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Executive Summary

North American Fall Zone rivers and streams are some of Earth’s most beautiful, economically valuable, and biologically diverse aquatic resources. When maintained for these values, they provide food, limited water, a cooling local climate, murmuring and vibrant sounds of energized water, and peace of mind in a world dominated by modern lifestyles.

Visually, Chatham County’s Rocky River is typical of many southeastern Fall Zone rivers and streams, such as the upper Meherrin and Nottoway rivers in Virginia, the upper Dan River in Virginia and North Carolina, parts of the Rocky River in the Charlotte Metro Area, parts of the Pacolet River in North and South Carolina, and Stevens Creek in South Carolina. Like the Meherrin River, Nottoway River, Dan River, and Stevens Creek, the Rocky River in Chatham County provides habitat for very significant and rare aquatic biological resources. However, without a meaningful change in management of Chatham County’s Rocky River Subbasin, it will rapidly mirror the biologically depauperate Rocky River Subbasin in the Charlotte Metro Area and the Pacolet River in parts of North and South Carolina.

During 2010, the Rocky River Heritage Foundation acquired funding for Alderman Environmental Services, Inc. to survey Chatham County’s Rocky River Subbasin for mussels, clams, snails, crayfish, and the Cape Fear shiner. This report documents project findings.

Signs of decline in Chatham County’s Rocky River are obvious. Of 16 freshwater mussel species documented since 1863, 7 have been extirpated, 6 will probably experience near-term extirpation, 2 are vulnerable to extirpation, and 1 species is in overall decline within the subbasin. Only 1 native clam species was documented during 2010. Its status is presently undetermined. One of 4 stream crayfish species appears vulnerable to extirpation. Of these 21 invertebrate species, only 4 species may possibly remain extant within the subbasin within the foreseeable future.

Overall, fish diversity appeared good within the Rocky River Subbasin with 24 species documented during 2010. Since the primary focus of our fish surveys was evaluation of the Rocky River Cape Fear shiner population, we can say little about other species’ populations. Although the Cape Fear shiner, a federally listed endangered fish species, continues to be documented as extirpated from the Rocky River upriver from Woody Dam, data suggest that a good to excellent population exists throughout the Rocky River downriver from Woody Dam and upstream within Bear Creek at least to state route 2155.

Although the documented declines in the Rocky River are disturbing, there is a more numbing, jarring, and disturbing reality: Native Americans lived here for thousands of years, settlers moved in during the 1700s, and all of the known native documented Rocky River aquatic species were present through the 1960s. Based upon numerous surveys conducted by the N.C. Wildlife Resources Commission, N.C. Museum of Natural
Sciences, N.C. Natural Heritage Program, and other biologists since 1970, all the documented declines in the Rocky River aquatic species diversity occurred since passage of the National Environmental Policy Act, the Clean Water Act, the Clean Air Act, the Endangered Species Act, and associated North Carolina state statutes. These statutes and their associated regulations are failing to secure a natural resources future for United States citizens. We need major changes in various public and private behaviors:

- Political leaders need to enlighten citizens about the rapid declines in thousands of our country’s native species. We now live in a country with more than 300 million citizens, and our human population is growing. Associated with this growth is increasing intensity of human management of our natural ecosystems. Nature is reacting very poorly to this management. If we wish to have even rudimentary functioning natural ecosystems in the near future, we will need to have more, not less, natural resources regulation of our activities.

- Relative to development projects, it is critical that regulatory and review agencies require sufficient management, not just necessary mitigation, to protect our fragile aquatic natural resources. Permit review agencies (e.g., U.S. Fish & Wildlife Service, N.C. Wildlife Resources Commission) and permit awarding agencies (e.g., U.S. Army Corps of Engineers, N.C. Division of Water Quality) must ensure that all direct, cumulative, indirect, interrelated, and interdependent project effects are fully identified and essentially eliminated, otherwise we’re simply adding impacts to resources already in significant decline. In the future, all agencies need to do a much better job of explaining why required conservation techniques are essential to ensure conservation of our children’s natural resources.

- If the agricultural and silvicultural interests can’t adopt sufficient best management practices to protect citizens’ natural resources and ensure implementation of these best management practices, then these interests should be regulated by state and federal regulatory agencies.

- It is clear that the judicial system’s ability to ensure compliance with existing statutes and regulations required to protect the Rocky River Subbasin is inadequate. At a minimum, existing uses, including each native aquatic species, must be conserved perpetually within the subbasin. From a recent court case involving the Rocky River, it’s obvious that the present judicial system believes that just having any mussels or any snails or any fish or any other aquatic taxa group present within the subbasin constitutes conservation or protection of existing uses. Such a decision flies in the face of modern understandings of ecology, taxonomy, and population biology. It is basically impossible to protect or conserve long term the native aquatic species (each being an existing use of the subbasin) without maintaining relatively large, healthy populations found throughout much or most of the subbasin. Without a competent judicial system, adequate conservation of the Rocky River’s aquatic resources will be nearly impossible.
Local citizens and their local governments need to realize that our aquatic natural resources are disappearing at a dramatically accelerating rate, and collectively we must change how we interact with nature.

Four high priority aquatic habitats exist within the Rocky River Subbasin: 1) Rocky River, upriver from the Siler City Reservoir, 2) Tick Creek, 3) Bear Creek, and 4) the Rocky River downriver from Woody Dam. Although these are high priority areas for improved conservation, citizens must understand that long term, the associated species’ viabilities will only be ensured by improving conditions throughout the Subbasin. Populations need to increase in size, repopulate unpopulated areas of the Rocky River and its other tributaries, thus helping to ensure long term survival.

Without meaningful changes in our behaviors, the Rocky River’s aquatic biodiversity significance will probably be reduced to insignificance within the next 10 years. Although not exhaustive, the following are necessary initial actions required to reverse the downward biodiversity trends to allow restoration of the Rocky River Subbasin:

- As we have learned during the past decade, contaminants associated with effluent (e.g., excreted pharmaceuticals, including estrogenic compounds) are significantly harming aquatic ecosystems throughout much of the United States. During the foreseeable future, these contaminants along with other pollutants cannot be removed from Siler City’s discharge to the Rocky River. Blame for this situation rests entirely with state and federal regulatory and review agencies and with the NC State Legislature, not with Siler City. Given this existing reality, we need Siler City and Chatham County to lead in the recovery of the Rocky River. Therefore, consistent with the goals and policies of the Clean Water Act, effluent from the Siler City wastewater treatment facility needs to be removed as a direct discharge to the Rocky River. In the future, effluent needs to be spray irrigated onto the surrounding landscapes, or other effluent removal technologies need to be implemented. During Rocky River low flow periods, additional water needs to be released from the Siler City reservoir to eliminate the effects of reduced flow associated with removal of the effluent discharge, and Chatham County needs to provide an equal volume of potable water to Siler City at cost to meet the city’s needs during these low flow periods. If at all possible, state and federal grants and various other private foundation funds should be acquired to address this need.

- Wide wooded buffers need to be established along all waterways within the Rocky River Subbasin. Emphasis should be placed upon maintenance of mature native plant communities within these buffers. Financial resources should be acquired to help landowners implement this strategy. Also, local governments should remove any taxes on lands established as such buffers, since these buffers will help protect all citizens’ water quality.
• Technologies need to be developed and implemented to ensure that all stream ecosystems maintain nutrient levels consistent with those expected before European settlement.

• Given sincere and quantifiable cooperation from all local governments within the Rocky River Subbasin, conservation groups and interested citizens should aggressively help recruit high quality, high technology, low impact businesses to municipal centers within the subbasin. Such companies will only be interested in such areas if local governments and communities help to maintain a quality local environment, including improving conditions within the Rocky River Subbasin.

John M. Alderman, President
Alderman Environmental Services, Inc.
Introduction

More than 300 recognized species and subspecies of freshwater mussels are known from North America north of Mexico. Nearly 72% of these taxa are considered endangered, threatened, or of special concern to the scientific community (Williams et al. 1992). Roughly 600 freshwater snail species occur in North America (Burch 1989, Masters et al. 1998), and because of limited, current distribution and abundance information, their overall statuses are largely undetermined. However, based upon discussions with many field biologists, many freshwater snail taxa are also in significant imperilment. More than 360 crayfish taxa are documented from North America north of Mexico. Of these, 174 (47.9%) are considered endangered, threatened, vulnerable, or extinct (2 species) by the scientific community (Taylor et al. 2007). For the 1,187 species of North American freshwater and diadromous fish, 46% are considered endangered, threatened, or vulnerable, and 36 freshwater fish have become extinct (Jelks et al. 2008).

Within North Carolina, more than half of our ~60 freshwater mussel species, 10% of our >40 snail species, 8 of our ~40 crayfish species, and 42 of our more than 175 freshwater fish species are state listed endangered, threatened, or of special concern (NC Wildlife Resources Commission 2008).

Alderman Environmental Services, Inc. was hired by Rocky River Heritage Foundation to complete surveys of the Rocky River Subbasin in Chatham County for freshwater mussel, clam, snail, and crayfish taxa, plus document the current range and distribution of
the Cape Fear shiner within the subbasin. Data acquired will serve as a distribution and abundance baseline for these taxa within the watershed.

**Methods**

Alderman Environmental Services, Inc. employed survey techniques that varied according to targeted taxa. Visual sampling for freshwater mussels was conducted with the assistance of bathyscopes. Tactile techniques augmented visual sampling in areas of poor visibility. The collected live mussels were identified in the field and returned to the substrate. Clams were separated from loose substrate, such as silt or sand, by sifting the collected contents. The larger particles, including pea clams, remained within the dipnet for identification in the field or laboratory. The shells of clams were also noted during the visual mussel survey. Freshwater snails and limpets were collected by examining larger rocks and woody debris for attached snails. Approximately 20 rocks or pieces of woody debris were examined in this manner at each site. The attached snails were collected, field identified, or preserved for later identification. Crayfish were collected by hand or dipnet to be field identified or preserved for later identification. Fish were sampled either by seine or dipnet. The seine is nylon, 6 foot by 12 foot with 1/8 inch mesh, and 1 lead weight every 12 inches. Two biologists would pull the seine through any potential Cape Fear shiner habitat, quickly identify all species, determine qualitative abundances (i.e., rare, uncommon, common, abundant), and would quickly return the fish to the water. If identification of a fish were difficult, it would be removed and preserved for later identification. (No Cape Fear shiners were injured, killed, or preserved.) Often within riffle habitat, one biologist would hold the seine downstream as the other biologist would kick in a downstream direction to drive fish into the net. This method was
especially effective for collecting darters. All surveys were completed within 32 sites or stream reaches from 6 April 2010 to 9 June 2010 (Figure 1, Appendix).

**Results and Discussion**

Although 16 species of freshwater mussels were historically known from the Rocky River Subbasin (Table 1), 9 freshwater mussel species were documented as extant within the areas surveyed for this project and last year’s Tick Creek survey project (Figure 2): Carolina lance (*Elliptio angustata*), Eastern elliptio (*Elliptio complanata*), Atlantic spike (*Elliptio producta*), eastern floater (*Pyganodon cataracta*), creeper (*Strophitus undulatus*), Florida pondhorn (*Uniomerus carolinianus*), notched rainbow (*Villosa constricta*), eastern creekshell (*Villas delumbis*), and Carolina creekshell (*Villosa vaughaniana*).

Two clam species were documented (Table 2): the invasive Asian clam (*Corbicula fluminea*) and the native striated fingernail clam (*Sphaerium striatinum*) (Figure 3).

Eight snail taxa were documented (Table 3, Figure 4): pointed campeloma (*Campeloma decisum*), gravel elimia (*Elimia catenaria*), creeping ancylid (*Ferrissia rivularis*), two-ridge-rams-horn (*Helisoma anceps*), marsh rams-horn (*Helisoma trivolvis*), dusky ancylid (*Laevapex fuscus*), panhandle pebblesnail (*Somatogyrus virginicus*), and a *Physa* species.

Four crayfish taxa were documented during 2009 and 2010 associated with the current study and our Tick Creek aquatic inventory (Table 4, Figure 5): Carolina ladle crayfish
Rocky River crayfish (*Cambarus (Depressicambarus) reducns*), and White River crayfish (*Procambatus (Ortmannicus) acutus*).


The diversity of Rocky River freshwater mussels, compared to historical data, is apparently in a dramatic decline. Historical surveys since the mid-1800s (Shelley 1987, Alderman 2010) documented 16 species of mussels, compared to the nine species collected during our 2009 and 2010 surveys. This survey, as well as all recent surveys, found no evidence of *Alasmidonta undulata, Alasmidonta varicosa, Fusconaia masoni, Lampsilis cariosa, or Toxolasma pullus*. These mussel species, all listed as endangered
by the NCWRC and species of special concern by the USFWS, plus the state listed threatened *Lampsilis radiata*, are likely extirpated from the Rocky River Subbasin. For the remaining nine species of mussels, the population sizes are apparently decreasing, compared to previous surveys within the subbasin. Only *Elliptio complanata*, found at 22 sites, seems to have a presently viable population during the foreseeable future. However, it is also in decline and needs to be regularly monitored. *Pyganodon cataracta*, found at nine sites, and *Uniomerus carolinianus*, found at three sites, are vulnerable to extirpation with apparently small populations that are geographically isolated (Figure 2). The remaining six species, *Elliptio angustata, Elliptio producta, Strophitus undulatus, Villosa constricta, Villosa delumbis*, and *Villosa vaughaniana*, are subject to near term exterpation due to currently documented small populations that are geographically isolated (Figure 2).

The population of the striated fingernail clam (*Sphaerium striatinum*) is very difficult to assess due to the seasonal variability in pea clam population density (Hornbach et al. 1982). In the five local populations of striated fingernail clam, the density varied from just a few old shells to dozens of live individuals per sample. The invasive Asian clam (*Corbicula fluminea*) had a stable population throughout much of the subbasin.

Of the eight species of freshwater snails collected during this survey, we consider only the *Physa* species to be secure in the Rocky River Subbasin. Both the gravel elimia (*Elimia catenaria*) and the pointed campeloma (*Campeloma decisum*) are vulnerable to extirpation due to mostly small populations found in few sites. The pointed campeloma
was only found at six sites, with very few individuals, except for the population in the upper Rocky River documented at site 2010406.1jma. The gravel elimia was geographically isolated with only two populations found throughout this study. It was more difficult to make a determination with the last five species: the creeping ancylid (*Ferrissia rivularis*), two-ridge-rams-horn (*Helisoma anceps*), marsh rams-horn (*Helisoma trivolvis*), dusky ancylid (*Laevapex fuscus*), and the panhandle pebblesnail (*Somatogyrus virginicus*).

The majority of the crayfish populations we encountered during this survey appear to be fairly stable. Of the four species collected, only the Carolina ladle crayfish (*Cambarus* (*Cambarus*) *davidi*) appears to be vulnerable to extirpation. The Carolina ladle crayfish was only found at four sites associated with the 2009 Tick Creek inventory project, all with heavily forested deciduous landscape and clear, cold water. These populations are geographically isolated and appear to have little competition from the other three species collected in the Rocky River Subbasin.

Overall, fish diversity appears good within the Rocky River Subbasin with 24 species documented during 2010. Since the primary focus of our fish surveys was evaluation of the Rocky River Cape Fear shiner population, we can say little about other species’ populations. Although the Cape Fear shiner, a federally listed endangered fish species, continues to be documented as extirpated from the Rocky River upriver from Woody Dam, data suggest that a good to excellent population exists throughout the Rocky River
downriver from Woody Dam and upstream within Bear Creek at least to state route 2155 (Figure 6).
References


Figure 1. Freshwater mussel, snail, crayfish, and fish survey sites within the Rocky River Subbasin, Chatham County, North Carolina; see Appendix for site specific data
Figure 2. Known, current freshwater mussel taxa distributions within the Rocky River Subbasin; summary of 2006-08 Alderman Environmental Services, Inc. Rocky River Subbasin Surveys, 2009 Tick Creek, and 2010 other Rocky River Subbasin surveys
Figure 3. Known, current, native freshwater clam taxa distributions within the Rocky River Subbasin; summary of 2006-08 Alderman Environmental Services, Inc. Rocky River Subbasin Surveys, 2009 Tick Creek, and 2010 other Rocky River Subbasin surveys
Campeloma decisum = 1  Helisoma trivolvis = 5
Elimia catenaria = 2  Hydrobiidae/
Ferrissia rivularis = 3  Somatogyrus virginicus = 6
Helisoma anceps = 4  Laevapex fuscus = 7
Physa sp. = 8

Figure 4. Known, current freshwater snail taxa distributions within the Rocky River Subbasin; summary of 2006-08 Alderman Environmental Services, Inc. Rocky River Subbasin Surveys, 2009 Tick Creek, and 2010 other Rocky River Subbasin surveys
Figure 5. Known, current freshwater crayfish taxa distributions within the Rocky River Subbasin; summary of 2009 Tick Creek and 2010 other Rocky River Subbasin surveys.
Figure 6. 2010 confirmed Cape Fear shiner (*Notropis mekistocholas*) within the Rocky River Subbasin
Table 1. Freshwater mussel species documented from the Rocky River Subbasin since the mid-1800s; all species considered extant in 1970

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
<th>TNC G Rank</th>
<th>TNC S Rank</th>
<th>NCWRC Status</th>
<th>USFWS Status</th>
<th>Rocky River Vulnerability</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Alasmidonta undulata</em></td>
<td>Triangle floater</td>
<td>G4</td>
<td>S2</td>
<td>Endangered</td>
<td>N/A</td>
<td>Extirpated</td>
</tr>
<tr>
<td><em>Alasmidonta varicosa</em></td>
<td>Brook floater</td>
<td>G3</td>
<td>S1</td>
<td>Endangered</td>
<td>Species of Concern</td>
<td>Extirpated</td>
</tr>
<tr>
<td><em>Elliptio angustata</em></td>
<td>Carolina lance</td>
<td>G4</td>
<td>S4</td>
<td>N/A</td>
<td>N/A</td>
<td>Nearterm Extirpation Probable</td>
</tr>
<tr>
<td><em>Elliptio complanata</em></td>
<td>Eastern elliptio</td>
<td>G5</td>
<td>S4S5</td>
<td>Common</td>
<td>N/A</td>
<td>Declining</td>
</tr>
<tr>
<td><em>Elliptio producta</em></td>
<td>Atlantic spike</td>
<td>G3Q</td>
<td>SU</td>
<td>N/A</td>
<td>N/A</td>
<td>Nearterm Extirpation Probable</td>
</tr>
<tr>
<td><em>Fusconaia masoni</em></td>
<td>Atlantic pigtoe</td>
<td>G2</td>
<td>S1</td>
<td>Endangered</td>
<td>Species of Concern</td>
<td>Extirpated</td>
</tr>
<tr>
<td><em>Lampsilis cariosa</em></td>
<td>Yellow lampmussel</td>
<td>G3G4</td>
<td>S1</td>
<td>Endangered</td>
<td>Species of Concern</td>
<td>Extirpated</td>
</tr>
<tr>
<td><em>Lampsilis radiata</em></td>
<td>Eastern lampmussel</td>
<td>G5</td>
<td>S1S2</td>
<td>Threatened</td>
<td>N/A</td>
<td>Extirpated</td>
</tr>
<tr>
<td><em>Lasmigona Subviridis</em></td>
<td>Green floater</td>
<td>G3</td>
<td>S1</td>
<td>Endangered</td>
<td>Species of Concern</td>
<td>Extirpated</td>
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<td><em>Pyganodon cataracta</em></td>
<td>Eastern floater</td>
<td>G5</td>
<td>S5</td>
<td>Common</td>
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<tr>
<td><em>Strophitus undulatus</em></td>
<td>Creeper</td>
<td>G5</td>
<td>S2</td>
<td>Threatened</td>
<td>N/A</td>
<td>Nearterm Extirpation Probable</td>
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<tr>
<td><em>Toxolasma pullus</em></td>
<td>Savannah lilliput</td>
<td>G2</td>
<td>S1</td>
<td>Endangered</td>
<td>Species of Concern</td>
<td>Extirpated</td>
</tr>
<tr>
<td><em>Unioomerus carolinianus</em></td>
<td>Florida pondhorn</td>
<td>G4</td>
<td>SU</td>
<td>N/A</td>
<td>N/A</td>
<td>Vulnerable to extirpation</td>
</tr>
<tr>
<td><em>Villosa constricta</em></td>
<td>Notched rainbow</td>
<td>G3</td>
<td>S3</td>
<td>Special Concern</td>
<td>N/A</td>
<td>Nearterm Extirpation Probable</td>
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<td><em>Villosa delumbis</em></td>
<td>Eastern creekshell</td>
<td>G4</td>
<td>S3</td>
<td>Significantly Rare (NHP)</td>
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<tr>
<td><em>Villosa vaughaniana</em></td>
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<td>S2</td>
<td>Endangered</td>
<td>Species of Concern</td>
<td>Nearterm Extirpation Probable</td>
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Table 2. Freshwater clam species documented from the Rocky River Subbasin

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
<th>TNC G Rank</th>
<th>TNC S Rank</th>
<th>NCWRC Status</th>
<th>USFWS Status</th>
<th>Rocky River Vulnerability</th>
</tr>
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<tbody>
<tr>
<td><em>Corbicula fluminea</em></td>
<td>Asian clam</td>
<td>G5</td>
<td>SNA</td>
<td>N/A</td>
<td>N/A</td>
<td>Exotic, Secure</td>
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<td><em>Sphaerium striatinum</em></td>
<td>Striated Fingernailclam</td>
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<td>S5</td>
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<td>N/A</td>
<td>Undetermined</td>
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Table 3. Freshwater snail species documented from the Rocky River Subbasin

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
<th>TNC G Rank</th>
<th>TNC S Rank</th>
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<th>USFWS Status</th>
<th>Rocky River Vulnerability</th>
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</thead>
<tbody>
<tr>
<td><em>Campeloma decisum</em></td>
<td>Pointed Campeloma</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
<td>Vulnerable to extirpation</td>
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<tr>
<td><em>Elimia catenaria</em></td>
<td>Gravel Elimia</td>
<td>G4</td>
<td>S3</td>
<td>N/A</td>
<td>N/A</td>
<td>Vulnerable to extirpation</td>
</tr>
<tr>
<td><em>Ferrissia rivularis</em></td>
<td>Creeping Ancylid</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
<td>Undetermined</td>
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<tr>
<td><em>Helisoma aniceps</em></td>
<td>Two-ridge-rams-horn</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
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<td><em>Helisoma trivolvis</em></td>
<td>Marsh rams-horn</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
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<td><em>Laevapex fuscus</em></td>
<td>Dusky Ancylid</td>
<td>G5</td>
<td>S5</td>
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<td>N/A</td>
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<td><em>Physa sp.</em></td>
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<td>Secure</td>
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<td><em>Somatogyrus virginicus</em></td>
<td>Panhandle pebblesnail</td>
<td>G2G3</td>
<td>S1?</td>
<td>Special Concern</td>
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Table 4. Lotic (stream) crayfish species documented from the Rocky River subbasin

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<th>Species</th>
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<th>TNC S Rank</th>
<th>NCWRC Status</th>
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<th>Rocky River Vulnerability</th>
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<tr>
<td>Cambarus (C.) davidi</td>
<td>Carolina ladle crayfish</td>
<td>G3</td>
<td>S2S3</td>
<td>N/A</td>
<td>N/A</td>
<td>Vulnerable to extirpation</td>
</tr>
<tr>
<td>Cambarus (D.) reduncus</td>
<td>Sickle crayfish</td>
<td>G4G5</td>
<td>S3</td>
<td>N/A</td>
<td>N/A</td>
<td>Secure</td>
</tr>
<tr>
<td>Cambarus (P.) hobbsorum</td>
<td>Rocky River crayfish</td>
<td>G3G4</td>
<td>S3S4</td>
<td>N/A</td>
<td>N/A</td>
<td>Secure</td>
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<tr>
<td>Procambarus (O.) acutus</td>
<td>White River crayfish</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
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Table 5. Fish species documented from the Rocky River subbasin during current study.

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<th>TNC S Rank</th>
<th>NCWRC Status</th>
<th>USFWS Status</th>
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<tr>
<td>Aphredoderus sayanus</td>
<td>Pirate perch</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Erimyzon oblongus</td>
<td>Creek chubsucker</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Esox niger</td>
<td>Chain pickerel</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Etheostoma olmstedii</td>
<td>Tessellated darter</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Fundulus rathbuni</td>
<td>Speckled killifish</td>
<td>G4</td>
<td>S4</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Gambusia affinis</td>
<td>Western mosquitofish</td>
<td>G5</td>
<td>SNA</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Lepisosteus osseus</td>
<td>Longnose gar</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Lepomis auritus</td>
<td>Redbreast sunfish</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Lepomis macrochirus</td>
<td>Bluegill</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Lepomis cyanellus</td>
<td>Green sunfish</td>
<td>G5</td>
<td>SNA</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Luxilus albeolus</td>
<td>White shiner</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Micropterus salmoides</td>
<td>Largemouth bass</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Moxostoma collapsum</td>
<td>Notchlip redhorse</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Table 5 (cont.). Fish species documented from the Rocky River subbasin during current study.

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
<th>TNC G Rank</th>
<th>TNC S Rank</th>
<th>NCWRC Status</th>
<th>USFWS Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Nocomis leptcephalus</em></td>
<td>Bluehead chub</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><em>Notemigonus crysoleucas</em></td>
<td>Golden shiner</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><em>Notropis alborus</em></td>
<td>Whitemouth shiner</td>
<td>G4</td>
<td>S4</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><em>Notropis altipinnis</em></td>
<td>Highfin shiner</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><em>Notropis hudsonius</em></td>
<td>Spottail shiner</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><em>Notropis mekistocholas</em></td>
<td>Cape Fear shiner</td>
<td>G1</td>
<td>S1</td>
<td>Endangered</td>
<td>Endangered</td>
</tr>
<tr>
<td><em>Notropis procne</em></td>
<td>Swallowtail shiner</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><em>Notropis scepticus</em></td>
<td>Sandbar shiner</td>
<td>G4</td>
<td>S4</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><em>Noturus insignis</em></td>
<td>Margined madtom</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><em>Percina crassa</em></td>
<td>Piedmont darter</td>
<td>G4</td>
<td>S4</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><em>Semotilus atromaculatus</em></td>
<td>Creek chub</td>
<td>G5</td>
<td>S5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
The Nature Conservancy Ranks

Global Ranks:

G1 - Critically Imperiled - At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.

G2 – Imperiled - At high risk of extinction or elimination due to very restricted range, very few populations, steep declines, or other factors.

G3 – At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.

G4 - Apparently Secure - Uncommon but not rare; some cause for long-term concern due to declines or other factors.

G5 – Common; widespread, and abundant.

Q - Questionable taxonomy that may reduce conservation priority—Distinctiveness of this entity as a taxon or ecosystem type at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon or type in another taxon or type, with the resulting taxon having a lower-priority (numerically higher) conservation status rank. The “Q” modifier is only used at a global level and not at a national or subnational level.

State Ranks:

S1 - Critically Imperiled - Critically imperiled in the jurisdiction because of extreme rarity or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the jurisdiction.

S2 – Imperiled in the state or province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state or province.

S3 – Vulnerable in the state or province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

S4 - Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.

S5 – Common, widespread, and abundant in the state or province.

? - Inexact Numeric Rank—Denotes inexact numeric rank; this should not be used with any of the Variant Global Conservation Status Ranks or GX or GH.

SNA - Not Applicable - A conservation status rank is not applicable because the species or ecosystem is not a suitable target for conservation activities.
APPENDIX – Survey station results from the Rocky River Subbasin, Cape Fear River Basin

PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION 20010406.1jma

LOCATION: Rocky River, Chatham Co., NC; 35.81441 N, 79.53738 W (at SR 1305)

Figure 1. Rocky River, just downstream from SR 1305

SURVEY DATE: April 6, 2010

SITE COMMENTS: Algae abundant; no Corbicula fluminea observed, no Cape Fear shiner habitat

HABITAT:

WATERBODY TYPE: Stream
FLOW: Run, riffle, slack, pool
RELATIVE DEPTH: Very shallow
DEPTH (%<2 FEET): 99
WATER LEVEL: Normal
WEATHER: Sunny, hot
SUBSTRATE: Clay, silt, sand, gravel, pebble, cobble, boulder, bedrock
COMPACTNESS: Normal and unconsolidated
HABITAT (cont.):

SAND/GRAVEL BARS: Present
WOODY DEBRIS: Average to high
BEAVER ACTIVITY: Evidence (gnawed sticks)
WINDTHROW: Moderate
TEMPORARY POOLS: None
CHANNEL WIDTH: 8+ m
BANK HEIGHT: 1.5+ m
BANK STABILITY: Some erosion/undercutting
BUFFER WIDTH: Wide
RIPARIAN VEGETATION: Wooded, shrub-brush
LAND USE: Natural, timber, rural
PERCENT COVER: 60
WOODLAND EXTENT: Extensive
NATURAL LEVEES: At least one
VISIBILITY: Slightly turbid

TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME: 1.0 person-hour for mussels + additional time for other taxa

TAXA:

FRESHWATER MUSSELS:

*Elliptio complanata* – 134 live; range: 21.7 – 89.5 mm
*Villosa constricta* – 2 males (23.7, 35.0 mm) and 1 female (31.6 mm)
*Pyganodon cataracta* – 1 shell
*Villosa delumbis* – 1 male (37.1 mm) and 1 female (31.6 mm)
*Uniomerus carolinianus* – 2 live: 61.8, 47.7 mm

Clams:

*Sphaerium striatinum* - present

Snails:

*Campeloma decisum* – common to abundant
*Helisoma aniceps* – common
*Physa* sp. – uncommon
Crayfish:

Cambarus (Puncticambarus) hobbsorum – present

Fish:

Nocomis leptcephalus – present
Notropis alitipinnis – common
Etheostoma olmstedi - present

Figure 2. Elliptio complanata
Figure 3. *Villosa delumbis*

Figure 4. *Villosa constricta*
Figure 5. *Uniomerus carolinianus*

Figure 6. *Campeloma decisum*
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100407.1jma

LOCATION: Rocky R., Chatham Co., NC; downstream from US 15-501 bridge; 35.62214 N, 79.18812 W

Figure 7. Rocky R. downstream from US 15-501

SURVEY DATE: April 7, 2010

SITE COMMENTS: - 7 seine hauls to collect fish
**HABITAT:**

| WATERBODY TYPE: | River            |
| FLOW:          | Run, riffle, slack, pool |
| RELATIVE DEPTH: | Very shallow     |
| DEPTH (%<2 FEET): | 98              |
| SUBSTRATE:     | Silt, sand, gravel, pebble, cobble, boulder |
| COMPACTNESS:   | Normal           |
| SAND/GRAVEL BARS: | Rare         |
| WOODY DEBRIS:  | Low              |
| BEAVER ACTIVITY: | Evidence (gnawed sticks) |
| WINDTHROW:     | Low              |
| TEMPORARY POOLS: | None observed |
| CHANNEL WIDTH: | 30+ m          |
| BANK HEIGHT:   | Varies          |
| BANK STABILITY: | Very stable     |
| BUFFER WIDTH:  | Wide            |
| RIPARIAN VEGETATION: | Wooded, shrub-brush |
| LAND USE:      | Natural, timber, rural |
| PERCENT COVER: | 3               |
| WOODLAND EXTENT: | Extensive     |
| NATURAL LEVEES: | None            |
| VISIBILITY:    | Clear           |
| WATER LEVEL:   | Normal          |
| WEATHER:       | Sunny, hot      |

**TECHNIQUES AND SURVEY TIME:**

TECHNIQUES: Visual, tactile, dip-net, seine  
SURVEY TIME: 1.0 person-hour for mussels + additional time for other taxa

**TAXA:**

**FRESHWATER MUSSELS:**

*Elliptio complanata* – 15 live  
*Pyganodon cataracta* – 1 shell  
*Elliptio producta* – 1 shell  
*Elliptio angustata* – 1 shell  
*Uniomerus carolinianus* – 1 shell
CLAMS:

*Corbicula fluminea*

SNAILS:

*Elimia catenaria*
*Campeloma decisum*
*Ferrissia rivularis*
*Somatogyrus virginicus*

CRAYFISH:

*Cambarus (Puncticambarus) hobbsorum – 5 live*
*Procambarus (Ortmannicus) acutus – 6 live*

FISH:

*Notropis mekistocholas – 31 live: males + females*
*Notropis altipinnis – abundant*
*Notropis scepticus – common*
*Etheostoma olmstedi – 1 live*
*Percina crassa – 1 live*
*Nocomis leptoccephalus – 2 live*
*Lepomis auritus – present*
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100407.2jma

LOCATION: Harlands Cr., Chatham County, NC, downstream from US 64; 35.72676 N, 79.24628 W

Figure 8. Harlands Creek

SURVEY DATE: April 7, 2010

SITE COMMENTS: No Corbicula fluminea observed
HABITAT:

WATERBODY TYPE: Stream
FLOW: Run, riffle, slack
RELATIVE DEPTH: Very shallow
DEPTH (%<2 FEET): 100
SUBSTRATE: Silt, sand, gravel, pebble, cobble, boulder, bedrock
COMPACTNESS: Normal
SAND/GRAVEL BARS: Present
WOODY DEBRIS: Average
BEAVER ACTIVITY: Evidence (gnawed sticks)
WINDTHROW: Low
TEMPORARY POOLS: None
CHANNEL WIDTH: 8+ m
BANK HEIGHT: 1.75+ m
BANK STABILITY: Very stable mostly
BUFFER WIDTH: Wide
RIPARIAN VEGETATION: Wooded, shrub-brush
LAND USE: Natural, timber, rural
PERCENT COVER: 80
WOODLAND EXTENT: Extensive
NATURAL LEVEES: At least one
VISIBILITY: Slightly turbid
WATER LEVEL: Normal
WEATHER: Sunny, hot

TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME: 1.0 person-hour for mussels + additional time for other taxa

TAXA:

FRESHWATER MUSSELS:

*Elliptio complanata* – 167 live
*Pyganodon cataracta* – 4 live

CLAMS:

*Sphaerium striatum* - present
SNAILS:

*Helisoma anceps*
*Campeloma decisum*
*Ferrissia rivularis*

Crayfish:

*Procambarus (Ortmannicus) acutus*
*Cambarus (Puncticambarus) hobbsorum*

Fish:

*Notropis altipinnis* – common
*Notropis procne* – common
*Etheostoma olmstedi* – common in places
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100408.1jma

LOCATION: Unnamed tributary to Rocky R., Chatham County, North Carolina, downstream from SR 2158 crossing; 35.65980 N, 79.23525 W

Figure 9. Unnamed tributary to Rocky River

SURVEY DATE: April 8, 2010

SITE COMMENTS: Deeply incised near Rocky River, from road to Rocky River

HABITAT:

<table>
<thead>
<tr>
<th>WATERBODY TYPE:</th>
<th>Stream</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLOW:</td>
<td>Riffle, run, slack, pool</td>
</tr>
<tr>
<td>RELATIVE DEPTH:</td>
<td>Very shallow</td>
</tr>
<tr>
<td>DEPTH (%&lt;2 FEET):</td>
<td>99</td>
</tr>
<tr>
<td>SUBSTRATE:</td>
<td>Clay, silt, sand, gravel, pebble, cobble, boulder, bedrock</td>
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**HABITAT (cont.):**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
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<tbody>
<tr>
<td>COMPACTNESS</td>
<td>Normal and unconsolidated (near confluence)</td>
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<tr>
<td>SAND/GRAVEL BARS</td>
<td>Present</td>
</tr>
<tr>
<td>WOODY DEBRIS</td>
<td>Average</td>
</tr>
<tr>
<td>BEAVER ACTIVITY</td>
<td>Evidence (gnawed sticks)</td>
</tr>
<tr>
<td>WINDTHROW</td>
<td>Low</td>
</tr>
<tr>
<td>TEMPORARY POOLS</td>
<td>None observed</td>
</tr>
<tr>
<td>CHANNEL WIDTH</td>
<td>6+ m</td>
</tr>
<tr>
<td>BANK HEIGHT</td>
<td>1 – 2.75+ m</td>
</tr>
<tr>
<td>BANK STABILITY</td>
<td>Varies</td>
</tr>
<tr>
<td>BUFFER WIDTH</td>
<td>Wide</td>
</tr>
<tr>
<td>RIPARIAN VEGETATION</td>
<td>Wooded, shrub-brush</td>
</tr>
<tr>
<td>LAND USE</td>
<td>Natural, timber, rural</td>
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<tr>
<td>PERCENT COVER</td>
<td>75+</td>
</tr>
<tr>
<td>WOODLAND EXTENT</td>
<td>Extensive</td>
</tr>
<tr>
<td>NATURAL LEVEES</td>
<td>-</td>
</tr>
<tr>
<td>VISIBILITY</td>
<td>Clear</td>
</tr>
<tr>
<td>WATER LEVEL</td>
<td>Normal</td>
</tr>
<tr>
<td>WEATHER</td>
<td>Sunny, hot</td>
</tr>
</tbody>
</table>

**TECHNIQUES AND SURVEY TIME:**

- **TECHNIQUES:** Visual; dip-net; seine
- **SURVEY TIME:** 1.0 person-hour mussels; 1.5 person-hours for other taxa

**FRESHWATER MUSSELS:**

None

**CLAMS:**

None

**SNAILS:**

*Laevapex fuscus*

**CRAYFISH:**

*Procambarus (Ortmannicus) acutus* – 1 live
*Cambarus (Puncticambarus) hobbsorum* – 19+ live
FISH:

*Etheostoma olmstedi* – common
*Notropis altipinnis* – common
*Notropis procne* – present
*Lepomis* sp.
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100408.2jma

LOCATION: Unnamed tributary to Rocky River, Chatham County, North Carolina, upstream from SR 2157 crossing; 35.65296 N, 79.21535 W

Figure 10. Unnamed tributary to Rocky River

SURVEY DATE: April 08, 2010

SITE COMMENTS: -

HABITAT:

| WATERBODY TYPE: | Stream |
| FLOW: | Run, riffle, slack, pool |
| RELATIVE DEPTH: | Very shallow |
| DEPTH (%<2 FEET): | 99 |
| SUBSTRATE: | Silt, sand, pebble, gravel, cobble, boulder, bedrock |
| COMPACTNESS: | Normal |
| SAND/GRAVEL BARS: | None |
| WOODY DEBRIS: | Low |
HABITAT (cont.):

BEAVER ACTIVITY: Evidence (gnawed sticks)
WINDTHROW: Low
TEMPORARY POOLS: None observed
CHANNEL WIDTH: 4-8+ m
BANK HEIGHT: Varies
BANK STABILITY: Very stable
BUFFER WIDTH: Wide
RIPARIAN VEGETATION: Wooded, shrub-brush
LAND USE: Natural, timber, rural
PERCENT COVER: 95
WOODLAND EXTENT: Extensive
NATURAL LEVEES: None
VISIBILITY: Clear
WATER LEVEL: Low
WEATHER: Sunny, hot

TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME: 2.5 person-hours

TAXA:

FRESHWATER MUSSELS:

None

CLAMS

None collected

SNAILS:

Ferrissia rivularis – Present

CRAYFISH:

Cambarus (Puncticambarus) hobbsorum – 5 Live

FISH:

Lepomis sp. – 1 individual seen
Etheostoma olmstedii - Present
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
            Joseph Alderman

STATION: 20100408.3jma

LOCATION: Unnamed tributary to Rocky River, Chatham County, North Carolina, upstream from SR 2222 crossing; 35.63376 N, 79.19550 W

Figure 11. Unnamed tributary to Rocky River

SURVEY DATE: April 08, 2010

SITE COMMENTS: - Small stream

HABITAT:

<table>
<thead>
<tr>
<th>WATERBODY TYPE:</th>
<th>Stream</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLOW:</td>
<td>Run, riffle, slack, pool</td>
</tr>
<tr>
<td>RELATIVE DEPTH:</td>
<td>Very shallow</td>
</tr>
<tr>
<td>DEPTH (%&lt;2 FEET):</td>
<td>100</td>
</tr>
<tr>
<td>SUBSTRATE:</td>
<td>Silt, sand, gravel, pebble, cobble, boulder</td>
</tr>
<tr>
<td>COMPACTNESS:</td>
<td>Normal</td>
</tr>
<tr>
<td>SAND/GRAVEL BARS:</td>
<td>Present</td>
</tr>
<tr>
<td>WOODY DEBRIS:</td>
<td>Average</td>
</tr>
<tr>
<td>BEAVER ACTIVITY:</td>
<td>Evidence (gnawed sticks)</td>
</tr>
</tbody>
</table>
HABITAT (cont.):

- **WINDTHROW:** Low
- **TEMPORARY POOLS:** Present
- **CHANNEL WIDTH:** 2-5+ m
- **BANK HEIGHT:** <0.5 m
- **BANK STABILITY:** Very stable
- **BUFFER WIDTH:** Wide
- **RIPARIAN VEGETATION:** Wooded, shrub-brush
- **LAND USE:** Natural, timber, rural
- **PERCENT COVER:** 80+
- **WOODLAND EXTENT:** Extensive
- **NATURAL LEVEES:** None
- **VISIBILITY:** Clear
- **WATER LEVEL:** Low
- **WEATHER:** Sunny-cloud, hot

TECHNIQUES AND SURVEY TIME:

- **TECHNIQUES:** Visual; tactile; dip-net; seine
- **SURVEY TIME:** 1.0 person-hour

TAXA:

FRESHWATER MUSSELS:

None

CLAMS

None collected

SNAILS:

*Ferrissia rivularis* – Present

CRAYFISH:

*Cambarus (Puncticambarus) hobbsorum* – 5 Live
*Procambarus (Ortmannicus) acutus* – 6 live
FISH:

*Gambusia affinis* – Patchy common

*Etheostoma olmstedi* - Rare
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100408.4jma

LOCATION: Bear Creek, Chatham County, North Carolina, upstream and downstream from SR 2156 crossing; 35.63453 N, 79.21181 W

Figure 12. Bear Creek

SURVEY DATE: April 08, 2010

SITE COMMENTS: - Mussels very rare, 4 seine hauls for fish

HABITAT:

- WATERBODY TYPE: Stream
- FLOW: Run, riffle, slack, pool
- RELATIVE DEPTH: Shallow
- DEPTH (%<2 FEET): 80
- SUBSTRATE: Silt, sand, gravel, pebble, cobble, boulder, bedrock
- COMPACTNESS: Normal
- SAND/GRAVEL BARS: Rare
HABITAT (cont.):

WOODY DEBRIS: Low
BEAVER ACTIVITY: Evidence (gnawed sticks)
WINDTHROW: Low
TEMPORARY POOLS: None
CHANNEL WIDTH: 10+ m
BANK HEIGHT: Varies
BANK STABILITY: Very stable
BUFFER WIDTH: Wide
RIPARIAN VEGETATION: Wooded, shrub-brush
LAND USE: Natural, timber, rural
PERCENT COVER: 60+
WOODLAND EXTENT: Varies
NATURAL LEVEES: At least one
VISIBILITY: Clear
WATER LEVEL: Normal
WEATHER: Sun-cloud, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME: 5 total person-hours
1.5 person-hour mussels

FRESHWATER MUSSELS:

*Elliptio complanata* - 13 live + shells
*Elliptio producta* - 1 shell
*Strophitus undulatus* - 1 shell
*Villosa delumbis* - 1 male shell

CLAMS:

None collected

SNAILS:

*Campeloma decisum* - 1 shell

CRAYFISH:

*Cambarus (Puncticambarus) hobbsorum* - 1 male, dead
FISH:

*Nocomis leptocephalus* - 2 live
*Luxilus albeolus* - Present
*Lepomis sp.* - Present
*Notropis altipinnis* - several
*Notropis mekistocholas* - 7 live
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100426.1jma

LOCATION: Rocky River, Chatham County, North Carolina, upstream and downstream from US 64 crossing; 35.73470 N, 79.42275 W

Figure 13. Rocky River

SURVEY DATE: April 26, 2010

SITE COMMENTS: - Start of canoe survey; at this site, emphasis on fish

HABITAT:

<table>
<thead>
<tr>
<th>WATERBODY TYPE:</th>
<th>River</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLOW:</td>
<td>Run, riffle, slack, pool</td>
</tr>
<tr>
<td>RELATIVE DEPTH:</td>
<td>Very Shallow</td>
</tr>
<tr>
<td>DEPTH (%&lt;2 FEET):</td>
<td>98</td>
</tr>
<tr>
<td>SUBSTRATE:</td>
<td>Silt, sand, gravel, pebble, cobble, boulder, bedrock</td>
</tr>
<tr>
<td>COMPACTNESS:</td>
<td>Normal</td>
</tr>
<tr>
<td>SAND/GRAVEL BARS:</td>
<td>None</td>
</tr>
<tr>
<td>WOODY DEBRIS:</td>
<td>Average</td>
</tr>
<tr>
<td>BEAVER ACTIVITY:</td>
<td>Evidence (gnawed sticks)</td>
</tr>
</tbody>
</table>
HABITAT (cont.):

WINDTHROW: Low
TEMPORARY POOLS: None
CHANNEL WIDTH: Varies
BANK HEIGHT: Varies
BANK STABILITY: Very stable
BUFFER WIDTH: Varies
RIPARIAN VEGETATION: Wooded, shrub-brush, grass
LAND USE: Urban
PERCENT COVER: 5
WOODLAND EXTENT: Varies
NATURAL LEVEES: None
VISIBILITY: Clear
WATER LEVEL: Low
WEATHER: Sun-cloud, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME: -

TAXA:

FRESHWATER MUSSELS:

Use data from last year

CLAMS:

*Corbicula fluminea*

SNAILS:

*Physa* sp. - present

CRAYFISH:

None collected
FISH:

*Erimyzon oblongus* - Rare
*Etheostoma olmstedii* - Common
*Semotilus atromaculatus* - Rare
*Lepomis macrochirus* - Common
*Luxilus albeolus* - Common
*Notropis alborus* - Uncommon
*Notropis altipinnis* - Common
*Notemigonus crysoleucas* - Rare
*Notropis hudsonius* - Rare
*Notropis santeeus* - Common to abundant
*Percina crassa* - Rare
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman

Joseph Alderman

STATION: 20100426.2jma

LOCATION: Rocky River, Chatham County, North Carolina, 35.72746 N, 79.41346 W; 0.77 air miles downriver from US 64 bridge crossing

Figure 14. Rocky River

SURVEY DATE: April 26, 2010

SITE COMMENTS: - Part of canoe survey

HABITAT:

<table>
<thead>
<tr>
<th>WATERBODY TYPE:</th>
<th>River</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLOW:</td>
<td>Run, riffle, slack, pool</td>
</tr>
<tr>
<td>RELATIVE DEPTH:</td>
<td>Very Shallow</td>
</tr>
<tr>
<td>DEPTH (%&lt;2 FEET):</td>
<td>98</td>
</tr>
<tr>
<td>SUBSTRATE:</td>
<td>Silt, sand, gravel, pebble, cobble, boulder</td>
</tr>
<tr>
<td>COMPACTNESS:</td>
<td>Normal</td>
</tr>
<tr>
<td>SAND/GRAVEL BARS:</td>
<td>None</td>
</tr>
<tr>
<td>WOODY DEBRIS:</td>
<td>Average</td>
</tr>
<tr>
<td>BEAVER ACTIVITY:</td>
<td>Evidence (gnawed sticks)</td>
</tr>
</tbody>
</table>
HABITAT (cont.):

WINDTHROW: Low
TEMPORARY POOLS: With fish
CHANNEL WIDTH: 25+
BANK HEIGHT: Varies
BANK STABILITY: Very stable
BUFFER WIDTH: Wide
RIPARIAN VEGETATION: Wooded, shrub-brush
LAND USE: Natural, rural, timber
PERCENT COVER: 15
WOODLAND EXTENT: Extensive
NATURAL LEVEES: None
VISIBILITY: Clear
WATER LEVEL: Low
WEATHER: Sun-cloud, Warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME: -

TAXA:

FRESHWATER MUSSELS:

Elliptio complanata – only shells

CLAMS

Corbicula fluminea

MACROSNAILS:

Physa sp. - Present

CRAYFISH:

Cambarus (Puncticambarus) hobbsorum – 1 dead
Procambarus (Ortmannicus) acutus – 1 live
FISH:

*Etheostoma olmstedi* - Rare
*Lepomis auritus* - Rare
*Lepisosteus osseus* - Rare
*Luxilus albeolus* – Common to abundant
*Micropterus salmoides* – Rare
*Nocomis leptocephalus* - Common
*Notropis altipinnis* - Common
*Notropis procne* - Uncommon
*Notropis scepticus* - Abundant
*Percina crassa* - Rare
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100426.3jma

LOCATION: Rocky River, Chatham County, North Carolina, 35.72010 N, 79.38987 W; 2.13 air miles downriver from US 64 bridge crossing

Figure 15. Rocky River

SURVEY DATE: April 26, 2010

SITE COMMENTS: - Part of canoe survey

HABITAT:

- WATERBODY TYPE: River
- FLOW: Run, riffle, slack, pool
- RELATIVE DEPTH: Very Shallow
- DEPTH (%<2 FEET): 99
- SUBSTRATE: Silt, sand, gravel, pebble, cobble, boulder
- COMPACTNESS: Normal
- SAND/GRAVEL BARS: Present
- WOODY DEBRIS: Low
- BEAVER ACTIVITY: Evidence (gnawed sticks)
- WINDTHROW: Low
- TEMPORARY POOLS: None
- CHANNEL WIDTH: Varies
- BANK HEIGHT: Varies
- BANK STABILITY: Very stable
HABITAT (cont.):

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUFFER WIDTH:</td>
<td>Wide</td>
</tr>
<tr>
<td>RIPARIAN VEGETATION:</td>
<td>Wooded, shrub-brush</td>
</tr>
<tr>
<td>LAND USE:</td>
<td>Natural, rural, timber</td>
</tr>
<tr>
<td>PERCENT COVER:</td>
<td>15</td>
</tr>
<tr>
<td>WOODLAND EXTENT:</td>
<td>Extensive</td>
</tr>
<tr>
<td>NATURAL LEVEES:</td>
<td>None</td>
</tr>
<tr>
<td>VISIBILITY:</td>
<td>Clear</td>
</tr>
<tr>
<td>WATER LEVEL:</td>
<td>Low</td>
</tr>
<tr>
<td>WEATHER:</td>
<td>Sun-cloud, Warm</td>
</tr>
</tbody>
</table>

TECHNIQUES AND SURVEY TIME:

| TECHNIQUES:                      | Visual; tactile; dip-net; seine |
| SURVEY TIME:                     | Mussel: 0.25 person hours      |

TAXA:

FRESHWATER MUSSELS:
None observed

CLAMS:

*Corbicula fluminea*

MACROSNAILS:

*Helisoma anceps* - Uncommon

CRAYFISH:

*Cambarus (Puncticambarus) hobbsorum* – Common

FISH:

*Erimyzon oblongus* - Rare
*Etheostoma olmstedii* - Rare
*Lepomis* sp. - Common
*Luxilus albeolus* - Abundant
*Nocomis leptocephalus* - Common
*Notropis altipinnis* - Abundant
*Notropis procne* - Uncommon
*Notropis scepticus* - Abundant
*Percina crassa* – Uncommon
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100427.1jma

LOCATION: Rocky River, Chatham County, North Carolina, upstream from NC 902; 35.67714 N, 79.28698 W

Figure 16. Rocky River

SURVEY DATE: April 27, 2010

SITE COMMENTS: - Part of canoe survey

HABITAT:

<table>
<thead>
<tr>
<th>WATERBODY TYPE:</th>
<th>River</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLOW:</td>
<td>Run, riffle, slack, pool</td>
</tr>
<tr>
<td>RELATIVE DEPTH:</td>
<td>Very Shallow</td>
</tr>
<tr>
<td>DEPTH (%&lt;2 FEET):</td>
<td>98</td>
</tr>
<tr>
<td>SUBSTRATE:</td>
<td>Silt, sand, gravel, pebble, cobble, boulder, bedrock,</td>
</tr>
<tr>
<td>COMPACTNESS:</td>
<td>Normal</td>
</tr>
<tr>
<td>SAND/GRAVEL BARS:</td>
<td>Present</td>
</tr>
<tr>
<td>WOODY DEBRIS:</td>
<td>Low</td>
</tr>
<tr>
<td>BEAVER ACTIVITY:</td>
<td>Evidence (gnawed sticks)</td>
</tr>
<tr>
<td>WINDTHROW:</td>
<td>Low</td>
</tr>
<tr>
<td>TEMPORARY POOLS:</td>
<td>None</td>
</tr>
<tr>
<td>CHANNEL WIDTH:</td>
<td>Varies</td>
</tr>
<tr>
<td>BANK HEIGHT:</td>
<td>Varies</td>
</tr>
<tr>
<td>BANK STABILITY:</td>
<td>Very stable</td>
</tr>
<tr>
<td>BUFFER WIDTH:</td>
<td>Wide</td>
</tr>
</tbody>
</table>
HABITAT (cont.):

Riparian Vegetation: Wooded, shrub-brush
Land Use: Natural, rural, timber
Percent Cover: 10
Woodland Extent: Extensive
Natural levees: None
Visibility: Clear
Water Level: Normal
Weather: Sunny-cloud, Warm

Techniques and Survey Time:

Techniques: Visual; tactile; dip-net; seine
Survey Time: Mussel: 0.3 person-hours

Taxa:

Freshwater Mussels:

Elliptio angustata – 1 live
Elliptio complanata – 11 live
Villosa delumbis – 1 male live

Clams

Corbicula fluminea

Snails:

Hydrobiidae - Abundant

Crayfish:

Cambarus (Puncticambarus) hobbsorum – Present
FISH:

*Erimyzon oblongus* - Rare
*Fundulus rathbuni* - Common
*Lepomis* sp. - Present
*Luxilus albeolus* – Common to abundant
*Nocomis leptocephalus* - Uncommon
*Notropis alipinnis* - Common
*Notropis procne* - Uncommon
*Notropis scepticus* – Common to abundant
*Noturus insignis* – Rare
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100427.2jma

LOCATION: Rocky River, Chatham County, North Carolina, upstream from NC 902; 35.67357 N, 79.27200 W

Figure 17. Rocky River

SURVEY DATE: April 27, 2010

SITE COMMENTS: From this point up several hundred yards along left descending bank, bank significantly disturbed by pulling shrubs and small trees from bank, piled up on landscape; part of canoe survey

HABITAT:

| WATERBODY TYPE: | River |
| FLOW: | Run, riffle, slack, pool |
| RELATIVE DEPTH: | Very Shallow |
| DEPTH (%<2 FEET): | 98 |
| SUBSTRATE: | Silt, sand, cobble, boulder, pebble gravel |
| COMPACTNESS: | Normal |
| SAND/GRAVEL BARS: | Present |
| WOODY DEBRIS: | Low |
| BEAVER ACTIVITY: | Evidence (gnawed sticks) |
| WINDTHROW: | Low |
| TEMPORARY POOLS: | None |
| CHANNEL WIDTH: | Varies |
| BANK HEIGHT: | Varies |
HABITAT (cont.):

BANK STABILITY: Very stable
BUFFER WIDTH: Wide
RIPARIAN VEGETATION: Wooded, shrub-brush
LAND USE: Natural, rural, timber
PERCENT COVER: 5+
WOODLAND EXTENT: Extensive to not extensive pasture
NATURAL LEVEES: unknown
VISIBILITY: Clear
WATER LEVEL: Low
WEATHER: Sunny-cloud, Warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME: mussel: 0.3 person-hours

TAXA:

FRESHWATER MUSSELS:

_Elliottio complanata_ – approximately 20 shells

CLAMS

_Corbicula fluminea_

SNAILS:

Hydrobiidae - Abundant

Crayfish:

_Cambarus (Puncticambarus) hobbsorum_ – Present
FISH:

*Etheostoma olmstedi* - Common
*Fundulus rathbuni* - Rare
*Lepomis auritus* - Present
*Luxilus albeolus* – Common to abundant
*Nocomis leptocephalus* - Rare
*Notropis alipinnis* - Common
*Notropis procne* - Uncommon
*Notropis scepticus* - Abundant
*Percina crassa* - Abundant
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
           Joseph Alderman

STATION: 20100427.3jma

LOCATION: Rocky River, Chatham County, North Carolina, upstream and downstream from SR 1010; 35.65889 N, 79.24068 W

Figure 18. Rocky River

SURVEY DATE: April 27, 2010

SITE COMMENTS: Part of canoe survey; will use mussel data from last year

HABITAT:

<table>
<thead>
<tr>
<th>WATERBODY TYPE:</th>
<th>River</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLOW:</td>
<td>Run, riffle, slack</td>
</tr>
<tr>
<td>RELATIVE DEPTH:</td>
<td>Very Shallow</td>
</tr>
<tr>
<td>DEPTH (%&lt;2 FEET):</td>
<td>99</td>
</tr>
<tr>
<td>SUBSTRATE:</td>
<td>Silt, sand, gravel, , pebble, cobble, bedrock, boulder</td>
</tr>
<tr>
<td>COMPACTNESS:</td>
<td>Normal</td>
</tr>
<tr>
<td>SAND/GRAVEL BARS:</td>
<td>Present</td>
</tr>
<tr>
<td>WOODY DEBRIS:</td>
<td>Low</td>
</tr>
<tr>
<td>BEAVER ACTIVITY:</td>
<td>Evidence (gnawed sticks)</td>
</tr>
<tr>
<td>WINDTHROW:</td>
<td>Low</td>
</tr>
<tr>
<td>TEMPORARY POOLS:</td>
<td>None</td>
</tr>
<tr>
<td>CHANNEL WIDTH:</td>
<td>Varies</td>
</tr>
<tr>
<td>BANK HEIGHT:</td>
<td>Varies</td>
</tr>
<tr>
<td>BANK STABILITY:</td>
<td>Very stable</td>
</tr>
</tbody>
</table>
HABITAT (cont.):

- BUFFER WIDTH: Wide
- RIPARIAN VEGETATION: Wooded, shrub-brush, grass
- LAND USE: Natural, rural, timber
- PERCENT COVER: 10
- WOODLAND EXTENT: Extensive
- NATURAL LEVEES: unknown
- VISIBILITY: Clear
- WATER LEVEL: Normal
- WEATHER: Cloudy, cool

TECHNIQUES AND SURVEY TIME:

- TECHNIQUES: Visual; tactile; dip-net; seine
- SURVEY TIME:

FRESHWATER MUSSELS:

Use last year’s data

CLAMS

*Corbicula fluminea*

SNAILS:

Hydrobiidae
- *Campeloma decisum* - Rare
- *Elimia catenaria* – Common to abundant
- *Helisoma aniceps* - Rare
- *Physa sp.* - Rare

CRAYFISH:

*Cambarus (Puncticambarus) hobbsorum* – Present
FISH:

*Etheostoma olmstedi* - Rare
*Luxilus albeolus* – Common to abundant
*Nocomis leptocephalus* - Uncommon
*Notropis altipinnis* – Common to abundant
*Notropis proene* - Uncommon
*Notropis scepticus* – Common to abundant
*Percina crassa* – Common to abundant
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100428.1jma

LOCATION: Rocky River, Chatham County, North Carolina; 35.68238 N, 79.32481 W; 3.1 air miles downriver from SR 2170 bridge crossing

SURVEY DATE: April 28, 2010

SITE COMMENTS: Walked down to site

HABITAT:

WATERBODY TYPE: River
FLOW: Run, riffle, slack, pool
RELATIVE DEPTH: Very Shallow
DEPTH (%<2 FEET): 90
SUBSTRATE: Silt, sand, gravel, pebble, cobble, boulder
COMPACTNESS: Normal
SAND/GRAVEL BARS: Present
WOODY DEBRIS: Low
BEAVER ACTIVITY: Evidence (gnawed sticks)
HABITAT (cont.):

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WINDTHROW:</td>
<td>Low</td>
</tr>
<tr>
<td>TEMPORARY POOLS:</td>
<td>None</td>
</tr>
<tr>
<td>CHANNEL WIDTH:</td>
<td>Varies</td>
</tr>
<tr>
<td>BANK HEIGHT:</td>
<td>Varies</td>
</tr>
<tr>
<td>BANK STABILITY:</td>
<td>Very stable</td>
</tr>
<tr>
<td>BUFFER WIDTH:</td>
<td>Varies</td>
</tr>
<tr>
<td>RIPARIAN VEGETATION:</td>
<td>Wooded, shrub-brush, grass</td>
</tr>
<tr>
<td>LAND USE:</td>
<td>Natural, rural, timber, active pasture</td>
</tr>
<tr>
<td>PERCENT COVER:</td>
<td>15</td>
</tr>
<tr>
<td>WOODLAND EXTENT:</td>
<td>Varies</td>
</tr>
<tr>
<td>NATURAL LEVEES:</td>
<td>unknown</td>
</tr>
<tr>
<td>VISIBILITY:</td>
<td>Clear</td>
</tr>
<tr>
<td>WATER LEVEL:</td>
<td>Normal</td>
</tr>
<tr>
<td>WEATHER:</td>
<td>Sun-cloud, Cool</td>
</tr>
</tbody>
</table>

TECHNIQUES AND SURVEY TIME:

<table>
<thead>
<tr>
<th>Technique</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TECHNIQUES:</td>
<td>Visual; tactile; dip-net; seine</td>
</tr>
<tr>
<td>SURVEY TIME:</td>
<td>mussel: 0.25 person-hours</td>
</tr>
</tbody>
</table>

TAXA:

FRESHWATER MUSSELS:

*Elliptio complanata* – 11 live

CLAMS

*Corbicula fluminea*

SNAILS:

Hydrobiidae – Common to abundant
*Helisoma aniceps* – Rare
*Physa sp.* - Uncommon

CRAYFISH:

*Cambarus (Puncticambarus) hobbsorum* – Present
**FISH:**

*Erimyzon oblongus* - Present
*Etheostoma olmstedii* - Uncommon
*Fundulus rathbuni* - Uncommon
*Lepomis auritus* - Present
*Luxilus albeolus* - Common
*Moxostoma collapsum* - Present
*Nocomis leptoccephalus* - Common
*Notropis altipinnis* – Common to abundant
*Notropis hudsonius* - Rare
*Notropis procne* - Abundant
*Percina crassa* - Common
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman
Sarah McRae

STATION: 20100429.1jma

LOCATION: Rocky River, Chatham County, North Carolina, downstream from US 15-501; 35.61953 N, 79.18420 W; start of canoe survey

Figure 20. Rocky River

SURVEY DATE: April 29, 2010

SITE COMMENTS: Part of canoe survey
HABITAT:

WATERBODY TYPE: River
FLOW: Run, riffle, slack, pool
RELATIVE DEPTH: Very shallow to shallow
DEPTH (%<2 FEET): 70
SUBSTRATE: Silt, sand, gravel, pebble, cobble, bedrock, boulder
COMPACTNESS: Normal
SAND/GRAVEL BARS: None
WOODY DEBRIS: Low
BEAVER ACTIVITY: Evidence (gnawed sticks)
WINDTHROW: Low
TEMPORARY POOLS: None
CHANNEL WIDTH: Varies
BANK HEIGHT: Varies
BANK STABILITY: Very stable
BUFFER WIDTH: Wide
RIPARIAN VEGETATION: Wooded, shrub-brush
LAND USE: Natural, rural, timber
PERCENT COVER: 5
WOODLAND EXTENT: Extensive
NATURAL LEVEES: None
VISIBILITY: Clear
WATER LEVEL: Normal
WEATHER: Sunny, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME:

TAXA:

FRESHWATER MUSSELS:

No survey effort; focus on Cape Fear shiner

CLAMS:

Corbicula fluminea
SNAILS:

Hydrobiidae - Abundant
*Helisoma aniceps* - Present
*Physa* sp. - Present
*Elimia catenaria* - Present

CRAYFISH:

*Cambarus (Puncticambarus) hobbsorum* – Present

FISH:

*Etheostoma olmstedi* - Present
*Lepomis auritus* – 1 live rare
*Lepisosteus osseus* – 1 live rare
*Luxilus albeolus* - Abundant
*Nocomis leptocephalus* - Rare
*Notropis altipinnis* - Abundant
*Notropis mekistocholas* – Abundant; approximately 3 sizes, males and females
*Percina crassa* - Present
*Notropis scepticus* - Common
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
           Joseph Alderman
           Sarah McRae

STATION: 20100429.2jma

LOCATION: Rocky River, Chatham County, North Carolina; 35.62293 N, 79.18237 W

Figure 21. Rocky River; downriver from US 15-501 bridge crossing

SURVEY DATE: April 29, 2010

SITE COMMENTS: Part of canoe survey; only surveyed for fish
HABITAT:

WATERBODY TYPE: River
FLOW: Run, riffle, slack, pool
RELATIVE DEPTH: Very Shallow to shallow
DEPTH (%<2 FEET): 70
SUBSTRATE: Silt, sand, gravel, pebble, cobble, bedrock, boulder
COMPACTNESS: Normal
SAND/GRAVEL BARS: None
WOODY DEBRIS: Low
BEAVER ACTIVITY: Evidence (gnawed sticks)
WINDTHROW: Low
TEMPORARY POOLS: None
CHANNEL WIDTH: Varies
BANK HEIGHT: Varies
BANK STABILITY: Very stable
BUFFER WIDTH: Wide
RIPARIAN VEGETATION: Wooded, shrub-brush
LAND USE: Natural, rural, timber
PERCENT COVER: 5
WOODLAND EXTENT: Extensive
NATURAL LEVEES: None
VISIBILITY: Clear
WATER LEVEL: Normal
WEATHER: Sunny, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME:

TAXA:

FRESHWATER MUSSELS:
Did not survey

SNAILS:
Did not survey

CRAYFISH:
Did not survey
**FISH:**

_Etheostoma olmstedi_ - Present  
*Lepomis auritus* - Present  
*Lepisosteus osseus* - Present  
_Luxilus albeolus_ - Abundant  
_Notropis alipinnis* - Abundant  
_Notropis hudsonius* - Rare  
_Notropis mekistocholas* – Abundant, approximately 3 size classes  
_Notropis procne* - Rare  
_Notropis scepticus* - Common  
_Percina crassa* - Present
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman
Sarah McRae

STATION: 20100429.3jma

LOCATION: Rocky River, Chatham County, North Carolina; 35.61864 N, 79.15919 W; 0.5 air miles upriver from Deep River confluence

Figure 22. Rocky River

SURVEY DATE: April 29, 2010

SITE COMMENTS: Part of canoe survey. Only surveyed for fish
HABITAT:

WATERBODY TYPE: River
FLOW: Run, riffle, slack, pool
RELATIVE DEPTH: Very Shallow to shallow
DEPTH (%<2 FEET): 70
SUBSTRATE: Silt, sand, gravel, pebble, cobble, bedrock, boulder
COMPACTNESS: Normal
SAND/GRAVEL BARS: None
WOODY DEBRIS: Low
BEAVER ACTIVITY: Evidence (gnawed sticks)
WINDTHROW: Low
TEMPORARY POOLS: None
CHANNEL WIDTH: Varies
BANK HEIGHT: Varies
BANK STABILITY: Very stable
BUFFER WIDTH: Wide
RIPARIAN VEGETATION: Wooded, shrub-brush
LAND USE: Natural, rural, timber
PERCENT COVER: 5
WOODLAND EXTENT: Extensive
NATURAL LEVEES: None
VISIBILITY: Clear
WATER LEVEL: Normal
WEATHER: Sunny, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME:

TAXA:

FRESHWATER MUSSELS:

Strophitus undulatus – 1 shell observed; emphasis on Cape Fear shiner

CLAMS:

Corbicula fluminea

SNAILS:

Campeloma decisum – noted as present; emphasis on Cape Fear shiner
CRAYFISH:

None collected; emphasis on Cape Fear shiner

FISH:

*Fundulus rathbuni* - Present  
*Notropis alipinnis* - Present  
*Notropis mekistocholas* – Abundant, approximately 40 live both males and females in 1 seine haul

Figure 23. Cape Fear shiner (*Notropis mekistocholas*)
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100603.1jma

LOCATION: U/T to Rocky River, Chatham County, North Carolina, upstream from SR 1506; 35.68889 N, 79.31686 W

Figure 24. Unnamed tributary to Rocky River

SURVEY DATE: June 03, 2010

SITE COMMENTS: Probably dries out in late summer/fall

HABITAT:

- WATERBODY TYPE: Stream
- FLOW: Run, riffle, slack, pool
- RELATIVE DEPTH: Very shallow
- DEPTH (%<2 FEET): 98
- SUBSTRATE: Clay, silt, sand, gravel, pebble, cobble, boulder, bedrock
- COMPACTNESS: Normal
- SAND/GRAVEL BARS: Rare
- WOODY DEBRIS: Average
HABITAT (cont.):

BEAVER ACTIVITY: Evidence (gnawed sticks)
WINDTHROW: Low
TEMPORARY POOLS: None
CHANNEL WIDTH: 5+ m
BANK HEIGHT: 1.25+ m
BANK STABILITY: Some erosion/undercutting to unstable
BUFFER WIDTH: Wide
RIPARIAN VEGETATION: Wooded, shrub-brush
LAND USE: Natural, rural, timber
PERCENT COVER: 98+
WOODLAND EXTENT: Extensive
NATURAL LEVEES: At least one
VISIBILITY: Turbid to slightly turbid
WATER LEVEL: Normal
WEATHER: Cloudy, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME: 1 person-hour

TAXA:

FRESHWATER MUSSELS:
None observed

CLAMS:
None observed

SNAILS:
Family Planorbidae, too young to identify

CRAYFISH:

Cambarus (Puncticambarus) hobbsorum – 1 male, live
Procambarus (Ortmannicus) acutus – 3 live

FISH:
None observed
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100603.2jma

LOCATION: Unnamed tributary to Rocky River, Chatham County, North Carolina, downstream from SR 1506; 35.71762 N, 79.33471 W

Figure 25. Unnamed tributary to Rocky River

SURVEY DATE: June 03, 2010

SITE COMMENTS:

HABITAT:

<table>
<thead>
<tr>
<th>WATERBODY TYPE:</th>
<th>Stream</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLOW:</td>
<td>Run, riffle, slack</td>
</tr>
<tr>
<td>RELATIVE DEPTH:</td>
<td>Very Shallow</td>
</tr>
<tr>
<td>DEPTH (%&lt;2 FEET):</td>
<td>100</td>
</tr>
<tr>
<td>SUBSTRATE:</td>
<td>Silt, sand, gravel, pebble, cobble, boulder</td>
</tr>
<tr>
<td>COMPACTNESS:</td>
<td>Normal</td>
</tr>
<tr>
<td>SAND/GRAVEL BARS:</td>
<td>Rare</td>
</tr>
<tr>
<td>WOODY DEBRIS:</td>
<td>Low</td>
</tr>
<tr>
<td>BEAVER ACTIVITY:</td>
<td>Evidence (gnawed sticks)</td>
</tr>
</tbody>
</table>
HABITAT (cont.):

WINDTHROW: Low
TEMPORARY POOLS: None
CHANNEL WIDTH: 4+ m
BANK HEIGHT: <1 m
BANK STABILITY: Very stable
BUFFER WIDTH: Varies
RIPARIAN VEGETATION: Wooded, shrub-brush, grass
LAND USE: Rural
PERCENT COVER: 90
WOODLAND EXTENT: Extensive, intermediate, not extensive
NATURAL LEVEES: None
VISIBILITY: Clear to slightly turbid
WATER LEVEL: Normal
WEATHER: Sun-cloud, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME: 1 person-hour

TAXA:

FRESHWATER MUSSELS:

*Elliptio complanata* – 1 shell

CLAMS:

None observed

SNAILS:

*Helisoma trivolvis* – Present

CRAYFISH:

*Cambarus (Puncticambarus) hobbsorum* – Common
*Procambarus (Ortmannicus) acutus* – Present

FISH:

*Nocomis leptocephalus* – Common
*Noturus insignis* – 1 live
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100603.3jma

LOCATION: Unnamed tributary to Rocky River, Chatham County, North Carolina, downstream from SR 2155; 35.62501 N, 79.20970 W

Figure 26. Unnamed tributary to Rocky River

SURVEY DATE: June 03, 2010

SITE COMMENTS:

HABITAT:

<table>
<thead>
<tr>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>WATERBODY TYPE</td>
<td>Stream</td>
</tr>
<tr>
<td>FLOW</td>
<td>Run, riffle, slack, pool</td>
</tr>
<tr>
<td>RELATIVE DEPTH</td>
<td>Very Shallow</td>
</tr>
<tr>
<td>DEPTH (%&lt;2 FEET)</td>
<td>100</td>
</tr>
<tr>
<td>SUBSTRATE</td>
<td>Sand, gravel, pebble, cobble, boulder,</td>
</tr>
<tr>
<td>COMPACTNESS</td>
<td>Normal</td>
</tr>
<tr>
<td>SAND/GRAVEL BARS</td>
<td>Rare</td>
</tr>
<tr>
<td>WOODY DEBRIS</td>
<td>Low</td>
</tr>
<tr>
<td>BEAVER ACTIVITY</td>
<td>None</td>
</tr>
</tbody>
</table>
HABITAT (cont.):

WINDTHROW: Low
TEMPORARY POOLS: None
CHANNEL WIDTH: 1.5 + m
BANK HEIGHT: <1 m
BANK STABILITY: Some erosion/undercutting
BUFFER WIDTH: Wide
RIPARIAN VEGETATION: Wooded, shrub-brush
LAND USE: Natural, timber, rural
PERCENT COVER: 100
WOODLAND EXTENT: Extensive
NATURAL LEVEES: None
VISIBILITY: Clear
WATER LEVEL: Normal
WEATHER: Cloudy, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME: 0.7 person-hour

TAXA:

FRESHWATER MUSSELS:
None observed

CLAMS:
None observed

MACROSNAILS:

Ferrissia rivularis – Present

CRAYFISH:

Procambarus (Ortmannicus) acutus – 5 live

FISH:

Lepomis auritus – 2 live
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100607.1jma

LOCATION: Tick Creek, Chatham County, North Carolina, upstream and downstream from SR 2170; 35.67435 N, 79.36292 W

SURVEY DATE: June 07, 2010

SITE COMMENTS: Only surveyed for fish and crayfish

HABITAT:

- WATERBODY TYPE: Stream
- FLOW: Run, riffle, slack, pool
- RELATIVE DEPTH: Very shallow
- DEPTH (%<2 FEET): 95
- SUBSTRATE: Clay, silt, sand, gravel, pebble, cobble, boulder, bedrock
- COMPACTNESS: Compact, normal, unconsolidated
- SAND/GRAVEL BARS: Present
- WOODY DEBRIS: Average
- BEAVER ACTIVITY: Evidence (gnawed sticks)
- WINDTHROW: Moderate
- TEMPORARY POOLS: None observed
- CHANNEL WIDTH: 8+ m
- BANK HEIGHT: 1.75+ m
- BANK STABILITY: Very stable with some erosion/undercutting
- BUFFER WIDTH: None to wide
- RIPARIAN VEGETATION: Wooded, shrub-brush, grass
- LAND USE: Active crop, timber, rural
- PERCENT COVER: 80
- WOODLAND EXTENT: Extensive to not extensive
- NATURAL LEVEES: At least one
- VISIBILITY: Clear
- WATER LEVEL: Normal
- WEATHER: Sunny, hot
TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual, tactile, dip-net, seine

SURVEY TIME: N/A

TAXA:

CRAYFISH:

Cambarus (Puncticambarus) hobbsorum – 2 live
Procambarus (Ortmannicus) acutus – 2 live

FISH:

Esox niger – 1 live
Etheostoma olmstedi - Rare
Lepomis auritus - Present
Lepomis cyanellus - Present
Luxilus albeolus - Common
Notropis altipinnis - Abundant
Notemigonus crysoleucas - Rare
Percina crassa - Rare
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman

Joseph Alderman

STATION: 20100607.2jma

LOCATION: Bear Creek, Chatham County, North Carolina, upstream from SR 1010; 35.63895 N, 79.26698 W

SURVEY DATE: June 07, 2010

SITE COMMENTS: Primarily a fish and crayfish survey

HABITAT:

<table>
<thead>
<tr>
<th>WATERBODY TYPE:</th>
<th>Stream</th>
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<tbody>
<tr>
<td>FLOW:</td>
<td>Run, slack, pool</td>
</tr>
<tr>
<td>RELATIVE DEPTH:</td>
<td>Shallow</td>
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<tr>
<td>DEPTH (%&lt;2 FEET):</td>
<td>50</td>
</tr>
<tr>
<td>SUBSTRATE:</td>
<td>Silt, sand, gravel, pebble, cobble, bedrock, boulder</td>
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<td>COMPACTNESS:</td>
<td>Normal to unconsolidated</td>
</tr>
<tr>
<td>SAND/GRAVEL BARS:</td>
<td>Present</td>
</tr>
<tr>
<td>WOODY DEBRIS:</td>
<td>Average</td>
</tr>
<tr>
<td>BEAVER ACTIVITY:</td>
<td>Evidence (gnawed sticks)</td>
</tr>
<tr>
<td>WINDTHROW:</td>
<td>Low</td>
</tr>
<tr>
<td>TEMPORARY POOLS:</td>
<td>None</td>
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<tr>
<td>CHANNEL WIDTH:</td>
<td>13+ m</td>
</tr>
<tr>
<td>BANK HEIGHT:</td>
<td>2+ m</td>
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<tr>
<td>BANK STABILITY:</td>
<td>Very stable</td>
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<tr>
<td>BUFFER WIDTH:</td>
<td>Wide</td>
</tr>
<tr>
<td>RIPARIAN VEGETATION:</td>
<td>Wooded, shrub-brush</td>
</tr>
<tr>
<td>LAND USE:</td>
<td>Natural, timber, rural</td>
</tr>
<tr>
<td>PERCENT COVER:</td>
<td>50</td>
</tr>
<tr>
<td>WOODLAND EXTENT:</td>
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<tr>
<td>NATURAL LEVEES:</td>
<td>At least one</td>
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<tr>
<td>VISIBILITY:</td>
<td>Slightly turbid</td>
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<tr>
<td>WATER LEVEL:</td>
<td>Normal</td>
</tr>
<tr>
<td>WEATHER:</td>
<td>Sunny, hot</td>
</tr>
</tbody>
</table>

TECHNIQUES AND SURVEY TIME:

<table>
<thead>
<tr>
<th>TECHNIQUES:</th>
<th>Visual; tactile; dip-net; seine</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURVEY TIME:</td>
<td>0.5 person-hour</td>
</tr>
</tbody>
</table>
TAXA:

FRESHWATER MUSSELS:

*Elliptio complanata* - 6 shells  
*Elliptio angustata* – 1 shell

CLAMS:

*Corbicula fluminea*

SNAILS:

None collected

CRAYFISH:

*Procambarus (Ortmannicus) acutus* – 1 live

FISH:

*Esox niger* – 1 live, rare  
*Etheostoma olmstedii* - Rare  
*Lepomis auritus* - Rare  
*Luxilus albeolus* - Present  
*Notropis altipinnis* - Abundant
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
            Joseph Alderman

STATION: 20100607.3jma

LOCATION: Varnell Creek, Chatham County, North Carolina, downstream from SR 1003; 35.77225 N, 79.38385 W.

Figure 27. Varnell Creek

SURVEY DATE: June 07, 2010

SITE COMMENTS: Old dam site up from road

HABITAT:

<table>
<thead>
<tr>
<th>WATERBODY TYPE:</th>
<th>Stream</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLOW:</td>
<td>Run, riffle, slack, pool</td>
</tr>
<tr>
<td>RELATIVE DEPTH:</td>
<td>Very Shallow</td>
</tr>
<tr>
<td>DEPTH (%&lt;2 FEET):</td>
<td>98</td>
</tr>
<tr>
<td>SUBSTRATE:</td>
<td>Clay, silt, sand, gravel, pebble, cobble, bedrock, boulder</td>
</tr>
<tr>
<td>COMPACTNESS:</td>
<td>Normal</td>
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<tr>
<td>SAND/GRAVEL BARS:</td>
<td>None</td>
</tr>
<tr>
<td>WOODY DEBRIS:</td>
<td>Low</td>
</tr>
</tbody>
</table>
HABITAT (cont.):

BEAVER ACTIVITY: Evidence (gnawed sticks)
WINDTHROW: Low
TEMPORARY POOLS: None
CHANNEL WIDTH: 2+ m
BANK HEIGHT: Varies
BANK STABILITY: Very stable
BUFFER WIDTH: Wide
RIPARIAN VEGETATION: Wooded, shrub-brush
LAND USE: Natural, timber, rural
PERCENT COVER: 100
WOODLAND EXTENT: Extensive to intermediate
NATURAL LEVEES: None
VISIBILITY: Slightly turbid
WATER LEVEL: Normal
WEATHER: Sunny, hot

TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME: 1.5 person-hours

TAXA:

FRESHWATER MUSSELS:

*Elliptio complanata* - Approximately 25 live

CLAMS:

*Sphaerium striatinum* – present

SNAILS:

*Helisoma anceps* – Present
*Physa sp.* – Present

CRAYFISH:

*Cambarus (Puncticambarus) hobbsorum* – Abundant
*Procambarus (Ortmannicus) acutus* – Common
FISH:

*Lepomis* sp. - Present
*Notropis* sp. - Present
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100608.1jma

LOCATION: Unnamed tributary to Rocky River, Chatham County, North Carolina, downstream from SR 1328; 35.76341 N, 79.42873 W

Figure 8. Unnamed tributary to Rocky River

SURVEY DATE: June 08, 2010

SITE COMMENTS: Good quality stream, high gradient

HABITAT:

- WATERBODY TYPE: Stream
- FLOW: Run, riffle, slack, pool
- RELATIVE DEPTH: Very Shallow
- DEPTH (%<2 FEET): 100
- SUBSTRATE: Silt, sand, gravel, pebble, cobble, bedrock, boulder
- COMPACTNESS: Normal
- SAND/GRAVEL BARS: None
- WOODY DEBRIS: Low
- BEAVER ACTIVITY: None
HABITAT (cont.):

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
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<tbody>
<tr>
<td>WINDTHROW</td>
<td>Low</td>
</tr>
<tr>
<td>TEMPORARY POOLS</td>
<td>None</td>
</tr>
<tr>
<td>CHANNEL WIDTH</td>
<td>6+ m</td>
</tr>
<tr>
<td>BANK HEIGHT</td>
<td>Varies</td>
</tr>
<tr>
<td>BANK STABILITY</td>
<td>Very stable</td>
</tr>
<tr>
<td>BUFFER WIDTH</td>
<td>Wide</td>
</tr>
<tr>
<td>RIPARIAN VEGETATION</td>
<td>Wooded, shrub-brush</td>
</tr>
<tr>
<td>LAND USE</td>
<td>Natural, timber, rural</td>
</tr>
<tr>
<td>PERCENT COVER</td>
<td>99</td>
</tr>
<tr>
<td>WOODLAND EXTENT</td>
<td>Extensive</td>
</tr>
<tr>
<td>NATURAL LEVEES</td>
<td>None</td>
</tr>
<tr>
<td>VISIBILITY</td>
<td>Clear</td>
</tr>
<tr>
<td>WATER LEVEL</td>
<td>Low</td>
</tr>
<tr>
<td>WEATHER</td>
<td>Sunny, warm</td>
</tr>
</tbody>
</table>

TECHNIQUES AND SURVEY TIME:

- TECHNIQUES: Visual; tactile; dip-net; seine
- SURVEY TIME: 1.5 person-hours

TAXA:

FRESHWATER MUSSELS:

None Collected

CLAMS:

None Collected

SNAILS:

*Physa* sp.

CRAYFISH:

*Cambarus (Puncticambarus) hobbsorum* – Abundant
*Procambarus (Ortmannicus) acutus* – Present
*Cambarus (Depressicambarus) reduncus* – 1 dead

FISH:

*Lepomis macrochirus* – 1 live
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100608.2jma

LOCATION: Nick Creek, Chatham County, North Carolina, upstream and downstream from SR 1332; 35.76754 N, 79.43620 W

Figure 8. Nick Creek

SURVEY DATE: June 08, 2010

SITE COMMENTS: Good habitat, possibly dries out in places during droughts

HABITAT:

<table>
<thead>
<tr>
<th>WATERBODY TYPE:</th>
<th>Stream</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLOW:</td>
<td>Run, riffle, slack, pool</td>
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<tr>
<td>RELATIVE DEPTH:</td>
<td>Very Shallow</td>
</tr>
<tr>
<td>DEPTH (%&lt;2 FEET):</td>
<td>99</td>
</tr>
<tr>
<td>SUBSTRATE:</td>
<td>Clay, silt, sand, gravel, pebble, cobble, boulder, bedrock</td>
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<tr>
<td>COMPACTNESS:</td>
<td>Normal</td>
</tr>
<tr>
<td>SAND/GRAVEL BARS:</td>
<td>Present</td>
</tr>
<tr>
<td>WOODY DEBRIS:</td>
<td>Low</td>
</tr>
</tbody>
</table>
HABITAT (cont.):

BEAVER ACTIVITY: Evidence (gnawed sticks)
WINDTHROW: Low
TEMPORARY POOLS: None observed
CHANNEL WIDTH: 8+ m
BANK HEIGHT: 1.75+
BANK STABILITY: Very stable, some erosion/undercutting
BUFFER WIDTH: Wide
RIPARIAN VEGETATION: Wooded, shrub-brush
LAND USE: Natural, timber, rural
PERCENT COVER: 98
WOODLAND EXTENT: Extensive
NATURAL LEVEES: At least one
VISIBILITY: Clear
WATER LEVEL: Low
WEATHER: Sunny, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME: 1.5 person-hours

TAXA:

FRESHWATER MUSSELS:

*Elliptio complanata* – 7 live

CLAMS:

None collected

SNAILS:

*Physa* sp. - Present

CRAYFISH:

*Cambarus* (*Puncticambarus*) *hobbsorum* – Abundant
*Procambarus* (*Ortmannicus*) *acutus* – Common
FISH:

*Etheostoma olmstedii* – 1 live
*Lepomus cyanellus* - Present
*Notropis altipinnis* - Common
*Notemgonus crysoleucas* - Present
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100608.3jma

LOCATION: Loves Creek, Chatham County, North Carolina, upstream from US 421; 35.73074 N, 79.43357 W

Figure 8. Loves Creek at old crib style bridge site; upstream from Siler City wastewater treatment plant; downstream from urban/suburban runoff

SURVEY DATE: June 08, 2010

SITE COMMENTS: Very shallow, hard to seine

HABITAT:

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>WATERBODY TYPE</td>
<td>Stream</td>
</tr>
<tr>
<td>FLOW</td>
<td>Run, riffle, slack, pool</td>
</tr>
<tr>
<td>RELATIVE DEPTH</td>
<td>Very Shallow</td>
</tr>
<tr>
<td>DEPTH (%&lt;2 FEET)</td>
<td>90</td>
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<tr>
<td>SUBSTRATE</td>
<td>Silt, Sand, cobble, bedrock, boulder, pebble</td>
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<tr>
<td>COMPACTNESS</td>
<td>Normal</td>
</tr>
<tr>
<td>SAND/GRAVEL BARS</td>
<td>None</td>
</tr>
<tr>
<td>WOODY DEBRIS</td>
<td>Low</td>
</tr>
</tbody>
</table>
HABITAT (cont.):

BEAVER ACTIVITY: Evidence (gnawed sticks)
WINDTHROW: Low
TEMPORARY POOLS: None observed
CHANNEL WIDTH: 7+ m
BANK HEIGHT: 0.5+ m
BANK STABILITY: Very stable, some erosion/undercutting
BUFFER WIDTH: Wide
RIPARIAN VEGETATION: Wooded, shrub-brush
LAND USE: Natural, timber, rural
PERCENT COVER: 80
WOODLAND EXTENT: Extensive
NATURAL LEVEES: At least one
VISIBILITY: Clear
WATER LEVEL: Low
WEATHER: Sunny, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME: 1.5 person-hours

TAXA:

FRESHWATER MUSSELS:

*Elliptio complanata* – 2 live
*Pyganodon cataracta* – 1.5 shells

CLAMS:

*Sphaerium striatinum* - Present

SNAILS:

*Helisoma anceps* - Present

CRAYFISH:

*Cambarus (Puncticambarus) hobbsorum* – Present
*Procambarus (Ortmannicus) acutus* – Common
FISH:

*Etheostoma olmstedi* - Present
*Lepomis sp.* - Present
*Micropterus salmoides* – 1 live
*Notropis altipinnis* - Present
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100608.4jma

LOCATION: Unnamed tributary to Rocky River, Chatham County, North Carolina, upstream and downstream from SR 2118; 35.67224 N, 79.41951 W

SURVEY DATE: June 08, 2010

SITE COMMENTS: Small stream

HABITAT:

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<tr>
<th>WATERBODY TYPE:</th>
<th>Stream</th>
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<tbody>
<tr>
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<td>Run, riffle, slack, pool</td>
</tr>
<tr>
<td>RELATIVE DEPTH:</td>
<td>Very Shallow</td>
</tr>
<tr>
<td>DEPTH (%&lt;2 FEET):</td>
<td>100</td>
</tr>
<tr>
<td>SUBSTRATE:</td>
<td>Clay, silt, sand, gravel, pebble, cobble</td>
</tr>
<tr>
<td>COMPACTNESS:</td>
<td>Normal</td>
</tr>
<tr>
<td>SAND/GRAVEL BARS:</td>
<td>None</td>
</tr>
<tr>
<td>WOODY DEBRIS:</td>
<td>Low</td>
</tr>
<tr>
<td>BEAVER ACTIVITY:</td>
<td>None</td>
</tr>
<tr>
<td>WINDTHROW:</td>
<td>High</td>
</tr>
<tr>
<td>TEMPORARY POOLS:</td>
<td>None observed</td>
</tr>
<tr>
<td>CHANNEL WIDTH:</td>
<td>3-4 m</td>
</tr>
<tr>
<td>BANK HEIGHT:</td>
<td>0.5+ m</td>
</tr>
<tr>
<td>BANK STABILITY:</td>
<td>Very stable to unstable</td>
</tr>
<tr>
<td>BUFFER WIDTH:</td>
<td>Varies</td>
</tr>
<tr>
<td>RIPARIAN VEGETATION:</td>
<td>Wooded, shrub-brush, grass</td>
</tr>
<tr>
<td>LAND USE:</td>
<td>Rural</td>
</tr>
<tr>
<td>PERCENT COVER:</td>
<td>100</td>
</tr>
<tr>
<td>WOODLAND EXTENT:</td>
<td>Extensive to not extensive</td>
</tr>
<tr>
<td>NATURAL LEVEES:</td>
<td>-</td>
</tr>
<tr>
<td>VISIBILITY:</td>
<td>Clear</td>
</tr>
<tr>
<td>WATER LEVEL:</td>
<td>Low</td>
</tr>
<tr>
<td>WEATHER:</td>
<td>Sun - cloud, warm</td>
</tr>
</tbody>
</table>

TECHNIQUES AND SURVEY TIME:

| TECHNIQUES:         | Visual; tactile; dip-net; seine |
| SURVEY TIME:        | 0.25 person-hour |
TAXA:

FRESHWATER MUSSELS:
None collected

CLAMS:
None collected

SNAILS:
Physa sp. - Rare

CRAYFISH:
Cambarus (Puncticambarus) hobbsorum – Rare

FISH:
None collected
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100608.5jma

LOCATION: Meadow Creek, Chatham County, North Carolina, downstream from SR 2170; 35.69179 N, 79.37103 W

SURVEY DATE: June 08, 2010

SITE COMMENTS:

HABITAT:

WATERBODY TYPE: Stream
FLOW: Run, riffle, slack, pool
RELATIVE DEPTH: Very Shallow
DEPTH (%<2 FEET): 99
SUBSTRATE: Clay, silt, sand, gravel, pebble, cobble, boulder
COMPACTNESS: Normal
SAND/GRAVEL BARS: Present
WOODY DEBRIS: Low
BEAVER ACTIVITY: Evidence (gnawed sticks)
WINDTHROW: Low
TEMPORARY POOLS: None
CHANNEL WIDTH: 7+ m
BANK HEIGHT: 1.25+ m
BANK STABILITY: Very stable, some erosion/undercutting
BUFFER WIDTH: Wide
RIPARIAN VEGETATION: Wooded, shrub-brush
LAND USE: Natural, timber, rural
PERCENT COVER: 75
WOODLAND EXTENT: Extensive
NATURAL LEVEES: At least one
VISIBILITY: Clear
WATER LEVEL: Low
WEATHER: Sun-cloud, hot

TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME: 1 person-hour
TAXA:

FRESHWATER MUSSELS:

None observed

CLAMS:

None observed

SNAILS:

*Helisoma trivolvis* – Abundant
*L. rivularis* – Present

CRAYFISH:

*Cambarus (Puncticambarus) hobbsorum* - Present

FISH:

*Luxilus albeolus* - Common
*Notemigonus crysoleucas* - Present
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100609.1jma

LOCATION: Bear Creek, Chatham County, North Carolina; 35.60135 N, 79.45443 W

SURVEY DATE: June 09, 2010

SITE COMMENTS: Many species missing (e.g., Notropis spp., mussels, most snails, darters); nutrient issues?

HABITAT:
- WATERBODY TYPE: Stream
- FLOW: Run, riffle, slack, pool
- RELATIVE DEPTH: Very Shallow
- DEPTH (%<2 FEET): 99
- SUBSTRATE: Clay, silt, sand, gravel, pebble, cobble, boulder, bedrock
- COMPACTNESS: Normal to unconsolidated
- SAND/GRAVEL BARS: Present
- WOODY DEBRIS: Average
- BEAVER ACTIVITY: Evidence (gnawed sticks)
- WINDTHROW: Low
- TEMPORARY POOLS: Present
- CHANNEL WIDTH: 6+ m
- BANK HEIGHT: 1.5+ m
- BANK STABILITY: Very stable, some erosion/undercutting, unstable
- BUFFER WIDTH: Wide
- RIPARIAN VEGETATION: Wooded, shrub-brush
- LAND USE: Natural, timber, rural
- PERCENT COVER: 95
- WOODLAND EXTENT: Extensive
- NATURAL LEVEES: At least one
- VISIBILITY: Light turbid to slightly turbid
- WATER LEVEL: Low
- WEATHER: Sun-cloud, hot

TECHNIQUES AND SURVEY TIME:
- TECHNIQUES: Visual; tactile; dip-net; seine
- SURVEY TIME: 1.5 person-hours
TAXA:

FRESHWATER MUSSELS:

None collected

CLAMS:

None collected

SNAILS:

Physa sp. – Present

CRAYFISH:

Cambarus (Puncticambarus) hobbsorum – Present
Procambarus (Ortmannicus) acutus – Present

FISH:

Aphredoderus sayanus – 1 live
Gambusia affinis – Patchy common
Lepomus cyanellus - Common
Notemigonus crysoleucas - Uncommon
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100609.2jma

LOCATION: Unnamed tributary to Rocky River, Chatham County, North Carolina, upstream and downstream from SR 2167; 35.72011 N, 79.30488 W

SURVEY DATE: June 09, 2010

SITE COMMENTS: Poor quality habitat, heavy sediment load

HABITAT:

- WATERBODY TYPE: Stream
- FLOW: Run, slack, pool
- RELATIVE DEPTH: Very Shallow
- DEPTH (%<2 FEET): 80
- SUBSTRATE: Clay, silt, sand, gravel, pebble, cobble, boulder, bedrock
- COMPACTNESS: Normal to unconsolidated
- SAND/GRAVEL BARS: Present
- WOODY DEBRIS: Average
- BEAVER ACTIVITY: Evidence (gnawed sticks)
- WINDTHROW: Low
- TEMPORARY POOLS: None
- CHANNEL WIDTH: 7+ m
- BANK HEIGHT: 1.75+ m
- BANK STABILITY: Some erosion/undercutting, unstable
- BUFFER WIDTH: Varies
- RIPARIAN VEGETATION: Wooded, shrub-brush, grass
- LAND USE: Rural
- PERCENT COVER: 80
- WOODLAND EXTENT: Varies
- NATURAL LEVEES: At least one
- VISIBILITY: Turbid to slightly turbid
- WATER LEVEL: Low
- WEATHER: Cloudy, warm
TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME: 1 person-hour

TAXA:

FRESHWATER MUSSELS:
None collected

CLAMS:

*Sphaerium striatinum* – Present

SNAILS:

*Helisoma trivolvis* – Present

CRAYFISH:

*Cambarus (Puncticambarus) hobbsorum* – Present

FISH:

*Etheostoma olmstedi* - Present
*Lepomis macrochirus* - Present
*Lepomus cyanellus* - Present
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
           Joseph Alderman

STATION: 20010609.3jma

LOCATION: Bear Creek, Chatham County, North Carolina, upstream and downstream from SR 2187; 35.62577 N, 79.29896 W

SURVEY DATE: June 09, 2010

SITE COMMENTS: Mussels uncommon, very low diversity of fish, should have seen hundreds of fish, no microsnails seen

HABITAT:
   WATERBODY TYPE: Stream
   FLOW: Run, riffle, slack, pool
   RELATIVE DEPTH: Very Shallow
   DEPTH (%<2 FEET): 98
   SUBSTRATE: Silt, sand, gravel, pebble, cobble, boulder, bedrock
   COMPACTNESS: Normal
   SAND/GRAVEL BARS: Present
   WOODY DEBRIS: Low
   BEAVER ACTIVITY: Evidence (gnawed sticks)
   WINDTHROW: Low
   TEMPORARY POOLS: None
   CHANNEL WIDTH: 14+ m
   BANK HEIGHT: Varies
   BANK STABILITY: Very stable
   BUFFER WIDTH: Wide
   RIPARIAN VEGETATION: Wooded, shrub-brush
   LAND USE: Natural, timber, rural
   PERCENT COVER: 80
   WOODLAND EXTENT: Extensive
   NATURAL LEVEES: -
   VISIBILITY: Lightly tannic to slightly turbid
   WATER LEVEL: Low
   WEATHER: Cloudy, warm

TECHNIQUES AND SURVEY TIME:
   TECHNIQUES: Visual; tactile; dip-net; seine
   SURVEY TIME: 2 person-hours total, 0.7 person-hour mussels
TAXA:

FRESHWATER MUSSELS:

*Elliptio complanata* – 5 live

CLAMS:

*Corbicula fluminea*

SNAILS:

*Helisoma trivolvis* – Present

CRAYFISH:

*Procambarus (Ortmannicus) acutus* – Present

FISH:

*Luxilus albeolus* - Common
*Notropis alipinnis* - Common
PROJECT: Freshwater taxa surveys for RRHF

TARGET SPECIES: Freshwater mussels, snails, crayfish, Cape Fear shiner

BIOLOGISTS: John Alderman
Joseph Alderman

STATION: 20100609.4jma

LOCATION: Bear Creek, Chatham County, North Carolina, upstream from SR 2155; 35.63182 N, 79.23688 W

SURVEY DATE: June 09, 2010

SITE COMMENTS: Justicia americana in large patches

HABITAT:

<table>
<thead>
<tr>
<th>WATERBODY TYPE:</th>
<th>Stream</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLOW:</td>
<td>Run, riffle, slack, pool</td>
</tr>
<tr>
<td>RELATIVE DEPTH:</td>
<td>Very Shallow</td>
</tr>
<tr>
<td>DEPTH (%&lt;2 FEET):</td>
<td>99</td>
</tr>
<tr>
<td>SUBSTRATE:</td>
<td>Silt, sand, gravel, pebble, cobble, boulder, bedrock</td>
</tr>
<tr>
<td>COMPACTNESS:</td>
<td>Normal</td>
</tr>
<tr>
<td>SAND/GRAVEL BARS:</td>
<td>None</td>
</tr>
<tr>
<td>WOODY DEBRIS:</td>
<td>Low</td>
</tr>
<tr>
<td>BEAVER ACTIVITY:</td>
<td>Evidence (gnawed sticks)</td>
</tr>
<tr>
<td>WINDTHROW:</td>
<td>Low</td>
</tr>
<tr>
<td>TEMPORARY POOLS:</td>
<td>None</td>
</tr>
<tr>
<td>CHANNEL WIDTH:</td>
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<tr>
<td>BANK HEIGHT:</td>
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<tr>
<td>RIPARIAN VEGETATION:</td>
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<td>PERCENT COVER:</td>
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<td>Lightly tannic</td>
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<tr>
<td>WATER LEVEL:</td>
<td>Low</td>
</tr>
<tr>
<td>WEATHER:</td>
<td>Cloudy, warm</td>
</tr>
</tbody>
</table>
TECHNIQUES AND SURVEY TIME:

TECHNIQUES: Visual; tactile; dip-net; seine
SURVEY TIME: 1.5 total person-hours; 0.7 person-hour for mussels

TAXA:

FRESHWATER MUSSELS:

Elliptio complanata – 15 live
Pyganodon cataracta – 1 live

CLAMS:

Corbicula fluminea

SNAILS:

Helisoma trivolvis – Present
Ferrissia rivularis - Present
Physa sp. – Present

CRAYFISH:

Procambarus (Ortmannicus) acutus – Present
Cambarus (Puncticambarus) hobbsorum – Present

FISH:

Etheostoma olmstedi - Common
Luxilus albeolus - Present
Notropis altipinnis - Common
Notropis mekistocholas – 8 Live, females and males in 1 seine haul
Percina crassa - Common