Tick Creek Factsheet #1
NC Ecosystem Enhancement Program's 2005 Local Watershed Plan

Introduction

A group of partners coordinated by Watershed Education for Communities and Officials (WECO) at NC State University is using a US Environmental Protection Agency (EPA) grant to help restore aquatic ecosystems in the Tick Creek watershed. This team is reviewing existing data, identifying information needs, and identifying and implementing watershed improvement projects. The NC Ecosystem Enhancement Program (EEP), a non-regulatory program within the NC Department of Environment and Natural Resources, sponsored a Local Watershed Plan (LWP) in the Rocky River watershed that includes Tick Creek. The purpose of the planning process was to assess the health of the Rocky River and its tributaries, develop protection and improvement recommendations for the LWP area, and identify watershed protection and restoration projects. Watershed assessments included stream monitoring of water quality and biology by NC Division of Water Quality. Final recommendations are reflected in a "Targeting of Management Report" produced by Tetra Tech, Inc., a technical consultant to the project. This Fact Sheet summarizes the results of this work for the Tick Creek watershed. EEP's documents are posted on the Tick Creek /Rocky River project website at www.ncsu.edu/weco/rocky

About Tick Creek

EEP selected the Upper Rocky River watersheds, including Tick Creek, as high-priority areas for planning due to documented water quality and aquatic habitat problems in selected stream segments, and ongoing threats to local watershed health which may be attributed to impacts from urban/suburban development, clearing of riparian buffers, agricultural activities and or other nonpoint sources. The Rocky River LWP area is a part of the upper Cape Fear River Basin encompassing three 14-digit hydrologic units and totaling an area of about 177 square miles. The three hydrologic units are the Upper Rocky River, the Middle Rocky River, and Bear Creek. The study area comprises a portion of the upper Rocky River main stem and its tributaries which include North Prong Rocky River, Greenbrier Creek, Nick Creek, Loves Creek, Varnell Creek, Meadow Creek, Tick Creek, and Bear Creek. Approximately 90 percent of the study area, including Tick Creek, is located in western Chatham County.

Tick Creek is about 10 miles long and flows into the Rocky River. The land around Tick Creek is used for farming. Tick Creek is classified by DWQ as Class C waters, meaning it should support aquatic life propagation and maintenance of biological integrity. Class C is the minimum designation standard for all freshwaters in North Carolina. Due to a Fair fish

Figure 1: Tick Creek at Bonlee

community rating, Tick Creek was included on NC DWQ's 2004 list of impaired waters (i.e., 303(d) list), meaning Tick Creek does not meet its designated use of supporting aquatic life. Tick Creek remains on the DWQ's most recent 2008 list of impaired waters.

Watershed Assessment Methods and results

During the LWP, EEP gave subwatersheds draining to Tick Creek identification labels from MR17-MR22. Then, EEP used existing data to complete a preliminary analysis of all watersheds and a plan for completing a more detailed assessment of the LWP. The detailed assessment included risk assessment of streambank erosion. Selected stream sites were then evaluated in the field using the BEHI method to correlate the model results to actual field conditions. Additionally, DWQ conducted water quality monitoring and aquatic habitat assessments. Watershed modeling was used to estimate nutrient loading, sedimentation and erosion. The results of these activities were used to characterize likely sources of stream degradation, identify stream reaches in need of attention, and locate high quality habitat worth preserving through voluntary means.

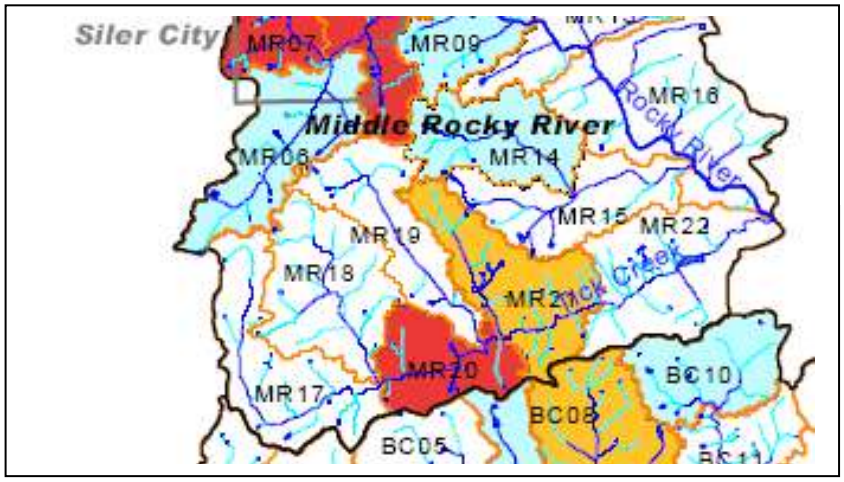

Figure 2: Tick Creek subwatersheds were labeled MR17-MR22. All subwatersheds were ranked for restoration priority, and then shaded to reflect relative priority. The highest priority is ranked 11.

Bank Erosion Hazard Index

Stream bank erosion contributes significantly to excess stream sediment loading, particularly in the North Carolina Piedmont, where local soils are highly erodible. The Bank Erosion Hazard Index or BEHI, is a way to measure erosion, as it has been correlated with measured annual stream bank erosion rates. The higher the BEHI value, the higher the erosion potential.

BEHI scores were calculated at 5 sites in the Tick Creek watershed. BEHI values for Tick Creek were high in Subwatershed MR17 at 3 sites; Joe Brown Road, and Maple Spring Lane,with scores of 32.7 and 32.8, very high/extreme on Petty Road with a score of 44.9. Moderate BEHI values were recorded on Al Davis Road(Subwatershed MR20) and Rives Church Road(Subwatershed MR22) with scores of 28 and 23.8, respectively. Sites that scored in the BEHI classes of high, very high or extreme tended to be located in pastures where cattle had access to the stream. These streams were characterized as having very little riparian vegetation and trampled banks.

Biological Sampling and water quality monitoring

In Tick Creek, DWQ sampled fish and benthic (stream bottom) macro invertebrate communities prior to the EEP study and, during the LWP, they monitored physical and chemical conditions at the Tick Creek /US 421 crossing from August 2004- February 2005.

Benthic macro invertebrate samples collected from two sites on Tick Creek received "Good-Fair" ratings from their most recent sampling event, and the habitat score at the SR 2120 station reflected adequate benthic habitat quality. Tick Creek had a decline in fish diversity from "Excellent" in 1994 to "Fair" in 2003. Of the 13 sites in the entire study area surveyed for bioclassifications, Loves Creek and Tick Creek were the only sites with any historically low classifications. Loves Creek and Tick Creek also had the lowest habitat scores in the study area. Tick Creek had a score of 69 out of a possible 100 at the SR 2120 site, with severe bank erosion and bank trampling from cattle evident. Middle Tick Creek was identified as one of the subwatersheds in the EEP study area with the highest stream bank stress levels. Agricultural activities were identified as the primary source of the stressors.

Elevated levels of fecal coliform bacteria, phosphorus, sediment, aluminum, copper, and iron were observed in Tick Creek during storm flows. High levels of aluminum, iron, and fecal coliform bacteria were also found in baseflows. The other parameters measured were within normal benchmark ranges for both baseflow and stormflow. All monitoring results are in Table 3.9, Appendix B of the report.

Conclusions

EEP identified the primary water quality issue in Tick Creek as sediment loading from mostly stream bank but also upland erosion. Both sediment sources are linked to agriculture and pasture management issues, the dominant land use in the watershed. Developed areas, while limited in the watershed, also contributed to stream bank erosion due to increased flows. Nutrient loading (phosphorus loading during storm events was observed in Tick Creek) to streams is a second issue of concern in areas receiving land application of chicken manure and in areas where cattle deposit manure onto pastures and directly into stream. Fecal coliform bacteria loading from both chicken and cattle manure is a third issue of concern. As a typical Slate Belt watershed, low flows were commonly observed during periods of drought. These low flows can exacerbate issues that arise from pollutant impacts as well as reduce available aquatic habitat. Finally, field inspections and GIS analysis revealed several stream segments that were severely degraded and in need of restoration.

Recommendations for Tick Creek

Two risk stressors that need to be addressed are stream bank stability and upland sediment delivery from agricultural land disturbance and from the post-construction impacts development. Strategies to improve pollutant loading from development include effective site design, erosion, and sediment control regulations and peak flow control requirements.

Stream bank stability and increased sediment runoff currently threaten watershed functions. Loss of the functions means loss of things that people in the community care about and value. Increased sedimentation and erosion, upland sediment, and nutrient delivery means decreased water quality, aesthetic impacts to the streams and steams corridors through people's land, increased flooding problems, loss of water supply storage capacity in the reservoirs due to sediment buildup, and increased eutrophication in the water supply reservoirs.

In the rural sub watersheds, existing degradation is often a function of current or past agricultural practices, whereas in urban areas the impacts of development are associated with loss of forest cover, increased imperviousness, and increases in storm water runoff and nonpoint source pollutant loads.

Tetra Tech conducted an analysis of rural BMP cost-effectiveness using BMP systems rather than individual BMPs, since BMPs are typically used in combinations to mitigate on-farm loss of soil and nutrients. Human land use consists primarily of pastureland, hay field, and poultry operations with some small areas of row crop production. BMPs analyzed included:

- Cattle exclusion/alternate watering
- Stream stabilization/restoration
- No-till cropping
- Conservation cropping
- Nutrient management (waste storage, application, mortality disposal)
- Pest management

The cost of implementing management systems is of utmost importance to actual realization of reductions in stressor loads to streams in the study area. The BMP systems and cost-effectiveness analyses are described in detail in Tetra Tech's Detailed Assessment and Targeting of Management Report.

Any construction site with land disturbance greater than one acre requires a plan for and control of sedimentation and erosion. Proper implementation of this plan is needed to prevent damage to Tick Creek from removal of topsoil and organic matter, reshaping the lay of the land, exposing subsoil to precipitation, failure to control sediment at the source onsite, allowing gullies to form, and improper removal of vegetation, particularly near streams.

The general categories of urban storm water BMPs are infiltration, retention, filtering and detention. Storm water BMPs function to improve water quality and reduce peak runoff volume. The factors that degrade watershed functions are peak storm flows associated with increasing amounts of imperviousness, excess sedimentation, and excess nutrient loading. Storm water BMPs that address these factors includes storm water and pocket wetlands, wet detention ponds, grass swales and bioretention facilities. Tetra Tech recommends that local governments encourage developers to follow low-impact storm water design principles for high density and rural, low density areas. Almost all developable land in the Rocky River study area has high soil erosion potential and medium-to-high upland sediment delivery potential.

Potential watershed improvement projects in Tick Creek

Due to the large study area of the Rocky River watershed, EEP ranked and selected subwatersheds with the highest calculated risk for nutrient and sediment loading and bank erosion, and then identified specific projects within these subwatersheds for their management plan. Two subwatersheds in Tick Creek were chosen as high priority, including Welch Creek and the middle main stem of Tick Creek. These subwatersheds are identified as MR20 and MR21 in the EEP report. It identified the following potential management activities in those 2 subwatersheds:

- 9,500 linear feet of stream management (cattle exclusion, stream stabilization, stream restoration)
- 730 acres of pasture BMPs
- 750 acres of cropland BMPs
- 150 acres of high priority for voluntary preservation

Stream management projects were also identified in other stream reaches of Tick Creek watershed, but EEP only calculated the potential improvements in nutrient removal and sedimentation/erosion reduction in the MR20 and MR21 subwatersheds. If all the identified projects are implemented in MR20 and MR21, the following reductions are projected: 618 lb/year or 18% of phosphorus loading; 1,713 lb/yr or 15% of nitrogen loading; and 566 tn/year or 33% of bank erosion loading.

EEP identified and ranked land that they consider the best aquatic habitat in the study area and therefore worth preserving. This land occurs in the 100-year floodplain or within 300 feet of streams, and contained a minimum of 1,000 linear feet of stream or 7 acres. Highest priorities included bottomland hardwood and swamp forest, floodplain forest, shrub habitats and early successional habitat. Land was identified throughout the Tick Creek watershed.

For more information about EEP's Upper Rocky River LWP, please contact Mike Herrmann (Email: michael.herrmann@ncdenr.gov, phone (919)715-5458).

Sources:

Upper Rocky River Local Watershed Plan Preliminary Findings Report. Feb. 2005. NC Ecosystem Enhancement Program, prepared by Tetra Tech, Inc.

Upper Rocky River Local Watershed Plan Detailed Assessment and Targeting of Management Report. June 2005. NC Ecosystem Enhancement Program, prepared by Tetra Tech, Inc.