Ferruginous Hawk

Buteo regalis

REGULATORY STATUS

USFWS: Listing Denied; Migratory Bird
USFS R2: Sensitive
USFS R4: No special status
Wyoming BLM: Sensitive
State of Wyoming: Protected Bird

CONSERVATION RANKS

USFWS: Bird of Conservation Concern
WGFD: NSS4 (Cb), Tier II
WYNDD: G4, S4S5B/S3N
Wyoming Contribution: MEDIUM
IUCN: Least Concern
PIF Continental Concern Score: 11

STATUS AND RANK COMMENTS

Ferruginous Hawk (*Buteo regalis*) was petitioned for protection under the Federal Endangered Species Act in 1991 but was denied listing based on lack of evidence [1]. The Wyoming Natural Diversity Database has assigned Ferruginous Hawk a state breeding conservation rank ranging from S4 (Apparently Secure) to S5 (Secure) because of uncertainty about the abundance and population trends of the species in Wyoming. Additionally, Ferruginous Hawk is assigned a different state conservation rank in the non-breeding season due to much lower abundance and proportion of area occupied in the state in the winter.

NATURAL HISTORY

Taxonomy:

Ferruginous Hawk is monotypic. No subspecies are currently recognized [2].

Description:

Identification of Ferruginous Hawk is possible in the field. Ferruginous Hawk is the largest North American hawk in the genus *Buteo*, with a wingspan of about 142 cm and measuring 56–69 cm from bill to tail [2, 3]. Both sexes are large and heavy with broad, long, pointed wings and have a large head and bill, long gape, and robust chest; however, females are slightly larger and notably heavier than males [2]. Plumage is identical between sexes but varies between light and dark morph individuals. Light morphs comprise 90% of all individuals, but dark morphs are present range-wide [2, 3]. Light morph individuals have white primary, secondary, and tail feathers. The breast and belly are white with rufous speckling on the belly. The back is rufous. Upper secondary feathers are darker grey while upper primaries are light. Leg feathers are dark rufous and form a characteristic "V" when in flight. Some dark morph birds can have white primary, secondary, and tail feathers, but the head, leg feathers, back, breast, and belly are uniformly dark with rufous highlights [2, 3]. Ferruginous Hawk is most similar in appearance to Red-tailed Hawk

(*B. jamaicensis*) and Swainson's Hawk (*B. swainsoni*). Red-tailed Hawk differs from Ferruginous Hawk in that it has a dark band on its belly, dark patagial marks on the leading edge of the underside of the wing, and adults have a red tail. Swainson's Hawk differs from Ferruginous Hawk in flight in that it has dark flight feathers on the trailing edge of the wing.

Distribution & Range:
Ferruginous Hawk is widely distributed across the western United States. Wyoming is centrally located within the breeding range of Ferruginous Hawk. Ferruginous Hawk winters in southwestern United States and Northern Mexico [2, 4]. Southern Wyoming represents the northern periphery of the species' winter range [4]; however, numbers of Ferruginous Hawk wintering in Wyoming are likely very low. Range contractions have been observed in parts of Canada where grasslands have been converted for agriculture [5].

Habitat:
Ferruginous Hawk occupies open lower-elevation grassland, shrubsteppe, and desert habitats and tends to avoid croplands, forests, and narrow canyons [2, 4]. In Wyoming, the species is most abundant in these habitats in south-central Wyoming during the breeding season [6, 7]. Nest sites vary and can be directly on the ground or on elevated features such as boulders, creek banks, knolls, cliffs, buttes, hoodoos, large shrubs, isolated trees, anthropogenic structures, and artificial nesting substrate. Nesting substrates used in Wyoming include trees and shrubs, artificial nesting platforms, windmills, power poles, and energy development structures [8]. Habitat use in summer and winter are similar. However, in winter, Ferruginous Hawk concentrates in grasslands with prairie dog (*Cynomys* spp.) colonies [2, 4].

Phenology:
Ferruginous Hawk adults migrate north from wintering grounds in March and April. Younger individuals migrate later than adults [2]. Nests are initiated from mid-April to mid-May with eggs hatching 32–33 days after being laid. Fledglings leave the nest between 38–50 days after hatching [2]. Migration by fledglings the first fall is characterized by extensive, wide-ranging movements until arriving on wintering ground in mid-October [9]. Ferruginous Hawk can make two distinct migrations with movements first to fall ranges which have high prey availability and then south to wintering grounds later [2, 9]. Although Ferruginous Hawk is found in portions of Wyoming year round, the species is very rare in winter and the majority of individuals breeding in Wyoming migrate south for the winter.

Diet:
In Wyoming, Ferruginous Hawk feed primarily on ground squirrels (*Urocitellus* spp.), lagomorphs (*Sylvilagus* spp., *Lepus* spp.) and prairie dogs [2, 4, 10]. Additional prey items include small mammals, birds, reptiles, and large invertebrates [4, 5].

CONSERVATION CONCERNS

Abundance:
Continental: WIDESPREAD
Wyoming: UNCOMMON
Based on results from Breeding Bird Survey (BBS) data, Partners in Flight estimated the Wyoming population of Ferruginous Hawk to be 11,000 [11]. The global population is estimated to be 80,000 birds [11]. During the breeding season, Ferruginous Hawk is considered fairly common and widespread across suitable habitat in Wyoming [6]. In 2011, the Wyoming Game and Fish

Department (WGFD) estimated 1,107 nesting pairs of Ferruginous Hawk in a large study area in Wyoming with a density of 94.7 pairs per km [4, 12]. In winter, Ferruginous Hawk is likely very rare in the state [4, 6].

Population Trends:

Historic: MODERATE DECLINE

Recent: STABLE

Ferruginous Hawk population trend data from BBS routes in Wyoming from 1968–2013 suggest the state population is likely stable, however, results are not conclusive due to limited number of detections [13]. Across its range, Ferruginous Hawk is generally believed to be declining; however, the magnitude and direction of trends vary among states and regions making overall estimation of trends difficult [4, 5, 14, 15]. The most recent study found nesting density in Wyoming to be similar or slightly lower compared to previous estimates across the range of this species [12].

Intrinsic Vulnerability:

MODERATE VULNERABILITY

Ferruginous Hawk is sensitive to disturbances during nesting and disruptions or continued disturbances often lead to nest abandonment, especially during incubation [2, 7, 16]. Urban and exurban development, and energy exploration and development all increase potential disturbances and subsequent nest desertion by nesting Ferruginous Hawk [17]. In some locations, Ferruginous Hawk density is thought to be limited by presence of suitable nesting substrate [2, 4]. Although the species will nest on the ground and on rock features, nest success is lower at these sites due to their accessibility to mammalian predators [18]. Prey availability also influences Ferruginous Hawk abundance and nest success. Hawks nesting in areas with abundant prairie dog colonies produced significantly more fledglings per nesting attempt than those in areas without prairie dogs [17]. In Alberta, Canada, reduction in ground squirrel numbers is believed to have resulted in a 4.5-fold decline in nesting density [15]. Re-occupancy of nesting territories in Wyoming was associated with ground squirrel abundance in some years [7, 10]. Severe storms during the brood-rearing period in Wyoming resulted in reduced productivity [8].

Extrinsic Stressors:

MODERATELY STRESSED

The foremost historical and current threat to Ferruginous Hawk is loss of suitable breeding habitat to agricultural conversion, urbanization, and energy development [2, 7, 16]. In Wyoming, exploration and development of natural gas, oil, and wind energy resources have increased throughout the range of Ferruginous Hawk [4, 19]. However, population-level responses of Ferruginous Hawk to energy development activities are complex. The effects of oil and gas activities on nest site selection and nest success may vary with spatial scale, well density, available nesting substrate, prey abundance, and potentially climate (drought) [7, 8, 10, 16, 20, 21]. Increased disturbance, road networks, and human presence associated with energy development and urbanization present significant threats to Ferruginous Hawk including increased morality of young birds [4, 7, 17, 22, 23]. Because Ferruginous Hawk populations can be strongly influenced by prey abundance, reduction in prey populations due to poisoning, shooting, habitat conversion, and disease could negatively impact Ferruginous Hawk. Healthy shrub-steppe nesting habitat is important as hawks were found to produce more young on average in territories that had greater than 20% shrub cover [8].

KEY ACTIVITIES IN WYOMING

Cooperative monitoring efforts by state and federal land management agencies have been initiated in response to land use changes in the state [24]. WGFD completed a study initiated in 2010 examining Ferruginous Hawk population trends in relation to the progression of wind energy development projects in south-central Wyoming [25]. Results suggest no apparent effects of wind energy on nest occupancy or production. However, long term or cumulative impacts are still unknown [25]. WGFD and the United States Forest Service Rocky Mountain Research Station began a study in 2010 to examine effects of energy development and other environmental factors on Ferruginous Hawk productivity, occupancy, and nesting density [8, 10, 24]. Occupancy was not found to be strongly related to density of oil and natural gas development, but this was likely confounded by focusing only on recently occupied territories in the post-development construction period and also by the successful use of artificial nest platforms by Ferruginous Hawks [7, 10]. Occupancy showed a strong positive relationship to ground squirrel abundance and a negative relationship to sagebrush (*Artemisia* spp.) cover [7, 10]. GPS locations are still being collected on 8 pairs of Ferruginous Hawks nesting in energy development areas [23].

ECOLOGICAL INFORMATION NEEDS

Knowledge of population trends for Ferruginous Hawk is needed in Wyoming. Research is needed to examine the extent to which the species overwinters in Wyoming. Long term and cumulative impacts from energy development and urban and exurban development appear complex and poorly understood. Ferruginous Hawk would benefit from continued studies on the effects of energy development activities on population demographics and habitat use by this species in Wyoming. Recent work by Wallace and colleagues [8, 10] provide an excellent baseline for conducting further long-term monitoring for this species. Studies on primary factors driving trends in prey populations of ground squirrels and lagomorphs also would be valuable. Additionally, the ecology and potential limiting factors or threats to Ferruginous Hawk on wintering grounds is poorly understood.

MANAGEMENT IN WYOMING

This section authored solely by WGFD; Susan M. Patla. Rapid development of energy resources in Ferruginous Hawk nesting habitat in Wyoming remains of primary concern for this species [23]. A recent study based on aerial surveys of randomly selected townships in 2010 and 2011 resulted in finding 105 nesting territories [7, 8, 10]. In addition, GPS transmitters from 8 pairs of hawks that nest in oil/gas fields are still providing location information [23]. Resource selection models from this study indicate that Ferruginous Hawks select nest areas with lower topographic roughness, more bare ground and shorter relative shrub heights [10]. The study did not identify disturbance associated with energy development to be an important predictor of habitat selection in Wyoming, but was conducted post-energy development construction and focused only on recently occupied territories [10]. Where birds initially select territories and if they become tolerant of disturbance needs to be tested using a before/after longer-term impact study [10]. In addition, infrastructure associated with development such as additional perch sites and artificial nesting structures may provide some benefits for nesting birds. There is likely a non-linear relationship between habitat suitability and the level of energy development also and fields with dense development may show a decline in nesting pairs over time [23]. Future publications from this study will include a study of movements in both the breeding and winter seasons, resource selection in the winter, genetic structure compared to other populations, and mapping of potential

prey at the landscape scale [23]. A long-term monitoring plan will also be developed in cooperation with agency partners. Longer-term monitoring and additional studies based on the valuable non-biased data set of nest sites obtained in 2010 and 2011 will help clarify the relative importance of different environmental factors related to occupancy, productivity and survival. It may take years or many generations to determine how disturbance might affect populations of a long-lived species such as the Ferruginous Hawk [10]. In addition, longer-term studies are needed on environmental factors related to prey abundance given rapidly changing climate conditions and increasing development in Ferruginous Hawk habitat.

CONTRIBUTORS

Ian M. Abernethy, WYNDD
Wendy A. Estes-Zumpf, WYNDD
Susan M. Patla, WGFD
Bob Oakleaf, retired WGFD
Douglas A. Keinath, WYNDD

REFERENCES

[1] United States Fish and Wildlife Service. (1992) Endangered and Threatened Wildlife and Plants; Notice of Finding on Petition to List the Ferruginous Hawk, *Federal Register 57*, 37507-37513.
[2] Bechard, M. J., and Schmutz, J. K. (1995) Ferruginous Hawk (*Buteo regalis*), 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/ferhaw.
[3] Sibley, D. A. (2000) *The Sibley Guide to Birds*, Alfred A. Knopf, Inc., New York.
[4] Travsky, A., and Beauvais, G. P. (2005) Species assessment for the Ferruginous Hawk (*Buteo regalis*) in Wyoming, p 41, Wyoming Natural Diversity Database and USDI Bureau of Land Management, University of Wyoming, Laramie, WY.
[5] Collins, C. P., and Reynolds, T. D. (2005) Ferruginous Hawk (*Buteo regalis*): a technical conservation assessment, p 64, U.S.D.A. Forest Service, Rocky Mountain Region.
[6] Faulkner, D. W. (2010) *Birds of Wyoming*, Roberts and Company Publishers, Greenwood Village, CO.
[7] Wallace, Z. P. (2014) Effects of oil and natural gas development on territory occupancy of Ferruginous Hawks and Golden Eagles in Wyoming, USA, p 137, Oregon State University, Corvallis, Oregon.
[8] Wallace, Z. P., Kennedy, P. L., Squires, J. R., Olson, L. E., and Oakleaf, R. J. (2016) Human-made structures, vegetation, and weather influence Ferruginous Hawk breeding performance, *Journal of Wildlife Management 80*, 78-90.
[9] Watson, J. W. (2003) Migration and winter ranges of Ferruginous Hawks from Washington. Final Report, p 63, Washington Department of Fish and Wildlife, Olympia, Washington, USA.
[10] Wallace, Z. P., Kennedy, P. L., Squires, J. R., Oakleaf, R. J., Olson, L. E., and Dugger, K. M. (2016) Re-occupancy of breeding territories by Ferruginous Hawks in Wyoming: relationships to environmental and anthropogenic factors, *PLoS ONE 11*, e0152977.
[11] Partners in Flight Science Committee. (2013) Population Estimates Database, version 2013, http://rmbo.org/pifpopestimates.
[12] 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.
[13] Sauer, J. R., Hines, J. E., Fallon, J. E., Pardieck, K. L., Ziolkowski, D. J., Jr., and Link, W. A. (2014) The North American Breeding Bird Survey, Results and Analysis 1966 - 2013. Version 01.30.2015, USGS Patuxent Wildlife Research Center, Laurel, MD.
[14] Hoffman, S. W., and Smith, J. P. (2003) Population trends of migratory raptors in western North America, 1977-2001, *Condor 105*.
[15] Schmutz, J. K., Flockhart, D. T. T., Houston, C. S., and McLoughlin, P. D. (2008) Demography of Ferruginous Hawk breeding in western Canada, *The Journal of Wildlife Management 72*, 1352-1360.

[16] Keough, H. L. (2006) Factors influencing breeding Ferruginous Hawks (*Buteo regalis*) in the Uintah Basin, Utah, p 154, Utah State University, Logan, UT.
[17] Keeley, W. H. (2009) Diet and behavior of Ferruginous Hawks nesting in two grasslands in New Mexico with differing anthropogenic alteration, p 159, Boise State University, Boise, ID.
[18] Neal, M. C. (2007) Dynamics associated with Ferruginous Hawk (*Buteo regalis*) nest-site utilization in south-central Wyoming, p 62, University of Wyoming, Laramie, WY.
[19] Bureau of Land Management. (2005) Oil and gas activity on public lands in the United States and Wyoming, United States Department of the Interior, Bureau of Land Management, Wyoming State Office, Cheyenne, Wyoming.
[20] Smith, J. P., Slater, S. J., and Neal, M. C. (2010) An assessment of the effects of oil and gas field activities on nesting raptors in the Rawlins, Wyoming and Price, Utah Field Office of the Bureau of Land Management., In *BLM Technical Note 433*, p 88, Bureau of Land Management.
[21] Oakleaf, R. J., Olsen, L. E., and Squires, J. R. (2013) The status of Ferruginous Hawk (*Buteo regalis*) in Wyoming: A preliminary review, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report*, pp 154-193, Wyoming Game and Fish Department.
[22] Keeley, W. H., and Bechard, M. J. (2011) Flushing distances of Ferruginous Hawks nesting in rural and exurban New Mexico, *Journal of Wildlife Management 75*, 1034-1039.
[23] Squires, J. R. (2016) Personal Communication.
[24] Oakleaf, R. J., Olsen, L. E., and Squires, J. R. (2012) Effects of energy development on the productivity and distribution of Ferruginous Hawks and Golden Eagles in Wyoming based on GPS telemetry and conservation genetics, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report*, Wyoming Game and Fish Department.
[25] 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.

Figure 1: Adult light morph Ferruginous Hawk in Boulder County, Colorado. (Photo courtesy of Bill Schmoker)

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

Figure 3: Grassland habitat in Thunder Basin National Grassland, Wyoming. (Photo courtesy of Michael T. Wickens)

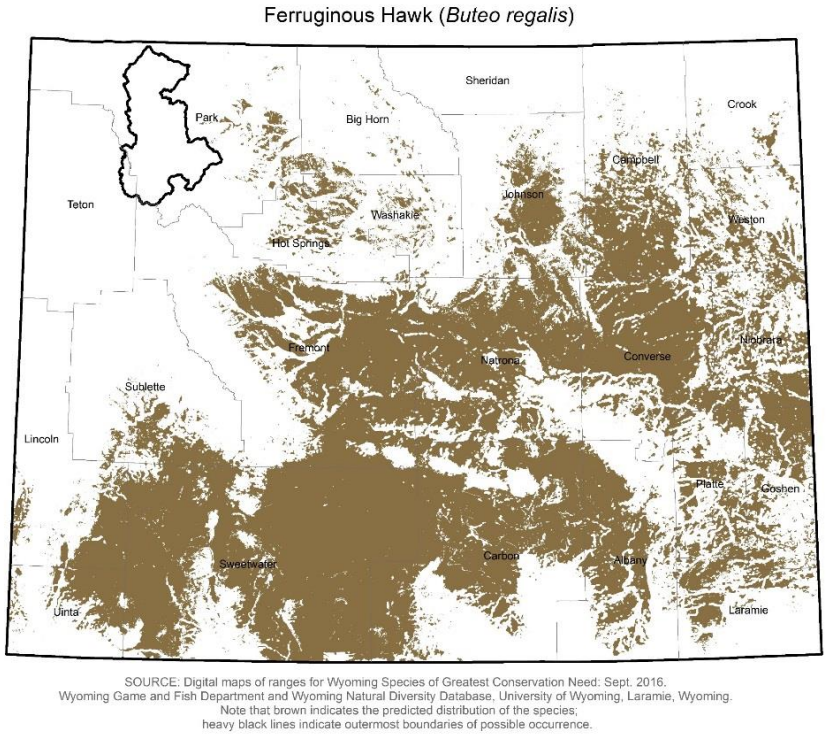

Figure 4: Range and predicted distribution of *Buteo regalis* in Wyoming.

Figure 5: Adult light morph Ferruginous Hawk in flight in Albany County, Wyoming. (Photo courtesy of Shawn Billerman)