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STATE OF NEVADA
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SAGEBRUSH ECOSYSTEM COUNCIL
STAFF REPORT
MEETING DATE: October 10, 2013

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TO: Sagebrush Ecosystem Council Members

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SUBJECT: Additional detail on "cumulative impacts" for Agenda Item 11.B.

The following is intended to provide additional background prior to the discussion of the question presented under Agenda Item 11.B. "3. How should the State Plan account for cumulative impacts?"

What does "cumulative impacts" mean?
To clarify, this is not referencing "cumulative impacts analysis" as part of the NEPA process. However, it is relating to the same concept that collective impacts as a whole may be greater than the sum of the parts. A single mine, a single transmission line, or a single fire alone may not lead to a long term decline in sage-grouse in a given landscape; however, the additive effect of all three of these could lead to sufficient degradation of the landscape that would lead to eventual, effective, loss of habitat in the valley (Knick et al 2011, Leu and Hanser 2011).

The direct and indirect impacts from habitat fragmentation and degradation caused by development and disturbances become cumulative across scales and over time and affect populations of sage-grouse as well as individuals. These impacts are not related linearly to the extent of original habitat. There are thresholds where local extinction may be imminent even though only a small percentage of original habitat has been lost (Natural Resources Conservation Service 2013). These thresholds are met when habitat is degraded sufficiently to be effectively lost –either habitat is no longer used (area is avoided) or the area becomes a population sink (area of low-quality habitat where reproductive success is less than mortality).

For example, the Lone Willow PMU story (Montana Mountains): Fire burned the entire Double H mountain complex portion of the PMU in the late 1990s, something that just short of erased habitat for sage-grouse. Then there was the Holloway fire last summer (2012) that burned 237,000 acres or so of the Bilk Creek and Trout Creek Mountains and a portion of the Montana Mountains in Nevada and converted it to perennial grass/invasive grassland. What remains of this PMU following these fires is a core of sagebrush shrubland left in the Montana Mountains which remains as the only source population to repopulate burned areas as they recover. There is now interest in development of a mine in the Montana Mountains that would include development of new roads, transmission lines and noise that will further fragment and degrade the remaining habitat. This accumulation of impacts further decreases the chance sage-grouse in this region have for persistence under this scenario. This example is provided simply to illustrate a real life example of potential cumulative effects.

Why is managing for cumulative impacts important for long-term sage-grouse conservation?
"Ultimately, the cumulative impact of the individual disturbance and multiple land uses, rather than any single source, likely has the most significant influence on the trajectory of sagebrush ecosystems" (Knick et al 2011. P 249). Studies by Knick and Hanser (2011) indicate that restoration of sagebrush, if successful in and of itself, will not be as successful in increasing the viability of sage-grouse populations long-term if those areas also are heavily influenced by human activities or fire. Once the landscape has been disturbed, given the unique challenges of successful restoration in the Great Basin, it is not clear that we will be able to reverse the habitat loss, fragmentation, and degradation in a time period that would benefit sage-grouse (Stevens 2004, James et al 2011, Miller et al 2011).

Managing for cumulative impacts to sage-grouse habitat at the landscape scale will help to ensure the threshold is not crossed at which point the long term viability of a population would be lost.

What types of impacts/disturbances contribute to cumulative impacts? What disturbances should be "counted"?
Any impact or disturbance that has a long-term negative effect on sage grouse should be included in a calculation of cumulative impacts, regardless if it is from a natural or anthropogenic cause (Knick et al 2011, Leu and Hanser 2011). It does not matter the cause- If an impact has a negative effect on sage-grouse populations, it should be considered as potentially contributing to the additive effects of multiple impacts to a landscape.

Short-term impacts should be evaluated to determine if they may in fact have long-term consequences. As a hypothetical example, the short term loss of a wet meadow could result in substantial mortality to a population (due to loss of late-brood rearing habitat). If this wet meadow is not restored until after the population is lost from the area (lack of sufficient recruitment to maintain the population due to loss of late-brood rearing habitat) then the population would not be recoverable, and in fact long term impacts to the population would be felt despite the only "short term" loss of the wetland.

Is there a threshold of density of disturbance beyond which sage-grouse will no longer use a landscape and thus would be effective habitat loss? How much disturbance is too much?
The long term persistence of sage-grouse is linked to conservation of relatively large blocks of sagebrush dominated habitat in good ecological condition (Connelly et al 2011). "Long-term viability of sage-grouse populations is no longer possible when habitat within a landscape is reduced and connectivity among populations is decreased be yond some limiting threshold. We have identified strong correlations between land uses and sage-grouse population responses. However, the threshold levels or underlying mechanisms often remain unclear" (Knick et al 2011 [p.249-250] and citations therein).

The research and literature on these specific questions is still emerging on this issue, however the following citations present insight regarding densities of impacts to sage-grouse and scale at which the landscape is perceived by sage-grouse:

Study completed by Knick et al 2013 assessing ecological minimums for sage-grouse in the western portion of their range showed that:

- Ninety-nine percent of active leks were in landscapes with <3% developed;
- Ninety three percent of active leks fell below the threshold of 0.01 km/km^2 of interstate highways;
- Habitat suitability was highest at power line densities <0.06 km/km^2 and pipeline and communication tower densities <0.01 km/km^2;
- Leks were absent from areas where power line densities exceeded 0.20 km/km^2; pipeline densities exceeded 0.47 km/km^2, or communication towers exceeded 0.08 km/km^2.

Below are several conclusions from landscape scale studies identifying scales at which impacts were identified to have a negative impact on long term viability of sage-grouse populations:

> Probability of persistence of sage-grouse populations in a range-wide comparison of historical and current distributions was greatest in areas containing >30% sagebrush within a 30 km radius of a given point and with a human density of <4/km2 (Aldridge et al 2008).

Fire within a 54-km radius and human activity within 5 km of a lek influenced the probability of persistence over 40 years (Knick and Hanser 2011).

Leu et al (2011) found that sage-grouse dispersal and movement patters have adapted to sagebrush landscape scales between 4.5 and 9.0 km

Johnson et al (2011) looked at the relationship between trends of sage-grouse lek counts from 1997 to 2007 and a variety of natural and anthropogenic features across the range of sage-grouse, both by subregions and by the range as a whole. Trends that were found to be negative, or lower, would indicate a decrease in male attendance at leks over time. Trends that were found to be positive, or higher, would indicate an increase in male lek attendance over time. Some of the relationships identified are listed below:

> Lek trends tended to be lower as the cover of exotic species increased at both the 5-km and 18-km scales. Few leks had >8% coverage within either 5 km or 18 km.
> Lek trends decreased as area burned within 5 km of lek in the Southern Great Basin.
> Lek trends were lower as the number of communication towers increased within either 5 km or 18 km. Similarly lek trends generally increased as distance to nearest tower increased.
> Lek trends were lower as developed land increased. Most leks had no development within 5 km, but those that did tended to have lower trends than those that did not. At 18 km, a stong and consistent negative relation was evident.

Wisdom et al (2011) evaluated differences in environmental variables between areas of former range (extirpated range) and areas still occupied by sage-grouse (occupied range).

> Mean patch size of sagebrush was more than 9 times larger, and mean core area more than 11 times larger, in occupied versus extirpated range. Sagebrush patches also were substantially closer to one another in occupied range.
>
> Mean human density was 26 times lower in occupied than in extirpated range.
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> Road density was lower and highways substantially farther from historical locations in occupied ranged.
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> This study also found that models that evaluated combinations of variables (looking at several impacts at one time) were better able to predict occupied or extirpated range that were single-variable models, thus emphasizing importance of cumulative impacts.

> Fedy et al (2012) quantified how far individual sage-grouse moved across landscapes between key life stages to access required habitats in Wyoming using radio-telemetry. They found remarkable variation in the extent of movement distances both within and among sites across Wyoming, with some individuals remaining year-round in the same vicinity and others moving over 50 km between life stages. The data included in these analyses are from sage-grouse in the core of the species' range, including relatively unfragmented habitats. The spatial extent required by an individual to meet annual resource requirements from populations in more fragmented, or heterogeneous, landscapes may be considerably larger (Fedy et al 2012 and citations therein).

The 2012 State plan has a recommendation of 5% per 640 acres will trigger consultation with the SETT. Further consideration should be given to the size of the area, given current research indicates that sage-grouse perceive the landscape at a much larger scale than this, and further consideration should be given to what management action should occur if a threshold of a landscape is met.

Summary

With policy decisions that are made by the Council, it needs to be asked if these actions, if put in place, will meet the long term goal of the State, which is long term conservation of sage-grouse and the sagebrush ecosystem. The same question should be asked of the short term goal of the State, which is to establish regulatory mechanisms (through the State Plan and the State Alternative for the EIS) that will help preclude the need to list the greater sage-grouse.

To meet these ends, understanding how policy decisions tie back to sage-grouse and the sagebrush ecosystem is important. Will these policies provide the long term benefits that the sagebrush ecosystem and the sage-grouse need? Will it provide adequate protection so the FWS has sufficient reason to change their 2010 finding? In 2010, the FWS found that it was warranted for listing (but precluded by species of a higher priority). Presumably the FWS needs something beyond the status quo for them to not propose a listing in 2015.

In developing policy for conservation of sagebrush ecosystems and sage-grouse, it should be done by looking to limit disturbances to a landscape at the cumulative level to ensure it is not disturbed past the threshold which could then result in a loss of long term persistence of the species.

Literature Cited

Aldridge C.L., S.E. Nielsen, H.L. Beyer, M.S. Boyce, J.W. Connelly, S.T. Knick, and M.A. Schoeder. 2008. Range-wide patterns of Greater Sage-Grouse persistence. Diversity and Distributions 14:983–994.

Connelly, J.W., E.T. Rinkes, and C.E. Braun. 2011. Characteristics of Greater Sage-Grouse habitats: a landscape species at micro- and macroscales. Pp. 69-83 *in* S.T. Knick and J.W. Connelly (editors). Greater Sage-Grouse: ecology, and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkeley, CA.

Fedy , B.C., C.L. Aldridge, K.E. Doherty, M. O'Donnell, J.L. Beck, B. Bedrosian, M.J. Holloran, G.D. Johnson, N.W. Kaczor, C.P. Kirol, C.A. Mandich, D. Marshall, G. McKee, C. Olson, C.C. Swanson, and B.L. Walker. 2012. Interseasonal movements of greater sage-grouse, migratory behavior, and an assessment of the core regions concept in Wyoming. Journal of Wildlife Management 76:1062-1071.

James, J. J., T. J. Svejcar, and M. J. Rinella. 2011. Demographic processes limiting seedling recruitment in arid grassland restoration. Journal of Applied Ecology 48:961–969.

Johnson, D.H., M.J. Holloran, J.W. Connelly, S.E. Hanser, C.L. Amundson, and S.T. Knick. 2011. Influences of environmental and anthropogenic features on Greater Sage-Grouse populations, 1997-2007. Pp. 407-450 *in* S.T. Knick and J.W. Connelly (editors). Greater Sage-Grouse: ecology, and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkeley, CA.

Knick S.T., S.E. Hanser, and K.L.Preston. 2013. Modeling ecological minimum requirements for distribution of greater sage-grouse leks: implications for population connectivity across their western range, U.S.A. Ecology and Evolution 3(6): 1539–1551.

Knick, S.T., and S.E. Hanser. 2011. Connecing pattern and process in Greater Sage-Grouse populations and sagebrush landscapes. Pp. 383-405 *in* S.T. Knick and J.W. Connelly (editors). Greater Sage-Grouse: ecology, and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkeley, CA.

Knick, S.T., S.E. Hanser, R.F. Miller, D.A. Pyke, M.J. Wisdom, S.P. Finn, E.T. Rinkes, and C.J. Henny. 2011. Ecological influence and pathways of land use in sagebrush. Pp. 203-251 *in* S.T. Knick and J.W. Connelly (editors). Greater Sage-Grouse: ecology, and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkeley, CA.

Leu, M., and S.E. Hanser. 2011. Influences of the human footprint on sagebrush landscape patterns: implications for sage-grouse conservation. Pp. 253-271 *in* S.T. Knick and J.W. Connelly (editors). Greater Sage-Grouse: ecology, and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkeley, CA.

Miller, R.F., S.T. Knick, D.A. Pyke, C.W. Meinke, S.E. Hanser, M.J. Wisdom, and A.L. Hild. 2011. Characteristics of sagebrush habitats and limitations to long-term conservation. Pp. 145-184 *in* S.T. Knick and J.W. Connelly (editors). Greater Sage-Grouse: ecology, and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkeley, CA.

Natural Resources Conservation Service. 2013. https://prod.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_015259.pdf No longer able to access the website to determine proper citation due to federal government shutdown. Accessed September 29, 2013.

Stevens, R. 2004. Basic considerations for range and wildland revegetation and restoration. *In*: S. B. Monsen, R. Stevens, and N. L. Shaw (editors). Restoring western ranges and wildlands. Fort Collins, CO, USA: USDA Forest Service Rocky Mountain Research Station. p. 19–24.

Wisdom, M.J., C.W. Meinke, S.T. Knick, and M.A. Schroeder. 2011. Factors associated with extirpation of Sage-Grouse. Pp. 451-472 *in* S.T. Knick and J.W. Connelly (editors). Greater Sage-Grouse: ecology, and conservation of a landscape species and its habitats. Studies in Avian Biology (vol. 38), University of California Press, Berkeley, CA.

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