



National Natural Landmarks Program

Supporting Conservation of America's Natural Heritage
Annual Report 2010



J. McCannan

Garden of the Gods, Colorado

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Cover Photo: Irvine Ranch, California by Stephen Francis

Program Overview



National Natural Landmarks Program coordinator Deb DiQuinzio assisted with park resource protection during shoreline cleanup efforts in the wake of the Deepwater Horizon Oil Spill. Deb was stationed at Gulf Islands National Seashore for a 14-day detail.

The National Natural Landmarks (NNL) 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 by contractors 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. There are currently 586 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



NNLP staff briefs the NPS Associate Director for Natural Resource Stewardship and Science.

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.

The National Natural Landmarks Program is funded with Natural Recreation and Preservation (NR&P) funds. Authorized funding in 2010 was \$561,000. Seventy-four percent (\$415,000) of these funds were distributed to NPS Regional Offices to support the six regional NNLP coordinators who monitor conditions at NNLs, provide technical support to NNL owners and managers, and oversee the evaluation process of potential NNLs. In addition, this funding supports one service-wide program manager whose duties include overall program policy and direction, budget, staff oversight, and production of this annual report.

The NNL Program is authorized to accept monetary and in-kind donations. No donations were received during 2010.

Landmark Events



Caverns of Sonora, Texas

Two Texas Caves Celebrate 50-Year Anniversaries

Natural Bridge Caverns was discovered on March 27, 1960 by four students from St. Mary's University in San Antonio, Texas. Their fourth expedition into the cave system, located beneath a 60-foot natural limestone bridge, revealed exceptional natural wonders including gigantic towering columns, emerald pools, delicate, crystalline soda straws and a room the size of a football field. This family-owned and operated commercial cave is located northeast of New Braunfels and opened for public tours in 1964. The site was designated a National Natural Landmark in 1971 for its outstanding speleothems, including unusual "fried eggs" and intricate helictites.

Caverns of Sonora, located southwest of Sonora, Texas, is also a family-owned and operated commercial cave. Site owners have been welcoming and educating visitors since the cave was first opened to the public on July 16, 1960. Discovered on Labor Day weekend in 1955, this national treasure was designated a NNL in 1966 because of its unusual cave formations, such as bladed helictites and coralloid growths, and its exceptional beauty. Both landmark sites celebrated their anniversaries with day-long celebrations and special tours and events throughout the year.



50th anniversary celebration at Natural Bridge Caverns.



Falls of the Ohio

Fossil Festival at Falls of the Ohio

The annual Falls Fossil Festival is hosted by the Falls of the Ohio NNL, also called the Ohio Coral Reef. The event, held in September, featured speakers, site tours, mineral and fossil “digs” for children, and a movie about the park and its history. This year, the NNL Program staffed a booth at the festival and handed out information about the program and the significance of the NNL designation. The site was designated a NNL in 1966 and is a classic example of a Silurian and Devonian coral community. This NNL is located within the Ohio River and is a state park.

Youth Corps Work Day at Great Falls of Paterson

The 2010 NNL staff visit to Great Falls of Paterson-Garrett Mountain NNL coincided with a work day for the recently formed Great Falls Youth Corps. The Corps was organized by the NJ Community Development Corporation and funded in part by the NPS. Along with staff from the Passaic Valley Sewerage Commission’s River Restoration Program, the Youth Corps removed fallen trees, litter and other debris from atop the falls. Flow of the Passaic River over the falls was diverted through the adjacent hydroelectric plant to facilitate their work, but also affording magnificent views of the underlying jointed basalt for which the site is naturally significant.



Great Falls of Paterson-Garrett Mountain

Landmark Notes



Ramsey Canyon Frog

Located in far southern Arizona, the Ramsey Canyon NNL was known to provide habitat for a special namesake amphibian, the Ramsey Canyon leopard frog, which was described as a distinct species in 1993. However, recent molecular genetic analysis indicates it is the same species as the Chiricahua leopard frog (*Lithobates chiricahuensis*). The US Fish and Wildlife Service officially recognized this change and published such findings in the Federal Register, December 16, 2009. Chiricahua leopard frogs are a federally-listed threatened species and recovery is guided by a 2007 species recovery plan. Managers at Ramsey Canyon, a Nature Conservancy preserve, have actively managed for and monitored the reproductive success of leopard frogs at this site and will continue to do so regardless of the frog's official name.

Landmark Information Briefs Translated into Spanish

The information briefs for five NNLs in Puerto Rico have been translated into Spanish by the staff at San Juan National Historic Site. The NPS historian at San Juan NHS volunteered to assist the NNL Program with this effort to allow Spanish-speaking NNL owners, managers, and community members to better understand the significance of the NNLs and the NNL designation. Many of the Puerto Rico NNLs had not been visited in quite some time prior to visits made by NNL staff in the summer of 2010. Site managers were enthused to learn about the program and the designation of so many sites on the island.



Puerto Rico NNL briefs will be available in Spanish thanks to NPS historian Eric Lopez, pictured here with Heather Germaine and Carolyn Davis.

New Advisory Commission will Benefit Madison Boulder

The New Hampshire Division of Parks and Recreation and the Town of Madison have initiated an operational partnership to improve and maintain the Madison Boulder Natural Area and Geologic Park. This is the first agreement of its kind between the State of NH and a local organization, and was formally signed at a dedication ceremony held on August 7. The Madison Boulder Advisory Commission is the entity authorized by the Town to implement the agreement, which includes physical improvements to the access road, grounds, and trails, regular maintenance, annual work days, and enhancement of interpretive media. The Madison Boulder NNL is the largest known glacial erratic in North America, and



the site has become victim to vandalism and graffiti in recent years. The establishment of this unique state-town partnership will greatly benefit this nationally significant geologic resource.



Research Conducted in Northeast NNLs

A study of the Microscopic Past of Poutwater Pond in Massachusetts was recently published in the journal *Northeastern Naturalist*. The study provided insight into the historic biodiversity of the pond, and also the mechanism for formation of the bog. Information about the undisturbed, sphagnum-heath bog was provided to the authors by the NNL Program, and the NNL boundary map featured in the article. The abstract of the article authored by Adrienne P. Smyth and Peter M. Bradley of Worcester State College is available at: www.eaglehill.us/NENAonline/articles/NENA-16-4/18-Bradley.shtml.

The William L. Hutcheson Memorial Forest NNL in New Jersey is world-renowned for its body of long-term research.

The site's owner, Rutgers University is now in the process of documenting GPS locations of old-growth trees in order to monitor blow-downs and resulting changes. Due to the small size of this old-growth, mixed oak upland forest, it is highly susceptible to blow down events. A bibliography of research conducted at the Hutcheson Memorial Forest is available at: hmf.rutgers.edu/Bibliography.htm.



Rejuvenation of Stone Harbor Bird Sanctuary

An enlarged culvert installed in 2009 to restore increased tidal flow to the Stone Harbor Bird Sanctuary NNL in New Jersey is showing promising success. The improved culvert under the roadway provides better access for fish and



crabs, which has resulted in more egrets and herons feeding within the Sanctuary. In addition, the increased tidal flow appears to be having negative impact on the invasive *Phragmites australis* or common reed. It is hoped that this improvement to the ecology of the Sanctuary will increase the nesting heron population

to historic high levels. The project involved numerous partners, and was funded by the Town of Stone Harbor and also donations obtained through the "Campaign for Rejuvenation." This campaign is ongoing to support management and improvements at the Sanctuary. Additional information about the various rejuvenation activities at the Sanctuary is available at: www.stoneharborbirdsantuary.com/SHBS/About_the_Sanctuary.html.



1 The first tidal water from McAllister Creek begins to enter the first slough breach at Nisqually National Wildlife Refuge after more than 100 years.



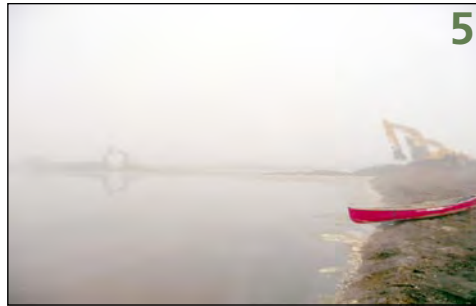
2 The double sill allows water to enter the slough gradually to equalize with interior water levels. Turbidity dissipates inside the restored site before exiting back out into the slough.



3 The inner sill is removed once water levels equalize as the tide continues to enter the restored site.



4 Tidal waters from McAllister Creek in the foreground flow freely into the first reconnected slough in the distance at the Nisqually estuary restoration site.



5 Shannon Slough is located along McAllister Creek and is the largest slough to be reconnected with Puget Sound tides. Heavy equipment works to remove the sill separating it from McAllister Creek.



6 The first tide starts to enter Shannon Slough from McAllister Creek in the background.



7 As the fog starts to clear, tidal waters pours into Shannon Slough and the restoration site from McAllister Creek on the left and heavy equipment prepares to depart from the breach site.



8 The fog lifts over Shannon Slough revealing the return of a tidal system for the first time in more than 100 years, as the Nisqually estuary begins to restore.

Estuary Recovery Project Restores Nisqually Delta

The waters of Puget Sound recently returned to the Nisqually Delta NNL river estuary, after being blocked for over 100 years by man-made dikes. The twelve-year, \$13 million wetland restoration project in Thurston County, Washington, included the removal of four miles of exterior dike, essentially restoring some 762 acres of estuary on the 3,000-acre Nisqually National Wildlife Refuge. All told, this project coupled with two other estuary-restoration projects totaling 140 acres and completed by the Nisqually Tribe on the Pierce County side of the river, make the Nisqually Delta NNL home to the largest estuary recovery of its kind on the West Coast. The restoration project is already paying dividends with evidence of salmon using the newly available habitat, including chinook, coho, chum, and pinks.

Landmark Recognition



Corkscrew Swamp Sanctuary

Okefenokee Nominated to the World Heritage List

The Okefenokee National Wildlife Refuge in Georgia was nominated for inclusion on the World Heritage List. Okefenokee is one of the world's largest naturally driven freshwater ecosystems, and has a large diversity of habitat types, including 21 vegetative types.

The refuge is also known worldwide for its diversity of amphibians and reptiles, mammals, birds, fishes, and perhaps as many as 1,000 species of moths. Unlike many other significant wetland areas, the swamp is the source of rivers rather than the recipient, as would be the case with a delta, and therefore escapes most disturbances to natural hydrology and water flow. The refuge's undisturbed peat beds store information on environmental conditions during the past 5,000 years, and are therefore an important source of information related to global changes. The **Okefenokee Swamp NNL** is located within the National Wildlife Refuge.



Okefenokee Swamp

NNLs Recognized as Wetlands of International Importance

Three NNLs in the southeast have been recognized with the "Ramsar Wetland of International Importance" designation. These include the **Francis Beidler Forest** in South Carolina, **Okefenokee Swamp** in Georgia, and **Corkscrew Swamp** in Florida. Named after the Iranian city of Ramsar in 1971, the Ramsar Convention on Wetlands promotes conservation of these vital habitats around the world. Renowned Ramsar designations include Africa's Okavango Delta and the Florida Everglades. There are nearly 1,750 sites that have been designated Wetlands of International Importance, covering a surface area of 161 million hectares in 158 countries. Only 26 sites within the United States have received this designation.

Technical Support and Advocacy



Land & Water Conservation Funds Awarded to North and South Rivers NNL

The town of Marshfield, Massachusetts received a \$250,000 Land and Water Conservation Fund grant for design, permitting, and construction of the proposed South River Park, located within the **North and South Rivers National Natural Landmark**. The large and diverse estuarine wetland system contains salt, brackish, and fresh water marshes. The two rivers are classic examples of drowned, river-mouth estuaries and support abundant bird and fish species. The South River is not as well protected as the North River and public access is limited. The park will reclaim for the public an area of the South River in downtown Marshfield and further promote wise stewardship of this nationally significant resource.

The NNL Program provided a letter of support for the South River Park project to the state agency administering the LWCF grant. An additional \$250,000 of Community Preservation funds was approved by the Town for this effort. Construction of the park is expected to begin in

spring 2011 and will include environmentally sensitive design features, interpretive signage, and a boardwalk to the river. The park fits into a broader effort for a South River Greenway -- a network of open space and trails. The NNL Program also provided a letter of support for the North and South Rivers Watershed Association's Greenway Trail application to the NPS' Rivers, Trails, and Conservation Assistance Program, but the project was not selected for 2010.

More information about the North and South Rivers Watershed Association and the South River Park is available at: www.nsrwa.org/Page.133.html.

2010 Projects



New cabinet and NNL plaque for Shark Tooth Hill on display at Bakersfield College

Completed Projects

STAFF PROJECTS

- The seventh annual photo contest conducted;
- An outstanding 2011 NNL Calendar was produced and distributed to NNL owners, managers, and others; the calendars showcased winning photos from the photo contest;
- NNL Program display was set up and staffed at the International Conference on Conservation Biology in Edmonton, Alberta, Canada in July;
- The NNL Program display was set up and staffed at the Interior Department's Conference on the Environment in Portland, OR in April;
- The NNL staff handbook was updated and distributed.



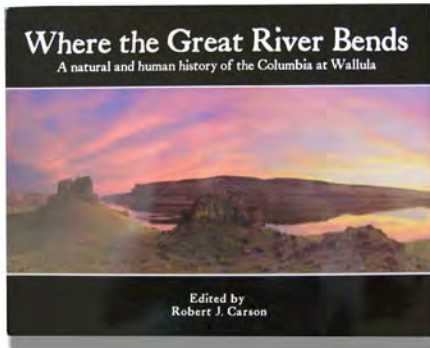
Margi Brooks with the NNL Program display at the International Conference on Conservation Biology in Canada.

CHALLENGE COST SHARE-FUNDED PROJECTS

- “Parks Online Resources for Teachers and Students” (PORTS Program) at Anza Borrego Desert State Park NNL in southern California. This program connects children who are not able to visit parks due to reduced school budgets and geographic distance to park resources through innovative ‘live feeds’ via videoconferencing interpretive programs.
- Interpretive display at Shark Tooth Hill NNL in Kern County, California, which includes the site's bronze plaque, shark teeth uncovered at the site, and professionally drafted geologic and paleontological maps depicting the area's geologic history. The display also contains geologic handouts and brochures for visitors.



Staff at Anza-Borrego NNL reaches students in the classroom via video conferencing technology through the PORTS project.



Sales of the book *Where the Great River Bends: a Natural and Human History of the Columbia at Wallula* are strong and continue to benefit the NNL Program.

Continuing Projects

STAFF PROJECTS

- Updating program web information, photos, and links to NNL web sites are continuing and the new web pages will be online in early 2011.

CHALLENGE COST SHARE-FUNDED PROJECTS

- Continued receipt of royalties 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 Pacific West Region's NNL Program.



Christopher Grenard

Garden Park Fossil Area

New Projects

STAFF PROJECTS

Three projects were established this year to re-evaluate NNLs to determine if boundary expansions are warranted at the Kaibab

Squirrel Area in Arizona, Garden Park Fossil Area in Colorado, and Glacial Lake Missoula in Montana. Scientists from the University of Arizona, Colorado State University and the University of Montana, respectively, will prepare new evaluation reports for these sites to provide the NNL Program and landmark owners and managers with updated scientific information about each site's significant resources as well as recommend a new NNL boundary that better reflects the location and extent of the resources.

Working with scientists from the University of Arizona, a project was established to conduct various data analyses to develop a population estimation tool for tassel-eared squirrels that can be readily used by land managers. A great deal of squirrel sign data have been collected over the past years across both the Kaibab and Coconino National Forests, but little has been done to optimize utilization of the data for management of this species. Analysis of existing data sets will provide valuable squirrel population baseline data for the Kaibab Squirrel Area NNL and provide a tool such that future survey data can be easily analyzed by forest and park managers to help monitor population trends.





Outdoor amphitheater at Sun Lakes-Dry Falls State Park at Grand Coulee

CHALLENGE COST SHARE-FUNDED PROJECTS



- “Project 23 Education” at the George C. Page Museum at **Rancho La Brea NNL** in downtown Los Angeles. The “Project 23 Education” venue showcased the recent discovery of a cache (23 crates) of Pleistocene mammal fossils that more than doubled the museum’s holdings of ice age fossils. The project provided training for Museum education staff and docents, along with a suite of educational materials including a mobile cart that displayed fossils to visitors at both the museum and the outside excavation site.
- Outdoor amphitheater at Sun Lakes-Dry Falls State Park at **Grand Coulee NNL** in Washington State. The amphitheater will provide educational programs related to the natural and cultural resources of the park to approximately 3,000 visitors each weekend during the upcoming 2011 summer season.
- Environmental Education Materials for Jepson Prairie at **Dixon Vernal Pools NNL** in California. The project will develop information and templates for a new guidebook at Jepson Prairie, modify information for up to ten interpretive panels, and develop a web page based on the new guidebook.

Twenty ten marked the first year in which applications for the National Park Foundation’s Impact Grant Program were opened up to non-NPS units, 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. Nine projects were submitted, including stabilization of a dinosaur track site, creating and installing interpretive signage at a quarry, creating a virtual cave tour experience, and assisting with supplies for an ongoing hands-on project involving at-risk youths. None of the projects at NNLs were selected to receive Impact Grants.



The threatened Delta Green Ground Beetle is found only at the Dixon Vernal Pools NNL

Progress Toward New Landmark Designations



Barfoot Park, Arizona is a sky island of jagged cliffs, mixed conifers and boasts the largest population of the tiny twin-spotted rattlesnake, a protected species in Arizona.

Evaluation reports for six proposed NNLs were completed and submitted for review by the National Natural Landmarks Committee of the National Park System Advisory Board. The public will be invited to comment on these proposed designations in early 2011, prior to review by the full National Park Service Advisory Board (NPSAB) and consideration by the Secretary. Sites under consideration are:

- 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

In addition to the evaluations noted above, an additional 12 evaluation reports are underway, with five expected to be completed and ready for submittal in 2011. No new National Natural Landmarks were designated by the Secretary of the Interior in 2010.



The Island, Jefferson County, Oregon

Site Visits and Reports



NNL staff visits Crystal Bog, Maine with staff from The Nature Conservancy

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 year 2000. The report, as it was formatted in the past is no longer produced; however, the annual 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 3 years or 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 and forty six (146) landmarks were reported on in 2010, or 25% of total designated sites. This includes

both personal and telephone “visits.” One hundred one (101) sites were visited in person.

The number of landmarks reported on is significantly less than in past years – 270 sites, or 49%, were reported on

in 2002. This is less than the number of sites reported on in 2009 and 2008, which was 181 and 170, respectively.

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 or providing information, and any pertinent information about condition, anticipated events, projects, damage, etc.



Judy Alderson visits Worthington Glacier NNL in Alaska

Improving Conditions



MOBILE-TENSAW RIVER BOTTOMLANDS

Baldwin, Mobile, and Washington Counties, Alabama

Ownership: Federal (Army Corps of Engineers), State (Division of Conservation and Natural Resources), and private

This 185,000-acre wetland and bottomland forest is one of the most extensive and significant wetlands in the United States. Many different habitat types, ranging from floodplain forests and freshwater swamps, to open brackish marshes, support a wide variety of wildlife and plant species, including several rare and endangered species.

The State of Alabama, with its Forever Wild land acquisition program, has taken an active role in protecting this area. Over the past decade the Forever Wild Program has applied for and received grants from the U.S. Forest Service Forest Legacy Program, North American Wetland Conservation Association, and the National Coastal Wetlands Conservation Grant Program to purchase and protect additional lands within the Mobile-Tensaw Delta area. The State has partnered with The Nature Conservancy Alabama Chapter and Ducks Unlimited in acquiring several of these grants. Through these additional land purchases, many of the threats described in previous years have been minimized and overall conditions at the site are improving. Development on adjacent lands, oil and gas activities, and exotic invasive vegetation are still threats present in some areas, and the NPS will continue to monitor the situation.



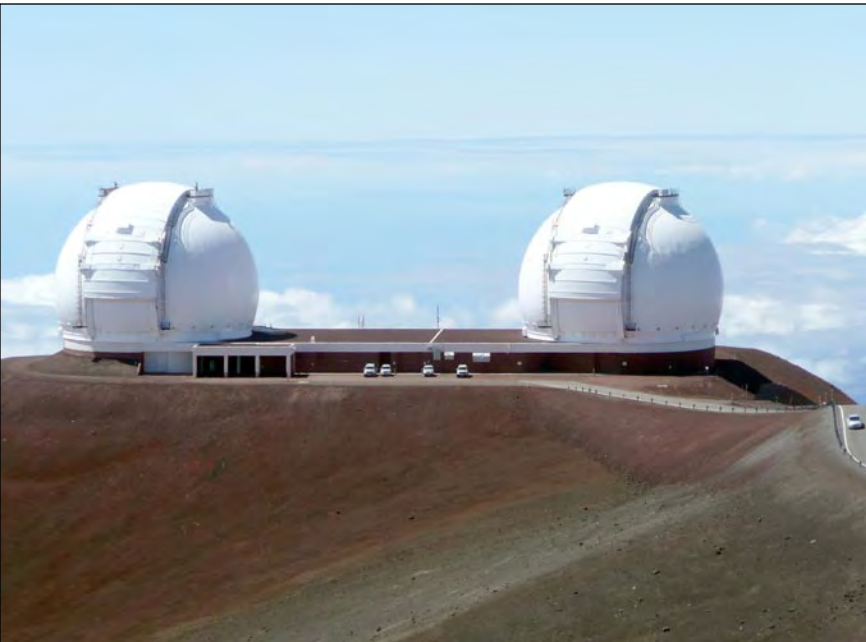
TIJUANA RIVER ESTUARY

San Diego County, California

Ownership: Federal (Navy, U.S. Fish and Wildlife Service), State (Department of Parks and Recreation), San Diego County and City, and private

The Tijuana River Estuary is located between Imperial Beach, California, and the U.S.-Mexico international boundary. The site is part of a National Estuarine Research Reserve (NERR) administered by NOAA. Four biotic communities occur within the reserve: salt marsh, riparian, coastal sage scrub, and sand dune. Seven species of endangered birds, five of which are federally listed, seasonally reside or nest within the Reserve. One federally listed endangered plant is also found within the reserve.

Threats to NNL resources still occur from foot and vehicle traffic, development, and associated erosion. Road and fence construction to aid in Border Patrol law enforcement, which had been a significant threat, was recently completed. Sediment still enters the estuary occasionally, but sediment basins have proven effective in protecting the nationally significant estuary from being filled in. This has had a positive effect on the federally threatened Western snowy plover and the endangered California least tern, which are holding their own within the NNL.



MAUNA KEA

Island of Hawaii
Ownership: State

Mauna Kea is an exposed portion of the highest insular mountain in the United States and is the most majestic expression of shield volcanism in the Hawaiian Archipelago, if not the world. Also present is the highest lake in the U.S. and evidence of glaciations above the 11,000-foot level.

Mauna Kea was listed as threatened in the previous year's report because of the planned construction of a Thirty Meter Telescope Observatory within the upper summit area of the landmark's 530-acre "Astronomy Precinct." However, a recent visit to the site revealed that the landmark is in very good condition and the new telescope has been sited to minimize adverse impacts on the biota and visual resources of the site.



LOWER CACHE RIVER SWAMP

Johnson and Pulaski Counties, Illinois
Ownership: State (Department of Natural Resources) and private

This 1,250-acre tract of wet forest and swamp is 1/4 to 1/2 mile wide and extends for five miles along the Lower Cache River, which occupies an underfit stream valley carved by glacial outwash drainage. The tract lies at the northern range edge of many southern plants and animals and contains many large trees. No comparable area of large cypress and water tupelo is known in Indiana, Kentucky, Missouri, Arkansas, or Tennessee.

The site has been threatened by diversion and channelization of the major tributaries emptying into the Lower Cache Swamp. Accelerated siltation is still occurring, which in time may change the species composition and structure of the natural communities. However, the restoration of flow between the Upper and Lower Cache Rivers is underway, which will improve the situation. In 2010 The Nature Conservancy received more than \$700,000 for restoring habitats, including creation of wetlands and planting bottomland hardwood seedlings. Total restoration will include 1,600 acres of forest and 700 acres of wetlands.



VIRGINIA COAST RESERVE

Accomack and Northampton Counties, Virginia
Ownership: Private (The Nature Conservancy)

This 35,000-acre site consists of a mosaic of 14 barrier islands, saltmarsh, lagoons, and mudflat all in relatively undisturbed condition. It comprises the majority of the barrier island system of Virginia and serves as a valuable refuge for migratory shorebirds, waterfowl and colonial nesting birds. Previously reported threats to this site include land development, offshore sand dredging, extraction of marine resources, invasive species, marsh erosion, and predator impacts to nesting birds.

The real estate boom on the lower eastern shore has ceased with the downturn in the economy; however, the federal facilities on Wallops Island continue to fuel real estate development in Accomack County, at the north end of the Reserve. Sand dredging and construction of rock groins north of the Reserve will likely occur as part of the Wallops Island beach nourishment project. However, plans for a 500-ft terminal groin, perpendicular to the beach, were abandoned, alleviating the concern about future sand supply to the northern islands. Very few clam-dredging boats continue to operate, and crab-dredging is outlawed. Aquaculture is abundant, and somewhat problematic on the bay side due to the large scale of operation. Predator control programs have been extremely successful, doubling the nesting Piping Plover population and restoring nesting shorebird and water bird populations.

Recent findings of long-term research shows that water quality in the coastal bays is exceptional, and that mainland fringing marshes are keeping up with and exceeding sea-level rise. In the past ten years, 49 acres of oyster reefs and over 4,500 acres of eelgrass have been restored, improving resiliency of the bays to climate change, currently the most pressing issue for the Reserve. TNC is undertaking a major climate change adaptation study on the Eastern Shore; and a Special Area Management Plan is under development, that will zone uses in the bays and create enforceable policy to ensure protection of resources. Progress on these initiatives and remaining issues at the Reserve will continue to be closely monitored.

Damaged and Threatened Landmarks



Hemlocks Natural Area

Woolly Adelgids Continues to Threaten Eastern Landmarks

The introduction and continuing spread of hemlock woolly adelgid (*Adelges tsugae*) and balsam woolly adelgid (*Adelges piceae*) pose a widespread threat to the health and sustainability of hemlock and fir forest throughout their range in the Eastern U.S. 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 has damaged and threatens National Natural Landmarks throughout the Eastern U.S. Two sites in central Pennsylvania, designated for old-growth hemlock stands are showing severe impacts from HWA infestation. *Snyder-Middleswarth Natural Area*, located in Snyder County within Bald Eagle State Forest is an outstanding example of a relict forest; and *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). HWA was discovered in Pennsylvania in 1967 and is currently present in at least 49 counties. Cold winters help to reduce HWA, and study continues of a small, healthy stand of what appear to be naturally resistant trees at Hemlocks Natural Area.

Also hard hit by HWA is the climax hemlock forest at *Mianus River Gorge* in Westchester County, New York. The privately owned site provides 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 in at least 20 counties, largely in the southeastern portion of the state.

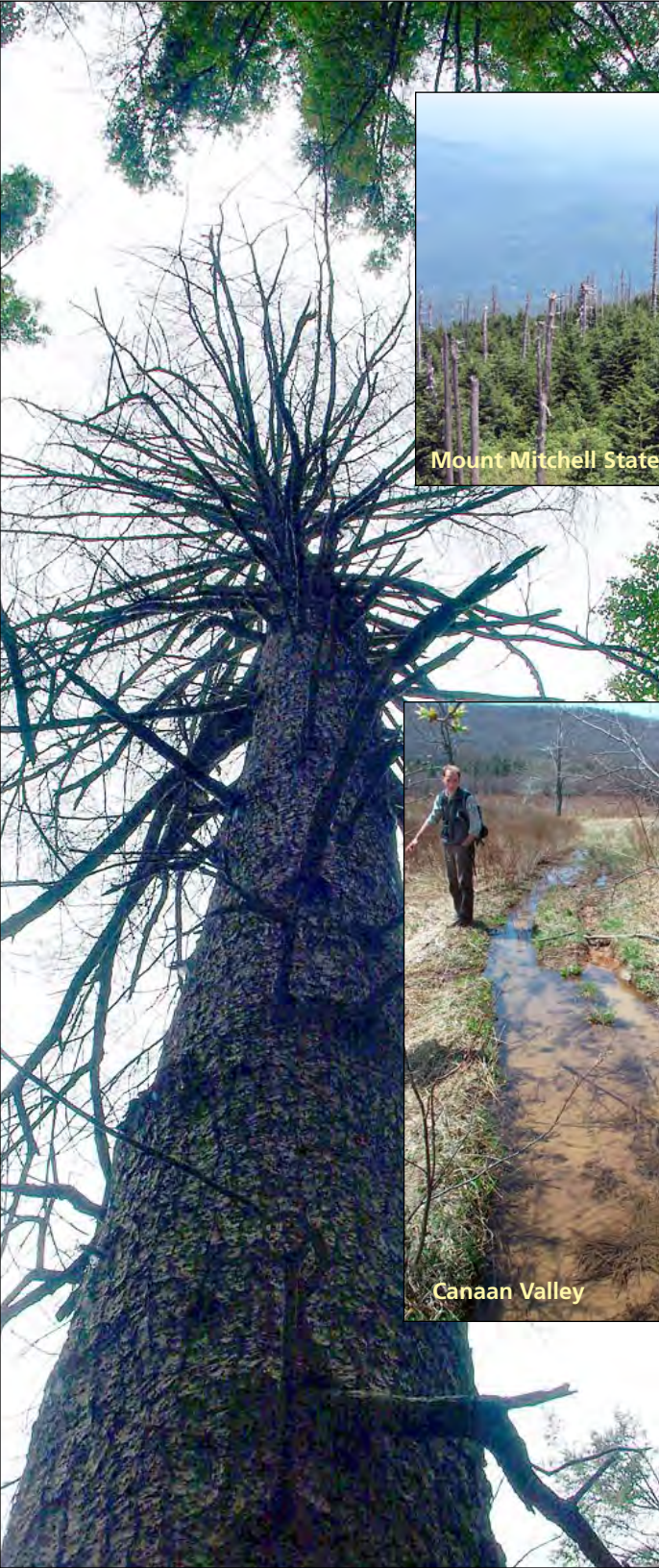


At *Mount Mitchell State Park* in Yancey County, North Carolina, the balsam woolly adelgid has caused a severe decline in the endemic Fraser fir. Some of the most extensive stands of Fraser fir in the country are found within this

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. BWA is known to be present in at least 10 western counties in North Carolina.



Mianus River Gorge



Mount Mitchell State Park



Canaan Valley

At Canaan Valley in Tucker County, West Virginia, infestation by both balsam woolly adelgid and the hemlock woolly adelgid is causing mortality of balsam fir and eastern hemlock trees, respectively. HWA is known to occur in 28 and BWA in 3 counties in West Virginia. This NNL contains a diverse assemblage of relict northern boreal communities and wetlands that are seldom found in the

eastern United States. Balsam and hemlock are important wetland and riparian forest species, and comprise plant communities listed as rare by the state. In addition, beech bark disease is causing a decline in American beech trees. Additional threats to the biotic resources at this site include land development and recreational activities.

As staffing and funding permits, chemical 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: nrs.fs.fed.us/tools/afpe/maps/.



Snyder-Middleswarth Natural Area

Sixteen Landmarks Threatened by a Variety of Activities

The National Natural Landmarks (NNLs) listed below are noted as threatened or damaged. A threat to the NNL resources must be imminent to warrant a listing; for example, a major project that could affect NNL resources should be in the study stage, not merely an alternative in the discussion stage. 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, 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 Eurasian watermilfoil (*Myriophyllum spicatum*), an alien plant species that forms dense canopies that can shade out native vegetation. The result is monospecific stands that provide poor habitat for waterfowl, fish, and other wildlife. California State Parks has initiated a pilot study whereby landscape cloth is tacked to the bottom of the bay to control the spread of the watermilfoil, and dive crews are working to ensure eradication of the plant.





SAN FELIPE CREEK

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 continues to be used as a route for illegal aliens and drug smugglers, and subsequent pursuit by Border Patrol agents. The Border Patrol continues dragging tire-arrays along dirt roads to create a fresh surface for detecting recent traffic, but greater care is taken to avoid resource impacts than was the case in the past.



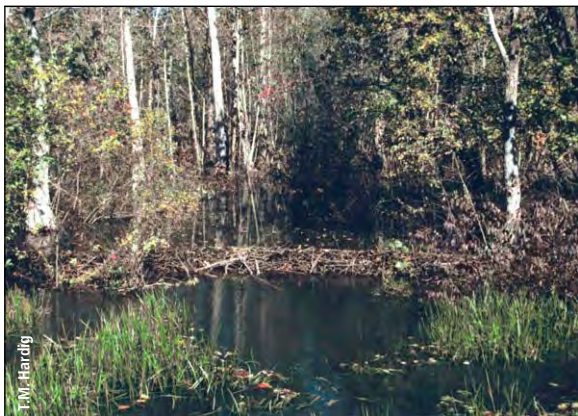
PAYNES PRAIRIE

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 is impacted by urbanization. The most imminent threat is the discharge of stormwater and wastewater effluent into Sweetwater Branch and the Alachua Sink which has had negative ecological effects on the area. A plan is currently in place to create a wetland treatment system to help remedy this threat and restore water flow to 1,300 acres of prairie currently drained by a canal. Development of the treatment system should begin in 2012. Invasion by exotic species and successional changes in vegetation are on-going, with vegetation generally shifting from freshwater marsh species to woody herbaceous shrubs in various portions of the site. High wildlife mortality on Highway 75 continues to be an issue.



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 (nutrient enrichment), 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. However 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 from Illinois Beach. The site was ranked number one of over 1,000 natural areas identified by the Illinois Natural Areas Inventory on the basis of its lack of disturbance, large size, diversity of habitats, and presence of endangered and threatened species.

The site is threatened by marina construction north of the park, which has cut off the natural process of sand replenishment and is contributing to shoreline erosion. Hydrological changes appear to be causing species changes, and exotic species are replacing native species.



WAUCONDA BOG NATURE PRESERVE

Lake County, Illinois

Ownership: County

Wauconda Bog is actually a fen (due to almost neutral to alkaline pH) in very good condition. It occurs 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.

Four invasive exotic plants have invaded the site: purple loosestrife, glossy buckthorn, reed canary grass, and hybrid cattail. An Illinois State Water Survey reported that lawn chemical runoff and septic systems pose moderate to high potential for contaminating surface waters, and that culverts and roads may contribute contaminants to ground water.



BELT WOODS

Prince George's County, Maryland

Ownership: State (Department of Natural Resources)

The site is one of the few remaining mature 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 (DPW&T) includes widening Church Road, which is adjacent to the east side of Belt Woods, 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, potentially altering 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 site has long faced problems from fossil hunters physically removing the resource. Despite the County declaring it closed to the public, there remains easy access to the site and visible continued, unregulated use by visitors. The site is suffering from neglect, with trails in need of repair and a lack of signage and interpretation. It is also closely bordered by residential development, from which there are additional access points. The scientific and educational values of this site are in jeopardy.



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.

Public Service Electric and Gas Company is planning to enlarge an existing transmission line that bisects the site. The Susquehanna to Roseland Transmission Line Project will increase existing towers from 80 to nearly 200 feet, and potentially enlarge the maintenance right-of-way. There is the potential for physical impacts due to construction and maintenance activities, and further habitat fragmentation and degradation. The site may also already be affected by lead contamination on a private in-holding, which is not part of the NNL.



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 due to softness. The site is also significant for vertebrate fossils.

The site is threatened by theft of the resources, which are then sold. 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 continues to be 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.



SANTA ANA NATIONAL WILDLIFE REFUGE

Hidalgo County, Texas

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

This 2,088-acre NNL is located on the U.S.-Mexico border in a bend of the Rio Grande River. The site is an excellent example of mid-valley riparian forest that has largely disappeared from the lower Rio Grande Valley. Woodland, brushy areas, lakes, and ponds provide habitat for nearly 300 butterfly species, and 400 species of birds, including a number of Mexican bird species at their extreme northern limit. The mammal population includes ocelot and jaguarundi, which are federally listed endangered species. Over 450 species of plants grow on the refuge, many of which are endemic to the region.

Dam construction has effectively eliminated the natural flooding regime, causing a habitat conversion from flood forests to thorn scrub. Water is less available to recharge wetlands, forests, and groundwater, and the water table is dropping. Siltation, an aspect of natural flooding that replenishes nutrients in the soil, has also been eliminated and salt buildup is occurring. Rare plant species, especially the larger trees, are dying and slowly being replaced by species more adapted to xeric (dry) conditions. The refuge also supports rare wildlife species, which are threatened by the habitat conversion.



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 activities associated with a marina and boat building operation that releases toxins into the bay affecting water quality, mangrove health, and human health. Invasive exotic vegetation is also a threat to the bay area.



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 and the only Joshua tree forest in Utah. 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 only a narrow buffer around the pond and bog proper, putting the core of the site quite close to privately owned lands.

Activities on lands within and adjacent to the NNL pose a threat to the bog. 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. Ongoing land use activities, such as tree-farming continue to encroach on the bog and pond.



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



National Natural Landmarks Program

Supporting Conservation of America's Natural Heritage