COMMUNITY-BASED WATERSHED PLANNING IN THE KINGSTON LAKE WATERSHED OF NORTHEASTERN SOUTH CAROLINA

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Abstract. A community-based effort at watershed management is being conducted in the Kingston Lake Watershed (HUC 0304020608). This drainage basin is 130 mi^2 and has three subwatersheds. It is located in the Waccamaw River subbasin in northeastern South Carolina. Land use has been shifting from agricultural to residential, accompanied by rapid development fueled by population growth. The major threats to environmental quality in this watershed are from polluted stormwater runoff and habitat loss. Coastal Carolina University's Waccamaw Watershed Academy (WWA) has taken the lead in directing watershed planning and implementation efforts. Initial funding was provided by a Wetland Program Development grant from US EPA Region IV. Planning activities have included: (1) development of a baseline assessment report, (2) a field assessment overseen by the Center for Watershed Protection, (3) a random mail survey of the community, (4) and development of a habitat assessment plan with financial support from the USFWS. Implementation activities include: (1) initiation of a restoration project based in an urbanized stream, (2) upgrades in city and county stormwater ordinances, (3) updates of the natural resource and land use elements in city and county comprehensive plans, (4) establishment of a volunteer monitoring program, (5) extension of regulatory-level biotic and water quality monitoring, and (6) development of a watershed runoff forecasting model (N-SPECT) in partnership with NOAA's Coastal Services Center and Clemson University's Strom Thurmond Institute. Much of this progress was effected by an intensive program of watershed education conducted jointly with the Coastal Waccamaw Stormwater Education Consortium.

INTRODUCTION AND BACKGROUND

The Waccamaw Subbasin has been targeted for watershed planning due to the rapid pace of development in this biologically unique and relatively pristine blackwater river system. The Subbasin lies within the Pee Dee Basin and falls within the jurisdiction of four coastal counties, Horry and Georgetown in South Carolina and Columbus and Brunswick Counties in North Carolina (Figure 1). This subbasin contains the Waccamaw River, which flows entirely within the coastal plain and empties into the Atlantic Ocean at Winyah Bay. The latter is the third largest estuary in terms of discharge on the eastern USA coastline. The only city on the river, Conway, is located in Kingston Lake Watershed (KLW) and lies within Horry County (Figure 2). This county has experienced a 36.5% increase in population between 1990 and 2000 with another 71% increase projected for 2000-2025.[1] Current research indicates that the rate of land development is about three times faster than that of population growth.

According to the U.S. Fish and Wildlife Service, 44% of Horry County is covered by wetlands with another 2% in

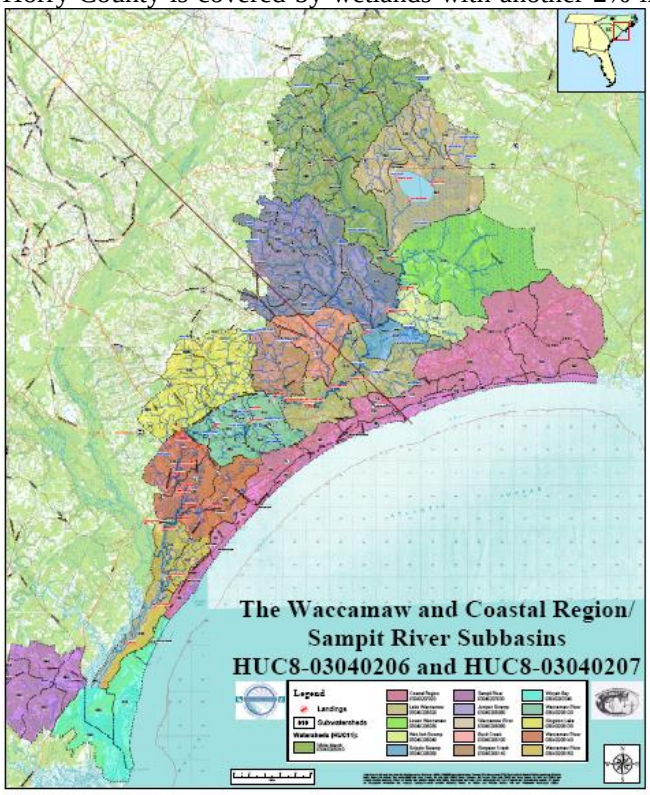

Figure 1. The Waccamaw and Coastal Region Subbasins showing their HUC-14 watersheds. The KLW is yellow.

open water.[2] Most of these wetlands are lowland swamps that border the Waccamaw and Pee Dee Rivers. .

The watershed planning initiative focuses on KLW (HUC 03040206-08), which is one of the twelve watersheds in the basin (Figure 1). KLW is comprised of 83,448 acres with 184 stream miles and has a population of about 23,000 (Census 2000). It has been delineated into three HUC14 subwatersheds by the US Geological Survey (Figure 3). The subwatershed that contains most of the City of Conway has several sites on the federal 303(d) list of impaired water bodies. The listings are for water quality problems caused by high levels of fecal coliforms and low dissolved oxygen concentrations.[3] Based on work conducted by the lead author from 1999 to 2002 as part of a US EPA 319 project, problems with turbidity and nutrients have also been documented.[4] Water quality problems were observed during both dry and wet weather flows. At the conclusion of the US EPA 319 project, Coastal Carolina University's Waccamaw Watershed Academy (WWA) hosted a community workshop to gauge interest in addressing these and similar problems throughout the Waccamaw Basin using the US EPA's watershed approach.[5] This workshop, entitled "Coastal Development and Watershed Planning: Collaborative Problem Solving to Protect Water Resources", was held in November 2003 and attended by approximately 100 stakeholders.[6]

The stakeholders at the workshop identified watershed planning as a top priority. The external training consultant, the Center for Watershed Protection (CWP), recommended developing a single watershed plan that could be used as a model for the other eleven watersheds in the Waccamaw basin. KLW was selected for the model plan because it is: (1) on the federal 303(d) list, (2) an upstream source of pollutants covered by a total maximum daily load (TMDL), (3) the subject of a successful US EPA 319 Program project, (4) covered by an NPDES Phase II stormwater permit, and (5) located in an area undergoing rapid development.

The WWA took the lead in acquiring funding from the USEPA to begin the watershed planning efforts. US EPA Region IV targeted this project for funding through a Wetland Program Development grant because of their interest in building capacity in the local community for watershed planning efforts. Prior to this project, watershed planning had not been conducted in northeastern South Carolina nor did the state have an estuary in the National Estuary Program. Funding was awarded in June 2005 for a period of four years. In addition to matches provided by the project collaborators, additional funding has been supplied by Horry Telephone, Inc. and the International Paper Company.

The project partners include: the City of Conway, Horry County, the Waccamaw Riverkeeper (Winyah Rivers Foundation), SC Department of Health and Environmental Control's Bureau of Water and Office of Ocean & Coastal Resource Management, the Waccamaw Regional Council of Governments, US Fish and Wildlife Service's Coastal Program, Earthworks (a locally based environmental engineering company), the Natural Resources Conservation Service, the Winyah Bay Focus Area Task Force, the SC Sea Grant Consortium, the North Inlet-Winyah Bay National Estuarine Research Reserve's Coastal Training Program, the Center for Watershed Protection, and the South Carolina Water Resources Institute.

GOALS AND OBJECTIVES

The goal of the ongoing Wetland Program Development grant has been to: (1) generate a holistic, partnership-based watershed plan for KLW with special emphasis on its urban subwatershed (HUC14 03040206130-030) and (2) craft this plan such that it will serve as a model for generation of similar plans throughout the 1.243-million acre Waccamaw Basin (North and South Carolina). In addition to creating a template for future plan development, local capacity for further watershed protection was to be generated by: (1) creating guidance documents and web-based GIS resources for use throughout the basin and (2) training and supporting key personnel who would then be available to assist with development of plans throughout the basin.

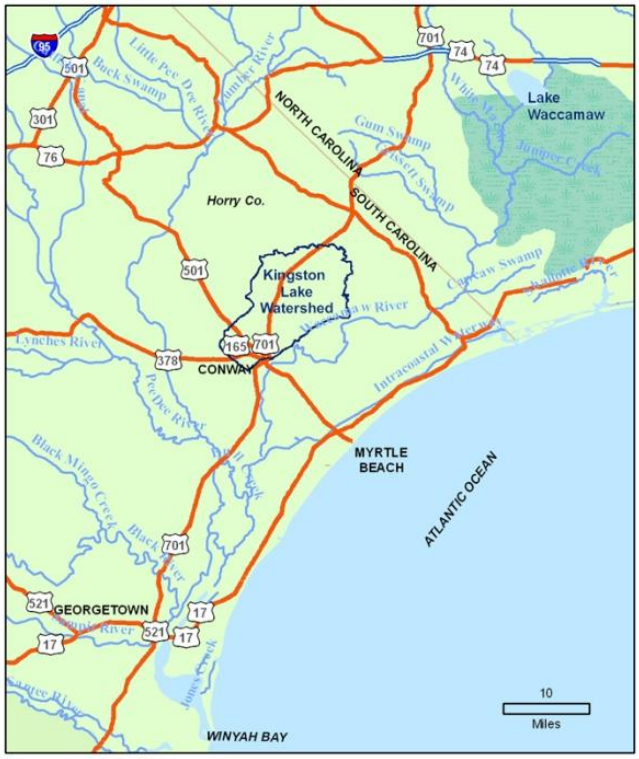

Figure 2. The Kingston Lake Watershed

ACTIVITIES AND ACCOMPLISHMENTS

The following activities have been undertaken to date:

(1) A web and paper-based survey of watershed attitudes and knowledge was sent out to 1200 randomly selected residents in KLW and 1200 randomly selected residents in a "control" watershed. Pre-project results were used to identify stakeholder interest in specific watershed protection activities and willingness to pay for these. A post-project survey will be administered to document changes in attitude and knowledge.

(2) CWP assisted local stakeholders in conducting a field survey of watershed conditions and retrofit opportunities. Using CWP's Unified Subwatershed and Site Reconnaissance and Unified Stream Assessment,[7,8] the field work was a galvanizing experience for the participants and led to prioritization of a restoration effort in the urban subwatershed.

(3) A baseline assessment report has been prepared summarizing watershed conditions. A major finding was the pervasive system of ditches has increased the natural linear stream miles by a factor of 7 in the urban subwatershed. An example is Crabtree Canal, which was created in the mid 1960s by the US Army Corps of Engineers by cutting a channel longitudinally through Crabtree Swamp (Figure 4).

(4) The City of Conway's Water Quality and Drainage Commission led the formation of a watershed stakeholder group by establishing a special task force, Project Klean (Kingston Lake Environmental Awareness Network), to focus on restoration of the urban subwatershed. A critical outcome of this effort was the adoption of a Memo of Understanding between the City of Conway, Horry County, the Crabtree Swamp Watershed Conservation District and the Horry County Soil and Water Conservation District to work together to remediate the impaired water bodies in the urban subwatershed, i.e., Crabtree Canal and Kingston Lake.

(5) CWP has worked with the city and county to perform a code and ordinance audit to identify opportunities for improvement of stormwater quality and quantity controls. The resulting recommendations have been used to update stormwater ordinances, land development regulations, comprehensive plans, and greenway and Parks and Open Space plans in both Horry County and the city of Conway.

(6) Due to work demand on the project, a professional watershed planner was hired in 2005.

(7) A volunteer water quality monitoring program was established to increase public awareness and assist with illicit discharge detection. The program is being run by the WWA's Environmental Quality Lab in partnership with the Waccamaw Riverkeeper using EPA quality assurance and quality control protocols developed for volunteer monitoring groups.[9] At present 12 sites are being sampled bimonthly by 30 trained volunteers. The results are being served to the public through the WWA's website.[10] Continued funding is being provided by the City of Conway, Georgetown County and Horry County as this program helps meet their NPDES Phase II Stormwater Program requirements.

(8) NOAA's Coastal Services Center is partnering on a demonstration of their new outreach product, Nonpoint Source Pollution and Erosion Comparison Tool (N-SPECT), to create a runoff model for KLW.[11] The model helps visualize potential changes in pollutant loadings as a result of selected growth scenarios. These scenarios were generated by one of the project collaborators, the SC Water Resources Institute (Dr. J. Allen).

(9) To guide the design of restoration projects in Crabtree Canal, a sediment transport model has been developed by A. Jayakaran (Clemson) in partnership with CCU's EQL. Funding was provided by the SC Water Resources Institute.

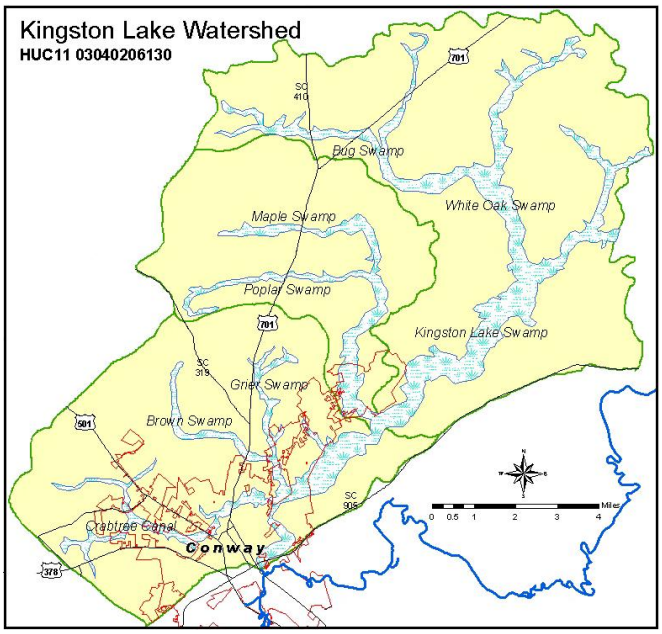

Figure 3. Subwatersheds in the Kingston Lake Watershed. The red outline is the city boundary of Conway. The blue areas are lowland swamps.

(10) Supplemental water quality monitoring has been funded by the city of Conway and Horry County to augment the monthly ambient stream sampling conducted by SC DHEC and the information provided by USGS water quality sensors and gaging stations in Crabtree Canal and the mainstem of the Waccamaw River. Several intensive surveys were also conducted during dry and wet weather to identify land-based sources of fecal coliform, oxygen demand and sediment throughout the Crabtree Swamp system. SC DHEC and SC DNR have also

conducted macrobenthic invertebrate assessments within streams in KLW.

(11) Funding from the USFWS's Coastal Training Program enabled development of a habitat assessment map designed to guide selection of parcels for conservation/preservation.

The lead PI is a founding member of the Coastal Waccamaw Stormwater Education Consortium, which serves Horry and Georgetown Counties, providing assistance to the local communities in complying with the NDPES Phase II Stormwater Program requirements for public education and involvement.[12] This connection provides an opportunity to communicate the progress of the KLW project to people residing in the other watersheds of the Waccamaw Subbasin.

CONCLUSIONS AND FUTURE PLANNING

The watershed management plan for KLW is scheduled to be completed in the spring of 2009. Immediately prior to this, the stratified random survey will be re-administered to evaluate knowledge and attitude changes in the population living in KLW. The results will be compared with the pre-project survey to test for significant change.

Although the plan has not been finalized, work has begun on several action items, most notably a floodplain restoration project along the banks of Crabtree Canal to be conducted during fall 2008. Funding for earthworks has been provided by the City of Conway and Horry County with re-vegetation covered by the USFWS. The Waccamaw River volunteer water quality monitoring program will expand into North Carolina under the aegis of Southeastern Community College (Whiteville, NC).

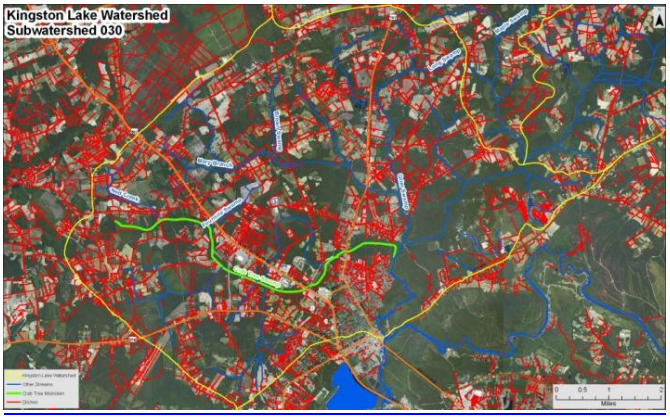

Figure 4: Hydrological Features in the urban subwatershed of KLW. Manmade features (drainage ditches) are red, natural streamlines are blue, and the channelized portion of Crabtree Swamp, aka Crabtree Canal, is in green.

Notable outreach to other watersheds include volunteer water quality monitoring in Murrells Inlet, watershed planning in Sterritt Swamp, a tributary to the Waccamaw River, and watershed planning in Withers Swash in Myrtle Beach.

ACKNOWLEDGEMENTS

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