

Den Bones

Scientists continue to uncover fossils that help them piece together the past and track the evolution of species. While research and scientific breakthroughs help to determine our future, they also tell the story of the past.



A Lab on Wheels

Everyone hates waiting on test results - even paleontologists - which is why they have created a mobile paleontology lab! In 2008, scientists from the N.C. Museum of Natural Sciences, Montana State University and North Carolina State University bought and renovated a 48-foot semi trailer, turning it into a high-tech lab where they could chemically analyze fossils. "We have found that our chances of recovering both tissues and cells from dinosaur bone, as well as any molecular information, are greatly enhanced by examining the bone as soon as possible after it comes out of the ground," said museum paleontologist Mary Schweitzer. The mobile lab is the first of its kind and, according to Schweitzer, "a dream come true."

This image is on the side of the mobile paleontology trailer. Trailer graphic design by Brenda Wynne, N.C. Museum of Natural Sciences.



NC STATE UNIVERSITY

MUSEUM OF THE ROCKIES
Montana State University

NORTH CAROLINA
MUSEUM OF NATURAL SCIENCES

Molecular Paleontology Field Station



*Duckbilled dinosaur skull.
N.C. Museum of Natural Sciences.*

Duckbilled Dinosaur

Want to know a secret about museum dinosaurs? Most of them are made up of only about 50 percent real bone, the rest being made out of a cast material. Even then, the real bones are often from more than one individual dinosaur specimen. This is because paleontologists rarely find a specimen that is more than halfway complete. That is why it was so exciting in 2006 when researchers from the N.C. Museum of Natural Sciences and North Carolina State University recovered an 80 percent complete skeleton and skin impressions from a 67-million-year-old duckbilled dinosaur known as *Edmontosaurus annectens*.

Bones from the specimen were originally discovered in 2004 by geologists from the University of Wisconsin working in Ekalaka, Mont. The University of Wisconsin team already had an *Edmontosaurus* specimen, and their paleontology focus had shifted to other kinds of dinosaurs, so they invited the museum scientists to take over their dig permit. Unearthing the dinosaur, not to mention getting it back to North Carolina, was quite a task. The skull alone weighed 400 pounds! At least five people were needed to carry some of the heaviest pieces from the site.

The duckbilled dinosaur specimen is the most complete dinosaur ever brought to North Carolina. It is estimated to be among the top five percent of all dinosaur specimens worldwide in terms of its completeness and preservation. The museum looks forward to having the unique specimen on display.

You Could Have Been an Underwater Archaeologist

Cathy Neilson almost tripped over what she thought was an old cypress trunk in Lake Waccamaw, but was surprised when she reached down and pulled up a piece of bone. Her 2008 find led to a full-fledged fossil hunt. Paleontologists are used to chiseling out fossils on land, but recovering bones that were underwater, some of which were encased in limestone, made things a challenge. Staff from Lake Waccamaw State Park called upon the state's Underwater Archaeology Branch (yes, there is such a beast!). While used to diving in shipwrecks searching for man-made artifacts, the archaeologists quickly became underwater paleontologists.

What was uncovered was a prehistoric whale skull. It is actually not uncommon to discover whale fossils in eastern North Carolina. While Lake Waccamaw is a freshwater lake located about 50 miles from the ocean, many millennia ago much of the state east of present-day Interstate 95 was under salty ocean water. What makes this find so exciting is that the skull was largely in one piece, rare for a whale skull found in North Carolina. Researchers will continue to reconstruct the recovered bones that were collected.



Vince Schneider, paleontologist with the N.C. Museum of Natural Sciences, and Richard Lawrence, diver with the state's Underwater Archaeology Branch, with a whale skull fragment found in Lake Waccamaw.



Lake Waccamaw. N.C. Division of Parks and Recreation.

In Partnership

The Department of Environment and Natural Resources has more than 4,000 employees working in more than 30 offices and divisions across the state. Although each division has its own focus and goals, the overall mission of everyone in DENR is the same: “to conserve and protect North Carolina’s natural resources, and to maintain an environment of high quality for the health, well-being and benefit of all.” While division employees are passionate about their specific area, we know that when we work together we accomplish more than we could on our own. Below are some of the standout examples of divisions partnering with each other — as well as with other agencies and organizations — to work toward a common mission.

Love-A-Tree

Teachers who want to integrate environmental education into the classroom curriculum often aren’t sure where to begin. A lot of resources are available, but it can be difficult to know which are reputable and which will help teachers cover the standards mandated by the state. The Office of Environmental Education has made it easy for classroom teachers to get quality lesson plans, materials and resources through the Love-A-Tree Program. Through funding from International Paper, Love-A-Tree provides activities from many DENR divisions that have been correlated to the fifth grade Standard Course of Study.

Each Love-A-Tree packet produced emphasizes a particular environmental theme. The 2007 packet was called North Carolina Naturally: One State, Many Habitats. It included activities from 10 DENR divisions that focused on the goods and services provided by nature and our natural resources. The packets are extremely popular, with educators from all 100 counties in North Carolina ordering Love-A-Tree kits for their classrooms.



Students from C.T. Overton Elementary in Salisbury stand on an outline of North Carolina’s river basins. Stencils for the river basin playground map were created as part of the 2007 Love-A-Tree program. Photo by Debbie Leslie.



Marine patrol pilot Shephard Newman prepares for an enforcement flight in a marine patrol helicopter. N.C. Division of Marine Fisheries.

Marine Patrol

The Marine Patrol, part of the Division of Marine Fisheries, is responsible for ensuring sustainable marine and estuarine fisheries in North Carolina. The Division of Coastal Management works to protect, conserve and manage North Carolina’s coastal resources, which includes enforcing the Coastal Area Management Act (CAMA), a law meant to ensure coastal resource protection. While the enforcement responsibilities of the two agencies don’t overlap, the areas they patrol do. In 2006, the Marine Patrol increased its cross-training with the Division of Coastal Management so that Marine Patrol officers would be able to recognize CAMA violations. The Marine Patrol has not only become an extra pair of eyes for Coastal Management enforcers, but also an extra pair of wings, providing observation flights from which to monitor coastal areas. This is just another example of DENR agencies working together to do more.

Enhancing Ecosystems

The Ecosystem Enhancement Program's very existence is based on some unique partnerships. It was in 2001 that some of these unlikely partners sat down together to try and solve a problem. Through the mid-1990s, the N.C. Department of Transportation had seen a growing trend of significant delays on many of its construction projects. About 40 percent of these delays were caused by problems surrounding wetland and stream mitigation. The federal Clean Water Act mandates that whenever wetlands and streams are destroyed, equivalent aquatic resources must be restored in the same watershed, as these resources serve as nature's own water purifiers and their protection is essential.

The Department of Environment and Natural Resources, NCDOT and the U.S. Army Corps of Engineers decided to reinvent the state's method of protecting the environment while facilitating responsible economic growth. What they created through this unique partnership was the Ecosystem Enhancement Program, which began operations in 2003 and is housed within DENR. Instead of focusing on the impacts of an individual highway project, EEP's innovation would be to develop holistic plans to "fix" watersheds by considering the cumulative impacts within a given watershed. The partnership agreed to solve many of the regulatory problems and expedite permitting approvals by constructing new wetlands before the development project impacted existing wetlands. Road construction and its associated wetland and stream mitigation are now planned seven years out.

Since EEP's inception, there have been no delays due to lack of mitigation permitting, a stark contrast to years prior. While the agencies that partnered to create EEP did not always agree on every facet of the program, their commitment to protecting the health and well-being of North Carolina's people, economy and natural resources created a strong foundation that became more than the sum of its parts.



EEP monitoring supervisor Mac Haupt explains the design of a restored rural creek at an EEP stream restoration project in Wilkes County. Ecosystem Enhancement Program.

The Ecosystem Enhancement Program further expanded its partnership in 2003 to accelerate its advance mitigation. A contract was struck with the Conservation Trust for North Carolina and 22 local or regional land trusts to improve preservation efforts of natural areas around the state. EEP identified regions where environmental impacts were expected to occur, and then relied on the local expertise of the land trusts to find high-quality sites for preservation and work with landowners to protect these areas.

The Mingo tract, a 5,600-acre acquisition in Caldwell and Wilkes counties, was purchased by EEP and other state programs in 2003. Ecosystem Enhancement Program.

Take a Child Outside

In 2007, the Museum of Natural Sciences spearheaded a national program designed to help reconnect children with the outdoors. Take A Child Outside Week is now an international, annual occasion occurring Sept. 24-30. The first year of the program, more than 130 organizations signed on as partners from across the country, offering events and outings in celebration of Take A Child Outside Week. The museum created the Web site takeachildoutside.org where parents, teachers and other caregivers could pledge to take children outside, find partner locations near them and learn fun and easy outdoor activities. Those who pledged could even return to the site and share what they had discovered while exploring the out-of-doors.

Through bird watching and hiking, children learn about the animals that live in the Theodore Roosevelt Natural Area that surrounds the N.C. Aquarium at Pine Knoll Shores. N.C. Aquariums.



Taking a closer look at a snail. Photo by Juan Pons.

Ranging in New Directions

“I became a state park ranger for the N.C. Division of Parks and Recreation at Eno River State Park about 3.5 years ago. Shortly after I was hired, my supervisor enrolled me in the N.C. Environmental Education (EE) Certification program. I knew very little about the certification, only that it was a requirement for all new park rangers and took a long time to complete. I think it is understandable, given the circumstances, that EE certification was the last thing on my mind.

I had moved to a new state and was working at a new park; I was responsible for hundreds of acres of land, miles of trails, the park’s interpretative program and a seasonal employee. However, my attitude completely changed once I attended my first few workshops and visited a couple of the environmental education centers scattered throughout the state. I was hooked!

I was increasing my knowledge of the natural and cultural resources this beautiful state has to offer at the same time that I was learning new skills and improving upon earlier experiences. I began to realize the importance of the certification program as a statewide vehicle—for getting environmental education into the classroom and students into the field; for teachers and non-formal educators to network and establish partnerships; and for helping N.C. State Parks to achieve its mission of instilling a stewardship ethic in us all.

The day I completed my EE certification, I did take a big ‘sigh’ of relief, knowing that I was able to check this requirement off my list, but more importantly, I gave a jubilant shout of praise for the fun I had, the good people I met, the essential skills I learned and the places I hope it will take me in the future, because this is just the beginning.”

Ranger Christopher Ammon – Eno River State Park, 2008



Ranger Christopher Ammon leads an interpretive program. N.C. Division of Parks and Recreation.

Pollution Prevention Goes Whole Hog

There are more hogs in North Carolina than there are people, so dealing with the potential environmental impacts of hog farms has long been part of the role of the N.C. Department of Environment and Natural Resources. As agreements went into place for managing environmental impacts of large, company-owned farms, department staff realized that contract and independent farmers needed assistance, tools and training to better manage their environmental impacts.

In 2001, the Division of Pollution Prevention and Environmental Assistance worked with the N.C. Cooperative Extension Service and the N.C. Division of Soil and Water Conservation to help seven pilot pork farms design and implement an environmental management system, or EMS. An EMS is a set of processes and practices that allow an organization to reduce its environmental impacts and increase its operating efficiency.

DPPEA staff had knowledge and experience in EMS development, while Cooperative Extension and Soil and Water staff were knowledgeable about pork production operations and environmental regulations and requirements affecting the industry and had established relationships with pork farmers in the state. The program was extremely helpful to pork producers, and the DPPEA has used the experience to develop tools and resources available to all pork producers in the state. Here is what one of the pilot farmers had to say about his experience developing and implementing an EMS:

“EMS for me is the coat of wax on a nice car. In my operation, I had done all that was possible to identify environmental issues. However, with an operation my size, this was not enough. Invariably I found myself behind the problem rather than in front of it. Although EMS has not instantaneously corrected all of my problems, it has given me the vision needed to address environmental impacts related to my farm. Within the year I feel confident that my overall operation will be dramatically enhanced by the implementation of EMS. Some say that we in the industry are just trying to use EMS to justify an unjustifiable way of farming. This is incorrect. Each EMS is different in design and nature because each application is different. One size will never fit all where EMS is concerned. Simply put, what is an issue to me as a hog farmer in North Carolina may not be as big an issue to a hog farmer in Iowa or a dairy farmer in Wisconsin or even another hog farmer in North Carolina.

EMS enables you to take a long and hard look at your overall operation, while at the same time examining the effectiveness of specific components that allow your farm to function daily. Within the framework of EMS, you are able to set long-term goals, while simultaneously and systematically accomplishing short-term objectives. In a nutshell, EMS is a living, breathing animal that flourishes if used, but dies on the vine if not fed by the injection of variables, both long and short term. Today it is simply not adequate to identify a set of problems, goals or strengths. As farmers, we must go after improvements, mark them off as completed, and move on to the next challenge. EMS is the vehicle to accomplish this. EMS allows us to incorporate a system of checks and balances that eventually will hold us accountable to ourselves and others, that in the end will result in a more environmentally efficient farm.”

Chuck Stokes – Little Creek Farms, 2004



Piglets suckling sow at farrowing barn. N.C. Division of Pollution Prevention and Environmental Assistance.



I'd Know That Stream Anywhere

What is a stream? It may seem an odd question to ask. There are, however, different kinds of streams, and they fall under different regulations. The Division of Water Quality realized that everyone across the state needed to be speaking the same language, and so developed a method of identifying streams as ephemeral, intermittent or perennial. Beginning in 2002, the division began teaching stream identification classes to their own staff as well as Division of Forest Resources staff.

Since that time, more than two dozen stream identification classes have been taught, and not just to Forest Resources staff. Employees of the N.C. Department of Transportation, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency and state employees from South Carolina, Tennessee and Virginia have taken the training. Several federal, state and local agencies across the country have adopted the stream identification method developed by North Carolina's Division of Water Quality for their own areas and programs.



Individuals take part in a Division of Water Quality stream identification class held at Browns Summit.

FerryMon

For most oceanographic survey work on water quality, more than 50 percent of the cost is for the survey vessel itself. For an innovative water quality monitoring program in the Pamlico Sound and Neuse River Estuary, the vessels were free!

Spurred by pollution issues following Hurricane Floyd, the Division of Water Quality wanted to find a way to characterize and monitor a broad area of the Pamlico Sound on a consistent basis. In 2001, through a unique partnership with the University of North Carolina at Chapel Hill's Institute of Marine Sciences, the Duke University Marine Laboratory and the Department of Transportation's Ferry Division, ferries were outfitted with water monitoring equipment. Through the FerryMon project, as it's called, readings are taken every three minutes and then sent immediately to the UNC and Duke labs.

The program forms the basis for evaluating how the Pamlico Sound ecosystem responds to human-created, as well as nature-related, phenomena. If data results are abnormal, the Division of Water Quality and other environmental agencies can immediately be notified. FerryMon now serves as a model for other states of how to conduct unattended, continuous water quality monitoring using existing transportation infrastructure.



Carteret ferry. N.C. Department of Transportation

North Carolinians are lucky to live in a state with such a rich and diverse array of ecosystems. From the rhododendron-covered peaks of the Blue Ridge to the lush forests of the Piedmont to the salt marshes of the coastal plain — the state is breathtaking from the mountains to the sea! It's a wonderful state to get out and explore. Trail systems crisscross the landscape and facilities make it easy to paddle, ride and hike your way through the great outdoors.

Get Going!



Photos courtesy of N.C. Division of Tourism, Film and Sports Development.



N.C. Birding Trail

Efforts to develop the North Carolina Birding Trail began in 2003. This endeavor is being led by a partnership among the N.C. Wildlife Resources Commission, the U.S. Fish and Wildlife Service, the N.C. Cooperative Extension Service, N.C. Sea Grant, Audubon North Carolina and N.C. State Parks. The trail will go from the coast to the mountains, connecting prime bird-watching locations. 2007 marked the inauguration of the eastern section of the trail. Included in the 102 sites on the eastern section of the trail were 14 state parks and the N.C. Aquariums at Pine Knoll Shores and Fort Fisher.

Birders enjoy Hammocks Beach State Park on the day the coastal segment of the N.C. Birding Trail was dedicated. N.C. Division of Parks and Recreation.



Searching the skies for migrating birds. N.C. Aquariums.

