UTAH WEST DESERT GOLDEN EAGLE MANAGEMENT RECOMMENDATIONS

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West Desert Eagle Management Recommendations

RECOMMENDED CITATION

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DOCUMENT AUTHORSHIP

This document is based on the expert opinions of the Utah Legacy Raptor Project (ULRP) partners and three phases of West Desert Golden Eagle monitoring and research supported by the U.S. Department of Defense, Legacy Resources Management Program (Project #10-102). The ULRP partners that contributed to this document include the Bureau of Land Management (Traci Allen, Robin Naeve), Department of Defense (Robert Knight), HawkWatch International, Inc. (Kylan Frye, Steve Slater), Raptor Inventory Nest Survey (Robyn MacDuff), Utah Division of Wildlife Resources (Kimberly Asmus, Jim Parrish), and U.S. Fish and Wildlife Service (Melissa Burns, Nathan Darnall), and a volunteer eagle specialist (Kent Keller).

INTRODUCTION

Research conducted through three phases of the Utah Legacy Raptor Project (ULRP) to document breeding raptor responses to fire and cheatgrass invasion suggests West Desert Golden Eagle (*Aquila chrysaetos*) breeding activity, as measured through the proportion of surveyed territories occupied or with eggs laid, has declined significantly since 2007 corresponding with large-scale fire and shrub loss and perceived jackrabbit (*Lepus* spp.) prey declines (Slater et al. 2012, 2013). Although the proportion of Golden Eagles pairs attempting to lay eggs is known to vary annually in relation to prey abundance and weather (e.g., Steenhof et al. 1997), proportional occupancy (i.e., the proportion of available territories with breeding adults present) should remain relatively stable over the long-term in a healthy population. Given recent concerns over the status of the Golden Eagle in the West Desert (and elsewhere; e.g., see Kochert and Steenhof [2002], Smith et al. [2008]), we drew upon our research in the region, the experience and knowledge of ULRP partners, and relevant scientific literature to provide specific West Desert Golden Eagle management recommendations (this document), but also identified those recommendations that we believe are applicable more broadly (i.e., across Utah or the species' western range). Our recommendations are grouped into six sections containing information regarding: 1) habitat and landscape management recommendations in a broad sense; 2) individual nest and territory management recommendations; 3) post-fledging mortality management; 4) research needs concerning West Desert and Utah eagles; 5) existing research, monitoring, and protection efforts; and 6) recommendations for additional implementation.

EAGLE HABITAT AND LANDSCAPE MANAGEMENT RECOMMEDATIONS

Manage at the landscape scale.

Recent research suggests eagles may occasionally range much farther from nest sites and other seasonal ranges to acquire prey than previously believed. At least some West Desert birds appear to be year-round residents, but may use larger areas outside the territorial breeding season. Additionally, it appears that West Desert eagle occupancy declined concurrently across a large and environmentally variable region coincident with localized, large fires, suggesting a threshold in overall landscape change may have been reached (Slater et al. 2013).

These facts suggest eagle habitat management should extend beyond the typical core breeding space use areas of 20–83 km² (Marzluff et al. 1997, Kochert et al. 2002; 2.5–5.1-km circular radius) and to larger landscapes and regions containing nesting and wintering habitat (e.g., the West Desert). Specific recommendations regarding the management of such landscapes follow.

Minimize habitat degradation and fragmentation.

Specific, large-scale activities that may degrade or fragment Golden Eagle landscapes and habitat in Utah and beyond include:

- Fire (wildland and human-caused)
- Urban, rural, and agricultural development
- Motorized vehicle travel
- Livestock grazing (e.g., sheep and cattle)
- Energy development
    - Renewable energy (wind, solar, and geothermal)
    - Conventional energy (oil, gas, and coal)
    - Associated right-of-ways (roads, pipelines, transmission/distribution lines)

These types of events and activities should be controlled, managed and/or sited carefully in landscapes or regions supporting Golden Eagle habitat to reduce the potential for negative impacts.

Protect shrub cover.

Shrub cover provides important habitat structure and security for many reptiles, birds, and mammals in the western U.S., including many prey species of the Golden Eagle. Leporids (hares and rabbits) are primary prey species in the Great Basin and Southwest regions and are limited by available security cover, such as that provided by shrubs. Increased fire frequency related to human activities, invasive cheatgrass, climate change, etc., has greatly reduced shrub cover on western rangelands. We encourage land managers to avoid large-scale development activities, shrub removal, or other treatment projects within landscapes supporting nesting eagles. For example, West Desert territories with higher egg-laying rates over time averaged significantly higher shrub cover within a 4-km radius of nests (i.e., 83% shrub cover; Slater et al. 2013). Additionally, jackrabbit prey do not regularly venture more than 300–400 m from protective shrub cover (Westoby and Wagner 1973, McAdoo et al. 1987). We suggest land managers consider establishing and maintaining fire breaks in vulnerable shrub habitats to reduce the potential for large, stand-destroying fires. In the West Desert, greasewood (*Sarcobatus vermiculatus*) stands appear to be less prone to fire and therefore provide important cover for leporids prey species.

Encourage shrub restoration.

Where possible and appropriate based on perceived probability of success, we recommend lands managers rehabilitate disturbed lands with seed mixes containing native shrubs based on the ecological site description from the NRCS mapped soil survey. The Utah Watershed Restoration Initiative (WRI) is a possible funding source for restoration efforts throughout the state.

Reduce future cheatgrass invasion and fire risk.

Cheatgrass has been identified as a leading cause of fire and shrub loss in the Great Basin region and is associated with increased frequency of fire in the West Desert. Research conducted by the ULRP found invasion was most prevalent north and south of I-80 (Slater et al. 2012). We advocate for careful management of travel, recreation, and development activities in areas that have thus far escaped heavy invasion, but with substantial risk for future invasion (e.g., low to mid elevations along roadways; see Slater et al. [2012]). Specific areas of potential value to eagles and at risk of future cheatgrass invasion include:

- Eastern and southeastern flank of Deep Creek Range and Trout Creek area
- Southern flank of Fish Springs Range and western flank of Spor Mountain
- Picture Rock/Keg Mountain area

- Eastern flank of Confusion Range and western flank of House Range
- Areas to west, east, and south of Sevier Lake and Wah Wah Valley

EAGLE NEST AND TERRITORY MANAGEMENT RECOMMEDATIONS

Manage potential alternate nests collectively.

Although reproductively active eagles only lay eggs in one nest in a given year, one or more alternate nests are often maintained for use in subsequent years. Western and central Utah eagles used an average of 3.1 nests per territory (range = 1–8 total nests; Slater et al. [2013]). In comparison, eagles maintained an average of 3.7 nests (range 1–18) in a high-density breeding area in southwestern Idaho (Kochert and Steenhof 2012). Nest switching is believed to convey fitness benefits to eagles by reducing nest parasites (Watson 1997). Therefore, we strongly advocate for equal protection of all nests contained within an individual breeding territory (i.e., if nest A was used in 2012, alternate nests B and C should also be treated as active in 2012 in subsequent management decisions). If the relationship of proximate nests is unknown, we recommend treating all suspected eagle nests within 2 km of each other as potential alternates (e.g., 90% of all West Desert alternate nests were within 1,575 m of their nearest neighbor; $n = 208$).

Minimize nest disturbance.

The Bald and Golden Eagle Protection Act (BGEPA) specifically prohibits nest disturbance. Areas used by nesting eagles are also often attractive to humans. Specific activities with the potential to inadvertently disturb nesting eagles include:

- Motorized vehicle travel
- Camping or staging
- Military testing and training activity
- Rock climbing and mountaineering near active nests
- Shooting activities (e.g., target shooting)
- Sheepherding or cattle herding activities
- Energy development (e.g., coal, oil, gas, wind, solar, and geothermal)
- Gravel mining
- Other novel, but sustained activities near nests

Additionally, intentional disturbance (e.g., shooting) or nest destruction occasionally occurs (e.g., burning or knocking a nest down).

To reduce the potential for illegal disturbance or take, land managers typically apply spatial and temporal nest protections. We recommend that all potential alternate nests (i.e., nests within 2 km of each other) be protected from potential disturbance activities (see above) by a 800-m (½-mile) radius buffer during the active nesting period or from Jan 1–Aug 31 (Romin and Muck 2002) for a minimum of 4 years since the last documented use of any potential alternate nest (i.e., 90% of all observed inter-territory nest re-use in western and central Utah occurred within 4 years of last use; Slater et al. 2013). If alternate nests have not been comprehensively searched for in the surrounding area (i.e., 2-km radius), we recommend protecting individual nests for at least 7 years to account for potential undocumented alternate nest use (Slater et al. 2013). Human activities allowed outside the active nesting season should not result in establishment of permanent roads, facilities, etc., that have the potential to result in disturbance during the subsequent nesting season.

We recognize that a number of existing roads, trails, camp sites, etc., occur within 800 m of recently active Golden Eagle nest sites. Where feasible and publicly acceptable, we recommend removing such sites from future use. Where not feasible or acceptable (likely the vast majority of sites), we advocate for annual nest monitoring and seasonal road, trail, climbing route, or camping closures near active nests. We further recommend that future travel and recreation planning documents consult existing eagle nest records and include the tools and language necessary to facilitate temporary closures.

Provide additional protection to experienced breeders

Golden Eagles are long-lived and slow-reproducing birds. In the West Desert, it is not uncommon to find proximate eagle territories occupying similar habitats, but with vastly different reproductive output, suggesting that individual or pair experience and fitness may be more important than local habitat quality. A handful of territories in the West Desert are consistently active (i.e., eggs are laid) and produce a disproportionate number of fledglings across years. It stands to reason that these territories should be afforded disproportionate protection (i.e., apply all nest disturbance minimization measures previously discussed to the full extent possible).

Protect nest location data.

We recommend that raptor nest location data be treated as sensitive information to avoid potential nest disturbance. Raptor surveyors should be instructed to avoid revealing the location of nests through their actions in the field. Land managers should avoid revealing detailed nest location information in publicly available documents and should carefully weigh the potential benefits and risks associated with field signage indicating the presence of nesting raptors (e.g., vague signage, such as "Trail Closed-Sensitive Natural Resource Area", may be preferable).

Use compensatory mitigation as a last resort.

Given the long-lived, slow-reproducing nature of the Golden Eagle and current concern over the species' status in the West Desert and across broader regions, we suggest compensatory mitigation (i.e., an action to offset an impact) should be a last resort only. When a potential impact is anticipated, we recommend a sequential application of mitigation consistent with the 2009 Eagle Act regulations as follows:

- Avoiding the impact altogether
- Minimize the impact by limiting the degree or magnitude
- Rectify the impact over time (e.g., repair, rehabilitate, or restore the affected environment)

POST-FLEDGING MORTALITY MANAGEMENT

Reduce known sources of mortality.

Band return data suggests vehicle collision (n = 27), electrocution, (n = 26), and shooting (n = 12) are the leading causes of known mortality for free-flying eagles fledged in the region (n = 157; Slater et al. 2013). Although biases exist in human mortality reporting, these causes are also fairly manageable through:

- Reduction of big game vehicle strike risk
- Timely removal of big game road-kill
- Identification and retrofitting of hazard power poles

- Shooter education and closure of sensitive areas to shooting

RESEARCH NEEDS

Improve modeling of factors likely contributing to annual breeding activity.

Our ability to assess factors influencing annual nest occupancy, proportion of nests with eggs laid, and productivity would likely be improved by:

- Incorporation of annual prey abundance into models of annual eagle reproductive effort and output. Research elsewhere has demonstrated the influence of prey abundance on Golden Eagle reproduction (e.g., Steenhof et al. 1997). Future breeding season research efforts in Utah should also assess and incorporate information on prey abundance, particularly jackrabbit abundance for desert eagles, to account for its known influence on breeding activity.
- Incorporation of fine-scale spatial and/or temporal weather into models of annual eagle reproductive effort and output. Previously, we have utilized broad regional weather data (e.g., NOAA western Utah climate division data) covering relatively long time frames (e.g., monthly averages), but we suspect more localized or short-term events have a greater influence on annual eagle breeding activity. For example, monthly temperature or precipitation averages do not capture short-lived, extreme weather events such as a late spring snow storms that may cause nest failure.

Identify important non-breeding habitats.

Although substantial effort has been directed at inventorying and monitoring eagle nest sites, very little attention has been given to Golden Eagle winter habitat use in Utah. Although numerous exploratory raptor migration count sites were visited historically throughout Utah, this information has not been compiled and therefore does not provide adequate insight into potential important eagle migration pathways.

Quantify age-related sources of mortality.

For most long-lived, slow reproducing species, recruitment (i.e., survival to breeding age) is a potential factor limiting population growth. To date, very little information has been gathered on post-fledging survival of free-flying Golden Eagles to adulthood (i.e., year 5), but we suspect mortality may be significant during this initial period of exploration accompanied by a lack of experience. Further advancing our understanding of movement ecology and mortality factors during this period is a high priority.

Advance understanding of local movement ecology.

Additional information is needed on localized space use associated with breeding and non-breeding seasonal ranges and inter-seasonal movements. Recent unpublished research suggests desert eagles may occasionally travel much greater distances during the breeding season than previously believed. This has significant implications for management of potential mortality risk factors for this species (e.g., collisions or electrocution).

Assess effectiveness of potential mitigation strategies.

Although perch guards are an accepted tool for electrocution risk reduction, little research has been conducted on the utility of other potential mitigation strategies, such as habitat improvement or road-kill removal. Before a particular mitigation strategy can be endorsed or implemented widely, its efficacy should be demonstrated.

EXISTING IMPLEMENTATION EFFORTS

Existing research and monitoring efforts.

A number of on-going Golden Eagle research and monitoring efforts do exist in the West Desert and Utah in general. Below we focus on research-related or sustained monitoring efforts, but recognize that numerous project-specific efforts and/or shorter-term efforts also exist (e.g., single-year clearance surveys).

- Annual nest monitoring of historic nests. West Desert Golden Eagle nest monitoring continues to be performed by DoD, HWI, Kent Keller and RINS. RINS continues to expand their monitoring effort into previously under-surveyed southern portions of the West Desert (e.g., Juab and Millard Counties). Central Utah eagle nests are also annually monitored by Kent Keller and RINS. Targeted annual helicopter surveys are performed near Price by industry consultants.
- Post-fledging tracking study. DoD and HWI will deploy up to 20 satellite transmitters on West Desert nestling eagles in 2013 to document post-fledging movement ecology and survival.
- Winter eagle surveys. DoD and HWI conducted West Desert winter eagle surveys from Nov 15, 2012–Jan 30, 2013. Additionally, HWI initiated a citizen science winter raptor survey effort in 2012 that they hope to sustain and expand in the future. The ultimate goal is to use collected winter eagle location data to model predicted winter habitat.
- Historic migration data. In addition to a long-term count site historically operated by HWI in the Wellsville Mountains, HWI also previously conducted exploratory fall and spring migration counts at numerous topographic features throughout Utah. The majority of this exploratory data exists in raw format paper records only (e.g., as daily count sheets), although efforts are underway to digitize this data. HWI is also in the process of using historic eagle migration data to model the migration volume potential of western ridges in general (final products expected in 2015).
- Compilation of historic jackrabbit data. DoD and HWI are compiling existing historic records (primarily covering the 1960s–1990s) on jackrabbit abundance to further inform interpretation of past eagle reproductive trends.
- Annual jackrabbit surveys. Surveys were conducted in 2011 and 2012 through the ULRP project (see Slater et al. 2013); DoD is funding spring and fall rabbit surveys in 2013 with the hope of establishing long-term transect locations for future monitoring by ULRP partners.

Existing protection efforts.

The following list of recent or on-going protection efforts serve to illustrate the types of implementable actions available to managers:

- Temporary BLM road closure to protect an active eagle nest in the Cedar Mountains.
- Temporary camping restriction on BLM lands within a half mile of a regularly activity eagle territory.
- Pony Express Special Recreation Permit System to facilitate staging and camping areas with minimal impact to wildlife
- U.S. Fish and Wildlife Service guidance for wind energy development and conservation of Golden Eagles (U.S. Fish and Wildlife 2013).
- IM 2010-156, Bald and Golden Eagle Protection Act- BLM requirements for avian protection plans for renewable energy development

RECOMMENDATIONS FOR FURTHER IMPLEMENTATION

In light of the previously discussed Golden Eagle management recommendations, research needs, and existing efforts, we provide the following suggestions to further advance implementation of the stated recommendations and to close outstanding knowledge gaps.

Assemble a Golden Eagle working group.

We recommend that a Utah Golden Eagle working group be established that includes subject-matter experts, data collectors/holders, land and resource mangers, and other interested parties to guide and assist with implementation of the recommendations in this document. Additionally, we recommend that the working designate a member or members to represent Utah at larger regional Golden Eagle meetings and to the U.S. Fish and Wildlife Service.

Strive to halt or reverse the decline of Golden Eagles in the West Desert of Utah.

Our research suggests the proportion of occupied West Desert Golden Eagle territories has been reduced by approximately half since 2007 (Slater et al. 2013). The increased fire frequency, shrub loss, and low jackrabbit abundance believed to be responsible are not expected to abate or recover in the near term. We strongly advocate for concerted efforts to halt or reverse this decline through adoption of the recommendations in this document to the degree possible by all relevant land and resource managers. Specifically, we recommend the previously recommended Golden Eagle working group or others work to raise awareness of this issue and encourage and coordinate efforts to maximize individual nest protection, shrub protection and restoration, experimental creation of jackrabbit cover, and reduction of sources of eagle mortality.

Compile existing Golden Eagle seasonal data into a state-wide database.

A wealth of data exists within Utah on Golden Eagle nest locations, migration sites, and winter locations in various formats and held by various groups and agencies (see existing efforts section). This data would be of great value to land managers and decision makers if it were compiled into a single, or a few individual, state-wide databases. We recognize that a number of challenges must be surmounted to achieve this goal. The major impediments include concerns over data sharing and protection and the extensive time needed for the retrieval and transcription of paper records.

Standardize future Golden Eagle data collection.

Given the wide array of parties involved in collection of Golden Eagle data in the state, we recommend the establishment of standardized data collection protocols for use by all parties involved in future eagle inventory and monitoring efforts. Standardized nesting data collection protocols are provided in the "Utah West Desert Raptor Nest Survey and Monitoring Protocol Manual" (ULRP 2011). Standardized fall migration protocols are provided by the Hawk Migration Association of North America (available online at: http://rpi-project.org/docs/HMANA_Data_Collection_Protocol_20060611.pdf). Currently, standardized guidance for winter Golden Eagle surveys is lacking, but we recommend they occur between November 15 and January 30 to avoid overlap with the migration or breeding periods.

Maintain existing nest season monitoring.

Various individuals and entities have contributed thousands of hours inventorying and monitoring Golden Eagle in Utah over the past 3–4 decades. The vast majority of this work was accomplished by volunteers and we

strongly recommend that land and resource managers continue to recognize, support, and expand their use of this highly valuable resource.

Maintain and expand winter monitoring efforts.
Eagles may be at increased mortality risk during winter months due to localized increases in bird density related to relaxed territoriality during this period. We currently know little about winter eagle distributions and recommend that recent volunteer efforts to monitor wintering eagles be maintained and expanded in the future.

Compile historic migration data.
As previously mentioned, a wealth of exploratory migration data from within the state exists in paper form. This data should be compiled to assess state-wide migration patterns and migratory corridors.

Expand genetic comparisons.
West Desert and central Utah Golden Eagle genetics were recently assessed through active and passive feather collection (Slater et al. 2013). To further understand gene flow within Utah and the larger western region, we recommend partnering with other Golden Eagle researchers in the state and beyond. Passive feather collection (i.e., post-fledging or nest failure) has proven to be a highly effective means of gathering genetic material at recently active nests (i.e., active in the current or past 1–2 years).

Educate private landowners.
Private landowners in Utah own and manage some of the best Golden Eagle habitat in the state. We recommend that the Natural Resources Conservation Service (NRCS), UDWR, and subject-matter experts educate private landowners on the importance and value of eagles, with a focus on the ecosystem benefit this species can provide them through pest management.

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