Morgan and Little Creeks Local Watershed Planning Initiative

Meeting Announcement & Summary

Wednesday, August 6, 2003 meeting held at the Totten Center

Next meeting:

October 22nd, 2003

2:00-4:00 pm

Totten Center, NC Botanical Gardens

Directions to the Totten Center:

From I-40: Take exit 273 from the West, 273-B from the East. Turn right onto Highway 54 W, go 2.4 miles; turn left at the traffic light onto Finley Golf Course Road. Go 0.6 mile and curve right onto Old Mason Farm Road. Go 0.7 mile, see North Carolina Botanical Garden sign on left; turn left into parking lot.

From the 15-501 and 54 Bypass (Fordham Blvd.): Look for the brown landscaped wall on the south side of Fordham Blvd., 0.6 mile west of the Hwy 54 overpass. Turn onto Old Mason Farm Road at the east end of the wall. See North Carolina Botanical Garden wooden sign on immediate right and turn right into parking lot.

Maps can be found at the following URL: http://www.unc.edu/depts/ncbg/info.htm#Directions

October 22nd Meeting Agenda

- ► Welcome and Introductions
- ► Review and approval of August minutes
- ► Report on Nutrient Assessment
- ► Ongoing Restoration Opportunities
- ► Better Site Design
- ► Plans for Next Meeting

Team members present at 8/6/03 meeting:

Shari Bryant, NC Wildlife Resources Commission
Patricia D'Arconte, Town of Chapel Hill
Ed Holland, Orange Water and Sewer Authority
Sydney Miller, Triangle J Council of Governments
Tina Moon, Orange County Environment & Resource Conservation Dept.
Sharon Myers, UNC-Chapel Hill
Kat Oury, NC Cooperative Extension Service
Johnny Randall, NC Botanical Gardens/Morgan Creek Valley Alliance
Fred Royal, Town of Chapel Hill
John-Ann Shearer, US Fish and Wildlife Service
Jim Ward, NC Botanical Gardens
Sydney Miller, Triangle J Council of Governments

Team members not present:

Brent Bogue, Natural Resources Conservation Service
Lorelei Costa, Triangle Land Conservancy
Ren Ivins, Orange County
Karen McAdams, Cooperative Extension Service
Doug Nicholas, Triangle Land Conservancy
Garland Pardue, US Fish and Wildlife Service
Jonathan Parkinson, Friends of Bolin Creek
John Thomas Jr., US Army Corps of Engineers
Dave Stancil, Orange County
Richard Whisnant, UNC-Chapel Hill School of Government

Guests Present:

Mackenzie Dilts, UNC-Chapel Hill
Misty Franklin, NC Botanical Gardens/Morgan Creek Valley Alliance
Susan MacKinnon, Little Creek Watershed Resident
Doug MacKinnon, Little Creek Watershed Resident
Brian McRae, NC Wildlife Resources Commission
Perry Sugg, Orange County Planning Dept.

Support Staff Present:

Deborah Amaral, Cape Fear River Assembly
Jim Blose, Dept. of Environment and Natural Resources
Jon Butcher, TetraTech, Inc.
Samantha Sheehy, Cape Fear River Assembly
Jason Doll, TetraTech, Inc.
Bonnie Duncan, N.C. Wetlands Restoration Program
Heather Fisher, TetraTech, Inc.

Summary of the 8/06/03 Meeting

Meeting Agenda / Stakeholder Introductions

Deborah Amaral of the Cape Fear River Assembly opened the meeting and reviewed the agenda items. Participants then introduced themselves and stated which organization they represented. Minutes of the May meeting were approved.

Progress on Key Indicators

Jason Doll of Tetra Tech updated the group concerning the progress being made on the assessment and evaluation of key indicators for Morgan Creek watershed area. The source analysis of fecal coliform bacteria loading has been completed, and Tetra Tech staff are continuing efforts to define nutrient loading and eutrophication potential and field survey efforts to evaluate stream erosion and instability have begun. The Preliminary Summary of Findings Report of the assessment is nearly complete and a draft report (in PDF format) will be available on the NC Wetlands Restoration Program and Cape Fear River Assembly websites prior to the next stakeholders meeting. Comments and suggestions from the team are welcome in finalizing this initial report. Stakeholder team members will be notified by e-mail of the website location of the Preliminary Findings Report as soon as it is posted.

Assessment of Potential Fecal Coliform Bacteria Sources

[Note: Ed Holland expressed concerns that the data sources for the OWASA sewer system condition analysis be described and qualified more carefully than they were during the presentation and in the meeting summary. He argued that the summary should emphasize that the findings do NOT imply causality. (The statistically proper use of the term 'explain' actually implies more causality than is intended.) The following changes have been reviewed and are agreeable to Mr. Holland. They are shown using the redline/strikeout feature.]

Heather Fisher of Tetra Tech presented the initial findings of a study for potential fecal coliform bacteria sources within the Morgan Creek watershed area. The objectives of the study were to identify potential sources of fecal coliform, to determine the correlation between these sources and the counts detected in the water, and to propose future analysis efforts. Fecal coliform was monitored at 14 sites by the NC Division of Water Quality, and at sites monitored by the towns of Chapel Hill and Carrboro. The monitoring data was organized into one of two categories: (1) compliance, where the counts were *less than or equal to* the NC criterion of 200 counts per 100 mL, or (2) excursion, where the counts *exceeded* the NC standard. Eight ~~explanatory~~ variables were chosen to ~~possibly explain~~examine in relation to the level of excursions in the water:

- Percent Floodplain Occupied by Buildings
- Percent Disturbed Land (Urban, Suburban)
- Percent Pasture
- Number of Non-vacant Parcels Per Acre (Households, Pets)
- Miles of Sewer Pipe Type Per Acre (Clay, Concrete, Iron, etc.)
- Number of Sewer Pipe Service Defects Per Acre (Root Intrusion, Blockage) per acre
- Number of Sewer Pipe Structural Defects Per Acre (Leaks, Corrosion)
- Number of Unsewered Parcels Per Acre (Septic Tanks)

To characterize the structure of the pipes in the watershed, ~~samples~~ a small sample of pipes ~~throughout the county were~~ was monitored on closed-circuit TV to assess cracks and defects. Pipe types were also mapped. Data was collected only for gravity flow sewers. Pipes subject to force flow were not characterized. For each variable at each station, analysis of data occurred at three different subwatershed levels – first with data from just one subwatershed upstream of the station taken into account, second with data from the next subwatershed upstream of the station included and last, with the data from the third subwatershed upstream of the original station considered.

In order to determine which variable ~~was the most successful in explaining~~had the strongest relationship to the monitored counts, a classification tree model was used. The model sorted the excursions and compliances based on the ~~best explanatory variables~~variables having the strongest association with ~~for~~ each event, similar to a coin separating machine in which each coin falls into the slots where it fits best. During this process, the model ranked the ~~explanatory~~ variables according to ~~how well they explained~~ the

differences between a compliance event and an excursion event. Of the highest ranked variables, a clear relationship with fecal coliform was found for the following three variables:

- High Sewer Pipe Service Defects (Root Intrusion, Blockage)
- Low Ratios of Ductile Iron Pipe
- High Ratios of Cast Iron Pipe

Percent floodplain occupied by buildings, percent pasture, and unsewered parcels ~~made it into the second node~~ranked highly in the sorting process, but no clear relationship between these sources and the excursion counts was found. Percent land disturbance, number of households (pets), and structural pipe defects (cracks or corrosion), ~~were put in the lowest node, and thus were the least successful in explaining the relationship~~could be sorted using this statistical technique, but showed the weakest association with the presence of fecal coliform. Therefore, in areas with high levels of sewer pipe defects, high quantities of cast iron piping, or low levels of ductile iron piping, fecal coliform excursions are more likely to occur. It should be noted that this analysis merely shows a correlation between the above variables and fecal coliform excursions, but it does not prove that these variables cause fecal coliform excursions. Areas with older pipes may have dense housing, well-established pet populations, and other confounding variables that would contribute to high fecal coliform loading. The results suggest that more extensive monitoring and analysis should be performed in subwatersheds with high sewer pipe service defects, high proportions of cast iron sewer pipe, and low proportions of ductile iron sewer pipe. It should also be noted that this entire analysis was based solely on fecal coliform data collected during base flow conditions. An analysis of fecal coliform samples collected during storm events could produce a significantly different set of relationships. [Note: This paragraph does address the need for emphasis that the findings do not imply causality.]

Assessment of Stream Erosion and Instability

Jason Doll updated the group on the ongoing stream erosion and instability assessment. A stable stream is defined as a stream that effectively transports the sediment load supplied by its watershed while maintaining its dimension, pattern, and profile over time, such that it does not aggrade or degrade (Rosgen, 1996). In situ measurements based on real world data, such as the Bank Erosion Hazard Index (BEHI) and the Stream Visual Assessment Protocol (SVAP) can be used to assess current stream conditions, while future conditions can be predicted using modeling approaches such as stream power analysis and stream critical velocity. Stream power is defined as the stream's ability to move sediment, and is a function of slope and stream velocity (Brookes, 1990). Stream velocity criteria can also be determined as a function of bank particle size and cohesion, and used to estimate the velocity threshold at which stream banks begin to erode. HEC models can generate estimates of both of these variables, but the process is not appropriate for all stream types.

Land use data (GIS mapping) from 1999, along with current zoning, were analyzed to identify which streams could be subjected to possible erosion now and in the future. Areas with low vegetation cover are prone to erosion and high risk of instability. Because imperviousness was not a factor in Tetra Tech's GIS mapping, lower Bolin Creek was not identified to be at high risk for erosion, but field reconnaissance efforts have revealed that this area is actively eroding and unstable. Stream reconnaissance was performed to compare conditions within the watershed and to identify potential assessment locations. A preliminary SVAP returned good scores for sites along Morgan, upper Bolin, and Neville Creeks, but lower Bolin Creek and the most upstream segment, near Hogan Farms, scored poorly. In order to predict future stream conditions, the potential for subdivision of existing land parcels was assessed. New development in the Orange County portion of the University Lake watershed is restricted to a 5-acre minimum lot size, but Chatham County has a greater future development potential due to less stringent controls. Aggressive new stormwater rules within the Town of Chapel Hill dictate "all new storm flow must be infiltrated" will help prevent serious changes in the current stream conditions.

Surveys of stream cross-sections are currently being conducted across the LWP study area. The cross-section data will be utilized to develop hydraulic models to predict the stream flow changes resulting from future development in order to perform stream power and critical velocity assessments of stream stability under future conditions. The modeling analysis will be used to assess the potential impacts of wide spread low density suburban development in the University Lake watershed will also be extended to evaluate potential conditions in Bolin Creek and Buck Ranch. A detailed description of the methodology and results associated with this modeling analysis will be included in the Detailed Assessment Report and its appendices.

Assessment of Nutrient Loading and Eutrophication

Jon Butcher of Tetra Tech gave a presentation about nutrient loading and eutrophication and how these factors are being evaluated and addressed at various geographic scales pertinent to this local watershed planning effort. Loading of nutrients into reservoirs such as Jordan and University Lakes is a prime concern, because excess nutrients promote excess algal growth (eutrophication). Currently, flowing streams within the area are not experiencing problems with eutrophication. To assess the

effects of nutrient loading on the reservoirs, Tetra Tech is working with the State to model Jordan Lake and its watershed, and with OWASA to model the University Lake and its watershed (see information below). These impoundments and their watersheds have very different spatial scales, but both are linked to the Morgan Creek LWP and the results of the nutrient loading analysis for the LWP will be more comprehensive based on results derived from all three evaluations. These efforts are not duplicative, and will complement one another. University Lake watershed is a subset of the Morgan Creek LWP study area, which is a subset of the Jordan Lake watershed; so all projects are interconnected and focused on similar issues.

Jordan Lake Assessment

The Jordan Lake area upstream of SR 1008 (Mt. Carmel Church Rd.), just South of our LWP study area, frequently exceeds the state chlorophyll a standard of 40 µg/l, and has been listed by the NC Division of Water Quality (NC DWQ) for development of a Total Maximum Daily Load (TMDL), as specified in the Federal Clean Water Act. Chlorophyll a levels occasionally exceed 100µg/l, and are often associated with extreme algal blooms. Tetra Tech is investigating this issue with linked hydrodynamic and water quality models. The lake modeling results show that nitrogen is an important limiting factor of algal growth in the upper portion of the lake. The shallow segments of the upper portion of the lake are subject to long residence time, exposure to light, and multiple point source discharges, creating ideal conditions to induce high algal growth. Point source loads to the upper sections include OWASA, Durham City, and Durham County. Non-point sources in Chapel Hill, Carrboro, Cary and RTP also contribute significant amounts of nitrogen to the upper portion of Jordan Lake.

Tetra Tech is also developing a watershed model for Jordan Lake, which will focus on non-point sources by estimating seasonal loading at the 14-digit hydrologic unit scale. A GWLF (watershed) modeling framework and a SPARROW (delivery) model will be used to predict the quantities of nitrogen and phosphorus delivered to Jordan Lake from the watershed under various management scenarios. The current NC DWQ TMDL effort will likely result in the specification of allowable point and non-point source loads of nitrogen and phosphorus to achieve water quality standards in Jordan Lake, and Tetra Tech is assisting with technical support on this phase of the project.

[Note: This paragraph was moved from the University Lake Section to the Jordan Lake Section of this meeting summary.] Sydney Miller is also working with NC DWQ to facilitate a collaborative stakeholder effort between local and state level officials, such as water quality managers, stormwater managers, and utility directors, to make a report to the Environmental Management Commission (EMC) concerning the Jordan Lake efforts. The agencies working to address non-point sources of pollution, including the Natural Resources Conservation Service and the Division of Soil and Water Conservation, will also be involved. The collaboration began in May 2003, and the team is aiming for a product in March 2004. A final recommendation to the EMC will be completed by October of 2004. This effort will be a supplement to the Jordan Lake TMDL. (To find out more about the Jordan Lake stakeholder project, go to www.tjcog.dst.nc.us, and click on programs, then water resources, then current projects.)

University Lake Assessment

Tetra Tech is currently working with OWASA to study implications of existing water supply protection ordinances on University Lake. Assessment tools include a BATHTUB model of nutrient response, parcel based analysis of existing and potential land use, and a calibrated GWLF model of watershed nutrient loading. These models are being used to investigate potential risks from future development and possible management opportunities, such as buffer protection and land acquisition, within the watershed.

The TMDL process for Jordan Lake will determine loading targets for nutrients that ~~will~~ may be applied to the Morgan Creek LWP. The LWP area contributes nutrients to Jordan Lake in the form of non-point loads, but these alone do not determine response because the contribution is small relative to the cumulative nutrient loads to the listed upper segments of the lake (including point and non-point source loads from outside the LWP study area from Durham, RTP and Cary). The University Lake model will produce a detailed, calibrated analysis of current and future nutrient loads as well as reservoir response. Also, potential management scenarios to protect the lake will be investigated. The final results will provide potential loading targets for the upper Morgan Creek portion of the LWP.

Because the Jordan Lake ~~and University Lake~~ effort~~s~~ does not include fine scale analysis of the rest of the Morgan Creek Local Watershed Planning area, such as the Bolin and Booker Creek areas, Tetra Tech will extend the OWASA analysis to the other two-thirds of the LWP area. Assessments will include parcel-based analysis of potential land development; investigations of areas demonstrating increased nutrient loading, and potential

management options to meet TMDL requirements of Jordan Lake. A team member asked about loading from the Haw River, and Jon explained that the Haw affects the middle of Jordan Lake, but has little effect on the northern section. Another team member asked about any correlation between nutrient loading and the leaky pipes discussed in the fecal coliform study. Jon answered that pipe defects are probably not a significant source relative to the total load.

~~Sydney Miller is also working with NC DWQ to facilitate a collaborative stakeholder effort between local and state level officials, such as water quality managers, stormwater managers, and utility directors, to make a report to the Environmental Management Commission (EMC) concerning the Jordan Lake efforts. The agencies working to address non-point sources of pollution, including the Natural Resources Conservation Service and the Division of Soil and Water Conservation, will also be involved. The collaboration began in May 2003, and the team is aiming for a product in March 2004. A final recommendation to the EMC will be completed by October of 2004. This effort will be a supplement to the Jordan Lake TMDL, and will also assist OWASA in determining possible management practices. (To find out more about the Jordan Lake stakeholder project, go to www.tjcog.dst.nc.us, and click on programs, then water resources, then current projects.)~~

A team member asked Bonnie Duncan how the team would rank the importance of different issues being studied as the group makes its final recommendations. Bonnie answered that recommendations will be based on the particular conditions of different subwatersheds, as different issues, such as water quality or habitat protection, rank differently for individual areas. However, non-problem areas will not be excluded, as recommendations for protecting healthy areas will be made as well. Jason added that the subwatershed recommendations would be selected based on advice and consent from the group. The meeting was adjourned.