

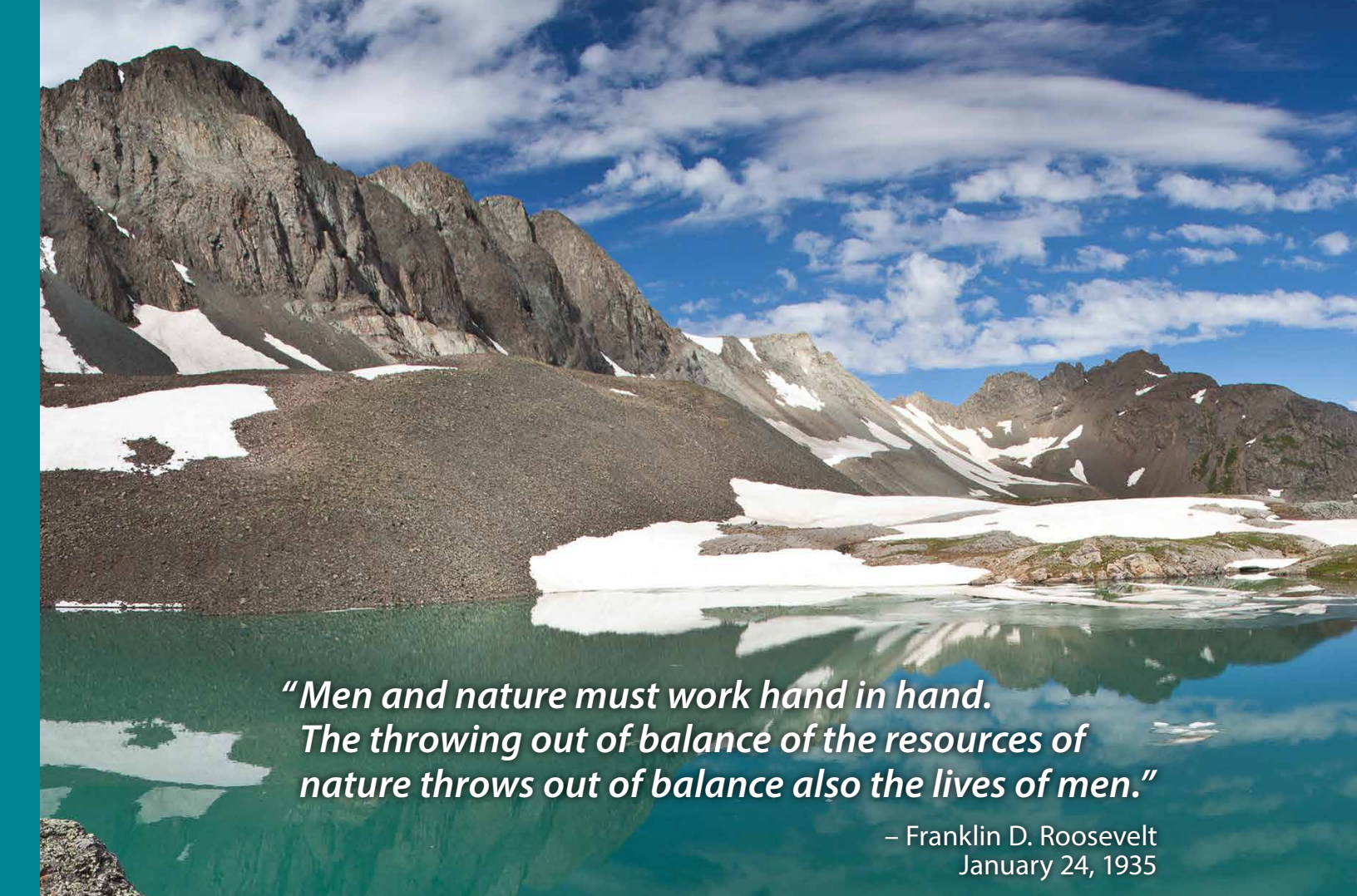
Bureau of Land Management

- Soil,
- Water, and
- Air Program Highlights

Fiscal Year 2014

Division of Environmental Quality and Protection





***“Men and nature must work hand in hand.  
The throwing out of balance of the resources of  
nature throws out of balance also the lives of men.”***

– Franklin D. Roosevelt  
January 24, 1935

## Mission Statement

We maintain and improve foundational processes to ensure resilience of our watersheds and other landscapes and to promote ecosystem integrity by protecting, maintaining, and improving the quality of soil, water, and air resources on public lands in partnership with communities and stakeholders.

## Vision Statement

The Soil, Water, and Air Program seeks to improve the quality and effectiveness of decisions made by the Bureau of Land Management by:

1. Integrating natural resource conservation and sustainable use principles in soil, water, and air activities and functions.
2. Providing effective engagement with other programs, partners, and stakeholders.
3. Striving to make soil, water, and air resources knowledge and expertise accessible throughout the BLM.



# Table of Contents

<b>Introduction</b> .....	ii
<b>Soil</b> .....	1
BLM and NRCS Continue Soil Surveys in the White Mountains – Alaska .....	1
Arid Lands Study Progresses to the Next Phase – Utah .....	2
Land Management Agencies Sign Interagency Ecological Site Description Memorandum of Understanding – Washington, DC .....	2
<b>Water</b> .....	3
BLM Applies the Latest Science to Improve Recovery of Placer-Mined Streams – Alaska .....	3
Forty Miles of Idaho’s Big Wood River to be Assessed – Idaho .....	4
Moab Field Office Collaborates to Stabilize Onion Creek Road – Utah .....	4
Campbell Creek Science Center Hosts Water Discovery Days – Alaska .....	5
BLM Assists with Crooked Creek Watershed Assessment – Alaska .....	5
BLM Initiates Project to Protect Coastal Habitat – Eastern States .....	7
BLM Coordinates with USGS in Badger Wash Study – Colorado .....	7
BLM Studies Land Use Effects on Sediment, Salinity, and Selenium in the Stinking Water Gulch Area – Colorado .....	8
BLM Recommends Water Rights Appropriations to Improve Habitat – Colorado .....	8
Gunnison Field Office Participates in Work Group to Help Area Adapt to Changing Climate – Colorado .....	9
Use of LiDAR Increases Accuracy of Stream Locations – Oregon/Washington .....	10
Partnership Enhances Streamflow and Habitat – Wyoming .....	11
District Installs Stream Sensors to Collect Data in Support of Restoration – Nevada .....	11
BLM Analyzes Preliminary Findings of Prescriptive Grazing Practices on Squaw Valley Ranch – Nevada .....	12
Winnemucca District Focuses on the Fourth of July Meadow Restoration Project – Nevada .....	13
BLM Participates in Coastal Ecosystem-Based Management with Local Initiative – California .....	14
Pumpkin Creek Restoration Project Continues and Monitoring is Implemented – Montana/Dakotas .....	15
NOC Performs Ground Water Assessments/Water Supply Development in Nevada – National Operations Center .....	16
NOC Works on Creating Water Wells and Springs GIS Data Layer – National Operations Center .....	16
New Water Rights Training Course Saves Hundreds of Pounds of Paper – National Training Center .....	16
<b>Air</b> .....	17
Collaborative Agreement Initiates an All-Lands Wind-Erosion Model – National Operations Center .....	17
BLM Initiates Ambient Air Quality Sampling Pilot Projects in Northern Alaska – Alaska .....	18
BLM Colorado Awards Fairplay with Air Monitoring Contract – Colorado .....	19
Colorado Air Resources Management Modeling Study Nears Completion – Colorado .....	19
BLM Colorado Develops Several Online Tools – Colorado .....	20
BLM Collaborates on Regional Nitrogen Dioxide Study – New Mexico .....	20
University of Nevada Completes Dust Emissions Study – Nevada .....	21
Washington Office Creates Strategy and Guidance to Support Air Resources – Washington, DC .....	22



# Introduction

The Bureau of Land Management (BLM) manages more than 245 million acres of public land—the most of any federal agency. This land is primarily located in 12 Western States, including Alaska. The BLM’s multiple-use mission is to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations. The BLM accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production and by conserving natural, historical, cultural, and other resources on public lands.

Soil, water, and air resources are the most foundational and basic of natural resources. Soil, water, and air processes determine, to a large extent, the structure and function of ecosystems:

**Soil** provides the foundation for vegetation and biotic communities; sustains resilient, productive grasslands, shrublands, forests, and other areas; safeguards water and air quality; and supports many other resource uses on public lands managed by the BLM.

**Water** of sufficient quality and quantity is integral to the successful management of public lands managed by the BLM. The quality of water generated on public lands is just as important as the quantity because clean water is a necessary resource both for uses by humankind and for ecosystem sustainability. Clean and adequate supplies of water are necessary to promote resilient watersheds, provide fish and wildlife habitat, maintain drinking water sources, allow safe recreational use of surface water, and maintain healthy plant communities and wildlife habitats.

**Air** resources are managed to ensure that the uses the BLM initiates or authorizes on public lands are consistent with the federal, state, local, and tribal regulatory framework under the Clean Air Act. The BLM uses the National Environmental Policy Act process to analyze the potentially significant environmental impacts of its proposed actions on

air resources (and other resources) and to select appropriate measures to mitigate adverse impacts. These steps enable the BLM to continue authorizing diverse land uses on public lands while protecting air resources and preparing for new challenges.

Many BLM management decisions require reliable and readily accessible soil, water, and air resource information. Soil, water, and air resource information, combined with sound science, is essential to ensure sustainable resource management and to meet the BLM’s multiple-use mission. Soil, water, and air information is critical for the BLM to effectively adapt to a changing climate and to address issues associated with prolonged droughts, increased wildland fires, and establishment of invasive species.

Some goals for the BLM Soil, Water, and Air Program include:

1. Develop a Soil Program strategy that emphasizes the need to build coordinated program support for ecological site description development across range, riparian, forest, and wetland landscapes.
2. Improve capabilities to quantify and report reductions of sediment and salt transport into the Colorado River Basin that result from management actions.
3. Focus on a watershed approach to management and restoration activities.
4. Focus on regional air quality modeling, and improve air emissions inventories for authorized uses, including the oil and gas sector throughout the Western United States.
5. Improve integration of the Soil, Water, and Air Program with other disciplines within the BLM and with external partners.

This document presents some fiscal year (FY) 2014 highlights of the Soil, Water, and Air Program and introduces the types of projects and work the BLM state offices and national centers contribute to the management of public lands through the Soil, Water, and Air Program.

# Soil

## BLM and NRCS Continue Soils Surveys in the White Mountains – Alaska

The BLM and the Natural Resources Conservation Service have partnered to conduct soil surveys on 2.2 million acres of the White Mountains National Recreation Area and the Steese National Conservation Area over the past several years. In 2014, the BLM added two youth interns who were hired through the Chicago Botanic Garden's Conservation and Land Management Internship Program to assist with this effort. This marginal cost helped the BLM realize a 50 percent gain in field work productivity.



The Alaska soil survey combines ecological site descriptions with the soil surveys of the past 15 years; each field team is composed of a soil scientist and a botanist or ecologist. The remote nature of the soil survey sites requires careful planning for access.



This soil profile in permafrost soils shows the type of work performed by the Alaska soil survey team. This particular field work involved studying insulation and thawing of permafrost in mineral-rich soil.



The use of helicopters allows teams to be set out on ridge tops so that transects can be run down across the terrain. This helps capture the various soil changes with elevation, as well as slope aspect and position. The team accesses other sites by boat from one of the many rivers when possible, in which case transects are run uphill.

This partnership provides an opportunity for the two agencies to benefit from the cooperative effort and extend the program funding as far as possible in this remote area. It also permits the teams to collect additional data on tree diameters and distribution to help with a preliminary forest inventory.

## Arid Lands Study Progresses to the Next Phase – Utah

In 2014, the BLM Vernal Field Office received \$10,000 to continue studying vegetative reclamation of disturbed arid lands (typically well pads and associated energy infrastructure) in the Uinta Basin of north-east Utah. Previously, phases I and II concluded that (1) most disturbed sites are compacted, and soils have high salinity content; (2) invasive or noxious species (e.g., halogeton, cheatgrass, Russian thistle) are prevalent; and (3) amending soils with organic carbon increases establishment of native plants and negatively effects invasive/noxious species. With 2014 salinity funding, the field office established a



series of 6-by-6-meter plots with nine treatments at two locations. The field office will monitor the establishment of native plants and invasive/noxious species, compaction control, and organic carbon content for at least 2-3 years.

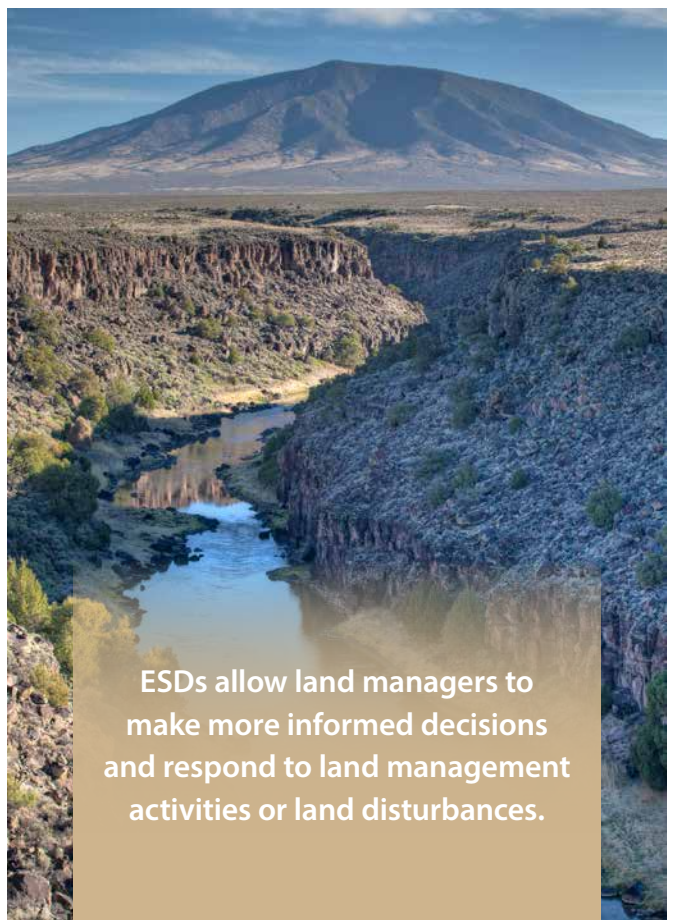
## Land Management Agencies Sign Interagency Ecological Site Description Memorandum of Understanding – Washington, DC

A memorandum of understanding (MOU) signed by Natural Resources Conservation Service, U.S. Forest Service, and BLM officials on September 19, 2014, establishes a framework that the three participating agencies will use to provide a scientific, standardized process to develop ecological site descriptions (ESDs). ESDs are documents that describe the climate, soil, geomorphology, hydrology, and vegetation information of individual ecological sites. ESDs allow land managers to make more informed decisions and respond to land management activities or land disturbances.

Ecological Site Manual;” and (3) the “Interagency Ecological Site Handbook for Rangelands.” The MOU calls on the agencies to develop a joint plan for implementing the MOU and to develop appropriate joint training efforts and materials.



The MOU implementation plan is based on three documents: (1) the interagency agreement, or the MOU, itself; (2) the “Rangeland Interagency



ESDs allow land managers to make more informed decisions and respond to land management activities or land disturbances.

# Water

## BLM Applies the Latest Science to Improve Recovery of Placer-Mined Streams – Alaska

The BLM is making progress on a stream design/reclamation demonstration project within the Fortymile Wild and Scenic River corridor. This multi-year project is designed to accelerate the recovery of instream and riparian habitats in a historically mined area. Within the project area, the stream is in a degraded state with poor floodplain connectivity and limited riparian vegetation. Instream habitats are homogenous with few quality pools. Compared to reference streams in the region, the density and biomass of Arctic grayling are well below expected levels.

The techniques used on this project will take into account major limiting factors that are unique to Alaska, such as significant ice accumulation and short growing seasons, both of which have contributed to stream reclamation failures in the sub-Arctic. The demonstration project will serve multiple purposes that benefit the BLM and the public. Key benefits include:

- Organize training for BLM staff on data collection methods and the use of data in the design, construction, and monitoring of a stream reclamation project.

- Create an outdoor classroom for miners, consultants, agency staff, and members of the public about stream reclamation planning, construction, and techniques based on the latest science that can later be applied on other placer reclamation projects.
- Establish a testing ground for various streambank stabilization methods and riparian vegetation rehabilitation.
- Evaluate recovery rates of a designed stream toward the BLM performance standards in the 43 CFR 3809 regulations.
- Ensure the sustainability of the mining industry based on attainment of the performance standards, which provide for the recovery of public lands.
- Reestablish floodplain connectivity, healthy riparian areas, improved habitat heterogeneity, and reduced sedimentation and erosion in the project area.

The demonstration project will serve multiple purposes that benefit the BLM and the public.



## Forty Miles of Idaho's Big Wood River to Be Assessed – Idaho

The Big Wood River provides a dynamic and vibrant corridor that connects people and resources through the Wood River Valley near the city of Ketchum, Idaho. The corridor is treasured for its pristine wildlife habitat, diverse ecosystems, and abundant recreational opportunities. However, this corridor, which runs through multiple communities, comes with many land and water management challenges.



To better understand and manage the resources along the Big Wood River, the BLM is partnering

with Trout Unlimited and the Wood River Land Trust to fund a detailed geomorphic study of the fluvial system. The study is expected to be complete by October 2015 and will lead to a better understanding of the river function, processes, and conditions that will be used to inform decisions about its management.

For the study, Biota Research and Consulting of Jackson, Wyoming, will evaluate approximately 40 miles of the main stem of the Big Wood River from the confluence of the North Fork down to Magic Reservoir. The year-long study includes four phases: phase I involves highlighting the significant geomorphic processes operating within the watershed; phase II involves collecting detailed sediment, hydrology, and riparian data that will quantify reference conditions and highlight areas not functioning naturally; phase III involves developing suggestions for ways to balance ecological and social values within the area; and phase IV involves prioritizing actions that support the long-term health and function of the Big Wood River system.

## Moab Field Office Collaborates to Stabilize Onion Creek Road – Utah

Near Moab, Utah, located in a narrow canyon, Onion Creek road is an 8-mile dirt road, which crosses the Onion Creek tributary several times. As the Onion Creek tributary conveys water from the La Sal Mountains to the Colorado River in less than 30 miles, the steep gradient and narrow canyon contribute to very large floods after any rainstorm event. The BLM has been working with the Grand County Road Department for more than a decade to stabilize the road and streambanks on a site-by-site basis.

The Moab Field Office collaborated with the Grand County Road Department and the Utah Division of Water Quality to fund an indepth engineering study



on stabilizing portions of the Onion Creek road. The BLM received \$25,000 in FY 2014 for this study and is currently working with a contractor to focus on alternative road locations and appropriate stabilization techniques. After the study, road improvements will be implemented over the next several years.



## Campbell Creek Science Center Hosts Water Discovery Days – Alaska

More than 800 fourth-grade students visited the BLM Alaska Campbell Creek Science Center in September 2014 to take part in Water Discovery Days. During the 3-day outdoor event, students made their way through three stations where they explored the connections between aquatic insects, salmon, and people. They learned about how we all depend on healthy streams and oceans to survive.

At the first station, students designed and built their own creek critters out of craft materials to learn how aquatic organisms adapt to life in the cold, fast waters of Campbell Creek. At the second station, students and instructors used special nets to collect caddisflies, mayflies, and other creek critters. They then sorted, categorized, and identified the different species found within their samples. At the third station, students trapped and released

juvenile salmon but not until first observing them up close and personal. Students learned about the water cycle, watersheds, the life cycle of salmon, and the connections between healthy streams, healthy oceans, and people.



Students visit one of three stations, learning about connections between aquatic insects, salmon, and people and the importance of healthy streams and oceans.

## BLM Assists with Crooked Creek Watershed Assessment – Alaska

The BLM and Alaska Department of Environmental Conservation (ADEC) are collaborating on a multi-year monitoring project, documenting flows and water quality for two adjacent placer-mined watersheds in interior Alaska—Crooked Creek (primarily

on state land) and the Birch Creek watershed (which includes the Birch Creek Wild and Scenic River managed by the BLM).

Assisting ADEC with watershed assessment is a high priority for the BLM because Crooked Creek is a major tributary to the Birch Creek Wild and Scenic River, and headwaters of the Crooked Creek watershed are adjacent to the eastern boundary of the BLM-managed Steese National Conservation Area.

Much of the 510-square mile Crooked Creek watershed has been placer-mined since the early 1900s, and several of the streams within the watershed were listed in the “Integrated Water Quality Monitoring and Assessment Report” as water quality-impaired for turbidity in 1992. Turbidity sources in the watershed are both point sources, such as active placer mines, and nonpoint sources, such as runoff from active and abandoned placer mines, streambank erosion, and resuspension of deposited sediment.



Upstream view of a placer-mined tributary of Crooked Creek showing a stream reach confined by stacked unconsolidated placer tailings on the left and right side of the channel. The stream is in disequilibrium with frequent morphological changes as a result of excess sediment loading from tailing piles, unstable bank conditions, and altered floodplains, as well as slow revegetation rates and the flashy nature of the watershed.

Water quality assessment of highly disturbed streams in interior Alaska is challenging, in part, because monitoring sites are remote and also because of the extreme climate. In the winter, it is common for ice to form in layers above flowing ground water during freezing temperatures.



Downstream view showing aufeis accumulation of 10 feet on a placer-mined tributary of Birch Creek in May 2014. Aufeis typically forms by upwelling of river water behind ice dams or by ground water discharge. Successive ice layers form throughout winter and can lead to aufeis accumulations that are several feet thick.

This ice accumulation is called aufeis, and it often delays the deployment of instruments. In summer, flashy streamflow coupled with high transport of coarse bedload material frequently results in damage or loss of monitoring equipment.

In FY 2014, the BLM Eastern Interior Field Office received a letter of recognition from the director of the ADEC for assisting with an assessment of the Crooked Creek watershed near Central, Alaska. As noted by ADEC Director Michelle Hale, "The Crooked Creek watershed assessment is a high priority for the division and will hopefully result in actions leading to improved water quality. The data will also complement efforts by the BLM in the Birch Creek watershed."

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## BLM Initiates Project to Protect Coastal Habitat – Eastern States

The BLM initiated a project to protect coastal habitat on BLM-managed land in Alabama. The project entails designing and constructing two dune walkovers and paving two gravel roadways to help prevent erosion. The paving will also keep the gravel from migrating into the adjacent dunes during storm surges, which degrades the dune habitats.



## BLM Coordinates with USGS in Badger Wash Study – Colorado



Silt fences constructed in the Badger Wash in western Colorado and hillslope erosion and climate and flow monitoring equipment.

Badger Wash is a small drainage system located in the desert of western Colorado. It consists of a small watershed that the U.S. Geological Survey has used

for hydrologic research for more than 30 years. In FY 2014, the USGS, in coordination with the BLM, installed a network of flumes, silt fences, precipitation gauges, and dust collectors above reservoirs in subwatersheds in Badger Wash. As a result, the USGS has successfully measured hillslope-scale erosion rates using these devices. These rates will be used to customize key parameters in the Rangeland Hydrology Erosion Model for more accurate quantification of erosion and salt contributions to the Colorado River from public lands with Mancos shale. Currently, the BLM Grand Junction Field Office uses the Rangeland Hydrology Erosion Model results to help develop disturbance thresholds in Mancos shale landscapes as part of the BLM's comprehensive travel management planning effort.



Dust and wind erosion monitoring equipment in the Badger Wash in western Colorado.

## BLM Studies Land Use Effects on Sediment, Salinity, and Selenium in the Stinking Water Gulch Area – Colorado

The BLM performed reconnaissance of the Stinking Water Gulch area near Rangely, Colorado, in September 2014 and developed a draft proposal. This study will aid in understanding the mechanisms that control the distribution, storage, and release of sediment, salinity, and selenium which has important implications to managers facing changing

land use on Mancos shale. The BLM, along with the Colorado River Basin Salinity Control Forum, strives to implement management actions that help control the release of excess sediment, salinity, and selenium from Mancos shale sources. The U.S. Geological Survey used the results of this study for two scientific investigations reports.

## BLM Recommends Water Rights Appropriations to Improve Habitat – Colorado

Based on data collection and a formal recommendation from the BLM in Colorado, the Colorado Water Conservation Board made an initial appropriation for an instream flow water right on the lower Dolores River between the confluence of the San Miguel River and the confluence of West Creek. This is one of the largest instream flow water rights ever appropriated by the state agencies, and it ranges from 900 cubic feet per second during snowmelt runoff to 100 cubic feet per second during base flow periods. The flow rates will support some of the healthiest populations in Colorado of the roundtail chub, flannelmouth sucker, and bluehead sucker—three species on the BLM's sensitive species list. The Colorado water court system will finalize and decree the appropriation in 2015.

In addition, the BLM obtained a final water court decree for a change to the Lovato Ditch water right located in Colorado's San Luis Valley. The decree allows the BLM to offset stream depletions created by BLM wells that support wetland complexes in the San Luis Valley. It also allows the BLM to directly irrigate wetland habitats in several locations, which will benefit habitat for the southwestern willow flycatcher and other species.



The Dolores River near the confluence of West Creek near Gateway, Colorado.



Southwestern willow flycatcher habitat on BLM land in south-central Colorado.

## Gunnison Field Office Participates in Work Group to Help Area Adapt to Changing Climate – Colorado

The Upper Gunnison Climate Change Adaptation project is a collaborative project supported by several partners, including the BLM Gunnison Field Office, that are collectively known as the Gunnison Climate Working Group (GCWG). The GCWG works to design and implement an on-the-ground climate adaptation project to retain water and enhance the resilience of riparian/wetland areas in Colorado's Gunnison Basin in light of climate change.

In FY 2014, the GCWG installed drift fences and instream rock structures at Chance Gulch in the Gunnison Basin to improve floodplain interaction, improve colonization of obligate wetland species, reduce erosion, and raise water tables. Chance Gulch provides brood rearing habitat to Gunnison sage-grouse, a threatened species under the Endangered Species Act. In addition to Gunnison sage-grouse, wetland plants and other wildlife species (e.g., neotropical migratory birds, mule deer, elk, and



Instream structures installed in Chance Gulch by the Western Colorado Conservation Corps.

domestic livestock) depend on these ecosystems. A number of these areas in the Gunnison Basin are already compromised by lowered water tables and erosion; many of these areas are likely to be further altered by drought, invasive species, and erosion from intense runoff events associated with a changing climate.

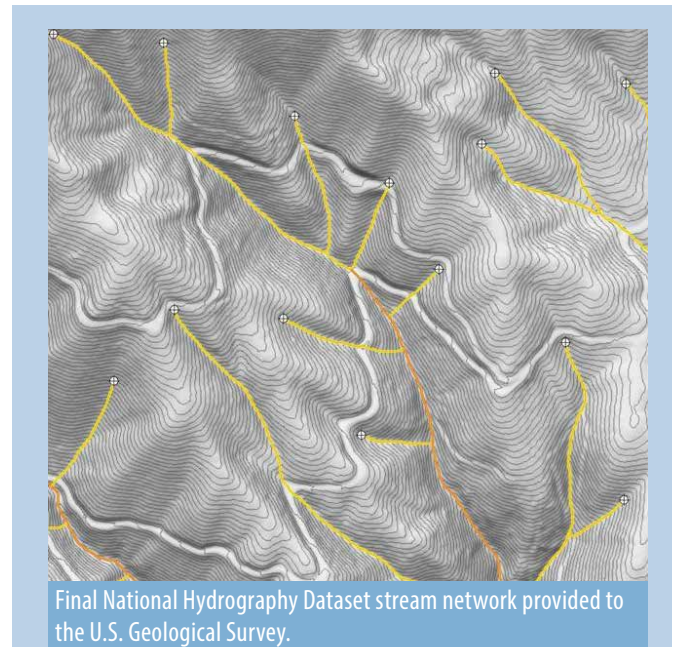


In addition to Gunnison sage-grouse, wetland plants and other wildlife species (e.g., neotropical migratory birds, mule deer, elk, and domestic livestock) depend on these ecosystems.

## Use of LiDAR Increases Accuracy of Stream Locations – Oregon/Washington

Following the 2013 Douglas Complex wildfire, natural resource specialists and managers across several agencies required updated hydrography within six subwatersheds to support postfire recovery efforts. BLM Oregon/Washington revised stream locations in nine subwatersheds in western Oregon by combining light detection and ranging (LiDAR) digital elevation models and the U.S. Geological Survey National Hydrography

Dataset (NHD). With the use of LiDAR, data modeling can accomplish mapping with elevations to within one-tenth of a foot on every square meter of ground. This greatly enhances the definition of the land surface and thus the routing of water across that landscape. The new data were provided to the U.S. Geological Survey and loaded into the BLM Aquatic Resource Inventory Management System (ARIMS) database.



In addition, BLM Oregon/Washington revised the existing subwatershed boundaries in the national Water Boundary Dataset. The resulting stream network allowed for proper planning for stream buffers under the Northwest Forest Plan during postfire timber salvage sales.

With the use of LiDAR, data modeling can accomplish mapping with elevations to within one-tenth of a foot on every square meter of ground. This greatly enhances the definition of the land surface and thus the routing of water across that landscape.

## Partnership Enhances Streamflow and Habitat – Wyoming

In 2010, the BLM Rock Springs Field Office entered into a cooperative agreement with the Trout Unlimited Wyoming Water Project in an effort to enhance streamflows and fish and wildlife habitat in Wyoming streams and rivers. So far, the project includes efforts south of Rock Springs, Wyoming, on Gooseberry Creek, Trout Creek, and Currant Creek in the Little Mountain area. In 2014, the partnership completed a stream stabilization and fish passage project on Gooseberry Creek where two sizable head-cut areas were reshaped to allow for fish passage and to reduce erosion. A culvert was also replaced on a county road to allow fish passage.



The completion of this project now allows fish to travel into an additional 1 mile of stream that has been inaccessible for many years. Other partners include the Wyoming Game and Fish Department, Muley Fanatic Foundation, Seedskadee Chapter of Trout Unlimited, and students from Green River High School.



High school students from the local area planted willows, which will help stabilize the soil and reduce sediment from reaching the Flaming Gorge Reservoir not far downstream. The next two projects on Trout Creek and Currant Creek will involve culvert replacement, irrigation diversion modification to screen fish, step-pool construction for fish passage, and streambank stabilization.

## District Installs Stream Sensors to Collect Data in Support of Restoration – Nevada

The BLM Battle Mountain District is working on the 3 Bars Ecosystem and Landscape Restoration Project, which identifies three occupied Lahontan cutthroat trout streams and one recovery stream for rehabilitation. To support these efforts and gather baseline data, the district installed small sensors (Solinst level loggers and HOBO conductivity sensors) in the channels to collect data that relates to variables that are important to fish health (e.g., discharge, temperature, conductivity), as well as to provide insight to the local hydrologic pathways in support of future restoration decisions. Air temperature sensors were also installed.

Because riparian areas buffer surface water temperatures, the difference in temperature will provide insight to riparian function and habitat suitability. These relationships will provide an early indicator, relative to population changes, of the success/failure of future restoration activities.

Furthermore, monitoring discharge allows the BLM to: (1) perform flood-frequency analysis to design channel characteristics appropriately; and (2) assess the effectiveness of piñon-juniper thinning, stream restoration, and other actions taken to improve the timing and magnitude of flow.

# BLM Analyzes Preliminary Findings of Prescriptive Grazing Practices on Squaw Valley Ranch – Nevada

The BLM Elko District is currently working with the Squaw Valley Ranch to document changes in stream and riparian habitat conditions on the Squaw Valley allotment in response to application of prescriptive grazing practices. The Squaw Valley Ranch is located in northeastern Nevada and encompasses almost 260,000 acres of public and private lands. The allotment supports Lahontan cutthroat trout, a federally listed threatened species, as well as some of the most important sage-grouse habitat in the district.



View of Middle Rock Creek looking downstream in August 1977.



View of Middle Rock Creek looking downstream in August 2014.

In 2004, the Squaw Valley Ranch began applying prescriptive grazing practices in cooperation with the BLM and other partners to improve priority



View of Upper Willow Creek looking downstream in September 2002.



View of Upper Willow Creek looking downstream in September 2014.

habitats for fish and other species of wildlife. In an effort to document the success of the grazing program, the BLM is working with the ranch and Open Range Consulting, Inc., to quantify immediate changes and changes over time at the landscape level. A combination of field surveys and remote sensing techniques are used to show differences in both condition and the extent of riparian vegetation since changes in livestock management were implemented more than 10 years ago. Changes are also able to be evaluated over a longer period since baseline data are available for habitat conditions as far back as the late 1970s.



Preliminary results indicate that 30 of 36 stream miles (81 percent) are in proper functioning condition and that stream and riparian habitat conditions on most priority stream reaches are good to excellent. In terms of changes in extent and distribution of riparian vegetation, Landsat and National Agricultural Imagery Program imagery shows that the percent of riparian vegetation within a spatially defined "potential riparian area" increased by an average of 700 percent between 2004 and 2013.

Grazing management in the past has resulted in impacts to the watershed, but recent implementation of rest-rotation systems has improved conditions. Good watershed health is crucial to the fish and wildlife that depend on this ecosystem. Grazing management continues to be challenging in some portions of the watershed, and the Elko District is working with land users to create solutions. The stream gauge will help the BLM to better understand watershed characteristics and make long-term management decisions.



View of Toe Jam Creek looking across in July 2003.



View of Toe Jam Creek looking across in September 2014.

## Winnemucca District Focuses on the Fourth of July Meadow Restoration Project – Nevada

In FY 2014, in collaboration with the Nevada Department of Wildlife, the BLM Winnemucca District focused on improving summer (late brood rearing) habitat in the Fourth of July Meadow, which is located in a very productive sage-grouse nesting and brooding area. The Fourth of July Meadow Project was developed and implemented to increase the sage-grouse populations near the Nevada mountains by restoring and reconfiguring stream channels and improving riparian habitat conditions.

Two major factors contributing to the decline of habitat quality include domestic grazing impacts and the location and condition of road culverts at stream crossings. Incised stream channels have formed in the meadow above and below road crossings, and active head-cuts have developed in the channels that are currently moving upstream, causing bank

erosion, draining of ground water, drying of the meadow, and subsequent changes to plant communities from wetland to upland associations.





Several restoration actions are also planned, including construction of fences around the meadow area to exclude domestic grazing, removal of culverts, construction of low water crossings, construction of a large rock grade-control riffle, resloping streambanks, and revegetation where appropriate. These efforts are expected to raise the water table within the meadow complex, producing many beneficial outcomes, such as rewatering peat soils, increasing wetland plant species density and diversity, increasing water retention and slow release potentials, and improving overall water quality and quantity to fisheries downstream. All of these benefits, when fully realized, will enhance habitat resources for greater sage-grouse and other valued sagebrush steppe species.



## BLM Participates in Coastal Ecosystem-Based Management with Local Initiative – California

The BLM Arcata Field Office staff follows the activities and attends the meetings of the Humboldt Bay Initiative, which seeks to create a coordinated resource management framework that links the needs of people, habitats, and species by increasing scientific understanding of the ecosystem. California's Humboldt Bay supports a wide range of bird and aquatic life and is bordered by Eureka and Arcata.

This local effort provides a vital link for the BLM to the best thinking and operational expertise for coastal ecosystem-based management, particularly in regard to climate change and sea level rise. As the resource management plan update for the Arcata Field Office approaches, information from the Humboldt Bay Initiative's steering committee will help the BLM specify management objectives for the Humboldt Bay public lands managed by the BLM.

## Pumpkin Creek Restoration Project Continues and Monitoring is Implemented – Montana/Dakotas

In 2009, the BLM Miles City Field Office acquired more than 14,000 acres in a land exchange that included more than 8 miles of lower Pumpkin Creek. Pumpkin Creek is a relatively large prairie stream that provides important fish and wildlife habitat in eastern Montana. Upon acquiring the Pumpkin Creek Ranch, the field office embarked on assessing the parcel's land health. This included detailed riparian, upland, wildlife, and water quality assessments. While overall conditions were good, the Montana Department of Environmental Quality identified the stream as being impaired by high water temperature due in part to a lack of riparian vegetation.

The combination of the water quality and riparian issues led to several restoration activities aimed at stabilizing streambanks, reducing stream width, and providing additional shading. The BLM portion of the project ran from 2011 to 2014 and has resulted in the planting of more than 15,000 willow cuttings and 2,800 rooted stock plants, such as cottonwoods, redosier dogwoods, boxelder, and other native riparian shrubs. In 2014, the field office also repaired several wildlife exclosures damaged during floods in 2013.



Willows awaiting planting.

Results from postproject monitoring show that 56 percent of the plantings survived the transplanting (and flooding) and that natural revegetation of both cottonwoods and willows were occurring



Montana Conservation Corps member using a "stinger" to plant willows.

in areas disturbed by the flooding. These findings demonstrate the success of the riparian restoration efforts. With time, the Pumpkin Creek area should once again have a healthy, stable, and resilient riparian community capable of moderating water temperatures and providing valuable habitat to the 26 fish species (19 native) and other wildlife such as songbirds, game birds like pheasant and sharp-tailed grouse, small mammals, and deer.

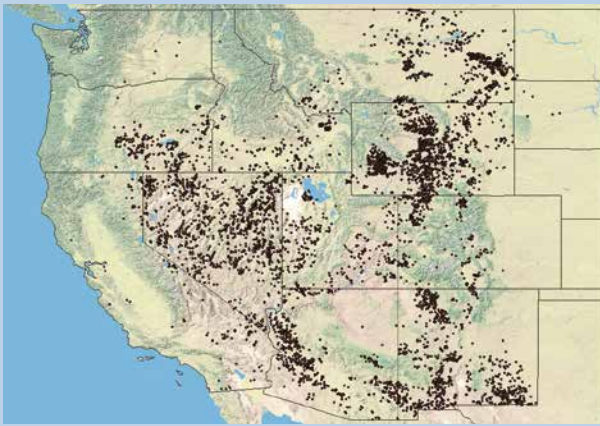
To ensure success, the BLM has implemented the following monitoring on Pumpkin Creek: (1) funding a U.S. Geological Survey stream gauge just below the restored reach (flows and water quality); (2) deploying thermographs in the upper and lower end of the reach; (3) monitoring water quality throughout the reach twice a year (conductivity, specific conductance, pH, water temperature, and dissolved oxygen); and (4) establishing a multiple indicator monitoring site in the reach (including photo points).

## NOC Performs Ground Water Assessments/Water Supply Development in Nevada – National Operations Center

The BLM National Operations Center performed ground water assessments to determine the depth to drill and whether an adequate ground water supply existed to develop a well for a fire facility near Las Vegas and a popular campground near the Red Rock Canyon National Conservation Area. Based on the hydrogeological assessment, a well was drilled at each location. Each area obtained a water supply exceeding the minimum water requirements.



## NOC Works on Creating Water Wells and Springs GIS Data Layer – National Operations Center



The BLM National Operations Center is creating a GIS data layer of all wells drilled for stock water and campgrounds on BLM public lands. This data layer consists of almost 7,000 wells and will allow resource specialists to retrieve information on individual wells, such as water level, depth drilled, date of completion, and producing aquifers. Water wells have been drilled on BLM lands to supply stock water since 1940, thus predating creation of the BLM as an agency. Water supply wells continue to be drilled for stock water supplies, wildlife, campgrounds, and remote fire stations.

## New Water Rights Training Course Saves Hundreds of Pounds of Paper – National Training Center

In October 2014, the BLM National Training Center (NTC), in cooperation with the U.S. Forest Service (USFS), conducted the New Mexico Water Rights Course in Albuquerque, New Mexico, for 68 BLM and USFS participants from New Mexico. This course was last administered in May 2005 and consisted of a classroom notebook of 945 pages. This time, the NTC conducted a paperless course for the

classroom session. Going paperless saved more than 63,315 pages of paper, which is equivalent to about 126 reams of paper or about 12.6 cases of paper. The course material was distributed via a jump drive and also copied to the Soil, Water, and Air Program SharePoint site. The NTC Soil, Water, and Air Section will continue to conduct paperless courses.

# Air

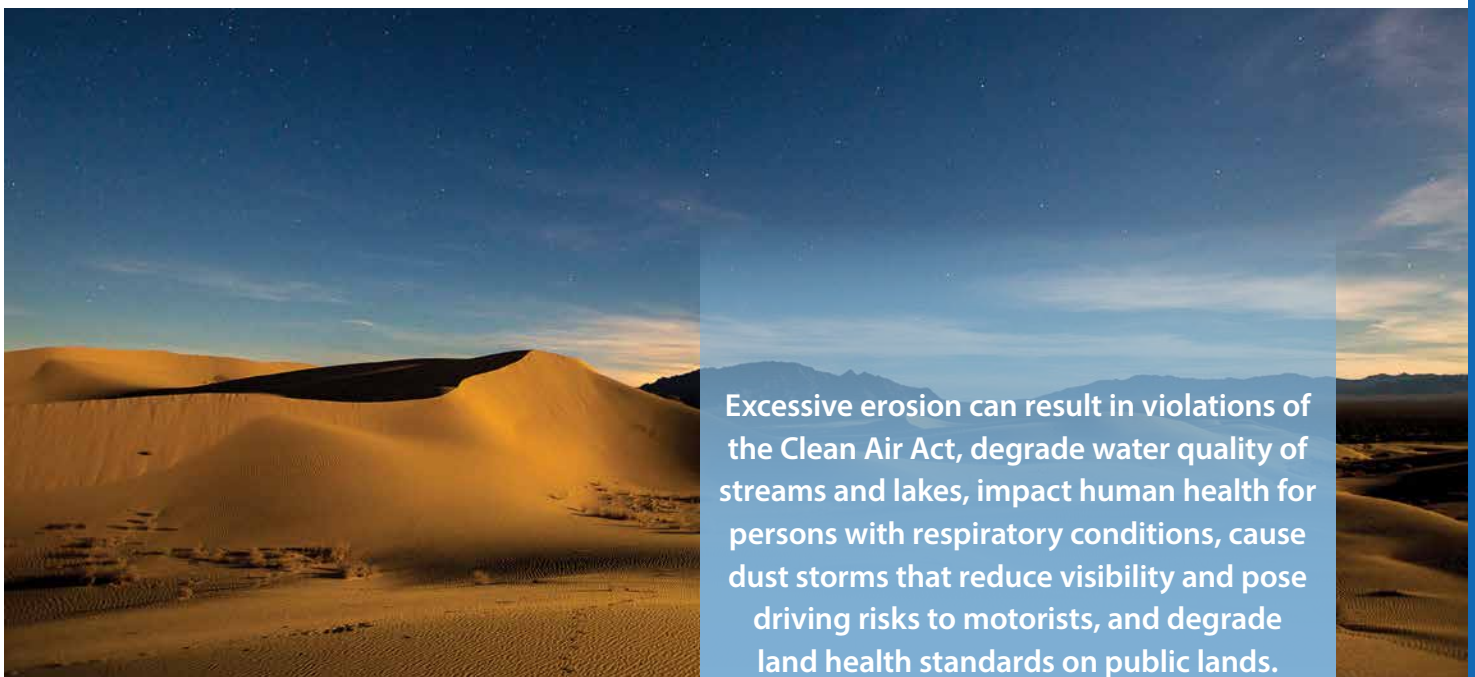
## Collaborative Agreement Initiates an All-Lands Wind-Erosion Model – National Operations Center

Accelerated soil erosion occurs on public lands that have been disturbed by activities such as livestock grazing, off-highway vehicle use, wildland fires, and energy development. Excessive erosion can result in violations of the Clean Air Act, degrade water quality of streams and lakes, impact human health for persons with respiratory conditions, cause dust storms that reduce visibility and pose driving risks to motorists, and degrade land health standards on public lands. Effective management of these issues requires predictive tools to determine where and when unacceptable erosion and deposition will occur. There are no available models, however, to comprehensively assess erosion from wind on public lands. For example, a model currently used on rangelands predicts sediment flux and dust emissions but does not provide information about erosion or deposition.

The BLM National Operations Center initiated an agreement in 2014 with the Agricultural Research

Service-Jornada Experimental Range to collaborate on the development of a comprehensive all-lands wind-erosion model. The agreement provides for installing and operating monitoring stations on public lands to collect additional data to refine and calibrate the model and ensure it is suitable for assessing a wide range of features common to land management issues.

Plans call for sites to be installed by early 2015 in southern California (Mojave Desert), southern Idaho, southern Utah, and southern Colorado. Sites will be instrumented to collect high-resolution meteorological and dust emissions data. Once completed, the model will provide BLM resource specialists with a scientifically defensible and consistent approach for conducting National Environmental Policy Act impact analyses for planning and land use authorizations, prioritizing future management and restoration activities, and complying with Clean Air Act requirements.



Excessive erosion can result in violations of the Clean Air Act, degrade water quality of streams and lakes, impact human health for persons with respiratory conditions, cause dust storms that reduce visibility and pose driving risks to motorists, and degrade land health standards on public lands.

## BLM Initiates Ambient Air Quality Sampling Pilot Projects in Northern Alaska – Alaska

In 2014, the BLM initiated two air quality sampling pilot studies to complement the high-quality particle size distribution meteorological data collection at the Inigok meteorological monitoring station in the remote National Petroleum Reserve in Alaska. The extreme Arctic climate conditions and remote location, combined with no electric line power, infrequent or seasonal site access, and high cost of regular air quality sampling, make any air quality project a challenge. The project is an exploratory and opportunistic approach with the goal of evaluating which type of monitoring might work best for this environment and the site and how to handle logistical difficulties.



Passive ammonia samplers installed at the Inigok field camp in the National Petroleum Reserve in Alaska.

Ammonia data, amongst others, are used in far field modeling analyses to estimate the chemical formation of particulate-based nitric and sulfuric acid in the atmosphere. These values feed into the calculation of air quality related values. Additionally, the State of Alaska has established Alaska Ambient Air Quality Standards for ammonia. Very little ammonia data exists in Alaska, especially on the North Slope. Ammonia concentrations are expected to be low but might be increasing due to global increase.

For the first pilot study, passive ammonia samplers were deployed at Inigok, Umiat, Bettles and Fairbanks during the summer months. Preliminary

results indicate that ammonia sampling through the national Ammonia Monitoring Network project at Bettles might be an adequate substitute for sampling at the remote Inigok meteorological site.

Ozone surface observations are limited in this part of Alaska with few year-round or even regular seasonal sampling stations. Most of the existing ozone sampling locations are near major sources of nitrogen oxides (e.g., communities and oil and gas activity), which usually document ozone scavenging rather than ozone formation. The ozone monitoring at the Inigok site is intended to document the regional nature of the chemistry on the North Slope. Ozone is a criteria pollutant and is regulated under the Clean Air Act. Ozone baseline data are also used in near and far field modeling analyses in accordance with the National Environmental Policy Act and are a key component to understanding atmospheric processes in an airshed.

For the second pilot study, BLM Utah offered to provide the instrument and technical assistance in setting up an ozone analyzer during the summer months. This analyzer was powered using solar panels. The analyzer operated as a survey tool, thus not requiring the usual bimonthly calibration checks. Preliminary data suggest that ozone trends at Inigok follow the larger coastal trends seen at long-term monitoring sites in Barrow, Alaska, but questions still remain regarding concentration levels and local impacts.



Portable ozone monitor with a high-quality particle size distribution meteorological station in the background.

## BLM Colorado Awards Fairplay with Air Monitoring Contract – Colorado

BLM Colorado awarded Fairplay, Colorado, with an air monitoring contract that provides federal reference method monitoring equipment for all criteria pollutants and hazardous air pollutants. The Royal Gorge Field Office will use the equipment to collect baseline air quality data in the vicinity of a proposed master leasing plan area near Cañon City, Colorado. The rig itself is of a portable design, which means the asset can be moved as needed after the baseline data is collected.

The contract also provides portable dust monitoring equipment to be deployed by field office staff to aid in refining BLM Colorado’s understanding of dust impacts related to oil and gas development. The dust monitoring equipment accompanies meteorological instrumentation that will help to understand downwind concentrations of various development processes next to well pads and access roads.



## Colorado Air Resources Management Modeling Study Nears Completion – Colorado



BLM Colorado funded the Colorado Air Resources Management Modeling Study (CARMMS) to predict impacts from future federal and nonfederal energy development in the state. The CARMMS models future air quality projected for the year 2021 for a 4-kilometer gridded domain covering all of Colorado. Ozone formation was higher in unmonitored areas based on the model’s absolute results within the gridded domain. The BLM is beginning to gain a better understanding of the data and its limitations, but initial results suggest that parts of northwest Colorado are having the highest impacts on the National Ambient Air Quality Standards and the air quality related values in surrounding Class I and sensitive Class II areas.

## BLM Colorado Develops Several Online Tools – Colorado

BLM Colorado air resource specialists finished, deployed, and provided field office management and personnel training on several online tools designed to increase field office capacity for providing defensible National Environmental Policy Act air quality analyses. The tools include a website that provides a convenient container for Agricultural Research Service data and BLM resources. Another tool is an online emissions inventory tool designed to allow field office staff and project proponents to complete inventories related to their projects, regardless of scale. A

dispersion screen assessment tool provides worst case downwind concentrations of pollutants from a project; the tool screens typical oil and gas release parameters for point and volume sources and spans 5 years of Colorado-specific meteorology to ensure conservative results. Lastly, field office-specific templates for applications for permit to drill and lease sale environmental assessments provide the latest available data on existing air quality (monitoring) and regional (county-level) emissions data from various cumulative source groups.

## BLM Collaborates on Regional Nitrogen Dioxide Study – New Mexico

The BLM collaborated with the American Petroleum Institute, ConocoPhillips, Environmental Protection Agency, and state environmental agencies to initiate a study measuring the impacts of oil and gas drill rig operations on ambient air 1-hour nitrogen dioxide ( $\text{NO}_2$ ) levels. BLM New Mexico is leading the project, but it is a collaborative project among the BLM air resources team.



The study site in Kuparuk, Alaska.

The data will enable a comprehensive analysis of regulatory air dispersion model performance for  $\text{NO}_2$ . During the National Environmental Policy Act analyses, the BLM discloses 1-hour  $\text{NO}_2$  impacts from drill rig operations; this study will improve the scientific basis for determining these impacts.



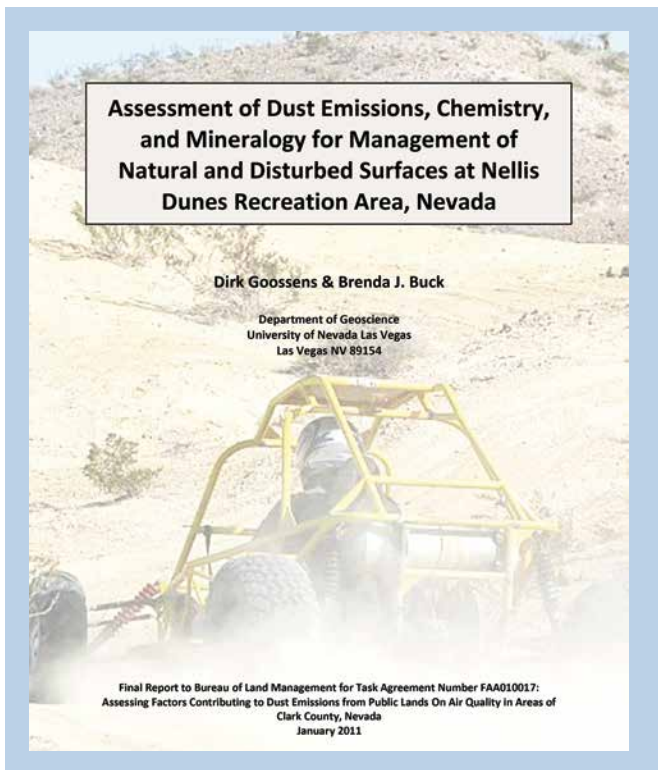
The study site in Platteville, Colorado.

Two initial sites were chosen for the study: Kuparuk, Alaska, and Platteville, Colorado. Ozone, nitrogen oxides, and  $\text{NO}_2$  were measured at both sites with concurrent meteorological data collection and emissions measurements. Measurements were made with federal reference method analyzers with appropriate quality assurance/quality control. Each site had a slightly different monitoring plan; the Alaska site had monitors in fixed locations, while the Colorado site allowed for the movement of monitors to capture emission plumes with changing wind directions. The data will be used to evaluate future model performance.



# University of Nevada Completes Dust Emissions Study – Nevada

In 2014, the University of Nevada, Las Vegas, Department of Geological Sciences and Engineering completed a 3-year study that characterized dust emissions at the Nellis Dunes Recreation Area. The study included the analysis of airborne arsenic, dust generation from several recreational vehicle types, and toxicology using mice and blood work from human volunteers. The goal of the study was to better understand the occurrence, distribution, and geologic processes that formed the bedrock and surficial deposits of the recreation area. The data can be used to predict occurrence of arsenic and other metals that become airborne as a result of natural wind erosion or off-highway vehicle (OHV) recreation. The data are necessary for a human health risk assessment and land use planning.




## Results of the human health risk assessment include:

- Annual emissions from OHV activities equal dust emissions from wind.
- Naturally occurring arsenic is as high as 7,058 parts per million (ppm) in soft “bedrock,” and as high as 346 ppm in soils.
- There is a 1:1 relationship between arsenic content at the surface and airborne arsenic (up to about 1 m in height).
- The arsenic concentration in soils in the sand dunes is low; however, during windy conditions, so much dust becomes airborne that arsenic concentrations in the air can meet or exceed those near industrial smelters.
- Airborne arsenic concentrations behind OHVs (four wheelers) are several hundred times higher than background concentrations, even for areas where the surface contains typical or average arsenic concentrations for the Western U.S.
- For OHV driving, silty soils produced the most dust, whereas for natural wind, sandy soils produce the most dust.
- The preliminary human exposure study found that even limited OHV driving exceeds the total dust exposure limits set by both the Occupational Safety and Health Administration and American Conference of Governmental Industrial Hygienists guidelines.

## Unexpected study results include:

- Naturally occurring asbestos was found at the end of the study. The asbestos is currently thought to have originated in the Boulder City area and blown into the recreation area throughout geological time scales. Because very low levels of asbestos are known to cause disease, there is concern that the asbestos may pose significant risk for people at the recreation area, especially during windy days or while performing OHV activities.
- Preliminary data suggests that wearing a full-face helmet during OHV activity significantly decreases dust exposure.
- Preliminary human exposure found no increase in absorbed metals in the blood of volunteers.
- Overall, lifetime cancer risks and chronic and short-term noncancer risks were considered below levels of concern; however, asbestos was not included in this assessment.



## Washington Office Creates Strategy and Guidance to Support Air Resources – Washington, DC

The BLM Washington Office published the “BLM Air Resource Management Program Strategy 2015–2020” in FY 2014. The strategy describes the BLM’s 5-year plan for the Air Resource Management Program to meet challenges posed by the increasing demand for resource development and recreational opportunities on public lands. The strategy also demonstrates the BLM’s commitment to implementation of the June 2011 memorandum of understanding (MOU) between federal land managers and the Environmental Protection Agency. The MOU commits the signatories to a clearly defined, efficient approach to compliance with the National Environmental Policy Act regarding air quality in connection with oil and gas development on federal lands.

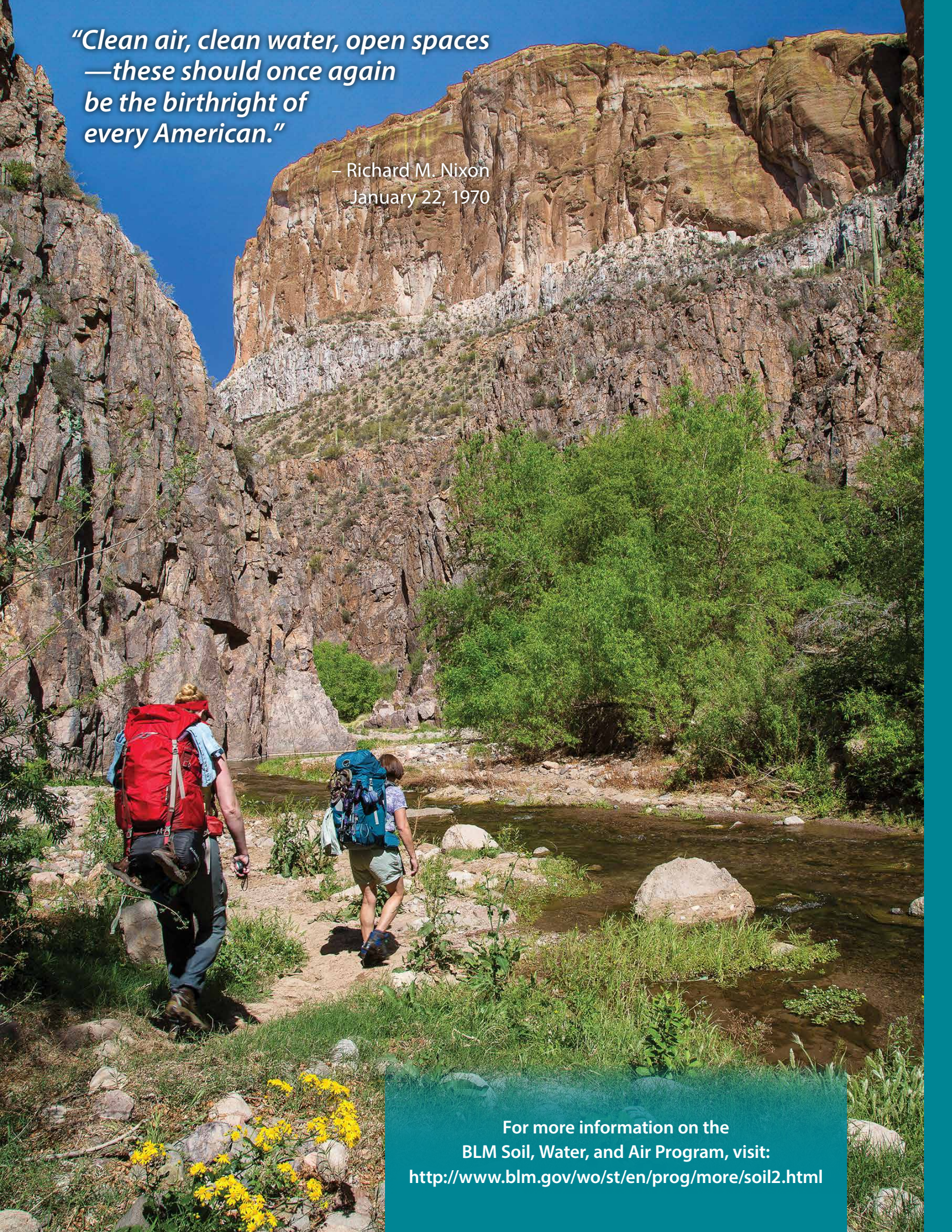
Additionally, to guide implementation of the MOU, the BLM air resources team completed an optional checklist titled “Air Resource Optional Checklist for Technical Workgroup for Memorandum of Understanding Implementation.” This checklist includes a list of implementation activities and their respective timeframes.

The BLM Washington Office also developed a fact sheet that provides an overview of the General Conformity Rule established under the Clean Air Act. Under the General Conformity Rule, federal agencies must work with state, tribal, and local governments in a nonattainment or maintenance area to ensure that federal actions conform to the air quality plans established in the applicable state or tribal implementation plan.

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*“Clean air, clean water, open spaces  
—these should once again  
be the birthright of  
every American.”*

– Richard M. Nixon  
January 22, 1970

A photograph of two hikers with large backpacks walking along a river in a canyon. The hiker in the foreground is wearing a red backpack and dark pants, while the hiker in the background is wearing a blue backpack and light-colored shorts. The river is surrounded by lush green vegetation and large rocks. The canyon walls are made of reddish-brown rock. The sky is clear and blue.

For more information on the  
BLM Soil, Water, and Air Program, visit:  
<http://www.blm.gov/wo/st/en/prog/more/soil2.html>

