Greater sage-grouse and predator management in Montana

Montana Fish, Wildlife and Parks
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In the U.S. Fish and Wildlife Service (USFWS; United States Department of the Interior 2010) decision document to list the greater sage-grouse as a candidate species under the Endangered Species Act, the USFWS stated "Based on the best scientific and commercial information available, we conclude that predation is not a significant threat to the species such that the species requires listing under the Act as threatened or endangered." The USFWS acknowledged that increasing patterns of landscape fragmentation are likely contributing to increased predation on the species and identified two areas, neither in Montana (southwestern Wyoming and northeastern Nevada), where predators may be limiting sage-grouse populations because of intense habitat alteration and fragmentation. Despite the USFWS document stating that predation is not a significant threat to sage-grouse populations in Montana, the public remains concerned about the influence of predators on sage-grouse conservation (Montana's Sage-grouse Habitat Conservation Advisory Council, pers. comm.). Here Montana Fish, Wildlife, and Parks (FWP) provides a discussion of the science relevant to predator management and sage-grouse, and offers recommendations for managing predators in the context of sage-grouse conservation.

Background

The overall goal of Montana's state sage-grouse conservation plan is to: *Provide for the long-term conservation and enhancement of the sagebrush steppe/mixed-grass prairie complex within Montana in a manner that supports sage grouse, a healthy diversity and abundance of wildlife species, and human uses* (Montana Sage-grouse Working Group 2005). As with other native wildlife species, a key principle for maintaining viable and resilient sage-grouse populations is to conserve and enhance habitat of sufficient quality and quantity to provide for the long term needs of the species.

Sage-grouse populations demonstrate annual and cyclic fluctuations, which are influenced by weather patterns such as drought and the composition and abundance of predators (Montana Sage Grouse Working Group 2005). Montana populations appear to cycle over approximately a 10-year period under existing habitat conditions and the current combination of weather and predation (Montana Sage Grouse Working Group 2005; Montana Fish, Wildlife and Parks, unpubl. data). Longer term trends in sage-grouse population abundance and distribution can be a function of habitat loss or deterioration (Garton et al. 2011). The majority of Montana's sage-grouse populations are expected to persist over the next 100 years, if habitat conditions remain consistent, which suggests Montana's populations are relatively stable (Garton et al. 2011).

Sage-grouse are part of the sagebrush grassland ecosystem that comprises an interlinked web of plant and animal species, including herbivores and carnivores. As one of many prey species in sagebrush habitats, sage-grouse are adapted to predation and in unaltered systems will persist indefinitely with predation pressure (Hagen 2011). The influence of predation on sage-grouse population dynamics typically only becomes problematic when vital rates, especially nest, chick, and hen survival, are consistently reduced below naturally-occurring levels (Taylor et al. 2012). Naturally-occurring variability in vital rates is a function of annual variation in conditions (e.g., weather, vegetation cover quality, predator abundance) and is expected with a species that shows cyclic tendencies. Based on a number of research projects, reported vital rates for sage-grouse populations in Montana vary within range-wide estimates, suggesting predation rates are within the range of normal variability (Table 1).

Table 1. Average range of vital rates for sage-grouse, range-wide and in Montana.

Vital Rate	Range-wide rates[1]	Montana rates	Years of MT study	Location	Reference
Nest success	15 – 86%	64%	1969 - 1972	Petroleum Co.	Wallestad and Pyrah 1974
		28 - 43%	2004 - 2005	Musselshell and Golden Valley Co.	Sika 2006
		35 – 61%	2001 - 2003	S. Phillips Co.	Moynahan et al. 2007
		53 – 61%	2007 - 2008	Milk River Basin	Tack 2009
		59%	2011 - 2012	Musselshell and Golden Valley Co.	Berkeley, unpubl. data[2]
Chick survival	12 – 50%	33 – 38%	2007 - 2008	Milk River Basin	Tack 2009
		12%	2011 - 2012	Musselshell and Golden Valley Co.	Berkeley, unpubl. data[2]
Hen survival	37 – 78%	25 – 96%[3]	2001 – 2003	S. Phillips Co, Montana	Moynahan et al. 2006
		94% (nesting season) 84 – 93% (late summer)	2004 - 2005	Musselshell and Golden Valley Co.	Sika 2006
		55 – 91% (spring/summer) 84 – 92% (over winter)	2007 - 2008	Milk River Basin	Tack 2009
		59%	2011 - 2012	Musselshell and Golden Valley Co.	Berkeley, unpubl. data

[1]Range-wide stimates from Connelly et al. 2011.

[2] Spring and early summer weather during 2011 and 2012 were subject to historic extremes of high precipitation in 2011 and severe drought in 2012, which likely affected nest and chick survival rates.

[3]25% annual survival in 2003 was attributed to a WNv outbreak and severe winter conditions; annual survival in 2001-2002 averaged 96%.

Predators that prey on sage-grouse tend to be generalists that take prey opportunistically but do not focus solely or preferentially on sage-grouse (Hagen 2011). Predators of juvenile and adult sage-grouse are commonly coyote, red fox, American badger, bobcat, golden eagles, and several other species of raptors (Schroeder and Baydack 2001; Hagen 2011). Younger birds can also be taken by common ravens, northern harriers, ground squirrels, and weasels. Nest predators include coyote, American badger, common raven and black-billed magpie (Schroeder and Baydack 2001; Hagen 2011). Smaller predators of sage-grouse, such as red fox or skunks, can also serve as prey to larger predators such as coyotes.

Human altered landscapes have contributed to significant increases over historical numbers in some predator abundances, particularly red fox and ravens (Coates and Delehanty 2010, Sauer et al. 2012). The influx of predators in altered sagebrush habitat can lead to decreased annual recruitment of sage-grouse (Schroeder and Baydack 2001, Coates 2007, Hagen 2011). Sage-grouse in altered systems are also typically forced to nest in less suitable or marginal habitats where predators can more easily detect nesting birds (Connelly et al. 2004). In Strawberry Valley, Utah, low sage-grouse survival was attributed to an unusually high density of red fox that were attracted to the area by anthropogenic activity (Baxter et al. 2007). Holloran (2005) attributed increased nest depredation rates on sage-grouse to high corvid abundance in western Wyoming; the latter was influenced by anthropogenic structures associated with natural gas development. In the same area, Bui (2009) found ravens used road networks, fences, power lines, and other infrastructure associated with development. Bui et al. (2010) also detected a negative association between raven presence and sage-grouse nest and brood fate. Coates and Delehanty (2010) found increased raven density in northeastern Nevada was associated with decreased sage-grouse nest success, especially in areas with lower shrub density.

Predator Control

Historically, predator control programs in North America were designed to protect domestic livestock, not wildlife (Hagen 2011). Predator control as a tool to manage grouse populations was rarely recommended historically, even for threatened and endangered populations in altered or fragmented habitats (Schroeder and Baydack 2001). It is likely the termination of widespread predator control in the early 1970's has influenced changes in predator abundance observed anecdotally by the public in recent years (Montana Sage Grouse Working Group 2005). Maintaining and enhancing intact ecosystems of sufficient size and quality to support a particular species is of greater ecological value and sustainability than an alternate approach that relies heavily on human intervention (e.g., artificial feeding, predator control, animal husbandry, zoos). The former approach works *with* the natural system that is adapted to working as an interconnected resilient network. The latter approach is costly, temporary, risks variable results, and is not likely to avert an ESA listing (United States Department of Interior 2010).

Recent predator control programs designed to benefit sage-grouse have had mixed results (United States Department of Interior 2010, Hagen 2011). In Strawberry Valley, Utah, fox removal appeared to increase adult survival and productivity but inference is limited because a control area was not included to compare changes in demographic rates, which were coincidentally increasing across the region during the study period (Baxter et al. 2007). Coyote control, however, appeared to have no effect on nest success or chick survival in Wyoming (Slater 2003). In fact, removal of coyotes can lead to a release of otherwise suppressed medium-sized predators, such as red fox, which tend to be more effective predators of sage-grouse nests and individuals (Mezquida et al. 2006). Ongoing control efforts of mammalian and avian predators (except raptors) in southwestern Colorado designed to increase recruitment in a small population of Gunnison's sage-grouse may be showing some success but sample sizes are extremely low (5 chicks monitored/year; Colorado Parks and Wildlife, pers. comm.). There are 13 displaying males currently in this population and cost of monitoring and control has totaled $267,000 over 5 years (Colorado Parks and Wildlife, pers. comm.), bringing in to question the sustainability of this program. Raven removal in northeastern Nevada resulted in short-term reductions in raven populations; however, other individuals re-populated the vacated habitat within a year (Coates 2007). Badger predation may also have compensated somewhat for decreases in raven numbers (Coates 2007). Predation by ravens on sage-grouse in southwestern Wyoming was attributed primarily to territorial pairs, not groups of juveniles, sub-adults, and non-breeding birds (Bui et al. 2010). Thus, the removal of raven groups at foraging sites is unlikely to influence sage-grouse nest success, and the removal of territorial pairs will likely have only short-term effects until the habitat is re-occupied by a new pair.

FWP Recommendations for Sage-grouse Predator Management in Montana

Rationale:

FWP's recommendations augment the Montana Sage Grouse Management and Conservation Plan – Final (Montana Sage Grouse Working Group 2005) and are based on the following rationale:

- Anthropogenic, landscape level changes have increased abundance of some predators, notably red fox and common raven, within the sage-grouse range (United States Department of the Interior 2010; Hagen et al. 2011).
- Nest success, chick survival, and adult survival tend to be higher in large, intact sagebrush habitat in comparison with habitat altered by anthropogenic disturbances (Connelly et al. 2011).
- Managers can improve nest success and chick survival by meeting published habitat guidelines for shrub cover, height and species composition; grass cover and height; and forb abundance at a local scale (Taylor et al. 2012).
- Reductions in the human footprint and associated anthropogenic subsidies that support predator populations, such as landfills, tall structures, abandoned buildings and other infrastructure, and road networks, are an important step toward reducing predator populations (Bui et al. 2010, Leu and Hanser 2011).
- Predator control programs can have localized, short-term effects, but the sustainability of predator control as a long-term management tool has not been demonstrated (Schroeder and Baydack 2001; Hagen 2011).
- Comprehensive predator control programs and associated monitoring at a scale and extent that may be effective is not likely to be socially or economically viable (Messmer et al. 1999).
- Funds and personnel resources directed to predator control might otherwise be available for addressing the factors that were identified by the USFWS (United States Department of the Interior 2010) as being significant to warrant listing the sage-grouse as threatened or endangered.

Recommendations:

1. Immediate reduction or modification of anthropogenic subsidies that support predator populations, to include:
    a. Removal of unnecessary tall structures, such as fence posts, power line poles, and cell towers, that can serve as perching structures for aerial predators,
    b. Adequate buffers (3.8 – 4 miles from leks) between placement of new tall structures and nesting and brood-rearing habitat to minimize influence of predators. Bury power lines, when feasible,
    c. Modification of land-fills and other areas of predator concentrations to restrict predator access to subsidized food resources,
    d. Removal of abandoned farmhouses, barns, building debris piles, and other structures that harbor mammalian predators.
2. Passage of a Governor-led initiative designed to minimize new anthropogenic disturbance and enhance habitat quality in important sage-grouse habitat, with the goal of keeping sage-grouse nest success and survival rates within the current range of variability, to include:
    a. Regulatory mechanisms and voluntary incentives to minimize new surface disturbance,
    b. Implementation of new and existing programs to support sustainable range management practices that enhance nesting, brood-rearing, and wintering habitat for sage-grouse,
    c. Restoration of altered habitat.
3. FWP believes the recommendations listed above are sufficient for managing predators because cumulatively they reduce the habitat's capacity to support predators and enhance habitat for sage-grouse, which can lead to increased nest success and survival. However, if the Montana Sage-grouse Advisory Council determines that additional action is required, FWP recommends that the Montana

Sage-grouse Advisory Council, in cooperation with the Montana Sage Grouse Working Group, develops an adaptive management strategy for predator control, to include at a minimum:

a. Population and vital rate triggers required to initiate predator control, such as documented low survival or recruitment rates,
b. Methods for characterizing the predator community in a given area of concern,
c. Requirements for defining the effected population, monitoring the effectiveness of control, and triggers for modifying actions.

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