

Interim Golden Eagle Breeding Survey Recommendations in Nevada: FWS R8 Migratory Birds June 13, 2023

These recommendations are intended to augment the USFWS Golden Eagle (GOEA) interim inventory and monitoring guidance (Pagel et al. 2010), USFWS Eagle Conservation Plan Guidance (USFWS 2013), and USFWS (2020) wind energy memo, not to replace them.

The following recommendations have been developed by the USFWS Region 8 Migratory Bird Program to provide technical assistance relating to developing GOEA survey plans for development projects. Our recommendations are meant to cover various activities and industrial development projects across Nevada. While providing a general framework to build upon, we understand there may be project and site-specific details that require adjustments to survey approaches and there may be local or other guidance that may need to be considered, so please engage with appropriate federal, state, and local agency staff for additional guidance as needed. Also, please be aware that weather, road conditions, and other factors may require adjustments to survey planning and implementation with associated adjustments to survey methodology and timing.

Overall Survey Objectives

When considering eagles, providing an accurate understanding of GOEA territory distribution and occupancy status within the project-area is the primary goal to estimate project area population, along with identifying nests and assessing their in-use status. This provides the ability to assess risk to the local breeding population and consider potential impacts to individual breeding pairs and breeding attempts. Knowledge of eagle breeding success and productivity can be useful at the project level and when compiled in a meta-analysis across broader areas by management agencies. The level of scrutiny is often not as great for other raptor species but identifying nests and species' use patterns is often of value to project managers and management and regulatory agencies.

1. Nest Inventory

The Nevada Department of Wildlife (NDOW) is the primary source of raptor nest data in Nevada, so a data request should be sent to NDOW (ndowdata@ndow.org) prior to nest inventory or commencement of other baseline survey efforts. Nest location data from NDOW should be considered a framework from which to guide search effort, but NDOW nest data should not be considered comprehensive for any project area and should not be used in lieu of conducting current surveys in the project vicinity. Project-associated nest inventory surveys should evaluate all suitable cliff-nesting raptor nest substrate, but note that GOEAs occasionally nest on transmission lines, other artificial structures, and trees in Nevada. Surveys for woodland and ground-nesting raptors (e.g., northern goshawk, ferruginous hawk, burrowing owl, northern harrier, cavity-nesting owls) should consider other survey methods, although aerial and ground survey approaches targeting the pinyon-juniper woodland/sagebrush ecotone in conjunction with surveys of rocky outcrops, cliffs, and transmission lines can be suitable for ferruginous hawks. Based on the extent of survey area, complexity of terrain, and need to obtain a comprehensive inventory, nest inventory surveys for cliff-nesting raptors are often best conducted using an aerial survey approach of all suitable nesting habitat and **can be conducted any time of the year** (i.e., compiling a raptor nest inventory for a given project area can occur outside the raptor breeding season).

Objectives

- Develop a raptor nest inventory within the survey area
 - Usually this inventory is the first step in a baseline survey effort
 - Can be used to direct future survey efforts
 - Can be combined with territory occupancy and nest use surveys if timing occurs within the GOEA courtship/early incubation period (see below)

2. Occupancy Surveys

Following Pagel et al. (2010), occupancy surveys should be conducted during two periods in the eagle breeding season (i.e., courtship/early incubation, and incubation/early nestling stages). Initial early season occupancy surveys should be conducted within the courtship period (or into early incubation in some cases). The second round of occupancy surveys should be conducted during incubation into early brood rearing. The survey area extent for different types of development projects are considered in the following section.

Initial GOEA Occupancy Surveys

Objectives

- Assess GOEA territory occupancy at all known territories and all other suitable nesting habitat within the survey area and document in-use nests as appropriate;
- Can be combined with a nest inventory if conducted aerially and when using high quality image-stabilized photographs and post-survey desktop processing.

Survey Methods – Initial early season occupancy surveys should be conducted between January – February in most areas of Nevada to assess GOEA territory occupancy at all known territories within the survey area and document in-use nests as appropriate. Areas at higher elevation, portions of northern Nevada, or in years with high snowfall may shift the initial occupancy survey window to February – mid-March.

Territory occupancy surveys are most effectively conducted as ground-based surveys, with surveys lasting four hours at a territory or until essential information is obtained to verify territory occupancy or nest in-use status (Pagel et al. 2010). If land access, weather, road conditions, or other constraints hinder ground surveys then aerial surveys can be used in their place; however, as eagles are highly mobile during the courtship period, and the length of observation in any territory is low, aerial surveys tend to have significantly fewer observations of eagles than ground surveys and generally underestimate occupancy.

If aerial surveys must be used, aerial surveys prior to egg-laying (while recording all GOEA observations) should focus heavily on assessing nest condition and material freshness using high quality image-stabilized photographs – preferably zooming in on nests to verify the presence or absence of new sticks, fresh greenery, or recently improved nest bowls. Pilots and aerial survey crews should always consider safety first, so capturing high quality nest photographs is not always practicable and these surveys may rely on visual observations when nest visibility is ideal or circling and hovering with a helicopter is not considered safe. Because the ability of early season aerial surveys to establish territory occupancy will likely rely heavily on detecting nest maintenance evidence, the timing of these surveys may occur during the later portion of the occupancy survey window and may even extend into mid-March.

Note, surveys conducted during the courtship/early incubation stages are intended to assess GOEA *territory* occupancy, so ground survey observations should be focused on the areas around nests (e.g., prominent perches and airspace), nest cliffs, and other suitable nesting habitat. While it is possible GOEAs may lay eggs and begin incubating by late January, laying is not likely at this time so surveyors should focus on presence and behavior of eagles instead of strictly monitoring nests themselves. Unless potential nesting habitat is rather limited and straightforward to assess, ground surveys should only be conducted after a complete aerial nest inventory has been completed and distribution of nesting territories has been estimated. That is, initial occupancy surveys for new projects will generally need to have a comprehensive nest inventory in place to guide ground efforts, whereas initial occupancy surveys in subsequent years of multi-year monitoring efforts can utilize inventories from previous years.

When considering ground surveys: 1) assess whether observation point locations present a potential disturbance to raptors (see Pagel et al. 2010, page 9); 2) strive for observation points between 400–1,200 m from nesting areas in most cases, although viewing from farther away can be effective in situations with ideal visibility; and 3) make sure observation points have at least a view of nest cliff faces, nearby suitable nesting terrain and potential prominent perches and airspace overhead of the suitable terrain. If conditions do not allow for observations at an appropriate location that allows for the above considerations while eliminating or minimizing potential disturbance to territory-holding eagles, then consider an alternate observation point or a different survey method. Observation points within territories can be adjusted within and between surveys to ensure adequate coverage. Be aware that likelihood of disturbance is reduced when observers are able to remain in vehicles. Note, snowmobiles and snowshoes can be good alternatives to allow ground surveys with extensive snow cover without resorting to aerial surveys with a lower likelihood to accurately assess GOEA occupancy.

Specific ground observational criteria used for establishing early season GOEA territory occupancy are:

- a. An adult eagle within 500 meters of a nest within the territory, when the bird is clearly in view of the nest, and when the eagle's presence is clearly not a rapid pass-over of the nest.
- b. Two adults, or an adult and a sub-adult bird paired within the territory.
- c. Reproductive or territorial behavior within the territory:
 - i. Courtship behavior, undulating flight, copulation
 - ii. Territorial defense
 - iii. Nest building behaviors (stick carrying, nest maintenance).

Follow up Occupancy Surveys

A second round of surveys following Pagel et al. (2010) should be conducted at least 30 days following initial GOEA occupancy surveys.

Objectives

- Assess territory occupancy in areas not confirmed during the initial survey.
- Assess all suitable nesting habitat to identify previously undocumented nests.
- Assess territory occupancy and nest in-use status of all GOEA and nests of other cliff-nesting raptor species.

Survey Methods – Ideally conducted between March – mid-April. See above (*Initial GOEA Occupancy Surveys*) for suggested survey methodology, but for large surveys area in complicated terrain, aerial surveys may be most effective to complete nest inventories and assess nest occupancy. Ground surveys are also effective where terrain and access allow and should be considered for GOEAs near project areas as practicable. Note, it takes at least two surveys as presented above (ground-based or aerial) to categorize a territory as unoccupied (aka, ‘occupancy not observed’) each year.

3. Late Nestling Productivity Surveys

A final survey (aerial or ground-based; generally late-May through June) to assess GOEA breeding success is dependent on project goals and survey objectives; however, it: 1) can be beneficial for supporting any needed National Environmental Policy Act (NEPA) analyses; 2) helps contextualize project area population status, prey and habitat conditions; 3) is often important for assessing potential project impacts to breeding GOEAs and may be a required incidental eagle disturbance take permit condition; and 4) may be useful for also assessing breeding status of other later-nesting raptor species (e.g., ferruginous hawks) by inclusion of nest checks of these other species in the survey. Breeding success/productivity surveys should be conducted at nests identified as in-use during the initial and follow up surveys and at the time when GOEAs are expected to have late-stage nestlings to assess breeding success and productivity (i.e., breeding attempts are considered successful when ≥ 1 nestling reaches ≥ 51 days old).

GOEA Nesting Season and Other Wildlife Concerns – The USFWS Region 8 Migratory Bird Program considers the GOEA breeding season (i.e., courtship, incubation, nestling, and post-fledging stages) to extend annually from 15 December to 31 July in Nevada. Unless an incidental eagle disturbance take permit is in place or without coordination with USFWS staff, GOEA nests that may be subject to disturbance by project or other human activities should be considered in-use (see 50 CFR 22.3 for definition of “in-use”) for a given breeding season until they are confirmed to not be in-use on 15 April or later. Prior to 15 April, GOEA nests are considered potentially in-use unless an alternative nest within the same territory is already confirmed in-use. Based in part on lack of breeding each year and imperfect nest detection, it is possible that a GOEA territory could be occupied (eagles observed in the territory), but no nests within the territory yield in-use evidence. Therefore, although the territory is occupied, all nests within the territory may be classified as not in use. Unless other measures agreed upon by the appropriate BLM, USFS, NDOW, and/or USFWS staff are in place, spatial disturbance buffers (generally 1-mile for most human activities or 2-miles for blasting) should be adhered to until nests are confirmed to be not in-use, 4 weeks after nestlings fledge if monitoring confirms approximate fledging date, or after 31 July if they are in-use and not otherwise monitored to verify fledging date.

Consult with NDOW to determine if bighorn sheep lambing habitat overlaps the aerial raptor survey area. If suitable raptor nesting habitat overlaps lambing habitat and surveys must occur during important lambing periods, then consult with USFWS and NDOW biologists to minimize potential impacts and consider ground surveys if practicable. Pilots and surveyors should strive to minimize disturbance to bighorn ewes and lambs, and all other wildlife encountered.

Survey Areas and Frequency by Development Activity Type:

Operational Mines and Large-Scale Solar Energy – This type of activity may include other development types, but generally results in >1,000 acres of long-term habitat alteration that may constitute disturbance resulting in loss of suitable habitat (e.g., home range and foraging area), and activities associated with the

development may result in disturbance of individual GOEAs and/or breeding attempts. These types of development activities do not generally pose a direct mortality risk to eagles. Note, disturbance associated with operational underground mining projects is generally restricted to access points to the underground workings (portals) and associated infrastructure and traffic to and from mine portals, so a 2-mile survey area is recommended as with large exploration activities.

We recommend initial baseline GOEA breeding surveys of all suitable GOEA/raptor nesting habitat for at least two years prior to commencement of any project activities, and prior to substantial project expansion activities. For operational mines and large-scale solar energy development in Nevada, we recommend surveys are conducted within the project boundary and out to 10 miles surrounding the project-area during that two-year period. This level of surveying may be appropriate in other instances depending on perceived impacts to the project-area GOEA population. Baseline surveys are intended to develop a nest inventory around the project-area, begin delineating GOEA territories, provide information for determining an approximate project-area population, and can be helpful to assess breeding effort, breeding success, and productivity of GOEA. This helps set the stage for relative GOEA/raptor use in the area pre- and post-construction, supports project NEPA analyses, and provides context regarding potential project impacts on nesting GOEAs and other raptors. Baseline surveys without a preexisting nest inventory are generally most effectively conducted using an aerial survey method, but ground-based surveys may be considered in areas with less complex terrain, limited nesting substrate, or an extensive road network to facilitate access.

If project activities may represent a disturbance risk to GOEAs within disturbance buffers survey and monitoring efforts in subsequent years should reduce to a 4-mile area extending beyond the project area boundary, as this is generally the area at greatest risk of disturbance for GOEAs, unless project-specific conditions of approval require additional surveys within 10 miles surrounding the project area footprint. Ongoing survey and monitoring efforts are often a condition of incidental eagle take permits, may be requested or required by other federal, state, or local agencies, or may be called for in other instances when projects are predicted to potentially impact the local project area GOEA population. Ongoing monitoring of eagles may not be necessary if there is no requirement to do so and there are no other concerns relating to GOEA project area impacts.

Exploratory Mining – We recommend one year of preconstruction baseline surveys of all suitable GOEA/raptor nesting habitat out to a 1-mile area around the project-area prior to development (ideally the year of, or year prior to, development) on smaller exploration projects. The survey area would extend to a 2-mile radius on larger exploration projects or projects that will include blasting. For smaller exploration projects (i.e., small-scale drilling exploration projects with < 5 acres of disturbance, are temporary [one to two years], leave no engineered infrastructure [e.g., power lines or ponds], and receive minimal vehicular traffic) that can avoid disturbance by using spatial or temporal buffers, surveys should prioritize a nest inventory during the courtship-incubation nesting stages. Larger exploration projects (i.e., projects similar to small exploration but with no acreage limits, that result in disturbance over two or more years, or utilize blasting) should conduct two full years of surveys prior to ground-disturbing activities.

Geothermal Energy – This type of activity typically includes geothermal exploration and resource confirmation drilling, as well as long-term energy production if resources are deemed sufficient. While well sites (extraction, injection, and monitoring) can be lasting and connected with surface piping, little of

the surrounding habitat is disturbed, drill pads are typically < 1 acre, vehicular traffic is minimal, and energy production facilities are generally 5–10 acres.

We recommend the survey area extend to 2 miles outside the project-area. A minimum of one year of baseline surveys should precede resource confirmation drilling, and at least two years of baseline surveys should precede construction of energy production facilities. If resource confirmation results lead to energy production, then we suggest projects consider annual post-construction surveys for two years.

Wind Energy – Based on the 2020 memorandum and updated Eagle Nest Survey Protocol from USFWS Headquarters, a revision of GOEA nest survey recommendations to the USFWS (2013) land-based wind energy guidance now exists. The updated protocol reduces the survey area to within 2 miles of the project-area, which is based on risk of turbine blade strike to eagles in relation to ranging distance of eagles from territory centers, although site-specific considerations may lead to greater survey distance recommendations. Note, site evaluation, predicted project impacts, post-construction impact studies, and best management practices for wind energy development can be found at USFWS (2013). We recommend surveys of the project-area eagle/raptor nesting population be conducted for at least two years prior to construction. Note also that risk assessments to GOEAs within wind energy project areas are weighted heavily by information gathered from fixed-radius large bird (including eagles) point counts (USFWS 2013). This contrasts with most other development activities in which project area impact assessments rely on data more relevant to disturbance to eagles and loss of home range, prey base, and foraging areas that could result in territory loss or reduced project area nesting density golden eagle carrying capacity.

In addition to project-area breeding surveys prior to development, project developers are recommended to evaluate the broader geographic area to assess relative importance to resident, migrant, and wintering eagles, while also predicting eagle fatalities (USFWS 2013). Survey needs and permit recommendations may vary based on site categorization relating to mortality risk to eagles and other factors. Please see USFWS (2013) for further information.

Electrical Transmission Lines – Construction of electrical transmission lines includes towers of various sizes designed to cover a range of power loads. They are generally constructed in a right-of-way that may, or may not, have pre-existing transmission lines. Preconstruction baseline surveys of all suitable GOEA and other raptor species' nesting habitat should be conducted to develop a nest inventory out to a 1-mile radius survey area around the project-area prior to development (including existing transmission towers). Surveys prior to transmission line construction often consist of a single survey year, so all nests should be considered potentially in-use the year of construction unless pre-construction surveys confirm presence/absence of breeding in nests a maximum of three days prior to disturbance.

Important Dates to Consider:

- GOEA breeding season (courtship, incubation, nestling, fledgling): 15 December – 31 July (or 4 weeks after young fledge)
- Determine a GOEA nest not in-use for a breeding season: 15 April
- Preferred survey windows:
 - GOEA ground occupancy 1: January – February (extend to mid-March at high elevations and high snow years)
 - GOEA aerial occupancy 1: February – mid-March
 - Occupancy follow-up/all raptors: March – mid/late-April

- GOEA Productivity/all raptors: late May – June
- Bighorn sheep lambing season (as provided by NDOW; NVMA 2018) in areas with lambing habitat:
 - Southern Nevada: 1 January – 31 March
 - Central Nevada: 1 February – 30 April
 - Northern Nevada: 1 April – 31 May

Other Resources to Consult:

Pagel, J.E., D.M. Whittington, and G.T. Allen. 2010. Interim Golden Eagle Inventory and Monitoring Protocols; and other recommendations in support of golden eagle management and permit issuance. U.S. Fish and Wildlife Service.

Nevada Mining Association (NVMA). 2018. Golden Eagle Protection Best Practices: Nevada mineral exploration and mining industry. Reno, NV.

United States Fish and Wildlife Service (USFWS). 2013. Eagle Conservation Plan Guidance: Module 1 – Land-based wind energy, version 2. U.S. Fish and Wildlife Service, Migratory Bird Program.

United States Fish and Wildlife Service (USFWS). 2020. Updated Eagle Nest Survey Protocol. U.S. Fish and Wildlife Service, Migratory Bird Program.

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Driscoll, D.E. 2010. Protocol for Golden Eagle occupancy, reproduction, and prey population assessment. American Eagle Research Institute. Apache Junction, AZ.

Slater, S.J., K.R. Keller, and R.N. Knight. 2017. Interannual Golden Eagle (*Aquila chrysaetos*) nest-use patterns in central Utah: Implications for long-term nest protection. *Journal of Raptor Research* 51:129–135.

Watson, J.W., R. Marheine, and T. Fitzherry. 2014. Focal activity of nesting Golden Eagles near unused nests. *Journal of Raptor Research* 48:284–288.