

Cathey's Creek Critical Area Report Summary for the Technical Advisory Committee

February 7, 2005



1.0 INTRODUCTION

This summary of the Critical Area Analysis report highlights the findings of the water quality and biological monitoring and field assessment activities in the Cathey's Creek watershed. The monitoring and field assessment strategy was guided by the findings of the GIS-based Initial Watershed Characterization submitted by Earth Tech in February 2004. The critical area analysis was designed to further elucidate the causes of functional degradation in the watershed and determine the critical areas for focusing future watershed management and restoration efforts.

Three sub-watersheds will be chosen for further study by the Technical Advisory Committee at a meeting in February based on the data and results presented in the Critical Area Analysis report. Detailed restoration plans for these three sub-watersheds, including site-specific recommendations, will then be developed and presented in a Solution Identification Plan.

Summary Results of the Initial Watershed Characterization: The Initial Watershed Characterization for Cathey's Creek used geographic data such as such as land cover, soils, terrestrial habitat, and hydrography, water quality and aquatic community data, interviews, and visual observations to estimate the relative impacts to watershed functions from past and current land use practices. The Cathey's Creek watershed was divided into 14 sub-watersheds which allowed the analysis to isolate localized sources of pollution or degradation for each tributary to Cathey's Creek. These sub-watershed were ranked and classified using a system described in the Initial Watershed Characterization which evaluated indicators for three major watershed functions: watershed quality, hydrology, and habitat. Based on the results of this analysis, each subwatershed was assigned a functional status of High, Medium or Low. The attached map (Figure 1) illustrates the sub-watershed divisions used in this study.

The functional degradation concerns identified in the Initial Watershed Characterization are summarized as follows:

Water Quality

- Water quality monitoring results consistently indicate stressed stream biota
- Urban runoff and sediment are suspected causes of degradation
- Spindale Waste Water Treatment Plant (WWTP) discharge
- Possible mercury contamination from historic mining operations

Hydrology

- Historic mining and farming practices have altered stream morphology resulting in reduced ability to handle peak flows in a stable manner
- Straightened, entrenched streams seeking equilibrium are remeandering and causing in-channel erosion
- Increased impervious surface, loss of forest cover, and changes to soil permeability in upland areas have caused increased runoff volumes and peak flows
- Flood control lakes have altered sediment balance

Habitat

- Straightened and entrenched streams lack aquatic habitat variety
- Increased sediment load and sandy substrates create hostile environment for aquatic species

- Terrestrial habitat is threatened by deforestation and fragmentation
- Species richness is low and exotic species are common
- Flood control lakes have impacted downstream biological communities

Overview of the Field Assessment: The Initial Watershed Characterization indicated areas of probable decline in watershed function when compared to reference or least-impacted watershed conditions. The purpose of the field assessment was to verify the findings of the Initial Watershed Characterization by observing and evaluating indicators of watershed functions at specific sites across the Cathey's Creek watershed. Field assessment tools including stream walks to evaluate floodplain land uses and buffer and stream bank condition, streambank erosion measurements, fish community surveys, and water quality monitoring. Figure 1 on page 9 shows the locations of the field sites and monitoring locations. A more detailed description of methods used in the detailed field assessment will be available for review at www.ces.ncsu.edu/WECO/catheys/ (in the Critical Areas Report).

The following objectives for further investigation were selected, with assistance of the Advisory Committee, to address the watershed functional deficiencies and concerns identified through the GIS analysis:

- Assess the sources, severity, and causes of sedimentation and erosion
- Assess causes and severity of habitat degradation
- Assess impacts of urban runoff on watershed functions
- Evaluate the Spindale wastewater treatment plant discharge to determine its contribution to water quality degradation
- Assess the potential mercury contamination from historic gold mining operations
- Identify the most critical areas for stream stabilization and restoration, best management practices and other watershed improvement efforts

The data collected from the detailed assessment was used to refine the preliminary ranking outlined in the Initial Watershed Characterization. Critical areas were identified where functional deficiencies are the greatest and where implementation of watershed improvements such as stream or wetland restoration and best management practices will have the greatest impact on water quality and watershed functions.

Table 1 shows how indicator scores for subwatersheds were calculated using data collected in the assessment.

Table 1. Indicators of Functional Degradation for Subwatersheds

INDICATORS OF FUNCTIONAL DEGRADATION FOR SUBWATERSHEDS
<i>Erosion</i> = (Near Bank Stress + Bank Erosion Hazard Index) / 2
<i>Sedimentation</i> = (Bottom Substrate + Pool Variety + Riffle Habitats) / 3
<i>Habitat Degradation</i> = (In-Stream Habitat + Light Penetration) / 2
<i>Channel Integrity</i> = (Channel Modification + Bank Stability and Vegetation) / 2
<i>Buffer Quality</i> = (Buffer Type + Riparian Vegetative Zone Width + % Stream Length Adequately Buffered) / 3
<i>Landscape Quality</i> = (% Pervious Cover + Adjacent Landscape Type) / 2

Overall scores for the subwatersheds (SWs) were calculated by averaging all the indicator scores. These overall scores were used to classify them into three relative levels of function, which refer to the level at which a watershed is performing its ecological functions: High, Moderate, and Low. The sub-watershed status classification results from the Initial Watershed Characterization and also from the field assessment were as follows:

Table 2. Initial Watershed Characterization Ranks vs. Field Assessment Ranks

	Initial Watershed Characterization	Field Assessment
HIGH	02, 03, 10	02, 03, 04, 05
MODERATE	01, 04, 05, 06, 07, 11, 12, 14	01, 06, 07, 12
LOW	08, 09, 13	08, 09, 10, 11, 13, 14

When a subwatershed held the same ranking following the field assessment, evidence is strong that the ranking is accurate (these SWs are highlighted in bold). Figure 2 on page 10 illustrates the subwatersheds shaded according to their rankings, with recommended focus areas highlighted.

2.0 SUMMARY OF RESULTS/CONCLUSIONS FROM FIELD ASSESSMENT

Sediment and erosion, and relation to instream habitat degradation:

The subwatersheds with the worst sediment impacts (sedimentation?) and habitat degradation are mainly in the lower end of the watershed, whereas the worst erosion is in the upper end. This seems to indicate that a source of sediment in the lower reaches is from eroding banks in the upper and middle reaches of the watershed. Restoration projects that reduce streambank erosion in headwater streams and soil erosion from cleared areas including fields, pastures, and forestry operations are critical to improving instream habitat in the lower reaches of Cathey's Creek.

The assessment showed that sedimentation is a significant problem throughout the Cathey's Creek watershed. Fish monitoring results from Hollands and Catheys Creeks indicate that fish were more abundant and diverse at sites with better habitat (clean riffles, good pools, woody debris, and vegetated banks). Poor aquatic habitat scores are directly related to increased embeddedness, pool filling, and deposition of sediment throughout segments in the watershed. A certain amount of sand in the system is not unexpected, given the typical geology and soil types of the area. However, the large amounts observed in this study demonstrate the sensitivity of the system to in-stream or landscape disturbances such as mining, agriculture, forestry, or urban development.

Urban runoff, point and nonpoint source pollution

The urban runoff volumes, peak flows, and pollutant loads will continue to increase as development continues in the Cathey's Creek watershed. The population statistics showing slow growth and migration into the area and economic trends suggest that significant changes in land use may be imminent. During the field assessment, it was noted that several large forested tracts in both the upper and lower ends of the watershed (SWs 01, 02, 11, 13, 14) have been cleared since the 1998 aerial photography was obtained. These changes have the potential to

significantly degrade water quality and other watershed functions even further by increasing the volume of stormwater runoff and sediment pollution, and this was reflected in the scores of individual sampling points located downstream of these disturbances.

All five sites sampled for fecal coliform bacteria by the NC Division of Water Quality were above the NC water quality standard of 200 colonies/100ml as geometric mean during baseflow conditions. The highest baseflow concentrations were at the Reynolds Creek site in SW 13 (700 colonies/100ml). Three stormflow samples were collected at each site and concentrations at all sites ranged from 2,700 to 27,000 colonies/100 ml. The Case Branch site (SW 13) and the upper Cathey's Creek site (SW 05) both receive drainage from large pasture areas. Faulty sewer collection and septic systems and straight pipes may contribute to high levels at urban sites. High fecal coliform bacteria counts can indicate a risk to public health. Corrective actions should be taken by Spindale and Rutherford County to reduce sources of fecal coliform bacteria.

Dye and dead fish were observed in Reynolds Creek by Earth Tech personnel, and several citizens have reported dye in Case Branch. Treatment plant personnel suggested that this occurs from time to time as a result of sewer system overflows or bypasses. The overflows are sometimes caused by vandals deliberately dumping objects in manholes.

Presence of pollutants in stormwater samples indicates that rain events wash sediment and metals from the urban land sources into the streams. Urban pollutants can degrade water quality and impact biological communities. Best management practices to reduce pollutants or remove pollutants from stormwater runoff may be needed to improve and protect water quality.

Total phosphorus at baseflow was much higher at the lower Cathey's Creek site in SW 12 than at any other site. The likely source was the Spindale wastewater treatment plant (WWTP) (a point-source). High concentrations of nutrients can stress biological communities in streams and downstream reservoirs.

Terrestrial Species Habitat

The study confirmed that species richness is low and invasive exotic species are well established in the watershed. Invasive exotic species include kudzu (*Pueraria lobata*), Japanese honeysuckle (*Lonicera japonica*), mimosa (*Albizia julibrissin*), Japanese grass (*Microstegium vimineum*), multiflora rose (*Rosa multiflora*), and Chinese privet (*Ligustrum sinense*).

The field assessment findings show that limited high-quality habitat is available in the watershed for certain species of interest, although some significant pockets do exist. The terrestrial habitat suitability for federal Threatened and Endangered Species was evaluated in the vicinity of the sampling points. Forested habitat that is marginally suitable for dwarf-flowered heartleaf (*Hexastylis naniflora*) and/or small whorled pogonia (*Isotria medeoloides*) was found in small areas adjacent to 10 sampling points. Searches for individuals of these plants were beyond the scope of this project.

A Natural Heritage Program (NHP) County Inventory is currently underway. According to a personal communication from James Padgett of NHP (December 2004), white irisette (*Sisyrinchium dichotomum*) was found along the headwaters of Cathey's Creek in sub-watershed 02, somewhat upstream of the Earth Tech sampling point on that reach. The plants were not in

bloom, so the identification will be verified in the spring. Mr. Padgett concurs that habitat for dwarf-flowered heartleaf and small whorled pogonia exists in the Cathey's Creek watershed.

Mr. Padgett predicted a high probability of finding most of the plants listed as Federal Species of Concern (FSC) in the watershed, with the exception of mountain catchfly (*Silene ovata*) and Carolina saxifrage (*Saxifraga caroliniana*). The Diana fritillary butterfly (*Speyeria diana*) and the cerulean warbler (*Dendroica cerulea*), also FSC, are known to occur in the watershed. Some state watchlist species also have been identified, along with a Significant Natural Area along Cathey's Creek in SW 02.

Historic goldmine impacts

Sediment samples were taken upstream and downstream of an historic gold mine and downstream of the Spindale WWTP. The highest overall levels of metals were found in sediment samples from a tributary draining the old Wolverine gold mine and from Cathey's Creek below this tributary in SW 07. However, the highest mercury levels were found at the downstream Cathey's Creek site in SW 12. The sources of mercury at this lower site may include not only historic gold mining, but urban sources and the Spindale WWTP. Mercury levels at this site approached values expected to cause biological impacts. Chromium and copper may be of concern in the vicinity of the gold mine.

3.0 FOCUS AREAS RECOMMENDED BY EARTH TECH, INC.

The findings of this study confirm that the Cathey's Creek watershed as a whole shows signs of moderate functional degradation in terms of water quality, hydrology, and habitat. All of the sub-watersheds offer some opportunity for better management of land and water resources. Criteria for targeting sub-watersheds for restoration could include: mitigation credit potential for the NC Ecosystem Enhancement Program, functional improvement potential, ability to raise public awareness of watershed health issues, and ability to provide other public benefits such as recreation or urban renewal.

Several sub-watersheds fell into the Low functional classification either on the basis of functional indicators or causal factors. Of the predominantly urban ones (SWs 09,13, and 14), a focus on SW 09 is recommended for its position at the headwaters of Holland's Creek. Although the majority of the stream length has adequate buffer cover, approximately 19% of the sub-watershed is impervious surface, indicating potential for stormwater management projects. There are two large campuses in the sub-watershed that could provide ample opportunities for stormwater retrofit projects. One is the high school, which is an attractive project opportunity because of the educational potential. The other is the Broyhill Furniture Industries site, which currently holds a stormwater discharge permit. Although the facility is currently closed, if it reopens or changes hands, it may also provide some project opportunity as well community visibility for watershed health issues.

At least one promising opportunity for traditional stream restoration is also present along a straightened reach of the headwater of Holland's Creek, which flows through agricultural fields. Sub-watershed 13 also presents opportunities for stormwater management on several small industrial sites as well as opportunities for habitat improvement through exotic plant removal and

buffer restoration. Dye and fish kills, presumably from sewer system bypasses, were also observed in Case Branch and Reynolds Creek by citizens and project staff.

Sub-watershed 08 presents some interesting opportunities as well. Although it is rural in character, a small airfield accounting for a significant amount of impervious surface is located in this sub-watershed and runoff reportedly is causing some problems for adjacent landowners. There are several reaches of streams that are degraded by cattle access and lack adequate buffers as well. An equestrian facility with a stormwater permit is also located in this sub-watershed. A point was sampled in this location and significant opportunities for stream and wetland restoration and agricultural BMPs were identified. Although the low position of this site in the sub-watershed is not ideal, the tributary draining the equestrian facility empties directly into the mainstem of Cathey's Creek. The landowner is also a prominent businessman in the community.

Rural SWs 01, 04, and 07 also present several possibilities for traditional stream and possibly wetland mitigation. Although these SWs classified as having Moderate functional degradation, they have ample project opportunities and prominent landowners. Their position in the middle to upper reaches of the Cathey's Creek watershed make them likely to have a favorable impact downstream on the identified problems of sedimentation and high fecal coliform bacteria levels if projects are implemented.

Figure 1: Cathey's Creek Watershed with Subwatersheds, monitoring, and field sites indicated

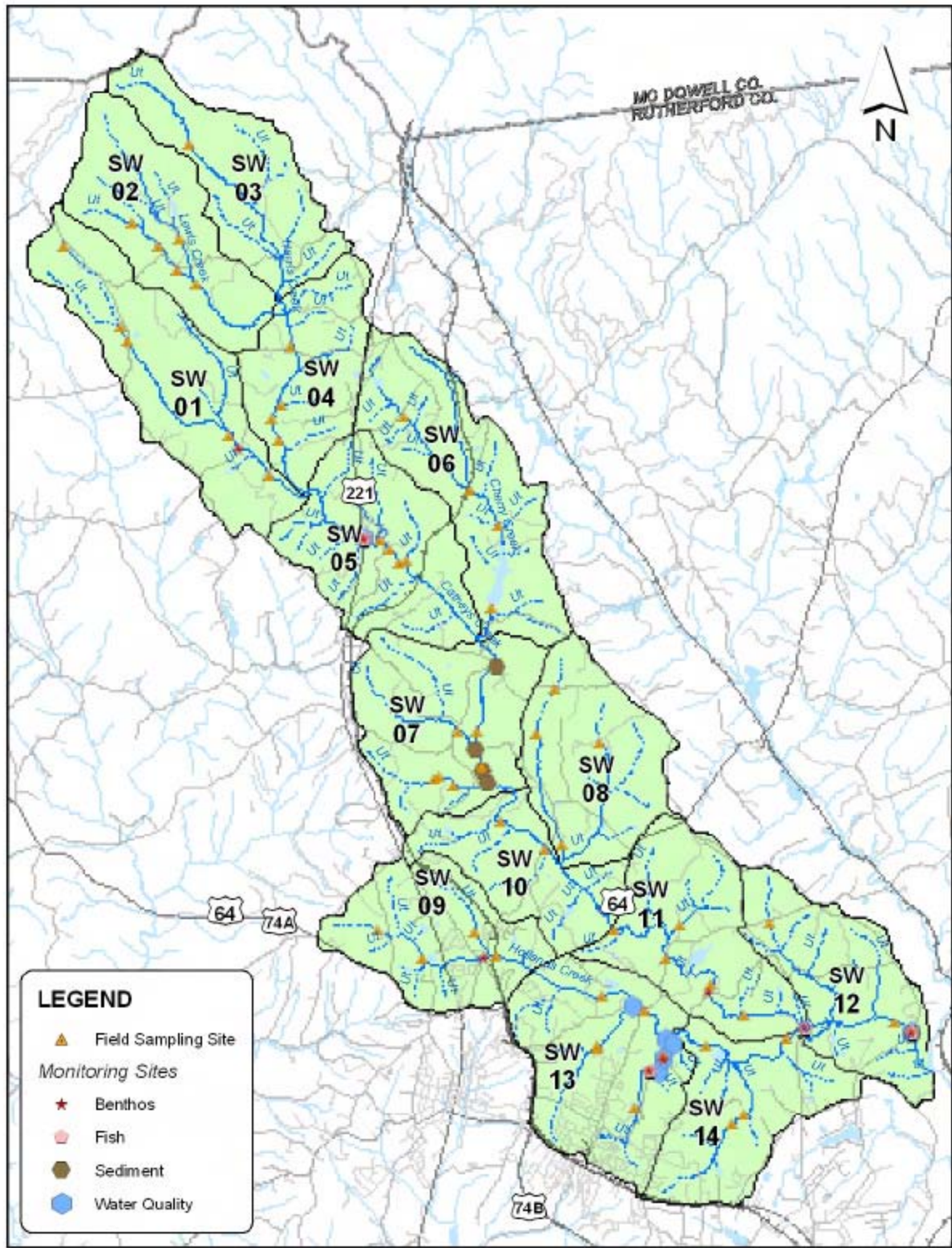


Figure 2: Cathey's Creek Watershed with subwatersheds shaded according to field assessment results, and with potential focus areas recommended by Earth Tech highlighted

