

**NORTH CAROLINA
NATURAL HERITAGE PROGRAM
2013 BIENNIAL REPORT**



**Office of Conservation, Planning, and Community Affairs
Department of Environment and Natural Resources
Raleigh, North Carolina
www.ncnhp.org**

REPORT ON ACTIVITIES OF 2011-12

As directed by the North Carolina Nature Preserves Act (GS 113A-164.1-.11), the North Carolina Natural Heritage Program (NCNHP) in the Department of Environment and Natural Resources, has prepared this report to summarize program activities occurring during calendar years 2011 and 2012.

NCNHP is the North Carolina component of a national network of natural heritage programs that reaches from Canada through the United States and into much of Latin America. Members of this network share a common methodology and a commitment to document occurrences of rare species and significant natural areas. The 80 programs that comprise this network are affiliated through NatureServe, a private, nonprofit organization based in Arlington, Va.

Established in 1976, NCNHP is housed within the Office of Conservation, Planning, and Community Affairs, within the Office of the Secretary of the Department of Environment and Natural Resources. Support for all except two positions is funded with receipts from the Natural Heritage Trust Fund (NHTF).

NCNHP works in partnership with a variety of state and federal agencies, private organizations, individuals and corporations to: 1) identify the most significant natural areas of North Carolina and, 2) share information about these significant natural areas so that future generations can enjoy the full diversity of North Carolina's natural heritage.

Program activities of 2011 and 2012 are summarized in this report under the three major program areas of NCNHP: Information Services, Inventory, and Conservation Planning and Protection.

INFORMATION SERVICES

North Carolina is fortunate to have a variety of outstanding naturalists working independently or as part of state and federal conservation agencies, in academia, as independent consultants or in private conservation organizations. Working as part of this informal network of exceptional naturalists, NCNHP consolidates the information collected about rare species, high quality natural communities, and significant natural areas and makes it available for use in private, statewide, and regional initiatives for a variety of land uses, including conservation and development planning. The information is also used to weigh the ecological significance of various sites, and to evaluate the likelihood and nature of ecological impacts. This information supports informed evaluations of the possible impacts of development projects before plans have been finalized. Finally, this information facilitates the establishment of priorities for the protection of North Carolina's most significant natural areas.

Compiling biological information from a wide variety of sources is a complex process. That process is crucial to developing the information needed for wise conservation and development planning, and to the environmental review function required by the national and state environmental policy acts. Equally important is sharing that information with a wide variety of agencies, corporations and individuals.

Information Requests

A completely revised website for NCNHP went online in August 2012. In September and October 2012, NCNHP staff conducted a series of workshops in Raleigh and Asheville to educate partners about the array of services NCNHP now provides online. The online information database, which is accessible to the general public, generates reports of rare species, high quality natural communities, significant natural heritage areas, and conservation managed areas, summarized by county or by USGS quadrangle. This web-based information system has been well received, by both partner agencies and the public. This service is updated quarterly and allows users to get information directly from the BIOTICS database with minimal training. This has reduced the workload for staff while allowing easier access to the most requested information.

During 2011 and 2012, NCNHP provided 674 written responses to citizens, federal and state agencies, consulting firms, academic institutions, conservation organizations and city and county governments, and responded to an uncounted number of telephone inquiries. We eliminated the need for the public NHP file room as we made more information available online and through GIS, and scanned many more files to make digital copies available.

Publications

NCNHP produces four reference publications (listed below). These publications are used by staff of numerous federal, state, and private agencies, including Fort Bragg, the N.C. Department of Transportation, the N.C. Wildlife Resources Commission, the U.S. Forest Service, and various corporations, as well as environmental consultants, academic institutions, and amateur naturalists. The publications are provided at cost upon request. In addition, NCNHP provides digital files of these publications on the website (<http://www.ncnhp.org/>).

Natural Heritage Program reference publications:

- Natural Heritage Program List of the Rare Animal Species of North Carolina;
- Natural Heritage Program List of the Rare Plant Species of North Carolina;
- Classification of the Natural Communities of North Carolina;
- Priority List of Significant Natural Heritage Areas.

Copies of county natural area inventory reports or rare species accounts are also available upon request or online (<http://www.ncnhp.org/Pages/publications.html>). A list of all NCNHP reports in 2011 and 2012 are included in Appendix A.

INVENTORY

NCNHP natural area inventory efforts are conducted as part of a comprehensive effort to identify the highest quality sites for conservation action. Natural area surveys are also conducted when possible for protection-focused projects on behalf of partners such as the N.C. Division of Parks and Recreation, the Nature Conservancy, or any of several local land trusts. Inventories are also conducted with partners for particular rare species or specific natural communities.

2011-2012 Natural Area Inventories

A Natural Area Inventory is a systematic search for the best examples of natural communities and locations of rare species throughout a pre-defined location, typically a county. The identification of these “Significant Natural Heritage Areas” is a fundamental step in the effort to conserve our state's biodiversity. The conservation of these natural areas can greatly enhance the quality of life for the citizens of North Carolina.

Inventory reports map and describe the most important natural areas and their ecological significance. This information benefits a wide range of users, from individual landowners to various government agencies. County governments and municipalities use these inventories to help plan for growth and development in balance with the natural environment. State agencies and local land trusts rely on Natural Heritage data to make informed decisions about land and water use and site conservation. For example, the Wildlife Resources Commission was awarded a grant from the Natural Heritage Trust Fund (NHTF) in 2012 to add the Raby Farm tract to the Needmore Game Land. The site provides a riparian buffer for the Little Tennessee River Aquatic Habitat, which was highlighted in the 2010 Macon County Inventory. The tract will expand a core area of conservation lands in the Needmore Game Lands along the Little Tennessee River, adding approximately 2,500 feet of river frontage. In 2011, the Natural Heritage Trust Fund also awarded funding for the N.C. Division of Parks and Recreation to protect large, privately held tracts within the Rumbling Bald/Shumont Mountain Significant Natural Heritage Area, a site highlighted in the 2006 Rutherford County Inventory. These tracts will be added to Chimney Rock State Park.

Raby Farm tract along the Tennessee River at Needmore Game Land



Shooting Star, a state threatened plant protected at the Rumbling Bald tract of Chimney Rock State Park



Funding for natural area inventories is provided in large part by the NHTF. Whenever possible, matching funds are secured from local governments or raised by a partner, such as a land trust. The commitment of the NHTF board and the partner agencies to natural area inventories and to local conservation actions is greatly appreciated.

Table I. Natural Area Inventories conducted in 2011-2012 by NCNHP

| County or Region | Principal Natural Heritage Program Scientists |
|--------------------------------------|--|
| Alexander County | James Padgett |
| Cherokee County | Ed Schwartzman |
| Dare County | Bruce Sorrie |
| Graham County | Ed Schwartzman |
| Mitchell County | Shawn Oakley |
| Roanoke River Brownwater Floodplains | Harry LeGrand, Jr., Steve Hall |
| Tyrrell County | Bruce Sorrie |
| Union County | Bruce Sorrie |

2011-2012 Rare Species and Natural Community Inventories

In addition to county-focused inventories, NCNHP inventories the distribution and habitats of rare species of the state and the remaining high-quality or rare examples of natural communities. Many of these inventories are conducted in cooperation with the Wildlife Diversity Program of the N.C. Wildlife Resources Commission, the Plant Conservation Program of the N.C. Department of Agriculture and Consumer Services and the U.S. Fish and Wildlife Service. Other partners include the N.C. Museum of Natural Sciences, the N.C. Native Plant Society and the N.C. Herpetological Association. Table II shows inventories conducted during 2011-2012.

Table II. Rare Species and Significant Natural Community Inventories

| Target Element | Partner Agency | Principal NHP Scientists |
|--|--|--|
| American Ginseng, Great Smoky National Park | N.C. Department of Agriculture & Consumer Services, U.S. National Park Service | Laura Gadd |
| Bat species (mist netting), Graham County | N.C. Wildlife Resources Commission | Ed Schwartzman |
| Bog Turtle – Alleghany County | N.C. Wildlife Resources Commission | James Padgett |
| Bunched Arrowhead | U.S. Fish and Wildlife Service, N.C. Plant Conservation Program | Ed Schwartzman |
| Dare County Pocosin -- effects of Payne’s Bay wildfire on pocosins | Alligator River National Wildlife Refuge | Mike Schafale |
| Dwarf-flowered Heartleaf | U.S. Fish and Wildlife Service, U.S. National Park Service | James Padgett, Laura Gadd, Kimberly Israel |
| Golden Sedge, Sandy Run State Natural Area | N.C. Botanical Garden, N.C. Division of Parks and Recreation, U.S. Fish and Wildlife Service | Laura Gadd |
| Green Salamander, | N.C. Division of Parks and | James Padgett |

| Target Element | Partner Agency | Principal NHP Scientists |
|--|---------------------------------------|--|
| Chimney Rock State Park | Recreation | |
| Natural communities and rare plants of Highfields Farm | Green Stables and private owner | Mike Schafale |
| Natural communities and rare plants of Julian Price Park wetlands | U.S. National Park Service | Mike Schafale |
| Natural communities and rare plants of seven Mecklenburg County Nature Preserves | Mecklenburg County Parks | Mike Schafale |
| Natural communities of Croatan National Forest sites | U.S. Forest Service | Mike Schafale |
| Natural communities of Jones Island | N.C. Division of Parks and Recreation | Mike Schafale |
| Natural communities of portions of South Mountains Game Land | N.C. Wildlife Resources Commission | Mike Schafale |
| Natural communities of Rachel Carson Estuarine Research Reserve | N.C. Division of Coastal Management | Mike Schafale |
| Natural communities of Shackleford Banks | U.S. National Park Service | Mike Schafale |
| Natural communities of South Butner Diabase Swamp | Town of Butner | Misty Buchanan, Mike Schafale, Kimberly Israel |
| Natural communities of the Coastal Plain and Piedmont Triangle area -- quantitative sampling | Carolina Vegetation Survey | Mike Schafale |
| Neuse River Waterdog | N.C. Wildlife Resources Commission | Judith Ratcliffe, John Finnegan, Scott Pohlman |
| Rare plants and natural communities at Pettigrew State Park | N.C. Division of Parks and Recreation | Harry LeGrand, Laura Gadd, Bruce Sorrie |
| Rare plants and natural communities at Walthour Moss Foundation, Moore County | Walthour Moss Foundation | Bruce Sorrie, Katy Walsh |

| Target Element | Partner Agency | Principal NHP Scientists |
|---|---|---|
| Rare plants, coastal natural communities at Cape Hatteras National Seashore | U.S. National Park Service | Bruce Sorrie, Laura Gadd, Mike Schafale |
| Rough-leaf Loosestrife, Carteret, Craven, and Onslow Counties | N.C. Botanical Garden, The Nature Conservancy | Misty Buchanan, Laura Gadd |
| Sensitive Joint-vetch | U.S. Fish and Wildlife Service, The Nature Conservancy, V.A. Natural Heritage Program | Misty Buchanan and Laura Gadd |
| Southern Anemone survey, Little Long Mountain preserve | Land Trust for Central North Carolina | Mike Schafale |
| White Irisette Monitoring, Rumbling Bald Mountain | N.C. Division of Parks and Recreation, U.S. Fish and Wildlife Service, The Nature Conservancy | James Padgett |

Table III provides an overview of the Natural Heritage database that contains the core of NCNHP information. This database summarizes information about the occurrences of rare species, significant natural communities, and significant natural heritage areas in North Carolina.

Table III. Summary of NCNHP Database

| Database Components | Calendar Year 2011 | Calendar Year 2012 |
|---|---------------------------|---------------------------|
| Number of Elements Tracked by NCNHP | 1,662 | 1,905 |
| Number of Records of Element Occurrences (EOs) | 24,992 | 25,603 |
| Vertebrate animals | 4,892 | 4,892 |
| Invertebrate animals | 2,082 | 2,055 |
| Vascular plants | 10,553 | 10,593 |
| Non-vascular plants | 1,211 | 1,063 |
| Natural communities | 5,772 | 6,815 |
| Special animal habitats/features | 412 | 412 |
| Number of Significant Natural Heritage Areas Identified | 2,585 | 2,575 |
| Number of Managed Natural Areas Mapped | 1,419 | 1,118 |

CONSERVATION PLANNING AND NATURAL AREA PROTECTION

Conservation Planning Tool

The North Carolina Conservation Planning Tool identifies and prioritizes both the essential high quality natural resources and the crucial land gaps between ecosystems across the state. The methods used are both strategic and scientifically-based, and provide a vision for a green infrastructure network of supporting ecosystems.

During the past biennium, significant progress has been made in integrating the Conservation Planning Tool Biodiversity/Wildlife Habitat Assessment into the Wildlife Resources Commission's Green Growth Toolbox, which is shared with local governments and regional planning groups that want to address natural resources as part of their planning process. The Conservation Planning Tool and Green Growth Toolbox have been presented in workshops with NCDOT staff, Metropolitan and Rural Planning Organizations and the Federal Highway Administration to inform their transportation planning processes.

The Conservation Planning Tool has been presented to a range of audiences that include partners from federal, state and local agencies, regional planning organizations, academia, and nonprofit conservation organizations. The accuracy and usefulness of the information provided in the Conservation Planning Tool has been widely accepted and in many cases incorporated into local and regional planning efforts. This tool has proven to be helpful in building collaborative partnerships and supporting proactive planning for compatible land uses. It is currently being used as a model for regional green infrastructure mapping as part of a Piedmont Triad Sustainable Communities project (http://triadsustainability.org/?page_id=395), and as a model for conservation planning and mapping of important natural resources in Chatham County (<http://chathamconservation.wikispaces.com/Comprehensive+Conservation+Plan>).

Managed Areas

As part of its statewide conservation planning and management efforts, NCNHP maintains a dataset of lands managed primarily for conservation. Knowledge of the extent and location of these lands is crucial for implementation of the North Carolina State Wildlife Action Plan and for the preservation of the state's biodiversity. The majority (88 percent) of land in North Carolina is privately owned. Lands in public ownership include four national forests, 11 national wildlife refuges, 60 state parks, nine state forests, 60 state game lands, and numerous county and city parks. There are also at least 21 private land trusts acquiring land and easements throughout the state. In 2011-2012, with support from a contract with the U.S. Geological Survey Gap Analysis program, NCNHP staff made a systematic effort to contact all sources and combine all conservation lands into a complete dataset. By reaching out to partners across the state, NCNHP added 78,571 acres to the database of conservation managed areas in North Carolina. This includes 6,566 acres of federal lands, 1,083 acres of state lands, 62,741 acres owned by local governments, and 7,921 acres of private land. The GIS files for all conservation managed lands in North Carolina were provided to the USGS Protected Areas Database, following national standards. The process of incorporating recent contact information for contributing agencies will facilitate future coordination to keep the data up to date.

Landscape Analysis

NCNHP continued efforts to identify and evaluate large blocks of habitat still serving ecological functions at the landscape level (*i.e.*, that have high landscape integrity). This project concentrates on mapping core areas for landscape habitat indicator guilds. Landscape mapping was completed for the Northern Mountains region of the state in 2011. This completed our initial analysis of the entire state, with a total of 46 Landscape-Habitat Indicator Guilds currently recognized and 457 landscape units mapped and prioritized for conservation. The GIS layers resulting from this effort have been incorporated into the Conservation Planning Tool and the accompanying reports are now available on the NCNHP website.

Field work was conducted in the Uwharrie Mountains region in 2010 and 2011 specifically to obtain occurrence data on the indicator species used to assess landscape integrity. Thirty-six sites were surveyed, with 555 occurrence records obtained for 118 indicator species representing 14 different guilds, including several that were not previously documented in this region. Five landscape units have been provisionally identified for the two of the new guilds and 15 units were added for previously documented guilds. Landscape-Site Survey Reports have been completed for all sampling sites and a general report on this project is currently being prepared with new landscape maps being delineated in the process.

A landscape-oriented survey similar to that conducted in the Uwharries was included in a project to survey brownwater floodplain habitats along the lower Roanoke River. Field work was conducted in 2012 and data are now being compiled and analyzed. A report, along with revised landscape maps, will be completed in 2013. Data currently compiled include 265 occurrence records for 77 indicator species belonging to 20 different guilds.

Conservation action at the landscape level will require the involvement of multiple parties working together over several years. NCNHP hopes that this effort will serve as a model for the development of other conservation initiatives at this level.

2011-2012 Dedications and Registries

The NCNHP encourages conservation and stewardship of Significant Natural Heritage Areas through two programs that create Dedicated Nature Preserves (DNP) and Registered Natural Heritage Areas (RHA). Dedicated Nature Preserves, owned by state agencies, local governments, or nonprofit conservation groups, are permanently protected through a legally binding agreement with DENR to manage the land for conservation of its natural heritage values. State-owned land can only be removed from dedication upon approval of the governor and the Council of State. Owners of Registered Natural Heritage Areas have also signed a voluntary, though non-binding, agreement with DENR demonstrating their commitment to protecting the natural heritage values of their property. These landowners may also receive management recommendations to help ensure survival of the rare species or natural communities on their property.

During this biennium, NCNHP has worked with partner agencies, including the State Property Office, to dedicate more natural areas than during any other biennium. In all, 70,611 acres were designated as State Nature Preserves in the last two years. Of this, 21,996 acres were dedicated as new nature preserves, while the remaining acreage was added to existing preserves (see Table IV.)

Overall, 161 properties totaling 401,854 acres have been designated as Dedicated State Nature Preserves.

Table IV. 2011-2012 New Dedicated State Nature Preserves

| State Agency Ownership | Dedicated Nature Preserve Name |
|--|--|
| N.C. Division of Soil and Water Conservation | Eagles Island Natural Area DNP (242 acres) |
| N.C. Division of Parks and Recreation | Bear Paw State Natural Area DNP (306 acres) |
| N.C. Division of Parks and Recreation | Chimney Rock State Park DNP (2,555 acres) |
| N.C. Division of Parks and Recreation | Grandfather Mountain State Park DNP (2,488 acres) |
| N.C. Division of Parks and Recreation | Haw River State Park DNP (16 acres) |
| N.C. Division of Parks and Recreation | Lake James State Park DNP (295 acres) |
| N.C. Division of Parks and Recreation | Sandy Run Savannas State Natural Area DNP (1,254 acres) |
| N.C. Forest Service | Clemmons Educational State Forest DNP (312 acres) |
| N.C. Natural Heritage Program | Pretty Pond Limesink Complex Preserve DNP (10 acres) |
| N.C. Wildlife Resources Commission | Brinkleyville Game Land DNP (1,835 acres) |
| N.C. Wildlife Resources Commission | Embro Game Land DNP (8,844 acres) |
| N.C. Wildlife Resources Commission | Gull Island Wildlife Conservation Area DNP (69 acres) |
| N.C. Wildlife Resources Commission | Lower Fishing Creek Game Land DNP (1,294 acres) |
| N.C. Wildlife Resources Commission | Mulberry Mill Meadow Bog Wildlife Conservation Area DNP (39 acres) |
| N.C. Wildlife Resources Commission | Sandy Creek Game Land DNP (923 acres) |
| N.C. Wildlife Resources Commission | Whitehall Plantation Game Land DNP (1,438 acres) |
| Private, Classical American Homes Preservation Trust | James M. Johnston Nature Preserve DNP (76 acres) |

Additions were made to 16 existing Dedicated State Nature Preserves. These are listed in Table V. These additions added 48,615 acres.

Table V. Amended Dedicated Nature Preserves

| State Agency Ownership | Dedicated Nature Preserve Name |
|---------------------------------------|--|
| N.C. Division of Coastal Management | Bald Head Woods Coastal Reserve DNP (+12 acres) |
| N.C. Division of Coastal Management | Buxton Woods Coastal Reserve DNP (-56 acres) |
| N.C. Division of Coastal Management | Currituck Banks Component of the North Carolina National Estuarine Research Reserve DNP (+613 acres) |
| N.C. Division of Coastal Management | Emily and Richardson Preyer Buckridge Coastal Reserve DNP (+8,719 acres) |
| N.C. Division of Coastal Management | Kitty Hawk Woods Coastal Reserve DNP (+1,378 acres) |
| N.C. Division of Coastal Management | Rachel Carson Component of the North Carolina National Estuarine Research Reserve DNP (+284 acres) |
| N.C. Division of Coastal Management | Sandhills Game Land DNP (+ 620 acres) |
| N.C. Division of Coastal Management | Zeke’s Island Component of the North Carolina National Estuarine Research Reserve DNP (-75 acres) |
| N.C. Division of Parks and Recreation | Gorges State Park DNP (+215 acres) |
| N.C. Wildlife Resources Commission | Alligator River Game Land DNP (+9,099 acres) |
| N.C. Wildlife Resources Commission | Caswell Game Land DNP (+756 acres) |
| N.C. Wildlife Resources Commission | Chowan Swamp Game Land DNP (+18,636 acres) |
| N.C. Wildlife Resources Commission | Neuse River Game Land DNP (+385 acres) |
| N.C. Wildlife Resources Commission | Shocco Creek Game Land DNP (+7,516 acres) |
| N.C. Wildlife Resources Commission | Stones Creek Game Land DNP (+56 acres) |
| N.C. Zoological Park | North Carolina Zoological Park DNP (+561 acres) |

A total of 134,786 acres were designated as Registered Heritage Area during 2011-2012. To date, 704,591 acres at 304 sites are designated as Registered Heritage Areas.

Table VI. 2011-2012 Registered Heritage Areas

| Landowner | Registered Heritage Area Name |
|--------------------------------|--|
| Private (130 of Chatham, LLC) | Box Creek Wilderness |
| Private (Campbell Group) | Phase II: Cypress Creek Bay, Haw Creek Meanders, Hood Creek Floodplain and Slopes, Mark Pine Bay, Schulzens Savanna, Waccamaw River Cross Swamp Bottomland SNHAs |
| U.S. Fish and Wildlife Service | Alligator River National Wildlife Refuge |
| U.S. National Park Service | Wright Brothers Memorial |

During 2012, NCNHP contacted owners of all RHAs, soliciting updates on ownership and natural area conditions, offering expertise with land management decision-making, and acknowledging our appreciation of their participation in the Registry Program.

We are especially pleased with the registry of the Box Creek Wilderness Area, a privately owned tract in the South Mountains along the border of McDowell and Rutherford Counties. A registry agreement formalizing the landowner’s intent to protect 3,016 acres was signed in June 2012. After more lands were purchased later in 2012, the owner offered to expand the Registered Heritage Area to more than 5,000 acres. Even before the expansion, the RHA was the largest privately owned RHA in the state, more than three times the size of the second largest privately owned RHA. Given its size and location, the natural area serves as an ecological bridge between the mountain and piedmont eco-regions and provides an un-fragmented corridor for migratory animals. The site harbors a remarkable diversity of natural communities, including a number of rare types. Of particular note are the rock outcrops and cliffs. The site also supports a large collection of rare plant and animal species, including state Threatened divided-leaf ragwort, and state Special Concern American golden-banner and American barberry, among others. Several rare aquatic animals are present in Box Creek, including the globally rare Broad River stream crayfish, Carolina foothills crayfish, and Piedmont shiner. The globally rare South Mountains gray-cheeked salamander and Southern Appalachian eastern woodrat have been found here recently, and ongoing survey is likely to reveal additional rare animals. We are very pleased to add this site to the list of Registered Heritage Areas.

NCNHP also has a Memorandum of Understanding regarding management of powerline corridors supporting rare species populations. The MOU recognizes 33 locations in the Piedmont and Coastal Plain formerly managed by Progress Energy. In 2012 NCNHP staff met with Duke Energy to develop the MOU that would continue to recognize the conservation significance of the sites that were transferred to Duke Energy in the merger with Progress Energy.

Aquatic Ecosystem Protection

Threats to aquatic species, including freshwater mussels, fishes, crayfishes, amphibians, snails and macroinvertebrates, continue to be of concern to the conservation community. NCNHP employs two full-time freshwater ecologists (one serving river basins west of, and including, the Yadkin River basin, and one serving basins east of the Yadkin River basin). Matching funds for these positions are provided by the N.C. Wildlife Resources Commission.

NHP assists partner agencies (N.C. Wildlife Resources Commission, N.C. Department of Transportation, N.C. Division of Water Quality, N.C. State University, and N.C. Museum of Natural Sciences) in surveys for rare aquatic species across North Carolina. Survey results from various agencies and private consulting firms are incorporated into the NCNHP database for distribution to conservation partners and for use on the Program's online Map Viewer and Database Search. Through the NCNHP Natural Area Inventory process, aquatic site descriptions and aquatic element occurrences are updated and included in regional and county inventory reports. NCNHP staff work with several regional restoration and education initiatives, including the Regional Sedimentation and Erosion Control Initiative and the N.C. Division of Water Quality-led Water Quality Collaborative. Ecologists provide data and guidance regarding aquatic species conservation to watershed planning efforts lead by partners including the N.C. Ecosystem Enhancement Program, Piedmont Triad Regional Council, Triangle J Council of Governments, the Nature Conservancy, and the National Oceanic and Atmospheric Administration. Recent efforts include the Wake-Johnston Collaborative Local Watershed Plan, Upper Cape Fear River Basin Assessment, Eden Area Watershed Restoration Plan, the Norton Creek Watershed Restoration Project, and the Cape Fear River Partnership. NCNHP freshwater ecologists continue to provide input on interagency efforts such as the DENR Watershed Restoration Improvement Team and the Ecological Flows Science Advisory Board.

In January 2012, NCNHP hosted the Southeast Atlantic Slope Mollusk Meeting in Raleigh. Fifty-six participants from Virginia, North Carolina, South Carolina, and Georgia were in attendance, representing nine state agencies, two federal agencies, two universities, three nonprofit organizations, and three private companies. In addition to general updates, the meeting featured several topical presentations, including U.S. Fish and Wildlife Service initiatives, ecological flows, strategic habitat conservation, and an update on propagation efforts throughout the region.

Information and leadership from NCNHP's Freshwater Program has been essential in building and contributing to conservation partnerships throughout the state, including the Chatham Conservation Partnership, Partners for the Little Tennessee, Little River (Neuse) conservation efforts, Franklin to Fontana workgroup, Greater Uwharrie Conservation Partnership, and the North Toe Restoration Project.

Natural Communities

Part of the NCNHP mission has been to classify and describe the natural communities of North Carolina in publications. A natural community is defined as "a distinct and reoccurring assemblage of populations of plants, animals, bacteria, and fungi naturally associated with each other and their physical environment." Community classification accounts for a wide variety of ecological components, so that the natural community types represent differences in local-scale ecosystem function and structure, as well as differences in species composition. We seek to define natural communities that are the result of the processes of nature, that differ in ways that

are enduring and significant, and that would be found again in other places with similar environments. Natural communities are central to the work of the NCNHP. Tracking occurrences of good examples of them is one of the major portions of the program's inventory and database work. The NCNHP currently has about 6,815 records of high quality natural communities across the state, and new examples are found each year, through the work of NCNHP biologists and partners.

Natural community publications are available for free download at <http://www.ncnhp.org/>. We refer to successive versions of these publications as "approximations" in recognition of the fact that the process of discovering and classifying the natural communities of North Carolina is ongoing, and more information is being gathered each year, which may strengthen or change our concepts. Each new approximation is based on field research and quantitative analysis of research plots, such as the Carolina Vegetation Survey database.

Since the Third Approximation was published in 1990, much new information, experience, and understanding have accumulated. NCNHP inventories have found hundreds of new, good examples of natural communities. Numerous new graduate studies and published scientific papers offer new insights. The Carolina Vegetation Survey has been systematically amassing the largest set of vegetation plot data ever collected in the state. The National Vegetation Classification has developed, and offers different perspectives on, the crucial vegetation component of natural communities in North Carolina and other states. NCNHP has reviewed results from these efforts and incorporated them into natural community concepts and the NCNHP data management system.

In 2011-2012, NCNHP published a Fourth Approximation Guide to the Natural Communities of North Carolina. The guide is a relatively brief document, intended to make the 4th Approximation concepts and units available to users as quickly as possible. A longer document, with more thorough descriptions and additional information, will follow. In 2011-2012, NCNHP converted all database records of natural communities from the Third Approximation to the Fourth Approximation. With all of the natural community records now in the new classification, NCNHP can determine how many occurrences are known for each community type, and how many acres there are for most. One of the next tasks will be to determine rarity/imperilment ranks for each.

Volunteers

In 2011-2012, volunteers logged a record number of hours at NCNHP. Two very dedicated volunteers worked a total of more than 500 hours. Work included assisting staff in reviewing, mapping, and updating natural community records, and determining counties of occurrence for animals on the watch list.

NATURAL HERITAGE PROGRAM STAFF

NCNHP staff are recognized across the state for their ecological expertise and knowledge of conservation practices. Program staff are listed below.

Raleigh Staff (Permanent)

Misty Buchanan, Inventory Manager
Laura Gadd, Botanist (starting 3/2011)
John Finnegan, Conservation Information Manager
Stephen Hall, Landscape Ecologist
Harry LeGrand Jr., Zoologist
Suzanne Mason, Environmental Biologist (through 8/2012), Conservation Information Specialist (beginning 9/2012)
Scott Pohlman, Conservation Incentives Program Director
Ann Prince, Protection Specialist (½ time)
Judith Ratcliffe, Aquatic Ecologist
Michael P. Schafale, Community Ecologist
Allison Weakley, Conservation Planner (beginning 2/2011)

Field Staff (Permanent)

Andrea Leslie, Aquatic Ecologist (beginning 7/2012)
Shawn Oakley, Inventory Specialist
James Padgett, Inventory Specialist
Angie Rodgers, Aquatic Ecologist (through 3/2012)
Edward Schwartzman, Inventory Specialist
Bruce Sorrie, Inventory Specialist

Raleigh Staff (Temporary)

Jame Amoroso, Inventory Data Assistant
Keren Cepero-Perez, Intern (part-time) (ending 03/2011)
Kimberly Israel, Inventory Data Assistant (beginning 05/2012)

Field Staff (Temporary)

Moni Bates, Inventory Assistant
Reed Rossell, Zoology Inventory Assistant

Major Activities Planned for 2013 and 2014

- I. Publish Natural Area Inventories completed in 2012: Mitchell County and Roanoke River Floodplains; complete inventories in Cherokee and Graham counties and Tar River Floodplains; continue inventories in Clay, Dare, Tyrrell, and Wilkes counties.
- II. Improve the online interface of the North Carolina Conservation Planning Tool and increase awareness of the tool by local governments and partner agencies and organizations.
- III. Educate partners about the improved process for rating the ecological significance of Significant Natural Heritage Areas.
- IV. Continue updating Element Occurrences Records and Element Ranks for animal, plants, and natural communities tracked by NCNHP.
- V. Conduct comprehensive surveys of federally listed plants dwarf-flowered heartleaf and small-anthered bittercress (funded by U.S. Fish and Wildlife Service).
- VI. Review state imperilment ranks of S1 (critically imperiled) species and natural communities, using NatureServe element ranking guidelines.
- VII. Monitor Registered Heritage Areas and Dedicated Nature Preserves as needed and respond to land managers and land owners as needed.
- VIII. Conduct natural areas surveys in special project areas, including the Asheville Watershed, 130 of Chatham lands, and special interest areas in the Pisgah and Nantahala National Forests.
- IX. Participate in data exchange with the national NatureServe office, to incorporate NCNHP data into nationwide network of heritage data; prepare to upgrade data management system from Biotics 4 to Biotics 5.

APPENDIX A

**North Carolina Natural Heritage Program
Publications and Reports
2011 - 2012**

**NC NATURAL HERITAGE PROGRAM
PUBLICATIONS and CONTRACT REPORTS**

2011

Hall, S.P. 2011. Statewide assessment of conservation priorities at the landscape level. Upland and interbasin habitats, Northern Mountains Region. Unpublished report. Raleigh, NC: N.C. Natural Heritage Program.

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APPENDIX B

**North Carolina Natural Heritage Program
Biennial Protection Plan**

**NORTH CAROLINA
NATURAL HERITAGE PROGRAM
BIENNIAL PROTECTION PLAN**

List of Significant Natural Heritage Areas

2013

**North Carolina Natural Heritage Program
Office of Conservation, Planning, & Community Affairs
N.C. Department of Environment and Natural Resources
Raleigh, North Carolina**

North Carolina Natural Heritage Program
SIGNIFICANT NATURAL HERITAGE AREAS
February 2013

Introduction

The North Carolina Natural Heritage Program (NCNHP) compiles the N.C. Department of Environment and Natural Resources' list of Significant Natural Heritage Areas (SNHAs) as required by the Nature Preserves Act (NCGS Chapter 113A-164 of Article 9A). The list is based on the program's inventory of the natural diversity in the state. SNHAs (also known as "sites") are evaluated on the basis of the occurrences of rare plant and animal species, rare or high quality natural communities, and special animal habitats, collectively termed the Elements of Natural Diversity. They represent the program's estimates of the best locations for supporting natural diversity in the state and are given priority ranks that indicate the degree of their importance for conservation. The complete list of SNHAs is available for free download at the publications page of the NCNHP website, <http://www.ncnhp.org/>. Inclusion on this list does not directly confer protection to a site. Instead, the information on SNHAs included in the Biennial Protection Plan is intended to help guide the conservation decisions affecting the state's biodiversity at multiple levels, including the actions of state agencies, local government planning offices, private conservation groups, and individual landowners. The list includes both protected and unprotected areas. Inclusion on this list does not mean that public access exists. Permission of the land owner is needed to access all lands not open to the public.

The list of SNHAs and their significance ratings are based on the best available information. All data used in our assessments are obtained from field surveys conducted in the SNHAs either by the staff of the Natural Heritage Program or by other field biologists. Only species, communities, and other features of biodiversity that were actually observed in the SNHA are used in our evaluations of their significance.

This information is compiled in the program's Biotics Database and conforms to standards established by the nationwide network of Natural Heritage Programs in partnership with NatureServe. These standards include the specifications for recording and evaluating individual occurrences of NCNHP elements, as well as guidelines for estimating the degree of imperilment of these elements at the state and global levels. All of this information is used in defining and prioritizing SNHAs.

Data used in our evaluations of SNHAs are acquired or updated on an ongoing basis. The Protection Plan is produced every two years. This list updates the set of known significant areas and their significance ratings, reflecting changes since the last list was published. Not all sites have been visited in this time period, and some of the ratings are based on older data. It is possible that some sites have been damaged or destroyed since they were last visited. More information on these natural areas may be obtained from the Natural Heritage Program. For contact information, as well as direct access to many of our datasets, please visit our website at www.ncnhp.org.

Natural Area Significance

Natural Heritage methodology is designed to address both species and natural communities as Elements of biodiversity. This standard methodology is used to describe the rarity of particular Natural Heritage Elements and to delineate individual occurrences of these elements across the landscape. In assigning priorities for conservation, NCNHP gives special emphasis to natural areas that support populations of rare species or rare or high quality natural communities. A natural area that meets these criteria is designated as a Significant Natural Heritage Area (SNHA). A key product resulting from this information is the assessment of conservation priorities for the natural areas that have been identified.

This year, NCNHP has revised its process for establishing conservation priorities among the more than 2,400 Significant Natural Heritage Areas that have been identified through field investigations. Each SNHA receives two significance ratings, which measure different values:

1. Element Collective Value rates each SNHA on the basis of the number and rarity of all the elements it contains.
2. Element Representational Value rates each SNHA on its importance in protecting the best occurrences of individual elements.

This paired rating system provides two distinct values for each site, one which reflects the biodiversity of the state and one which reflects the overall biodiversity of each SNHA. Each site is assigned two values, a Representational Rating (R1-R5) and a Collective Value Rating (C1-C5). The two ratings measure different and complementary qualities of each site.

Natural Area Significance Ratings

Element Collective Value

The Element Collective Value Rating for each site sums the number of elements at a given site, and the rarity of those elements, weighted by their degree of imperilment at both the global level (G-Rank) and state level, within North Carolina (S-Rank).

The imperilment scores are assigned to each viable element occurrence on a 10-point scale, based on their combination of G-Ranks and S-Ranks as shown in Table 1. The highest scores are given to elements that are considered critically imperiled at both the global (G1) and state (S1) levels with successively lower scores given to elements that are considered more secure (G5S5 being considered secure at both the global and state levels).

Table 1: Collective Value Point Scoring for each G-Rank and S-Rank Combination

| G-Rank | S-Rank | Element Score |
|--------|--------|---------------|
| G1 | S1 | 10 |
| G2 | S1 | 9 |
| G2 | S2 | 8 |
| G3 | S1 | 7 |
| G3 | S2 | 6 |
| G3 | S3 | 5 |

| G-Rank | S-Rank | Element Score |
|---------------|---------------|----------------------|
| G4/G5 | S1 | 4 |
| G4/G5 | S2 | 3 |
| G4/G5 | S3 | 2 |
| G4/G5 | S4/S5 | 1 |

For each site, the scores for occurrences of each element are added to give the final “Collective Value Score” for the site. (For example, if a site has four elements: a G2S2, a G3S1, a G5S1, and a G5S3, it scores: 8 + 7 + 4 + 2 = 21 points.) The total scores are divided into five categories of “site significance”: Outstanding (C1 rating), Very High (C2 rating), High (C3 rating), Moderate (C4 rating), and General (C5 rating).

Table 2: Collective Value Ratings

| Collective Value Rating | Collective Value Score | Minimum Number of Elements |
|--------------------------------|-------------------------------|-----------------------------------|
| Outstanding (C1) | 91 and above | 10 |
| Very High (C2) | 61-90 | 7 |
| High (C3) | 31-60 | 4 |
| Moderate (C4) | 11-30 | 2 |
| General (C5) | 1-10 | 1 |

Element Representational

NCNHP uses Element Occurrence ranks to determine the SNHAs containing the 10-12 best occurrences of each element. Data used to determine the best EOs include (in order of importance): viability, condition, acreage, landscape context, aggregate acreage of community EOs at the site, total number of EOs at the site, and last observation date. The relative rating for each occurrence is assigned using the categories listed in Table 3. When there are more than 12 occurrences of a G1-G2 element or ten occurrences of a G3-G5 element, the remaining sites containing occurrences are assigned to the General category (R5), as described below. Information about these sites and the element occurrences is maintained in the database.

Collectively, these SNHAs will make up a portfolio representing the best sites for each element tracked by NCNHP. Each of the SNHAs is rated according to the importance of the Element Occurrences contained within the site.

The NCNHP database is queried for occurrences for each element. The query sorts the EOs from best to worst using data in the database, and then assigns them to categories. The initial sorting is by EO rank, which summarizes information on viability and value for conservation, incorporating condition, size, and landscape context. The EOs are then further sorted to clarify which ones are the best within the same EO rank, breaking ties to determine which will be selected for the portfolio of highest quality occurrences. Data used to help determine the best EOs include (in order of importance): viability, condition, acreage, landscape context, aggregate acreage of community EOs at the site, and total number of EOs at the site. The fields that are most accurate for the purpose of identifying the best EOs are used first, and if they are unavailable or result in ties, the next most desirable fields are used. Use of all the fields in the hierarchy effectively eliminates ties and provides an unambiguous calculation of which EOs are

best to meet the conservation goals. It should be noted that if the ratings returned by this query seem unreasonable or inaccurate, a more detailed analysis of the data is performed. In cases where the algorithm does not measure the most important ecological features of a site, NCNHP staff can override the calculated results and record justification comments in the database.

After EOs are sorted and ranked from 1-12 for each element, SNHAs are rated on the basis of the quality of the EOs they contain. The highest element importance in the site determines the SNHA significance rating. This value is entered into the site record in the NCNHP database.

Table 3: Representational Value Ratings for SNHAs Based on Element Occurrences

| Representational Rating | Definition | Defining EO Importance | |
|-------------------------|--|-------------------------------------|-------------------------------------|
| | | G1-G2 | G3-G5 |
| Outstanding (R1) | Site contains one of the best two examples of G1 or G2 Elements. | 1 st or 2 nd | -- |
| Very High (R2) | Site contains the 3 rd or 4 th best examples in the state of G1-G2 Elements, and/or one of the best two examples of other Elements. | 3 rd or 4 th | 1 st or 2 nd |
| High (R3) | Site contains the 5 th to 8 th best examples in the state of G1-G2 Elements and/or the 3 rd to 6 th best occurrences of any G3-G5 Element within it. | 5 th to 8 th | 3 rd to 6 th |
| Moderate (R4) | Site contains the 9 th to 12 th best examples in the state of G1-G2 Elements within it and/or the 7 th to 10 th best occurrences of any G3-G5 Element within it. | 9 th to 12 th | 7 th to 10 th |
| General (R5) | Site contains one or more viable occurrences that are not among the 12 best of G1-G2 Elements and/or one or more viable Element occurrences that are not among the ten best for G3-G5 Elements. | >12 th | >10 th |

Organization of the List

Significant Natural Heritage Area (SNHA) Name

The list of North Carolina's most significant natural areas is organized by county, and then alphabetically by natural area name.

Acres

The number of acres included within the Significant Natural Heritage Area boundary (rounded off to the nearest whole number).

County

SNHAs are listed in separate rows for each county in which they occur; thus, SNHAs occurring in multiple counties are repeated in this list.

Representational Value

Outstanding (R1)

Very High (R2)

High (R3)

Moderate (R4)

General (R5)

Collective Value

Outstanding (C1)

Very High (C2)

High (C3)

Moderate (C4)

General (C5)

Occurrences of Highest Significance within the SNHA

Rare species and high quality natural communities of highest significance within the SNHA are listed. The occurrences listed here determine the Representational Value score of the SNHA. Only the most significant occurrences for the SNHA are listed; therefore, this is not a comprehensive list of all the occurrences for each SNHA.

Some of the species we track are subject to poaching or harassment. To protect these species from harm, names of these sensitive species have been removed. Records for the Blue Ridge Parkway are also removed from the list, in honor of the terms of the NCNHP-Blue Ridge Parkway data sharing agreement. In cases where information has been removed from the list, we have indicated “Contact Natural Heritage Program for more information.”

Examples

Altamahaw Alluvial Forest in Alamance County (the first SNHA on the list) has a Representational Value of R5, because the Piedmont Alluvial Forest is of General conservation significance, but is not among the best ten occurrences of this community in North Carolina. The SNHA has a Collective Value of C5, because it supports one apparently secure natural community, of General biodiversity significance.

At the other end of the list, Woods Mountain/Singecat Ridge in Yancey County (the last SNHA on the list) has a Representational Value of R1, due to the Very High significance of one or more rare species, which are among the best populations of these species in North Carolina. Because the species may be harmed by poaching or harassment, we recommend that you contact NCNHP staff for more information. The SNHA also has a Collective Value of C3, due to the high number of elements present there (two rare plants, ranging from critically imperiled to imperiled, two rare animals considered imperiled to vulnerable, and one vulnerable natural community).

For more information about Significant Natural Heritage Areas, species and natural communities tracked by the North Carolina Natural Heritage Program, updated data, or other questions, contact Natural Heritage Program Staff or visit our website at www.ncnhp.org.