STATEMENT
OF
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U.S. DEPARTMENT OF THE INTERIOR
BEFORE THE SENATE SUBCOMMITTEE ON PUBLIC LANDS AND FORESTS
REGARDING THE GREAT BASIN RESTORATION INITIATIVE

October 11, 2007

Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to appear here today to discuss the major threats to ecological and economic stability in the Great Basin and the Bureau of Land Management's efforts through the Great Basin Restoration Initiative to reduce these threats. My testimony will focus on the key threats of invasive species, especially cheatgrass, and wildfires. Climate change, including extended droughts, is expected to intensify these issues and also negatively affect water management in the Great Basin. I am the Coordinator for the Bureau of Land Management's Great Basin Restoration Initiative and am responsible for coordinating restoration-related activities across a five-state area for the Bureau of Land Management.

Background

The Great Basin is North America's largest desert, encompassing 135 million acres of land between the Rocky and Sierra Nevada Mountains in western North America. The manager of the largest land base in the Great Basin (includes parts of Nevada, Utah, Idaho, Oregon, and California) is the U.S. Department of the Interior's Bureau of Land Management (BLM) with oversight of 75 million acres of public land. The Great Basin is characterized by aridity (over half the area receives less than 12 inches annual precipitation) and a mix of shrubs [sagebrush (*Artemisia tridentata*) being the dominant], with an understory of native grasses and forbs. Today, population growth, wildfires, and invasive species are reducing the quality of native rangelands at an accelerating rate (BLM 2000). Based on recent studies by the U.S. Geological Survey and others, climate change could well be expected to accelerate these changes and associated impacts.

The Great Basin is a land of wide, historical fluctuations in climate both on a relatively short and long time frame. Extremes in precipitation (wet years followed by multi-year extreme droughts) and temperature challenge the management of livestock, wild horses and burros, and wildlife on public lands. Given this variability in climate, public land managers have flexibility in adjusting time and amount of forage consumption and water use to sustain land health over the long term. BLM managers evaluate these situations on a local basis and have the regulatory authority to remove livestock or wild horses during extended droughts when forage production or water sources are inadequate to sustain native vegetation. The challenge is to separate the natural climatic variation, especially extended droughts that have always existed in the Great Basin, from climate change, in order to modify and adapt management strategies to adjust to the changing environment.

<u>Factors Relating to Climate Change, Including Water, Invasive Species, and Wildfires in the Great Basin</u>

The impact of climate change on Great Basin ecosystems may be magnified compared to other ecosystems due to the aridity and lower resiliency of these lands. Rangelands in the Great Basin always are "on the edge" given the uncertain timing and quantity of precipitation, invasive species, altered fire regimes and increasing human population pressures.

Water

Water is the lifeblood of the Great Basin, given the low precipitation and high evapotranspiration (the sum of evaporation and plant transpiration from the earth's land surface to atmosphere) over the majority of the desert. Water is needed to support an increasing population (three of the ten fastest-growing metropolitan areas in the United States - Boise, ID, Reno, NV, and Las Vegas, NV - are in or on the edge of the Great Basin) while still meeting livestock, wildlife and fish needs. The predicted changes of a decline in snowpack, earlier peak spring streamflows, lower summer streamflows, and elevated stream temperatures could have dramatic effects on habitats and resources available to stream fishes (Isaak et al. 2007). Rainbow and brown trout are predicted to be restricted to higher elevations (Jager et al. 1999). The geographic distribution of the Lahontan cutthroat is projected to be reduced (Dunham et al. 1999) while the bull trout, currently listed under the Endangered Species Act as "threatened" with extinction in the northern portion of the Great Basin, could potentially face even greater risks as a result of climate change (Rieman et al. 1997).

Change in the timing and amount of streamflows and spring and seep discharges will affect a wide range of wildlife species, livestock, and wild horses and burros. Water availability from these sources could dry up earlier in the summer as a result of the early melt of the snowpack causing increased competition for water and forage across the landscape. Pipelines and troughs installed by BLM and livestock permittees that provide water for livestock, wild horses, and wildlife species over tens of millions of acres may have reduced capacity to meet these needs.

Climate change and the associated impacts on the timing and quantity of water available may exacerbate conflicts over water rights between agricultural and urban interests. Proposals to transport water from the Great Basin to Las Vegas are already a contentious issue and could affect important aspects of human occupation and the resource values in the Great Basin.

Native Plant Communities and Invasive Species

Invasive species are one of the greatest concerns of many managers in the Great Basin. A consortium of organizations led by The Nature Conservancy identified the Great Basin as the third most endangered ecosystem in the United States due in large part to the dominance of exotic species (Stein et al. 2000). Cheatgrass (*Bromus tectorum*) is an invasive exotic and the most ubiquitous invasive plant in the Great Basin, occupying over 25 million acres of public lands managed by BLM (BLM 2000). Besides being a serious competitor with native plants, cheatgrass is a significant contributor to the increase in frequency and size of wildfires in the Great Basin (Whisenant 1990). Cheatgrass is expected to respond even more favorably than most native plants to conditions with increased atmospheric CO_2 (Smith et al. 2000). One recent study hypothesized that the increase in rangeland wildfires is partially due to enhanced cheatgrass production stimulated by increasing CO_2 levels (Ziska et al. 2005). This study also found that cheatgrass will become more coarse (e.g., lignin content will increase) in the future which will reduce the time that it is palatable to livestock and wildlife and thereby result in the greater accumulation of fuel loads.

Managers are also concerned about the predicted increase in woody vegetation as a result of climate change. An increase in woodland encroachment into shrublands/grasslands, including a significant expansion of juniper into sagebrush steppe, is expected. One model predicts that much of the sagebrush in the southern Great Basin could eventually be replaced by Mojave Desert shrubs to the south due to projected higher temperatures and less frost in this portion of the Great Basin (Neilson et al. 2005). The increase in juniper trees will reduce palatable forage for livestock, habitat for wildlife, and protective understory vegetation resulting in more soil erosion. Loss of sagebrush will have significant impacts on wildlife species, especially sage-grouse and other sagebrush obligate species, which are dependent on this shrub-dominated ecosystem for food and shelter (Knick 1999).

Wildfires

Wildfires in the Great Basin are a subject of debate again as approximately 2.7 million Federal and non-Federal acres in the Great Basin burned during the 2007 fire season. Over the last 17 years, nearly 16.2 million Federal and non-Federal acres have burned in the Great Basin. Over 1.9 million acres of the total wildfire acres burned two or more times during this same period due, in large part, to increased fuel continuity as a result of the presence of annual grasses, including cheatgrass. (Whisenant 1990) Wildfires spread quickly across such landscapes. (Whisenant 1990) These figures do not include wildfires prior to 1990 so the acreage of reburned areas in the Great Basin is considerably larger. Fire suppression and rehabilitation costs, and private property losses could increase if the plant community changes projected for the Great Basin occur. Besides the increased cost to the American public, wildfire behavior could be more extreme, especially in areas where woody vegetation has increased fuel loads. Risks to fire fighters and the public may continue to rise as well.

More severe and frequent wildfires will increase with the invasion of exotic annual plants, such as cheatgrass, and with increased frequency of extreme wet/dry conditions. Wet conditions result in the increased spread of certain exotic annual grasses that then serve as a continuous fuel for wildfires during subsequent dry periods. In turn, these wildfires could further increase weed expansion, soil erosion, and carbon loss. As the exotic annual grasses become more abundant, the potential for fire increases, resulting in a positive feedback loop. Increased wildfires in shrublands in the Great Basin and conversion to cheatgrass dominance has now been documented to cause large scale conversion of rangeland carbon sinks to carbon sources (Bradley et al. 2006). Disruptions to livestock operations on public lands could be more common and habitat important to wildlife and wild horses and burros may continue to decline. It is not known how climate change, more generally, will impact the distribution of state or federal listed noxious weed species that currently cause great ecological and economic harm within the Great Basin.

Efforts to Address Environmental Threats and Climate Change in the Great Basin

Planning

The Great Basin Restoration Initiative (GBRI) has assisted in preparing some draft guidance to address potential effects of climate change in several Great Basin Land Use Plans. The Ely, Nevada, Resource Management Plan currently underway now includes a landscape approach to restoration which is closely tied to GBRI. GBRI promotes a strategy of maintaining intact native plant communities and strategically restoring degraded areas. This strategy is being used in other planning documents outside the Great Basin.

Climate change is addressed in the "2006 Conservation Plan for Greater Sage-Grouse in Idaho (http://fishandgame.idaho.gov/cms/hunt/grouse/conserve_plan/)" as it was ranked as the ninth of 19 threats to sage-grouse and sage-grouse habitat in Idaho. Twenty conservation measures (ranging from public education to planning restoration projects) were developed to help local sage-grouse working groups address climate change as they develop conservation strategies and local projects. More emphasis on climate change will be incorporated into land use and sage-grouse plans in the future with additional agency and Departmental guidance and GBRI technical assistance.

Science and Monitoring

A key component of GBRI is the application of science and monitoring to improve our ability to maintain healthy landscapes and strategically restore degraded areas. Consideration of potential effects of climate change are incorporated into these restoration strategies since treatments applied today will have to be applicable in the future to meet resource and social needs. For example, re-establishment of sagebrush in areas burned by wildfires is a high restoration priority. Sagebrush is very sensitive to the local climatic conditions. Since sagebrush has an expected life span of 50-100 years, it is imperative that appropriate seed sources be selected for current seeding projects to maximize the potential that the sagebrush will adapt to survive in an altered climate in the future.

One important strategy to increase the resiliency of Great Basin ecosystems to future disturbances and climate change is to either maintain or restore a diverse native plant community. Native plant diversity acts as an insurance policy against future changes by including a suite of species adapted to different environmental conditions. Loss of a few species, although not desirable, will not cause the system to crash. To improve the BLM's ability to restore degraded rangelands now and into the future, GBRI has sponsored a regional science and development project to increase the availability of native plants for restoration. This program, "Great Basin Native Plant Selection and Increase Project" was initiated in 1999 as part of the BLM's Native Plant Materials Development Initiative and has 17 state, federal, academic and seed industry cooperators today (http://www.fs.fed.us/rm/boise/research/shrub/greatbasin.shtml). Native seed have been collected from nearly 1,500 sites in the Great Basin providing the project cooperators with the ability to evaluate, select and augment production of native plant seed. Having such collections available for purchase in the future will provide managers with the needed plant materials to re-establish diverse native plant communities more resilient to the effects of a warmer climate with more erratic precipitation patterns.

Reducing the size and extent of wildfires is another component of GBRI's science program. GBRI is involved in the assessment of livestock grazing effects on fire spread and severity in the Murphy Complex fire. This wildfire burned nearly 650,000 acres in Idaho and Nevada this past summer. A team of fire and resource specialists is addressing this issue with rancher input, remote sensing, monitoring data, and fire models to determine how livestock grazing may be used in the future to reduce catastrophic wildfires. This is one of several projects in the Great Basin addressing livestock, fuels, and wildfires.

Monitoring the potential impacts of climate change on the flora and fauna on the 75 million acres of public land in the Great Basin requires a landscape approach. GBRI is participating with the USGS on the development of a "Great Basin Integrated Landscape Monitoring Pilot Project" that will assist managers to predict effects of climate change on stressors such as invasive species and wildfires at a landscape scale (http://fresc.usgs.gov/research/StudyDetail.asp?Study_ID=566). GBRI has also implemented a regional pilot project under the BLM Assessment, Inventory, and Monitoring Initiative project in the heart of the Great Basin in the Owhyee Uplands (http://web.id.blm.gov/owyheeuplands/). This project has been designed in part to provide baseline data at the landscape level to monitor plant community changes over time. This will improve the BLM's ability to detect plant community changes over time and to better distinguish climate change influences from other forms of disturbance. GBRI has partnered with The Nature Conservancy to co-fund a landscape ecologist to assist in this project.

BLM/GBRI is represented on the Executive Committee for the development of the Intermountain Regional Ecological Observatory Network (IRON), the Great Basin regional application to the National Science Foundation's National Ecological Observatory Network (NEON) (http://www.neon-iron.org/). NEON seeks to establish a continent-wide distribution of environmental monitoring infrastructure, including eddy flux towers, sensors for air, soil, and surface water temperatures, windspeed and direction, precipitation, and barometric pressure, photosynthetically active radiation, plant transpiration, and atmospheric composition (CO, CO_2, O_3, others). Measuring biological response to climate and climatic variation, including the spread of invasive species and infectious diseases, is central to this program. The IRON application seeks to install the monitoring infrastructure on BLM land in the Utah West Desert. IRON asks how ecosystems and their components will respond to changes in natural and human-induced climate across spatial and temporal scales and what system attributes best predict sensitivity to climatic factors. BLM scientists are participating in the design of experiments specific to land management in the Great Basin.

GBRI is representing the BLM in the development of the “Great Basin Research and Management Partnership” to improve communication and research to better meet manager needs across the Great Basin. Over 200 managers, scientists, non-government organizations and private citizens met in Reno, Nevada, in the winter of 2006 and identified climate change, invasive species, and wildfires as key challenges in the Great Basin where better linkages between scientists and managers would prove beneficial. GBRI is also an active participant in the development of the Great Basin Environmental Program, sponsored by University of Nevada Reno,

The BLM is an active participant in other research that has or is producing data and analysis with application in adaptation to climate change. These efforts include the National Center for Ecological Analysis and Synthesis Nevada Conservation Area Design, the Joint Fire Science-Funded Sagebrush Steppe Treatment Evaluation Project and the USDA-funded Integrating Weed Control and Restoration for Great Basin Rangelands.

Restoration Implementation

Restoring native vegetation where conversions to exotic annual grasses or noxious weeds have occurred will provide greater plant community stability under an environment influenced by climate change. In addition, carbon sequestration will be enhanced in native communities compared to annual grass communities that reburn at frequent intervals (Bradley et al. 2006). Nearly 25 million acres of public lands in the Great Basin have some cheatgrass as a component of the community (BLM 2000).

The Department of the Interior’s Healthy Lands Initiative (http://www.doi.gov/initiatives/healthylands.html) is providing support and funds to implement restoration projects at the landscape level with multiple partners. All of the projects implemented under this Initiative will promote the maintenance or restoration of healthy native plant communities with the increased ability to survive or adapt to anticipated changes in the environment in the future. Three of the six geographic areas receiving Healthy Lands Initiative funding are in the Great Basin which provides multiple opportunities to improve or maintain land health in this important landscape.

The increased focus on native seeds and seeding equipment improvement supported by GBRI will improve success and efficiency in the Emergency Stabilization and rehabilitation (ES&R) program. ES&R seeding treatments after wildfires will not result in the restoration of fully functioning native plant communities, however these treatments will start the process toward site stabilization and provide future opportunities for restoration to native or desired plant communities if a restoration funding is available.

GBRI will continue to serve as a focal point for the application of science and technology to successfully restore Great Basin rangelands. As the science and predictive ability of climate change models continues to evolve, GBRI will provide a basin-wide perspective on this issue to inform BLM managers of appropriate restoration strategies.

Summary

Based on studies by the U.S. Geological Survey and others, the Great Basin is experiencing climate change effects that are potentially expected to increase in the future and may increase impacts of invasive species and wildfires. Managers in the Great Basin are cognizant of some of these changes but the magnitude of the changes expected in the future probably exceed the capability of this fragile desert to adapt in full to the changes. However, the BLM has a long history of adapting to environmental variability, so mechanisms are in place to adjust management to accommodate for some of the projected changes. GBRI and the BLM will maintain a close watch on invasive species and climate change in the Great Basin and the science that U.S. Geological Survey and others provide. GBRI will continue to assist managers in the adaptation process by supporting the science and technology required to maintain or restore healthy plant communities.

This concludes my testimony. I would be happy to answer any questions you may have.

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