Golden Eagle

Aquila chrysaetos

REGULATORY STATUS

USFWS: Migratory Bird
USFS R2: No special status
USFS R4: No special status
Wyoming BLM: No special status
State of Wyoming: Protected Bird

CONSERVATION RANKS

USFWS: Bird of Conservation Concern
WGFD: NSS4 (Bc), Tier II
WYNDD: G5, S5B/S4S5N
Wyoming Contribution: MEDIUM
IUCN: Least Concern
PIF Continental Concern Score: 10

STATUS AND RANK COMMENTS

Golden Eagle (*Aquila chrysaetos*) is protected by the Bald and Golden Eagle Protection Act of 1940, as amended [1]. Golden Eagle has been assigned different state conservation ranks by the Wyoming Natural Diversity Database for the breeding and non-breeding seasons because of potential differences in distribution and abundance of the species among seasons. Additionally, the species has been assigned a range of state conservation ranks for the nonbreeding season because of uncertainties regarding distribution, abundance, and threats to Golden Eagle during this season.

NATURAL HISTORY

Taxonomy:

Five or six subspecies of Golden Eagle are recognized worldwide. Only one subspecies is found in North America: *A. c. canadensis*. The remaining subspecies occur in Eurasia. It is uncertain if individuals from northeast Asia constitute a unique subspecies [2].

Description:

Identification of Golden Eagle is possible in the field. Golden Eagle is the second largest North American raptor, and the largest found in Wyoming. The species has a wingspan of over 2 m and stands up to 1 m tall when perched [3]. Males and females are identical in plumage, although females are larger in size. Adults have dark brown plumage overall, a gold tinted crown and nape, yellow legs, and yellow bill with a black tip [3]. Golden Eagle takes up to five years to reach full adult plumage, but all age classes are similar in overall appearance. Juvenile and sub-adult birds have a broad white band across the base of the tail and white patches on the underwing that vary in size among individuals, but generally become smaller with age [4]. In Wyoming, the only other very large soaring raptor is Bald Eagle (*Haliaeetus leucocephalus*). Adult Bald Eagle has an all-white head and tail, while Golden Eagle is dark overall. Juvenile and sub-adult Bald Eagle

has more extensive white on the underside of the wings and tail than any age class of Golden Eagle, and white patches on the underwing of Golden Eagle are restricted to the base of the flight feathers [3].

Distribution & Range:
Golden Eagle is broadly distributed across the Northern Hemisphere worldwide. In North America, the species is generally found west of the 100th meridian during the breeding season, with a scattered breeding distribution in the northern and eastern arctic. Wyoming is in the center of the species' western range, and Golden Eagle occurs across the state year round. Golden Eagle has been documented as breeding in all of Wyoming's 28 latitude/longitude degree blocks [5]. Individuals breeding at more northern latitudes migrate south during the non-breeding season and winter throughout the breeding range in the western U.S. and Mexico, including Wyoming [2]. Historically, Golden Eagle bred across North America, but portions of its historical distribution are not currently occupied [2].

Habitat:
In Wyoming, Golden Eagle occurs throughout the state in a wide variety of habitats including sagebrush steppe, desert shrubland, prairie grassland, juniper woodland edges, lower elevation riparian areas, and mountainous cliff habitat in high elevation areas [5, 6]. The species generally nests on cliff faces and rock outcrops in open habitats [2], but also nests on trees [7], river banks [8], and manmade structures [9]. Proximity to foraging habitat appears to be an important factor in nest site selection [9, 10]. Nesting territories often include multiple alternative nests that are likely to be reused and can be occupied over a century if undisturbed [11]. Wyoming represented the largest concentration of high-suitability habitat for Golden Eagle during late summer in the western United States due to the prevalence of undisturbed landscapes with high wind speeds, moderate aridity, and relatively little forest cover [12]. During migration and the non-breeding season, the species uses similar habitats as during the breeding season, as well as wetlands and reservoir areas [2]. Winter distribution of Golden Eagle in Wyoming likely shifts to lower elevations, as short-distance migrants move downslope from high-elevation mountainous terrain.

Phenology:
In Wyoming, the breeding population of Golden Eagle is considered non-migratory [13]. Territory establishment is initiated in early February, courtship begins in early March, and young have fledged by the end of July [14]. Incubation lasts 41–45 days, and hatching occurs between early March and late June. Young fledge from the nest between 45 and 84 days of age [2]. Young stay with the parents for 1–6 months after fledging. In the Laramie Basin, Schmalzried [15] documented egg laying between 23 March and 4 April, hatching from 2 May to 31 May, and fledging from 15 July to 7 August. In southcentral Wyoming, Millsap [16] documented an earlier phenology, with laying from 11 March to 4 April, hatching from 7 April to 18 May, and fledging from 12 June to 11 July. Golden Eagles in the northern part of the range in North America migrate south in September and October [2, 17]. Passage of Golden Eagle through Wyoming occurs during September and October, and likely continues into November [13, 18]. Large concentrations of migrant eagles can occur throughout the winter months depending on prey availability such as carrion, leporids, and waterfowl [14, 19 20].

Diet:
The diet of Golden Eagle in Wyoming is composed primarily of leporids (family leporidae: jackrabbits, *Lepus* spp.; and cottontail rabbits, *Sylvilagus* spp.), secondarily of sciurids (family sciuridae: ground squirrels, *Urocitellus* spp.; and prairie dogs, *Cynomys* spp.), and also includes

fawns of pronghorn (*Antilocapra americana*), various other mammals, and birds [21]. The species' diet varies with habitat and season, with carrion consumed more frequently during winter [2, 21].

CONSERVATION CONCERNS

Abundance:
Continental: WIDESPREAD
Wyoming: COMMON
Using North American Breeding Bird Survey (BBS) data, the Partners in Flight Science Committee estimated the global population of Golden Eagle to be 300,000 birds [22], with 12,000 birds (4.3% of the global population) occurring in Wyoming during the breeding season [23]. The most recent population estimate for Golden Eagle in the United States including Alaska was approximately 39,000–40,000 in 2014 [24]. Results from surveys in Wyoming from 1973–1978 estimated statewide abundance of 4,174 nesting pairs and average density of 60 km^2/nesting pair, excluding approximately 20% of the state classified as marginal habitat [8]; however, this study may have overestimated the population size because it did not use design-based sampling and extrapolated from study areas with high-quality habitat [6]. A recent study from 2010–2011 reported a considerably lower density of 165.9 km^2/nesting pair of Golden Eagle within the breeding range of Ferruginous Hawk in Wyoming (approximately 50% of the state) [25]. The influx of migrants increases the population size in Wyoming during winter, although abundance fluctuates with prey availability [14]. Winter season aerial surveys conducted during January of 1972 and 1973 suggested abundance of 11,965 and 10,554 Golden Eagle, respectively [19]. The statewide rank of COMMON is based on the relatively large area of the state known to be occupied in any given season, and the large coverage of suitable habitat within that area.

Population Trends:
Historic: MODERATE DECLINE
Recent: STABLE
The population of Golden Eagle in the western United States is thought to be stable or possibly declining [26]. The annual aerial transect survey conducted across portions of thirteen western states, including Wyoming, did not show any statistically significant population trends for juveniles or all age-classes between 2006 and 2015 [27]. Models integrating data from the aerial survey and the BBS suggested populations were stable during 1968–2014 [26], while demographic models developed by U.S. Fish and Wildlife Service (USFWS) project a gradual decline in the future [24]. Apparent long-term stability of golden eagle populations across the western U.S. still allows for divergent trends in abundance and other demographic rates at local and regional scales. For example, two studies in Wyoming reported declines in the number of occupied nests: the number of occupied nesting territories within a 3,215-km^2 study area near Medicine Bow declined from 50 in 1978, to an average of 28.5 from 1997–2000, and 27 in 2009 [28]. Similarly, the number of occupied Golden Eagle nests in a 783-km^2 study area north of Baggs declined from 16 in 1993, to 0 in 1994, and 3 in 2008 [29]. A recent status review of Golden Eagle in Wyoming suggested that a severe statewide decline in nesting eagles and leporids occurred in 1993 and the abundance of nesting eagles in low elevation areas has stabilized at lower levels since then [6]. Abundance of nesting pairs in mountainous habitats in western Wyoming, however, appears to have remained stable or increased since the late 1970s [6].

Intrinsic Vulnerability:
MODERATE VULNERABILITY

Golden Eagle has moderate intrinsic vulnerability in Wyoming because of its slow life history strategy and relatively low density. Golden Eagle does not reach sexual maturity until 4–5 years of age, has relatively low fecundity, and a long life expectancy [2]. Reproductive output fluctuates with prey abundance – especially of leporids in Wyoming – and females may not lay eggs during low prey years [6]. Golden Eagle populations are, therefore, sensitive to changes in adult and sub-adult survival, and any factors that increase mortality rates of these age classes could trigger population declines [24]. Additionally, the species occurs at low density and has a large breeding season home range (up to 89 km^2) [8] and even more extensive winter home range (e.g., minimum of 5,420.5 km^2) [30].

Extrinsic Stressors:

SLIGHTLY STRESSED

Human activities are the leading cause of mortality for Golden Eagle [2]. Golden Eagle experiences high rates of fatality at wind energy facilities and is thought to be one of the most vulnerable species to wind energy development [31-33]. Other anthropogenic sources of mortality include collisions with fences and vehicles [2], electrocution on power lines [34, 35], shooting[35, 36], trapping [2], poisoning and contaminants such as lead and mercury [37-39]. Human disturbance of Golden Eagle nests may lead to reduced productivity: for example, territories in areas with significant increases in off-highway vehicle use were less productive than those with little or no motorized recreation [40]. Declines in prey populations resulting from drought, wildfire, or disease can cause declines in nesting populations [6, 41].

KEY ACTIVITIES IN WYOMING

Golden Eagle has been federally protected under the "Bald and Golden Eagle Protection Act," and subsequent amendments, since 1940. This act prohibits the "take" of Golden Eagles, which also includes parts, nests, and eggs of the species. This act also protects nest sites that may be affected by human activities [1]. Although Golden Eagle was not designated a state species of conservation concern until 2016, Wyoming Game and Fish Department (WGFD) initiated nest occupancy and productivity surveys for this species in 1978–1982 and has since collected data on nesting eagles in various areas of the state [6, 28, 42]. In 1996, the WGFD and the Bureau of Land Management began long term raptor nest surveys in Wyoming to provide an inventory of nest locations focused in areas with potential oil and gas development [42]. A more focused study in 2009 examined the population trend of nesting raptors, including Golden Eagle, in response to wind energy development over a 10-year period in Carbon and Albany counties [28]. A large-scale study was initiated in 2010 to evaluate the effects of energy development on both Ferruginous Hawk and Golden Eagle abundance, nesting density, occupancy, and reproduction in lowland areas of Wyoming based on aerial line transect surveys of 99 randomly selected townships [25]. Data on Golden Eagle have been summarized in a preliminary status review for the state [6]. Data on abundance and population trends have also been collected in Wyoming as part of a long-term regional monitoring effort in the western U.S. based on line-transect distance sampling [26, 27, 43]; results of this survey are summarized for Bird Conservation Regions and estimates specific to the state of Wyoming are not available. An intensive demographic study in the Bighorn Basin has provided valuable information on reproductive rates and diet of Golden Eagle in this area of the state [44]. Overall, the nesting population in Wyoming appears to be stable [27] following a decrease in the number of nesting pairs in lowland areas of the state in 1993 related to a large drop in leporid prey populations [6]. Other ongoing monitoring efforts that provide data on occurrence, abundance, or trend of Golden Eagle in Wyoming include counts of migrating raptors conducted

annually since 2002 at Commissary Ridge in southwestern Wyoming [18], BBS surveys [23], and point counts from the Integrated Monitoring in Bird Conservation Regions program [45]. Some Golden Eagles are captured in Wyoming for falconry, and the WGFD monitors annual harvest [46, 47].

ECOLOGICAL INFORMATION NEEDS

Recent research on Golden Eagle has helped determine relatively reliable estimates of abundance and trend for populations in Wyoming and the western U.S. [6, 25, 43, 44]. Although the breeding population currently appears to be stable, given uncertain effects of increasing energy development on this species [32, 48], a key need is to design and implement a long-term monitoring program [6]. Knowledge is lacking on major factors that drive population trend year round, including habitat modification, contaminants (heavy metals and anti-coagulant rodenticides, such as Rozal), disease (West Nile virus), and direct and indirect effects of energy development [2, 49]. Data are also lacking on winter ecology and distribution, migration concentration areas, and juvenile dispersal patterns [48]. Long-term monitoring and research on key prey species (i.e., leporids) is also needed to understand year-to-year fluctuations and long-term trends in Golden Eagle populations [6].

MANAGEMENT IN WYOMING

This section authored solely by WGFD; Andrea C. Orabona and Susan M. Patla. A priority for Golden Eagle management identified in a recent status review of the species in Wyoming is to develop a design-based monitoring program using existing data sets that include randomly selected nesting territories [6]. A recent evaluation of results from a landscape scale study to determine abundance and density of nesting pairs suggested fixed-winged surveys are more cost effective than helicopters for surveying large areas of the state with relatively smooth terrain [25]. Work is underway to determine if preferred habitats have been adequately sampled in the past and to develop a state-wide monitoring strategy [50]. In May 2015, a Raptor Symposium was held in Campbell County to address issues concerning energy development and raptors in eastern Wyoming. Topics of discussion included developing a centralized raptor survey database [51]. Efforts to form a Wyoming Golden Eagle Working Group were initiated in 2015 and the group held its first meeting in November 2016, including participants from federal and state agencies, the USFWS Western Golden Eagle Team (WGET), researchers, and NGOs. Some of the major objectives developed by the group include information sharing, coordination of efforts, review of conservation strategies and management plans, identification of data gaps, and reaching out to include a broader spectrum of participants [49]. The USFWS formed the WGET in 2013 to address energy-related conservation needs of Golden Eagles by developing landscape-scale conservation strategies. Conservation strategies are currently being developed for the Wyoming Basin and Northwestern Great Plains ecoregions in Wyoming [52]. A web site will be developed by WGET to provide information and reports on this regional effort. Predictive spatial models have recently been developed of nesting occurrence in relation to areas of the state suitable for wind energy development [48] and additional data products being developed by WGET include models of habitat suitability for nesting and winter seasons [52]. The authors recommend using these models to identify important target areas for conservation in the state.

CONTRIBUTORS

Susan M. Patla, WGFD

Andrea C. Orabona, WGFD
Zach P. Wallace, WYNDD
Bob Oakleaf, retired WGFD
Michael T. Wickens, WYNDD
Ian M. Abernethy, WYNDD
Douglas A. Keinath, WYNDD

REFERENCES

[1] United States Federal Government. (1940) Bald and Golden Eagle protection act (16 United States Code 618-618d).

[2] Kochert, M. N., Steenhof, K., McIntyre, C. L., and Craig, E. H. (2002) Golden Eagle (*Aquila chrysaetos*), In *The Birds of North America* (Rodewald, P. G., Ed.), Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America: https://birdsna.org/Species-Account/bna/species/goleag.

[3] Peterson, R. T. (2008) *Peterson Field Guide to Birds of North America*, First ed., Houghton Mifflin Company, New York.

[4] Clark, W. S., and Wheeler, B. K. (1987) *A Field Guide to Hawks of North America (Peterson Field Guides)*, Houghton Mifflin Company, Boston, MA.

[5] Orabona, A. C., Rudd, C. K., Bjornlie, N. L., Walker, Z. J., Patla, S. M., and Oakleaf, R. J. (2016) *Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming*, Wyoming Game and Fish Department Nongame Program, Lander, Wyoming.

[6] Oakleaf, R. J., Olson, L. E., Squires, J. R., and Wallace, Z. P. (2014) The status of Golden Eagles in Wyoming: a preliminary review, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Orabona, A. C., and Cudworth, N., Eds.), pp 357-395, Wyoming Game and Fish Department.

[7] Menkens, G. E., and Anderson, S. H. (1987) Nest site characteristics of a predominantly tree-nesting population of Golden Eagles, *Journal of Field Ornithology 58*, 22-25.

[8] Phillips, R. L., McEneaney, T. P., and Beske, A. E. (1984) Population densities of breeding Golden Eagles in Wyoming, *Wildlife Society Bulletin 12*, 269-273.

[9] Camenzind, F. J. (1969) Nesting ecology and behavior of the Golden Eagle *Aquila chrysaetos L.*, *Brigham Young University Science Bulletin, Biological Series 10*, 4-15.

[10] Crandall, R. H., Bedrosian, B. E., and Craighead, D. (2015) Habitat selection and factors influencing nest survival of Golden Eagles in south-central Montana, *Journal of Raptor Research 49*, 413-428.

[11] Millsap, B. A., Grubb, T. G., Murphy, R. K., Swem, T., and Watson, J. W. (2015) Conservation significance of alternative nests of Golden Eagles, *Global Ecology and Conservation 3*, 234-241.

[12] Nielson, R. M., Murphy, R. K., Millsap, B. A., Howe, W. H., and Gardner, G. (2016) Modeling late-summer distribution of Golden Eagles (*Aquila chrysaetos*) in the Western United States, *Plos One 11*, 18.

[13] Faulkner, D. W. (2010) *Birds of Wyoming*, Roberts and Company Publishers, Greenwood Village, CO.

[14] Oakleaf, B. (2012) Personal communication.

[15] Schmalzried, J. T. (1976) Nesting and food habits of the golden eagle on the Laramie plains, p 86, University of Wyoming, Laramie, WY.

[16] Millsap, B. A. (1978) Raptor nesting and production in southern Wyoming during 1978, *U.S. Bureau of Land Management*.

[17] McIntyre, C. L., and Collopy, M. W. (2006) Postfledging dependence period of migratory Golden Eagles (*Aquila chrysaetos*) in Denali National Park and Preserve, Alaska, *Auk 123*, 877-884.

[18] Hawks, S. E., and Mika, M. (2012) Fall 2011 raptor migration studies at Commissary Ridge in southwestern Wyoming, p 32, HawkWatch International, Inc., Salt Lake City, UT.

[19] Higby, L. W. (1975) The eagle survey in Wyoming, In *Population Status of Raptors: Proceedings of the Conference on Raptor Conservation Techniques (Part 6)* (Murphy, J. R., White, C. M., and Harrell, B. E., Eds.), pp 97-102, Raptor Research Foundation, Inc., Vermilliion, South Dakota.

[20] Bagdonas, K., Snyder, L., Rodeman, K., Milliken, G., and Blau, G. (1985) A study of the effect of drilling on eagle behavior at overwintering roost sites on Pine Mountain, Natrona County, Wyoming: final report to Moncrief Oil, 12 October 1984 - 15 April 1985., *University of Wyoming-Casper Research and Statistical Consulting Center*.

[21] Bedrosian, G., Watson, J. W., Steenhof, K., Kochert, M. N., Preston, C. R., Woodbridge, B., Williams, G. E., Keller, K. R., and Crandall, R. H. (In press) Spatial and temporal patterns in Golden Eagle diets in the western United States, with implications for conservation planning, *Journal of Raptor Research*.
[22] Partners in Flight Science Committee. (2012) Species Assessment Database, http://rmbo.org/pifassessment/.
[23] Partners in Flight Science Committee. (2013) Population Estimates Database, version 2013, http://rmbo.org/pifpopestimates.
[24] United States Fish and Wildlife Service. (2016) Bald and Golden Eagles: population demographics and estimation of sustainable take in the United States, 2016 update., *Division of Migratory Bird Management*.
[25] Olson, L. E., Oakleaf, R. J., Squires, J. R., Wallace, Z. P., and Kennedy, P. L. (2015) Nesting pair density and abundance of Ferruginous Hawks (*Buteo regalis*) and Golden Eagles (*Aquila chrysaetos*) from aerial surveys in Wyoming, *Journal of Raptor Research 49*, 400-412.
[26] Millsap, B. A., Zimmerman, G. S., Sauer, J. R., Nielson, R. M., Otto, M., Bjerre, E., and Murphy, R. (2013) Golden eagle population trends in the western United States: 1968-2010, *Journal of Wildlife Management 77*, 1436-1448.
[27] Nielson, R. M., DiDonato, G. T., and McDonald, L. L. (2016) A survey of Golden Eagles (*Aquila chrysaetos*) in the western U.S.: 2006-2015, Report prepared for U.S. Fish & Wildlife Service, Migratory Birds, Albuquerque, NM by Western EcoSystems Technology Inc., Cheyenne, WY.
[28] Young, D., LeBeau, C., Erickson, W., Nomani, S., Boehrs, J. R., and Oakleaf, B. (2010) Status of breeding populations of Ferruginous Hawks, Golden Eagles, and Bald Eagles in Albany and Carbon counties, Wyoming, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Orabona, A. C., Ed.), pp 42-75, Wyoming Game and Fish Department.
[29] Ayers, L. W., Oakleaf, B., and Filipi, T. (2009) Distribution and abundance of breeding Ferruginous Hawk pairs in south-central Wyoming, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Orabona, A. C., Ed.), pp 72-85, Wyoming Game and Fish Department, Lander, Wyoming.
[30] Domenech, R., Bedrosian, B. E., Crandall, R. H., and Slabe, V. A. (2015) Space use and habitat selection by adult migrant Golden Eagles wintering in the western United States, *Journal of Raptor Research 49*, 429-440.
[31] Smallwood, K. S., and Thelander, C. (2008) Bird mortality in the Altamont Pass Wind Resource Area, California, *Journal of Wildlife Management 72*, 215-223.
[32] Noguera, J. C., Perez, I., and Minguez, E. (2010) Impact of terrestrial wind farms on diurnal raptors: developing a spatial vulnerability index and potential vulnerability maps, *Ardeola 57*, 41-53.
[33] Bay, K., Nasman, K., Erickson, W., Taylor, K., and Kosciuch, K. (2016) Predicting eagle fatalities at wind facilities, *Journal of Wildlife Management 80*, 1000-1010.
[34] Lehman, R. N., Kennedy, P. L., and Savidge, J. A. (2007) The state of the art in raptor electrocution research: a global review, *Biological Conservation 136*, 159-174.
[35] McIntyre, C. L. (2012) Quantifying sources of mortality and wintering ranges of Golden Eagles from interior Alaska using banding and satellite tracking, *Journal of Raptor Research 46*, 129-134.
[36] Beans, B. E. (1997) *Eagle's Plume: The Struggle to Preserve the Life and Haunts of America's Bald Eagle*, University of Nebraska Press, Lincoln, Nebraska.
[37] Wayland, M., Wilson, L. K., Elliott, J. E., Miller, M. J. R., Bollinger, T., McAdie, M., Langelier, K., Keating, J., and Froese, J. M. W. (2003) Mortality, morbidity, and lead poisoning of eagles in western Canada, 1986-98, *Journal of Raptor Research 37*, 8-18.
[38] Stauber, E., Finch, N., Talcott, P. A., and Gay, J. M. (2010) Lead poisoning of Bald (*Haliaeetus leucocephalus*) and Golden (*Aquila chrysaetos*) Eagles in the US inland Pacific northwest region – an 18-year retrospective study: 1991 – 2008, *Journal of Avian Medicine and Surgery 24*, 279-287.
[39] Langner, H. W., Domenech, R., Slabe, V. A., and Sullivan, S. P. (2015) Lead and mercury in fall migrant Golden Eagles from western North America, *Archives of Environmental Contamination and Toxicology 69*, 54-61.
[40] Steenhof, K., Brown, J. L., and Kochert, M. N. (2014) Temporal and spatial changes in Golden Eagle reproduction in relation to increased off highway vehicle activity, *Wildlife Society Bulletin 38*, 682-688.
[41] Steenhof, K., Kochert, M. N., and McDonald, T. L. (1997) Interactive effects of prey and weather on golden eagle reproduction, *Journal of Animal Ecology 66*, 350-362.
[42] Orabona, A. (2010) Raptor nest survey cooperative agreement, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Orabona, A. C., Ed.), pp 76-84, Wyoming Game and Fish Department.

[43] Nielson, R. M., McManus, L., Rintz, T., McDonald, L. L., Murphy, R. K., Howe, W. H., and Good, R. E. (2014) Monitoring abundance of Golden Eagles in the western United States, *Journal of Wildlife Management 78*, 721-730.
[44] Preston, C. R. (2015) Golden Eagle nesting ecology in the Bighorn Basin, Unpublished 2014 progress report, Draper Natural History Museum, Cody, WY.
[45] Hanni, D. J., White, C. M., VanLanen, N. J., Birek, J. J., Berven, J. M., and McLaren, M. A. (2014) Integrated Monitoring of Bird Conservation Regions (IMBCR): Field protocol for spatially-balanced sampling of landbird populations, Rocky Mountain Bird Observatory, Brighton, Colorado, USA.
[46] Cudworth, N., and DeHart, M. (2012) Harvest of Raptors for Falconry, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Grenier, M. B., Abel, B., and Cudworth, N., Eds.), pp 213-215, Wyoming Game and Fish Department.
[47] Rudd, C., and Roberts, N. (2014) Harvest of raptors for falconry, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Orabona, A. C., and Cudworth, N., Eds.), pp 343-345.
[48] Tack, J. D., and Fedy, B. C. (2015) Landscapes for energy and wildlife: conservation prioritization for Golden Eagles across large spatial scales, *Plos One 10*, 18.
[49] Wyoming Golden Eagle Working Group. (2016) Annual meeting minutes.
[50] Squires, J. R. (2016) Personal Communication.
[51] Orabona, A. (2016) Personal communication.
[52] Williams, G. (2016) Personal communication.

Figure 1: Golden Eagle in southwest Wyoming. (Photo courtesy of Kaylan A. Hubbard)

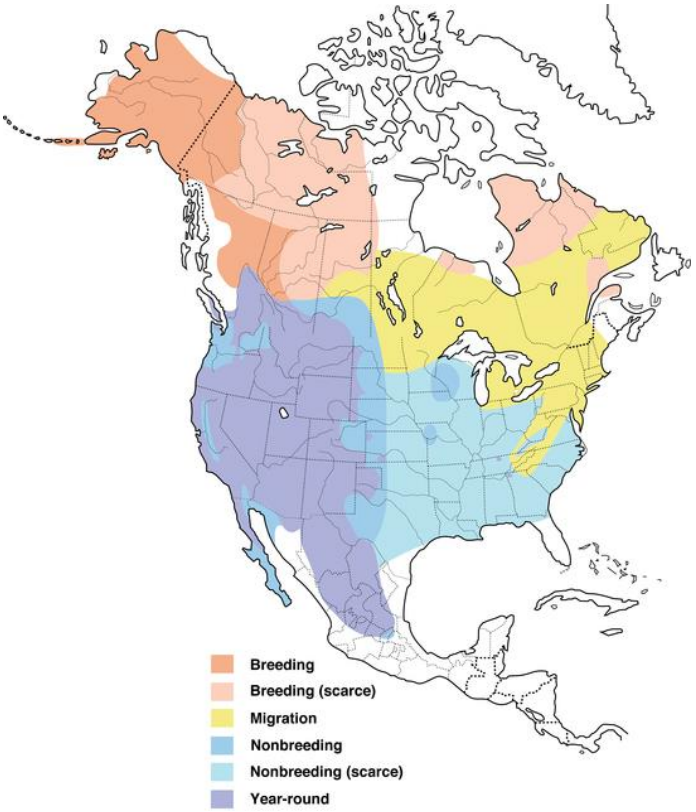

Figure 2: North American range of *Aquila chrysaetos*. (Map courtesy of Birds of North America, http://bna.birds.cornell.edu/bna, maintained by the Cornell Lab of Ornithology)

Figure 3: Golden Eagle nesting habitat in the Bighorn Basin near Leiter, Montana. (Photo courtesy of Erik Jansen)

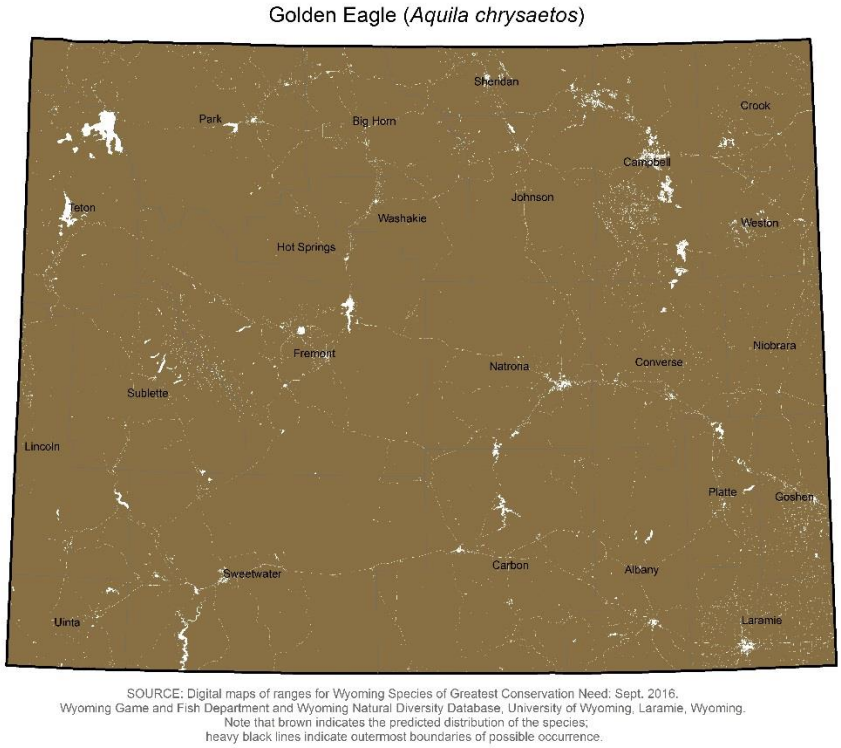

Figure 4: Range and predicted distribution of *Aquila chrysaetos* in Wyoming.

Figure 5: Golden Eagle in flight in Albany County, Wyoming. (Photo courtesy of Shawn Billerman)