



National Natural Landmarks Program

Supporting Conservation of America's Natural Heritage
2012 Biennial Report



**Emerald Bay NNL
threatened by aquatic invasive
species, page 20**

Contents

Program Overview	I
Landmark and Program Events	2
Landmark Notes	4
Technical Support and Advocacy	7
Projects	8
Continuing Projects	
New Projects	
New Landmark Designations	II
Evaluations in Progress	14
Site Visits and Reports	15
Reporting Requirements	
Site Visits	
Improving Conditions at Landmarks	16
Damaged and Threatened Landmarks	17
Woolly Adelgids Continue to Threaten Eastern Landmarks	
Fifteen Landmarks Threatened by a Variety of Activities	

Cover Photo: Garden of the Gods NNL by S. Hutchison

Program Overview



NPS Advisory Board at Garden of the Gods NNL



Brad Udall speaking at anniversary event in Denver

The National Natural Landmarks (NNLP) Program was established in 1962 by the Secretary of the Interior under the authority of the Historic Sites Act of 1935 (16 U.S.C. 461 et seq.) to encourage the preservation of the best remaining examples of the major biotic communities and geologic features composing the nation's natural landscape. The program is managed by the National Park Service (NPS). It is the only natural areas program of national scope that identifies and recognizes the best examples of biological and geological features in both public and private ownership.

Sites considered for possible NNL designation are identified primarily through inventory studies conducted under NPS direction. Recommendations received from non-NPS sources can be considered in relationship to those in the above-mentioned inventories. Highly recommended areas are then inspected in the field and evaluated comparatively by expert natural scientists with respect to significance criteria. Areas

judged the best examples of ecological or geological features are nominated to the Secretary of the Interior for designation as NNLs and, if designated, are listed on the National Registry of Natural Landmarks. As of 2012 there are 594 sites designated in 48 states, 3 territories, and the Commonwealth of Puerto Rico.

Natural landmark designation is not a land withdrawal, does not change the ownership of a site, and does not dictate activity. The Secretary employs the designation of nationally significant natural areas to encourage their voluntary preservation, their well-informed management, and their consideration in public and private planning efforts through public recognition. Federal agencies should consider the unique properties of landmarks in National Environmental Policy Act (NEPA) compliance, and there may be state or local planning or land use implications.

Landmark and Program Events

NNL Program Fiftieth Anniversary Recognized in Denver

The National Natural Landmarks Program marked a significant milestone in 2012, commemorating 50 years supporting the conservation of America's natural heritage. This milestone was acknowledged during the May 2012 meeting of the National Park System Advisory Board. Speakers included NPS Director Jon Jarvis, National Geographic Society Vice President John Francis, and Brad Udall, nephew of NNL Program founder Secretary of the Interior Stewart Udall.

Dedication Ceremonies Herald New Landmarks

The **Island NNL** dedication ceremony occurred on May 10, 2012 and the panel of speakers included NNL Pacific West coordinator Steve Gibbons, representatives from the site's two owners, the Bureau of Land Management and the U.S. Forest Service, and other regional dignitaries.

NPS Director Jon Jarvis joined scientists, resource managers, local landowners and community members in May of 2012 to dedicate the addition of several significant fossil sites in Golden, Colorado to the NNL Program. **Morrison-Golden Fossil Areas** is the new name given to the original Morrison Fossil Area NNL after its boundaries were expanded by Secretary Salazar in June of 2011

The **Lake Shasta Caverns NNL** dedication ceremony was held on August 3, 2012. Speakers included Dr. John Tinsley of the U.S. Geological Survey, Redding Mayor Dick Dickerson, Shasta County Supervisor Linda Hartman, NNL Pacific West coordinator Steve Gibbons, NNL owner John Winther, and general manager of the caverns Matt Doyle. The event was attended by over 50 people. Lake Shasta Caverns is California's 36th national natural landmark.

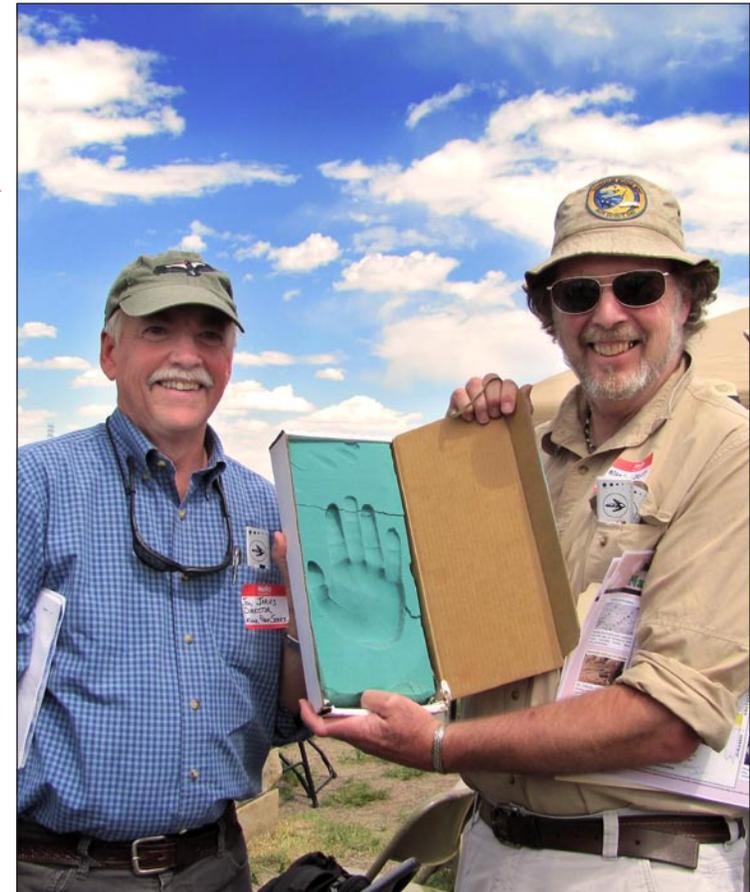


The Island dedication ceremony in Oregon



NNL Pacific West coordinator Steve Gibbons presents at the Lake Shasta Caverns ceremony in northern California

BACK TO INDEX



NPS Director Jarvis and Dr. Martin Lockley at Morrison-Golden Fossil Areas NNL, Colorado



Presentation of the plaque at Ice Mountain



Deb DiQuinzio speaking at Stone Harbor Bird Sanctuary ceremony

BACK TO INDEX

The newly-designated Ice Mountain NNL, located in Hampshire County, West Virginia was celebrated at a reception and site tour on September 25, 2012. Speakers at the event included NPS Deputy Associate Director for Natural Resources Stewardship and Science Beth Johnson, TNC State Director Rodney Bartgis, TNC Stewardship Manager Mike Powell, and community members Steve and Terry Bailes.

NNLP at Bioblitz Biodiversity Festivals

The NNL Program participated in two Bioblitz events: one at Saguaro National Park in October 2011 and another held outside Rocky Mountain National Park in August 2012. The Bioblitz events are sponsored by the National Park Service and National Geographic Society (NGS) and include a biodiversity festival aimed at school-age children. Brochures were produced by the NNL Program to orient children to landmarks in each of the host states, and included educational puzzles and word games to learn about landmark features. The festivals were attended by nearly 2,000 children. Posters and calendars were distributed and NNL staff was interviewed by National Geographic reporter David Braun for a piece on the NGS web site.

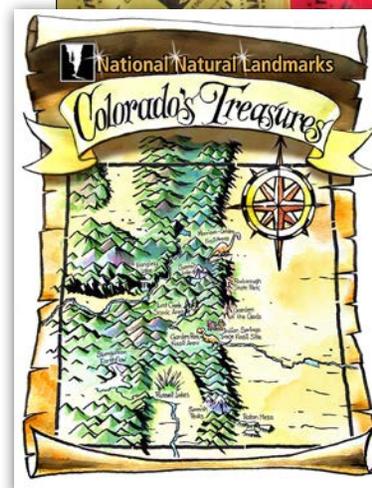
Stone Harbor Bird Sanctuary Ceremony

NNLP staff participated in a re-dedication of Stone Harbor Bird Sanctuary, New Jersey's first NNL, designated in 1965. The event, held on May 21, 2011 celebrated the completion of a five-year rejuvenation effort at the Sanctuary, which included trail improvements and restoration of tidal flow with the construction of a much enlarged under-road culvert. A positive response by both aquatic and bird life has already been observed. The event was well attended by community members and by the project volunteers, municipal, state and federal project partners.



Margi Brooks and Melanie Myers at Rocky Mountain NP Bioblitz

Brochure for 2012 Bioblitz



Landmark Notes



Learning Center and Lodge Open at Archbold Biological Station, FL

New buildings and plaza at Archbold Biological Station, FL

The recently completed Frances Archbold Hufty Learning Center and Adrian Archbold Lodge will greatly expand educational and visitor services at the [Archbold Biological Station NNL](#). The Learning Center, a LEED Platinum certified facility, houses the education administrative office along with meeting and event rooms, observation decks, and interpretive displays. With its numerous green features, the building itself is an educational tool about environmental sustainability. The Learning Center and Lodge join the existing historic buildings that house the Station's renowned research facilities. Significant improvements were also made to the Archbold Expeditions Plaza, located between the new

and historic buildings, including a new prominent mount for the NNL bronze plaque.

Archbold Biological Station was designated a NNL in 1987, as it contains the largest known, relatively undisturbed tract of contiguous natural communities characteristic of the Lake Wales Ridge, an ancient sandy ecosystem of south-central Florida. A large number of endemic and rare species of plants and animals occur, including the state's only endemic bird species, the Florida scrub jay.

Student's Work Will Benefit Alabama NNL

A project was initiated in 2012 at Shelta Cave NNL to conduct an intensive biotic inventory, something which had never been done in this cave, despite its status as a 'laboratory cave'. The survey is being conducted by a graduate student from the University of Alabama to determine whether cave ecosystems are recovering after four decades of the cave having been gated. This gate excluded bats from the cave, which are a major source of energy input into the ecosystem. The study of this unique cave will allow for multi-organization cooperation including The National Speleological Society, The University of Alabama, The University of Alabama in Huntsville, U.S. Fish and Wildlife Service, Alabama Department of Conservation and Natural Resources, and the National Natural Landmarks Program.



Chris Miller collects samples in Shelta Cave

Chris Miller



A leatherback sea turtle at Sandy Point NNL

Leatherback Sea Turtle Sets Nesting Record

Sandy Point NNL, located within Sandy Point National Wildlife Refuge, U.S. Virgin Islands is the only place within the U.S. and American Territories regularly used by the endangered leatherback sea turtle for nesting.

In March 2012, a leatherback sea turtle claimed the record for coming to nest at Sandy Point. The turtle was first observed nesting at Sandy Point in 1981, over 31 years ago. According to U.S. Fish and Wildlife Service Biologist, Claudia Lombard, other projects studying nesting leatherbacks have

recorded females returning to beaches for 18 or 19 years, but none of them coming close to 31 years. This particular turtle has returned to lay a total of 59 nests at Sandy Point.

When scientists last saw this turtle she was severely injured with multiple head wounds. Sea turtles are most vulnerable to boat strike injuries when they are at the ocean's surface. The number of boat-strike-injured sea turtles documented at Sandy Point is increasing, and the Refuge is urging boaters to operate their vessels responsibly and at safe speeds when close to nesting beaches or foraging areas.



Pool where mat-spreading quillwort was first described at Heggie's Rock NNL

Rare Georgia Ecosystem Provides New Discoveries

It started with the discovery of a species new to science in 1976, the mat-spreading quillwort (*Isoetes tegetiformans*). Over 30 years later, the rare granitic outcrops at Heggie's Rock NNL in Georgia are home to another scientific discovery, the predacious water beetle (*Hydrocolus heggiensis*). This beetle species, newly described to science is named for Heggie's Rock, a site protected by The Georgia Nature Conservancy. Additionally, a freshwater seep copepod (*Stolonicyclops heggiensis*) has been formally described and its genus and species are new to science. Other arthropod species found at the site are awaiting description, but are likely to be new discoveries as well. The Nature Conservancy is also interested in conducting further research on a flightless midge found at Heggie's Rock since it appears to be endemic to the site. All these organisms were discovered by Dr. John Spooner, professor emeritus at the University of South Carolina at Aiken.

Community Group Assists Arizona Landmark

Rehabilitation of a mile and a half of illegally established trails and roads within the Grapevine Mesa Joshua Trees NNL in northwest Arizona was completed almost entirely by volunteers in March 2011. Twenty plus volunteers restored two sets of illegal tracks within the sensitive Joshua tree forest, picked up trash and installed NNL signs along the boundary. A community group in Meadview, AZ initiated the public lands project.

**Grapevine Mesa Joshua Tree Forest,
National Natural Landmark!
"A Legacy Worth Saving"**

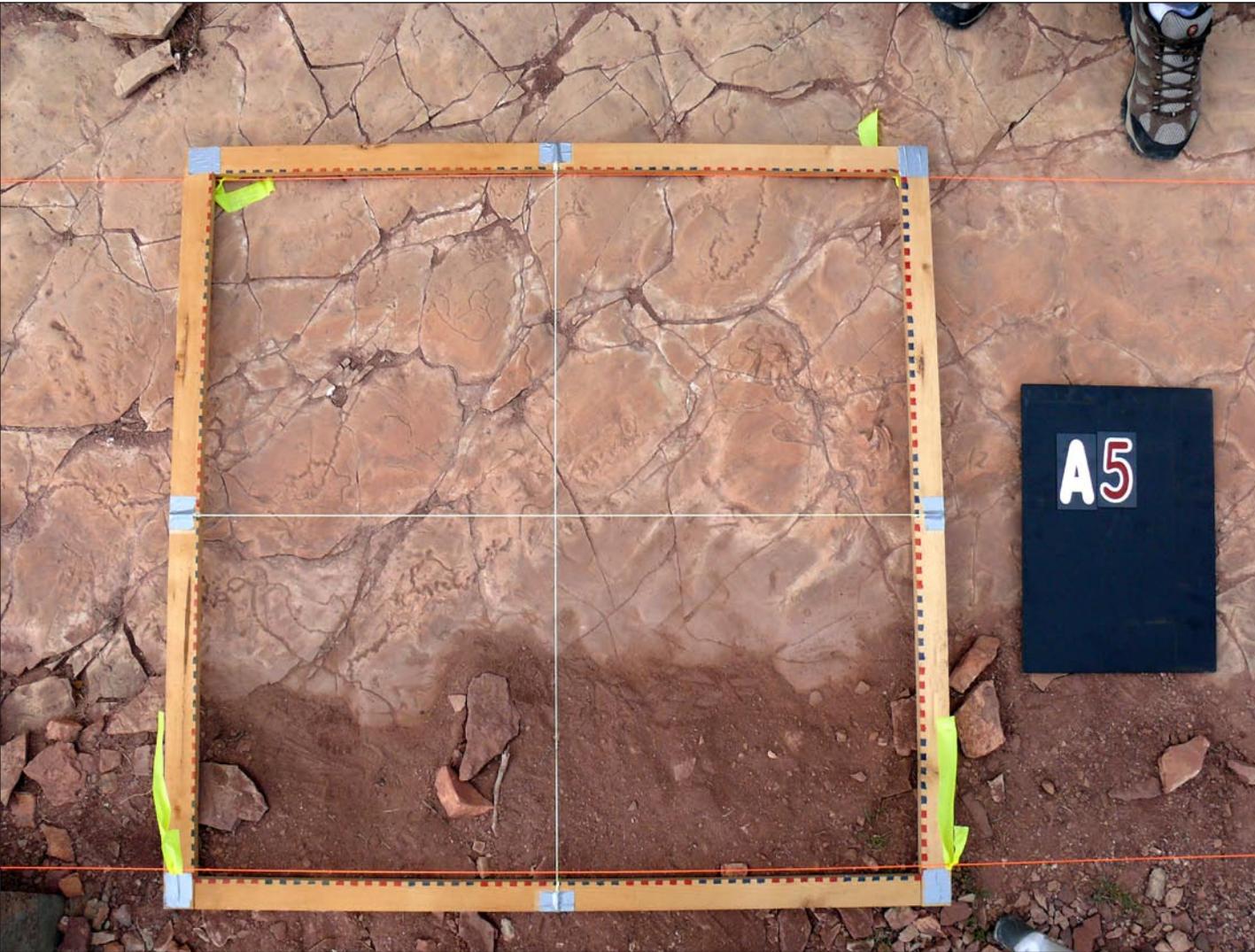
Volunteers Needed!

BLM Kingman Field Office is seeking the assistance of volunteers with a reclamation project within the NNL. The project will begin in March.



**Join us in helping
reclaim our
Joshua Tree Forest**

Technical Support and Advocacy

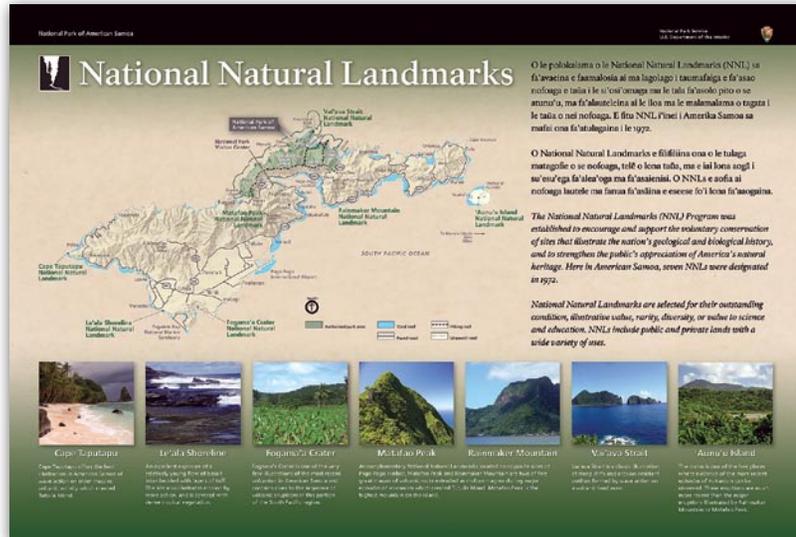


Fossil inventory at Indian Springs Trace Fossil Area

Park Staff Assists Colorado NNL

A paleontologist and two Geological Society of America GeoCorps interns from Florissant Fossil Beds National Monument provided technical assistance to the Indian Springs Trace Fossil Area in central Colorado in 2011. Staff completed a full baseline inventory of all the fossils that occur within the small single-bedding plane at this NNL site. The resulting report and photo inventory provides managers with an excellent tool for monitoring the condition of the site over time.

Projects

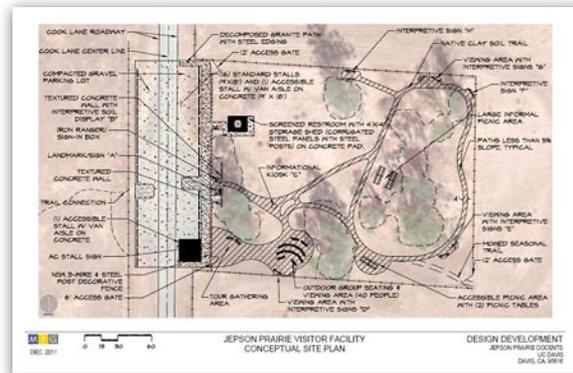


Interpretive exhibit at American Samoa

Continuing Projects

STAFF PROJECTS

An interpretive exhibit panel will be installed at various village locations representing the seven NNLs. The project has been a joint venture involving the NNL Program, staff of National Park of American Samoa (NPSA), and numerous High Chiefs and High Talking Chiefs of the seven affiliated NNL villages. An accompanying “American Samoa National Natural Landmarks” brochure has also been designed and produced by the National Park of American Samoa and will complement the seven interpretive wayside panels. The free brochure is currently available to the public at the NPSA visitor center in Pago Pago.



Dixon Vernal Pools site plan

CHALLENGE COST SHARE-FUNDED PROJECTS

- An ongoing project titled “Passive Environmental Education Materials for Jepson Prairie: Guidebook, Interpretive Panels, and Website” is nearing completion for Dixon Vernal Pools NNL, California. The Challenge Cost Share project, which was funded for \$17,200 in February 2010, also includes design concept plans for visitor facility upgrades at Jepson Prairie proper within Dixon Vernal Pools NNL.
- Royalties continue from sales of the book *Where the Great River Bends: a Natural and Human History of the Columbia at Wallula*. This book explores the history of the region surrounding the Wallula Gap NNL in Washington State. Forty percent of the proceeds from the sale of this book continue to benefit the NNL Program in the Pacific West Region.





Interpretive display at Harrell Prairie Hill

New Projects

STAFF PROJECTS

NNL Program staff collaborated with the National Park Service Harpers Ferry Center in 2012 to design interpretive wayside exhibits for three NNL sites.

- At **Harrell Prairie Hill NNL**, located within the Bienville National Forest of Mississippi, an exhibit was created to highlight the ecological significance of the prairie and its management through prescribed fire. This 160-acre tall grass prairie is a rare example of the Jackson Prairie Belt that historically stretched across Mississippi and is frequently used as an outdoor classroom for local school groups to learn about ecology and rare species. The prairie also receives the highest number of visitors within the entire Bienville National Forest and this new wayside exhibit serves to orient and educate these visitors.

- Two wayside exhibits were produced for **Gay Head Cliffs NNL** on Martha's Vineyard in Massachusetts. These panels provide orientation to the site and interpret the geological and natural history of the cliffs. They also explain how prohibited activities including climbing and removing clay and fossils accelerate erosion of the cliffs, and why preservation of the cliffs is important.



Wayside exhibits at Gay Head Cliffs

- Replacement wayside panels for education stations along the **Orono Bog NNL** Boardwalk in Maine were also produced under this partnership project.



Orono Bog exhibit



NNL plaque and entrance to Cathedral Caverns

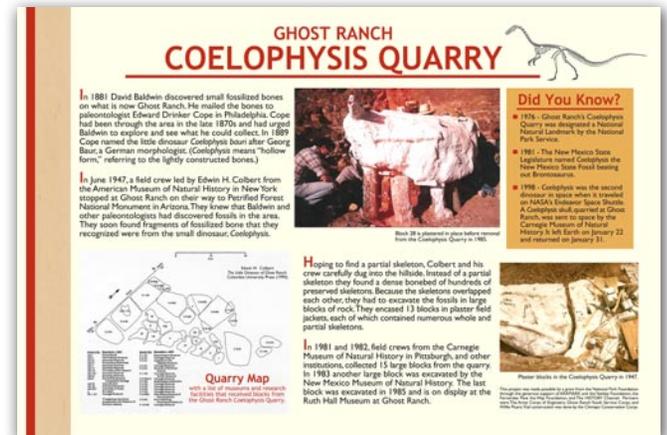


Madison Boulder NNL

PROJECTS FUNDED BY NATIONAL PARK FOUNDATION IMPACT GRANTS

Twenty ten marked the first year in which applications for the National Park Foundation's (NPF) Impact Grant Program were opened up to NPS-affiliated areas, including NNLs. Offering awards up to \$10,000, the Impact Grants Program is designed to provide a small amount of additional funding to strengthen the efforts of a local partnership or turn an underfunded and innovative idea into a successful project. The following NNLs were selected to receive Impact Grants in 2011 and 2012.

- **Cathedral Caverns NNL** in Alabama received NPF Impact Grant funds to replace cave lights with energy efficient LED light fixtures. The new LED lights should help reduce problematic algal growth within the cave and allow cave features to be seen in a more natural light spectrum.
- **Ghost Ranch NNL** in New Mexico received NPF Impact Grant funds to complete trail improvements to the fossil quarry site and provide new interpretive signage at the site.
- **Morrison-Golden Fossil Areas NNL** in Colorado received NPF Impact Grant funds to complete stabilization efforts at the main track site located on Dinosaur Ridge.
- **Madison Boulder NNL** in New Hampshire received NPF Impact Grant funds for improvements to facilities, access, and interpretation; including refurbishment of the Park's access road and walking trails, security improvements, and installation of geologic and natural history signage and kiosks. The project will enhance visitor experience and understanding of the Boulder's significance as the largest glacial erratic in North America. Cooperating on this project are the Geological Society of NH and the NH Division of Parks & Recreation.

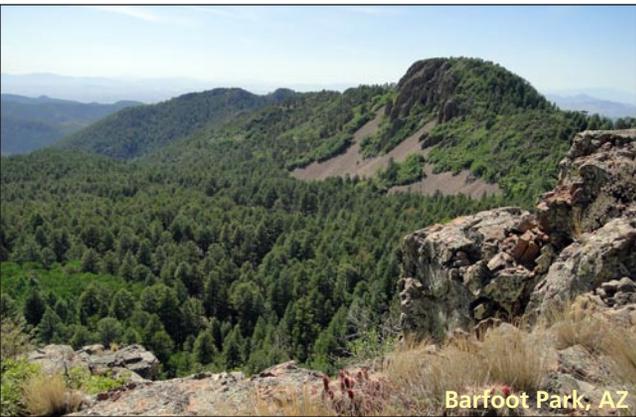


Ghost Ranch interpretive panel



Stabilization at Morrison-Golden Fossil Areas

New Landmark Designations



Barfoot Park, AZ



Fossilized palm frond at Morrison-Golden Fossil Areas, CO

A total of nine new landmarks were designated during 2011 and 2012. Six NNLs were designated by the Secretary of the Interior in 2011:

- Barfoot Park, Cochise County, Arizona
- Golden Fossil Areas, Jefferson County, Colorado
- Hanging Lake, Garfield County, Colorado
- Kahlotus Ridgetop, Franklin County, Washington
- Round Top Butte, Jackson County, Oregon
- The Island, Jefferson County, Oregon

Barfoot Park National Natural Landmark is located in the Chiricahua Mountains of southern Arizona. The site supports an unusual mix of Sierra Madre and Rocky Mountain flora and fauna that includes four pine species and 18 other tree species. It also includes more than 15 acres of talus slopes, along with three meadows and two permanent springs. The landmark encompasses 680 acres of federal land managed by the Forest Service.

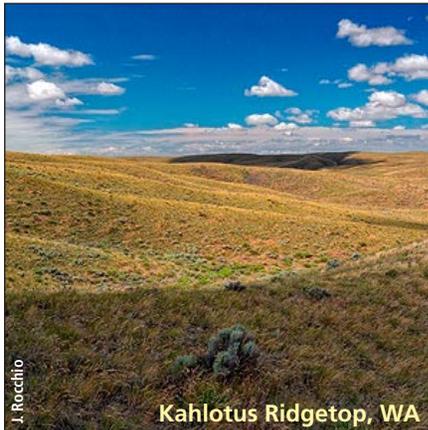
The 19-acre Golden Fossil Areas west and north of Golden, Colorado were designated as an extension to the existing Morrison-Golden Fossil Areas NNL, and will now be known as the Morrison-Golden Fossil Areas National Natural Landmark. The Golden Fossil Areas are among the most important paleontological sites in the Front Range and the western United States. They are known internationally as the only sites in the world to have produced a number of



Hanging Lake, CO

unique fossil footprints representing reptiles, birds, and mammals.

Hanging Lake National Natural Landmark is located along I-70, east of Glenwood Springs, Colorado. The site is an outstanding example of a lake formed by travertine deposition. The lake and associated falls support a rare wetland ecosystem, including hanging gardens. The 72-acre site is situated within the White River National Forest.



J. Rocchio

Kahlotus Ridgetop, WA

Kahlotus Ridgetop National Natural Landmark is a remnant of the Palouse Prairie located about four miles north of Kahlotus, Washington. The Palouse Prairie is the most endangered and the most altered landscape in the inland Pacific Northwest. Approximately one percent of the original prairie remains and occurs in small fragments in developed landscapes. This 240-acre site is managed by the Washington Department of Natural Resources.

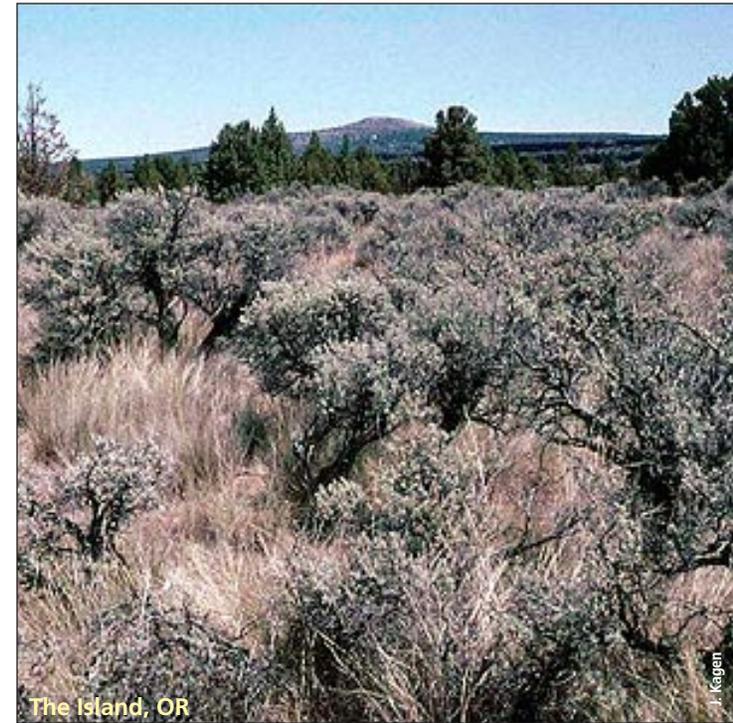


J. Kagen

Round Top Butte, OR

Round Top Butte National Natural Landmark includes a basaltic butte, flat volcanic plains and small hills near Medford, Oregon. Its vegetation is a mix of dry grassland, ponderosa pine, white oak and buck brush. The habitats are exceptional because they are dominated by native bunchgrasses. The new landmark encompasses 747 acres in two parcels: an established Research Natural Area managed by the Bureau of Land Management, and a preserve managed by The Nature Conservancy.

The Island National Natural Landmark is located on an isolated plateau at the confluence of the Deschutes and Crooked rivers in east-central Oregon. This 208-acre site supports one of the best known and least disturbed examples of native juniper savanna located within the Columbia Plateau. The Island is also a designated Research Natural Area, and is jointly managed by the Bureau of Land Management and the Forest Service.



The Island, OR

J. Kagen



Big Spring Creek, CO



Dr. J. Steven Kite of West Virginia University discusses cool air vents at Ice Mountain, WV

Three NNLs were designated by the Secretary in 2012:

- Big Spring Creek, Saguache County, Colorado
- Ice Mountain, Hampshire County, West Virginia
- Lake Shasta Caverns, Shasta County, California

Big Spring Creek National Natural Landmark is located within Great Sand Dunes National Park and Preserve in south-central Colorado. This new NNL is a spring-fed, gaining stream that is formed by groundwater discharging from an unconfined aquifer. Emergent wetlands form along the creek that support a diversity of rare species and plant communities in the otherwise arid landscape. The natural flow pattern of the meandering creek provides an excellent example of natural geologic and hydrologic patterns. Limited public access is permitted by the NPS.

Ice Mountain National Natural Landmark is considered to be the best example of glacière talus within the Appalachian Ranges. It supports the richest collection of vascular plants of any known cold-air producing talus slope site within this region. The unique ecology of the site occurs in response to cold air that is chilled deep within the talus and emitted through vents in the rock slope, supporting species near the vents that normally occur in much colder regions. This site also showcases the process of mass wasting and the formation of thick talus slopes from Devonian Oriskany sandstone, and exhibits an outstanding example of Devonian Oriskany sandstone cliffs. The site is located

in northeastern West Virginia and owned by The Nature Conservancy. Guided tours are offered to the public.

Lake Shasta Caverns National Natural Landmark is an extremely well decorated solution cave that contains an especially diverse assemblage of calcite cave formations ranging from millimeters to several tens of meters. The assemblage of well-developed cave formations contained in Lake Shasta Caverns includes all common and many of the more scarce types of cave formations found in solution caves worldwide. This privately-owned site is located in northern California and is open to the public for educational tours about caves, cave-forming processes, and conservation of these fragile features.



Lake Shasta Caverns, CA

Lake Shasta Caverns

Evaluations in Progress



Eight sites are currently being evaluated by scientists to determine if they meet the criteria for NNL designation. These evaluations will be peer reviewed and, if the sites appear to meet national significance criteria, the public will be invited to comment on the proposed designations prior to review by the National Park System Advisory Board (NPSAB) and consideration by the Secretary.

Evaluations to determine boundary revisions at existing landmarks are also underway, including Cosumnes River Riparian Woodland, CA; Glacial Lake Missoula, MT; and Kaibab Squirrel Area, AZ. Boundary adjustments will also be offered for public review and review by the NPSAB prior to being submitted for the Secretary's consideration.

Site Visits and Reports



Carolyn Davis descends into Shelta Cave, AL during a site visit



Deb DiQuinzio conducting site visit at Ironsides Island, NY

Reporting Requirements

Prior to the year 2000, Section 8 of the National Park System General Authorities Act of 1970, as amended in 1976, required the Secretary of the Interior to monitor the status and condition of National Natural Landmarks (NNLs) and report on those that are threatened or damaged. To meet this requirement, landmarks were visited and/or owners contacted by telephone, and an annual report on damaged and threatened national natural landmarks was prepared by the NPS and submitted to Congress. For over 20 years, this report was distributed to government agencies, NNL owners and managers, conservation organizations, and other interested parties.

There is no longer a Congressional mandate that requires the report on damaged and threatened NNLs be submitted to Congress. Section 3003(a)(1) of the Federal Reports and Elimination and Sunset Act of 1995 eliminated the Section 8 Report, and many others beginning with the year 2000. The report, as it was formatted in the past is no longer produced; however, the biennial report does contain information on threatened and damaged landmarks.

Site Visits

The NNLP staff maintains a continuing relationship with the owners and managers of designated landmarks through periodic site visits. These visits allow program staff to determine whether the sites have retained the values that initially qualified them for landmark designation (as required in the program regulations) and provide opportunities to collect information to update administrative records. Ideally, landmarks are visited every other year, although reduced budgets have resulted in landmark visits once every three years or



Deb DiQuinzio meets with managers at Presque Isle, PA

less. Threatened or damaged landmarks are generally visited more frequently to assess changing conditions, while landmarks that change little (geologic sites, for example) may be visited less frequently. While field visits are the preferred method, it may be necessary and appropriate to collect information regarding resource condition by telephone, or have an employee from a NPS unit located near the landmark visit and collect information.

One hundred eleven (111) landmarks were reported on in 2012, or nearly 19% of total designated sites. This includes both onsite visits and correspondence. Seventy four (74) sites were reported on with an onsite visit. One hundred thirteen (113) landmarks were reported on in 2011, or nearly 19% of total designated sites. Ninety six (96) sites were reported on with an onsite visit. The number of landmarks visited and reported on is significantly less than in past years, and reflects diminished program funding and staff. In contrast, the number of sites reported on in 2010, 2009, and 2008, was 146, 181, and 170, respectively. Two hundred seventy (270) sites, or 49%, were reported on in 2002.

Site visits are documented by status reports, and copies are sent to landmark owners and placed in the program files. Status reports are generally brief, and include the names and contact information for the people conducting the site visit and providing pertinent site information including condition, anticipated events, projects, or damage.

Improving Conditions at Landmarks



TROY MEADOWS

Morris County, New Jersey

Ownership: State and private (Wildlife Preserves, Inc.)

Troy Meadows contains the last unpolluted freshwater marsh of large size in the region. It is an important habitat for a variety of bird and animal species. This NNL was listed in the 2010 report as threatened because of the proposed expansion of an existing transmission line that bisects the site.

An existing transmission line within Troy Meadows is being upgraded and will include raising the height of existing towers from 80 to nearly 200 feet. This project will include wetland enhancement and restoration of areas invaded by common reed (*Phragmites australis*) back to native cattail marsh.

Damaged and Threatened Landmarks



Hemlocks Natural Area

Woolly Adelgids Continue to Threaten Eastern Landmarks

The introduction and spread of hemlock woolly adelgid (*Adelges tsugae*) and balsam woolly adelgid (*Adelges piceae*) continue to pose a widespread threat to the health and sustainability of hemlock and fir forest throughout their range in the Eastern United States. Hemlock woolly adelgid (HWA), native to Asia, and balsam woolly adelgid (BWA), native to Europe, were first reported in the Eastern U.S. during the early 1950's. HWA infestation of eastern and Carolina hemlocks has resulted in areas of extensive tree mortality and decline, most severely in Virginia, New Jersey, Pennsylvania and Connecticut. BWA has killed vast stands of Fraser and balsam fir throughout much of these species' ranges in the East. The potential loss of hemlock and fir forest from these exotic insects is comparable to the chestnut blight and Dutch elm disease.

HWA was discovered in Pennsylvania in 1967 and is impacting several landmarks within the state. **Snyder-Middleswarth Natural Area**, located in Snyder County within Bald Eagle State Forest, is an outstanding example of a relict forest and HWA is slowly causing decline in the health of the hemlock forest. **Hemlocks Natural Area**, located in Perry County within Tuscarora State Forest, contains virgin forest of hemlock-northern hardwood type (atypical in this oak-

chestnut region).

While many of the old hemlocks have died, there remains a small, healthy stand of what appear to be naturally resistant trees. Pennsylvania continues to treat individual trees with insecticide. Most recently, the HWA has been detected within **Cook Forest NNL**, located in the northwest corner of the state in Clarion County.



Predominately comprised of white pine, hemlock and mixed hardwood tree species, this site is a relic of the forest type that once covered the northern Pennsylvania landscape.

Also hard hit by HWA is the climax hemlock forest at **Mianus River Gorge** in Westchester County, New York. The privately owned site provides an exceptional illustration of piedmont physiography and geomorphology, as it has remained relatively undisturbed from the time of discovery and early exploration. HWA was discovered in New York in 1985 and is currently present largely in the southeastern portion of the



Mianus River Gorge



Mount Mitchell State Park



Canaan Valley

state. The hemlock stand at Mianus persists, although severely weakened by two decades of infestation by HWA, combined with the toppling of old-growth trees by several large storms in recent years.

At **Mount Mitchell State Park** in Yancey County, North Carolina, the balsam woolly adelgid has caused a severe decline in the endemic Fraser fir. Some of the most extensive stands of Fraser fir in the country are found within this landmark, and it is now estimated that nearly 80% of the

fir canopy has died. The death of mature trees has increased over the last 10 years and the entire ridge where the landmark is located has been affected. Fraser fir does not have a seed bank; if reproduction is not successful prior to the death of infested trees, this important species may be lost altogether from the high elevation Southern Appalachian biotic communities.

Within West Virginia both the hemlock woolly adelgid and balsam woolly adelgid are present. HWA has been spreading, whereas BWA appears to be more localized and is known to be in three counties within the state. At **Cathedral Park**, located in Preston County, West Virginia, the hemlock woolly adelgid is present and has caused some damage to the virgin hemlock forest.

Efforts are under way to inject trees with insecticide and conduct a release of predatory beetles. At **Canaan Valley** in Tucker County, West Virginia, infestation by both balsam and hemlock woolly adelgids is causing mortality of balsam fir and eastern hemlock trees, respectively. This NNL contains a diverse assemblage of relict northern boreal communities and wetlands that are seldom found in the eastern United States. Balsam



Snyder-Middleswarth Natural Area



Park manager at Cathedral Park, WV next to an old hemlock

and hemlock are important wetland and riparian forest species, and comprise plant communities listed as rare by the state. Predatory beetles are being released by the state in nearby areas which may benefit Canaan Valley.

Hemlock woolly adelgid has also been detected at [Savage Gulf NNL](#), located in Grundy County, Tennessee and the state has been proactive in its treatment efforts. Savage Gulf contains the best and largest virgin forest that remains in the mixed mesophytic region of the eastern deciduous forest. Nearby at [Piney Falls NNL](#) in Rhea County, Tennessee, HWA has been found on private land near the boundary. The Tennessee Natural Areas Program is working with The Nature Conservancy and private landowners in the area to treat the hemlocks and slow the spread. Piney Falls supports a rare virgin mixed mesophytic forest representative of the primeval eastern deciduous forest biome.

As staffing and funding permits, both chemical and biological methods for controlling HWA and BWA continue to be employed at these sites with variable success. The best option for management in forest settings may be biological control, using natural enemies (predators and pathogens) from the native environments of HWA and BWA. Efforts to locate, evaluate, and establish natural enemies are ongoing. In the meantime, impacts from HWA and BWA are expected to spread and intensify. Further information about these and other alien forest pests is available at the U.S. Forest Service's website: www.nrs.fs.fed.us/tools/afpe/.

Fifteen Landmarks Threatened by a Variety of Activities

The National Natural Landmarks (NNLs) listed below are noted as threatened or damaged. The list is organized alphabetically by state. A description of each landmark and an overview of current threats and/or damage follow the landmark name, location, and ownership. The information provided is intentionally brief, and more details can be obtained from the National Natural Landmarks Program staff, if desired.



BOGOSLOF ISLAND

Located in the Bering Sea, 25 miles north of Umnak Island, Alaska

Ownership: Federal (U.S. Fish and Wildlife Service)

The site is a remnant of three volcanic eruptions, a rookery for Steller sea lions, and nesting ground for over 50,000 seabirds, including murrelets, puffins, and the rare Red-legged Kittiwake. It is part of the Alaska Maritime National Wildlife Refuge and is the scene of continued active volcanism.

Steller sea lion populations west of 144 degrees continue to be listed as endangered. There are multiple possible causes for the decline and research continues on fisheries competition, predation, ecosystem wide changes and other factors. The National Marine Fisheries Service (NMFS) issues annual rules to disperse fishing effort over time and area to provide protection from potential competition for important Steller sea lion prey species in waters adjacent to rookeries and important haul outs. Steller sea lion populations east of 144 degrees, listed as threatened, are showing some stabilization and local improvement.

EMERALD BAY

El Dorado County, California

Ownership: Federal and state

Emerald Bay is a vividly colored oval embayment of Lake Tahoe that was formed by moraines when parallel glaciers receded. The site was designated in 1968 as an outstanding example of glacial geology and for its aquatic resources.

The aquatic resources of the bay are currently threatened by several aquatic invasive species. Eurasian watermilfoil (*Myriophyllum spicatum*) and curly-leaf pondweed (*Potamogeton crispus*) are invasive plants that form dense canopies that can shade out native vegetation, negatively impact recreation, and alter the character of the bay. California State Parks initiated an aggressive control program in 2010 working cooperatively with other agencies, scientists, and professional divers in the Tahoe basin, which has been effective in reducing the threat of Eurasian watermilfoil and eliminating curly-leaf pondweed. Continued monitoring and control work will be required to manage populations of invasive plants as viable plant fragments continue to be transported by boats and currents into Emerald Bay from other infested sites in Lake Tahoe.

A new Asian clam (*Corbicula fluminea*) infestation was recently discovered at the mouth of Emerald Bay and it quickly





grew to over five acres. A collaboration of 40 public and private partners, including California State Parks, called the Lake Tahoe Aquatic Invasive Species Program, initiated a large scale project in the fall of 2012 to smother the clam infestation with five acres of rubber barriers. Scientists from UC Davis will monitor the effectiveness of the treatment until the barriers are removed in the fall of 2013.

SAN FELIPE CREEK AREA

Imperial County, California

Ownership: Federal (Bureau of Land Management) and private

The site represents one of the best examples of a natural desert stream and associated aquatic ecosystem remaining in the Colorado Desert. Extensive marshes occur along the stream channels, where rushes dominate along with tamarix, arrow weed, atriplex, and mesquite. Aquatic snails, frogs, and large population of pupfish inhabit the stream environment, while numerous birds and various mammals, such as coyotes and raccoons frequent the site.

The site is threatened by groundwater pumping, increased agricultural land use, exotic species, and off-road vehicle use. Resource impacts include reduced water supply to creeks, degradation of water quality, increased nutrient levels and herbicide contamination, and damage to, or displacement of native vegetation. The area is used as a route for illegal aliens and drug smugglers, and subsequent pursuit by Border Patrol agents. The Border Patrol continues to drag tire-arrays along dirt roads to create a fresh surface for detecting recent traffic, but has been taking greater care to avoid resource impacts.

PAYNES PRAIRIE

Alachua County, Florida

Ownership: State (Department of Environmental Protection) and private

This NNL contains the largest and most diverse freshwater marsh or wet “prairie” in northern Florida. The area is further characterized by karst topography and contains the Alachua Sink, one of the largest and most significant sinkholes in Florida. Disturbed live oak hammock forest, interspersed with a diversity of other species surrounds the prairie on nearly all sides. The site is a major inland wintering ground for waterfowl in the Florida Peninsula and provides habitat for numerous other wildlife species, including the American alligator and southern bald eagle.

This site is adjacent to the city of Gainesville, Florida and continues to be affected by urbanization of surrounding lands. The most imminent threat is the discharge of storm water and wastewater effluent into Sweetwater Branch and the Alachua Sink. A plan is currently in place to create a wetland treatment system to help remedy this threat and restore water flow to the 1,300 acres of prairie currently drained by





a canal and levee. The project will remove two miles of canals and levees and will sheet flow the purified Sweetwater Branch flow across Paynes Prairie, similar to historical conditions. Construction on the system, known as the Paynes Prairie Sheetflow Restoration Project, began in October 2012 and is scheduled for completion in 2014.

EBENEZER CREEK SWAMP

Effingham County, Georgia

Ownership: Private (multiple owners)

This 1,350-acre NNL occupies the floodplain of Ebenezer Creek, a tributary of the Savannah River. It has been noted as the best remaining cypress-gum swamp forest in the Savannah River basin. Old growth bald cypress and tupelo gum are common in this natural and relatively undeveloped area.

There are threats to water quality that stem from watershed development, regulation of water levels in the Savannah River, and runoff from developed land that contains wastewater, soil, and high levels of nutrients. There has been an irreplaceable loss of cypress trees, and the swamp is exhibiting typical signs of eutrophication, such as fish kills and excessive blooms of aquatic weeds. A portion of this site was damaged by clear cut timbering of old growth bald cypress trees in 2007. There has not been any additional logging since then.

ILLINOIS BEACH NATURE PRESERVE

Lake County, Illinois

Ownership: State (Department of Natural Resources)

This NNL is part of Illinois Beach State Park, located on the shoreline of Lake Michigan near the Illinois/Wisconsin state line. The site consists of a series of numerous Holocene beach ridges parallel to the modern beach. There are 14 community types present, including sand prairie, sand savanna, beach, foredune, lake, pond, creek, seep, panne, marsh, sedge meadow, and forest. Over 60 species of animals and plants on the Illinois preliminary list of endangered and threatened species are known to occur here. The site was ranked number one of over 1,000 natural areas identified by the Illinois Natural Areas Inventory for its lack of disturbance, large size, diversity of habitats, and presence of endangered and threatened species.

The site is threatened by the lack of natural sand replenishment processes due to a marina constructed to the north of the park. Hydrological changes appear to be causing species changes, and exotic species are replacing native species; however, park managers are making great headway with exotic plant control efforts. Additional shoreline deterioration is occurring from decreased pack ice formation in winter. Warmer winter temperatures are decreasing the pack ice, which would naturally protect the shorelines during severe winter storms. Open water in the winter is resulting in shoreline erosion during winter storm events.





WAUCONDA BOG NATURE PRESERVE

Lake County, Illinois

Ownership: County

Wauconda Bog is actually a fen due to almost neutral to alkaline pH occurring near the southern limits of bog or fen vegetation in Illinois, and represents an unusual biotic community for the region. The site represents a fen community in a mature state and has no open water. It illustrates bog succession, and is a mixture of trees, shrubs, and herbaceous plants.

The preserve has made great headway in the control of exotic plants, but hydrology and water quality are still a concern. High levels of chlorine and fertilizers in the bog waters result from run-off originating on neighboring developed land. The preserve has been working with neighboring residential areas to reduce fertilizer use, with limited success. The next step will be to work with the local storm water management agency to pursue possible ways to reduce water quality impacts.



BELT WOODS

Prince George's County, Maryland

Ownership: State (Department of Natural Resources)

The site is one of the few remaining old growth upland forests occurring in the Atlantic Coastal Plain physiographic province. Tulip poplar and white oak dominate this 43-acre site, located within 15 miles of downtown Washington, D.C. Dominant trees average over two feet in diameter at breast height (dbh) and some are as large as 4.5 feet dbh. The site supports a diverse bird population, including neo-tropical migrants.

A master plan by the Prince George's County Department of Public Works and Transportation includes widening Church Road, adjacent to the east side of the NNL, from two to four lanes. The project would remove a 150-foot swath of trees within the NNL and expose sensitive interior tree and plant species. This would result in a direct loss of old growth trees and could potentially alter the microclimate of the interior forest and jeopardize its continued use by neo-tropical migratory birds.



RIKER HILL FOSSIL SITE

Essex County, New Jersey

Ownership: County

The Riker Hill Fossil Site is one of only two known localities of major size along the northeastern coast where large numbers of dinosaur footprints are preserved in-situ. It is locally known as the Walter Kidde Dinosaur Park.

The scientific and educational values of this NNL are in jeopardy due to physical removal of the resource by fossil hunters and unregulated visitor use of the site. Despite the county declaring it closed to the public, there remains easy access to the site, including trails from adjacent residential development. There are no directional or interpretive signs and trails are in need of repair.

TAMARACK SWAMP

Warren County, Pennsylvania

Ownership: State

Tamarack Swamp is an outstanding example of a large headwater swamp occurring in a glacially blocked stream valley. The site's two acid, kettle-hole bogs are rich in wetland vegetation, including a number of rare species.

Hydro-fracturing wastewater injection wells have been proposed and permitted in close proximity to Tamarack Swamp. The nearest well would be located under one mile from the NNL, and less than a quarter mile from an intermittent tributary to the swamp. As there is no authority to require monitoring of water quality by the owner and operator of the wells, the PA Game and PA Fish and Boat Commissions have recommended a monitoring protocol be carried out as a volunteer effort. While the NPS was not asked to formally comment on this action, the agency has received and responded to letters of concern from local citizens.





SNAKE BUTTE

Jackson County, South Dakota

Ownership: Indian Trust (Oglala Sioux Tribe)

Snake Butte is of great geologic value due to sand calcite crystals that have formed on the undersides of the overhanging ledges of the butte. It is one of the two known locations for sand calcite crystals in the world. Upon exposure to weather the crystals lose their sharp angles and become rounded. The site is also significant for vertebrate fossils.

The site is threatened by theft of the resources, blocks of rock that support ledges are showing signs of collapse, and ledges in the main quarry area have been cut back significantly. Remaining crystals have been damaged by tools that are used in the collection process.

REELFOOT LAKE

Lake and Obion Counties, Tennessee

Ownership: Federal (U.S. Fish and Wildlife Service), and state (Wildlife Resources Agency and Department of Conservation)

The site is comprised of 23,000 acres of cypress swamps, sawgrass jungle, water lily glades, and scattered bodies of open water. The landscape was formed in 1811-12 by the action of the New Madrid earthquake, the most severe recorded in the United States. Over an area of some 30,000-50,000 square miles, intensive shocks resulted in domes and sunken lands, fissures, sinks, sand blowouts, and large landslides. The sinking of a large area and temporary damming of the Mississippi River tributaries formed the lake.

The site is threatened by silt accumulation and the construction of levees and other flood control and drainage improvements along the Mississippi River that have altered the seasonal flooding regime. Resource impacts include loss of recreational waters and waterfowl habitat, loss of fisheries and aquatic habitat, aquatic plant growth, and changes in pH levels. A





new spillway is currently being constructed and is expected to improve conditions at the lake when completed.

SALT RIVER BAY

St. Croix, U.S. Virgin Islands

Ownership: Federal (National Park Service), and private

This 690-acre site contains Salt River Bay, including Sugar Bay and Triton Bay tributaries. Together the bays encompass a variety of tropical marine and terrestrial ecosystems. It includes mature mangrove forests and one of the last remaining stands of the large swamp fern. The area contains a high-energy tropical reef system. The submarine canyon at the mouth of Salt River Bay provides habitat for deep-water corals, sponges, and fishes.

The site is threatened by a marina and boat building operation that releases contaminants into the bay that degrade water quality, alter species composition, and threaten marine life.



JOSHUA TREE NATURAL AREA

Washington County, Utah

Ownership: Federal (Bureau of Land Management)

This 1,052-acre site is the northernmost stand of yucca trees in the United States. Its occurrence is due to the well-drained sand and gravels from coarse soils around slabs of protruding Mississippian limestone. Other plants thriving on the exposed limestone that reach the northern edge of their range include the Utah agave, barrel cactus and cottontop cactus. Animals at this site are mostly of the Mojave Desert affinity, with the desert tortoise, cactus wren, Scott's oriole and kit fox reaching the northern edge of their range.

Two fires have gone through this site since 2004 causing extensive mortality of Joshua trees; very few of the Joshua trees were left unburned. The Joshua tree association is not a fire-resistant system and the sparse vegetation and bare soil normally wouldn't carry a fire. However, recent invasion of exotic grasses, primarily cheatgrass has created a non-natural fuel load capable of carrying fire across great distances. While some of the burned Joshua trees have begun to sprout, there is still very little regeneration.

This NNL lies within the newly established Beaver Dam Wash National Conservation Area. This new designation brings funding for new positions within the BLM office for this area and withdraws the



site from mining. The NNL may also benefit from the establishment of the Mojave Desert Initiative – a multi-agency, multi-state initiative focused on protecting and restoring key habitats and corridors within this ecoregion.

MOLLY BOG

Lamoille County, Vermont

Ownership: State (University of Vermont) and private

Molly Bog illustrates a classic, early successional, cold northern bog. The site contains a small, dark-water pond, floating mat of sphagnum moss and heath plants, and black spruce-tamarack forest. The pond and directly adjacent bog are owned and well managed by the University of Vermont (UVM) as one of its Natural Areas. UVM owns a narrow buffer around the pond and bog proper, putting the core of the site close to privately owned lands.

Activities on lands within and adjacent to the NNL pose a threat to the bog. Ongoing land use activities, such as tree-farming continue to encroach on the bog and pond. Most recently, a sizable portion of land had been clear-cut and is on the market for sale, posing the potential further threat of development.



For more information please visit our web site at:

 www.nature.nps.gov/nnl

Information provided on the NNL Program web pages includes a guide to landmarks by state, frequently asked questions, the regulations that govern the program, including the designation process, and contact information for NNL Program staff. There may also be links to the web sites of landmarks that are open to the public, NNL Program publications, articles on landmarks by others, and photographs of landmark resources.



C. Murdock



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