

Regional Highlights

Mid-Atlantic

Assisted by the NPS Mining and Minerals Branch, the U.S. Bureau of Mines (BOM), and regional Chief Scientist John Karish, Friendship Hill NHS is identifying and developing mitigation projects for the treatment of acid drainage from mines within the park. Although the interagency agreement between the two agencies has ended, BOM has continued to investigate the chemical and biological processes in the wetlands constructed at Friendship Hill for the purpose of acid mine drainage treatment.

BOM recently developed and evaluated a method for comparing the abilities of different organic additives (brewer's yeast, molasses, polylactic acid, and dairy whey) to stimulate sulfate reduction when added to wetland sediments. Bacterial sulfate reduction not only removes metals and sulfate from acid mine drainage, but also adds alkalinity. They tested both fermented and unfermented organic additives in the experiment.

Using an underground pipe system within the Friendship Hill wetlands, BOM pumped whey into the compost of one wetland lane and within two weeks, most of the whey had passed through the lane. Staff sampled the wetland water each week for four months monitoring changes in water quality. They found slightly lower sulfate concentrations in the treated lane following the whey addition and indicating that the single whey dose may have slightly affected bacterial activity. Future experiments will be based on a continual feed system.

Two visitors to Shenandoah NP reported seeing peregrine falcons on Stony Man Mountain in late July. Park staff investigated and discovered an eyrie with a male and female chick in excellent condition. USFWS staff banded the chicks and secured the area from human disturbance. The chicks fledged in mid-August.

Shenandoah's Fish In Sensitive Habitats (FISH), a three year research project, underwent its second year peer review in August. FISH will enable modeling of the effects of stream acidification on fish individuals and populations.

Recently signed by the regional director, Colonial NHP's Water Resources

Management Plan will soon be ready for distribution. It contains an electrostatically-plotted map portfolio produced by the park's GIS (with the assistance of the North Carolina State University FTSC). Colonial is also continuing a fisheries inventory of park waters under an agreement with the USFWS Fisheries Assistance Office in White Marsh, Virginia.

North Atlantic

The Natural Resource Protection Program (NRPP)-funded study of storm breach threats to northern U.S. national seashores has begun. Jim Allen (former NPS coastal geomorphologist and now with NBS) is leading a group of investigators from the University of Rhode Island, SUNY/Stony Brook, and Rutgers who are studying the physical impacts of storm breaching on barrier islands dynamics and multiple inlet estuarine circulation at Fire Island NS, Cape Cod NS, and Sandy Hook/Gateway NRA.

The methodology uses numerical modeling calibrated by intensive field surveys which employ the latest technological developments (electronic total stations, kinematic GPS, remote pressure-temperature-salinity data loggers, etc.). The research will quantify the expected physical changes to barrier-estuarine systems in order to provide a basis for ecosystem impact assessments and breach management planning in this highly developed coastal environment.

Janice Minushkin of the regional office visited six national natural landmarks (NNLs) this year in preparation of the annual section 8 report. She focused on threatened and endangered NNLs and reports that one site, Acushnet Cedar Swamp in New Bedford, Massachusetts, included in last year's report, will be removed this year because threats to the site have been mitigated by the state park that manages the property.

Southeast

Blue Ridge Parkway and North Carolina Wildlife Resources Commission conducted a stream restoration project on Little Glade Creek on the parkway in Allegheny County, North Carolina during 1993 and early 1994. They improved water quality and trout habitat by excluding livestock from the riparian zone through installation of a fence. The project also

aimed to increase vegetative cover and restore eroded stream banks.

Stream bank restoration consisted of installing an erosion-resistant foundation of root wads, rip-rap, or logs at the base of eroded stream banks at water level. Banks were sloped to this foundation at a 2:1 to 3:1 grade, smoothed, seeded, fertilized, and mulched. Crews repaired 23 sites totalling 292 m (950 ft.) and established 2 gravel livestock crossings. Project leader Bob Cherry estimated that more than 450 work-hours and \$17,000, including materials and salaries, were expended on this project.

Twelve Blue Ridge Parkway employees spent four days in the hot sun in June planting more than 800 Heller's blazing stars (*Liatris helleri*) along the Grandfather Mountain Corridor. Heller's blazing star is a federally listed plant that occurs on the Parkway and in only six other locations in the world. The plants were reared in a greenhouse at the University of Georgia at Athens from seeds collected on the Parkway. They were moved to the North Carolina Arboretum in Asheville, North Carolina where the plants were maintained by horticulturalists and greenhouse personnel. Staff will watch this endangered plant population closely for several years to determine the effectiveness of the restoration effort. If successful, the population will have been augmented from around 150 naturally growing plants to more than 1,000.

Four parks in the southeast have begun long-term monitoring projects of amphibians. Blue Ridge Parkway, Cumberland Gap NHP, and Great Smoky Mountains and Mammoth Cave NPs have conducted field surveys and selected study sites for pond, stream, and terrestrial-breeding frogs and salamanders. The parks will focus on two species of temporary pond breeders (wood frogs and spotted salamanders) and six species of stream breeders. The plan is to collect temporary pond habitat data on water PH, conductivity, temperature, pond depth, total number of egg masses laid, and developmental stages of eggs and their survival in egg masses. Sampling stream and terrestrial breeding salamanders in 30 x 40m subplots, the researchers also hope to learn reproductive status (larva, juvenile, adult), body length, and distance of animals from streams.

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Soil erosion is a major concern at Virgin Islands NP and is being studied by Dr. Lee MacDonald of Colorado State University. Soil erosion damages the coral reefs and other marine ecosystems, major features of the park, by increasing turbidity and redepositing the fine sediment. Along with his master's student Don Anderson, MacDonald is working to understand the erosion sources and sediment delivery mechanisms caused by development on the island of St. John in order to minimize the impacts on the marine resources.

The two researchers originally hypothesized that the majority of steep hillsides erosion is caused by overland flow and shallow landslides triggered by large tropical storms such as Hurricane Hugo. A site visit together with Dr. Bill Dietrich from the University of California at Berkeley revealed that neither overland flow nor landslides presently contribute much sediment to the process. While historic agriculture may have substantially increased erosion rates in the 18th and 19th centuries, vegetation regrowth early this century (following a population decline) may have reduced it to only slightly higher than presettlement conditions. Instead, they found soil erosion from unpaved roads to be the overwhelming cause of the problem. The researchers developed a GIS-based road erosion model to help predict the amount of sediment being generated and delivered for each catchment on St. John.

Dr. MacDonald hopes to follow this initial study with more intensive work on road erosion processes and the relative amounts of sediment generated from unpaved road surfaces, cut banks, roadside ditches, sidecast material, and culvert incision. This work should provide more detailed guidance for planning and mitigation purposes on St. John and other areas. A detailed article on the results of this initial study is planned for a future issue of *Park Science*.

Jim Renfro, air quality program manager at Great Smoky Mountains, is currently managing one of the NPS's most extensive and sophisticated air quality research and monitoring programs in any national park. Projects include monitoring ozone and assessing its effects on vegetation, studying visibility impairment from sulfate aerosols, and recording acidic deposition.

The NPS, Tennessee Valley Authority, Environmental Protection Agency, and State of Tennessee are currently funding several ambient ozone monitoring stations there. The benefits of this work will include a greatly improved understanding of the ozone exposures and precursors to ozone formation. The work will also provide an enhanced database on ozone exposure that will be helpful in assessing impacts to sensitive plants.

The park is also using a low cost means of monitoring ground-level ozone. The WASO air quality division funded a summer passive ozone sampler study to improve understanding of spatial variability away from continuous monitoring sites and to improve the exposure-response connection of foliar injury. The measurements were made near Cove Mountain and in the canopy of the northern hardwoods.

The EPA and TVA began a three-year study this summer at Cove Mountain and Twin Creeks at the park to study the ambient ozone effects on mature trees species. This work is extremely important in determining the physiological effects of ozone on sensitive hardwood species growing in the park. The last two years have shown that nearly 80 percent of the tall milkweed plants were injured and nearly 80% of the leaves on each injured plant was damaged from ozone.

The University of California at Davis recently reported that concentrations of sulfate particles worsened by 39% over the last 10 years in the park, more than in any other national park in the country. The park conducted an intensive visibility research study at Look Rock this summer to document the ammonium sulfate aerosols and to determine why current models, able to reconstruct measured light scattering at sites in the western U.S., are unable to do so in the east with the same accuracy. This study will improve the understanding of atmospheric sulfates and their impact upon visibility.

The Smokies have also recorded some of the highest sulfur and nitrogen deposition in the country. The EPA has selected Clingmans Dome (elevation 6,643 ft) in the park as one of four acid deposition monitoring sites as part of their CASTNet (Clean Air Status and Trends Network) Mountain Acid Deposition Program (MADMP). Data collected at the dome will be used to determine the effectiveness of emissions reductions mandated by

the 1990 Clean Air Act amendments which require a 50% reduction in sulfur dioxide emissions by the year 2000.

Researchers from the NBS-CPSU at the University of Tennessee were very busy in August presenting papers and leading field trips at the joint Southern Appalachian meeting of the Ecological Society of America and American Institute of Biological Sciences. Held in Knoxville, the symposium was attended by 3,000 participants from the United States, Canada, Europe, South America, Africa, Asia, and Australia. Field trips and presentations focused on Southern Appalachian plant ecology, ecology and hydrogeology of the Mammoth Cave Karst aquifer, stream acidification, and many others.

Dr. Stephen Nodvin, Research Ecologist with the CPSU, and Dr. Niki Nicholas of the Tennessee Valley Authority led a symposium on multiple stressors to the high elevation spruce-fir ecosystem. As part of the symposium, Dr. Ted Simons of the NBS-CPSU at North Carolina State University presented a talk entitled, "Avian Diversity in Managed and Unmanaged Landscapes in the Southern Appalachians." The CPSU contributed many other papers and poster sessions.

Mammoth Cave NP and the Cave Research Foundation co-sponsored the Third Mammoth Cave Science Conference in July. Attended by more than 60 individuals, the research forum enabled in-depth discussion across specialty areas. The annual event benefits researchers and managers alike.

Pacific Northwest

The general management planning process for Mount Rainier will include addressing geologic hazards associated with the volcano. Members of the planning team from the Denver Service Center, park staff, and WASO, North Cascades, and regional geologists met with USGS and Washington Department of Natural Resources geologists at the Cascade Volcano Observatory to share information on the present state of geologic knowledge and ongoing research of Mount Rainier. They also identified research and monitoring needs.

The group devoted three days to examining facilities in the park located adja-

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cent to major rivers that drain the volcano. Very little hydraulic, geomorphic, and channel profile information exists on these rivers within the park. As a result, the profile and rate of change of channel morphology and discharge capacity is poorly known. River channels will be surveyed to address geologic hazards associated with floods and debris flows which are a threat to life and property. Other potential hazards include rock falls, earthquakes, and processes associated with volcanic eruptions.

Mount Rainier is listed as a decade volcano by the United Nations. This designation applies to a select group of active and potentially active volcanoes around the world that are located near large population regions which could be severely affected during an eruptive event. The U.N. identified these volcanoes during the early 1990s as needing to be studied for their geologic hazards in the hope of providing forewarning and protection to the people living near them. Although no funding support is provided by the U.N. for geologic research on decade volcanoes in the United States (there is also one in Hawaii), designating Mount Rainier has increased concern over the variety and potential effects of geologic hazards. The upcoming Geological Society of America (GSA) Annual Meeting, to be held in Seattle in October, will give further attention to this on a field trip to Mt. Rainier.

Acting regional chief scientist Kathy Joep participated in the first two biweekly meetings of the Northwest forest ecosystem research and monitoring committee. Functions of the committee, which are called for in the record of decision on the Forest Plan, include research, monitoring, and scientific oversight of various aspects of implementation of the plan. This committee will provide a forum for coordinating agencies' research and monitoring throughout the range of the northern spotted owl, and will also help ensure that the agencies are addressing the research and monitoring needs called for in the record of decision.

Joep also gave a presentation to a group of teachers, consisting of two from every state as well as Washington, D.C., and Puerto Rico, participating in a two-week wilderness workshop sponsored by the NPS. While the presentation addressed NPS wilderness, it also emphasized the

need to build a sense of connection between people and the environment, and a sense of personal responsibility for conserving healthy ecosystems everywhere if the natural systems in wilderness are to survive for long.

Craig Dalby coordinated the region's response to a request from the eastside ecosystem management project (EEMP) for data on visitation statistics, including spatial data for each of the eastside parks. As part of the EIS development for the Columbia Basin, the EEMP is looking at recreational opportunities, among other factors, using the Forest Service's recreational opportunity spectrum (ROS) classification system. Where possible, Dalby "crosswalked" NPS management zones into the ROS system for each of the affected parks, creating a corresponding spatial data set. These data, along with visitation figures from the parks, were sent to the EEMP.

Dalby and Marsha Davis coordinated the response to a second call from the EEMP, requesting grazing allotment data. The requested information included spatial data for grazing allotments at City of Rocks, John Day Fossil Beds, and Nez Perce, and attributes concerning the nature of the grazing activity for each allotment.

The Comprehensive Management Plan for City of Rocks is nearing completion. Marsha has been working with the planning team in reviewing and editing final revisions to the document. This included participation in a meeting, held in Boise, with representatives of Idaho State Parks, City of Rocks (NPS and Idaho State), and the regional office to review and discuss the final draft version of the comprehensive management plan.

The Pacific Northwest Region is tentatively planning the following natural resource training opportunities for FY95: GIS and GPS for Cultural Resource Management, Hazard Tree Management, Landscape Restoration Workshop, Planning for Resource Stewardship, Professional Development in Natural Resources, Regional Natural Resource Refresher Workshop, Orientation to the Management of NPS Resources (Natural and Cultural), Vegetation Monitoring Workshop, and nu-

merous wilderness management correspondence courses.

Rocky Mountain

The wolves are coming! The way has been cleared for reintroduction of the gray wolf to the Yellowstone ecosystem and the USFWS has asked Canadian officials to provide 30 wolves this fall for relocation to the park and central Idaho. No lawsuits challenging wolf reintroduction are expected and wildlife managers are proceeding with recovery plans.

The black-footed ferret is coming, too! The last major hurdle to restoration of black-footed ferrets into Badlands NP and the Conata Basin in South Dakota has been cleared through publication of the special rule in the August 18 *Federal Register* establishing them as a nonessential experimental population. The NPS, USFWS, and USFS have worked for six years to bring the ferrets to the site. This will be the second reintroduction for the ferret and the first attempted in black-tailed prairie dog habitat. The first ferrets (from captive breeding facilities) should arrive soon after Labor Day, with release expected in mid-September.

The first of its kind in the region, a cooperative weed management agreement based on the requirements of the 1990 amendment to the Federal Noxious Weed Act was developed for Devil's Tower NM by park and regional staff. The agreement facilitates a partnership between the monument, Crook County, Wyoming, and local landowners for controlling noxious weeds on the monument and adjacent private lands. Under the agreement, a cooperative venture was initiated this year using goats to control leafy spurge as one part of an integrated program. The agreement will serve as a model for weed management partnerships at other parks.

The NPS, the State of Montana, and the Department of Justice executed a reserved water rights compact in late January describing the water rights of the U.S. for Big Hole Battlefield NHP and Glacier and Yellowstone NPs. The compact established a process for protecting water resources at the three parks. The hydrothermal systems and features of Yellowstone will be the most protected of their kind in

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the world. The objective is to allow no impact to the geysers, mudpots, steam vents, and hot springs within the park.

Late last December, Colorado's water division #1 district court granted summary judgment to the U.S.' reserved water rights claims for national parks at Rocky Mountain NP. In granting these rights, the court said, "It appears that Congress in setting aside Rocky Mountain NP intended to reserve all of the unappropriated water in the park for park purposes. Only by doing so can the underlying purposes of the creation of the park be achieved."

Great Sand Dunes NM recently completed a prototype strategy that focuses resource management activities on achieving the park's purposes a little differently than in most resource management planning processes. The experimental effort differs in that it views park resources as part of a larger ecosystem and involves the public in learning about the park's purposes. Together, the groups defined the components and boundaries of the ecosystem, described the processes needed to understand, monitor, and manage it, and developed a feedback loop to evaluate the success of resource management actions on the system. The strategy also accepts human culture as part of the ecosystem and can be integrated into present resource management planning processes. Recently signed by the regional director, the Great Sand Dunes resource management strategy is available to parks to act as a model in developing their own similar products.