

# Watershed Research in the Bureau of Land Management

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## Abstract

The Bureau of Land Management (BLM) has been involved with research on watersheds for decades. Research related to processes that affect precipitation infiltration and runoff, soil transport, vegetation health, and overall sustainability of watersheds is accomplished cooperatively with other Federal agencies and State institutions. The purpose of this paper is to review BLM's approaches to conducting watershed research on public lands, with an emphasis on future research direction.

**Keywords:** science strategy, science catalogues, watershed unit, watershed scales

## Introduction

### BLM's management role

BLM manages over 261 million acres of public lands as mandated by the Federal Land Policy and Management Act (FLPMA) of 1976. BLM's mission is to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations. These lands are generally open to a number of uses, such as recreational opportunities, commercial activities, scientific and educational activities, transportation systems, and conservation initiatives (e.g., wildlife habitat management). Portions of these lands are designated as special management areas, which include wilderness areas, wild and scenic rivers, national monuments, and national conservation areas. Issues arise due to competing and more concentrated uses of public lands and resources. Land and resource

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management issues related to the use of public lands are increasing due to population growth and expanding recreational expectations. Credible science-based information is essential in determining which combinations of uses by location will best meet the present and future needs of the American people.

### BLM's scientific role

FLPMA often refers to science and implies the need for scientific information to manage the public lands. Consistent with this law, BLM developed a national Science Strategy in 2000 with three primary objectives: to delineate the role of science in BLM decision making; to establish a clear process for identifying science needs and priorities; and to provide a mechanism for communicating those needs (Bureau of Land Management 2000). This process ensures that science needs are reflected in BLM's planning and budget documents.

In accordance with the Science Strategy, management issues are documented in catalogues that highlight science needs at both the national and regional levels. Once issues are identified, BLM scopes the subjects with science providers and begins to develop science-related funding proposals through the BLM budget planning system. Funding priorities are based on approved projects and the availability of appropriated funds. The results of research and other scientific investigations are used in planning and decision making, including agency strategic planning, policy formation, land use planning, and specific activity-level planning.

BLM works with its science partners to assist in addressing land and resource management issues. A significant component of this process is communicating national and regional science needs to science partners, such as the Cooperative Ecosystem Studies Units (CESU 2002). Communication and feedback are key elements in

BLM's efforts to identify and prioritize its science needs. Additionally, effective communications with partners is needed to ensure that results are applied to land management activities and decisions.

## Watershed Research

BLM acknowledges a long history of cooperation with the Agricultural Research Service (ARS). BLM's rangelands equal about 165 million acres (U.S. Department of the Interior 2003) or approximately 63 percent of the total public lands managed by the agency. Riparian and wetland areas, which intersect both forests and rangelands, account for another 23 million acres. These figures provide an appreciation for the steady demand by BLM for rangeland research, and why the agency has depended on and utilized ARS published results in its land management processes. Research sites located in watersheds, such as Walnut Gulch (Arizona) and Reynolds Creek (Idaho), have provided data, models, and interpretations related to precipitation effectiveness for plant growth, soil moisture availability to plants, effects of vegetation management on runoff in streams, and various natural and land use stresses on vegetation production.

The watershed unit is used by BLM to assess resource conditions and evaluate compliance with rangeland health standards (U.S. Department of the Interior 2001) and forest health protocols. Resource conditions are typically measured using indicators of health, such as those reported by Prichard (1993), Pellant et al. (2000), The Heinz Center (2002), and the 2003 Sustainable Rangelands Roundtable First Approximation Report (Sustainable Rangelands Roundtable 2003). Various scales of watershed units (e.g., sub-watershed, watershed, basin) must be considered, as not all indicators of health are appropriately assessed at any one level. In other words, it may not be possible or feasible to measure conditions within sub-watersheds and simply aggregate those values for determining conditions at more coarse scales. In view of research needs, the land management agencies will continue to depend on studies reflecting diverse watershed scales.

A review of current and recently published research being cooperatively sponsored between BLM and ARS was completed for this paper (U.S. Department of Agriculture 2003a, U.S. Department of Agriculture 2003b). A list of selected themes of interest to BLM that reflects ongoing watershed-related research projects in ARS appears in Table 1.

Table 1. Selected research interests at BLM and ARS.

<b>Theme</b>	<b>Process</b>	<b>Management Implication</b>
Ecology	Vegetation sustainability Wildfire Hillslope erosion Invasive weed production Plant transpiration Plant nutrition	Decision support systems Fuels management Vegetation management Weed control Water conservation Vegetation management
Hydrology	Sediment transport Ephemeral streamflow	Water quality compliance Runoff conservation Watershed stability
Climatology	Climate change Weather simulation	Water storage implications Vegetation management Grazing-related management

## Future Research

### Institutional considerations

The Department of the Interior is in the final stages of developing its strategic plan for 2003–2008 (U.S. Department of the Interior 2003), as required by the Government Performance and Results Act. This law, and the related strategic goals that agencies are required to develop, mandates that expenditures and accomplishments be in accordance with agency-specific approved plans. Funding for research and scientific development will need to support the goals and outcomes set forth in the Department's strategy.

Changing demographics and related landscapes may be considered another significant force affecting research priorities. Issues related to tradeoffs between traditional commodities (e.g., grazing, timber harvesting, mineral extraction) and protection of the environment is being compounded by ever increasing population centers in the West and demands for recreation on the public lands. Within wildland areas surrounding western U.S. towns and cities, land management agencies are dealing with the need to manage numerous competing uses (e.g., off-road vehicles, camping, hiking), while protecting the ecological integrity of these lands. Research and other scientific studies will necessarily give attention to these types of impacts as the agencies continue to deal with urban expansion and its effects on the environment.

BLM expects to see moderate levels of funding available for scientific investigations as it continues to implement the science strategy and work through its science providers. With the goal of understanding the condition of public lands, the BLM Applications of Science Initiative solicits needs from field offices and selects high-priority proposals to develop fiscal year requests for funds. Funding in 2003 was added to the BLM budget, and consequently, 23 projects were funded. The Joint Fire Science Program (2003) provides additional funding to BLM in support of development of information and tools dealing with wildland fire issues. With the establishment and management of national conservation areas and national monuments, BLM continues to prepare management plans that include the identification of science opportunities and research needs.

There is a long history in the Federal government of cooperation between science providers and land managers. Future relationships between these

entities should recognize two factors in developing research topics and using research results. First, all parties need to work diligently at jointly recognizing broad research topics of concern and establishing research priorities related to land management issues. Specific project proposals should be developed only after affected land managers and scientists have agreed on the problem to be addressed and related study methods to ensure a useable outcome. In particular, research planning and strategies at the national and regional levels need to focus on broader land and resource management issues and avoid extensive discussions on detailed project proposals. The resulting agreements or guidelines will allow agencies with varying roles to communicate more effectively and be more competitive in obtaining precious funds for conducting critically important research.

Second, BLM is seeing more successful research partnerships as agencies and interdisciplinary teams interact more frequently throughout the projects. From the time a resource management problem is identified, researched, and resolved, the interaction between scientists and land managers must be a continual process. Research partnerships can be positively influenced by land managers who are given ample opportunity to express their concerns and demonstrate resource management problems. Upon initiation of studies, all interests should meet frequently to review progress and ensure that objectives are either being met, or in some cases, being redefined. It is arguable that the most critical part of research efforts is the application of results to aid in solving land and resource management issues. Close interaction between the researchers and land managers in transferring research results can be realized through continued coordination (e.g., interagency, academia), such as training sessions, development of technical guidance, on-the-ground demonstrations, and peer involvement in developing management alternatives.

### Research needs

Research needs are initiated through BLM's Budget Planning System (BPS). In 2004, highlights of the BPS include continued development of systems to monitor and understand changing resource conditions (e.g., remotely sensed data, GIS models) and techniques for restoring plants and watersheds damaged by invasive, non-native plants and major wildfires (U.S. Department of the Interior 2003). Due to the recent establishment of national

monuments and national conservation areas managed by BLM, and the scientific values acknowledged in the establishment of these areas, scientifically credible baseline information is needed to develop land use plans to manage resource values. Scientific investigations will be initiated or continued in order to provide information related to energy and mineral resources development in relation to the protection of hydrological resources and a variety of habitat concerns.

BLM is committed to identifying the agency's priority research needs through its science catalogues as a means of conveying these needs to the CESU affiliates and other science partners. Based on the author's review of CESU-related watershed research, general areas of interest appear to be in subjects such as managing biological resources, controlling the effects of abandoned mine land pollution on land and water, developing sustainable recreation environments, and predicting the impacts of produced waters from oil and gas development. Relative to these areas of interest and the numerous specific studies listed in the catalogues, research related to managing biological resources is worth noting. Successful management of biological resources is often expressed with vegetation attributes, which reflect soil, climate, and moisture conditions. For BLM, biological resource priorities include wildfire impacts and post-fire rehabilitation, invasive weeds inventory and control, rare and endangered species assessments and management, critical habitat assessment and improvement, and forest and range plant community sustainability.

## Summary

In managing over 261 million acres of public lands, BLM continues to be an active participant in watershed and rangeland research, enabling more science-based land management decisions. In issuing its Science Strategy, the agency has set forth clear direction regarding its process for identifying national and regional science needs and working cooperatively in conducting studies and research. One example is BLM's long history of working with the ARS on watershed and rangeland issues, ensuring that the results of ecological, hydrological, and climatological studies are applied to land management situations.

In reference to future research in BLM, five institutional considerations were noted. First, in accordance with the Government Performance and Results Act and related requirements to report planned accomplishments, BLM is increasingly accountable for its expenditures, including funds invested in research. Second, the once open western rangelands traditionally used for production of goods are now under heavy pressure by expanding population areas to provide resources for recreation and wilderness. Third, an important consideration related to the Federal budget is BLM's appropriations, which are expected to provide only moderate levels of funds for research and the need to be extremely targeted in funding the highest priority research. Fourth is the need for effective communications between science providers and land managers to ensure the wise investment of public funds and full utilization of research results. And, fifth is the need for science and management partnerships to be more interactive throughout the study process and in applying results.

The highest priority research needs in watershed and rangeland environments are those that will facilitate a better understanding of changing resource conditions and techniques to restore plants and watersheds damaged by invasive weeds and wildfire. Resource management priorities include studies related to wildfire and invasive weed impacts and control, critical habitat assessment and improvement, and plant community sustainability. BLM will continue to convey its priority issues and research needs through its science catalogues to CESU affiliates and other science partners.

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