Upper Neuse River Basin Association

Memorandum

To: Deborah Amaral, NC Ecosystem Enhancement Program

From: Chris Dreps, Upper Neuse River Basin Association

Copy: Little Lick Creek Local Watershed Plan Technical Team Members

Date: July 18, 2005

Re: Little Lick Creek Technical Memorandum #3—Setting priorities for watershed restoration projects

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A central objective of the Little Lick Creek Local Watershed Plan is to identify and prioritize restoration projects throughout the 21-mile watershed. Toward this end, the Little Lick Creek Technical Team and Project Partners have conducted GIS analysis, fieldwork, and simple modeling. Through these efforts, we have begun to characterize subwatersheds within Little Lick Creek and identify a host of potential restoration projects.

This draft technical memorandum outlines a general approach for prioritizing restoration projects, suggests a simple approach for assessing the subwatershed-wide need for restoration, reviews the major goals of the Little Lick Creek Local Watershed Plan, identifies possible indicators available to the Little Lick Creek Technical Team, and suggests some criteria that could be used for project prioritization.

General Prioritization Approach

The Little Lick Creek planning process has begun to assess restoration need in thirteen subwatersheds of Little Lick Creek. Subwatersheds with the greatest restoration need may receive higher priority for restoration efforts.

Individual restoration practices can be prioritized or ranked using a broad array of criteria. The criteria we choose ultimately depend upon our management goals and the feasibility of projects. The technical team guiding the Little Lick Creek Local Watershed Plan has established watershed management goals. These goals (originally identified in Technical Memorandum #1) are listed below.

1. Improve hydrology of the Little Lick Creek Watershed
2. Restore and protect aquatic and riparian habitat
3. Improve water quality

4. Protect water quality and habitat in Falls Lake
5. Improve natural conditions for people living in the watershed
6. Foster community stewardship of the watershed

The Little Lick Creek Technical Team should select an approach for prioritizing projects that considers three categories of factors:

1. Environmental benefits
2. Community acceptance or support
3. Implementation feasibility

The watershed management goals address the first two categories, environmental benefits and community support. Environmental benefits include such factors as water quality benefits, channel protection, or habitat benefits. These are the direct benefits that might improve the overall functioning of the watershed.

Community acceptance criteria measure whether a project or group of projects can be built or maintained by volunteers, will align with community goals, or will provide good educational opportunities for nearby schools and the general public.

Implementation feasibility criteria do not measure a project's benefits, but rather these criteria consider the practicality of the project. Feasibility considerations include construction cost, number of stakeholders, ease of access, ease of maintenance, or utility conflicts. Although the goals of this project do not directly address feasibility, these considerations are crucial in determining whether a project can be undertaken.

Assessing Restoration Need at the Subwatershed Level

It is recommended that the Little Lick Creek Technical Team assess the need for restoration at the subwatershed level. This will allow the technical team to target management strategies to appropriately and effectively address management needs, which vary widely among subwatersheds.

Information available to the technical team for each subwatershed includes:

- Current and future land use
- Current and future impervious cover
- Stream reach conditions (from USA fieldwork)
- Potential watershed restoration projects
    - Stream repair
    - Stormwater retrofit
- Monitoring data (for selected subwatersheds)
    - Benthic macroinvertebrate ratings
    - Water quality parameters
- Pollution hot spots (including sand filter septic systems)
- Priority critical lands for protection (to come)
- Jurisdiction & municipal practices

The UNRBA and Center for Watershed Protection are creating detailed spreadsheets that summarize the above information for each subwatershed. These spreadsheets will be available once the technical team has held an initial discussion of prioritization criteria for restoration projects.

A subwaterhed's need for restoration can be estimated using current land use, current impervious cover, findings from water quality monitoring, stream reach conditions, and number of identified pollution hot spots and potential retrofits.

Questions for the LLC Technical Team:
Do you consider a watershed's percent impervious cover a primary criterion for identifying the need for restoration in the LLC watershed?

Do you think that the observation (during fieldwork) of erosion or active channel dynamics on the downstream reach is a primary criterion for identifying areas where restoration is needed?

To what extent will data from water quality monitoring affect our decisions? Is it a problem that data are not available for all subwatersheds?

Indicators for Use in Considering Environmental Benefits of Restoration

In order to determine the benefits of individual restoration projects, it is useful to use indicators, or quantifiable measures that provide a means of evaluating the health of watershed functions. Indicators can be directly measured or modeled to estimate current conditions or predict future conditions.

In order to link measurable indicators to the goals of the project, we must first understand the forces within the Little Lick Creek watershed that have the potential to affect hydrology, aquatic and riparian habitat, water quality, downstream water quality in Falls Lake, and human use of all these resources. These forces are referred to as "stressors".

Table 1 identifies "stressors" to the watershed functions defined in the Little Lick Creek management goals. Goal 6 does not directly reflect a watershed function; however, impacts from stressors can affect the level of stewardship that occurs in the watershed.

	1. Hydrology	2. Aquatic & Riparian Habitat	3. Water Quality	4. Falls Lake	5. Human Use	6. Community Stewardship
Type of Stressor						
Increase in Surface Water Runoff	✓	✓	✓		✓	✓
Eutrophication		✓	✓	✓	✓	✓
Sedimentation and Erosion		✓	✓	✓	✓	✓
Toxics		✓	✓	✓	✓	✓
Pathogens		✓	✓	✓	✓	✓
Biochemical Oxygen Demand		✓		✓	✓	✓

Table 1. Relevant stressors in Little Lick Creek (available from modeling and/or monitoring) and their applicability to LLC project goals.

Several indicators may be available for quantifying the level of any given stressor and measuring the extent to which the recommended management strategies meet the goals of the plan. Table 2 lists some indicators available to guide planning decisions.

Management Goal	Indicators Available
1. Watershed Hydrology	Impervious cover*, stream reach score^
2. Aquatic & Riparian Habitat	Impervious cover*, loss of riparian buffer^, total phosphorous+#, total nitrogen+#, dissolved oxygen+, total suspended solids+#, turbidity+, metals+, fecal coliforms+, temperature+, specific conductivity? +
3. Water Quality	Total phosphorous+#, total nitrogen+#, dissolved oxygen+, total suspended solids+#, turbidity+, metals+, fecal coliforms+, specific conductivity? +
4. Falls Lake	Total phosphorous+#, total nitrogen+#, dissolved oxygen+, total suspended solids+#, turbidity+, metals+, fecal coliforms+
5. Improve conditions for People in Watershed	Fecal coliforms+
6. Community Stewardship	All indicators

Table 2. Indicators measured or modeled in Little Lick Creek and how they affect management goals

*Data from GIS analysis.

^Assessments from USA or USSR fieldwork.

[+] Data from monitoring. Of the indicators listed in Table 2, the Little Lick Creek project is monitoring only in selected subwatersheds.

[#] Data from modeling. The Watershed Treatment Model makes relative estimations of nutrients (total phosphorous and total nitrogen) and sediment levels (TSS).

Questions for the LLC Technical Team:
Which of the indicators above do you consider the most useful in measuring the potential beneficial effects of a restoration project?

Do you have any suggestions for additional indicators?

Can we group stressors and indicators to simplify the prioritization process?

Project Prioritization Criteria

The following groups of questions are meant to address a potential project's environmental benefits, community acceptance or support, or implementation feasibility. These criteria questions can be weighted to reflect their relative importance in prioritization or ranking schemes.

Environmental benefits

Goal 1: Hydrology

Does the project/practice improve hydrology by removing or reducing impervious cover, reducing the directly connected impervious area (disconnecting roof drains, storing rooftop runoff, or disconnecting other impervious surfaces), or promoting infiltration (reforestation, restoring stream buffers, converting channels to grass, or installing structural stormwater practice designed for infiltration?

Does the project provide channel protection control? (1-year peak runoff control requirement)

Does the project reduce channel erosion through stream repair or repair of failing stormwater infrastructure?

Goal 2: Aquatic and Riparian Habitat

Were impacted buffers found at the project site? (Yes if (a) there's an IB form/point or (b) the reach was ranked as fair or poor. Justification – using the overall reach score rather than looking at specific scores for buffers is justifiable because most of the low scoring streams were experiencing this)

Are there relatively high benthic macroinvertebrate ratings (relative to LLC as a whole) in this subwatershed?

Does this proposed restoration/protection practice restore or protect aquatic or riparian habitat through one of the following:

- Buffer plantings and reforestation
- Stream repair techniques
- Remove fish barriers
- Structural stormwater retrofit that includes aquatic/wetland plantings

Goal 3: Water Quality

Is there a need to improve water quality at this location? Existence of:

- Confirmed hotspots at this location.
- Sanitary sewer and septic system impacts noted at this location or reach.
- Water quality issues identified during monitoring.

Will the proposed practice improve water quality? What is the pollutant removal efficiency of the proposed structural stormwater practice?

Goal 4: Falls Lake

Is the project expected to reduce nutrients (phosphorous and nitrogen) flowing into the lake?

Is the project expected to remove toxics or pathogens?

Community Acceptance or Support

Goal 5: Improve natural conditions for people living in the watershed

Is public health better protected?

Is this project visible to watershed residents?

Will residents interact with this project (e.g. projects at schools, library, community center, park, etc)?

What is the land ownership of the proposed project? Can residents visit this area? (e.g. publicly owned lands, HOA lands, commercial property, etc)

Are flooding impacts reduced?

Are property values expected to increase?

Goal 6: Foster community stewardship of the watershed

Will the practice/program educate watershed residents?

Can citizens be involved in implementation?

Can the public be involved in long term sustainability of watershed restoration through monitoring, maintenance, or watchdog efforts?

Can the community take credit for the project under Phase I requirements?

Implementation Feasibility
What is the cost of the project? (low, medium, high, extremely high)

Does the project meet NC EEP criteria?

How many public agencies would likely be involved in the funding, design, and review of this project?

What is the maintenance burden required for this project? (High, moderate, easy)

Are there any anticipated impacts the project may have on existing utilities?

Is there good or poor access for construction and maintenance?

Questions for the LLC Technical Team:
Do you disagree with any of the questions listed above?

Do you have any suggestions for additional criteria?

Do you prefer a ranking approach or a more general prioritization approach that uses some categories such as “low, medium, and high-priority”?

References

Winer, R. 2000. National Pollutant Removal Performance Database for Stormwater Treatment Practices. 2nd Edition. Center for Watershed Protection. Ellicott City, MD.

National Summary (Winer, 2000) of BMP Removal Rates

Table D-1: Median Bacteria and Organic Carbon Removal (%) by Stormwater Treatment Practice (Source: Winer, 2000)

BMP Group	Bacteria[1]	Organic Carbon[2]	Hydrocarbons
Filtration[3]	37	54	84[4]
Ponds	70	43	81[4]
Wetlands	78[4]	18	85[4]

1. Bacteria data include fecal streptococci, enterococci, fecal coliform, E. coli, and total coliform
2. Organic carbon data includes BOD, COD, and TOC removal data
3. Excludes vertical sand filters and filter strips
4. Data based on fewer than five data points

Table D-2: Median Pollutant Removal (%) of Stormwater Treatment Practices (Source: Winer, 2000)

BMP Group	TSS	TP	Sol P	TN	NO_x	Cu	Zn
Bioretention[1]	N/A	65	N/A	49	16	97	95
Filtration[2]	86	59	3	38	-14	49	88
Infiltration	95[1]	70	85[1]	51	82[1]	N/A	99[1]
Ponds	80	51	66	33	43	57	66
Wetlands	76	49	35	30	67	40	44

1. Data based on fewer than five data points
2. Excludes vertical sand filters and filter strips

NOTES:

- N/A indicates that the data are not available.
- TSS = Total Suspended Solids; TP = Total Phosphorus; Sol P= Soluble Phosphorus; TN = Total Nitrogen; NOx = Nitrate and Nitrite Nitrogen; Cu = Copper; Zn = Zinc