheet (Attachment 12) to record information. Record fly-overs as ñFOò in the distance information will provide little useful insight.

Recording Data

Record the following information on the top of the data sheet (Attachment 12):
¶ Survey route name and unique code (e.g., Shirley Basin = SB).
¶ Survey date.
¶ Data sheet page number (e.g., page 1 of 2).
¶ Detailed route location description (e.g., road number, distance to important intersections, County).

¶ Observer name, e-mail address, and phone number (or other contact information).

Record the following information at every point on each route:

¶ Unique point code (e.g., SB1, SB2, SB3).
¶ UTM coordinates in NAD 83.
¶ Start time.
¶ Number of mountain plovers detected, distance in meters to each, and distance aide used.
¶ Mountain plover juveniles detected.
¶ Habitat and land use information.
¶ Comments and other species of interest detected.

b. Patch Occupancy Sampling to Estimate Relative Abundances

The second approach to providing an area-based estimate of plover numbers is to determine the plover use of randomly selected patches of landscape. This approach is also likely too expensive in time and costs to employ as a simple trend survey technique. Rather, it has applications in research contexts where an observer wants to evaluate the comparative value/use of different sites by plovers, and it provides a comparative feel for the magnitude of differences between/among sites as those sites provide habitat for a plover population. The approach has been applied to a real plover question by Dreitz et al. (2006), who compared the importance of shortgrass prairie, prairie dog towns, and agricultural fields to mountain plovers in eastern Colorado. Patch occupancy has much promise, but may only be cost effective when working in areas where concentrations of plovers are known to be dense. For most of Wyoming, plovers are so widely dispersed as to make this approach cost prohibitive as a valid survey strategy to monitor trends across time.

Establishing plots

¶ Identify appropriate plover habitat within the geographic area of interest.
¶ Predetermine plot boundaries using natural features or by flagging/marking corners of plots. Plots can vary in size, but should not exceed 650 feet (200 meters) on any one side, as observers will miss some birds at greater distances.

Conducting the plot surveys

¶ Surveys can be done from a vehicle or by walking the perimeter of the plot. The observer should not enter the plot. (This option of walking the plot boundaries is generally problematic with plover surveys in that plovers may respond to the observer and move outside the plot before detection.)
¶ Plots should be surveyed multiple times, but at least more than 3 times. The purpose of multiple surveys is to confirm which plots do not have plovers.

¶ Use the standardized mountain plover data sheet (Attachment 12) to record information on dates, locations, plot numbers, and number of plovers detected. Weather information will provide little useful insight.
¶ Reference the Dreitz et al. (2006) study for modeling procedures.

Recording data

Record the following information on the top of the data sheet (Attachment 12):
¶ Route name and unique code (e.g., Shirley Basin = SB).
¶ Survey date.
¶ Data sheet page number (e.g., page 1 of 2).
¶ Detailed route location description (e.g., road number, distance to important intersections, County).
¶ Observer-ôs name, mail address, and phone number (or other contact information).

Record the following information at every point on each route:
¶ Unique point code (e.g., SB1, SB2, SB3).
¶ UTM coordinates in NAD 83.
¶ Start time.
¶ Number of mountain plovers detected.
¶ Comments and other species of interest detected.

3. Analysis of Data ï The Nongame Bird Biologist (in conjunction with the Wildlife Management Coordinator in each region, District Biologists, biologists from other agencies, and volunteers) assigns locations for these surveys and assures they are conducted. The Nongame Bird Biologist compiles and analyzes data, and prepares summaries for annual completion reports.

4. Disposition of Data ï Send completed survey forms to the Nongame Bird Biologist. Data are incorporated into the Threatened, Endangered, and Nongame Pr Nongame Bird and Mammal Investigations Annual Completion Report; are used to update the Wyoming Bird Conservation Plan, Wyoming State Wildlife Action Plan, and wildlife distribution maps; and are added to various databases, including the Department ôs WOS database, the Birds, Mammals, Amphibians, and Atlas o Reptiles in Wyoming database.

H. Upland Sandpiper Surveys ï

1. Rationale ï Upland sandpipers are primarily found in native mixed grass prairie habitat in eastern Wyoming; however, information on distribution and abundance is limited. Surveys are used to determine sandpiper presence/absence in potential habitat, and can be beneficial in ascertaining additional information on specific habitat associations. Once distribution is better known, further targeted monitoring efforts can detect population trends.

2. Application ï The following survey guidelines were developed to determine upland sandpiper presence/absence on their breeding grounds during the nesting season.

   Survey Protocol

   - ¶ Surveys are conducted to coincide with the peak in the upland sandpiper breeding season. In Wyoming, sandpipers are typically found on their breeding grounds from June to mid-July.
   - ¶ A minimum of 1 survey is conducted along each route on approximately the same date each year. If possible, 1 or 2 replicates can also be conducted, with a minimum of 10 and maximum of 14 days between replicates to incorporate the range of the upland sandpiper breeding season and facilitate detection.
   - ¶ Surveys begin 20 minutes before local sunrise, and should be completed within 5 hours of the start time.
   - ¶ Stops are made every 0.5 mile (0.8 kilometer) along the survey route. The number of stops along each survey route depends on available sandpiper habitat.
   - ¶ Each stop consists of a 5-minute listening and observation period, separated into 2 count segments, 0-3 minutes and 3-5 minutes, to aid in compatibility with the Breeding Bird Survey (BBS) protocol (Robbins and Van Velzen 1970). The observer should use binoculars (at least 7-power) to visually scan in a 360 degree circumference during each count segment. If needed, a spotting scope can be used to follow up on specific sightings. Visual and auditory counts of sandpipers are made during each stop, and the distance band (≤400 m or ≥400 m) from the first detection of each sandpiper is recorded, again for compatibility with the BBS protocol.
   - ¶ All upland sandpipers observed and/or detected by vocalizations are recorded in the appropriate column on the standardized data sheet (Attachment 13). Upland sandpiper vocalizations include a loud *qui*, clear *di-di-di-di-di-dui* ò, with the last note lower and grow*lrrigrrggrgrrñrr* ò), and a flighting whistle (an un *ñbububuLEE-hLEEyoooooooo* ò that slowly rises, then f whistle at the end).
   - ¶ Other information recorded at each stop includes: start time, total upland sandpipers detected, habitat or land use within 0.5 mile (0.8 kilometer) of the stop, temperature, wind speed, cloud cover, precipitation, comments, and other notable species detected. Survey disturbances (e.g., noise, vehicles) and the type of vocalization(s) heard should be noted in the comments column.

3. Analysis of Data ï The Nongame Bird Biologist (in conjunction with the Wildlife Management Coordinator in each region, District Biologists, biologists from other agencies, and volunteers) assigns locations for these surveys and assures they are conducted. The Nongame Bird Biologist compiles and analyzes data, and prepares summaries for annual completion reports.

4. Disposition of Data ï Send completed survey forms to the Nongame Bird Biologist. Data are incorporated Threatened, Endangered, and Nongame Pr

Nongame Bird and Mammal Investigations Annual Completion Report; are used to update the Wyoming Bird Conservation Plan, Wyoming State Wildlife Action Plan, and wildlife distribution maps; and are added to various databases, including the Departmentôs WOS database and the Atlas o Reptiles in Wyoming database.

I. Long-billed Curlew Surveys ï

1. Rationale ïLong-billed curlews prefer large, open [>820 feet (250 meters) wide] patches of suitable habitat in a wide variety of grassland types comprised mainly of lower-growing grasses with open ground and relatively flat terrain. Curlews are one of only 9 species of grassland birds classified as endemic to the Great Plains (Dugger and Dugger 2002). Populations have been documented as declining across the speciesô range, particularly in the short- and mid-grass prairies of the western Great Plains (Brown et. al 2001). The greatest threats to curlew populations are habitat loss due to conversions of native grasslands to agricultural croplands, urban areas, and energy development, and from habitat degradation due to planting and encroachment of woody vegetation and non-native plants (Dark-Smiley and Keinath 2004, Dugger and Dugger 2006, Sedgwick 2006). Accurate monitoring, particularly in areas where surveys have not been conducted, is needed.

2. Application ïTwo types of surveys can be implemented for long-billed curlews: 1) a roadside-based survey coinciding with the peak in likelihood of detection, which will document presence/absence and can be used to estimate occupancy and distribution, and 2) a stratified random sampling design adapted from Saunders (2001) to estimate population size.

   a. Surveys to Determine Presence/Absence

   ¶ Identify appropriate curlew habitat and habitat of interest (e.g., development project area) within the geographic areas of interest.
   ¶ Observers conduct 2 separate surveys along each route during the pre-incubation and courtship stages when curlews are easier to detect (21 April-15 May in Wyoming). If routes are conducted in subsequent years, observers should attempt to survey on or close to the same dates each year.
   ¶ Count points are located 0.5 mile (0.8 kilometers) apart along the survey route, and include both the starting and ending point. The number of count points within each route depends on available curlew habitat in the area of interest.
   ¶ Surveys begin 30 minutes before sunrise and are completed within 4-6 hours. Each stop consists of a 5-minute listening and observation period. Use binoculars (at least 7-power) to visually scan in a 360 degree circumference. Use a spotting scope to follow up on specific sightings; do not use a spotting scope to scan. All curlews observed only, heard only, and both observed and heard are recorded separately. Flocks are defined as groups of 5 or more individuals observed together. For compatibility with the Breeding Bird Survey protocol (Robbins and Van Velzen 1970), curlew detections are grouped into two categories: 0-3

minutes and 3-5 minutes. All curlews detected are recorded in the appropriate section of the data sheet (Attachment 14a).

¶ Record temperature, cloud cover, precipitation, Beaufort wind speed, other species detected, and disturbances (e.g., noise, vehicles) in the comments section of the data sheet (Attachment 14a).

b. Surveys to Estimate Occupancy and Density

Observers should be trained on point counts before using this specialized technique for long-billed curlews. This method uses stratification to partition curlew habitat into sample units to measure population size (Saunders 2001). Stratification is based on the percentage of native prairie and/or other suitable curlew habitat within a township, or on the basis of the existence of contiguous patches of grassland >820 feet (250 meters) wide. Count data from points along each route are used to estimate the long-billed curlew population size for that route, which is the population estimate for the sample unit that contains the route.

Establishing Transects

¶ Identify appropriate curlew habitat within the geographic areas of interest to determine the location of sample units.

¶ Within each sample unit, a single 20-mile (32 kilometer) survey route is established on secondary roads and other rights-of-way based on suitable habitat in proportion to availability. Parallel routes are placed a minimum of 1.25 miles (2 kilometers) apart. If no roads are located in a selected area, a 15-mile (24-kilometer) off-road route is selected instead.

¶ Each survey route consists of 40 count points placed 0.5 mile (0.8 kilometers) apart.

Conducting the Point Counts

¶ Surveys are timed to correspond with the arrival and pre-incubation period of curlews, when males are performing their aerial display flights and most conspicuous (21 April-15 May in Wyoming).

¶ Surveys begin at local sunrise and are completed within 4-6 hours. Each stop consists of a 5-minute listening and observation period. Use binoculars (at least 7-power) to visually scan in a 360 degree circumference. Use a spotting scope to follow up on specific sightings; do not use a spotting scope to scan. All curlews observed only, heard only, and both observed and heard are recorded separately. For compatibility with the Breeding Bird Survey protocol (Robbins and Van Velzen 1970), curlew detections are grouped into two categories: 0-3 minutes and 3-5 minutes.

¶ Routes are surveyed by teams of 2 observers per route. A primary observer and a secondary observer are designated at each stop, with the roles alternating between stops. The primary observer is responsible for detecting curlews by sight or sound, determining the detection distance (preferably by laser rangefinder), and

communicating this information to the secondary observer. The secondary observer is responsible for recording the information.

- All curlews detected are recorded in the appropriate section of the data sheet (Attachment 14a). To enable the use of distance sampling to estimate density of individual species in a specific habitat (Buckland et al. 2001; Thomas et al. 2010), the distance to each curlew upon first detection and the distance aide used are recorded.
- Note temperature, cloud cover, precipitation, Beaufort wind speed, other species detected, and disturbances (e.g., noise, vehicles) in the comments section of the data sheet (Attachment 14a).
- This data collection protocol will allow estimation of detection probabilities and population sizes using two distinctly different methods: the double-observer approach (Nichols et al. 2000) and the removal-model approach (Farnsworth et al. 2002). Distance data will also allow calculation of the total area sampled along a route so the population size estimate for the route can be converted to a density estimate.

3. Analysis of Data ï The Nongame Bird Biologist (in conjunction with the Wildlife Management Coordinator in each region, District Biologists, biologists from other agencies, and volunteers) assigns locations for these surveys and assures they are conducted. The Nongame Bird Biologist compiles and analyzes data, and prepares summaries for annual completion reports.

4. Disposition of Data ï Send completed survey forms to the Nongame Bird Biologist. Data are incorporated Threatened, Endangered, and Nongame Pr Nongame Bird and Mammal Investigations Annual Completion Report; are used to update the Wyoming Bird Conservation Plan, Wyoming State Wildlife Action Plan, and wildlife distribution maps; and are added to various databases, including the Department ôs WOS database, mammals, amphibians, and Atlas o Reptiles in Wyoming database.

J. Forest Owl Surveys ï

1. Rationale ï Forest owls typically inhabit mature coniferous and mixed coniferous/deciduous forests in Wyoming. These forests are often the target of timber removal operations. While some owl species require scattered small openings to forage within the forest, removal of large acreages of preferred habitat can be devastating to local and regional populations. In addition, some types of recreational activities may be disruptive or incompatible, especially during the breeding season. Most species of owls are primarily nocturnal, and this makes casual observations and documentation of presence in a particular area challenging. Surveys conducted at night during the peak of the breeding season for these species provide broad-scale monitoring of presence/absence, relative abundance, distribution, habitat associations, and changes in these parameters over time. Survey results can also be used as a baseline for additional, more specific population or nesting productivity surveys. The following survey protocol for Wyoming was adapted from (Takats et al. 2001).

2. Application ïSurvey routes are selected to be representative of the region being surveyed, which enables valid statistical inferences to be made regarding forest owl populations in the region. Routes should be selected randomly using a stratified sampling scheme within the region being surveyed. If a fully random selection is not possible (e.g., due to winter access issues), routes should be selected without prior knowledge of owl distribution. Routes should be separated by at least 3 miles (5 kilometers) to minimize the risk of detecting the same owls on more than one route (Anderson et al. 1979). Each route should contain 10 count stations spaced 1 mile (1.6 kilometers) apart.

   Surveys should be conducted during the peak of the breeding season for each owl species (Table 4). Each route should be surveyed twice per year, and with a minimum of 2 weeks between replicates. If the target species was detected during the first survey, a second survey may not be needed. Each route should be surveyed close to the same date in subsequent years. Routes without owls or routes without owls for 2 years in a row can be discontinued, but should be re-surveyed every 5 years to determine if owls have returned to the area.

TABLE 4. Peak breeding seasons and preferred habitats of forest owl species.

Owl Species and Codes	**Peak Breeding Season**	**Habitat**	**Nest Type**
Great Gray Owl (GGOW)	1 March ï15 April	Mature lodgepole pine, Douglas-fir, spruce-fir, and aspen	Broken treetop or stick nest
Great Horned Owl (GHOW)	1 February ï31 March	Coniferous forest and cottonwoods, below 9,000 ô	Stick nest
Eastern Screech-Owl (EASO)	1 February ï30 April	Mature riparian deciduous forest, Douglas-fir, cottonwoods, and aspen	Cavity nest
Western Screech-Owl (WESO)	1 February ï30 April	Mature riparian deciduous forest, Douglas-fir, cottonwoods, and aspen, below 7,000 ô	Cavity nest
Northern Saw-whet Owl (NSWO)	15 February ï30 April	Coniferous forest, mixed aspen-coniferous forest, aspen, and mature riparian deciduous forest	Cavity nest
Long-eared Owl (LEOW)	Late February ï 31 March	Mature riparian deciduous forest, mature' cottonwoods, and mixed open coniferous forest, below 8,000 ô	Stick nest
Boreal Owl (BOOW)	1 March ï15 April	Mature coniferous and mixed coniferous/ deciduous forests with scattered small openings from 6,560-10,630 ô, e s-fir, e c i a lodgepole pine, and aspen	Cavity nest
Northern Pygmy-Owl (NOPO)	1 April ï31 April & 1 September ï 31 October	Mixed spruce-fir, Douglas-fir, and lodgepole pine	Stick nest

Survey routes should be scouted and marked during daylight hours. Observers should get to the furthest point on the route before dark to obtain a sense of the habitat, terrain, and snow conditions. Using an odometer or georeferencing capabilities, observers should stop at 1 mile (1.6 kilometer) intervals, record the UTM coordinates in NAD 83, and assign a unique identification number to each survey point along the route (e.g., PL1, PL2, PL3). Count stations can be marked with fluorescent flags or ribbon to assist with location identification at night.

Surveys should begin no earlier than ½ hour after sunset (about when the first stars begin to show), and continue no later than midnight (2400 hours). The first few hours after dark appear to be the most vocal period for most forest owl species. Each route should be conducted at approximately the same time of night each year. Surveys should only be conducted under favorable weather conditions [wind speed less than 12 miles/hour (20 kilometers/hour), no precipitation, and temperatures close to the average for the season]. If conditions become unfavorable during the survey (e.g., windy, heavy snow, extreme cold), the route can be suspended and resumed at the appropriate count station on a subsequent evening when conditions improve.

At each count station, note the weather conditions, cloud cover, and start time, then extinguish all lights prior to beginning the survey. Observers should alternate between listening and playing the owl call(s). Calls should be broadcast on each side of the trail or road at a volume that can be heard at 0.25 mile (400 meters) but not 0.5 mile (800 meters) to ensure that owls at one station cannot hear the recording from another station. If possible, measure the volume at a standard distance [e.g., 3.3 feet (1 meter) from the speakers] using a decibel meter to ensure volume consistency throughout each survey. The call-playback unit should be elevated above the head or placed on a snow machine seat to help project the sound. Begin with passive listening for 2 minutes, play the desired call for 20 seconds, listen for a response for 2 minutes, play the call for another 20 seconds, and listen for a final 2 minutes. If multiple species of owls are surveyed during the same time, observers should start with smaller owls first, then proceed to the larger owls, or start with the least common species first, then proceed to the more common species. For example, play the Boreal Owl vocalization and listen for a response, then play the Great Gray Owl vocalization and listen for a response; or play the Northern Pygmy-Owl vocalization and listen for a response, then play the Northern Saw-whet Owl vocalization and listen for a response. To reduce the potential for predation on smaller owls by Great Horned Owls, discontinue calling smaller species if a Great Horned Owl has been detected at the count station.

All owls detected should be recorded using the appropriate species codes on the standardized Forest Owl Survey Data Sheet (Attachment 15). If using a route map, the approximate location of each owl should be marked. Observers should estimate the direction from North and distance to each owl upon first detection (in meters). Distances can either be estimated (e.g., $\pm$50 meters, $\pm$100 meters) or grouped into categories (e.g., $\leq$50 meters, 50-100 meters, 100-200 meters, 200-300 meters, >300

meters). Distance and direction information can be used to determine if the same owls are being detected at different count stations along the route, can assist with habitat associations, and can be used to adjust for some of the variation in detection rates. Data can be analyzed using route regression to calculate trends within routes, and distance sampling to estimate the density of individual owl species in a specific habitat. Observers should complete the Forest Owl Survey Summary Form at the end of each route (Attachment 16).

Equipment needed: snow machine and/or snowshoes and/or cross-country skis, headlamp or flashlight and extra batteries, wildlife call-playback unit with appropriate owl calls and extra batteries, survey forms and maps, GPS unit and extra batteries, clipboards and pencils, watch or timer, thermometer, compass, fluorescent flags or ribbon, binoculars and field guide, food and water, first aid kit, survival kit, sleeping bag, and warm clothing.

3. Analysis of Data ïThe Nongame Bird Biologist (in conjunction with the Wildlife Management Coordinator in each region, District Biologists, biologists from other agencies, and volunteers) assigns locations for these surveys and assures they are conducted. The Nongame Bird Biologist compiles and analyzes data, and prepares summaries for annual completion reports.

4. Disposition of Data ïSend completed survey forms to the Nongame Bird Biologist. Data are incorporated Threatened, Endangered, and Nongame Pr Nongame Bird and Mammal Investigations Annual Completion Report; are used to update the Wyoming Bird Conservation Plan, Wyoming State Wildlife Action Plan, and wildlife distribution maps; and are added to various databases, including the Departmentôs WOS database and the Atlas o Reptiles in Wyoming database.

K. Burrowing Owl Surveys ï

1. Rationale ïBurrowing owls inhabit prairie dog colonies in grassland and shrub-steppe habitats, but occur in relatively low densities and have a patchy distribution across their range. Significant rangewide population declines have been documented due to the eradication of burrowing mammals that provide nest sites and shelter, habitat loss from urban development and conversion to agriculture, disturbance at nest and roost sites, and pesticides (Haug et al. 1993). Effective burrowing owl management and conservation requires the development and implementation of specialized monitoring techniques (Andelman and Stock 1994, Conway and Simon 2003). Implementation of a standardized survey protocol will 1) increase detection probability by using a call-broadcast technique, 2) reduce variation in trend estimates by using three replicate surveys, and 3) provide greater statistical power to detect population changes (Conway and Simon 2003).

2. Application ïTwo types of surveys can be implemented for burrowing owls, depending on project goals: 1) document burrowing owl presence/absence in potential nesting habitat to determine distribution, and 2) estimate occupancy and

density of burrowing owls throughout their breeding range in Wyoming. Presence/absence surveys can be used to determine if burrowing owls inhabit specific project locations or other areas of interest. Sites of particular importance are those with favorable topographic and vegetation parameters (i.e., slope of <5 degrees, shortgrass or mixed grass habitat) and the location of prairie dog towns (Haug et al. 1993). Due to high site fidelity of some burrowing owls, historic nest sites can also be important for survey route location placement (Korfanta et al. 2001). The following survey protocols are adapted from Conway and Simon (2003).

Survey Protocol

Surveys are conducted during the periods when burrowing owls will be above ground so that individuals present in a particular area of interest are not missed or underrepresented. In Wyoming, these dates are generally from 15 April-7 August. However, seasonal restrictions for ground disturbing activities in suitable burrowing owl breeding habitat may extend outside these dates to guarantee protection of nesting adults and young that have not yet fledged from nest burrows.

Two types of surveys may be conducted: 1) surveys to determine the presence/absence of burrowing owls on their breeding range, and 2) surveys to estimate burrowing owl occupancy and density. The type of survey chosen will depend on the type of project activity and project goals.

a. Surveys to Determine Burrowing Owl Presence/Absence

¶ To ensure a 95% detection probability of burrowing owls, 3 replicates of each survey route should be conducted from 15 April-7 August. One replicate should occur during each of 3 30-day survey windows, with each window separated by 10 days (e.g., 20 April-19 May, 30 May-28 June, and 9 July-7 August). This will ensure that survey efforts occur during each of 3 nesting stages (pre-incubation, incubation/hatching, and nestling).

¶ Survey routes should follow secondary roads within the area of interest.

¶ Each stop along the route should be separated by ≥0.5 mile (0.8 kilometer). Exact locations of survey points should be selected to provide an optimal viewing radius of the surrounding area. Survey points should be recorded using a GPS unit in North American Datum (NAD) 83 so the survey can be repeated at the exact location.

¶ Surveys should be conducted during 2 optimal time periods ï early morning (30 minutes before sunrise to 0900 hours) and evening (1700 hours until 30 minutes after sunset). Surveys should not be conducted if it is raining or if the wind speed is ≥12 miles/hour (20 kilometers/hour).

¶ At each stop, the observer should exit the vehicle, listen, and use binoculars to search for burrowing owls in a 360 degree circumference during a 6-minute survey period.

¶ All burrowing owls detected and other pertinent information are recorded on the standardized survey data sheet (Attachment 17).

b. Surveys to Estimate Occupancy and Density of Burrowing Owls

¶ To ensure a 95% detection probability of burrowing owls, 3 replicates of each survey route should be conducted from 15 April-7 August. One replicate should occur during each of 3 30-day survey windows, with each window separated by 10 days (e.g., 20 April-19 May, 30 May-28 June, and 9 July-7 August). This will assure survey efforts occur during each of 3 nesting stages (pre-incubation, incubation/hatching, and nestling).

¶ One point-count survey route should be established within each township/range that falls within the known breeding range of burrowing owls. Routes should follow a secondary road, beginning within the center 4 sections of each township/range (sections 15, 16, 21, 22). The location of each route should be selected based on the availability of potential burrowing owl habitat (prairie dog colonies, native grasslands, abandoned pastures, active grazing allotments, and roadside shoulders adjacent to active pastures). If burrowing owl habitat is not present or available within the central 4 sections, a route can be located in the surrounding 12 sections.

¶ Each survey route should be ≥4.5 miles (7.2 kilometers) long and include 10 survey points separated by ≥0.5 mile (0.8 kilometers). The exact location of each survey point should be selected to provide an optimal viewing radius of the surrounding area. Survey points should be recorded using a GPS unit in North American Datum (NAD) 83 so the survey can be repeated at the exact location.

¶ Surveys should be conducted during 2 optimal time periods ï early morning (30 minutes before sunrise to 0900 hours) and evening (1700 hours until 30 minutes after sunset). Surveys should not be conducted if it is raining or the wind speed is ≥12 miles/hour (20 kilometers/hour).

¶ At each stop, the observer should exit the vehicle, listen, and use binoculars to search for burrowing owls during the first 3-minute passive period. The observer should then play the male burrowing owl ñ*coo-coo* ò song for 30 seconds, followed by a 30-second passive listening period, and then repeat this series. The observer should then play 30-seconds of the burrowing owl ñ*quick-quick-quick* ò alarm call, followed by a 30-second passive listening period. [The song and call should be broadcast at 90dB measured 3.3 feet (1 meter) in front of the speaker, and the call-broadcast unit should be rotated during the call period to cover 360°.] During each segment, the observer should search in a full circle around the stop and record all adult and juvenile burrowing owls detected, as well as the number of burrowing owl nest sites that are presumed present. Other species heard or observed should also be noted.

¶ The observer should repeat the above series at each stop along the survey route, being careful not to double count birds. Data are recorded on the standardized burrowing owl survey data sheet (Attachment 17).

3. Analysis of Data ï The Nongame Bird Biologist (in conjunction with the Wildlife Management Coordinator in each region, District Biologists, biologists from other agencies, and volunteers) assigns locations for these surveys and assures they are

conducted. The Nongame Bird Biologist compiles and analyzes data, and prepares summaries for annual completion reports.

4. Disposition of Data ï Send completed survey forms to the Nongame Bird Biologist. Data are incorporated into the Threatened, Endangered, and Nongame Pr Nongame Bird and Mammal Investigations Annual Completion Report; are used to update the Wyoming Bird Conservation Plan, Wyoming State Wildlife Action Plan, and wildlife distribution maps; and are added to various databases including the Department ô s WOS data, Birds, Mammals, Amphibians, and Atlas o Reptiles in Wyoming database.

III. DISTRIBUTION AND MOVEMENT ï

A. Bird Sightings ï

1. Wildlife Observation System ï

a. Rationale ï Organized records of bird sightings provide a means to assess species distribution and abundance. Over time, these records enable managers to monitor expansion or contraction of speciesô ra records are frequently consulted to document potential impacts of agency actions. The Wildlife Observation Form is illustrated in Appendix I.

b. Application ï All avian observations are potentially useful; however, it is not possible to record everything. Especially useful observations include:

¶ Observations of nesting birds, especially common loons, colonial nesters, and raptors.
¶ Arrival and departure dates of migratory species.
¶ Any observation outside current distribution based on records in the Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming (Orabona et al. 2012 ï next section).
¶ Species listed in Table 5 ï note the specific types of information needed.

c. Analysis of Data ï Refer to the Chapter I, Section V.C.3 (Pronghorn ï Distribution and Movement).

d. Disposition of Data ï Data are maintained in the Dep Observation System database and are incorporated into the overall wildlife distribution mapping effort.

2. Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming ï Refer to:
Orabona, A., C. Rudd, M. Grenier, Z. Walker, S. Patla, and B. Oakleaf. 2012. Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming. Wyoming Game and Fish Department Nongame Program, Lander. 232pp.

a. Rationale ï Important distribution information can be obtained from special surveys and studies, as well as knowledgeable bird watchers. The avian portion of the ñAtlasò summarizes these data in a usable format.

b. Application ï The ñAtlasò provides basic information on birds, mammals, amphibians, and reptiles in the State. The information is used to describe the environmental setting and analyze potential effects of resource management decisions, and is frequently consulted by individuals interested in observing species of interest. The ñAtlasò encourages use of the data to record new observations and distribution records for each species represented.

c. Analysis of Data ï Data are solicited from qualified observers. Nongame Program personnel periodically update the

d. Disposition of Data ï Observation data will be compiled and used to update the ñAtlas.ò Such information will also be that is queried for references and to develop management policies and recommendations.

TABLE 5. Avian observations (in alphabetical order) that are especially needed.

Region	Species	Comments
All Regions	American Redstart	All observations
All Regions	American Three-toed Woodpecker	All observations
All Regions	Ash-throated Flycatcher	All observations
Sheridan, Casper, Laramie	Bairdôs Sparrow	All observations
All Regions	Barn Owl	All observations
Green River, Laramie	Bewickôs Wren	All observations
All Regions	Black-backed Woodpecker	All observations
Jackson, Cody, Sheridan, Lander, Laramie	Black Rosy-Finch	All observations during June and July
Jackson, Cody, Green River, Lander	Black-throated Gray Warbler	All observations
Green River	Black-throated Sparrow	All observations
All Regions	Blue-gray Gnatcatcher	All observations
All Regions	Blue Grosbeak	All observations
All Regions	Bobolink	All observations
Jackson, Cody, Green River, Lander, Laramie	Boreal Owl	All observations
All Regions	Brewerôs Sparrow	All observations during June and July
Laramie	Brown-capped Rosy-Finch	All observations during June and July
All Regions	Burrowing Owl	All observations
Green River, Laramie	Bushtit	All observations
All Regions	Chestnut-collared Longspur	All observations during June and July
All Regions	Colonial Waterbirds	All observations, especially nesting sites
All Regions	Common Loon	All observations, especially nesting sites

All Regions	Cooperôs Hawk	All observations
Sheridan, Green River, Casper, Laramie	Dickcissel	All observations
All Regions	Eastern Phoebe	All observations
All Regions	Field Sparrow	All observations
All Regions	Franklinôs Gull	All observations, especially nesting sites
All Regions	Grasshopper Sparrow	All observations
Jackson, Cody, Sheridan, Lander, Laramie	Gray-crowned Rosy-Finch	All observations during June and July
All Regions	Gray Flycatcher	All observations
Jackson, Cody, Lander	Great Gray Owl	All observations
Jackson, Cody, Lander	Harlequin Duck	All observations
All Regions	Indigo Bunting	All observations
Green River, Laramie	Juniper Titmouse	All observations
All Regions	Lark Bunting	All nesting and production observations
All Regions	Lewisôs Woodpec	All observations, especially during summer
All Regions	Loggerhead Shrike	All observations
All Regions	Long-billed Curlew	All observations
All Regions	McCownôs Longsp	All observations during June and July
All Regions	Mountain Plover	All observations
Green River, Lander	Northern Mockingbird	All observations
Jackson, Cody, Green River, Lander, Laramie	Northern Pygmy-Owl	All observations
All Regions	Northern Saw-whet Owl	All observations
All Regions	Orange-crowned Warbler	All observations
Casper, Laramie, Sheridan	Orchard Oriole	All observations
All Regions	Ovenbird	All observations
All Regions	Peregrine Falcon	All observations
Cody, Green River, Laramie, Sheridan	Purple Martin	All observations
Jackson, Green River	Pygmy Nuthatch	All observations
All Regions	Raptors	All nesting and production observations
All Regions	Rose-breasted Grosbeak	All observations during June and July
All Regions	Sage Sparrow	All nesting and production observations
All Regions	Sage Thrasher	All nesting and production observations
Green River, Laramie	Scottôs Oriole	All observations
All Regions	Short-eared Owl	All observations
All Regions	Spragueôs Pipit	All observations
Jackson, Cody, Green River, Lander	Townsendôs Warb	All observations
Jackson	Trumpeter Swan	All nesting and production observations
All Regions	Upland Sandpiper	All observations
All Regions	Virginia Rail	All observations during June and July
All Regions	Virginiaôs Warb	All observations
Green River, Laramie	Western Scrub-Jay	All observations

All Regions, especially Jackson/Pinedale	Whooping Crane	All observations; need to start documenting areas used by Whooping Cranes summering in the Daniel area
All Regions	Willow Flycatcher	All observations
Jackson, Cody	Winter Wren	All observations
All Regions	Yellow-billed Cuckoo	All observations

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ATTACHMENT 1 RARE AND UNUSUAL BIRD SIGHTING FORM

Rationale ïThe Departmentôs Nongame Program requests SGCN to assist in tracking species locations and habitat associations. Additionally, through the Wyoming Bird Records Committee (WBRC), the Nongame Program uses the Rare and Unusual Bird Sighting Form to document species for which all sightings or first latilong sightings are requested. The Nongame Bird Biologist acts as the non-voting Secretary of the WBRC, and all records are maintained by the Nongame Bird Bi Office.

The WBRC is interested in promoting and maintaining quality and integrity in the reporting of Wyoming bird observations, and it treats all bird records as significant historical documents. The WBRC operates under a set of bylaws approved in 1991 and updated in 1992 and 1998. The goals of the WBRC are: 1) To solicit, organize, and maintain records, documentation, photographs, recordings, and any other material relative to the birds of Wyoming. 2) To review records of new or rare species or species difficult to identify, and offer an intelligent, unbiased opinion of the validity or thoroughness of these reports. From these reviews, the WBRC will develop and maintain an Official State List of pertinent material concerning the field identification of Wyoming birds in order to assist Wyoming birders in increasing their knowledge and skill.

The Nongame Program enters all pertinent sightings of avian SGCN and all sightings accepted by the WBRC into the WOS database, and uses the information to update the Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming (Orabona et al. 2012). The Rare and Unusual Bird Sighting Form is made available to Department personnel, biologists from other agencies and organizations, and the general public as a formal way to request additional information on important avian observations.

Species/Observations of Interest ïIn addition to all avian SGCN, the following lists provide guidance on avian species for which submission of a rare and unusual bird sighting form is requested.

DOCUMENTATION REQUESTED FOR ALL SIGHTINGS (AS) OF THE FOLLOWING SPECIES

Fulvous Whistling-Duck
Brant
Mute Swan
Whooper Swan
Eurasian Wigeon
American Black Duck
Mottled Duck
Garganey
Tufted Duck
Black Scoter
Ruddy Shelduck
Common Shelduck
Northern Bobwhite
White-tailed Ptarmigan
Greater Prairie-Chicken
Red-throated Loon
Yellow-billed Loon
Red-necked Grebe
Streaked Shearwater
Wood Stork
Lesser Frigatebird
Brown Pelican
Least Bittern
Great Egret
Little Blue Heron
Tricolored Heron
Green Heron
Yellow-crowned Night-Heron
White Ibis
Glossy Ibis
White-tailed Kite
Mississippi Kite
Harris's Hawk
Red-shouldered Hawk
Crested Caracara
Gyrfalcon
Yellow Rail
Black Rail
Purple Gallinule
Common Gallinule
Whooping Crane
Snowy Plover
Piping Plover
Hudsonian Godwit
Red Knot
Buff-breasted Sandpiper
Short-billed Dowitcher
American Woodcock
Red Phalarope
Black-legged Kittiwake
Black-headed Gull
Little Gull
Ross's Gull
Laughing Gull
Heermann's Gull
Mew Gull
Thayer's Gull
Lesser Black-backed Gull
Glaucous-winged Gull
Glaucous Gull
Great Black-backed Gull
Least Tern
Arctic Tern
Pomarine Jaeger
Parasitic Jaeger
Long-billed Murrelet
Ancient Murrelet
Band-tailed Pigeon
White-winged Dove
Barn Owl (except L21)
Flammulated Owl
Western Screech-Owl (except L8)
Snowy Owl
Northern Hawk Owl
Barred Owl
Lesser Nighthawk
Vauxôs Swift
Magnificent Hummingbird
Ruby-throated Hummingbird
Anna's Hummingbird
Acorn Woodpecker
Red-bellied Woodpecker
Yellow-bellied Sapsucker
White-headed Woodpecker
Pileated Woodpecker
Eastern Wood-Pewee
Eastern Phoebe
Vermilion Flycatcher
Great Crested Flycatcher
Scissor-tailed Flycatcher
White-eyed Vireo
Gray Vireo
Yellow-throated Vireo
Cassin's Vireo
Blue-headed Vireo
Philadelphia Vireo
Purple Martin
Carolina Wren
Pacific Wren
Winter Wren
Sedge Wren
Western Bluebird
Gray-cheeked Thrush
Wood Thrush
Varied Thrush
Sprague's Pipit
Smith's Longspur
Worm-eating Warbler
Golden-winged Warbler
Blue-winged Warbler
Prothonotary Warbler
Connecticut Warbler
Mourning Warbler
Kentucky Warbler
Hooded Warbler
Cape May Warbler
Bay-breasted Warbler
Blackburnian Warbler
Palm Warbler
Pine Warbler
Yellow-throated Warbler
Prairie Warbler
Hermit Warbler
Black-throated Green Warbler
Canada Warbler
Red-faced Warbler
Canyon Towhee
Cassin's Sparrow (except Torrington area)
Field Sparrow
Black-throated Sparrow
Baird's Sparrow
Le Conte's Sparrow
Nelson's Sparrow
Golden-crowned Sparrow
Hepatic Tanager
Summer Tanager
Scarlet Tanager
Northern Cardinal
Yellow Grosbeak
Painted Bunting
Eastern Meadowlark
Rusty Blackbird
Baltimore Oriole
Scott's Oriole
Brambling
Purple Finch
Hoary Redpoll
Lawrence's Goldfinch
European Goldfinch

DOCUMENTATION REQUESTED FOR THE FIRST LATILONG SIGHTINGS (FL) AND ALL NESTING OBSERVATIONS OF THE FOLLOWING SPECIES

Greater White-fronted Goose
Ross's Goose
Cackling Goose
Trumpeter Swan
Greater Scaup
Surf Scoter
White-winged Scoter
Long-tailed Duck
Pacific Loon
American Bittern
Cattle Egret
Broad-winged Hawk
Peregrine Falcon
American Golden-Plover
Upland Sandpiper
Whimbrel
Ruddy Turnstone
White-rumped Sandpiper
Dunlin
Sabine's Gull
Common Tern
Yellow-billed Cuckoo
Black-billed Cuckoo
Eastern Screech-Owl
Northern Pygmy-Owl
Boreal Owl
Northern Saw-whet Owl
Chimney Swift
Black-chinned Hummingbird
Red-headed Woodpecker
Black-backed Woodpecker
Least Flycatcher
Hammond's Flycatcher
Gray Flycatcher
Ash-throated Flycatcher
Cassin's Kingbird
Western Scrub-Jay
Juniper Titmouse
Bushtit
Bewick's Wren
Eastern Bluebird
Chestnut-collared Longspur
Black-and-white Warbler
Tennessee Warbler
Nashville Warbler
Virginia's Warbler
Northern Parula
Magnolia Warbler
Chestnut-sided Warbler
Blackpoll Warbler
Black-throated Blue Warbler
Black-throated Gray Warbler
Swamp Sparrow
Rose-breasted Grosbeak
Indigo Bunting
Dickcissel
Great-tailed Grackle
Orchard Oriole
Brown-capped Rosy-Finch
White-winged Crossbill
Lesser Goldfinch

Rare and Unusual Bird Sighting Form
WYOMING BIRD RECORDS COMMITTEE
260 BUENA VISTA, LANDER, WY 82520

The Wyoming Bird Records Committee sincerely thanks all observers for submitting this form to help keep Wyoming's bird records up-to-date and accurate. It is not necessary to complete every block if some details are lacking, but please provide all the details you can and attach photographs, if available.

Common Name:	Specific location of observation:
Scientific Name:	
Observation Date:	
Observation Time:	UTM E_____ UTM N_____ Datum_____ Zone____T
Length of Observation:	Latitude_____° _____′ _____″N Longitude_____° _____′ _____″W
Distance from Bird:	T_____N R_____W Sec. _____ ¼ Sec._____ ¼ ¼ Sec. _____
Light Conditions:	Weather at time of observation:
Optical Equipment:	
Notes made: _____During sighting _____From memory	Prior weather and number of days since last change:
Date report prepared:	

Give a general description of the bird seen and any other details of interest relating to the observation.

GENDER	AGE	PLUMAGE		PHOTO/TAPE/DRAWING
Male:	Adult:	Breeding:	Juvenal:	Enclosed:
Female:	Juvenile/Immature:	Winter:	Dark Morph:	Available:
Unknown:	2-3 year bird:	Eclipse:	Light Morph:	Please submit a copy of your field drawings.
Total Number:	Unknown:	Other:		

If possible, please include in the sections below details of the specific body parts actually observed during the sighting.

BILL:

HEAD:

NECK:

UPPERPARTS:

UNDERPARTS:

Please do not write below here; for WBRC use only. ***Form updated January 2008***

Record Number	Category	Latilong	Date Received

WINGS:	
TAIL:	
LEGS & FEET:	
List similar species and describe how or why you eliminated them.	
Describe the behavior of this bird and the interaction with others.	
What is the habitat at this location?	
If heard, describe the bird's song or vocalizations.	Reporter's name, address, phone number, and e-mail address.
How many years have you birded?	Corroborating observers who are not reporting separately.
Have you observed this species before?	

Please do not write below here; for WBRC use only. ***Form updated January 2008***

Record Number	**Latilong**	**Atlas Update**	**Sighting Entered in WGFD WOS Database**

THANK YOU FOR SUBMITTING YOUR SIGHTING TO THE WYOMING BIRD RECORDS COMMITTEE!

ATTACHMENT 2 RIPARIAN TRANSECT SURVEY FORM

RIPARIAN TRANSECT SURVEY FORM

Route Name: _____ Date: _____ Page ____ of ____

Location: _____

Time of Beginning: _____ Temp: ____ °F Wind: ____ mph Cloud Cover: ____ % No. of Species ____

Time of Completion: _____ Temp: ____ °F Wind: ____ mph Cloud Cover: ____ % No. of Individuals ____

Observer: _____ Ass't _____ Comments: _____

CENSUS STATION NUMBERS

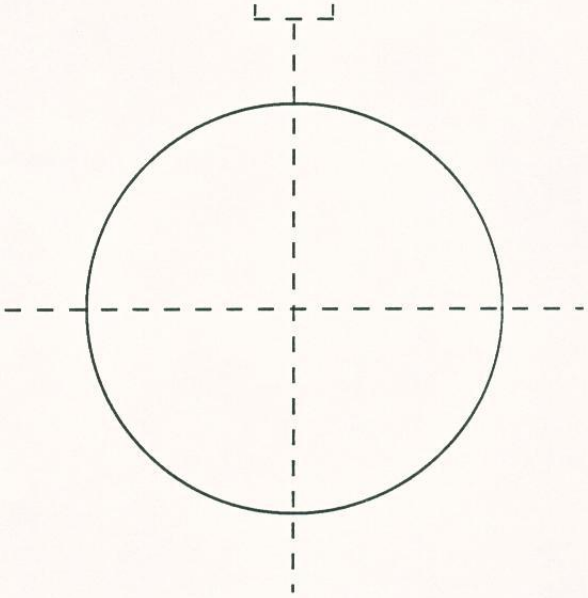
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTAL

ATTACHMENT 3 POINT COUNT LOCATION MAPPING FORM

POINT COUNT LOCATION MAPPING

STATE	REGION	STATION	MONTH	DAY	YEAR	POINT

DIR



MAPPING SYMBOLS

CODE		
S	MAWA	Position of singing male
S	MAWA	Approximate position of singing male
S	MAWA — MAWA	Simultaneous song of 2 males
S	MAWA → MAWA	Known change in position
S	MAWA ← MAWA	Assumed change in position
N	MAWA *	Nest

CODE		
M	MAWA	Male observed
F	MAWA	Female observed
C	MAWA	Calling, sex unknown
P	MAWA	Pair together assumed mated
O	MAWA	Observed, sex unknown

ATTACHMENT 4 POINT COUNT DATA FORM

POINT COUNT DATA FORM

STATE REGION STATION MONTH DAY YEAR VISIT #

Observer:_____ E-mail:_____

Point No.	Time	Species Alpha Code	≤ 50 meters			≥ 50 meters			Distance (meters)	Fly-overs		
			0-3 min.	3-5 min.	5-10 min.	0-3 min.	3-5 min.	5-10 min.		0-3 min.	3-5 min.	5-10 min.

Weather:_____

Notes:_____

_____

ATTACHMENT 5 POINT COUNT LOCATION AND VEGETATION FORM

LOCATION AND VEGETATION FORM

LOCATION

STATE | REGION | STATION | LOCATION / POINT | MONTH | DAY | YEAR

LATITUDE | LONGITUDE

ELEVATION (M)	ASPECT	% SLOPE	WATER	PLOT RADIUS (M)	NOTES

VEGETATION

LAYER	TOT COV	HEIGHT (0.1 M) LOW	SPECIES	UPPER	SPECIES	DBH (CM) MIN	SPECIES	MAX	SPECIES	NUMBER SUBLAYERS
TREE		.		.						
SHRUB		.		.						
HERB		.		.						
MOSS		.		.						

SUBLAYER	COVER	SPECIES

SUBLAYER	COVER	SPECIES

SUBLAYER	COVER	SPECIES

3/26/92

ATTACHMENT 6 COMMON LOON NESTING SURVEY AND HABITAT DESCRIPTION FORM

COMMON LOON NESTING SURVEY AND HABITAT DESCRIPTION FORM

Observer's Name_____ Phone #_____

Address_____ E-mail_____

Lake Name_____

Lake Location _____

(Circle the legal description used: UTM / Latitude, Longitude / Township, Range, Section)

Zone_____ Datum_____ Map Name_____

Lake Size (acres or hectares)_____ Lake Elevation (feet or meters)_____

Survey Date_____ Time Start_____ Time End_____

Common Loons Observed: No_____ Yes_____ (If yes, record # and behavior below)

Number of Adults Observed_____ Number of Young Observed_____

Describe Loon Behavior_____

_____

_____

_____

_____

Describe Lake Characteristics (Is shoreline convoluted? Is emergent vegetation present? Where are emergents located? What vegetation type is along shoreline? Are islands present? How many? What are islands made of? Is vegetation present on islands? What type? Is water level controlled?)_____

_____

_____

_____

_____

_____

Are Fish Present: Yes_____ No_____ Species_____

Other Species Observed_____

_____

_____

Observations WOFed: Yes_____ No_____ WOFed By:_____

ATTACHMENT 7 SECRETIVE MARSH BIRD SURVEY FORM

Wyoming Secretive Marsh Bird Survey Data Sheet

Page_____of_____

Date (day, month, year): _____

Name of marsh or route : _____

Observer(s) *(list all)** : _____

Multiple observer survey: Y / N (circle one)

Water depth:

location: _____

depth: _____

location: _____

depth: _____

Survey type:** _____

***(e.g., foot, driving, boat)*

location: _____

depth: _____

location: _____

depth: _____

**List all observers in the order of their contribution to the data collected*

Place a "1" in the response columns if the bird was heard, an "S" if it was seen, and a "1S" if it was both heard and seen

Station	Start Time (military)	Temperature (C or F circle one)	Sky	Wind (Beaufort)	Salinity	Background Noise	NAD 83 Datum, Zone_____		Species	Responsed During							Call Type	Direction from North	In Target Area	Distance (meters)	Distance Aide	Detected at a Previous Point	Comments/Other Species Detected
							UTM - Easting	UTM - Northing		Passive 0-1	Passive 1-2	Passive 2-3	Passive 3-4	Passive 4-5	Call-broadcast	Outside Survey Period							

Sky: 0 = clear or a few clouds, 1 = partly cloudy or variable sky, 2 = cloudy or overcast, 3 = sand or dust storm, 4 = fog or smoke, 5 = drizzle, 6 = snow, 7 = snow/sleet, 8 = showers.

Beaufort Scale: 0 = smoke rises vertically; 1 = wind direction shown by smoke drift; 2 = wind felt on face, leaves rustle; 3 = leaves and small twigs in constant motion, light flag extended; 4 = raises dust and loose paper, small branches are moved; 5 = small trees with leaves sway, crested wavelets on inland waters.

Background Noise: 0 = no noise, 1 = faint noise, 2 = moderate noise (probably can't hear some birds beyond 100m), 3 = loud noise (probably can't hear some birds beyond 50m), 4 = intense noise (probably can't hear some birds beyond 25m), 9 = not recorded.

Secretive Marsh Bird Species Codes: AMBI = American Bittern, AMCO = American Coot, PBGR = Pied-billed Grebe, SORA = Sora, VIRA = Virginia Rail.

Distance Aide: 0 = none, 1 = range finder, 2 = distance bands on aerial photo, 3 = surveyor flags tied to vegetation.

Notes:_____ **WGFD WOS Database:**_____

ATTACHMENT 8 KEY TO THE EGGS OF MARSH BIRDS AND ASSOCIATED SPECIES

KEY TO THE EGGS OF MARSHBIRDS AND ASSOCIATED SPECIES

Forster's Tern Nests in colonies close together; birds are very social. Nest is a deeply hollowed, well-rounded, compactly woven platform lined with bits of reeds, grass. Also makes depression in mud and sand or pats down grass and soil, lined with shells, grass. Nests are often on muskrat houses, or occasionally (occ) uses nests of Western Grebe. Nest is similar to that of the Common Tern. Eggs are buff, marked with dark brown, often wreathed; 43 mm long, 30 mm wide; usually 3 eggs, occ 2-5.

Black Tern Nests in dense emergent vegetation (veg). Some nests are elaborate; most are only a loose floating mat of damp veg raising eggs just above water. Eggs are often wet. Nest is often on muskrat house, occ in abandoned grebe nest, occ no nest. Eggs are dark olive/buff, marked with dark brown, usually wreathed; 33 mm long, 23 mm wide; usually 3 eggs, occ 2-4.

White-faced Ibis Nests in emergent aquatic veg or more rarely on an island in a low shrub. Nest is a fairly large, substantial structure, deeper than that of a Black-crowned Night-Heron, made of coarse emergent veg and lined with finer materials. Eggs are greenish-blue/bluish-green, unmarked, and a little glossier and more elongated than those of Black-crowned Night-Herons. Eggs are 52 mm long, 34 mm wide; usually 3-4 eggs, occ 2-7.

Snowy Egret Nest is a flimsy platform of sticks and is lined with fine twigs, rushes. It is similar to ibis and night-heron nests, but the material is finer. Eggs are light bluish-green, unmarked, with a smooth shell having little or no gloss; smaller than ibis and night-heron eggs, 43 mm long, 33 mm wide; usually 3-5 eggs, occ 6.

Black-crowned Night-Heron Nest is similar to ibis nest but is not as deep and often contains some terrestrial veg. Eggs are light bluish/greenish, smooth, not glossy, and unmarked; 52 mm long, 36 mm wide; less elongated than ibis eggs; usually 4-5 eggs, occ 2-7.

American Bittern Nest is a scanty platform of available marsh veg; has a separate path for entrance and exit; sometimes there is an arch over the nest. Eggs are smooth, slightly glossy, plain brown to olive/buff, and unmarked; 48 mm long; usually 4-5 eggs, occ 2-7.

Western and Clark's Grebes Nest characteristics of these two species are similar. Both are strongly colonial and nest in marshes on a floating platform in shallow water. Nest is a compact mass of fresh and decayed veg, usually anchored to or built up over live veg; may be in the open or concealed. Eggs are bluish-white, chalky, or nest-stained buff/brown; 58 mm long; usually 3-4 eggs, occ 2-7.

Franklin's Gull Nest is a well maintained, floating platform of coarse