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UNITED STATES DEPARTMENT OF THE INTERIOR
OFFICE OF HEARINGS AND APPEALS
BOARD OF LAND APPEALS

WESTERN WATERSHEDS PROJECT, CENTER FOR BIOLOGICAL DIVERSITY, and AMERICAN BIRD CONSERVANCY, Appellants, v. BUREAU OF LAND MANAGEMENT, Respondent.	IBLA No. _____ Appeal of the Decision Record, Finding of No Significant Impact, Environmental Assessment DOI-BLM-UT-W020-2017-0001-EA for the September 2017 Competitive Oil and Gas Lease Sale

DECLARATION OF AMY HAAK, Ph.D

I, Amy Haak, hereby declare as follows:

1. My name is Amy Haak and I reside in Boise, Idaho. This declaration is based on my personal knowledge and if called as a witness I would and could truthfully testify to the matters stated here.

Summary of Work Performed

2. I was asked to analyze the contribution of the Sheeprock Mountains landscape to the conservation of habitat diversity across the current range of the greater sage-grouse. The purpose of my analysis was to evaluate the change in greater sage-grouse habitat diversity from its historic to its current range and to characterize the habitat of the Sheeprock Mountains using the same factors.

Qualifications and Experience

3. I have over 30 years of professional experience in the application of geospatial technologies to environmental characterization and natural resource modeling. I hold a Bachelors of Arts degree in Geography from Dartmouth College (1980), a Master of Science degree in Geography (specializing in Land Management) from the University of Idaho (1984), and a PhD in Geography with an emphasis in Conservation Biology from the University of Idaho (2004).

4. Presently, I am the Executive Director of Conservation Geography, a non-profit corporation that provides analytical support to non-profit conservation organizations. In my capacity with Conservation Geography, I have provided expert assistance and testimony in several sage-grouse litigation matters before the U.S. District Court for the District of Idaho, and I am familiar with sage-grouse science and literature.

5. I also served as the assistant director of Trout Unlimited's National Science Program for over a decade. Working in this capacity I developed analytical methodologies to support native trout conservation based on the founding principles of conservation biology: Representation, Resilience, and Redundancy – the 3-Rs. I gave numerous presentations on this methodology, provided training to inter-agency work groups, and published peer-reviewed

articles on the approach (Haak and Williams 2013; Haak and Williams 2012; Haak et al. 2010; Williams and Haak 2010).

Scientific Foundation of Analysis

6. The analysis I present in this declaration is founded in the principles of conservation biology as they pertain to the preservation of biodiversity. Specifically, I draw on portfolio theory and the 3-R framework as described below.

Portfolio Theory and the 3-R Framework

7. One of the basic tenets of conservation biology is that biological diversity provides stability (Primack 2002). Biologically rich systems can more easily withstand disturbance and swings in environmental conditions that would destabilize communities dominated by few species or species dominated by only a few small populations. The ability of diverse natural systems to maintain their function and productivity in the face of rapid environmental change has been termed the 'portfolio effect', a concept analogous to the desire among financial managers to maintain a diverse economic portfolio as a hedge on uncertain futures (Figge 2004). A diversified portfolio seeks to optimize the mix of assets associated with different risk classes in order to provide a hedge against catastrophic conditions. To characterize the diversity within a conservation portfolio, I use the 3-R framework.

8. The 3-R framework provides a structure to describe levels of diversity for a conservation element such as a species or its habitat. The elements of the 3-R framework are described as follows:

- Representation – retention of each unique element of diversity (e.g. genetics, life history traits, geographic diversity) across the environmental gradients of a

species' range in order to conserve the adaptive capabilities of a species or its habitat.

- Resilience – the ability of a species or its habitat to recover from disturbances. This typically equates to the size of populations or extent of the habitat with large unfragmented populations and habitats being the most resilient.
- Redundancy – multiple geographically dispersed populations and habitats so that one can be lost without jeopardizing the whole. This is the safety net that provides a hedge against the loss of any single population or habitat.

9. The 3-R framework has been recognized and adopted by the U.S. Fish and Wildlife Service in developing recovery plans for threatened and endangered species (Carroll et al. 2006), and in assessing greater sage-grouse conservation measures, as discussed below.

The 3-R Framework and Greater Sage-grouse

10. In 2013, the U.S. Fish and Wildlife Service released a peer-reviewed report of its Conservation Objectives Team (COT) that describes range-wide conservation objectives for greater sage-grouse, which itself employs the 3-R approach. The COT Report is recognized by federal agencies as best available science on sage-grouse conservation, and it identified Priority Areas for Conservation (PACs) that form the basis for BLM's establishing of Priority Habitat Management Areas in Utah and other states as part of the federal land use plan amendments in 2015. These PACs include the Sheeprocks PAC in central Utah, at issue here.

11. Section 4 of the COT Report describes their Conservation Framework stating: "We used three parameters – population and habitat **representation, redundancy, and resilience** … as guiding concepts in developing our conservation goal, priority areas for

conservation, conservation objectives, and measures.' (U.S. Fish and Wildlife Service 2013, p. 12) (emphasis added).

11. Of particular relevance to my analysis is the COT Report's application of the 3-Rs to habitat (as well as populations) and the emphasis placed on "*conserving well distributed sage-grouse populations across* ***geographic and ecological gradients***' (*Id.,* p. 12) (emphasis added). This underscores the importance of preserving unique habitats beyond the core areas in order to preserve the adaptive capacity of the species across its range.

Data Analysis and Results

12. Given the temporal and spatial variability in the delineation of discrete sage-grouse populations, I used a habitat-based approach to characterize the range-wide conservation portfolio. This is consistent with management objectives that emphasize habitat preservation as a long-term conservation strategy rather than population counts due to the annual population fluctuations that can occur.

13. There is no exact quantitative measure for a balanced portfolio, rather it is evaluated along a continuum from historical levels of diversity to current or future conditions that have lost the ecological, morphological, genetic, or behavioral diversity that enabled the species or ecosystem to evolve and persist. My analysis compares habitat diversity across the historical range of sage-grouse to the current distribution to identify those elements of historical habitat diversity that have been lost or disproportionately diminished relative to other elements.

14. Within the 3-R framework, my focus for these analyses was on Representation and Redundancy – given the small size of the Sheeprock Mountains PAC I determined at the outset that it would not contribute to Resilience within a range-wide conservation portfolio.

I conducted my analysis as an iterative process: first was a range-wide perspective using the coarser Level III ecoregions and elevation followed by a more detailed evaluation of habitat within the Sheeprock Mountains PAC using Level IV ecoregions.

Data Compilation

15. My analysis combines spatial data on the historical and current distribution of sage-grouse habitat with spatial data on habitat characteristics. For the historical range I used data developed by Schroeder et al. (2004) that was obtained digitally through the U.S. Geological Survey's Sagemap website. Given the variability in spatial resolution that exists between states in defining sage-grouse habitat, I relied on the PACs developed by the Conservation Objectives Team as a consistent range-wide representation of current sage-grouse habitat. I recognize that PACs do not represent populations or even the entirety of current sage-grouse habitat. However, they are indicative of the most significant areas for sage-grouse conservation and thus suitable for this analysis which is habitat-based.

16. My analysis relies on the integration of biotic and abiotic factors that represent the habitat potential across environmental gradients. Specifically, I used Ecoregions as developed by the U.S. Environmental Protection Agency, which describe areas where ecosystems are generally similar. They are developed through the integration of factors such as geology, landforms, soils, vegetation, climate, land use, wildlife, and hydrology. They are frequently used by federal and state agencies for structuring ecosystem management strategies. They have been developed in hierarchical levels ranging from general regions (i.e. Level I with 12 ecoregions in the continental U.S.) to more detailed regions (i.e. Level IV with 967 ecoregions in the continental U.S.). My analysis uses Level III and Level IV.

Level III Ecoregions and Elevation

18. I 'clipped' the Level III ecoregions and a digital elevation model (DEM) to both the historic range and the PACs. Figure 1 (below) and Table 1 (next page) show the portions of the 13 ecoregions which are found across the historical sage-grouse range. The PACs are also shown as an overlay in a stipple pattern and I have outlined the Sheeprocks Mountain PAC in Figure 1.

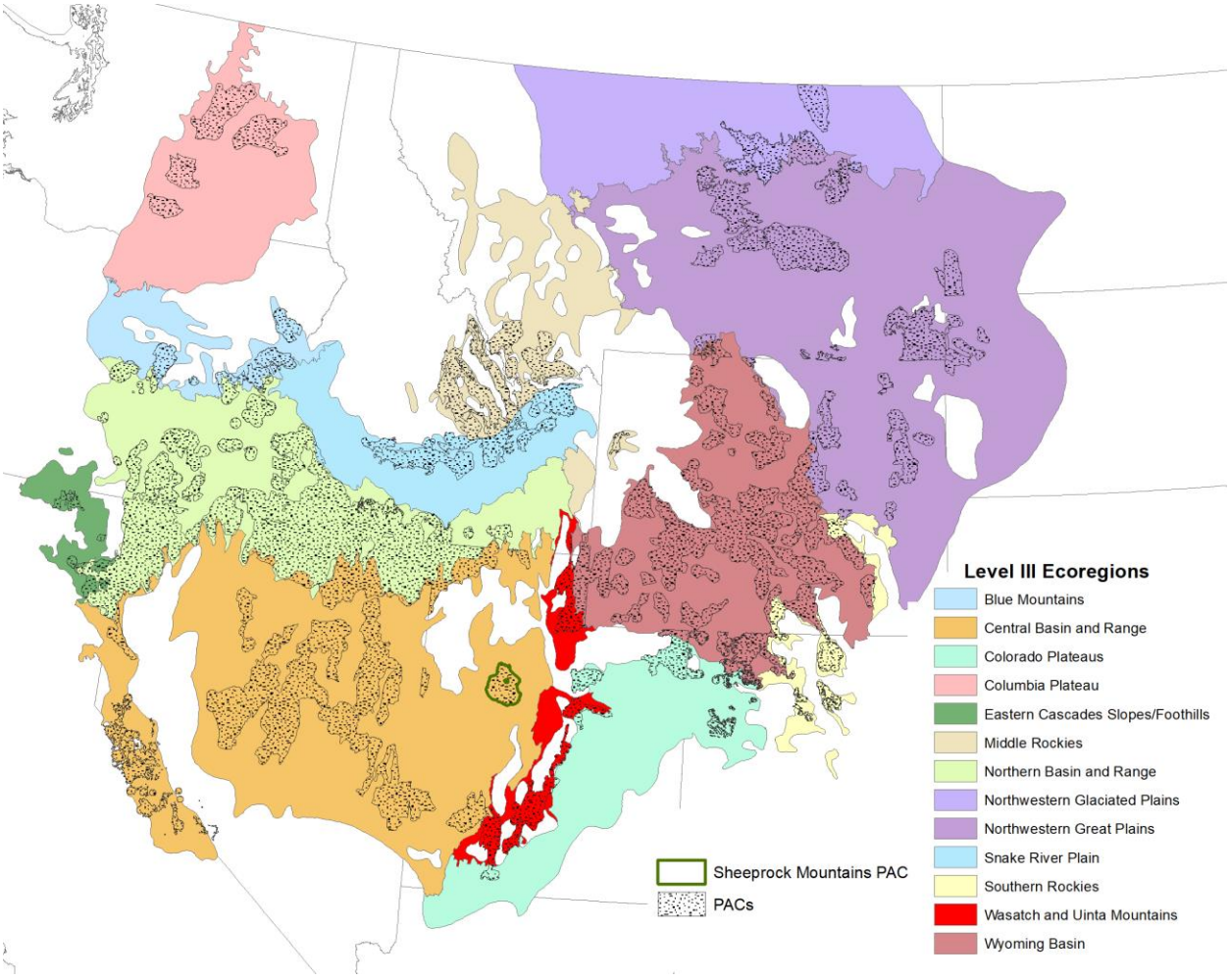

Figure 1. Level III Ecoregions across the historical range of the greater sage-grouse. The PACs are shown in a stipple pattern and the Sheeprock Mountains PAC is outlined.

Range-wide Analysis		
Level III Ecoregions	**Historic Range (% Total)**	**PACs (% Total)**
Blue Mountains	2%	2%
Central Basin and Range	19%	20%
Colorado Plateaus	6%	2%
Columbia Plateau	6%	3%
Eastern Cascades Slopes and Foothills	1%	1%
Middle Rockies	5%	5%
Northern Basin and Range	11%	24%
Northwestern Glaciated plains	8%	2%
Northwestern Great Plains	23%	12%
Snake River Plain	4%	4%
Southern Rockies	1%	2%
Wasatch and Uinta Mountains	2%	3%
Wyoming Basin	11%	19%

Table 1. Representation of level III ecoregions within the historical range compared to PACs.

19. I also included elevation ranges as an additional habitat characteristic to further refine my analysis based on the Level III ecoregions. Given the size of the Level III ecoregions, elevation provides further refinement to the characterization of habitat diversity within the ecoregions. Table 2 (below) and Figure 2 (next page) display the elevation zones generated from the DEM.

Range-wide Analysis		
Elevation Zones (feet)	**Historic Range (Prct Total)**	**PACs (Prct Total)**
Less than 1500	3%	1%
1500 – 3000	22%	12%
3000 - 4500	27%	14%
4500 - 6000	30%	42%
6000 - 7500	16%	28%
Greater than 7500	2%	3%

Table 2. Representation of elevation zones within the historical range compared to PACs.

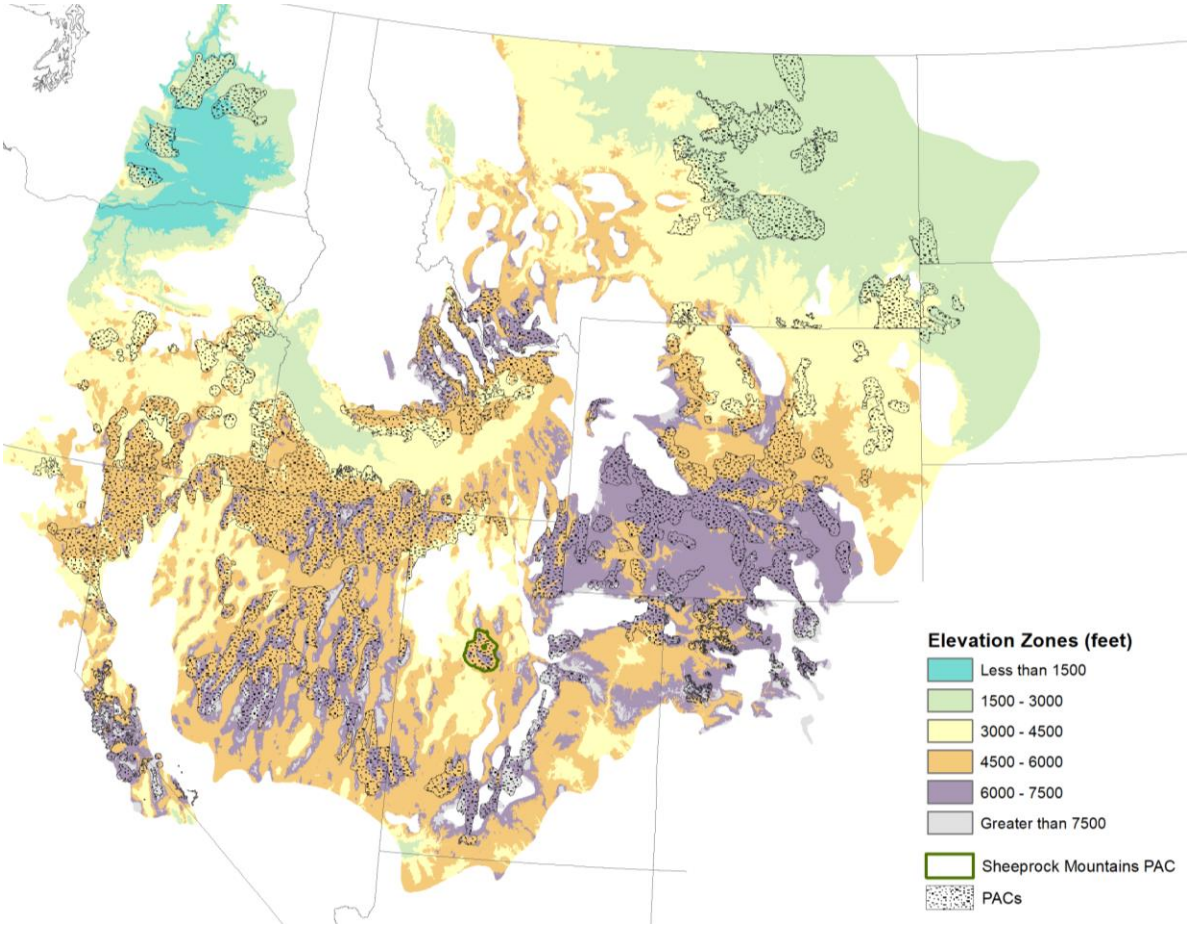

Figure 2. Elevation zones across the historical range of the greater sage-grouse. The PACs are shown in a stipple pattern and the Sheeprock Mountains PAC is outlined.

19. All of the Level III ecoregions are represented within the PACs. However, the distribution has shifted with the Wyoming Range and Northern Basin and Range showing an increase in the overall composition (combined 33% of the PACs verses 22% historically) while the Northwestern Great Plains and Glaciated Plains have shown a significant decline (combined 14% of the PACs verses 31% historically). Given the scale of the Level III ecoregions, it is likely that unique habitats within the larger ecoregion are no longer represented within the PACs, particularly in those ecoregions that have experienced the greatest reduction.

20. The elevation zones show a similar change in composition between the historical range and PACs with the lower elevations comprising a smaller portion of the PACs than was found within the historical range. Historically 4500 feet represented an approximate mid-point in elevation across the range with 52% below 4500 feet and 48% above. In contrast, 73% of the PACs are above 4500 feet with just 27% below.

Sheeprock Mountains Analysis

21. The Sheeprock Mountains PAC is within the Central Basin and Range Ecoregion. This ecoregion comprised 19% of the historical sage-grouse range and thus was an important part of the core populations. It continues to be well represented as it comprises 20% of the PACs. However, given the very large area it encompasses and the location of the Sheeprock Mountains PAC in the northeastern corner of the ecoregion, I conducted a finer-scaled review of habitat types using the more detailed Level IV ecoregions.

22. There are 24 Level IV ecoregions that comprise the historical habitat within the Central Basin and Range, and 7 PACs are found within the region – six are completely contained within it and one straddles the border with the Northern Basin and Range. I completed the same calculation of habitat composition as done previously for the Level III ecoregions and elevation zones. The results are shown in Table 3 (next page). I highlighted the two habitat types that have experienced the most significant decrease from the historical range to the PACs: Sagebrush Basins and Slopes, and Shadscale-Dominated Saline Basins. Together these two habitats comprised 23% of the historical range whereas they currently make up just 12% of the PACs within the Central Basin and Range.

Central Basin and Range		
Level IV Ecoregion	**Historic Range (% Total)**	**PACs (% Total)**
Carbonate Sagebrush Valleys	10%	16%
Carbonate Woodland Zone	7%	9%
Central Nevada Bald Mountains	1%	3%
Central Nevada High Valleys	8%	16%
Central Nevada Mid-Slope Woodland and Brushland	4%	7%
High Elevation Carbonate Mountains	1%	1%
Lahontan and Tonopah Playas	1%	0%
Lahontan Sagebrush Slopes	4%	2%
Lahontan Salt Shrub Basin	4%	1%
Lahontan Uplands	1%	1%
Malad and Cache Valleys	1%	0%
Mid-Elevation Ruby Mountains	1%	1%
Moist Wasatch Front Footslopes	1%	0%
Sagebrush Basins and Slopes	11%	8%
Salt Deserts	2%	0%
Shadscale-Dominated Saline Basins	12%	4%
Sierra Nevada-Influenced High Elevation Mountains	1%	2%
Sierra Nevada-Influenced Ranges	3%	4%
Sierra Nevada-Influenced Semiarid Hills and Basins	3%	3%
Tonopah Basin	4%	0%
Tonopah Sagebrush Foothills	1%	0%
Upper Humboldt Plains	6%	12%
Upper Lahontan Basin	5%	1%
Woodland- and Shrub-Covered Low Mountains	7%	8%

Table 3. Level IV ecoregions within the Central Basin and Range. The habitats showing the greatest decrease in representation from the historical range to the PACs have been highlighted

23. Table 4 (next page) shows the composition of the level IV ecoregions within the Sheeprock Mountains PAC. The two under-represented habitat types within the Central Basin and Range comprise 48% of the PAC. The full extent of the three habitat types associated with the Sheeprock Mountains PAC within the Central Basin and Range is shown in Figure 3 (next page).

Sheeprock Mountains PAC	
Level IV Ecoregion	**%**
Sagebrush Basins and Slopes	44%
Shadscale-Dominated Saline Basins	4%
Woodland- and Shrub-Covered Low Mountains	52%

Table 4. Level IV ecoregions within the Sheeprock Mountains PAC.

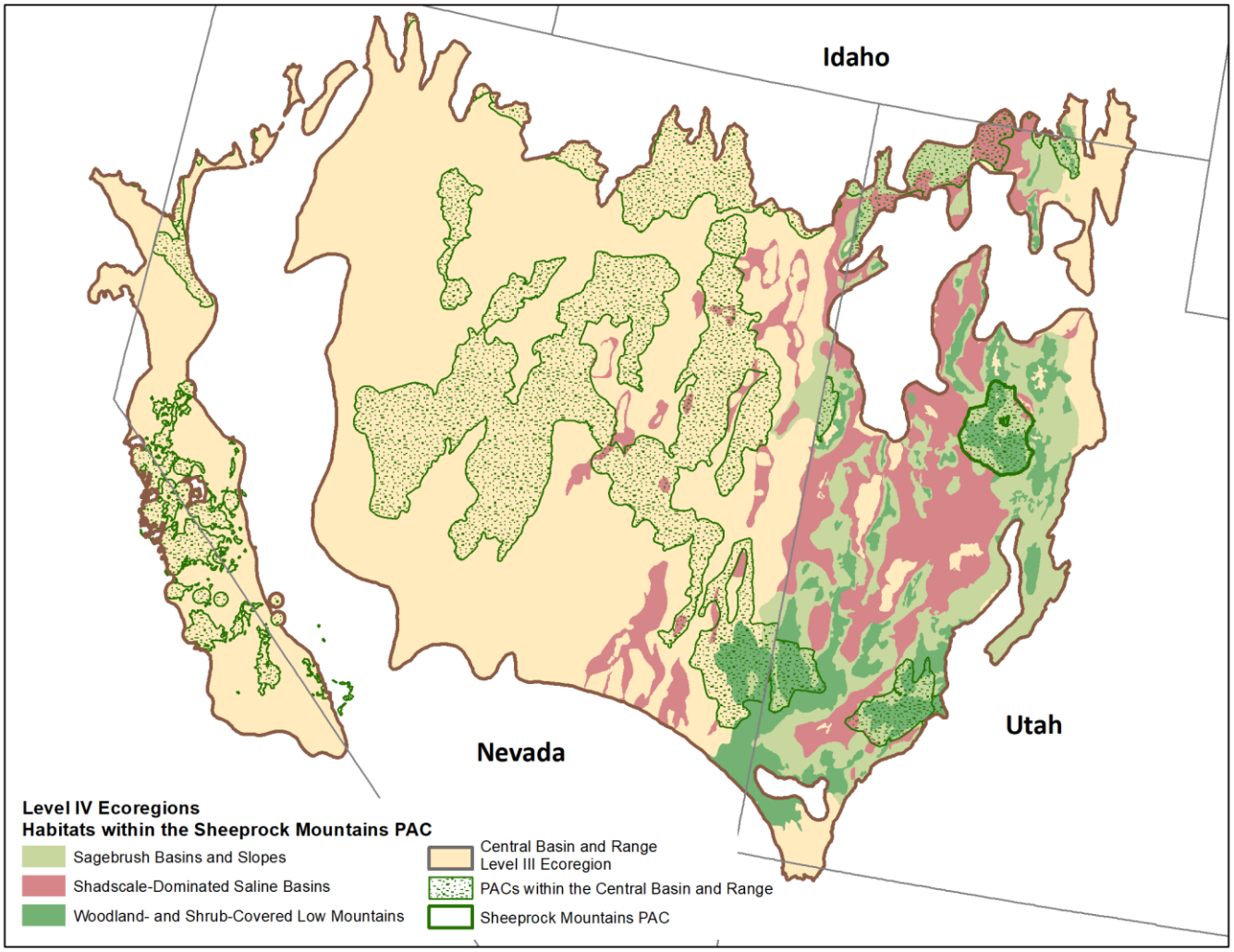

Figure 3. Distribution of level IV ecoregions associated with Sheeprock Mountains PAC.

24. I conducted a similar analysis of the elevation zones. Table 5 (below) provides the elevation distribution for the Central Basin and Range while Table 6 (below) shows the break-down for the Sheeprock Mountains PAC and Figure 4 (next page) hows the spatial distribution of the elevation zones. Although the Central Basin and Range is a relatively high region, the PACs represent an increase in habitats above 6000 feet when compared to historical levels – going from 24% historically to 40%. With only 20% of the Sheeprock Mountains PAC above 6000 feet, it contributes important lower elevation habitats to the overall diversity within the Central Basin and Range.

Central Basin and Range		
Elevation Zones (feet)	**Historic Range (% Total)**	**PACs (% Total)**
3000 - 4500	23%	5%
4500 - 6000	53%	55%
6000 - 7500	20%	33%
Greater than 7500	4%	7%

Table 5. Elevation zones within the Central Basin and Range.

Sheeprock Mountains PAC	
Elevation Zones (feet)	**%**
3000 – 4500	2%
4500 – 6000	79%
6000 - 7500	19%
Greater than 7500	1%

Table 6. Elevation zones within the Sheeprock Mountains PAC.

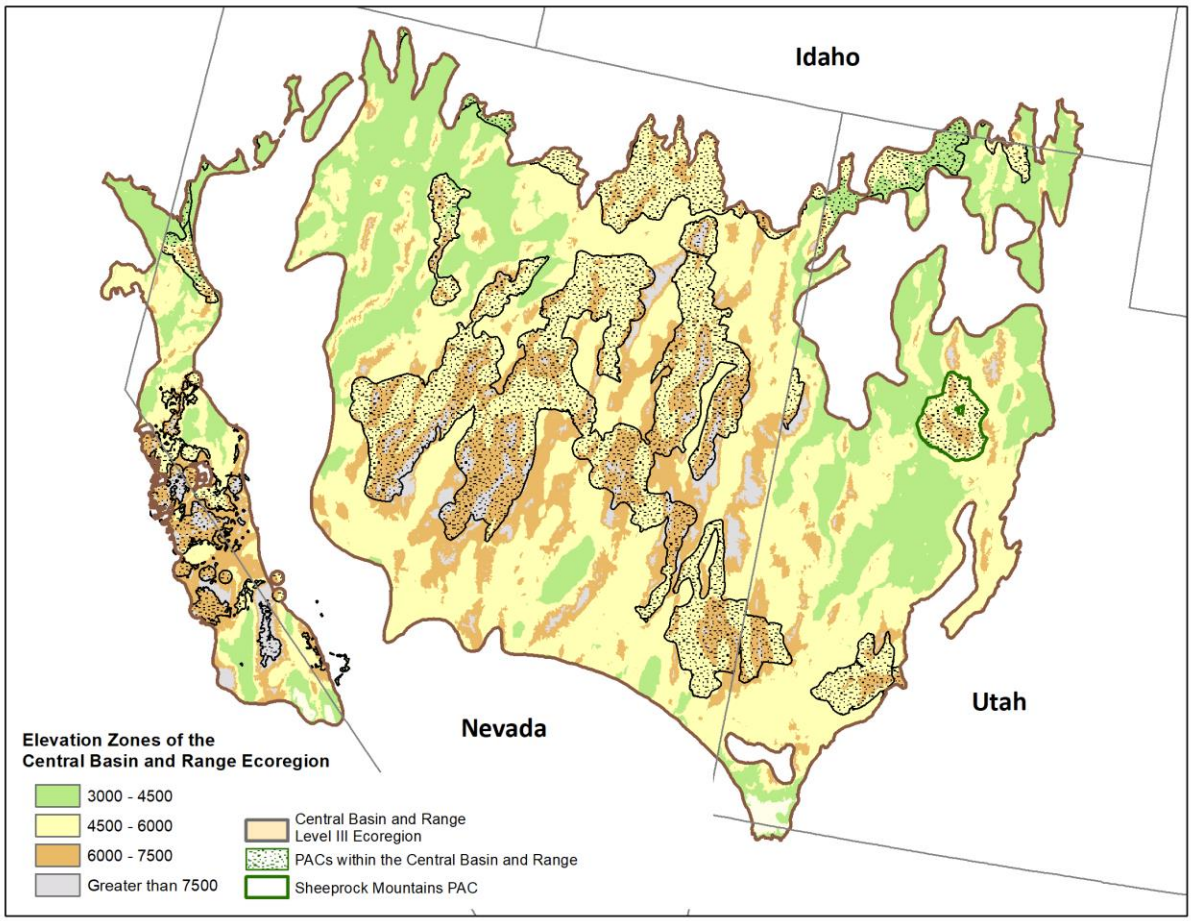

Figure 4. Distribution of elevation zones across the Central Basin and Range Ecoregion.

Summary

26. The preservation of biodiversity is critical to the long-term stability of ecosystems and populations. Biologically diverse natural systems are more resilient to rapid environmental change – this concept is explained through 'portfolio theory'. The diversity captured within a Conservation Portfolio can be evaluated using the 3-R framework (Representation, Resilience, and Redundancy). The COT report emphasizes the importance of preserving greater sage-grouse habitats that encompass the 3-Rs and are well distributed across environmental and geographic gradients.

27. My analysis of the Sheeprock Mountains PAC shows that it makes a significant contribution to the Representation and Redundancy portions of the overall Conservation Portfolio for the greater sage-grouse. The sagebrush basins and slopes and shadscale dominant saline basins within the PAC are representative of habitat types that were historically more prevalent but found to a lesser extent in the PACs. Preserving these habitats is important to maintaining adequate representation of historical habitat diversity within the Conservation Portfolio. The fact that these habitats occur at elevations below 6000 feet adds to their significance. Although there are three other PACs with similar habitat attributes, two of them are also relatively small and therefore vulnerable to disturbance events so maintaining Redundancy within the portfolio as a hedge against future losses is important.

I declare under penalty of perjury pursuant to the laws of the United States that the foregoing is true and correct. Executed this 19th day of October, 2017 at Boise, Idaho.

Amy Haak

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