

Appendix F: Natural Resource Monitoring in Regional or Adjacent Lands

Air Quality

Arizona Department of Environmental Quality, Air Quality Division

Network of stations monitoring SO₂, particulate Pb, particulate matter, O₃, NO₂, and CO.
<http://www.adeq.state.az.us/environ/air/index.html>

Clean Air Status and Trends Network (CASTNet)

EPA-administered network that provides data on dry deposition, ground level ozone, and other forms of atmospheric pollution.
<http://www.epa.gov/castnet/>

Colorado Department of Public Health and Environment

Network of stations throughout the state. Substances monitored include volatile organic compounds, particulate matter, benzene, CO, NO_x, and SO₂.
<http://www.cdphe.state.co.us/op/aqcc/aqcchom.asp>

Interagency Monitoring of Protected Visual Environments (IMPROVE) Network

Measures visibility in Class I areas stipulated by the Clean Air Act.
<http://vista.cira.colostate.edu/improve/>

Los Alamos National Laboratory

Los Alamos National Laboratory (LANL) is a Department of Energy (DOE) laboratory that is managed by the University of California and located near BAND in New Mexico. Non-radioactive and radioactive air emissions are monitored to meet federal and state air quality obligations. The laboratory also collects data on seismic activity in the area.

Mercury Deposition Network (MDN)

A national database of weekly concentrations of mercury in precipitation and seasonal and annual flux of mercury in wet atmospheric deposition. Over 85 sites in operation including one in southwest Colorado.
<http://nadp.sws.uiuc.edu/mdn>

National Atmospheric Deposition Program/National Trends Network

The National Atmospheric Deposition Program/National Trends Network (NADP/NTN) monitors precipitation at a nationwide network of sites. Several groups cooperate to maintain the network, including State Agricultural Experiment Stations, U.S. Geological Survey, U.S. Department of Agriculture, and numerous other governmental and private entities. Data is collected on the chemistry of precipitation for monitoring of geographical and temporal long-term trends. Weekly precipitation samples are collected and then analyzed for pH, sulfate, nitrate, ammonium, chloride, and base cations, at the Central Analytical Laboratory.
<http://nadp.sws.uiuc.edu/>

New Mexico Environment Department, Four Corners Interstate Air Quality Control Region.

NO₂, SO₂, and particulate matter monitoring throughout the state. There are also 2 ozone monitoring stations in San Juan County in northwestern New Mexico.
http://www.nmenv.state.nm.us/aqb/modeling/aqcr_map.html

Utah Department of Environmental Quality, Air Quality Division

Series of monitoring stations, the majority of which are located in northern and north-central Utah. Monitoring includes SO₂, CO, O₃, NO₂, Pb, and particulate matter.
<http://www.airmonitoring.utah.gov/County.htm>

Climate

Arizona Meteorological Network

The Arizona Cooperative Extension maintains climate stations throughout Arizona specifically aimed at agricultural and horticultural interests. Stations in Northern Arizona include one in Flagstaff, one in Prescott, and one in Payson.

<http://ag.arizona.edu/azmet>

Los Alamos National Laboratory

Researchers at LANL are working in conjunction with the AmeriFlux carbon exchange research project to monitor carbon exchange in grasslands at Valles Caldera National Preserve in order to understand the role of grasslands in uptake of excess carbon created by burning of fossil fuels.

<http://www.lanl.gov/worldview/news/releases/archive/04-061.shtml>

National Oceanic and Atmospheric Administration, U.S. Climate Reference Network

The National Oceanic and Atmospheric Administration (NOAA) is establishing a network of climate stations (Climate Reference Network) with the help of the Western Regional Climate Center, as part of a NOAA initiative. The goal of this project is to monitor long-term precipitation and temperature observations to couple with past observations in order to investigate present and future climate change. If fully implemented, the network will establish about 250 stations nationwide.

<http://www.ncdc.noaa.gov/oa/ncdc.html>

U.S. Forest Service, Remote Automated Weather Station Network (RAWS)

Nearly 1500 stations positioned in forested regions throughout the U.S. that monitor temperature, dew point, precipitation, wind speed, wind direction, relative humidity, fuel temperature, and fuel moisture. The purpose of this network is to aid in fire hazard monitoring.

<http://www.fs.fed.us/raws/>

U.S. Geological Survey (USGS), Earth Surface Dynamics Program, Southwest Climate Impacts Project

The Southwest Climate Impacts Project investigates how climate and human activities affect geologic processes (weathering, erosion, deposition) that change the landscape. The project involves the use of remotely placed CLIM-MET meteorological stations which function for long periods of time, usually long enough to support a parent project that monitors surficial processes. This project is part of the USGS Earth Surface Dynamics Program, which is one of several areas of research the USGS leads as part of its participation in the larger U.S. Global Change Research Program.

U.S. Geological Survey (USGS), Global Change Research in Biology, Arid Lands Research Theme

This program supports a series of projects to determine the relationship of climate to past, present, and potential future changes in vegetation communities and ecosystem processes. Specific goals of the program are to determine soil stability in relation to climate and land use, develop regional climate models to address changes in plant functional groups or species under a doubled CO₂ environment, provide maps depicting potential climate-related changes in arid and semiarid ecosystems, and use past change (decades to thousands of years) as a basis for understanding the relationship between previous climatic change and vegetation change.

http://www.nrel.colostate.edu/projects/brd_global_change/theme_arid_lands.html

University of Arizona & National Aeronautics and Space Administration (NASA)

Dr. Alfredo Huete, University of Arizona, and climate researchers at NASA are currently developing techniques using remote sensing aimed at assessing climate-related and land use change influences on carbon and nutrient cycles, photosynthesis, and plant health status over a wide range of biomes with an emphasis on arid region and savannah ecosystems.

<http://ag.arizona.edu/SWES/people/cv/huete.htm>

See also

***Jornada Experimental Range
Sevilleta Long Term Ecological Research Station***

Earth and Soil Sciences

Interpreting Indicators of Rangeland Health: Land Health Assessments

A collaboration among the U.S. Geological Survey, the USDA Agricultural Research Station, the Bureau of Land Management, and the National Resource Conservation Service, the Interpreting Indicators of Rangeland Health program is designed to provide a quick, qualitative assessment of rangeland health based on the functional status of 17 indicator variables. These indicators reflect three resource attributes of rangelands: soil stability, hydrologic function, and biotic integrity. The program is not a quantitative monitoring technique, but is designed to identify areas of concern, which would then need further quantitative assessment and/or monitoring.

Wildlife – Riparian Species

U.S. Fish and Wildlife Service, Lower Colorado River Multi-Species Conservation Plan

The Lower Colorado River Multi-Species Conservation Plan (MSCP) was initiated in 1995 as a partnership providing Endangered Species Act compliance for water and power resource management in southern California, Nevada, and Arizona. The goal is to meet public needs, avoid species jeopardy, and assist in recovery of such species as the bonytail chub, razorback sucker, southwestern willow flycatcher, and Yuma clapper rail. But the MSCP does more, by targeting at least 90 species in an approach that addresses all the habitats that comprise the riverine corridor of the lower Colorado River from Hoover Dam to the Mexican border: aquatic, marsh, cottonwood-willow riparian, and mesquite bosque. Non-listed species that will benefit from the plan include the flannelmouth sucker fish, the yellow-billed cuckoo, and other neotropical migratory birds and bats that use riparian habitats.

<http://www.sci.sdsu.edu/salton/LowerColoradoRiverMSCP.html>

USDA Forest Service and Rio Grande Bird Research

This cooperative endeavor consists of banding stations along the Rio Grande at Bosque del Apache NWR and Rio Grande Nature Center. The purpose is to monitor long term changes in diversity of neotropical migrants.

See also

***Bureau of Land Management, Farmington, NM Field Office
Institute for Bird Populations, Monitoring Avian Productivity and Survivorship Program
Rocky Mountain Bird Observatory***

Wildlife – Endangered, Threatened or Species of Concern (Terrestrial)

Bureau of Land Management, Farmington Field Office

The BLM monitors all federal and state listed species that occur on BLM properties. Species of concern include Southwest willow flycatcher and yellow-billed cuckoo in riparian habitats. In addition, the BLM monitors bald eagles, golden eagles, ferruginous hawks, prairie falcons, and burrowing owls.

Navajo Natural Heritage Program (NNHP)

The purpose of NNHP is to collect and manage biological and ecological information and to disseminate this information to land managers to promote conservation of biological diversity on the Navajo Nation. NNHP conducts surveys for rare and protected species and monitors known populations.

<http://www.natureserve.org/nhp/us/navajo/>

New Mexico Department of Game and Fish (NMDGF)

NMDGF monitors or collects information on state and federally listed species throughout the state as well as species of special concern. Species found around SCPN units include Southwest willow flycatcher, peregrine falcon, bald eagle, ferruginous hawk, northern goshawk, Mexican spotted owl, Jemez Mountain salamander, boreal toad, northern leopard frog, Gunnison's prairie dog, and rocky mountain bighorn sheep.

<http://www.wildlife.state.nm.us/conservation/index.htm>

Utah Division of Wildlife Resources (UDWR), Non-Game Avian Program

The Utah Division of Wildlife Resources operates a Non-Game Avian Program. The program involves various research, inventory, and monitoring projects throughout the state. Species associated with current projects include the bald eagle, golden eagle, peregrine falcon, ferruginous hawk, northern goshawk, black swift, Southwest willow flycatcher, and the yellow-billed cuckoo. The state is actively looking to collaborate with other agencies in avian monitoring programs.

<http://www.wildlife.utah.gov/>

Utah Division of Wildlife Resources, Mammals Program

The Utah Division of Wildlife (UDWR) Resources Mammals Program conducts inventory and monitoring of bats, rodents, carnivores, and lagomorphs, many of which fall under the Sensitive Species branch of this program. Special status species such as the Utah prairie dog and the black-footed ferret have been intensively monitored for years, in cooperation with other agencies such as the USFWS. Other species with minimal monitoring or plans to begin monitoring include the jackrabbit, pygmy rabbit, pika, black bear, mountain lion, lynx, marten, wolverine, fisher, kit fox, swift fox, kangaroo rat, Gunnison prairie dog, white-tailed prairie dog, and bats. The UDWR is currently the lead agency in a cooperative effort to monitor Utah bats, primarily in abandoned mines.

<http://www.wildlife.utah.gov/>

Utah Division of Wildlife Resources, Conservation Species Data Center

The Utah Conservation Data Center (UCDC) is the central repository for Utah biodiversity information. Although the UCDC focuses primarily on Utah's rare native species and other high-interest species (game animals and raptors, for example), information on all Utah vertebrate wildlife species, many invertebrate species, and numerous plant species is available. Major data contributors include the Utah Division of Wildlife Resources, the Utah Reclamation Mitigation and Conservation Commission, the United States National Park Service, the United States Forest Service, the United States Fish and Wildlife Service, the United States Bureau of Land Management, Utah State University, the University of Utah, Brigham Young University, the network of state/province Natural Heritage Programs and Conservation Data Centers, The Nature Conservancy, NatureServe, various museums, and numerous individuals.

<http://dwrcdc.nr.utah.gov/ucdc/>

Avian—Habitat based

Bureau of Land Management, Farmington Field Office

This office is currently conducting pilot studies of bird communities in sagebrush habitats in order to better understand the effects of brush removal on bird communities.

Rocky Mountain Bird Observatory (RMBO), Monitoring Colorado's Birds (MCB)

Monitoring Colorado's Birds (MCB) is a multi-agency monitoring program coordinated by the Rocky Mountain Bird Observatory (RMBO) to detect trends in breeding birds that regularly occur in Colorado. Funding and fieldwork are contributed mainly by The Colorado Division of Wildlife, but also by the Bureau of Land Management, the United States Forest Service, and the National Park Service, with each agency responsible for the dominant habitats - of 17 total habitat types identified for Colorado- on the lands they manage. The goal of MCB is to focus on species for which Colorado is an important breeding area, and which are not currently being monitored under

other programs. Generally this means that game and special status species will not receive specific attention. Methods are primarily transect-based, using distance sampling, although some species will require specialized techniques. These specialized techniques are described under the "Special Monitoring Projects" component of the MCB program.

<http://www.rmbo.org/conservation/mcb.html>

USDA Forest Service Rocky Mountain Research Station (RMRS), Albuquerque Forestry Science Office

In 1999, a five-year study was initiated in order to evaluate population dynamics, species richness, and habitat use of wintering birds within grassland ecosystems of the Sevilleta NWR. The study is designed to estimate bird populations in grazed and ungrazed grasslands.

<http://www.fs.fed.us/rm/albuq/rwud4351.htm>

USDA Forest Service RMRS, Flagstaff Field Office

Conducting studies to examine effects of fire on Ponderosa pine bird communities (passerines and cavity nesters) on the Kaibab Plateau.

<http://www.rmrs.nau.edu/lab/4251/birdsnburns/index.shtml>

USGS Fort Collins Science Center

Avian monitoring efforts of the Fort Collins Science Center include short grass prairie bird species, shorebird species, and desert grassland bird species.

<http://www.mesc.usgs.gov/research/300/300.asp>

Utah Division of Wildlife Resources (UDWR), Upland Game Species Program

The Utah Division of Wildlife Resources operates an Upland Game Species Program, mostly but not entirely focused on birds. The program involves various research, inventory, and monitoring projects throughout the state. The Division collects annually, or has on file, population data for the following species: pheasant, mourning dove, band-tailed pigeon, greater sage grouse, Gunnison sage grouse, ruffed grouse, blue grouse, California quail, turkey, white-tailed ptarmigan, cottontail rabbit, snowshoe hare. In addition, UDWR maintains comprehensive GIS distribution and habitat data for each of these species.

<http://www.wildlife.utah.gov/>

Avian—General

Institute for Bird Populations, Monitoring Avian Productivity and Survivorship Program

The Institute for Bird Populations at Point Reyes Station, California, is a non-profit corporation focused on research and monitoring of avian populations at a global scale. In 1989, the Institute initiated the Monitoring Avian Productivity and Survivorship Program (MAPS) in cooperation with USGS, NPS, USFWS, state fish and wildlife agencies, and others to monitor avian productivity and survivorship at constant-effort mist net trapping and banding stations across the United States. Currently, data from over 500 MAPS stations have contributed to productivity indices and improving understanding of population trends, ranges and habitat of various species. MAPS stations can be run by any agency or organization, which follows the standard protocols, used by the IBP, and which contributes their data to the national MAPS database.

<http://www.birdpop.org/>

National Audubon Society, Christmas Bird Count

The National Audubon Society's Christmas Bird Count (CBC) is an annual 15-mile diameter circle Area Search for birds, conducted on one day in the winter by volunteers. Results from the CBC achieve the primary objective of monitoring the status and distribution of bird populations across the Western Hemisphere. The CBC has been conducted since 1900, and results are available from a national website sponsored by the National Audubon Society and the Cornell Lab of Ornithology.

<http://www.audubon.org/bird/cbc/index.html>

North American Breeding Bird Survey

Begun in 1966, the North American Breeding Bird Survey (BBS) was first administrated by the U.S. Fish and Wildlife Service, and is currently being administered by the U.S. Geological Survey, Patuxent Wildlife Research Center. The survey is conducted once in June across North America, at over 3500 routes. Routes are 24.5 miles long with observers stopping every 0.5 miles to record all birds seen and heard during a 3-minute point count. Analysis of the data results in continent-scale abundance maps, and trend information on individual species and groups such as neotropical migrants.

<http://www.mbr-pwrc.usgs.gov/bbs/bbs.html>

U.S. Geological Survey (USGS), Breeding Biology Research & Monitoring Database

A component of the USGS Global Change Research Program, the Breeding Biology Research and Monitoring Database (BBIRD) is a national program that uses standardized protocols to study bird nest success and nesting habitat requirements. Study sites consist of nest-finding plots, a minimum of 4 ha in size, which are intensively surveyed throughout the breeding season. Study sites often match unaltered with altered plots to examine how land use affects the ability of habitats to support source or sink populations of birds. Participants contribute their data to the national BBIRD database, which can then be used to identify large-scale patterns and trends. BBIRD sites on the Colorado Plateau do not appear to be common.

<http://pica.wru.umd.edu/BBIRD/info.htm>

Partners in Flight, All-bird Monitoring and Assessment Program, Western Working Group

This effort is still under development. Partners in Flight (PIF) began in 1989 as a national effort to document and reverse apparent declines in neotropical migratory birds. It is a cooperative effort with federal, state, and local government agencies, philanthropic foundations, professional organizations, conservation groups, industry, the academic community, and private individuals. The goals of monitoring and assessment program are to develop coordinated bird monitoring programs that can help identify species of concern and causes of declines, describe habitats these species need, identify areas for conservation action, define management objectives, and evaluate management programs.

<http://www.partnersinflight.org/>

Mammals

State Wildlife Agencies

Arizona Game and Fish Department (AZGFD), Colorado Division of Wildlife (CDOW), New Mexico Department of Game and Fish (NMDGF) and the Utah Division of Wildlife Resources (UDWR) monitor predators and game species in their respective states.

<http://www.gf.state.az.us/>

<http://wildlife.state.co.us/>

<http://www.wildlife.state.nm.us/>

<http://www.wildlife.utah.gov/>

U.S. Geological Survey (USGS), Bat Population Status in the United States and Territories

The USGS Bat Population Status project is intended to synthesize bat information from states, conservation organizations, and Interior Department land managers that will then support hypothesis testing, the development of monitoring protocols, and a summary of conservation needs. The initial phase of the project involved the creation of a Bat Population Database. This database will then be used for hypothesis testing, statistical analysis, and in the design of potential long-term monitoring programs.

Reptiles and Amphibians

Arizona Game and Fish Department (AZGFD)

The AZGFD monitors leopard frog populations throughout Arizona.

Colorado Herpetofaunal Atlas

The Colorado Herpetofaunal Atlas is based on an interactive website that includes historical distributional information based on museum records, scientific publications, unpublished field survey reports, and other sources. Through this website, volunteers, scientists, and other interested parties can augment this historical information by reporting new observational data on an ongoing basis. The website includes a searchable GIS-based database and downloadable observation forms.

<http://ndis.nrel.colostate.edu/herpatlas/coherpatlas/>

Partners in Amphibian and Reptile Conservation (PARC)

This is a national partnership including state and federal agencies and NGOs dedicated to herpetile conservation. Arizona has a state working group of PARC and has recently formed an inventory and monitoring subcommittee which is initiating a statewide atlas project.

<http://www.reptilesfaz.com/>

U.S. Geological Survey (USGS), Amphibian Research and Monitoring Initiative

In response to growing awareness of amphibian declines and malformations, the USGS Amphibian Research and Monitoring Initiative (ARMI) program was initiated by the United States Congress in 2000 to monitor trends in amphibian populations on Department of Interior (DOI) lands, and to research the cause of amphibian declines. While intensive monitoring will be focused on DOI lands, ARMI will also provide a framework for incorporating amphibian monitoring data by other agencies outside of DOI lands. Partnerships with other DOI agencies include a nationwide survey by the Fish and Wildlife Service on 48 National Wildlife Refuges in 31 states for contaminants that may induce malformations in amphibians.

<http://armi.usgs.gov/>

U.S. Geological Survey (USGS) Inventory, Monitoring, and Research Database for Reptiles

The USGS reptile database project originally aimed to collect information about reptile inventory, monitoring, and research projects on U.S. Department of Interior lands. It has expanded its scope to include all federal lands, as well as to include amphibian data. The database is intended to complement database work under the Amphibian Initiative, and will eventually become part of the PARC (Partners in Amphibian and Reptile Conservation) website and the USGS website.

Utah Division of Wildlife Resources, Amphibian Inventory and Monitoring

The Utah Division of Wildlife Resources conducts general amphibian inventories and specific monitoring of special status amphibians in the state. The Division began leading a boreal toad monitoring project in southwestern Utah in cooperation with the United States Forest Service in 1994, and a Columbia spotted frog monitoring program in central and western Utah in 1994. In 1999, the Division began an ongoing inventory for amphibians in the Virgin River Basin.

See also

Wildlife—Endangered, Threatened, or Species of Concern (Terrestrial)

Fish (Including Endangered Species)

Colorado Division of Wildlife (CDOW), Sport and Native Fish Monitoring Programs

The Colorado Division of Wildlife monitors native fish informally, such as the Colorado River Cutthroat Trout (State Species of Concern), as well as sport fish in the Gunnison River. Standard protocols, including electrofishing, are used.

New Mexico Game and Fish Department (NMGFD)

The state agency, in conjunction with U.S. Fish and Wildlife Department, monitors species of concern: Rio Grande Cutthroat Trout, Rio Grande Silvery Minnow, Gila chub, Gila Trout, Zuni bluehead sucker, and razorback sucker. The state agency also monitors populations of game species.

U.S. Bureau of Reclamation (U.S. BoR)

From 2000-2002, the USBoR monitored populations of Rio Grande Silvery Minnow at 20 sites along the Rio Grande from the Angostura Diversion Dam to Elephant Butte Reservoir.

http://www.usbr.gov/uc/albuq/rm/rg/rgsm2002/Fish_Data.html

USFWS San Juan River Program

This program is a partnership between USFWS, the State of Colorado, the State of New Mexico, U.S. BoR, BLM, BIA, Ute Mountain Indian Tribe, Southern Ute Indian Tribe, the Navajo Nation, and the Jicarilla Apache Nation with a goal to protect and restore native fish populations in the San Juan River basin. Species of special concern are the Colorado pike minnow and the razorback sucker. The program will enhance populations of these species through augmentation, identify important reaches of the river for the life cycles of the fish, monitor water chemistry, examine interactions of native and non-native species, and monitor these and other fish species found in the study area.

Invertebrates

USDA Forest Service, RMRS, Albuquerque Forestry Science Office

The Albuquerque office of RMRS is conducting pre- and post-fire surveys of arthropod communities on the Kowa National Grasslands in northeastern New Mexico.

Bosque Ecological Monitoring Program (University of New Mexico) (BEMP)

Initiated in 1996, the aim of this program is to understand how flooding influences the ecology of the middle Rio Grande Bosque. The program uses citizen volunteers to collect abiotic and biotic data at four sites near Albuquerque, NM. Indicator arthropod data are collected for this project.

<http://www.bosqueschool.org/BEMP/bemp.htm>

Landscape Vegetation Pattern and Disturbance

BLM, Farmington Field Office

The Farmington field office is currently working to obtain high resolution aerial photography in order to map vegetation and monitor disturbance.

Central Arizona-Phoenix Long Term Ecological Research Station (CAP-LTER)

The CAP LTER site is unique in that in addition to research focusing on an arid-land ecosystem, it provides an opportunity to examine a landscape profoundly influenced by the presence and activities of humans. Biological, physical, and social scientists from Arizona State University and a wide range of local partners are working together to study the structure and function of the urban ecosystem, assess the effects of urban development on the Sonoran Desert, and define the impact of ecological conditions on urban development. Research focuses on landscape change, hydrologic function, and anthropogenic disturbance.

<http://caplter.asu.edu/home/index.jsp>

EPA Landscape Ecology Branch, Landscape Characterization Branch (LCB)

This branch of the EPA develops approaches for regional and national ecological assessment in order to improve the prediction of ecological indicators at varying scales of interest and to assist with remediation. LCB conducts research on the spatial characteristics of landscapes, including the distribution of resources, stressors, and biophysical processes, and how those characteristics change over time.

<http://www.epa.gov/nerlesd1/land-sci/lcb/default.htm>

Jornada Experimental Range

Originally set aside in 1912, these lands are now operated by the USDA – Agricultural Research Service. Research projects cover a wide-range of topics from nutrient cycling, temporal changes in vegetation, rangeland health, key process and linkages in desert landscapes, and the role and impact of biota in ecosystems. Over 100 permanent quadrats were established in 1915 to

monitor vegetation patterns. These were monitored annually until 1947 with a subset annually monitored until 1979. Many of these quadrats were relocated and measured in 1995 and 2001. <http://usda-ars.nmsu.edu/>

Jornada Basin Long-Term Ecological Research Project

The Jornada Basin Long-Term Ecological Research (LTER) site is comprised of the Chihuahuan Desert Rangeland Research Center operated by New Mexico State University and the USDA Jornada Experimental Range (see description in this section). The LTER covers approximately 100,000 ha in the Chihuahuan Desert of southern New Mexico. Research at the LTER focuses on five habitat types: black grama grassland, creosote bush scrub, mesquite duneland, tarbush shrublands and playa. Research focuses primarily on factors influencing desertification including animal-induced soil disturbances, primary production, biodiversity and ecosystem function, soil microbial processes, and eolian processes.

<http://jornada-www.nmsu.edu/index.htm>

NRCS National Resources Inventory

The National Resources Inventory (NRI) is a statistical survey designed to assess natural resource status, conditions, and trends on the nation's nonfederal land. The survey is conducted annually and consists of photo-interpretation and other remote sensing methods and standards along with ancillary materials such as USDA field office records, information from NRCS field staff, soil survey and other inventory maps and reports, and tables and technical guides developed by local field office staffs.

<http://www.nrcs.usda.gov/technical/dataresources/>

Sevilleta Long Term Ecological Research Station (LTER)

The Sevilleta LTER is located near Albuquerque, New Mexico and is comprised mostly of the Sevilleta National Wildlife Refuge. Originally acquired by The Nature Conservancy, the refuge lands were turned over in 1973 to the U.S. Fish and Wildlife Service. In a cooperative effort with University of New Mexico the refuge became host to a LTER in 1988 – one of twenty-four nationwide sites where research focuses on global warming trends and other environmental concerns. The LTER lands encompass subalpine mixed-conifer forest, riparian cottonwood communities, desert grasslands, mesquite and sand dunes, and Great Basin shrub and part of the Rio Grande river valley.

<http://sev.lternet.edu/>

U.S. Geological Survey, Landscape-scale Assessment of Native and Exotic Plant Diversity and Microbiotic Crusts in the Grand Staircase-Escalante National Monument.

The U.S. Geological Survey (USGS), in cooperation with the Natural Resource Ecology Laboratory (NREL), and Grand Staircase - Escalante National Monument (GSENM) staff, will be providing the BLM with scientific data from the Landscape-scale Assessment project to assist with their management objectives for GSENM. As stated in the project website, the project will address, "(1) Identifying hot spots of native plant diversity and rare/unique habitats; (2) Determining areas where cryptobiotic crusts and plant communities are particularly sensitive to disturbance; (3) Detecting the loss of native plant diversity caused by exotic plants; and (4) Developing a science-based long-term monitoring plan for vegetation and soil resources." Methods include using a multi-phase, multi-scale approach, in addition to remotely sensed data, field sampling and predictive models.

USDA Forest Service, Forest Health Monitoring Program

USDA Forest Service, Forest Health Monitoring (FHM) is a component of the national Forest Inventory and Analysis program. Forest Health Monitoring is designed to determine status, changes, and trends in indicators of forest condition on an annual basis. Its focus is on forest health issues that affect ecosystem sustainability. Intensive data are collected from a subset of plots already established by the FIA program. These data, identified as indicators of forest health, provide information about vegetation diversity, soils, lichens, downed woody debris, and

tree crowns. They provide the basis for developing analytical approaches to addressing forest health issues.

<http://fhm.fs.fed.us/>

USDA Forest Service, Forest Inventory and Analysis Program

The Forest Inventory and Analysis Program (FIA) is a national USDA Forest Service program that provides a census of landscape-level information about forestry resources since 1930. The FIA program inventories all forested lands, including federal, private and state lands. Forest Inventory and Analysis on the Colorado Plateau (UT, WY, CO, AZ) is conducted by the Interior West branch of the national program, at the USDA Rocky Mountain Research Station, Ogden Forestry Sciences Laboratory. Although plot locations are confidential to protect land ownership information, access to the data is available through the National Forest Inventory and Analysis Geospatial Data Service Center.

http://www.fs.fed.us/ne/fia/spatial/index_ss.html

See also

Interpreting Indicators of Rangeland Health: Land Health Assessments

Plants

BLM, Farmington Field Office

The Farmington field office is engaged in an ongoing study to address long term effects of grazing on riparian vegetation composition and structure. The office also monitors populations of endemic cacti.

New Mexico Rare Plant Technical Council

The New Mexico Rare Plant Technical Council is a volunteer organization that has developed and now maintains an internet database that contains information on biology and conservation status of the nearly 200 plant species found in New Mexico.

<http://nmrareplants.unm.edu/index.html>

USDA Forest Service, RMRS, Flagstaff Field Office

One project of the Flagstaff RMRS is designed to evaluate riparian hydrologic, geomorphic, and biologic dynamics. Part of this project includes monitoring riparian composition, hydrologic function and dynamics on the Verde and Gila Rivers.

See also

Navajo Natural Heritage Program

Exotic Species

Tamarix Cooperative Mapping Initiative (T-MAP)

T-Map is a cooperative partnership designed to combat the invasion of *Tamarix* species into North American landscapes by providing real-time accurate locational information on current *Tamarix* populations / infestations. The goal is to provide an interactive site on which land managers, scientists, and the public may contribute data. Another goal is to identify easily measured or derived factors that will predict the occurrence of *Tamarix* species.

<http://www.tamarixmap.org>

USDA Forest Service, RMRS, Flagstaff Field Office

Part of the project to evaluate riparian dynamics (see above) includes monitoring exotic species in riparian areas and their affects on native vegetation.

USGS Fort Collins Science Center, Invasive Species Science Program

The Invasive Species Science Program staff provides research and technical assistance relating to invasive species management concerns, including understanding how these species are

introduced, identifying vulnerable areas, forecasting invasions, and developing control methods. Scientists are developing the Invasive Species Information Node of the National Biological Information Infrastructure (NBII), a comprehensive, accessible database of invasive species of plants, animals, and disease agents. From these data, models can be constructed which facilitate the understanding and help to predict invasive species behavior for more effective management. <http://www.mesc.usgs.gov/research/100/100.asp>

Regional Research, Monitoring, and Database Programs

Arizona Natural Heritage Program

The Arizona Natural Heritage Program is one of 86 primary data centers throughout the United States, Canada, Latin America, and the Caribbean countries, which uses the Natural Heritage Methodology for ranking and preserving species and communities. Its database contains scientific information on species and subspecies. This allows the program to rank relative degree of imperilment of these elements, rank populations or occurrences of each according to their level of health or quality, and delineate and rank potential conservation areas. http://www.azgfd.gov/w_c/edits/species_concern.shtml

Colorado Natural Heritage Program

The Colorado Natural Heritage Program is one of 86 primary data centers throughout the United States, Canada, Latin America, and the Caribbean countries, which uses the Natural Heritage Methodology for ranking and preserving species and communities. Its database contains scientific information on species, subspecies and significant natural communities. This allows the program to rank relative degree of imperilment of these elements, rank populations or occurrences of each according to their level of health or quality, and delineate and rank potential conservation areas. In Colorado, the Natural Heritage Program does more inventory work than monitoring, such as the Small Mammal Atlas project for the state, and rare plant and weed inventory and mapping on the west slope of the Rocky Mountains. <http://www.cnhp.colostate.edu/>

Natural Heritage New Mexico

The New Mexico Natural Heritage Program is one of 86 primary data centers throughout the United States, Canada, Latin America, and the Caribbean countries, which uses the Natural Heritage Methodology for ranking and preserving species and communities. Its database contains scientific information on two elements: species, and subspecies. This allows the program to rank relative degree of imperilment of these elements, rank populations or occurrences of each according to their level of health or quality, and delineate and rank potential conservation areas. <http://nmnhp.unm.edu/>

Museum of Southwestern Biology, Curation of Biological Survey Collection

In 1994, United States Geological Survey (USGS) scientific collections of western vertebrates were moved from Fort Collins, CO, to Albuquerque, NM, where they joined a larger collection at the Museum of Southwestern Biology. This project creates and maintains electronic databases and curates the USGS collections, which consist of amphibians, reptiles, fishes, birds and mammals, mostly from the Rocky Mountains and Intermountain West. The collection is rich in bats and rodents, and a general research emphasis has been to document mammal species from public lands in the West. <http://www.msb.unm.edu/>

U.S. Geological Survey, Grand Canyon Monitoring and Research Center

The U.S. Geological Survey, through the Grand Canyon Monitoring and Research Center (GCMRC), coordinates numerous studies relating to flows below Glen Canyon Dam. Currently they have projects relating to sand transport, sediment transport, exotic fish removal, TES studies including the Kanab ambersnail and humpback chub, avian monitoring of riparian species and the Southwest willow flycatcher, and water quality in the Colorado River ecosystem. The GCMRC,

located in Flagstaff, Arizona is the cornerstone of the Glen Canyon Dam Adaptive Management Program (AMP). The GCMRC measures effects of Glen Canyon Dam operations on the resources along the Colorado River from Glen Canyon Dam to Lake Mead. The GCMRC's scientific activities contribute to meeting the statutory requirements placed on the Secretary of the Interior by Congress via the 1992 Grand Canyon Protection Act, the 1995 Glen Canyon Dam Environmental Impact Statement, and the 1996 Record of Decision.

www.gcmrc.gov

Valles Caldera National Preserve

The Valles Caldera National Preserve was established adjacent to BAND by the Valles Caldera Preservation Act (H.R. 3288S) in 2000. This preserve was created through the purchase of nearly 90,000 acres of the Baca Ranch in the Jemez Mountains of north-central New Mexico. The purpose of the preserve was to "...protect and preserve the scientific, scenic, geologic, watershed, fish, wildlife, historic, cultural, and recreational values of the Preserve, and to provide for multiple use and sustained yield of renewable resources within the Preserve." Although the lands are a unit of the U.S. Forest Service, a wholly-owned government corporation will manage the Preserve, and a nine-member Board of Trustees will govern the Trust. The Board is made up of the Forest Supervisor of the Santa Fe National Forest, the Superintendent of Bandelier National Monument, and seven individuals with a variety of skills. The property is known for its huge meadows, abundant wildlife, meandering streams and remarkable scenery.

<http://www.vallescaldera.gov/>

Water Quality and Water Quantity Monitoring

U.S. Environmental Protection Agency (US EPA), Environmental Monitoring and Assessment Program (EMAP) Surface Waters - Western Pilot Study

The Western Pilot Study is the Surface Waters component of the U.S. Environmental Protection Agency's (EPA) Western Geographic Study through the Environmental Monitoring and Assessment Program (EMAP). It is a six-year program whose objective is to develop monitoring tools to estimate ecological condition of surface waters across a large geographic area of the Western U.S. Its goal is to answer questions about the importance of stressors and the extent of their effects on ecological condition of wadeable streams. Methodology of the project includes sampling of water chemistry, stream discharge, periphyton, sediment, benthic macroinvertebrates, fish, and physical habitat characteristics. Primary candidate sampling sites are spread throughout Arizona, Colorado and Utah.

<http://www.epa.gov/emap/west/index.html>

U.S. Geological Survey – Water Monitoring

The U.S. Geological Survey was created by an act of Congress in 1879 and has become the principal federal agency providing water information needed to manage the nation's water resources. The U.S. Geological Survey operates and maintains a network of about 7,000 streamflow-gaging stations nationwide and about 70% of these have real-time capabilities. The U.S. Geological Survey monitors the quantity and quality of water in many rivers, streams, lakes, and reservoirs. The monitoring program is a cooperative effort that is funded jointly by numerous federal, state, and local agencies. Streamflow data collected as part of the monitoring program are used for hydrologic research, reservoir operations, forecasting floods and droughts, maintaining water quality, and monitoring water-quality conditions and trends.

<http://water.usgs.gov/>