



CITY OF DURHAM
Department of Public Works

Eno River Aquatic Vegetation Survey
January 2014

Submerged Aquatic Vegetation Survey for *Hydrilla verticillata* (hydrilla), *Podostemum ceratophyllum* (riverweed), and *Myriophyllum aquaticum* (parrot feather) in the Eno River near Durham, NC

EXECUTIVE SUMMARY

There have been recent anecdotal reports of the invasive aquatic plants *Hydrilla verticillata* (hydrilla) and *Myriophyllum aquaticum* (parrot feather) in the Eno River in North Carolina. These plants grow rapidly and have been known to significantly impact water quality, sport fisheries, and recreational resources. These plants can also out-compete the native *Podostemum ceratophyllum* (riverweed), which provides habitat for snails, amphibians, and juvenile fishes.

In August, 2013 the City of Durham surveyed the Eno River in and just outside City limits for hydrilla, parrot feather, and riverweed. The primary purpose of this survey was to provide data that could be evaluated and considered during generation of the Eno River Watershed Implementation Plan. This plan, in part, assesses current watershed conditions, formulates watershed restoration goals, and recommends watershed restoration opportunities. This survey was also part of a larger surveying effort by Eno River State Parks, Eno River Association, North Carolina Wildlife Resources Commission, and NC State University. These groups surveyed the Eno River upstream of Durham to Hillsborough in Orange County and downstream of Durham to Falls Lake. This report presents the results of the survey conducted by the City of Durham.

Survey results identified riverweed throughout the survey extent, most commonly in riffles. Although far less common, hydrilla was identified in a few sparse beds. Parrot feather was not found during this survey. Overall, this survey did not indicate a significant adverse impact by hydrilla or parrot feather in the Eno River in or near the City of Durham. However, this survey was performed after an abnormally wet summer that resulted in abnormally high stream flows. It is possible that these flows affected the presence and density of hydrilla and parrot feather beds.

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INTRODUCTION

The Eno River is approximately 40 miles long and originates in northwest Orange County in North Carolina. The river then flows eastward through Orange County to Durham County, including the City of Durham, before discharging to Falls Lake. The entire watershed drains 103,262 acres, 10,390 acres (10%) of which drains a northern portion of the City. The Eno River itself is a significant recreational resource for the area. Fishing, swimming, boating, and hiking are popular activities associated with the river. Falls Lake is a drinking water supply reservoir for the City of Raleigh.

The invasive aquatic plants hydrilla and parrot feather have been anecdotally reported in the Eno River Watershed. Hydrilla and parrot feather are invasive submerged aquatic plants that can degrade aquatic habitats and recreational resources. Dense populations of these plants can degrade fishing and swimming areas, foul boat props, degrade fisheries, and reduce the aesthetic value of water resources (Kay and Hoyle 2002, Richardson et al. 2008). Hydrilla and parrot feather grow significantly faster than native aquatic plants and can form large mats that block out sunlight and severely restrict water flow (Ecological Consultants 2013). The reduction in sunlight and water flow decreases available habitat for native plant species. Although these plants have been reported, there have been no targeted surveys to fully determine the coverage extent.

Riverweed is a native aquatic plant commonly found in the Eno River and its tributaries. Riverweed beds provide habitat for a wide variety of fish, amphibians, snails, and aquatic insects. Hydrilla and parrot feather could over shade many of the riverweed beds in the Eno River, significantly degrade the habitat, and cause a significant reduction in aquatic organisms.

In August, 2013 the City of Durham surveyed the Eno River in and just outside City limits for hydrilla, parrot feather, and riverweed. The primary purpose of this survey was to provide data that could be evaluated and considered during generation of the Eno River Watershed Implementation Plan. This plan, in part, assesses current

watershed conditions, formulates watershed restoration goals, and recommends watershed restoration opportunities. This survey was also part of a larger surveying effort by Eno River State Parks, Eno River Association, North Carolina Wildlife Resources Commission, and NC State University. These groups surveyed the Eno River upstream of Durham to Hillsborough in Orange County and downstream of Durham to Falls Lake. The City of Durham volunteered to survey the Eno River (excluding tributaries) for hydrilla, parrot feather, and riverweed within the City's corporate limits (Figure 1). This survey will enable the agencies to determine the current distribution and abundance of these plants in the Eno River watershed. Results of this survey will also be available for consideration in the Eno River Watershed Implementation Plan.

METHODS

On August 29 and 30, 2013, City of Durham staff surveyed the Eno River near Durham for hydrilla, parrot feather, and riverweed. The survey targeted the end of the growing season when submerged aquatic vegetation biomass is at its peak. Two City staff members performed the survey each day. The survey started at Cole Mill Road and ended at Old Oxford Highway. These road crossings were chosen as the start and end-points of the survey because they bracketed City limits and were convenient access points to the Eno River.

The survey was conducted by visually searching for the targeted plant species from single person kayaks. In areas where the water was too shallow to paddle, the survey was performed on foot. In areas where the water was too deep to see the river bottom, a double sided rake was used (Figure 2). The rake was deployed from the kayak by tossing the rake and dragging across the bottom approximately 10'. The use of the rake would begin at the upstream end of deep pools. The rake was then deployed downstream every 200' until the bottom was visible and the visual survey could resume. If a targeted plant was found, sampling with the rake was performed at 25' intervals in the upstream and downstream directions until the start and end of the bed could be determined.

When a targeted plant species was identified, the GPS coordinates were recorded with a Garmin eTrex. If the targeted plant bed was greater than 30' in length two points were recorded, one for 'start bed' and one for 'end bed'. If the plant bed was less than 30' only one point was recorded. Other characteristics were recorded on the data sheet such as bed density (sparse, moderate, heavy), stream feature where bed was located (riffle, run, pool), stream width at bed location (feet), percent vegetation cover across stream, and plant ID (Appendix A).

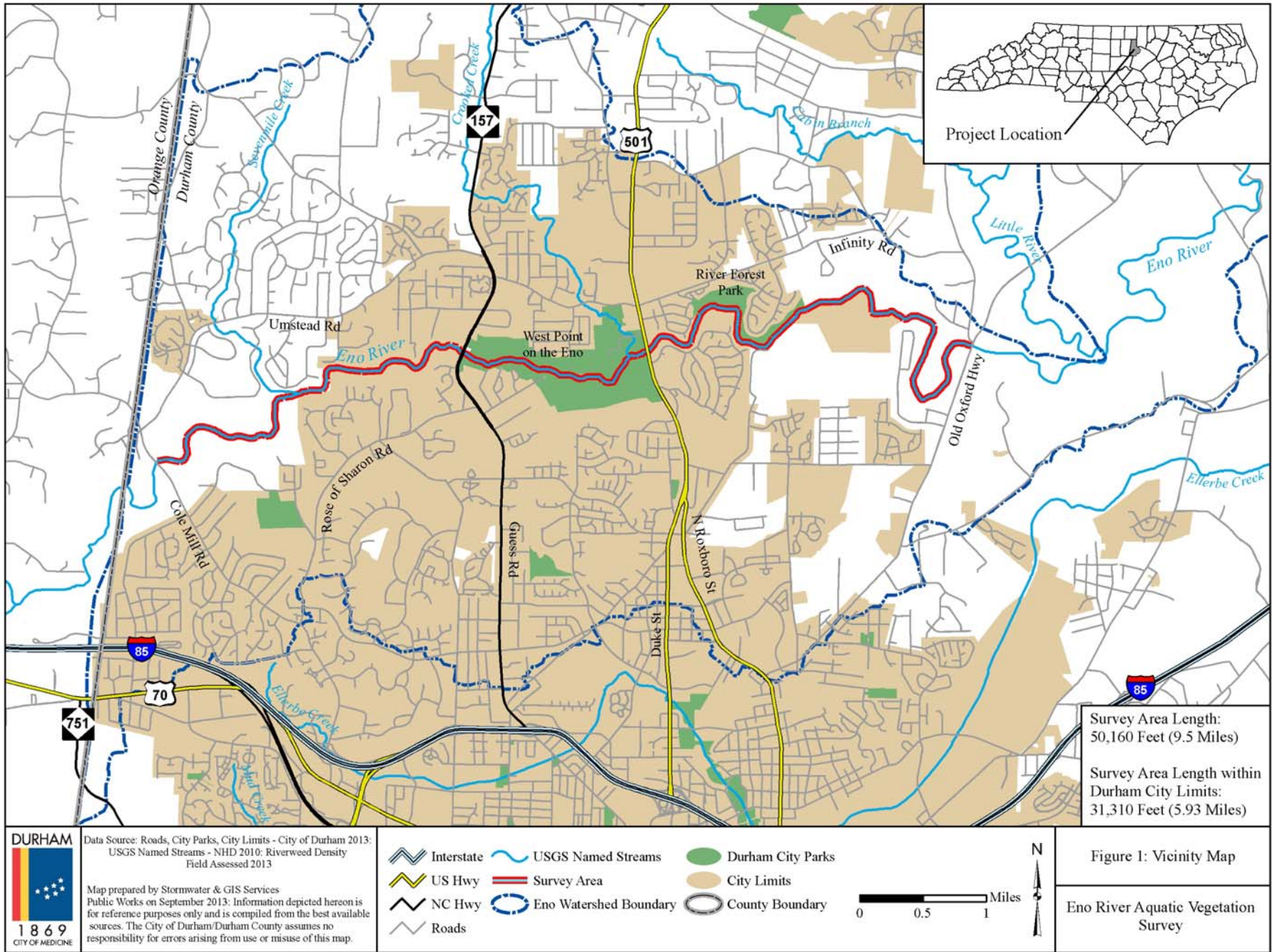


Figure 2. Double headed rake used to search for aquatic plants in deep sections of the Eno River.

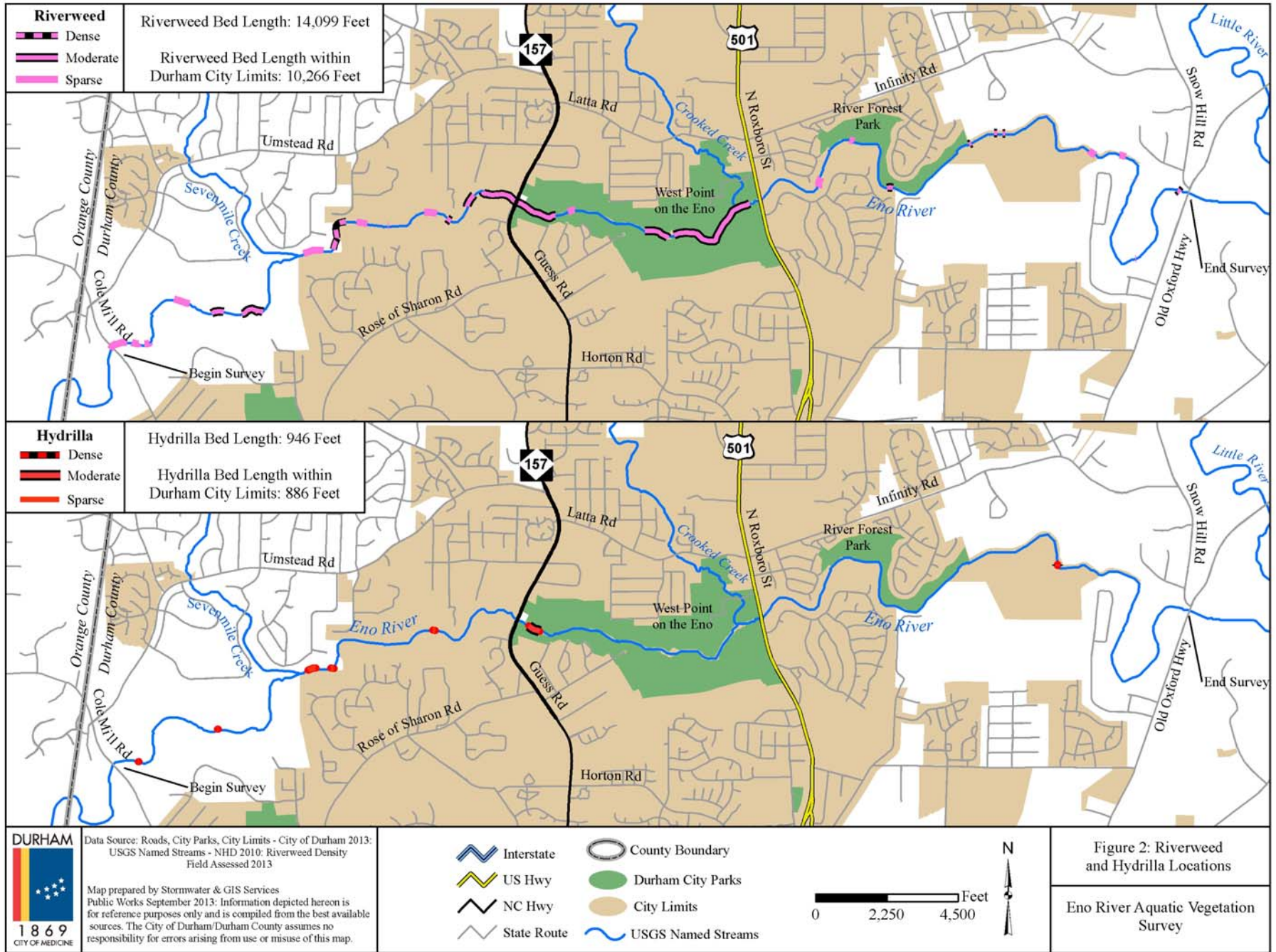


RESULTS

This survey included 5,153 feet (0.98 river miles) of the Eno River, 4,126 feet (0.78 river miles) of which were in the City’s corporate limits. Riverweed was common throughout the survey length (Table 1; Figure 3). There were 30 riverweed beds ranging from 13’ to 3,070’ in length. Riverweed bed densities were generally sparse to moderate with a couple of dense beds. Riverweed beds covered a total of 10% of the entire survey length.

Table 1. Submerged aquatic vegetation survey summary table.

	Bed Density	Number of Beds	Bed Length Range (ft)	Average Bed Length (ft)	Total Bed Length (ft)	Linear Coverage (%)
Riverweed	Sparse	16	13-660	262	4187	7
	Moderate	12	71-3070	728	728	1
	Dense	2	370-760	563	1127	2
	Total	30	13-3070	468	6042	10
Hydrilla	Sparse	5	30-254	102	511	1
	Moderate	2	42-393	216	435	1
	Dense	0	-	-	-	-
	Total	7	30-393	135	946	2
Parrot Feather	Sparse	0	-	-	-	0
	Moderate	0	-	-	-	0
	Dense	0	-	-	-	0
	Total	0	-	-	-	0



Hydrilla was less common than riverweed and was identified in seven beds (Table 1; Figure 3). Beds ranged from 30' to 393' in length. Hydrilla beds were sparse with a couple of moderate beds. No hydrilla beds were observed as dense. Hydrilla beds covered 2% of the entire survey length. Parrot feather was not identified during the survey.

DISCUSSION AND CONCLUSIONS

This survey showed the prevalence of riverweed throughout the survey area (10% of the entire survey length). Hydrilla was far less prevalent, but was present nonetheless (2% of the survey length), and Parrot feather was never identified. Riverweed was almost always associated with riffles while hydrilla was associated with riffles and runs. At the time of this survey, hydrilla and parrot feather did not appear to significantly impact recreational or aesthetic uses of the river. It did not appear that hydrilla or parrot feather were displacing riverweed. Hydrilla and parrot feather appeared to have little impact on the aquatic habitat in the Eno River associated with this survey.

Rainfall during the summer of 2013 may have affected survey results. More than 20 inches of rain fell in the Eno River watershed in the three months prior to conducting the surveys (USGS, 2013). The Eno River maintained above average flows for most of the summer of 2013 due to this rainfall. It is possible that the higher flows scoured the bed and banks and reduced the number of beds and bed densities present at the time of the survey. It is unknown if the survey results may have been different during an average or below average rainfall year.

Parrot feather has been observed in past years by Eno River State Parks personnel approximately 700 feet upstream of the North Roxboro Street bridge (Keith Nealon, personal communication, August 23, 2013). Parrot feather typically undergoes fall senescence and re-emerges from its rhizomes in the spring (Washington State University, 2013). While parrot feather was not observed during this survey it may still be present in the Eno River. It is possible that the above average flow broke the plants off and deposited them downstream. If this were the case, parrot feather rhizomes could remain in the stream bottom leading to re-emergence the following spring.

Results of this survey can be compared to surveys performed on the Eno River upstream and downstream of Durham's survey. The groups that performed these surveys during the fall of 2013 used similar methods to those employed for this survey. Data generated from this survey near Durham combined with survey data from Eno River State Parks, Eno River Association, North Carolina Wildlife Resources Commission, and NC State University can be used to evaluate 'hotspots' or trends in the occurrence of the invasive parrot feather and hydrilla for treatment and management purposes.

Future survey efforts should be conducted in the same manner and during a similar time of year. Flow should be at or below base flow to maximize the potential of identifying beds. Other invasive plants such as creeping water primrose (*Ludwigia hexapetata*) may need to be

added to the survey list. Creeping water primrose has been found in Falls Lake and is currently being treated with herbicides by the City of Raleigh (Ecological Consultants, 2013).

REFERENCES

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APPENDIX A: Field Data Sheet

Eno River Vegetation Species Survey												
Stream Name:			Start GPS Survey: /			Stop GPS Survey: /			Date (MM/DD/YY):			
Reach Name:		Description - Start Location:				Description - Stop Location:						
GPS Unit ID:				Observers:				Contact info:				
Site Number	Start - Vegetation Bed		Stop - Vegetation Bed		Density Sparse Moderate Heavy	Stream Feature	Stream Width (ft)	Percent Vegetation Cover Across Stream				Comments/Species (Hydrilla - Parrot Feather - Riverweed)
	Lat.	Long.	Lat.	Long.				Sparse 0-25%	Moderate 26-50%	Dense 51-75%	Very Dense 76-100%	

Stream Feature - (r) riffle, (u) run, (p) pool, (g) glide
 Site Naming Convention - Eno River, reach 5, site 1, start (ER-5-1-S)
 Site Naming Convention - Eno River, reach 5, site 1, end (ER-5-1-E)
 Site Naming Convention - Eno River, reach 5, site 1, start bed Hydrilla (ER-5-1-SH)
 Site Naming Convention - Eno River, reach 5, site 1, end bed Hydrilla (ER-5-1-EH)
 P=Parrot Feather, H=Hydrilla, R=Riverweed
 Reach Names = Cole Mill to Guess Rd (5), Guess Rd to Roxboro (4), Roxboro to Old Oxford (3)