

BUREAU OF LAND MANAGEMENT

**FY 2004-2005 SCIENCE
PRIORITIES**

CURRENT AS OF JUNE 20, 2003

BLM FY 2004/2005 SCIENCE PRIORITIES

ReGap - Gap Analysis Program Regional Land Cover Mapping

Issue: Vegetation/land cover information is among the core resource management information needs of the BLM. BLM critically requires a vegetation data base that is consistent in detail and accuracy, is geographically complete for the western United States, and is GIS ready (digital). Vegetation maps currently in use at BLM were developed at varying levels of detail using many different methodologies. BLM is in need of a consistent vegetation base encompassing areas of public lands under their jurisdiction. Providing field office's with vegetation base information will help BLM to respond to management issues in a more science based, timely and cost efficient manner.

As part of the Gap Analysis Program, USGS/BRD is mapping land cover regionally. Currently underway is SW ReGap, a regional land cover mapping effort for AZ, CO, NM, NV, and UT. This land cover mapping effort will result in a detailed, consistent, seamless, standard and accuracy assessed regional land cover map. The land cover map will be developed from Landsat Thematic Mapper imagery with 30 meter resolution or equivalent to 1/4 acre on the ground.

The land cover classification will adhere to the Federal Geographic Data Committee (FGDC), National Vegetation Classification System (NVCS). The goal is to map natural and semi-natural vegetation to the alliance level. An example of an alliance within the NVCS classification hierarchy would be the *Artemesia tridentata* Shrubland Alliance.

In vegetation communities where mapping to the alliance level of detail is not possible, NatureServe has developed Ecological System Units, which are ecological groupings of the NVCS Alliances. For example, the *Artemesia tridentata* Shrubland Alliance along with other *Artemesia tridentata* spp. Shrubland Alliances are grouped into the Inter-Mountain Basins Big Sagebrush Shrubland Ecological System.

Land cover mapped to the Ecological System Unit level of detail will provide BLM with most of the consistent baseline vegetation information we so critically require. However, the existing USGS/BRD funding allocated for this effort does not include mapping of invasive exotics, such as cheatgrass and noxious weeds, or the refinement of shrub and juniper categories. As demonstrated by current BLM Initiatives, such as the National Fire Plan, Great Basin Restoration Initiative and the Sagebrush Steppe Initiative, BLM requires specific mapping refinement and detail in the invasive exotics, sagebrush steppe, salt desert shrub and pinyon-juniper communities. In order for BLM to address these many resource management challenges, it is necessary that these important vegetation types be included in this land cover mapping effort.

This information will not only provide baseline information, but provide the ability to monitor and assess changes in these vegetation over time. The additional request in funding is to provide the Gap Analysis Program with the required resources to provide the land cover mapping refinement and detail that BLM needs to address specific issues. Specifically, this effort will allow for the Bureau to significantly affect the outcome of

the final vegetation product, meeting BLM specific objectives. BLM Field Offices will derive great benefit from the use of a comprehensive vegetation base for resource management analysis and decision making.

Topics/Geographic Areas: The eleven Western States and Alaska.

Proposed Level of Funding A level of \$400,000 is recommended over a multi-year basis. At this funding level, Bureau wide refinement of specific land cover types could be addressed for SW ReGap and the upcoming NW ReGap, California, and Alaska ReGap efforts. This funding request includes a potential 30-40% total match from other agency partners, including, EPA, USFS, USFWS and other national, regional and local partners.

Bureau Field Support: BLM Resource Specialists at the field level can support this effort by contributing in-kind services in the form of collecting field information needed for the vegetation mapping, verification and accuracy assessment.

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BLM FY 2004/2005 SCIENCE PRIORITIES

Prescribed Fire

Issue: There is significant interest in the use of prescribed fire to restore rangeland health, and to control noxious weeds and other invasive species. Questions exist as to the effect of fire both on specific species of native rangeland plant and invasives, as well as the postfire competitive interactions among these species and species groups. It is generally assumed that healthy native perennials that survive fire without significant damage to growing points will have a competitive advantage over plants that are establishing from seed because their root mass already occupy the soil. How true this is for the noxious weeds and invasives is not known. Specific research questions are:

How can we use prescribed fire to manage noxious weeds and invasive species while maintaining or enhancing the health of native perennial species?

How do we recognize the need for postfire rehabilitation because there is a risk of enhanced populations of weeds and invasives?

There is a more basic question that is integral to designing prescribed fire prescriptions and for predicting the need for rehabilitation after wildfires. What is the relationship between the behavior and characteristics of a fire and its impact on individual plants of different growth form and species? It is apparent that bunchgrass mortality can vary among fires, and that it relates to the amount of heat received by basal buds and meristems. These growing points are located at various depths below the surface of the bunch, which in itself has different fuel characteristics related to blade width, basal density, biomass, plant surface area, and live to dead fuel ratio. In forest fuels, subsurface heating relates to the residence time of the fire. Flaming residence time relates to windspeed, fuel temperature, fuel moisture content, and the amount, arrangement and size class distribution of fuel. The duration of all phases of combustion depends largely on the moisture content and amount of more slowly drying, large diameter woody fuels and deeper soil litter and organic layers. These relationships have never been determined in rangeland plant communities. Flaming residence time likely relates closely to windspeed and fine fuel characteristics, but the factors that determine ignition and sustained combustion of dense fuels within the base of bunchgrass plants, and the litter and organic layers beneath rangeland shrubs and trees has not been documented. There are no current guidelines to predict mortality based on damage, nor to relate damage to the conditions under which a fire occurs.

Fire effects on annual weedy species relate to the consumption or survival of seeds, the effect on seedbed, and the postfire seed environment as it relates both to the number of surviving seeds that can establish and the competition these seedlings receive from regenerating perennials. In addition to these factors, fire effects on perennial weeds relates to the amount of direct fire caused mortality of regenerating structures. There are many species of both annual and perennial weeds. Modeling direct effects of fire on these species requires knowledge of the reproductive ecology of the individual species, and the heat regime created by fires burning under a range of burning conditions in fuels

of different characteristics. If these factors were known, mortality could be modeled relative to fire occurrence in the fuel and fuel moisture complexes that typify the range of plant communities in which weeds occur.

Topics/Geographic Areas: Arid and semi-arid regions of western United States.

Proposed Level of Funding: \$250,000 per year (for several years).

Bureau Field Support: Restoration of healthy rangelands and noxious weed management are a high priority in the BLM strategic plan. Field offices are engaged in the use of prescribed fire and noxious weed management activities. Offices can provide field support and assistance, including the implementation of experimental fires.

The Joint Fire Sciences Program (JFSP) of the Forest Service and Department of the Interior provides funding for wildland fire research. The Congressional intent is to focus on questions relative to wildland fuels management. The JFSP will be funding some research on fuels treatment as it relates to fire prevention and ecosystem restoration, and is broadening its perspective to look more closely at relationships between fire and invasive plants. Considering the scope of the problem, however, a much larger effort is needed.

Bureau Contact:

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BLM FY 2004/2005 SCIENCE PRIORITIES

Wild Horse and Burro Management

Issue and Background: In late 2000, the Midcontinent Ecological Science Center of the US Geological Survey, Biological Resources Division (USGS-BRD) was charged with developing a strategic research plan for the Bureau of Land Management (BLM) in their management of wild horses and burros. The purpose of the strategic planning process was to:

- review past progress and identify problems;
- set broad goals central to the BLM's mission for wild horse and burro management;
- establish specific, time-bound, measurable goals, and strategies to achieve them; and
- evaluate the progress towards those goals at set time periods.

Until this point, there had been no previous prioritization of the BLM's wild horse and burro research and management needs. This planning process was designed to develop a strategy for fulfilling those needs within a specified time period. The strategic plan is to be updated at three to five-year intervals.

Issue: The BLM has now determined research priorities for the Wild Horse and Burro Program. The result is the development of the Strategic Research Plan for Wild Horse and Burro Management. This document focuses primarily on 4 major topic areas including fertility control, aerial census and population modeling, genetic viability of herds and animal health. Fertility control has been identified as a priority within the research strategy. BLM continues to seek out a safe and effective 3-4 year immuno-contraceptive agent. Selective removal policies (i.e., horses 5 years and under in age) and the implementation of fertility control raise concerns of what constitutes genetically viable populations. There remains a need to develop scientific information to help guide the BLM in future management decisions relative to population viability so as to avoid negative results from inbreeding and potential loss of individual herds. The BLM also continues to be challenged on population estimates. There is a need to develop cost effective, repeatable, and safe remote technology to provide the BLM with the best population information for long-term management of the program. Animal health issues remain paramount in all aspects of the program.

The Strategic Research Plan for Wild Horse and Burro Management is accessible at <http://web.blm.gov/internal/wo-200/wo-260/health/index.html>. Principal input has come from the USGS-BRD on topics of contraception, aerial census, population modeling, and genetics. Principal input has come from the APHIS on topics of disease and animal health monitoring and surveillance. Advice and input has also come from the BLM managers and specialists assigned to the Wild Horse and Burro Program, BLM's WH&B Advisory Board, the BLM Wild Horse and Burro Washington Office staff, the BLM Director's Science Advisory Committee, and from seven topic-specific advisory panels that were convened by USGS-BRD. Direction has come from the Wild Horse and Burro Act of 1971 and the National Strategic Plan for the Wild Horse and Burro Program, 1992.

Topics/Geographic Areas: BLM's WH&B science needs are centered primarily in the western United States. Specific topics for investigation include determination of: **A.** Multi-year, one-application fertility control agent and possible impacts to wild horse herd health, genetics, demographics and behavior; **B.** Best remote census methodology; **C.** Genetically viable herds, and **D.** Animal health issues.

In order to implement research efforts, a BLM research advisory team has been formed with equal participation by the BLM (the BLM's wild horse and burro research coordinator), the USGS-BRD, and the APHIS to provide recommendations to the Wild Horse and Burro (WH&B) Group Manager. A three-member advisory group exists at this time: Dr. F. Singer (USGS-BRD), L. Coates-Markle (BLM), and Dr. A. Kane (APHIS). Interested parties are invited to submit research proposals to this team for review and assessment. Details for proposal submission requirements can be obtained by contacting the WH&B research coordinator listed below.

Bureau Field Support: BLM has personnel, information, and equipment currently in the WH&B program that can support research efforts.

Bureau Contacts:

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Linda Coates-Markle, WH&B Research

BLM FY 2004 SCIENCE PRIORITIES - Terrestrial Wildlife Ecosystems

1. Effects of Energy Development on Sage Grouse, Mule Deer and Pronghorn Habitat and Populations

Issue: It is important that we understand the interaction between sage grouse, big game, etc. and energy development, particularly oil and gas and wind energy development. There is an urgent need to collect data, analyze it and publish results so environmental protection measures can be fully adequate but not unduly burdensome. Misunderstandings and differences of opinion (even among wildlife biologists) frustrate the execution of effective and consistent management. Without critical information there are two risks: first, decisions based on weak information or anecdotal observations may not prevent unacceptable impacts to habitats; and secondly, field managers, intent on taking energy development proposals successfully past legal challenge may impose mitigation that unnecessarily interferes with good oil field practice.

Oil and Gas Development:

Historically, public lands in western states have provided a significant share of the habitat that remains for sage grouse, big game, raptors and other species. For example, the nationally-important crucial big game winter ranges and sage-grouse habitats in southwestern Wyoming give this region a special, if not unique, importance to hunters and naturalists that attracts national attention. This same area contains the largest reserve of natural gas found in several decades. This resource will provide environmentally clean, safe and reliable fuels to Americans for generations to come, but the integration of energy and habitat values has been difficult.

This is a unique opportunity. For a generation, environmental management and petroleum development have evolved into a system of fairly-effective practices that allow development and protect the environment. However, the scale of anticipated activity in areas like southwest Wyoming and the Powder River Basin of Wyoming and Montana is unusual. The protection of the nationally-important crucial wildlife habitats noted above (sage grouse strutting grounds, deer and antelope crucial winter ranges, etc.), in the face of this large scale industrial development, has attracted a national audience. This is proper because the high value of the wildlife and energy resources warrant the scrutiny of U.S. citizens.

Americans expect continued improvement and will expect it here. Industries and institutions periodically face challenges that require creative re-invention, and for the nearly merged disciplines of oil and gas production and environmental management, this may be such a time. There has been progress, but the sophisticated integration of oil and gas development with habitat enhancement and protection remains a young science.

Topics/Geographic Area: Southwestern Wyoming's rich mix of resource values and concomitant resource conflicts make it a logical geographic base for discussion, but western Colorado, south central New Mexico and other areas rich in wildlife and in oil

and gas reserves should also receive equal consideration. Many issues need to be addressed, some are shown below:

- 1) What are the impacts to breeding sage grouse by drilling, production and other activities? What is the nature of the impacts, and at what distances does this impact occur?
- 2) Do oil and natural gas field facilities (e.g. power lines, treater stacks, storage tanks, etc.) create extraordinary opportunities for avian and other predators to prey on breeding sage grouse? If so, what factors cause this increased mortality and does distance to a facility play a role? What types of anti-perch deterrents have been effective?
- 3) Does human activity in and around oil fields have positive or negative effects for wildlife, such as providing safer parturition areas for antelope by discouraging predation or abandonment of habitats due to disturbance?

Proposed Level of Funding: Approximately \$400,000 is necessary for a variety of projects with habitat/oil and gas related conflicts. All studies would include project design by a multi-disciplinary group, data collection, analysis focused on practicable mitigation, and publication of results.

Bureau Field Support: State and field office staff would be available to offer primary assistance. They include biologists, environmental scientists, natural resource specialists or any other staff familiar with the issues. Existing data, studies and other information would also be available. Some additional support could be anticipated from other federal and state agencies and from oil and gas field representatives. However, there are practical limits to what can be offered; this funding is necessary precisely because field people are usually overextended during the spring, summer and fall when vulnerable species breed and reproduce to sustain their populations.

Wind Energy Development:

Issue: The issue of collisions of birds and bats with wind turbines has been well-studied in both the U.S and Europe and is now considered manageable through siting and the use of low speed turbines. However, there may be a larger issue. There is little hard data on the impacts of wind energy development on sagebrush habitat and sagebrush species such as the sage grouse. The problem of wind facility and wind tower avoidance by wildlife has received little scientific attention, despite findings at a wind turbine facility in Kansas of very significant impacts to lesser prairie chickens which avoided wind towers, well-traveled roads, residences, powerplants, etc., generally more than a mile. Wind turbines are large structures, and are known to have adverse impacts on sage grouse in Wyoming up to four miles away, but scientific documentation is lacking.

Topics/Geographic Area: Great Basin in Nevada and southern half of Wyoming have and are slated for wind energy development, and have large expanses of sagebrush. Sites being applied for are tending to be in some of the best unfragmented sagebrush habitat.

Some of the issues are similar to oil and gas. Some that need to be addressed are:

- 1) What are the impacts to breeding sage grouse by wind towers, facilities, road construction, maintenance operations, and other activities? Do sage grouse avoid facilities, particularly towers, and by what distance? What is the nature of the impacts, and at what distances does this impact occur?
- 2) Do wind facilities (e.g. towers, power lines, etc.) create extraordinary opportunities for avian and other predators to prey on breeding sage grouse? If so, what factors cause this increased mortality and does distance to a facility play a role? What types of anti-perch deterrents have been effective?
- 3) Does human activity in and around wind facilities, including road travel, have positive or negative effects for wildlife, such as providing safer parturition areas for antelope by discouraging predation or abandonment of habitats due to disturbance?

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BLM FY 200/20054 SCIENCE PRIORITIES

Terrestrial Wildlife Research Needs in the Columbia River Basin ¹

Issue:

1. How does spatial pattern of land use affect movement or persistence of native vertebrates? For example, does concentrating activities such as grazing and future human developments away from movement corridors or source habitats promote viability of native vertebrates?
2. Within sagebrush ecosystems, how do soil characteristics, nutrient and water flows, vertebrate and invertebrate assemblages, and sagebrush-obligate species vary across the landscape in areas of different: patch size, habitat quality (i.e., composition and cover of exotic forbs, native grasses, native forbs), grazing history, current grazing system, and distance from sagebrush Amainland@? In a mosaic of varying land uses and vegetation types, how does rate of habitat change and conversion compare with historic rates of change and conversion? Do size and geometry of fragments and their interspersion across the landscape predict spread of exotics, nutrient flow into and from ecosystem fragments, or abundance of species with large or specialized habitat requirements?
3. What level of connectivity do >corridors= of different width, length, or quality/type (e.g., natural remnants vs. fencelines vs. created corridors) provide for mobile organisms, if any?
4. Does distribution of individual exotic animal species correlate with biotic or abiotic factors within subwatersheds or at larger scales? For example, do bullfrogs only colonize bodies of water above some threshold temperature or water depth, with low vegetative cover, year-round permanence, or having certain fish assemblages?
5. Are there areas where beavers occurred historically, have been extirpated, and could feasibly be re-introduced? After re-introduction, what is the effect on nutrient and sediment levels, channel characteristics, and riparian biodiversity?
6. After fires of large spatial extent when native seeds cannot be collected or produced in sufficient amount to re-seed the entire burned area, what spatial arrangement of native and non-native reseeding creates greatest productivity and diversity of native species?
7. In preparing seed mixes and restoration plantings with native species, what mix provides an optimum compromise between the objectives of rapid soil stabilization, development of diverse native flora, and creation of soil nutrient and hydrological dynamics that are resistant to exotic species?

¹ A full description of research needs can be found in ARESEARCH PLAN FOR DOI-ADMINISTERED LANDS IN THE INTERIOR COLUMBIA BASIN AND SNAKE RIVER PLATEAU@, June 14, 2001, compiled by Dr. Eric Beever, U.S.G.S. Forest and Rangeland Ecosystem Science Center, 3200 SW Jefferson Way,Corvallis, Oregon 97331

Proposed Level of Funding: Approximately \$750,000 is necessary for initial terrestrial research projects in the Columbia River Basin. All studies would include project design by a multi-disciplinary group, data collection, analysis focused on practicable mitigation, and publication of results.

Bureau Field Support: State and field office staff would be available to offer primary assistance. They include biologists, environmental scientists, natural resource specialists or any other staff familiar with the issues. Existing data, studies and other information would also be available. Some additional support could be anticipated from other federal and state agencies and from oil and gas field representatives.

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BLM FY 2004/2005 SCIENCE PRIORITIES

Terrestrial Wildlife Research Needs in the Sagebrush and Prairie Ecosystems ¹

Issue:

1. Development of efficient and effective methods to document the condition of habitats and abundance of species on an ecosystem basis. Comprehensive assessment of the condition of habitats and their spatial arrangements at the landscape and regional level.
2. Determination of the adequacy of the remaining intact habitats.
3. Determination of the requirements for restoration of damaged habitats.
4. Determination of the effects of weeds, fire, grazing and other management actions on endangered species and habitats within these ecosystems.

Immediate Needs: The potential conflicts between the various needs of the different species and the multiple use programs necessitate development of broad-based landscape level data. The Bureau is currently focusing on two ecosystems in particular - sagebrush steppe and shortgrass prairie. For these ecosystems, we specifically need 1) a current broad-scale vegetation map for the sagebrush steppe ecosystem and the short grass prairie ecosystem; 2) a current habitat map identifying where the breeding, nesting, and wintering habitats are located for the sage grouse, mountain plover and other species in the sagebrush and prairie ecosystems; 3) to discover the type of population (resident, 1-stage migratory, 2-stage migratory, other) and the geographic area, seasonal ranges and migration corridors that sage grouse use throughout the year; 4) to define the relationship between current and historic livestock grazing system, season of use and stocking levels, and the species composition, canopy cover, frequency of occurrence and vigor of native shrubs, grasses and forbs in sage grouse habitat; 5) to discover how sage grouse do, or do not, use restored habitats in various seasonal ranges and in migration corridors; 6) continue to research the value of different plant species, planting techniques and other factors that contribute to restoration of sagebrush habitats; 7) determine the relationship between palatability and nutrition of sagebrush species, subspecies, ecotypes, stand age and local populations, and their use by livestock and sage grouse; 8) discover the relationship between the historic and current vegetation conditions, fire history and other factors and the supply of invertebrates, particularly ants, in brood-rearing habitats; 9) discover the relationship between canopy cover, vigor and species richness of native shrubs, grasses and forbs and the productivity and survival of sage grouse collect; 10) explore genetic issues as these pertain directly to the long-term persistence of sage grouse populations; 11) discover the relationship between hunting and natural mortality; and 12) synthesize those data necessary to produce robust demographic models that will provide an understanding of population dynamics.

There are several ecosystems occurring within rangelands that warrant our attention

¹ Research information needs for these ecosystems were developed by the mapping and assessment committees of the Sagebrush and Prairie Conservation Strategy Development Teams.

because of the number of endangered, threatened, or sensitive species they support and the effects of multiple land uses. For example, the sagebrush steppe ecosystem occupies more than 150 million acres in the West, a majority of which occurs in the Great Basin. BLM manages approximately 30 percent of this area or over 45 million acres in nine western states. In addition, about 99 percent of the short grass prairie ecosystem has been lost to agricultural development and BLM manages about 17 million acres within this ecosystem. The southwestern deserts of Arizona and New Mexico support nearly 100 federally listed species while the California Desert Conservation Area supports about 65 special status species.

Proposed Level of Funding: Approximately \$800,000 is necessary for a variety of projects associated with assessment and impact analysis in sagebrush and grassland ecosystems. All studies would include project design by a multi-disciplinary group, data collection, analysis focused on practicable mitigation, and publication of results.

Bureau Field Support: State and field office staff would be available to offer primary assistance. They include biologists, environmental scientists, natural resource specialists or any other staff familiar with the issues. Existing data, studies and other information would also be available. Some additional support could be anticipated from other federal and state agencies

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BLM FY 2004/2005 SCIENCE PRIORITIES

Special Status Species

Issue: The Endangered Species Act (ESA) mandates federal agencies to promote conservation of species at risk and implement recovery measures for species currently listed. The number of endangered and threatened species occurring on public lands managed by BLM continues to increase at an alarming rate. Currently on BLM lands support almost 300 species of federally threatened or endangered plants and animals. In addition, there are almost 50 plant and animal species proposed for listing and over 1200 plant and animals species identified as sensitive by BLM State Directors.

Due to increasing numbers of listed species occurring on public lands, regional multi-species conservation strategies and plans are being developed through cooperative efforts of federal, state, and local governments throughout the West. However, for many of these special status species, BLM lacks sufficient knowledge to carry out conservation responsibilities. Land managers need a scientifically-based understanding of the abundance and distribution of species at risk that includes their historical distributions and life cycles, natural and human-caused risks, acceptable levels of land uses to achieve healthy, resilient ecosystems capable of supporting native plants and animals in adequate abundance. Spatial records and a tracking system are critical to maintaining records and promoting species protection and recovery.

Topics/Geographic Areas: Research needs include the following:

1. Development of efficient and effective methods to document the condition of habitats and abundance of species on an ecosystem basis. Comprehensive assessment of the condition of habitats and their spatial arrangements at the landscape and regional level. Survey data should be documented in GIS.
2. Determination of the adequacy of the remaining intact habitats.
3. Determination of the requirements for restoration of damaged habitats.
4. Determination of the effects of weeds, fire, grazing and other management actions on endangered species and habitats within these ecosystems.

Immediate Needs: Baseline and population trend monitoring of special status species in sagebrush and prairie grassland habitats, Colorado Plateau and Wyoming Basin. Sagebrush/prairie grassland communities, containing proposed gas field development areas, are critical to many sage-brush obligates such as sage-grouse, mountain plover, prairie dogs, pygmy rabbits, and numerous neotropical migratory bird species. The potential conflicts between the various needs of the different species and the multiple use programs necessitate development of broad-based landscape level data. For these ecosystems, we specifically need GIS maps of 1) current broad-scale vegetation 2) breeding, nesting, and wintering habitats for sage-grouse, mountain plover, prairie dogs, pygmy rabbits, neotropical migratory birds and other species in the sagebrush and prairie

ecosystems. We also need to discover the types of populations (resident, 1-stage migratory, 2-stage migratory, other) of these avian species at risk and the geographic area, seasonal ranges and migration corridors that they use throughout the year.

There are several ecosystems occurring within rangelands that warrant our attention because of the number of endangered, threatened, or sensitive species they support and the effects of multiple land uses. For example, the sagebrush steppe ecosystem occupies more than 150 million acres in the West, a majority of which occurs in the Great Basin. BLM manages approximately 30 percent of this area or over 45 million acres in nine western states. In addition, about 99 percent of the short grass prairie ecosystem has been lost to agricultural development and BLM manages about 17 million acres within this ecosystem. The southwestern deserts of Arizona and New Mexico support nearly 100 federally listed species while the California Desert Conservation Area supports about 65 special status species.

Proposed Level of Funding: \$600,000

Bureau Field Support: The BLM has wildlife and management staff in Field Offices, National Centers, and Washington, D.C. that can be of assistance. Logistical field support could likely be arranged in most instances.

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BLM FY 2004/2005 SCIENCE PRIORITIES

Aquatic and Riparian Systems: Studies of water quality, salmonid and non-salmonid fishes, watershed health and restoration

Issue: The BLM is mandated by various Federal laws, regulations, and policies to protect or restore aquatic habitat that supports native and desired non-native fauna. The BLM is also mandated to ensure that all water bodies located on BLM land, or influenced by BLM activities, are in compliance with State water-quality standards. Traditional land management activities (e.g., livestock grazing, timber production, etc.) must be designed and implemented to minimize degradation of aquatic/riparian habitats and water quality. BLM managers are frequently required to develop aquatic/riparian recovery plans with expectations for measurable improvements in upland conditions, riparian conditions, fisheries, and water quality. Managers and resource staff personnel must have a clear understanding of the consequences of management options for watershed restoration to achieve Clean Water Action Plan objectives, and provide suitable habitat for threatened and endangered species including salmon, steelhead, and some native trout populations, as well as the numerous species of non-salmonid species that occur on BLM lands throughout the west. In order to design effective management plans and watershed restoration strategies, managers and resource staff personnel must understand the temporal and spatial links between upland actions and effects on aquatic/riparian habitats, aquatic organisms, and water quality.

Topics/Geographic Areas: This is a bureau-wide issue, as aquatic/riparian systems, and watershed health and recovery are national concerns. These issues have been highlighted through concerns for addressing watershed health and recovery, the Clean Water Action Plan, and recovery of threatened and endangered fish species. Research is needed at a variety of scales from site specific studies to river basin or even regional scales to determine the health of aquatic/riparian components of watersheds and to identify instream and riparian trends. The research should be focused on quantifying the temporal and spatial links between implementation of land management activities and the response of aquatic/riparian systems. The research would include physical, chemical, and biological aspects of aquatic/riparian systems.

Proposed Level of Funding: The proposed level of funding for this area of research is \$300,000.

Bureau Field Support: Depending on location and staffing, BLM could provide field assistance to the USGS for studies related to aquatic/riparian systems. BLM employs a variety of aquatic/riparian related specialists including fishery and aquatic biologists, hydrologists, botanists, and soil scientists. In addition, many BLM field offices have temporary employees during the field season who could assist in field data collection.

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BLM 2004/2005 SCIENCE PRIORITIES

Rangeland Health and Restoration

Issue: Restoring plant communities damaged by wildfires, invasive non-native and native plant species. Information, knowledge, and techniques gained in the restoration of plant communities from wildfires, invasive non-native and native plant species effort would also benefit the restoration of rangelands impaired from historic livestock overgrazing, big game concentration and inappropriate off-road vehicle use.

Millions of BLM managed acres have been impacted by invasive plants such as cheatgrass, red brome, juniper and pinyon trees. There are numerous sources of information documenting the millions of acres impacted by cheatgrass (see Proceedings: Ecology and Management of Annual Rangelands) and the increase in woody species dominated rangelands (see Proceedings: Pinyon-Juniper Conference). These public lands have diminished value for wildlife, livestock forage, watershed values, recreation, and aesthetics. The impacts of wildfires, cheatgrass and other invasive species on the Sagebrush Steppe Ecosystem, as well as other western ecosystems, continues to be a major concern to the BLM throughout the West. The Snake River Birds of Prey Natural Conservation Area typifies the problems BLM faces from these impacts.

Through their invasive characteristics, and very competitive nature and ecology, cheatgrass, red brome and other grasses are dramatically impacting millions of acres of BLM managed public lands. Also, these lands are being impacted from encroachment by native juniper or pinyon trees to a level far beyond what may have existed prior to European settlement. In either case, biodiversity and other values as described above are diminished. Other agencies, such as the National Park Service are faced with the similar issues and problems, increasing the applicability of this effort. The information gained would be very easily transferable to many offices or locations within the DOI and other Federal and State agencies.

Topics/Geographic Areas: The geographic area of the cheatgrass issue was documented by Aldo Leopold and others. Thought to be confined to the Great Basin, it has since grown to impact the Colorado Plateau, Snake River Plains, and Sonoran Desert. The impact of juniper and pinyon is now affecting the eastern side of the Interior Columbia Basin, Great Basin, Colorado Plateau and the western Slope of the Rockies.

Proposed Level of Funding: A level of \$600,000 is recommended over a multi-year basis. At this funding level, existing projects could be maintained and the limited development of additional projects could be addressed.

Bureau Field Support: There is a high level of interest in DOI's Bureaus for restoring and controlling plant communities devastated from wildfires, invasive non-native and native plant species. There are presently projects, relative to cheatgrass, that have been initiated in the past with USGS -BRD (e.g., Vegetation Diversity Project). Presently there is a high level of interest in offices in Utah, Idaho, Nevada and Oregon, where

partnerships could be initiated and strengthened. Economies of scale or other efficiencies could possibly be made by developing partnerships with the Agricultural Research Service (Burns, Oregon, etc.) and the research arm of the USFS.

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BLM FY 2004/2005 SCIENCE PRIORITIES

Invasive Plant Issues

Issue: Management of the majority of the public rangelands in the West falls under the authority of the BLM. The flora of this land ranges from highly diverse native plant communities to deteriorated lands dominated by introduced annuals and perennials. The spread of invasive plants claims 4,600 acres per day of Federal lands. Infestations have increased from 2.5 million acres in 1985 to more than 8 million acres in 1994. In many locations, invasive plants have taken over large areas and caused losses in plant community productivity and diversity. Invasive plants adversely affect wildlife habitat and use patterns, recreation opportunities, visual quality, forage production, land value and management activities. Invasive plants impact agriculture, recreation and other sectors of society, resulting in economic costs (losses) in the billions of dollars annually. Invasive plant control is costly and difficult. Failure to respond to the threat posed by invasive plants could severely limit BLM's future management options.

Topics/Geographic Areas: All geographic areas are subject to invasive plant impacts. Needed information falls into three broad areas.

1. *Invasion Dynamics:* (a) Determining how weeds spread and assessing threats to specific landscapes. This includes determining the risk indicators of a site at risk for being invaded by noxious weeds. The risk factors include such things as disturbance regimes, habitat conditions, climate and soils. (b) Developing improved detection methods for timely identification of weed infestations of only a few plants on a small (10-20 square foot) area. (c) Determining the replacement sequence of native plants. (d) Identifying the factors that limit invaders. (e) Determining which native species or ecotypes can maintain or expand after invasion by noxious weeds.

2. *Management Implications - Determining impacts on weed distribution and abundance on:* (a) Range forage productivity and use by livestock. (b) Wildlife habitat and use patterns. (c) Soil erosion. (d) Management opportunities foregone. (e) The use of prescribed fire.

3. *Treatment Options and Site Restoration:* (a) Identifying native and introduced plants with associated site characteristics that have the potential for restoring invaded sites to a desirable plant community. (b) Determining the appropriate biological, chemical, and physical control methods by weed species. (c) Determining the appropriate restoration strategies for both areas that have large established weed populations and for small, isolated-spot weed infestations.

The BLM would like to see the development and integration of an online model that would serve as a center for knowledge and action related to invasive species, where diverse groups can interact to disseminate information, and for the purposes of formulating, evaluating, initiating, and monitoring actions.

Public lands are affected by many invasive plant species. The Perennial Pepperweed is one example of a priority invasive plant needing study. It is a relatively recent addition to the large number of perennial noxious weeds that have been accidentally introduced to wildlands in western North America. In addition to causing major problems in aquatic

habitats and wetlands, this weed appears to be capable of invading upland and more arid sites. The weed currently occurs in substantial areas of all western States except Arizona.

Proposed Level of Funding: Approximately \$600,000 is recommended on an annual basis for a minimum of five years.

Bureau Field Support: BLM scientists at the field level could facilitate work being done on invasive and native plants. Each state office has an invasive plant coordinator and many field offices have scientists that are involved in inventory, control and monitoring of invasive plants. This BLM also has a National Weed Team that concentrates its efforts on invasive plants. The National Weed Team has a thorough understanding of the problems and information needs.

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BLM 2004/2005 SCIENCE PRIORITIES

Pinyon-Juniper Encroachment into Sagebrush/Grasslands

Issue: Background. Pinyon and/or juniper are invading shrub-grass range sites in all of the western States. This encroachment is causing a major type conversion from shrub/grass to woodland over millions of acres. The causal mechanisms of this invasion are complex and poorly understood. Historic grazing and fire suppression are widely believed to be the primary factors but there is evidence that these woodlands have not reached their ecological maximum given the Holocene climate, and on some sites, pinyon and juniper may actually be recovering from extensive logging during the early mining era. Regardless of the causes this conversion is widely recognized as being associated with major changes in watershed value, livestock forage, and wildlife habitat, as well as fire behavior and postfire effects.

The social and ecological consequences of this type conversion are becoming unacceptable. In many areas pinyon-juniper forests are experiencing increasing subdivision. Risk to people living in PJ fuel types is very high, because these sites are likely to burn with high intensity crown fires. There are significant concerns about loss of forage and browse for livestock and wildlife as the tree canopy closes. Soil loss has been significant on sites that have lost much of the shrub and herbaceous layer. These sites have increased susceptibility to invasion by weedy species, particularly after severe fire. These trees use much more water than the vegetation they have replaced, causing springs to dry, and stream flow to be significantly reduced. Less water is available for the growing human population in these areas.

There has been an emphasis on loss of sage grouse habitat to wildfire and cheatgrass at lower elevations. There is also a significant long-term loss of spring and summer habitat as conifers replace the shrub/grass layer at mid and upper elevations. Former meadow habitats are no longer available because either coniferous water use has lowered the water table, or the trees themselves have invaded. Sage grouse may become increasingly rare, as summer habitat loss continues, contributing to a potential listing under ESA.

In the absence of intensive management, this expansion of conifers will continue, resulting in a homogenization of the landscape. The decrease in vegetation patchiness will lead to larger more uniformly severe wildfires with numerous consequences for fire suppression and resource management. Fire suppression, rehabilitation, and restoration costs will increase, as well as social, economic, and resource losses from fire. Fuel treatment will become increasingly expensive as trees become dominant on more acres and opportunities for prescribed fire without mechanical pretreatment diminish. PJ expansion will increasingly impact local economies as suitability of these lands for livestock and wildlife declines and water supply from stream flow and groundwater becomes less dependable.

Research issues include the quantification of the extent of pinyon and juniper invasion in the western U. S., and identification of those plant communities, community condition, and soil types where it is likely to invade. The extent of sage grouse habitat loss due to

this invasion can be estimated. Threshold levels of pinyon and juniper cover can be identified for different soil and vegetation types to predict when trees begin to impinge significantly on understory vegetation production, when the site is closed to herbaceous and shrub vegetation, and where in this progression that significant soil loss begins. This information could be used to set priorities on treatment of pinyon and juniper both for fuels management and ecosystem restoration purposes, as well as specific treatments for wildlife and livestock habitat improvement.

Topics/Geographic Areas: Arid and semi-arid regions of the interior western United States, including Washington, Idaho, Wyoming, Utah, Nevada, California, Arizona, and New Mexico.

Proposed Level of Funding: \$250,000 per year (for several years).

Bureau Field Support: Restoration of healthy rangelands, and wildland fuels management are high priorities within the BLM, and conservation and restoration of sage grouse habitat a critical need. Field offices are engaged in fuels treatment activities. Offices can provide field support and assistance, including the implementation of experimental fires.

The Joint Fire Sciences Program (JFSP) of the Forest Service and Department of the Interior provides funding for wildland fire research. The Congressional intent is to focus on questions relative to wildland fuels management. The JFSP will be funding some research on fuels treatment as it relates to fire prevention and ecosystem restoration, and has funded some work that specifically relates to pinyon and juniper on western rangelands. Considering the scope of the problem, however, a much larger effort is needed.

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BLM FY 2002 SCIENCE PRIORITIES

Water Quality and Hydrological Issues

Issue: Water resources management and protection, including scientific hydrology and credible water quality planning, monitoring, evaluation and management are probably one of the most underestimated areas of responsibility in the BLM mission. Most controversy about western land use in this decade is related directly (CWA, water supply, public health and recreation, road construction, mineral extraction) or indirectly (special status species dependent upon aquatic environments) to the water- land interface; the hydrologic system. Federal land managers need better and more useful *information* about the effects and interactions of their land use decisions and protective stipulations for the long term resource base. Managers must know how decisions will affect flows into community water supplies. How will legacy watershed erosion structures and roads influence water quality (turbidity) levels in streams that do not currently meet standards? Managers need to understand and be able to furnish credible data showing how restoration of rangelands will improve water quality in ephemeral and intermittent streams as well as improve channel stability and riparian functionality.

Topics and Geographic Areas: A systematic effort will be needed to review previous need surveys, update current issues such as Clean Water litigation, coal-bed methane development, and related Departmental initiatives (CWAP) and regional ecosystem studies (Colorado Plateau, NW Forest Plan Area). Several important topics are briefly described below.

Mining-Related Hydrology. In the Powder River Basin of Wyoming extensive development of coal is occurring. The coal-bed hydrology must be better understood to accurately predict development impacts on methane production. Hydrologic data and science support are essential before NEPA analysis and decisions can proceed on leases. Potential mining related hydrologic investigations are needed on the Mark Twain National Forest, Missouri. This will evaluate hydrology and geology of the Eleven Point District for potential lead-zinc development.

Water Resources Development. Hydrologic investigations and water balance analyses are needed in Arizona's Upper San Pedro River Basin to support analysis of the factors influencing reduced streamflow. In the inter-montane San Luis Valley of Colorado, hydrologic study is needed of a complex dual-system aquifer being eyed by thirsty Front Range population centers. Deep well pumping in the Valley and Rio Grande flow obligations to New Mexico are affecting public land riparian values.

Geochemistry of Hydrologic Systems. Geochemical signature techniques such as those used by David Naftz near Aneth are needed at Utah's Newfoundland Evaporation basin to assist in the determination of K and Mg bearing brines in shallow aquifers. In New Mexico's Carlsbad Resource Area, evaluations are needed to determine contributions of potash mine tailings effluent on brine in the Pecos River.

Sedimentation Research. An Office of Public Lands Hydrology within the USGS provided excellent sedimentation support to the Bureau in the 1950s-70s. However it was dissolved in 1977 as new energy-water related priorities emerged. In February of 1997 the BLM participated with other Federal agencies in a USGS-convened workshop

on sediment-related issues including the public lands. As discussed at that workshop, one of the most challenging water quality problems for public lands managers is sediment production and management on some 264 million acres. Many water quality-impaired segments on BLM watersheds are state-303(d) listed due to turbidity or suspended solids violations. A cross-cutting strategy following on from the 1997 workshop would help the BLM to improve its understanding and management of sediment problems, e.g. as associated with the pickup and transport of dissolved solids in tributary watersheds of the Colorado River Basin.

Proposed level of funding: Approximately \$550,000 is recommended as a starting point for at least five years. Hydrologic data collection, monitoring and modeling on complex issues as those above will blur the lines between research, studies, and regional reconnaissance. Water resources problems require credible data. Oversimplified checklists, photo plots and windshield surveys waste money and create unrealistic expectations.

Brief identification of bureau field support: A cadre of experienced physical scientists, including hydrologists, geologists, soil scientists, and fish biologists is available. Many BLMers have worked to support past USGS program areas (e.g. the Office of Public Lands Hydrology, and the Energy Minerals Rehabilitation Inventory and Analysis Program on known coal leasing areas) and these employees could provide valuable support to USGS. The BLM field personnel know the lands with which the Agency is charged, the resource controversies, and the data available about these lands and related water resources issues.

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BLM FY 2004/2005 SCIENCE PRIORITIES

Air Quality

Issue: Concerns about degrading air quality on remote Public Lands (including resultant visibility degradation and atmospheric deposition impacts to aquatic ecosystems) are continually increasing. Specifically, the BLM needs timely, representative, high quality atmospheric contaminant, effects and meteorology data to conduct its Air Quality Impact Assessments required under NEPA, and to monitor the longer-term trends reflecting mitigation measures required by BLM management in land use authorizations. In addition to BLM's needs, this information would be useful to the National Park Service and the USDA-Forest Service which have unique management needs for potentially sensitive PSD Class I areas, to the State of Wyoming Air Quality Division which has primary responsibility for permitting air pollutant emission facilities, and EPA which has a general oversight responsibilities under the Clean Air Act.

The parameters of interest are currently measured by a wide range of organizations for a wide range of purposes (including industrial site monitoring of sulfur dioxide, urban ozone monitoring, background National Atmospheric Deposition Program precipitation chemistry analysis, IMPROVE particulate monitoring for source identification, etc.), but no comprehensive monitoring approach has been developed for the remote Public Lands.

The proposed research project would: 1) evaluate which air quality and meteorology parameters are needed by BLM for conducting its air resource management responsibilities; 2) evaluate how and where those parameters are currently being monitored throughout the western United States; 3) design a prototype monitoring and data archive system; 4) subject to BLM evaluation and comment, construct, deploy and operate (with BLM staff assistance) the prototype monitoring and data archive system; and 5) based on at least one-year of field collected data, provide a summary and critique of the prototype monitoring and data archive system for further development and application by the BLM.

Topics/Geographic Area: Air quality monitoring techniques, especially related to southwestern Wyoming, and other states experiencing potential air quality degradation from government authorized activities such as minerals extraction, oil and gas and coalbed methane development, prescribed fire, etc.

Proposed Level of Funding: \$250,000

Bureau Field Support: BLM Management would be available to advise project staff regarding issues of concern; BLM air resource management staff would be available for technical review, direction and data evaluation; and BLM field staff would be available for system installation, operation, and data collection.

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BLM FY 2004/2005 Science Priorities

Coalbed Methane Reservoir Geology/Hydrology

Issue: Coalbed methane (CBM) development has greatly accelerated throughout the United States in recent years. There has been large-scale development in the San Juan Basin of southern Colorado and northern New Mexico and the Powder River Basin (PRB) of Wyoming. CBM development in the PRB is expanding into adjacent portions of Montana. Additional interest is developing in other Colorado and Wyoming basins and elsewhere in coal areas throughout the United States. This rapidly accelerating development coupled with a lack of adequate data regarding the coalbed methane resource is taxing BLM's abilities to manage development of the CBM and related resources.

There are complex issues related to development and management of the CBM resources as well as other related resources. The primary issues include: reservoir characteristics of the producing coals, with respect to both water and CBM; effects on the coal seam aquifers, including depletion and recharge rates; water disposal issues (e.g. surface discharge, reinjection, etc); and effects on coal mining operations. These issues are not restricted to any one area or coal field but may occur to varying extents everywhere there is CBM development. The effects of activity in the PRB is an urgent concern because of the extensive coal and CBM reserves (estimated at more than 450 billion short tons of coal and as much as 24-25 TCF recoverable gas reserves in Wyoming), the explosive growth of development, high volumes of produced water, and the close proximity of CBM development to active surface mining operations. Scientific data concerning the CBM reservoir geology and hydrology is lacking in other less developed basins and in parts of the PRB in particular. Much of the necessary data collection requires drilling, coring and laboratory analyses that BLM lacks the facilities and expertise to perform.

Topics/Geographic Areas:

Powder River Basin – Wyoming/Montana In late 1998, the BLM's Wyoming Reservoir Management Group enlisted the assistance of the USGS Central Region Energy Team and established a cooperative project to collect and analyze CBM data, derived primarily from coal cores, in the PRB. Joint agency funding was provided in FY 1999 through 2002. Montana BLM has similar data needs and has a companion cooperative agreement with USGS in preparation. CBM operators and coal mining companies have provided cores for this project in eastern and central portions of the PRB. Most of the western PRB and large areas in the central part of the basin have not been sampled. Although operator interest is growing in these areas, additional opportunities for core collection have been limited. Data should be acquired in these areas before full-scale development. The data collected can be used to address the CBM resource and related issues described above. As an added benefit, the wells drilled to collect cores can be converted to water monitoring wells, at minimal costs, to acquire additional hydrologic data.

Piceance Basin – Colorado The Piceance Basin of Colorado has been the recent focus of growing interest in oil and gas leasing for coalbed methane. Many of the Expressions of Interest overlie or are adjacent to active underground coal mines. Accurate CBM reservoir data are not presently available in this area. Coal gas content data is the most

pressing need. Acquisition of this data provides the basis for determining the potential resource size and estimates of CBM development and possible conflicts with other mineral development. Additional research would be directed at the topics/issues outlined below.

While CBM reservoir data is generally lacking or inadequate in many areas, a significant body of knowledge exists concerning coalbed hydrology in extensively developed areas. For example, in the active coal mining areas of the Wyoming PRB, the Gillette Area Groundwater Monitoring Organization (GAGMO) monitors groundwater consequences of coal mining and collects and publishes hydrological data. A comprehensive literature survey to determine research needs or assess whether further research is needed has been conducted. Hydrologic data is sparsely distributed in undeveloped portions of the PRB and in other undeveloped basins. Data needs can be more easily identified in these areas and data collection can be accomplished in conjunction with collection of CBM reservoir data.

Depending on initial data collection efforts and the outcome of an initial literature search, additional research in the could be directed to the following topics:

- Characterization of the coal seam reservoirs with respect to water and CBM
- Identifying and documenting original conditions in the CBM and water reservoirs
- Effects of de-watering on CBM reservoir performance and production rates
- Analysis of CBM and water production and recovery rates
- Coal seam aquifer recharge potential and rates
- Effects of CBM development on current and future mining
- Effects of surface discharge and long-term management of surface waters
- Alternatives to surface disposal of produced water
- Feasibility of and necessity for managing coalbed waters to enhance biogenic methane generation

Proposed Level of Funding: *Powder River Basin – Wyoming/Montana* Estimate of \$125,000 per year for collection and analysis of additional core and CBM reservoir and hydrologic data. The coal bed hydrological study (see BLM FY-2001 Science Priorities issue paper on ‘Water Quality and Hydrological Issues’) may be combined with this project and support funding may be transferred from the hydrological study.

Piceance Basin – Colorado \$25,000 per year for collection and analysis of core and CBM reservoir data including desorption and adsorption analyses, coal quality analyses (necessary for accurate gas content calculations), and other required analyses. The estimated total cost includes funds/staffing costs to support core collection in the field.

Bureau Field Support: The BLM Wyoming Reservoir Management Group and USGS Central Region Energy Team are conducting core collection and CBM data analyses in the Wyoming PRB under a cooperative agreement initiated in late 1998. Montana BLM has also expressed an interest in this research and is preparing a cooperative agreement

with USGS for similar studies in the Montana PRB. Colorado expects to establish a similar cooperative relationship(s) with USGS and coal mining companies in the area to collect and analyze cores.

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BLM FY 2004/2005 Science Priorities

Methane Hydrates

Issue: There are complex technical issues related to the quantification, development, and production of methane gas from hydrates. The primary issues include: reservoir characterization, development of drilling and completion technology, construction of infrastructure, and land subsidence.

Topics/Geographic Areas:
North Slope of Alaska

BP Exploration (Alaska), Inc., the Universities of Arizona and Alaska-Fairbanks, and the USGS has initiated a project to determine the technical and economic feasibility of methane hydrate production on BP's ANS leases. Thick layers of permafrost from the surface to a depth of approximately 2000 feet are thought to contain significant methane hydrate resources. Research should be directed toward the following topics:

- Characterizing the geology of hydrate reservoirs
- Estimating gas-in-place and economics of development
- Identifying and documenting original conditions of methane migration/entrapment
- Effects of de-composition of methane hydrates on downhole equipment
- Analysis of gas hydrate production and recovery rates
- Analysis of technology necessary to establish commercial production

Proposed Level of Funding: Alaska North Slope – The President's FY03 budget mark for DOE Office of Fossil Energy Hydrate R&D funding was \$4.5 million, as opposed to the Congressionally authorized level of \$11 million. The FY03 House mark was \$10.8 million and the FY03 Senate mark was \$10.5 million. DOI is working cooperatively with DOE on its R&D effort. No additional funding from DOI is expected.

Bureau Field Support: The BLM Alaska State Office is working with North Slope producer BP Exploration.

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BLM FY 2004/ 2005 Science Priorities Abandoned Mine Lands (AML)

Issue: The Bureau of Land Management (BLM) requests technical assistance in two areas: (1) evaluating impaired watersheds for potential water quality improvement through the cleanup of pollution-contributing abandoned hardrock mine sites. The BLM, together with its reclamation partners, needs science-based analyses to ensure that water quality in selected watersheds can actually be improved through the cleanup of AML sites; and (2) cost-effective technical solutions for water treatment and remediation, and more effective ways to conduct site characterization and devise reclamation costs.

Topics/Geographic Areas: The BLM is implementing its water quality-based AML cleanup program using a watershed approach based on the Clean water Action Plan from the previous Administration. The BLM, together with its partner land management agencies (e.g., U.S. Forest Service, National Park Service), State governments, and science bureaus (e.g., USGS) are to use a risk-based approach in prioritizing watersheds and surrounding sites for potential cleanup. Thus, the first cut to be made is to assess which impaired watersheds have the potential for meaningful improvement of water quality through AML site cleanup that will result in real benefits to people, wildlife, land use and similar purposes. If, for example, technical studies reveal that natural background levels of key contaminants occur at such levels that they would not be effectively reduced by AML site cleanups, then that particular watershed would probably not be selected for funding. Technical advice and assistance is needed to evaluate the likelihood of success for the potential dollars to be spent. Analyses may include such factors as biologic assessment; baseline toxicity assessment and recommended remedies; aquatic micro-invertebrate and fisheries sampling; and analysis of groundwater flow and impacts in light of use attainability criteria.

The BLM has very limited funding for AML water quality cleanups, and needs to rely to the maximum extent possible on the application of low cost/low maintenance passive water treatment systems or similar alternatives. Advice is needed on best technologies for this kind of treatment for acid rock drainage.

Proposed Level of Funding: \$1,000,000 per year is anticipated to be needed to fund 3-5 mid-sized watershed projects which will likely require geologic, hydrological and biologic studies.

Bureau Field Support: Assistance requests and project proposals will be generated from a core of AML coordinators in BLM State Offices that have AML-impacted priority watersheds and potential partnership opportunities. Each technical proposal will be evaluated by BLM Headquarters for potential to benefit the program as a whole and/or opportunities to leverage funding through partnerships.

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**BLM FY 2004/2005 SCIENCE PRIORITIES
DOE-Funded Research**

Issue: DOE has entered into a cooperative agreement with BLM for the purpose of enhancing access to Federal lands for oil and gas development with respect to good environmental stewardship. To date DOE has funded over a million dollars of research through this agreement. BLM field staff proposes research that meets local or regional needs for the stated purpose. BLM management and DOE jointly select research proposals to be funded.

The search must study some aspect of environmental protection as it relates to oil and gas exploration and development. The research can study effects on wildlife, soils, cultural values, and other resources. Much of the research is focused on solving immediate needs. As an example water from coal bed natural gas production has become a significant environmental issue. Research funded through this agreement is investigating methods of disposal of such water and impacts of removing this water from local and regional aquifers. Research is also focused on impacts on T&E species with the objective of determining if suspected impacts actually occur. The goal of such research is to determine if the stipulations or conditions of approval are effective or excessive.

Topics/Geographic Area: Research can occur wherever environmental issues affect access to federal oil and gas exploration and development.

Proposed Level of Funding: Approximately \$500,000 annually from DOE. Other sources of funding especially from state and industry can be used to enhance individual projects.

Bureau Field Support: Bureau wide

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BLM FY 2004/2005 SCIENCE PRIORITIES
Resource Assessments for Resource Management Plans (RMPs)

Issue: In 2000, the Bureau of Land Management (BLM) reported to Congress a need of \$50 million annually over the next decade to fully update and maintain its planning infrastructure: updating the 162 existing land use plans as well as develop plans for the 27 newly designated administrative units. These plans are critical to the BLM's participation in developing energy and minerals, protecting communities from uncontrolled wildfire, resolving resource management conflicts, and meeting growing and changing demands on the public lands. BLM has faced increasing challenges in court, particularly in those areas without updated comprehensive land use plans. Since FY 2001, Congress has provided an additional \$40 million for planning. The BLM is currently involved in over 80 planning efforts. Adequate data and information to make informed land use planning decisions is critical to the success of these planning efforts.

Topics/Geographic Areas: In FY 2004 and 2005, the BLM will be initiating Resource Management Plan revisions or amendments in the following states and areas:

<u>State</u>	<u>Year</u>	<u>Plan Name</u>
AK	2004	Kobuk/Seward Peninsula
	2005	White Mountains NRA
	2005	Bay
AZ	2004	Tucson
	2005	Kingman
CA	2004	Folsom
CO	2004	Little Snake Coalbed Methane Amend.
	2004	Uncompahgre
	2005	San Juan
ES	2004	Arkansas/Louisiana
ID	2004	Cottonwood/Coeur d'Alene
	2005	Jarbidge
	2005	Idaho Falls
MT	2004	Headwaters
NM	2004	Rio Puerco Amendment
OR	2004	Baker
	2004	John Day Basin

UT	2004	Cedar/Beaver/Garfield/Antimony
	2004	Kanab
WY	2004	Lander
	2005	Grass Creek/Washakie
	2005	Cody

The best time to identify resource assessment needs in the planning process is at the time of the RMP work plan preparation.

Proposed Level of Funding: Data gathering and information collection is an ongoing part of each planning effort. Specific needs, and associated costs, will be identified at the time of RMP work plan preparation.

Bureau Field Support: Affected States and Field Offices.

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BLM FY 2004/2005 SCIENCE PRIORITIES

National Landscape Conservation System

Issue: The Bureau of Land Management has established the National Landscape Conservation System (NLCS) to help protect some of the nation's most remarkable and rugged landscapes, including the important scientific and ecological attributes associated with these areas. The NLCS includes fifteen national monuments, twelve national conservation areas, the Headwaters Forest Reserve in California, the Yaquina Head Outstanding Natural Area and the Steens Mountain Cooperative Management and Protection Area in Oregon, and the White Mountain National Recreation Area in Alaska, portions of the following units under BLM management: Wilderness Areas and Wilderness Study Areas; National Wild and Scenic Rivers; and National Historic Trails. The purpose of the NLCS is to increase the public's awareness of, and appreciation for, these public land treasures, and to focus more management attention and resources on them.

Many of the science needs related to the NLCS are not unique, but are shared with other public lands managed by the BLM and other land management agencies. Inappropriate land use, invasive species, declining populations of valued species, problems of habitat restoration and lack of basic resource inventory data are shared by many of the units of the NLCS. The goal of the BLM to protect existing resources and manage the units of the NLCS for their scientific value provides unusual opportunities to use these lands not only to advance science, but also to use science to advance and improve land management concepts and techniques. Although the NLCS is too new, in most instances, for a comprehensive inventory of science needs to have been developed, representative examples of urgent or priority needs for some of the NLCS units are noted below:

Grand Staircase-Escalante National Monument. Baseline soils and vegetation studies are needed to support a grazing EIS to be completed in the near future. In addition, inventories of archeological sites, T&E species, and paleontological resources are being implemented.

Grand Canyon Parashunt National Monument. A priority management issue is to restore the original ponderosa pine savanna-type habitat the formerly existed in areas such as around Mt. Trumbull. Control of ground vegetation and brush by prescribed fire and subsequent planting and restoration of desired vegetation within allowable guidelines are subjects requiring study.

Agua Fria National Monument. The primary needs are related to archaeological resources. Basic information is lacking for most of the Monument on the value of resources present and methods to restore and stabilize known sites.

California Coastal National Monument. There is an immediate need to utilize remote sensing to determine the extent of the monument and to precisely locate the various islands, rocks and reefs which comprise the Monument to resolve jurisdiction and adjudication issues. Sensitive issues and species need to be identified and protection

needs need to be clarified.

Cascade-Siskiyou National Monument. An important need is to assess the effects of livestock grazing on the area and determine whether or not continued grazing is compatible with the management of the Monument. A scientific investigation of the impacts of grazing is needed, including its potential impact on the great diversity of plants, butterflies and other living organisms that make this area so outstanding for recreational enjoyment and scientific study.

Canyons of the Ancients National Monument. Studies of the best ways to stabilize and restore the many archaeological ruins is a primary issue. Two wilderness study areas within the Monument need additional survey and inventory to evaluate resources, and studies are needed on T&E species.

Ironwood Forest National Monument. Research is needed on the unusual ironwood forest vegetative community. The basic ecology of this ironwood forest needs to be investigated and understood, and potential impacts of a nearby open pit mine needs to be ascertained.

San Pedro National Conservation Area. Water and hydrology are important issues in this NCA. The basic hydrology is not well understood, and water is essential to the maintenance of this unique riparian community with its diversity of avian and reptilian life.

Snake River Birds of Prey National Conservation Area. Although the basic issues related to the decline of the unique concentration of birds of prey in the Snake River Canyon appears to have been established, ways to reverse the decline remain uncertain. Fire control, habitat restoration and impacts of agriculture are key concerns requiring further investigation.

Gunnison Gorge National Conservation Area. Research to understand the ecology and population biology of the Gunnison sage grouse is a critical need in this NCA. It is related to BLM's wider concerns related to understanding sage grouse population decline and the general ecology of sage brush communities throughout the West.

Wilderness and Wilderness Study Areas. More work is needed to better understand the question of wildlife guzzlers and the presence of these structures in areas classified as "wilderness." Restoration of disturbed arid lands, especially abandoned roads needs study in wilderness areas and presents questions similar to the guzzlers. The BLM also has important science needs related to desert big-horn sheep in many of its wilderness areas.

Wild and Scenic Rivers. Grazing in areas near streams and protection of adjacent riparian areas is a critical issue for the BLM and an important one related to the Wild and Scenic Rivers Act.

Topics/Geographic Area: Science needs related to assessment/inventory, protection and restoration of unique management areas/habitats in the western United States.

Proposed Level of Funding: \$1,100,000

Bureau Field Support: The BLM has resource management specialists in Field Offices, National Centers, and Washington, D. C. that can be of assistance. Management staff and scientific expertise are currently available at some established NLCS units and will be available at the newer units in time. Logistical field support could likely be arranged in most instances.

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