

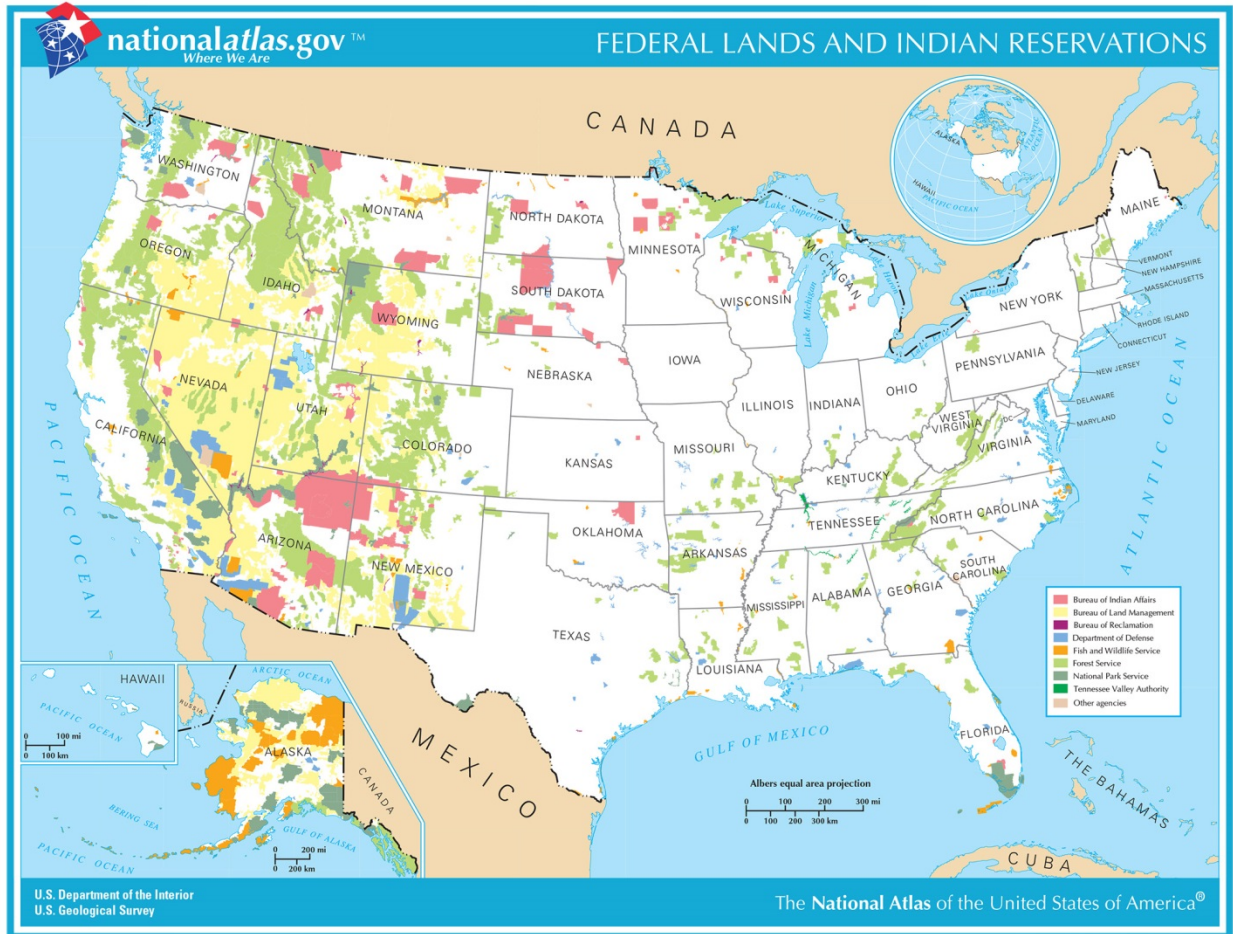
NATURAL RESOURCES in the WEST (DRAFT Background Statement)

Collectively the American public owns approximately 640 million acres or 28% of the 2.27 billion acres of land in the U.S. These lands are managed by Federal agencies including the U.S. Forest Service (USDA), Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (USFWS) and the National Parks Service (DOI). The Department of Defense also administers 19 million acres and a variety of other agencies administer the remaining public lands. Federal legislation and administrative regulations dictate and guide the purposes for which these public lands are managed. The BLM is responsible for 248 million acres of the public lands. The multi-use mandate for BLM to manage these lands includes managing grazing, recreation, energy development, wild horses and burros and for sustained utilization by the American public. The 193 million acres managed by the U.S. Forest Service involves timber harvesting, grazing, recreation, watershed protection and fish and wildlife habitats. Both BLM and FS have an increasing responsibility for wildfire protection. The Federal Lands and Indian Reservations map clearly shows that Federal land ownership is concentrated in the west with an average of 47% of western acreage owned by the public as compared to 4% of the remaining U.S. being publically owned. (R.W. Gorte, C.H. Vincent, L.A. Hanson and M.R. Rosenblum, Congressional Research Service Report for Congress, 7-5700, www.crs.gov, R42346, 2012). This creates unique challenges and opportunities for the western Land Grant Universities to provide research, education and outreach programs to enhance stability and growth of the western agricultural enterprise while sustaining and restoring the natural resources of the west.

The Western Region encompasses a vast geographical area that covers large distances between our states and protectorates extending from Guam in the west to Colorado/New Mexico in the east and from Alaska in the north to American Samoa in the south. This expansive area covered by the western Land Grant Universities includes a diverse demographic distribution and extremes in climate. Many western Land Grant Universities are located in high desert semi-arid (Great Basin) and arid desert (Mojave/Sonoran) environments while others either serve as the gateway to the Pacific serving tropical agriculture or extend to the artic with agriculture/natural resources in sub-zero climates. The breadbasket state of California has rich soil and optimal growing conditions for a high level of production for a wide spectrum of agricultural products and the northwest states have abundant rainfall producing a rich diversity of agricultural and forest productivity. In spite of this large ecosystem diversity and temperature extremes, the western region has many natural resource issues in common that the Land Grant System including campus based education, state of the art and applied research and community based outreach is addressing. These high priority programs will not only require continuation, but will need greater levels of support and focus if they are to address both current and future needs. Natural Resource sustainability and the continued delivery of benefits and products is intimately connected to agriculture production including 1) water availability and quality, 2) wildfire management including utilization, suppression, enhanced community protection, and restoration following widespread devastation from wildfires, 3) limiting and reversing encroachment of invasive species, and 4) managing for endangered species. All of these critical issues are common to agriculture, natural resources management, rural economics, and recreational activities. In many ways, the agricultural producers are the stewards of the land

and must develop and incorporate agricultural practices that create a sustainable environment and perpetual benefits from our natural resource base.

Themes common to the western Land Grant Universities that are important for agricultural practices that support sustainability in both the environment and our diverse ecosystems include:



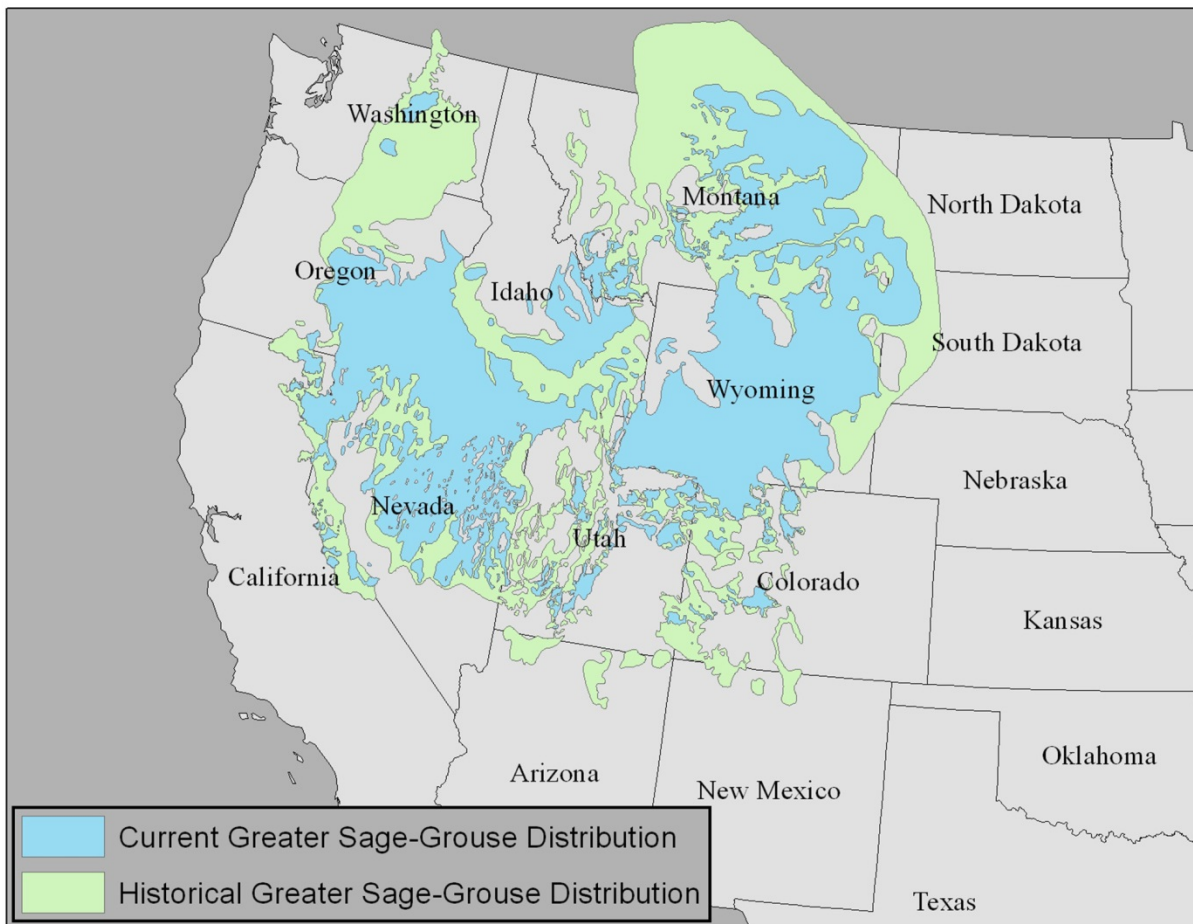
Expansive Public Lands Management in the West - The map of the U.S. (above) showing the publically owned land clearly emphasizes the fact that a high percentage of public land is located in the western states. These lands are managed by a variety of Federal agencies including Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service, National Parks Service, Department of Defense, Department of Indian Affairs, Bureau of Reclamation and the Atomic Energy Commission. As an example of the magnitude of federal influence on the west, the U.S. Forest Service oversees 192.8 million land acres in the United States of which 155.53 million acres (81%) are located in the western states. (www.fs.us/land/staff/lar/2007/Table_4.htm). Much of western agriculture is dependent on utilization of public land for livestock and forestry production requiring partnering with Federal agencies for the utilization of public lands. This presents some challenges as Federal policy dictates how and when the public land is available for use by producers. Part of this challenge is

the fact that Federal regulations and control of western natural resources are dependent on local Federal management which can be variable and in continual transition at different locations within the same agency and among agencies. Western states are the location of many cherished natural resources that attracts visitors from around the world, so recreation and visitations are important considerations for the use of public lands. The Western Land Grant Universities are uniquely placed to address critical agricultural and natural resource challenges and issues at the interface of public and private lands, made more complex by the varied landscape and climatic conditions of the region.

Water Quantity and Quality - Water is a scarce commodity in the west and is projected to be a limiting resource for western agriculture and natural resource management in the future, particularly in light of ongoing climate change. A reliable source of clean water is critical to maintaining strong communities, sustaining and developing rural economies, supporting agricultural productivity, sustaining ecosystem function and habitat and maintaining a high quality of life. We are facing significant challenges to meet future water demands as the population grows and water supplies become more limited. Population growth, economic development, extreme weather fluctuations and expansive wildfires place challenges on future water resources. Targeted research and education will play an important role in addressing these challenges by exploring new plant biology to develop more water efficient plants, improving water efficient management systems, and developing collaborative solutions for water distributions. The Western Governors' Association advocates an integrated and innovative strategy involving interstate collaboration for the management of water resources. (Western Governors' Association Policy Resolution 2014-03, Water Resource Management in the West).

Western Land Grant activity in water was searched on the CRIS System to identify all active projects including 3D grants, AFRI grants, Cooperative Agreements, Evans-Allen, Hatch, Mc-Stennis and NRI grants. This does not include local, county, State, and private funding applications, so this estimate will be low. The following keywords surfaced the reported number of projects as follows: Water Quality-71, Water Conservation-26, Water Management-23, Water Reuse-6, Water Use Efficiency-29, Drought-91 and the following Western Multi-State projects include: W2190-Water Policy and Management Challenges in the West, W2004-Marketing, Trade, and Management of Aquaculture and Fishery Resources, W2128-Microirrigation for Sustainable Water Use, W2170-Soil-Based Use of Residuals, Wastewater and Reclaimed Water, WERA102- Nutrient Management and Water Quality, WERA 1022-Meteorological and Climate Data to Support ET-Based Irrigation Scheduling, Water Conservation and Water Resource Management. This indicates that there is substantial investment in research, education and outreach activity in the area of western water. A more complete listing of Western Land Grant activity in this area will require a survey of each of the western Land Grants as local and state programs on water issues are not included in the CRIS/REReport systems.

Protecting Wildlife, especially imperiled and potentially endangered species - Large intact and functioning ecosystems, healthy fish and wildlife populations, and public access to natural landscapes are significant contributing factors to the West's economy and quality of life" (Western Governors Association Policy Resolution 2013-04). They estimate that wildlife recreation in the 19 western states exceeds \$65 Billion annually, which represents a significant contribution to the west's economy and emphasizes the need to ensure that wildlife habitat be protected, reestablished, and sustained to maintain healthy and diverse populations and prevent dysfunction leading to the listing of endangered species. One species that is currently under scrutiny is the Greater Sage-Grouse. The sage grouse distribution map shows that all of the continental western states have a history with sage-grouse habitat. Current threats to wildlife habitat include encroachment of invasive plant species that can lead to devastating expansive wildfires which in turn can expand the encroachment of the invasives creating an invasive species-fire cycle that destroys critical habitat for wildlife. The USFWL published a listing decision on the greater sage-grouse and has identified specific conservation measures for developing Resource Management Plans (RMP'S). Western Land Grant programs have an important role to inform decisions regarding preservation and enhancement of wildlife habitat, controlling **invasive species** and **reclamation of impacted ecosystems**, in the west.



Wildfires in the West - Every year, thousands of wildfires burn millions of acres of forest and rangelands in the western United States, having a significant impact on the Federal budget, wildlife habitat, agricultural production and the local and regional economies. For example, in 2013, Federal firefighting costs for suppression only included dealing with 47,579 fires that burned 4,319,546 acres with a total suppression costs for FS and DOI agencies of \$1,740,934,000. Unrecognized by the public, fire suppression activities only account for a small percentage of the costs of a wildfire event. (The True Costs of Wildfire in the Western United States, The Western Forestry Leadership Coalition, www.wflcweb.org). The WFLC conducted several case studies that showed that fire suppression in six western fires represented from 5-53% of the total cost of a wildfire. They considered impacts to watersheds, ecosystems, infrastructure, businesses, individuals and the local and national economy. Also factored in was property losses, post fire impacts, air and water quality damage, healthcare costs, injuries, fatalities, lost revenue to producers that lost grazing potential, lost revenue to residents that were evacuated, infrastructure shutdown and a series of ecosystem service and restoration costs that could extend well beyond the initial costs as they could extend into the future. Because of the large publicly owned land mass of the western states, the west is disproportionately affected by wildfires. Western Land Grant Universities have an important role in developing new strategies to address more effective fuels management practices to help reduce the occurrence of catastrophic fires, effectively utilize fire as a tool in managing ecosystems and mitigating the intensity of wildfire, and innovative ways to stabilize and reclaim the rangeland and natural resources following such ecosystem disturbances.

Western Land Grant activity in this area was searched on the CRIS System to identify all active projects including 3D grants, AFRI grants, Cooperative Agreements, Evans-Allen, Hatch, Mc-Stennis and NRI grants. This does not include local, county, State, and private funding applications, so this estimate will be low. The following keywords surfaced the reported number of projects as follows: Climate Change-194, Endangered Species-40, Invasive Species-97, Restoration-188, Sustainable Agriculture-51, Wildfire-59. The following Western Multi-State projects are currently supporting research, education and outreach in the area of sustainable natural resource practices: W2045- Agrochemical Impacts on Human and Environmental Health: Mechanisms and Mitigations, W2082- Evaluating the Physical and Biological Availability of Pesticides and Contaminants in Agricultural Ecosystems, W3133- Benefits and Costs of Natural Resources Policies Affecting Ecosystem Services on Public and Private Lands, W2188- Characterizing Mass and Energy Transport at Different Vadose Zone Scales, W2192- Improving Safety and Health of Wildland Firefighters Through Personal Protective Clothing, WCC1008- Rangeland Education Across Institutional Borders, WDC028- Coordination of Western Regional Extension Forestry Activities, WERA039-Coordination of Sheep and Goat Research and Education Programs for the Western States, WERA040- Application and Utility of the Ecological Site and Condition Concept for Monitoring Rangeland Ecological Status in the Western U.S., WERA102-Climate Data and Analyses for Application to Agriculture and Natural Resources, WERA1008- Rangelands West Partnership, WERA1013- Intermountain Regional Evaluation and Introduction of Native Species, WERA1015-Developing the U.S. Virtual Herbarium, WERA1018-The Social-Ecological Resilience of Rangelands in Working Landscapes.

Climate Change effects on Natural Resources - Climate change has been implicated in the increase in western fire occurrence and magnitude and is predicted to contribute to rapid increases of fire prone species like cheatgrass and medusahead in the Great Basin. . The insular areas, Guam, Northern Marianas, American Samoa, and all the entities in the Freely Associated States (Marshall's, Federated States of Micronesia and Palau) have vast interests in issues regarding climate change because the potential rising of oceanic water levels projected to result from climatic warming may completely cover most low lying atolls and cause salt water inundation into active farmlands. The western Land Grants have an important role in evaluating and predicting the impacts of climate change on agricultural and natural resources production and sustainability and researching alternatives to help offset these impacts.

Invasive Species – An invasive species is a non-native species for an ecosystem whose introduction leads to economic and/or environmental harm or negatively impact human health. Invasive of non-native species can include terrestrial, wetlands and waterways. The invasion of exotic and noxious weeds, destructive insects and disease causing organisms is an issue facing virtually every state in the west. For example, the Great Basin has invasion of cheatgrass and medusahead while Lake Tahoe is suffering from the invasion of an aquatic plant called Milfoil. This non-native plant supports the production of algae blooms at Lake Tahoe decreasing the clarity by promoting a green hue and thereby impacting the recreational experience. The movement of invasive species into fragile island ecosystems from SE Asia and the South Pacific into the Insular Areas have the potential for movement of these invasive species to subtropical Hawaii and Mediterranean climates in California which is another example of concern regarding the invasion of species that could disrupt the normal ecology.

The western Land Grants have an increasing role in researching, educating and providing outreach to public and private land owners and managers by providing solutions to control the spread of invasive species and to develop methodologies to reclaim the natural resource for public and private use.

Urbanization of the west - The west has states like Nevada that is considered one the most urban states (% of population) with a high % of rural land. Urban centers are the center of population growth, and their large population controls statewide decisions on *agricultural and natural resource issues*. *The expanding metropolitan base encroaches on agricultural and natural resources lands throughout the west.* For example, in Nevada, the requirement of water for a growing Las Vegas at the expense of agriculture and the Great Basin environment has become a real concern for the future of Nevada agriculture. Similarly, the threat of wildfire at the urban/rural interface has become a major concern for residents and fire protection. This is especially true around the Lake Tahoe area, as well as many of the other western states. Rural/urban interface issues are common throughout the west, and the western Land Grants have an important role in evaluation of the impact of urbanization on natural resource encroachment and providing mitigation solutions.

As a final note, the Federal agencies rarely utilize or participate in western land grant research (i.e. grazing, economics, re-vegetation, wild horses) for critical issues such as water, sage-grouse, and wildfire pre-suppression, although they have responsibility to manage our valuable natural resources. One of the western Land Grant challenges is to develop strategies to engage these agencies and capitalize on their funding to help solve the major issues in our western states. Indigenous knowledge and research is too often not utilized by these federal partners for making on the ground utilization decisions. The Western LGU's should champion the use of substantiated peer reviewed science to develop Federal Agency policy and decision making in the western U.S. and strategize to direct substantial funding for research and education to accomplish science based decision making.