

Morgan and Little Creeks Local Watershed Planning Initiative



Meeting Announcement & Summary

Wednesday, February 18th, 2004 meeting held at the Totten Center

Next meeting:

April 1st, 2004

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>

April 1st Meeting Agenda

- ▶ Welcome and Introduction
- ▶ Review and approval of February minutes
- ▶ Comprehensive Evaluation of Watershed Indicators
- ▶ Priority subwatershed identification
- ▶ Announcements and Plans for Next Meeting

Team members present at 02/18/04 meeting:

Shari Bryant, NC Wildlife Resources Commission
Patricia D'Arconte, Town of Chapel Hill
Sydney Miller, Triangle J Council of Governments
Sharon Myers, UNC-Chapel Hill
Doug Nicholas, Triangle Land Conservancy
Johnny Randall, NC Botanical Gardens/Morgan Creek Valley Alliance
Noah Ranells, Town of Carrboro
Fred Royal, Town of Chapel Hill

Team members not present:

Brent Bogue, Natural Resources Conservation Service
Jim Blose, Dept. of Environment and Natural Resources
Lorelei Costa, Triangle Land Conservancy
Ren Ivins, Orange County
Ed Holland, Orange Water and Sewer Authority
Karen McAdams, Cooperative Extension Service
Kat Oury, NC Cooperative Extension Service
Garland Pardue, US Fish and Wildlife Service
Jonathan Parkinson, Friends of Bolin Creek
John Thomas Jr., US Army Corps of Engineers
John-Ann Shearer, US Fish and Wildlife Service
Dave Stancel, Orange County
Richard Whisnant, UNC-Chapel Hill School of Government

Guests Present:

Justin Crane, Town of Chapel Hill
Meg Holton, UNC-Chapel Hill Energy Services
Kristen Sinclair, NC Botanical Gardens

Support Staff Present:

Deborah Amaral, Cape Fear River Assembly
Jason Doll, TetraTech, Inc.
Bonnie Duncan, N.C. Wetlands Restoration Program
Don Freeman, Cape Fear River Assembly
Heather Fisher, TetraTech, Inc.
Samantha Sheehy, Cape Fear River Assembly

Summary of the 2/18/03 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 both the August and October meetings were reviewed and approved.

Stream Erosion and Stability Assessment

Jason Doll of TetraTech, Inc. presented the preliminary results of the stream erosion and stability assessment in the Morgan/Bolin/Little Creek area. So far, the environmental stressors in the watershed have been studied, and now the group is reviewing where those stressors are having an effect by looking at the stream and terrestrial habitat health in the area. These detailed assessments will be used in order to target preservation efforts and identify actual locations where restoration and watershed improvements will be provided in the final Local Watershed Plan recommendations.

In order to analyze stream instability, the following definition of a stable stream was used as the benchmark:

“A stable stream 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).

A stable stream will maintain both bank and bed stability over time. This is important, because severe erosion can cause severe bank failures resulting in deposition of large amounts of sediment into the stream. Bed stability is also imperative, because if the bottom of a stream erodes, the water level will lower, causing the water table to drop as well. Many times, wetland vegetation near the banks is lost because it dries out as the water table drops down below the root level. Stable streams also maintain bed form, and instability can cause sediment accumulation, where heavy loads of fine sediment can cover the bed and eliminate the riffles and pools which are the habitats of benthic macroinvertebrates. Stream substrates with varying particle sizes, from sand and gravel to cobble and boulders provide a full range of benthic habitat types that are essential to sustain a diverse, healthy biological community in our streams.

Stream Erosion/Instability Assessment Tools

Two major methods are being used in order to assess the erosion and instability of streams within the watershed: in situ measurements and modeling approaches. In situ measurements rely on composite

scores based on real world data. One example of an in situ measurement is the Stream Visual Assessment Protocol (SVAP), which was completed for the Local Watershed Plan. The SVAP gives each stream section a composite score based on 12 parameters, which range from habitat viability and water quality to channel morphology and evidence of erosion. Another in situ measurement, the Bank Erosion Hazard Index (BEHI), is specifically aimed at analyzing river banks and their tendency to erode. BEHI measurements have not been utilized in this study.

Modeling approaches allow for the prediction of future conditions based on the present conditions evaluated by the in situ measurements. The two major modeling tactics used in TetraTech’s study are based on the Stream Power Criteria (Brookes, 1990) and the Stream Velocity Criteria (many sources). The Stream Power Criteria investigates the power threshold for a stable versus an unstable stream, and is appropriate for use in Piedmont streams that have the same general substrate composition as those studied to develop the Stream Power literature standard. Stream power is a measure of a stream’s ability to move material and focuses on this narrow range of substrate types. The Stream Velocity Criteria is used for a wider range of substrates and uses established velocity thresholds at which stream banks or beds are known to erode. The stream velocity and the thresholds are a function of both particle size and particle cohesion.

These approaches are used to generate estimates with HEC models at given study area locations, but are not appropriate for all stream types. For example, at Morgan Creek a modeling analysis is appropriate because its sandy bottom and consistent banks fit the stream power and stream velocity criteria requirements. Many segments of Booker Creek are not appropriate for application of stream power criteria because they resemble mountain step-pool streams with large particle and bedrock substrates that tend to hold their grade well in spite of increased stormwater runoff from their watershed.

Instability Risk Assessment

An initial GIS analysis was used in the Preliminary Findings phase of this LWP study to generate a map indicating areas of low, high, and very high stream reach instability risk within the watershed. A GIS overlay was used to analyze erosion-prone soils and the amount of vegetation in stream corridors. This type of modeling is helping to project where, in the future, heavy erosion could occur based on local conditions.

Stream Visual Assessment Protocols (SVAP) were conducted at 55 reconnaissance sites within the watershed to evaluate present conditions. In order to use project resources efficiently, only two people (as opposed to the three) evaluated the streams using the SVAP criteria. As expected, the more remote and rural headwaters area is in a healthy, fairly pristine condition, but conditions deteriorate downstream. The upper portion of Bolin Creek returned good scores with the exception of the Hogan Farm area, but streams near downtown Chapel Hill scored much lower. Lower Morgan Creek appears to be healthy and scored well, most likely due to the presence of University Lake which serves as a flood control.

A GIS analysis of development potential at the parcel level was also performed in order to evaluate those subwatersheds, or portions of the study area with the greatest potential for future change in land use. The analysis showed that most of the development potential in Chapel Hill consists of scattered opportunities for infill which will most likely be high to very high density. The greatest overall development potential exists in the headwater areas of Bolin Creek, including the Horace Williams Airport and Adams Tracts, and also in the area around Southern Durham near Jordan Lake. In the University Lake watershed, development potential is also higher in Chatham County, where minimum development can occur on two-acre lots, as opposed to the five-acre minimum rule in the Orange County portion. Areas that were identified as a high stream degradation risk as well as a high potential for development were used in the modeling analysis, and other areas have been assessed solely through on-site evaluations.

Detailed on-site visual assessments were done at sites throughout the entire watershed, and many key risk areas were identified. For example, a degraded portion of Chapel Creek runs through an abandoned fairway on University Golf Course, and the stream is actively eroding and full of sediment. However, because there are no trees adjacent to the banks, the section is a prime spot for a stream restoration project. Detailed cross section surveys were completed for the field sites used in the modeling analysis, such as a stretch of Morgan Creek where the banks are beginning to incise. The modeling tools use information about changes in land use conditions, runoff, channel dimensions, maximum flow events, and stream velocity in order to predict future stream stability conditions.

In order to test how well the models fit real life conditions, a verification of bank predictions was done by comparing the SVAP scores for channel morphology

and the modeling results for stability/instability at each field site. For the stream bank stability model, predictions at 22 out of 32 sites agreed with the SVAP rating for the Bank Condition parameter, and for the stream bed stability model, predictions also at 22 out of 32 sites agreed with the SVAP rating for the Stream Incision parameter. Overall, the two methods agreed about 70% of the time. However, only a 1 point difference existed in 3 cases between the stream bank stability model and the Bank Condition parameter, and in 6 cases between the stream bed stability model and the Stream Incision parameter, so if a 1 point margin of error was acceptable, the two methods would agree 90% of the time. This confirms the assumption that the bank and bed modeling predictions are closely mimicking actual events and conditions in the watershed streams. Stream Power Criteria were not used in this verification, because that model is only useful for a narrow selection of substrates and in the entire watershed there were too many different substrate types present.

Existing and Future Stability Ratings

In order to identify existing areas of stream stability and instability, a high, medium, or low instability risk was assigned at the subwatershed scale. Each field assessment site was given a point score, and the scores were averaged for the entire subwatershed. Middle Bolin Creek and Morgan Creek just above University Lake are at a high risk of instability, and in some cases bank pins should be used in order to measure erosion in these areas. The Morgan Creek headwaters area, Upper Bolin Creek, and the areas around Southern Village are also medium risk instability areas at this time.

Using modeling tools that take into account potential development, areas of future instability were also given a low, medium, or high risk value in each subwatershed. Most notably, in the future, the instability risk jumps from medium to high in the Wilson Creek area because of the impending development there. Risk levels also increase in the Upper Bolin Creek area, but not enough to turn the entire subwatershed to a high risk, since below Hogan Farm near Homestead Road the stream would still be in good shape. Above Homestead Road, there is a substantially increased risk of erosion. Another high risk area would be at Tom's Creek where it crosses Main Street in Carrboro. It is interesting to note that risk does not increase in the University Lake subwatershed, because the low-density development restrictions there are predicted to keep the streams fairly stable. Overall, the greatest future instability risks are in locations where risk already exists, and this is where efforts should be focused. The final report will include a site by site analysis in much finer detail.

Assessment of Terrestrial Habitat and Preservation Potential

Jason Doll then went on to present the results from a detailed assessment of terrestrial habitats within the watershed, and identified some priority areas for preservation efforts. Whereas most of the technical assessment for this local watershed planning effort has focused on factors resulting in degradation of watershed conditions, this final part of study, will focus on identification of high value, pristine areas that are a priority to protect. The major data sources used to assess riparian corridor and overall terrestrial habitat come from the Triangle Land Conservancy (TLC) and Orange County's past efforts to evaluate wildlife habitat quality, the NC GAP Analysis project, the NC Natural Heritage Program and the National Wetlands Inventory.

The mission of the GAP analysis is to conduct regional assessments of the conservation status of native terrestrial vertebrate species and natural land cover types, and to apply this information to land management activities to maintain biodiversity. The NC GAP data has recently been released, and is derived from the Multi-Resolution Land Characteristics Consortium (MRLC) national database, updated with aerial photos. Using 30 meter grid resolution, 23 land cover/vegetation Alliances were classified in the study area, and forested land was analyzed with aerial photography, field surveys, NRCS soils, and NWI data. Non-forested land was classified using 1992-1993 National Land Cover Data (NLCD). GAP data uses 70 associated community types to describe a diversity of habitats. Examples of community types found within the watershed are Agricultural Crop Fields, Piedmont/Mountain Emergent Vegetation, Coniferous Cultivated Plantation, and Dry Mesic Oak Pine Forests.

A Local Watershed Planning subcommittee including stakeholders from the Division of Wildlife Resources, the NC Natural Heritage Program, the US Fish and Wildlife Service, and the NC State University NC-Gap Program convened in December to discuss strengths, weaknesses, and constraints of the various data types used in the habitat assessment. The group provided critical feedback on the most valuable or "high priority" habitats in the GAP data, and talked about how to best use the different sources of data and information.

The TLC/Orange County assessment provided lots of spatial data to quantify the local terrestrial habitat, and this information was used to study overall forest contiguity in each subwatershed. However, the data had to be updated to reflect prime habitat areas that had recently been developed, such as Southern Village and Meadowmont. In addition to forest contiguity,

conditions of wetlands and the state of vegetation in the riparian corridors was also analyzed. In order to rate the habitat and calculate preservation potential, each subwatershed was evaluated using GIS analysis to determine the proportional content of three key metrics: high value habitats from the GAP data, NWI wetlands, and overall forest cover. Subwatersheds were broken into quartiles based on the content of each metric, and a point scores were assigned to each quartile. In addition to the three metrics, bonus points could be earned for the presence of Natural Heritage Element occurrences, significant Natural Heritage Areas, and TLC/Orange County High Quality Forest Habitat Areas. Scores were then ranked into three priority categories: low priority (scores 4-12), medium priority (scores 13-18), and high priority (scores 19-22).

Habitat Assessment Results

The highest priority terrestroa; habitat protection areas within the watershed are the headwaters of Bolin and Morgan Creeks, as well as the Little Creek Arm and Morgan Creek Arms located near Jordan Lake. Because the lower most Morgan and Little Creek subwatersheds are already protected from development, it will most likely be recommended that the major focus of preservation should be in the Upper Bolin Creek/Morgan Headwaters area, especially because this area also has high development potential. In the final phase of the effort habitat preservation priorities will be evaluated on a parcel scale, in order to identify areas where preservation resources will result in the greatest benefits in terms of habitat quality and quantity.

The stressors to the streams have already been analyzed in previous assessments, so the greatest risks have been identified, and now this habitat assessment serves to identify the areas most important to protect. In the third phase of the project, specific projects such as stream restoration, Best Management Practices (BMPs), and other protection efforts will be reviewed. The team will be asked to help identify the BMPs and restoration efforts that provide the greatest overall benefit and serve multiple restoration and protection goals. For example, one area could be suffering from high nutrient loading, high erosion, and metals loading. So, which BMP or protection effort will help to resolve all three problems? Each watershed improvement or protection effort will be evaluated on a case by case basis, depending on its ability to control flow, reduce nutrient loading, and improve habitat at the particular location. A detailed assessment of the modeling analysis will be completed in late March, and the Local Watershed Planning team will meet to make recommendations in the following months as grants, projects, and funding sources are established.

Better Site Design Implementation: Upper Neuse River Basin and Cape Fear Basin Experience

Deborah Amaral presented a review of the Center for Watershed Protection's Code and Ordinance Worksheet, and gave some recent results for other North Carolina communities who have conducted the evaluation in their river basins. The Cape Fear River Assembly hopes to help communities evaluate current ordinances and identify areas where improvements can be made.

In 1996, the Center for Watershed Protection (CWP) convened a diverse group of stakeholders that established recommendations for a Site Planning Roundtable approach and a set of 22 Model Development Principles to protect water resources in communities across the nation. These initiatives serve to reduce impervious surface, conserve natural areas, and reduce stormwater pollution from new developments. The principles are not national standards but need to be adapted to meet unique conditions in each community, and should maintain consistency with local environmental and watershed plans. Furthermore, they do not address issues of infill and redevelopment, and will not apply to all developments.

The 22 Model Development Principles are divided into three categories:

- A. Residential Streets and Parking Lots
- B. Lot Development
- C. Conservation of Natural Resources

The Code and Ordinances Worksheet was developed by the Center for Watershed Protection to facilitate assessment of how well a community is doing to protect watersheds from run-off through its existing rules. Scoring is based on the completion of a series of questions about current rules and regulations. The following is the scoring system:

90 – 100 Community has above-average provisions that promote the protection of streams, lakes, and estuaries.

80 – 89 Local development rules are good, but could use minor adjustments or revisions in some areas.

70 – 79 Opportunities exist to improve development rules. Consider making a site planning roundtable.

60 – 69 Development rules are likely inadequate to protect local aquatic resources. A site planning roundtable would be useful.

< 60 Development rules need to be examined carefully in order to determine where obstacles to resource protection occur as well as how to overcome these obstacles.

The Upper Neuse River Basin Association has recently participated in the Better Site Design process, and completed the Code and Ordinance Worksheet during the summer of 2002. The process guided participants in identifying concrete opportunities for improvement and the assessment shows clear areas of achievement. The team members focused on what they could learn from the CWP's suggested rules, as opposed to focusing on the actual worksheet score. The draft report is currently under review, but will soon be posted at www.unrba.org. Additionally, jurisdictions in two Local Watershed Planning Teams, including the Morgan and Little Creek team, have recently provided data for the Cape Fear Basin.

The overall score for the Cape Fear Basin averaged 56 out of 100 points, which is the same overall score obtained in the Upper Neuse Basin study. Communities participating include Chapel Hill, Orange County, Holly Springs, Harnett County, and Fuquay-Varina. Chapel Hill maintained the highest score of 74 out of 100. However, it should be noted that the worksheet serves to identify areas for improvement, and not to rank or categorize the ordinances of the participating communities.



Residential Streets and Parking Lots

This section of the 22 Model Development Principles focuses on 10 suggestions for reducing impacts from residential streets and parking areas, including street width, street length, right-of-way width, culs-de-sac, vegetated open channels, parking ratios, parking codes, parking lot design, structured parking, and parking lot runoff. Many of the questions asked about provisions for minimum requirements, suggesting that an obstacle to good development rules is that the streets/parking areas are not allowed to be smaller sized. One example of the Residential Streets and Parking Lots Principles is #10: Stormwater Treatment on Parking Lots, which states that bioretention areas, filter strips, and other practices that can be integrated into required landscaping areas and traffic islands should be implemented in order to treat stormwater runoff.

For the Upper Neuse River Basin assessment, the average score for this first section of the worksheet was a 20, out of 40 possible points. Granville County had the highest score of 30 out of 40, while Person County had the lowest with only 10 out of 40. The average score in the Cape Fear Basin assessment was 16 out of 30 points, with Chapel Hill scoring the highest at 26 out of 30 points and Fuquay-Varina scoring the lowest at 3 out of 40 points.

Lot Development

This section of the principles focuses on 6 proposals for reducing impacts from lot developments, including open space developments, setbacks and frontages, sidewalks, driveways, open space management, and rooftop runoff. One example of these kinds of principles is #16: Direct Rooftop Runoff to Pervious Areas, which suggests that rooftop runoff should be directed to pervious areas such as yards, open channels, or vegetated areas and that routing runoff to the roadway and stormwater conveyance systems should be avoided.

For the Upper Neuse River Basin evaluation, the average score for the Lot Development section of the worksheet was a 22, out of 36 possible points. Franklin County had the highest score of 29 out of 40, while Person County had the lowest with only 7 out of 40. For the Cape Fear Basin study, the average score was a 25 out of 36 points, with Harnett County returning the highest score of 30 out of 36 points, and Fuquay-Varina with the lowest score of 22 out of 36 points.

Conservation of Natural Areas

This last portion of the principles focuses on conserving natural areas, and highlights 6 principles that deal with aquatic buffers, buffer maintenance, clearing and grading, tree conservation, conservation incentives, and stormwater outfalls. One example of these principles is #22: Improve Stormwater Management, which states that new stormwater outfalls should not discharge unmanaged stormwater into jurisdictional wetlands, sole-source aquifers, or sensitive areas. One management practice could be to implement a stormwater retention pond, which moderates the flow of stormwater, and allows sediment to drop out so the flow to the stream is cleaner.

In the Upper Neuse River Basin study, the average score for this section was a 16, out of 24 possible points. For the Cape Fear Basin evaluation, the average score was 11 out of 24 points, with Chapel Hill scoring the highest at 17 out of 24 points, and Fuquay-Varina scoring the lowest at 5 out of 24 points.

In general, the five communities participating in the Cape Fear River Basin Assessment met or exceeded the principles dealing with street width, driveways, open space management, culs-de-sac, parking ratios, parking lot impervious surfaces, sidewalks, and clearing and grading. Principles that could be improved upon include parking codes, structured parking, street rights-of-way, open space design, setbacks and frontages, buffer maintenance, natural vegetation conservation and stormwater outfalls.

Communities in the both the Upper Neuse River Basin and the Cape Fear River Basin are making progress towards protecting their watershed, but recognize the magnitude of their task. Total scores for Chapel Hill (74/100) and Orange County (54/100) indicate that there is still some room for improvement of the codes and ordinances in these communities. Hopefully, the town of Carrboro will soon complete the worksheet and the additional data will help the team to better identify where improvement is needed in the entire watershed. The Better Site Design Handbook is a great resource to help craft ordinance language and zero in on which rules and regulations could be changed in order to better protect the watershed. It can be purchased directly from the Center for Watershed Protection.

Another Watershed Protection Roundtable was initiated in the Wilmington area in the past few years, and the Code and Ordinances Worksheet was used there to assess water quality protection. During the initial review, the average score was a 62 out of 100 points, but during the two-year roundtable, regulatory changes increased that score to a 67. If all the recommendations in the July 2001 Wilmington Roundtable Report are adopted, the score will again rise to 88 out of 100, significantly improving watershed health.

This full report is available at:

www.ci.wilmington.nc.us/pubservices/stormwater/publicationsandreports.htm

The meeting was adjourned.

Cape Fear River Assembly
31st Annual Meeting
Wilmington, NC
April 29-30, 2004
www.cfra-nc.org