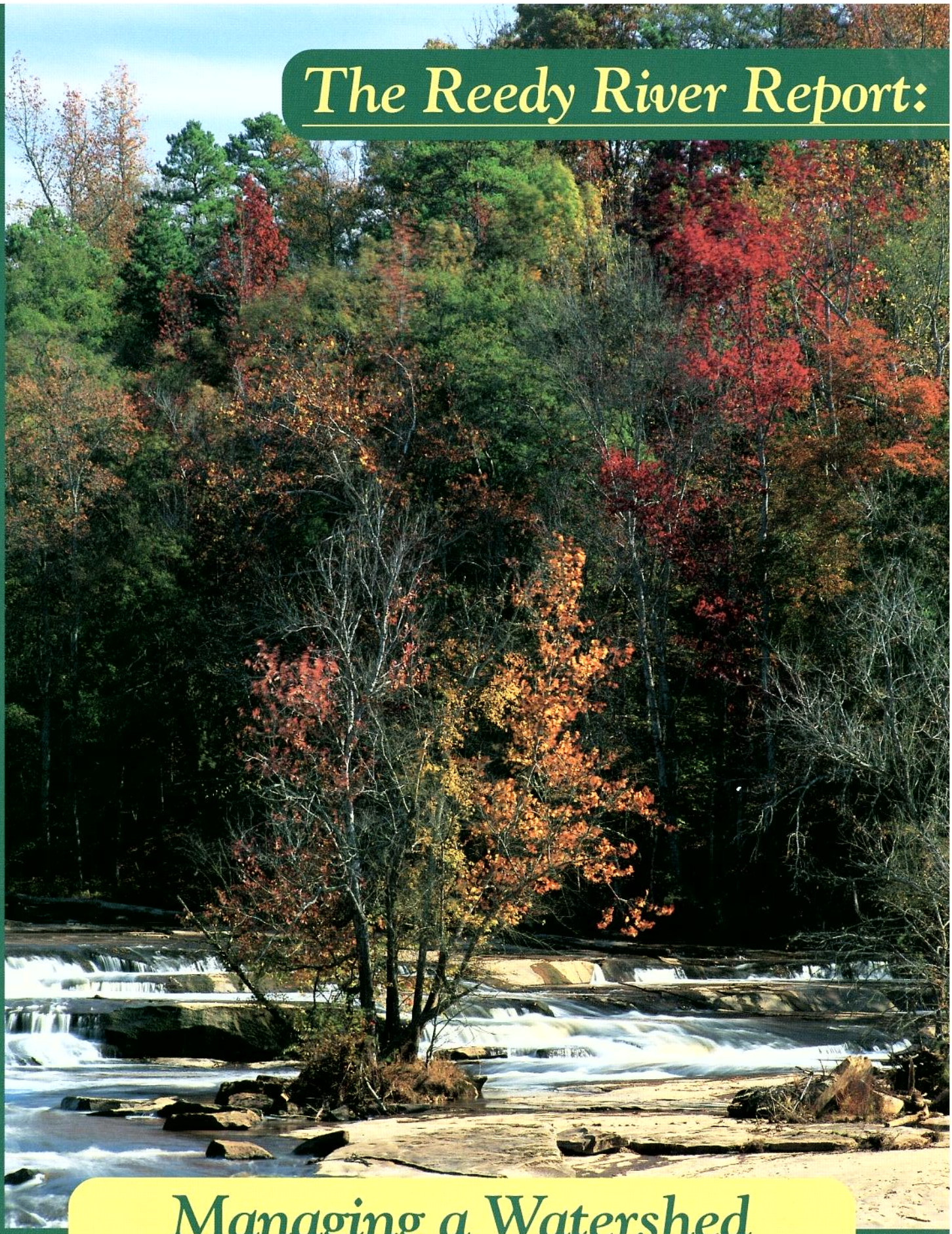
The Reedy River Report:



Managing a Watershed

The Reedy River Report:
Managing a Watershed

Funding Provided By:

The United States Environmental Protection Agency - Wetlands Protection State Development Grant

Project Coordinators:

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South Carolina Department of Natural Resources
Land, Water and Conservation Division

April 2001
Report 22

Cover photograph of the Reedy River by Tom Blagden

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*pages 1, 2, 16, 31, 59, 73, 79, 83, 87

Fish Illustrations by Duane Raver

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Acknowledgements

The Reedy River Report: Managing a Watershed is a comprehensive investigation of the critical resources of the Reedy River. A study of this scope and complexity requires the support and involvement of numerous individuals making a wide array of contributions. The Friends of the Reedy River initiated interest in a study of the Reedy River and, as a result, this organization deserves much of the credit for this effort.

Next, appreciation goes to the members of the Reedy River Task Force (see Table 1). This 36-member group directed the study and assembled this watershed plan. These individuals gave significant time and effort over many months to see that a well-balanced, comprehensive management plan for this valuable natural resource was completed. The task force represented a broad range of interests, yet they worked together to assemble a plan that takes a long-term, watershed-based view of the management of the Reedy River.

The task force and project staff had significant support from individuals and organizations in the area that made many contributions to the effort. Guy Jones of River Runner Outdoor Center in Columbia provided canoes and logistical support for several canoe trips on the Reedy River. Dave Hargett also provided much appreciated help and support on the canoe trips. Presbyterian College graciously provided meeting space for several task force meetings throughout the study. The Western Carolina Regional Sewer Authority provided an insightful tour of the Durbin Creek Wastewater Treatment Plant. Richard Sawyer took task force members on a walking tour of the urban portion of the river in Greenville and gave a comprehensive overview of the history of this portion of the Reedy River.

Completing a study like this for the Reedy River Watershed is not possible without significant staff support. A very special thanks is owed to John Foster of the Natural Resources Information Management and Analysis (NRIMA) Section of the South Carolina Department of Natural Resources. John is responsible for many of the geographic information system maps (GIS) in the document. Richard Lacy, also of NRIMA, helped with the remote sensing maps on growth. Special thanks also go to Dave Chestnut of the South Carolina Department of Health and Environmental Control's Bureau of Water. Dave provided water quality data and maps which illustrated SCDHEC's sampling locations and use classifications. We appreciate the assistance of Kathryn Diaz in the layout and design of the report. Ann Nolte provided invaluable editing assistance, as she does with each of our reports. Also, we would like to thank Tom Blagden for the beautiful photographs used on the cover and throughout the document.

One last special thanks is owed to Lynn Quattro. When it was time to put this document together, our administrative assistant was on maternity leave. Although she was also officially on maternity leave, Lynn volunteered to coordinate the editing of the final report and use her word processing skills to pull all the separate pieces of this document into a final report. All of this work is greatly appreciated.

Finally, we would like to recognize the individuals who served on the seven issue committees. These individuals provided significant expertise to the study, giving the final plan needed insight and credibility in the issues addressed in this management plan. Committee members

attended numerous meetings and gave an incredible amount of time and effort as they examined issues and drafted the recommendations contained in this study. The members of the issue committees deserve a great deal of credit for the success of the Reedy River study.

To give special recognition to these individuals, they are listed here.

Storm Water Issue Committee

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Richard Coleman, Greenwood Metropolitan District
Jack Earle, Laurens County Water & Sewer Commission
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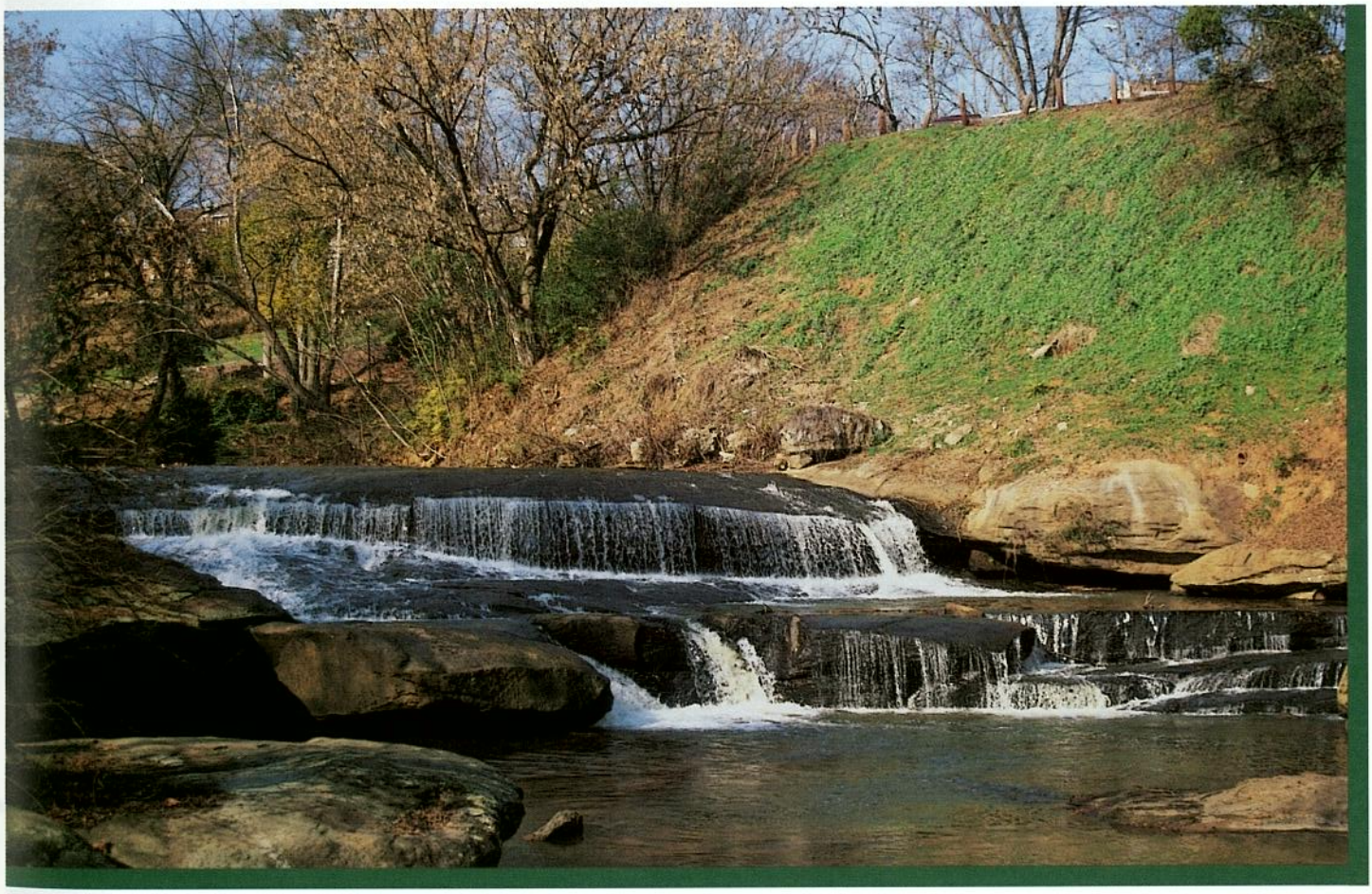
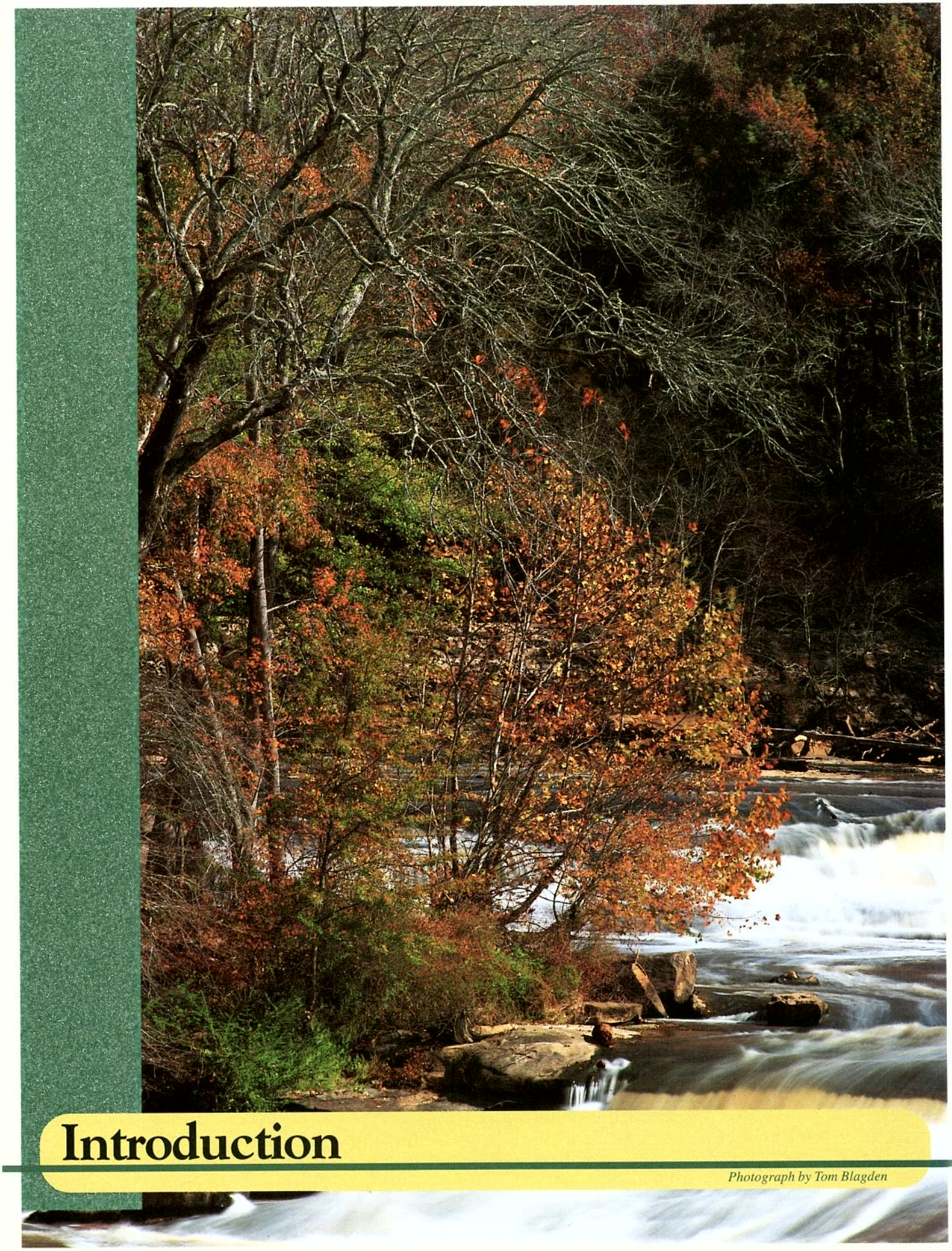




Introduction

Photograph by Tom Blagden

The Reedy River is a small river with big responsibilities. Although the Reedy flows through a relatively small watershed of approximately 167,000 acres, the upper portion of the watershed includes the rapidly growing City of Greenville, portions of Mauldin and Simpsonville and the industrialized Interstate 85 corridor. Flowing through this urban environment places a significant set of demands on this small ribbon of water. The Reedy takes the community's treated wastewater, the runoff from yards, parking lots, streets and construction sites, other trash and debris we leave behind and moves silently downstream.

Like many of our nation's rivers, the Reedy River has accepted and transported our refuse for decades. However, we have come to understand that the river is more than a simple receptacle for our various forms of waste. The Reedy River is much more. It is home to an array of aquatic creatures and provides us with a source of recreation. Its riparian forests provide habitat for a range of birds and animals. It connects us to our past through the historical resources associated with the river.

For many years the Reedy River occupied a special place in the lives of the people of Greenville and Laurens Counties. Kids played in the Reedy River. Couples were married below the beautiful falls of the Reedy. Families picnicked and played at places like the Reedy River Falls, Cedar Falls and Ekom Beach along the Reedy River.

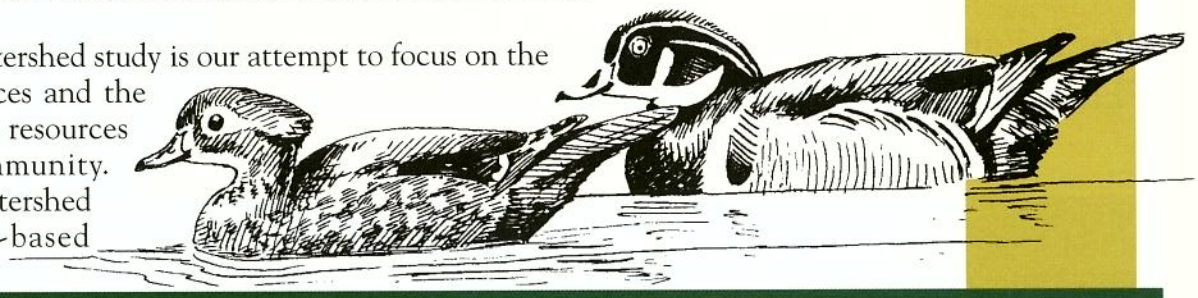
Over time, activities along the river changed. Textile mills dominated the use of the river in the City of Greenville, while picnic areas and swimming holes were forgotten. The use of the river changed during this time and this once vibrant, important resource became polluted and little used for recreational activities. It continued to be used for waste purposes.

In recent years, the character of Reedy River has changed for the better. Laws such as the Clean Water Act of 1972 have allowed the Reedy to rebound resulting in improved water quality. Additionally, community interest in the river throughout the watershed appears to be at an all time high.

The community has turned its attention to the Reedy River with a wide range of concerns for this important resource. Into this mix comes a comprehensive study of the Reedy River Watershed. In recent years we have developed a better understanding of the inter-connected nature of the resources that sustain and drive human society. The natural resources of land and water are obviously bound together and the health of these resources is tied to our economic well-being. Both our natural resources base and sound economic opportunities yield a good quality of life for everyone in the watershed.

In years past we have too often made one-dimensional decisions based on a single societal need or value. In too many cases, we have failed to examine and consider the multiple values represented in natural resources such as our rivers, lakes and forests.

A comprehensive watershed study is our attempt to focus on the broader set of resources and the values each of these resources represents in a community. The Reedy River watershed study is a citizen-based



planning effort that takes a comprehensive look at the watershed's resources and examines the inter-relationships among these resources in a long-term management plan. This type of approach to natural resources planning recognizes that to be successful in sustaining our natural resources, we must understand all uses and interests in the community to make sound management decisions.

In light of these considerations, the Reedy River Task Force was established to examine the critical resources in the watershed and create a long-term management plan to help guide the use of this critical asset. The task force is a group of 36 individuals who represent the wide range of interests, values and expertise surrounding the resources of the watershed (Table 1). The work of the task force was facilitated by the South Carolina Department of Natural Resources (SCDNR).

On a fundamental level, the watershed study is an effort to create a common vision for the future of the Reedy River and its surrounding watershed that is based on sound information and local values as determined by the citizens who served on the task force. This vision will assist in the long-term management and sustainability of the critical natural resources of the Reedy River.

The watershed study takes a landscape level approach to understanding these natural resources. The recommendations developed as a result of this study will assist in making proactive decisions that can help guide the continuing growth and change in the watershed. It is hoped that this study can assist decision makers in shaping change to meet the needs of coming generations, as they will also need to depend upon the natural resource base of the Reedy River.

The Reedy River is a unique river in that it heads up in the foothills, flows through a major metropolitan area and discharges into a lake. The Reedy has been the catalyst for economic development in the early twentieth century. Because of this, the Reedy has been a very abused river.

The Reedy River Task Force, by pulling together a broad range of interests, has been able to develop a workable plan that will satisfy all the interests and restore the Reedy to a healthy river. In its renewed state, the Reedy will return to its status as a major economic development tool and, at the same time, protect the environmental qualities of the area.

Jack Earle
Laurens County Water and Sewer Commission

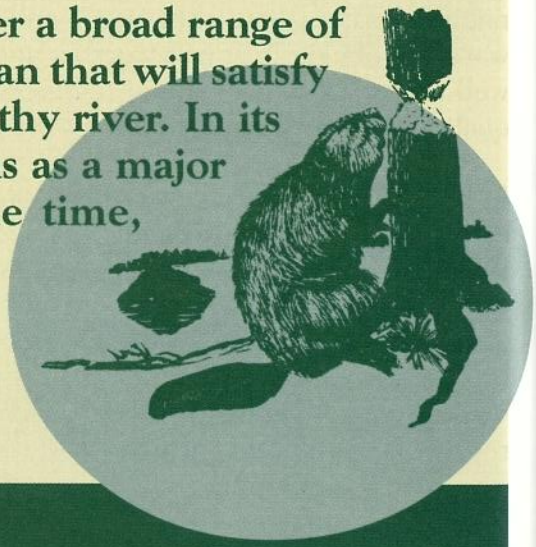


Table 1: Reedy River Task Force Members

Name	Affiliation
George Acker	Duke Power Company
Jeff Allen	Clemson University
Judith Bainbridge	Furman University
Robert Becker	Clemson University
Chip Bentley	Appalachian Council of Governments
Larry Bloomer	Crescent Resources, Inc.
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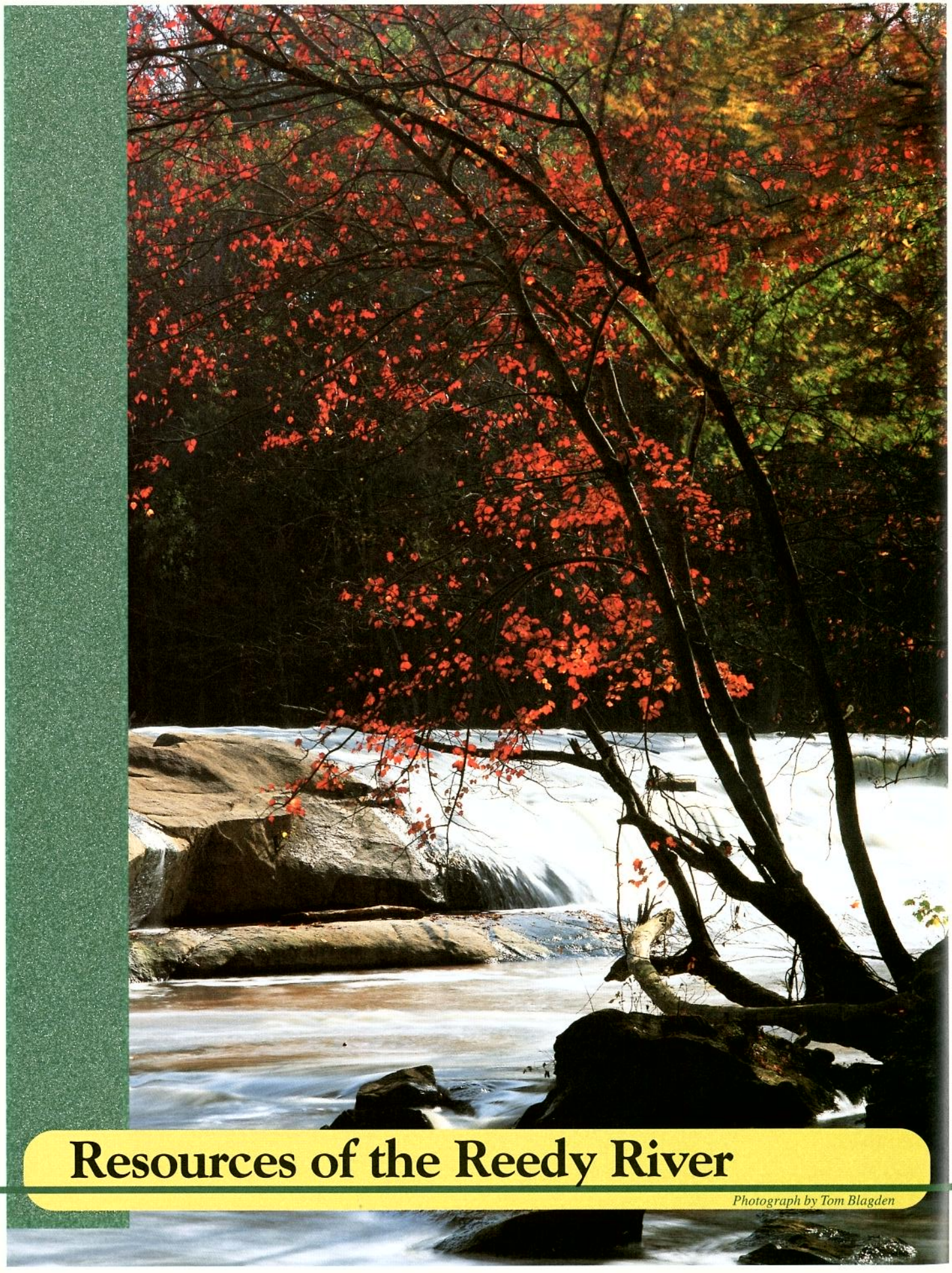
Dave Demarest	United States Department of Agriculture
Jack Earle	Laurens County Water and Sewer Authority
Patricia Edmonds	Upper Savannah Council of Governments
Joe Edwards	Laurens County Council
Paul Ellis	City of Greenville Department of Parks and Recreation
Bill Erkes	Laurens County Recreation Department
Tom Fischer	Laurens County Community Member
George Fletcher	The Fletcher Group
Jimmy Forbes	Greenville County Planning Commission
Dave Hargett	Friends of the Reedy River
Robert Harley	Bowater, Inc.
Robert Hudson	Presbyterian College
Bob Hughes	Hughes Development
Ryan Lawson	Commissioner, Laurens County Soil and Water Conservation District
Pedrick Lowery	Carolina Foothills Garden Club
Charlotte Lynch	Greenville County
Marion Mahon	Commissioner, Laurens County Soil and Water Conservation District
Ray Orvin	Western Carolina Regional Sewer Authority
Michael Pitts	Laurens County Council
Ernest Segars	Laurens County Administrator
Norm Sharp	Sierra Club
Coleman Smoak	City of Laurens Public Works
Steve Thompson	City of Greenville
Tom Trantham	Landowner
Stan Turner	Landowner
Knox White	Mayor, City of Greenville
Brad Wyche	Upstate Forever



Resources of the Reedy River

Photograph by Tom Blagden

Rivers provide local communities with numerous goods and services, such as water for drinking, manufacturing and irrigation, electricity from hydropower production, and various recreational opportunities. They also channel floods, provide essential fish and wildlife habitat and assimilate wastes. Rivers are dynamic and their physical, chemical and biological characteristics are a function of the landscape that they drain. Alteration of the watershed results in changes in the structure and function of rivers. When a river is degraded and can no longer meet societal needs, a decline in the goods and services humans receive within the watershed may result. Costly examples of degradation may include a drop in real estate values due to erosion or flooding; a decline in drinking water quality and increased treatment costs; loss of recreational opportunities; and reduced ability of the river to receive wastewater due to a decrease in water supply.

The Reedy River has been an important natural resource for hundreds of years. It has been utilized and valued by people who have admired its scenic beauty and relied on its water. The river's name was derived from the dense groves of forest and extensive floodplain marshes that once teemed with reeds. The watershed has undergone a great deal of change since the days when the land surrounding the river provided the setting for villages and valuable hunting grounds for Native Americans. European settlers discovered the Reedy in the late 1700s and began building mills on its banks. As development increased along the river, the importance of the river to the community increased.

Over the past century, the Reedy River has been under increasing pressure from a number of sources. The relationship between a community and its water resources is often taken for granted; however, the social and economic costs of degradation can be significant. The appropriate use of river resources and protection of their valuable natural, cultural and recreational features can drive local and state initiatives in river management, conservation and restoration. *The Reedy River Report: Managing a Watershed* is a tool to conserve and restore the beauty of the Reedy River.

Located in northwestern South Carolina, the Reedy River originates near the town of Travelers Rest at the base of the Appalachian Mountains where two groundwater-fed streams meet. The river flows through the City of Greenville and into Lake Conestee, a mid-stream reservoir originally constructed in the early 1800s. Below the lake, the river flows unimpounded to Boyd Mill Pond, passing the Town of Fork Shoals (Figure 1).

The Reedy River Watershed contains 325 miles of streams encompassing more than 167,000 acres (Figure 2). The northern portion of the watershed is divided from the southern portion at the confluence of the river and Huff Creek, near the Town of Fork Shoals (Figures 3 and 4). Along its 73-mile course, the character of the Reedy River and its adjacent landscape change substantially, yielding a watershed with two distinctly different portions: one urban and one rural.

The Reedy River Watershed has grown over the past several decades. As population and economy of the watershed continue to expand, demand on this river by the community will increase, along with its dependency upon its resources. Today, the problems facing the Reedy River are complicated. The manner in which these problems are approached and addressed may affect everything from quality of life to future economic growth in the watershed.

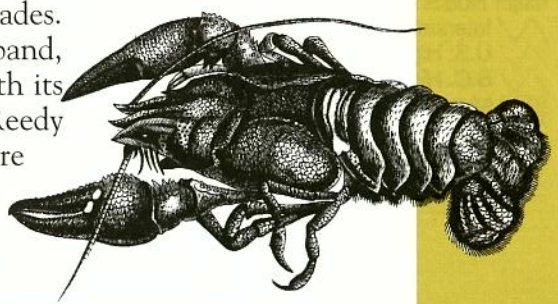


Figure 1: Reedy River Watershed Study Project Area

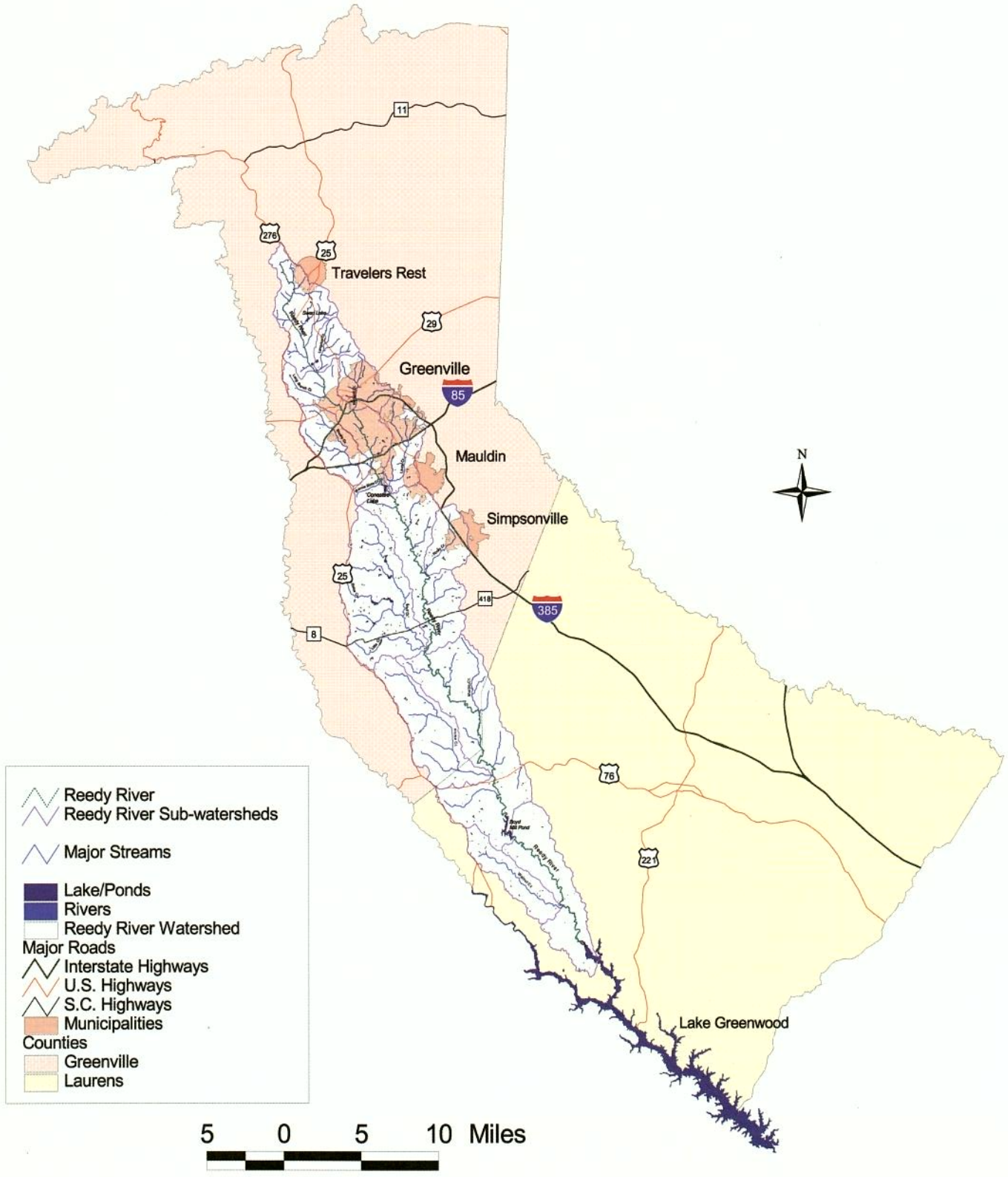


Figure 2: Reedy River Watershed Surface Hydrology

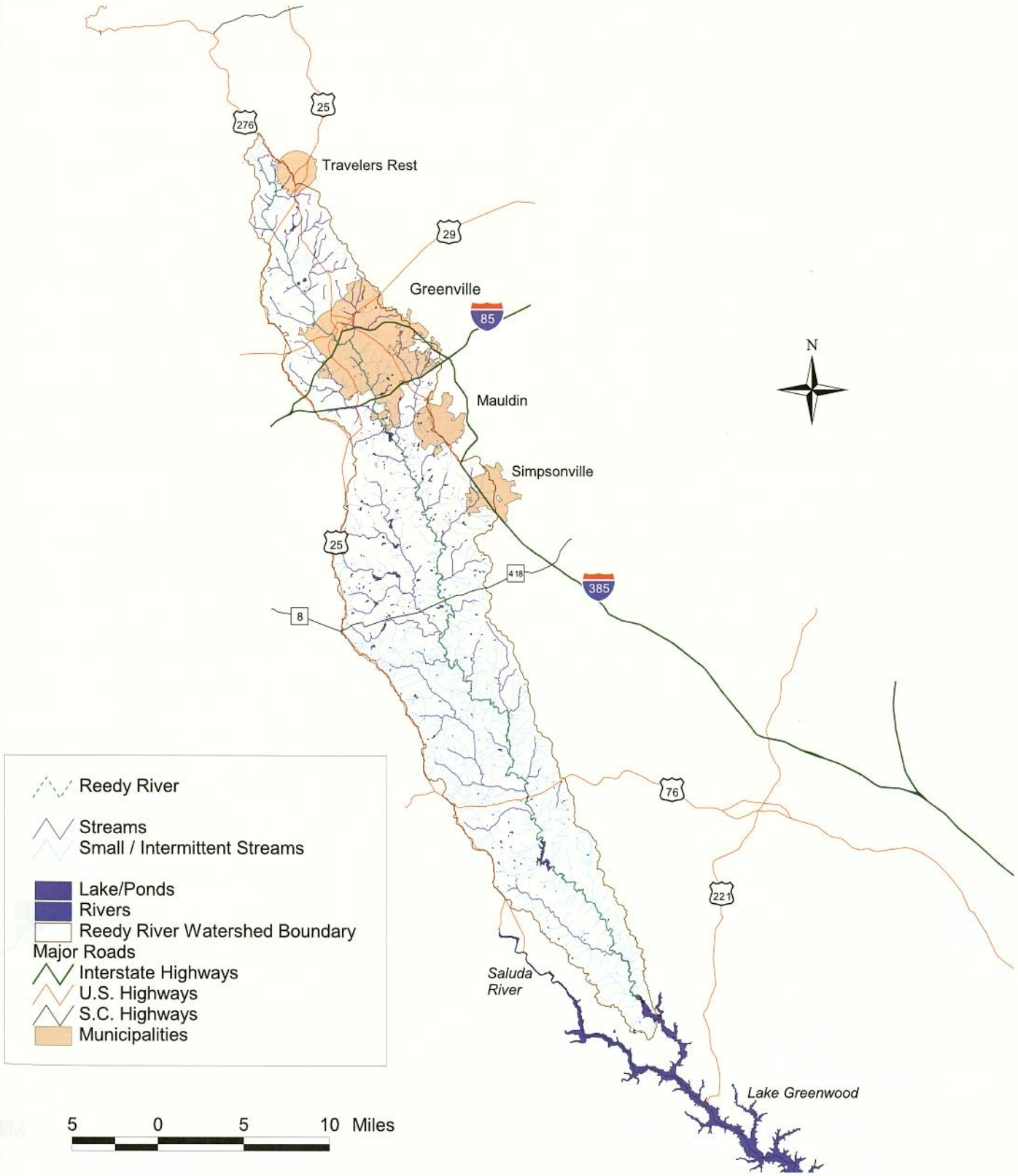


Figure 3: Northern Reedy River Watershed

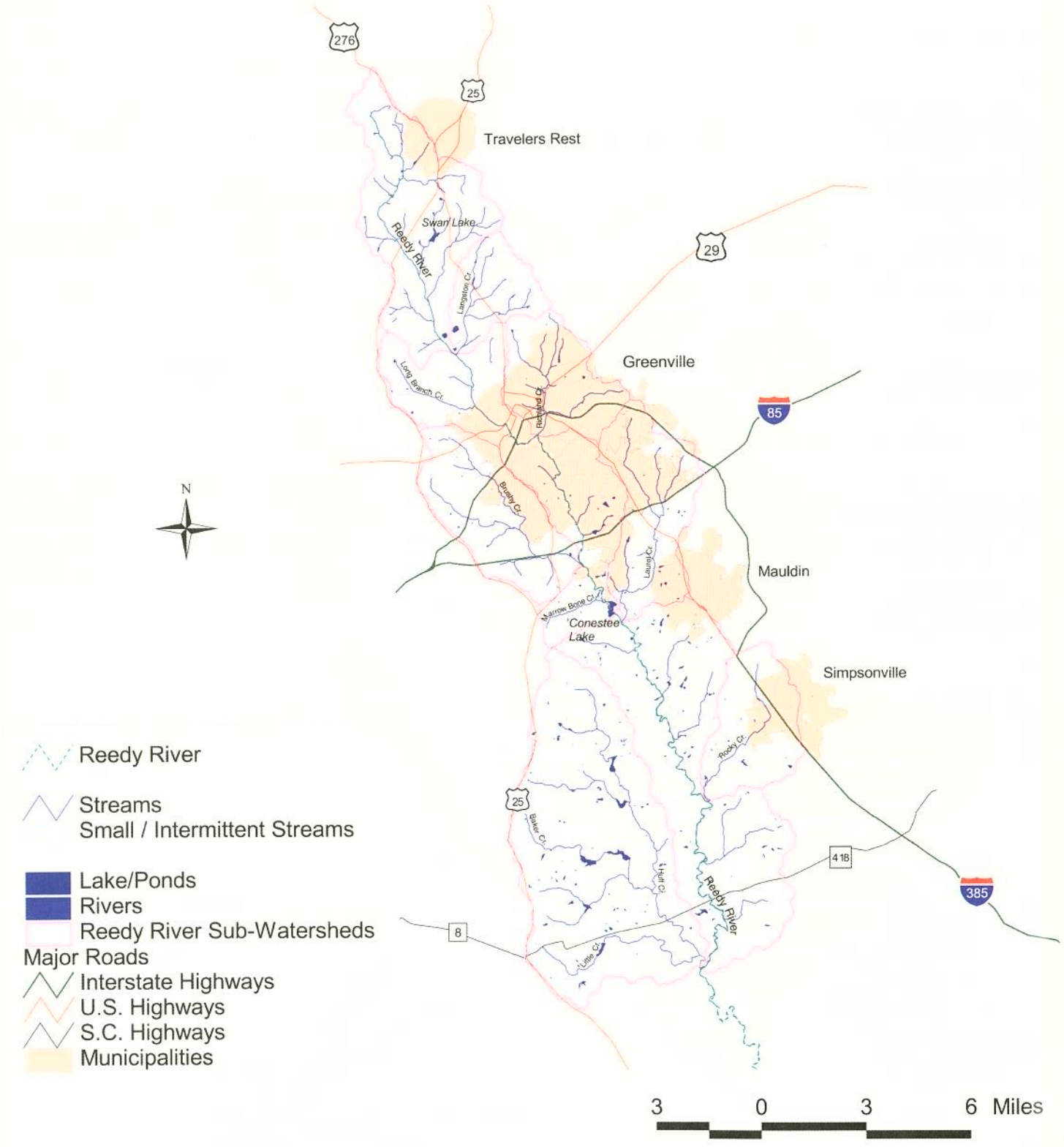
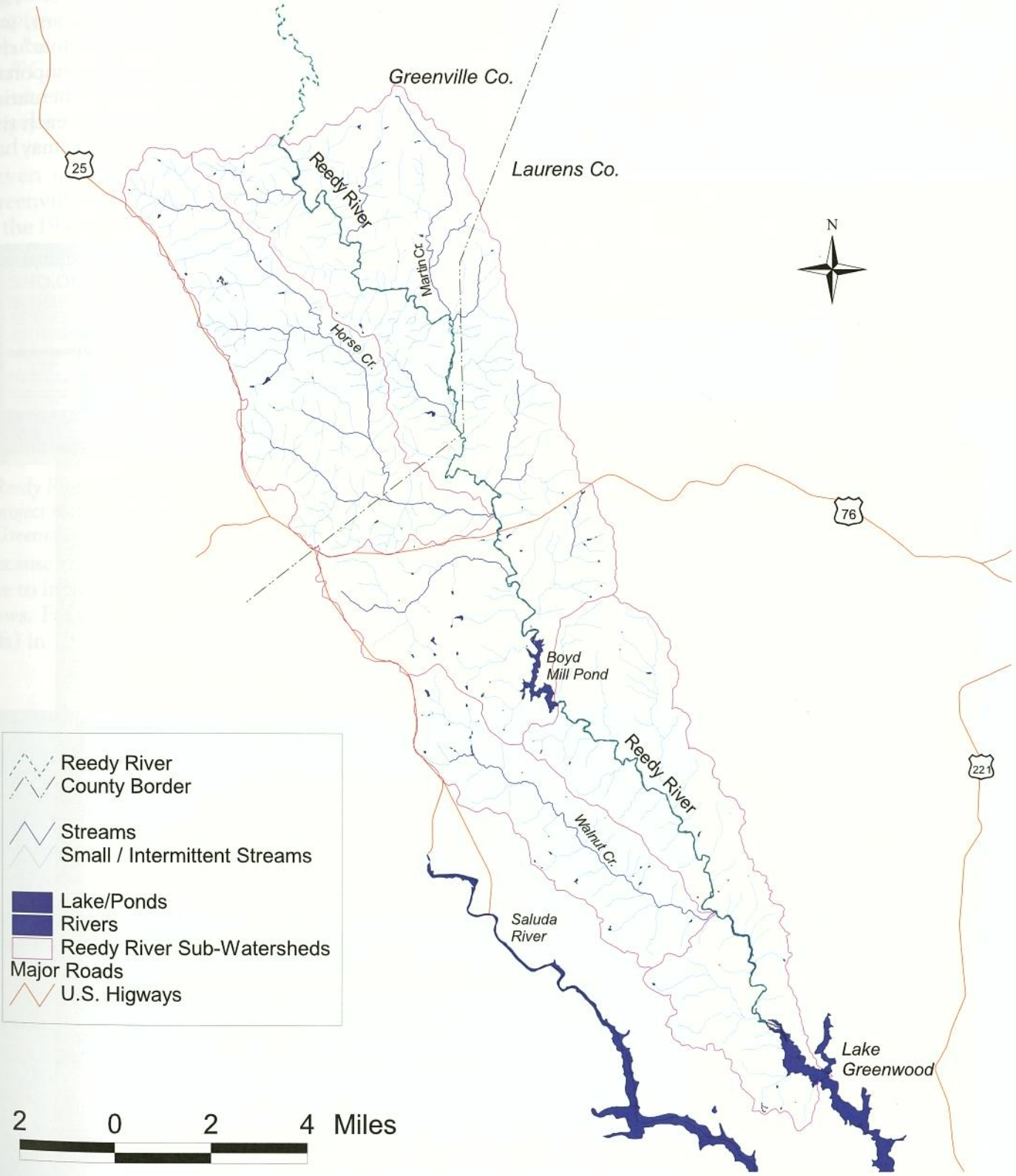


Figure 4: Southern Reedy River Watershed



The Reedy River was included in the *South Carolina Rivers Assessment* (South Carolina Water Resources Commission, 1988). The assessment provided an analysis of the importance of each river in the state as it relates to river uses and was designed as a planning tool to aid in decisions about the future of individual rivers in the state. A value was placed on each river based on 14 river use categories, providing a common index for river comparison in the state and serving as one of the best available collections of data for determining compatible and conflicting river uses in South Carolina. The study set the stage for statewide multi-objective river corridor planning.

The Reedy River was given a rating by value class for each river use category (Table 2). Value classes ranged from one to four, with class one of highest value. "Value class one" rivers were considered superior in the rivers assessment, with resources of statewide or greater significance. "Value class two" rivers were considered outstanding, with resources of regional significance. "Value class three" rivers were considered significant, with resources of local significance. "Value class four" river resources were considered unknown, but important enough to require further research and documentation. Although the entire river was evaluated for each river use category, only specific portions of the river may have fallen inside the class ranks stated in Table 2.

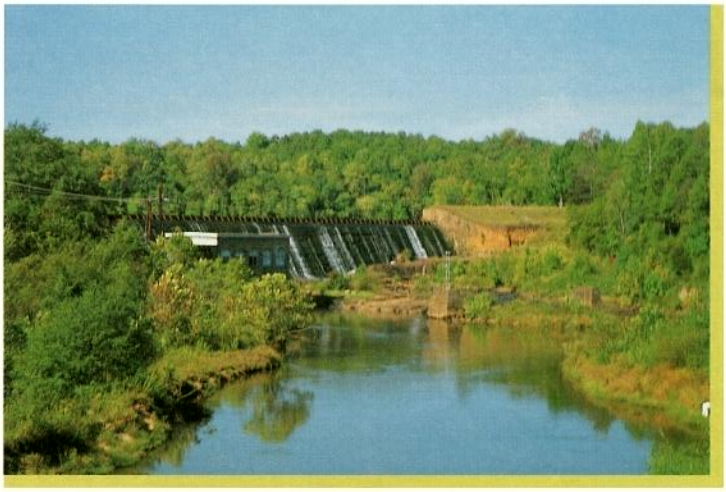
Table 2: River Use Classifications for the Reedy River (From the *South Carolina Rivers Assessment*)

River Use Category	Class
Agricultural	-
Historic and Cultural	-
Industrial	2
Inland Fisheries	3
Natural Features	-
Recreational Boating (flatwater/backcountry)	-
Recreational Fishing	3
Timber Management	-
Undeveloped	-
Urban	2
Utilities	1
Water Quality	-
Water Supply	2/3
Wildlife Habitat	3

(- Represents category falling outside of class ranks)

Hydrology

The entire Reedy River Watershed is located within South Carolina. There are 13 subwatersheds, illustrated in Figure 5, within the Reedy drainage. Two major impoundments, Lake Conestee and Boyd Mill Pond, are present along the 73-mile course of the river. Major tributaries include Long Branch Creek, Brushy Creek, Huff Creek, Horse Creek, Martin Creek and Walnut Creek. Many other small creeks and drainage ditches empty into the river.



Boyd Mill Dam

Seven miles of the Reedy River in the City of Greenville were affected by a "beautification" project in the 1930s that included removing debris and riparian vegetation. This project involved modification of the river's channel by straightening bends and meanders and removal of riparian vegetation along the riverbank. Additionally, the river channel has been carved out, both manually (to "improve" the river) and naturally (through increased flow), resulting in steeply sloped banks. This channel modification disconnected the river from its floodplain and, over time, has resulted in a canyon-like setting. Today, the runoff from urban areas creates storm water surges (or flashfloods) within the river channel.


Greenville News January 21, 1943

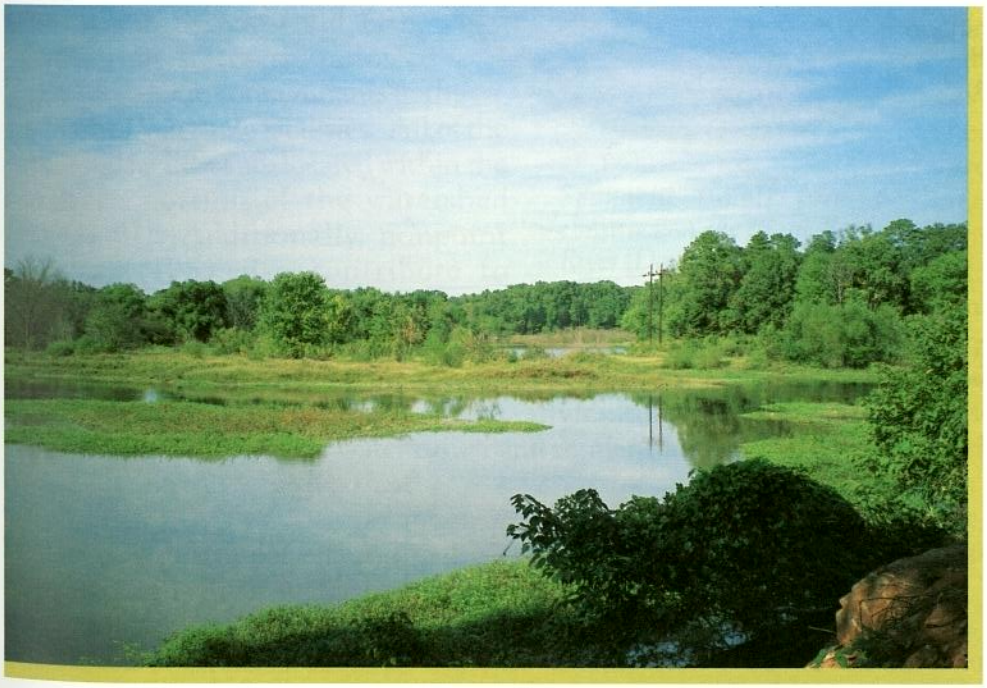
$50,000 BEAUTY TREAT

PUBLIC HEALTH ONE FACTOR OF HUGE PROGRAM

Reedy Gets Beauty Treatment

Reedy River "beautification" project makes headlines in the Greenville News

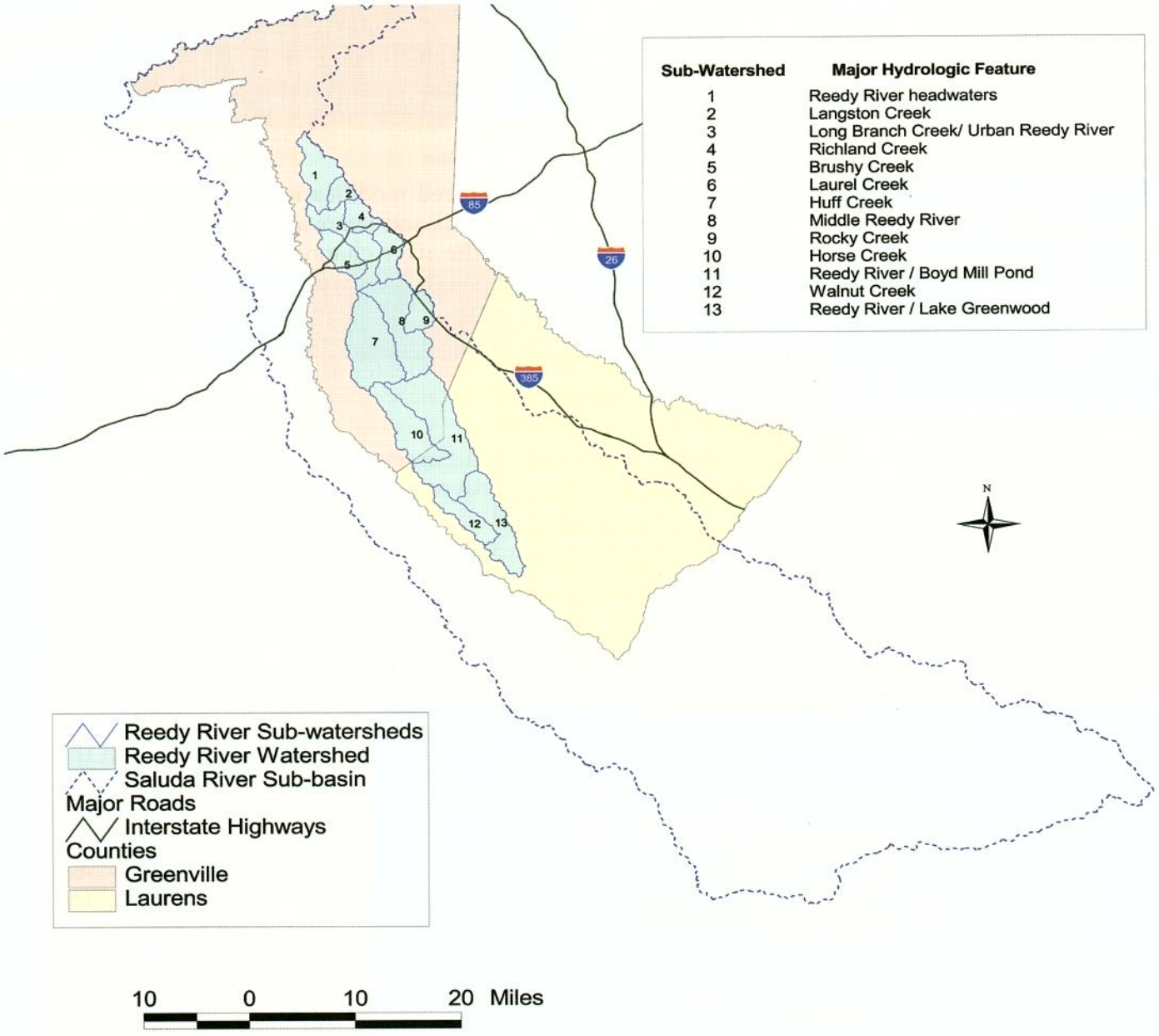
The United States Geological Survey (USGS) currently maintains three gauging stations on the Reedy River: near Greenville (installed in 1941); above Fork Shoals (installed in1993); and near Ware Shoals (installed in 1939). Because the Reedy basin is long and narrow with steep slopes, water levels within the river rise and fall quickly due to increased runoff during precipitation events. This phenomenon is evident in the variations in mean daily flows. For example, near Ware Shoals the mean daily flow (historically) has varied from 4.8 cubic feet per second (cfs) in 1973 to 8,800 cfs in 1963.



Lake Conestee

Based on data from the three USGS gauging stations, average annual streamflow in the Reedy varies. Near Greenville, average annual flow is 83.2 cfs; above Fork Shoals, average annual flow is 235 cfs; and near Ware Shoals, average annual flow is 359 cfs. The lowest daily mean flow of record within the river (4.8 cfs) was measured near Ware Shoals on September 9, 1973. The highest daily mean flow (8,800 cfs) also occurred near Ware Shoals, on March 7, 1963. Very high flows were measured at all stations on August 27, 1995, during Tropical Storm Jerry. At that time, flows varied from 5,400 cfs near Greenville to 6,260 cfs above Fork Shoals.

Figure 5: Subwatersheds of the Reedy River

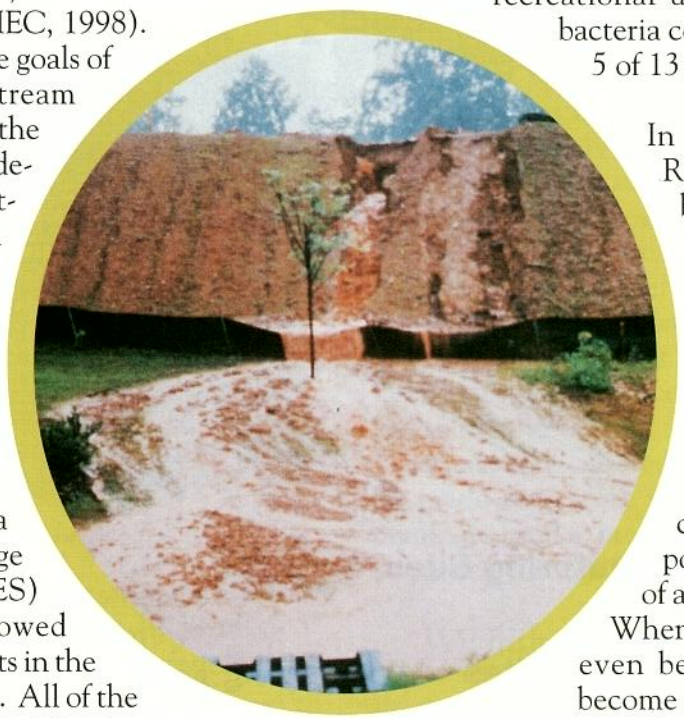


As development throughout the watershed increases, storm runoff will also increase. Because the Reedy is already experiencing drastic fluctuations in flow, efforts should be made to reduce storm water flows to the river.

Natural Resources

Water Quality

The South Carolina Department of Health and Environmental Control (SCDHEC) classifies the Reedy River as Freshwaters (FW). Waters with the FW classification are protected for several uses including drinking water after treatment, recreation, survival and propagation of a balanced aquatic community of flora and fauna, and industrial and agricultural uses (SCDHEC, 1998). This classification reflects the goals of SCDHEC rather than instream water quality. Additionally, the FW classification is used to determine permit limits for treatedwastewater dischargers and any other activities that may impact water quality.



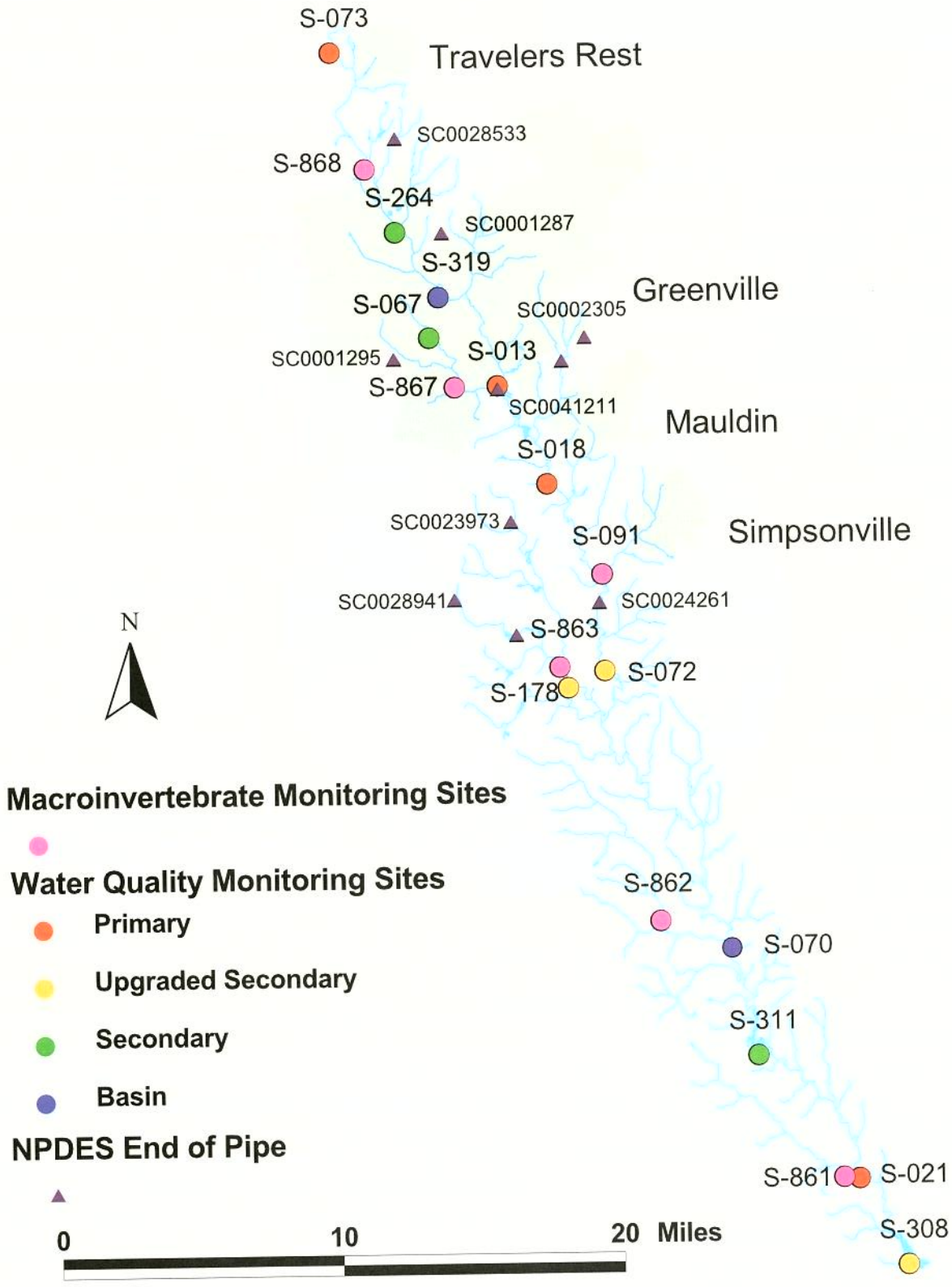
Sediment runoff from a construction site to the Reedy River [Dave Hargett]

There are ten permitted point source dischargers within the Reedy River Watershed. Each of these facilities currently has a National Pollutant Discharge Elimination System (NPDES) permit that states the allowed levels for specific contaminants in the discharge from these facilities. All of the permitted facilities are located within the northern portion of the watershed (Figure 6). Additionally, nonpoint sources (NPS) also contribute to contaminant loading within the river. NPS contamination is generally introduced to a water body during a storm event and originates from a variety of activities that include agriculture, silviculture, construction, urban storm water runoff and residential wastes.

SCDHEC regularly collects and analyzes water samples from the Reedy River Watershed to determine whether its classification of FW is being met. There are a total of 18 monitoring sites located on the river. These sites are divided among primary, secondary, and basin monitoring sites and macroinvertebrate monitoring sites (Figure 6). Four primary stations are located on the mainstem of the river; samples are collected from these stations monthly throughout the year. Six secondary stations are located within the watershed; samples are collected from these stations monthly from May through October, a period critical to aquatic life due to higher water temperatures and lower flows. Two basin stations are located on the mainstem of the river from which samples are collected on a monthly basis, year round, during a basin's target year. Finally, six macroinvertebrate sampling stations are located within the watershed. Data collected from these sites are used to determine whether aquatic life use and recreational use are supported at each station. For the Reedy River, aquatic life use is supported at 9 of 16 stations and recreational use (based on fecal coliform bacteria concentrations) is supported at 5 of 13 stations.

In recent years, portions of the Reedy River appear to have been adversely affected by nutrification, the process whereby an excess of plant nutrients are added to the river. In terms of water quality, phosphorus and nitrogen are the nutrients that cause the most concern. In general, increased nutrient concentrations provide the potential for accelerated growth of aquatic plants, including algae. When present in great quantities, even beneficial aquatic plants can become a nuisance. Nuisance plant growth is detrimental for several reasons. Aquatic communities can change as the number and density of plants increase. This creates an imbalance in the ecosystem and may result in reduction in animal communities, such as fish and aquatic insects. Large concentrations of plants can reduce dissolved oxygen levels and cause fluctuations in pH, resulting in catastrophic fish kills in extreme cases. Human communities are affected by nuisance plant growth, too. As waterways become choked with nuisance plants, aesthetic and access problems occur. South Carolina currently has no official standards or criteria for nutrients in water. However, the United States Environmental Protection

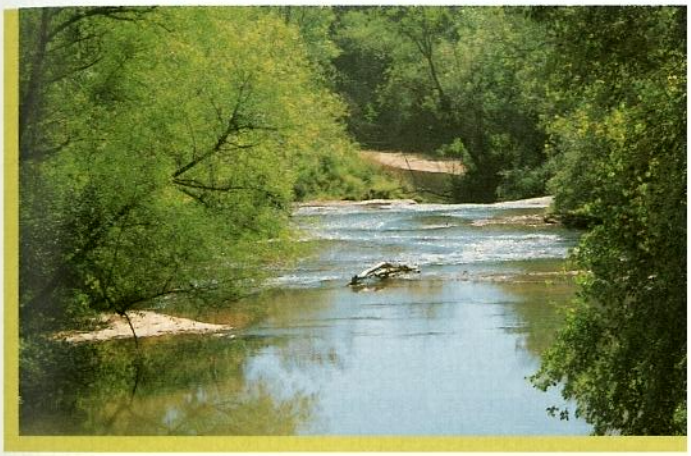
Figure 6: Locations of Permitted Facilities and Monitoring Sites



Prepared by the South Carolina Department of Health and Environmental Control, Bureau of Water, for the Reedy River Task Force

Agency (USEPA) has issued recommendations for phosphorus concentrations to prevent over-enrichment of water bodies. SCDHEC does include phosphorus standards for applicable NPDES permits. Both Boyd Mill Pond and the Reedy segment of Lake Greenwood are exhibiting high concentrations of phosphorus that is resulting in high densities of algae.

Litter and debris in the Reedy River also result in potential water quality problems, as well as aesthetic impacts. In 1994, the problem of litter in the Reedy prompted Friends of the Reedy River to organize a stream adoption program. Individuals, businesses and corporations came together to inspect and clean specific segments of the river on a regular basis. During three cleanups between 1994 and 1995, more than 12,000 pounds of trash and 900 tires were retrieved from the river.



Healthy riparian zone adjacent to the river

With increasing growth and urbanization occurring within the watershed, additional efforts will be needed to lower the amount of NPS and point source pollution and reduce litter in the watershed.

Riparian Zone

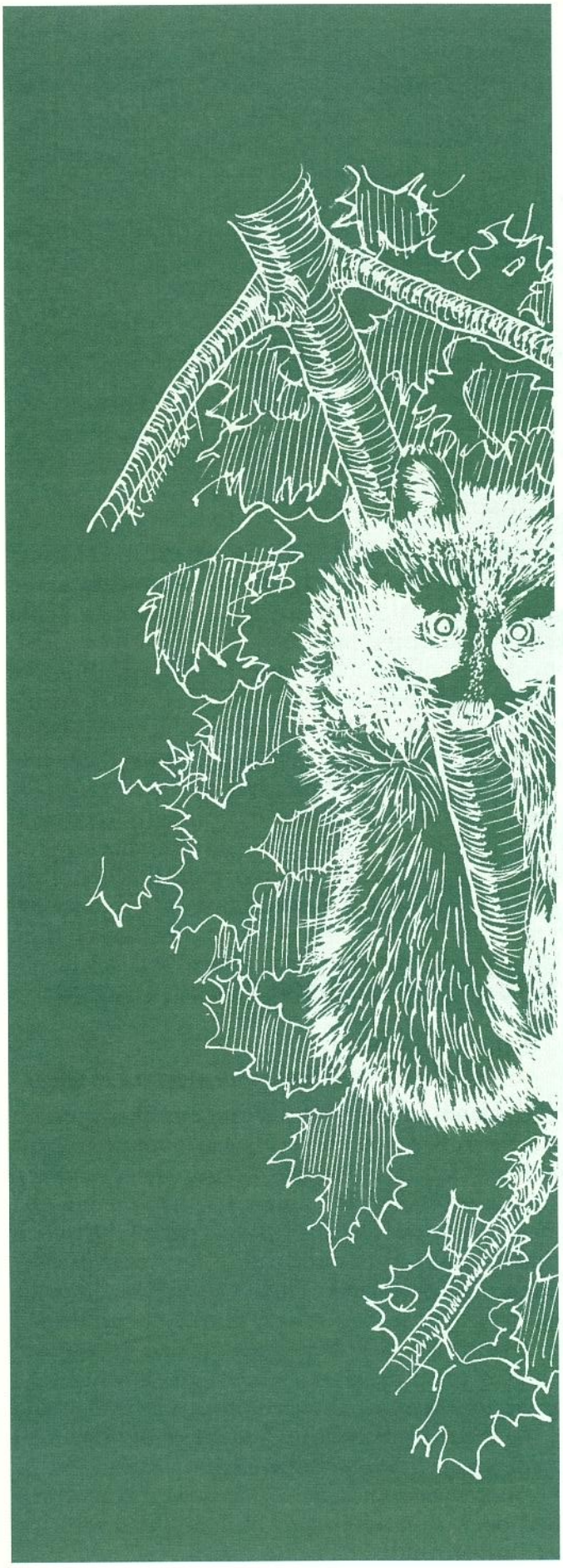
The health and viability of the river are dependent on several factors. One of the most important of these factors is the condition of the riparian zone. On the smallest scale, the riparian zone would be the immediate water's edge where specialized plants and animals form a distinct community. At a larger scale, it would be the area periodically inundated by high water that includes the banks and floodplain of the river. Finally, on the largest scale, it would be the band of forest that has a significant influence on the river ecosystem or, conversely, is significantly influenced by the river (Hunter, 1990).

Modified riparian zone [Dave Hargett]

Activities on river-bordering land have a direct and immediate impact on the river. An undisturbed vegetated area along the river can serve as a buffer between intensive land uses and the river. This provides benefits such as streambank stabilization, erosion and flood control, filtration of runoff, scenic beauty, recreation areas, stream shading and wildlife habitat. In the northern portion of the river, much of the riparian zone has completely disappeared, especially around urban centers, like downtown Greenville. Below the City of Greenville, however, much of the riparian zone is intact and the river flows through forestland and scattered farms. However, efforts should be made to restore riparian areas that have been eliminated and to protect existing areas as development continues throughout the watershed.

Wildlife and Fish

Forested lands mostly characterize the southern portion of the Reedy River (mainly evergreen forests, with some deciduous and mixed forests adjacent to the river). These forests provide habitat for many game and nongame species. The northern portion of the river is characterized mainly by urban development with small pockets of forested land. These forested areas provide important habitat for a variety of wildlife species and the basic necessities these animals need for survival including cover, food and water. Areas where the riparian zone is intact also serve as travel corridors and nesting/breeding grounds for forest species. Common wildlife species in these forested areas include foxes, gray squirrels, opossums, otters, raccoons, turkey, white-tailed deer, a variety of amphibians and reptiles, waterfowl and numerous songbirds.



In addition to supporting terrestrial wildlife, the Reedy River provides habitat for game and nongame fish species and a variety of aquatic invertebrate species. Critical elements of aquatic habitats include riffles, pools, undercut streambanks, downed trees, lack of impoundments and the forest canopy. In the northern portion of the river, many of these elements are not present. The riparian zone in urban areas of the upper Reedy has been cleared and developed in many areas, which has resulted in limited habitat for terrestrial wildlife and contributed to instability of the riverbanks during periods of high flow. Bank instability results in scouring during periods of high flow, which in turn, increases sedimentation in the river channel and greatly limits habitat available for fish and aquatic invertebrates. Clean water is also critical to healthy aquatic populations. Point and NPS discharges have reduced water quality in the river in its northern portion. Impacted water quality and aquatic habitat have resulted in less species diversity for both fish and invertebrates in the northern portion of the Reedy.

In the southern portion of the Reedy River, fish habitat impacts due to sedimentation are reduced because the riparian zone is more intact. Although there are no point source discharges below Fork Shoals, contaminants originating upstream continue to plague the southern portion of the river. Specifically, sediment and nutrient loading transported downstream have adverse effects on aquatic health. Like the northern portion of the river, the southern portion also exhibits reduced fish and invertebrate species diversity.

Over 22 miles of the southern portion of the river was severely impacted in June 1996 by a diesel fuel spill. The spill resulted in a significant fish kill and contamination of the river sediments. Data suggest that the area of the river affected by the spill is recovering and aquatic life is recolonizing the area; however, fuel residue entrained in the sediments and just beneath the river's channel may continue to pose a long-term problem.

In response to the 1996 diesel spill, the South Carolina Department of Natural Resources (SCDNR) conducted a fish kill investigation in the Reedy River (1996). This study determined that common fish species in the river include catfish, bullheads, sunfish (including redbreast sunfish), minnows, shiners, chubs, carp, gizzard shad and the recreationally important crappie and largemouth bass.

Cultural & Historical Resources –

Looking over today's urbanizing landscape of the upper Reedy River Watershed, as seen from Paris Mountain, one might have to strain to imagine the first humans arriving in these valleys some 15,000 years ago, finding grasslands and pine forests near the end of the last ice age. The Paleo-Indians of 10,000 to 12,000 years ago were hunting mammoth, mastodon, and giant bison with spears, and beginning the human alteration of the landscape with fires set to drive their big game. For the next 10,000 years, as the end of Pleistocene glaciation changed the region's ecology to a northern hardwood forest, and then a subtropical hardwood forest, various Indian cultures adapted and thrived, introducing agriculture to the landscape. However, the arrival of colonial Europeans in the 1500's, first Spanish, then French and then English, brought collapse of the native cultures through disease, war, slavery and alcohol. Reminders of the Native American presence include place names like Cherokee and Saluda and culinary traditions like barbecue.

The view to the north of Paris Mountain reveals the Blue Ridge Mountains in the distance, uplifted more than 350 million years ago by continental collisions and rising magma, and subsequently worn down by erosion. Paris Mountain stands apart from the Blue Ridge. It is a monadnock, or small, isolated mountain surrounded by the Piedmont uplands that are the terrain for the rest of the Reedy River Watershed. From the French for "foot of the mountains," the Piedmont has broad, rolling hills between wider, more gently sloping river valleys than the Blue Ridge, though both share the same billion-year old basement rock metamorphosed into gneiss and schist, with granite intrusions of cooled magma that are mined today for crushed stone.

Today's Reedy River Watershed boundaries are remarkably coincident with roads originally located along rounded ridgelines that avoid stream crossings. The beginning of the watershed is at the intersection of two such roads, US 276 and Old White Horse Road. Again, Paris Mountain is an exception, with Altamount Road accessing the peak along a steeper, more irregular ridgeline that defines part of the eastern edge of the watershed. Further to the south, the eastern watershed boundary coincides with portions of Pelham Road, I-385, the CSX railroad, Fairview Road, Neely Ferry Road and Todds Quarters Road. On the western edge of the watershed, the boundary travels south along Augusta Road, Indian Mound Road, and then River Fork Road to Lake Greenwood.

In the days of colonial Carolina, some of these same roads were paths between the "Back Country" and the first, permanent European settlement at Charles Town, founded in 1670. Carolina traders came to the "Back Country" to barter with the Indians for deerskins, which were exported to England. Scotch-Irish and German farmers settled portions of the Piedmont in the mid-1700's, bringing open-range cattle and hogs, and tobacco and wheat as cash crops. Though the Cherokees controlled most of what is now known as Greenville, Anderson, Oconee and Pickens Counties until the late 1700's, Indian trader Richard Pearis managed to acquire lands in the 1770's for a plantation and store at the falls of the Reedy River, the heart of the future city of Greenville.

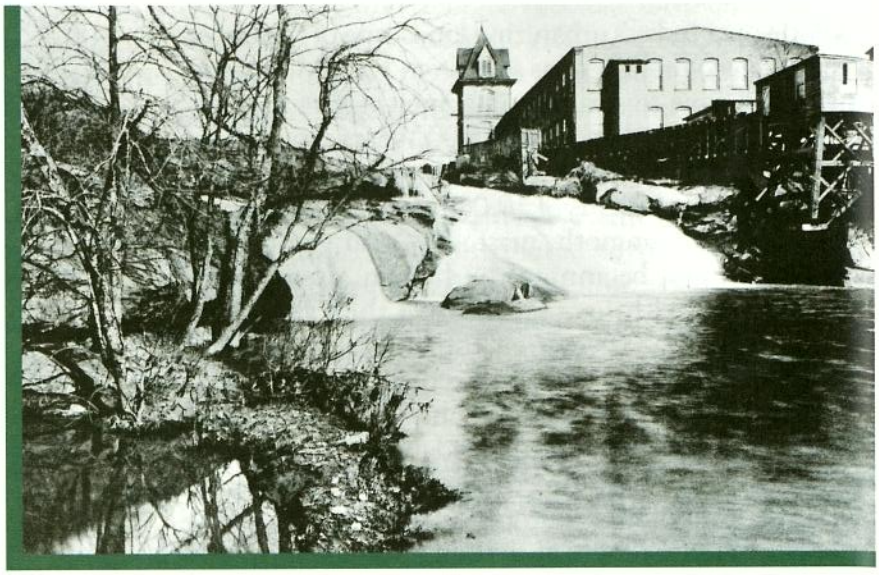
A more significant agricultural transformation of the upstate landscape began after the Revolutionary War, as cotton displaced indigo, and eventually rice, in the "Low Country" plantation economy. In the first few decades of the 1800's, cotton plantations and slavery spread rapidly into the Piedmont, supplying a growing textile manufacturing industry in England. With land cheaper than labor, most planters grew cotton until the fertility of the soil was exhausted, then abandoned their fields, and cleared more forests to plant again. Many migrated to Georgia, Alabama and Mississippi before the Civil War to find more fertile land. Not all farms in South Carolina were large cotton plantations run with slaves during this period. The area now known as Greenville and Laurens Counties tended to have smaller farms with fewer slaves, though Laurens grew much more cotton than Greenville.

Canals and railroads radiated inland from Charleston during the 1800's, serving the expansion of cotton plantations. By the 1850's, the Greenville and Columbia Railroad as well as the Laurens Railroad were operating. Towns formed along the railroads, such as Fountain Inn, Simpsonville and Mauldin on the eastern edge of the Reedy River Watershed.

In 1860, South Carolina was third in the nation for per capita income, but would drop to fortieth by 1870, in the aftermath of the Civil War. In the following decades, cotton production rebounded under a tenant farming system, despite low prices for the crop. It also shifted from the lower Piedmont toward the upper Piedmont as continuous cropping wore out the land. Phosphate fertilizers from the outer Coastal Plain were applied to stretch the yields.

These same decades around the turn of the century saw the textile mill industry expand rapidly in the upper

Piedmont, taking advantage of its waterpower, cotton production, lower wages and rail transportation. The companies established self-contained mill villages to attract workers. Though the Piedmont landscape had already been altered with hundreds of millponds constructed in the 18th and 19th centuries to mechanically power gristmills and saw mills, these new textile mills used waterpower for electricity. Larger dams and reservoirs for hydroelectricity were developed in later years, including Lake Greenwood in 1940.



Camperdown Mill on the Falls of the Reedy River in the early 1900's [Coxe Collection of the Greenville County Historical Society]

Cotton production peaked in South Carolina in 1920. The collapse of cotton prices after World War I and the boll weevil infestation were part of the decline, but soil depletion was a more fundamental reason. "By the 1930's Piedmont South Carolina was one of the most severely eroded areas in the United States, so scarred and gullied that much of the land had become unsuitable for cultivation. It is estimated that from the beginning of the "King Cotton Era" in the 1800's through the 1930's much of the South Carolina Piedmont lost almost 10 inches of topsoil and in some large areas more than 12 inches." (Kovacik, 1987).

Population growth in the upper Piedmont during the early 1900's was much greater than that of the state as a whole and was characterized by an inmigration of whites, as well as an outmigration of blacks who were denied significant employment in the textile mills. Even the thriving mills were hurt by the Depression, which literally starved many South Carolinians. The New Deal programs of the 1930's, for cotton and tobacco acreage reductions and parity payments, soil conservation measures, reforestation and public works projects, began the economic recovery and hastened the decline of small-scale tenant farming. New employment opportunities for young men included the Civilian Conservation Corps (CCC), which started the development of the state parks, such as Paris Mountain. The CCC also drained, blasted and dug the channel of the Reedy River through Greenville to discharge floodwaters and flush pollutants.

Reedy River floodplain development in Greenville suffered recurring floods in the early 1900's [Coxe Collection of the Greenville County Historical Society]

Both agriculture and industry in South Carolina strengthened in the 1940's, as part of the World War II economy. New military installations were established, like the Greenville Army Air Base, which later became the Donaldson Center Industrial Air Park. However in the 1950's extensive cropland acreage was abandoned in the Piedmont, as handpicked cotton failed to compete with irrigated and mechanized farms in other states. Consequently, fields in various stages of vegetative succession are now a common sight in the Piedmont.

In a century-long natural process, abandoned, sunlit fields are first occupied by dog fennel and rabbit tobacco, followed by broomsedge, then pine seedlings, red cedar and wild cherry trees. After about 35 years, the pine trees dominate the upper canopy, but young oaks, hickories, dogwoods and red maples occupy the understory. After 70

to 75 years, the fields have mature pines and hardwoods. By then, the forest floor is too shaded for pine seedlings to replace dying pines and, 100 years after abandonment, the fields have a stable, climax forest of oak and hickory, with an understory of dogwood, red maple and sourwood. However, the most common tree in the Piedmont today is the loblolly pine, introduced from the Coastal Plain and widely planted by paper companies.

After World War II, South Carolina's economy shifted increasingly toward manufacturing and its population toward urban areas. By 1980, the state's inmigration exceeded outmigration and more than half the population was in urban places of 2,500 or more.

Donaldson Center Industrial Air Park began in World War II as the Greenville Army Air Base

However, within the metropolitan counties, like Greenville, most of the growth was in the suburbs, not the central cities. Residential development sprawled outward, supported by urban and interstate highway expansion that enabled commuting to central city jobs. Retail and office jobs followed residents to the suburbs and by the 1970's, Greenville business and government leaders were countering the trend with downtown revitalization projects.

Textile manufacturing employment peaked in South Carolina in the 1970's and its decline led to the adaptive reuse of mill buildings. However, other industries in metals, machinery, rubber, plastics, electronics, instruments and chemicals arrived, especially in Greenville and Spartanburg Counties. The State Development Board (now South Carolina Department of Commerce) aggressively marketed the

This post-World War II aerial photograph shows dispersed, low-density, automobile-oriented development forming around Greenville [Coxe Collection of the Greenville County Historical Society]

upstate's non-unionized labor pool, highway and airport transportation investments dating to the 1960's and quality of life. The State's financial incentives and technical education system helped attract major foreign investments from Germany, England, France and Japan. The most significant natural resource industry in South Carolina is now pulp and paper, using planted pines such as those evident in the lower Reedy River Watershed. Agriculture in the watershed includes beef and dairy cattle, horse pasture and vegetables.

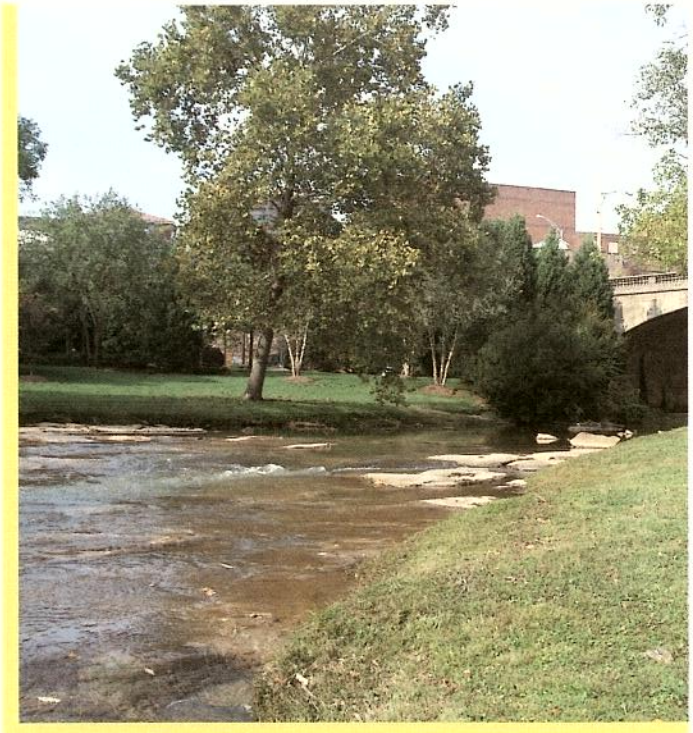
Humans have expected much of the Reedy River over the centuries and much has been left behind as evidence of this human activity. The cultural resources that exist in the river corridor are valuable to understanding our past and should be preserved to help build a better future.

This Michelin Tire plant represents foreign investment located in the Reedy River Watershed

Recreational Resources

One very important quality of life issue for community members is the availability of and opportunity to enjoy open space and the surrounding natural resources. In the northern portion of the Reedy River, open space and natural resources adjacent to the river are more limited than in the southern portion, especially in the City of Greenville. However, Cleveland Park and Linkie Stone Park, both in the city, provide the public with the opportunity to enjoy the Reedy River. Walking trails and picnic areas are available and kayaks and canoes are frequently seen on the river. Recently, the City of Greenville installed slalom gates for kayaks in Linkie Stone Park. As urban areas continue to expand throughout the watershed, it will be increasingly important to plan for open space and greenways.

Downstream of Greenville, the river flows through forestland and scattered farms. Wildlife is abundant and readily observed from a canoeist's perspective. The natural setting of the southern portion of the Reedy provides opportunities both for novices to enjoy a leisurely float and for experienced boaters to be challenged by its whitewater rapids.

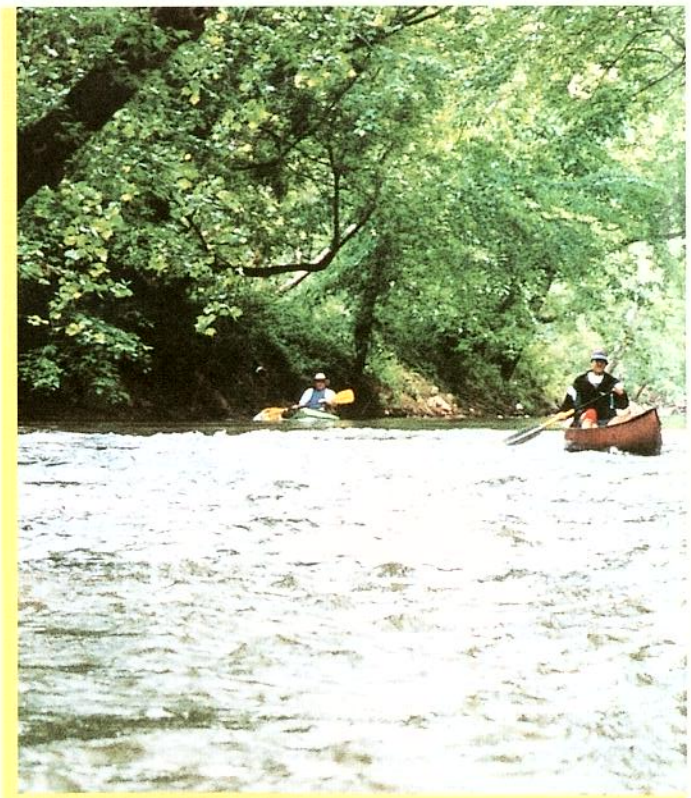


Cleveland Park in the City of Greenville

Another popular recreational activity on the river is fishing. Boyd Mill Pond and Lake Greenwood also attract fishermen to the watershed. The Reedy River is home to a number of game fish species including catfish, bream and bass.

The Monaghan Plant of JPS Converter occupies an old textile mill on the Reedy River

In addition to boating and fishing, the river and its floodplain host a number of species of plants and animals. Observation of the natural environment and the wildlife that inhabit it is another recreational use that the river offers. Kingfishers, herons, egrets, muskrats, otters and signs of beaver activity can be observed within the river corridor.



Canoeing on the Reedy River [Dave Hargett]

One of the most challenging issues facing local governments and recreation providers is how to allow access to the river without harming its environment or impacting the rights of riparian landowners. Currently, there are only a few legal public access points to the river within the watershed. Because the community has so few access points, trespassing on private property and degradation of the riparian zone at uncontrolled access points occurs. Finding a balance between public access and riparian landowners' rights, along with sufficient funding for publicly controlled access, will be essential.

Land Use

Land use within the Reedy River Watershed is distinctly different between the northern and southern portions of the river. The amount of forest and urban land use present within each portion of the watershed illustrates the major difference. Figures 7 and 8 illustrate the differences in land use for four major cover types (water, forest, agriculture and urban) between the northern and southern portions of the watershed. In these figures, forested areas dominate both portions of the watershed. However, 75.4 percent of the southern portion of the watershed is in forested land use compared to 57.4 percent in the northern portion. Urban land use represents 28.3 percent of the northern portion of the watershed, but only 7.5 percent of the southern portion. There is little difference between the percentage of agricultural areas between the northern and southern portions of the watershed. Therefore, the highly urbanized areas in and around the City of Greenville characterize the northern portion of the watershed and forested areas characterize the southern portion. The manner in which Figures 7 and 8 are created can result in some mistakes in land use determination. Though checked against aerial photographs, this analysis is prone to mistake some agricultural land of bare soil as urban, and some urban land in residential areas with many trees as forested land.

Although Figures 7 and 8 illustrate the basic land use differences within the watershed, the differences between the northern and southern portions are more striking when more than four types of land use are considered, as illustrated in Figure 9. In this figure, urban uses are divided into three separate categories and forest uses are divided into six separate categories. Therefore, the potential for mistakes is smaller. Figure 9 clearly shows the northern portion of the watershed in urban uses and the southern portion in rural lands.

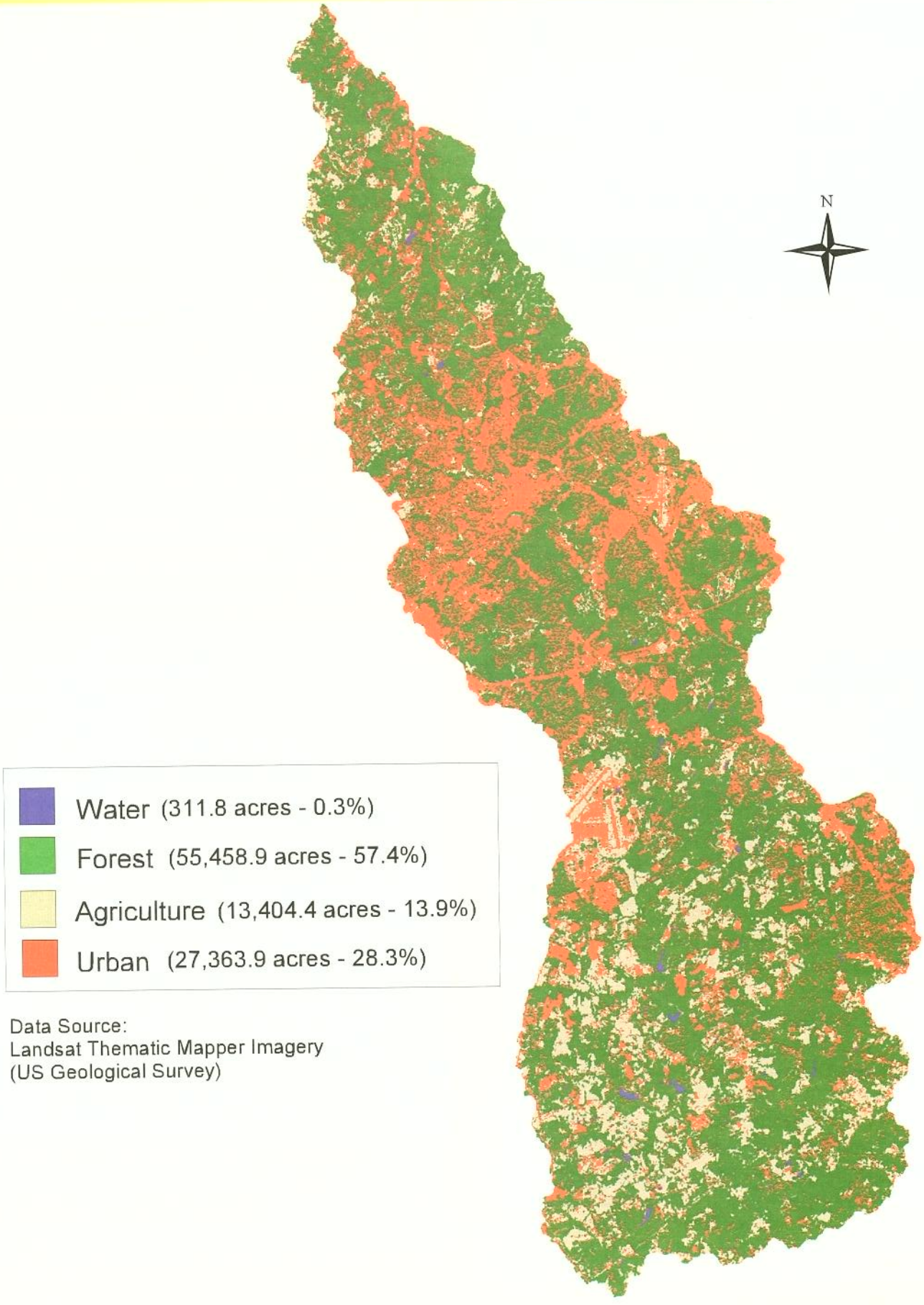
One of the things which impressed me the most while serving as a member of the Reedy River Watershed Task Force was the concept (new to me) of a community-based group to plan for the river's future. I believe that this idea presents the best approach to any study involving so many interests and is the only way to achieve success. Unless the viewpoints of various individuals are incorporated into this planning process, support from many groups will be lacking. I applaud the vision of Barry Beasley and other DNR members who were able to write the grant to allow this body to form.

Of personal interest, making contact with a variety of people from a variety of agencies has already been helpful to my teaching at Presbyterian College. My research for the last two decades with freshwater mussels has been funded primarily by the Tennessee Wildlife Resources Agency and TVA and I have had very little contact with biologists and others associated with ecosystem management and research in our own state. This task force has allowed me to become acquainted with several people in these fields and build relationships that should last long into the future.

Looking toward the future, my hopes are that the recommendations of our task force will be funded from the mitigation settlement as well as collective agency contributions to allow these recommendations to become a reality. Certainly easements for owners of riparian lands as well as assistance in the construction of water retention devices will be needed to allow individual companies and landowners to implement recommendations. Furthermore, I would like to see the development of some relationship between Presbyterian College and the proposed river education center which was initiated by a donation to Clemson University by Mr. Joe Adair involving some land along the Reedy River, similar to the relationship we share with the Joe Adair Outdoor Education Center in Laurens County. I believe that education is the best way to build enthusiasm about the stewardship of our environment. Once a person integrates what they learn into a personal relationship with their place in nature, harmony with this environment can begin. My personal relationship is certainly richer as a result of my service on this task force.

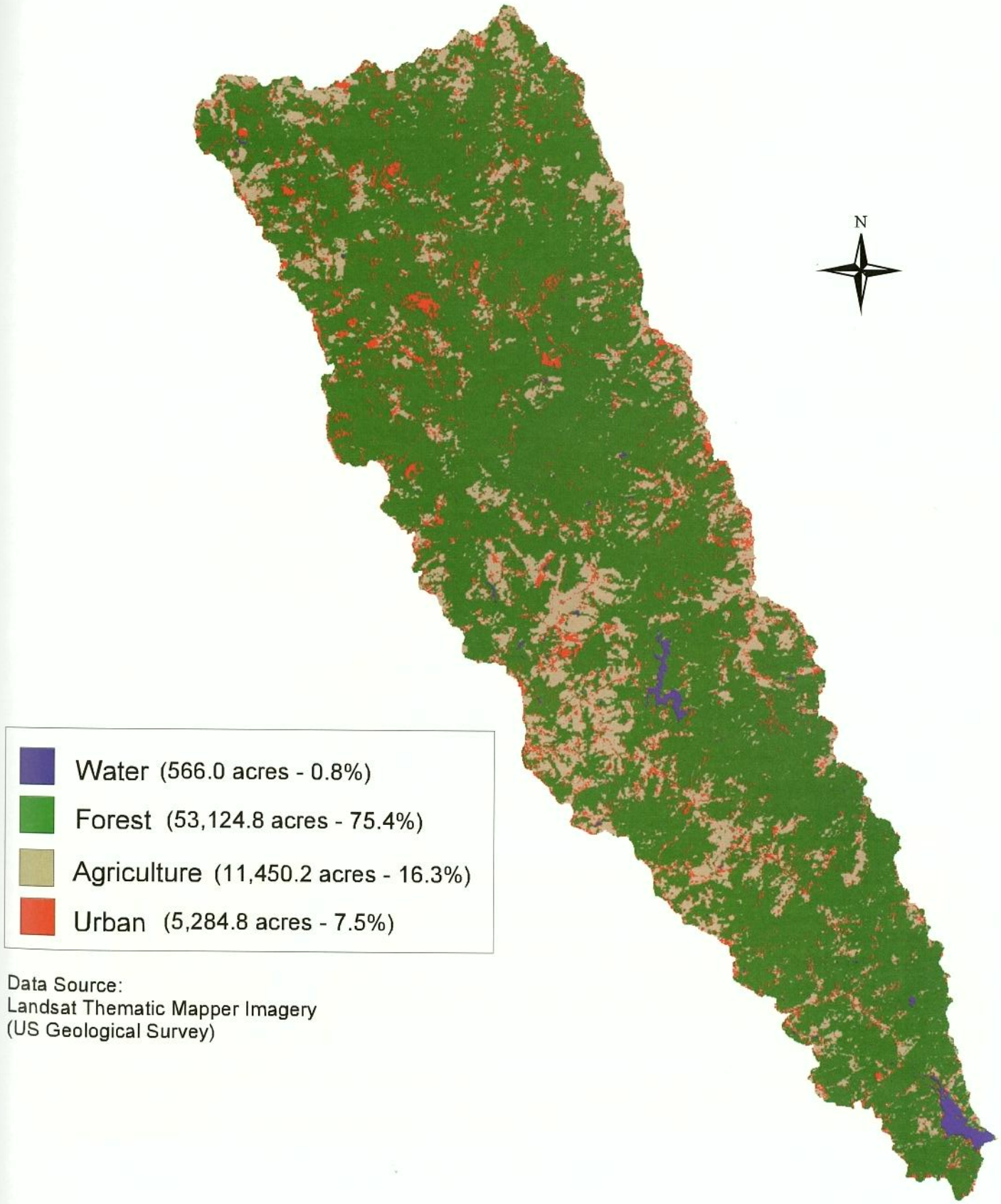
Thanks,
Bob Hudson
Presbyterian College

Figure 7: Land Use/Land Cover in the Northern Reedy River Watershed



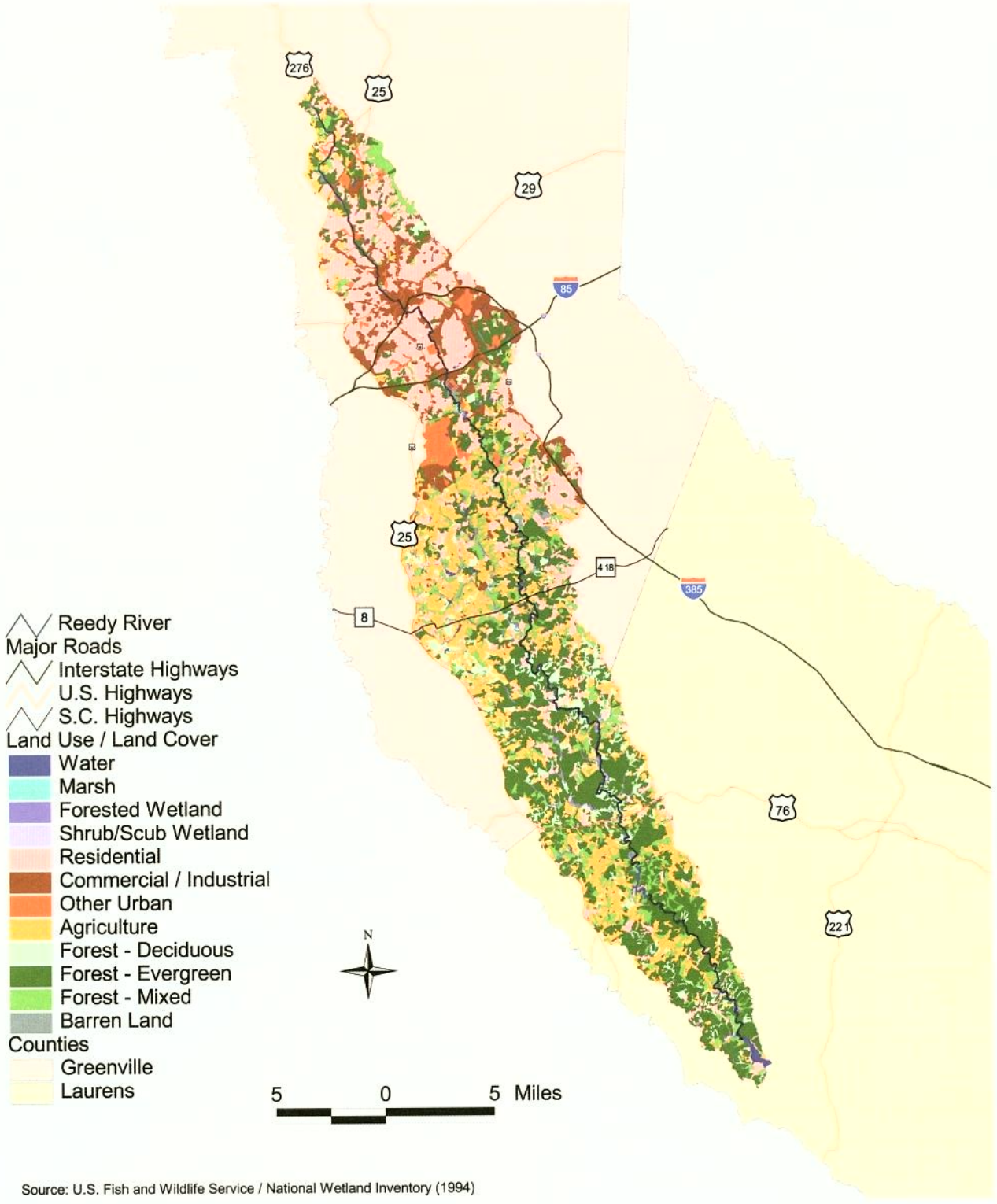
Data Source:
Landsat Thematic Mapper Imagery
(US Geological Survey)

Figure 8: Land Use/Land Cover in the Southern Reedy River Watershed

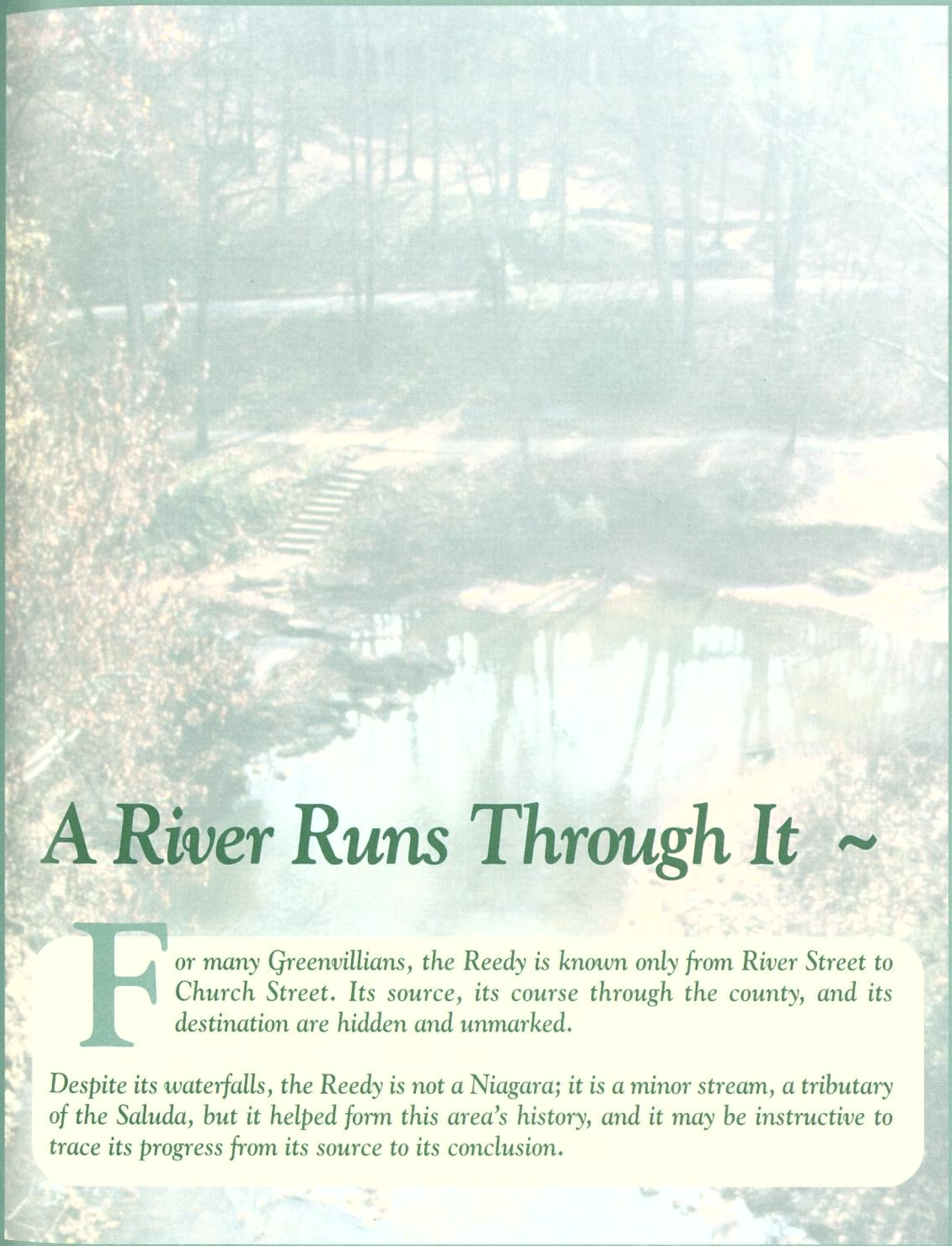


Data Source:
Landsat Thematic Mapper Imagery
(US Geological Survey)

Figure 9: Land Use/Land Cover in the Reedy River Watershed (Based on National Wetland Inventory Data)



Source: U.S. Fish and Wildlife Service / National Wetland Inventory (1994)



A River Runs Through It ~

For many Greenvillians, the Reedy is known only from River Street to Church Street. Its source, its course through the county, and its destination are hidden and unmarked.

Despite its waterfalls, the Reedy is not a Niagara; it is a minor stream, a tributary of the Saluda, but it helped form this area's history, and it may be instructive to trace its progress from its source to its conclusion.

It will not be a scenic tour.

Begin at Ebenezer Church a little north of Renfrew above Travelers Rest. Raindrops falling there have a choice of destination: those to the north reach creeks flowing into the Enoree Watershed; those to the west empty into the Saluda; those to the south eventually join a narrow stream that rises from two marshy springs about a hundred yards apart on low ground near Ebenezer Church Road. There they form the beginning of the Reedy River, initially a creek about four inches deep and five feet wide, edged always with thick underbrush and low-hanging trees.

It flows behind the old Renfrew Bleachery village, is bridged at McAlhaney Road, and helps form the water hazards at the Green Valley Golf Course. Years ago, Roe's Ford at Cherry Laurel Court provided an easy crossing point for the channel that has become almost ten feet wide.

The Reedy wends its way past Riverbend Equestrian Park. At its bridge on Riverbend Road, canebrakes--reed-like bamboo--cluster around the stream, giving a hint of its natural state and the source of its name.

After it curves around the Richmond Hill sub-division and crosses White Horse Road extension near University Inn, it broadens as other creeks flow into it: one from the sewage treatment ponds south of Renfrew, another from Travelers Rest, a third from Furman University's golf course and lake.

Furman's Alma Mater begins "A mountain city is her home / A mountain river laves her feet." Although it was written in 1907, when Furman was located in downtown Greenville, the description remains technically true.

Just beyond the university, near Sulpher Spring Road, Little Creek joins the Reedy; at Watkins Bridge Road it meets the railroad tracks of the Greenville and Northern Railroad that will accompany it all the way to Main Street.

Glimpses of the river come only when streets and highways cross it; bridges are not marked outside the city limits, but even in the countryside the high trees and shrubs along its bank and its floodplain identify its course.

By the time the river reaches Blue Ridge Drive, it has been joined by Langston Creek, the water source for the old Union Bleachery; tangled undergrowth makes its banks jungle-like.

Then it cuts between Cedar Lane Road and Old Bleachery Road on the edge of Sans Souci. Riverside, a middle class subdivision developed in 1907, overlooks it. Nearby Verner Springs, now a cluster of Habitat for Humanity homes with a new park, was once a local beauty spot and longtime home of a Coca-Cola bottling plant.

The Reedy edges Monaghan Mill (but does not flow along its central street; the creek beside Ravenel is another tributary--Greenville is a well-watered county). Then it curves toward the Southernside community where there was once a favored swimming hole for local boys.

At Southernside, named for the industrial area around the Southern Railroad Station and its roundhouse, the river, now 20 feet wide, flows around warehouses, industrial buildings, and two sets of railroad tracks, for both the Greenville and Northern's famous (or infamous) "Swamp Rabbit" and the Piedmont and Northern's interurban trains followed the river.

The well-named "Swamp Rabbit" ran from downtown along and through the course of the river's marshes and swamps to Montague Station on Duncan Chapel Road; then it diverged to go on to Travelers Rest and up the Middle Saluda to River Falls. James B. Duke's electrified interurban line provided passenger service connecting Charlotte, Greenville, and Greenwood from 1911 to 1947. Its tracks wander along and through the river for about five miles.

The Reedy crosses under Bramlett Avenue; Republic Locomotive Works is nearby. Then it flows behind the far end of West Washington Street, emerges at Willard Street next to the CSX Bulk Transfer operation, and curves gently into the marshy meadow behind Mayberry and Meadowbrook Parks. Once a favored ice-skating site for town residents, the parks recall Greenville's once-segregated athletic facilities.

The White Oak Branch from Poe Mill and Long Branch, rising near Woodside Mill, have joined it; the Poinsett Mill, opened in 1903 as the Carolina Mill and a part of Brandon Mills in the 1920s, perches on the hill above Mayberry Street. It is this floodplain area that developers are eyeing with particular interest.

At Mayberry and Hudson Streets, once a brickyard, now the site of the Sanitation Department headquarters and the city's central maintenance shops, the river's current course is identified by a marker. A treeline slanting across Hudson at Welborn Street still marks its former bed, a ghostly reminder of the frequency with which the river has been rechanneled, dammed, and dynamited.

Great boulders once lined its banks around Main Street; railroad tracks divided the river, providing service to the cotton warehouse, now Falls Place, on its bank; a dam above Main Street provided power for the Coach Factory.

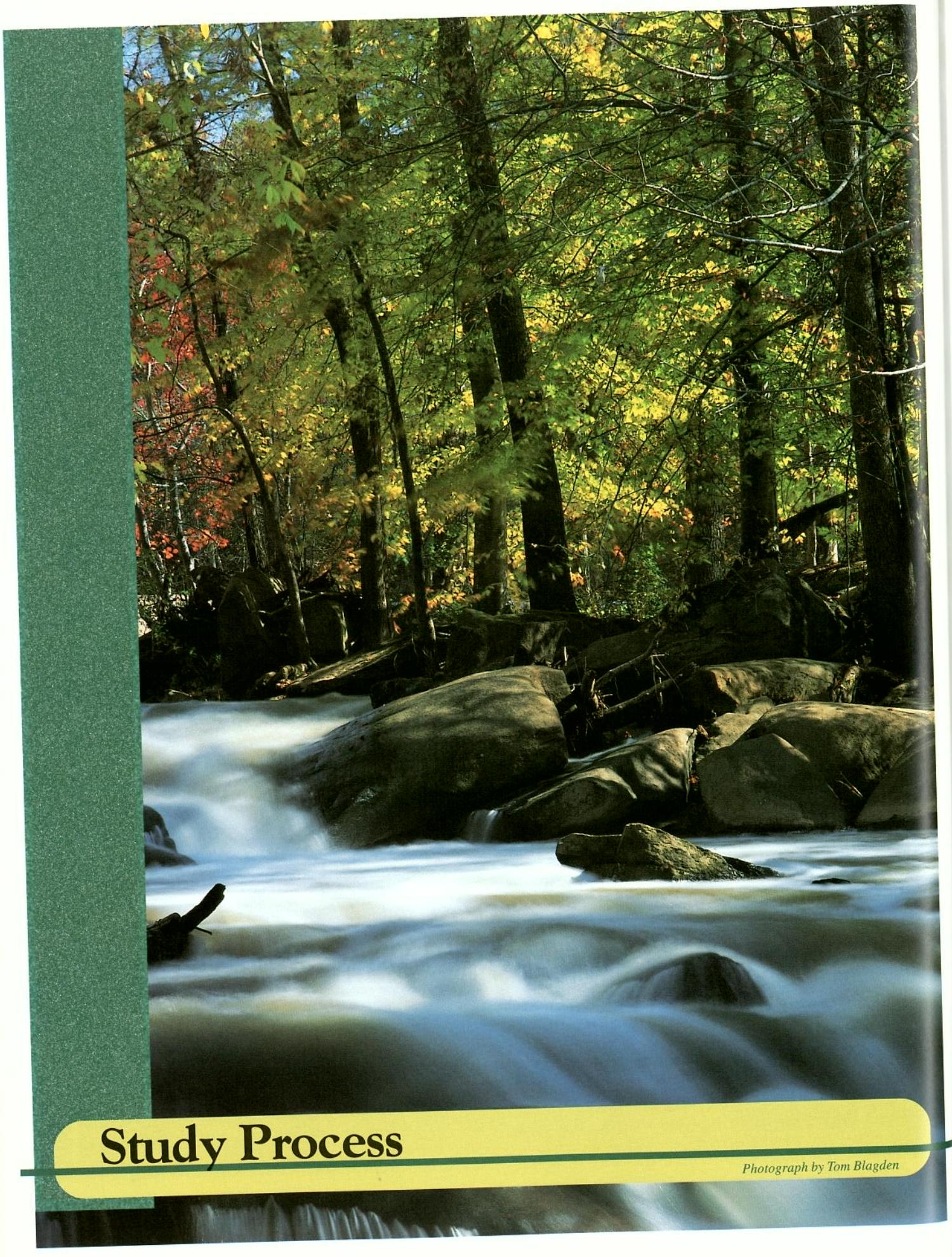
Between Hudson and River Streets there was once a "washhole" where young boys learned to swim (ladies crossing the Main Street bridge modestly averted their eyes from the nude swimmers). Nearer River Street was the favorite baptismal location for the Baptist Church.

From Linky Stone Park, crossing Main Street and flowing along the historic greenway to McDaniel Avenue and its intersection with Richland Creek in Cleveland Park, the Reedy is known, although the beauty of its falls is obscured by the Camperdown Bridge. Once the heart of Greenville industry, the area is now the pride of the city.

Then it edges the Greenville Country Club, flows under Interstate 85, pauses at the waste water treatment plant at Parkins Mill, and widens at its confluence with Brushy Creek. From there the river meanders southward toward the old mill and dam at Conestee, Fork Shoals, and past the site of the Revolutionary War Battle of the Great Canebrake some sixteen miles south of the city before entering Laurens County. Just past the old village of Waterloo it merges with the Saluda and eventually disappears into Lake Greenwood.

Not an impressive stream, perhaps, but it is ours, and we have a responsibility to use it wisely and develop it carefully.

Judith Bainbrige
Furman University



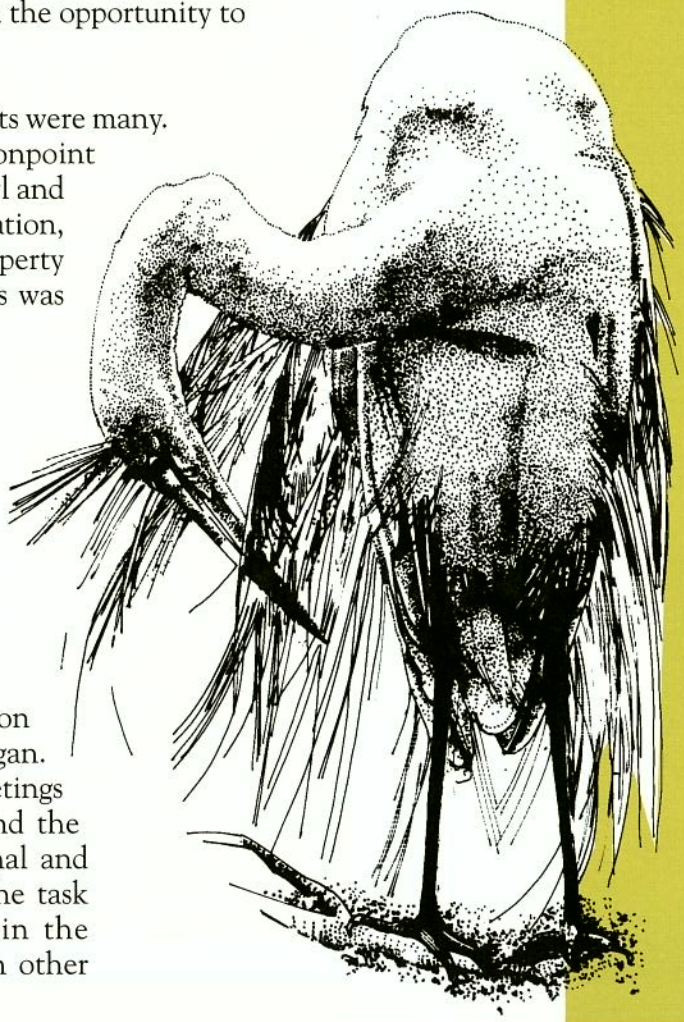
Study Process

Photograph by Tom Blagden

Developing a management plan for a land area that is the size of the Reedy River Watershed is a complex process. The many residents, landowners, industries and local governments sometimes have competing and conflicting interests. Gaining public acceptance for the plan is often equally as difficult as developing the plan itself. For these reasons, the Reedy River watershed study is a community driven project. The list of resource issues that needed to be addressed and the solutions that were proposed to remedy these resource problems are a product of people who live or work within the Reedy River basin, with occasional input from outside experts. The South Carolina Department of Natural Resources (SCDNR) staff took on the role of facilitators during the process and also offered technical and administrative support as needed.

The first step in the study process was the creation of the Reedy River Task Force. Members of this group developed the vision for the watershed, specified the issues that were explored and made the final decisions about the remedies for those issues. The task force was selected from a broad range of landowners, local government officials, researchers and academicians, representatives from industry, conservation organizations, community groups and state and federal agencies. Each member either had a special interest in the watershed or possessed expertise in one or more of the issues that were addressed.

The first meeting of the task force was held in Greenville on February 10, 1999. The task force and the public were given an overview of the watershed, key issues and the study process. During the following meeting, the task force identified critical issues and problems facing the river. All the individuals at the meeting were given the opportunity to express their ideas.



The needs and concerns expressed by the participants were many. They ranged from water quality problems, like nonpoint source pollution and industrial spills, to urban sprawl and the need for open space, to education and communication, to habitat protection and outdoor recreation, to property rights issues. The broad list of issues and concerns was grouped into seven critical issue areas:

- Storm Water Management/River Flow
- Water Quality
- Aquatic Health and Riparian Zone Management
- Cultural and Historical Resources
- Recreation
- Growth Management
- Education

Following the delineation of these issues, the education and evaluation phase of the Reedy River project began. For the next seven months, the general task force meetings were used to educate both task force members and the general public on the critical issues. Local, regional and national experts, identified in Table 3, spoke at the task force meetings on conditions and events within the watershed and problems and the remedies used in other watersheds.

Table 3: Content of Each Task Force Meeting

Meeting Date	Speakers	Issue/Topic
June 1, 1999	Jerald Robinson	Charlotte-Mecklenburg County Storm Water Monitoring Project
	George Fletcher	Greenville County Storm Water Task Force
	Julie Arrowood	City of Greenville Storm Water Program
July 8, 1999	Bud Badr	Hydrology of the Reedy Basin
August 11, 1999	David Chestnut	Water Quality in the Reedy River Watershed
	Andy Miller	Point and Non-Point Contamination Sources
	Dennis Bauknight	Best Management Practices for Agriculture
	Dale MasonBest	Management Practices for Forestry
September 8, 1999	Gerrit Jöbsis	Oil Spill Impact on Aquatic Health of Reedy River
	Jim Glover	Macroinvertebrate Community Sampling Following the 1996 Oil Spill
	Jim Bulak	Fish Community Sampling Following the 1996 Oil Spill
	Dave Hargett	Condition of the Riparian Zone in the Reedy River Watershed
October 7, 1999	Richard Sawyer	History of Greenville
	Judy Bainbridge	History of Mills in the Reedy River Watershed
	Elaine Martin	History of Laurens County
	Chris Stone	Recreational Vision of the Reedy River
	Tom Fischer	Recreational Program on the Enoree River
	Dave Hargett	Paddling Opportunities on the Reedy River
November 4, 1999	Mitch Woodward	Neuse River Educational Efforts
	Anne Marie Johnson	SCDHEC Non-Point Source Education and Outreach Program
	Laura Blind	Role of Watershed Based Outdoor Education Centers
	Dave Hargett	Educational Efforts of the Friends of the Reedy River
December 1, 1999	Sen. Phil Leventis	Growth: Should it be Managed? A State Perspective
	Dr. Jeff Allen	Lessons from the Low Country
	Bob Zimmerman	Growth and Impacts on Natural Resources: The Charles River
	Richard Lacy	Upstate Growth Trends

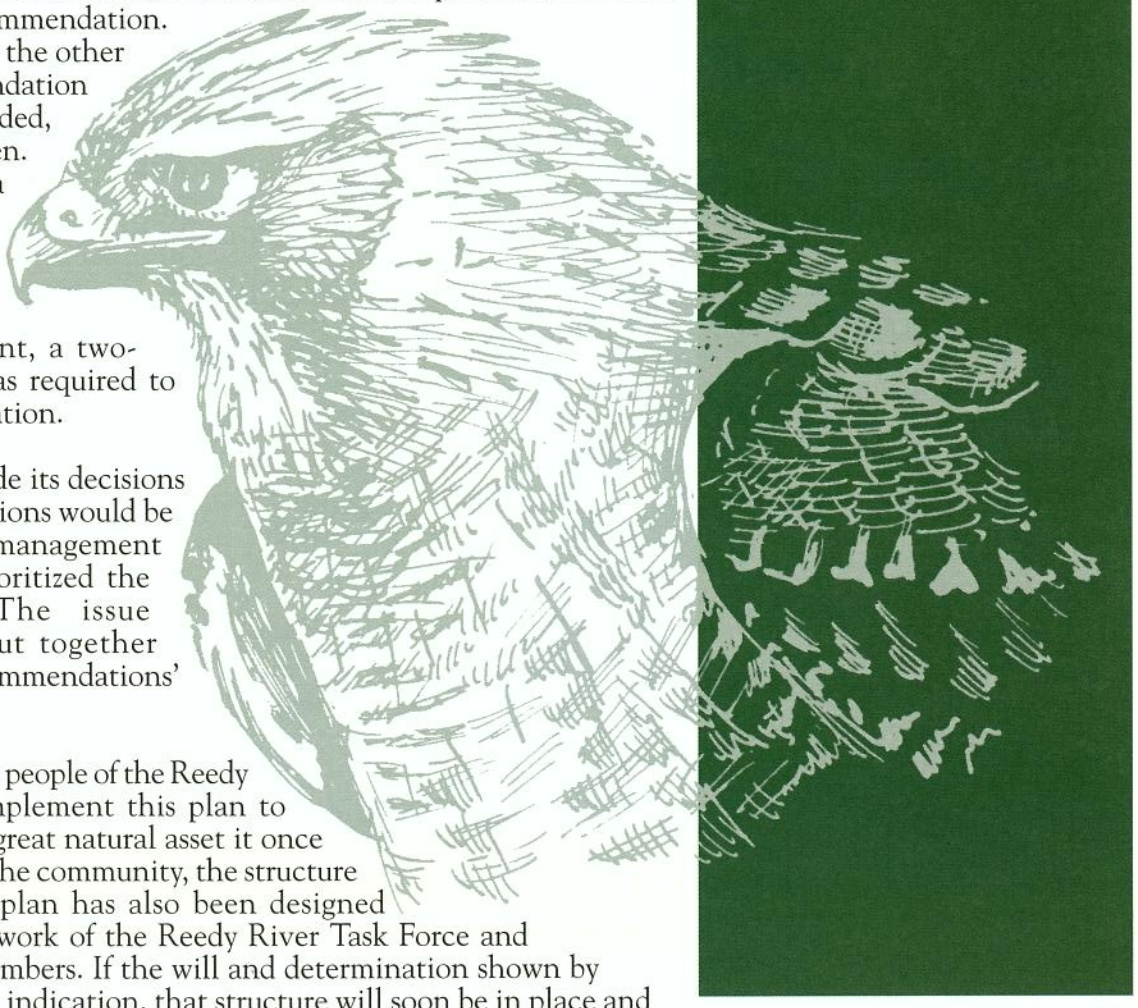
The SCDNR also arranged a number of informational field trips, including a walking tour of part of the urbanized portion of the watershed in Greenville and a tour of one of the Western Carolina Regional Sewer Authority's sewage treatment plants. Several canoe trips on different stretches of the river were sponsored, giving members of the task force and the general public a first hand view of some of the river's assets and problems.

Concurrent with the informational meetings, the task force formed subcommittees for each of the seven critical issue areas. Issue committee members are listed in the *Acknowledgements* section of this report. The individual issue committees studied specific problems in depth, then formulated recommendations to address the delineated management issues and problems. Each issue committee was asked to develop three to five recommendations.

The issue committees met from August of 1999 through February of 2000. Committees with overlapping interests sometimes held joint meetings in order to coordinate their efforts. All committee meetings were open to the public with input welcome from anyone who attended the meeting. The education and evaluation phase of the Reedy River project was completed during late winter of 1999/2000.

The recommendations that were developed by the individual issue committees were presented to the task force over the course of three general task force meetings. At these meetings, task force members and other attendees had the opportunity to ask questions and make comments concerning the recommendations. During the next two general meetings, the task force made their final decisions about whether to accept a recommendation and include it in *The Reedy River Watershed Plan*, reject a recommendation, or accept it with modifications.

The decision making process for each recommendation began with a reading of the recommendation before the whole group. Discussion followed, and the recommendation was approved by consensus or vote. If the vote was unanimous, the recommendation was accepted, and the next recommendation was read before the group. Sometimes a task force member would request a modification or amendment to a recommendation. If this was acceptable to the other members, the recommendation would be reread as amended, and a vote would be taken. In the rare case when a recommendation was not passed by the task force unanimously, and no modification could rectify the disagreement, a two-thirds majority vote was required to accept the recommendation.



After the task force made its decisions on which recommendations would be included in the final management plan, the members prioritized the recommendations. The issue committees met to put together strategies for their recommendations' implementation.

Ultimately, it is up to the people of the Reedy River Watershed to implement this plan to restore the river as the great natural asset it once was. However, to assist the community, the structure for implementing the plan has also been designed through the dedicated work of the Reedy River Task Force and the issue committee members. If the will and determination shown by this diverse group is any indication, that structure will soon be in place and the goals of this plan achieved.

Storm Water

Photograph by Tom Blagden

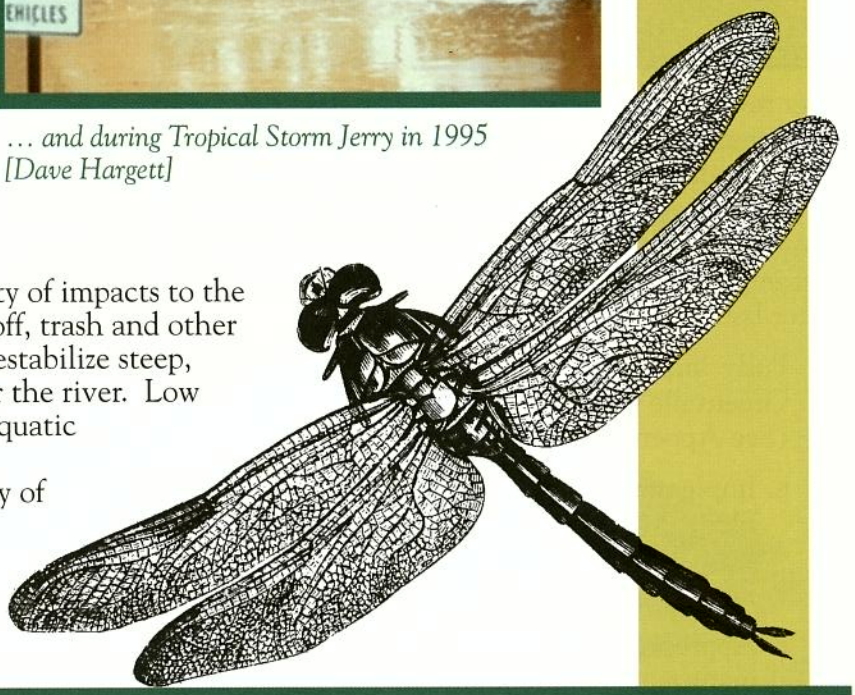
Flow issues are significant in any watershed; however, the characteristics of the Reedy River make the understanding and management of flow a critical issue for this river. The upper Reedy River drains a highly urbanized watershed. During significant rainfall, flow in the river can rise several hundred cubic feet per second in a matter of minutes. The shallow, docile Reedy River can become a raging torrent in flood situations as it did on August 27, 1995 during Tropical Storm Jerry. During the storm, the river rose to a flow of 5,400 cubic feet per second (cfs), flooding Cleveland Park and other areas in the Greenville vicinity. To put the flow from Tropical Strom Jerry in a more meaningful context, the mean flow for the month of July was 26.4 cfs and for the month of September the daily mean flow was 52 cfs. The annual mean flow for 1994 was 82.7 cfs and for 1995 it was 88.5 cfs. All of these data are from the United States Geological Survey gauging station near Mauldin Road in Greenville. Obviously a flow of 5,400 has a significant impact on the Reedy River given the river's average flow values.

Cleveland Park before...

Low flow events are as critical in the Reedy River as the flood flows. One statistic typically used as a measure of low flow is 7Q10. This figure is the lowest average flow over seven days during a period of ten years. The South Carolina Department of Health and Environmental Control (SCDHEC) uses this figure in considering flow allocations for wastewater permits. The 7Q10 value for the Reedy River at the gauging station at Mauldin Road is 16 cfs. During the recent drought cycles in South Carolina, the Reedy River has dropped below the 7Q10 flows for 49 days in 1999 and 63 days in 2000 as measured at the Mauldin Road station. Flow data for the Mauldin Road gauging station from 1941 to 2000 for the Reedy River are found in Appendix A.

... and during Tropical Storm Jerry in 1995 [Dave Hargett]

These flood and low flow cycles bring a variety of impacts to the Reedy River. Floodwaters carry polluted runoff, trash and other debris to the river. These flood events also destabilize steep, eroding riverbanks, causing sediment to enter the river. Low flow cycles impact the overall health of the aquatic system. Low flows also impact recreational opportunities and the overall aesthetic quality of the river.



It was the responsibility of the Storm Water Issue Committee to address these significant and complex issues.

Methodology

The Storm Water Issue Committee was chaired by George Fletcher of The Fletcher Group and included representatives from the private sector, Greenville and Laurens Counties, Soil and Water Conservation Districts, county and municipal government, utility interests in Greenville and Laurens counties, environmental organizations and other interested parties. The mission of the committee was to examine flow issues in the Reedy River Watershed, including storm water and low flow.

The committee met regularly from September 1999 through March 2000. The initial work of the committee was focused on defining the key dimensions of the storm water management and flow issues. Water quality was not a focus of this committee because two other issue committees were addressing that issue.

During its meetings, the Storm Water Issue Committee examined the work of the Greenville County Flood Mitigation Task Force, heard presentations on the hydrological characteristics of the Reedy River and reviewed available geographic information system databases and existing storm water management programs.

Based upon this information, the Storm Water Issue Committee agreed on the following recommendations.

Recommendations

After reviewing the issues that affect storm water, the issue committee developed and submitted the following recommendations to the Reedy River Task Force. All were subsequently approved for inclusion in this plan. Below each recommendation is the elaboration and brief implementation strategy provided by the Storm Water Issue Committee.

1. Fully implement the recommendations of the Greenville County Flood Mitigation Task Force (See Appendix B).
   a. Implementing the recommendations of the Flood Mitigation Task Force will provide a logical first step in implementing the long-range goals of the Reedy River Task Force.
   b. Appropriate ordinances and a flood mitigation management program should be adopted for Laurens County.
2. Combine all existing and proposed elements for storm water management into a Master Plan for the Reedy River. Studies for the Master Plan should include:
   a. Any studies on Total Daily Maximum Loads (TDMLs) for the river;
   b. Greenville County National Pollutant Discharge Elimination System (NPDES) Permit studies;
   c. Greenville County studies on Langston Creek;
   d. Federal Emergency Management Agency (FEMA) floodplain information; and
   e. Greenway Master Plan.
3. Adopt a 100-foot wide buffer on the Reedy River and all tributaries that drain 100 acres and more.
   a. Best Management Practices (BMPs) could be substituted for the buffer requirement, but in no case should the buffer be less than 35 feet in width.
   b. Existing uses should be grandfathered.
   c. Exceptions could be allowed after stringent review of proposed usage.
   d. Provide incentives for reforestation of floodplain.
4. Allow floodplains to be floodplains.
   a. Use any available funding sources to remove existing structures from floodplains.
   b. Building construction should be prohibited in the 100-year floodplain.
   c. In areas where the FEMA has not identified the 100-year floodplain, use soil data to determine the 100-year floodplain.
   d. Construction of roads, utilities or recreation facilities in the flood plain should be controlled through a permit process.
5. Provide additional storm water retention beyond that required by current ordinances.
   a. Design detention basins for at least the 25- year, 24-hour storm.
   b. Design storm water sewers for no more than the 10-year, 24-hour storm.
   c. Reduce impervious parking lots for malls and large shopping centers by 20 percent using Turf Pave™ or similar materials.

d. Improve inspection and maintenance of existing detention ponds.

6. Provide additional groundwater recharge opportunities in the design of storm water detention facilities.

   a. Provide incentives to develop possible locations for regional detention sites along the Reedy River.

   b. Provide incentives to develop underground storm retention areas that enhance re-infiltration of groundwater.

7. Conduct a study for base flow and peak flow issues in the Reedy River Watershed.

8. Develop appropriate Best Management Practices for the Reedy River basin.

   a. Develop BMPs as part of the Greenville County NPDES storm water permit.

   b. Adopt appropriate BMPs in all counties and municipalities in the watershed.

   c. Implement cross fencing, alternative watering systems and heavy use areas on all farms in the Reedy River Watershed raising livestock. This could be implemented by a cost share program or funded by Colonial Pipeline settlement.

   d. Provide design of, and incentives for, the restoration of stream banks and riparian areas.

9. Establish an integrated Reedy River Greenway Program.

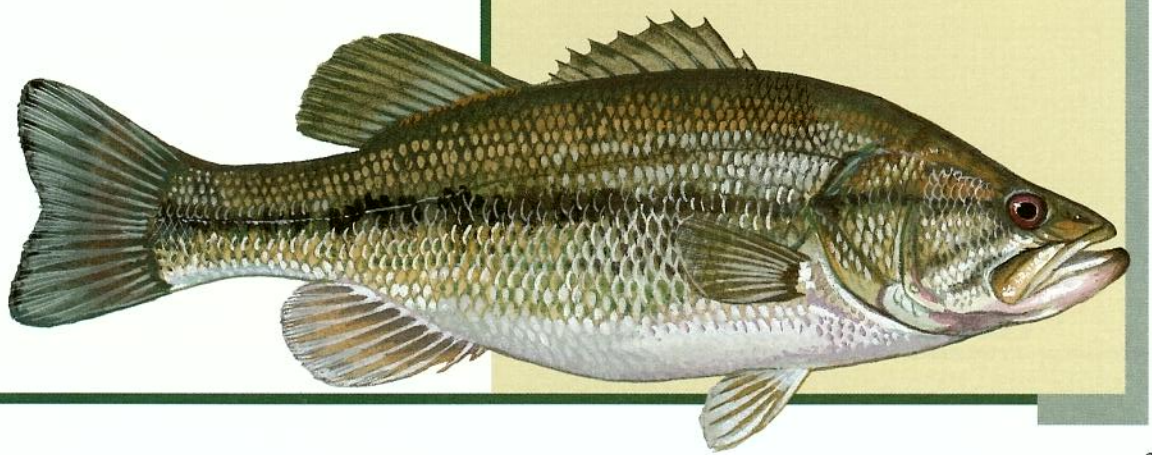
   a. Program should be funded by deed transfer tax.

   b. The Greenway should connect all municipalities and counties along the river.

      The first stage should connect Lake Conestee to Furman University.

Growing up along the Reedy River never truly gave me a full understanding of its value as a natural resource for the Upstate. It was an enlightening experience to be involved in the Reedy River Task Force. The entire process was filled with thought provoking discussions among a wide array of individuals. The meetings were open to all who were interested in participating. This provided for unique personal insights into the many functions of the watershed itself. Now is the time to fully embrace the recommendations of the Reedy River Task Force. The Reedy River Watershed is a regional resource. The task force is a regional collection of interested parties. The region must continue to work together to restore and preserve this valuable waterbody for the entire state.

Michelle Watson
Hydrogeologist
South Carolina Department of Health and Environmental Control

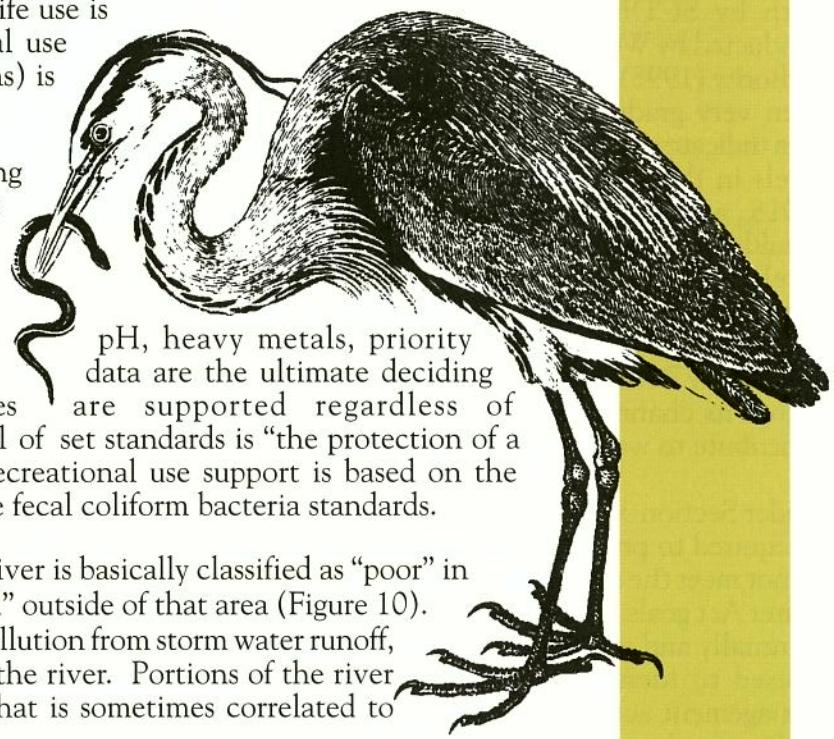


Water Quality

Photograph by Tom Blagden

The two basic sources of impacts to water quality within the Reedy River are point source pollution and nonpoint source (NPS) pollution. Point source pollution originates at a specific source, such as an industrial outfall or pipe. Currently, there are ten permitted point source dischargers within the Reedy River Watershed. Each of these facilities has a National Pollutant Discharge Elimination System (NPDES) permit that delineates the allowed levels for specific contaminants in the discharge from these facilities. All of the permitted facilities are located within the northern portion of the watershed (Figure 6 in the *Resources of the Reedy River* section of this report). Additionally, nonpoint sources also contribute to contaminant loading within the river. NPS contamination is generally introduced to a water body during a storm event and originates from a variety of activities that include agriculture, silviculture, construction, urban storm water runoff and residential wastes. Typical types of NPS contamination are pesticides, fertilizers, fecal coliform bacteria, grease, oil and sediment.

The South Carolina Department of Health and Environmental Control (SCDHEC) prepares a water quality assessment report for all rivers within the state. The most recent water quality assessment report for the Reedy River illustrates the condition of water quality within the Reedy River (SCDHEC, 1998). The Reedy is classified as "freshwaters" (FW). In order to determine how well this classification is being met, the river is investigated to determine whether it supports aquatic life and recreation. SCDHEC regularly collects and analyzes water samples from the Reedy River. There are a total of 18 monitoring sites located on the river. These stations are divided among primary, secondary, and basin monitoring sites and macroinvertebrate monitoring sites (Figure 6 in the *Resources of the Reedy River* section of this report). Four primary stations are located on the mainstem of the river with samples collected from these stations monthly throughout the year. Six secondary stations are located within the watershed. Samples are collected from these stations monthly from May through October, a period critical to aquatic life due to higher water temperatures and lower flows. Two basin stations are located on the mainstem of the river, with samples collected on a monthly basis during a basin's target year. Each basin within the state is targeted for additional sampling once every five years. Finally, six macroinvertebrate sampling stations are located within the watershed. Data collected from these sites is used to determine whether aquatic life use and recreational use are supported at each station. For the Reedy River, aquatic life use is supported at 9 of 16 stations and recreational use (based on fecal coliform bacteria concentrations) is supported at 5 of 13 stations.

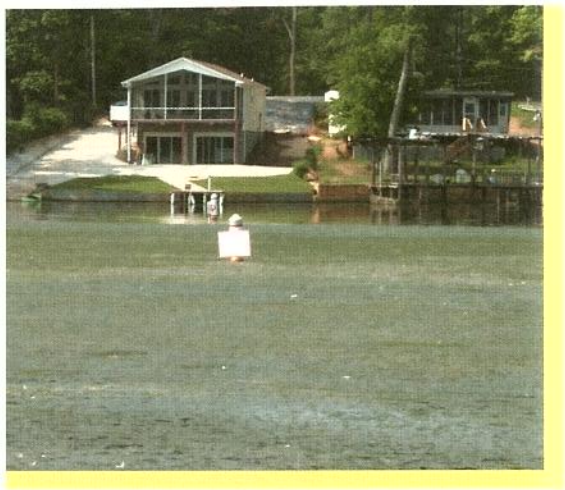


Aquatic life use support is assessed by comparing important water quality characteristics and the concentrations of potentially toxic pollutants with standards set by SCDHEC. Parameters that assist in determining whether aquatic life is supported include dissolved oxygen (DO), pH, heavy metals, priority pollutants, chlorine and ammonia. Biological data are the ultimate deciding factor used to determine whether aquatic life uses are supported regardless of chemical conditions because the ultimate goal of set standards is "the protection of a balanced indigenous aquatic community." Recreational use support is based on the frequency with which water samples exceed the fecal coliform bacteria standards.

In terms of supporting aquatic life, the Reedy River is basically classified as "poor" in the vicinity of the City of Greenville and "good" outside of that area (Figure 10). Metals, which tend to be associated with NPS pollution from storm water runoff, have been discovered in water samples within the river. Portions of the river also show a decreasing trend in pH, a trend that is sometimes correlated to atmospheric emissions.

In terms of recreational use, much of the Reedy River is classified as "poor;" however, the southern-most portion of the river (just above lake Greenwood) is classified as "fair" (Figure 11). Fecal coliform bacteria levels exceed SCDHEC's standards more than 25 percent of the time at all monitoring stations except those in Boyd Mill Pond and the Reedy portion of Lake Greenwood. Therefore, within the watershed, only Boyd Mill Pond and the Reedy portion of Lake Greenwood meet the "swimmable" standards. The frequency with which fecal coliform bacteria levels exceed the standards illustrates a noteworthy trend of an overall increase in fecal coliform bacteria levels within the Reedy River. Currently, the source of this contamination is unknown.

When overall use is considered for the Reedy River, the northern portion of the watershed is classified as "poor" and the southern portion of the river is classified as "fair" (Figure 12).



In recent years, portions of the Reedy River appear to have been adversely affectedby nutrification, which occurs when an excess of plant nutrients is added to the river. In terms of water quality, phosphorus and nitrogen are the nutrients that cause the most concern. Large concentrations of plants can reduce dissolved oxygen and cause fluctuations in pH, resultingin catastrophic fish kills in extreme cases. Although South Carolina currently has no official standards or criteria for nutrients in water, such standards may be included in revised SCDHEC regulations. However, the United States Environmental Protection Agency (USEPA) has issued recommendations for phosphorus concentrations to prevent over-enrichment of water bodies. SCDHEC does include phosphorus standards for applicable NPDES permits.

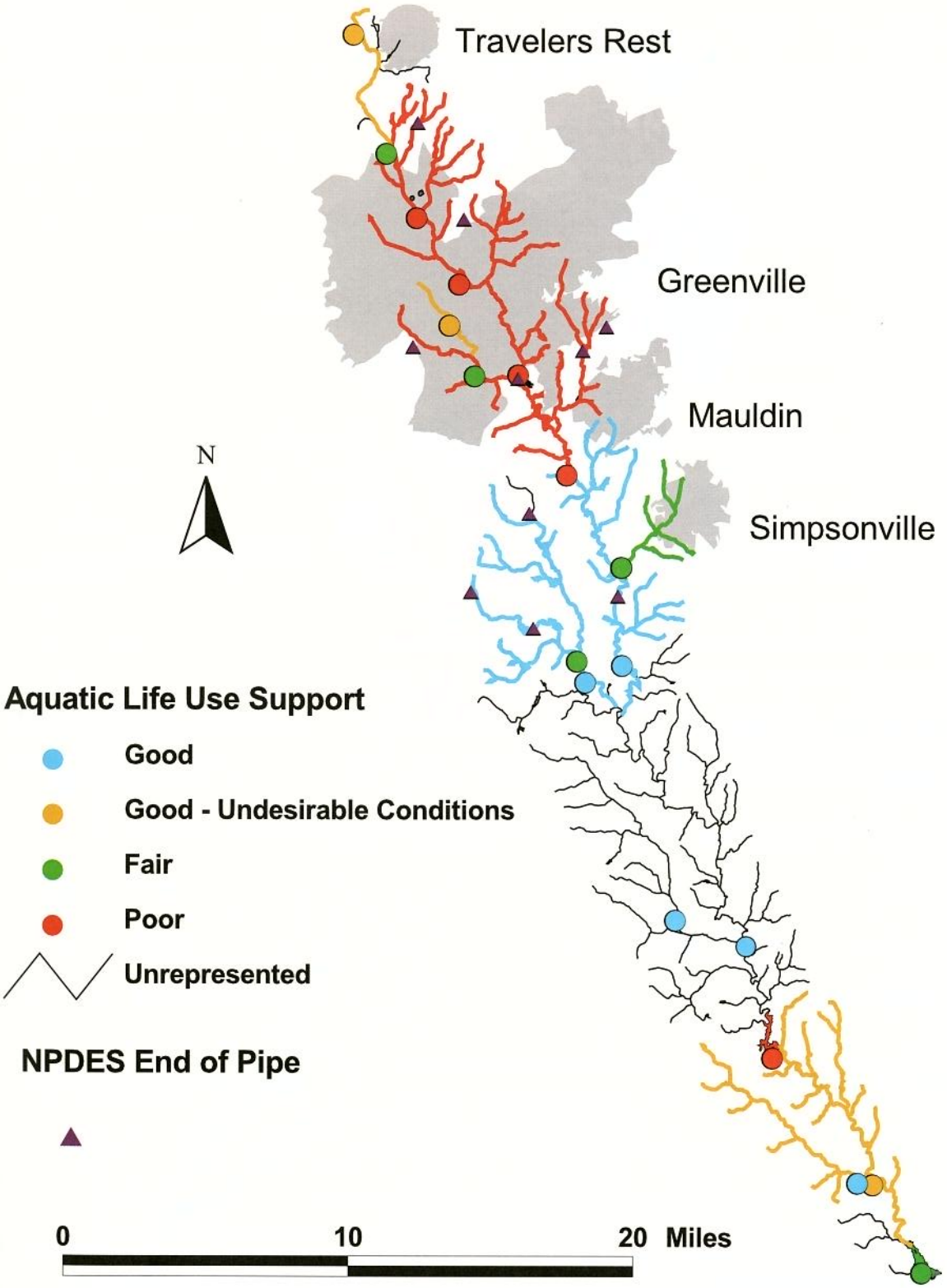
Lake Greenwood has recently been plagued by algal blooms that cover the water surface. These blooms result from excess nutrification

After phosphorus detergent was banned in 1992, statistically significant reductions in phosphorus occurred in much of the Reedy River. This trend of reduction in phosphorus has been discovered both by SCDHEC (1998) and in a study conducted by Western Carolina Regional Sewer authority (1998). However, these decreases have been very gradual. Additionally, monitoring data indicate a significant increase in phosphorus levels in the Reedy River at sampling station S-018, which is located south of the City of Mauldin and Lake Conestee. High phosphorus levels continue to be observed at the next two monitoring stations on the Reedy River, above Boyd Mill Pond.

The Reedy River is also adversely affected by a great deal of litter within its channel and along its banks. Some of this litter may contribute to water quality degradation.

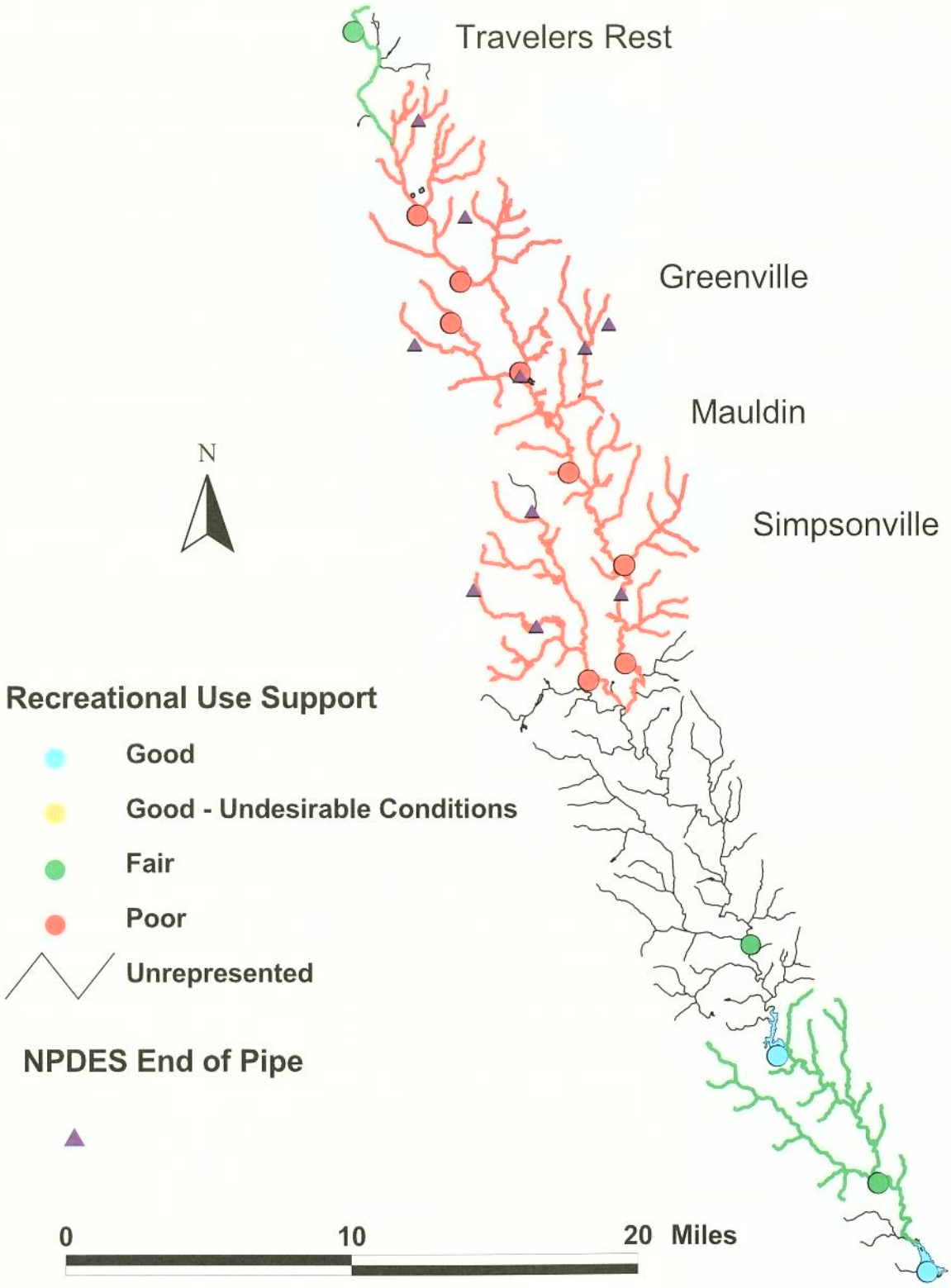
Under Section 303(d) of the Federal Clean Water Act, each state is required to provide a comprehensive inventory of waters that do not meet the state water quality standards or the Federal Clean Water Act goals. The list generated from this inventory is prepared biennially and is referred to as the "303(d) list." The 303(d) list is used to identify those waterbodies that need additional management actions. Water bodies are included on the 303(d) list by point locations (identified by the sampling station number); however, the impairment most likely extends for some distance upstream and/or downstream from the point location listed.

Figure 10: Aquatic Life Use Support 1993-1997



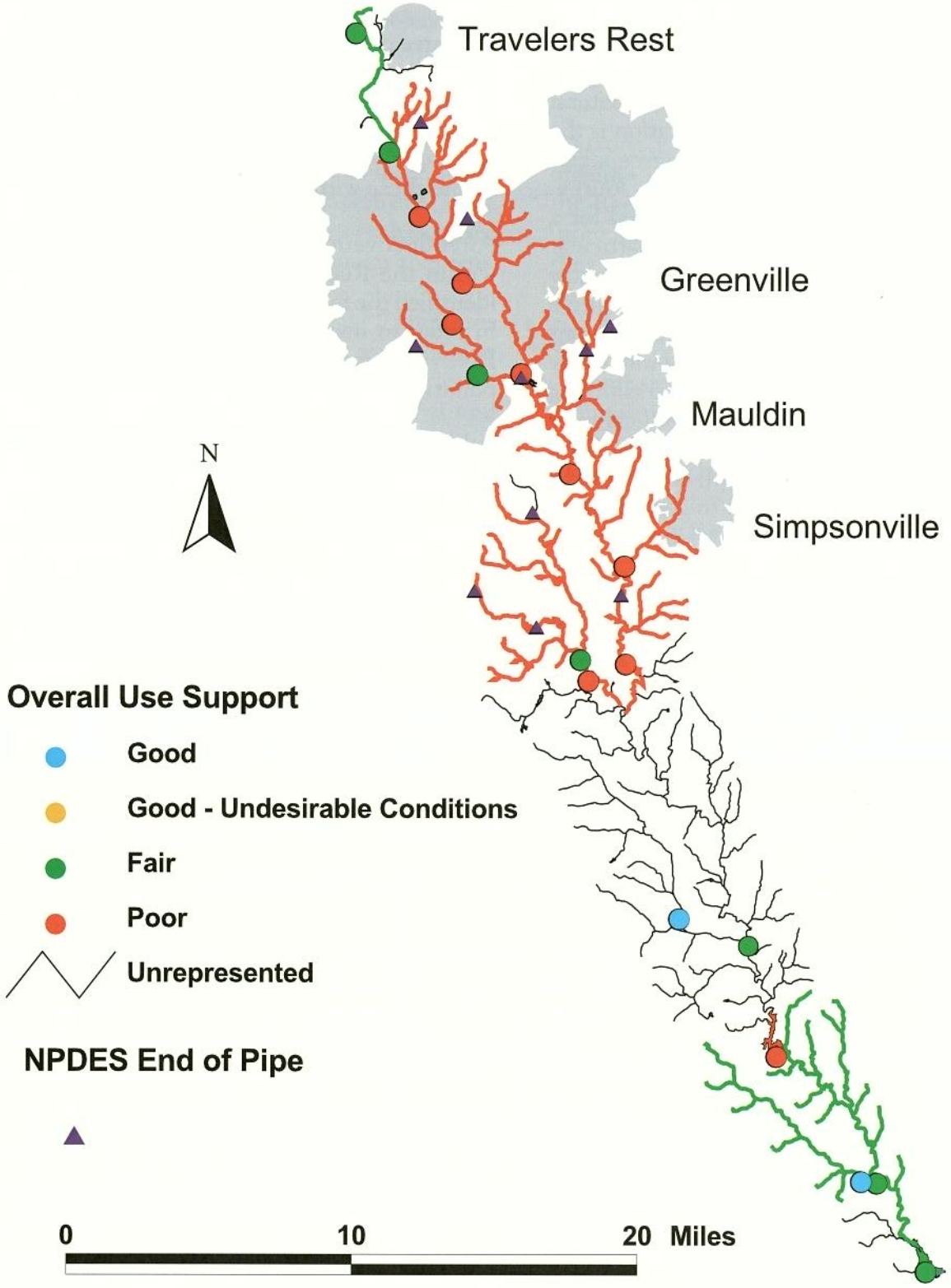
Prepared by the South Carolina Department of Health and Environmental Control, Bureau of Water, for the Reedy River Task Force

Figure 11: Recreational Use Support 1993-1997



Prepared by the South Carolina Department of Health and Environmental Control, Bureau of Water, for the Reedy River Task Force

Figure 12: Overall Use Support 1993-1997



Prepared by the South Carolina Department of Health and Environmental Control, Bureau of Water, for the Reedy River Task Force

SCDHEC must develop a Total Maximum Daily Load (TMDL) for each specific contaminant exceeded within a specific waterbody identified on the 303(d) list. A TMDL represents the maximum pollutant load allowed for a specific waterbody so that water quality standards can be maintained. Further, a TMDL is made up of two main components, a load allocation and a waste allocation. A load allocation is the portion of the receiving water's loading capacity attributed to existing or future NPS contamination or to natural background sources. The waste load allocation is the portion of the receiving water's loading capacity allocated to an existing or future point source. Although TMDLs were historically developed for a particular portion of a watershed or for a particular point source, broad watershed-based TMDLs are now being developed to address the combined cumulative impacts of all sources. For example, if concentrations of fecal coliform bacteria have resulted in a waterbody being placed on the 303(d) list at one or two sampling locations, a TMDL will be developed specifically for fecal coliform bacteria for the entire waterbody. Each point source within that waterbody will be allocated a specific waste load that it is allowed to contribute to the waterbody through its effluent.

There are nine monitoring stations within the Reedy River Watershed that are on the Section 303(d) list for 2000 (Table 4). Each station listed on the 303(d) is identified by its monitoring site number (refer to Figure 6 in the *Resources of the Reedy River* section of this report for the location of these stations). Additionally, the county in which the station is located, the impaired use (recreational or aquatic life supporting), the cause for listing and its priority for development of a TMDL are also presented in Table 4. Three of the stations on the 303(d) list within the Reedy River Watershed are listed for more than one cause. Priorities for development of TMDLs are identified numerically as "1," "2," or "3." Those stations with a priority of "1" will have TMDLs developed before those with a priority of "3."

After discovering the existing condition and impacts within the Reedy River Watershed, the committee identified the following issues that should be addressed in order to improve water quality within the Reedy River while arresting degradation of the river due to pollution, storm water flow and sediment input:

- Collection and consolidation of information
- Public education
- Identification of river flow regime
- Identification of potential for catastrophic releases
- Reduction in contaminant loading/development of TMDLs
- Elimination of trash

Table 4: Reedy River Monitoring Stations on 303(d) List for 2000

Station Number	County	Impaired Use	Cause	Priority
S-013	Greenville	Recreation	Fecal Coliform Bacteria	2
S-013	Greenville	Aquatic Life	Chromium	3
S-013	Greenville	Aquatic Life	Copper	3
S-018	Greenville	Recreation	Fecal Coliform Bacteria	1
S-018	Greenville	Aquatic Life	Chromium	2
S-018	Greenville	Aquatic Life	Zinc	2
S-021	Laurens	Recreation	Fecal Coliform Bacteria	2
S-070	Laurens	Recreation	Fecal Coliform Bacteria	3
S-072	Greenville	Recreation	Fecal Coliform Bacteria	1
S-073	Greenville	Recreation	Fecal Coliform Bacteria	3
S-319	Greenville	Recreation	Fecal Coliform Bacteria	1
S-319	Greenville	Aquatic Life	Zinc	1
S-178	Greenville	Aquatic Life	Macroinvertebrates	3
S-868	Greenville	Aquatic Life	Macroinvertebrates	3

Methodology

Improving water quality was identified as a key issue in the management and restoration of the Reedy River. The Water Quality Issue Committee was chaired by Bob Harley of Bowater Inc. and included fifteen other members representing state agencies, environmental groups, landowners, universities and industries. The committee met on a regular basis from August 1999 through July 2000. Several concerns of this committee overlapped with those of the Storm Water and Aquatic Health and Riparian Zone Management Issue Committees. Therefore, joint meetings of these three issue committees were held to discuss similar concerns.

The mission of the Water Quality Issue Committee was to determine how best to improve water quality within the Reedy River while arresting degradation of the river due to pollution, storm water flow and sediment input. The committee began by researching the existing impacts to and the current condition of water quality within the Reedy River. In order to conduct this research, the committee reviewed available water quality monitoring data from SCDHEC, flow data from the United States Geological Survey (USGS), land use maps of the watershed and other data and information from a variety of sources. Further, the committee used the experience of its members and other knowledgeable people to determine impacts.

Information Collection Consolidation

As the committee researched the current condition of water quality, the members realized that existing data, collected by a variety of entities, was stored in several different locations and was not easily accessible. Additionally, more data may need to be collected to adequately characterize water quality in the river. SCDHEC has collected water quality information for the parameters they use to classify waters of this state. However, there is very little information concerning sedimentation rates within the river. Also, monitoring stations within the watershed are limited in number. USGS has flow data from three stations within the river that can assist in determining how contamination is transported within the system. Because the detrimental effects of both flow and water chemistry can be additive, it would also be beneficial to be able to correlate this data to better determine the potential impact to water quality.

Once data is consolidated, it will be easier to investigate the overall water quality of the river. In the event that additional data is necessary, it can be collected. The data collected and consolidated can then be used to develop a comprehensive water quality model that could serve as a foundation for water quality management throughout the basin.

Public Education

Currently, both governmental and private organizations are working to educate the people within the Reedy River Watershed about the importance of protecting water quality and the river around which they make their homes. Governmental agencies with public outreach programs of this nature include SCDHEC, SCDNR, Natural Resource Conservation Service (NRCS), South Carolina Forestry Commission, South Carolina Department of Parks, Recreation and Tourism and the Soil and Water Conservation Districts for Greenville, Laurens and Greenwood Counties. Two local organizations that do a great deal of outreach in the watershed are Friends of the Reedy River (FoRR) and Upstate Forever.

Flow Regime

During their investigation, committee members attempted to determine whether the flow regime of the Reedy River had changed drastically within the last century due to changes in land use. It is well documented that flows within the river can change drastically during a storm event, resulting in very large peak flows. However, the committee was unable to determine whether base flow in the watershed has been altered due to increased development in the northern portion of the watershed. To assist in reducing water quality impacts, the flow regime within the river, ways to moderate peak flows, and ways to increase base flow should be investigated.

Catastrophic Releases

The 1996 diesel fuel spill in the Reedy River is an example of a catastrophic release. Such releases are generally accidental; however, these accidents can often be prevented. Currently, a list of all sources that may potentially result in a catastrophic release is not available. To better protect the river from such an event, it would be beneficial to identify all areas that have the potential to release contamination to the

river. Once identified, mitigation plans could be developed to reduce impacts in the event that a release were to occur in the future.

Contaminant Loading

Contaminants that enter the river can originate from a variety of sources. Those contaminants from point sources are generally well characterized through programs within SCDHEC. However, contaminants that are not monitored by SCDHEC and contaminants that originate from nonpoint sources are not characterized as thoroughly. It is important that all sources and types of contamination affecting the Reedy River be identified. Once this information is available, water quality management programs can be better implemented. This information can also be very beneficial during development of TMDLs for the Reedy River Watershed.

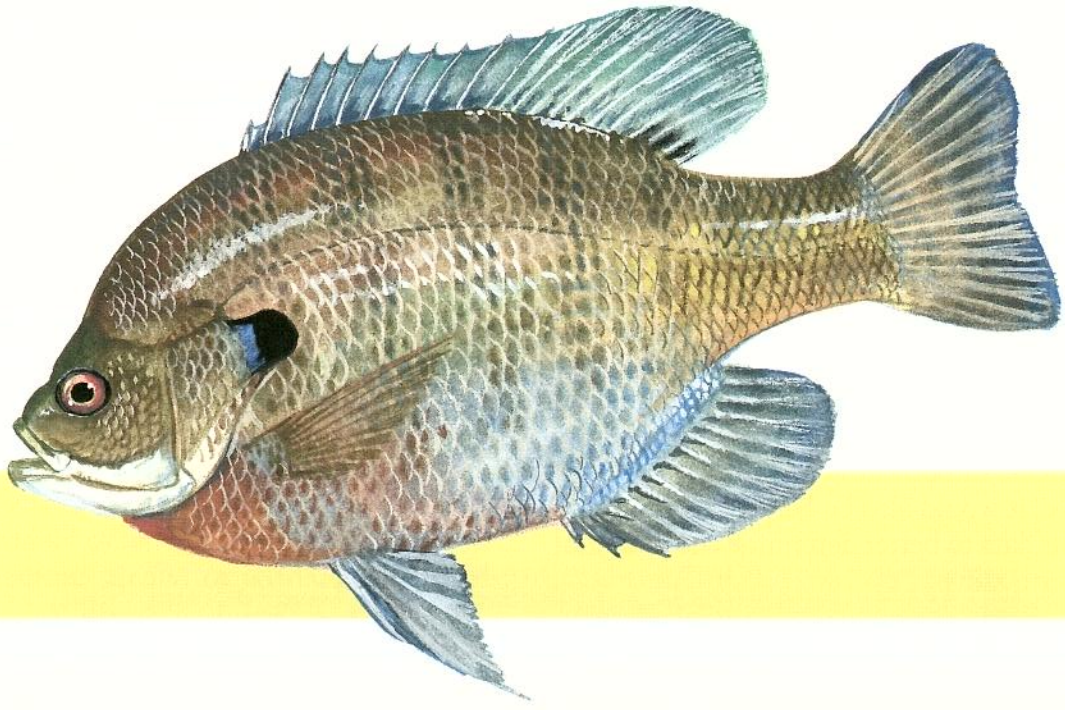
Trash Elimination

The beauty of the Reedy River is frequently marred by the amount of trash in the river and lining its banks. Although several groups are currently involved in organizing river cleanup days, more needs to be done to remove the existing trash and to reduce/eliminate the potential for future trash in the river.

Recommendations

After reviewing the issues that affect water quality, the issue committee developed and submitted the following recommendations to the Reedy River Task Force. All were subsequently approved for inclusion in this plan.

1. Build and maintain a comprehensive water quality model, including data for water chemistry, flow, sediment loading and aquatic habitats for the Reedy River basin that will serve as a foundation for water quality management throughout the basin. As part of development of the model, the following should be accomplished:
   a. Develop an easily accessible comprehensive database of all on-going studies and existing data addressing water quality issues.
   b. Identify water quality data gaps and develop solutions to address these gaps, including volunteer and cooperative monitoring programs.
2. Accelerate a nonpoint source educational program similar to the one currently in place in the Neuse River Basin, North Carolina.
3. Improve the flow regime of the Reedy River by increasing base flow and moderating peak flows.
4. Identify risks and mitigation strategies to prevent impairment to Reedy River water quality from catastrophic releases.
5. Reduce nutrient and contaminant loading into the Reedy River from both point and nonpoint sources. Cooperate with SCDHEC in the development and implementation of TMDLs within the Reedy River basin.
6. Develop an accelerated program to reduce and eliminate trash in and along the Reedy through an aggressive educational campaign and a program of coordinated cleanups utilizing supervised work forces during suitable conditions and times of year. Enforce existing litter laws.

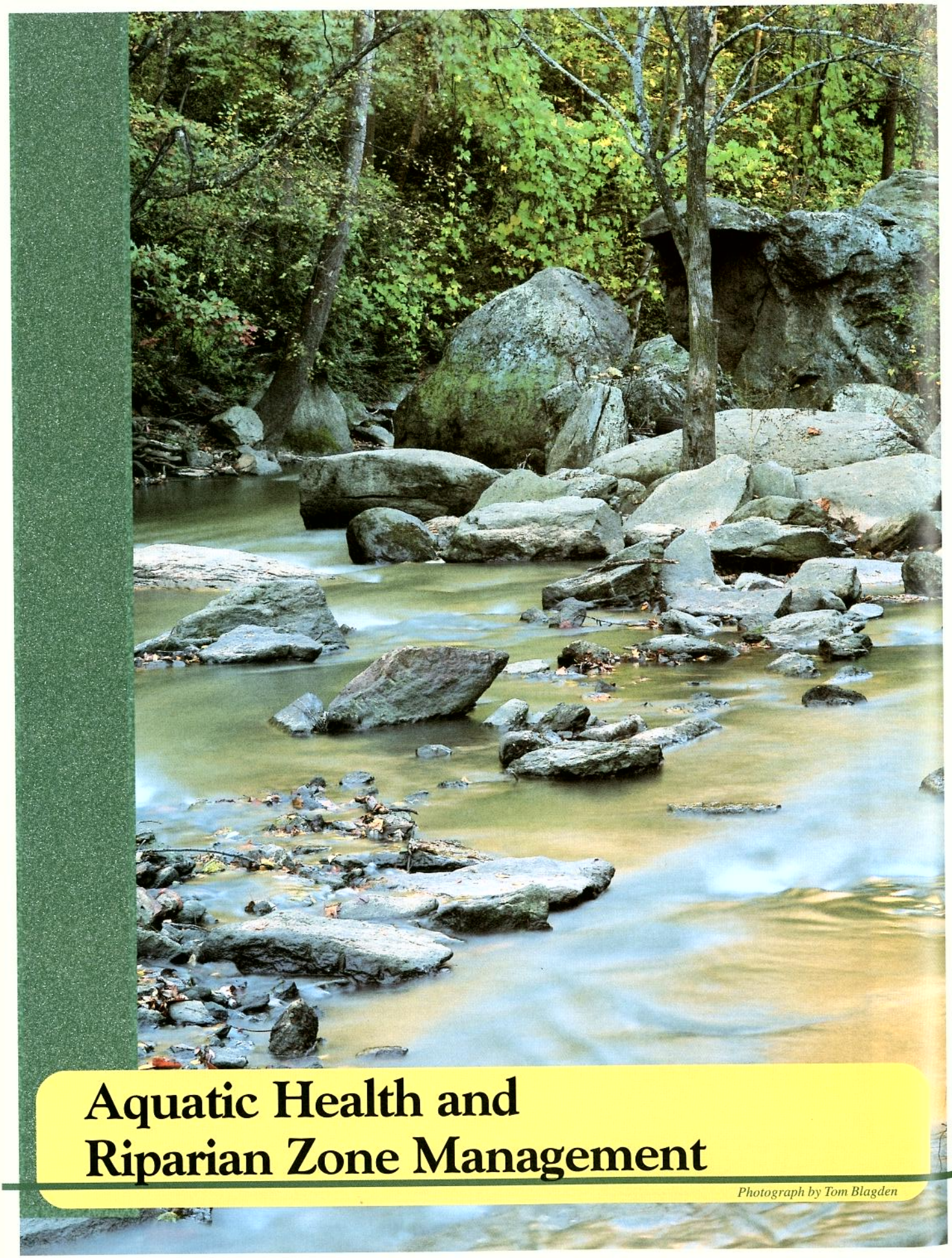


I have crossed, canoed and waded in many rivers. I have seen the powerful, the famous, the fast and the revered. But these rivers that have elicited awe and joy and sometimes a rush of fear have never cut a course through my heart like the Reedy.

This worn out farm that borders the Reedy has been in my family for generations. Sentimentality about the land and river would probably have been met with derision by my grandfather and great-uncles who remembered the intense labor and mind-numbing drudgery of farming. My parents too had a practical and unsentimental attitude about the farm and the river that defined one border. In the 1950s the river was ugly and polluted and stunk. Yet that was when I fell in love with the Reedy. It happened when I was in the bottom field with my father as he talked with men who were operating a sawmill. It was as if a portal to the past opened and I saw the river and surrounding land as it was before the white man came.

Almost half a century later, due to the tragic diesel spill that occurred in 1996, the Reedy River gained public attention. For months, I attended Reedy River Task Force meetings and listened as people spoke with knowledge and authority about the negative impact man has had on the river. And I listened as proposals were made to reverse the damage or to profit in some way. Through the many hours of discussion, I gained a broader perspective of the Reedy and insight into the complexities of a river that is both urban and rural. But the most important thing I learned was that others care about the river, too. With the help of others, my husband and I envision our old farm as a haven for wildlife, protected in perpetuity from development. We envision access areas to the river so that others can experience the joy of canoeing the Reedy and discovering its rapids. We cannot stop the spread of development but we can preserve a natural space along the Reedy River. Decades from now, this spot of green will remain.

Freda Alverson
Reedy River Landowner



Aquatic Health and Riparian Zone Management

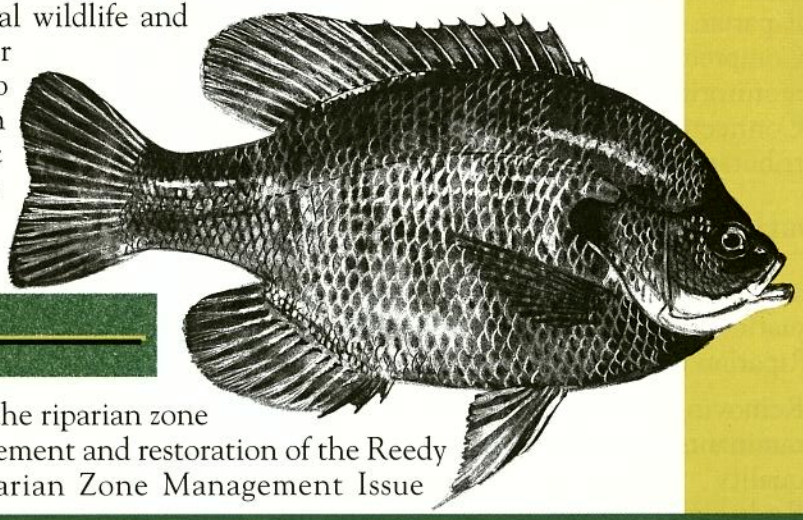
Photograph by Tom Blagden

The current condition of and impacts to aquatic health and riparian zones vary in different portions of the watershed. Many factors affect aquatic and riparian zone health including storm water runoff, point and nonpoint source discharges, trash and dams.

In northern Greenville County, storm water has adversely affected both aquatic health and the condition of the riparian zone. Increased storm water runoff has increased the magnitude of peak flows within the Reedy River. These flows scour the streambed, resulting in loss of aquatic habitat, bank erosion and increased sediment loading in the river. Increased sedimentation results in further loss of aquatic habitat and can also result in injury to or loss of aquatic life when fine sediments adhere to gills of aquatic organisms and respiration is impaired. Sediment trapped behind impoundments increases channel downcutting and bank erosion downstream of the dam, resulting in degradation of in-stream and riparian habitats. Decreasing water quality, through increased nonpoint source contaminants, continued point source discharges and increased nutrient loading within the river, has further degraded aquatic health. The amount of trash in the river can also impact water quality. The riparian zone has been cleared and developed throughout much of the northern portion of the river. Once altered in this fashion, the riparian zone is no longer effective in trapping sediments or absorbing pollutants from storm water runoff, nor can it support terrestrial wildlife. Further, when stream shading is lost in degraded riparian zones, water temperatures increase; this temperature increase can result in habitat losses for fish and other aquatic species. Dams within the watershed act as barriers to movements of fish and other aquatic life. When barriers are present in a stream channel, the ability of aquatic organisms to recolonize impacted areas, such as those affected during the 1996 diesel fuel spill, is reduced or eliminated.

In southern Greenville County and Laurens County, storm water flows to the Reedy are not as drastic as those in the northern section of the river; however, some impacts from sedimentation are evident. High flows originating upstream have resulted in down-cutting (a reduction in streambed elevation) which results in steep cutbanks. As in the northern section of the river, water quality has decreased due to nonpoint source contaminants, increased fecal coliform bacteria levels, increased nutrient loading, and trash in the river. Although there are no point source discharges in this portion of the river, flows from upstream continue to adversely affect this area of the Reedy. Further, aquatic life has still not fully recovered from the 1996 diesel fuel spill. The riparian zone in the southern portion of the river is more intact than in the river's northern section; however, the impacts described above will occur in the event the existing riparian zone is destroyed. Dams in the southern section of the river also act as barriers to aquatic life.

The health of both aquatic and terrestrial wildlife and plant communities within the Reedy River Watershed is not fully understood due to the lack of comprehensive population studies. However, existing data for aquatic macroinvertebrate and fish communities indicate that the aquatic health of the Reedy River is impacted.



Methodology

Protecting aquatic health and managing the riparian zone were identified as key issues in the management and restoration of the Reedy River. The Aquatic Health and Riparian Zone Management Issue

Committee was chaired by Dr. Robert Hudson of Presbyterian College and included ten other members representing state agencies, environmental groups, landowners and industry. The committee met on a regular basis from August 1999 through February 2000. Several concerns of this committee overlapped with those of the Storm Water and Water Quality Issue Committees. Therefore, joint meetings of these three issue committees were held to discuss similar concerns.

The mission of this committee was to determine how best to protect and restore aquatic health within the Reedy River as well as appropriate protection of existing riparian zones and restoration of denuded riparian zones within the watershed. The committee began by researching the existing impacts to and the current condition of aquatic health and riparian zones. In order to conduct this research, the committee reviewed 1994 aerial photographs, land use maps, buffer overlays on land use maps and maps of critical habitats. The committee also utilized current scientific literature and the experience of committee members and other knowledgeable people.

After discovering the existing condition of and impacts to the riparian zone and aquatic habitats within the Reedy River Watershed, the committee developed the following goal:

> ***Improve riparian and aquatic habitat in the ReedyRiver Watershed so that all waters "fully support" a balanced and indigenous population of flora and fauna as measured by acceptable biological protocols.***

Using this goal, the committee identified the following issues that should be addressed for protection and restoration of aquatic health and protection of existing riparian zones and restoration of altered riparian zones:

- Riparian buffers
- Comprehensive biological inventories/ monitoring
- Connectivity between the Reedy River, its tributaries and its floodplain

Riparian Buffers

Without an intact riparian buffer zone, the health of both aquatic and terrestrial organisms will begin to suffer. Riparian buffers benefit watersheds by:

- Removing sediment, nutrients and other contaminants from runoff, thereby improving water quality
- Reducing erosion of the streambank by reducing surface water flow velocity
- Stabilizing the streambank
- Providing habitat for aquatic wildlife through increased large woody debris in the stream channel
- Providing habitat for terrestrial wildlife
- Providing an energy source for the aquatic system through increased vegetative and wood debris
- Enhancing aesthetics
- Promoting recreational uses within the watershed such as picnicking, hiking and canoeing
- Preserving the integrity of historical and cultural sites
- Providing flood zone management by setting development back from the immediate banks of the stream

Extensive research has been conducted to determine what types of riparian buffers will protect rivers and their associated biota. The width and type of cover used for the buffer will determine its ability to trap sediment and other contaminants before they get into the stream, as well as the ability of the buffer to provide appropriate habitat for both aquatic and terrestrial life. Existing data demonstrate that buffers less than 100 feet in width can be effective in removing some sediment and improving some aspects of water quality, but may not protect overall aquatic health (Wenger, 1999). For example, buffers of 100 feet or greater are desired to adequately protect streams from the impacts associated with increases in nutrients such as phosphorus and nitrogen. A conceptual drawing of an appropriate buffer for the Reedy River is illustrated in Figure 13. Figure 14 and Table 5 illustrate the amount of land that would be required within Greenville and Laurens Counties to implement a buffer of 100 feet in the Reedy River Watershed. To more clearly illustrate the amount and type of land that would be required for a 100-foot riparian buffer, this information was determined for each of the 13 subwatersheds of the Reedy River. Figures delineating land use and acreages are presented in Appendix C.

Although all riparian buffers will offer some benefit to terrestrial wildlife, research has determined that maximum benefit to these organisms will be realized with buffers of greater than 300 feet (Wenger, 1999). This wider buffer is necessary to provide terrestrial wildlife with habitat for breeding, appropriate feeding grounds and migratory corridors.

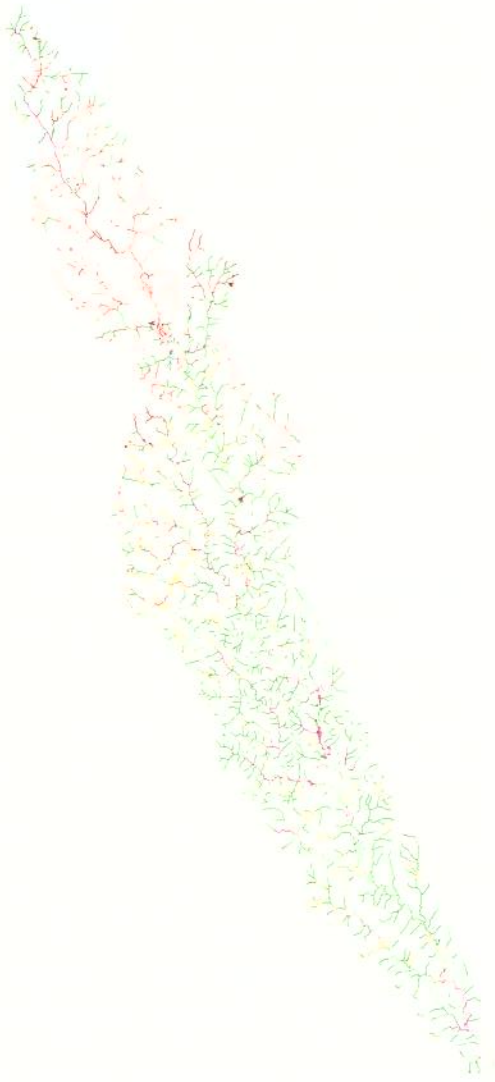
The vegetated cover present within the riparian zone is also important when determining the type of protection the buffer will allow. Grass strips have been

Figure 13: Conceptual Illustration of a Riparian Buffer

Figure 14: National Wetlands Inventory (NWI) Land Use/Land Cover 100' Buffer

Acreages of Land Cover / Land Use within 100' Hydrology Buffer

Description	Acres	Percent LU/LC
Agriculture	1647.31	9.35
Barren Land	29.99	0.17
Forest - Deciduous	2189.35	12.43
Forest - Evergreen	4886.42	27.75
Forest - Mixed	3349.02	19.02
Forested Wetland	1185.70	6.73
Marsh	105.40	0.60
Other Urban	542.19	3.08
Shrub/Scrub Wetland	205.54	1.17
Urban - Commercial/Industrial	764.87	4.34



100' Hydrology Buffer
Land Use / Land Cover *
Water
Marsh
Forested Wetland
Shrub/Scub Wetland
Residential
Commercial / Industrial
Other Urban
Agriculture
Forest - Deciduous
Forest - Evergreen
Forest - Mixed
Barren Land

2 0 2 4 6 8 Miles

* Source: U.S. Fish and Wildlife Service / National Wetland Inventory (1994)

Table 5: Land Area Affected by 100' Buffer Recommendation

Land Use Description	Acres Within the100' Buffer	% of Watershed Area	% of Total Greenville County Area	% of Total Laurens CountyArea
Agriculture	1,647.31	0.98	0.32	0.36
Barren Land	29.99	0.02	0.01	0.01
Forest - Deciduous	2,189.35	1.30	0.43	0.47
Forest - Evergreen	4,886.42	2.90	0.96	1.06
Forest - Mixed	3,349.02	1.99	0.66	0.72
Forested Wetland	1,185.70	0.70	0.23	0.26
Marsh	105.40	0.06	0.02	0.02
* Other Urban	542.19	0.32	0.11	0.12
Shrub/Scrub Wetland	205.54	0.12	0.04	0.04
* Urban - Commercial/Industrial	764.87	0.45	0.15	0.17
* Urban - Residential	2,705.10	1.61	0.53	0.58
TOTALS	17,610.89	10.45	3.46	3.81
Totals Minus Grandfathered Uses	1,598.73	8.27	2.74	3.02

* Uses typically grandfathered (would not be required to install 100' buffers)

Note: Acreage figures for this table were taken from the National Wetlands Inventory map. For the purpose of this table, total acreage within the Reedy River Watershed is 168,217 acres. This figure is different than the one used as the accepted acreage for the watershed.

shown to be effective in sediment and nutrient removal from runoff; however, forested buffers of native vegetation are necessary to protect the health of aquatic organisms (Wenger, 1999). Stream shading and debris/energy input from these forested areas are critical for survival of some aquatic species.

In developing a recommendation for riparian buffer zones within the Reedy River Watershed, the committee acknowledged that it is not feasible to create 100-foot buffers in some portions of the watershed, such as those areas that are currently developed. However, because storm water runoff and nonpoint source contamination enters the river from these areas, urban/developed portions of the watershed should consider retrofitting development with devices that would act like buffers. These devices include rain gardens, bio-retention basins and storm water collection systems.

Biological Monitoring/Inventories

Although it is generally accepted that both terrestrial and aquatic plant and animal communities are degraded within the Reedy River Watershed, comprehensive data illustrating this phenomenon are not available for most of the watershed. Studies within the Reedy watershed have generally been conducted in response to specific problems, such as the 1996 diesel fuel spill or the degrading water quality in the river. Without knowledge of existing plants and animals in the watershed, it will not be possible to adequately guide restoration of the system. Additionally, collection of physico-chemical parameters in conjunction with biological monitoring/inventories of aquatic communities is important. The types of organisms (both plant and animal) present within a stream are often dependent upon specific physico-chemical parameters. Understanding the chemistry and physical conditions of the river will assist in understanding the types of biological communities within the river and the impacts to those communities.

Four rare, threatened, and/or endangered plant species are known to be located within the upper portion of the Reedy River Watershed. The four plants are:

- Piedmont ragwort *(Senecio millefolium)*
- White goldenrod *(Solidago bicolor)*
- Bunched arrowhead *(Sagittaria fascicula)*
- Sweet pinesap *(Monotropsis odorata)*

General locations of these communities are illustrated in Figure 15. Comprehensive population studies have not been conducted for all plants and animals within the watershed and it is impossible to be certain that these are the only four special status species in the vicinity of the Reedy River. In order to ensure that all special status species are protected, it is necessary to determine which exist in the watershed so that restoration efforts can be conducted most effectively.

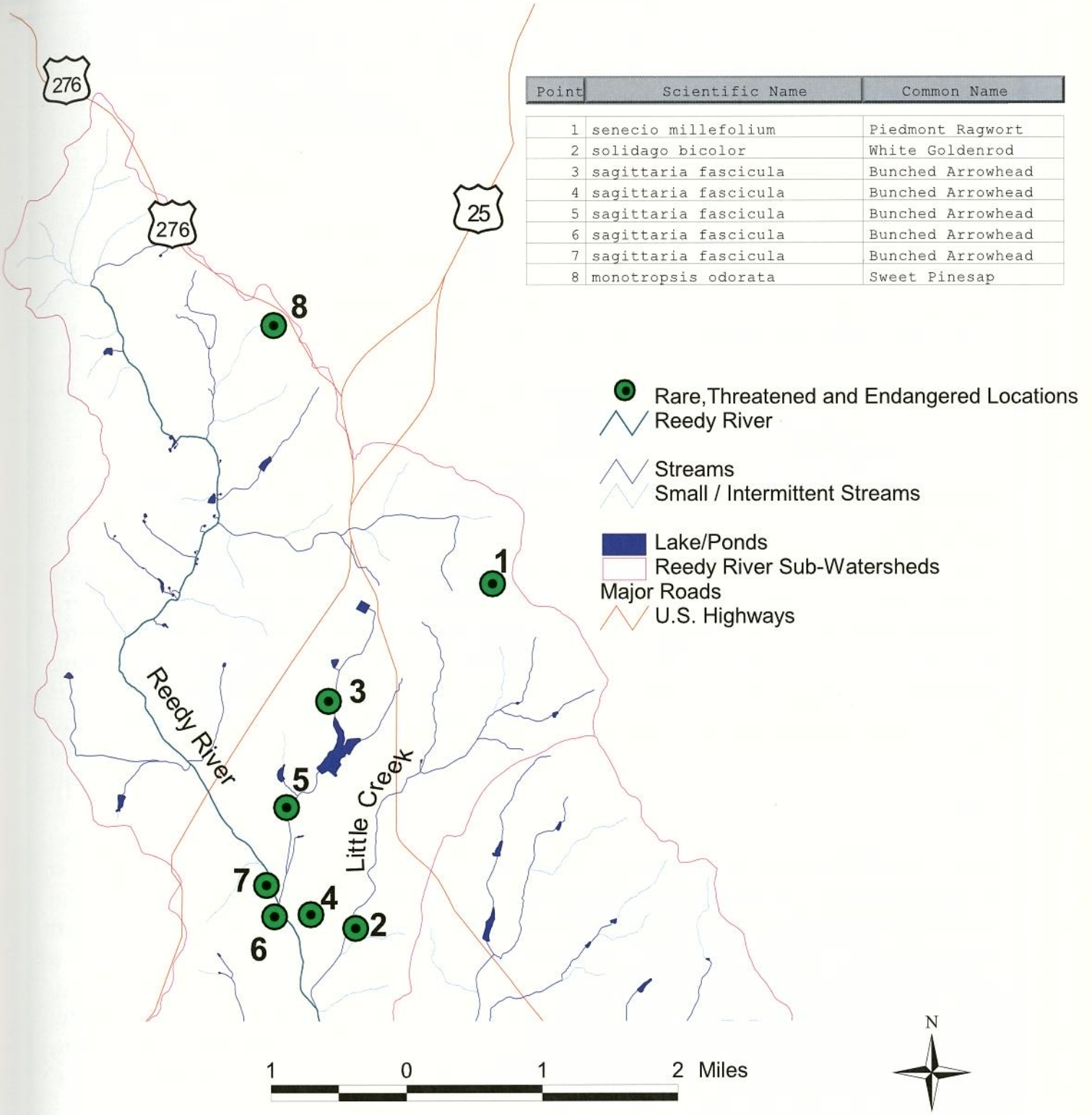
River Connectivity

Several dams currently exist within the Reedy River Watershed. Dams and their resulting impoundments are constructed for various reasons including water storage for water supplies (municipal, industrial agricultural), power generation, flood control, recreation and aesthetic values. Impoundments can also provide important habitat for a wide variety of aquatic, terrestrial and avian species. The utilization of impoundments by waterfowl and wading birds is well documented. Properly constructed and managed impoundments can maximize production of certain fish species and provide recreational fishery benefits.

Impoundments can also negatively impact natural resources, especially streams and those organisms dependent on stream habitats. The physical presence of dams often blocks the movement of aquatic organisms, such as fish, insects, mollusks and other species. Stream fish communities can be significantly impacted and sometimes displaced by impoundment construction. Impoundments also block the downstream transport of energy and nutrients, which normally move from headwater tributaries to larger streams. Dams result in warmer stream water temperatures in the summer and colder stream water temperatures during the winter due to broad, shallow

Asiatic clams in the Reedy River

Figure 15: Rare, Threatened, and Endangered Species



Point	Scientific Name	Common Name
1	senecio millefolium	Piedmont Ragwort
2	solidago bicolor	White Goldenrod
3	sagittaria fascicula	Bunched Arrowhead
4	sagittaria fascicula	Bunched Arrowhead
5	sagittaria fascicula	Bunched Arrowhead
6	sagittaria fascicula	Bunched Arrowhead
7	sagittaria fascicula	Bunched Arrowhead
8	monotropsis odorata	Sweet Pinesap

Greenville's Reedy River - How far we have come in 30 years.....

The 30th anniversary of Earth Day this year gave reason to reflect on how Greenville has changed over those 30 years. Like most towns, Greenville in 1970 was blissfully unaware of its impacts to the environment. Still dependent on the ways of a dated textile industry, environmental quality was far from the focus of community leaders.

The first Earth Day in 1970 brought an epiphany of awareness of our abuse of the environment to millions of Americans. For many communities, to include Greenville, the wake-up call took several more years to have effect.

The Greenville Piedmont warned in August 1980:

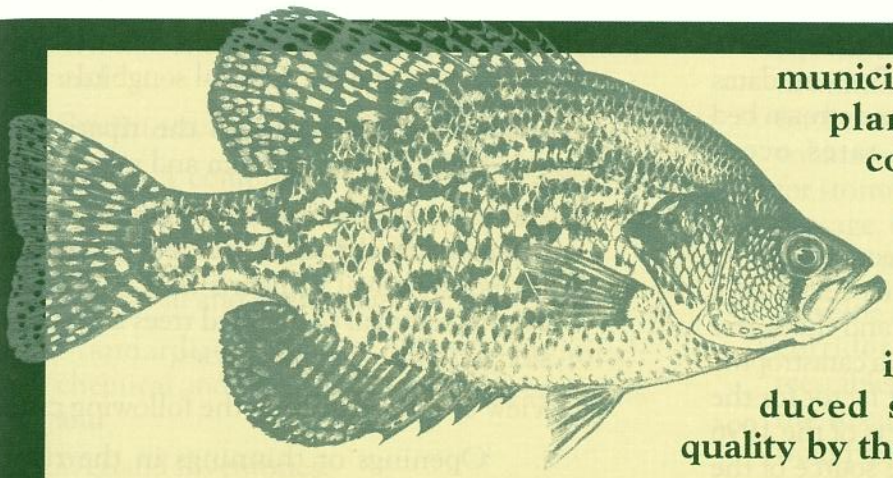
"Don't drink the water. Don't swim in the water. Don't fish in the water. Don't even look at the water. You won't like what you see. It's the Reedy River."

The warning was literal, and Greenvillians heeded it. The Reedy was indeed nasty.

Industrial polluters upstream of Greenville dumped one-and-a-half million gallons of dye-laden wastewater per day to the tiny Reedy at that time. The results were extreme discoloration, sudsing, and putrid odors, all abundantly evident along the river in Greenville, and downstream into Laurens County. The prevailing attitude toward pollution control during that era was basically, 'it's alright to put it in the river because no one cares.' And few did. Still, industrial practices of the 1970's were an enormous improvement over those of the late 1800's, when wastes from Greenville's bleacheries, slaughterhouses, tanneries, and foundries were all dumped directly into the Reedy along with sanitary wastes.

The consciousness brought by that first Earth Day resulted in the most comprehensive environmental legislation in our nation's history, including the federal Clean Water Act of 1972. For those inclined to believe that government regulation is a 'bad' thing, the effectiveness of the Clean Water Act provides a powerful lesson. Where there had been no economic incentive for polluters to clean up their acts, this law was successful in inducing significant changes. The Clean Water Act provided enforcement agencies with the tools they needed to eliminate many of the worst pollution sources and to measurably improve others.

Under this framework, the pollution faucet upstream of Greenville was finally cut off in 1983. Water quality improved immediately. The environmental awakening of this era also resulted in federally funded upgrades to hundreds of



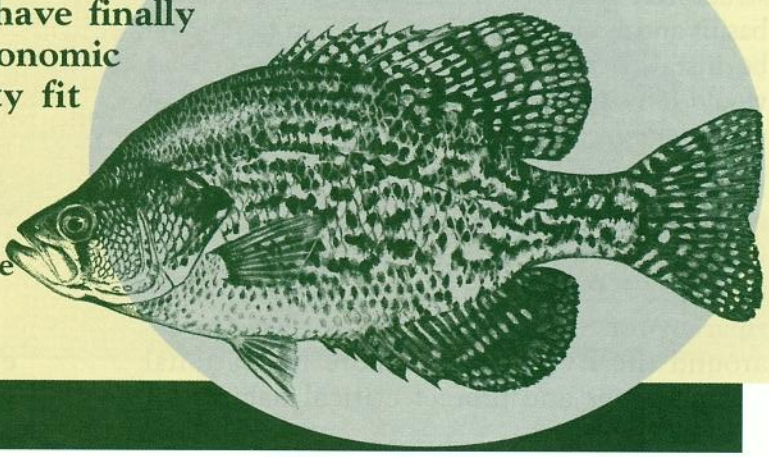
municipal wastewater treatment plants throughout the country, including a major overhaul of Greenville's treatment facility on the Reedy at Mauldin Road. Those facility improvements also produced strikingly better water quality by the late 1980's.

The environmental movement born around Earth Day in 1970 has been instrumental in the impressive turn-around in the health of the Reedy. In contrast to its image 30 years ago, the Reedy is now increasingly perceived as an exceptional resource worth preserving and restoring. We've already demonstrated our newfound stewardship of the Reedy with huge investments along the river, for example the Peace Center and Reedy River Falls Park. It is nothing short of remarkable that now we have investment groups competitively scrambling for the chance to build exciting new projects focused on the Reedy's 'waterfront'. As evidenced by this incredible resurrection, we've clearly recognized that the condition of our 'hometown river' is a core indicator of our 'quality of life.'

Although we've enjoyed significant environmental progress over the last 30 years, we must remain vigilant. Our streams, including the Reedy, are still threatened by uncoordinated growth that overwhelms our treatment plants faster than we can expand them. An even greater threat is the non-point pollution and runoff that increase alarmingly as we convert forests and farms to subdivisions and shopping malls.

We are fortunately blessed with a healthier environment, and a healthier business climate than we had 30 years ago. Now we face the challenge of maintaining that delicate balance between a thriving economy, and the quality of our environment. As reflected in our renewed pride in the Reedy, and our recognition of its value as a natural attraction to commerce and development, perhaps we have finally come to the wisdom that economic and environmental vitality fit hand-in-hand.

Dave Hargett
Friends of the Reedy River
(Reprinted from Greenville Journal, April, 20, 2000)



impoundments that increase exposure of water to the hot summer sun and winter's cold air. Because dams block the transport of sediments, increased stream bed cutting and stream bank erosion rates occur downstream of impoundments.

Dams can segment a river or disconnect it from its tributaries. The more connectivity that exists in a stream system, the healthier the stream and the better chance the resource has to rebound from a catastrophic event. This proved to be an important factor for the recovery of the Reedy River from impacts of the 1996 diesel spill. Tributary streams were the source of the new organisms that recolonized the Reedy after the spill with sampling stations near tributaries the first to show recovery. If dams had blocked these tributaries, recovery would have been slowed.

Recommendations

After reviewing the issues that affect aquatic health and the riparian zone, the issue committee developed and submitted the following recommendations to the Reedy River Task Force. All were subsequently approved for inclusion in this plan.

1. Where riparian buffers are feasible, establish and protect an undisturbed riparian buffer comprised of native trees, shrubs and undergrowth on both sides of perennial streams, intermittent streams and wetlands within the Reedy River Watershed. Areas considered "feasible" for protection are those where extensive development does not currently exist immediately adjacent to water bodies. At least 100 feet of riparian buffer should be preserved or established for the protection of aquatic health and to provide some riparian habitat.

   In areas where a 100 foot buffer does not exist or is not possible, establish as wide a buffer as feasible. In addition, the use of retention structures, such as rain gardens, bio-retention basins and storm water collection systems, should be installed to reduce impacts of run-off that would have been eliminated through the use of wider buffers.

   For individuals and entities that would like to ivoluntarily protect the value of the riparian zone itself, at least 300 feet of riparian buffer should be preserved. Protecting a larger portion of the riparian zone would better protect aesthetics around the river, provide more recreational opportunities and protect critical habitat for riparian dependent mammals, such as otters, mink, beavers and neotropical songbirds.

   Allowable activities within the riparian zone should be kept at a minimum and may include:

   a. Activities necessary to maintain the health and integrity of the area. Such activities may include removal of debris after severe storm events, removal of diseased trees and suppression of invasive plant species;

   b. View corridors utilizing the following criteria:

      i. Openings or thinnings in the riparian buffer to allow for a view of particular features or scenes should be established by selectively thinning underbrush, shrubs and low-hanging limbs. Cutting and felling trees should be avoided when attempting to create views. Such view corridors should extend no more than 75 feet or 1/3 of the lot width, whichever is less.

      ii. The exterior design and height of buildings and other structures may be designed to be compatible with and unobtrusive to the scenic, natural and cultural qualities of the corridor.

      iii. All signs should be designed to be unobtrusive and blend with the surroundings. Commercial signs should be prohibited and procedures for the removal of existing signage should be provided.

      iv. Restore the scenic quality of overused and abused areas in the corridor by landscaping and revegetating eroded and abused areas, planting additional wooded buffers in areas where the buffer is thin, and by controlling access and specific uses that are causing degradation.

   c. Docks, boat launches, public/private water supply intake structures, facilities for natural water quality treatment and purification, public/private wastewater outfall structures and similar structures which by their nature need to be located within the riparian zone;

   d. Pedestrian and/or vehicle access ways leading to docks, fishing piers and boat ramps providing that only permeable or semi-permeable material is used;

   e. Crossing by transportation facilities and utility lines;

f. Wildlife and fisheries management activities; and

g. Stream, streambank and vegetation restoration.

2. Establish a comprehensive water quality and biological assessment program for the Reedy River and its tributaries to include the following:

   a. Terrestrial and aquatic biotic inventories;

   b. Standardized aquatic physico-chemical, chemical and biological monitoring programs; and

   c. Wetland inventories.

3. The data collected through this program should be used to establish baseline conditions and determine whether the condition of aquatic and riparian communities is improving or degrading. In the event data indicate conditions are degrading, the data should also be used to guide development of restoration programs. The data collected should be readily available to the public through various media, including a website.

4. Identify and assess the value and necessity of current dams in the Reedy River Watershed. Where feasible, remove dams that separate the Reedy River from its tributaries or dams that segment the river itself in an environmentally responsible manner withconcern for release of sediments. Removal of appropriate dams would restore connectivity of the river system and aquatic organism populations. Additionally, avoid or minimize construction of new dams that would further segment the river or separate it from its tributaries. Consider construction of dry dams for storm water detention that allow unimpeded passage of aquatic organisms, sediments and organic matter.

5. Develop and implement a comprehensive stream corridor rehabilitation plan that will help reestablish the natural structure and function of the Reedy River's habitats and ecosystem. This would include:

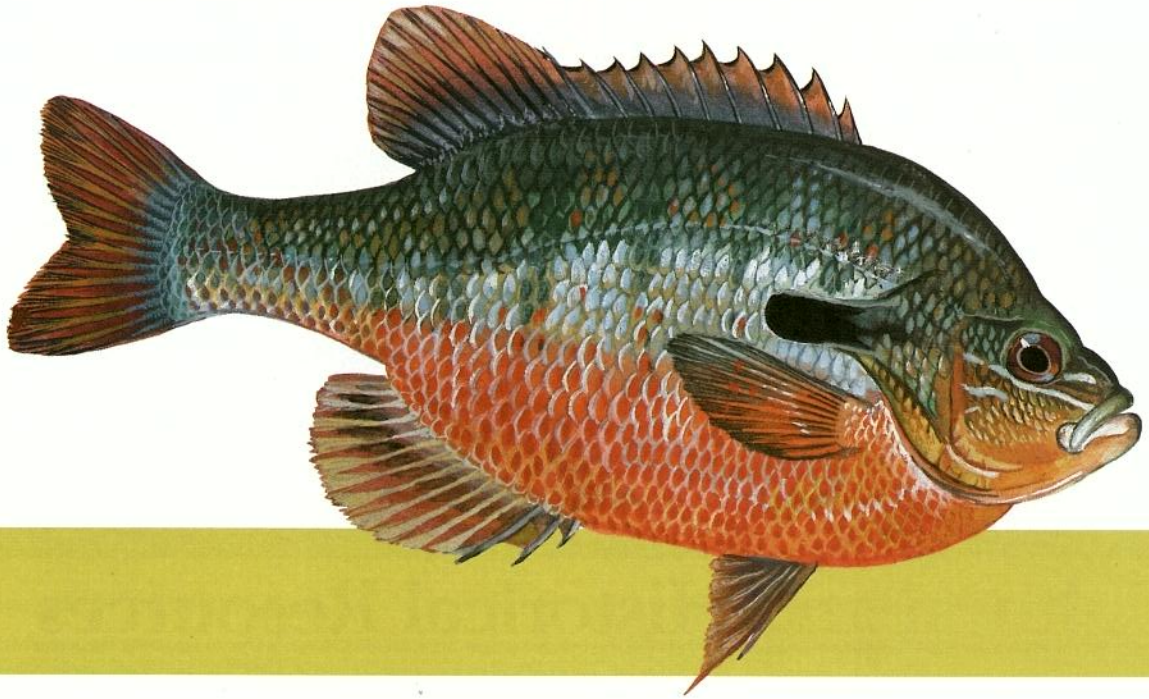
   a. A watershed-scale assessment of stream rehabilitation that addresses needs such as storm water management, stream bank stabilization, pool and riffle development, channel narrowing, stream and riparian habitat enhancement, etc.;

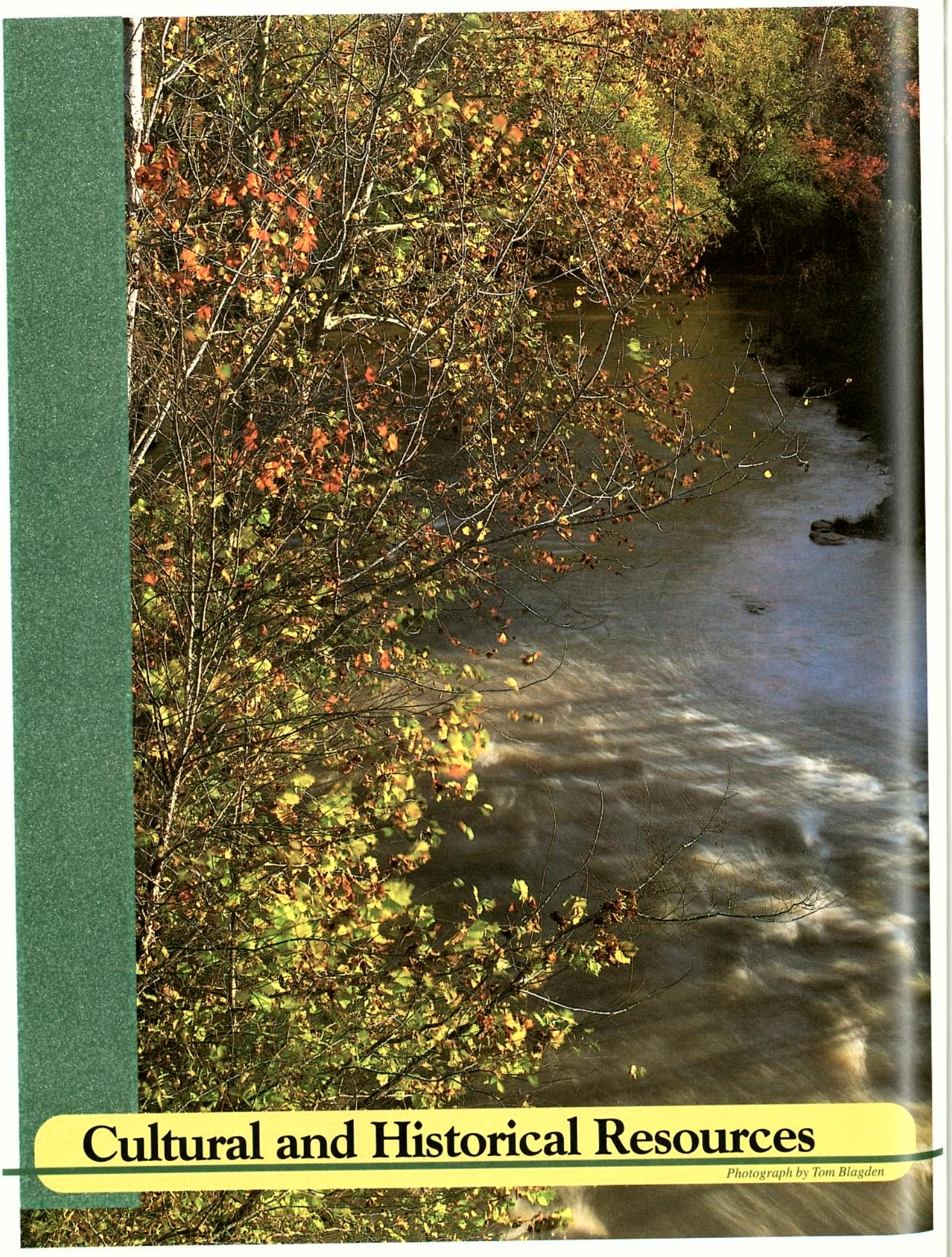
   b. A strategic implementation plan that fully accounts for downstream and upstream effects of each restoration project;

   c. Use of bioengineering techniques to the maximum extent possible to better maintain/ restore the river's aesthetics;

   d. A monitoring program to assess restoration efforts; and

   e. Alternatives for restoration projects that have failed to meet their objectives.





Cultural and Historical Resources

Photograph by Tom Blagden

The history of the Reedy River Watershed generally mirrors the settlement and evolution of much of the country. Evidence that Native Americans used or inhabited the area date back to the late Paleo Period (12,000–8,000 B.C.). When European explorers and settlers first came to the area, it was occupied by the Cherokee Nation. As settlers continued to migrate, they gradually moved northwestward through the state, eventually pushing the Cherokee out, around the time of the Revolutionary War.

Early on, the river and its tributaries were used for water and power sources for an assortment of mills built along their banks. At first the mills served agriculture and the timber industry. In the 19th century, textile mills became a key part of the region's economy. As cities and communities grew, the river also became an avenue for the disposal of municipal and industrial waste.

The Reedy River was once a source of pride and beauty to the communities built around it. Through the past two centuries, it gradually became a source of derision, embarrassment and disgust. After the passage of the Clean Water Act of 1972, the river's water quality gradually improved, and it is beginning again to be considered an asset that needs to be preserved and protected. A thorough knowledge and understanding of the watershed's history is vital to the understanding of the present and equally vital for future recreational, economic and industrial planning.

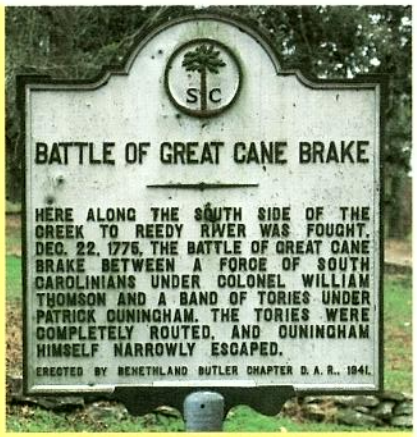
During its first several meetings, the Cultural/Historical Resources Issue Committee worked to pull together as much readily available historical information about the Reedy River basin as possible. The committee found a variety of sources of historical information for Greenville:

- The Greenville County Historical Society published a concise history of the Reedy River Falls Historic Park (Sawyer 1997). This book also includes some general county history, but only as it pertains to the City of Greenville.
- Henry Bacon McKoy wrote *The Story of Reedy River* (1969). The book includes a number of facts about the river's history, quotes regarding the river that had been written by others, and mention of some historic maps, personal thoughts and poems. By the author's own admission, the story is far from complete. He made little attempt to string together the information into a continuous history, to double check facts, or to include much information about areas outside the City of Greenville.
- The South Carolina Institute of Archeology and Anthropology (SCIAA) maintains data on at least 242 archeological sites within the Reedy River Watershed. The locations of these sites are kept confidential in order to discourage collecting by souvenir hunters. Members of the Greenville Historical Society are aware of a number of sites that the SCIAA does not know about. Other groups and individuals in Greenville County are believed to have information about even more sites. As of today, there is no complete database of archeological and historical sites in the Reedy basin.

Even less has been written about the Reedy River's history in Laurens County. Although the Laurens County Historical Society is active, it does not expend much effort within the Reedy River Watershed, as that portion of the county is relatively small and unpopulated. There are at least two buildings within the watershed that are on the National Register of Historic Places and a number of other buildings may be eligible for listing on the register.

Historical sites and buildings within the Reedy watershed have few protections. Greenville County Council passed the Greenville County Historic Preservation Ordinance in 1998. Among the ordinance's purposes is the protection,

preservation and enhancement of "...the distinctive architectural and cultural heritage of Greenville County..." The ordinance sets the criteria and procedure for designating a historic building, property or district, and the procedures that must be followed in order to alter or demolish structures with such a designation. It also establishes the make up of a commission to carry out the objectives of the ordinance. Its biggest limitation is that it only applies to the unincorporated parts of the county. Protection can only be extended into a municipality by approval of its city council.



A Battle of the Great Canebreak historic marker on Harrison Bridge Road near Simpsonville. This is the only American Revolutionary site in Greenville County.

Laurens County has no historic preservation ordinances. Existing protections only apply to the sites or buildings in the National Registry of Historic Places. Section 106 of the National Historic Preservation Act requires that federal agencies whose actions might affect registered properties take those properties into consideration and try to reduce any adverse affect that the project might have on those properties. When projects that might affect registered historical properties do not involve federal funding, Section 106 protections do not apply.

Methodology

The Cultural/Historical Resources Issue Committee was chaired by Marion Mahon of the Laurens County Soil and Water Conservation District and consisted of members from both the Greenville and Laurens County Historical Societies, a representative from the South Carolina Department of Archives and History, a faculty member of Furman University and several long time residents of the area. The committee met on a regular basis. Over the early course of their work, the committee developed three main objectives: identify the cultural and historical resources that exist, protect those resources whenever possible and educate the public about the importance of those resources.

After reviewing available historical information and applicable protective ordinances, the committee met several more times to discuss ways to improve the state of historical knowledge and resources within the watershed.

Recommendations

After reviewing the issues that affect cultural and historical resources, the issue committee developed and submitted the following recommendations to the Reedy River Task Force. All were subsequently approved for inclusion in this plan.

1. The committee has identified a number of historically important sites and buildings inthe Reedy River Watershed. However, there is concern that some important historical resources remain unidentified. While this concern exists for the entire watershed, there is particular concern for the lower portions of the watershed in both Laurens and Greenville Counties. For this reason, the committee recommends the following:
   a. A survey of cultural, historical and archeological sites within the watershed should be conducted.
   b. The survey should be used to determine which buildings, structures or sites within the Reedy River Watershed are eligible for listing in the National Register of Historic Places.
   c. Information derived from the survey and other studies should be archived, entered into a GIS database and be made available to interested parties, with certain restrictions concerning the locations of sensitive sites. These data should be housed both at county planning commission offices and with the Department of Archives and History.
2. South Carolina is growing and developing at an unprecedented rate. This is especially true in the Reedy River Watershed in and around the City of Greenville, but land use changes are also evident in the lower parts of the watershed. When land is developed for residential, commercial and industrial uses, unprotected historical and archeological sites can be destroyed.

   The Cultural/Historical Resources Issue Committee of the Reedy River Task force does not seek to prevent or otherwise hinder such development, but is concerned with the permanent loss of sites important to the culture, heritage and identity of the people of Greenville and Laurens Counties. Recognizing that preservation of all sites is impractical, we recommend the following:
   a. Upon completion of the survey and inventories recommended by this committee (see

Recommendation #1), the sites and resources should be ranked for their importance to history and culture. The ranking of these sites should be conducted by an appropriate panel of experts. The results of the ranking should be included in the GIS database (see Recommendation #1).

b. Whenever major development projects are planned, developers should be provided with a list and evaluation of the sites and/or resources known to exist on the land in question. When important sites or resources exist on the land,

A building from the Greenville Coach Factor remains on the banks of the Reedy as part of the Peace Center for the Performing Arts

developers should take appropriate measures to protect them. If this is not possible, archeologists and/or historians should be allowed access to the site for the purpose of collecting data and/or artifacts that will be studied and catalogued off site.

c. A land trust serving Laurens County needs to be established.

d. Ordinances protecting historic resources need to be adopted or expanded in Laurens and Greenville Counties.

e. An endowment should be established for the acquisition of land and historical easements, based on prioritized historic importance.

3. Local history of an area is an important resource in planning for the future. When people are aware of past events, activities and conditions in and around the Reedy River, they may be motivated to treat it as an asset worth protecting.

Opportunities to educate the public about local history are relatively limited. Given thatthe South Carolina Department of Education just completed the multi-year task of developing and writing curriculum standards, it is highly unlikely that the committee or task force would ever be able to influence the curricula of local schools to include Reedy River history. The committee chose to focus its education recommendations on those chance circumstances known as "teachable moments." Historical information needs to be made available when people want or need it.

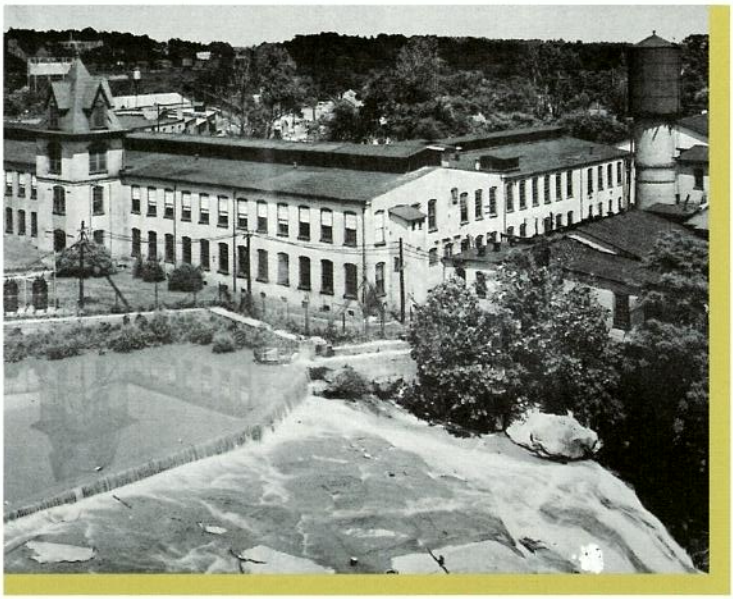
In order to increase public awareness of Reedy River history, the committee recommends the following:

a. Historical information should be included in paddling and other recreational guides that are published for the river. Each stretch of the river described for recreational purposes could also include the events and interesting historical sites that are related to that section.

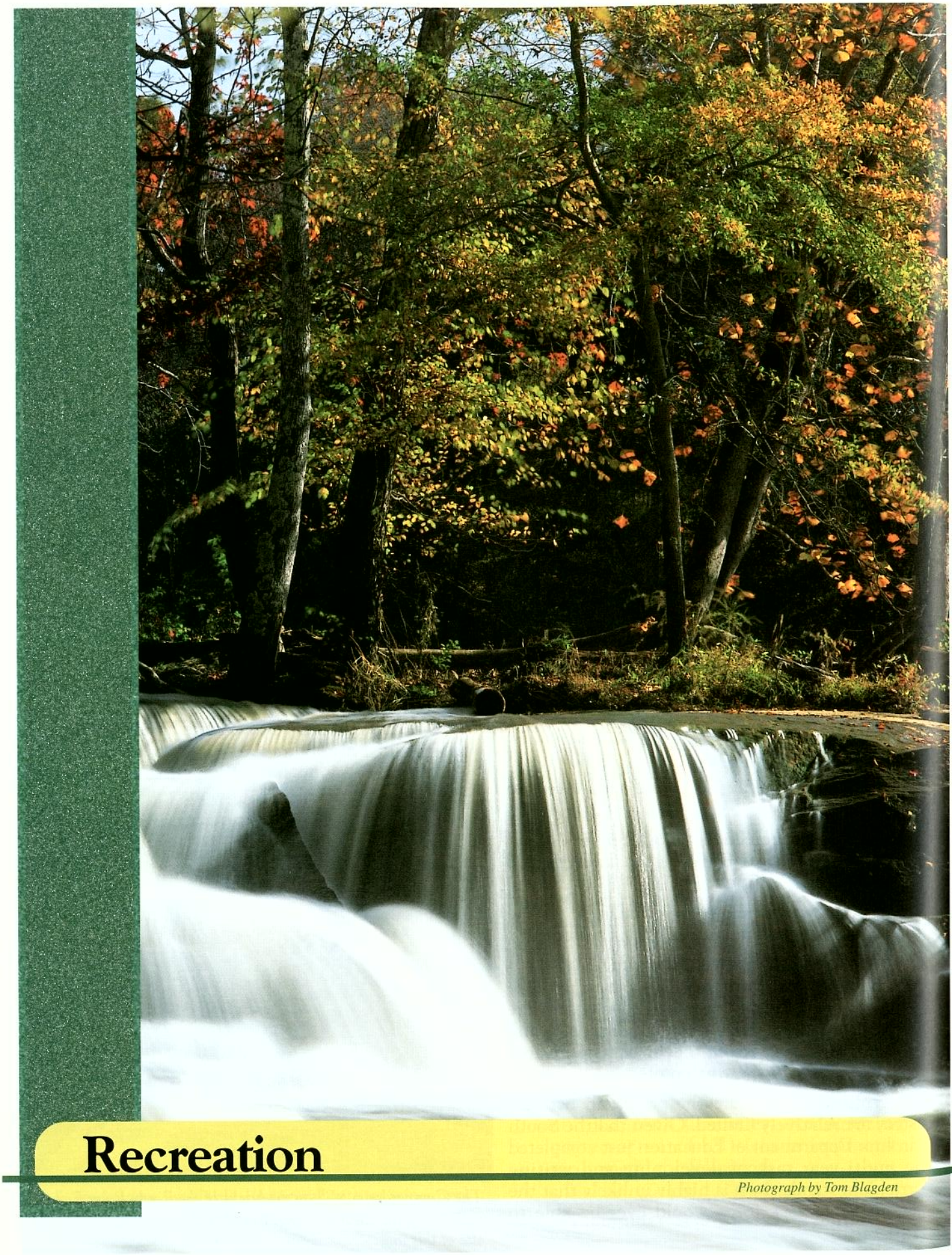
b. Information about the tax benefits of historical and conservation easements and other title restrictions that can preserve important sites should be publicized by land trusts serving the area.

c. Telephone numbers of the pertinent agencies and organizations involved with protection of cultural and historical resources should be listed in the telephone directories so that they are easily accessed when historical or archeological sites are discovered. Agencies and organizations should include the Department of Archives and History, historic preservation commissions, historic societies and the Stowe South Carolina room of the Greenville Public Library.

d. A commissioned history of the Reedy River would be a significant resource for identifying sites and educating the public on their importance. Such a history should be researched and written by a trained historian.



The Camperdown Mill on the banks of the Reedy River Falls operated from 1875 to 1956. Bowater, Inc. now stands on the site of this mill.

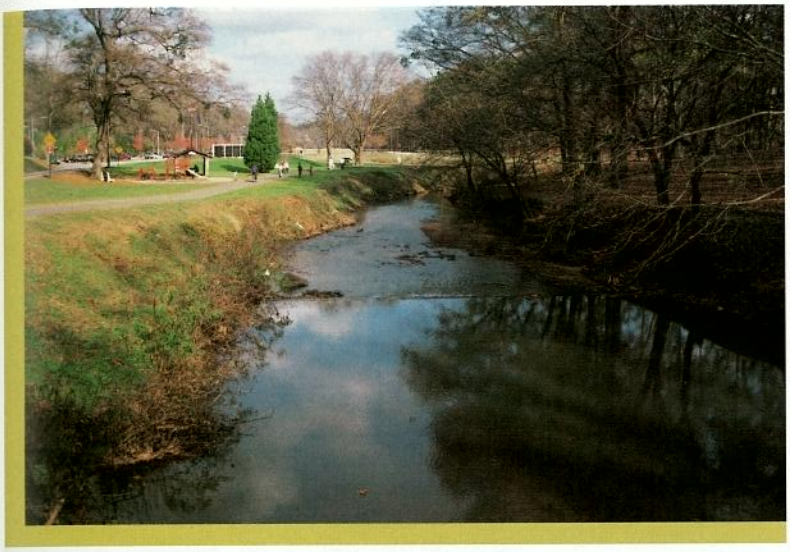


Recreation

Photograph by Tom Blagden

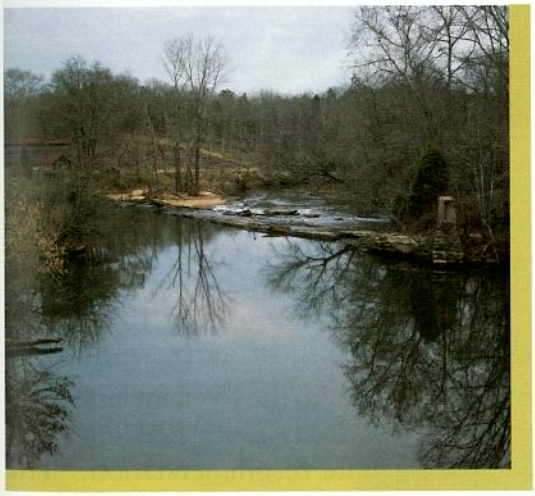
The Reedy River offers well-known and well-hidden recreational opportunities, from urban parks and greenways in the upper watershed to peaceful paddling in the lower watershed. Realizing the river's full recreation potential within this rapidly developing watershed will require concerted restoration and protection efforts and improved public access. The Reedy River Task Force identified recreation as a principal issue for future use of the river and formed the Recreation Issue Committee to provide recommendations.

The most well known recreational site on the Reedy River in the City of Greenville, Cleveland Park, started in 1924 with a donation of 110 acres from William Choice Cleveland. In 1933, the Reconstruction Finance Corporation, part of President Franklin Roosevelt's New Deal response to the Great Depression, granted funds for work on the Reedy River, including a new bed for the river in Cleveland Park.



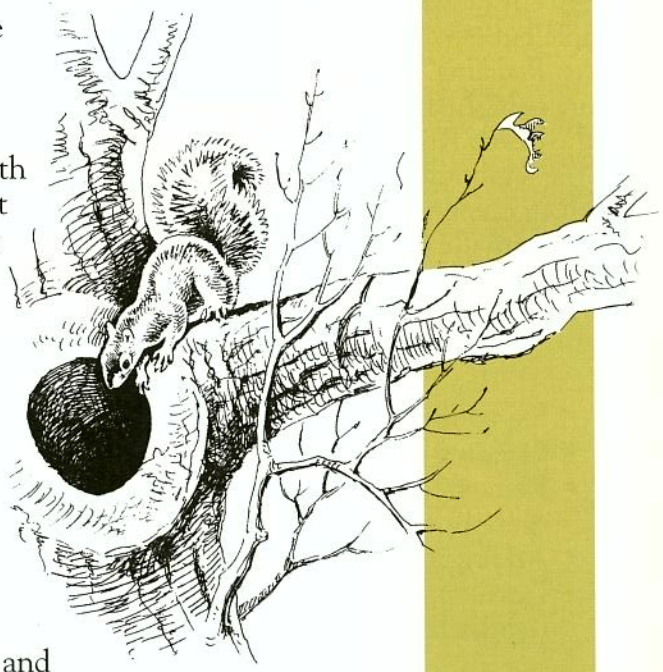
Today's Reedy River flows through the heart of Cleveland Park

In Laurens County, recreational sites have come and gone on private property. For example, Culbertson's Mill was built on the Reedy River at Ekom Beach Road about 1840. In subsequent years, the site had a store and post office and by 1950 included a skating rink and bowling alley. Visitors used the river for picnicking and swimming. Below the Reedy River, Lake Greenwood's swimming, fishing, boating and other recreational opportunities are attracting residential development to the shoreline.



Culbertson's Mill dam downstream of Ekom Beach Road

To help reveal the natural resources of the Reedy River to participants in the watershed study, South Carolina Department of Natural Resources (SCDNR) staff organized six canoe trips from September 1999 to June 2000. Though the first and last trips were cancelled due to drought-induced low flow in the river, we had successful trips from Cleveland Park to Lake Conestee south of urban Greenville, Cedar Falls Road to Hillside Church Road in southern Greenville County and Boyd Mill Pond to Ekom Beach Road in Laurens County.



Methodology

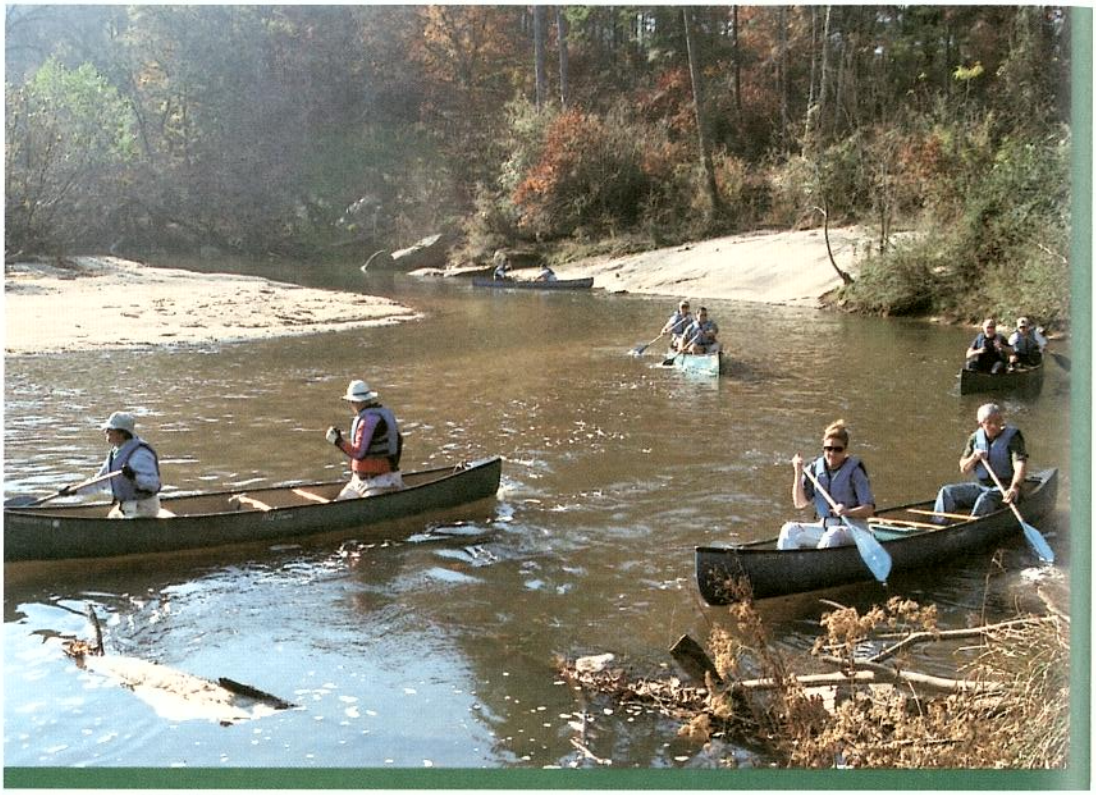
The Recreation Issue Committee was co-chaired by Paul Ellis of the City of Greenville Parks and Recreation Department and Bill Erkes of the Laurens County Recreation Department. Members of the committee included representatives from local government, state government, Clemson University, recreation businesses, tourism interests, paddling clubs, environmental organizations and riparian property owners. Hosted by the City of Greenville Parks and Recreation Department, the committee met regularly from September 1999 to April 2000. Discussions in the initial meetings focused on the existing recreation resources and events along the Reedy River, the potential recreation activities to be supported along the river and the potential funding sources for recreation.

The committee found that recreation promotion for the Reedy ranged from the simple but effective *Reedy River Paddling Trail* brochure published by Friends of the Reedy River (1999) to the elaborate *Master Vision for the Reedy River Corridor* prepared by Sasaki Development on behalf of the Greenville Convention and Visitors Bureau. The latter proposes major public improvements above and below the Reedy River Falls in downtown Greenville, which include:

- Expanding the park and garden spaces
- Creating a water theater
- Removing the Camperdown Way road bridge that obstructs the falls
- Adding a pedestrian bridge
- Developing river-oriented residential, office, retail, stadium and possibly convention projects

The committee also discussed smaller-scale community projects that would use public/private partnerships to achieve results, such as Poinsett Park. Additionally, the Clemson University Department of Planning and Landscape Architecture conducted a planning student project for Cleveland Park West in which the area's citizens engaged in park planning and design to stimulate neighborhood revitalization.

A key topic for the committee was improved access to the river. Only Cleveland Park provides adequate access for canoeing and kayaking on the river. New access facilities at bridge crossings for paddling, hiking, wildlife viewing, historic site interpretation, and public safety environmental response and search and rescue operations were discussed. The need for a boat ramp on the Reedy portion of Lake Greenwood was also identified.



A Reedy River Task Force canoe trip

To publicize improved access to the river, updating and expanding the existing *Reedy River Paddling Trail* brochure became a separate recommendation. The river map could be enhanced with more details about paddling hazards such as pipelines, bridges, dams and submerged "strainers." Other safety concerns, like understanding the dangers of flash flooding on the river, could be more fully addressed. The natural and cultural history of the river could be presented as part of the paddling experience, and, subsequently, hiking opportunities. Stewardship ethics would be emphasized as a basis for personal behavior while using the river's recreational resources.

Development of a greenway system along the entire river evolved as a major long-term goal. The committee concluded that riparian buffers were needed along the river and its tributaries, even where public access could not be provided. Hiking trails connecting future access points along the main river corridor were seen as the principal recreation amenity in the greenway system. Trails could also connect to nature centers or preserves that might be established in the river corridor at Lake Conestee in Greenville County, or the Clemson University tract in Laurens County.

The committee was determined to strive for implementation of its own recommendations, as well as those of other committees. Though members considered relying on existing organizations, they eventually decided to recommend establishment of a separate authority dedicated to overall implementation of *The Reedy River Report: Managing a Watershed.*

Recommendations

After reviewing the issues that affect recreation, the Recreation Issue Committee developed and submitted the following recommendations to the Reedy River Task Force. All were subsequently approved for inclusion in this plan.

1. Establish designated Reedy River Public Access Points along the river below Cleveland Park that are safe, functional and do not interfere with environmentally or historically sensitive property. These sites would provide recreational and emergency access.

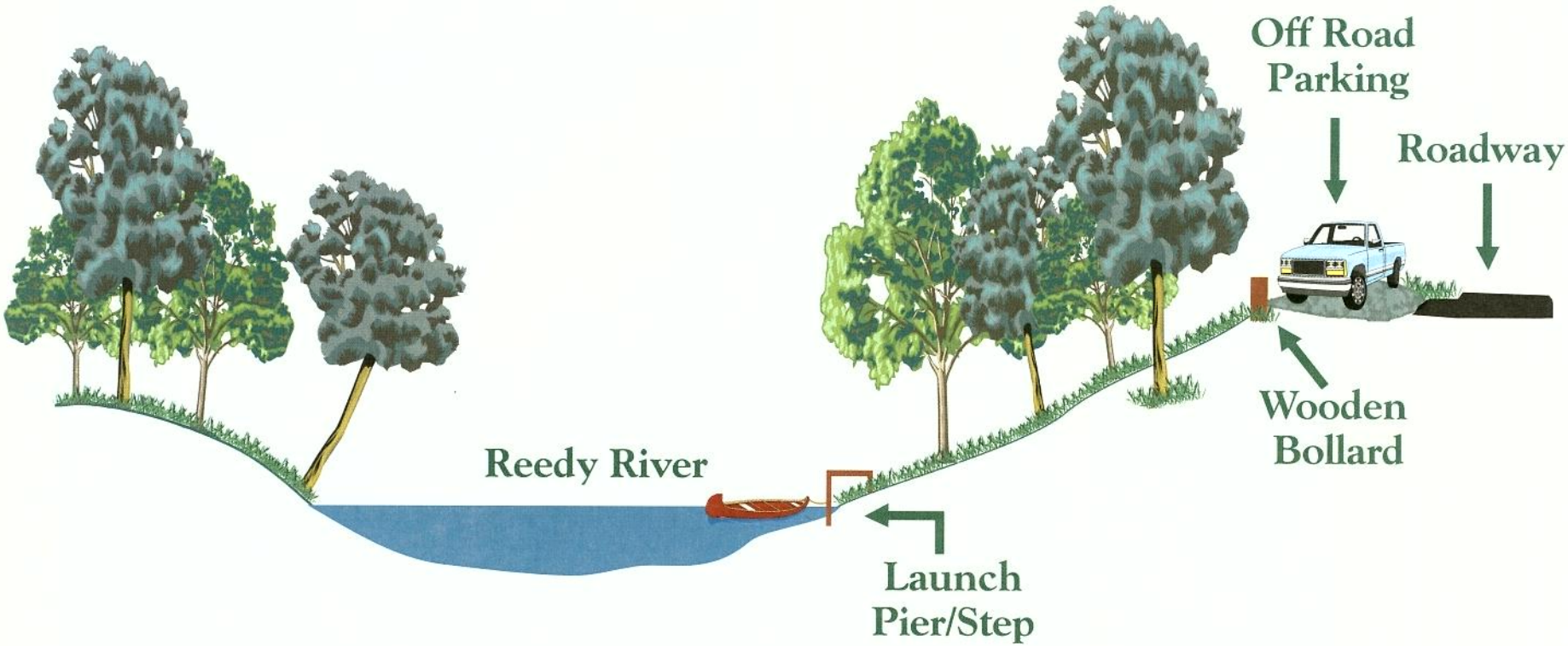
   Generally, land should be purchased adjoining existing highway bridge locations to establish permanent Reedy River Public Access Points. The primary amenities at these locations would include off-street parking, appropriate signage and launch steps. Optional amenities, such as picnic tables, trash cans, primitive camping sites and hiking trails, can be included if a responsible maintenance agency is identified, and the amenities do not interfere with private property. These access points should be located and designed in coordination with public safety considerations to facilitate search and rescue operations as well as environmental response actions. A conceptual drawing of the manner in which potential access points should be designed is illustrated in Figure 16.

   a. The types of recreational activities recommended to be encouraged and facilitated from the Reedy River Public Access Points are:

      i. Canoeing and kayaking
      ii. Hiking
      iii. Picnics
      iv. Nature/wildlife photography and observation
      v. Fishing or swimming activities (Note: Fishing and swimming are not recommended leisure activities above Boyd Mill Pond at this point in time due to the marginal quality of the water, especially during heavy rain periods.)

Cleveland Park offers parking and canoe access to the Reedy River

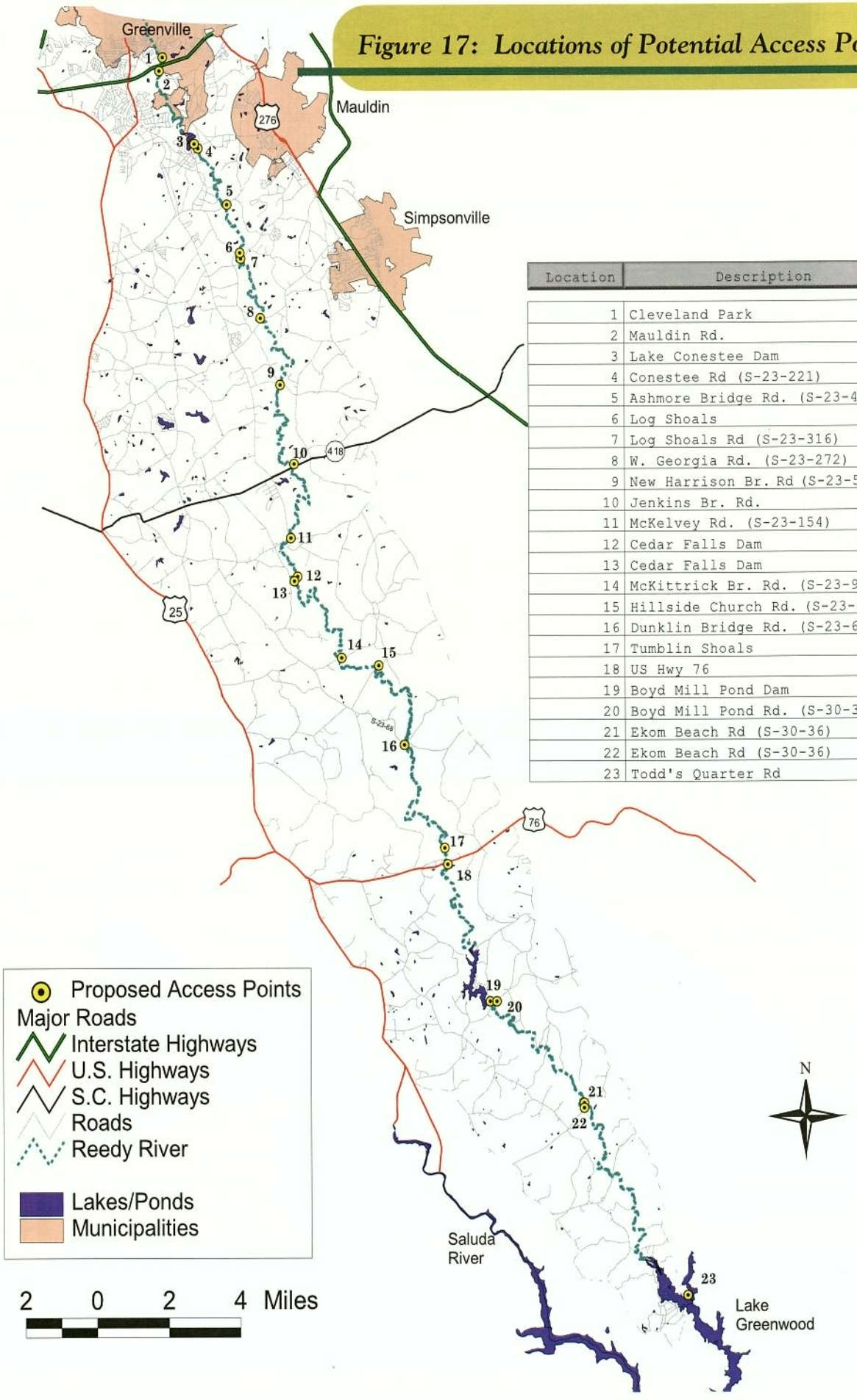
Figure 16: Conceptual Illustration of Potential Access Points



General Principals for Development of River Access Points:

1. Provide vehicle parking space safely off road way and an appropriate distance from the river's edge.
2. Use gentle slopes to reach the river's edge.
3. Maintain natural vegetation in the buffer area between the road and the river.
4. Minimize the use of impervious surfaces for vehicle parking and trails.
5. Provide a permanent launch platform or step at the rivers edge.

Figure 17: Locations of Potential Access Points



Location	Description
1	Cleveland Park
2	Mauldin Rd.
3	Lake Conestee Dam
4	Conestee Rd (S-23-221)
5	Ashmore Bridge Rd. (S-23-448)
6	Log Shoals
7	Log Shoals Rd (S-23-316)
8	W. Georgia Rd. (S-23-272)
9	New Harrison Br. Rd (S-23-542)
10	Jenkins Br. Rd.
11	McKelvey Rd. (S-23-154)
12	Cedar Falls Dam
13	Cedar Falls Dam
14	McKittrick Br. Rd. (S-23-985)
15	Hillside Church Rd. (S-23-455)
16	Dunklin Bridge Rd. (S-23-68)
17	Tumblin Shoals
18	US Hwy 76
19	Boyd Mill Pond Dam
20	Boyd Mill Pond Rd. (S-30-328)
21	Ekom Beach Rd (S-30-36)
22	Ekom Beach Rd (S-30-36)
23	Todd's Quarter Rd

Table 6: Public Access Points Priority for Development

Priority	Put In/Take Out	Mileage	Time
1	Boyd Mill Pond/Ekom Beach Road S-30-36	5.3 miles	3 hrs
2	Cedar Falls/Hillside Church Road	5.5 miles	3 hrs
3	Tumblin Shoals, US Highway 76/ Boyd Mill Pond	5.3 miles	2.3 hrs
4	Log Shoals Road S-23-316/ W. Georgia Road S-23-272	5.3 miles	3 hrs
5	Cleveland Park/Western Carolina-Mauldin Road	3.7 miles	2.5 hrs

b. The following recommended locations for Reedy River Public Access Points are illustrated in Figure 17:

i. Cleveland Park
ii. Western Carolina/Mauldin Road
iii. Lake Conestee Dam S-23-221
iv. Ashmore Bridge Road S-23-448
v. Log Shoals Road S-23-316
vi. W. Georgia Road S23-272
vii. New Harrison Bridge Road S-23-542
viii. Jenkins Bridge Road and SC Highway 418
ix. McKelvey Road S-23-154
x. Cedar Falls Dam
xi. McKittrick Bridge Road S-23-985
xii. Hillside Church Road
xiii. Dunklin Bridge Road S-23-68
xiv. Tumblin Shoals US Highway 76
xv. Boyd Mill Pond Dam
xvi. Ekom Beach Road S-30-36
xvii. Lake Greenwood-Dockside Landing Restaurant (private) or River Road (public)

c. Recommended priorities for development of Reedy River access points are presented in Table 6.

2. Expand the existing Reedy River Greenway in downtown Greenville upstream to Travelers Rest and downstream to Lake Greenwood to provide community recreation space, preserve water quality and safeguard against flooding.

Management control of the riparian zone should be achieved through a combination of land acquisition and conservation easements held in public trust or by private, non-profit conservation organizations. A minimum of a 200-foot riparian

zone along each side of the Reedy River, and 100 feet along each side of the major tributaries should be protected, enhanced, and preserved.

Where possible, larger tracts of land, such as the Clemson University riverfront holdings in Laurens County and property around Lake Conestee, should be considered for parks, outdoor education sites and nature preserves.

The primary amenity to be provided along the Reedy River Greenway would be hiking trails that connect Reedy River Public Access Points. Additional Reedy River Public Access points will be needed in the future, especially upstream from Linkie Stone Park, for access to the Reedy River Greenway.

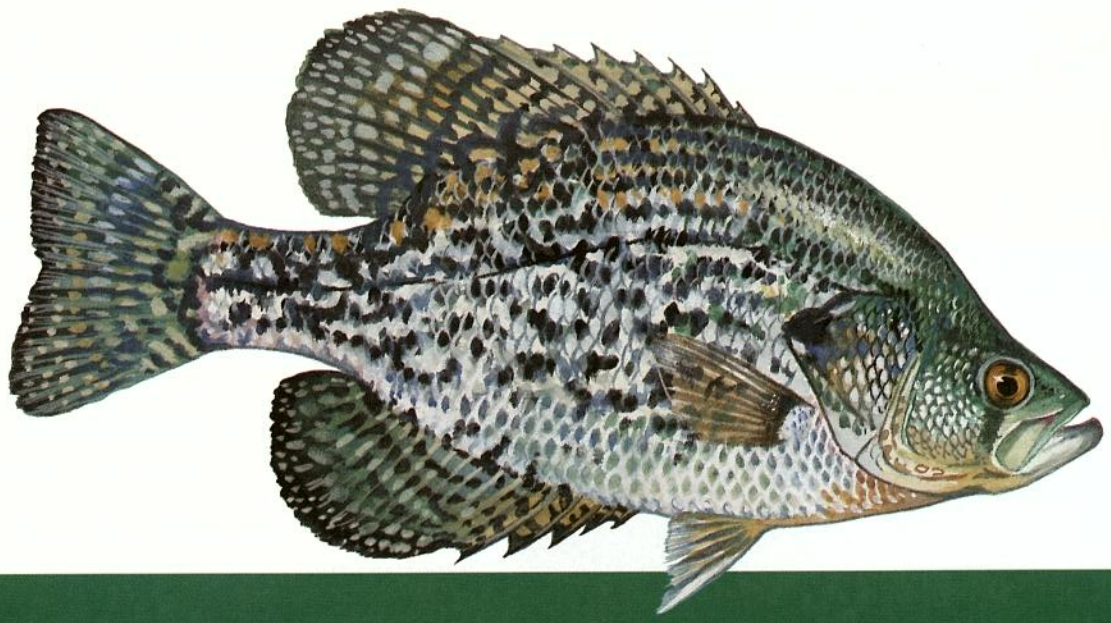
3. A Reedy River Access Guide should be printed and distributed throughout the upstate region of South Carolina. The guide will inform potential users of the recreation resources offered by the Reedy River, emphasizing the Access Points and a paddling guide. It will include natural and cultural history of the river corridor and guidance on the ethical use of the river and its stewardship.

4. Establish a *Reedy River Watershed Committee** with oversight responsibilities to continue the advancement and implementation of *The Reedy River Report: Managing a Watershed* recommendations.

In order to cover the operating expenses necessary for staffing, *The Reedy River Watershed Committee* should be funded by Laurens County, Greenville County and the City of Greenville. Two of the committee's seven members should be appointed by Laurens County Council, two members by Greenville County Council, two members by Greenville City Council and one member by the Governor. *The Reedy River Watershed Committee* should be organized so that it can be expanded in the future to include other river corridor initiatives in the upstate region.

There needs to be a determination as to which public agency or agencies will maintain the access points and whether access points can be included in the "Adopt-A-Landing" program sponsored by the SCDNR.

* The recommendation developed by the Recreation Issue Committee called for establishment of the "Reedy River Authority." Subsequent discussions by the Reedy River Task Force resulting in the name of the entity being changed to *"Reedy River Watershed Committee."* The current proposal for *The Reedy River Watershed Committee* is presented in Appendix D.



Eleanor Welling, President of Friends of the Reedy River, joined us on the Cleveland Park to Lake Conestee segment, and retold the story of the trip in an opinion piece for "The Greenville News." Her account captures the problems and potential of restoring recreation on the Reedy:

A trash and debris dam at a pipeline crossing obstructs canoeists

I recently had the good fortune to be a participant on a canoe trip on the Reedy River. This outing, sponsored by the South Carolina Department of Natural Resources and its Reedy River Task Force, was intended to give participants a different perspective on the resource that is the subject of its basin-wide planning efforts. As promised, we learned more from a few hours on the river than we could have in hundreds of hours of task force meetings.

The history of our community and that of the 77-mile long Reedy are inexorably intertwined. Greenville was founded on her banks and from earliest history until today, the river has served us in many capacities. The natural beauty of the falls served as "Greenville's trysting place" for young couples and the two mill ponds as swimming holes and baptismal fonts. The Reedy first provided power for our industrialization and then served for years as the dumping ground for industrial wastes and raw sewage.

Despite its long history of abuse, the river has somehow survived, and now is getting a little help from its friends. On our recent canoe trip, it was an extraordinary adventure to follow a great blue heron down this wild green corridor right in the midst of our city.

We learned of the critical importance of the streamside forests so essential in providing a protective buffer from surrounding homes, businesses and apartment complexes. These forests protect the river banks from erosion, reduce stormwater impacts, slow floodwaters and provide habitat to an amazing variety of wildlife and songbirds. Employees of the Western Carolina Regional Sewer Authority and the construction company putting in the major sewer trunk line met with us that day on the river.

Lake Conestee is gradually filling in with sediment from eroded soils

It was reassuring to know that the controversial but successful relocation of several miles of pipeline would do much to protect the river and the sensitive streamside forests so necessary for its survival.

As we silently paddled under Pleasantburg Drive and I-85, I felt we were in a beautiful but secret world that so few know of and even fewer value. I wanted to somehow bring Greenville to the river in its midst, to share the wildlife, the quiet and the beauty of one of our community's greatest resources. I was excited by the potential this corridor has for our community, to teach our history, to learn of our responsibilities as stewards of our environment, to provide recreational and educational opportunities.

It was disheartening to see the large amount of trash along the river, despite our numerous river cleanups over the past several years. "Dams" of trash had

to be broken up and hacked through. The brutal impact of Greenville's stormwater runoff was also clearly evident along our course, with huge trees undermined and banks scoured by the incredible power that quickly transforms a small stream into a raging torrent with even the slightest rain.

The stretch from I-85 to the village of Conestee is the wildest part of the river. Here the river is wide and its banks deeply forested. Much of this area is owned by the City of Greenville and the Sewer Authority, thus buffering it from the impact of growth.

Lake Conestee, lying just below the treatment plant, and behind the Greenville Braves stadium, provided the most eye-opening experience of the trip. Conestee, a historic mill community, was once a thriving village and reportedly had electricity before Greenville. It is sad commentary that this historic lake, once 145 acres, now consists primarily of contaminated sediments and only about 20 acres of water.

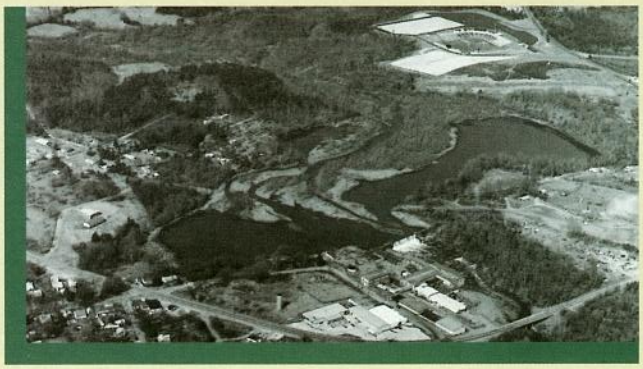
As Greenville grew, the lack of sediment control ordinances and waste water standards resulted in a failure to respect our neighbors downstream. Despite this evidence of poor stewardship, Lake Conestee demonstrates that nature is resilient. Beavers are busily managing the water resources we have neglected, waterfowl and shorebirds enjoy the remaining pools, songbirds thrive in the re-emerging wetland forests, and the tracks of deer, racoon and foxes are abundant.

One afternoon on the Reedy will open one's eyes to the history and inspiring beauty of our "hometown river." According to Leonardo da Vinci, "To touch a river, is to touch all that has come before, and all that is to come after."

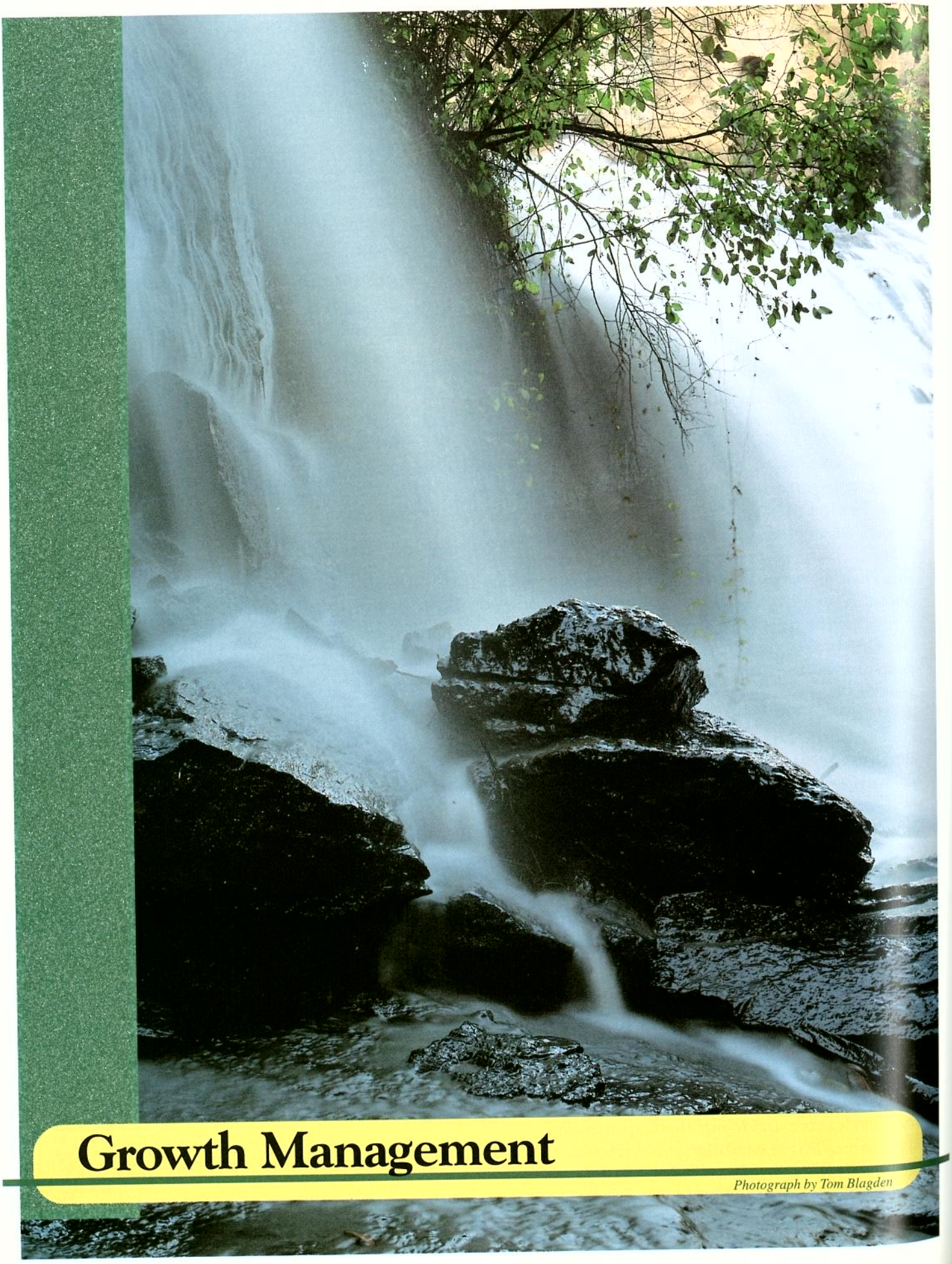
Touching the Reedy is a humbling and enriching experience that enables us to see the river's value and to feel the responsibility of restoring it to a condition in which we all can take pride. It has served us well for so long; perhaps now we should give it a hand.

Aerial photographs illustrating the sedimentation of Lake Conestee. The lake in 1943...

in the 1970's and....



in the 1980's.



Growth Management

Photograph by Tom Blagden

Human inhabitants have altered the Reedy River Watershed landscape for many thousands of years. However, today's pace and pattern of urban development markedly accelerates our impacts on the sustainability of this riverine ecosystem. The Reedy River Task Force identified growth management in the watershed as a fundamental issue for the river's future and assigned the topic to the Growth Management Issue Committee for recommendations.

Greenville County, with a population of about 358,400 in 2000, has been the most populous county in South Carolina for the last twenty years. It is projected to keep that lead, growing by more people over the next twenty years than the current population in all of Laurens County, which was about 63,700 in 2000. Similarly, Greenville County has led the state in the number of housing units, adding over 26,000 between 1990 and 1998. In the same period, housing units in Laurens County increased by nearly 4,000.

Residential subdivision development in southwest Mauldin

Using recent advances in satellite remote sensing and computer-based geographic information systems, the rooftops, parking lots, roads and other impervious surfaces associated with urban growth can be detected and tracked over time. The South Carolina Department of Natural Resources (SCDNR) has applied this technology to the Reedy River Watershed, to depict and measure the changing patterns and proportions of principal land use categories. Landsat Thematic Mapper satellite imagery, which "sees" portions of the landscape as small as 30 meters by 30 meters in size, was mapped by computer to reveal the extent of forest land, agricultural land, urban land and water surfaces in the 167,000-acre watershed. Images from early 1983 versus late 1997 indicate that over this nearly 15-year period about 20,000 acres of agricultural land (12% of the watershed) was converted into 10,000 acres of urban land and 10,000 acres of forest land (Figure 18). The new urban land is mostly dispersed, low-density, automobile-oriented sprawl, especially south and east of Greenville. The new forest land is mostly pine plantations of the forest products industry in the lower watershed. Though checked against aerial photographs, this analysis is prone to mistake some agricultural land of bare soil as urban, and some urban land in residential areas with many trees as forest land.

The sprawl development pattern in the upper portion of the watershed multiplies the amount of impervious surface serving each new resident, increasing storm water runoff and decreasing groundwater recharge. Consequences of sprawl in the Reedy River include flash floods, diminished base flow, channelization, streambank erosion, bottom scouring, siltation and nonpoint source pollution. Other impacts associated with growth include excess nitrogen and phosphorus from point and nonpoint discharges, devegetation of the riparian zone and litter.

Public awareness of the undesirable effects of community growth is becoming more evident. For example, during the recent update of Greenville County's Comprehensive Plan, *Designing Our Destiny*, citizens expressed concerns about traffic congestion, school overcrowding, flooding, overextension of infrastructure and the loss of rural landscapes. Citizens also asked for more farmland protection and greenways. Though the most recent Laurens County Comprehensive Plan dates from 1997, it echoes public concern for protecting important farmland from development.

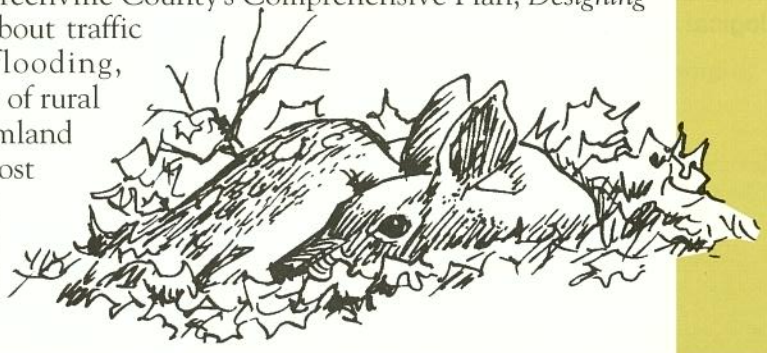
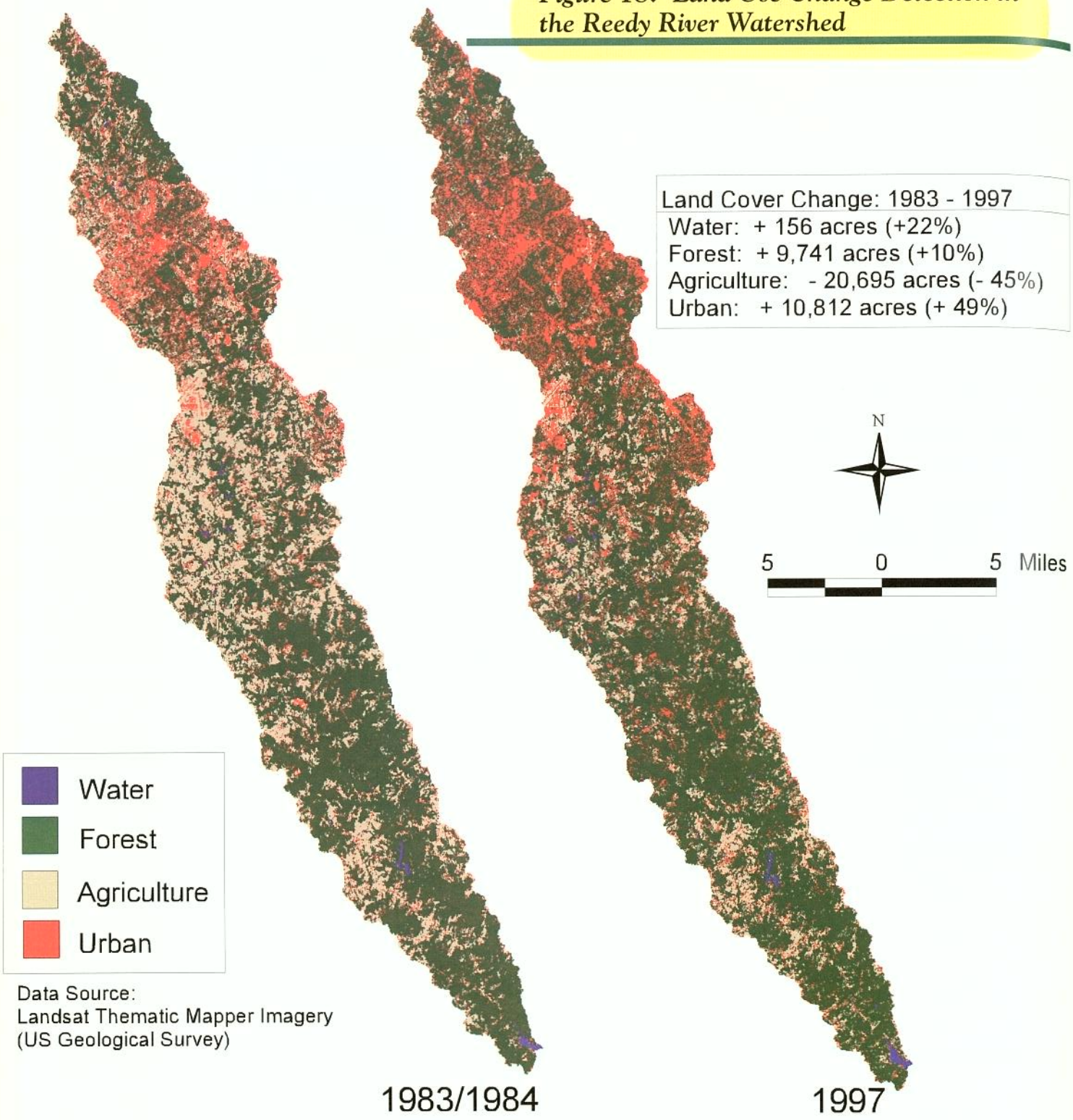


Figure 18: Land Use Change Detection in the Reedy River Watershed



Data Source:
Landsat Thematic Mapper Imagery
(US Geological Survey)

Class	1983/1984	1997
Water	722 acres (1%)	878 acres (1%)
Forest	98,979 acres (59%)	108,720 acres (65%)
Agriculture	45,617 acres (27%)	24,922 acres (15%)
Urban	22,039 acres (19%)	32,851 acres (19%)

Methodology

The Growth Management Issue Committee was chaired by Chip Bentley of the Appalachian Council of Governments. Members of the committee included representatives from local government, regional government, Clemson University, state and federal agencies, the development community and environmental organizations. The committee began meeting in August 1999, hosted by the Appalachian Council of Governments, and continued to meet through March 2000. Initial topics of conversation at the first few meetings included regional development context of the watershed, status of local land use controls, such as zoning, in the watershed and region, infrastructure costs of growth and the need for state and local coordination on land use planning.

The committee also contributed to the agenda for the growth management conference hosted by the Reedy River Task Force. They considered topics such as greenways, flooding, land use impacts on water quality, traffic impacts on air quality, intergovernmental coordination of infrastructure, pending state legislation for farm and forest land protection, brownfields redevelopment and smart growth assistance and incentives. The final agenda balanced perspectives on economic development, community land use planning and natural resources protection.

During the committee's deliberations, the Greenville Water System reversed its intention to extend a water line to southern Greenville County, citing growing concerns about stimulating sprawl. The Southern Connector was under construction, between I-185 and I-385, prompting Greenville County to refine its recently adopted comprehensive plan for related growth impacts. Greenville County also worked on expanding zoning in the southern portion of the county, creating a cluster development ordinance, and allowing pervious surfaces for overflow parking lots. Laurens County debated new development standards and county airport zoning. Greenwood County, Laurens County and Newberry County began meeting separately on environmental and land use issues affecting Lake Greenwood. Clemson University focused one of its graduate-level planning studies on the Reedy River. The South Carolina Department of Health and Environmental Control (SCDHEC) reconsidered its regulations on the use of septic systems for new development.

Final agenda for the growth management conference hosted by the Reedy River Task Force on December 1, 1999

Agenda
Changes in the Reedy River Watershed: A Discussion of Growth Management

7:45 am **Registration/coffee and pastries**

8:30 am **Welcome**
Alfred H. Vang, Deputy Director, SCDNR

8:45 am **Growth: Should It Be Managed? A State Perspective**
Senator Phil Leventis

9:15 am **Lessons from the Lowcountry**
Dr. Jeff Allen, Strom Thurmond Institute, Clemson University

9:45 am **Break**

10:00 am **Growth and Impacts on Natural Resources: The Charles River**
Bob Zimmerman, Exec. Dir., The Charles River Watershed Assn.

**** Panels will be moderated by Dr. Robert Becker, Director of the Strom Thurmond Institute, Clemson University****

11:00 am **How Does Growth Management Affect Us?**
Beverly Turner Reedy River Property Owner
Tom Trantham, Dairy Farmer
Vivian Lancaster, Friends of Lake Greenwood

12:15 pm **Lunch**

12:45 pm **Upstate Growth Trends (during lunch)**
Richard Lacy, SCDNR

1:30 pm **How Do We Guide Growth Management?**
Brad Wyche, Upstate Forever
Gale Crawford, Homebuilders Association
Ed McMullen, SC Policy Council
George Fletcher, President Elect, Greenville Chamber of Commerce

4:15 pm **Can We Manage Growth? Bringing It All Together**
Senator Phil Leventis
Mayor Knox White, City of Greenville
Michael Pitts, Vice Chair, Laurens County Council

5:00 pm **Questions/wrap-up**

5:30 pm **Adjourn**

As the committee formed its recommendations for the task force, it debated the use of the following:

- Vegetated buffers along riparian corridors
- Constructed wetlands for storm water management
- Incentives for design standards within the river corridor
- Conservation subdivisions that create shared open space along with new houses
- Best development practices for site construction, particularly storm water management
- Public greenways along the river system
- A management and maintenance entity for the Reedy River
- Improved floodplain mapping in the watershed
- "Truth in location" notifications to property buyers about public vs. private land use responsibilities

Coordination of public infrastructure investments, especially for roads, schools, water supply and sewage disposal, was deemed essential for regional growth management, but no practical recommendation emerged to apply to the watershed per se.

Recommendations

After reviewing the issues that affect growth within the watershed, the issue committee developed and submitted the following recommendations to the Reedy River Task Force. All were subsequently approved for inclusion in this plan.

1. Implement a program to establish a comprehensive greenway system for the Reedy River Watershed.

   To implement this recommendation, we propose the creation of a Greenway Advisory Council, established between Greenville County and Laurens County. The council would oversee the establishment of a greenway system extending throughout the Reedy River Watershed. The advisory council should work closely with the county recreation districts, municipal recreation departments and local planning staffs to develop and implement a Greenway Master Plan and should be charged with the following tasks:

   a. Develop an inventory of existing and potential greenway and open space resources in the watershed.

   b. Identify priorities for acquisition and development of lands for greenways.

   c. Develop a Greenway Master Plan, including implementation strategies.

   d. Identify and secure funding for greenway resource acquisition and development.

   e. Facilitate cooperation among counties, municipalities and other authorities for managing open space resources.

2. Develop a River Corridor Stewardship Guide that promotes the responsible management of the resources of the Reedy River Watershed, consistent with larger community goals.

   Within the watershed, each governmental entity (counties, municipalities and special districts) should develop compatible strategies and incentives to manage growth in a way that meets both environmental and economic goals. Many tools exist to coordinate growth in a manner that meets both goals. The key to successful protection of the Reedy will be to tailor a subset of these tools to fit the institutional, economic and environmental needs of the Reedy River Watershed and its residents.

   To accomplish this, the Reedy River Best Practices Council should be established to develop a guide that is tailored to the Reedy River Watershed and sets out the best strategies for this area. The goal of this document should be to promote incentives and strategies to enhance the protection of the Reedy River while maintaining the economic

Commercial supercenter development off Bramlette Road

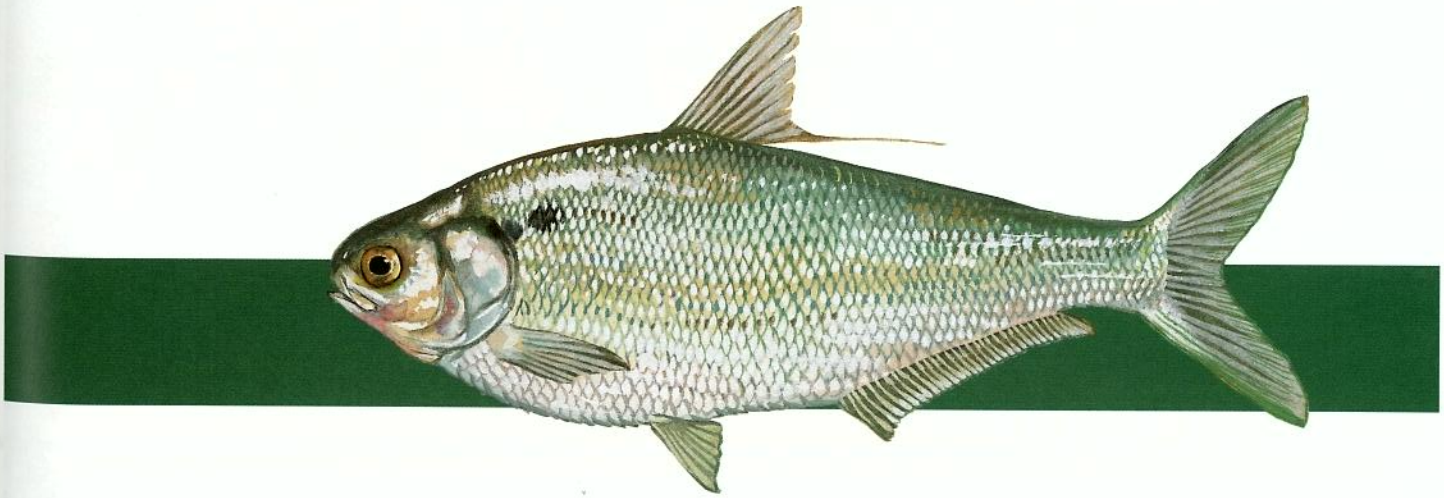
development potential of the watershed. Suggested strategies might include advocating open space preservation and incorporating cluster development concepts for residential areas. Such a development strategy could minimize total impervious surfaces, reduce total construction costs, provide open space, conserve natural areas and promote watershed protection. Strategies should also address future commercial and industrial development. Parking requirements for commercial and industrial land uses should be reviewed to see where the overall imperviousness associated with parking lots can be reduced. The use of land trusts, conservation easements and tax abatement should also be looked at as ways to promote conservation of the riparian areas without causing hardships to local economic development efforts.

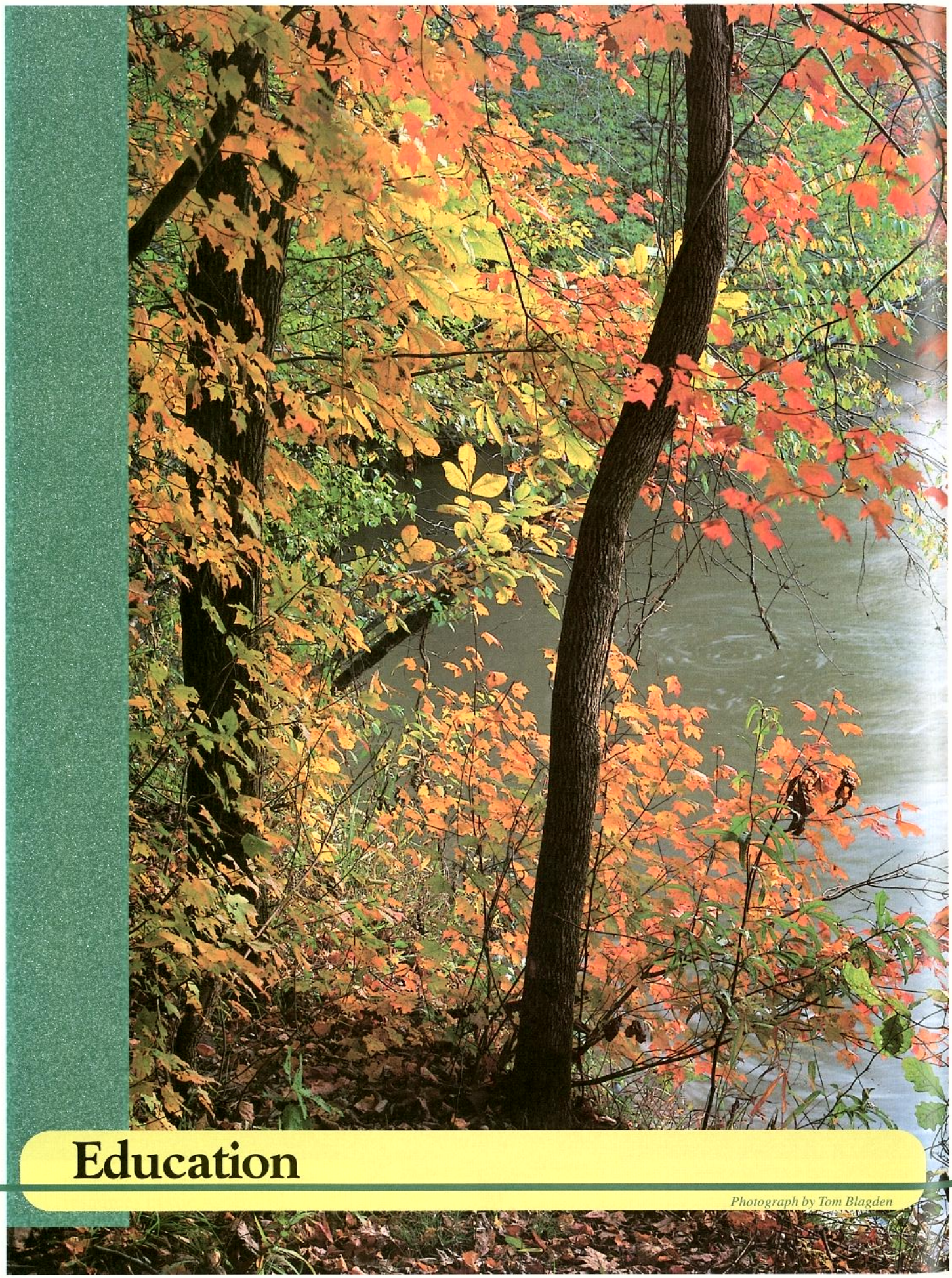
Greenville Technical College uses part of the Reedy River floodplain for stormwater, parking, and tennis

Appropriate redevelopment strategies that help reduce the necessity of additional construction in the watershed should also be explored. Additionally, these strategies should coordinate with the Greenway Master Plan to implement its recommendations. The Best Practices Council should also conduct an analysis of current development plans and regulations in the watershed in order to understand the extent of potential future development. Based on this analysis, the Best Practices Council can suggest strategies most appropriate for expected future development.

3. Develop a system to track growth, development and related environmental impacts within the watershed. This information will be provided to the appropriate agencies for use in the development of growth management policies and regulations.

   It is recommended that the Greenville County GIS Department develop a monitoring system that tracks growth within the watershed on a continual basis. This would be accomplished with the use of existing GIS information, aerial photography, satellite imagery and ground truth measures to monitor changes as they take place within the watershed. Using the county's existing GIS technology, the department could track changes in land use and identify trends. Counties, as well as school districts, special purpose districts and municipalities could use this data as they develop best practices strategies to address future growth and economic development.





Education

Photograph by Tom Blagden

Studies and polls show the majority of Americans consider themselves environmentalists and are willing to take steps and change behaviors in order to improve and maintain the quality of their environment (National Environmental Education and Training Foundation, 1999). Unfortunately, some of those same studies show that the general public does not understand the workings of the natural world. They do not know what the principal threats to our waterways are, or the manner in which their daily actions might affect those waterways.

New methods and technologies for dealing with environmental problems are developed regularly. Such developments are rarely covered in the general media and research scientists and engineers are not always successful at publicizing important findings. These are the two main problems that the Education Issue Committee sought to address. Education, outreach and communication should serve to make the community aware of river-related issues and keep people abreast of the best ways of dealing with them.

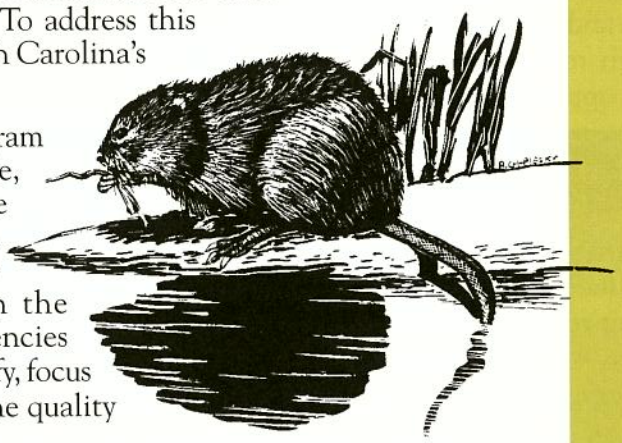
Methodology

The Education Issue Committee was chaired by Laura Blind of the Joe Adair Outdoor Education Center and consisted of members from Greenville Technical College, Clemson University, local schools and state agencies. The committee met on a regular basis. During the first few committee meetings, the members compiled a list of needs for environmental education that included:

- Increase the public's general awareness of the river
- Form networks between communities that are affected by the river
- Teach about:
  - Nonpoint source pollution
  - Point source pollution and TMDLs
  - Importance of storm water management
  - Other specific curricula
- Make sure citizens know which government officials and agencies they could turn to for help
- Increase recreation opportunities—learn through enjoyment

As the meetings progressed, the committee determined that it would not develop specific curricula because this activity would be extremely time consuming and the end result of such work would be dubious without having the specific venues where the material could be taught in place. The committee, therefore, looked at the broader picture in order to establish a framework from which a watershed education program could be built for the Reedy River.

A chief concern of the committee regarded the continued implementation of the management plan after the task force's work is complete. The public's awareness must be maintained long after publication of the plan. To address this issue, the committee looked to the program in North Carolina's Neuse River Watershed.



The Neuse River Watershed is host to a pilot program of the North Carolina Cooperative Extension Service, the *Neuse Education Team* (or the *Neuse Effort*). The *Neuse Effort* originated in 1997 when the North Carolina General Assembly approved funding to enhance environmental educational efforts in the watershed. The team works with local and state agencies and governments, as well as private citizens, to identify, focus and coordinate educational programs to improve the quality of the Neuse River.

The *Neuse Education Team* targets their programs to all within the watershed whose actions have an impact on the quality of the river. Their audiences include the agricultural and forestry community, industry, and urban, suburban and rural homeowners. They also have extensive resources that schoolteachers can use with students.

The educational methods of the *Neuse Effort* include tours of demonstration and research projects, workshops, pamphlets and other literature, conferences and specialists who are available for more individualized advice and guidance. The team coordinator also acts as a public relations coordinator and deals extensively with the media. The Education Issue Committee recommends a similar approach to the one used in the *Neuse Effort*.

A complementary approach to watershed education and maintaining public focus on the river is the establishment of a watershed education and research center. Environmental education centers stress teaching through hands-on activities and direct observation. A well-sited and equipped center can attract top researchers and the kinds of projects that would benefit water quality and ecosystem health within the Reedy basin and in similar watersheds throughout the Piedmont region.

The Education Issue Committee envisions a center (or centers) where different approaches for dealing with the river-related environmental problems can be tested and demonstrated for industries, land users and homeowners. Since the Reedy flows through urban, suburban and rural areas, environmental problems that occur in each should be addressed.

In addition, a center can be used to enhance people's appreciation and enjoyment of the river and its riparian zone through more general outdoor education and recreational opportunities.

Recommendations

After reviewing the issues that affect education, the Education Issue Committee developed and submitted the following recommendations to the Reedy River Task Force. All were subsequently approved for inclusion in this plan.

1.a. A full time watershed education/public relations coordinator, modeled loosely on that of North Carolina's *Neuse River Effort*, should be employed for the Reedy River Watershed. Education efforts, such as demonstration projects, informational literature, press releases and other media promotions should be coordinated through this position. The person hired for this position should act as a liaison between:

i. Researchers working on projects connected with the river

ii. Such researchers and the public and media

iii. Communities and governments affected by river issues

Partnering between interested parties (citizen groups, governments, educational institutions) can be facilitated through this position.

Organizations that may be suitable to administer job requirements, evaluations, salary and benefits, etc. for the coordinator position include, but are not necessary limited to, Clemson Extension, South Carolina Department of Health and Environmental Control, South Carolina Department of Natural Resources and affected Soil and Water Conservation Districts.

b. The Education Issue Committee fully supports the recommendation by the Aquatic Health and Riparian Zone Management Issue Committee that establishes a comprehensive biological assessment program for the Reedy River and its tributaries, including biotic inventories (terrestrial and aquatic), water monitoring and wetland inventories. While the primary purpose of such an assessment program should be the establishment of baseline conditions and to monitor improvement/degradation of the river, the assessment offers a unique opportunity for increasing public awareness of the river and its associated resources. The watershed education coordinator should:

i. Regularly update the local media, through press releases, photo and/or video opportunities of the purposes, progress and special findings of the assessment.

ii. Where feasible, find and take advantage of opportunities for the involvement of local schools, neighborhoods and community groups in the assessment.

In addition, the coordinator should ready for publication a nature field guide for the river and its riparian zone, using the information and data produced by these assessments.

2. Establish a watershed education center (or centers) that addresses land use and water quality issues of both the urbanized upper portion and the rural lower portion of the Reedy River Watershed. The education center(s) will:

   a. Provide a full educational experience, from classroom to in-field observation and hands-on learning.

   b. Provide grounds and facilities needed for research and demonstration projects.

   c. Bring and maintain the attention of the public to the river.

   d. Serve as a focal point for river-related issues and events.

   e. Provide river-related recreational opportunities.

   The benefits of an education center are not to be restricted to schoolchildren. Formal and informal instruction can be provided for homeowners, developers, and forestry and agricultural land users in the form of demonstration projects and seminars. University level research should also be encouraged on the grounds, if the site lends itself to such activity.

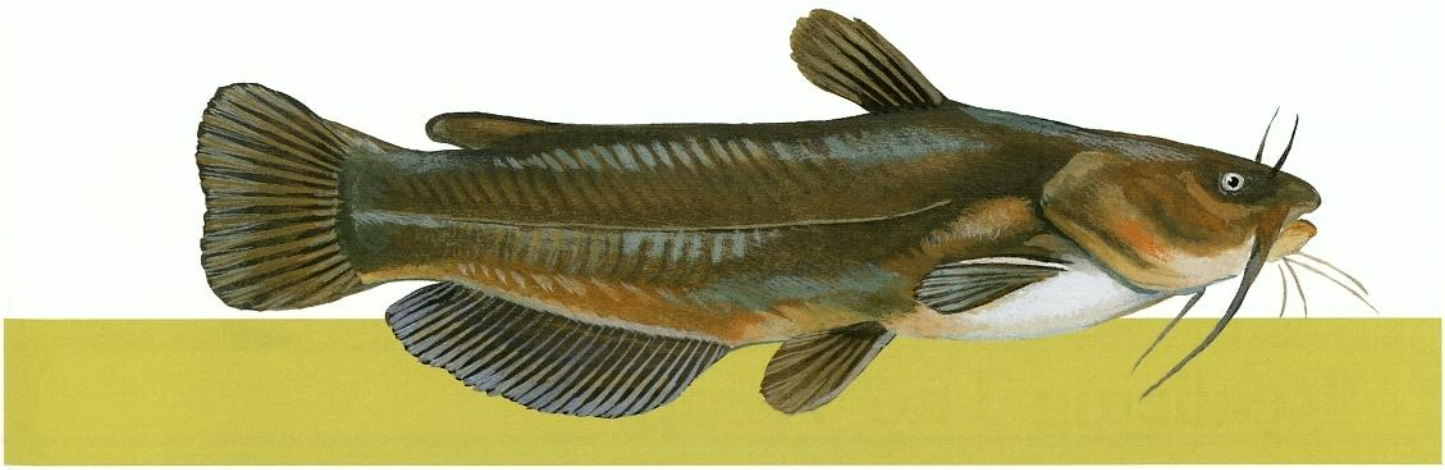
Education center facilities and surrounding lands should be sufficient to include classroom and meeting space, space for research and demonstration projects, room for interpretive materials and any necessary exhibits or overview materials that explain research and demonstration projects and site appropriate recreation facilities such as canoe landings and nature trails.

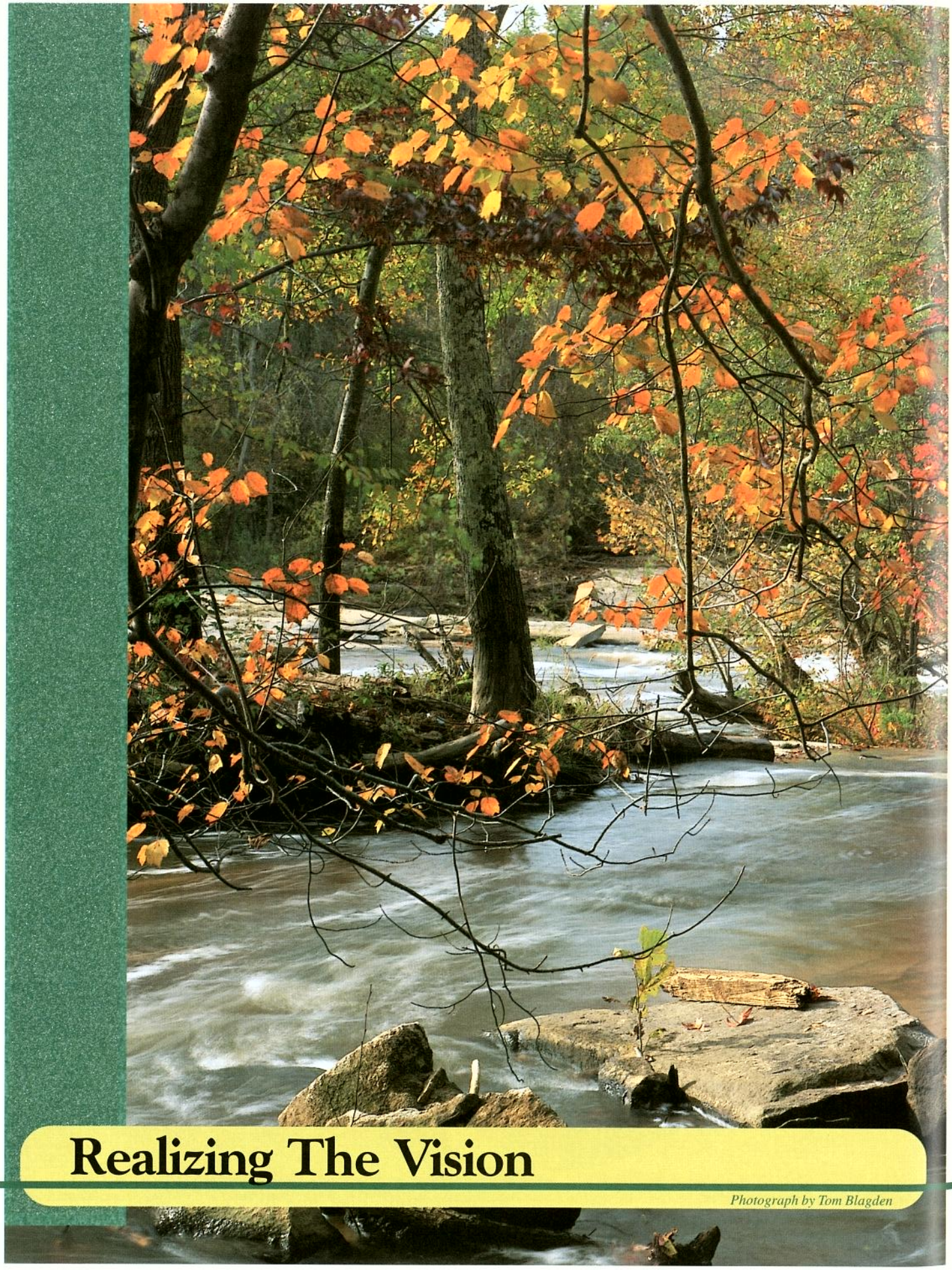
Potential sites for an education center are presented below. This list is not all-inclusive. Other sites may also be worthy of consideration.

- Taylor Island in Lake Conestee—Just south of the City of Greenville, this wooded island sits in the silted-in portion of the lake. The location makes Taylor Island ideal for research and education centered on urban water quality problems.

- The Adair Property (now owned by Clemson University)—On the lower Reedy River in Laurens County is a 500-acre tract on a rural, largely wooded area of the watershed. The size and natural environment of this parcel sets few limits on its research and education potentials. This is also an ideal site for river-related recreational opportunities.

- Brashier Campus of Greenville Technical College—This campus, south of the City of Greenville, borders the river in an area where land use is rapidly changing from agricultural to suburban residential.





Realizing The Vision

Photograph by Tom Blagden

Natural resources planning and management is becoming increasingly complex. In our never-ending attempt to simplify difficult questions and issues, we are finding that we must look at the inter-connected nature of our problems. For example, we cannot understand the quality of water in our rivers without looking at land use and land management issues.

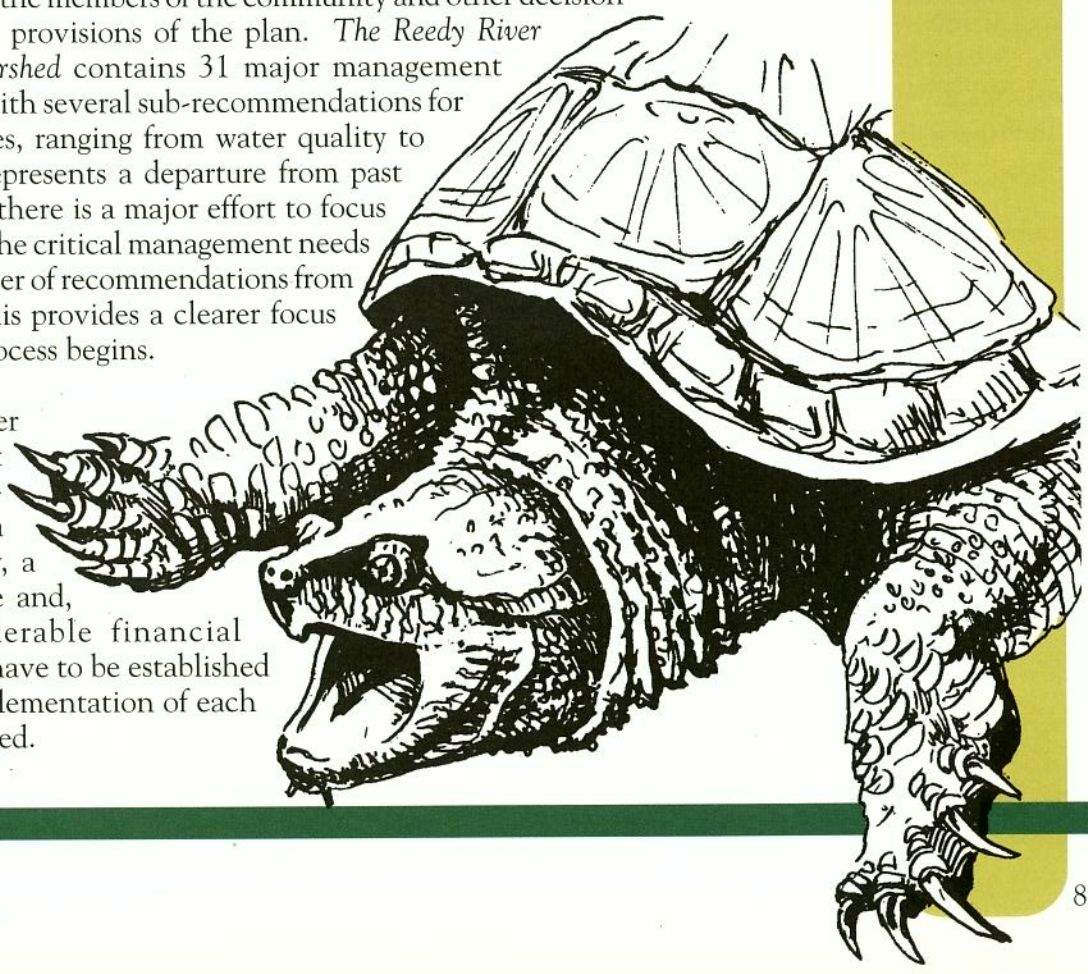
The Reedy River Report: Managing a Watershed is an attempt to examine the complexity and inter-connectedness of natural resources. Completing a watershed management plan is a challenging process. Over an 18 month period, the Reedy River Task Force, its issue committees and the general public completed an examination of the critical resources in this watershed and compiled a comprehensive management plan.

Over 140 individuals devoted significant time and effort to the completion of this study. Completing this process is a significant achievement that will contribute positively to the management of the Reedy River. However, the process of completing a plan is actually the simplest phase in resource management. The final phase in the process, the implementation phase, is always the most demanding part.

In a citizen-based planning effort, the process itself contains many positive outcomes. Participants are exposed to a variety of viewpoints, increasing the understanding of ways that different groups use the resource base and the needs of each group. A second benefit of this approach is a final plan that is based on collective wisdom, representing a balanced view that acknowledges all legitimate resource needs. This type of plan can also lead to proactive decision-making. When citizens come together to construct a common vision for resource management, the result is a guidebook for a broad cross-section of decision makers and resource users.

For all the positive benefits associated with this type of planning process, the true measure of success lies in the ability of the members of the community and other decision makers to implement the provisions of the plan. *The Reedy River Report: Managing a Watershed* contains 31 major management recommendations along with several sub-recommendations for the basin and its resources, ranging from water quality to recreation. This study represents a departure from past watershed studies in that there is a major effort to focus the recommendations on the critical management needs and limit the overall number of recommendations from each issue committee. This provides a clearer focus as the implementation process begins.

Even with a smaller number of overall management recommendations, implementation will require a carefully crafted strategy, a significant amount of time and, in some cases, considerable financial resources. Priorities will have to be established and strategies for the implementation of each recommendation developed.



Not all recommendations will require the same type of effort to implement. Many recommendations will require cooperative approaches involving partnerships among governmental entities or public-private partnerships. Implementing other recommendations will require financial resources. Many will require political decisions that must be made by local or state governments. However, an overwhelming majority of the recommendations in this plan can be implemented by landowners, river users, local organizations or political leaders who simply decide these recommendations provide a reasonable means for managing the basin's resources. Many of the recommendations in this latter group will rely upon education as the key vehicle for implementation. Regardless of which approach is needed for implementation, each recommendation will require efforts over a long period of time.

Creating An Implementation Process

One of the first steps in the implementation process is to create a permanent entity to succeed the Reedy River Task Force. The task force has recommended creating *The Reedy River Watershed Committee* to be charged with the responsibility of implementation.

The recommendation calls for this committee to be appointed by county and municipal governments in the Reedy River/Lake Greenwood Watershed. This is a critically important task. The river obviously ignores political boundaries, and long-term management and problem solving will take cooperation and communication at the local government level. County and city governments must be key players in this process.

A commitment to a permanent implementation process is critical to realizing the vision contained in this plan. The creation of *The Reedy River Watershed Committee* presents an opportunity to make the vision reality.

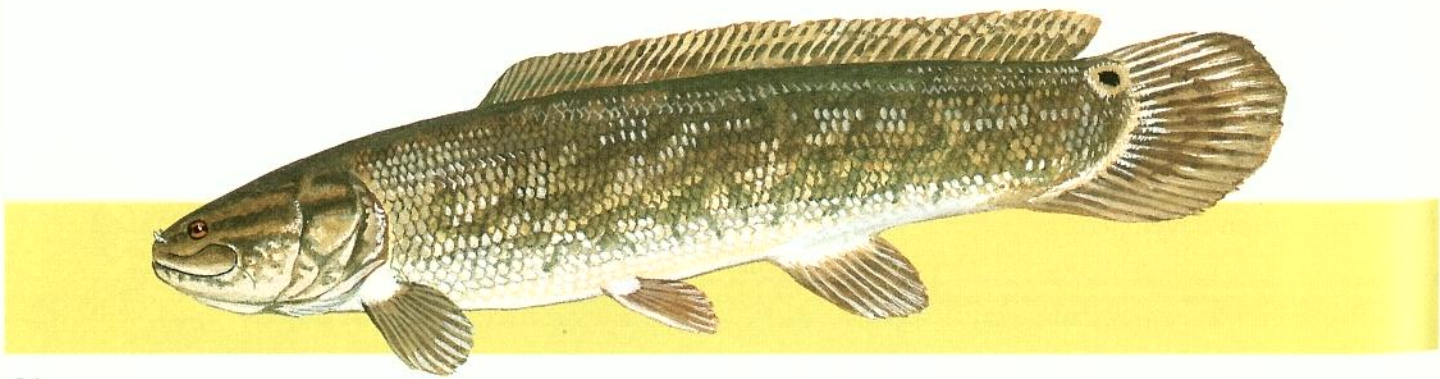
Conclusion

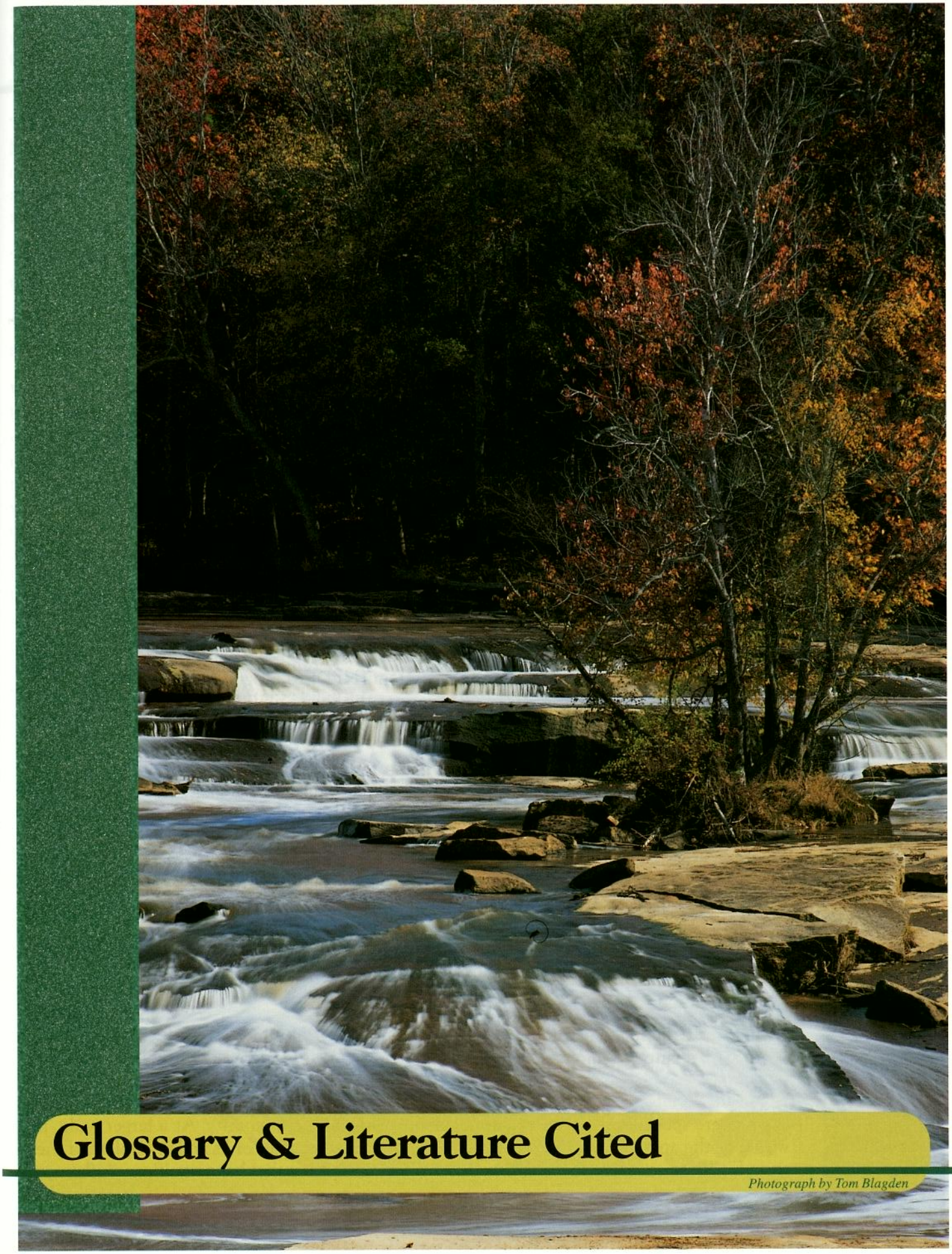
This report is the result of a community-based and inclusive planning process involving numerous citizens from throughout the Reedy River Watershed. The planning process brought people with diverse views together and has resulted in a plan grounded in local values and based on long-term sustainable management goals.

This planning process has already yielded positive benefits for the Reedy River Watershed. To fully realize the efforts of the people who created this plan, we must be committed to implementation. These implementation efforts should utilize education and a broad-based outreach strategy, as did the planning process. It will depend upon the creation of a permanent *Reedy River Watershed Committee*, with assistance from local, regional and state government.

The basin's economic, ecological, cultural and recreational resource base is constantly changing. Social and cultural forces bring change. Political forces bring change. These phenomena make our resource base dynamic. Thus, a management plan must also be dynamic and subject to change.

Aldo Leopold stated, "*A conservationist is one who is humbly aware that with each stroke he is writing his signature on the face of the land.*" In the complex world in which we now find ourselves, it is more important than ever before to use care "in writing our signature on the face of the land." We must understand the nature of the impacts our actions and decisions have upon our natural resource base. Utilizing proactive, comprehensive management plans, such as *The Reedy River Report: Managing a Watershed*, may give us an opportunity to sustain a viable resource base for those who follow in our footsteps.





Glossary & Literature Cited

Photograph by Tom Blagden

Glossary

303(d) List: Under Section 303(d) of the federal Clean Water Act, each state is required to provide a comprehensive inventory of waters that do not meet the state water quality standards or the goals of the Clean Water Act. This list is prepared biannually and identifies those waterbodies that need additional management actions.

7Q10: The lowest average flow in a river, calculated over seven days during a period of ten years.

Aquatic Macroinvertebrates: Aquatic insects and other aquatic invertebrates that are generally associated with substrates of waterbodies (including streams, rivers and lakes). These organisms can be useful indicators of water quality.

Basin Monitoring Stations: Locations from which samples are collected on a monthly basis, year round, during a during a basin's target year. Each basin within the state is targeted for additional sampling once every five years.

Habitat: The specific area or environment in which a particular type of plant or animal lives (elements of habitat include food, cover and water).

Nonpoint Source Pollution: Contamination that comes from a diffuse source rather than from a specific point. Examples include storm water runoff from roads, urban areas and agricultural areas.

NPDES Permit: Pipe discharges of treated wastewater require a permit under the federal National Pollutant Discharge Elimination System (NPDES) program. The permit is based on a wasteload allocation model that determines the river's ability to assimilate particular pollutants. The permit specifies the types and amounts of pollutants that can be released to the river by each respective discharger.

Nutrification: The process by which an excess of plant nutrients are added to a waterbody; phosphorus and nitrogen are the nutrients that typically cause the most concern in terms of nutrification.

Point Source Pollution: Contamination that comes from a specific, definable source such as an outfall pipe.

Primary Monitoring Stations: Locations from which samples are collected monthly throughout the year.

Riparian Buffer: A strip of natural vegetation along a stream or river. Riparian buffers fulfill three basic roles: maintenance of the hydrologic, hydraulic and ecological integrity of the stream channel; removal of pollution from runoff; and protection of fish and wildlife.

Riparian Zone: At the smallest scale, the riparian zone would be the immediate water's edge where specialized plants and animals form a distinct community. At a larger scale, it would be the area periodically inundated by high water; i.e., the banks and floodplain of the river. Finally, on the largest scale, it would be the band of forest that has a significant influence on the river ecosystem, or conversely is significantly influenced by the river (Hunter, 1990).

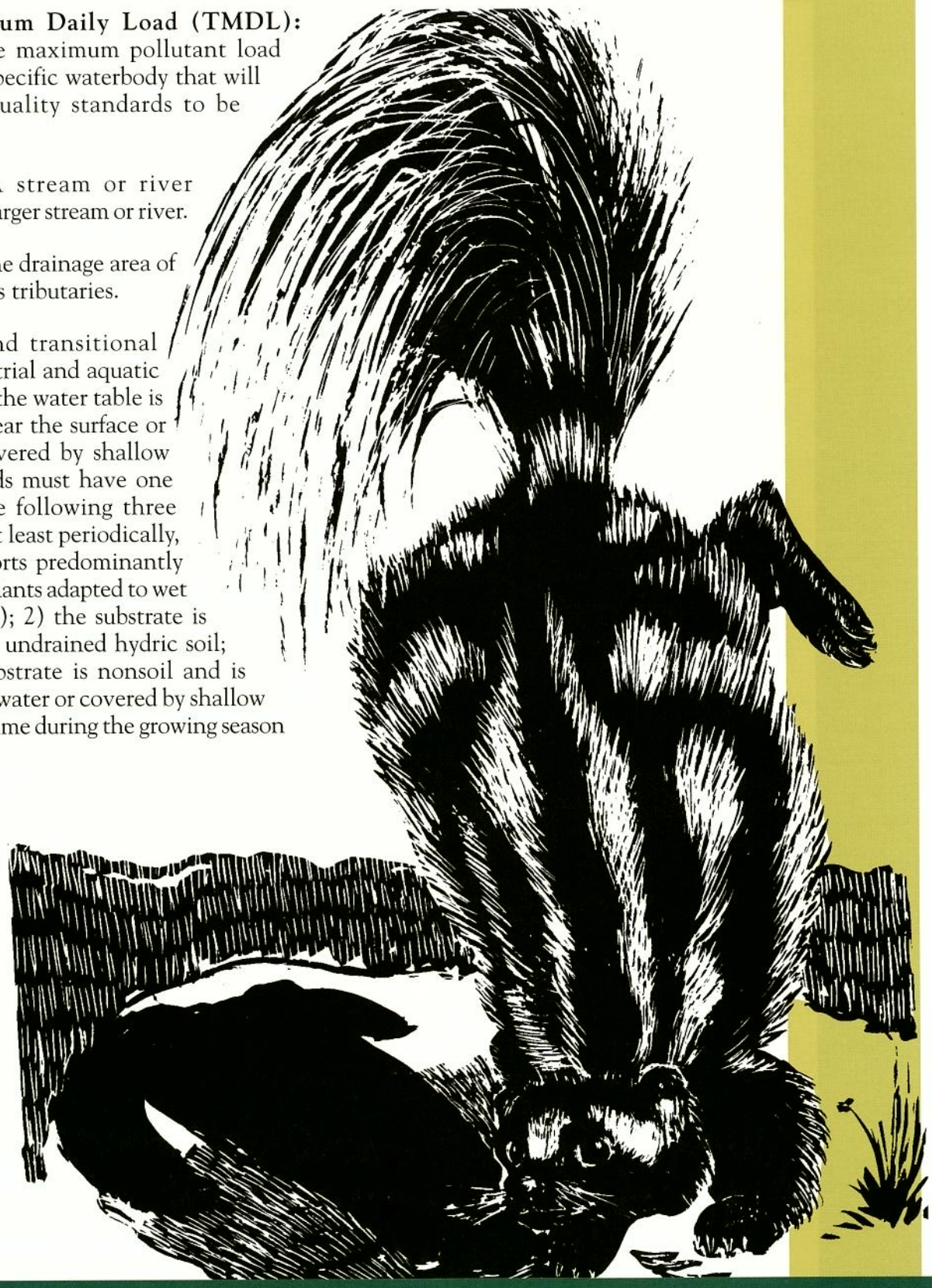
Secondary Monitoring Stations: Locations from which samples are collected monthly from May through October, a period critical to aquatic life due to higher water temperatures and lower flows.

Total Maximum Daily Load (TMDL): Represents the maximum pollutant load allowed for a specific waterbody that will allow water quality standards to be maintained.

Tributary: A stream or river flowing into a larger stream or river.

Watershed: The drainage area of a stream and its tributaries.

Wetland: Land transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands must have one or more of the following three attributes: 1) at least periodically, the land supports predominantly hydrophytes (plants adapted to wet soil conditions); 2) the substrate is predominantly undrained hydric soil; and 3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.



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Appendix A
Reedy River Flow Data, 1941-2000

Reedy River Flow Data, 1941-2000

(Peliminary- Data has not been quality reviewed)

Year	Total Annual Flow	Annual Mean Flow	Days < 7Q10 (16 cfs)	Days < 29 MGD (19 cfs)	Days < Annual Mean	Days > Annual Mean	Ratio >:< Annual Mean
1941 *	1665.00	40.81	04	10	31	NA	NA
1942	21208.00	58.10	00	12	277	88.00	0.32
1943	26250.00	71.92	00	02	277	88.00	0.32
1944	29431.00	80.41	00	00	267	99.00	0.37
1945	28616.00	78.40	00	00	285	80.00	0.28
1946	30288.00	82.98	02	03	265	100.00	0.38
1947	25431.00	69.67	02	03	266	99.00	0.37
1948	34009.00	92.92	00	00	269	97.00	0.36
1949	47308.00	129.61	00	00	292	73.00	0.25
1950	25854.00	70.83	00	00	262	103.00	0.39
1951	25565.00	70.04	00	03	287	78.00	0.27
1952	29403.00	80.34	00	09	280	86.00	0.31
1953	24456.00	67.00	15	29	256	109.00	0.43
1954	20384.00	55.85	77	95	273	92.00	0.34
1955	17579.00	48.16	10	42	279	86.00	0.31
1956	27251.00	74.46	03	28	285	81.00	0.28
1957	28243.00	77.38	02	10	254	111.00	0.44
1958	33243.00	91.08	00	00	263	102.00	0.39
1959	36215.00	99.22	00	00	272	93.00	0.34
1960	34691.00	94.78	00	00	245	121.00	0.49
1961	37730.00	103.37	00	00	288	77.00	0.27
1962	34013.00	93.19	00	00	269	96.00	0.36
1963	30330.00	83.10	00	00	302	63.00	0.21
1964	48971.00	133.80	00	00	300	66.00	0.22
1965	31418.00	86.08	00	00	255	110.00	0.43
1966	30773.00	84.31	00	02	280	85.00	0.30
1967	26901.00	73.70	00	00	268	97.00	0.36
1968	31508.00	86.09	00	00	287	79.00	0.28
1969	36675.00	100.48	00	00	280	85.00	0.30
1970	23177.00	63.50	00	00	253	112.00	0.44
1971 *	23792.00	87.15	00	00	190	NA	NA
1987 *	8861.00	42.00	00	36	161	204.00	NA
1988	16526.00	45.15	46	70	272	94.00	0.35
1989	27180.00	74.47	00	00	289	76.00	0.26
1990	31002.00	84.94	00	09	280	85.00	0.30
1991	31162.00	85.38	00	00	277	88.00	0.32
1992	31526.00	86.14	00	01	287	79.00	0.28
1993	31704.00	86.86	25	41	263	102.00	0.39
1994	30174.00	82.67	00	00	287	78.00	0.27
1995	34084.00	93.38	06	17	300	65.00	0.22
1996	29735.00	81.24	00	03	276	90.99	0.33
1997	28848.00	79.04	00	00	287	78.00	0.27
1998	33991.40	93.64	04	18	270	95.00	0.35
1999	17073.00	48.23	49	71	269	96.00	0.36
2000	16188.31	47.20	63	93	248	118.00	0.48

* Only partial data available for this year

Note: Data is unavailable from 1972 through 1986. All data are from the USGS gauging station at Mauldin Road

Appendix B
Greenville County Flood Mitigation Task Force Recommendations

EXECUTIVE SUMMARY
FLOOD MITIGATION TASK FORCE
August, 1999

On January 7, 1998, County Council formed the Flood Mitigation Task Force and charged them with making recommendations on how to respond to repeated subdivision flooding due to residential construction permitted by pre-1993 subdivision regulations as well as recent problems. The Task Force was asked to recommend viable alternatives that are "practical, citizen sensitive, cost effective and do not precipitously increase housing cost or unnecessarily 'take' property. It is preferred that this issue be addressed without the need to increase taxes or the wholesale imposition of new fees."

This Executive Summary responds to specific questions asked by Council and then addresses the broader issues of storm water management.

Specific Response to Charge:

1) Identify the nature of drainage problems and where they exist

There is a broad range of drainage problems identified in the report. Some of these, such as the Del Norte area, have had flooding problems for the past 20 years in houses that were built in the flood plain. A number of new flooding problems occurred during Hurricane Jerry in August, 1995, which dumped 15 inches of rain on Greenville in a 36 hour period. Smaller storms in early 1998 caused similar flood problems and people got very skeptical about 100 year storms and 500 year storms. People have also observed waters rising in the creeks much faster than it used to, and attribute that to development. The drought in the past twelve months has reduced some of the citizens' frustration, but they will be back when the rains return. This provides a generalized approach to all the county's flood problems.

2) Determine an appropriate level for rainstorm flooding

Since 1993, storm water design is based on the 10 year/24 hour storm. The Task Force believes that if the present laws had been historically in place (and enforced), there would not be a major problem. Needless to say, many developments were built prior to the current laws. The Task Force recommends that new designs be based on the 25 year/24 hour storm to help reduce pre-1993 problems.

3) Determine if this is an issue for retrospective regulatory intervention, and if retrospective intervention to 10-year flood proof homes is feasible. If so, who or what entity should be responsible for such action.

There is nothing the County can reasonably do to prevent problems from a situation like Hurricane Jerry. There is also very little that can be done for houses built in the 100 year flood plain, short of buying, moving or raising those houses. There are situations, however, where problems have been exacerbated by the County's growth. The Task Force believes that flood control is an issue that requires retrospective regulatory intervention. The report recommends that the County become much more active in maintaining detention ponds and live streams. The report also recommends that County funds continue to be used to clean up previous problems. The forthcoming study on Brushy Creek will provide a cost/benefit analysis for potential solutions to the problems in the Del Norte area. Those solutions might include additional upstream detention, removing downstream impediments and/or removing structures in the floodplain. This study should provide a blueprint for approaching problems that exist in other areas of the County.

4) Determine the fiscal impact to correct and how it should be financed.

The Task Force cannot estimate the total cost of this effort. The County is currently spending $425,000 per year to solve drainage problems. There will be an additional $5 million in year 2001 that can be used for this purpose. In all areas of storm water management, the Task Force recommends that the County prioritize problems by cost and benefit, and solve the highest priority problems as money becomes available. The Task Force believes that a 50/50 level of cost sharing with local residents affected by flooding is appropriate. The level of cost sharing may depend on specific circumstances.

The Task Force also believes that all property owners bear some responsibility for generating storm water runoff and therefore the use of general funds or storm water user fees for storm water management and flood mitigation is appropriate.

Basic Principles of Storm Water Management

Storm water management involves three basic principles:

- Control runoff from new development to pre development levels for the design storm.
- Let the flood plains flood.
- Minimize contaminants that can be picked up in storm water.

Although storm water contamination was not in the charge, it is hard to separate the problems of quality from the quantity problems. The recommendations in general consider both issues.

Conclusions

1. Hurricane Jerry, which dumped 15 inches of rain on Greenville in a 36 hour period, brought many of the flooding issues to the forefront. While unfortunate, the County should not base decisions on Hurricane Jerry. It will be impossible to prevent flooding from this kind of a storm.

2. The Task Force has seen few cases where the County could be considered responsible for flooding problems. However, the County is in the best position to help solve previous problems and prevent problems in the future.

3. Flood waters are rising faster in the flood plains than they used to. Most citizens believe this is due to development in the watershed, but downstream debris which blocks the stream can also be a major factor.

4. There are an estimated 550 homes constructed in the 100 year floodplain. Most of the homes were built prior to the 1993 Subdivision ordinance and most of the problems of house flooding have occurred in these homes. Having the County purchase homes on a cost share basis may be an option.

5. Homes are still being constructed in the 100-year floodplain, since FEMA has formally designated floodplains in only 1/6 of the streams. This should not be an excuse. Engineers and soil scientists can determine flood prone soils and homes should not be built in these areas.

6. There are four local agencies, five municipalities, three state agencies and six federal agencies involved with storm water management. Coordination between agencies is poor.

7. The County has some competent and hard working people in storm water management. However, the County's management systems for addressing flood problems and erosion control need improvement.

8. With money becoming available for mitigating pre-1993 problems, a management system should be established to prioritize problems by cost and benefit.

9. When properly controlled, storm water and the flood plains can become an environmental amenity in the County's future.

Recommendations

The Task Force has broken down recommendations into five general categories:

- **Master Planning by Basin**
  - Pre-1993 Problems
  - Ordinances
  - Management
  - Vision of the Future
  - Funding

Master Planning by Basin

1. Develop storm water master plans and associated costs by river basin, as well as plans for critical sub-basins. The plans should include flood levels when the basin is fully developed. (Page V-1, V-2, VI-1)

Pre-1993 Problems

2. Set up a priority system for addressing pre-1993 problems. (Page VI-2)

- Category 1: Minor Problems and Needs
- Category 2: Major Neighborhood and Floodplain Management Problems
- Category 3: Watershed Management Problems and Needs

3. Establish a Storm Water Management Advisory Board. (Page VI-3)

4. Use the Corps of Engineers study on Brushy Creek as a model for determining costs and priorities of mitigating pre-1993 flood problems. (Page VI-3)

5. Use the SC Department of Natural Resources 1998 report *Flood Hazard Mitigation – A Plan for South Carolina Agencies* for guidance on mitigation techniques. (Page VI-3, Appendix H)

Ordinances

6. Change the design storm for runoff and detention ponds from the 10-year/24 hr storm to the 25 yr/ 24 hr storm. Maintain the 10-year storm for the design of piping and ditch sections. The 100-year storm would be utilized in the design of all regional facilities. (Page VI-4)

7. Eliminate all construction in the 100-year flood plain, with the exception of utilities, recreation facilities, roads, parking and non-habitable structures except lots platted prior to the passage of this ordinance, or unless engineering justification is provided. (Page VI-4)

8. In the absence of formally designated 100-year flood plains, building construction should be prohibited in areas where vegetation, hydrology and soils indicate there are flood problems. This information is available in the 1977 Soil Survey for Greenville County and will be available on Geographical Information System (GIS). (Page VI-4)

9. Construction of utilities, roads, etc. in floodways should be controlled through the existing floodplain development permit process. (Page VI-4)

10. Modify Subdivision and Erosion Control Ordinances as appropriate to: (Page VI-5)

    - Show the impact of the 2, 10 and 25 year storms for commercial, service and industrial developments and R-15 or smaller developments in the design of detention ponds.
    - Allow R20 and Rural/Suburban classifications to use qualitative erosion controls that could include but are not limited to undisturbed land and/or buffers in lieu of detention ponds
    - Allow qualitative approaches for erosion control instead of temporary sedimentation traps during construction as long as trapping efficiency is maintained.
    - Stiffen penalties for violations of the Erosion Control Ordinance, particularly for chronic offenders. The Task Force proposes a three-step process consisting of 1) a warning, 2) a stop-work order, and 3) a $100 per day per deficiency fine until adequate corrections are made.
    - Make the builder and the lot owner, as well as the developer, responsible for erosion control.

11. Note on the tax maps all information on the 100-year flood so that potential purchasers will know when the flood plain determinations have been made. (Page VI-5)

12. Adopt cluster density policy. (VI-5)

13. Adopt a county-wide minimum 35 ft stream buffer on all streams with drainage areas of more than 50 acres. (Page VI-6)

14. Develop a green line ordinance for County subdivisions. (Page VI-7)

15. Review all regulations for ways to reduce required impervious areas. (Page VI-7)

Management

16. Establish the local Soil and Water Conservation District as the central point of public contact on storm water matters. (Page VI-8)

17. Improve Management Procedures within the Soil and Water Conservation District (Page VI-8)

    - Provide a more public-friendly phone system.
    - Observe and record all complaints of flood problems.
    - Provide Public Works with an initial opinion of priority.
    - Ensure uniform application of permit standards (including municipalities and SC DOT) throughout the County.
    - Enforce ordinances against chronic offenders.
    - Establish a system for recording, monitoring and tracking violations.

- Implement the regulations proposed in the Ordinances Section.

18. Expand current public education program to include the following initiatives: (Page VI-9, VIII-2)

    - Implement an "Adopt a Stream" program which parallels the "adopt a highway" program.
    - Identify all property owners in Greenville County who are in or near a FEMA-regulated floodplain, or who have a history of flooding.
    - Establish guidance information on the use of riparian techniques (bank slopes, rip-rap, natural trees and plants, geotextiles) for flood control.
    - Work with the NPDES Permit process to reduce the contamination from municipal operations.
    - Target educational initiatives to discrete constituencies including citizens, industry, commercial establishments and developmental interests.

19. Make an annual report to County Council documenting progress in all areas of Storm Water Management. (Page VI-10)

20. Forge an agreement with SC DOT that insures that storm water appurtenances on state roads meet local design standards. (Page VI-10)

21. Compile a master list of work of all existing information on the 100-year floodplain for all streams larger than 50 cubic feet per second (cfs) or drainage areas of 50 acres in the County. (Page VI-10)

22. Provide at least a once per year inspection of detention ponds on subdivisions, commercial sites, multi-family sites and industrial sites. If the owner refuses to maintain the pond, the County should perform the maintenance and back-bill the owner or owners. (Page VI –10, VIII-6)

23. Provide limited maintenance on live streams where trees or obstructions can cause flooding of upstream or downstream property owners. (Page VI-11, VIII-6)

24. When completed by FEMA, the County should invest in the software used for mapping flood plains and take responsibility for the mapping. The development community can use the software on a fee basis to simplify their design and help the County recover the estimated $250,000 cost. (Page V-3)

25. Use inspectors from Building Codes to help inspect erosion control measures. (Page VI-11)
26. Greenville County should take responsibility for implementing the NPDES Permit and contracting parts to WCRSA or other agencies as appropriate. (Page VI-11)

Visions of the Future

27. Establish a comprehensive greenways program in Greenville County.

28. To implement the greenways program, Greenville County should establish a Greenways Advisory Council. (Page VI-12)

29. Greenville County should encourage development of a fee-based wetlands mitigation program,as well as a stream mitigation program. The purpose of these programs would be to provide a readily available option to developers and infrasructure entities to satisfy State and Federal wetlands and stream mitigation requirements. (Page VI-13)

30. The Planning Commission should develop a green line ordinance for subdivisions. (Page VI-7)

31. Develop regional solutions for storm water detention. (Page VI – 14)

Funding

32. Utilize all available sources of funds for storm water management (Page VI-14)

    a. Storm water utility management fee
    b. County General Funds
    c. Matching state and federal funds
    d. Fees from mitigation banks
    e. Public/private partnerships for various river segments.
    f. Impact Fees

33. Establish budgets by category for various storm water initiatives. Prioritize problems and implement solutions as funds become available. (Page VI-16)

The attached report details actions that must be taken by County Council, the Soil and Water Conservation District, the Greenville Planning Commission, Greenville County Public Works Department and the Appalachian Council of Governments.

Project	Existing Budget	Proposed Increase
Soil and Water Conservation	$211,000	$150,000 (1)
County Public Services	$120,000 (2)	
Annual Special Projects	$425,000	(3)
Mitigation of pre-1993 Floodplain Problems		$5,000,000 (4)
Maintenance of Live Streams/Detention Ponds		$150,000 (5)
Basin Planning (Matching Funds)	0	$275,000 (6)
WISE Software		$250,000 (7)
Greenways Task Force	0	$150,000 (8)
Flood Warning System		$200,000 (9)
NPDES Permit Implementation	$113,000	TBD (10)
Current Annual Expenditure	**$869,000**	
Proposed Additional Annual Expenditure		**$300,000**
Special Studies, less NPDES (from $5,000,000)		**$675,000**
Software paid over time by user fees		**$250,000**

Notes:

1. This money will fund 2.5 additional positions, complaint tracking tools and public education.
2. Budget is based on the estimated percentage of time of individuals currently assigned to storm water. The County should continue their present effort until additional funds are appropriated.
3. The $425,000 annual authorization should continue until additional funds are appropriated.
4. The $5 million should be used for matching existing Corps of Engineer studies and for mitigating pre-1993 based on priorities established in those studies. It could also be used to reduce the multi-year backlog that presently exists.
5. These are new programs requiring a new source of funds. County Council should consider reimplementing the storm water fee at the previous $4 per household assessment, which yielded $1.25 million/year in funds.
6. This is a one-time expenditure for studies on Gilder, Brushy and Rocky Creeks. This could be funded from the $5 million mitigation fund.
7. This is a one-time expenditure for software in fiscal year 2000 and can be repaid from user fees.
8. This is a one time expenditure for planning and Task Force support.
9. This money can come from the $5 million and prioritized with other needs.
10. When the permit is issued, a study will be done to determine what the budget costs will be. The original Piedmont Olson Hensley estimate was $1.25 million per year.

We appreciate the opportunity to study these problems for County Council and we hope this report will prove useful to County Council and the citizens of Greenville County.
On behalf of the Task Force, we would like to thank the many people for their help. We have listed some of those people on page II-3 of the report. In particular, we would like to thank the following people who were either regular attendees at our meetings or a great help to our effort.

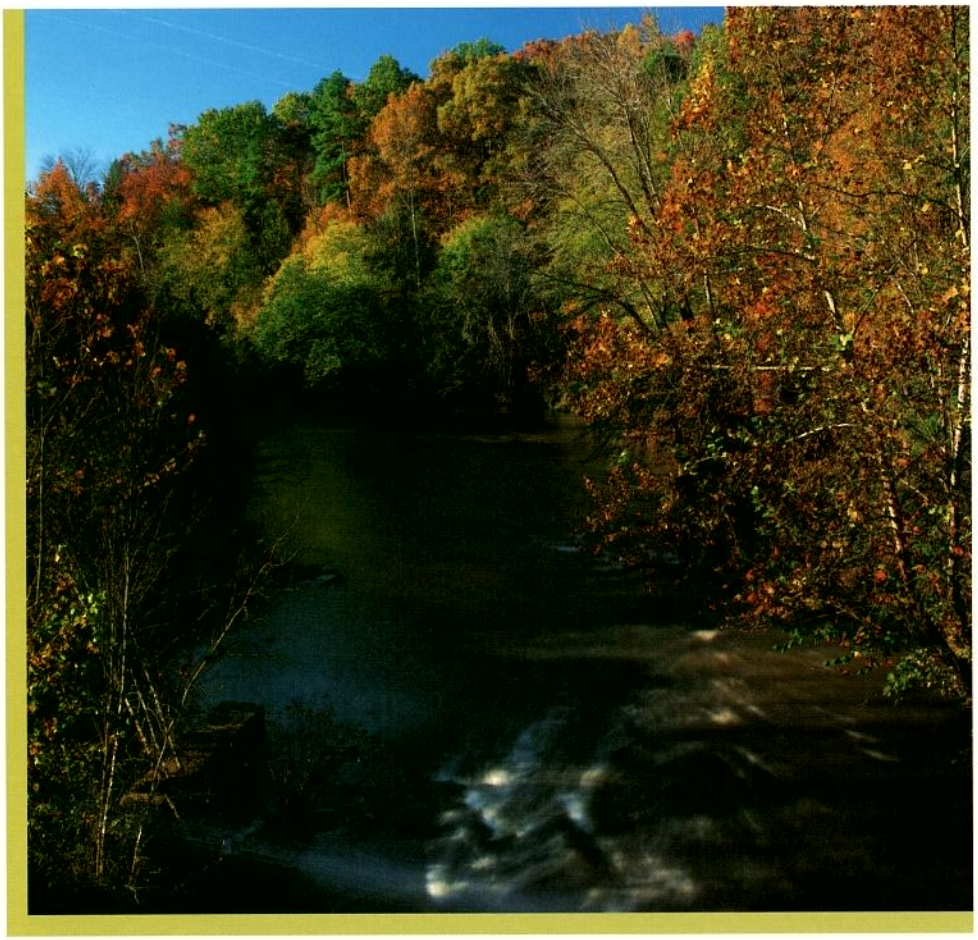
Citizens: Glen Barnes, Jim Mueller, Charles Laine, Erskine Johnson, Sister Venita.

Agency Personnel: Harold Moon, Jason Gillespie, Pat Webb, Judy Hughey, Dave Demarest

Technical/Legal: Gordon Gibson, Charles Jeter, Brad Wyche

Administrative: Sharon Coker, Chris Stapleton

Storm Water Task Force



Photograph by Tom Blagden

George W. Fletcher, Chairman
Joan Peters, Vice-Chairman

George Acker, Utility Company
Joe Barron, Consulting Engineer
Chip Bentley, Appalachian Council of Governments
Richard Cothran, Soil & Water Conservation Commission
David Hargett, Conservation Group
Dave Knapp, Simpsonville Storm Water Task Force
Charles Laico, Citizen
J.D. Martin, Consulting Engineer
Drew Norwood, Real Estate Company
Ray Orvin, WCRSA
Deb Sofield, Citizen
Bill Streyer, Realtor

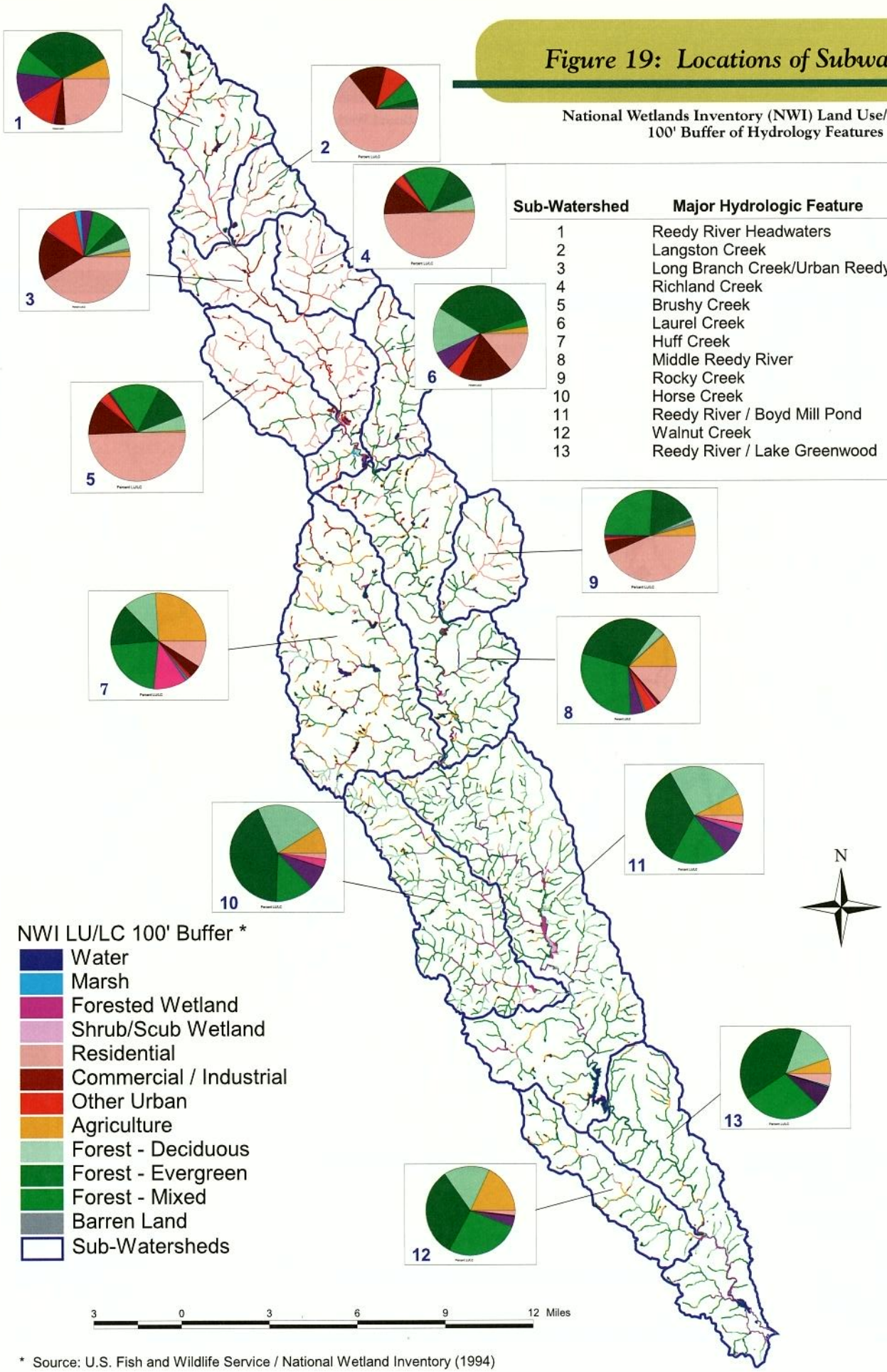
Original appointees Rich Parker, Citizen and Wes Giles, Homebuilders Association, stopped participating on the Task Force in February, 1998. Gordon Gibson represented the Homebuilders Association on the Subdivision Ordinance Sub-Committee.

Appendix C: Buffer Land Use and Acreages for Each of the 13 Subwatersheds of the Reedy River

The figures contained in this appendix illustrate, by subwatershed, the amount of land and the type of use that would be required for creation of a 100-foot riparian buffer within the Reedy River Watershed. First, Figure 19 illustrates the locations of each of these subwatersheds with a pie-chart representing the amount of land in each subwatershed by use. The pie-charts are helpful because they clearly illustrate the differences in land use between the northern and southern portions of the watershed. Note that in the subwatersheds of the northern portion, the pie-charts are mostly pink and red, representing urban uses. Conversely, in the subwatersheds of the southern portion, the pie-charts are mostly green, representing forest lands. Figures 20 through 31 illustrate each subwatershed in the Reedy River.

Figure 19: Locations of Subwatersheds

National Wetlands Inventory (NWI) Land Use/Land Cover
100' Buffer of Hydrology Features



Sub-Watershed	Major Hydrologic Feature
1	Reedy River Headwaters
2	Langston Creek
3	Long Branch Creek/Urban Reedy River
4	Richland Creek
5	Brushy Creek
6	Laurel Creek
7	Huff Creek
8	Middle Reedy River
9	Rocky Creek
10	Horse Creek
11	Reedy River / Boyd Mill Pond
12	Walnut Creek
13	Reedy River / Lake Greenwood

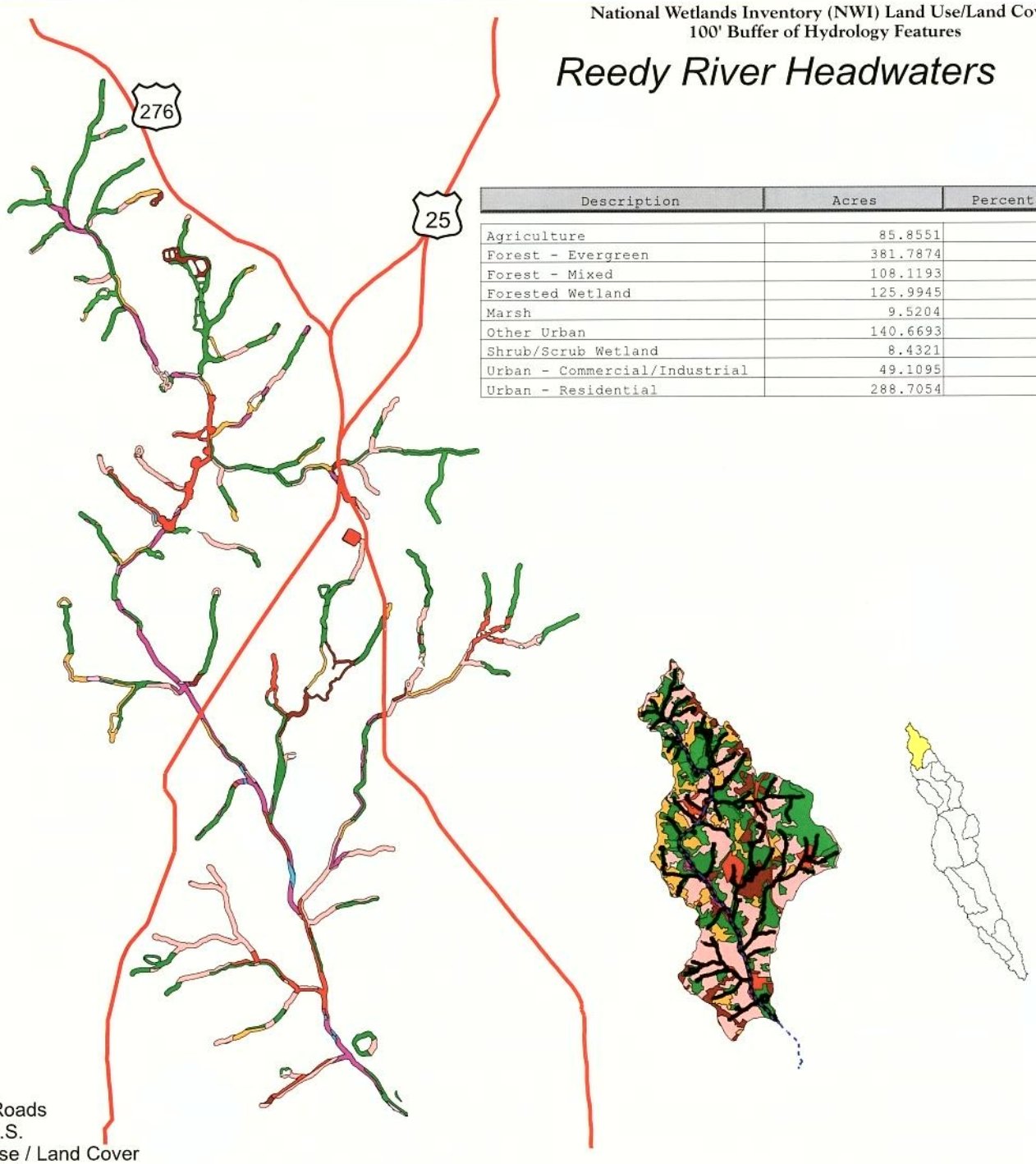
* Source: U.S. Fish and Wildlife Service / National Wetland Inventory (1994)

Figure 20: Reedy River Headwaters

National Wetlands Inventory (NWI) Land Use/Land Cover
100' Buffer of Hydrology Features

Reedy River Headwaters

Description	Acres	Percent LU/LC
Agriculture	85.8551	7.17
Forest - Evergreen	381.7874	31.86
Forest - Mixed	108.1193	9.02
Forested Wetland	125.9945	10.52
Marsh	9.5204	0.79
Other Urban	140.6693	11.74
Shrub/Scrub Wetland	8.4321	0.70
Urban - Commercial/Industrial	49.1095	4.10
Urban - Residential	288.7054	24.10



Major Roads
U.S.
Land Use / Land Cover
Water
Marsh
Forested Wetland
Shrub/Scub Wetland
Residential
Commercial / Industrial
Other Urban
Agriculture
Forest - Deciduous
Forest - Evergreen
Forest - Mixed
Barren Land

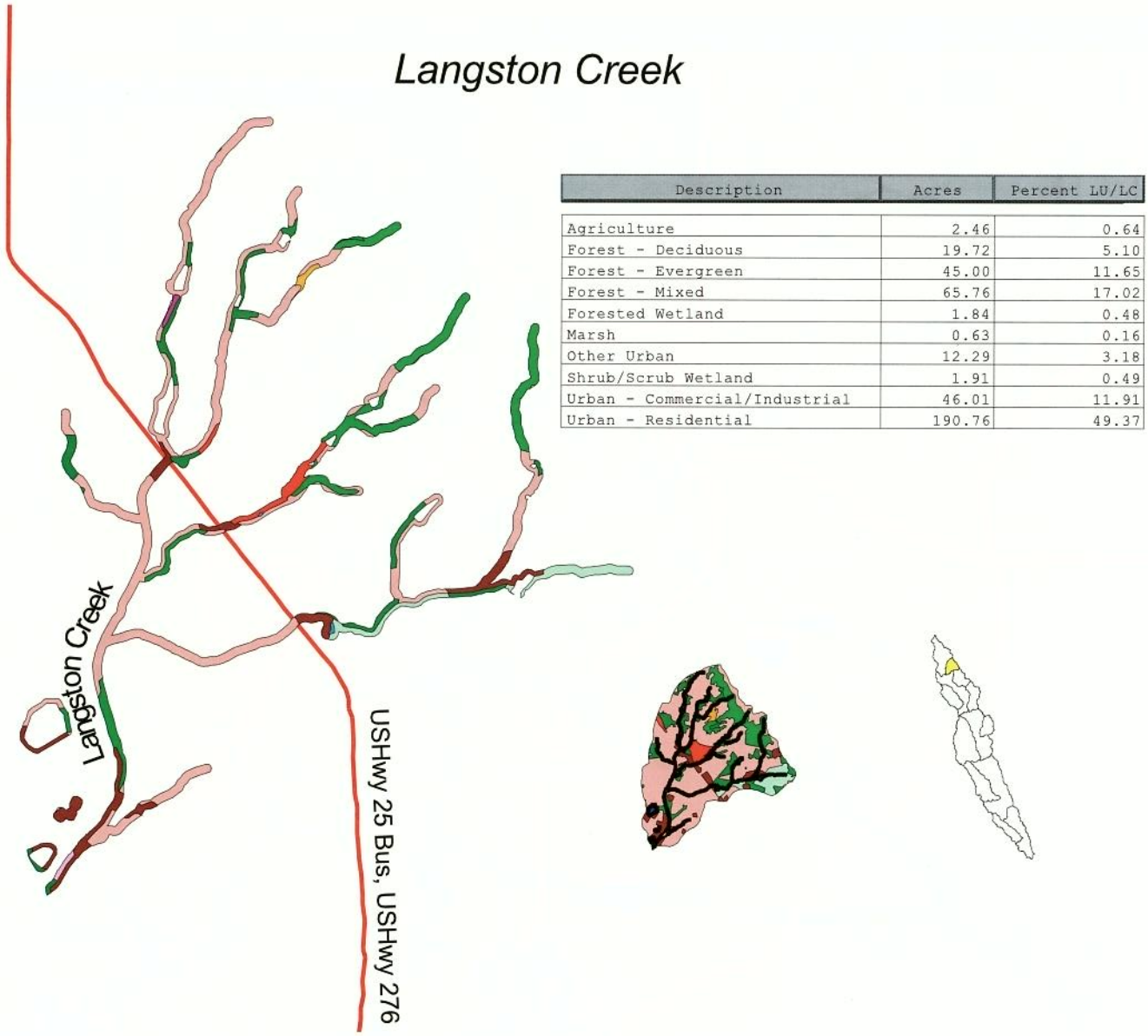
1 0 1 2 Miles

N

Source: U.S. Fish and Wildlife Service / National Wetland Inventory (1994)

Figure 21: Langston Creek Subwatershed

National Wetlands Inventory (NWI) Land Use/Land Cover
100' Buffer of Hydrology Features



Description	Acres	Percent LU/LC
Agriculture	2.46	0.64
Forest - Deciduous	19.72	5.10
Forest - Evergreen	45.00	11.65
Forest - Mixed	65.76	17.02
Forested Wetland	1.84	0.48
Marsh	0.63	0.16
Other Urban	12.29	3.18
Shrub/Scrub Wetland	1.91	0.49
Urban - Commercial/Industrial	46.01	11.91
Urban - Residential	190.76	49.37

Land Cover/Land Use
- Water
- Marsh
- Forested Wetland
- Shrub/Scub Wetland
- Residential
- Commercial / Industrial
- Other Urban
- Agriculture
- Forest - Deciduous
- Forest - Evergreen
- Forest - Mixed
- Barren Land

Major Roads
- U.S. Highways

2 0 2 4 Miles

N

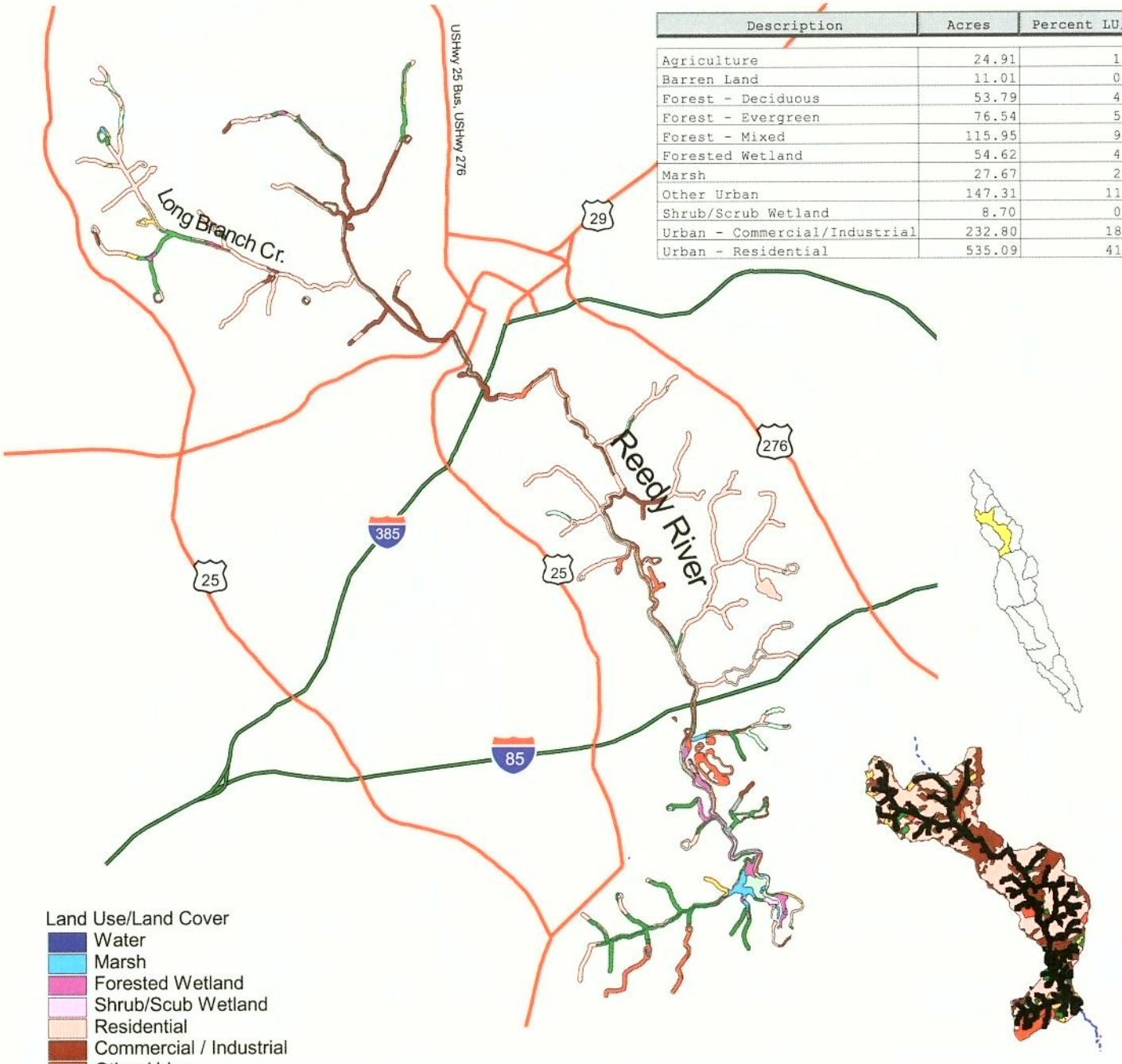
Source: U.S. Fish and Wildlife Service / National Wetland Inventory (1994)

Figure 22: Long Branch Creek/Urban Reedy River Subwatershed

National Wetlands Inventory (NWI) Land Use/Land Cover
100' Buffer of Hydrology Features

Long Branch Creek / Urban Reedy River

Description	Acres	Percent LU/LC
Agriculture	24.91	1.93
Barren Land	11.01	0.85
Forest - Deciduous	53.79	4.17
Forest - Evergreen	76.54	5.94
Forest - Mixed	115.95	9.00
Forested Wetland	54.62	4.24
Marsh	27.67	2.15
Other Urban	147.31	11.43
Shrub/Scrub Wetland	8.70	0.68
Urban - Commercial/Industrial	232.80	18.07
Urban - Residential	535.09	41.53

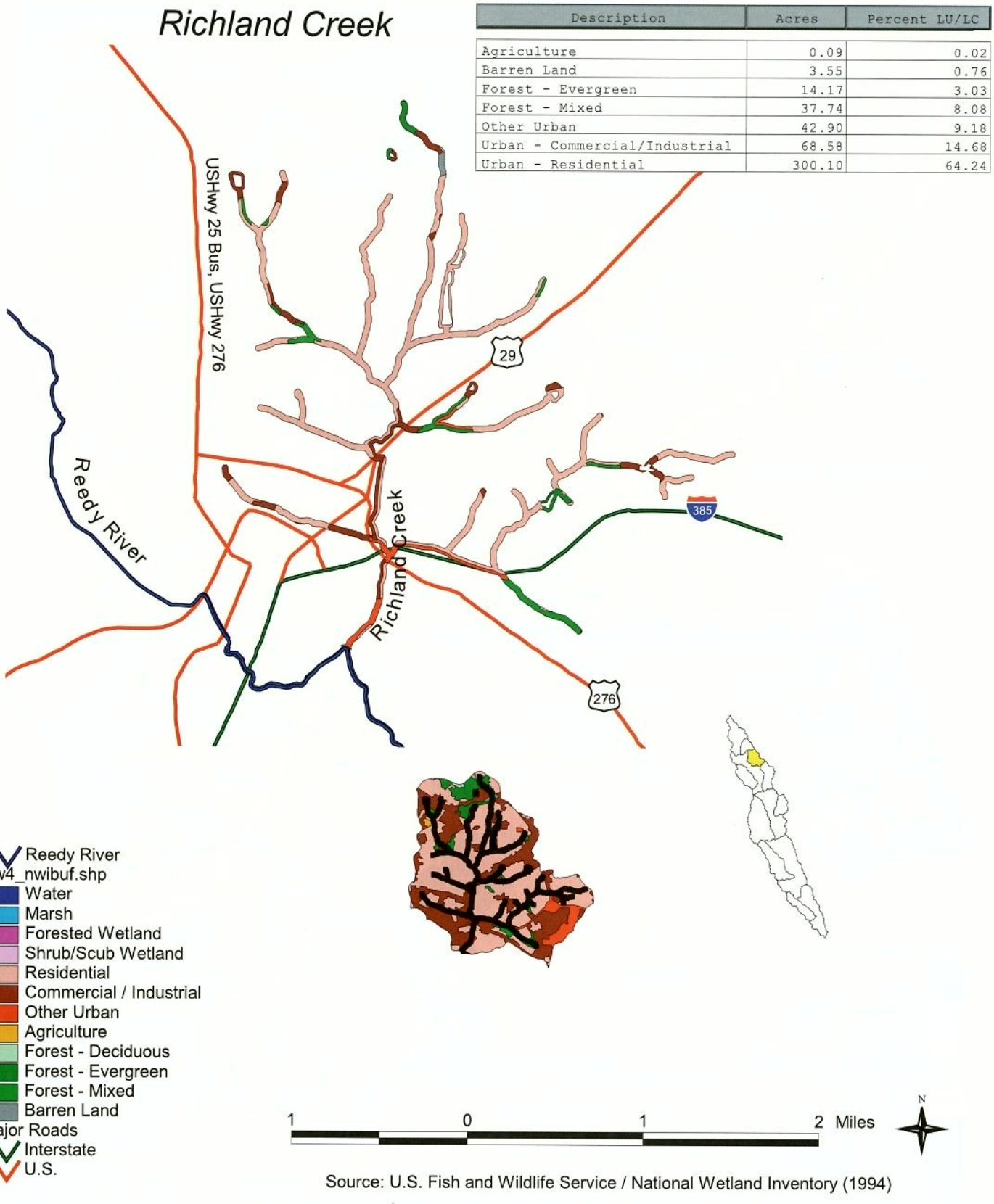


Source: U.S. Fish and Wildlife Service / National Wetland Inventory (1994)

Figure 23: Richland Creek Subwatershed

National Wetlands Inventory (NWI) Land Use/Land Cover
100' Buffer of Hydrology Features

Description	Acres	Percent LU/LC
Agriculture	0.09	0.02
Barren Land	3.55	0.76
Forest - Evergreen	14.17	3.03
Forest - Mixed	37.74	8.08
Other Urban	42.90	9.18
Urban - Commercial/Industrial	68.58	14.68
Urban - Residential	300.10	64.24



Source: U.S. Fish and Wildlife Service / National Wetland Inventory (1994)

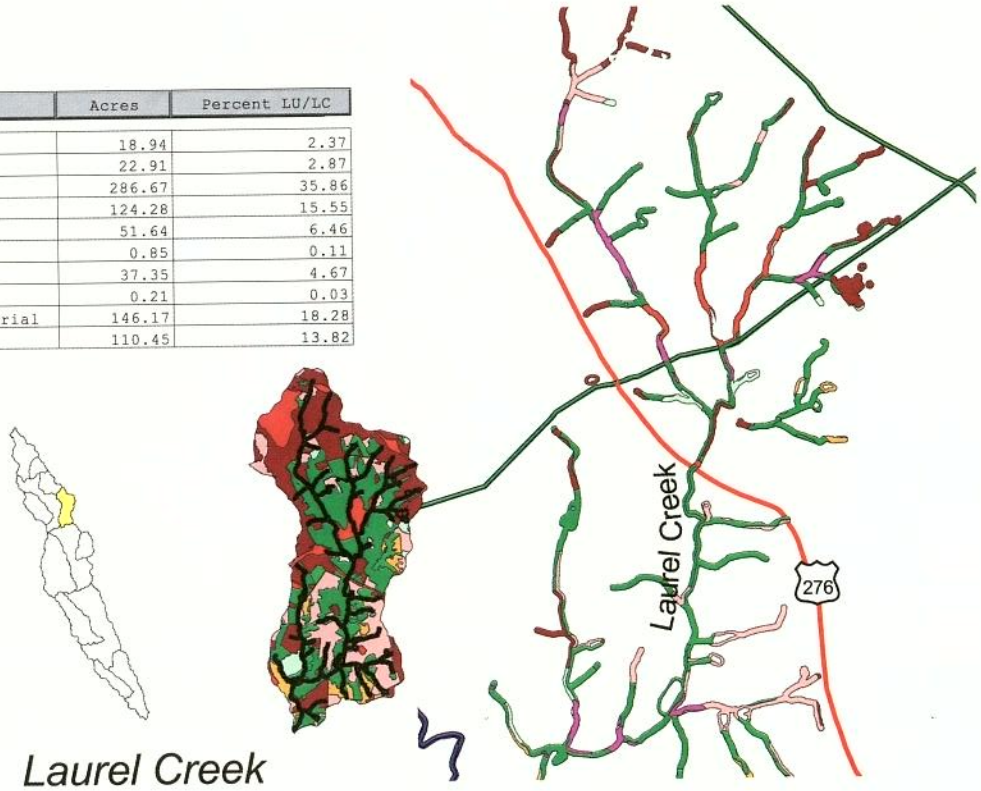
Figure 24: Brushy Creek and Laurel Creek Subwatersheds

Brushy Creek

National Wetlands Inventory (NWI) Land Use/Land Cover
100' Buffer of Hydrology Features

Description	Acres	Percent LU/LC
Agriculture	2.46	0.64
Forest - Deciduous	19.72	5.10
Forest - Evergreen	45.00	11.65
Forest - Mixed	65.76	17.02
Forested Wetland	1.84	0.48
Marsh	0.63	0.16
Other Urban	12.29	3.18
Shrub/Scrub Wetland	1.91	0.49
Urban - Commercial/Industrial	46.01	11.91
Urban - Residential	190.76	49.37

Description	Acres	Percent LU/LC
Agriculture	18.94	2.37
Forest - Deciduous	22.91	2.87
Forest - Evergreen	286.67	35.86
Forest - Mixed	124.28	15.55
Forested Wetland	51.64	6.46
Marsh	0.85	0.11
Other Urban	37.35	4.67
Shrub/Scrub Wetland	0.21	0.03
Urban - Commercial/Industrial	146.17	18.28
Urban - Residential	110.45	13.82



Laurel Creek

Land Cover/Land Use
- Water
- Marsh
- Forested Wetland
- Shrub/Scub Wetland
- Residential
- Commercial / Industrial
- Other Urban
- Agriculture
- Forest - Deciduous
- Forest - Evergreen
- Forest - Mixed
- Barren Land

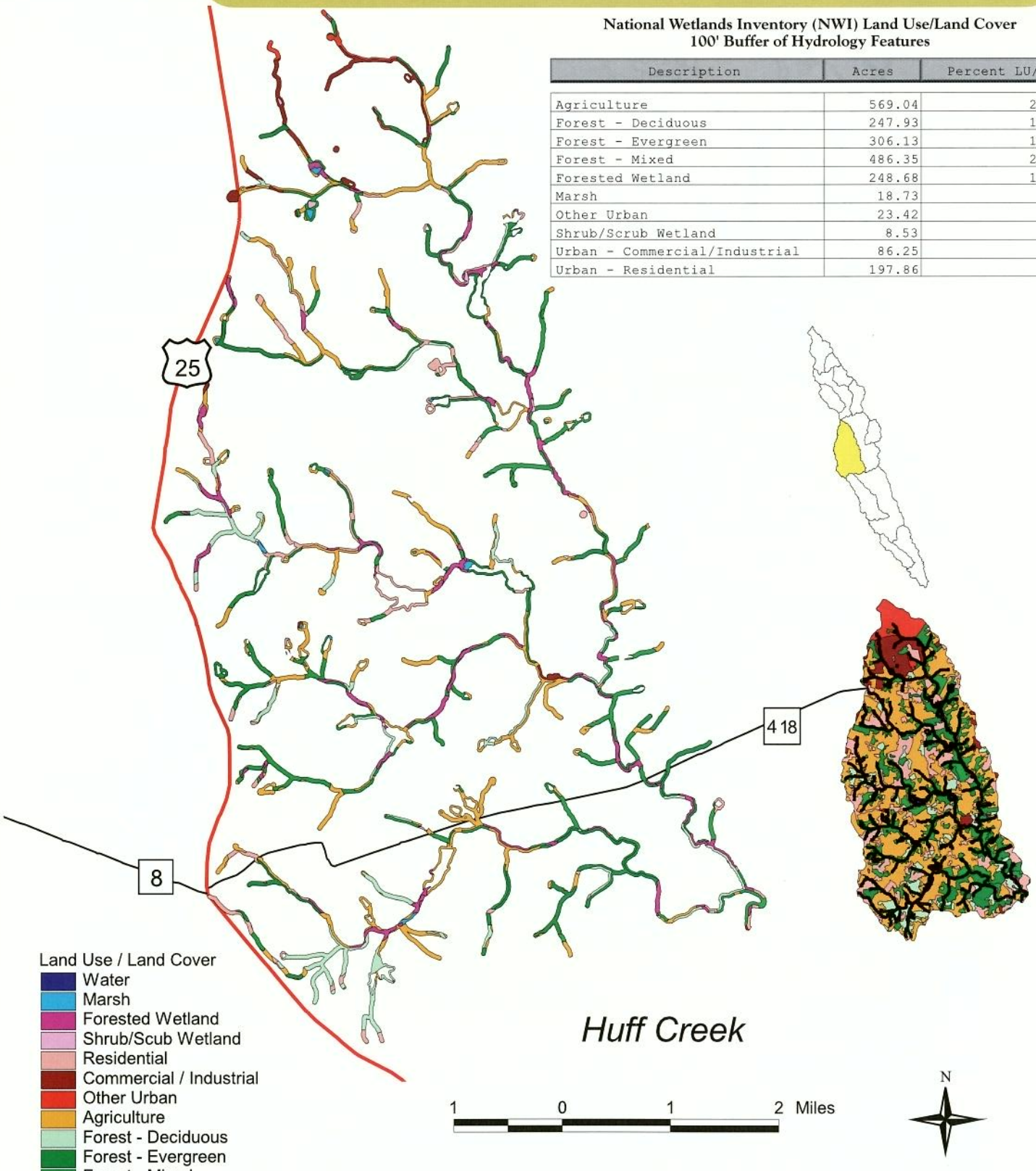
Major Roads
- U.S. Highways

1 0 1 2 Miles

N

Source: U.S. Fish and Wildlife Service / National Wetland Inventory (1994)

Figure 25: Huff Creek Subwatershed

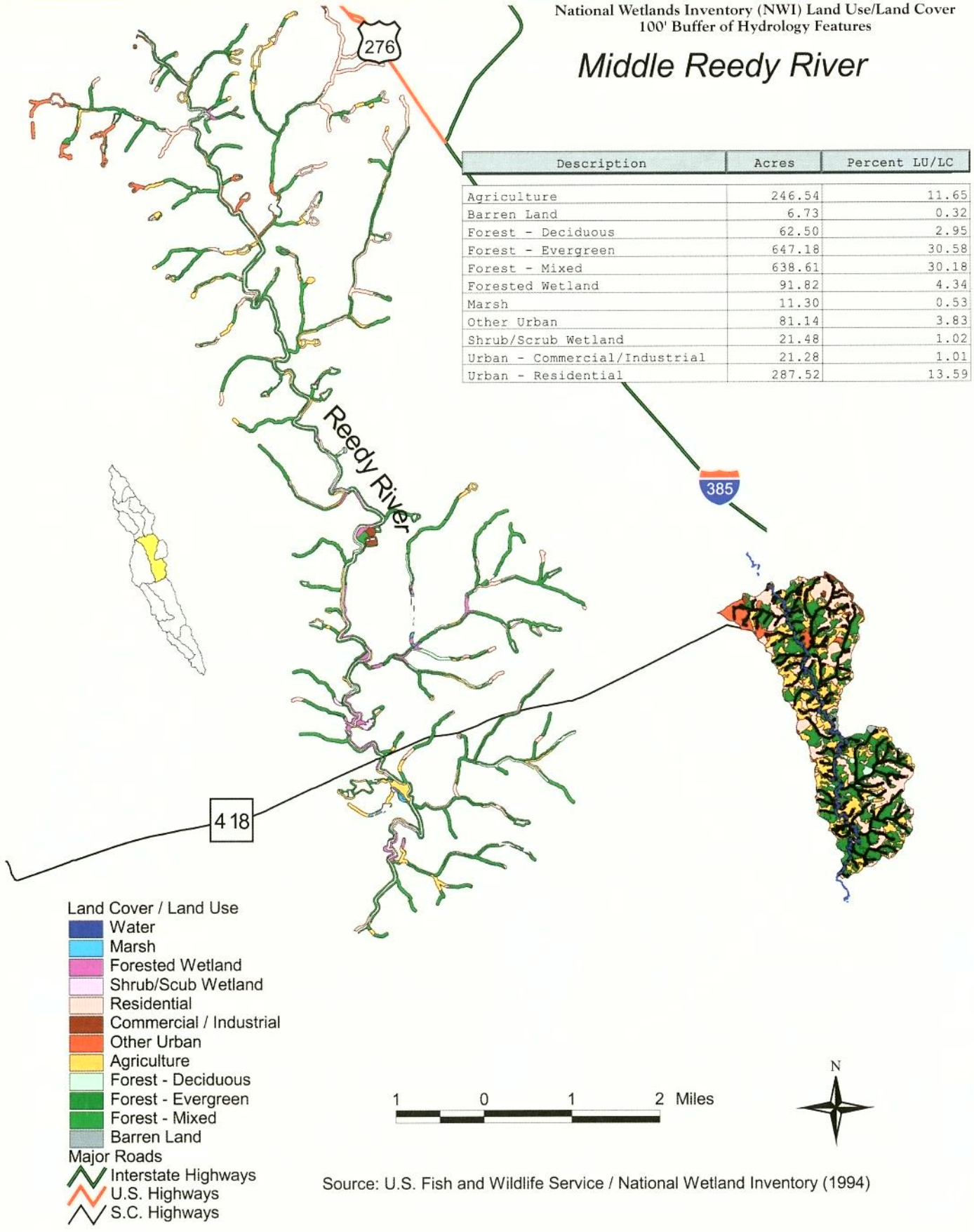


National Wetlands Inventory (NWI) Land Use/Land Cover
100' Buffer of Hydrology Features

Description	Acres	Percent LU/LC
Agriculture	569.04	25.95
Forest - Deciduous	247.93	11.31
Forest - Evergreen	306.13	13.96
Forest - Mixed	486.35	22.18
Forested Wetland	248.68	11.34
Marsh	18.73	0.85
Other Urban	23.42	1.07
Shrub/Scrub Wetland	8.53	0.39
Urban - Commercial/Industrial	86.25	3.93
Urban - Residential	197.86	9.02

Source: U.S. Fish and Wildlife Service / National Wetland Inventory (1994)

Figure 26: Middle Reedy River Subwatershed



Description	Acres	Percent LU/LC
Agriculture	246.54	11.65
Barren Land	6.73	0.32
Forest - Deciduous	62.50	2.95
Forest - Evergreen	647.18	30.58
Forest - Mixed	638.61	30.18
Forested Wetland	91.82	4.34
Marsh	11.30	0.53
Other Urban	81.14	3.83
Shrub/Scrub Wetland	21.48	1.02
Urban - Commercial/Industrial	21.28	1.01
Urban - Residential	287.52	13.59

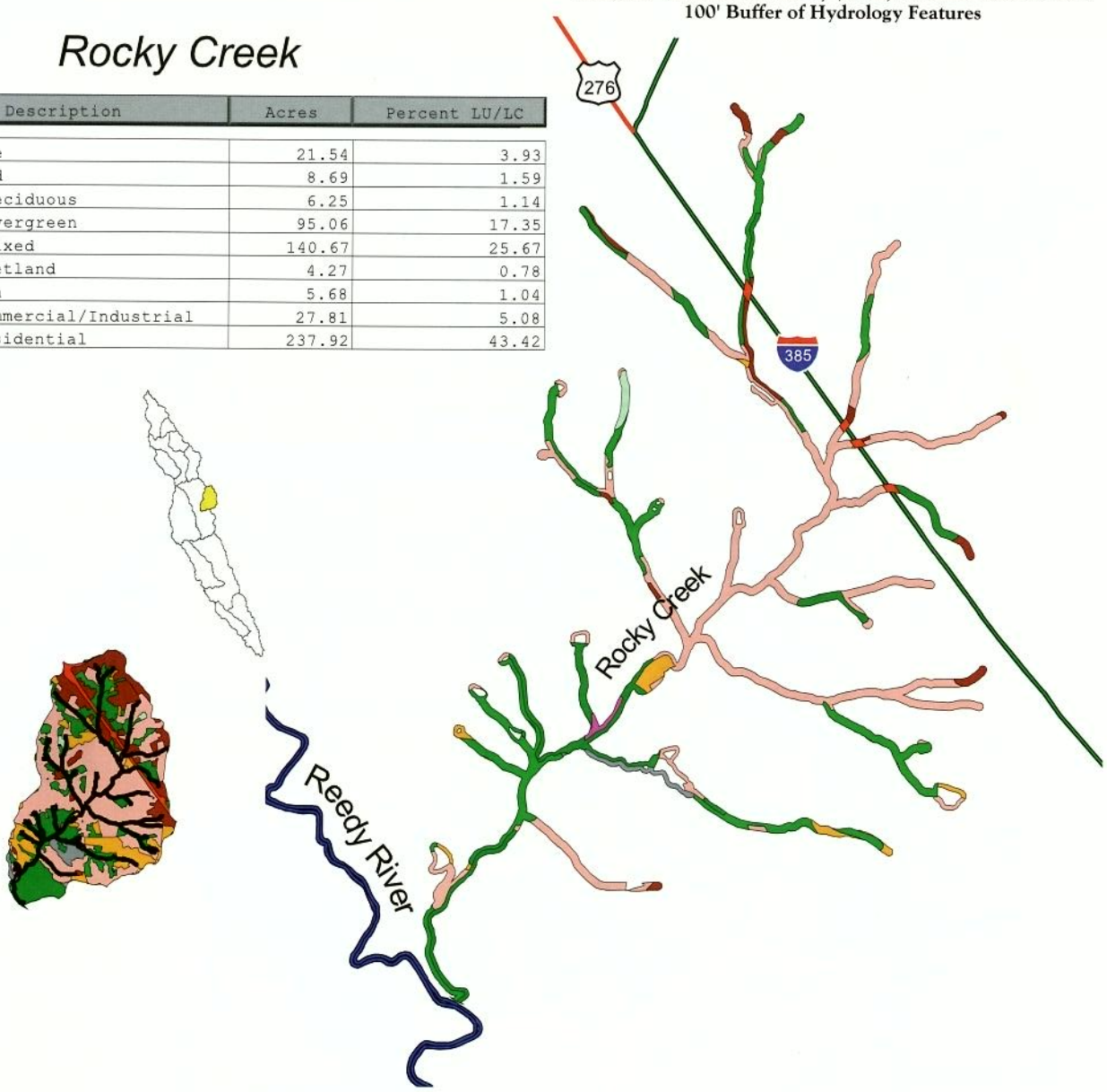
Source: U.S. Fish and Wildlife Service / National Wetland Inventory (1994)

Figure 27: Rocky Creek Subwatershed

National Wetlands Inventory (NWI) Land Use/Land Cover
100' Buffer of Hydrology Features

Rocky Creek

Description	Acres	Percent LU/LC
Agriculture	21.54	3.93
Barren Land	8.69	1.59
Forest - Deciduous	6.25	1.14
Forest - Evergreen	95.06	17.35
Forest - Mixed	140.67	25.67
Forested Wetland	4.27	0.78
Other Urban	5.68	1.04
Urban - Commercial/Industrial	27.81	5.08
Urban - Residential	237.92	43.42



Land Use / Land Cover
- Water
- Marsh
- Forested Wetland
- Shrub/Scub Wetland
- Residential
- Commercial / Industrial
- Other Urban
- Agriculture
- Forest - Deciduous
- Forest - Evergreen
- Forest - Mixed
- Barren Land
- Reedy River

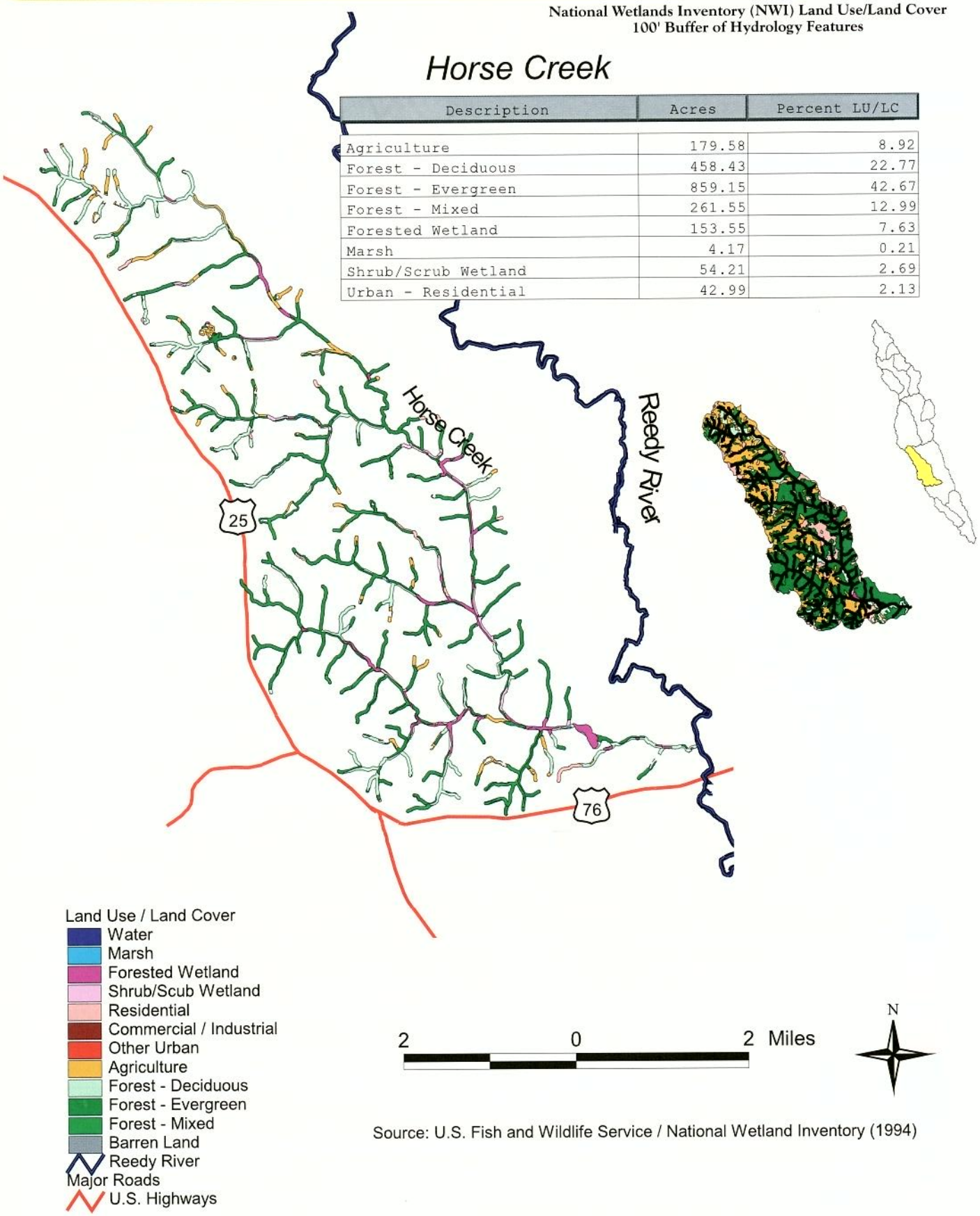
Major Roads
- Interstate Highways
- U.S. Highways

1 0 1 Miles

N

Source: U.S. Fish and Wildlife Service / National Wetland Inventory (1994)

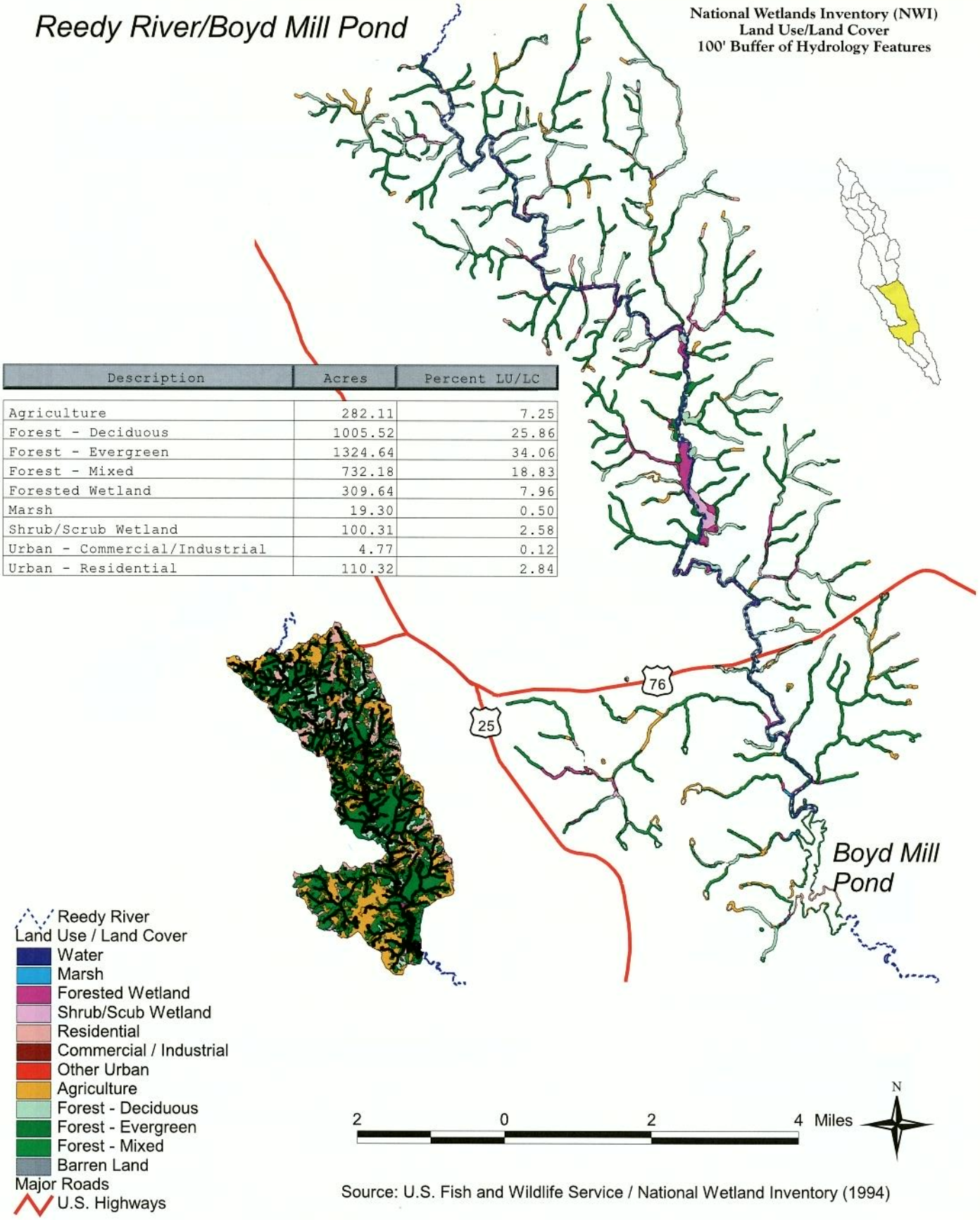
Figure 28: Horse Creek Subwatershed



Description	Acres	Percent LU/LC
Agriculture	179.58	8.92
Forest - Deciduous	458.43	22.77
Forest - Evergreen	859.15	42.67
Forest - Mixed	261.55	12.99
Forested Wetland	153.55	7.63
Marsh	4.17	0.21
Shrub/Scrub Wetland	54.21	2.69
Urban - Residential	42.99	2.13

Source: U.S. Fish and Wildlife Service / National Wetland Inventory (1994)

Figure 29: Reedy River/Boyd Mill Pond Subwatershed



Description	Acres	Percent LU/LC
Agriculture	282.11	7.25
Forest - Deciduous	1005.52	25.86
Forest - Evergreen	1324.64	34.06
Forest - Mixed	732.18	18.83
Forested Wetland	309.64	7.96
Marsh	19.30	0.50
Shrub/Scrub Wetland	100.31	2.58
Urban - Commercial/Industrial	4.77	0.12
Urban - Residential	110.32	2.84

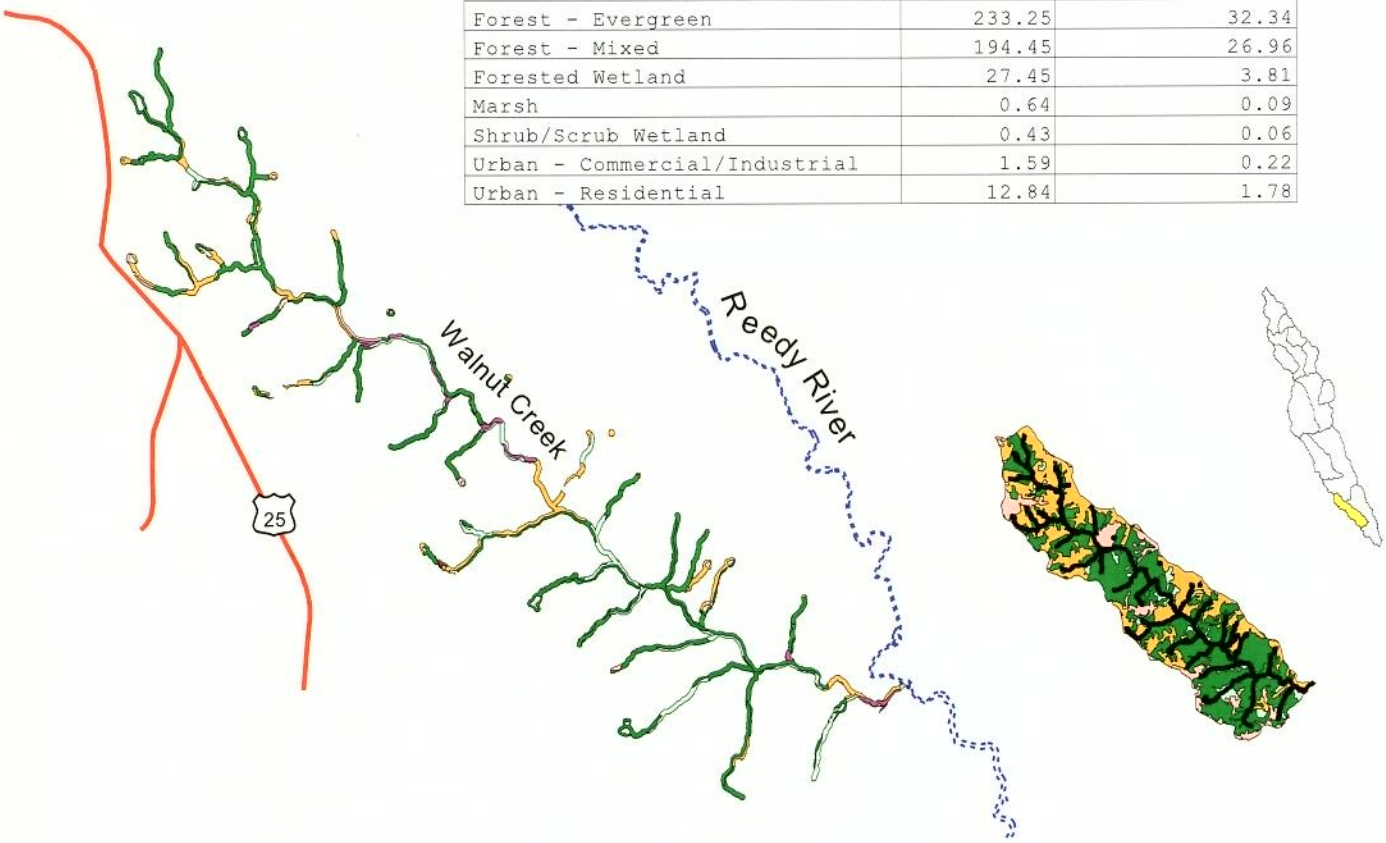
Source: U.S. Fish and Wildlife Service / National Wetland Inventory (1994)

Figure 30: Walnut Creek Subwatershed

National Wetlands Inventory (NWI) Land Use/Land Cover
100' Buffer of Hydrology Features

Walnut Creek

Description	Acres	Percent LU/LC
Agriculture	129.81	18.00
Forest - Deciduous	120.81	16.75
Forest - Evergreen	233.25	32.34
Forest - Mixed	194.45	26.96
Forested Wetland	27.45	3.81
Marsh	0.64	0.09
Shrub/Scrub Wetland	0.43	0.06
Urban - Commercial/Industrial	1.59	0.22
Urban - Residential	12.84	1.78



Land Cover/Land Use
- Water
- Marsh
- Forested Wetland
- Shrub/Scub Wetland
- Residential
- Commercial / Industrial
- Other Urban
- Agriculture
- Forest - Deciduous
- Forest - Evergreen
- Forest - Mixed
- Barren Land
- Reedy River

Major Roads
- U.S.

N

1 0 1 2 3 Miles

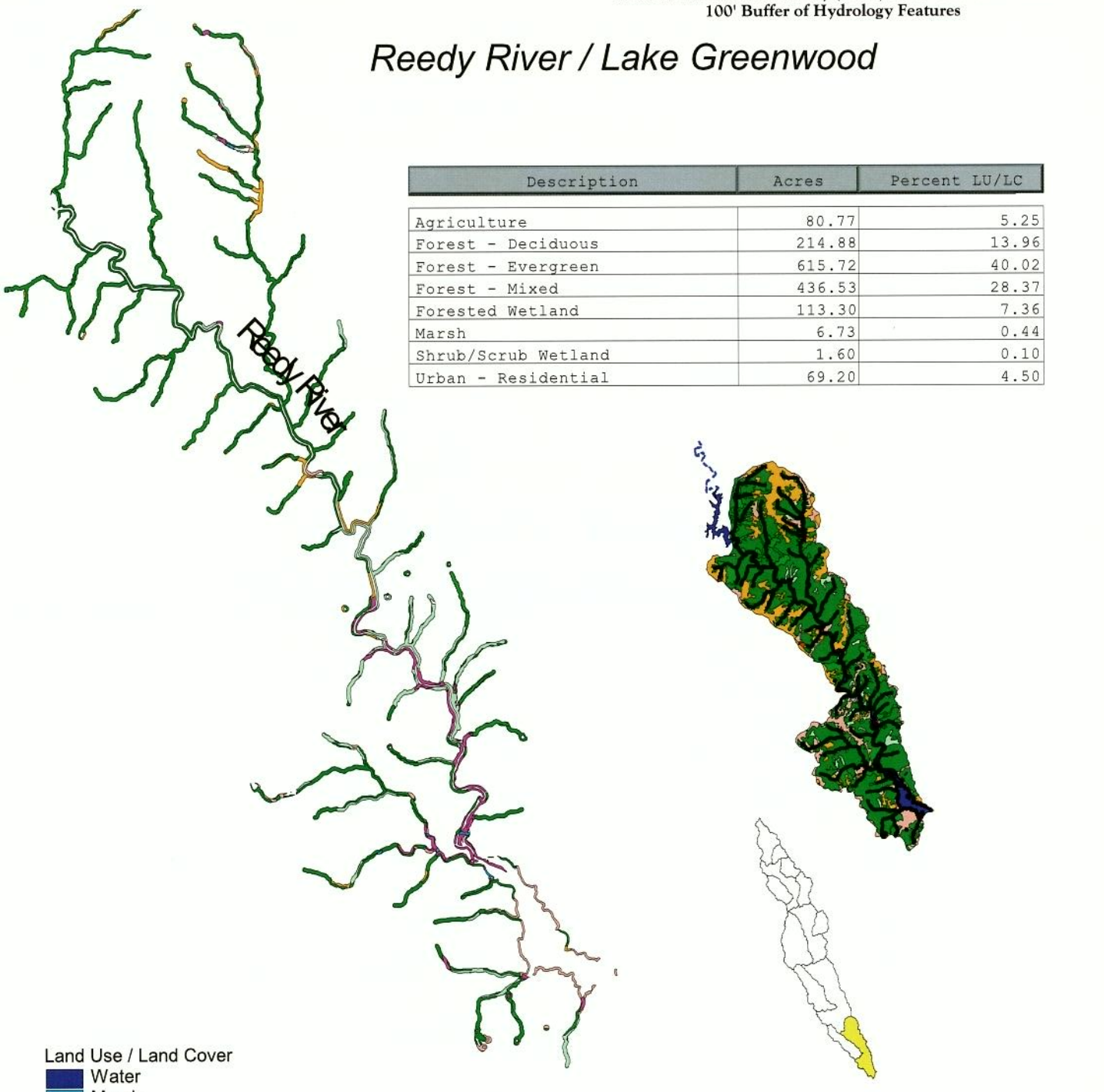
Source: U.S. Fish and Wildlife Service / National Wetland Inventory (1994)

Figure 31: Reedy River/Lake Greenwood Subwatershed

National Wetlands Inventory (NWI) Land Use/Land Cover
100' Buffer of Hydrology Features

Reedy River / Lake Greenwood

Description	Acres	Percent LU/LC
Agriculture	80.77	5.25
Forest - Deciduous	214.88	13.96
Forest - Evergreen	615.72	40.02
Forest - Mixed	436.53	28.37
Forested Wetland	113.30	7.36
Marsh	6.73	0.44
Shrub/Scrub Wetland	1.60	0.10
Urban - Residential	69.20	4.50



Source: U.S. Fish and Wildlife Service / National Wetland Inventory (1994)

Appendix D: Reedy River Watershed Committee Proposal

The Reedy River Watershed Committee (RRWC)

1. **Legal Authority:** RRWC shall be set up as a 501-C-3 educational/conservation advocacy organization that is accountable and makes recommendations directly to Laruens, Greenwood and Greenville County Councils and Greenville City Council. RRWC shall serve as the functionary for these local governments to encourage multi-governmental cooperation, serve as a communication conduit and implement the recommendations of the Reedy River Watershed Task Force's Management Plan.
2. **Membership:** Thirteen total members – Four members appointed by Laurens, Greenwood and Greenville County Councils and one member appointed by Greenville City Council. No compensation shall be paid to any appointed member.
   A. **Length of Terms:** Staggered terms must be established to allow for continuity in committee membership. Membership is limited to a maximum of eight years.
   B. **Ex-officio Members:** All meetings are open to the public, but representatives from related agencies that are invited by the three County and the City of Greenville Councils would participate in the RRWC discussions, receive all meeting notices and minutes, but would not be allowed to vote on RRWC business.

The following agencies are recommended for consideration:

- Western Carolina Regional Sewer Authority
- Friends of the Reedy River
- Council of Governments
- Conservation Districts
- Development assoc. of Greater Greenville
- Friends of Lake Greenwood
- Greenville Water System
- SCDHEC
- Sierra Club
- Foothills RC&D
- Donaldson Commission
- Lake Conastee Foundation

   C. **Structure:** Chairman, Vic-Chair, Secretary and Treasurer shall be elected by the appointed members and shall make up the Executive Committee. Each appointed member will have one vote.
3. **Re-authorization:** RRWC would be re-authorized as appropriate by the agreement of Laurens, Greenwood and Greenville County Councils and the Greenville City Council.
4. **Funding Sources:** It is recommended that Laurens, Greenwood and Greenville Counties and the City of Greenville provide annual financial support for the RRWC. Other potential funding sources are:

Colonial Pipeline Settlement	Private Donations	ISTEA Grants
Sponsorships	PARD Grants	Foundations
LWCF Grants	Potential Lottery Funds	RELT Grants
Potential Tobacco Settlement Funds	SCPRT Trail Grants	Municipal/County Boards
Land Trust	Deed Transfer Fees/Taxes	Donated Services
Local Matching Funds	SCPRT Fund Sharing Grant (for brochures)	

5. **Staffing:** RRWC staff shall be employed as needed to achieve the goals and implement the progress of the committee. Staffing is contingent on the financial resources available to the RRWC.
6. **Accountability:** RRWC must be accountable to the four governmental entities that make the appointments. An Annual Report shall be presented to each of the four government councils by the RRWC President.
7. **Functions:**
   A. Establish education and environmental advocacy programs.
   B. Conduct research.
   C. Purchase greenway property.
   D. Contract for services.
   E. Receive financial and property donations.

All functions shall directly relate to the goals and objectives adopted by the Laurens, Greenwood and Greenville County Councils and the Greenville City Council.

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