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GREAT BASIN THREATS

HEARING

BEFORE THE

SUBCOMMITTEE ON PUBLIC LANDS AND FORESTS

OF THE

COMMITTEE ON
ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

ONE HUNDRED TENTH CONGRESS

FIRST SESSION

TO

CONSIDER THE MAJOR ENVIRONMENTAL THREATS TO THE GREAT BASIN IN THE 21ST CENTURY

LAS VEGAS, NV, OCTOBER 11, 2007

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GREAT BASIN THREATS

THURSDAY, OCTOBER 11, 2007

U.S. SENATE,
SUBCOMMITTEE ON PUBLIC LANDS AND FORESTS,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Las Vegas, NV.

The subcommittee met, pursuant to notice, at 10 a.m., at Thomas & Mack Moot Court, William S. Boyd School of Law, University of Nevada, Las Vegas, Hon. Ron Wyden presiding.

OPENING STATEMENT OF HON. RON WYDEN, U.S. SENATOR FROM OREGON

Senator WYDEN. The Subcommittee on Public Lands and Forests, the Senate Committee on Energy and Natural Resources will come to order. This has been a busy year for our subcommittee.

We have spent considerable time, with strong support of the Senate majority leader, working to reauthorize Securing Rural Schools and the Community Self Determination Act, which is a lifeline for rural communities.

It would also include, as a result of the work of the Senate majority leader, major expansion of the health program, the payment in lieu of the taxes program, which we all know to be so important to westerners.

We've also spent a considerable amount of time working to protect wilderness in our special places, and when that legislation is enacted, it will be the biggest expansion of wilderness protection in many years. We've also spent a considerable amount of effort looking at how to reduce fire risks, particularly by thinning out hundreds of thousands of acres of choked, overstocked timber stands.

Today, at the request of the Senate majority leader, we are here to consider the major environmental threats to the Great Basin in the 21st Century.

These include invasive species, wildfire, drought and global warming.

The Great Basin is composed of most of Nevada and portions of Oregon, California, Utah and Idaho.

The Great Basin is a place where the combination of invasive species, wildfire, drought and global warming has created a vortex of ecological deterioration.

It's my view that our generation has a choice. Sit around and tolerate ecological collapse of a great ecosystem, or roll up our sleeves and go to work to protect the Basin's special way of life. To get started in that effort, we're fortunate to have the Senate majority leader here to lead us in that cause.

The Senate majority leader has been a good friend of mine for more than a quarter of a century, and he possesses a trait that we westerners value very much. When he says something you can count on it. He has made it clear to me that working to protect the Great Basin is a special priority of his, and I am glad to join him in this effort.

Now, before we call up our Senate majority leader I also want to say a big thanks to a number of those who have helped make this possible.

Today we have David Ashly, the president of the university, with us; and we welcome you, Mr. Ashly.

We have Dean John White of the law school, and I will tell you, Dean, I am a lawyer really in name only. Senator Reid, of course, is a very distinguished lawyer, but I've noted that your school is already one of the top schools in the country, and we commend you for it.

Mrs. Mack, I think you're going to get a more formal thank you from the Senate majority leader, but we are very grateful to you for your contribution to the State and the community, and I gather we're having somewhat of a christening out here today with this morning's Senate appeal hearing.

Our first panel of witnesses will include Mike Pellant, the coordinator for the Bureau of Land Management, Great Basin Restoration Initiative and Doctor Jayne Belnap, research ecologist with the US Geological Survey.

On the second panel we will have the Honorable Dan Nichols, County Commissioner for Harney County in Oregon.

We're thrilled to have Dan here. He always comes to my town meetings when I have them around the State, and he is a great advocate for rural communities.

Patricia Mulroy, general manager of the Southern Nevada Water Authority will be with us on the second panel, and Doctor Boyd Spratling, President of the Nevada Cattlemen's Association.

So let us go forward. We're going to have a busy day.

Our first witness will be the distinguished Senate majority leader, who has been involved in a host of major environmental causes.

I particularly appreciate his leadership and the effort to address global climate change, and it's my hope that the Senate majority leader, after making a statement, will come and join the panel for whatever time his schedule allows. Majority leader, welcome.

STATEMENT OF HON. HARRY REID, U.S. SENATOR FROM NEVADA

Senator REID. Mr. Chairman, thank you very much.

I must underscore the statement about our relationship.

We have served together in the House; of course, we now serve together in the Senate. Not only are you a member of this prestigious committee, but you're a member of the finance committee, and Ron is a man who doesn't take credit for the things that he does, so I'll give him a little credit for a number of things.

Ron is a real thinker. He came to the Congress having been an attorney for the great campus. One of the things he's done so well during his many years in Congress is make sure that people in their golden years are treated as if they were gold.

Also, he's one of the people that understand that legislation is a compromise, it takes a long time to get things done, and one of the hallmarks of Ron Wyden is that he has done a lot of things, and one of the things that he's now way out in front of everyone—I shouldn't say everyone that's here, but at least members sitting on the finance committee, where it will happen. He is on health care, he has a bipartisan piece of legislation that's receiving rave reviews around the country, and so, Ron, it's a pleasure to have you here. This committee is so important to our country.

This subcommittee is so important to the State of Nevada, we have a situation where we have 87 percent of the land is owned by the Federal Government. Forty percent of our land is restricted military air space, so the Federal Government is involved in virtually everything that we do, and so your holding this hearing today is extremely important.

I do want to also acknowledge Joyce Mack.

The Mack family, together with the Thomas family, have done—I don't know anyone that's comparable to having helped education as much as they.

In addition to their big hearts and giving parts of their personal fortune to education, they've been involved in many other things, and I think their story is a story of what America is all about. Both the Thomas and Mack families basically had nothing, and with the American dream they obtained something, but have given much of it away.

Joyce is here. She's a dear friend. I so miss her wonderful husband and his political advice, which he loved to give, and his favorite person in politics, at least from my perspective, was Scoop Jackson.

He was—Scoop Jackson, he knew Nevada as well as he knew every State except for the State of Washington where he came from, and one reason is because of the relationship that he had with Sherry Mack.

So thank you very much, Joyce, for being here.

The official title of this hearing is to consider the major environmental threats to the Great Basin and in the century we're now in, the 21st century.

The witnesses have been selected and requested to focus mainly on the dangerous impact of global warming, which is, as the chairman mentioned, increasing wildlife and species endangerment, drought, heat waves, and making water supplies scarce, and how these adverse impacts are changing life, and how adapting to them makes everything increasingly costly. We've not asked the witness to discuss solutions to the global warming. That will come at a later time in your committee.

We expect and hope that you will in your role at this hearing, provide testimony that will serve as a platform to show that renewable energy is a better path than the more conventional means that we've been using for so long.

It's certainly clear that wildfire, invasive species, Cheatgrass and drought are wreaking havoc on the Great Basin. Temperatures in the west have been steadily rising for the past fifty years, but very much so in the past decade.

A report from the world's best climatologists shows that summer temperatures in the west could increase by up to nine degrees by mid-century. Hotter temperatures will make the southwestern States even warmer and more arid, even when conditions are compared to those we're experiencing today. The warming will make droughts, I'm sorry to say, longer and more severe. Invasive plants like Cheatgrass thrive in the hotter and drier conditions that will come with climate change.

We're all dealing with them here. You're going to be hearing from a cowboy, a cattleman, a rancher this afternoon, this morning, I should say, and you will find that they're really concerned about what's happening. The combination of Cheatgrass and other invasive species, and what they're doing with respect to fire, is drastically changing the Basin's ecosystems. Wildfires affect the livelihood of ranchers and the safety of many, many Nevadans.

Since 1999, wildfires have burned more than a million acres of land habitat each year. In just this past summer we shared a devastating fire in the State of Oregon. It took several weeks to burn out. To stop global warming we have to attack the primary cause: Greenhouse gas emissions from burning fossil fuels. We have a moral obligation to current and future generations to do that. Burning dirty, polluting coal, using outdated technology is a way to make wildfires more intense and continue drying out the Southwest. I don't know how anybody could choose a path of more coal in Nevada when we're so close to a renewable energy revolution.

Nevada and other western States have tens of thousands of megawatts of geothermal, solar, wind, biomass potential reaches all over America, but especially here in Nevada, so we need to redevelop these new, clean resources, and we need to do it quickly. It's very important.

I reviewed, Mr. Chairman, statements by the witnesses who will come here today, and they, really, I think, lay this out so well. I do want to single out one of the witnesses, and that's Patricia Mulroy.

As I mentioned to you in the holding room that when history is written about Nevada, a good part of the history of modern times, it will be talking about Patricia Mulroy. We've had some real challenges here in Las Vegas with our growth and the scarcity of water and the allocation that Nevada was given out of the Colorado River.

Most of it was given to other States, but what she's done with conservation is so staggeringly important to what we may have been able to accomplish here. Not only has she done what she could with the water out of the Colorado, but—and in that has done remarkable things with water bank, people used to just talk about that she's actually done that, especially with the State of Arizona, but not only that, she's searching for other sources of water. Senator Ensign and I have worked closely with her to make sure we're going to be able to do everything legislatively that's necessary to accomplish that.

So I'm glad this hearing will explore and document the threats to the Great Basin which is critical to the people who live with these threats here because they're transforming the world around

us and are very costly in many dangerous ways, so I look forward to being here while you listen to these witnesses.

I say to everyone here, we have staff here from Washington, and Senator Wyden's staff—the purpose of these field hearings is to learn what's going on around the rest of the country and to take that information back to the subcommittee, and, of course, to the full committee, and ultimately Congress to see what can be done about the issues that are certainly brought up here in Las Vegas.

Thank you, Mr. Chairman.

Senator WYDEN. Mr. Majority Leader, I so appreciate your delivering this wake-up call, because by throwing the weight of your office behind this cause, and this involves, I think you folks know, this involves five States, it's not just Nevada, but it's Oregon, California, Utah and Idaho and I think we have had a chance now to mobilize at a critical time an effort to protect this resource.

So I so appreciate what you have done by bringing us here, by asking us to come to this field hearing, and I look forward to working with you as you lead the effort to protect the Basin.

I know you've got a tight schedule, with many demands on you, but I hope that you will be able to sit with the panel and ask whatever questions you wish of your constituents. Just now I not only appreciate your leadership, but our friendship over so many years.

Senator REID. Mr. Chairman, I appreciate your invitation to sit up here with you, but this is your subcommittee. I will sit here during the hearing and listen, and I would feel uncomfortable asking questions.

Senator WYDEN. If it's not breaking any kind of Senate procedure, we have had Senators sit with us, and whatever is your pleasure.

Senator REID. Mr. Chairman, I have four children that I brag about all of the time, four boys now. My youngest boy was an athlete, and he—as you know, I've told you many times, played on three national championship soccer teams at the University of Virginia. So his mother and I bought him a World Cup shirt. He wouldn't wear it because he wasn't part of the World Cup.

He went to the World Cup and he wouldn't wear that shirt because he wasn't playing a World Cup team.

So since I'm not part of this committee, I'm going to sit back here and partake of the witnesses.

Thank you very much.

Senator WYDEN. I thank you.

Let us call our first panel, then, Mike Pellant and Doctor Jayne Belnap.

Welcome to both of you, we'll make your prepared statements a part of the hearing record and I think if you can take 5 minutes or thereabouts to summarize your principal views and that would save some time for questions, and welcome. Thank you for your leadership.

Doctor Belnap.

STATEMENT OF JAYNE BELNAP, RESEARCH ECOLOGIST, GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

Ms. BELNAP. Good morning, Chairman Wyden.

Thank you for the opportunity to appear here today to discuss how climate change models can help us better understand the interaction between climate change and environmental threats facing the Great Basin and the Colorado Plateau Region.

I'm addressing both regions in my remarks as they share ecosystems, resources and future concerns including the Colorado River. Climate models are based on well-established physical principals to which are added approximations and physical processes at the appropriate scale for the models being constructed. Many factors go into these models which can be seen on the screen, which is why they are so complicated.

The most recent generation of global circulation models couple data from the atmosphere, oceans and land. The atmospheric data describes the transfer of heat, radiation and water vapor in the process of cloud development and precipitation. Oceanic factors include sea surface temperatures, sea ice and ocean currents.

Land factors include vegetative cover, soil type and moisture, water storage and weather precipitation in forms of snow or rain. Models continue to evolve as research identifies the new factors that influence climate, such as methane, nitrous oxide, dust, soot, terrestrial carbon sources and vegetation dynamics. There are three fundamental ways to change the radiation balance of the earth. One is to change the incoming solar radiation; second is to change how much is reflected by the cloud's atmospheric particles, and vegetation.

The third is to influence how much radiation escapes into space by altering greenhouse gas concentration. Humans can influence the latter too. So what do the climate models predict in this region, and what is their uncertainty?

The 21 global models in this specific region predict temperatures will increase by up to 6 degrees Centigrade or 11 degrees Fahrenheit by the end of the century. There's much less certainty in predicting future precipitation because there are so many factors that influence this variable.

The 21 models also predict a 5 to 10 percent increase in winter and up to 15 percent decline in summer precipitation. However, this is very important: Even if there's no change in precipitation the rising temperatures will mean greater evaporation rates, which will reduce soil moisture and water availability.

Model uncertainties arise from several factors, including clouds, atmospheric concentration of greenhouses gasses and the reflection of the earth's surface due to the cover of sea ice and vegetation.

We simply don't know what the concentrations of greenhouse gasses will be in the future.

Sea ice is very reflective and so the extent of it is covered is very important to climate models. However, the melt rates are still very unpredictable. Activities that reduce the vegetative cover for disturbed soil surface such as grazing, vehicles and fires are increasing in this region.

They also increase the earth's reflection and need to be included in these models. This creates higher, drier air rising off the earth surface that can reduce local and regional cloud formations and precipitation, which then results in less vegetation, which then results in less rain. Higher temperatures will reduce soil moisture,

which also reduces vegetative cover. Fire frequency and severity in size will likely increase as soils dry and make the vegetation more susceptible to insect infestation and death.

All of these changes will greatly increase reflection and thus decrease local precipitation. Downscaling from global to regional and local scale models will need to take into account these land use activities and their effects on climate. Drying soils and decreasing precipitation will also increase soil erosion, which will also affect the climate. As soils dry and vegetative cover is reduced and soil surface disturbance from fires increase, we can expect much greater rates of soil erosion than with wind and water loss.

The replacement of desert soils is a very slow process; the formation takes five thousand to ten thousand years. Eroded sites will experience reduced fertility, reducing the biomass and nutritive quality of the plants.

In addition, soil erosion decreases the water holding capacity of soil moisture and soil moisture is an important factor and in climate models. Winter erosion will be especially problematic in this region. Most desert soils are stable until disturbed, surprisingly. Burned areas can also be a large source of dust. Dust has more substantial and far-reaching impacts than most of us can imagine, including automobile accidents, severe health problems and large economic losses.

Perhaps most importantly for this group dust is deposited on the snowpack of the nearby mountains, causing the snow to melt up to thirty days earlier or more than usual, reducing the amount of late season water delivery.

Lake cores show that the current deposition rates are three to six times higher than before 1850, and as soils dry and are increasingly disturbed, dust deposition and the snow melts rates will increase. Dust from fire increases particulates in the atmosphere, and this will, again, influence future climate. However, the degree of this influence has yet to be quantified.

Last, the combination of increased temperatures and albedo and earlier snow melt will decrease water supplies, especially in the summer. USGS models predict a ten to forty percent decline in stream flow for this region.

Many small springs and streams will likely dry up, affecting the plants, wildlife, livestock and humans that depend on them. Earlier impacts to snow melt will likely impact ecosystems such as the Colorado River. Reduced surface water will reduce evaporation rates, which can influence, again, regional cloud formation and precipitation.

So what can science do to improve our understanding of the challenges that the climate change will present?

First, we really need to continue to improve our climate models, use scientific research to identify and quantify new and important parameters. We especially need to improve our ability to downscale from global models to scales pertinent to resource management decisions.

We need to identify, map and prioritize resources at risk. For example, we need to know what soils are susceptible to plant invasion and erosion; we need to know what areas are susceptible to

fire, which springs and streams are likely to dry up, what species in the habitat are at special risk.

We need science to help managers understand how they can alter the types, timing and intensity of land use to reduce soil movement and plant invasion from fire, and we need long-term research sites that are part of a extensive national scale, local monitoring program to document and forecast climate effects which will improve understanding of the mechanisms behind the changes that are observed.

Thank you very much for your attention I'll be delighted to answer questions.

[The prepared statement of Ms. Belnap follows:]

PREPARED STATEMENT OF JAYNE BELNAP, RESEARCH ECOLOGIST, GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to appear here today to discuss how climate change models can help us better understand the interaction between climate change and environmental threats in the Great Basin/Colorado Plateau region. Climate change is perhaps the most complex and multi-faceted challenge facing public land managers. Climate change affects biota, water, ecosystems, cultures, and economies. Although climate change is a natural, continuous Earth process, changes to the Earth's climate are related to human activities as well. Whether the causes are natural or from human influences, the U.S. Geological Survey (USGS) climate change focus is on understanding its impacts and the potential adaptive strategies for managing natural resources and ecosystems in the face of these changes.

CLIMATE CHANGE MODELING

The most recent generation of global climate models are called Atmospheric-Ocean Global Circulation Models (AOGCM) because the predictions from these models are based on data from the atmosphere, oceans, and land masses. Atmospheric data in the models describe transfers of heat, radiation, and water vapor, and the processes of cloud development and precipitation. Oceanic factors include sea surface temperatures, sea ice, and ocean currents. Land factors include vegetative cover, soil types, water storage and the type of water delivery (i.e., rain versus snow). As the name implies, AOGCM combines these factors to create global climate models.

There are many issues that create uncertainty in these models. The most problematic concern how clouds, sea ice cover, and atmospheric greenhouse gas concentrations affect climate. Clouds affect climate in many ways, including increasing or decreasing radiation, creating precipitation, and affecting small-scale circulation patterns. To illustrate the problem, clouds cover approximately 60 percent of the Earth's surface and are responsible for up to two thirds of Earth's albedo (reflectance of light from the surface—which is about 30 percent). A decrease in albedo by only 1 percent can increase temperatures by about 1°C. Secondly, the future extent of sea ice and snow fields, which have a large influence on the outcome of the models, is another unknown. As the concentrations of greenhouse gases rise and warm the Earth, snow and ice begin to melt. As the underlying ground or water is darker than the snow and ice, they absorb more heat from the Sun, causing more melting, which results in additional warming. This creates a feedback loop known as the 'ice-albedo feedback'. Lastly, the level of emissions (carbon dioxide and other greenhouse gases) that can be expected in the future is unknown. Detecting, understanding and accurately quantifying such feedbacks and emissions is extremely difficult, but the valuation of these factors can greatly alter climate predictions.

There are issues associated with downscaling of the AOGCM projections as well. Whereas we are fairly confident in global-scale drivers of climate, the effect of local factors are much less certain. There are two main approaches to downscaling. The first approach constructs an empirical relationship between a local factor (e.g., stream flow) and large scale atmospheric circulation model prediction of that factor. The second approach, dynamical downscaling, basically uses a weather prediction model to downscale AOGCM output to much higher resolutions. Both methods have their advantages and disadvantages. Empirical downscaling requires a long record of high quality data in order to build the required empirical relationships. For many parts of the United States, such records are lacking. For example, there are very few long-term climate station records in the Great Basin/Colorado Plateau region

that can be used to create or verify downscaled models. In addition, the paucity of climate stations means that climate information for a specific location can only be modeled (that is, data from a few stations are extrapolated over a larger area that has similar elevation, topography, etc.). Thus, data for the model is often coming from another model, increasing the risk of error.

The primary disadvantage of dynamical downscaling is the high computational cost. Both methods will give erroneous climate projections if the large-scale circulation provided by the AOGCMs is incorrect, as they provide the boundary conditions for the heat, water vapor, and pressure fields. As physical equations are then used to calculate what these fields are in higher resolution, any error in the large scale fields is propagated throughout the downscaled models.

USE OF MODELS IN UNDERSTANDING FUTURE CONDITIONS

It is not valid simply to extrapolate the observed past changes in climate change forward into the future. However, the demonstrated success of current climate models in simulating the global pattern of observed 20th century changes means that those models are credible, though far from perfect, tools for looking into the future. As discussed in more detail below, given the most realistic assumptions about future atmospheric carbon dioxide concentrations and other drivers of climate change, these models project a long-term drying trend in the Southwest, including the Great Basin. The drying trend in the Southwest implies an increasing probability of occurrence of Southwestern drought. These projections are, at best, a general outline of climate change for the real future. I note, however, that there is much room for improvement. For example:

- Climate models typically represent conditions over very large areas. Such an approach has been adequate to assess global warming. However, climate varies geographically on a much finer scale, especially in mountainous regions. Therefore, to assess practical impacts on water and to design, plan, and implement needed adaptations, resource managers and policymakers need information on a much finer spatial scale, more like that of a county. To deliver this, much-higher-resolution climate models are needed.
- The Nation has no comprehensive network for the monitoring of climate change. The available measurements, assembled from stations established for other purposes, such as stream gauges, have proven critical for the progress that has been made in detecting global change. However, keeping higher-resolution models accurate and tracking ongoing changes related to climate change impacts will require higher-resolution measurements.
- Current climate models do not capture the effects of development, land use, and land-cover change on climate. This has not been identified as a crucial impediment for global analyses, but it likely matters at the finer spatial scale of most resource management decision-making.
- A change in climate causes a change in water demand, e.g., for irrigation and for natural ecosystems. Our understanding of this relation between climate and water demand needs improvement if models are to be more effective in predicting the effects of climate change on future water needs.
- To make best use of available information in a changing climate, resource managers will need to employ a wider variety of science-based decision support tools than those that have sufficed in the past. These new tools must recognize that climate will change during the lifetime of an operational project and that estimates of the changing climate are uncertain. This will require a sea change in the field of resource management. Such a change will not be accomplished without a concerted effort by government, academia, and professional societies.

MODELING AND RESEARCH FINDINGS

The averaging of 21 climate models predicts that temperatures will increase by up to 6°C (11°F) in the Great Basin/Colorado Plateau region during the next century (Christensen et al., 2007). This is a large increase, and thus, it is likely to have profound effects on water resources and the living systems that depend on those resources. Atmospheric carbon dioxide and nitrogen levels are also likely to increase. There is much more uncertainty in predicting future precipitation than temperature. Precipitation predictions vary widely, depending on how the models are constructed. The Intergovernmental Panel on Climate Change averaged model predicts 5-10 percent increase in winter precipitation, 0-15 percent decline in summer precipitation, and 0-5 percent decline in annual precipitation (Christensen et al., 2007).

In addition, a review of these models shows that extreme events (e.g., drought, wet years, floods, high winds) will increase. These extreme events will cause significant challenges to the biological components of the Earth system in terms of their

ability to adapt or mitigate to other areas as a result of abruptly-changing climate (Christensen et al., 2007).

Land use activities (e.g., recreation, clearing for housing, grazing, cropland, military activities) are also increasing rapidly in this region and will further exacerbate the effects of climate change on biological resources. These activities enhance the invasion of exotic plants, reduce or remove vegetative cover, and destroy physical and biological soil crusts, leaving soils unprotected, reducing forage and habitat, and increasing the reflectance, or albedo, of the soil surface (Foley et al., 2005; Notaro et al., 2006).

INVASIVE SPECIES

With climate change and land use invasive plants, especially exotic annual grasses, will likely increase. Soil surface disturbance, elevated carbon dioxide levels, the deposition of atmospheric nitrogen, and increased fire will all contribute to a likely increase in exotic annual grasses such as cheatgrass (D'Antonio and Vitousek, 1992; Brooks et al., 2004). In an area such as the Great Basin/Colorado Plateau region, where exotic annual grasses have been replacing native perennial plant communities, this could have severe consequences, resulting in years where such landscapes will have little or no forage and habitat for wildlife and livestock, resulting in a severe loss of biodiversity. During this time, soils will also be highly vulnerable to erosion. In addition, annual grasses alter soil biota, decomposition rates, and nutrient cycling rates, resulting in lower soil fertility.

WILDLAND FIRE

Fire frequency and severity will also increase with the invasion of annual plants and future extreme wet/dry conditions. Re-burning of areas facilitates further annual plant invasion, which will lead to increased fire frequency (Brooks et al., 2004). Because most desert shrubs grow slowly and require extended periods without fire to re-establish, more frequent fire is particularly destructive in shrub-dominated desert systems such as those found in the Great Basin/Colorado Plateau region. With the loss of perennial vegetation, important microclimates are lost, including those that enhance the germination and establishment of native plants and habitat for native animals. Fire can also create hydrophobic soils that, when combined with loss of vegetation cover, allow for increase soil erosion, and can deplete the nutrient and carbon stocks in soils. Biota living at, or just beneath, the soil surface are often killed, slowing decomposition cycles and reducing soil nutrient availability.

SOIL MOISTURE

As temperatures rise, soil moisture will decrease. One study has shown that, by 2050, even if there is no decrease in precipitation, increasing temperatures alone will result in average soil moisture conditions being lower than those experienced during any of the mega-droughts of this century (Dust Bowl years of the 1930s; drought years 1953-1956 and 1999-2004; Andreadis and Lettenmaier, 2006). This will result in reduced plant cover and biomass, and thus, less forage and habitat for livestock and wildlife. Insect outbreaks are also often associated with lower soil moisture, as the resistance of vegetation to infestation is reduced as a result of this stress. The combination of dry soils and insect infestation have been known to kill thousands of square miles of vegetation (e.g., the 2002-2003 Ips beetle infection/infestation of Pinyon Pine in the Southwest United States), leaving the area highly susceptible to fire and subsequent invasion by weeds (Breshears et al., 2005).

Observations during dry periods of above average temperature have also shown that shallowly rooted plants, such as perennial grasses and cactus, will be highly vulnerable to future dry and hot conditions (Ehleringer et al. 1999; Breshears et al. 2005). Many animals at the base of the food chain (e.g., mice, rabbits) depend on grass and cactus for food and shelter; thus, a reduction in these species is expected to reverberate upward, resulting in the loss of predators such as raptors, mountain lions, and bears. Grass is also the main food for cattle and elk. Soil lichens, which add stability, carbon, and nitrogen to soils, also die with increased temperatures. Their loss will further contribute to a reduction in soil stability and fertility (Belnap et al., 2006).

Research by USGS and colleagues shows that increased warming could decrease runoff by up to 30 percent in many streams and rivers in the Great Basin/Colorado Plateau region (Milly et al., 2005). This includes water in the Colorado River, which currently supplies the needs of 25 million people in seven U.S. states, two Mexican states, and 34 Native American tribes (Pulwarty et al. 2005). As population grows, the demand for water will increase at the same time that water availability is decreasing due to climatic conditions (and soil erosion, see below). Small springs and

streams may dry up earlier in the season, or completely, placing plants, animals, and humans that depend on surface water at risk.

SOIL EROSION

Research by USGS and others shows that desert soils are mostly stable until disturbed (Marticorena et al., 1997; Belnap, 2003). However, the interaction of lower soil moisture, fire, exotic plant invasions, and surface-disturbing activities will reduce the cover of natural soil stabilizers (plants, physical and biological soil crusts, rocks) and result in greater soil erosion. Restabilization of these soils often depends on heavy precipitation events; thus soils will continue to erode during continued drought. As erosion differentially removes the fine particles in soils to which nutrients are attached and which increase water-holding capacity of the soil, the remaining soils are less fertile and dry more quickly. This will result in less plant biomass and thus less forage and habitat for wildlife and livestock. In addition, reduced soil fertility will likely result in a reduction in the nutritive quality of the plant tissue (Marschner, 1995). Thus, livestock and wildlife will need to eat more to meet their nutritional requirements.

Soils eroded by water increase the sediment load in streams and, ultimately, large rivers. These sediments are often heavily laden with salts and heavy metals, contributing to water-quality problems downstream. Soil deposition into small springs and streams can be especially problematic, as the amount of water present is so low the resource can be completely lost.

DUST STORMS

One largely overlooked issue regarding soil erosion by wind is that it can produce dust storms that can have profound and lasting effects. Dust obscures visibility on highways and thus endangers travelers. If inhaled, the fine particles found in dust can cause asthma and other respiratory disease. Dust can carry Valley Fever, which can be fatal (Kirkland and Fierer, 1996). Dust storms can cause large economic losses through lost work time and ruined machinery. Blowing sediment can bury plants and eliminate habitat and forage. Dust also affects water storage and delivery. When dark-colored dust is deposited on the snowpack of downwind mountains and absorbs solar radiation, the underlying snowpack melts 30 days or more earlier than normal (Painter et al., 2006). Earlier melting reduces water storage in the snowpack, thereby reducing the amount of water that is available in streams and rivers during late summer. A faster melting rate may also increase spring flooding, reducing the opportunity to store water in those downstream reservoirs (Parker, 2000).

INCREASED ALBEDOS

The loss of vegetation turns the Earth's surface from a dark color to a light color. Thus, the energy from the sunlight hitting a lightened surface is reflected upwards, rather than being absorbed by dark vegetative surface. In addition, the surface is smoothed and moisture evaporated from plants is lacking. The resultant rising hot and dry air reduces cloud formation, thus reducing subsequent precipitation. The result can be dramatic. Areas with reduced vegetative cover receive less precipitation than adjacent land covered by vegetation (Charney et al., 1975). Therefore, as land use, drought, fire, or a combination of these factors results in reduced vegetative cover, we can expect a reduction in precipitation as well (Foley et al., 2005; Notaro et al., 2006). This often creates a feedback loop, where drought reduces vegetative cover which increases albedo; this increase, in turn, increases the severity of the drought, which further reduces vegetative cover. This problem is especially severe where native perennial plants have been replaced by annual grasses. Under drought conditions, soils in these areas often completely lack vegetative cover, and thus albedos are greatly increased.

PLANT RE-ESTABLISHMENT

Because plant recovery depends on soil moisture availability, lower soil moisture will slow or prevent the recovery of plants and soils from fire or surface-disturbing activities. The presence of invasive annual grasses will often prevent the re-establishment of native vegetation by facilitating frequent fires, killing the native plants (Brooks et al., 2004). Almost all the research done on restoring drylands has occurred during the past 30 years, which was a relatively wet period. Thus, many of the restoration techniques that have been developed may not work under anticipated future dry conditions. Additional research will be needed to determine restoration techniques under dry conditions.

Natural and human-caused disturbances have interacted over the past several decades to change rangelands and ecosystems across as much as one half of the Great Basin's one hundred million acres (McIver et al., 2004). Protracted drought coupled with invasive species, altered fire regimes, grazing, human settlement and recreation, and energy exploration and development have yielded suites of vegetation that often cannot support wildlife species. Increasing annual temperature and decreasing precipitation regimes have exacerbated these ecological changes, and climate change will continue to interact with plant and animal dynamics on dry lands.

CONCLUSION

To better understand the interaction between climate change and these environmental threats, and to provide the science needed by resource managers and decision makers, the USGS is working to:

- understand how climate change, and the interaction among climate, land use, invasive plants, and fire, will impact ecosystem processes, soil stability and fertility, plants, wildlife, and humans at the local and regional scale.; document past climate, land use, land cover, and disturbance regimes (e.g., fire, extreme climate events); expand existing, long-term monitoring of climate, air, and water quality (including wind and water borne sediments), soils, ecosystem processes, vegetation, animals, and land use/land cover; and simulate future conditions with experimental research techniques and modeling;
- document how the interactions between hydrology, climate, land use, and vegetation affect soil movement; identify and map soils vulnerable to invasion and erosion, and identify where eroded soils are deposited; research ways to alter the type, timing, and intensity of land use to reduce soil movement; measure the effects of dust on water storage (in soils, ground water, aquifers, and snowpack), delivery (timing, intensity, and duration), and quality (salinity, heavy metals, sediment load); document impacts of altered hydrologic cycles on terrestrial and aquatic resources; expand current water-quantity and water-quality monitoring at different scales within the watershed, expand current aquatic and terrestrial resource monitoring, and determine the sources and sinks for mobilized sediment;
- research new restoration techniques and test old techniques under future climate conditions in collaboration with our colleagues at land management agencies such at the Bureau of Land Management; research ways to restore ecosystem processes, such as decomposition and nitrogen cycling; test old restoration techniques under future conditions by using manipulative research;
- model future climate change at the regional and local scale and use the understanding of the interactions discussed above to forecast future conditions in relation to changing climate, land use, disturbance, and land cover; and
- effectively communicate these findings to policy makers, land managers, scientists, and the public.

Mr. Chairman, thank you for this opportunity to present testimony. I would be pleased to respond any questions that you or other Members of the Subcommittee may have on this topic.

Senator WYDEN. Thank you, doctor, fine statement.

Tom.

STATEMENT OF MIKE PELLANT, GREAT BASIN RESTORATION INITIATIVE COORDINATOR, BUREAU OF LAND MANAGEMENT, DEPARTMENT OF THE INTERIOR

Mr. PELLANT. Thank you, Mr. Chair, for the opportunity to address the committee on the Great Basin and through the actions that were taken to mitigate the problems.

I'll put the first slide up. What I'd like to do in the next 5 minutes is to briefly address some of the issues and then move into some of the activities that BLM Great Basin Restoration Initiative has taken to try to mitigate these issues.

First, as you mentioned before, the Great Basin includes parts of five States. BLM is the majority land manager in the area managing a little over 50 percent of the total acreage within the Great Basin. Wildfires are what we feel are the symptom. The illness is

really the invasive species and the lack of land health. We've got three main issues; basically Cheatgrass, I think we're all familiar with, BLM lands, some 25 million acres are pretty heavily infested with this annual grass. We have Juniper encroachment occurring in many of our communities, and then finally, kind of the new wave of invaders from annual biannual perennial forbs that are invasive as well, so all of these are areas of concern.

This graphic shows the wildfires in the Great Basin over the last 17 years, so we've only looked at it for 17 years because of the some of the difficulties going back further and getting polygons of fires, but I think what really sticks out here is the red areas are fires that occurred this past summer. I might point out that two of them, one of them, the Murphy Complex fire, this was over 650,000 acres; the Milford Flat fire in Utah was nearly 350,000. Both of these were the largest fires in those States, at least on public lands that have ever been recorded.

So as you can see the wildfire issue is growing. A lot of it can be associated with Cheatgrass areas. For example, the north central area of Nevada between Elko and Winnemucca, the Snake River Plane in Southern Idaho and some of the West Valley areas in Utah. Some of the implications of climate change, Juniper encroachment is expected to increase, which has a lot of implications.

Also, sagebrush is predicted to be driven more northward as temperature and frost free periods increase in the southern part of the Great Basin. Obviously, all of this has some very significant, not only social and economic, but legal aspects, the Endangered Species Act, for example.

Perhaps one of our biggest concerns is the effect of increased carbon dioxide on Cheatgrass, not only does it increase Cheatgrass, but it's also tending to change the makeup of Cheatgrass, more lignens which is the less digestible component, and we're concerned about less digest—or less palpability; more fuel accumulations over time because of this as well.

So what can we do about it? We've got a lot of issues facing us. The strategy we've put together under the Great Basin Restoration Initiative is let's maintain those areas that are functioning now.

In this example make putting a green strip between a Cheatgrass area and a sagebrush area to protect the integrity of the sagebrush area, and then let's do restoration, but let's do it strategically. The postage stamp approach doesn't work; we really need to leave as big of a footprint as we can with our restoration effort. The secretary's healthy lands initiative is a good example of a proactive approach to restoration in the Great Basin.

Another thing that we obviously need to do is become more flexible in our management and our planning, adaptive management is going to be even more important in the future, and as well we need to incorporate climate change into our land use plans and landscape level restoration. We're working closely with the Ely Field office, the Eastern Nevada Landscape Coalition, to do a landscape level plan on twelve million acres of public land in this part of the Great Basin.

I will talk just briefly about Cheatgrass and using the livestock to control it.

The upper photo shows a very descriptive approach using livestock in the wild and urban interface, it works very well. The big question is, can we employ livestock on the more landscape level to meet these objectives?

The Idaho BLM State director has put together a task force of scientists and managers to address this issue on the 650,000 acre Murphy Complex fire. His charge is to come up with some recommendations relative to livestock use that may not only be applicable to this fire, but to others as well within the Great Basin.

So we do want to take a very careful look at this and utilize this tool where appropriate. Last, it's important not to just get rid of the problem with the Cheatgrass and the other invasive's, but try to get back to a native community, there's kind of a misconception that the native can't compete with Cheatgrass. I think we've demonstrated through some of our native planting that they can. We've also got a native plant development program that's producing a lot of results in terms of seeding equipment.

So I'll just close simply with just reiterating what our USGS colleagues have said, that we need better tools and science; we need to incorporate better adaptation in our management, be very strategic in restoration, and obviously work with others in terms of collaboration and cooperation.

Thank you.

[The prepared statement of Mr. Pellant follows:]

PREPARED STATEMENT OF MIKE PELLANT, GREAT BASIN RESTORATION INITIATIVE COORDINATOR, BUREAU OF LAND MANAGEMENT, DEPARTMENT OF THE INTERIOR

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.

FACTORS RELATING TO CLIMATE CHANGE, INCLUDING WATER, INVASIVE SPECIES, AND WILDFIRES IN THE GREAT BASIN

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, nongovernment 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 en-

hanced 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.

Senator WYDEN. Thank you. Thank you both for your testimony, and let me start by telling you what an extraordinary session we are part of today.

We have the Senate majority leader sitting in the front row, totally involved in this kind of effort.

What I want to do is have us walk out of here this morning with some specific steps that the Senate can take under the majority leader's leadership that will allow us to tackle it. I've got some questions and then I'll give you a chance to make an assessment at the end.

Starting with you Mr. Pellant, our understanding is that in the progress report on the initiative's 2001 assessment that, quote, no permanent account exists for restoration, the Great Basin Restoration Initiative is not a separate line item in the budget.

Now, piecing together a budget for a short period of time is a pretty precarious exercise, and what I think is needed is a consistent source of funding so that you can have proper prioritization, planning and project work, and that's essentially been what the report has said. So now we're 8 years into the initiative, and it's my understanding that the initiative is still, quote, piecing together a budget.

So tell us by way of starting this, how the budget does work from the initiative and what is precisely the story with respect to the financing.

Mr. PELLANT. Yes. Thank you, Mr. Chair.

Basically, the Great Basin Restoration Initiative is serving as an umbrella with other programs that do fund restoration through BLM.

For example, I previously mentioned the Healthy Lands Initiative, there are funds proposed in the budget for BLM, I think fifteen million dollars that would go to underground restoration. Three of the Healthy Lands Initiatives, both of the areas are in the Great Basin, so a large part of the Great Basin would have a potential to utilize these funds to do the proactive restoration.

Also our fields program under the National Fire Plan, a lot of the activities taken there do promote recovery of healthy lands as well, so I guess in terms of the Great Basin Restoration Initiative the funding was primarily through my position, and then we have a core team of other BLM representatives from each State, some of our more national and regional offices, and we kind of function as a group, then, to try get the message out to provide technical expertise, so I guess—I guess if that answers your question. If not I'll be happy to——

Senator WYDEN. No, it still leaves me troubled.

There is no permanent account for restoration as of today, is that correct? You just kind of look at these various budgets and sometimes there will be the money and sometimes there aren't. There's no permanent account today for restoration.

Mr. PELLANT. That is correct.

Senator WYDEN. Now, the 2001 report, and this is something important to focus on, I represented, two out of the three Oregon BLM offices in the Great Basin who weren't participants in the initiative. Has that changed? Are they involved out of there now?

Mr. PELLANT. Again, we, through our Great Basin Restoration Initiative core team includes a Oregon representative, and then that representative then works with the field offices to incorporate the strategies, the technical expertise that the Great Basin Restoration Initiative basically provides, so I think all of the offices are aware of the initiative and it's just various levels of participation, but again, since there isn't funding for implementation, it's not, you know, a direct linkage, so to speak, it's more through providing science, technical expertise and support to carry out activities funded through other the programs.

Senator WYDEN. The testimony submitted by Commissioner Nichols from my home State discusses the Medusahead challenge, which was organized in 2004 under the leadership of the Agricultural Research Service. To what extent has the Great Basin Restoration Initiative coordinated with that challenge?

Mr. PELLANT. Is that the program that Doctor Roger Sealy had initiated?

Senator WYDEN. I think that's part of it.

Mr. PELLANT. Yes.

Actually I participated and wrote a letter of support for that initiative; just actually received word yesterday from Doctor Sealy

that funding was approved, roughly three million dollars of the five million requested.

So again, this is another program that offers a lot of opportunity and hope to apply good science to do restoration and to do it strategically within the Great Basin, and GBRI is an active member of that team.

Senator WYDEN. A recent report from the general accounting office is very critical of the land management agency's lack of planning on the climate change question.

That was mentioned by the majority leader and it's a view that I share.

Now, what the Government Accountability Office has found was the grassland resource managers agreed that climate change is not on the agency's agenda as a significant policy concern.

Can you tell me what the Great Basin Initiative is doing to get an aid to land managers on the climate change question?

Mr. PELLANT. Sure.

I guess the first thing, a few years ago we just did a graph paper on considerations for climate change for land use planning, and that was distributed widely in the Great Basin.

Currently the Secretary of the Interior has a committee of DOI agencies, representatives working on climate change, and one of the strong components of—of those committees is how can we incorporate those into the management including the planning.

So I think, you know, it hasn't been as far forward on the radar screen, but I think that's changing fairly rapidly now with the DOI committee working on it, and just the acknowledgement and some of the work going on in the Great Basin in terms of adjusting——

Senator WYDEN. When do you think that committee would come in with an actual plan that would assist the land managers on the climate change issue?

Mr. PELLANT. I'm a member of one of the subcommittees, and I believe the target decline was by the end of this year.

Ms. BELNAP. Yes.

Mr. PELLANT. So that's when the first report there, a draft out for review from the internal committee right now, and I think it's moving—moving ahead to meet that deadline.

Ms. BELNAP. January.

Senator WYDEN. We'll give you a little bit of a break, Mr. Pellant, with some questions for you, and we'll get back to you before we wrap it up.

Doctor Belnap, on the climate change and wildfire issue, we have seen the unprecedented level of wildfire activity in the Great Basin. This began up in Oregon, and Nevada shares, what do the climate models tell us about future wildfires.

Ms. BELNAP. As my testimony indicated, there are a lot of reasons to expect that this will increase.

The biggest reasons is that we will have drier soils, we'll have drier fuels, and all of the indications is that invasive plants will be facilitated by land use, by rising levels of CO_2, and all of the other reasons that they're invading currently, and so the model would project that they will increase.

Senator WYDEN. Now, some of the invasive grasses in the Basin respond more favorably to high level carbon dioxides than do most of the native grasses.

Tell us a little bit about how that, you know, plays out, and particularly how climate change in effect worsens those kind of invasions.

Ms. BELNAP. There's a bunch of factors, and CO_2 is just one, because the plants have to get established too, and CO_2 facilitates their growth. So first you have to have the conditions that get them established.

That's more in terms of the soil moisture levels, the disturbance factors, other things like that, and actually soil chemistry and physical structure when we determine where they can invade or not, and I don't want to leave the impression the entire Great Basin and Colorado Plateau Region are evadable, because they're not.

There are certain areas that we can triage in this sense. But once they get established due to these factors, which are all likely to increase as well, which is why we expect to see then the CO_2 comes into play. Annual plants respond much more—what—they respond in a greater fashion than perennial plants. It's not just an annual grass, it can be any annual.

So other invasive annuals are also expected to increase with the CO_2, and so there's this interplay of this annual versus perennial.

Now, as Mike pointed out, though, we still have very little indications that—that Cheatgrass actually out-competes the native plants given the right plan, and so you get the invasion. I think we can expect to see landscapes for the interstate filled with Cheatgrass. This does not mean that we have to lose our native perennial component.

Senator WYDEN. With respect to the history of invasive grasses, what are the historical mechanisms that in effect have facilitated all of this?

I gather from your testimony and a number of the experts that there really are a set of historical mechanisms that facilitated the invasion of all of these exotics and annual grasses. Tell us a little about that.

Ms. BELNAP. There is. It's also still a little puzzling.

Most of the people have said that that annual—well, first the romas specifically was introduced in about five places throughout the west, and they were not all accidental.

It spread out from there. One thing that's of importance is—Oh-oh. I just lost my train of thought. Could you ask me my question again? I'm sure that's really unusual.

Senator WYDEN. Yes.

I think what we're trying to is get a bit of the history, because you and the other researchers in the field make a compelling case, that all of this is part of a historical, you know, evolution, that there are historical mechanisms that are in effect facilitating the invasion of all of these exotic grasses, and I think it would be interesting to have that on record.

Ms. BELNAP. So basically everyone thought it took surface disturbance to get these invasive grasses to get established in the first place. That said, we have plenty of places where that could not

occur. There's not the surface disturbance, and these areas are still reinvade.

So my lab has actually spent a lot of time asking this question about what makes an area evadable or not, and one thing, really, is climate. It has a huge impact on whether or not these plants can invade, and so one of the things if you look back in the history, in the front of the invasion what has happened is invasions have gone just wild in the years. Cheatgrass germinates in the fall.

If we have three, four, 5 weeks of good, constant rains, they don't need to be heavy rains, just good constant rains in those falls, you will have huge germination events.

So there's another—it actually ties together. There's two ways. Basically these guys need soil, they need the seeds, they need to stay moist to germinate. They can either be covered with soil through surface disturbance, or they can get a lot of rain. Either thing works, and so I think part of the big historical picture here that we've always been confused in saying oh, it takes disturbance to germinate; it also can be climate; it's just keeping those seeds healthy, and once they do, then they really go to town and that creates this conflict that we see in the literature about well, it can't invade in undisturbed areas; they have to be invasive in disturbed areas.

But this means probably in the future what we're looking at are those extreme areas is when the Cheatgrass is really going to take off, because another thing to keep in mind is every time it rains, it may not be enough rain to sustain a plant, but it releases nutrients and those nutrients build up so when it does rain to germinate those plants, they have a nutrient-rich environment to germinate in.

Senator WYDEN. What would you say are the most significant influences on invasive species, say in the next 20 years?

Ms. BELNAP. I think it's going to be that relationship between those climate years where things were perfect, and soil surface disturbance. It's going to be how those two interact, and then fire is the other thing was that we have to bring into it because fire also brings soil nutrients to the surface, and so we see a real enhancement of Cheatgrass invasion after fire, so that can come, and that's very much a climate and vegetation feedback, so it's going to be those three factors.

Senator WYDEN. Let's wrap up this panel with this question for you, Mr. Pellant, and then for you, Doctor Belnap.

Let's say our roles are reversed, and you are chair of the Subcommittee on Forestry and Public Lands, and your close friends, the Senate majority leader, the audience is engrossed by this, and as chair of this subcommittee you could recommend a couple of things to the Senate majority leaders that would really help the Basin.

What would, say, two things be, concrete steps, Mr. Pellant, that would make a big difference if we pursue them?

Mr. PELLANT. That's a tough question, and I never wanted to get into politics.

[Laughter.]

Senator WYDEN. We'll let you do the role reversal for purposes of this question, and then you can go back to doing the good work.

Mr. PELLANT. I think one obvious need is just resources to address these issues. I like to talk about—we don't want to look back twenty years from now and talk about the good old days when Cheatgrass was our problem because we've got other weeds, we've got other issues interacting with climate change that our environment is even more degraded, so I think resources, both the science to support better decisions is important, and I think the ability to apply proactive restoration treatments; it's kind of the "pay now or pay more later."

We can go out and put out fires, we can kill weeds, and we can do it time after time, versus going out and getting in an area that's big, so to speak, so if we do have a disturbance like fire or climate change, which becomes more of an impact, we've got a diverse community to support not only the ecology of the area but support the proper management also accommodates all of the uses.

Senator WYDEN. On those proactive treatments, which would you recommend?

Mr. PELLANT. I think a lot of our priorities now are just again to maintain those areas that are still functioning.

It's much cheaper and much better ecologically and economically in the long run to maintain community, keep fire out of it; fire is going to bring in Cheatgrass, so I think that idea of fuels, management on those perimeters is very important, just like we do on the wild land urban areas, and then again that idea is strategic; if we dole out money and bring it down to our smallest administrative units, we tend to just get back to the postage stamp approach.

What we're doing with this healthy public land use is trying to work together to identify those really critical areas, and not just fix one problem, but kind of make the area whole, so to speak, if there's riparian problems, weed problems, Cheatgrass problem, and try to fix an area and then move on, but do that in a strategic, priority-based manner.

Senator WYDEN. Doctor Belnap, the roles are reversed.

Ms. BELNAP. Do I have to wear a tie?

Senator WYDEN. No, you don't have to wear a tie.

I can see your great affection of both of you for politics. This will a one-time deal, so just pretend you're chair of the subcommittee.

Ms. BELNAP. I think our biggest need is understanding.

We really are just in beginning stages of understanding what drives conditions that are invasive, and we need to understand the feedback groups, we need to understand more about what's creating these problems. As was pointed out earlier, we're treating the symptoms. We really need to understand the mechanisms behind the problem. To me that takes a very substantial, planned, carefully thought-out and continuing effort, and with coordination we've got all of these efforts going on all over the map.

One thing that I can see that we really need is to get everyone thinking the same thoughts along the same path, and getting them to talk to each other and that includes the managers, it includes the policymakers, it includes the scientists.

But to really—it's—of course, I'm going to sound like I'm talking job security—but there's so much science that needs to be done for us to really make informed decisions. You know, right now we're

just doing whatever we think is going to work because it's all we know. We could find out a whole lot more.

We really—and I'm very optimistic about this, you know, I don't think it's hopeless at all, I think that we really—we're an incredibly ingenious species, and I think that we can really take this on and fix it.

Senator WYDEN. Won't it help to get the proper prioritization to have that separate line item in the budget through the Restoration Initiative, that's what the progress report says. The progress report says specifically you get it, the separate line item on the budget, and that's something that will really be useful with respect to proper prioritization and planning.

Ms. BELNAP. I don't know about the best techniques to reach the goal, but to me the goal is to get that long-termed sustained effort that's coordinated and, you know, if that's the best way, I don't know that.

Senator WYDEN. Fair enough.

Ms. BELNAP. But, you know, we certainly need that sustained effort.

Senator WYDEN. Good.

Thank you both for your good work, and know that you're putting a lot of effort into this cause, and the time is short. I think that was the point of the majority leader today. It's a point that I've tried to emphasize, this is something that you can't put off, and we thank you both for your good work.

Let's go to our next panel, the Honorable Dan Nichols, from my wonderful State, Harney County; Patricia Mulroy, from the Southern Nevada Water Authority and Doctor Boyd Spratling of the Nevada Cattlemen's Association.

Dan, welcome.

Mr. NICHOLS. Thank you.

Senator WYDEN. Thank you for being here, Ms. Mulroy, and do the Nevada cattlemen have a lot of involvement with Doctor Skinner in raising cattle?

Mr. SPRATLING. Yes, we do, I saw her a couple of weeks ago.

Senator WYDEN. Very good. All right, let's begin with you, Mr. Nichols.

STATEMENT OF DAN NICHOLS, RANCHER AND COUNTY COMMISSIONER, HARNEY COUNTY, OR

Mr. NICHOLS. Thank you, Senator, for the opportunity to discuss the future environmental concerns affecting the Great Basin, and thank you for your support and what you have done for us in Harney County and the Great Basin and the efforts that you have put into it and your attempt to understand these complex issues. Thank you.

As a rancher and a county commissioner I have the opportunity to attend lots of meetings here and lots of opinions, being around scientists of different levels. I've come to believe that continued exponential spread of Medusahead rye is absolutely the paramount environmental threat to the Great Basin and the surrounding ecosystems.

The Medusahead invasion has the potential to devastate the economics of rural western communities and create environmental

damage that will have negative consequences to the land and its citizens for generations in the future.

Medusahead has invaded over 20 million acres throughout the western States, with the majority of the invasion occurring on public lands. Medusahead is an alien invasive weed that originated from the Mediterranean region.

It was first recorded in Oregon in the 1880s and was found throughout the Willamette Valley and had spread into Idaho by 1940. By 1995 it was estimated that Medusahead had occupied one million acres in Idaho. It expanded south from Oregon into California, and it is thought that now may have successfully invaded all suitable sites within California that are approximately five million acres.

Medusahead has mainly invaded public and private land within the Great Basin, but has also created large, continuous infestations in ten States and is now being reported to be in New York and Pennsylvania as well. Invasions have been expanding exponentially since 1972 and now are expanding faster than nearly all other invasive weeds in the United States.

Medusahead basically thrives in clay soils, but I just learned the other day they're finding infestations in loam soils as well, which exacerbates the problem.

The climate precipitation patterns of the Great Basin are very conducive to Medusahead. Harney County, as an example, has an average precipitation level of eleven inches a year, with that coming mostly in the spring and fall in the form of snow and fall rains.

Harney County is the largest county in Oregon with a land mass of 10,121 square miles, it's larger than six States in the union, and the ownership is 27 percent privately owned property versus 73 percent Federal and State ownership.

Our local NRCS maps, soil maps, indicate that an excess of 70 percent of the soil types in Harney County are conducive to the establishment of Medusahead monocultures, so that's basically what the land mass, land mass of the Federal and State property in Harney County. It has, needless to say, it has a devastating impact on our local cattle industry, agricultural industry; it also affects land that provides habitat for mule deer, elk, sage grouse, native redband trout and bighorn sheep.

All of these species and more are absolutely susceptible to the detrimental effects of Medusahead monocultures and are negatively juxtaposed with current efforts and dollars being spent by the government agencies to protect them and enhance their environments.

Medusahead basically deteriorates healthy intact shrub-steppe communities into annual grass monocultures. It grows for short periods in the spring and fall permanently changes the nutrient and hydrological cycles while accelerating erosion. The thick mat of fine litter is slow to decompose because of its 10 percent silica composition, which is basically glass. This composition is the reason for an eighty percent reduction in grazing value, resulting in large amounts of fine fuels for intensive wildfire occurrences.

The Federal Interagency Committee for the management of noxious weeds reports that annual grass infestations increase the frequency of major wildlife—excuse me—wildland fires to every 3

years from every sixty years, and we're starting to see that within major portions of the Western States.

This past summer in excess of 130,000 acres burned, with an estimated cost in excess of eight million dollars in suppression efforts just in Harney County alone. These cost figures do not include the cost to private landowners from timber and grazing loss, herd reductions, supplemental fees and other associated business losses. Basically Medusahead promotes fire, and fire promotes Medusahead.

Wildfire destroys the sagebrush portion of the plant community. Sagebrush is host to a variety of wildlife, only one of which is the Sage Grouse. Sage Grouse is considered by some to be the key indicator species for the sagebrush steppe ecosystem of the Great Basin. It is a current example of the kinds of wildlife destruction that is created by this invasive weed.

The US Fish and Wildlife Service conducted a 12-month finding for Greater Sage Grouse, and the Conservation Assessment of Greater Sage Grouse and Sage Grouse habitats. The report concluded that two primary habitat threats are fires and invasive species such as Medusahead. All of these and many other ecological impacts translate into direct economic impacts on the Great Basin, where our livelihoods depend on a sustainable natural resource base. Watersheds are at risk, wildlife habitat is being destroyed, riparian areas are affected and frequent fires continue to accelerate the invasion process of Medusahead costing the Federal Governmental millions of dollars in suppressive activities.

The livestock industry is at risk and is the dominate industry throughout much of the Great Basin which supports the rural infrastructure and economies in nearby towns.

Medusahead has a direct and negative impact on hunting and other outdoor recreation opportunities that also comprise a portion of our local economies. Medusahead basically is an invasive weed that has no redeeming values. Medusahead trumps Cheatgrass, Juniper, the other invasive weeds, and the fact that it is a horribly tenacious weed and creates strictly an absolute monoculture. Medusahead will out-compete Cheatgrass, and with Cheatgrass there is some forage value, some habitat value. Medusahead, basically there is none. Because of its chemical composition and physiology, it essentially has no grazing or habitat value for the wildlife or domestic livestock.

Due to the spring and fall growth patterns, it permanently changes the nutrient and hydrological cycles. Long-term negative effects on watershed and water resources are a logical outcome of the invasive Medusahead monoculture.

Considering the plausible desertification trend of Medusahead and the region of the world that it originated from, are we possibly heading toward the desert landscapes of the mid-east as a result of the continued expansion of the Medusahead monocultures within the Great Basin? With that serious possibility and that reality, a group of local land managers, private landowners, researchers, scientists, educators and conservationists from six western States of Oregon, Washington, Idaho, Nevada, California and Utah met in Burns, Oregon in 2004 and created the Medusahead Challenge

under the leadership of the USDA Agricultural Research Service in Burns.

From that initial meeting over 150 people from the diverse entities mentioned above have created a working partnership and developed a strategic plan to deal with Medusahead from a comprehensive, holistic and systems approach.

The mission of the Medusahead Challenge is to enhance and coordinate education, research and management of Medusahead across the Western States. This outcome based program outlines 14 separate large scale management activities, 27 research projects and 14 educational programs necessary to protect the Great Basin.

On behalf of the Medusahead Challenge and Harney County, I would request your continued help to fully implement this plan. This group has been working successfully in a collaborative process combining private landowners, private business, scientific expertise, Federal agencies and conservation groups.

Over time it has become clear that a large well-coordinated holistic approach will be required if they are to make timely progress managing Medusahead and mitigating the ecological and economic impacts of the Great Basin associated with this invasive weed.

The Medusahead Challenge is well prepared and structured to implement the most ecologically based comprehensive program possible. Dedicated people have been working in a collaborative effort for the past 4 years, but now need your help for some long-term funding for the Medusahead Challenge through the USDA Agricultural Research Service in Burns.

Once again, an appropriations fund request for 2008 has been submitted for a total of one million dollars. This is a motivated consortium of people that have been collectively leveraging a variety of resources to meet the goals and objectives of the plan. Their continued advance in an effort to combat this major threat to the ecological and economic well-being of the Great Basin could be enhanced with your support.

[The prepared statement of Mr. Nichols follows:]

PREPARED STATEMENT OF DAN NICHOLS, RANCHER AND COUNTY COMMISSIONER, HARNEY COUNTY, OR

Thank you for the opportunity to discuss future environmental threats to the Great Basin ecosystem. As a rancher and conservationist I believe that the continued, exponential spread of medusahead is the paramount environmental threat to the Great Basin and surrounding ecosystems. The medusahead invasion has the potential to devastate the economies of rural western communities and create environmental damage that will have negative consequences to the land and its citizens for generations into the future. Medusahead has invaded over 20 million acres throughout the western States with the majority of the invasion occurring on public lands.

Medusahead thrives in the clay soils, climate and precipitation patterns of the Great Basin. Hanley County, as an example, has an average precipitation level of 11 inches a year with most of that in the form of snow and spring rain. Harney County is the largest county in Oregon with a land mass of 10,121 square miles and is larger than six States in the Union. Ownership is comprised of 27% private and 73% federal and state ownership. Local NRCS soil maps indicate that an excess of 70% of the soils in Harney County are conducive to the establishment of medusahead monocultures. That is basically equal to the landmass of the federal and state rangelands that are an integral. part of the counties livestock industry. It is also land that provides habitat for mule deer, elk, sage gouse, native redband trout and bighorn sheep. All of these species and more are absolutely susceptible to the detrimental effects of medusahead monocultures and are negatively juxtaposed with current efforts and dollars being spent by government agencies to protect them and enhance their environments.

Medusahead is an alien invasive weed originating from the Mediterranean region. It was first recorded in Oregon in the 1880's and was found throughout the Willamette Valley and into Idaho by 1940. By 1995 it was estimated that medusahead occupied 1 million acres in Idaho. It expanded south into California and may have successfully invaded all suitable sites within California at approximately 5 million acres. Medusahead has mainly invaded public and private land within the Great Basin but it has also created large continous infestations in 10 states including New York and Pennsylvania. Invasions have been expanding exponentially since 1972 and are now expanding faster than nearly all other invasive weeds in the United States.

Medusahead deteriorates healthy intact shrub-steppe communities into annual grass monocultures. It grows for short periods in. the spring and fall and permanently changes the nutrient and hydrological cycles while accelerating erosion. The thick mat of fine litter is slow to decompose because of the 10% silica composition (the main compound of glass). This composition is the reason for an 80% reduction in grazing value resulting in large amounts of fine fuels for intensive wildfire occurrences. The Federal Interagency Committee for the Management of Noxious Weeds reports that annual grass infestations increase the frequency of major wildland fires to every 3 years from every 60 years. This past summer in excess of 130,000 acres burned with an estimated cost in excess of eight million dollars in suppression efforts occurred in Harney County alone. These cost figures do not include the cost to private landowners for timber and grazing loss, herd reductions, supplemental feed and other associated business losses. Medusahead promotes tire and fire promotes medusahead.

Wildfire destroys the sagebrush portion of the plant community. Sagebrush is host to a variety of wildlife, only one of which is the sage grouse. Sage grouse is considered by some a key indicator species of the sagebrush steppe ecosystem of the Great Basin. It is a current example of the kinds of wildlife destruction that is created by this invasive weed. Sage grouse were nearly placed on the threatened and endangered species list in 2006. The U.S. Fish and Wildlife Service conducted a 12 month finding for Greater-Sage grouse and the Conservation Assessment of Greater Sage grouse and Sagebrush Habitats. They reported that two primary habitat threats are fires and invasive species such as medusahead.

All of these and many other ecological impacts translate into direct economic impacts in the Great Basin where our livelihoods depend upon a sustainable natural resource base. Watersheds are at risk, wildlife habitat is being destroyed, riparian areas are affected and frequent fires continue to accelerate the invasion process costing the federal government millions of dollars in suppression activities. The livestock industry is at risk and is the dominate industry throughout much of the Great Basin which supports the rural infrastructure and economies of nearby towns. Medusahead has a direct and negative impact on hunting and other outdoor recreation opportunities that also comprise a portion of our local economies.

Medusahead is an invasive weed that basically has no redeeming values. It is a tenacious weed that has the ability to expand and thrive under extreme conditions. It outcompetes other plant species for available water and nutrients. Because of its chemical composition and physiology it essentially has no grazing or habitat value for wildlife or domestic livestock. Due to the spring and fall growth pattern it permanently changes the nutrient and hydrological cycles that are considered to be the initial stages of desertification by many scientists. Long term negative effects on watershed and water resources are a logical outcome of an invasive medusahead monoculture. Considering the plausible desertification trend of medusahead and the region of the world that it originated from are we heading toward the desert landscapes of the mid-east as a result of the continued expansion of medusahead monocultures in the Great Basin?

With the serious possibility of that reality a group of public land managers, private landowners, researchers, scientists and educators from six western states of Oregon, Washington, Idaho, Nevada, California and Utah met in Burns, Oregon in 2004 and created the Medusahead Challenge under the leadership of the USDA-Agricultural Research Service in Burns. From that initial meeting over 150 people from the diverse entities mentioned above have created a working partnership and developed a strategic plan to deal with medusahcad from a comprehensive, holistic and systems approach. The mission of the Medusahead Challenge is to enhance and coordinate education, research and management of medusahead across the western states. This outcome based program outlines 14 separate large-scale management activities, 27 research projects and 14 educational programs necessary to protect the Great Basin. On behalf of the Medusahead Challenge and Harney County I request your help to fully implement this plan.

This group has been working successfully in a collaborative process combining private landowners, private business, scientific expertise, federal agencies and conservation groups. Over time it has become clear that a large well coordinated, holistic approach will be required if they are to make timely progress managing medusahead and mitigating the ecological and economic impacts for the Great Basin associated with this invasive weed. The Medusahead Challenge is well prepared and structured to implement the most ecologically based comprehensive program possible. Dedicated people have been working in a collaborative effort for the past three years but now need your help through some long tens funding for the Medusahead Challenge through the USDA-Agricultural Research Service in Burns, Oregon. Once again, an appropriations fund request for 2008 has been submitted for $1,000,000. This is a motivated consortium of people that have been collectively leveraging a variety of resources to meet the goals and objectives of the plan. Their continued advance in an effort to combat this major threat to the ecological and economic well being of the Great Basin could be enhanced with your support.

Thank you for your time and your consideration of this request.

Senator WYDEN. Very good. Thank you, we'll have some questions for you in a moment.

Ms. Mulroy.

STATEMENT OF PATRICIA MULROY, GENERAL MANAGER, SOUTHERN NEVADA WATER AUTHORITY, LAS VEGAS, NV

Ms. MULROY. Mr. Chairman, I'd like to thank you for the opportunity to be able to testify here today, and I'd particularly like to thank you and our Senate majority leader, Senator Reid, for allowing me this opportunity to bring out of the shadows an issue that I feel will define western culture and the culture in the western United States for this coming century.

My name is Pat Mulroy, and I'm the general manager of the Southern Nevada Water Authority, and I've been involved in water issues in Southern Nevada and the Colorado River Basin for over 20 years.

I would like to offer some perspective on an issue that has far-reaching consequences on the future of existing water supplies in the Western United States over the next century; that issue, quite simply stated, is climate change. Perhaps nowhere in the west are the consequences of climate change more manifest than in the Colorado River Basin, which abuts the Great Basin to the east and to the south, where a sustained drought has altered our historical understanding of the river.

It's forcing communities such as ours to adjust infrastructure plans, improve water efficiency and develop additional unused water supplies to maintain the reliability of our delivery system, and all of this has happened in just a matter of a few years. Because of its many storage facilitates, the Colorado River has always been considered a very reliable water supply. However, this quickly changed as the river entered what soon became the worst drought in recorded history. The impacts have been daunting.

Since 2001 inflows to Lakes Powell and Mead have been below average for all but 1 year, with 2002 being the worst thus far at 25 percent of average, inflows into Lake Powell over the past 7 years have been 61 percent of normal.

Today both Lakes Powell and Mead sit at roughly 49 percent capacity, a combined loss of around 25 million acre feet of water in less than a decade. It's sobering to note that Lake Mead would probably be dry today, were it not for the Glen Canyon Dam and Lake Powell. Almost two million in the Las Vegas valley depend on

Lake Mead for this daily water. Millions of others depend on it depend on it in Arizona, California and the country of Mexico. Because of the drought Southern Nevada has had to take steps to protect the operation of its two drinking water intakes in Lake Mead. Both are threatened by the lake's steadily declining water levels. The upper intake could be out of service as soon as 2010.

To address this situation we're proceeding as quickly as possible with the construction of a third intake. This new intake is not expected, however, to be completed before 2013. To address the loss of capacity that will occur at lake levels fall below the upper intake, we are augmenting the pumping capacity of our lower intake and have constructed bypass pipelines at our water treatment facility. This will allow our lower intake to deliver adequate water supplies while the third intake is still being constructed.

To further offset the drought's impact, Southern Nevada has implemented one of the most aggressive water conservation programs in the country. We adopted a comprehensive drought response plan initially that has actually resulted in permanent changes to how we use water.

The plan involves the mix of regional policy, education, pricing and incentives, including increases to tiered water rates, prohibition of turf in front yards and new developments; restrictions on time of day of watering, innovative conservation advertising and extensive water waste enforcement. The centerpiece of this new ethic is our Water Smart Landscapes Program. With money derived from local connection charges, this program provides water customers with rebates for removing turf from their landscaping. To date it has provided more than $85,000,000 in rebates and has resulted in our use for it declining by eighteen billion gallons and this despite nearly 330,000 new residents and 40,000,000 annual visitors.

Most importantly, conservation has evolved from a temporary drought response into a permanent way of life in Southern Nevada. As we transformed our approach to conservation, the seven States of the Colorado River Basin came together in response to the drought and embarked on negotiations to establish guidelines for dealing with shortage.

After years of discussion, the State submitted a comprehensive proposal to the Secretary of Interior in 2006 that establishes shortage guidelines and creates incentives for conservation and efficiency, and I'm happy to say that Monday the final pieces of that were put together to where it's now final. The proposal is a milestone in the history of the river.

For the first time a shared shortage amongst States and cities has been established, one that recognizes the interdependent nature of the river's users and the need to share impacts. This would not have been possible 10 years ago. To increase flexibility on the river, the seven Basin States are promoting changes to reservoir operations, interstate groundwater banking and other cooperative efforts.

For example, Nevada is helping to fund construction of a reservoir in California in return for a one-time supply of water. We've also funded a study of future supply options, predominantly desalination. Beyond these efforts, Southern Nevada is moving forward

to develop an alternate water supply that is hydrologically independent of the river. That supply is comprised of unused groundwater and several hydrographic basins in Eastern Nevada.

This year we were granted the right to 60,000 acre feet in Spring Valley, the pumping of which we must step into gradually.

To protect the environment, we've acquired seven large ranches in the area and have entered into a process with four agencies of the Department of Interior to monitor and now manage the valley's natural resources and the rural lifestyle. An integral part of our effort is to work with local, State and Federal agencies to protect the Great Basin from some of the threats that you've heard outlined here this morning.

Although these efforts—through these efforts we can responsibly develop this essential water supply. Let me underscore the word "essential." Today approximately 90 percent of Southern Nevada's water supply comes from the Colorado River. Further shortfalls in the Colorado River will jeopardize this community's water supply unless we develop alternate supplies.

In a community that already reuses 100 percent of its waste water, nothing short of an alternative supply will protect us from this risk. We've noted for over a decade in our water resource plan that conservation is the cornerstone, but it cannot be the only solution. The reliability of our water system and its supply are equally important. To solve the water resource challenges posed by climate change we will need additional supplies of unused water to protect us from the shortages that we know are coming on this river system. What we're experiencing today on the Colorado River may be a harbinger of an entirely new reality for the two countries and seven States within the United States that have come to rely so heavily on this river's scant resources. Old paradigms of single source supply are relics of a time gone by.

The security of communities in the arid west will depend on conservation, diversification of the resource portfolio and perhaps most critically, the recognition that we are interdependent. Only by embracing cooperation and partnership and by balancing competing needs and demands can we set new standards for resource management that will see our communities through this century and the consequences of climatic uncertainty.

Thank you for your time, and I'll be happy to answer questions.

[The prepared statement of Ms. Mulroy follows:]

PREPARED STATEMENT OF PATRICIA MULROY, GENERAL MANAGER, SOUTHERN NEVADA WATER AUTHORITY, LAS VEGAS, NV

Mr. Chairman, members of the subcommittee, thank you for the opportunity to testify today.

My name is Pat Mulroy, General Manager of the Southern Nevada Water Authority. I have been involved in water issues in Southern Nevada and the Colorado River Basin for over 20 years.

I would like to offer some perspective on an issue that has far-reaching consequences for future water development and the reliability of existing water supplies in the western United States over the next century. That issue is climate change.

Perhaps nowhere are the consequences of climate change more manifest than in the Colorado River Basin. Here, a sustained drought has altered our historical understanding of the river and challenged many underlying assumptions about its long-term management. It is forcing communities such as ours to adjust infrastructure plans, improve water efficiency and develop additional unused water supplies

to maintain the reliability of our delivery systems. All this has happened in only a matter of years.

As inconceivable as it sounds today, the States of the Colorado River Basin and the U.S. Bureau of Reclamation spent much of the nineties in negotiations about dividing surplus water on the river. Predictive models had indicated that the probability of a major water shortage was virtually zero. In the absence of compelling data or evidence to the contrary, most stakeholders on the river accepted this.

This quickly changed as the river entered what soon became the worst drought in the recorded history of the system. The impacts of the drought have been daunting. Since 2001, inflows to Lakes Powell and Mead have been below average for all but one year, with 2002 being the worst thus far at 25 percent of average. Historical average inflows into Lake Powell over the past seven years have been 61 percent of normal. Today, both Lake Powell and Lake Mead sit at roughly 49 percent of capacity—a combined loss of around 25 million acre-feet of system water, and in only a handful of years. It is sobering to note that Lake Mead would probably be dry today were it not for Glen Canyon Dam and Lake Powell. Almost two million people in the greater Las Vegas Valley depend on Lake Mead for their daily water. Millions of others depend on it downstream in Arizona and California.

Because of the drought, Southern Nevada has had to take steps to protect the operation of its two drinking water intakes in Lake Mead. Both are threatened by the lake's steadily declining water levels. The highest intake, Intake No. 1, sits at elevation 1050 and could be out of service as soon as 2010. The second intake, at elevation 1000, could be threatened sometime after that. To address the situation, Southern Nevada is proceeding as quickly as possible with the construction of a third intake. This new intake is not expected to be completed before 2013. To address the loss of capacity that will occur if lake levels fall below the level of Intake No. 1, we have augmented the pumping capacity for our second intake and constructed bypass pipelines at our Lake Mead water treatment facility. This will allow our second intake to compensate for the loss of Intake No. 1 and move up to 600 million gallons of water per day into the valley while the third intake is being constructed.

To further offset the impacts of the drought, Southern Nevada implemented more aggressive water conservation. When the Authority was formed in 1991, the region embarked on a modest campaign to achieve 10 percent conservation by 2010. By 2003, with the drought as backdrop, Southern Nevada adopted a comprehensive drought response plan that has resulted in permanent changes to how the community uses water. The plan involves a mix of regional policy, education, pricing and incentive initiatives, including increases to tiered water rates among all local water purveyors, prohibition of turf in front yards of new development, restrictions on time and day of watering, more innovative conservation advertising, and extensive water waste enforcement. The centerpiece of Southern Nevada's new conservation ethic is the Water Smart Landscapes Program. With revenues derived from local connection charges paid by new development, this program provides water customers with rebates for removing turf from their landscaping. To date, the program has provided more than $85 million in rebates, saving more than five billion gallons of water each year.

As a result of these conservation efforts, Southern Nevada's consumptive water use declined by approximately 18 billion gallons between 2002 and 2006, despite the arrival of nearly 330,000 new residents and 40 million annual visitors. Most importantly, conservation in our community has evolved from a temporary drought response into a permanent way of life.

As Southern Nevada transformed its approach to conservation, the seven States of the Colorado River Basin came together in response to the drought and embarked on negotiations to establish guidelines for dealing with shortage on the Colorado River. After several years of discussion, the States submitted a comprehensive proposal to the Secretary of the Interior in 2006 that establishes shortage guidelines and creates incentives for conservation and efficiency.

The proposal is a milestone in the history of the river. For the first time, a shared shortage among states and cities has been established, one that recognizes the interdependent nature of the river's users and the need to share impacts. To cite one example, in the event that the Secretary of the Interior declares a shortage on the Colorado River and Arizona cities are forced to cut back, Southern Nevada has agreed to reduce its consumption from the river by a proportionate amount. This type of arrangement would have been considered impossible ten years ago. It is happening today in direct response to the drought and long-term concern over how climate change may affect future water availability from the Colorado River.

In conjunction with their proposal to the Secretary of the Interior, the seven basin states are undertaking a number of water management initiatives to increase flexi-

bility on the river system. These include changes in the reservoir operation of Lakes Powell and Mead, additional interstate groundwater banking and other efforts. For example, a demonstration project to assess the use of "intentionally created surpluses," which would allow water from extraordinary conservation gains to be stored in Lakes Powell or Mead and withdrawn in future years, is underway at the Metropolitan Water District of Southern California. Southern Nevada is helping to fund the construction of the Drop 2 Storage Reservoir Project along the All-American Canal in return for a one-time supply of water that can be accessed in future years. The Drop 2 structure is intended to capture water that would otherwise be lost to Mexico over and above existing treaty obligations between that country and the United States. We have also funded a study of future supply options such as desalination for use by the seven basin states.

Beyond these collaborative efforts on the Colorado River, Southern Nevada is moving forward on its own plans to develop an alternate water supply that is hydrologically independent of the river. That supply is comprised of applications and water rights for available, unused groundwater in several hydrographic basins in eastern Nevada.

Two basins in particular form the backbone of this in-state groundwater project: Spring Valley and Snake Valley. Located west of Wheeler Peak and the Great Basin National Park, Spring Valley has perhaps the largest amount of unappropriated water of any basin in Nevada. In April 2007, the Nevada State Engineer granted Southern Nevada the right to 60,000 acre-feet in Spring Valley, the pumping of which we must step into gradually. In Snake Valley, a basin that is shared by both Nevada and Utah, Southern Nevada has applications for approximately 50,000 acre-feet of available, unused groundwater. Both states continue to negotiate over the disposition of water in Snake Valley.

Unlike Snake Valley, there is no community in Spring Valley, only a series of large ranches. Between 2006 and 2007, the Southern Nevada Water Authority acquired seven of these ranch properties as part of its commitment to adaptive management of the groundwater basins that encompass our in-state water project. The properties included more than 33,000 acre-feet of surface water rights and more than 6,000 acre-feet of groundwater rights, as well as a host of biological, recreational and other resources that will help support sustainable development of the water supply while minimizing impacts to the environment. To this end, we are retaining the surface water rights within the valley and will use them to recharge the basin as part of an overall effort to manage and protect the aesthetic and environmental values of the surrounding area. We will also continue ranching activities in Spring Valley to help the watershed and environment, and have hired a ranch manager who is developing and implementing strategies for more efficient and sustainable agricultural practices. Lastly, we entered into a stipulation agreement with the U.S. Department of Interior in September 2006 on behalf of the U.S. Fish and Wildlife Service, National Park Service, U.S. Bureau of Land Management and U.S. Bureau of Indian Affairs that outlines a detailed process for monitoring and management of Spring Valley as the in-state project moves forward. Through these various efforts, we can develop this essential water supply in a way that meets the needs of Southern Nevada, but does not compromise the basin of origin's natural resources or way of life.

Let me take a few moments to underscore that word "essential." Today, approximately 90 percent of Southern Nevada's water supply comes from the Colorado River. About 10 percent comes from groundwater in the Las Vegas Valley. Climate change and the drought may have helped transform Southern Nevada's conservation ethic to one of the most progressive in the West, but it also reminded us that you cannot supply 100 percent of an area's demands with only 10 percent of its water supply. In other words, further shortfalls in the Colorado River could jeopardize that portion of our water supply, leaving our community exposed unless we move forward as planned and develop alternate supplies such as the in-state groundwater project. There is nothing short of an alternative supply that will protect us from continued drought or future shortages. In terms of conservation, Southern Nevada has noted for over a decade in its regional water resource plan that conservation is the least expensive resource available to us. As such, it remains a priority when it comes to our balancing of the many competing interests that need to be addressed when managing water (1) in the most arid desert in the country, (2) for one of the fastest growing populations in the country, (3) in a valley with groundwater supplies that are fully appropriated, (4) in a state with the fewest rights to Colorado River water of all the states that use the river, and (5) in a region with no agricultural water use to provide a supply buffer in times of shortage. However, conservation cannot be our only priority. The reliability of our water system and its supply are equally important.

The reliability of a water system is not only a function of its physical infrastructure, but also of its ability to shift water supplies in the event of unforeseen circumstances. California is one example—their ability to shift supplies to alternate sources in response to climatic conditions is allowing them to avert a potentially disastrous shortfall. Reliability is the reason we invested in a second intake long ago and are currently developing a third. It is the reason we continue to diversify our water resource portfolio for current and future use. To solve the water management challenges posed by climate change and our unique situation as a desert community, we will still need additional, permanent supplies of unused water as an insurance policy to protect us from drought and shortages on the Colorado River. Our goal is to reduce our dependency on Colorado River water to approximately 60 percent by 2050.

As the drought has demonstrated, climate change represents an unprecedented challenge for Western communities, particularly as it relates to developing, storing and delivering adequate water supplies. The types of internecine fights for resource independence that marked our past have to be replaced by a recognition of interdependence. If a city develops groundwater supplies in an area outside its own boundaries, it is not a given that the area will be destroyed. There are sufficient environmental standards and regulatory processes to prevent such a thing, but most importantly, it is not in a community's interest to exhaust or irreparably harm resources that are vital to its own well-being. Rural communities will find that partnerships with an urban area can provide them with the resources needed to survive the impacts of climate change. And while urban conservation has long been the focus of much attention, there are many opportunities for improvement in agricultural irrigation. Urban areas are increasingly willing to finance those ventures.

What we are experiencing today on the Colorado River may be a harbinger of an entirely new reality for the two countries and the seven states within the United States that have come to rely so heavily on this river's scant resources. Old paradigms of single-source supply are relics of a time we cannot assume will return in the foreseeable future. The security of communities in the arid west will depend on conservation, diversification of the resource portfolio and, perhaps most critically, the recognition that we are interdependent. Only by embracing cooperation and partnership, and by balancing competing needs and demands, can we set new standards for resource management that will see our communities through this century and the consequences of climatic uncertainty. Our experiences in the Colorado River Basin and here in Southern Nevada demonstrate that many of our most difficult water issues can be resolved if everyone is willing to work together, take the time to understand one another's point of view, and share in the occasional tradeoffs necessary to achieve meaningful, long-lasting outcomes.

Thank you for your time. I will be happy to answer any questions you may have.

Senator WYDEN. Thank you for your testimony.

Doctor Spratling, welcome. We have some good news. I can tell more again on Saturday when I meet the Oregon cabinet.

STATEMENT OF BOYD SPRATLING, PRESIDENT, NEVADA CATTLEMEN'S ASSOCIATION, ELKO, NV

Mr. SPRATLING. It's good to hear we do have some good news. I'd like to outline a little bit some of the things that we have in common with concerns from the Oregon commissioner.

My name is Boyd Spratling. I'm the Nevada Cattlemen's president, a veterinarian and I'm a rancher in northeastern Nevada which on that map you saw earlier was kind of the ground zero for a large number of fires and some huge fires in that area.

Since 1999 things have changed, you know, you just look at fires that were ten to 20,000 acres, the vicinity is being the norm.

Now we're seeing fires with acreage in excess of six digits as being the norm. One hundred thousand acre fires are nothing. Six hundred thousand acre fires are something that I think that we'll see more of and that is our concern. We know that fire is very complex and the cause for it is very complex, and we would submit, though, that fuels buildup, is probably one of the major portion or cornerstone of that problem. We're talking about fuels buildup. We

have—the land managers have observed that going from wet years to dry years, we'll have the fuel buildup and grass buildup and some of the carryover that is not used, not grazed, will go ahead and carry from 1 year to the next, thus providing increased tonnage of fine fuels, which then will carry the fire from brush to brush into the heavier fuels.

Not only are we seeing the short term effects of fuel buildups, we're also seeing long-term effects, and these would be fuels that would be the more woody to heavier type fuels like Pinion Juniper that we have seen in large acreage's there, and also of the sage community becoming more decadent or more mature, instead of seeing a wide spectrum of aged groups, Sagebrush, we're seeing mostly populations of the existing, of the sagebrush that's left.

It is very mature, and those types of stands of sage are not necessarily beneficial to wildlife. Wildlife require and all species of the sagebrush require a full spectrum of ages from juvenile stages of brush into the mature stages.

What we have seen also in a 30-year period of time is a change in management decisions on the rangelands. I think it's time that we need to review and reexamine some of those thoughts.

Of course, the decisions were made over the years over a concern for the wildlife and wildlife use of the resource; also riparian values and native species values; those types of concerns, those single issue concerns, are now what drives the entire landscape decisions.

We see something for the concern of individual species such as Sage Grouse drive the entire management of the landscape of the Great Basin in general, but we also see it at a smaller level, even Bitterbrush recovery after a burn is something that drives the management and the rehabilitation of an area, instead of looking at the broader view and because of that negligence and looking at the fuel's buildup, we have a greater potential for fire and a reburn in the same area. We all know that that gives us the potential for Cheatgrass buildup, and if we have burns within a 10-year period of time on the same landscape, our chances of Cheatgrass infestation are multiplied dramatically.

If we have this Cheatgrass invasion and we have multiple burns in the areas the consequences become irreversible. It becomes almost impossible for perennials to come back in and especially for the woody species with all of those perennials are almost excluded entirely.

In the past, we have seen most of our fires occur on the valley floors, at lower elevations, and that's where we see the Cheatgrass, the Cheatgrass problem. With climate change we see the potential for Cheatgrass prone areas to increase further up the elevation scale on a mountainside.

Currently, I think one of our biggest concerns is for the areas that have not yet burned. That is our main concern. Let's save what we have just in the natural habitat of the Great Basin.

We're starting to see huge fires, very intense fires at higher elevations. The very best habitat that the Great Basin has to offer is what we're now seeing burn and go up in smoke.

Not only good habitat for wildlife, but for all creatures, both domestic and wild, those are the areas that are our very best livestock grazing that we live in harmony with the wildlife.

These extreme behaviors that we see in these fires in the upper elevations are because of the huge woody buildup of an accumulation of those types of fuels. Our contention is, as livestock producers and as resource users, we think that because of concern for a single issue and management for a single issue raises a potential to have a catastrophic fire that will eliminate those types of values we all hold dear, and what's bad for the habitat for wildlife is also bad for the livestock industry.

We will not be profitable, we will not be sustainable if we lose our resources, and that's a common resource that we share with wildlife and with other users of the public land. We are strong believers in multiple use. We believe that these types of fires do not make hunters happy, other recreationists, conversationists and land managers cannot be happy with what we're seeing and with what's happening now currently within the Great Basin.

In my written testimony, I had a long list of negative impacts to communities and to the resource, and rather than go through those I'd like to spend just a moment to talk a little bit about potential solutions as we see it from producers out on the landscape.

I think we need to see an equal priority given to fuels buildup.

Fuel management, forage management, both fine and heavy fuel, has to have an equal priority in land management decisions along with endangered species, along with riparian values, along with all of those values that we hold dear—we need to broaden our view of what's happening within the watershed, and so that prioritization of fuels buildup needs to be—is essential to the solution.

Prescriptive management of fuels, and as a livestock producer we see grazing as an absolute essential tool in the overall management of fuels. We would not be as bold to say that grazing can eliminate the potential for fire; that's simply untrue.

But fires burn very differently on areas that are grazed as opposed to those that are not. They burn cooler, they have less tendency to destroy the crown of the bunchgrass, or the—we'll see skeletons of brush and other shrubs that remain after the fire goes through in areas that have had proper grazing along the way, well-managed grazing and that's what we're looking for, something that does not devastate what areas we already have. Soil stabilization to us is the most critical portion of the rehab in areas that have already burned.

I'm encouraged to hear that through innovation and cultivars of grasses that the native species of grasses have the potential to essentially out-compete the Cheatgrass infestation. Unfortunately, at this point on a large scale that has not been the case.

I think partially because total number of grasses that are out there and the number of available tons of seed that are required, we have huge areas, is just not available. So it's essential in that soil stabilization that we work toward using some non-native species if necessary to stabilize that soil; therefore giving us the micro-environment over a period of time that will allow the woody species to come back in.

I think my last point is that well managed grazing is an essential tool.

Let's address that. When we remove anywhere from 400 to 800 pounds of forage per acre, that's going to make a big difference in

how a fire burns and moves through an area, and we feel that along with that prescriptive management of fuels, whether it's mechanical, or cool season burns, is something that has not been used. That particular tool has been underused because of regulatory and/or litigation concerns and protests in land management decisions.

We feel those burns are less likely to destroy the soil and the existing plant community, whereas these hot seasons, high intensity burns that we're experiencing now and in the middle of summer are very devastating to the basic plant community.

Also, research is being done at UNR'S—University of Nevada Reno's experimental station and extension service are working with ways to reduce the amount of—or the impacts of Cheatgrass infestation, both in early season grazing and also something that we have never really tried much in the past, late season grazing after the seed falls off of the plant, it then becomes something that's a little more palatable to use, and with proper supplementation cattle can reduce the carryover of fuel into the next season.

As we said earlier, it's predictable when we have two or three wet years, we will then have the dry—an inevitable dry season will come along, we'll have a dry lightning, low humidities and massive fires like we had last year.

I think if we can reduce that carryover that we can perhaps slow some of that action down. I think the most important thing is that we become, as has been said many times earlier today we need to be proactive.

We need to be preemptive; we need to be working toward a solution to the problem out there. We need the flexibilites at the district level of our land use agencies to be able to deal with these problems, and that's something that we've lost is that flexibility to make those decisions at the management level.

[The prepared statement of Mr. Spratling follows:]

PREPARED STATEMENT OF BOYD SPRATLING, PRESIDENT, NEVADA CATTLEMEN'S ASSOCIATION, ELKO, NV

The following discussion embodies the ranching industry's views regarding the relatively recent increase of catastrophic rangeland fire in the Great Basin and throughout the West. First and foremost, we agree that the causes of wildfire are extremely complex, but there are rather predictable consequences. The recent fire events, beginning in 1999 followed previous seasons of normal or above-normal precipitation. The results were substantial heavy growth and production. When fuels are allowed to build up and carry over through multiple years, and the inevitable dry summer follows, the stage is set for extreme fire potential. These accumulated grass-based fine fuels serve as a ladder to carry the flame between larger brush and shrubs. The fuel situation is multiplied by a reduced manipulation of heavier woody plants. Un-impacted, late seral stage decadent brush and expanding stands of Pinion Juniper have been allowed to increase in acreage, because of concern for dependent wildlife. In reality, sage grouse and mule deer require a mosaic of brush, with a full spectrum of seral stages. Juvenile sage is even more important than extremely mature sage. This variety of habitat is necessary from a landscape perspective.

Climate change has the potential to move the cheat grass-prone environment to higher elevations. Currently, these elevations have a higher precipitation potential and a greater probability of natural release and recovery to a pre-fire state. The tons of particulate matter, carbon dioxide and other gases released into the air during a fire are incalculable, and dust/ash storms during the following months degrade our fabled Nevada blue skies to a hazy brown. These environmental insults only worsen the potential for future climate changes.

We have watched our lower elevation valley floors burn, only to see invasive cheat grass replace what were once perennial bunch grasses, sage and other shrubs. The scenario was then set for repetitive short-cycle fires that easily burn through the

early maturing, highly flammable monoculture stands of cheat grass. Once established, cheat grass stands are very difficult to rehabilitate back to perennial grass and brush that are home to the wildlife native to the Great Basin. Additionally, the renewable grazing resource is altered, perhaps irrevocably, for a family-based industry that depends upon both public and private rangelands throughout the West.

Our concern has shifted somewhat. In the last few years, we have seen catastrophic, high-intensity, enormous acreage firestorms in our higher elevation prime rangelands. These are the finest examples of Great Basin landscape and habitat for all manner of animals, both wild and domestic. These types of fires exhibit behavior so extreme that if winds are added, safe fire suppression is impossible. It is difficult to find a location to make a stand.

Over the last thirty years, the trend has been to reduce impacts to the land. Regulatory actions have decreased the number of AUM's permitted on public lands, and actions to manipulate heavy fuels or break up landscapes with green strips have been hampered, often due to litigation. Of concern is the tendency for single issues to drive the entire management of a given watershed. These issues vary from post-fire regeneration and rehabilitation, to endangered species recovery, to bitterbrush and aspen growth or concerns over riparian health. We in the livestock industry agree that these are all very worthy, but forage and fuel management have been ignored to the extent that catastrophic fire totally wipes out all of the above listed values.

Below is a short list of negatives resulting from wildfire:

- Soil erosion (wind and water)
- Reduction of moisture absorption (huge fires can affect entire watershed functionality)
- Reduce feed and cover for all wildlife
- Degradation of air and water quality, both short and long term
- Degradation of viewscape
- Introduction of invasive weeds (cheat grass, thistle)
- Reduction of livestock grazing
- Displacement and economic strain on rangeland-dependent families
- Extreme cost of rehabilitation
- Prolonged time interval to get back to growth of woody shrubs
- Changes in watershed that increase the frequency of fire
- Reduction of other multiple uses on public land (hunting, fishing, recreation)
- Reduced ability to sustain appropriate number of wild horses

Possible solutions:

- Forage build-up and fuel management must be placed at an equal priority with other management issues. If it is ignored further, we will set back hard-earned landscape improvements by decades.

- Another principle we advocate is continuing prescriptive management of heavy fuels, such as Pinion Juniper or decadent stands of sagebrush. When fire reaches such stands, the flame length, heat and intensity increase dramatically. Firefighters can only work the flanks of such fire, because safety becomes a major concern. Some fear that sagebrush might be eliminated, and that is simply untrue. Breaking up these stands with plants of various seral stages and with fire-resistant grasses and forbs would not only provide locations to stop the fire, but would also be of major benefit to a variety of wildlife.

- Perhaps the most critical tool is the stabilization of the soil following a burn. Many native species have been unsuccessful at out-competing cheat grass infestation. Resource management professionals contend that some cultivars of native grasses are being developed to do a much better job. That being said, the simple truth is that non-native bunch grasses have a much better opportunity of success. The bottom line is that stabilization and out-competing of cheat grass is absolutely the most important approach we can take in this endeavor. If the goal is to eventually have some shrubs and brush, then aggressive perennial grass re-establishment is the critical first step. Many complain that such seeding only provides livestock feed, and that is most certainly a true assertion on the part of our critics. It just happens that such perennial, non-native grasses also give us the best opportunity to salvage our treasured landscape.

- Well-managed livestock grazing plays a major role in fuels management and healthy ranges. Grazing will not eliminate fire, but it will, absolutely, alter the fire activity and behavior. Fires where livestock have removed 400 to 800 lbs. of grass per acre will burn with much lower intensity and speed. One will observe large islands and fingers of unburned surface. Also, skeletons of burned

brush and crowns of bunch grasses remain intact, and they have a much higher potential for rapid recovery, even without expensive rehab efforts.

- Grazing also aids in control of cheat grass-prone areas. Very early season grazing can reduce cheat grass production, thus allowing an opportunity for the reestablishment of perennials. New grazing innovations are being tested to promote very late-season cheat grass grazing to assist in reduction of carryover of fuels into the next season. Flexibility must be given to land managers to allow grazing for this specific prescriptive function.

In short, grazing plays an important role in both fire pre-suppression and post-fire rehabilitation.

Senator WYDEN. I thank you all very much, and the Senate majority leader is going to have to go in a few minutes, and I want to have him make a closing statement and just as we go, Ms. Mulroy, tell us, so we have it for the record, the Senate Majority Leader feels strongly on this point, what are the Colorado River managers doing about climate change?

Ms. MULROY. There are—obviously, it's not a holistic group, but at this point I think we have come a long way to begin to look very differently at this river system.

We have to adapt, that's the point that we're at right now.

Now, however, at a—on a larger scale there is a group of the largest municipal agencies in the country that are coalescing around the issue of climate change.

They include New York, they include David Schaff from Portland, they include Seattle, San Francisco, Southern California, and all of us are looking at a three-pronged attack and reaction to what we're seeing emerge in climate change.

It is both from the adaptive level on promoting the necessary science to give us the tools that we need in order to manage around these water resources, and finally, it is to help be a part of the solution and begin mitigating our own impact on the environment.

Senator WYDEN. Thank you.

I think we can have the Senate majority leader for maybe ten more minutes or whatever his schedule will allow.

I'd very much like to have him make a closing statement. Can we have the Senate majority leader come forward?

Senator REID. Mr. Chairman, for me this has been very educational.

What we've heard from every witness, we hear from the Bureau of Land Management, we hear from the Geological Survey, we hear from the General Manager of the Southern Nevada Water Authority, we hear from our two cattlemen, basically; they don't have enough resources to do their job. They're all very kind, they don't want to get in trouble with their bosses, but that's what it all amounts to and you did everything you could to draw this out and they were afraid to say anything because they go back to their bosses and get in trouble. The fact is, you know Eastern Oregon is just like Northern Nevada.

Everyone thinks of Oregon as the great Pacific Ocean, but much of your State is just like our State, and we have the BLM that is terribly understaffed, the Geological Survey, terribly understaffed. Not only do they not have a constant flow of money that you talked about often, they don't know sometimes from month-to-month what they're going to be able to do.

Senator WYDEN. I think the Senate majority leader's microphone just went dead. Perhaps we can have that fixed. Go ahead, Mr. Reid.

Senator REID. They are worried from month-to-month, are they going to have to lay people off, literally, and I was very impressed with Doctor Belnap.

She said we can handle this problem, but what she didn't say is it's going to take a lot more resources, and if we stop and think what's going on in our country, what our priorities are, this land is my land, this land is your land. We're spending 2.3 billion dollars of borrowed money every week in Iraq. 2.3 billion dollars for a spec of, a couple—one day—if we could get 1 day of the money that is spent in Iraq we could solve the problems, or at least in the foreseeable future have an indication of what we need to do.

Mr. Chairman, you have fought for, you have counties in Oregon that survive on the money that they get from the Federal Government. In fact—it's a fact of life. We've got these great counties in Oregon that depended on cutting down trees, and that's how they survive. That is not—it's not there any more. We have—you have led the charge, but we've had, Western Senators, fighting for little dribs of money, so payment in lieu of taxes could get what we're supposed to get because of the Federal presence we have in these counties throughout the west, and we're not getting it.

We are not focusing attention where we need to focus attention. What we're talking about as these two I refer to cowboys, these two people who depend on rangelands for their existence; what they're saying is that this is a long-term problem, and we don't have a long-term solution that is meaningful. We need to do a lot more planning as Doctor Belnap said. Mike Pellant said it very clearly, that their programs work, but they don't have any money.

So, Mr. Chairman, thank you very much for being here today. This has been, for me, a real revelation. I guess ignorance is bliss. Sometimes you feel better not knowing what's really going on, but for me a picture is painted here today of the disaster we have facing us, and we're doing nothing about it—I shouldn't say nothing—but we're doing very limited attacks here, and we have the people to do it, we have the expertise to do it and we need to make sure that these people have the resources they need including more personnel.

Senator WYDEN. Mr. Leader, I want you to know that you lead this charge, I will help in any way I can. I think you summed it up. It's appropriate to wrap up with your words.

This really comes down to choices. It comes down to choices. It comes down to values, it comes down to what we care about, 300 million dollars a day for the war in Iraq, as you said, you addressed about the critical needs here in the west.

Senator REID. My favorite punching bag I've had lately has been coal. I can't leave here without saying something about that.

Mr. Chairman, we have a county called White Pine County in Nevada. It's a large county area-wise, beautiful. Do you remember John Syburn that we served with in the house?

Senator WYDEN. Yes.

Senator REID. He in the House had your same position. He was chairman of this subcommittee. Frankly, he hated Nevada. It was gambling, prostitution and bombs being set off here.

He came from a family of wealth. The entire—money that he inherited. He came to Nevada and we spent days traveling around looking at potential Forest Service wilderness. We had our final meeting in Washoe County in Northern Nevada, and he said, "I'm a convert. I've come to love Nevada because we have these wide open spaces," and back to White Pine County, we have vistas in White Pine County that you can see for more than a hundred miles.

Nevada is the most mountainous State in the union except for Alaska, we have 314 separate mountain ranges, and White Pine County is a place of beauty, pristine air, and the regulated monopoly we have in Nevada wants to build power plants in the middle of this pristine land and build on the first—and burn in the first phase, the first year they will get this done, if they get it done, which I'll do everything I can to stop it, they will burn seven million tons of coal. One year. Three years, 21 million tons of coal. They say, "We want clean coal technology." None exists, they have cleaner coal technology.

So one of my visions in my political career is to do something to protect those pristine areas, and we've been able to do it with Forest Service wilderness and we've done some Bureau of Land Management wilderness.

We have an obligation to protect these beautiful areas, and what has created all of the problems that we're talking about today? We've beaten around the bush, talking about global warming is here, but why is it here? Because we're burning—we're using 21 million barrels of oil every day; every day. Hundreds of millions of tons of coal.

We've got to stop that. That's the only way it's going to happen, so that we use alternative energy, that stuff that's up there every day; the sun shines every day, especially in Nevada, the wind blows every day in Nevada. We have geothermal; we have the Saudia Arabia geothermal energy, and we haven't talked about that today. That's going to help the cowboys, it's going to help casinos, the hotels; it's going to help your ranchers; it's going to help us all.

Mr. Chairman, thank you very much for—and I have to mention this—Ron and I've known each other all of these years. Ron within 2 weeks is going to be a new father. He is having—he isn't—but his wonderful wife, Nancy, is having twin, twin babies, in about 2 weeks, isn't that right?

Senator WYDEN. Exactly.

Senator REID. Thank you.

Senator WYDEN. Thank you for all of your friendship, Mr. Leader. God speed.

Let us briefly bring our witnesses back. Then I just had a couple of questions and then we can excuse everyone.

Ms. Mulroy, Mr. Nichols, and Doctor Spratling, we'll have you up for just a couple more minutes.

Dan, just by way of a question for you. If nothing changes, we sort of stay in place with what we have, what do we have to do

to the agricultural economy in your community? You're pretty much flattened, aren't you?

Mr. NICHOLS. Yes, we're basically in a—at the exponential rate it's growing, unless something is done to curb it, evade it, upper management techniques, we're basically done. How long that will be, who knows?

As I indicated, the Medusahead promotes fire and fire promotes Medusahead.

It is absolutely a monoculture that nothing else can compete with, it's a devastating weed. If it isn't brought under control, we're going to be done.

Senator WYDEN. It's going to turn the lights out on this part of Oregon, right?

Mr. NICHOLS. Lifestyle, wildlife, hydrology, riparian areas, this noxious weed has an impact on absolutely everything.

Senator WYDEN. The same question essentially for you, Doctor Spratling the challenge is a little bit different, but in terms of native species and wildfires.

If people don't wake up and do the kind of aggressive proactive work that the majority leader's talking about, won't this have devastating effects on the people you represent?

Mr. SPRATLING. I would agree wholeheartedly.

The inaction and hands-off policy is absolutely the worst thing that we can do; inaction is not the correct way to go. We've got to proactively go down that road, deal with these resource problems that not only affects the economies, but, you know, there's a lot of values, all the other values that we hold dear are all at risk by doing that.

Senator WYDEN. Ms. Mulroy, the last word is for you.

I'm glad to hear that the Colorado River, you know, managers, are getting into this, with the coalition of leaders around the country, but I hope the effort will accelerate.

I think that what we've heard, we've heard today, is that this is a now pull out stops kind of time, because if we don't use this, this period, we're going to have damage that will be irreversible, and I want to give you the last word.

Do you have anything that you would like to add as we wrap up?

Ms. MULROY. Thank you, Mr. Chairman.

I do agree that there's probably no more compelling issue, at least from where I sit, than to address the issues that everybody here talked about, and that includes also issues on water resources because I think we've only scratched the surface to see what the consequences are going to be on western water resources, whether it's rising oceans that turn the Sacramento Delta into a wasteland of sea water or whatever those consequences are as they manifest themselves in the west, but I'm completely convinced this is the most compelling issue facing the Western United States in this century.

Senator WYDEN. It is, and what we've got to do, is we've got to get people to act quickly. So often we see it in Washington, time is spent in sort of partisan, you know, bickerfests. I think you lose the Basin, you lose some of these treasurers. People aren't going to talk about democrats and republicans and say, "How did you let it happen?"

So you three have been very good. I particularly appreciate the coalition building efforts of rural folks, of Dan, you, Doctor Spratling, and at home or all these ranchers and cattle folks reach out to the environmental scientists, and others, and that's, of course, that's how you get it done that's how you are building support for the health program and secure rural schools program, and we don't have the total question solved, but we have the coalition, so with that, it's been a terrific hearing from the subcommittee, it gives us more work to do and more work seems to be done quickly.

With that, the subcommittee is adjourned.

[Whereupon, at 11:50 a.m., the hearing was adjourned.]

APPENDIX

RESPONSES TO ADDITIONAL QUESTIONS

STATEMENT OF DENNIS GHIGLIERI, CONSERVATION CHAIR, SIERRA CLUB, RENO, NV

These comments are submitted on behalf of the 5,500 members of the Toiyabe Chapter in Nevada and eastern California. One of the most significant threats to the Great Basin is the potential loss of its precious water. Unfortunately, this issue was not addressed by the Committee during the hearing.

Southern Nevada's break-neck growth has lead its water agency, the Southern Nevada Water Authority (SNWA), to propose pumping 200,000 acre-feet annually from desert valleys in eastern Nevada and sending the water to the Las Vegas Metropolis. Likewise, the Clark County and Lincoln County Commissions have approved a huge city 53 miles north-east of Las Vegas of more than 150,000 people. The new city is designed around numerous golf courses with plans to import water from further north and pump goundwater within Coyote Springs Valley. Mesquite, Nevada plans groundwater imports to fuel its housing growth. Much of the pumping and export pipelines and facilities will take place on public lands and seriously impact public lands throughout eastern Nevada negatively impacting rural communities and springs, wetlands, streams, and desert plants and animals.

Congress should immediately fund scientific studies on the groundwater systems of Nevada, western Utah, and eastern California to fully assess the potential for environmental and surface water impacts of the massive groundwater development proposed.

Current scientific knowledge tells us that the groundwater of eastern and southern Nevada, western Utah, and eastern California are linked hydrologically. Groundwater development will undoubtedly change this existing, stable hydrology. Congress should require that states develop agreements through an open public process, including establishing the baseline conditions as well as protection of surface water rights upon which rural communities and plants and animals depend before any groundwater development occurs or pipelines are constructed on public lands.

The threat of global warming is chilling for all of the southwest because reduced precipitation in an already dry area appears to be likely. Drought in this region hits not only the Colorado River, but eastern and southern Nevada, western Utah, and eastern California at the same time frequently. Congress needs to be much more proactive and require the 7 Colorado River States to meet standards for water conservation and efficiency. The Colorado River is stretched to the breaking point and demands from development leave the environment damaged and broken throughout the region. Congress has taken a "hands-off" approach but that will likely lead to increasing environmental damage and contention among the States. Instead a basin-wide water management plan with built-in environmental protection and mitigations needs to be developed to address present day water shortfalls and those which can be anticipated in the coming years.

Thank you for this opportunity to comment.

STATEMENT OF KENNETH HILL, WENDOVER, UT

The 11 Oct 2007 Las Vegas field hearing of the Senate Subcommittee on Public Lands and Forests covered a lot of important topics: invasive species, drought, wildfire, and climate change.

But one topic was missing: interbasin water transfer proposals, including the Southern Nevada Water Authority's proposal to pump and export 200,000 acre-feet of groundwater from rural Nevada and Utah for uncontrolled growth in southern Nevada.

Snake Valley, shared by Utah and Nevada, is particularly prone to wind and dust storms. These are likely to increase due to climate change as ground cover continues to die. If massive quantities of water are pumped and exported from this area it could be another Owens Valley with dangerous, unhealthy air quality.

Likewise, springs already are drying up at alarming rates throughout Snake Valley because of the drought. The SNWA water export scheme certainly will hasten this trend, endangering the delicate balance of biodiversity in the ecosystem here.

Massive water exportation from fragile desert basins is not sustainable and cannot be seen as a long-term solution for supplying water to urban areas like Las Vegas. By the time impacts develop they may be irreversible. Aggressive conservation is necessary. Las Vegas is well above other southwestern cities in per capita water use and has a long way to improve. Southern Nevada should be required to achieve consumption rates more like those of Tucson before dessication of rural valleys is permitted.

There is insufficient scientific data upon which to base decisions to authorize the SNWA water exportation plan. The recent BARCASS draft report did not study impacts of the proposal. A follow up study is needed before any decisions are made.

Congress should:

- Require the Colorado River states to meet standards for water conservation and efficiency.
- Require the Colorado River states to develop region-wide water management plans with built-in environmental protection and mitigation.
- Require western states to develop compacts on shared groundwater, including protection of community health and environmental resources through open and full public processes.
- Mandate and fund scientific studies by the USGS on groundwater exportation proposals (particularly the SNWA proposal in eastern Nevada and western Utah) to analyze potential impacts to the environment and local stake holders.

STATEMENT OF ABIGAIL JOHNSON, BAKER, NV

THREAT: Global warming is already exacerbating droughts and resulting in water shortages in the West. Groundwater is not available on a sustainable basis for massive interbasin water projects, like the Las Vegas water grab. Yet, SNWA is not seriously developing water supply options, including increasing water conservation or acquiring additional Colorado River supplies, nor pursuing desalination. SOLUTION: The US Congress should require the 7 Colorado River states to meet standards for water conservation and efficiency and to develop a basin-wide water management plan with built-in environmental protection and mitigation.

THREAT: The Nevada water grab may have direct serious negative environmental impacts in many other western states, including Utah, Arizona, and California. SOLUTION: The US Congress should require states to develop compacts on shared groundwater, including protection of environmental resources and community health through a full and open public process before ratification by Congress.

THREAT: There is insufficient scientific information on Western groundwater and on the environmental impacts of groundwater development and transfer. SOLUTION: The US Congress should mandate and fund scientific studies by the USGS on groundwater systems shared by states and the potential environmental and other impacts of groundwater development and transfer.

A major threat to the Great Basin is water mining such as is planned by the Southern Nevada Water Authority. Removing water without replacement threatens a large variety of plant and animal species, local economies (tourism, hunting, fishing, outdoor recreation, farming, ranching).

The body of science, though not complete, points to widespread and devastating effects of groundwater mining in already fragile and drought prone environments. Please make the following part of the hearing record as part of my comments:

—"Fueling Population Growth in Las Vegas: How Large-scale Groundwater Withdrawal Could Burn Regional Biodiversity" JAMES E. DEACON, AUSTIN E. WILLIAMS, CINDY DEACON WILLIAMS, AND JACK E. WILLIAMS, 688 BioScience, September 2007 / Vol. 57 No. 8 www.biosciencemag.org

—Effects Of Interbasin Water Transport on Ecosystems Of Spring Valley, White Pine County, Nevada", 24 June 2006, David Charlet, Ph.D. Professor of Biology, Community College Southern Nevada, Henderson NV 89015.

—"Gambling on the Water Table, The High-Stakes Implications of the Las Vegas Pipeline For Plants, Animals, Places and People", Defenders of Wildlife & The Great Basin Water Network, October, 2007."

—"BARCASS I:—Basin and Range Carbonate Aquifer System Study", USGS, June, 2007. Of particular note here are the new findings regarding the interconnectivity of basins suggesting that extracting groundwater from an aquifer upstream will affect those basins downstream. The multiple effects of pumping will affect negatively large areas of the Great Basin.

Thank you for considering my comments.

STATEMENT OF THE FOREST SERVICE, DEPARTMENT OF AGRICULTURE

Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to submit a written statement on the environmental threats to the Great Basin. The Forest Service is concerned about the rate at which invasive species are spreading and about increasing occurrence of severe wildfires across the Great Basin. In recent years, we have observed that wildfires are increasing in size and intensity, and that invasive species, especially cheatgrass, are expanding at a rapid rate in the Basin. Extended drought and increasing temperatures have exacerbated these changes. We also have observed declining snowpacks and other changing patterns of precipitation and runoff which increase the complexity of managing an already limited water resource. These environmental threats are affecting the health and the use of the Basin's environmental resources. The agency is working in partnership with others to address these challenges and to stem the tide of negative impacts on wildlife habitat and other uses of the land including livestock grazing and recreation.

BACKGROUND

The Forest Service manages 32 million acres of forest and rangelands across the Great Basin. These National Forest System lands intermingle with Bureau of Land Management (BLM) and private lands. The region is characterized by north-south trending mountain ranges separated by wide valley basins. In general, the basin portion of the Great Basin is in private ownership or managed by the BLM. The Forest Service primarily manages areas adjacent to these broad valleys. Large portions of the Basin are currently dominated by pinyon and juniper forests, but were historically sagebrush grasslands that were maintained by fires that occurred naturally across the Great Basin desert. In addition, the Great Basin desert has been invaded by cheatgrass, an annual grass introduced from Eurasia, which forms a dense carpet of easily ignitable dry fuel.

WILDLAND FIRE AND WEEDS

The fires of 2007 have brought to the forefront the issues of widespread wildfire and its implications for the environment in the Great Basin. Forest and grassland fuels across the Great Basin are extremely dry because of low winter snowpacks, below normal spring rains, very hot and dry summer weather, and increased vegetation stress and mortality from drought, disease and insects. Historically, fires in the sagebrush grasslands of the Great Basin occurred every 30 to 100 years. This fire frequency maintained the native sagebrush grasslands. Today, fire maintains cheatgrass, an invasive winter annual that germinates early, often under snow cover, and competes with the native grasses, shrubs, and wildflowers. With cheatgrass dominance, fire frequency has increased to approximately every 3 to 5 years. The shift of these ecosystems from diverse shrub-grass plant communities to near monocultures of annual grass can modify their structure and function. Cheatgrass, because of its annual nature and its shallow rooting system, does not protect the soils from erosion as well as the perennial, deeply rooted, native species. Additionally, erosion threatens the productivity of the land (removing the more productive topsoil) and water quality. If these shortened wildfire cycles are left unchecked, weed species, even more damaging than cheatgrass, may establish. In addition, areas dominated with invasive species, like cheatgrass and medusahead, are highly flammable and are very susceptible to frequent reburn, making it even more difficult to restore these landscapes.

CLIMATE CHANGE, INVASIVE SPECIES, AND ECOSYSTEM AND ECONOMIC RESILIENCE

The ultimate role of climate change in the Great Basin is not completely understood today. The Forest Service is conducting research on the effects of climate change, but more needs to be learned. Some climate change models predict significant temperature increases by the end of the century, as well as increases in carbon

dioxide levels. Precipitation models, while less robust, predict a slight increase in winter and decrease in summer precipitation. An important consequence of the simplification of Great Basin ecosystems through the loss of species diversity (e.g., replacement of native species by monocultures of invasive species) may be rangelands that are less resilient to effects of climate change and wildfire.

Shifts away from ecosystem complexity may also impact economic resources through loss of forage abundance for wildlife and livestock. Ranching as well as various outdoor activities are major components of rural economies within the Great Basin. As areas are unavailable for grazing as a result of wildfires, or as grazing seasons are shortened because of decreased forage abundance (annuals tend to produce less forage and mature earlier in the growing season), the effects may be economically detrimental to ranching operations and counties that depend on these forage resources.

WORKING TO ADDRESS INVASIVE SPECIES

The Forest Service is treating the land and working with others to help address these environmental issues within the Great Basin. One approach we are expanding is the use of targeted grazing. The Forest Service is using targeted grazing as a tool to control fuel levels by managing invasive species. The Forest Service is working with the American Sheep Industry (ASI) and the National Cattlemen's Beef Association (NCBA) to develop additional opportunities for effective landscape scale treatments. ASI has recently published the manual Targeted Grazing: A natural approach to vegetation management and landscape enhancement. Currently ASI, NCBA and the Forest Service are coordinating an effort to train land managers and livestock operators on the tools presented in this manual. The ability to increase the use of targeted grazing dramatically to achieve landscape scale treatments for both invasive species and fuels control has the potential to affect the landscape in the Great Basin.

The approaches being used include:

- In small areas, use of early season grazing by livestock on cheatgrass-infested landscapes as a part of ecosystem restoration to reduce or destroy cheatgrass to make reseeding projects more effective.
- Use of livestock to create fuel breaks surrounding communities at risk from wildland fires.
- Use of targeted grazing to maintain or improve habitat characteristics desirable for selected wildlife species.
- Use of goats to limit woody plant dominance, such as young juniper encroachment.

One example of targeted grazing is on the Humboldt-Toiyabe National Forest. Sheep flocks have been used to help reduce fuel accumulation on hillsides in early spring. Also, targeted grazing projects are being observed in the field to be successful across the region to manage and reduce fuels before the fire season, potentially helping to reduce catastrophic fires, and to slow the spread of invasive annual grasses that are destroying native ecosystems.

OTHER EFFORTS TO ADDRESS ENVIRONMENTAL THREATS IN THE GREAT BASIN

The Forest Service's Rocky Mountain Research Station (RMRS) is conducting research specifically related to Great Basin ecosystems and to climate change. The RMRS Ecology, Paleoecology and Restoration of Great Basin Watersheds Research Work Unit located on the campus of the University of Nevada Reno is focused on: 1) expansion of pinyon-juniper woodlands and the consequences for fire regimes and fire management; 2) susceptibility of sagebrush ecosystems to invasive plant and management options for control of plant invasions; and 3) effects of ongoing climate change on Great Basin ecosystems. In addition, RMRS is involved in research on the effects of climate change on forest and rangeland resources and research on metrics for ecosystem health.

The Forest Service is also involved in other research projects focusing on issues within the Great Basin such as the ongoing Joint Fire Sciences Program SageSTEP (Sagebrush Steppe Treatment Evaluation Project). SageSTEP is developing a basic understanding of the causes and effects of tree expansion and of increasing tree densities and cheatgrass invasion on sagebrush ecosystems and associated pinyon-juniper woodlands. Results will be used to devise techniques for restoring and maintaining sustainable sagebrush ecosystems and pinyon-juniper woodlands. Techniques being evaluated by this project include the use of prescribed fire as a restoration tool and the identification of plant species and seeding methods for restoring native communities. Other collaborative research efforts supported by the Joint Fire

Sciences Program that are specific to the Great Basin focus on the ecological response of watersheds, experiencing tree colonization, to the use of prescribed fire and mechanical treatments to control tree area expansion.

The Governors of Nevada, Idaho, Utah, and Wyoming are in the process of signing a Memorandum of Understanding (MOU) concerning fuels management and wildland fire rehabilitation and reseeding. They have pledged to work together to counter the adverse effects of fire, invasive species and other disruptive changes in vegetation conditions. We expect the States will formally request the support and cooperation of the Forest Service and Bureau of Land Management in rehabilitating lands in the Basin. The Forest Service is actively engaged in wildfire restoration and works with the States and private landowners to rehabilitate lands burned by wildfire.

The Forest Service has a long history of combating invasive species in the Great Basin. We have fostered and worked with cooperative weed management areas (CWMA) over most of the Basin. These groups include all landowners in an area, working together to manage invasive weed species across the landscape. We will continue to work with CWMAs using their experience and expertise to combat the spread of invasive species after wildfires.

CONCLUSION

Thank you for the opportunity to provide this Statement. Please submit any questions you may have to the Chief of the Forest Service.

STATEMENT OF RUPERT STEELE, CHAIRMAN, CONFEDERATED TRIBES OF THE GOSHUTE INDIAN RESERVATION

My name is Rupert Steele, Chairman of the Confederated Tribes of the Goshute Indian Reservation. The reservation is located in Eastern Nevada and Western Utah, approximately one-half of the reservation is located in Nevada and one-half is located in Utah.

I write to you today to express my concerns about effects of the proposed large volume of pumping of water from the Snake Valley in Utah and from the Spring Valley in Nevada. The Great Basin is a desert and pumping water will have grave effects on the region because there is a lack of adequate river or large streams that would provide recharge to the regional water system. Once the water is in the pipeline, I don't see anyone closing the valves or shutting down the pumps when the water table is lowered. The pumps will be allowed to operate until they burn out from the lack of water. This could happen the next day, the next week, the next month, or the next year because no one knows how much water is beneath the ground, however there are many assumptions and it is not a good practice and it is impossible to make high-quality decision based on assumptions.

The Goshute Indian Reservation is located between the two valleys. The water source for the reservation is provided by the precipitation run-off from the Deep Creek Range.

I am deeply troubled by the Basin and Range Carbonate Acquifer Study (BARCASS) because the Goshute Indian Reservation was not a part of the study, although the reservation is located between the two valleys and adjacent to the proposed pumping well/s. The Goshute Tribe adopted a Tribal Resolution opposing the project.

The Goshute Tribal economy is funded from revenue derived from the management of the natural resources. The funds are used to operate various programs to serve Tribal members and the Ibapah community. The Tribal economy is wholly dependent on the water system on the Goshute Indian Reservation. Large volume of water pumping will deplete the ground water storage, reduce the stream flows, greatly decrease and eliminate ground water-dependent ecosystems, increase saltwater intrusion, and have adverse changes in ground water quality. The depletion, disruption, and ultimately contamination of the ground water resources will have severe consequences on the reservation livelihood and will have irreparable damage and injury to local and adjacent hydrological and environmental systems.

I know that the surface water, the groundwater, and the deep water aquifers are interconnected and interdependent in almost all ecosystems. Ground water plays significant roles in sustaining the flow, chemistry, and temperature of streams, lakes, springs, wetlands, and cave systems on the Goshute Indian Reservation and adjacent adjoining valleys. Surface waters provide recharge to ground water. Ground water has a major influence on rock weathering, streambank erosion, and the headward progression of stream channels. In rough steep terrain, it governs slope stability; in flat terrain, it limits soil compaction and land subsidence.

Large volume of ground water pumping will reduce or eliminate discharges to springs and to wetlands. It will eliminate the sustainability of drinking-water supplies and maintenance of critical ground water-dependent habitats.

Our livelihood and existence on the Goshute Indian Reservation is in great jeopardy by the Southern Nevada Water Authority proposed project. I don't intend to change who we are or change our tribal identity because of the project. The Goshute Tribal land and water is directly tied to the tribal identity and to our spiritual way of life. I want to remind you that our Tribal sovereignty does not arise from our treaty with the government but from our unique relationship with Mother Earth.

Thank you for listening to my concerns.

STATEMENT OF ROSE STRICKLAND AND SUSAN LYNN, GREAT BASIN WATER NETWORK, RENO, NV

On behalf of the Great Basin Water Network, we are submitting testimony for the record on the October 11, 2007 field hearing in Las Vegas. The GBWN is an umbrella organization for groups and individuals committed to careful assessment of water projects and their environmental, social and economic consequences. Our mission is to protect locally sustainable water uses, natural resources and the public interest through coordination, communication, education, research, science, litigation and advocacy for water in the extended Great Basin.

We thank you for holding a hearing in Nevada on threats to the Great Basin in the next 100 years. We agree with the testimony of many of the witnesses about the threats of worsening noxious weed invasions, increasing wildfires in the Great Basin and Mojave deserts, longer and more frequent droughts which are being exacerbated by climate change, and the resulting negative impacts to the health of public rangelands and fragile desert ecosystems.

The GBWN would like to bring to your attention the eminent threat of massive interbasin water pumping and exportation proposals in Nevada and neighboring states and their potential harmful environmental and socioeconomic impacts on our rural and urban communities. In Nevada, the Southern Nevada Water Authority, water speculators, and developers are proposing to pump and move hundreds of thousands of acre feet of water each year from rural Nevada to support growth and development in urban areas. These massive water projects will result in the loss of native vegetation as groundwater tables drop and native plants are replaced by weeds or remain barren and subject to dustbowl conditions which are still plaguing Owens Valley in eastern California. Local economies based on livestock grazing, hunting and fishing and tourism will be adversely affected by the loss of ecosystem health. (See Gambling on the Water Table: The High-Stakes Implications of the Las Vegas Pipeline For Plants, Animals, Places and People www.defenders.org). Surface waters may also be impacted by groundwater development projects (See Gone to the Well Once Too Often: The Importance of Ground Water To Rivers in the West www.tu.org). Scientific knowledge is lacking on both groundwater availability and the extent of pumping impacts, although the dangers of such projects to fragile desert ecosystems is well-known (See attached BIOSCIENCE article).

Plants are not considered a beneficial use under Nevada Water Law and have no state protection. Federal environmental protection laws do not extend to ecosystem health. Federal land and resource management agencies, including the Bureau of Land Management, the US Forest Service, the National Park Service, the Bureau of Indian Affairs, and the US Fish and Wildlife Service have neither the direct mandate nor the staff and resources to protect public resources from the impacts of massive water transfers proposed in the Great Basin. In fact, the federal agencies have been under Department of Interior direction to settle their water protests of these transfer applications through "stipulated agreements" with water purveyors instead of participating in State Engineer water hearings to defend public resources. The meetings to develop these agreements are confidential and exclude any public input.

We see the following threats and offer solutions for Congressional consideration:

1. THREAT: Global warming is already exacerbating droughts and resulting in water shortages in the West. Groundwater is not available on a sustainable basis for massive interbasin water projects, like the one proposed by the Southern Nevada Water Authority. Yet, SNWA is not seriously developing water supply options, including increasing water conservation or acquiring additional Colorado River supplies, nor pursuing desalination nor recycling of used water. SOLUTION: The US Congress should require the 7 Colorado River states to meet standards for water conservation and efficiency and to develop a basin-wide water management plan with built-in environmental protection and mitigation.

2. THREAT: The Nevada groundwater development projects may have direct serious negative environmental impacts in many other western states, including Utah, Arizona, and California. SOLUTION: The US Congress should require states to develop compacts on shared groundwater, including protection of environmental resources and community health through a full and open public process before ratification by Congress.

3. THREAT: There is insufficient scientific information on Western groundwater and on the environmental impacts of groundwater development and transfer. SOLUTION: The US Congress should mandate and fund scientific studies by the USGS on groundwater systems shared by states and the potential environmental and other impacts of groundwater development and transfer.

4. THREAT: Federal land and resource agencies do not have sufficient budget or resources to protect public resources from the impacts of groundwater projects. SOLUTION: The US Congress should require federal agencies to diligently protect public lands and resources from the impacts of groundwater projects and provide adequate funding to carry out agency missions.

Thank you for considering our testimony.

STATEMENT OF MEGHAN WERELEY, NEVADA CATTLEMEN'S ASSOCIATION,

GRAZING IS PART OF THE SOLUTION

The Nevada Cattlemen's Association is a member organization dedicated to the preservation of ranches and rangelands in Nevada. The association supports and represents ecological and environmentally sustainable ranchers that operate on both private and public lands. As an association we seek to create a stable business climate for our members in which they can run these viable operations.

Over the past several years fire has played a large role in Nevada, largely in the Great Basin ecosystem. The State of Nevada can be a harsh environment for those who work the land. Cattlemen are susceptible to wildfire on public and private grazing lands. When fire moves through rangelands across the west vegetation communities change from shrub dominated, to annual cheatgrass dominated landscapes. Not only do the vegetation communities change, but the fire cycle increases, habitat for wildlife is decreased, and forage for both domestic livestock and wildlife is greatly reduced throughout the year.

Reducing fuels before the fire season using prescriptive grazing, brush thinning, green strips, and spring grazing on already cheatgrass dominated areas will help reduce the catastrophic fires that have moved through Nevada over the past few summers.

Fire not only hurts the rancher during the fire, but for the years after when the federal land is closed off. The recognition of the role that fire plays in the lives of rural Nevadans has been greatly overlooked and the association feels its time for that to change. The Nevada Cattlemen's Association will continue to support prefire management by ranchers and the federal land agencies as nothing prevents wildland fires.

The Nevada Cattlemen's Association supports the rehab efforts on burned landscapes as they directly effect soil stabilization, habitat/forage for wildlife, and forage for livestock. However there are several indirect impacts that seeded rehab efforts have on the landscape including: increased litter and organic component of the soil surface, competition with cheatgrass and/or other invasive species, seeded bunch grasses help to slow down fires as the interspaces between the plants break continuity of the fuel, and may help the plant communities move from annual to perennial grass species eventually leading to a shrub component on the site.

The Nevada Cattlemen's Association supports the reseeding of both native and non-native grass species. The association supports non-native grass species in rehab seed mix's because they are better able to compete with cheatgrass and other invasive species, as well as being drought tolerant, and less likely to carry fire. As the seeded species reestablish native perennial grasses and shrubs will soon move in creating greater diversity. Native species are hard to reseed and compete poorly with invasive grasses such as cheatgrass.

In burned areas the first step should start with stabilization and end with success. These rehab efforts are just the first step and are implemented for resource reasons only. However, if we let these reseeded areas continue to be ungrazed there could be vast negative impacts on biodiversity, habitat, and forage.

The Nevada Cattlemen's Association understands that grazing is not the only solution, but part of the overall picture of recovery; and that working together to find

solutions and implement known science in our current land management will not only help recovery but prevent catastrophic fires.

UNIVERSITY OF NEVADA LAS VEGAS,
DEPARTMENT OF ENVIRONMENTAL STUDIES AND BIOLOGY,
October 11, 2007.

Hon. RON WYDEN,
Chairman,

Hon. RICHARD BURR,
304 Dirksen Senate Building, Washington, DC.

DEAR SENATORS: Most major environmental threats to the Great Basin in the 21st century cannot be understood nor addressed without recognizing their relationship to groundwater development. In this, the driest region of the US, wildlife, invasive species, wildfire, climate change, economic development, sustainability, and livelihood of residents, are all, to one degree or another, dependent on policies and practices governing groundwater development. Because it is a limiting resource, water is widely acknowledged to be a major cause of conflict worldwide in this century. Nowhere is that more evident than here in the desert Southwest.

Limitations of groundwater resources stimulated the US Geological Survey to implement a Regional Aquifer-System Analysis (RASA) Project over the last three decades of the 20th century. The Great Basin Aquifer in Nevada and Utah constituted a major component of that project. That study was followed by another major study required under the Lincoln County Land Act—BARCAS (Basin and Range Carbonate Aquifer Study). Drawing heavily on the mass of information made available by those and related studies, I recently completed a general evaluation of the probable environmental consequences of proposed major groundwater withdrawals by the Southern Nevada Water Authority and others in eastern, central, and southern Nevada (see attached article from September 2007 Bioscience).* Figuring prominently in the "other" category is the Vidler Water Company, the largest corporation in America dedicated to converting water rights from agricultural to urban uses, and the largest landowner in Nevada.

What I found was that the SNWA groundwater project, by itself, is likely to produce perceptible reductions of the groundwater table extending from Death Valley, California to Sevier Lake, Utah. Those reductions are likely to exceed 50 feet over an area extending from Indian Springs just north of Las Vegas to Baker, Nevada at the base of Great Basin National Park, and in some areas could reach 1600 feet. To put that in perspective, the groundwater table in this region is known to have declined approximately 30 feet over the past 15,000 years as glaciers retreated and pluvial lakes in the Great Basin desiccated, creating the desert conditions we experience today. A consequence of water table declines of this magnitude will be reduction and or disappearance of spring discharge, wetland area, and plant communities dependent on shallow groundwater tables. Those consequences put in jeopardy the continued existence of more than 150 known wetland dependent species, including 20 listed as threatened or endangered. And, some estimates suggest that we may have only discovered somewhere in the neighborhood of 10% of the species actually living in the area.

Groundwater level declines of that magnitude will also dramatically increase the costs of groundwater pumping for everyone living in the affected areas of rural Nevada and Utah—rancher, farmer, rural resident, and small-town citizen alike. These consequences will also significantly diminish recreational opportunities and therefore quality of life for people living in metropolitan areas such as Las Vegas, Salt Lake City and Reno—recreational opportunities that are now available at Great Basin and Death Valley National Parks; Pahranagat, Moapa, Desert Game Range, and Ash Meadows National Wildlife Refuges; Wayne Kirch, Key Pittman, and Overton State Wildlife Management Areas; Lake Mead National Recreation Area, and the innumerable springs, streams, and wetland areas presently utilized for recreational purposes on both public and private land. These consequences can be expected as a result of only the proposed SNWA groundwater project. That proposal at present amounts to approximately 10-25% of the quantity of groundwater requested from the Nevada State Engineer! It is therefore likely that probable impacts mentioned above have been significantly underestimated.

SNWA has suggested that management of the groundwater basin using state-of-the-art methods will permit satisfactory mitigation of adverse impacts described above. Results of the recent BARCAS study indicating higher than expected

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*Article has been retained in subcommittee files.

interbasin groundwater flow, do not support that assertion. Because of relatively high interbasin flow, environmentally significant portions of a groundwater basin cannot be isolated without expenditure of huge quantities of energy to pump water uphill. It's unlikely that any society would be willing to undertake that expense for an infinite period of time. Without perpetual maintenance, major losses of biodiversity are inevitable. Furthermore, the fact that SNWA is likely to have control of no more than 25% of the groundwater in the area makes it highly unlikely that they will be able to have a controlling influence on adverse effects of groundwater pumping.

SNWA has also suggested that existing federal and state laws and regulations are adequate to protect existing rights and environmental values. Dry springs in Las Vegas Valley, Pahrump Valley, and many other locations around the Southwest demonstrate that historical practice does not support their suggestion. University of Wisconsin Professor Mary Anderson, in an editorial published in the July/August issue of the professional journal, Groundwater, noted that the traditional focus of the entire groundwater industry is to develop groundwater resources for "beneficial use by humans", a purpose that ultimately runs counter to efforts directed toward preserving, " . . . the integrity, stability, and beauty of the biotic community.". Unless the entire industry changes that traditional focus, environmental values and the rights many people associate with them will not be protected.

Of course, direct effects of proposed groundwater development discussed above, while serious, may be viewed as largely restricted to the state of Nevada, and therefore of less direct pertinence to your subcommittee's responsibilities. Direct pertinence to the Senate Public Lands subcommittee responsibilities is illustrated by the following:

1. The Lincoln County Land Act required Nevada and Utah to negotiate a mutually acceptable groundwater development agreement. The agreement has not yet been reached, and SNWA has, for now, shifted their focus away from Snake Valley, the area most likely to most quickly affect groundwater resources in Utah.
2. Proposed groundwater projects in Nevada and Utah, and throughout the United States are a major cause of wildlife decline, loss of biodiversity, and shifts in agricultural production.
3. The Nevada delegation, and probably members of your committee have already been approached by Las Vegas civic leaders with requests to convert additional public land adjacent to Las Vegas to private uses as a means of accommodating continued growth. That continued growth depends on acquiring additional water resources, a reality that increases pressure for unsustainable use of groundwater resources.
4. Groundwater is needed to provide cooling water for proposed coal-fired power plants near Ely, Nevada. Substantial quantities of electricity will be required to lift groundwater to the surface and pump it to Las Vegas. The power plants, if built will make substantial contributions to atmospheric CO_2 in a state with the greatest potential in the US for development of solar and geothermal energy, and major wind energy potential.
5. Changes to plant communities caused by declining groundwater tables increase the probability of invasion by cheatgrass and other exotics, which in turn increase the frequency and intensity of wildfire.

These considerations lead me to recommend the following:

1. Release of additional federal land near Las Vegas should be conditioned upon a demonstration that water resources to support growth on that land will not deplete groundwater resources or biodiversity, nor add carbon dioxide to the atmosphere.
2. Any legislation associated with changes in public land use in the Great Basin must require identification of sustainable water supplies that will not deplete groundwater resources, spring discharge, wetland area, or alter plant communities dependent on relatively shallow groundwater tables. It must also ensure carbon neutrality.
3. Increased funding for USGS studies to model effects of proposed groundwater development is needed. It should be considered a required information source prior to transfer of any federal land to private uses.
4. Congress should fund a groundwater modeling study of the deep carbonate aquifer in Utah and Nevada as a means of evaluating the environmental con-

sequences of development associated with proposed changes to the Clark County, Lincoln County, and White Pine County Land Acts.

Sincerely yours,

JAMES E. DEACON,
Emeritus Distinguished Professor.

STATEMENT OF KYLE DAVIS, POLICY DIRECTOR, NEVADA CONSERVATION LEAGUE, LAS VEGAS, NV

The Nevada Conservation League is a Nevada 501 C4 charitable organization. Our organization's mission is to help protect Nevada's land, air and fragile water supplies through public education and advocacy within government at all levels. On behalf of our membership and citizens of Nevada concerned about the threat of global climate change, we feel it is important to highlight the anticipated impacts on Nevada.

Global warming is one of the most important issues facing the State of Nevada. As set forth in the IPCC Fourth Assessment Report, scientists are in near universal agreement that our planet is warming and that this warming is caused by human activities that release greenhouse gases into the atmosphere. The consequences of doing nothing about this problem are significant, and we are already seeing some of the impacts here in our state. Most of the scientific models predict that even if we can keep our greenhouse gas emissions at current levels, our state faces the strong likelihood of increased drought and wildfires. As you are no doubt aware, our state has just endured a very costly and damaging wildfire season, and the problem will only get worse.

Nevadans are also dealing with the impacts of drought on our fragile water supplies. Our state is the driest state in the country, and global warming will only exacerbate this. According to the Natural Resources Defense Council, the impact will be most pronounced in a decrease of water throughout the Great Basin as well as decreased stream flows on most of Nevada's rivers, including the Colorado and Truckee Rivers. Both of these rivers are essential to the livelihoods of our most populated communities, making climate change not only an environmental concern, but a threat to our population. A shorter winter, characterized by more precipitation falling as rain rather than snow, will lead to drier conditions earlier in our forests and a lengthening fire season. The anticipated impacts of both longer droughts and increased wildfires will be devastating to our ecosystems throughout the great basin. Many of Nevada's residents in Eastern Nevada can attest to the drop in water tables, causing a substantial decrease in wildlife populations.

Keep in mind; these are the likely impacts if we curb our emissions today. Unfortunately, there are plans on the table to increase our emissions through the construction of three coal fired power plants. Burning coal accounts for 40% of the United States' output of carbon dioxide. Needless to say, if we are to build more coal-fired power plants, the consequences from global warming would be much worse. In fact, estimates from BLM documents put the carbon dioxide emission of these three plants at over 48 million tons of carbon dioxide a year. For comparison, this number would be more than could be saved by each household in America replacing two 60 watt bulbs with a compact fluorescent, or by planting four million trees!

If we do increase carbon dioxide emissions, the results could be disastrous. According to the California Climate Change Center, winter snowpack could be reduced by 70–90 percent, and wildfire activity could increase by 55 percent if greenhouse gas emissions continue at their current pace. This would render much of Nevada unlivable, as we rely on mountain snowpack and runoff to provide our water supply, not just for municipal use, but for agriculture as well. In addition to this, the National Academy of Sciences estimates that if current emissions continue, we can expect to see an average temperature increase between six and ten degrees Fahrenheit by the end of the century. Currently, the average summertime high temperature in Las Vegas is 102 degrees. What effect would an increase to 108–112 degrees have on our tourism-based economy, not to mention the quality of life of our residents?

Clearly, climate change is a clear threat, and Nevadans are already seeing the impacts right now. We have experienced a very warm summer in both Northern and Southern Nevada, and last year, both of our major cities were among the top cities in increase in summer temperature lows. Our fire season has been long and intense, with the Angora and Hawken fires threatening our neighborhoods and cities.

The time for action is now. We cannot continue to hide behind excuses and obfuscations of the facts. Global warming is a real problem; the scientific community is united on this. The impacts of global warming are likely to hit Nevada harder than

many other states. This is the most pressing environmental issue facing our state, and we need to take swift action at both the state and national level to reverse the effects of climate change so that we can preserve our quality of life, and preserve our state for our children and grandchildren.

STATEMENT OF MARK SALVO, DIRECTOR, AND ANDY KERR, ADVISOR, SAGEBRUSH SEA CAMPAIGN

CONCLUSIONS AND RECOMMENDATIONS

1. The Great Basin is a desert. Drying periods ("droughts") are common in the Great Basin.
2. A primary cause of excessive wildfires in the Great Basin is the spread of flammable, nonnative cheatgrass (Bromus tectorum). A primary cause of cheatgrass invasion is domestic livestock grazing.
3. Climate change, continued livestock grazing and the presence of nonnative weeds will complicate restoration of native ecosystems and watersheds in the Great Basin.
4. Federal agencies and programs fail to consider what is known about the relationship of livestock grazing to cheatgrass invasion, the cheatgrass-fire cycle, and implications for native restoration of cheatgrass-infested ecosystems in the Great Basin.
5. Great Basin rangelands should be restored to provide habitat for sage-grouse, pronghorn, mule deer and other wildlife; clean and plentiful water for Great Basin communities; and quality recreational opportunities for Americans.
6. Rangelands restored with native species and ungrazed by livestock will be more resistant and resilient to climate change than degraded lands.
7. The Federal government should:

   a. Require Federal land management agencies to develop and implement comprehensive plans to halt the spread of cheatgrass and conserve and restore native ecosystems and watersheds on Federal public lands.
   b. Prohibit the use of non-native plants/seeds for restoration and require the use of locally adapted native shrubs, wildflowers and grasses/seeds for restoration on Federal public lands.
   c. Discontinue livestock grazing on Federal public lands to eliminate a primary cause of weed invasion and increase the success of ecological and hydrological restoration programs for sagebrush steppe.

"DROUGHT" IS COMMON IN THE GREAT BASIN

The Great Basin is historically prone to droughts. At least six multi-year droughts have been recorded in the Great Basin: 1896–1905, 1930–1936, 1953–1965, 1974–1978, 1988–1993, and 1999–2004.[1] Although climate change may be contributing to recent droughts in the region, droughts are "a normal part of natural climate variations."[2] Droughts are "merely temporary abnormalities determined by deficient precipitation."[3]

CHEATGRASS OCCURRENCE AND DISTRIBUTION

Cheatgrass has become the dominant species on 100 million acres—158,000 square miles—in the Intermountain West.[4] More than fifty percent of sagebrush steppe may be invaded to some extent by cheatgrass, with losses projected to accelerate in the future.[5] Cheatgrass is spreading at a rate of 14 percent annually in

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[1] Bureau of Reclamation. "Drought in the West: Great Basin" (webpage). U.S. Dept. Interior, Bureau of Reclamation. (www.usbr.gov/uc/feature/great—basin.html; viewed Oct. 7, 2007).
[2] Bureau of Reclamation. "Drought in the West: Upper Colorado River Basin" (webpage). U.S. Dept. Interior, Bureau of Reclamation. (www.usbr.gov/uc/feature/drought.html; viewed Oct. 7, 2007).
[3] Bureau of Reclamation, "Upper Colorado River Basin."
[4] Rosentreter, R. 1994. Displacement of rare plants by exotic grasses. Pages 170–175 in S. B. Monsen and S. G. Kitchen (eds.). PROCEEDINGS—ECOLOGY AND MANAGEMENT OF ANNUAL RANGELANDS. Gen. Tech. Rep. INT-313. USDA, Forest Service, Intermountain Research Station. Ogden, UT: 170 (citing R. Mack. 1981. Invasion of Bromus tectorum L. into western North America: an ecological chronicle. Agro-Ecosystems 7: 145-165).
[5] Rowland, M. M. 2004. Effects of management practices on birds: Greater Sage-grouse. Northern Prairie Wildlife Research Center. Jamestown, ND. Available at Northern Prairie Wildlife Research Center Online: www.npwrc.usgs.gov/resource/literatr/grasbird/grsg/grsg.htm (ver.

Continued

the United States.[6] A BLM ecologist and program coordinator has warned that "[c]heatgrass is changing the West."[7]

The Great Basin and Nevada are particularly susceptible to cheatgrass incursion. Nearly 80 percent of the Great Basin and 80 percent of the land area in Nevada are estimated to be susceptible to displacement by cheatgrass at low or greater risk.[8] Sagebrush covers approximately 28 percent of the Great Basin, of which nearly 38 percent is estimated at moderate risk and nearly 20 percent at high risk of invasion by cheatgrass.[9] Eighty-four percent of Nevada is managed by the federal government (primarily by the Bureau of Land Management), and federal lands contain nearly 90 percent of the area estimated to be at moderate risk of cheatgrass invasion.[10]

FACTORS IN THE SPREAD OF CHEATGRASS

Cheatgrass thrives in disturbed, and especially burned, areas. Cultivation and subsequent land abandonment, livestock grazing, removal of native vegetation, and repeated fires can interact, or act singly, to proliferate cheatgrass. Cheatgrass can increase fire frequency, favoring itself and potentially inhibiting native plants from establishing in burned areas. The presence of cheatgrass in sagebrush steppe can lead to an eventual conversion of the shrubsteppe community to an exotic grassland. In some cases, cheatgrass encourages invasion by other exotic species such as knapweed and thistle.[11] Cheatgrass is well adapted to dry (xeric) sites and climate change may favor cheatgrass invasion.

LIVESTOCK GRAZING IS A PRIMARY CAUSE OF CHEATGRASS INVASION

The Bureau of Land Management (BLM) administers approximately 18,000 grazing permits and leases to graze almost 13 million AUMs (animal unit months)[12] on 165 million acres of public lands,[13] primarily in sagebrush steppe. More than 99 percent of remaining sagebrush steppe has been affected by livestock and approximately 30 percent has been heavily grazed.[14] The BLM grazing program is administered by 107 field offices that spend at least $58 million annually to manage public lands grazing,[15] at a loss of at least $54.6 million per year to federal taxpayers.[16]

12AUG2004) (citing N. E. West. 1999. Managing for biodiversity of rangelands. Pages 101-126 in W. W. Collins and C. O. Qualset (eds.). BIODIVERSITY IN AGROECOSYSTEMS. CRC Press. Boca Raton, FL [supporting statement that cheatgrass has invaded more than half of the sagebrush habitats] and M. A. Hemstrom, M. J. Wisdom, M. M. Rowland, et al. 2002. Sagebrush-steppe vegetation dynamics and potential for restoration in the interior Columbia Basin, USA. Conservation Biology 16: 1243-1255 [supporting contention that cheatgrass will continue to spread into sagebrush steppe]).

[6] Duncan, C. A. et al. 2004. Assessing the economic, environmental, and societal losses from invasive plants on rangeland and wildlands. Weed Technology (Invasive Weed Symposium) 18(5): 1412, Table 1.

[7] Miller, J. "Alien invader clings to socks, stokes West's wildfires." Daily Herald (Provo, UT) (Aug. 8, 2007).

[8] Suring, L. H., M. J. Wisdom, R. J. Tausch, R. F. Miller, M. M. Rowland, L. Schueck, C. W. Meinke. 2005. Modeling threats to sagebrush and other shrubland communities. Chap. 4 in part II: Regional assessment of habitats for species of conservation concern in the Great Basin. Pages 114-149 in M. J. Wisdom, M. M. Rowland, L. H. Suring (eds.). HABITAT THREATS IN THE SAGEBRUSH ECOSYSTEM: METHODS OF REGIONAL ASSESSMENT AND APPLICATIONS IN THE GREAT BASIN. Alliance Communications Group. Lawrence, KS: 138.

[9] Suring et al. (2005): 138.

[10] Suring et al. (2005): 140.

[11] Gucker, C. L. 2007. Bromus tectorum in Fire Effects Information System (database). U.S. Dept. Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. (www.fs.fed.us/database/feis; viewed Oct. 7, 2007) (and references cited).

[12] An animal unit month is a measure of the amount of forage necessary to sustain a cow and calf, one horse, or five sheep or goats, for one month.

[13] BLM. Undated. Bureau of Land Management 2007 Budget Justifications. Bureau of Land Management. Washington, DC: I-3; see also Government Accountability Office. 2005. Livestock grazing: federal expenditures and receipts vary depending on the agency and the purpose of the fee charged. GAO-05-869. Government Accountability Office. Washington, DC: 15, 76; BLM. 2007. Final Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programatic Environmental Report. Bureau of Land Management, Nevada State Office. Reno, NV: 4-94. (June 2007) (grazing permitted on 165 million acres of BLM lands).

[14] West, N. E. 1996. Strategies for maintenance and repair of biotic community diversity on rangelands. Chap. 22. Pages 326-346 in R. C. Szaro and D. W. Johnston (eds.). BIODIVERSITY IN MANAGED LANDSCAPES. THEORY AND PRACTICE. Oxford University Press. New York, NY: 336, 337.

[15] Government Accountability Office. 2005. Livestock grazing: federal expenditures and receipts vary depending on the agency and the purpose of the fee charged. GAO-05-869. Government Accountability Office. Washington, DC: 21.

[16] GAO (2005): 31.

Livestock spread cheatgrass by:

- disturbing the soil (and damaging biological soil crust—a living protective layer that prevents erosion, provides nutrients to plants, and helps prevent establishment of invasive plants);
- removing competing native vegetation; and
- spreading cheatgrass seeds on their coats and hooves.[17]

Furthermore, recent research indicates that nonnative ungulates—such as domestic livestock—select native plants over nonnative plants, giving a competitive advantage to nonnative weeds.[18]

Once cheatgrass is established, it is usually only a matter of time before the area burns. Livestock grazing following fire is especially damaging to recovery of sagebrush steppe. Livestock will graze and trample sagebrush seedlings, emerging grasses and wildflowers, and exposed soil on burned sites when they are most risk of invasion by cheatgrass and other exotic species. Current research suggests that native vegetation in the sagebrush steppe may require ten years or more to recover from various management treatments or disturbance (such as fire).[19] However, the BLM usually only prescribes two years of rest following fire.

MANAGING FOR THE LORDS OF YESTERDAY

Wildfires have burned more than 2.4 million acres of sagebrush steppe in Idaho, Nevada, and Utah in 2007. The BLM has blamed drought, climate change, high temperatures and "Mother Nature" for the fires.[20] Cheatgrass is also identified as a major cause of wildfires, but never the livestock that help introduce and spread the species. Indeed, one BLM state director has even suggested that his agency may need to "re-examine the convention of resting burned allotments for two or three years before allowing grazing again," claiming that "[l]ivestock may need to get back on the ground sooner to keep the fire load down."[21]

The public lands grazing industry has so captured[22] the process of Federal public lands management that livestock grazing is now commonly viewed as a solution to weed invasion, rather than a cause. Some agency staff have advocated seeding burned areas with nonnative forage plants rather than native shrubs, grasses and wild flowers because native plants "don't have a prayer" against cheatgrass.[23] In fact, native plants don't have a prayer against livestock. Others believe that livestock can be used to control cheatgrass, although research suggests that prescriptive grazing would have little effect on cheatgrass.[24]

A few simple facts prove that managing public lands for grazing, mining and other extractive industries—the "Lords of Yesterday"[25]—supports only a small minority of Americans, and at the expense of native flora and fauna, recreational opportunities and amenity-based businesses. In Nevada (the state with more federal land than any other outside of Alaska), federal public lands grazing provides 1,228 jobs.[26] By comparison, one casino in Las Vegas employs 37,000 people.[27] Changing

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[17] Gucker (2007); E. J. Rawlings, K. K. Hanson, R. L. Sanford, J. Belnap. 1997. The striking effects of land use practices and Bromus tectorum invasion on phosphorous cycling in a desert ecosystem of the Colorado Plateau. Bull. Ecological Soc'y of America 78: 300; A. J. Belsky and J. L. Gelbard. 2000. Livestock grazing and weed invasions in the arid West. Distributed report. Oregon Natural Desert Association. Bend, OR; J. Gelbard. 1999. Multiple scale causes of exotic plant invasions in the Colorado Plateau and Great Basin, USA. M.S. thesis. Duke University, Nicholas School of the Environment. Durham, NC.

[18] John D. Parker, J. D., D. E. Burkepile, M. E. Hay. Opposing effects of native and exotic herbivores on plant invasions. Science 311: 1459-1461.

[19] Monsen, S. B., R. Stevens, N. L. Shaw (compilers). 2004. RESTORING WESTERN RANGES AND WILDLANDS (vol. I). Gen. Tech. Rep. RMRS-GTR-136-Vol. 1. USDA-Forest Service, Rocky Mountain Research Station. Fort Collins, CO: 194-198.

[20] Christensen, M. "Dangerously dry." Times-News (Twin Falls, ID) (Aug. 6, 2007).

[21] Wilkins, D. "Summer fires rekindle grazing debate." Capital Press (July 27, 2007).

[22] Donahue, D. L. 2005. Western grazing: the capture of grass, ground, and government. Environmental Law 35: 721-806.

[23] Miller, "Alien invader clings to socks, stokes West's wildfires."

[24] Mayer, K. H. 2004. The effects of defoliation on Bromus tectorum seed production and growth. M.S. thesis. Oregon State University. Corvallis, OR.

[25] The term "Lords of Yesterday" refers to historic industries and was popularized in C. F. Wilkinson. 1992. CROSSING THE NEXT MERIDIAN: LAND, WATER AND THE FUTURE OF THE WEST. Island Press. Washington, DC.

[26] Power, T. 1996. LOST LANDSCAPES AND FAILED ECONOMIES: THE SEARCH FOR A VALUE OF PLACE. Island Press. Washington, DC: 184 (table 8-2).

[27] Greenhouse, S. "Behind Las Vegas's glitter, heavy losses and layoffs." New York Times (Oct. 19, 2001).

economics, lifestyle choices and retirement are contributing to a steady decline in public lands ranching across the West.

The mining industry, despite its omnipresence in the state, also employs relatively few Nevadans—approximately 14,000.[28] By comparison, the gaming industry employs more than 215,000 people in Nevada and generated $12.6 billion in revenue in 2006.[29]

Extractive industries are giving way to professional, service and amenity-based economies in the West.[30] Management of Federal public lands should support this transition.

CLIMATE CHANGE

Climate change is occurring in the Great Basin and may adversely affect native vegetation and restoration efforts. Atmospheric CO_2 has increased approximately 20 percent during the past century.[31] Average temperature has increased 0.6–1.1° F in the last 100 years in the Great Basin.[32] Climate change is projected to cause temperatures to continue to increase in the Great Basin by 3–4° F in spring and autumn, and by 5–6° F in winter and summer, by 2100.[33] One study estimated that as much as 80 percent of remaining sagebrush steppe in the West could be lost to the direct or indirect effects of global warming.[34]

Measures should be implemented immediately to conserve and restore sagebrush steppe in preparation for further climate change and concurrently take steps to adequately reduce greenhouse gas emissions to limit the estimated increase in temperature.

RECOMMENDATIONS FOR THE FEDERAL GOVERNMENT

Biological invasions, especially invasion by exotic weeds, are consistently cited as among the most important challenges to maintenance of healthy sagebrush communities.[35] The Federal government must acknowledge scientific evidence of the contributions of livestock grazing to cheatgrass invasion and resulting unnatural fires and develop strategies to reduce inappropriate grazing on Federal public lands. Current Federal management initiatives, such as the BLM 17-state Final Vegetation Treatments Using Herbicides Programmatic Environmental Impact Statement/Programmatic Environmental Report (the Record of Decision was just released on Friday, October 5),[36] that do not address the effects of livestock grazing on native vegetation and weed invasion, have no hope of solving the cheatgrass problem. Similarly, federally funded research projects such as the $13 million "SageSTEP" that purports to study ways to end the cheatgrass-fire cycle—without addressing the contributions of livestock grazing to cheatgrass invasion—are a waste of taxpayer funds.[37]

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[28] Dilanian, K. "Royalty-free mining days may be near end." USA Today (Oct. 1, 2007): 12A.

[29] American Gaming Association. "Industry Information/State Information: Statistics—Nevada" (webpage) (www.americangaming.org/Industry/state/statistics.cfm?stateid=9; visited October 1, 2007).

[30] Sonoran Institute. 2006. You've Come a Long Way, Cowboy: Ten Truths and Trends in the New American West. Sonoran Institute. Tucson, AZ. (www.sonoran.org/cowboy).

[31] West, N. E. 2000. Synecology and disturbance regimes of sagebrush steppe ecosystems. Pages 15-26 in P. G. Entwistle, A. M. Debolt, J. H. Kaltenecker, K. Steenhof (compilers). Proc. Sagebrush Steppe Ecosystems Symposium; June 21-23, 1999; Boise State University, Boise, ID. Publ. no. BLM/ID/PT-0001001+1150. Bureau of Land Management. Boise, ID: 16.

[32] Pellant, M., Great Basin Restoration Initiative Coordinator, Bureau of Land Management. Statement before the House Appropriations Subcommittee on Interior, Environment and Related Agencies, regarding Climate Change. (Apr. 26, 2007) (copy on file with the Sagebrush Sea Campaign).

[33] Pellant, M., Great Basin Restoration Initiative Coordinator, Bureau of Land Management. Statement before the House Appropriations Subcommittee on Interior, Environment and Related Agencies, regarding Climate Change. (Apr. 26, 2007) (citing data from the Intergovernmental Panel on Climate Change and the Hadley Centre, United Kingdom) (copy on file with the Sagebrush Sea Campaign).

[34] Neilson, R. P., J. M. Lenihan, D. Bachelet, R. J. Drapek. 2005. Climate change implications for sagebrush ecosystems. Trans. N. Amer. Wildl. & Nat. Res. Conf. 70: 145-159 (as cited in M. J. Wisdom, M. M. Rowland, R. J. Tausch. 2005. Effective management strategies for sage-grouse and sagebrush: a question of triage? Trans. N. Amer. Wildl. & Nat. Res. Conf. 70: 206). See also R. S. Thompson, S. E. Hostetler, P. J. Bartlein, K. H. Anderson. 1998. A Strategy for Assessing Potential Future Changes in Climate, Hydrology, and Vegetation in the Western United States. USGS Circular 1153. Government Printing Office. Washington, DC: 14 (available at pubs.usgs.gov/circ/1998/c1153/c1153.pdf; viewed Apr. 17, 2007) (the range of big sagebrush [Artemisia tridentata] is estimated to decline by 59 percent if atmospheric CO_2 is doubled from current levels).

[35] Suring et al. (2005): 114 and citations.

[36] 72 Fed. Reg. 57065 (Oct. 5, 2007).

[37] SageSTEP: Sagebrush Steppe Treatment Evaluation Project, (www.sagestep.org).

Successful ecological and hydrological restoration in the Great Basin will require that livestock grazing either be eliminated or significantly reduced on Federal public lands. The cheatgrass-fire cycle will not be broken unless the driver of livestock grazing is removed. Ending or reducing livestock grazing on Federal public lands, while beneficial for the land, water and wildlife, will have consequences for Federal grazing permittees. There is an ecologically imperative, economically rational, fiscally prudent, socially just and politically pragmatic solution to resolve grazing conflicts and also provide for ranchers: voluntary federal grazing permit buyout. A recent survey indicates that approximately half of public lands ranchers in Nevada may be interested in retiring their grazing permits at the price of $255 per animal unit month (AUM; the amount of forage necessary to sustain one cow and calf for one month).[38] If the price were $300/AUM, even more ranchers would be interested in voluntary permit buyout.[39] Given the amount of subsidies the Federal government annually pays to sustain public lands ranching, compensating grazing permittees to voluntarily end their grazing on public lands would be a good deal for taxpayers, ranchers and the environment.

CONCLUSION

The presence of cheatgrass in sagebrush habitats has contributed to larger, more intense and more frequent wildfires than what naturally occurred. Domestic livestock aid and abet cheatgrass invasion by disturbing the soil, removing competing native vegetation, and spreading cheatgrass seed on their coats and hooves. Federal agencies will fail to halt the cheatgrass invasion and resultant, excessive wildfires in sagebrush steppe unless and until the effects of livestock grazing are acknowledged and addressed in restoration planning.

ABOUT THE SAGEBRUSH SEA CAMPAIGN

The Sagebrush Sea Campaign (www.sagebrushsea.org) focuses public attention and conservation resources on protecting and restoring the vast sagebrush-steppe landscape in the American West. The campaign participates in public lands management planning, advocates for natural resource protection, and uses education, research, legislation and litigation to conserve and restore the Sagebrush Sea for present and future generations. The Sagebrush Sea Campaign is a project of Forest Guardians.

STATEMENT OF TERRY MARASCO, SILVER JACK INN & LECTROLUX CAFE, BAKER, NV

A greater threat than exotic vegetation to the Great Basin is water mining such as is planned by the Southern Nevada Water Authority. Removing water without replacement threatens a large variety of plant and animal species, local economies (tourism, hunting, fishing, outdoor recreation, farming, ranching).

The body of science, though not complete, points to widespread and devastating effects of groundwater mining in already fragile and drought prone environments. I submit the following to be included in this comment:

1. "Fueling Population Growth in Las Vegas: How Large-scale Groundwater Withdrawal Could Burn Regional Biodiversity " JAMES E. DEACON, AUSTIN E. WILLIAMS, CINDY DEACON WILLIAMS, AND JACK E. WILLIAMS, 688 BioScience, September 2007 / Vol. 57 No. 8 www.biosciencemag.org
2. "Effects Of Interbasin Water Transport on Ecosystems Of Spring Valley, White Pine County, Nevada", 24 June 2006, David Charlet, Ph.D. Professor of Biology, Community College Southern Nevada, Henderson NV 89015.
3. "Gambling on the Water Table, The High-Stakes Implications of the Las Vegas Pipeline For Plants, Animals, Places and People", Defenders of Wildlife & The Great Basin Water Network, October, 2007.
4. "BARCASSI: Basin and Range Carbonate Aquifer System Study", USGS, June, 2007. Of particular note here iws the new findings regarding the interconnectivity of basins suggesting that extracting groundwater from an aquifer

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[38] van Kooten, G. C., R. W. Thomsen, T. Hobby. 2006. Resolving range conflict in Nevada? Buyouts and other compensation alternatives. Rev. Agric. Econ. 28(4): 515-530.

[39] The Cascade-Siskiyou National Monument Voluntary and Equitable Grazing Conflict Resolution Act (S. 3858, 109th Congress), is cosponsored by Senators Ron Wyden (D-OR) and Gordon Smith (R-OR). The bill is expected to be reintroduced into the 110th Congress. The legislation would pay affected grazing lessees $300/AUM to retire their grazing permits. Nearly all affected lessees are expected to accept the offer.

upstream will affect those basins downstream. The multiple effects of pumping will affect negatively large areas of the Great Basin.

I also submit this letter noting statements by Senator Harry Reid into the record:

Dear Mr. Smith:

Saturday, July 2 Senator Harry Reid met with me and 6 other representatives of the Snake Valley Citizens Alliance (a group of rural Nevadans opposed to the pipeline project) in Baker. He stated strongly that he would not have as his legacy the destruction of White Pine County by impacts from the proposed Southern Nevada Water Authority's groundwater pipeline project. With a stronger wording he stated; "I will not see the rape of rural Nevada."

Senator Reid strongly opposed the pipeline from Honey Lake to Reno. In 1994 he stated that it would be "environmentally bad, too costly, and will provide too little water" and "the project is a hoax and a sham", and a "wistful boondoggle".

In a news release on the project, Sen. Reid stated: "My goal was to stop the waste of taxpayer's dollars and prevent needless environmental degradation". These comments are appropriate today for the Clark, Lincoln and White Pine Counties project.

Walker Lake provides another example of Reid's efforts to conserve water resources and Nevada's recreation and tourism sites by introducing the $200 Million Farm Bill.

What we rural Nevadans need to do is to keep Senator Reid informed of potentially disastrous impacts as they are made more clear, and bring to the table less impactful solutions to southern NV's water problems (desalination now technically and financially doable, and stringent conservation). For example we mentioned San Antonio, TX as a fine model of strict conservation.

We are moved by the Senator's words and all rural Nevadans need to watch the Senator from Searchlight's actions as the dangers of this project become clearer. We need him on our side."

In conclusion, the Committee must responsibly review all threats to the Great Basin.

STATEMENT OF KATIE FITE, WESTERN WATERSHEDS PROJECT, BOISE, ID

Please enter this as Testimony on the SNWA Ground Water Pumping Scheme Much of the Great Basin has undergone a significant degree of desertification due to livestock grazing impacts, removal of native vegetation in efforts to promote livestock forage, and other activities. Streams, springs, and springbrooks have been turned into dry gullies or trickles as a result of chronic grazing and trampling impacts.

Now, Global warming is exacerbating droughts and accelerating desertification processes.

Groundwater in the Great Basin and interior West is not available on a sustainable basis for massive interbasin water projects, like the Las Vegas water grab.

SNWA is engaging in Water Mining. It is not seriously developing alternative water supply options, including increasing water conservation or acquiring additional Colorado River supplies, nor pursuing desalination.

The US Congress should require the 7 Colorado River states to meet standards for water conservation and efficiency. A basin-wide water management plan with built-in environmental protection and mitigation, including retirement of federal lands grazing permits, should be put into place.

The U.S. Congress should also fund retirement of federal grazing permits on a willing seller basis as part of an effort to conserve scarce water suppiies in the Great Basin.

Under no circumstances should SNWA engage in public lands grazing—as is currently occurring and/or planned with permits it has acquired in this water grab. All federal land grazing permits acquired by SNWA should be immediately retired.

The Nevada water grab may have direct serious negative environmental impacts in many other western states, including Utah, Arizona, and California. On top of this, the effects of ground water depletion for coal-fired power plants, cyanide heap leach mining, and other activities may extend the impacts north into Idaho as well.

Proposals in the works to develop new utility orridors/rights-of-way in the Great Basin may also serve to extend pathways for pipeline corridors further outward as well.

The US Congress should require states to develop compacts on shared groundwater, including protection of environmental resources and community health through a full and open public process before ratification by Congress.

There is insufficient scientific information on Western groundwater and on the environmental impacts of groundwater development and transfer. The US Congress should mandate and fund scientific studies by the USGS on groundwater systems shared by states and the potential environmental and other impacts of groundwater development and transfer.

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