

FLINT RIVER CORRIDOR PROJECT: A RIPARIAN HEALTH ANALYSIS

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Abstract. The aspect of the Flint River Corridor Project presented here involves the assessment of riparian resources along a portion of the Flint River and several major tributaries. A "Riparian Health Analysis" was conducted and focused on the riparian health of the study area, coarse land-use patterns, intact natural areas for preservation, and areas in serious need of restoration. Results show that the riparian buffer of the northern section of the study area is mostly forested and is in good health. The middle section is dominated by extensive bottomland hardwood forests and is suffering more intensive land-use. The lower section is also highly impacted, particularly by agriculture. While Kinchafoonee and Muckalee creeks still retain some healthy forested riparian buffer, extensive logging, conversion to pine plantation, and residential development in the last decade seriously threaten these ecologically significant creeks. This analysis provides baseline data on the health of the Flint River as well as priorities for protection and restoration efforts.

INTRODUCTION

The Flint River watershed contains significant riparian resources which justify a special protection planning effort. The watershed encompasses 8,460 sq mi and has an annual discharge of 8,700 cfs. There are over 400,000 acres of wetlands, as determined from an analysis of Landsat TM imagery dated 1990. These stream-associated wetlands are critical to hydrologic cycles and play an important role in floodwater mediation and groundwater recharge. These areas also provide opportunities for recreation, including hunting, fishing, boating, hiking, and bird watching. The wetlands are also important for providing water quality through nutrient cycling and sediment control as well as flyways for neotropical migratory birds and habitat for wildlife and imperiled species. There are approximately 160 species in the Flint River basin that are currently recognized as being rare (GNHP 2000). This region is recognized for

harboring a large number of imperiled aquatic species (Brim Box and Williams 2000).

The Flint River Corridor Project was a three year study conducted by the Georgia Natural Heritage Program (GNHP) of the Georgia Department of Natural Resources. The three main objectives included: assessing the health of the riparian habitats, introducing landowners to a variety of incentive programs, and promoting the importance of the river and its natural habitats. The project was designed to develop an infrastructure and a methodology to systematically assess landscape level systems in cooperation with private landowners and local institutions.

This paper focuses on assessing the health of wetland habitats and associated upland communities along the Flint River and its major tributaries and prioritizing sites for conservation and restoration efforts. This was accomplished through remote assessment and field surveys. Research on rare species in the basin also provided important information.

METHODS

Study Area

The study area was defined as the wetlands and associated uplands of the Flint River and several major tributaries from the Georgia Highway 18 bridge in Meriwether County to Lake Chehaw (formerly Lake Worth) in Dougherty County. The black polygon in Figure 1 indicates the study area. Kinchafoonee and Muckalee creeks were two of the most intensively studied tributaries due to the high number of rare aquatic animals in the region.

Parcel Information

For the study area, parcel boundary and landowner information was collected from 17 county tax assessor offices (Figure 1). Landowner contact information was first entered into an Excel spreadsheet and later integrated

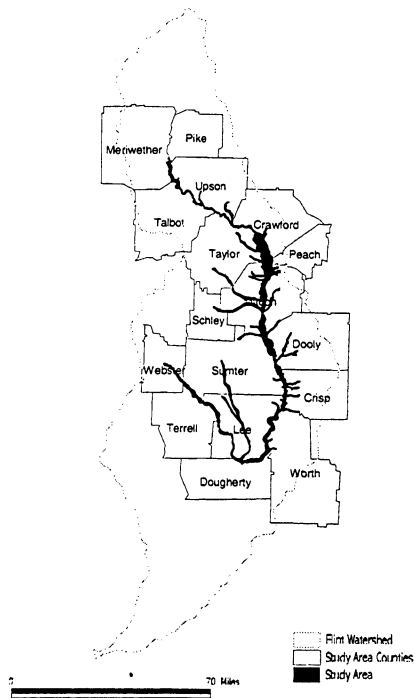


Figure 1. Flint River Corridor Project Study Area

into an Access database to improve efficiency. Over six hundred property boundaries were digitized into ArcView GIS based on recognizable features on the tax map aerial photographs and topographic maps.

Field Surveys

The contact information and parcel boundaries were used to conduct field surveys. With landowner permission, about 65 sites were visited, representing 10% of the parcels. Several of these parcels were quite large, particularly the corporate tracts. Site selection was based on a number of factors, including pre-field assessments and landowner cooperation, as well as the presence of rare species, targeted habitat types, and unique geomorphological features.

Field surveys were generally qualitative and descriptive in nature with a goal to assess the ecological integrity of the system. A field site assessment form was developed. The form addressed coarse level features such as natural community intactness and extent as well as geomorphology. More specific parameters were also included, such as dominant, indicator, invasive, and rare species; vegetative successional stage; faunal evidence; wildlife habitat; fish diversity and abundance; hydrologic alterations; natural geomorphologic features (such as oxbows, levees, sloughs, point bars, and islands); bank stability; river structure; habitat fragmentation; corridors; and pollution.

The intensity of field survey efforts was variable across the study area. More field work was conducted in counties that contained a larger portion of the study area or had more willing landowners, including the counties of Lee, Macon, Taylor, and Upson. Certain creeks also received more attention, particularly Whitewater, Kinchafoonee, and Muckalee.

Remote Assessment

The health of riparian resources was assessed using a number of remote sensing techniques. The primary software used throughout the project was ArcView GIS. Information from the Georgia GIS Clearinghouse was utilized. This included basic coverages such as roads, counties, rivers, and watersheds and more specific information on the study area, such as potential threats (surface mines, landfills, hazardous waste sites). Landcover maps, digital topographic maps (DRGs) and 1993 digital orthophotograph quarter quadrangles (DOQQs) were also very useful, not only in remote assessment, but in the field surveys as well.

The 1993 aerial photography (DOQQs) often gave an overview of land-use and habitat types, allowing staff to anticipate land-use issues. Unfortunately, land-uses have changed and these DOQQs could not be solely relied upon to accurately represent current conditions. Field visits revealed that some areas identified in the photographs as intact natural areas had actually degraded significantly. To remedy this problem, staff conducted aerial surveys during the project in order to videotape and photograph the riparian corridor. Three flights were made over the Flint River and its major tributaries (in August 1998, February 1999, and March 1999). During these flights, major threats, areas of acute impacts, land-use changes, and unusual habitats were noted.

RIPARIAN HEALTH ANALYSIS

A grid system was created as a theme in ArcView to overlay the study area. A 20 by 20 grid was generated within a topographic quadrangle, resulting in 400 individual rectangles of equal area (100 acres). This size was chosen based on parcel size and general land uses throughout the study area. The rectangles, or assessment blocks, were small enough to accurately represent on-the-ground activities without revealing parcel boundaries and large enough to allow feasible data management.

The analysis involved printing maps with parcel boundaries, assessment blocks, and topographic quads (at a scale between 1:40,000 and 1:50,000). These maps were used to record values on riparian health, land-use, restoration need, and preservation potential (see Table 1 for a description of the values). The assessment block layer was then attributed in ArcView using a button created for entering novel data (in this case, the

**Table 1. Riparian Health Analysis
Remote Assessment Components**

FACTOR	EXPLANATION
Riparian Health	1-Excellent, natural riparian buffer 2-Good, buffer not too compromised 3-Fair, only OK buffer
H	4-Poor, not much buffer, has obvious impacts 5-Very poor, no buffer or in very bad shape
Land-Use	1-Natural forest, intact 2-Impacted forest
L1	3-Pine plantation
L2	4-Pasture and livestock operations
L3	5-Agriculture (crops) 6-Residential 7-Industrial
Restoration Need	1-No, not needed 2-Moderate, could use some restoration 3-Increasing, will get worse if left alone
R	4-Yes, dire need
Preservation Potential	1-Exemplary natural area 2-Yes, nice natural area 3-Maybe, OK but compromised
P	4-No, too compromised or N/A

assessment values). The data in this analysis should be interpreted at a broad scale rather than at a specific point. An important point is that riparian health conditions are certainly not uniform throughout an entire assessment block.

In order to facilitate analysis and display the assessment block results, the study area was broken down into four sections. The divisions were based on characteristics of the riparian habitats and include 1) the narrow floodplain and bluffs of the Piedmont, 2) the expansive floodplains of the Upper Coastal Plain, 3) the incised river channel in the southern portion of the study area, and 4) two of the river's major tributaries. The best available photography was used for the different sections of the study area. The Northern Section, which was defined as the river corridor from the GA Highway 18 bridge to Magnolia Swamp in Macon County, was assessed using photographs obtained in the helicopter survey of March 1999. The Central Section, consisting of the extensive swamp complexes in Macon, Crawford, and Taylor counties and the river down through Macon County, was assessed using U.S. Farm Service Agency's Spring 2000 color slides projected onto a light table. Infrared photography (1999 9"x9" positives) was used for the assessment of the Southern Section (Macon County line to Lake Chehaw) as well as the Lower Tributaries Section, which includes Kinchafoonee and Muckalee creeks. In each section, oblique aerial photographs were used for comparison, orientation, and clarification. Some areas, particularly smaller tributaries, were not assessed due to time and monetary constraints.

RESULTS AND DISCUSSION

For the most part, the forces impacting the health of the riparian habitats in the study area are the very same as those impacting other natural habitats statewide. Habitat fragmentation, increased urbanization, and intensified land-use are some of the forces observed. Several threats were particularly evident in the study area, including habitat conversion, degradation of water quality, depletion of water resources, erosion, and exotic species.

Riparian Health Analysis

The Riparian Health Analysis of the entire study area proved to be very insightful. The analysis allowed for the rapid assessment of a large area. About 1,480 assessment blocks were analyzed, which translates to approximately 148,000 acres on the ground. The results of the analysis are presented here for each of the four sections.

Northern Section. The Northern Section of the study area extends roughly from the Georgia Highway 18 bridge to the Georgia Highway 137 bridge. The northern half of this Section was rated very high for both riparian health and preservation potential and generally had fewer blocks rated for restoration need than the other Sections. Preservation values are presented below (Figure 2). High preservation values note the areas which harbor the highest natural integrity. The southern half of this Section declines in overall condition. Riparian health here is fair to poor and restoration need is greater. The primary land-use designation for assessment blocks in the northern portion of this Section is natural forest and impacted forest, with some pine plantation and scattered pastures in secondary land-use. Forests are particularly prevalent in the steeper areas of this section. Some residential designations appear in both primary and secondary land-uses. In the southern portion, primary and secondary land-uses are dominated by pasture and pine plantations mixed with some natural and secondary forest.

It appears that the primary factor in sustaining riparian health in the northern part of the study area is topography. Typically, the topography is sufficiently steep to limit development immediately along the river and this results in relatively intact, forested buffers. In those areas where the topography is level and gradual, residences, hunt camps, and more intensive land-uses appear. Parcel size might also be an indirect factor in sustaining riparian health in as much as detrimental land-use activities on smaller parcels can be buffered by intact riparian buffers on neighboring parcels. On the other hand, smaller parcel size seems to be correlated with the establishment of long-term, intensive improvements (homes, driveways, yards) which can be an impediment to riparian health if not properly planned.

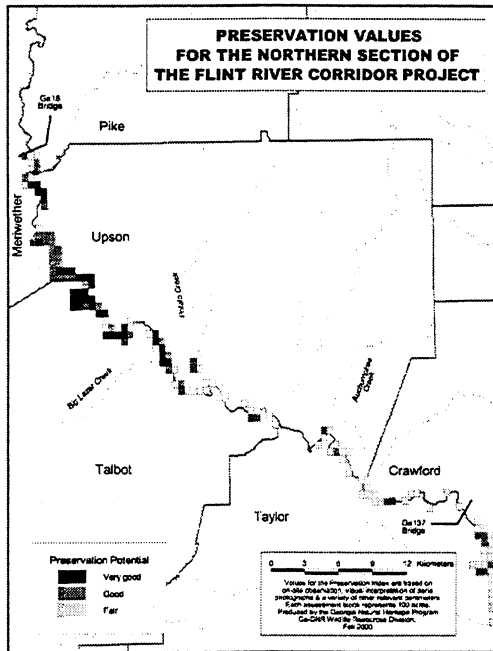


Figure 2. Sample map for Northern Section.

Central Section. The Central Section of the study area extends from the Georgia Highway 137 bridge to the confluence of Hogcraw Creek on the Flint River. The overall condition of this Section can be essentially described as “fair” to “good.” Riparian health values are presented below (Figure 3). The primary land-use in this section is forest. Agricultural activities are having a greater impact on these bottomland communities than on the river itself. Some silvicultural activities are directly impacting both the bottomlands and the river. The impact of roads may be greater in the Central Section because roads in the expansive floodplains require the construction of earthen berms which restrict the natural flow of water.

The Central Section contains several expansive swamp systems, including Beechwood-Magnolia and Bryant swamps. These bottomland hardwood forests cover more than half of this Section. While a portion of these bottomland hardwoods is fairly intact, the majority of this ecosystem has been impacted by timbering and ditching. Regular cycles of flooding have retarded development in many parts of the floodplain. Draining and ditching efforts, however, are evident throughout. Because many of the ditches created years ago have not degraded, they continue to serve their purpose today. In this analysis, it was assumed that the number of ditches identified is only a fraction of those actually present since they can be difficult to identify remotely. Many of them are lengthy but narrow and may now be obscured by trees. During field surveys, some of the trees that were found on the berms of ditches were surprisingly large in diameter.

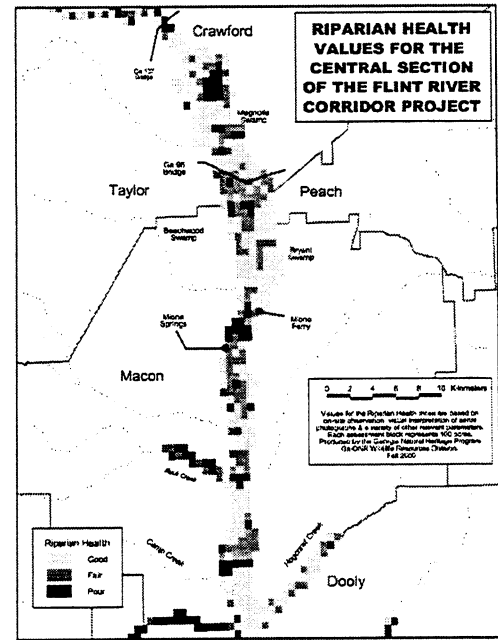


Figure 3. Sample map for Central Section.

Southern Section. The Southern Section extends from the confluence of Sweetwater Creek to the upstream end of Lake Chehaw. Lake Blackshear itself was not assessed since it now represents more of a lacustrine system. Most of the associated uplands around this reservoir are either under residential development or agricultural production. Despite the fact that impounding the Flint at this point has impacted the riparian habitat quality, several interesting wetlands have developed in the upstream portion of the Lake Blackshear.

Riparian health is generally “fair” to “very poor” for tributaries and for the southern-most portion of the river. The best preserved habitats are located along the Flint River in the northern portion of the Section near the confluence with Sweetwater Creek. All of the tributary streams in this Section need restoration efforts, with several portions rated as “dire.” The necessity for restoration along many of the tributary streams is due to agricultural activities and ditching with the exception of Sweetwater Creek, where mining activities are culpable. (Space limitations preclude a figure for this section.)

While hydrology has played a role in discouraging development in the northern portion of this Section, there are fewer barriers to development in the rest. In this Section, the topography is level, the river is more incised, parcel size is relatively large, and the local economy largely depends on agriculture. It is therefore not surprising that the riparian corridor and associated uplands are highly impacted and have lost much of their natural integrity. In some cases, the riparian corridor is composed of only several rows of trees fringing the river’s bank.

This is not a sufficient riparian buffer for a river of this magnitude.

Lower Tributaries Section. The Lower Tributaries Section includes Kinchafoonee, Muckalee, and Muckaloochee creeks. The study area on Kinchafoonee Creek extends from the city of Preston to Lake Chehaw and on Muckalee Creek from the city of Americus to Lake Chehaw. Because these tributaries support the last best populations of several species of imperiled mussels, it is imperative that conservation efforts be sharply focused on protecting the natural integrity of these systems. Unfortunately, within the last six years, aggressive hardwood timber cutting has occurred along these creeks. Purportedly, much of this clearing was conducted by a company not based in the region which had the machinery to reach those wetland areas. Although the clearing with insufficient buffers alone could be considered a serious threat to the imperiled species, the impacts are exacerbated by the fact that much of the cleared area was prepared with raised beds for planting pine. Although it is not clear how this habitat conversion will impact the imperiled mussels, it is presumed that altered hydrology and nutrient cycles, increases in sedimentation, applications of herbicides, and soil chemistry changes will further infringe on the recovery potential for these aquatic species.

Land-use activities in the upper reaches of these creeks

have historically been limited by hydrologic cycles. Today, however, silvicultural operations have encroached into palustrine habitats. In the lower reaches, the creeks are more incised and consequently more impacted by development pressures. Protection and restoration efforts are essential to the health of these creeks and the aquatic biodiversity that they support.

CONCLUSION

The results of this project indicate that the Flint River has pockets of intact natural forest communities and healthy buffers throughout the study area but that many areas have been intensively impacted and are in need of restoration efforts. Intensive land-use practices are expanding in the study area. These activities are impacting the natural system and its ability to serve important ecological functions such as mediating flood and drought conditions, filtering sediments and pollutants, and supporting the diversity of the remaining native wildlife.

This project established a baseline against which future assessments can be made and provided justification for focusing protection and restoration efforts in particular areas. This information can be very valuable to efforts such as the DNR's Georgia GreenSpace Program, The Nature Conservancy's Ecoregional Planning Process, and local land trust efforts.

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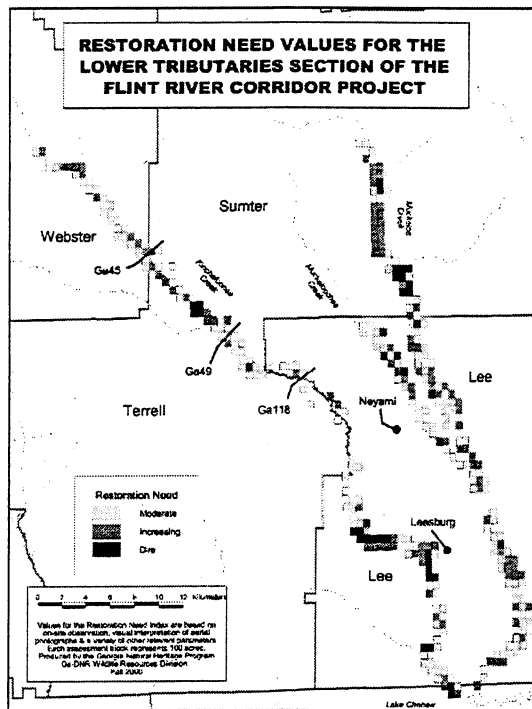


Figure 4. Sample map for Lower Tributaries Section.