North Carolina Sea Grant - Final Grant Report for Albemarle-Pamlico National Estuary Program
Title: Landscaping with Nature in Currituck County
May 19, 2010 – September 30, 2010

NCDENR Task Order 3073
NCSU PINS Proposal: 37880, OUC: 061501
Principal Investigators: Gloria Putnam and Barbara Doll, North Carolina Sea Grant

Stormwater Pond Retrofits: Accomplishments

In April, as a result of discussions of this project by the member of the Currituck Goes Green Initiative, a design charrette was organized and held for proposed development on the county land where the Cooperative Extension Facility is located. The county plans to add a YMCA, Senior Center, animal shelter, and various recreational facilities such as baseball diamonds to the site. Attendees at the charrette included staff from various county departments, county contracted landscape designers and engineers, NC Sea Grant, NCSU Cooperative Extension, and the Coastal Studies Institute. Design priorities for the site were discussed by the group as a whole, and the four groups focused on various aspects of sustainable development in more detail. One group looked exclusively at retrofitting the ponds and other water quality protection measures for the site, including the use of native vegetation in landscaping plans. That evening, over 40 citizens attended an open meeting to see the results of the charrette and provide their input. NC Sea Grant staffed a table at this event and shared the purpose and vision of the stormwater pond retrofits with those that stopped by.

During April and June, NC Sea Grant drafted engineering and planting plans for the retrofit of Ponds 1 and 3. The technical plans are shown in Exhibit A. Redesigns for Pond 2 were not produced because the design charrette resulted in substantial alterations to this pond and the land surrounding it. These changes would include adding pedestrian paths between the adjacent elementary school and the Cooperative Extension site. Since these suggestions are likely to be implemented, consideration of substantial improvements to Pond 2 was excluded from further consideration. This did however allow us to create a larger aquatic shelf on Pond 1.

In July, approval was granted from the NCDENR Division of Water Quality (DWQ) for the pond re-designs. The DWQ Washington Regional Office had originally indicated a permit modification would be needed for the state stormwater permit issued for the site but late deemed a permit modification was not necessary because the total pond volume and surface area would not be altered in the retrofit. Unexpectedly, the county did have to obtain an Erosion and Sedimentation Control Permit because the project impacted over an acre of land with both excavation and disposal activities.

In June, the county began the bid process for construction, selected a contractor in early July, and all work occurred between July 12 and 22. Construction photographs are provided in Exhibits B and C. Additional photos are available upon request.

For Pond 1, an aquatic shelf of 60 feet wide (at the widest point)with an average depth of 3 inches was excavated around 350 feet around the pond. Two existing forebay berms were repaired of pre-existing storm breeches , topsoil was added to the berms and the wetland benches, and wetland plants were installed. A vegetated riparian buffer of 10 feet in width around the entire perimeter of all three ponds was seeded with native perennials and grasses. This buffer will deter future use of the pond by Canada Geese, provide additional stormwater treatment from sheet flow, and provide wildlife habitat. The buffer is to be mowed only twice per year, to a height of 6-8" in order to provide the noted benefits. For Pond 3, an aquatic shelf was added along approximately 100 feet of the pond perimeter, topsoil and plants were added, and topsoil and plants were added to the berm as well.

Due to the high population of Canada Geese at the site (in excess of 70 birds after goslings hatched in 2010), temporary exclusion fencing was installed to prevent grazing on the newly installed tender plants. Overall, this technique has proven to be effective and will remain in place until the riparian buffer is well established, probably early summer of 2010. The last photograph in Exhibit B shows the exclusion fencing.

With input from county staff, an educational sign was designed by NC Sea Grant staff and installed onsite in August, after final construction. The sign is very durable and attractive and will provide information about the project for years to come (See Exhibit E). A path to the sign will be created in late 2001 after the additional planned buildings and parking are added to the site. Benches will be placed near the largest pond so visitors can enjoy the benefits of the pond improvements and the native plant landscaping (wildlife garden) discussed below.

As an addition to this project, partners were identified and funds were leveraged from NC Sea Grant in the amount of $7,350 to assess improvements in water quality treatment from the stormwater pond improvements (addition of wetland and shoreline vegetation). NC State University's Department of Biological and Agricultural Engineering (BAE) supplied and installed automated water quality samplers in August at both the inflow and outflow of Pond 1. The equipment will remain in place for one year in an effort to collect data from 15 to 20 storm events. Samples will be collected and tested by staff from UNC's Coastal Studies Institute (CSI) for total suspended solids and nutrients. Grab samples will also be obtained by CSI at least six times throughout the year during dry weather to enable comparison of removal rates during storm and non-storm flows. For your reference, Exhibit D contains photographs of the Pond #1 taken on October 23 which include the monitoring equipment located near the inflow pipe.

Wildlife Garden – Native Plant Landscaping

In July, the construction contractors prepared the bed for the wildlife garden by tilling approximately 1200 square feet of ground to a depth of eight inches, amending it with soil media, and placing a 4 inch layer of mulch on top. The plants, trees, and garden benches were selected with input from NC Sea Grant, the Currituck County Cooperative Extension horticulturist, and Currituck County environmental

planner. However, because of the extremely high temperatures and dry conditions, the groups decided to wait until the fall to install the plants (to increase the likelihood of plant survival). To reduce installation costs and provide an provide an educational opportunity, a volunteer planting day was established for October 23. On this day, the shrubs, perennials, and trees will be installed by members of the Master Gardener Program, county staff, and NC Sea Grant. An explanation of the entire project will be provided to the volunteers so they understand the purpose of the landscape changes at the site. Plants and trees will be purchased by the county. The following were selected for the site: live oak (Quercu virginiana), river birch (Betula nigra), bald cypress (Taxodium distichum), black tupelo (Nyssa sylvatica), Ilex verticillatta (Winterberry holly), Callicarpa americana (beautyberry), Muhlenbergia capillatries, Itea virginica (Virginia sweetspire), Amsonia ciliate, Amelanchier grandiflora (serviceberry tree), Solidago rugosa (goldenrod), Euonymus americanus (strawberry bush), Echinacea purpurea (coneflower), Coreopsis verticillata (threadlef coreopsis), Phlox divaricata (woodland phlox), Monarda fistulosa (beebalm), Hibiscus aculeatus (comfort root), and Ilex vomitoria (Yaupon holly, dwarf).

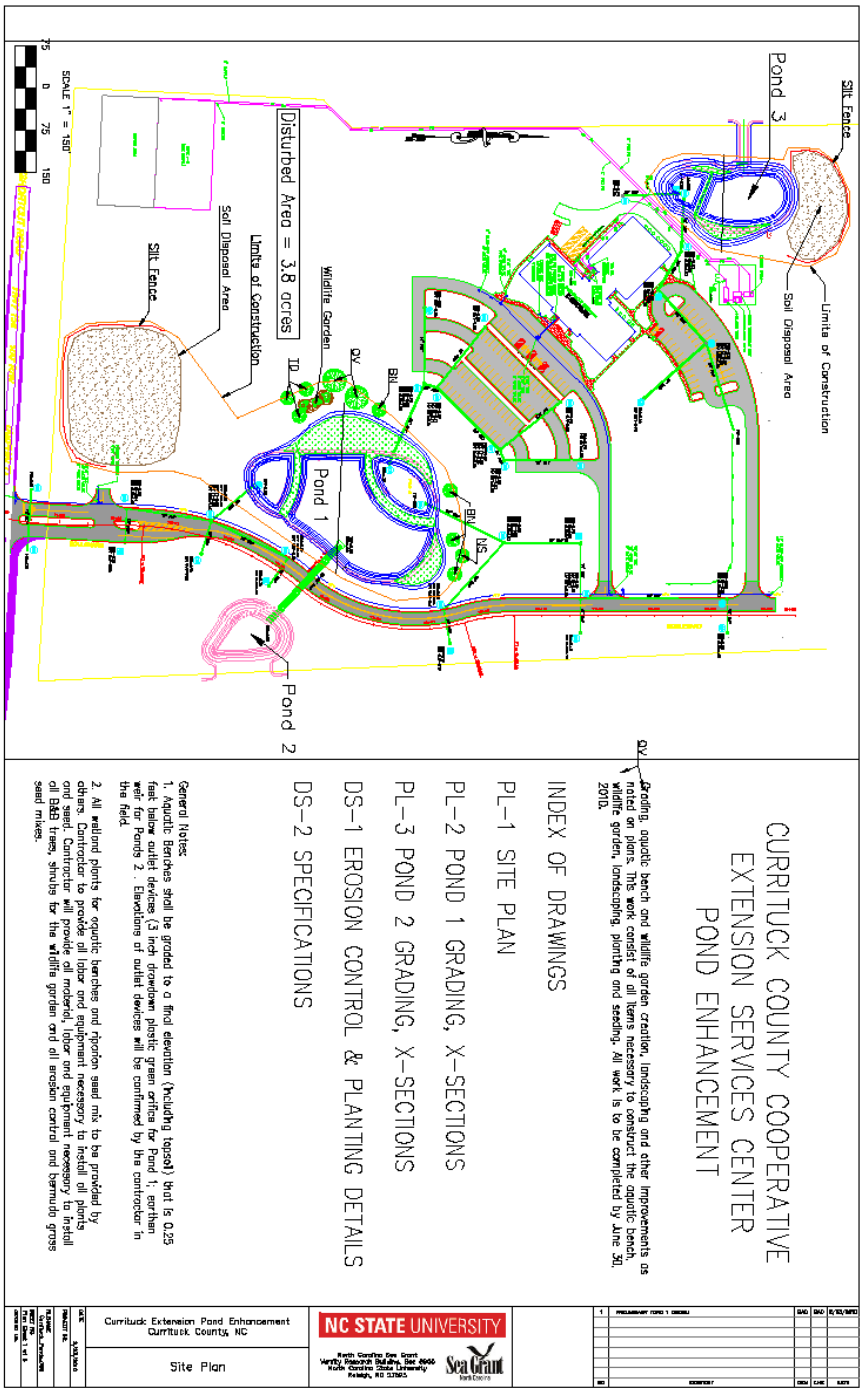
Although outside the timeframe of this grant, the garden was planted on October 23 and photographs of the planting and end product are included in Exhibit G.

Educational Activities

This project was featured at the "Leadership Training: Growth and Sustainability Strategies" course held at the Cooperative Extension Facility on May 6. Robert McLendon from UNC-CSI and Gloria Putnam talked about the project and led the group outside for a first-hand look at the pre-retrofit condition of the ponds (Exhibit F). Thirty-eight local government staff and officials attended this day long leadership training to increase their ability to initiate or become more effectively involved in water quality protection or restoration efforts. Representatives were from seven different towns and four different counties.

Currituck County's Soil and Water Conservation Office provided a tour of the retrofitted ponds on August 12 to twenty-eight Albemarle District Soil and Water Conservation Supervisors and staff. Currituck County's Public Information Office interviewed Barbra Doll and BAE staff about the project in August while they were onsite. They discussed the overall goals of retrofitting the ponds and the purpose of the water quality samplers being installed. The interviews and footage of the pond retrofit will be aired on the county's government access television channels. Information was also posted on the county website and distributed in an electronic newsletter. A feature story about this project will appear in the Holiday Issue of Coastwatch, and the NCSU College of Agriculture and Life Science's Perspective magazine will run a story on it this fall/winter.

EXHIBIT A: Pond 1 and 3 Retrofit Site Design



CURRITUCK COUNTY COOPERATIVE EXTENSION SERVICES CENTER POND ENHANCEMENT

QV Grading, aquatic bench and wildlife garden creation, landscaping and other improvements as noted on plans. This work consist of all items necessary to construct the aquatic bench, wildlife garden, landscaping, planting and seeding. All work is to be completed by June 30, 2010.

INDEX OF DRAWINGS

PL-1 SITE PLAN

PL-2 POND 1 GRADING, X-SECTIONS

PL-3 POND 2 GRADING, X-SECTIONS

DS-1 EROSION CONTROL & PLANTING DETAILS

DS-2 SPECIFICATIONS

General Notes:

1. Aquatic Benches shall be graded to a final elevation (including topsoil) that is 0.25 feet below outlet devices (3 inch drawdown plastic green orifice for Pond 1; gurthan weir for Ponds 2 . Elevations of outlet devices will be confirmed by the contractor in the field.

2. All wetland plants for aquatic benches and riprap seed mix to be provided by others. Contractor to provide all labor and equipment necessary to install all plants and seed. Contractor will provide all material, labor and equipment necessary to install all B&B trees, shrubs for the wildlife garden and all erosion control and bermuda grass seed mixes.

NO	DESCRIPTION	DRAWN	CHKD	DATE
1	PRELIMINARY POND 1 DESIGN	DAD	DAD	8/25/2010

Currituck Extension Pond Enhancement
Currituck County, NC

Site Plan

NC STATE UNIVERSITY
North Carolina Sea Grant
Veterinary Research Building, Box 8605
North Carolina State University
Raleigh, NC 27695

Sea Grant North Carolina

Exhibit B: Pond #1 During Grading and Planting

After Excavation and Prior to Plant Installation

Forebay and Newly Planted Wetland Bench

Exhibit B: continued . . . Pond #1

Wetland Plant Plugs Immediately After Installation

Native Plant Bed Tilled, Amended, and Mulched

Exhibit B: continued . . . Pond #1

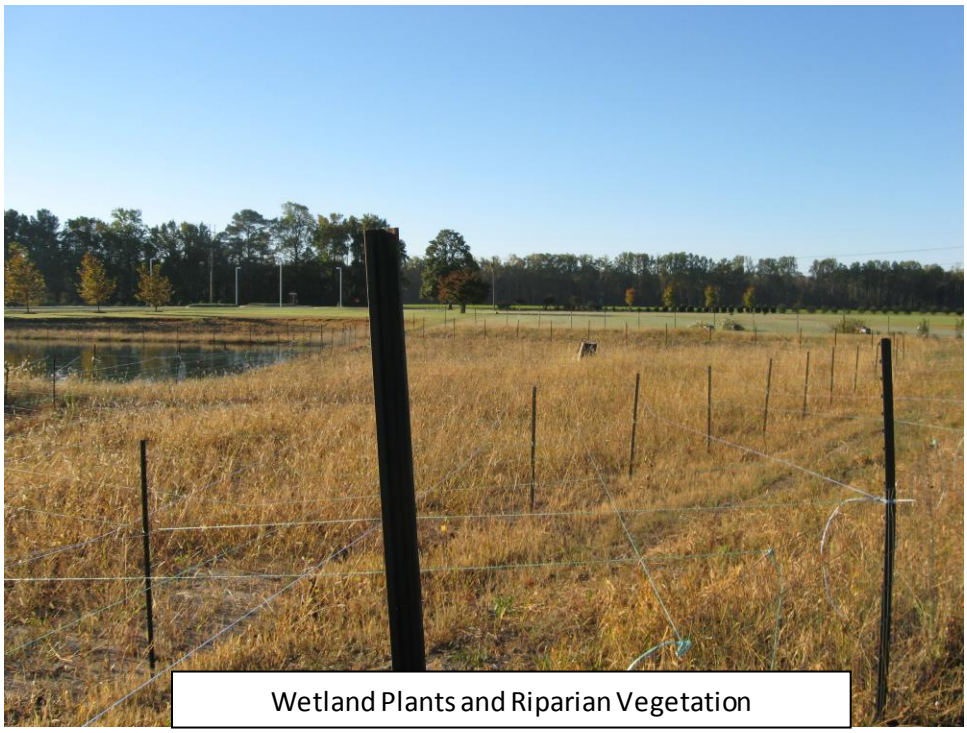
Goose Exclusion Fencing

Exhibit C: Pond #3 (Rear Pond) During Construction/Grading in July 2010

Partially Excavated Wetland Bench

Exhibit D: Pond #1 October 23, 2010

Water Quality Monitoring at Inflow



Wetland Plants and Riparian Vegetation

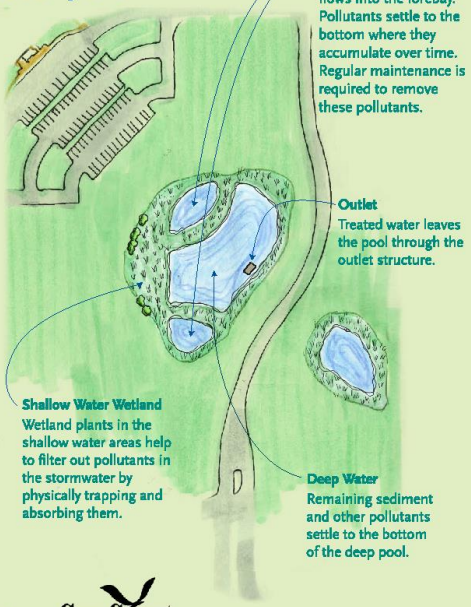
EXHIBIT E: Educational Sign Installed on Site

LANDSCAPING FOR WATER QUALITY
IN CURRITUCK COUNTY

Shallow water wetlands improve water quality treatment of existing stormwater pond

This stormwater pond was physically reconstructed to improve the quality of stormwater leaving this developed property. Soil was removed around the perimeter of the pond and plants were installed to create a shallow water wetland. Native plants also were incorporated along the shoreline. This vegetation increases the pollutant-removal capacity of the stormwater pond.

When it rains, water runs off the surrounding rooftops, roads and parking lots. This excess water is called stormwater runoff. Stormwater runoff picks up pollutants such as sediment, oil, antifreeze, brake dust, fertilizer and pesticides and can flush them into local waterways. Water from this property flows into the headwaters of the North River, which in turn drains into the Albemarle Sound. Best management practices (BMPs) like this pond are designed to capture and treat the runoff water before it leaves the property.



Forebay
Stormwater runoff first flows into the forebay. Pollutants settle to the bottom where they accumulate over time. Regular maintenance is required to remove these pollutants.

Outlet
Treated water leaves the pool through the outlet structure.

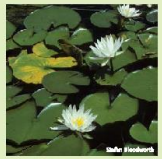
Shallow Water Wetland
Wetland plants in the shallow water areas help to filter out pollutants in the stormwater by physically trapping and absorbing them.

Deep Water
Remaining sediment and other pollutants settle to the bottom of the deep pool.

Before wetland enhancement, the pond provided minimal water quality treatment and aesthetic value.

The addition of plants and wetlands transform the treatment pond into a more natural landscape feature. Native wetland plants not only provide water quality benefits, but can add beauty and color to the landscape. They also attract beneficial insects and amphibians such as dragonflies, damselflies and frogs that eat mosquitoes.

Lizard Tail
Saururus cernuus



Fragrant Waterlily
Nymphaea odorata

Pickerel Weed
Pontederia cordata

Arrow Arum
Peltandra virginica

Pinewoods Treefrog
Hyla femoralis

Damselfly
Odonata

Duck Potato
Sagittaria latifolia

NC Cooperative Extension

Sea Grant North Carolina
UNC-SG-10-05

Sign design format courtesy of the City of Raleigh

Exhibit F: Tour of Pond on May 6, 2010 (Pre-retrofit)

Exhibit G: "Wildlife Garden" - October 23,2010

Master Gardener's and Others Installing Plants

Exhibit G: continued wildlife garden, etc

Edge of Wildlife Garden, Retrofitted Pond, and Educational Sign