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STATE OF NEVADA
Sagebrush Ecosystem Program

SAGEBRUSH ECOSYSTEM COUNCIL
STAFF REPORT
MEETING DATE: May 31 2013

DATE: May 30, 2013

TO: Sagebrush Ecosystem Council Members

FROM: Lara Niell, Wildlife Staff Specialist
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THROUGH: Tim Rubald, Program Manager, State Lands,
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SUBJECT: Briefing on habitat definitions

SUMMARY

This briefing paper was developed per the request of the Sagebrush Ecosystem Council (SEC) for further information on several habitat related tasks directed to the Sagebrush Ecosystem Technical Team (SETT). The SETT was given latitude to address those tasks which they found to be the highest priority and feasible given the time period between the April and May SEC meetings. The specific tasks that this briefing paper addresses are outlined below, under Previous Action. The purpose of this report is to provide further definitions and clarification on different classes of "habitat".

PREVIOUS ACTION

April 22, 2013. The SEC directed staff to 1) develop a cross walk of fundamental concepts of the Nevada Department of Wildlife (NDOW) habitat categorization map, Bureau of Land Management (BLM) categories of Preliminary Priority Habitat (PPH) and Preliminary General Habitat (PGH), and the Coates model, and 2) report on the definition of "occupied" and what considerations go into determining such.

BACKGROUND

The following provides definitions of NDOW's habitat categories and BLM's PPH and PGH. The white papers for each, which include a larger discussion of the definitions, are included as attachments. After these two sets of definitions, additional discussion is provided on habitat definitions in context of the Coates model, other definitions of habitat including occupied habitat, suitable habitat, and potential habitat.

NDOW habitat categories

The map is a statement of sage-grouse habitat value based upon best available information. The following is summarized from "Greater Sage-grouse Habitat Categorization White Paper" (NDOW 2012). A primary basis for the habitat

categorizations are the restoration potential classes (R-values) (Sather-Blair et al. 2000). These R-values were established based on existing vegetation cover, ecological site potential, and burned areas. The R-values are included as part of the habitat categorization definitions, so these are presented below.

R-0 – Areas with desired species composition that have sufficient, but not excessive, sagebrush canopy and sufficient grasses and forbs in the understory to provide adequate cover and forage to meet the seasonal needs of sage-grouse (nesting, early brooding, summer, fall/winter).

R-1 – Areas with potential to produce sagebrush plant communities that have good understory composition of desired grasses and forbs, but lacks sufficient sagebrush canopy. These areas could be characterized by native perennial grasslands post fire or seeded perennial grass rangelands.

R-2 – Existing sagebrush plant communities with insufficient desired grasses and forbs in the understory.

R-3 – Areas dominated by pinyon/juniper woodland that may have the potential to produce sagebrush plant communities. These areas include sagebrush sites that have been encroached by pinyon/juniper woodlands, as well as other pinyon/juniper dominated sites that may provide potential value to sage-grouse.

X-3 – Pinyon/Juniper areas that have crossed the threshold from sagebrush ecological site to pinyon/juniper or juniper woodland or have only had a potential for woodland plant community.

R-4 – Areas with potential to produce sagebrush plant communities, but are dominated by annual grasses, annual forbs, or weeds.

X-4 - Areas that have crossed the threshold from sagebrush ecological site to annual grasses, perennial weeds or bare ground or a non sagebrush ecological site.

Other – Areas with some value to sage-grouse but typically not considered traditional sage-grouse habitat. These areas typically included riparian zones, salt desert scrub communities, aspen stands, mountain mahogany stands, and agricultural lands.

R-value maps were developed for the entire state by the BLM, with cooperation from NDOW wildlife biologists, from 2002-2004 and updated in 2011. Adjustments to the R-values were made for the habitat categorization process, when necessary, based upon the best available vegetation cover data (SynthMap, Peterson 2008), updated aerial imagery and fire information, and on-the-ground knowledge of local land cover and land use impacts. These R-value maps were then evaluated by NDOW staff specialists and regional field biologists in concert with the 75% core breeding density dataset developed by Doherty et al (2010), lek location data, telemetry data, and incidental sage-grouse sightings collected by NDOW field biologists and other qualified observers, using geographic information system (GIS) platform. The results were categorized into five classes of habitat values, the habitat categorizations, that were initially defined by the Nevada Energy and Infrastructure Standards to Conserve Greater Sage-Grouse (Nevada Governor's Sage-Grouse Conservation Team 2010). These definitions have been shortened from the original version provided in the Nevada Energy and Infrastructure Standards document. For the complete definitions please see this document or the attached NDOW white paper.

Category 1 – Essential/Irreplaceable Habitat The lek itself and associated nesting habitat is categorized as essential and irreplaceable habitat. The interrelationships between the vegetal characteristics of a given area, female nest

site selection, and movement patterns of the population that drive males to establish a lek in areas of female use is spatially and temporally dynamic and has yet to be successfully recreated (ODFW correspondence 2008). However, focusing solely on the lek location and a certain buffer around the lek does not always adequately represent those areas that are crucial to the long term survival of particular populations, especially those that are migratory. Several telemetry monitoring efforts, particularly in eastern Nevada, have shown that females will move up in elevation from the lek sites to more mesic habitats to both nest and raise their broods. Category 1 habitat often corresponds to the R-0 habitat definition (see definitions above).

Category 2 – Important Habitat Suitable and diverse winter habitats and high quality brood rearing habitats are critical to the long-term persistence of sage-grouse populations. Winter habitats are very important to sage-grouse due in large part to their complete dependence on sagebrush during the late fall and winter months (Connelly et al. 2000). Depending on the year and the snowpack in a given area, winter habitats elevate in importance as snow accumulations rise. Because of the loss of sagebrush in Nevada over the last decade (approximately 2.6 million acres or 12% of available sage-grouse habitat), winter habitat is at a premium and depending on the particular PMU, could actually be considered essential and irreplaceable. High quality winter habitat may correspond to the R-2 habitat definition, but there are situations where important winter habitats could be nested within R-0 habitats as well.

Brood rearing habitats are also a very important component of sage-grouse habitats. A mosaic of upland sagebrush vegetation intermixed with mountain meadows and spring systems compose brood rearing habitat. These habitat types are fairly limited in Nevada because of the dry climate exhibited throughout the majority of the Great Basin. In theory, high quality brood rearing habitat corresponds best to the R-0 habitat definition; however, there are instances where high quality brood rearing habitat could be nested within R-1 and R-2 habitat definitions.

Category 3 – Habitat of Moderate Importance These habitats are those that are not meeting their full potential due to any number of factors, but serve some benefit to sage-grouse populations. These habitats can serve as nesting, brood rearing, winter or transitional habitat, but are marginal. For the short-term, these habitats may only be of limited value on a seasonal basis, but could serve additional long-term values if certain habitat components (most importantly sagebrush) return to the site.

Habitats within this Category could correspond to R-1, R-2 or R-3 habitat definitions. R-1 habitats generally tend to be upper elevation sagebrush habitats, normally mountain big sagebrush communities that have recently burned. These areas are likely to return to a mountain big sagebrush community within 35-100 years and would then serve greater value to sage-grouse, but presently may only be of marginal value during the brood rearing period for example. R-2 habitats with ample sagebrush, but little understory exist at various elevation and topography types. These areas can often be treated with passive management techniques, which are recommended in xeric sagebrush communities that receive ≤12" of precipitation. Pinyon and juniper encroached sagebrush habitats, or R-3 habitats that have not crossed a threshold, may be of value to sage-grouse depending on the level of encroachment.

Category 4 – Low Value Habitat and Transitional Range Habitats within this category currently contribute very little value to sage-grouse other than

transitional range from one seasonal habitat to another or minimal foraging use. Habitats within this category that correspond to R-3 habitat definitions have not completely crossed a threshold where restoration efforts would be ineffective, but would be very expensive with secondary work needed to recover the understory. The cost/benefit ratio is too high to apply recovery efforts at this time. Similarly, habitats that correspond to the R-4 habitat definition may not have necessarily crossed the restoration threshold, but restoration would be very expensive and also require secondary or tertiary treatments to control invasive plant species post treatment.

Category 5 – Unsuitable Habitat This category, in essence, represents non-habitat at this time unless greater strides are made with respect to restoration techniques. In general, habitat is in such poor condition that restoration efforts would not be feasible or effective. Non-habitat can either be designated non-habitat areas delineated within seasonal distribution maps or areas that have undergone substantial change and are not likely to recover. These areas could be lower elevation sagebrush habitats that have burned and are now annual grasslands dominated by various invasive weeds. Areas such as these are not likely to recover without substantial effort and expense. Other examples of habitat alteration that could render an area to be considered "non-habitat" include agricultural conversion, or cultivation, and urban/suburban development. Category 5 habitat could correspond to the R-3 or R-4 habitat definitions. These areas have little potential to produce sagebrush plant communities and are currently dominated by pinyon/juniper woodlands or annual grasses and forbs.

Not Applicable – Non-habitat This category identifies areas of no consequence to sage-grouse, such as dense conifer stands, alpine cliffs and rock outcrops, playas, and human disturbances such as highways, gravel pits, mines, and populated places.

BLM PPH and PGH

The BLM definitions for PPH and PGH were derived from the NDOW sage-grouse habitat categorization data. The following comes from the "White Paper on BLM and U.S. Forest Service Preliminary Habitat Map" (BLM 2012).

Preliminary Priority Habitat PPH consists of a combination of NDOW's essential and irreplaceable (Category 1) and important (Category 2) habitats. These areas include breeding habitat (lek sites and nesting habitat), brood-rearing habitat, winter range, and important movement corridors. PPH primarily consists of sagebrush, but may also include riparian communities, perennial grasslands, agriculturally-developed land, and restored habitat, including recovering burned areas. The BLM and the USFS defines PPH as having the highest conservation value to maintaining sustainable sage-grouse populations.

Preliminary General Habitat PGH consists of habitat of moderate importance (Category 3). PGH provides some benefit to greater sage-grouse populations but, in many instances, lacks a key component, such as adequate shrub height or density or sufficient herbaceous understory, which prevents it from meeting its full ecological potential. PGH also may include areas recently burned that have not sufficiently recovered or sagebrush communities with pinyon-juniper encroachment. PGH has the potential to be reclassified as PPH if restoration efforts enhance the habitat quality or ongoing field efforts document sage-grouse use.

Habitat Suitability Index (Coates model)

There are no habitat definitions, per se, that come out of this modeling. Statistical methods are used to evaluate the threshold that distinguishes between habitat and non-habitat –identify those areas where the suitability is sufficiently low that really would not be habitat for sage-grouse ("sufficiently" determined through statistical methods). This gives us likely habitat versus likely non-habitat. We could use a similar process to establish additional thresholds or set particular values and then translate those into habitat definitions that would meet our management needs. See further discussion of the Coates model under "Occupied Habitat".

Additional definitions of habitat

The following is a discussion of habitat, habitat quality, and critical habitat.

Habitat can be defined as an area that provides food, cover, water and space for an organism. It is the resources and conditions present in an area that are required by a species to carry out its life. Habitat implies more than just vegetation or vegetation structure; it is the sum of the specific resources that are needed by organisms. Other specific resources include physical and biological characteristics, such as: climate, precipitation, elevation, topography, water availability, soil type, etc. Wherever an organism is provided with resources that allow it to survive, that is habitat (Hall et al 1997).

In addition to the above definition, the temporal and spatial scales of habitat need to be acknowledged. The SEC is familiar with the different seasonal use habitats such as nesting/breeding, brood rearing, winter etc. These are seasonal time periods. We can also look at longer scales such as what habitat sage-grouse may use over a period of years. In winters of high precipitation the areas of sagebrush that they select for will likely be different that those they select for in years of low precipitation. Because sage-grouse do not use a particular area in a specific year does not mean that it is not habitat. We can also look at spatial scale, from distribution of the species across the western U.S., to landscape scale such as several mountain ranges and associated valleys, down to, for example, nest site selection. At the scale of species distribution, we generally associate sage-grouse habitat with sagebrush. At the landscape scale, sage-grouse are using different seasonal habitats and dispersing within and between different populations (such as the example that Pete Coates presented on the female bird that traveled from the Pine Nut Mountains down south to the Bodie Hills). At the scale of nest site selection, sage-grouse are generally looking more specifically for sagebrush that are larger and have greater obstructing cover (such as residual grasses) than average. Note that these different scales of habitat are not mutually exclusive. There is not a line on the landscape where in one side is nesting habitat and the other side is brood rearing habitat. These different habitats do very much overlap and may overlap more or less depending on the year.

One more point regarding habitat are the concepts of transitional or connective habitat. These are areas that sage-grouse likely do not spend much time in but use at stop-over locations or corridors from one location to another. We are still continuing to learn about the population dynamics of sage-grouse, when and why they may travel long distances (such as the questions raised from the female bird travelling from the Pine Nuts to Bodie Hills) and if that is necessary for the long term survival of the species. Other questions to ask are what may be barriers to dispersal (between seasonal use habitats or dispersal between populations)?

Habitat quality refers to the ability of the environment to provide conditions appropriate for individual and population persistence. It should be considered a continuous variable, ranging from low to medium to high, based on resources

available for survival, reproduction, and population persistence, respectively (Hall et al 1997). Habitat quality is a measure of "fitness consequences" associated with that habitat. Fitness is, in short, amount of reproduction and recruitment into the population- so, to look at habitat quality we need to look at demographic variables, such as reproduction and recruitment, in order to be able to assess the quality of habitat (Stiver et al 2010). High quality habitat would allow for higher levels of reproduction and recruitment, low quality would result in lower levels. As well, there is annual variation in habitat quality that is largely driven by received precipitation, but can be affected by other things such as wild horse utilization. For example, these two examples of precipitation and wild horse utilization can affect the amount and persistence of food sources available to sage grouse in a given year,

Finally, we cannot assume that a high density of individuals is always high quality habitat, as there may be situations were high density is not in high quality habitat. For example, we may find high concentrations of birds in an area after a fire (high density), but that area is several degraded and the birds will not persist (poor quality), but this is the only place for them to go following the fire.

Critical habitat This term is specific to the Endangered Species Act and is defined and used in the Act. It is a specific geographic area(s) that is essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery. An area is designated as "critical habitat" after the U.S. Fish and Wildlife Service publishes a proposed Federal regulation in the Federal Register has then received and considered public comments on the proposal. The final boundaries of the critical habitat area are also published in the Federal Register (U.S. Fish and Wildlife Service 2002).

Occupied, suitable, and potential habitat

So where does that leave us with the terms, occupied habitat, suitable habitat and potential? These were terms established within the 2012 Strategic Conservation Plan for Greater Sage-grouse in Nevada. I am not providing recommendations at this time to the SEC, but am providing a discussion, food for thought if you will, as the SEC moves forward with refining the state plan and state EIS alternative, and with developing management options and how those necessitate fine-tuned, definitions for concepts of habitat.

Occupied Habitat The term "occupied" implies that the species is definitively known to be present within the habitat. The time scale and spatial scale at which it is determined to be "occupied" would need to be defined. Is it occupied this season? This year? The last 20 years? Are we looking at a scale of 100 square feet of sagebrush? The scale of a few thousand acres? A county? Depending on the temporal and spatial scale, we may be able to define "occupied" through exhaustive surveys that verify the species is in fact present in a location. However, the longer the temporal and the smaller the spatial scales across a large area, the more unrealistic and impractical it would be to determine this. If the surveys do not identify the presence of individuals of a species, it could be assumed to be "unoccupied". However, is it truly unoccupied or was it a failure to detect, given how cryptic the bird can be?

I reviewed an array of sage-grouse reports and published journal articles to find definitions of occupied habitat. Only two of these defined "occupied". I have also provided additional definitions found in those reports that were relevant.

Sage-grouse Habitat Assessment Framework (Stiver et al 2010)

Occupied Habitat (sage-grouse): All sagebrush and associated plant communities known to be used by sage-grouse within the last 10 years. *Sagebrush areas contiguous with areas of known use, which do not have effective barriers to sage-grouse movement from known use areas, are considered occupied unless specific information exists that documents the lack of sage-grouse use.*

Habitat Suitability: The relative appropriateness of a certain ecological area for meeting the life requirements of an organism (i.e., food, shelter, water, space).

Gunnison Sage-grouse Range wide Conservation Plan (Gunnison Sage-grouse Range wide Steering Committee 2005)

Occupied habitat: Acreage of habitat within each population thought to be occupied by sage-grouse, as delineated by local biologists.

Vacant habitat: Acreage of apparently suitable habitat that is not currently known to be occupied habitat, as delineated by local biologists.

Potential habitat: Acreage of habitat that could, with intensive management, be suitable for sage-grouse, as delineated by local biologists.

Given the above discussion, I would suggest that generally sources that use the term occupied are suggesting a presumed to be occupied unless there is information to the contrary, occupied at a very coarse scale, or occupied as delineated by a knowledgeable biologist.

Suitable habitat The habitat suitability map that Dr. Coates and the USGS are working on for the state of Nevada, similarly will not give us "occupied" habitat. The map they produce for us will show where resources, which are determined to be important to sage-grouse (through the modeling effort), are located across the state. We will get an index of relative suitability for sage-grouse given what habitat resources are or are not present in an area. The modeling is done at a coarse scale (30 meters) and cannot take into account microhabitat variables (such as grass density surrounding an individual sagebrush plant). (For further discussion on details of the Coates model, see Staff Report: Update and Briefing on the Coates Model, prepared by Lara Niell, May 31, 2013.)

Suitability is not quality. As discussed above, the habitat suitability map will not evaluate the success (or lack thereof) of reproduction and recruitment, so we cannot provide an assessment of quality. We could generally assume such, but the resource variables put into the model are not an exhaustive list, and there may be other factors at the site that, for example, negatively affect reproduction rates and therefore is low quality habitat. A great example here is the Virginia Mountains PMU. This area was drastically affected by wildfire in 1999 and largely came back as perennial grassland. Over time, early seral stage shrubs, such as snowberry, gooseberry and rabbitbrush, came in as well; however, sagebrush was slow to recover. Sage-grouse have persisted on the site, so one could consider the site suitable, but not high quality; and, it has the potential to recover over time.

Hall et al (1997), the source of several of my definitions above, state that the term "suitable" habitat should not be used, "because if an organism occupies an area that supports at least some of its needs, then it is habitat. So, by definition then, habitat is suitable". However, I feel similarly to the definition provided by Stiver et al (2010) above, that suitability can be used as a relative term. As discussed above the relative suitability of habitat is determined by the abundance of more or less resources present in a specific area that are important to sage-grouse.

Potential habitat The use of "potential habitat" may be even more vague than any of the above terms. The confusion comes in what the word potential is addressing. One

use of the term assumes that the habitat is suitable, that sage-grouse should, in theory be there, that there is potential for sage-grouse to be there. The other use of the term assumes that the habitat is not currently suitable, for some reason it does not meet the habitat requirements of species, but there is potential for the habitat to be restored so that it would be suitable for sage-grouse.

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FISCAL IMPACT

There is no fiscal impact at this time.

RECOMMENDATION

This staff report is to further familiarize the SEC with various definitions of "habitat". If SEC members have questions they may individually contact Lara Niell, or request through Tim Rubald that this topic be added to the June 17 (or other future) agenda for discussion with the SEC.

Attachments:

1: NDOW habitat categorization map white paper
2: BLM PPH and PGH white paper

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GREATER SAGE-GROUSE HABITAT CATEGORIZATION
WHITE PAPER
December 2012

ABSTRACT

The Nevada Department of Wildlife (NDOW) Greater Sage-grouse Habitat Categorization Map (Sage-grouse Map) is an analysis tool that incorporates the best available data (lek observations, telemetry locations, survey and inventory reports, vegetation cover, soils information, and aerial photography) into a statewide prioritization of Greater sage-grouse (sage-grouse) habitat. This tool provides resource managers with information to guide conservation and land-use planning efforts in the context of sage-grouse management at the landscape scale. Sage-grouse habitat was categorized into the following five classes:

1. Essential/Irreplaceable Habitat
2. Important Habitat
3. Habitat of Moderate Importance
4. Low Value Habitat and Transitional Range
5. Unsuitable Habitat

N/A Non-habitat

The sage-grouse habitat categorization analysis was only performed for areas within the sage-grouse population management units (PMUs) identified by the Governor's Sage-Grouse Conservation Team (2004). Ongoing efforts will include revisions to the habitat categorization every 3-5 years based upon updated PMU boundaries, sage-grouse survey and inventory work, conservation projects, human land-use development, and wildfire events.

PURPOSE

Greater sage-grouse (sage-grouse) are broadly distributed throughout the northern two-thirds of Nevada and require extensive sagebrush habitat for survival and reproduction (Schroeder et al. 1999, Connelly et al. 2004). Since Euro-American settlement of western North America, sage-grouse range has declined substantially (Schroeder et al. 2004) and population numbers have been reduced in many states (Connelly et al. 2004), including Nevada. Sage-grouse are thought to be an important management indicator species for the health of the sagebrush-steppe ecosystem based on their specific needs at different life-stages (Patterson 1952). Furthermore, sage-grouse have been classified as an umbrella species (Rowland et al. 2006) because their populations function at relatively large spatial scales and management of sage-grouse across a landscape benefits other species of conservation concern, particularly those that function at smaller spatial scales, such as pygmy rabbit (*Brachylagus idahoensis*) and sage sparrow (*Amphispiza belli*).

Considering the current demands of increased public land use and management, several threats to sage-grouse population health and distribution in Nevada have been recognized. These include, but are not limited to:

- Reductions in habitat quantity and/or quality (Nevada Sage-Grouse Conservation Plan 2004);
- Wildfire (Nevada Sage-Grouse Conservation Plan 2004):
- Avoidance behavior by grouse of lek sites and habitats that are near anthropogenic sites (Lyon and Anderson 2003, Hall and Haney 1997, Braun 1998, Holloran 2005);
- Higher mortality rates of breeding sage-grouse in oil and gas fields (Holloran 2005, Kaiser 2006, Aldridge and Boyce 2007);
- Lower nest initiation rates and success (Hall and Haney 1997, Braun 1998);
- Lower lek attendance of males (Ellis 1984, Hall and Haney 1997, Walker et al. 2007);
- Population declines (Beck at al. 2006, Connelly et al. 2000);
- Loss or degradation of critical habitat (Braun 1998, Connelly et al. 2000, Crawford et al. 2004, Walker et al. 2007);
- Increases in avian predator populations (Ellis 1984, Braun 1998);
- Collisions with power lines and vehicles (Connelly et al. 2000);
- Noise associated with wind turbine rotor blades that is thought to reduce lek attendance (Connelly et al. 2004); and
- Displacement of nests near overhead transmission lines (Braun et al. 2002).

With these and other potential threats in mind, the Nevada Department of Wildlife (NDOW) has developed the NDOW Greater Sage-Grouse Habitat Categorization Map (Sage-grouse Map) to identify areas most important to sage-grouse populations and inform mitigation and conservation strategies to benefit the species at a landscape scale.

USE CONSTRAINTS

The Sage-grouse Map is intended to provide land use and resource managers and decision makers with a valuable tool to identify potential sage-grouse concerns at the landscape scale. This product is intended for general project planning and siting purposes in the context of sage-grouse use of the landscape. The map and the accompanying dataset are presented at 100-meter pixel resolution and should not be used for making planning decisions at the project design (fine) scale. To apply these data to specific locations it is recommended that a field investigation be conducted by a qualified biologist for the purpose of impact assessment.

No land use management decisions or directives are directly attached to or implied by the map. The map is a statement of sage-grouse habitat value based upon the best available information. Ultimately, land use decisions and directives will be made by the applicable land management agency using the existing planning processes (National Environmental Policy Act). However, comments on the NDOW Greater Sage-Grouse Habitat Categorization Map are welcome and should be directed to *sagegrouse@ndow.org*.

PROCESS

The Sage-grouse Map was developed using a mapping framework produced by the Bureau of Land Management (BLM) that designates the restoration potential of sagebrush communities (R-values) within the known range of sage-grouse in Nevada. The R-values were developed in a geographic

information system (GIS) by BLM State Office staff and District personnel, with cooperation from NDOW wildlife biologists, based upon existing vegetation cover, ecological site potential, and burned areas. R-value classifications were adapted from Sather-Blaire (2000) and are defined as follows for the Sage-grouse Map:

R-0 – Areas with desired species composition that have sufficient, but not excessive, sagebrush canopy and sufficient grasses and forbs in the understory to provide adequate cover and forage to meet the seasonal needs of sage-grouse (nesting, early brooding, summer, fall/winter).

R-1 – Areas with potential to produce sagebrush plant communities that have good understory composition of desired grasses and forbs, but lacks sufficient sagebrush canopy. These areas could be characterized by native perennial grasslands post fire or seeded perennial grass rangelands.

R-2 – Existing sagebrush plant communities with insufficient desired grasses and forbs in the understory.

R-3 – Areas dominated by pinyon/juniper woodland that may have the potential to produce sagebrush plant communities. These areas include sagebrush sites that have been encroached by pinyon/juniper woodlands, as well as other pinyon/juniper dominated sites that may provide potential value to sage-grouse.

X-3 – Pinyon/Juniper areas that have crossed the threshold from sagebrush ecological site to pinyon/juniper or juniper woodland or have only had a potential for woodland plant community.

R-4 – Areas with potential to produce sagebrush plant communities, but are dominated by annual grasses, annual forbs, or weeds.

X-4 - Areas that have crossed the threshold from sagebrush ecological site to annual grasses, perennial weeds or bare ground or a non sagebrush ecological site.

Other – Areas with some value to sage-grouse but typically not considered traditional sage-grouse habitat. These areas typically included riparian zones, salt desert scrub communities, aspen stands, mountain mahogany stands, and agricultural lands.

The original R-value data provided by the BLM was represented as 30-meter pixels. This resolution was determined to be too fine for the purposes of mapping sage-grouse habitat statewide. Therefore, the NDOW used GIS to aggregate the 30-meter pixel data to 100-meter pixel resolution using the mean aggregation technique. In order to produce landscape patches that represented homogenous R-values with minimal pixilation, the NDOW performed a majority filter to dissolve pixels based upon the majority of their eight neighboring pixel values. This process was performed five times, resulting in landscape patches that were optimized for efficient analysis while retaining the fundamental integrity of the original R-values. Finally, the 100-meter, majority filtered data was converted to vector polygons for further review and categorization.

Sage-grouse habitat categorization was performed on landscape patch polygons by NDOW staff specialists and regional field biologists. Individual polygons were reviewed and evaluated based on overall quality of habitat, patch size, and known sage-grouse activity. The 75% Core Breeding Density

dataset developed by Doherty et al. (2010) were also considered when categorizing sage-grouse habitat, especially in areas where bird activity data was missing or incomplete. Habitat quality was determined by the R-value and was assessed for accuracy by the review team. Adjustments to the R-values were made, when necessary, based upon the best available vegetation cover data (SynthMap 2008), updated aerial imagery and fire information, and on-the-ground knowledge of local land cover and land use impacts. Furthermore, landscape patch polygons were merged where patch size or type was determined to be insignificant and split to better represent local R-value or habitat quality homogeneity. Merging of polygons was determined to be an effective way to reduce any remaining pixilation and improve mapping efficiency. Landscape patches of 25 acres or less were evaluated and merged with neighboring polygons based upon the dominant vegetation cover and habitat quality. Known sage-grouse activity was represented by lek location and observation data, telemetry locations, and incidental sage-grouse sightings collected by NDOW field biologists and other qualified observers. Large, homogeneous landscape patches with variable amounts of documented sage-grouse activity were evaluated and often split to refine the habitat categorization based on bird use.

Sage-grouse habitat was categorized into the following five classes using definitions established by the Nevada Energy and Infrastructure Standards to Conserve Greater Sage-Grouse (Nevada Governor's Sage-Grouse Conservation Team 2010):

Category 1 – Essential/Irreplaceable Habitat

The lek itself and associated nesting habitat is categorized as essential and irreplaceable habitat. The interrelationships between the vegetal characteristics of a given area, female nest site selection, and movement patterns of the population that drive males to establish a lek in areas of female use is spatially and temporally dynamic and has yet to be successfully recreated (ODFW correspondence 2008). However, focusing solely on the lek location and a certain buffer around the lek does not always adequately represent those areas that are crucial to the long term survival of particular populations, especially those that are migratory. Several telemetry monitoring efforts, particularly in eastern Nevada, have shown that females will move up in elevation from the lek sites to more mesic habitats to both nest and raise their broods. These habitats should also be considered as Category 1 habitats that are essential and irreplaceable. Category 1 habitat often corresponds to the R-0 habitat definition (see definitions above).

Category 2 – Important Habitat

Suitable and diverse winter habitats and high quality brood rearing habitats are critical to the long-term persistence of sage-grouse populations. Winter habitats are very important to sage-grouse due in large part to their complete dependence on sagebrush during the late fall and winter months (Connelly et al. 2000). Depending on the year and the snowpack in a given area, winter habitats elevate in importance as snow accumulations rise. Because of the loss of sagebrush in Nevada over the last decade (approximately 2.6 million acres or 12% of available sage-grouse habitat), winter habitat is at a premium and depending on the particular PMU, could actually be considered essential and irreplaceable. Considering this further, the loss of Wyoming big sagebrush over the last decade coupled with the long recovery period of 50-120 years (Baker 2006) for this species, a "no net loss" or "net increase" policy should be adopted for this seasonal habitat. In Nevada, winter habitats are essentially comprised of mountain big sagebrush, Wyoming big sagebrush and/or low sagebrush communities. Plants within these communities are usually taller than at random sites (Connelly 1982, Schoenberg 1982). Also,

sagebrush canopy cover is typically greater than 20% at wintering sites (Hanf et al. 1994, Eng and Schladweiler 1972, Homer et al. 1993). High quality winter habitat may correspond to the R-2 habitat definition, but there are situations where important winter habitats could be nested within R-0 habitats as well.

Brood rearing habitats are also a very important component of sage-grouse habitats. A mosaic of upland sagebrush vegetation intermixed with mountain meadows and spring systems compose brood rearing habitat. These habitat types are fairly limited in Nevada because of the dry climate exhibited throughout the majority of the Great Basin. These habitats have been impacted by improper livestock grazing practices (whether prior or current), overutilization by wild horses, and pinyon and juniper encroachment. Due to past and current perturbations to these habitat types, a "no net loss" or "net benefit" policy should be adopted for this seasonal habitat type. In theory, high quality brood rearing habitat corresponds best to the R-0 habitat definition; however, there are instances where high quality brood rearing habitat could be nested within R-1 and R-2 habitat definitions.

Category 3 – Habitat of Moderate Importance

These habitats are those that are not meeting their full potential due to any number of factors, but serve some benefit to sage-grouse populations. These habitats can serve as nesting, brood rearing, winter or transitional habitat, but are marginal. For the short-term, these habitats may only be of limited value on a seasonal basis, but could serve additional long-term values if certain habitat components (most importantly sagebrush) return to the site.

Habitats within this Category could correspond to R-1, R-2 or R-3 habitat definitions. R-1 habitats generally tend to be upper elevation sagebrush habitats, normally mountain big sagebrush communities that have recently burned. These areas are likely to return to a mountain big sagebrush community within 35-100 years (Baker 2006) and would then serve greater value to sage-grouse, but presently may only be of marginal value during the brood rearing period for example. R-2 habitats with ample sagebrush, but little understory exist at various elevation and topography types. These areas can often be treated with passive management techniques, which are recommended in xeric sagebrush communities that receive ≤12" of precipitation. Pinyon and juniper encroached sagebrush habitats, or R-3 habitats that have not crossed a threshold, may be of value to sage-grouse depending on the level of encroachment. These areas can be restored through a number of treatment techniques such as hand thinning, mechanical treatment using equipment or prescribed fire and certainly be of future value.

Category 4 – Low Value Habitat and Transitional Range

Habitats within this category currently contribute very little value to sage-grouse other than transitional range from one seasonal habitat to another or minimal foraging use. Habitats within this category that correspond to R-3 habitat definitions have not completely crossed a threshold where restoration efforts would be ineffective, but would be very expensive with secondary work needed to recover the understory. The cost/benefit ratio is too high to apply recovery efforts at this time. Similarly, habitats that correspond to the R-4 habitat definition may not have necessarily crossed the restoration threshold, but restoration would be very expensive and also require secondary or tertiary treatments to control invasive plant species post treatment.

Category 5 – Unsuitable Habitat

This category, in essence, represents non-habitat at this time unless greater strides are made with respect to restoration techniques. In general, habitat is in such poor condition that restoration efforts would not be feasible or effective. Non-habitat can either be designated non-habitat areas delineated within seasonal distribution maps or areas that have undergone substantial change and are not likely to recover. These areas could be lower elevation sagebrush habitats that have burned and are now annual grasslands dominated by various invasive weeds. Areas such as these are not likely to recover without substantial effort and expense. Other examples of habitat alteration that could render an area to be considered "non-habitat" include agricultural conversion, or cultivation, and urban/suburban development. Category 5 habitat could correspond to the R-3 or R-4 habitat definitions. These areas have little potential to produce sagebrush plant communities and are currently dominated by pinyon/juniper woodlands or annual grasses and forbs.

Not Applicable – Non-habitat

The Not Applicable (N/A) category identifies areas of no consequence to sage-grouse, such as dense conifer stands, alpine cliffs and rock outcrops, playas, and human disturbances such as highways, gravel pits, mines, and populated places.

The final sage-grouse habitat categorization dataset was converted back into 100-meter raster format to reduce computational demand and improve performance. These 100-meter pixels become apparent when attempting to use the data at the local scale. For this reason the Sage-grouse Map should not be used for fine scale project design planning. The sage-grouse habitat categorization analysis was only performed for areas within the sage-grouse PMUs identified by the Governor's Sage-Grouse Conservation Team (2004). Ongoing efforts will include revisions to the habitat categorization every 3-5 years based upon updated PMU boundaries, continual sage-grouse survey and inventory work, conservation projects, human land-use development, and wildfire events.

KNOWN ISSUES

While every effort was made to produce an accurate map of sage-grouse habitat quality, the NDOW has identified the following known issues that may affect the use of this product:

- The R-3 category was not consistently applied to areas of pinyon/juniper encroachment vs. areas of true pinyon/juniper woodland. Therefore, R-3 landscape patches should be evaluated on a case by case basis to determine the true potential for meeting future sage-grouse needs.
- A key component of high quality sage-grouse habitat is the understory composition of sagebrush communities (Connelly et. al. 2000). The R-value mapping effort attempted to identify understory quality using the existing vegetation cover and the ecological site potential identified in the United States Department of Agriculture soil surveys. However, over the course of this project, it was determined the accuracy of the R-0 vs. R-2 classifications was variable. Further refinement of the Sage-grouse Map should include a more robust method for determining sagebrush understory composition and quality.
- Burned areas often dramatically alter the quality and composition of the landscape. The Sage-grouse Map used burned area perimeters provided by the BLM to categorize sage-grouse

habitat that had been affected by fire. It was assumed that fires affected burned areas uniformly within a given fire perimeter. No effort was made to account for the nuances of individual fire behavior and intensity. However, when categorizing burned areas, aerial photography, on-the-ground knowledge, time since burned, elevation, rehabilitation efforts, and other factors were considered. Furthermore, the BLM burned area dataset is not comprehensive and does not include fires on non-BLM managed lands (i.e. Humboldt-Toiyabe National Forest).

- Given the time constraints of providing the Sage-grouse Map to the public, the following areas were not categorized:
    - Steptoe-Cave PMU;
    - Nightingale PMU;
    - Sahwave 1 and 2 PMUs;
    - Limbo PMU;
    - Majuba 1, 2, 4, and 5 PMUs;
    - East Range PMU; and
    - Duck Valley Indian Reservation.

  These areas will be completed and available in subsequent versions of the Sage-grouse Map.

DISTRIBUTION

The NDOW Greater Sage-Grouse Habitat Categorization Map is available to the public through the Nevada Department of Wildlife's website at:

www.ndow.org/wild/conservation/sg

Comments to the Sage-grouse Map can be sent to:

sagegrouse@ndow.org

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White Paper on BLM and U.S. Forest Service
Preliminary Habitat Map

Greater Sage-Grouse Planning Strategy
The BLM and USFS National Greater Sage-Grouse Planning Strategy is a framework for identifying two categories of sage-grouse habitat: Preliminary Priority Habitat (PPH) and Preliminary General Habitat (PGH). Areas of PPH or PGH indicate where land-use changes could result in an expected negative impact to sage-grouse population health.

The Preliminary Habitat Map identifies PPH and PGH areas in Nevada. This map is a planning support tool that incorporates the best available data (lek observations, telemetry locations, survey and inventory reports, vegetation cover, soils information, and aerial photography) into a statewide preliminary spatial view of greater sage-grouse habitat. This tool provides resource managers with broad-scale information to guide conservation and land-use planning efforts in the context of greater sage-grouse management at the landscape scale (1:100,000). This map is not intended to be used to delineate sage-grouse habitat at the project-level scale. To apply these results to specific locations it is necessary to conduct a field investigation by a qualified biologist for the purpose of impact assessment.

This Preliminary Habitat Map was derived from the Nevada Department of Wildlife (NDOW) Sage-grouse Habitat Categorization data. The data were spatially intersected with Nevada Land Status data and lands managed by BLM and USFS were extracted from the results. The NDOW Category 1 – Essential/Irreplaceable Habitat and Category 2 -- Important Habitat were combined to create the PPH areas (bright pink). The NDOW Category 3 – Moderate Importance Habitat is shown as the PGH areas (blue). The NDOW Category 4 – Transitional Range, Category 5 – Unsuitable Habitat, and Non-Habitat areas are not shown. The habitat categorization analysis was performed only for areas within the sage-grouse population management units (PMUs) identified by the Governor's Sage-grouse Conservation Team (2002). It is noted that sage-grouse occur outside of the PMUs.

This map will provide information for the BLM and USFS greater sage-grouse planning process. It will be used in the development of alternatives to be considered in the NEPA EIS process to amend the agency Resource Management Plans and Forest Plans. The final PPH and PGH areas with resultant land use direction will be developed through this process. Therefore, this map is a starting point in the process and the boundaries of these areas are expected to change.

This Preliminary Habitat Map replaces the 75% Breeding Bird Density Map and provides the basis for application of the BLM's Greater sage-grouse interim guidance.

Preliminary Priority Habitat
In the context of the NDOW Greater Sage-Grouse Habitat Categorization Map, PPH consists of a combination of essential and irreplaceable (Category 1) and important (Category 2) habitats. These areas include breeding habitat (lek sites and nesting habitat), brood-rearing habitat, winter range, and important movement corridors. PPH primarily consists of sagebrush, but may also include riparian communities, perennial grasslands, agriculturally-developed land, and restored habitat, including recovering burned areas. The BLM and the USFS defines PPH as having the highest conservation value to maintaining sustainable sage-grouse populations.

Preliminary General Habitat
The NDOW Greater Sage-Grouse Habitat Categorization Map typically identifies PGH as habitat types of moderate importance (Category 3), however, PGH may also include areas of higher quality habitat that lacks bird survey and inventory data to support a priority habitat ranking. PGH provides some benefit to greater sage-grouse populations but, in many instances, lacks a key component, such as adequate shrub height or density or sufficient herbaceous understory, which prevents it from meeting its full ecological potential. PGH also may include areas recently burned that have not sufficiently recovered or sagebrush communities with pinyon-juniper encroachment. PGH has the potential to be reclassified as PPH if restoration efforts enhance the habitat quality or ongoing field efforts document sage-grouse use.

Input and Questions on the Preliminary Habitat Map

Questions on this map can be submitted through SageQuery@blm.gov.

Comments on this map for the planning effort scoping will be accepted until March 23, 2012 through sagewest@blm.gov. There will be an opportunity for additional public input during the comment period for the draft EIS.

BLM NV & USFS Greater Sage-Grouse Preliminary Habitat Map

- Download Geospatial Data

BLM NV & USFS Surface Management Greater Sage-Grouse Population Management Unit Map

Nevada Department of Wildlife Greater Sage-grouse Habitat Categorization Map:
http://www.ndow.org/wild/conservation/sg/index.shtm

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