Source Water Assessment Program Report for DURHAM, CITY OF

Community Water System

Introduction: What is a Source Water Assessment?

The North Carolina Division of Water Resources, Public Water Supply (PWS) Section is responsible for implementing the Source Water Assessment Program (SWAP) and completing assessments for all public drinking water supplies in the state. The 1996 amendments to the Safe Drinking Water Act provided federal support and required states to conduct assessments of all public water systems. A source water assessment is a qualitative evaluation of the potential of a drinking water source to become contaminated by the identified potential contaminant sources (PCS) within the delineated area. In North Carolina there are approximately 8,000 public water supply sources that were assessed by the state. The PWS Section has gathered information for each water supply and developed a process for completing the assessments. This process is summarized in the next few pages and detailed in Section 6 of this report.

This report provides a summary of the results for the **Source Water Assessment** for your drinking water source(s).

What is the Source of Your Drinking Water?

Everyone wants clean, safe drinking water and we assume this natural resource will always be available to us. However, drinking water sources can be threatened by many potential contaminant sources, including underground storage tanks for gasoline, permitted wastewater discharges and other waste disposal sites, improper handling of hazardous materials, urban storm water runoff, or other types of non-point source contamination such as runoff produced by agricultural activities and land clearing for development. Your drinking water source(s) is listed in Table 1. Protecting your drinking water from becoming contaminated is a wise investment in public health and your community's future.

Table 1. Public Water Supply System Information

System Name	DURHAM, CITY OF
City	DURHAM
PWS ID	NC0332010
Source Name	LAKE MICHIE
Source Name	LITTLE RIVER RESERVOIR

In addition to the sources listed in Table 1 above, this water supply system has interconnections to allow for the purchase of water from the following water system(s) or "Seller" system(s):

CARY, TOWN OF
CHATHAM CO-NORTH
HILLSBOROUGH, TOWN OF
ORANGE WATER & SEWER AUTHORITY
RALEIGH, CITY OF

Please refer to the Source Water Assessment Program Report for the "Seller" system(s) to review the assessment results for the purchased water supply sources that provide drinking water for this water system.

Assessment Report Contents

This assessment report includes the following sections:

Section 1: Assessment Area Delineation
Section 2: Potential Contaminant Source Inventory and Map
Section 3: What is a Susceptibility Rating?
Section 4: Reviewing Your SWAP Results
Section 5: Maps, Tables and Figures for your Drinking Water Source(s)
Section 6: North Carolina's SWAP Approach

Section 1: Assessment Area Delineation

The area delineated for your surface water source(s) for this assessment is the water supply watershed. A watershed is a geographic area of land draining to either a stream or lake. Local ordinances dictate the type of development that can take place in some sections of the water supply watershed. In general, the watershed of your surface water source(s) is the area through which contaminants, if released to the environment, can be reasonably expected to move across the land surface following the path of overland flow or shallow subsurface flow and into the surface water body (stream or lake).

Section 2: Potential Contaminant Source Inventory and Map

The potential contaminant source inventory map shows the delineated area for your drinking water source(s). This is the area where potential contaminant sources, if released to the environment, could reasonably be expected to be a risk or a potential for contamination of your drinking water supply. A PCS in this assessment report is a facility or site regulated under a state or federal regulatory program. These facilities are identified in electronic databases that contain location information for each facility. Only databases that include statewide information were used for this source water assessment. Included in this report are:

1) A table of any PCS identified within the delineated assessment area; and
2) A map of the delineated assessment area showing PCSs, roads, jurisdictional boundaries and other pertinent information.

It is important to note that the PCSs identified in this report are only potential sources of contamination to your drinking water source. Environmental contamination is not likely to occur if harmful contaminants are managed properly.

Section 3: What is a Susceptibility Rating?

In North Carolina the susceptibility of any drinking water source is based on two components, a contaminant rating and an inherent vulnerability rating. Your drinking water source(s) was assigned a qualitative susceptibility rating of higher, moderate or lower based on the results of the contaminant rating and inherent vulnerability rating process as described in the following paragraphs.

Susceptibility Rating

The final susceptibility rating for your drinking water source(s) is determined by combining the contaminant rating and the inherent vulnerability rating. More detailed information on the susceptibility rating process can be found in Section 6 of this report.

Contaminant Rating

The contaminant rating for your drinking water source(s) was determined based on the number and location of PCSs within the delineated area. Each PCS identified within the delineated area was assigned a risk rating of higher, moderate or lower. The number of PCSs that occur within the delineated area was determined and a contaminant rating of higher, moderate, or lower was assigned to your drinking water source(s).

Inherent Vulnerability Rating

The inherent vulnerability rating of your surface water source(s) refers to the geologic characteristics or existing conditions of the surface water source(s) and the delineated assessment area (watershed). These characteristics include water supply watershed classification, surface water source location, raw water quality rating, and the watershed characteristics rating. The watershed classification is based on the size of the watershed, development activities and allowable waste treatment and disposal practices. The surface water sources are located in streams, large multi-purpose impoundments or small water supply impoundments. The raw water quality rating assessed turbidity and total coliform values over twelve months. The watershed characteristics rating is an assessment of the likelihood that contaminants will follow the path of overland flow or shallow subsurface flow to a surface water source.

Table 2. SWAP Results Summary

Source Name	Inherent Vulnerability Rating	Contaminant Rating	Susceptibility Rating
LAKE MICHIE	Moderate	Higher	Higher
LITTLE RIVER RESERVOIR	Moderate	Higher	Higher

It is important to understand that a susceptibility rating of higher does not imply poor water quality. Susceptibility is an indication of a water supply's potential to become contaminated by the identified PCSs within the assessment area.

Table 3. Surface Water Source - Information

Source Name	Watershed Classification	Source Location
LAKE MICHIE	WS-III	Class 1
LITTLE RIVER RESERVOIR	WS-II	Class 1

Section 4: Reviewing Your SWAP Results

Please review the information on your drinking water source(s) provided in this report. If you believe any of this information is incorrect please contact the Public Water Supply Section by e-mail at the following address: **SWAP@ncdenr.gov** or you may submit comments to us at:

SWAP
Public Water Supply Section
1634 Mail Service Center
Raleigh, NC 27699-1634

Or you may contact the Source Water Assessment staff by phone at 919-707-9098.

Section 5: Maps, Tables and Figures for Your Drinking Water Source(s)

Maps, tables and figures specific to your drinking water source(s) are included in this report in the following pages and

are listed below.

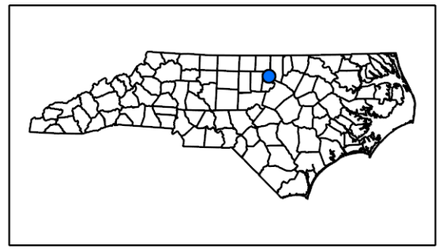
Map 1. Location Map
Map 2. Delineated Area and PCS Map

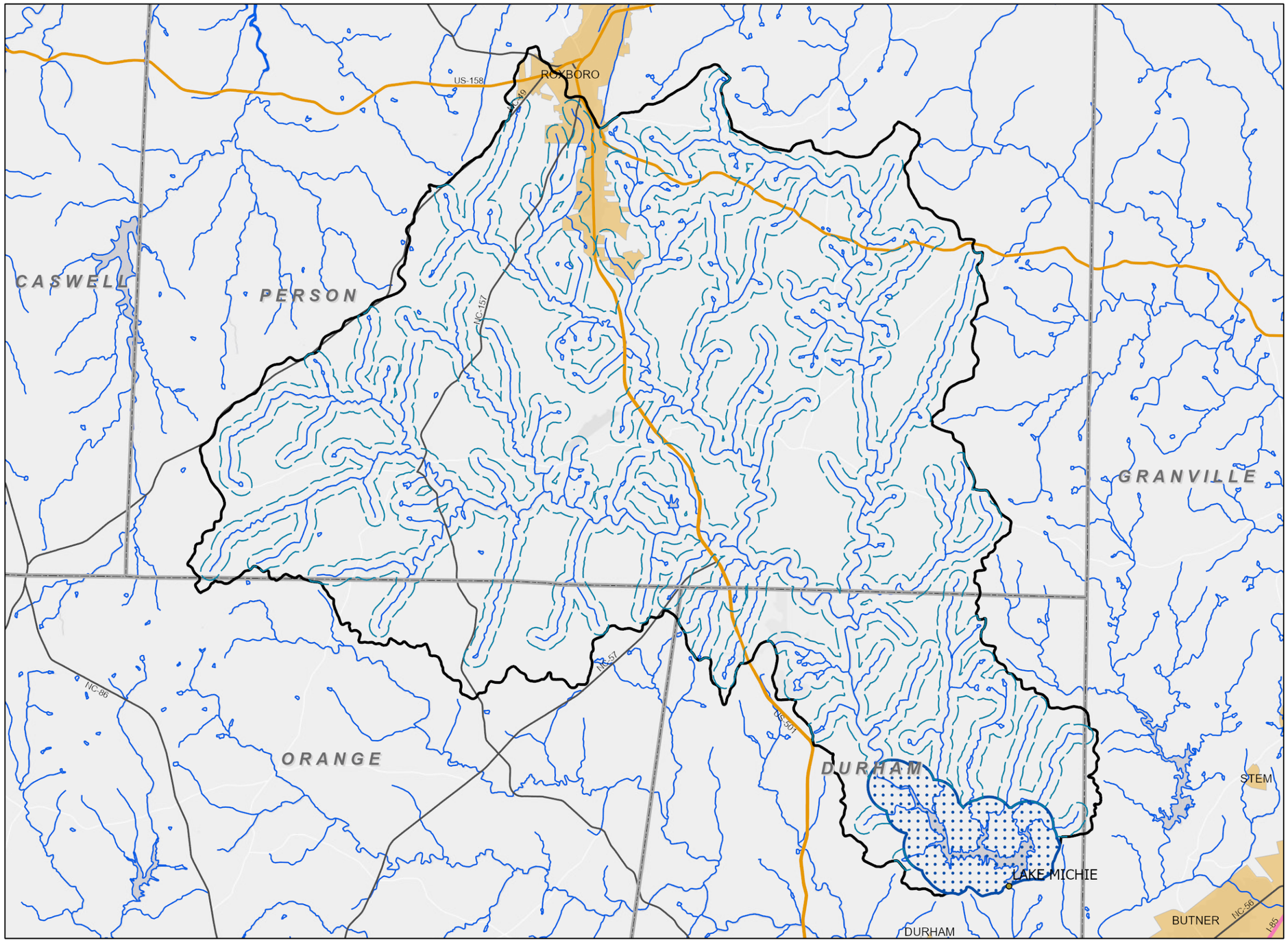
Table 4. Potential Contaminant Source Attributes
Table 5. Inherent Vulnerability Rating
Table 6. Unsaturated Zone Rating Calculation or Watershed Characteristics Rating Calculation

Figure 1. Land Use / Land Cover Categories
Figure 2. Unsaturated Zone Rating or Watershed Characteristics Rating
Figure 3. Vertical Hydraulic Conductance Rating or Average Annual Precipitation Rating
Figure 4. Land Surface Slope Rating
Figure 5. Land Use Rating
Figure 6. Land Cover Rating
Figure 7. Ground Water Contribution Rating (only appliable to surface water sources)

MAP 1. LOCATION MAP

DURHAM, CITY OF
PWS ID: 0332010
LAKE MICHIE





Major Roads
- Interstate
- US Route
- NC Route

Rivers and Streams
Major Hydrology
Municipal Boundaries
County Boundaries

Watershed Zones
- Critical Area Boundary
- Protected Area Boundary
- Stream Zone Boundary
- Watershed Boundary

0 1 2 3 Miles

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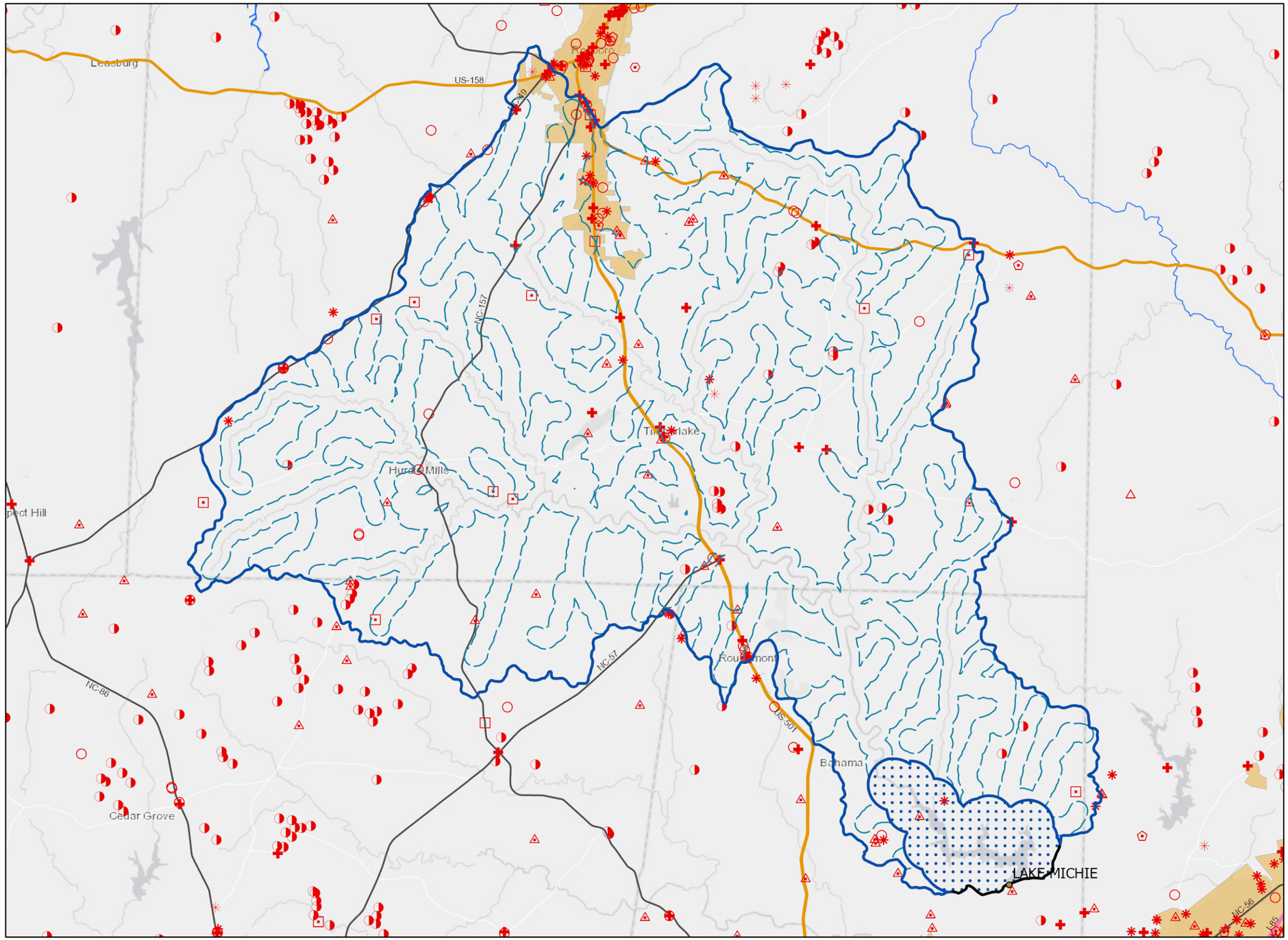
MAP 2. DELINEATED AREA AND PCS MAP

DURHAM, CITY OF
PWS ID: 0332010
LAKE MICHIE



PCS Types
- Animal Operations
- CERCLA-Fed. Remediation
- Hazardous Waste Sites
- Inactive Hazardous Waste Sites
- Non Discharge Permits
- NPDES Permits
- PCB Sites
- Pollution Incidents
- Septage Disposal Sites
- Soil Remediation Sites
- Solid Waste Facilities
- Tier II Sites
- Old Landfill Sites
- UIC Permits
- UST Permits

Major Roads
- Interstate
- US Route
- NC Route
- Major Hydrology
- Municipal Boundaries

Watershed Zones
- Critical Area Boundary
- Protected Area Boundary
- Stream Zone Boundary
- Watershed Boundary

0 1 2 3 Miles

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Table 4. Potential Contaminant Source Attributes
DURHAM, CITY OF
PWS ID: NC0332010, LAKE MICHIE

PCS Name	PCS ID	PCS Type	PCS Risk Rating	Street Address	City	Zip	County
BARTS SHELL	12605	Pollution Incidents	Higher	8151 Durham Road	Timberlake	27583-	Perso
NORRIS RESIDENCE (Arthur)	13056	Pollution Incidents	Higher	11155 Hurdle Mill Road	Hurdle Mills	27541-	Perso
TACKETT RESIDENCE	13145	Pollution Incidents	Higher	13117 Hwy 501	Rougemont	27572-	Durha
WHITE BROTHERS	15076	Pollution Incidents	Higher	9338 Hurdle Mills Road	Hurdle Mills	27541-	Perso
CHAMBERS, C.W., JR. STORE	15092	Pollution Incidents	Higher	7130 Burlington Rd	Hurdle Mills	27541-	Perso
NC HIGHWAY PATROL - ROXBORO	17216	Pollution Incidents	Higher	3434 Burlington Road	Roxboro	27573-	Perso
WHITFIELD PROPERTY	17564	Pollution Incidents	Higher	Highway 501 And Nc 57	Timberlake	27583-	Perso
BOWLING PROPERTY (ANNIE)	17956	Pollution Incidents	Higher	Highway 501	Rougemont	27572-	Durha
ROBERT'S SERVICE MART	26882	Pollution Incidents	Higher	8200 Burlington Rd.	Hurdle Mills	27541	Perso
THE PANTRY # 3187	26996	Pollution Incidents	Higher	804 Durham Road	Roxboro	27893-	Perso
BUY QUICK FOOD MART - BAHAMA RD	23187	Pollution Incidents	Higher	1506 Bahama Road	Bahama	27503-9101	Durha
LONG BROTHERS BP	15994	Pollution Incidents	Higher	Hwy 49	Roxboro	27573-	Perso
DUNCAN'S MINI MART	23651	Pollution Incidents	Higher	1909 Burlington Road	Roxboro	27573-	Perso
Fleming Property, Donald	39498	Pollution Incidents	Higher	2099 Old Durham Road	Roxboro	27573	Perso
LUNDSFORD TRUCKING	85549	Pollution Incidents	Higher	1024 Hurdle Mills Road (nc 157	Roxboro	27573	Perso
PROGRESS ENERGY ROXBORO PLANT	86904	Pollution Incidents	Higher	1700 Dunnaway Road	Roxboro	27843	Perso
STIGALL, AL PROPERTY	87959	Pollution Incidents	Higher	3568 Burlington Road	Roxboro	275747741	Perso
MORRISTOWN GROCERY	3346	Pollution Incidents	Higher	Rt. 3 Box 189	Roxboro		Perso
FOODMART #8 - HOME OIL CO.	6280	Pollution Incidents	Higher	Hwy 501 & Red Mountain Road	Rougemont		Durha
ALSCO/AMERIMARK CO.	9642	Pollution Incidents	Higher	3321(?) Old Durham Rd	Roxboro	27537	Perso
WALMART SUPERCENTER #1288	NCR000142000	Hazardous Waste Sites	Higher	1049 Durham Road, Ste A	Roxboro	27573	Person
ALERIS ROLLED PRODUCTS INC	NCD980844674	Hazardous Waste Sites	Higher	3321 Durham Road	Roxboro	27573	Person

PCS Name	PCS ID	PCS Type	PCS Risk Rating	Street Address	City	Zip	County
EATON CORPORATION	NCD004520136	Inactive Hazardous Sites	Higher	Route 501 South	Roxboro		Person
LOXCREEN	NONCD0002848	Inactive Hazardous Sites	Higher	Rt 501 S	Roxboro		Person
Jason Ellis - SFR	WQ0021682	Non-Discharge Permits	Lower				Durham
Jean Morrison SFR	WQ0004113	Non-Discharge Permits	Lower				Durham
13511 Roxboro Rd. SFR	WQ0035917	Non-Discharge Permits	Lower				Durham
Walnut Grove Church Rd. SFR	WQ0019332	Non-Discharge Permits	Lower				Orange
9517 Walnut Grove Church Rd. SFR #2	WQ0022021	Non-Discharge Permits	Lower				Orange
9517 Walnut Grove Church Rd. SFR #1	WQ0022017	Non-Discharge Permits	Lower				Orange
Parcel No. 9970962218 Walnut Grove Church Rd. SFR	WQ0040373	Non-Discharge Permits	Lower				Orange
632 Hillsborough Rd. SFR	WQ0005165	Non-Discharge Permits	Lower				Person
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
Parcel No. 20698 Weldon Painter Rd. SFR	WQ0008036	Non-Discharge Permits	Lower				Person
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
383 Weldon Painter Rd. SFR	WQ0008033	Non-Discharge Permits	Lower				Person
385 Weldon Painter Rd. SFR	WQ0008029	Non-Discharge Permits	Lower				Person
2033 Chambers Loop Rd. SFR	WQ0008030	Non-Discharge Permits	Lower				Person
2223 Chambers Loop SFR	WQ0008035	Non-Discharge Permits	Lower				Person
Oak Lane Elementary WWTF	WQ0004750	Non-Discharge Permits	Lower				Person
200 Harris MIll Rd	WQ0003180	Non-Discharge Permits	Lower				Durham
164 Barbees Ln. SFR	WQ0014319	Non-Discharge Permits	Lower				Person
Greater Cleggs Chapel Community Missionary Baptist Church WWTF	WQ0021950	Non-Discharge Permits	Lower				Person

PCS Name	PCS ID	PCS Type	PCS Risk Rating	Street Address	City	Zip	County
Greater Cleggs Chapel Community Missionary Baptist Church WWTF	WQ0021950	Non-Discharge Permits	Lower				Person
Greater Cleggs Chapel Community Missionary Baptist Church WWTF	WQ0021950	Non-Discharge Permits	Lower				Person
320 Flat Woods Rd. SFR	WQ0014375	Non-Discharge Permits	Lower				Person
3540 Antioch Church Rd. SFR	WQ0013405	Non-Discharge Permits	Lower				Person
4257 Antioch Church Rd. SFR	WQ0012264	Non-Discharge Permits	Lower				Person
4355 Antioch Church Rd. SFR	WQ0016342	Non-Discharge Permits	Lower				Person
NC Highway Patrol Station - Roxboro	NCG510489	NPDES Permits	Higher	3434 Burlington Rd	Roxboro	27573	Person
724 Hudson Blaylock Road	NCG550777	NPDES Permits	Higher	724 Houston Blalock Rd	Roxboro	27573	Person
288 Hillsborough Road	NCG551509	NPDES Permits	Higher	288 Hillsborough Rd	Timberlake	27583	Person
786 Dick Holeman Rd	NCG551631	NPDES Permits	Higher	786 Dick Holeman Rd	Timberlake	27583	Person
4124 Walnut Grove Church Road	NCG551703	NPDES Permits	Higher	9624 Walnut Grove Church Rd	Hillsborough	27278	Orange
Timberlake Covenience Store	NCG510337	NPDES Permits	Higher	8151 Durham Rd	Timberlake	27583	Person
122 Archery Range Road	NCG550557	NPDES Permits	Higher	122 Archery Range Rd	Bahama	27503	Durham
2710 Oxford Road	NCG550769	NPDES Permits	Higher	2710 Oxford Rd	Roxboro	27573	Person
6847 Helena Moriah Road	NCG550796	NPDES Permits	Higher	6847 Helena Moriah Rd	Rougemont	27572	Person
133 Outlaw Road	NCG550821	NPDES Permits	Higher	133 Outlaw Rd	Roxboro	27573	Person
10325 Hurdle Mills Road	NCG550875	NPDES Permits	Higher	10325 Hurdle Mills Rd	Hurdle Mills	27541	Person
895 Oxford Road	NCG550929	NPDES Permits	Higher	895 Oxford Rd	Roxboro	27573	Person
9722 Walnut Grove Church Road	NCG551102	NPDES Permits	Higher	9722 Walnut Grove Ch Rd	Hurdle Mills	27541	Orange
9402 NC Highway 157 West	NCG551144	NPDES Permits	Higher	9402 Nc Hwy 157 W	Rougemont	27572	Orange
200 Harris MIll Rd	NCG551177	NPDES Permits	Higher	200 Harris Mill Rd	Rougemont	27572	Durham
1325 Bahama Road	NCG551221	NPDES Permits	Higher	1325 Bahama Rd	Bahama	27503	Durham
1316 Bahama Road	NCG551401	NPDES Permits	Higher	1316 Bahama Rd	Bahama	27503	Durham
5312 Gray Road	NCG551412	NPDES Permits	Higher	5312 Gray Rd	Timberlake	27583	Orange
12911 Roxboro Road	NCG551512	NPDES Permits	Higher	12911 Roxboro Rd Us 501 N	Rougemont	27572	Durham
Person Quarry	NCG020058	NPDES Permits	Higher	Sr 1737-4 Miles N Of Hwy 501	Raleigh	27607	Person

PCS Name	PCS ID	PCS Type	PCS Risk Rating	Street Address	City	Zip	County
Roxboro plant	NCG030027	NPDES Permits	Higher	2564 Durham Rd	Roxboro	27573	Person
GKN Driveline	NCG030429	NPDES Permits	Higher	6400 Durham Rd	Timberlake	27583	Person
GKN Driveline	NCG030429	NPDES Permits	Higher	6400 Durham Rd	Timberlake	27583	Person
GKN Driveline	NCG030429	NPDES Permits	Higher	6400 Durham Rd	Timberlake	27583	Person
GKN Driveline	NCG030429	NPDES Permits	Higher	6400 Durham Rd	Timberlake	27583	Person
U.S. Flue-Cured Tobacco Growers, Inc.	NCG060254	NPDES Permits	Higher	250 Crown Blvd	Timberlake	27583	Person
U.S. Flue-Cured Tobacco Growers, Inc.	NCG060254	NPDES Permits	Higher	250 Crown Blvd	Timberlake	27583	Person
Snipes Brothers Oil Co-Roxboro	NCG080867	NPDES Permits	Higher	616 S Morgan St	Roxboro	27573	Person
Person County	NCG150043	NPDES Permits	Higher	385 Montgomery Dr	Timberlake	27583	Person
Person County	NCG150043	NPDES Permits	Higher	385 Montgomery Dr	Timberlake	27583	Person
Mark Line industries	NCG210378	NPDES Permits	Higher	455 Lucy Garret Rd	Roxboro	27574	Person
Wesbell Assest Recovery Center	NCGNE0720	NPDES Permits	Higher	555 Lucy Garrett Rd	Roxboro	27574	Person
NC Nat Gd- Roxboro	NCGNE0408	NPDES Permits	Higher	Po Box 379 1028 Burlingto	Roxboro	27573	Person
Butner Beef Cattle Field Laboratory	AWC320002	Animal Operations	Higher	8800 Cassam Rd	Bahama	275038566	Durham
Allen's Farm Inc.	AWI730001	Animal Operations	Higher	6155 Burlington Rd	Roxboro	27574	Person
Poindexter Farms	AWI730009	Animal Operations	Higher	990 Young Chapel Church Rd	Roxboro	27574	Person
Boyette Swine Farm	AWI730011	Animal Operations	Higher	888 John Roger Rd	Hurdle Mills	27541	Person
Beaver Creek Farm	AWS680003	Animal Operations	Higher	2425 Breeze Rd	Hurdle Mills	27541	Orange
James Thomas Farm	AWS730002	Animal Operations	Higher	8842	Timberlake	27583	Person
Foushee Farms LLC	AWS730005	Animal Operations	Higher	1859 Flat River Church Rd	Roxboro	27574	Person
Thomas Farms Pork Inc.	AWS730006	Animal Operations	Higher	686 Johnny Jones Rd	Timberlake	27583	Person
Paul G. Hatley Hog Farm	AWS730008	Animal Operations	Higher	888 John Rogers Rd	Hurdle Mills	27541	Person
Boyette Swine Farm	AWS730011	Animal Operations	Higher	888 John Roger Rd	Hurdle Mills	27541	Person
Thomas Lindsey Demo Landfill	73C-DEMO-	Solid Waste Facilities	Moderate	Ed Brooks Rd.	Timberlake	27583	Person
Person County Recycling Center	7306-TIRECOLL-2014	Solid Waste Facilities	Moderate	741 Martin Street	Roxboro	27573	Person
TIMBERLAKE NC CO	6362181	Tier II Sites	Higher	St Rd 1517	Timberlake	27583	Person

PCS Name	PCS ID	PCS Type	PCS Risk Rating	Street Address	City	Zip	County
AT&T - NC4700	6373284	Tier II Sites	Higher	Moseley Ft7s Lightguide	Hurdle Mills	27541	Person
Butner Beef Cattle Field Laboratory	6375335	Tier II Sites	Higher	8800 Cassam Rd.	Bahama	27503	Granville
Frontier HOLT AREA/BAHAMA HUT - 8513 STAGVILLE RD (FTR- 973-51038-87069)	6381882	Tier II Sites	Higher	8513 Stagville Rd	Durham	27503	Durham
LOWE'S OF ROXBORO, NC (STORE # 2210)	6392090	Tier II Sites	Higher	2044 Durham Road	Roxboro	27573	Person
Carolane Propane	6397106	Tier II Sites	Higher	2476 Durham Rd	Roxboro	27573	Person
GKN Driveline Roxboro	6397578	Tier II Sites	Higher	6400 Durham Road	Timberlake	27583	Person
Bahama 230 KV Substation	6398972	Tier II Sites	Higher	3200 Bahama Rd	Bahama	27503	Durham
Roxboro South 230 KV Substation	6398911	Tier II Sites	Higher	195 David Ln	Roxboro	27573	Person
Roxboro Line and Service	6397656	Tier II Sites	Higher	25 Burlington Rd	Roxboro	27573-5472	Person
U.S. Flue-Cured Tobacco Growers, Inc.	6407117	Tier II Sites	Higher	250 Crown Boulevard	Timberlake	27583	Person
Eaton Corporation	6404563	Tier II Sites	Higher	2564 Durham Road	Roxboro	27573	Person
Piedmont Electric Membership Cooperative	6438133	Tier II Sites	Higher	1125 Oxford Road	Roxboro	27573	Person
NC Highway Patrol Station - Roxboro	WI0500818	UIC Permits	Lower	3434 Burlington Rd	Roxboro	27573	Person
NC Highway Patrol - Roxboro	WI0500819	UIC Permits	Lower	3434 Burlington Rd	Roxboro	27574	Person
Eaton Corp. Roxboro Facility	WI0500980	UIC Permits	Lower	2564 Durham Rd	Roxboro	27573	Person
VILLAGE BP	00-0-0000035816	UST Permits	Moderate	12919 Us Hwy 501	Rougemont	27572-7825	Durham
ROUGEMONT FOOD MART	00-0-0000018927	UST Permits	Moderate	12924 Us Hwy 501	Rougemont	27572	Durham
BLALOCK'S CONVENIENCE STORE	00-0-0000016108	UST Permits	Moderate	13210 Us 501/rt 3, Box 14-a	Rougemont	27572	Durham
COUNTY LINE MARATHON	00-0-0000034552	UST Permits	Moderate	11029 Durham Road	Timberlake	27583-8404	Person
CHANDLER'S STORE	00-0-0000018922	UST Permits	Moderate	Route 1 (3685 Helena Moriah Rd)	Rougemont	27572	Person
HOLLOW RIDGE GRO	00-0-0000021400	UST Permits	Moderate	3150 Helena-moriah Road	Rougemont	27572-8231	Person
TIMBERLAKE CONVENIENCE	00-0-0000019169	UST Permits	Moderate	8151 Durham Road	Timberlake	27583-9577	Person
HELENA ELEMENTARY SCHOOL	00-0-0000026719	UST Permits	Moderate	295 Helena Moriah Road	Roxboro	27573	Person
PERSON COUNTY AIRPORT	00-0-0000029842	UST Permits	Moderate	385 Montgomery Dr	Timberlake	27583	Person

PCS Name	PCS ID	PCS Type	PCS Risk Rating	Street Address	City	Zip	County
ROBERTS SERVICE MART INC	00-0-0000018128	UST Permits	Moderate	8200 Burlington Road	Hurdle Mills	27541	Person
SOUTHSIDE CITGO	00-0-0000034821	UST Permits	Moderate	5488 Durham Rd	Roxboro	27573	Person
L J MARTIN & SONS INC	00-0-0000027763	UST Permits	Moderate	222 Kiser Martin Rd	Timberlake	27583	Person
SOUTHERN FOOD MART	00-0-0000019267	UST Permits	Moderate	1274 Hurdle Mills Road	Roxboro	27573	Person
Keith's Family Conv.	00-0-0000026222	UST Permits	Moderate	Hwy 158 E	Roxboro	27573	Person
FAS MART 105 - CITGO	00-0-0000021579	UST Permits	Moderate	3326 Durham Road	Roxboro	27573	Person
BREEZE THRU, LLC	00-0-0000025348	UST Permits	Moderate	3104 Durham Road	Roxboro	27573-6186	Person
CC&PS, DIV. OF STATE HWY PATROL	00-0-0000025114	UST Permits	Moderate	3434 Burlington Rd	Roxboro	27573	Person
ROSEVILLE GROCERY	00-0-0000028848	UST Permits	Moderate	3375 Burlington Rd	Roxboro	27573	Person
MURPHY USA 6858	00-0-0000036487	UST Permits	Moderate	1051 Durham	Roxboro	27573	Person
HOME OIL (PLANT)	00-0-0000018937	UST Permits	Moderate	150 Old Durham Rd	Roxboro	27573	Person
J.G. HARDISON CO., INC.	00-0-0000032096	UST Permits	Moderate	1340 Durham Road	Roxboro	27573	Person
A & M MINI MART	00-0-0000018926	UST Permits	Moderate	1384 Burlington Road, Highway 49	Roxboro	27573	Person
COLONY CONVIENCE MART	00-0-0000018961	UST Permits	Moderate	730 Durham Road	Roxboro	27573	Person
LITCHFIELD SERVICE STATION	00-0-0000019668	UST Permits	Moderate	628 S Morgan Street	Roxboro	27573	Person
SNIPES BROTHERS OIL CO	00-0-0000019674	UST Permits	Moderate	719 S Morgan St	Roxboro	27573	Person
FOODMART #8 - HOME OIL CO.	6280	Pollution Incidents	Higher	Hwy 501 & Red Mountain Road	Rougemont	27572-	Durha
MORRISTOWN GROCERY	3346	Pollution Incidents	Higher	4339 Oxford Road (us Hwy 158)	Roxboro	27573-	Perso
MT. HARMONY GROCERY	3831	Pollution Incidents	Higher	1818 Mt Harmony Church Rd	Roxboro	27573-	Perso
LOXCREEN(GASOLINE)	9179	Pollution Incidents	Higher	1658 Old Durham Rd	Roxboro	27573-	Perso
COUNTRY STORE-HURDLE MILLS	11675	Pollution Incidents	Higher	11250 Hurdle Mills Road	Hurdle Mills	27541-	Perso

Table 5. Inherent Vulnerability Rating
DURHAM, CITY OF
PWS ID: NC0332010, LAKE MICHIE

Surface Water Source Characteristics	Vulnerability
Watershed Classification	Moderate
Intake Location	Lower
Raw Water Quality (water plant data)	Higher
Watershed Characteristics Rating	Lower

Inherent Vulnerability Rating: Moderate

Table 6. Watershed Characteristics Rating Calculation
DURHAM, CITY OF
PWS ID: NC0332010, LAKE MICHIE

Watershed Characteristics Score	29.7

Notes:

1. Watershed Characteristics Score for each cell (CS):

CS = [3 x (precipitation score)] + [2 x (land surface slope score)] + [1 x (GW contribution)] + [3 x (land use score)] + [1 x (land cover score)]

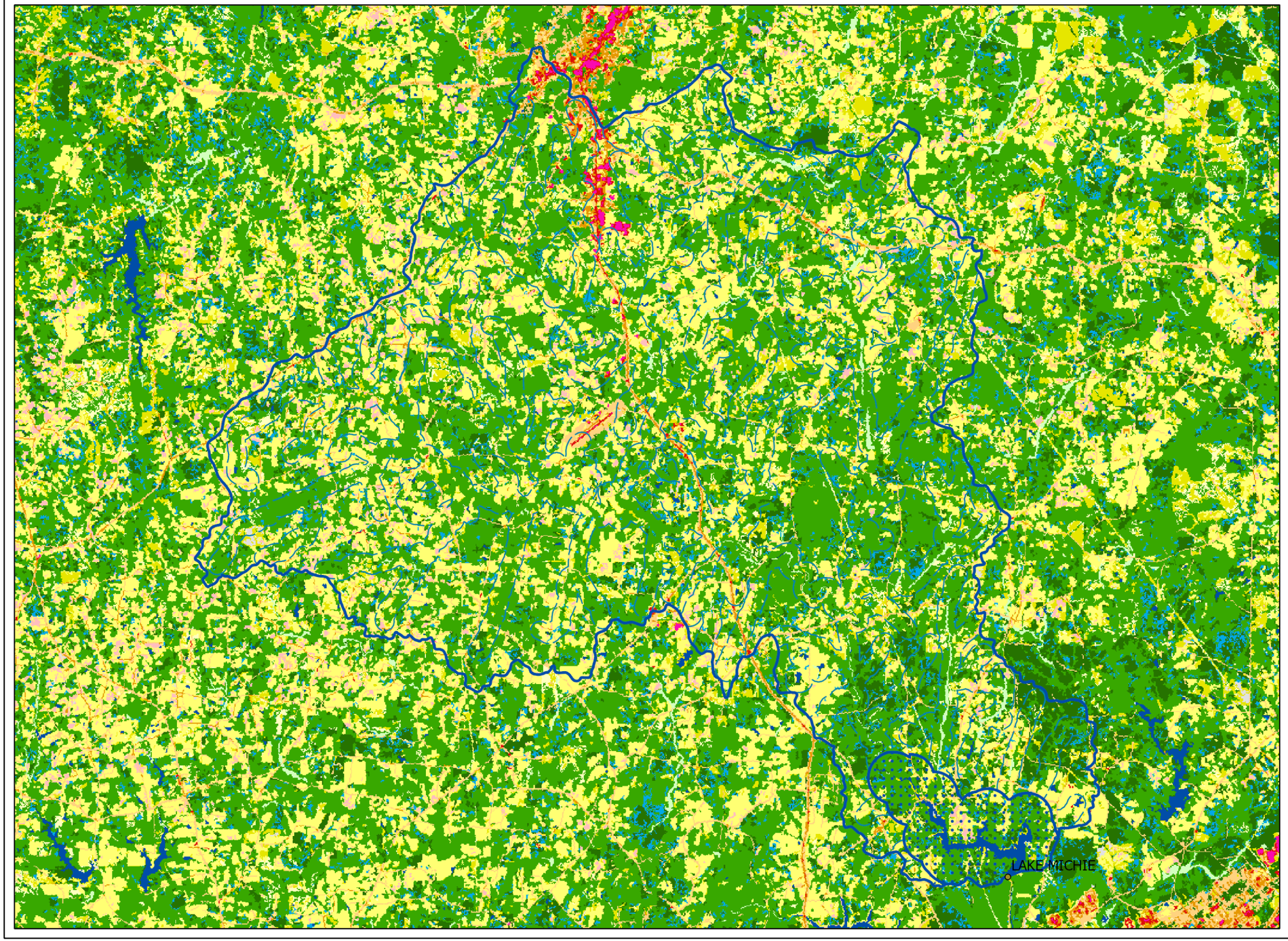
2. Watershed Characteristics Score (S) for the entire assessment area is the mean of the cell scores (CS) calculated as:

The sum of all cell watershed characteristics scores (CS) divided by the number of cells (N) within the assessment area: $S = (\Sigma CS) / N$

3. The USGS publication "Methods of ranking unsaturated zone and watershed characteristics of public water supplies in North Carolina", by J. L. Eimers, J. C. Weaver, S. Terziotti, and R. W. Midgette, 1999, provides a detailed discussion of the methods used to determine unsaturated zone ratings.

FIGURE 1. LAND USE/LAND COVER CATEGORIES

DURHAM, CITY OF
PWS ID: 0332010
LAKE MICHIE



- Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land (Rock, Sand, Clay)
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland, Herbaceous
- Pasture, Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

Watershed Zones

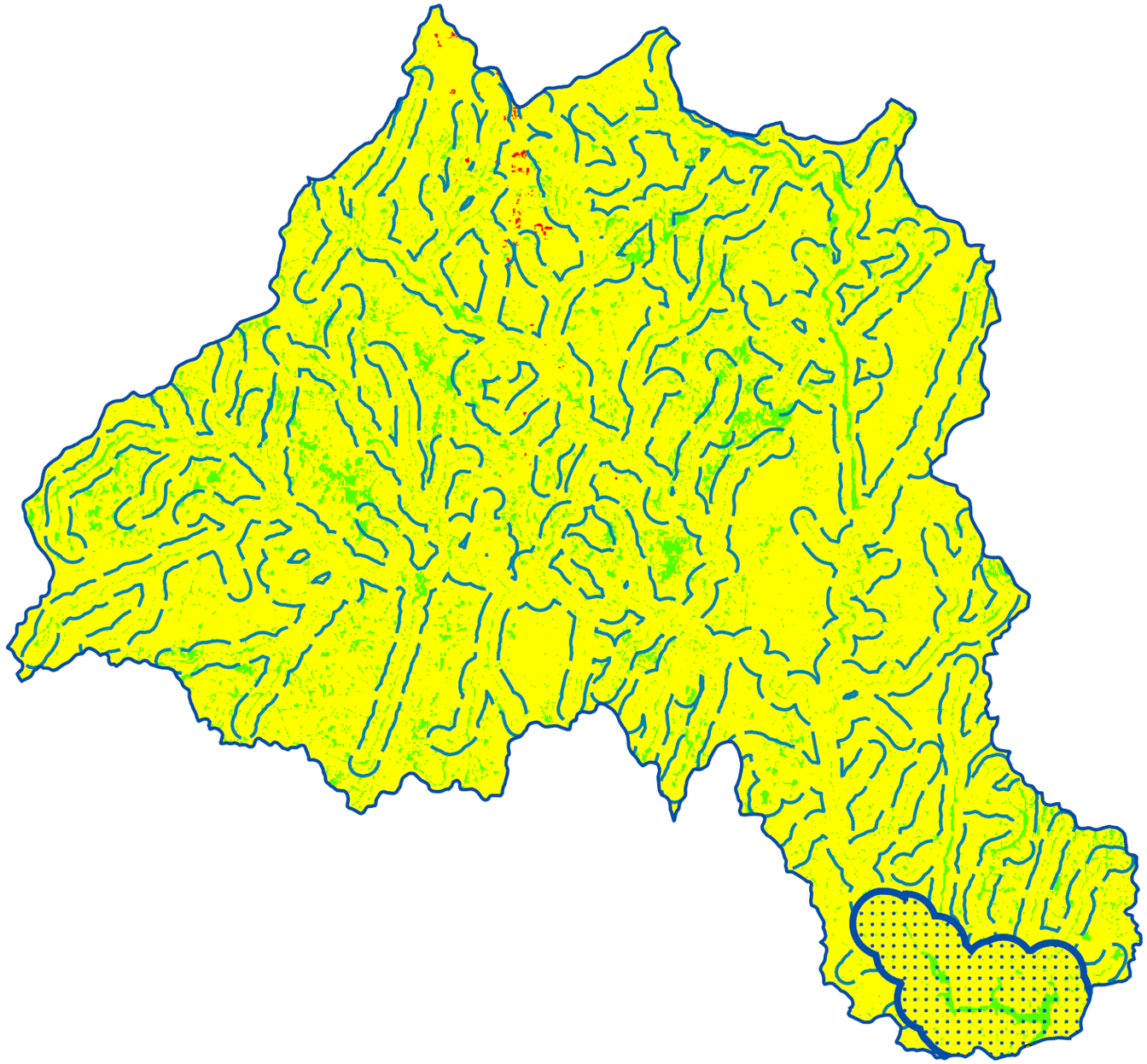
- Critical Area Boundary
- Protected Area Boundary
- Stream Zone Boundary
- Watershed Boundary

0 1 2 3
Miles

N
W E
S

FIGURE 2. WATERSHED CHARACTERISTICS RATING

DURHAM, CITY OF
PWS ID: 0332010
LAKE MICHIE



Lower <=31
Moderate >31 to 45
Higher > 45

Watershed Zones

Critical Area Boundary
Protected Area Boundary
Stream Zone Boundary
Watershed Boundary

0 1 2 3
Miles

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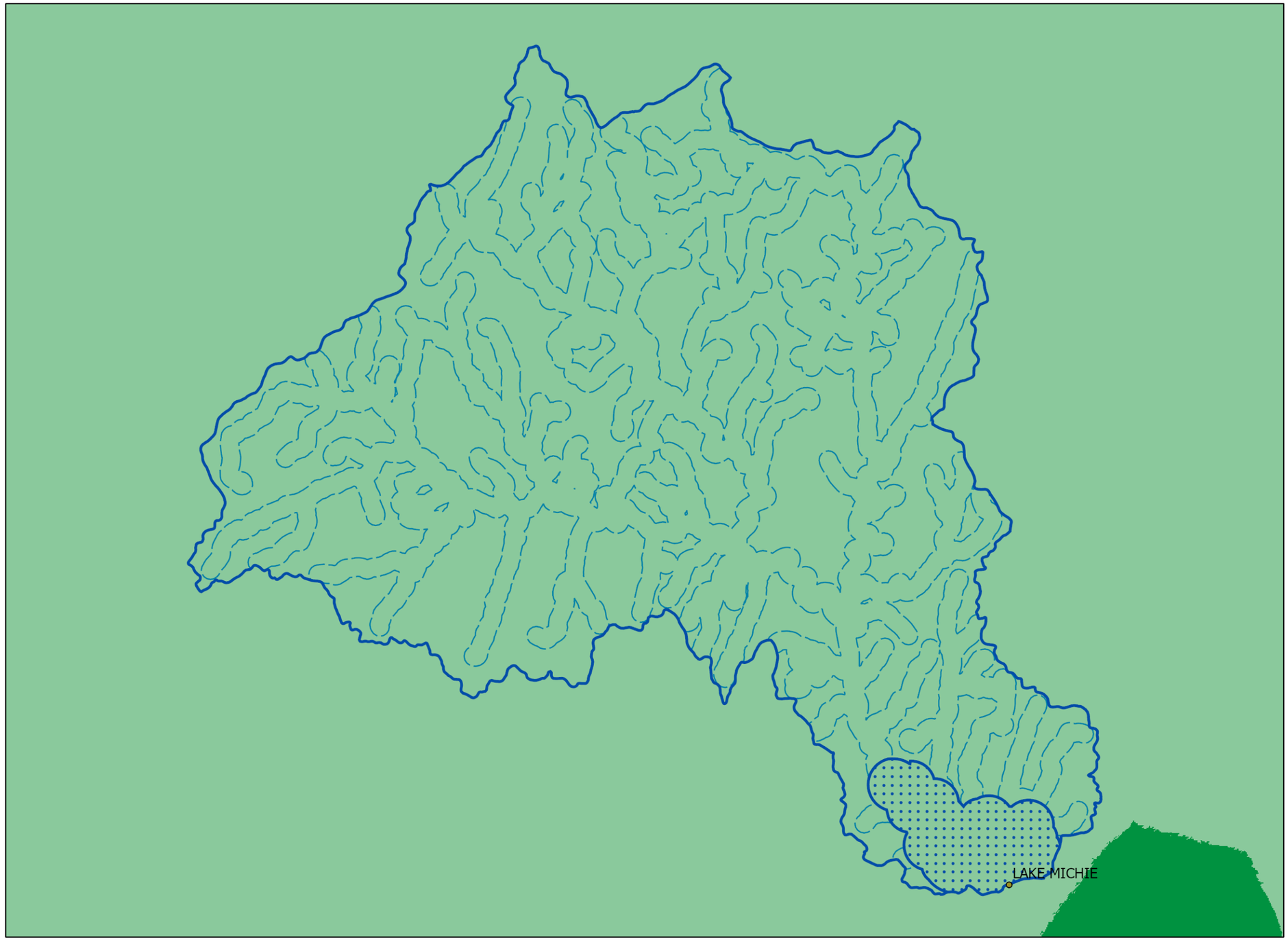
FIGURE 3. AVERAGE ANNUAL PRECIPITATION RATING

DURHAM, CITY OF
PWS ID: 0332010
LAKE MICHIE



Assigned Ratings
- 1 (<= 40 inches)
- 2 (> 40 to 45 inches)
- 3 (> 45 to 50 inches)
- 4 (> 50 to 55 inches)
- 5 (> 55 to 60 inches)
- 6 (> 60 to 65 inches)
- 7 (> 65 to 70 inches)
- 8 (> 70 to 75 inches)
- 9 (> 75 to 80 inches)
- 10 (> 80 inches)

Watershed Zones
- Critical Area Boundary
- Protected Area Boundary
- Stream Zone Boundary
- Watershed Boundary

0 1 2 3
Miles

N
W E
S

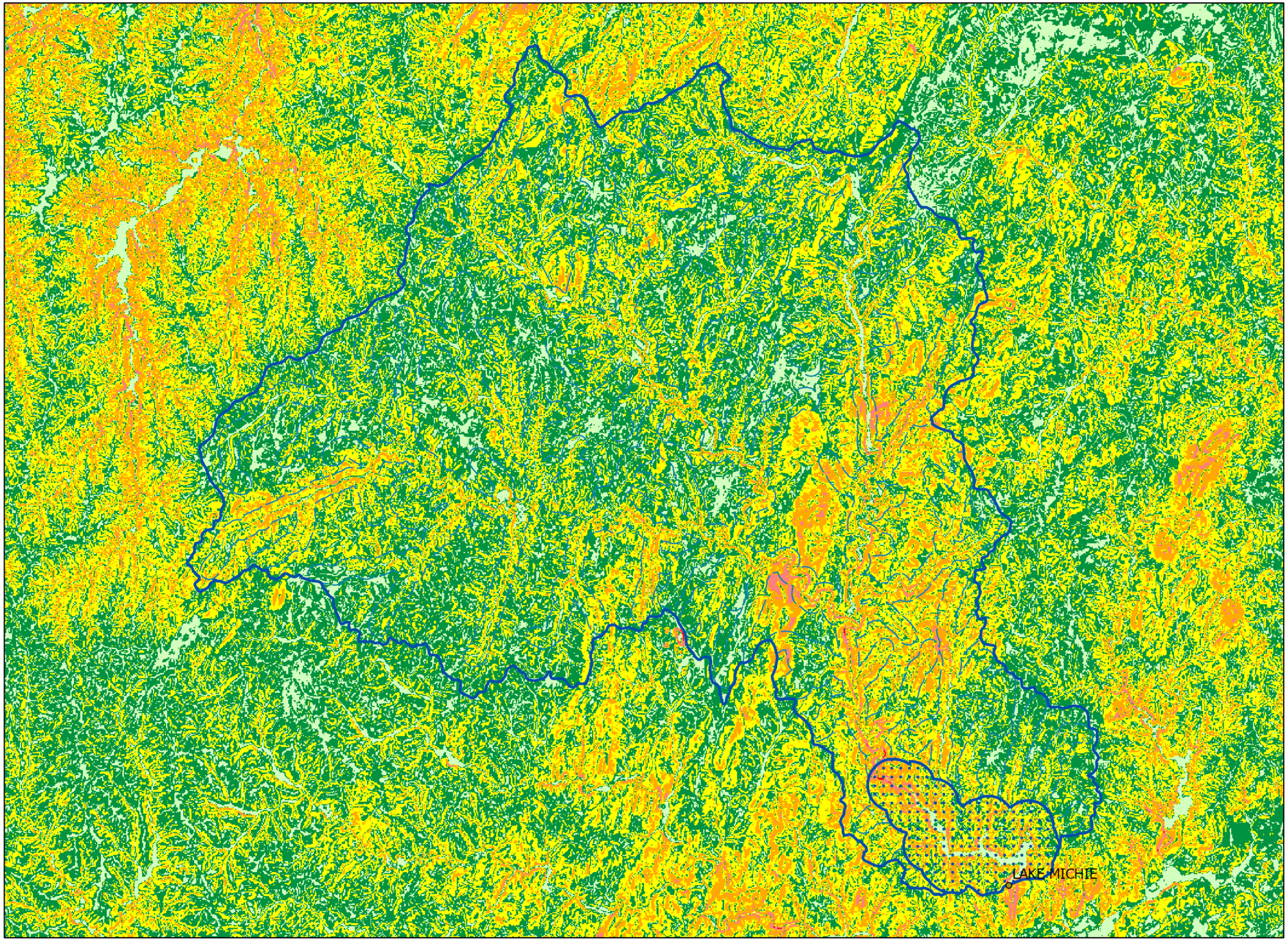


FIGURE 4. LAND SURFACE SLOPE RATING

DURHAM, CITY OF
PWS ID: 0332010
LAKE MICHIE

Assigned Ratings
- 1 (<= 2 percent)
- 3 (> 2 to 5 percent)
- 5 (> 5 to 10 percent)
- 7 (> 10 to 20 percent)
- 9 (> 20 to 50 percent)
- 10 (> 50 percent)

Watershed Zones
- Critical Area Boundary
- Protected Area Boundary
- Stream Zone Boundary
- Watershed Boundary

0 1 2 3
Miles

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W E
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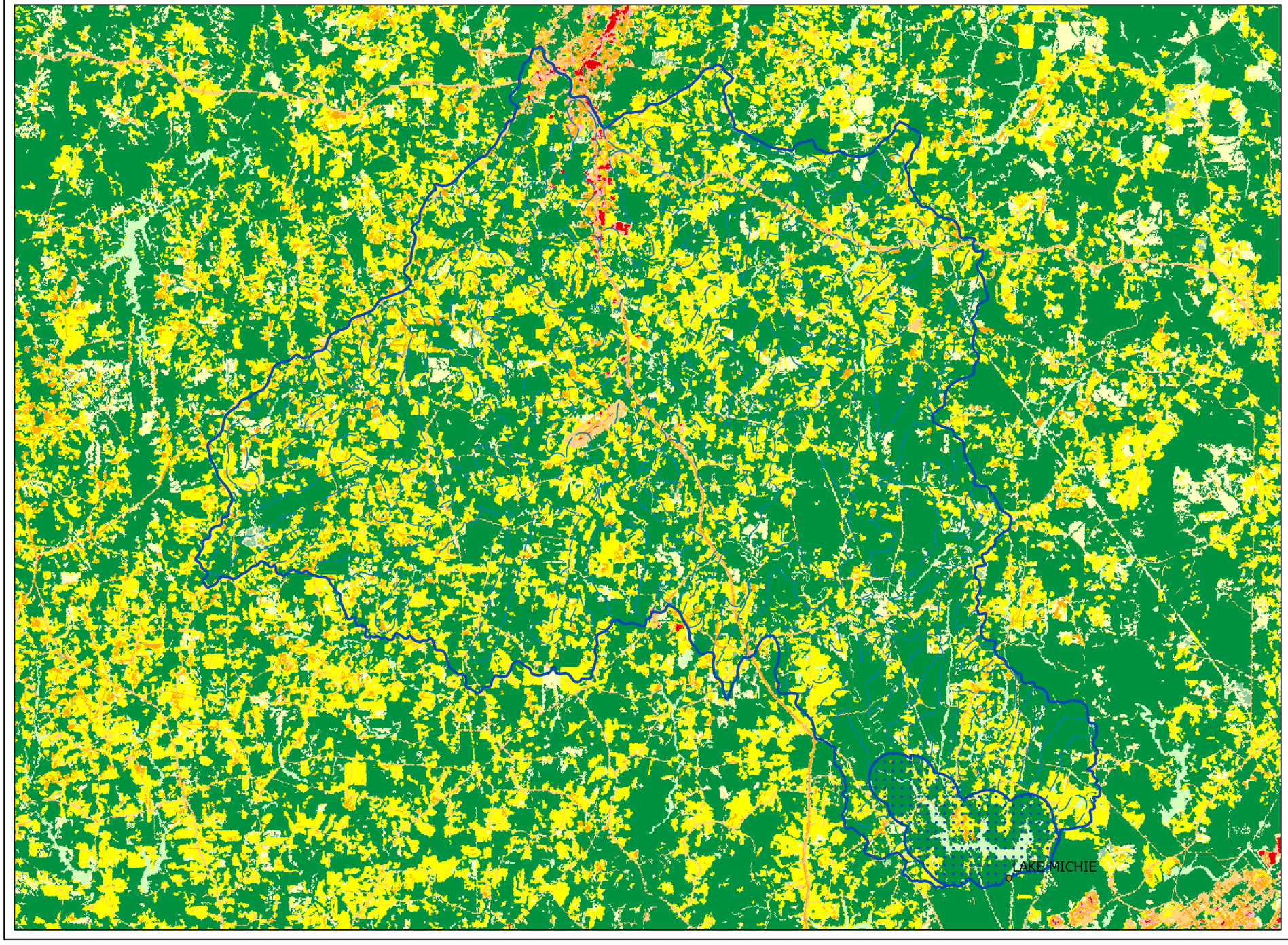
FIGURE 5. LAND USE RATING

DURHAM, CITY OF
PWS ID: 0332010
LAKE MICHIE



1 Water, Wetlands (Woody and Herbaceous)
2 Barren Land (Rock/Sand/Clay)
3 Forest (Deciduous, Evergreen, Mixed)
4 Grassland/Herbaceous; Shrub/Scrub
5 Pasture/Hay
6 Developed, Open Space
7 Developed, Low Intensity; Cultivated Crops
8 Developed, Medium Intensity
10 Developed, High Intensity

Watershed Zones

Critical Area Boundary
Protected Area Boundary
Stream Zone Boundary
Watershed Boundary

0 1 2 3
Miles

N
W E
S

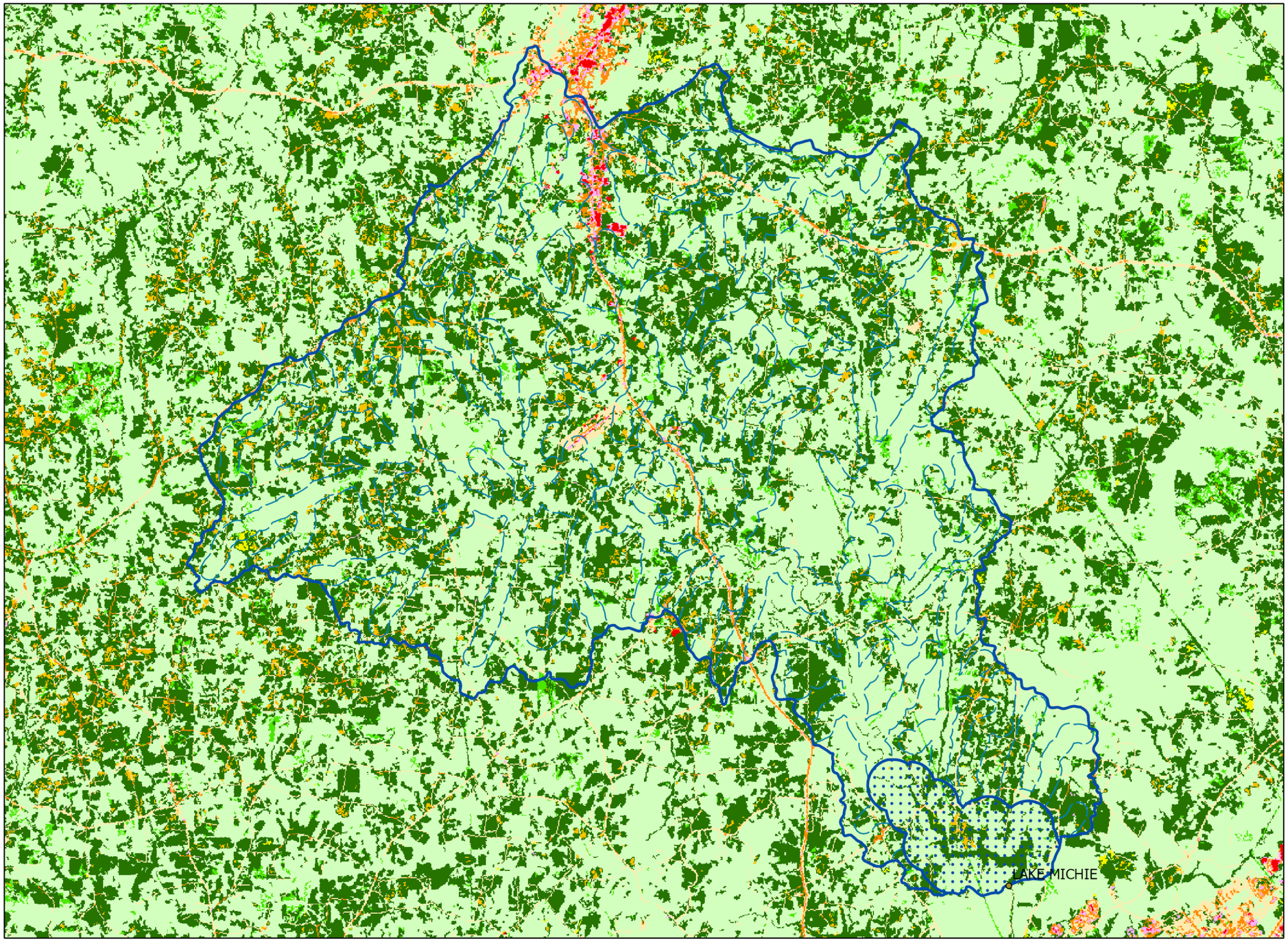


FIGURE 6. LAND COVER RATING

DURHAM, CITY OF
PWS ID: 0332010
LAKE MICHIE

Assigned Ratings
- 1 Deciduous, Evergreen and Mixed Forest
- 3 (Water, Pasture/hay, Woody wetlands, Emergent herbaceous wetlands)
- 3 Water, Wetlands, Pasture/Hay, Grassland/Herbaceous
- 5 (Quarries/strip mines/gravel pits, Bare rock/sand, Transitional)
- 5 Barren Land (Rock, Sand, Clay)
- 6 Cultivated Crops
- 7 Developed, Low Intensity
- 8 Developed, Medium Intensity
- 10 Developed, High Intensity

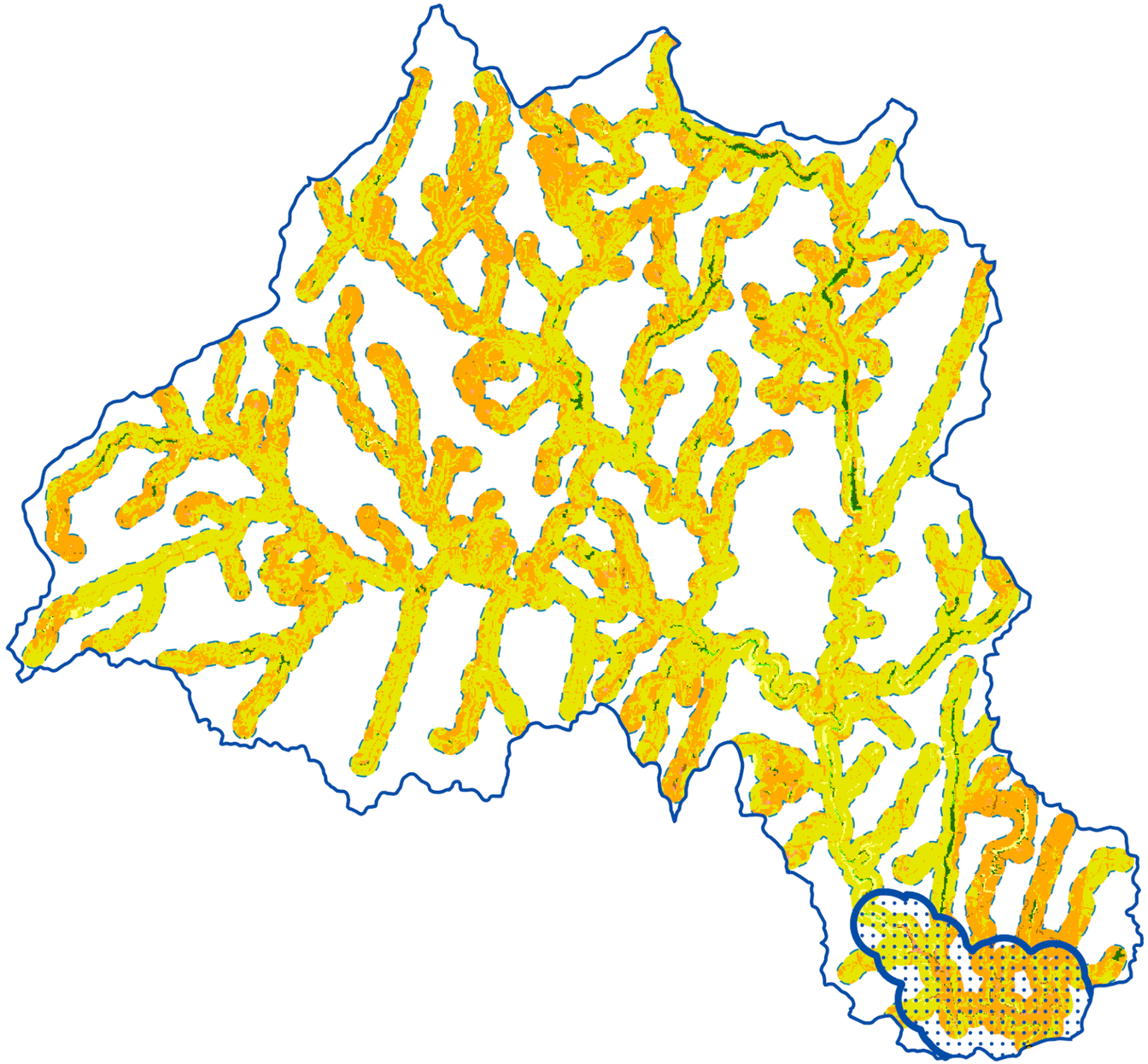
Watershed Zones
- Critical Area Boundary
- Protected Area Boundary
- Stream Zone Boundary
- Watershed Boundary

0 1 2 3 Miles

N W E S

FIGURE 7. GROUND WATER CONTRIBUTION RATING

DURHAM, CITY OF
PWS ID: 0332010
LAKE MICHIE



Assigned Ratings

- 1 (<= 10 Unsaturated Zone Rating)
- 2 (>= 10 to 20 Unsaturated Zone Rating)
- 3 (>= 20 to 30 Unsaturated Zone Rating)
- 4 (>= 30 to 40 Unsaturated Zone Rating)
- 5 (>= 40 to 50 Unsaturated Zone Rating)
- 6 (>= 50 to 60 Unsaturated Zone Rating)
- 7 (>= 60 to 70 Unsaturated Zone Rating)
- 8 (>= 70 to 80 Unsaturated Zone Rating)
- 9 (>= 80 to 90 Unsaturated Zone Rating)
- 10 (>= 90 to 100 Unsaturated Zone Rating)

Watershed Zones

- Critical Area Boundary
- Protected Area Boundary
- Stream Zone Boundary
- Watershed Boundary

0 1 2 3
Miles

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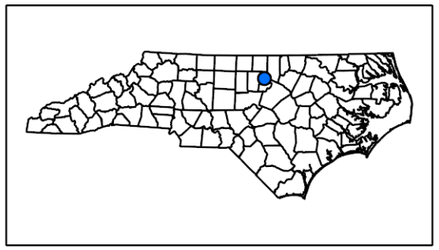
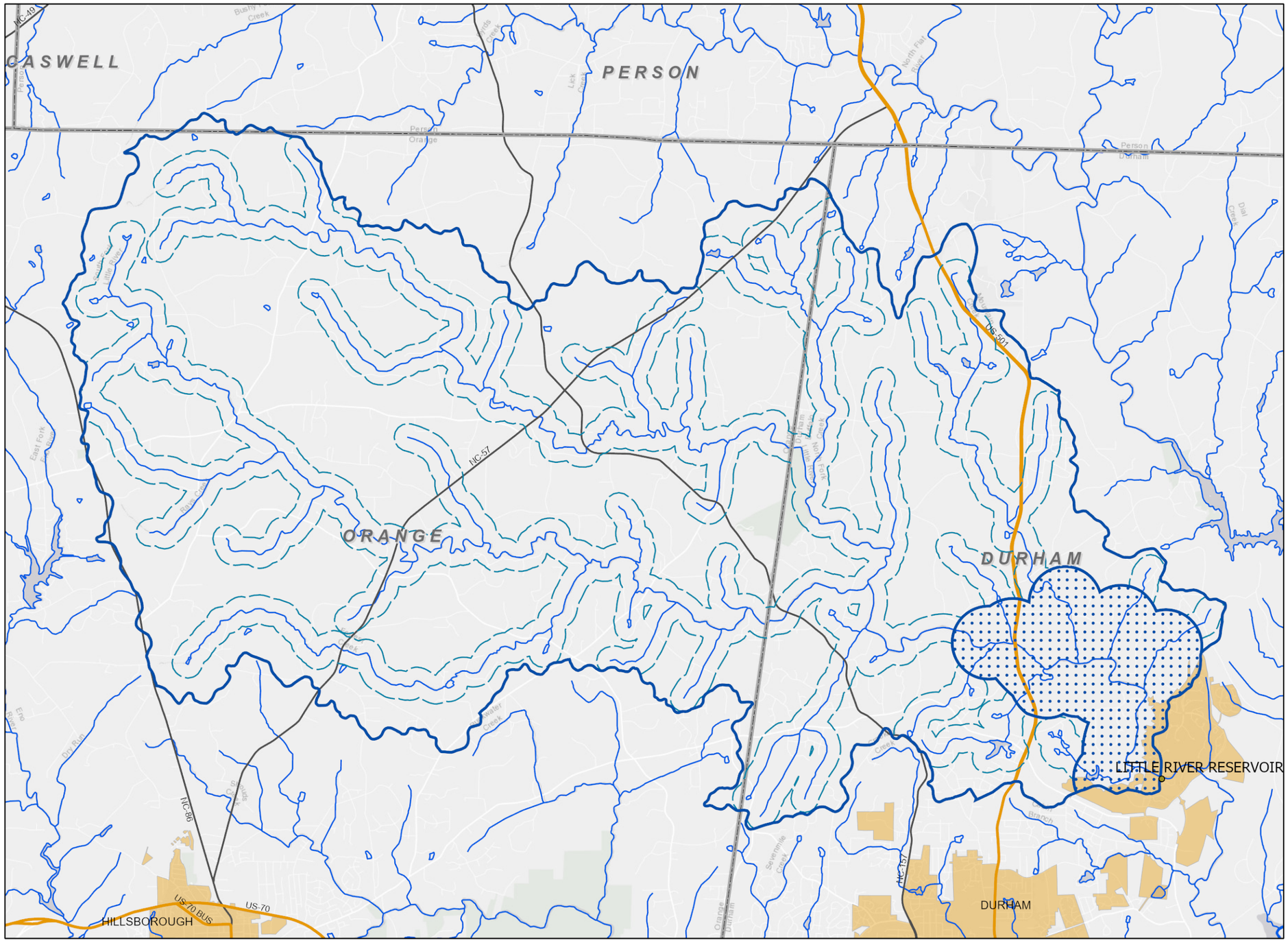
MAP 1. LOCATION MAP

DURHAM, CITY OF
PWS ID: 0332010
LITTLE RIVER RESERVOIR





Major Roads
- Interstate
- US Route
- NC Route

Rivers and Streams
Major Hydrology
Municipal Boundaries
County Boundaries

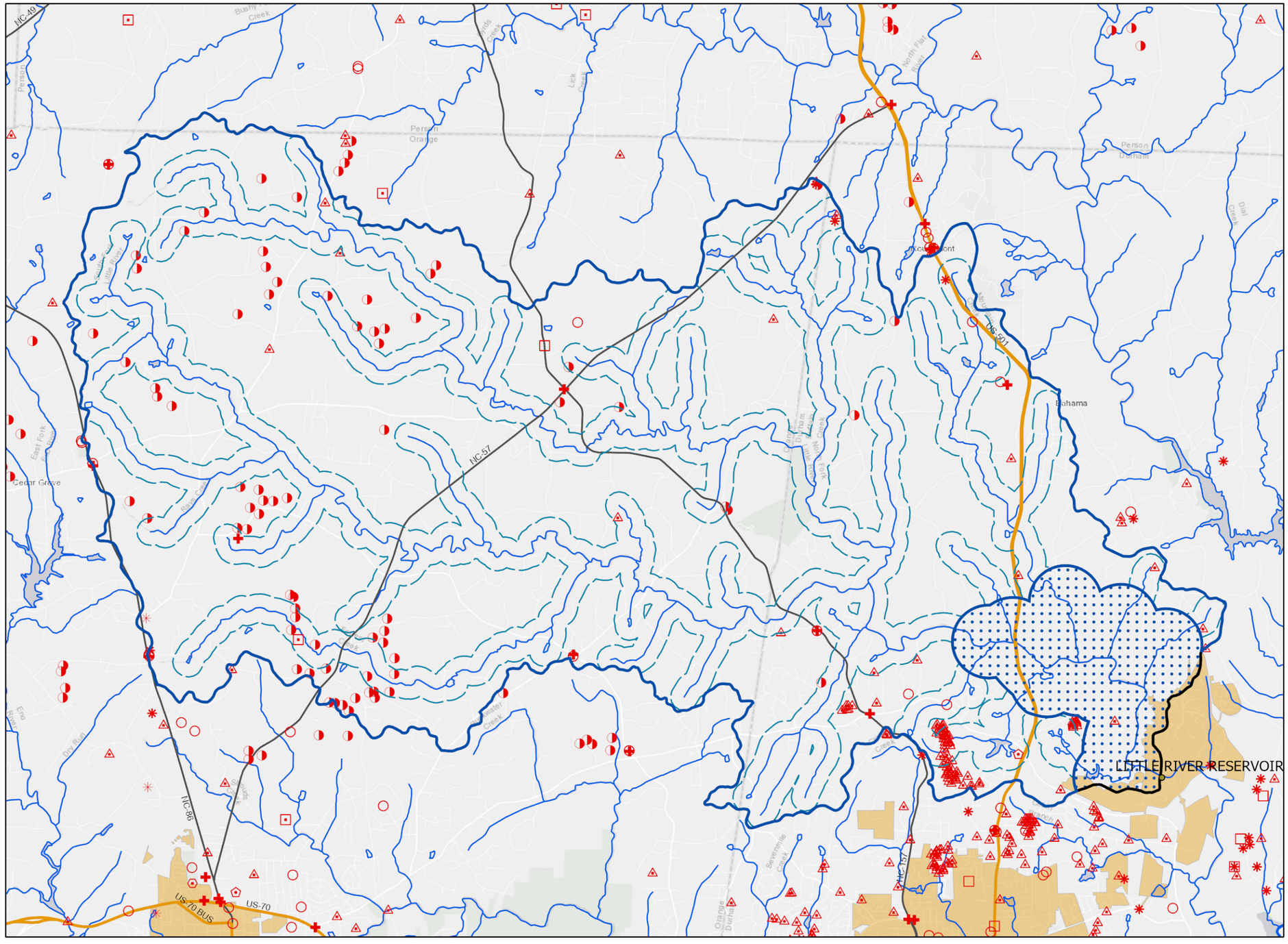
Watershed Zones
- Critical Area Boundary
- Protected Area Boundary
- Stream Zone Boundary
- Watershed Boundary

0 1 2 3 Miles

N
W E
S

MAP 2. DELINEATED AREA AND PCS MAP

DURHAM, CITY OF
PWS ID: 0332010
LITTLE RIVER RESERVOIR



PCS Types
- Animal Operations
- CERCLA-Fed. Remediation
- Hazardous Waste Sites
- Inactive Hazardous Waste Sites
- Non Discharge Permits
- NPDES Permits
- PCB Sites
- Pollution Incidents
- Septage Disposal Sites
- Soil Remediation Sites
- Solid Waste Facilities
- Tier II Sites
- Old Landfill Sites
- UIC Permits
- UST Permits

Major Roads
- Interstate
- US Route
- NC Route
- Rivers and Streams
- Major Hydrology
- Municipal Boundaries

Watershed Zones
- Critical Area Boundary
- Protected Area Boundary
- Stream Zone Boundary
- Watershed Boundary

0 1 2 3 Miles

N W E S

Table 4. Potential Contaminant Source Attributes
DURHAM, CITY OF
PWS ID: NC0332010, LITTLE RIVER RESERVOIR

PCS Name	PCS ID	PCS Type	PCS Risk Rating	Street Address	City	Zip	County
CARDENS BODY & PAINT SERVICE	NCD982128779	Hazardous Waste Sites	Higher	7709 Hwy 157	Rougemont	27572	Durham
PONDVIEW LANE	NONCD0002321	Inactive Hazardous Sites	Higher	Pondview Lane	Durham		Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
OWASA RLAP	WQ0001169	Non-Discharge Permits	Lower				Orange
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
11 Thistle Trace SFR	WQ0020018	Non-Discharge Permits	Lower				Durham
OWASA RLAP	WQ0001169	Non-Discharge Permits	Lower				Orange
OWASA RLAP	WQ0001169	Non-Discharge Permits	Lower				Orange
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
OWASA RLAP	WQ0001169	Non-Discharge Permits	Lower				Orange
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
OWASA RLAP	WQ0001169	Non-Discharge Permits	Lower				Orange
OWASA RLAP	WQ0001169	Non-Discharge Permits	Lower				Orange
OWASA RLAP	WQ0001169	Non-Discharge Permits	Lower				Orange
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham

PCS Name	PCS ID	PCS Type	PCS Risk Rating	Street Address	City	Zip	County
OWASA RLAP	WQ0001169	Non-Discharge Permits	Lower				Orange
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
4613 Guess Rd. SFR	WQ0007581	Non-Discharge Permits	Lower				Orange
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
5805 New Sharon Church Rd. SFR	WQ0006030	Non-Discharge Permits	Lower				Orange
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
Parcel No. 9888156073 Joshua Tree Ln. SFR	WQ0032943	Non-Discharge Permits	Lower				Orange
10311 Rougemont Rd. SFR	WQ0024720	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
7111 NC 57 SFR	WQ0023587	Non-Discharge Permits	Lower				Orange

PCS Name	PCS ID	PCS Type	PCS Risk Rating	Street Address	City	Zip	County
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
915 Olin Rd. SFR	WQ0036397	Non-Discharge Permits	Lower				Orange
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
7215 Caviness Jordan Rd. SFR	WQ0023179	Non-Discharge Permits	Lower				Orange
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
2109 Harris Rd. SFR	WQ0015950	Non-Discharge Permits	Lower				Durham
3527 Brown Road SFR	WQ0018009	Non-Discharge Permits	Lower				Orange
1508 Hawkins Rd. SFR	WQ0031527	Non-Discharge Permits	Lower				Orange
City of Durham RLAP	WQ0003504	Non-Discharge Permits	Lower				Durham
2211 Laws Store Rd. SFR	WQ0003540	Non-Discharge Permits	Lower				Orange
Parcel No. 9879354085 Walnut Grove Church Rd. SFR	WQ0039997	Non-Discharge Permits	Lower				Orange
7904 Walnut Grove Church Rd. SFR	WQ0006198	Non-Discharge Permits	Lower				Orange
3414 Laws Store Rd. SFR	WQ0019096	Non-Discharge Permits	Lower				Orange
8116 Wilkerson Rd. SFR	WQ0021182	Non-Discharge Permits	Lower				Orange
1717 Ormond Rd. SFR	WQ0031820	Non-Discharge Permits	Lower				Orange
3520 Laws Store Rd. SFR	WQ0005440	Non-Discharge Permits	Lower				Orange
8122 Wilkerson Rd. SFR	WQ0015793	Non-Discharge Permits	Lower				Orange
8514 Hester Rd. SFR	WQ0020254	Non-Discharge Permits	Lower				Orange
8501 Wilkerson Rd. SFR	WQ0012930	Non-Discharge Permits	Lower				Orange

PCS Name	PCS ID	PCS Type	PCS Risk Rating	Street Address	City	Zip	County
1103 Footprint Springs Rd. SFR	WQ0033740	Non-Discharge Permits	Lower				Orange
Lattisville Grove Missionary Baptist Church WWTF	WQ0022785	Non-Discharge Permits	Lower				Orange
Rougemont Concrete Plant	WQ0007345	Non-Discharge Permits	Lower				Orange
501 Lost Way SFR	WQ0029792	Non-Discharge Permits	Lower				Orange
JSOC, SOF C4 Facility (LI 66362)	SW6110103	NPDES Permits	Higher	Between Shaghart Way To The W Of The Train Tracks	Fort Bragg	28310	Cumberland
6225 Doyle Road	NCG550053	NPDES Permits	Higher	6225 Doyle Rd	Durham	27712	Durham
1411 Oak Forest Drive	NCG550497	NPDES Permits	Higher	1411 Oak Forest Dr	Hillsborough	27278	Durham
728 Jonquil Street	NCG550554	NPDES Permits	Higher	728 Jonquil St	Durham	27712	Durham
6107 Dello Road	NCG550587	NPDES Permits	Higher	6107 Dello St	Durham	27712	Durham
6915 Innesbrook Way	NCG550596	NPDES Permits	Higher	6915 Innesbrook Way	Bahama	27503	Durham
725 Harold Drive	NCG550676	NPDES Permits	Higher	725 Harold Dr	Durham	277121517	Durham
115 Jasmine Place	NCG550731	NPDES Permits	Higher	115 Jasmine Pl	Durham	27712	Durham
6121 Dello Street	NCG550837	NPDES Permits	Higher	6121 Dello St	Durham	27712	Durham
8604 Roxboro Road	NCG550842	NPDES Permits	Higher	8604 Roxboro Rd	Bahama	27503	Durham
1412 Oak Forest Drive	NCG550937	NPDES Permits	Higher	1412 Oak Forest Dr	Hillsborough	27278	Durham
7106 Walnut Grove Church Road	NCG551268	NPDES Permits	Higher	7106 Walnut Grove Church Rd	Hurdle Mills	275418848	Orange
727 Donlee Drive	NCG551269	NPDES Permits	Higher	727 Donlee Dr	Durham	27712	Durham
6506 Whitt Road	NCG551345	NPDES Permits	Higher	6506 Whitt Rd	Durham	27712	Durham
110 Jasmine Place	NCG551505	NPDES Permits	Higher	110 Jasmine Pl	Durham	27712	Durham
8411 McKee Road	NCG551582	NPDES Permits	Higher	8411 Mckee Rd	Rougemont	27572	Orange
7109 Stagville Road	NCG551607	NPDES Permits	Higher	7109 Stagville Rd	Bahama	27503	Durham
2707 Little River Drive	NCG551626	NPDES Permits	Higher	2707 Little River Dr	Hillsborough	27278	Durham
625 Donlee Drive	NCG551650	NPDES Permits	Higher	625 Donlee Dr	Durham	27712	Durham
6903 Iron Gate Drive	NCG551667	NPDES Permits	Higher	6903 Iron Gate Dr	Bahama	27503	Durham
7138 Windover Drive	NCG551694	NPDES Permits	Higher	7138 Windover Dirve	Eno Valley	27712	Durham
1423 Oak Forest Drive	NCG551715	NPDES Permits	Higher	1423 Oak Forest Dr	Hillsborough	27278	Durham
712 Jonquil Street	NCG550005	NPDES Permits	Higher	712 Jonquil St	Durham	27712	Durham
716 Jonquil Street	NCG550006	NPDES Permits	Higher	716 Jonquil St	Durham	27712	Durham
1314 Oak Forest Drive	NCG550019	NPDES Permits	Higher	1314 Oak Forest Dr	Durham	27712	Durham
653 Donlee Drive	NCG550020	NPDES Permits	Higher	653 Donlee Dr	Durham	27712	Durham
6230 Doyle Road	NCG550021	NPDES Permits	Higher	6230 Doyle Rd	Durham	27712	Durham
716 Harold Drive	NCG550022	NPDES Permits	Higher	716 Harold Dr	Durham	27712	Durham

PCS Name	PCS ID	PCS Type	PCS Risk Rating	Street Address	City	Zip	County
718 Donlee Drive	NCG550504	NPDES Permits	Higher	718 Donlee Dr	Durham	27712	Durham
615 Snow Hill Road	NCG550512	NPDES Permits	Higher	615 Snow Hill Rd	Durham	27712	Durham
6411 Whitt Road	NCG550537	NPDES Permits	Higher	6411 Whitt Rd	Durham	27712	Durham
725 Jonquil Street	NCG550562	NPDES Permits	Higher	725 Jonquil St	Durham	27712	Durham
646 Donlee Drive	NCG550589	NPDES Permits	Higher	646 Donlee Dr	Durham	27712	Durham
6918 Innesbrook Way	NCG550591	NPDES Permits	Higher	6918 Innesbrook Way	Bahama	27503	Durham
6906 Innesbrook Way	NCG550592	NPDES Permits	Higher	6906 Innesbrook Way	Bahama	27503	Durham
6911 Innesbrook Way	NCG550593	NPDES Permits	Higher	6911 Innesbrook Way	Bahama	27503	Durham
6914 Innesbrook Way	NCG550594	NPDES Permits	Higher	6914 Innesbrook Way	Bahama	27503	Durham
6903 Innesbrook Way	NCG550595	NPDES Permits	Higher	6903 Innesbrook Way	Bahama	27503	Durham
6907 Innesbrook Way	NCG550597	NPDES Permits	Higher	6907 Innesbrook Way	Bahama	27503	Durham
6919 Innesbrook Way	NCG550598	NPDES Permits	Higher	6919 Innesbrook Way	Bahama	27503	Durham
6433 Whitt Road	NCG550610	NPDES Permits	Higher	6433 Whitt Rd	Durham	27712	Durham
1800 Milton Road	NCG550620	NPDES Permits	Higher	1800 Milton Rd	Durham	27712	Durham
2414 Orange Factory Road	NCG550629	NPDES Permits	Higher	2414 Orange Factory Rd	Bahama	27503	Durham
105 Jasmine Place	NCG550631	NPDES Permits	Higher	105 Jasmine Pl	Durham	27712	Durham
6013 Baird Street	NCG550635	NPDES Permits	Higher	6013 Baird St	Durham	27712	Durham
6017 Baird Street	NCG550636	NPDES Permits	Higher	6017 Baird St	Durham	27712	Durham
6429 Whitt Road	NCG550638	NPDES Permits	Higher	6429 Whitt Rd	Durham	27712	Durham
721 Jonquil Street	NCG550670	NPDES Permits	Higher	721 Jonquil St	Durham	27712	Durham
724 Harold Drive	NCG550673	NPDES Permits	Higher	724 Harold Dr	Durham	27712	Durham
724 Jonquil Street	NCG550674	NPDES Permits	Higher	724 Jonquil St	Durham	27712	Durham
6922 Innesbrook Way	NCG550680	NPDES Permits	Higher	6922 Innesbrook Way	Bahama	27503	Durham
516 West Bywood Drive	NCG550691	NPDES Permits	Higher	516 W Bywood Dr	Durham	27712	Durham
712 Harold Drive	NCG550694	NPDES Permits	Higher	712 Harold Dr	Durham	27712	Durham
6212 Doyle Road	NCG550787	NPDES Permits	Higher	6212 Doyle Rd	Durham	27712	Durham
6104 Dello Street	NCG550799	NPDES Permits	Higher	6104 Dello St	Durham	27712	Durham
6926 Windover Drive	NCG550812	NPDES Permits	Higher	6926 Windover Dr	Durham	27712	Durham
504 Andover Road	NCG550825	NPDES Permits	Higher	504 Andover Rd	Durham	27712	Durham
709 Harold Drive	NCG550838	NPDES Permits	Higher	709 Harold Dr	Durham	27703	Durham
642 Donlee Drive	NCG550841	NPDES Permits	Higher	642 Donlee Dr	Durham	27712	Durham
114 Jasmine Place	NCG550843	NPDES Permits	Higher	114 Jasmine Pl	Durham	27712	Durham
6510 Whitt Road	NCG550950	NPDES Permits	Higher	6510 Whitt Rd	Durham	27712	Durham
6418 Whitt Road	NCG550991	NPDES Permits	Higher	6418 Whitt Rd	Durham	27712	Durham
1402 Oak Forest Drive	NCG551007	NPDES Permits	Higher	1402 Oak Forest Dr	Hillsborough	27278	Durham
726 Donlee Drive	NCG551026	NPDES Permits	Higher	726 Donlee Dr	Durham	27712	Durham

PCS Name	PCS ID	PCS Type	PCS Risk Rating	Street Address	City	Zip	County
6110 Dello Street	NCG551039	NPDES Permits	Higher	6110 Dello St	Durham	27712	Durham
1405 Oak Forest Drive	NCG551069	NPDES Permits	Higher	1405 Oak Forest Dr	Hillsborough	27278	Durham
6227 Dello Street	NCG551132	NPDES Permits	Higher	6227 Dello St	Durham	27712	Durham
6209 Doyle Road	NCG551156	NPDES Permits	Higher	6209 Doyle Rd	Durham	27712	Durham
2715 Brown Road	NCG551257	NPDES Permits	Higher	2715 Brown Rd	Hurdle Mills	27541	Orange
530 Andover Road	NCG551287	NPDES Permits	Higher	530 Andover Rd	Durham	277123406	Durham
8021 Stagville Road	NCG551299	NPDES Permits	Higher	8021 Stagville Rd	Bahama	27503	Durham
7115 Matthews Road	NCG551310	NPDES Permits	Higher	7115 Matthews Rd	Durham	27712	Durham
6406 Whitt Rd	NCG551371	NPDES Permits	Higher	6406 Whitt Rd	Durham	27712	Durham
720 Jonquil St	NCG551374	NPDES Permits	Higher	720 Jonquil St	Durham	27712	Durham
8923 Walnut Grove Church Road	NCG551408	NPDES Permits	Higher	8923 Walnut Grove Church Rd	Hurdle Mills	27541	Orange
11124 South Lowell Road	NCG551411	NPDES Permits	Higher	11124 S Lowell Rd	Bahama	27503	Durham
639 Donlee Drive	NCG551465	NPDES Permits	Higher	639 Donlee Dr	Durham	27712	Durham
1808 Milton Road	NCG551565	NPDES Permits	Higher	1808 Milton Rd	Durham	27712	Durham
723 Jonquil Street	NCG551569	NPDES Permits	Higher	723 Jonquil St	Durham	27712	Durham
106 Jasmine Place	NCG551610	NPDES Permits	Higher	106 Jasmine Pl	Durham	27707	Durham
6113 Dello Street	NCG551635	NPDES Permits	Higher	6113 Dello St	Durham	27712	Durham
707 Donlee Drive	NCG551642	NPDES Permits	Higher	707 Donlee Dr	Durham	27712	Durham
629 Donlee Drive	NCG551645	NPDES Permits	Higher	629 Donlee Dr	Eno Valley	27712	Durham
633 Donlee Drive	NCG551718	NPDES Permits	Higher	633 Donlee Dr	Durham	27712	Durham
510 Andover Road	NCG551719	NPDES Permits	Higher	510 Andover Rd	Durham	27712	Durham
714 Donlee Drive	NCG551731	NPDES Permits	Higher	714 Donlee Dr	Durham	27712	Durham
6201 Dello Street	NCG551747	NPDES Permits	Higher	6201 Dello St	Durham	27712	Durham
Hanson Aggregates - N Durham Quarry	NCG020235	NPDES Permits	Higher	1423 Bacon Rd	Rougemont	27572	Durham
Southern Equipment Co -Rougemont, Plant #25	NCG140130	NPDES Permits	Higher	9017 Mile Branch Rd	Rougemont	27572	Orange
Milton Latta & Sons Dairy Inc	AWC680015	Animal Operations	Higher	3315 Edmund Latta Rd	Hillsborough	27278	Orange
Milton Latta & Sons Dairy Inc	AWI680015	Animal Operations	Higher	3315 Edmund Latta Rd	Hillsborough	27278	Orange
Orange County Walnut Grove HHW	6805-HHW-2013	Solid Waste Facilities	Moderate	3605 Walnut Grove Church Road, Po Box 17177	Chapel Hill	27516-7177	Orange
Rougemont Well	6371102	Tier II Sites	Higher	12405 Roxboro Rd.	Rougemont	27572	Durham
Hanson Aggregates Southeast - Rougemont Quarry	6375982	Tier II Sites	Higher	1423 Bacon Road	Rougemont	27572	Durham
Hillsborough Plant	6405231	Tier II Sites	Higher	3215 Nc Hwy 86 North	Hillsborough	27278	Orange
Argos USA Rougemont Concrete Plant	6409366	Tier II Sites	Higher	9017 Mile Branch Road	Rougemont	27572	Orange

PCS Name	PCS ID	PCS Type	PCS Risk Rating	Street Address	City	Zip	County
FAST FOOD MART 5	00-0-0000016109	UST Permits	Moderate	1816 Mason Road	Durham	27712	Durham
KITTANEY, INC.	00-0-0000022161	UST Permits	Moderate	3121 Nc Hwy 86 North & Philps Rd	Hillsborough	27278	Orange
UNDERWOOD'S GROCERY	00-0-0000023142	UST Permits	Moderate	3500 New Sharon Church Rd	Hillsborough	27278-8043	Orange
THE FOOD MART TRUST 12	00-0-0000028032	UST Permits	Moderate	7723 Guess Road	Hillsborough	27278	Durham
FOX HILL FARM	00-0-0000024437	UST Permits	Moderate	850-a New Sharon Church Road	Hillsborough	27278	Orange
HANDY'S ANDY'S	00-0-0000023144	UST Permits	Moderate	7136 Hwy 57	Rougemont	27572-9048	Orange
LADANE WILLIAMSON'S RESIDENCE	00-0-0000031456	UST Permits	Moderate	10809 Roxboro Road	Rougement	27252	Durham
BILLY'S MINIMART	3327	Pollution Incidents	Higher	3121 Nc Hwy 86	Cedar Grove	27231-9424	Orang
GUESS ROAD FOOD MART	10630	Pollution Incidents	Higher	1816 Mason Rd	Durham	27712-	Durha
SNIPES GROCERY (AKA CORBITT COMMUNITY GROCERY	12315	Pollution Incidents	Higher	5515 Nc Hwy 86 North	Hillsborough	27231-	Orang
UNC-CH QUAIL ROOST CONF. CTR.	12464	Pollution Incidents	Higher	1000' W. Jct Us 501 & Sr 1615	Rougemont	27572-	Durha
UNDERWOOD GROCERY	26444	Pollution Incidents	Higher	3500 New Sharon Church Road	Hillsborough	27278-8043	Orang
KENS QUICKIE MART	22967	Pollution Incidents	Higher	3121 Nc 86 North	Hillsborough	27278-	Orang
Food Mart #12	33374	Pollution Incidents	Higher	7723 Guess Road	Hillsborough	27278	Durha
DURHAM COUNTY SHERIFF DEPARTMENT NORTH SATELL	86509	Pollution Incidents	Higher	11819 N Roxboro Rd	Rougemont	27702	Durha
PHELPS GROCERY (FORMER)	87378	Pollution Incidents	Higher	7403 Nc Highway 86 North	Hillsborough	27278	Orang
Darius, Davis E. - Property	92307	Pollution Incidents	Higher	6713 Matthews Road	Durham	27712	Durha

Table 5. Inherent Vulnerability Rating
DURHAM, CITY OF
PWS ID: NC0332010, LITTLE RIVER RESERVOIR

Surface Water Source Characteristics	Vulnerability
Watershed Classification	Moderate
Intake Location	Lower
Raw Water Quality (water plant data)	Higher
Watershed Characteristics Rating	Lower

Inherent Vulnerability Rating: Moderate

Table 6. Watershed Characteristics Rating Calculation
DURHAM, CITY OF
PWS ID: NC0332010, LITTLE RIVER RESERVOIR

Watershed Characteristics Score	29.2

Notes:

1. Watershed Characteristics Score for each cell (CS):

CS = [3 x (precipitation score)] + [2 x (land surface slope score)] + [1 x (GW contribution)] + [3 x (land use score)] + [1 x (land cover score)]

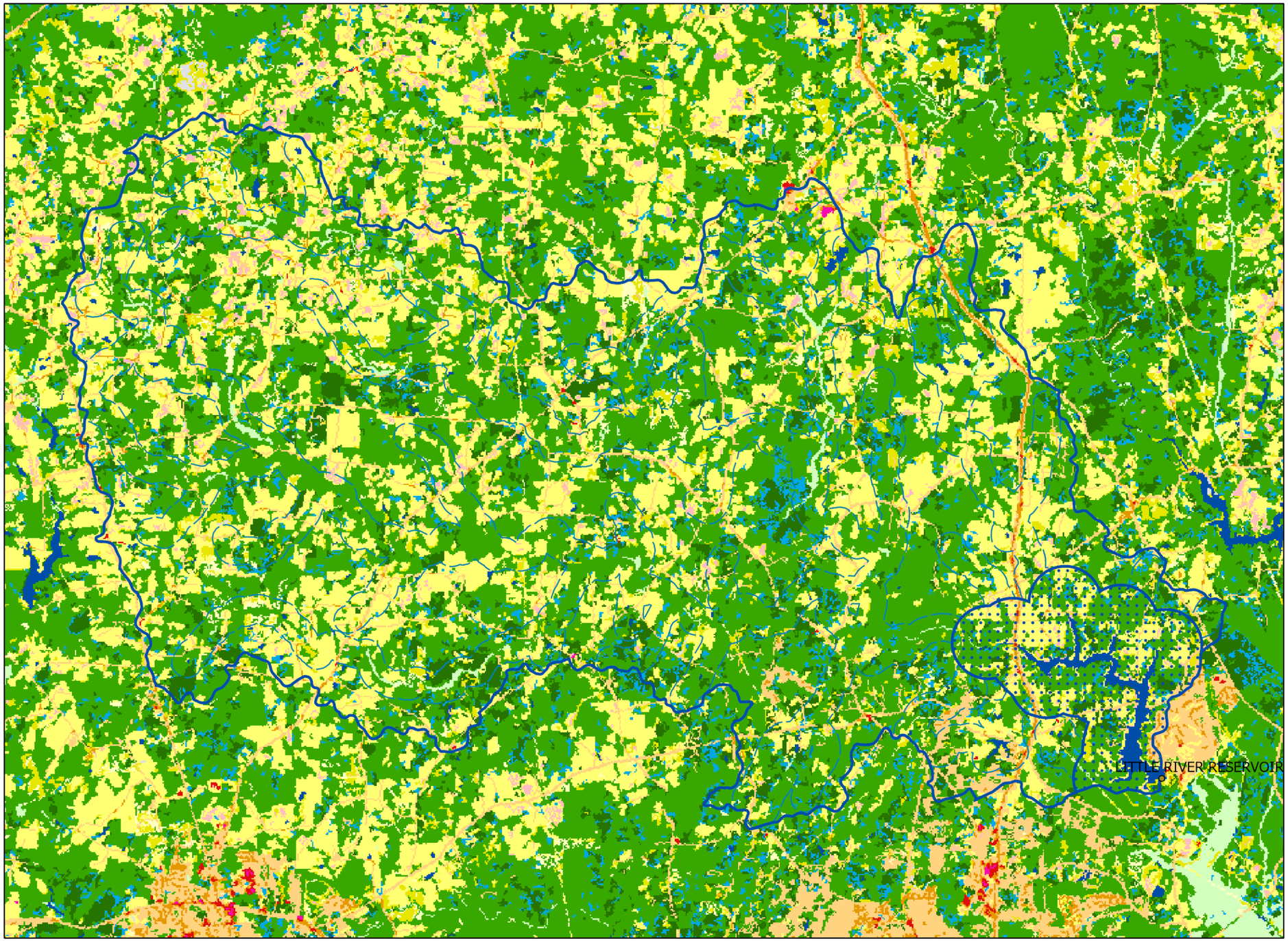
2. Watershed Characteristics Score (S) for the entire assessment area is the mean of the cell scores (CS) calculated as:

The sum of all cell watershed characteristics scores (CS) divided by the number of cells (N) within the assessment area: $S = (\Sigma CS) / N$

3. The USGS publication "Methods of ranking unsaturated zone and watershed characteristics of public water supplies in North Carolina", by J. L. Eimers, J. C. Weaver, S. Terziotti, and R. W. Midgette, 1999, provides a detailed discussion of the methods used to determine unsaturated zone ratings.

FIGURE 1. LAND USE/LAND COVER CATEGORIES

DURHAM, CITY OF
PWS ID: 0332010
LITTLE RIVER RESERVOIR



- Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land (Rock, Sand, Clay)
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland, Herbaceous
- Pasture, Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

Watershed Zones

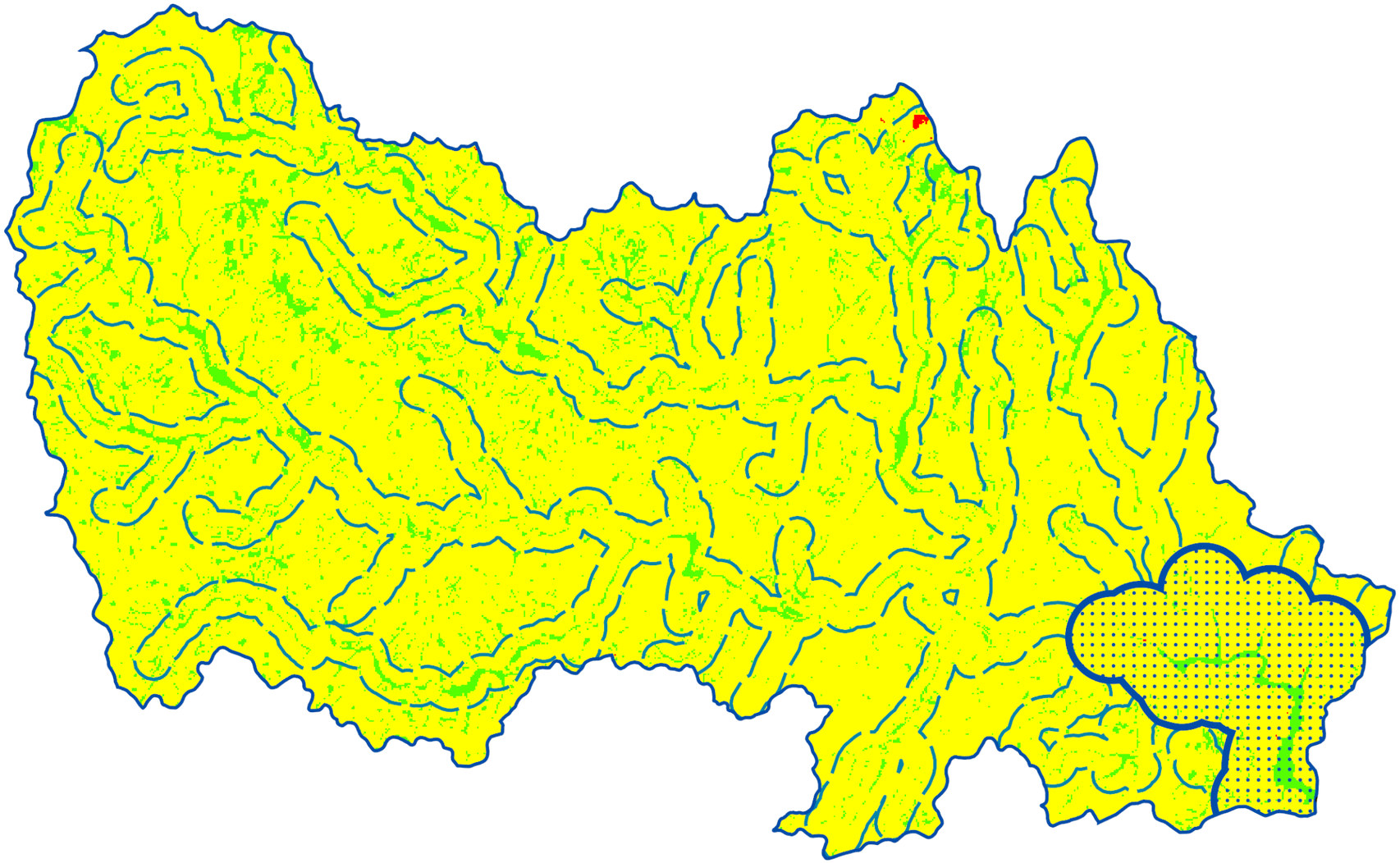
- Critical Area Boundary
- Protected Area Boundary
- Stream Zone Boundary
- Watershed Boundary

0 1 2 3 Miles

N
W E
S

FIGURE 2. WATERSHED CHARACTERISTICS RATING

DURHAM, CITY OF
PWS ID: 0332010
LITTLE RIVER RESERVOIR



Lower <=31
Moderate >31 to 45
Higher > 45

Watershed Zones

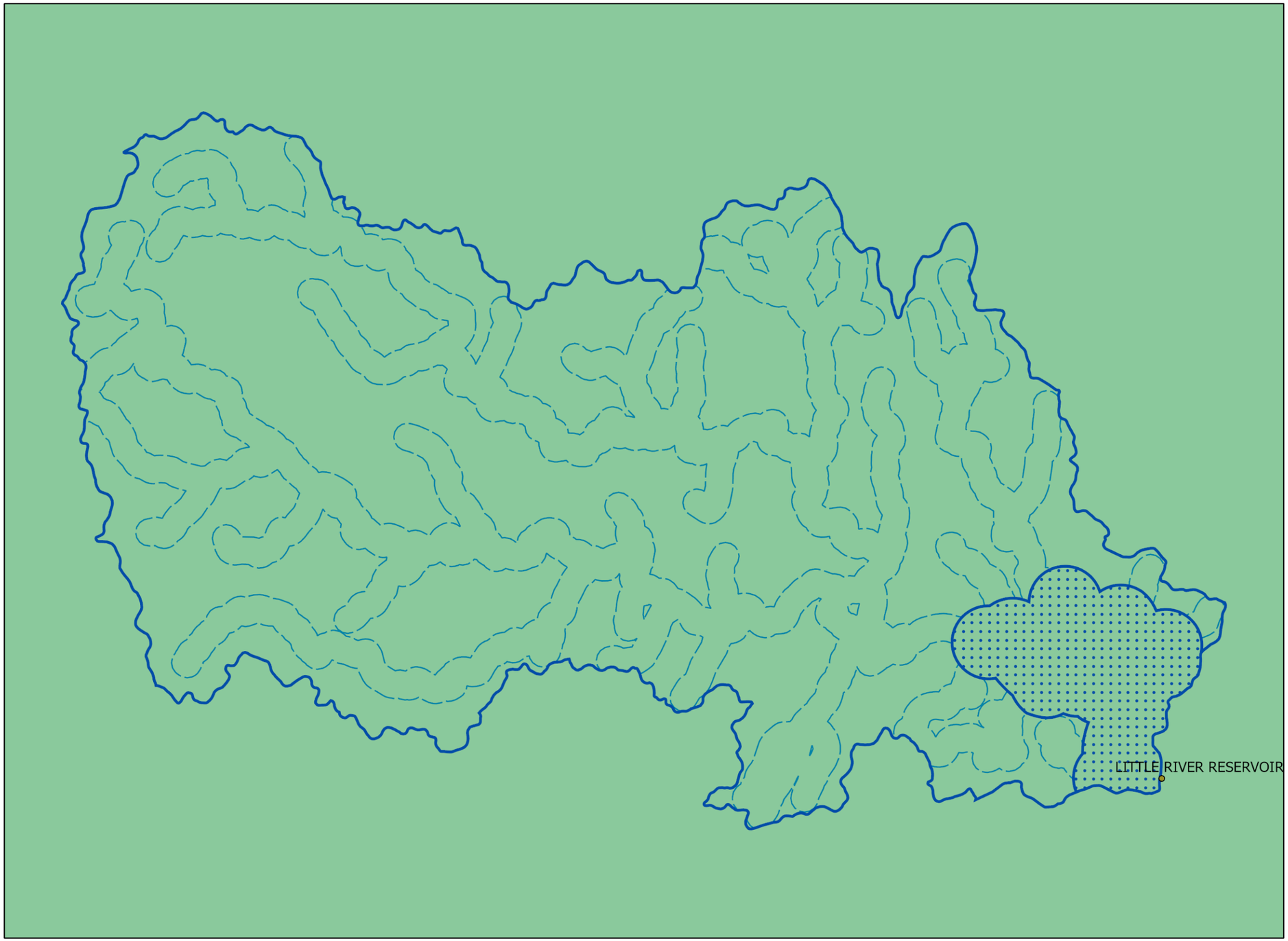
Critical Area Boundary
Protected Area Boundary
Stream Zone Boundary
Watershed Boundary

0 1 2 3
Miles

N
W E
S

FIGURE 3. AVERAGE ANNUAL PRECIPITATION RATING

DURHAM, CITY OF
PWS ID: 0332010
LITTLE RIVER RESERVOIR



Assigned Ratings

- 1 (<= 40 inches)
- 2 (> 40 to 45 inches)
- 3 (> 45 to 50 inches)
- 4 (> 50 to 55 inches)
- 5 (> 55 to 60 inches)
- 6 (> 60 to 65 inches)
- 7 (> 65 to 70 inches)
- 8 (> 70 to 75 inches)
- 9 (> 75 to 80 inches)
- 10 (> 80 inches)

Watershed Zones

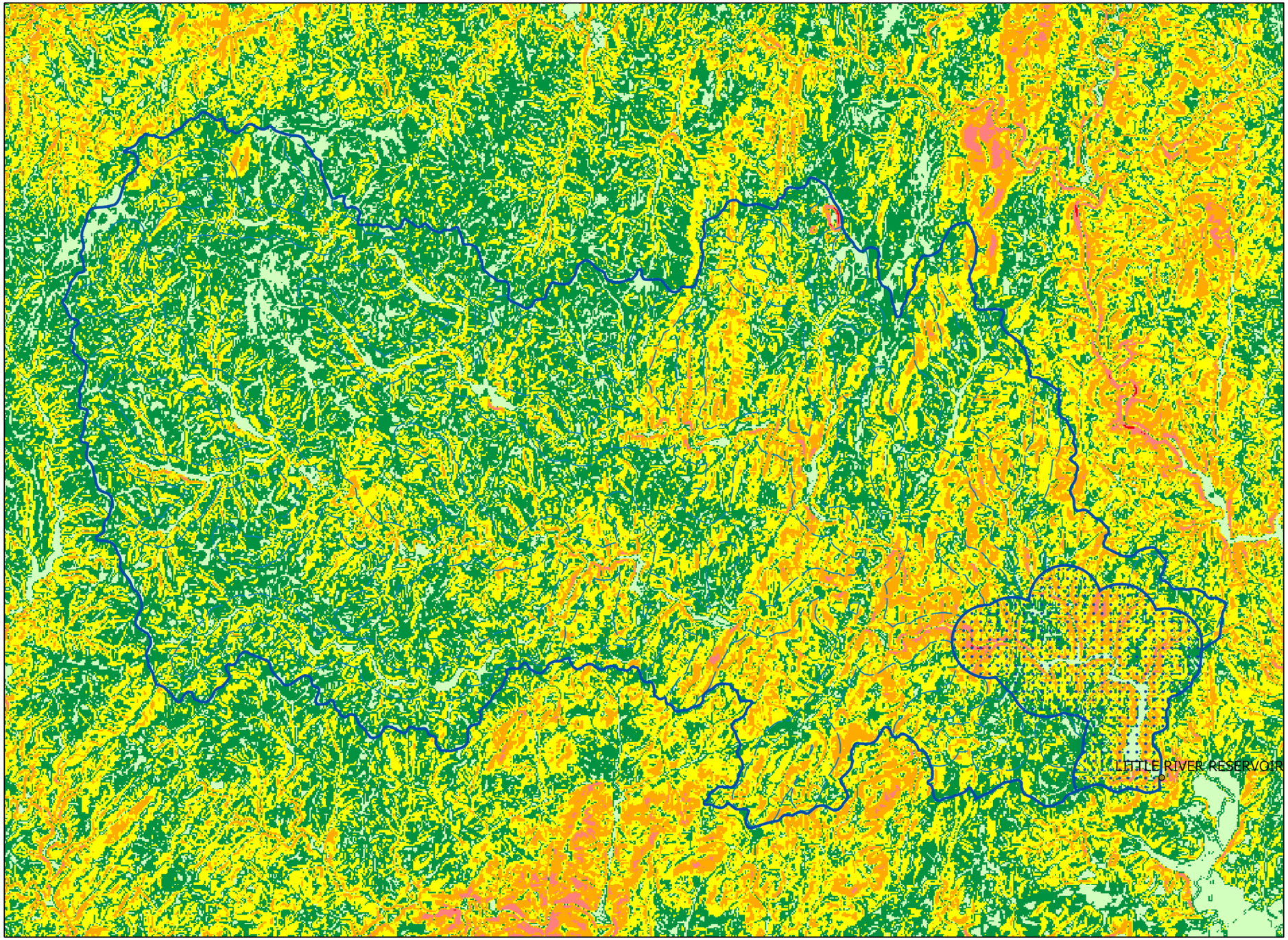
- Critical Area Boundary
- Protected Area Boundary
- Stream Zone Boundary
- Watershed Boundary

0 1 2 3 Miles

N
W E
S

FIGURE 4. LAND SURFACE SLOPE RATING

DURHAM, CITY OF
PWS ID: 0332010
LITTLE RIVER RESERVOIR



Assigned Ratings
- 1 (<= 2 percent)
- 3 (> 2 to 5 percent)
- 5 (> 5 to 10 percent)
- 7 (> 10 to 20 percent)
- 9 (> 20 to 50 percent)
- 10 (> 50 percent)

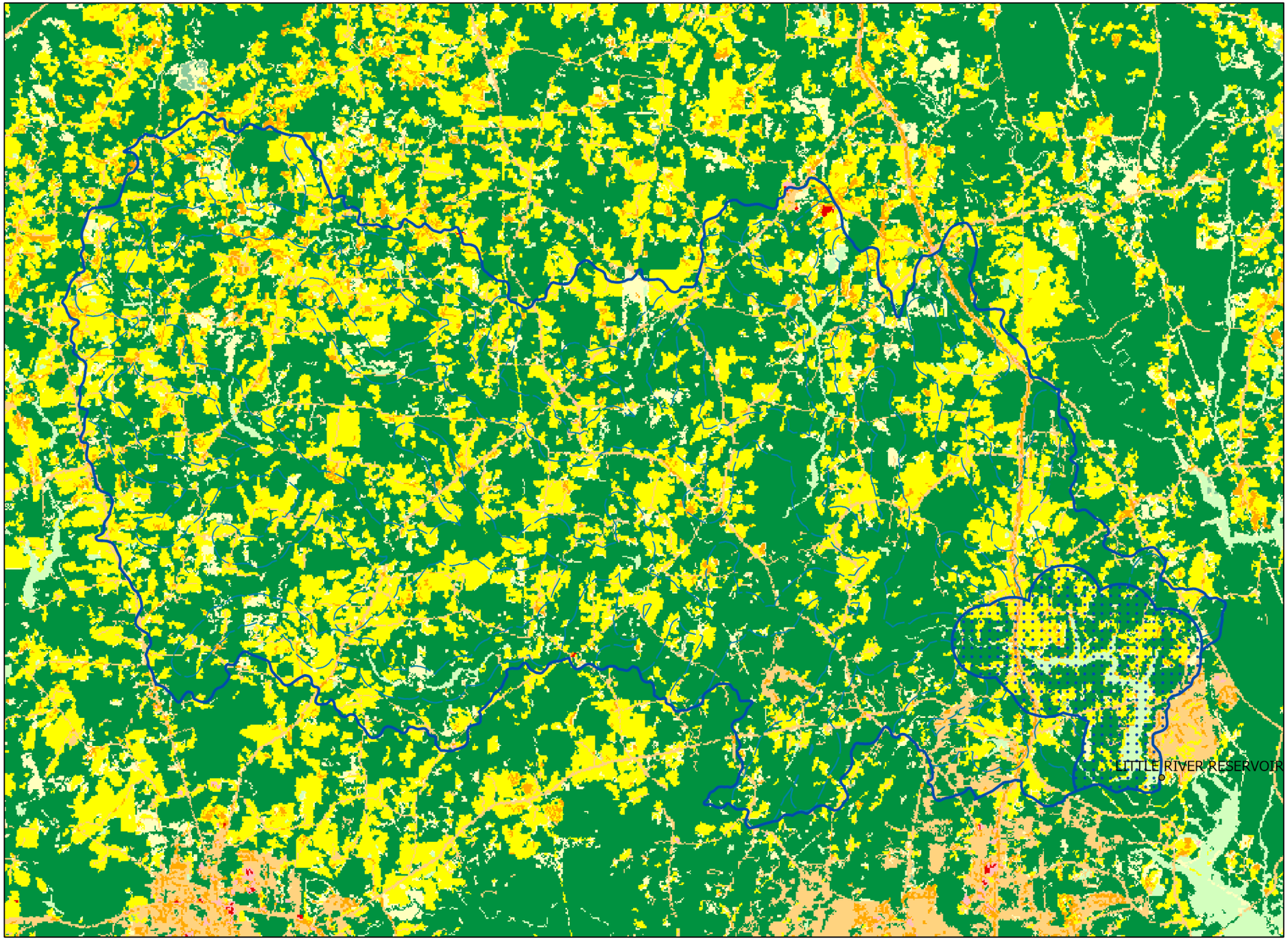
Watershed Zones
- Critical Area Boundary
- Protected Area Boundary
- Stream Zone Boundary
- Watershed Boundary

0 1 2 3 Miles

N
W E
S

FIGURE 5. LAND USE RATING

DURHAM, CITY OF
PWS ID: 0332010
LITTLE RIVER RESERVOIR



1 Water, Wetlands (Woody and Herbaceous)
2 Barren Land (Rock/Sand/Clay)
3 Forest (Deciduous, Evergreen, Mixed)
4 Grassland/Herbaceous; Shrub/Scrub
5 Pasture/Hay
6 Developed, Open Space
7 Developed, Low Intensity; Cultivated Crops
8 Developed, Medium Intensity
10 Developed, High Intensity

Watershed Zones

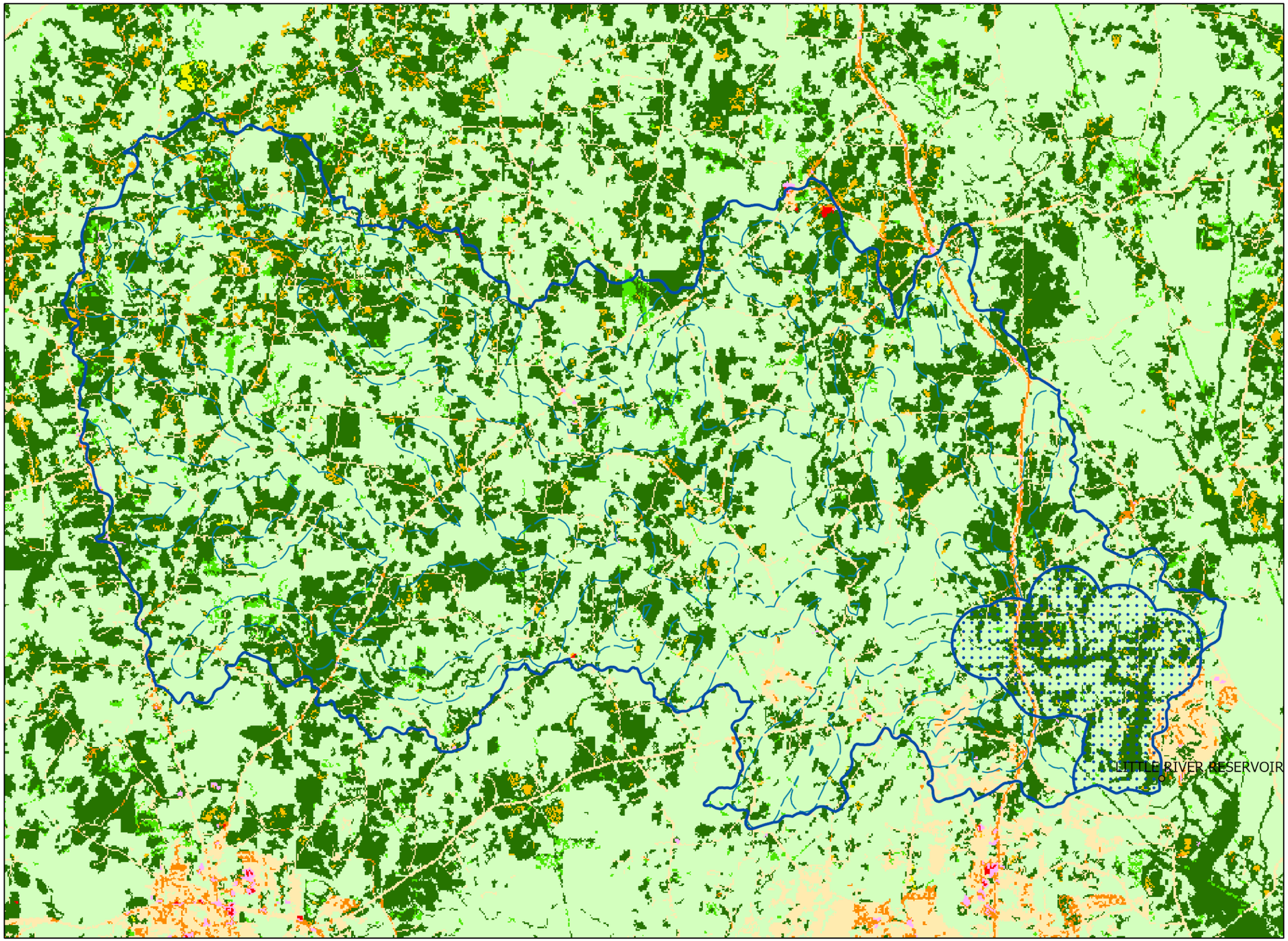
Critical Area Boundary
Protected Area Boundary
Stream Zone Boundary
Watershed Boundary

0 1 2 3 Miles

N
W E
S

FIGURE 6. LAND COVER RATING

DURHAM, CITY OF
PWS ID: 0332010
LITTLE RIVER RESERVOIR



Assigned Ratings

- 1 Deciduous, Evergreen and Mixed Forest
- 3 (Water, Pasture/hay, Woody wetlands, Emergent herbaceous wetlands)
- 3 Water, Wetlands, Pasture/Hay, Grassland/Herbaceous
- 5 (Quarries/strip mines/gravel pits, Bare rock/sand, Transitional)
- 5 Barren Land (Rock, Sand, Clay)
- 6 Cultivated Crops
- 7 Developed, Low Intensity
- 8 Developed, Medium Intensity
- 10 Developed, High Intensity

Watershed Zones

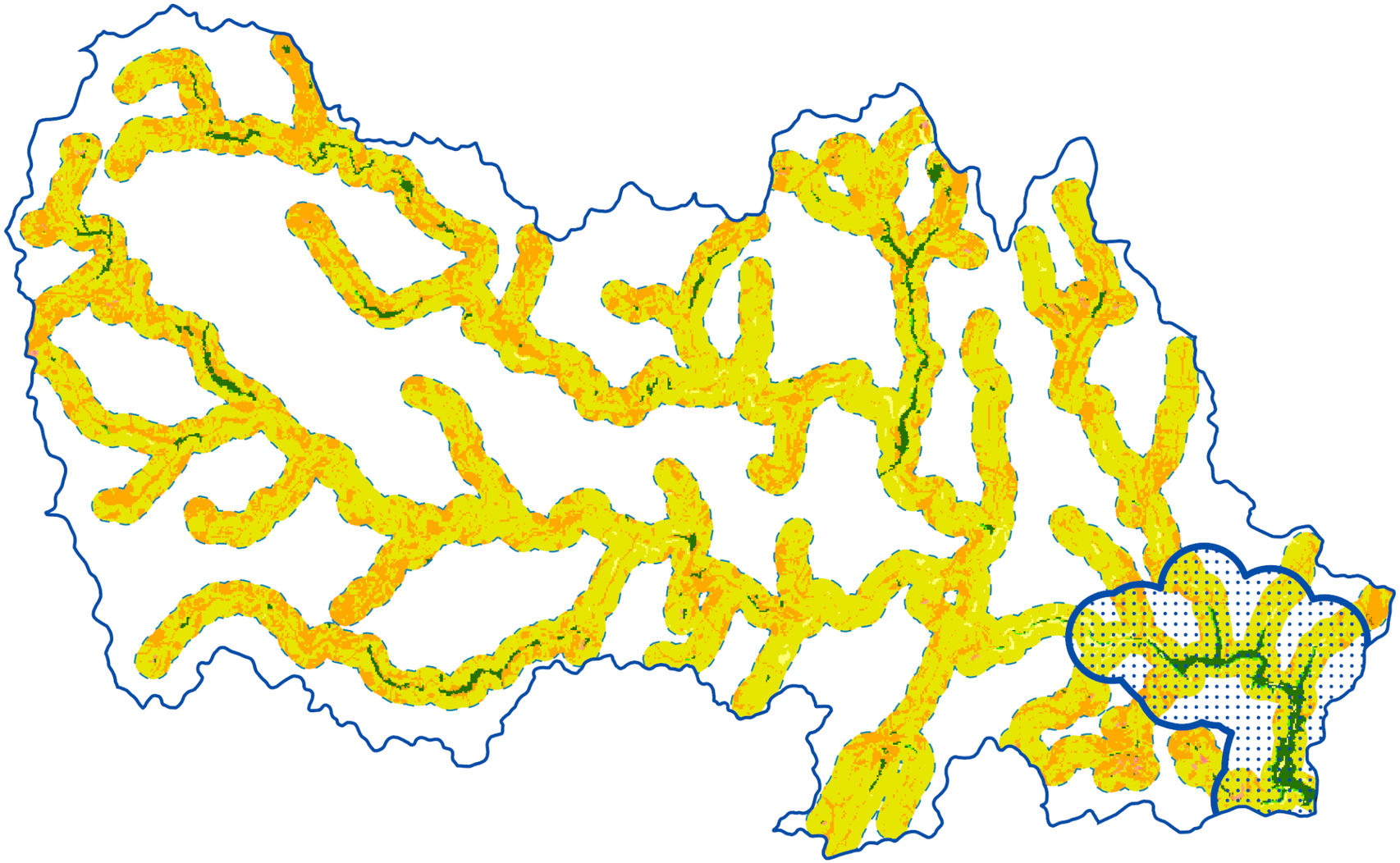
- Critical Area Boundary
- Protected Area Boundary
- Stream Zone Boundary
- Watershed Boundary

0 1 2 3 Miles

N
W E
S

FIGURE 7. GROUND WATER CONTRIBUTION RATING

DURHAM, CITY OF
PWS ID: 0332010
LITTLE RIVER RESERVOIR



Assigned Ratings

- 1 (<= 10 Unsaturated Zone Rating)
- 2 (>= 10 to 20 Unsaturated Zone Rating)
- 3 (>= 20 to 30 Unsaturated Zone Rating)
- 4 (>= 30 to 40 Unsaturated Zone Rating)
- 5 (>= 40 to 50 Unsaturated Zone Rating)
- 6 (>= 50 to 60 Unsaturated Zone Rating)
- 7 (>= 60 to 70 Unsaturated Zone Rating)
- 8 (>= 70 to 80 Unsaturated Zone Rating)
- 9 (>= 80 to 90 Unsaturated Zone Rating)
- 10 (>= 90 to 100 Unsaturated Zone Rating)

Watershed Zones

- Critical Area Boundary
- Protected Area Boundary
- Stream Zone Boundary
- Watershed Boundary

0 1 2 3
Miles

N
W E
S

Section 6: North Carolina's SWAP Approach

This section of the report is a more detailed description of North Carolina's SWAP approach. This is a summary of Chapter 2 of North Carolina's Source Water Assessment Program Plan.

Description of North Carolina's SWAP Approach

To meet the requirements of the 1996 SDWA Amendments, a Source Water Assessment was completed for approximately 8,000 drinking water sources in North Carolina. A delineated area for assessment was established for each drinking water source. An inventory of potential contaminant sources was conducted in each assessment area and finally, a susceptibility rating was assigned to each drinking water source. Because of the scope of this task and the limited time and resources available for completing the work, North Carolina's SWAP program efforts relies on Geographic Information Systems (GIS) to effectively use information. GIS allows databases to be linked to points on a map (e.g., public water supply sources, streams, geology, land use, roads, permitted waste disposal sites, Superfund sites, etc.) and overlaid on top of one another.

Delineation of Assessment Areas for Surface Water Sources

For the purpose of performing source water assessments, "delineation" means defining what land area constitutes the area contributing water to a public water supply source. The delineation of the source water assessment areas for surface water sources was done in consideration and collaboration with the Water Supply Watershed Protection (WSWP) Program. During the development of the WSWP program (final state rules adopted in 1992), the state worked with local governments to determine the location of all surface water sources and existing land uses within the water supply watersheds. This information, in conjunction with information on the types and location of wastewater discharges, was used to determine the appropriate Water Supply Watershed Classification for more than 200 surface water sources in the state. The watershed classifications, WS-I, WS-II, WS-III, WS-IV, and WS-V are based on the size of the watershed, development activities, and allowable waste treatment and disposal practices.

All surface water sources were located on US Geological Survey 1:24,000 scale topographic maps. The water supply watershed boundaries were delineated (except WS-V waters, which were delineated for the SWAP assessments by the PWS Section), and the boundaries of the Critical Area, and in the case of most WS-IV water supply watersheds Protected Areas (described below) were delineated.

For protection of the surface water sources in North Carolina, a segmentation of the water supply watersheds was implemented through the WSWP rules. The entire drainage areas of WS-I water supply watersheds were delineated. These watersheds are all publicly owned and no new development is allowed in these watersheds. These watersheds are very small. Some are located within National Forests. Others are owned by a local government.

All WS-II, WS-III and WS-IV water supplies require delineation of a Critical Area which is defined as the area within 1/2 mile and draining to the normal pool elevation of a water supply reservoir, or 1/2 mile and draining to a water supply intake in a river. For WS-II and WS-III water supplies, the remainder of the drainage area is subject to the development standards of the WSWP rules and are implemented through local land use ordinances. WS-IV water supplies, which are typically portions of major river systems, are segmented in a Critical Area (previously defined) and a Protected Area. The Protected Area is defined as the area within 5 miles and draining to the normal pool elevation of a reservoir or 10 miles upstream and draining to a river intake. In very few instances the WS-IV Protected Area encompasses the entire drainage area due to the size of the watershed. In 1995, the state allowed local governments to request that the 10 mile Protected Area boundary of a WS-IV water supply be measured "run of river" rather than using a 10-mile arc linear measurement. Surface waters that are used by industry to supply their employees with drinking water or waters formerly used as water supply are generally classified as WS-V. The WS-V waters are protected as

water supplies and are typically located upstream of and draining to Class WS-IV waters. Land use restrictions do not apply to WS-V waters under the WSWP rules.

Please note that for the purpose of the PWS Section's Source Water Assessments, delineation of WS-IV boundaries may be different from the WSWP Program's delineation. The PWS Section watershed assessment areas include all land draining to a drinking water source. However, the watersheds defined in accordance with the WSWP rules often exclude land area draining to a source based on municipal or county jurisdictional boundaries. Please refer to the WSWP program website for information on the regulations associated with their program and the land area affected by their regulations.

Delineation of Assessment Areas for Public Water Supply Wells

The delineation of source water assessment areas for wells was in accordance with North Carolina's EPA approved Wellhead Protection Program. The calculated fixed radius method was used to delineate assessment areas around each well in the following areas: piedmont and mountains; the unconfined surficial aquifer of the coastal plain; and in the semi-confined portions of the Castle Hayne aquifer with an estimated recharge rate of 250,000 gallons per day per square mile. The aquifer-source-volume method was used for confined aquifers of the coastal plain. These methods are described below. Well depth is the determining factor for a well to be considered confined. Well depths greater than 70 feet are considered confined.

Other assessment area delineation methods may be of interest to a PWS system in an effort to more accurately define the area contributing water to the well. The state will review delineations provided by any PWS system that employs acceptable alternative delineation methods. Resulting alternative delineation areas will be incorporated into the SWAP if the state concludes that the use of the more sophisticated method is appropriate.

Calculation of the Contributing Area

The first step in delineating the assessment areas is to determine the size of the contributing area to the well. When a well is pumped, it causes groundwater that is flowing through the subsurface to flow toward the well. The surface area surrounding a well that delineates the area in which water entering the groundwater system at the water table eventually flows to the well and discharges is known as the contributing area for the well. In this area, any contaminants released to the environment that reach the water table, can reasonably be expected to move toward and possibly reach the well. The calculated fixed radius method requires the pumping rate (Q) and the recharge rate (W) for the pumping well in order to calculate the size of the contributing area. The contributing area is calculated as follows:

$$Ac = \frac{Q}{W}$$

where:

Ac = contributing area in square miles,
Q = maximum daily pumping rate in gallons per day, and
W = average recharge rate in gallons per day per square mile.

The maximum daily pumping rate in gallons per day was determined from information on wells obtained from PWS Section sanitary survey inspection forms, Division of Water Resources Local Water Supply plans, and information supplied by system owners/operators. Where no information was available, an estimate of maximum daily pumping rate was assigned based on hydrogeologic characteristics of the aquifer supplying water to the well.

Size of the Assessment Area for Wells Using Calculated Fixed Radius Method

Estimates of the size of the contributing area can be obtained using the equation given above. However, because of the complex nature of groundwater flow and contaminant transport, it is not possible to define exact contributing area boundaries around each well. Two factors that affect the shape of the contributing area and its position and orientation with respect to a pumping well are the hydraulic gradient and aquifer transmissivity. The variation in aquifer transmissivity is important in determining the shape of the contributing area for a supply well. In areas where the hydraulic gradient and the aquifer transmissivity are essentially the same in all directions, the shape of the contributing area depends primarily on the hydraulic gradient. Where the water table is nearly flat, as near the water-table divide in broad interstream areas of low relief, the contributing area is approximately circular. Where the hydraulic gradient is moderate to steep, the contributing area is approximately elliptical, being oriented in the direction of groundwater movement.

Due to limited availability of information on both hydraulic gradient and aquifer transmissivity, the assessment area for each well was doubled. Therefore, the assessment area for each well is twice the size of the calculated contributing area or:

$$Aswap = 2Ac = \frac{2Q}{W}$$

Delineation of Assessment Areas for Wells in Confined Aquifers

Recharge to confined aquifers is much less than that to the surficial unconfined aquifer where the calculated fixed radius method was used. If the calculated fixed radius method were applied to wells withdrawing water from confined aquifers, the resulting assessment areas would be very large. With the exception of a portion of the Castle Hayne aquifer, the aquifer-source-volume method was used for delineating assessment areas for wells determined to be withdrawing water from highly confined and semi-confined aquifers. "Aquifer source volume" refers to the volume of the source aquifer that supplies the withdrawals from a well for a specified period of time. This factor has been adopted in many states for defining assessment areas for confined aquifers.

For the purpose of these assessments, the volume of aquifer that supplies ten years of withdrawals (i.e. the area surrounding a well in which the time of travel to the well is ten years) was used. A ten-year period should be sufficient to provide time to assess the potential impact of any groundwater contamination discovered within an assessment area and for developing appropriate remediation and source water protection strategies for the water supply. For any well in the coastal plain determined to be withdrawing water from a confined aquifer, the table below will be used to determine the size of the assessment area.

Table 1. Radii of Assessment Areas for Wells Withdrawing from Confined Aquifers in the Coastal Plain

Pumping Rate of Well (Gal. / min.)	Radius of Assessment Area (Feet Rounded)
50	1000
100	1000
200	1500
500	2000
1000	3000
2000	3500

Delineation of Assessment Areas for Water Supply Sources Classified as GWUDIs

Drinking water supplied by a well may include a surface water component. This is defined as Ground Water Under the Direct Influence of Surface Water (GWUDIs). This term is used to indicate that water withdrawn from a well contains a specific indicator or indicators (e.g., giardia) of the presence of a surface water component. The delineated area for a PWS well classified as a GWUDI well will be the combined area of a circle based on the calculated fixed radius method and the resulting upgradient watershed of the intersected surface water. Segmentation of the resulting watersheds was in accordance with the most appropriate water supply watershed classification scheme.

Delineation for Water Supply Sources Classified as Springs

Springs can be defined as areas where the water table intersects the ground surface. Ground water may have flowed many miles before appearing on the surface to form a particular spring. The delineated area for a drinking water source classified as a spring was defined as the entire watershed area upgradient of the spring. Segmentation of the resulting watersheds was in accordance with the most appropriate water supply watershed classification scheme.

Susceptibility Rating Methodology

The state determined that the overall susceptibility rating for each drinking water source should be based on two key components, a contaminant rating and an inherent vulnerability rating. Inherent vulnerability refers to the physical characteristics and existing conditions of the watershed or aquifer. A contaminant rating refers to an evaluation of the number and location of potential sources of contamination. The contaminant rating and inherent vulnerability methodologies are explained below.

Contaminant Rating Methodology

The contaminant rating for each water supply source was determined based on the number and location of potential contaminant sources (PCSs) within the delineated area. The delineated area for the drinking water source encompasses the area where PCSs, if released to the environment, could reasonably be expected to be a risk or a potential for contamination of the drinking water supply. A PCS in this assessment report is a facility or site regulated under a state or federal regulatory program. These facilities are identified in electronic databases that contain location information for each facility. Only databases that include information statewide were used for this source water assessment. Each PCS identified within the delineated area was assigned a risk rating of higher, moderate or lower. The number of PCSs that occur within the delineated area was determined and a Contaminant Rating of higher, moderate or lower was assigned to each drinking water source.

Contaminant Rating for Ground Water Sources

For each ground water source, define an inner Zone A with an area equal to half the area of the delineated assessment area. Using Table 2, determine the number of PCSs that occur within each risk category according to their location, either in Zone A or in the remaining delineated area. Determine the Contaminant Rating of higher, moderate or lower for each well by adding the totals for each risk category.

Table 2. Determination of Contaminant Rating for Ground Water Sources

Potential Contaminant Sources in:	Number of Higher Risk PCSs	Cumulative Number of Higher and Moderate Risk PCSs	Cumulative Number of Higher, Moderate and Lower Risk PCSs
Zone A (the inner 1/2 of the delineated area)	(Number of sources) > 1 Score: (1 or 0)	(Number of sources) > 2 Score: (1 or 0)	(Number of sources) > 4 Score: (1 or 0)
Delineated Area (Zone A plus the remaining delineated area)	(Number of sources) > 2 Score: (1 or 0)	(Number of sources) > 4 Score: (1 or 0)	(Number of sources) > 8 Score: (1 or 0)

For each category, score "1" if the number of contaminants exceeds the indicated threshold, or score "0" if the number of contaminants is less than the threshold. Total all the scores (1 or 0) for each category. Therefore, the highest possible score is 6.

Determine the **Contaminant Rating** for each well as follows:

Higher (6 - 4)
Moderate (3 - 2)
Lower (< 1)

Contaminant Rating for Surface Water Sources

Because the WSWP rules prohibit development in these watersheds, the existence of one PCS in the delineated area of a drinking water source located in a WS-I watershed will result in a contaminant rating of higher.

Using Table 3 for WS-II and WS-III watersheds, or Table 4 for WS-IV and V watersheds, determine the number of PCSs that occur within each risk category (i.e., lower, moderate or higher risk) and within each delineated assessment area (e.g., critical area, protected area, etc). Determine the Contaminant Rating for each surface water PWS source by summing the totals for each risk category.

Table 3. Determination of Contaminant Rating for Surface Water Sources in WS - II or III Watersheds

Potential Contaminant Sources in:	Number of Higher Risk PCSs	Cumulative Number of Higher and Moderate Risk PCSs	Cumulative Number of Higher, Moderate and Lower Risk PCSs
Critical Area	(Number of sources) > 1 Score: (1 or 0)	(Number of sources) > 5 Score: (1 or 0)	(Number of sources) > 10 Score: (1 or 0)
Watershed Area Within 1000 Foot Stream Zone	(Number of sources) > 5 Score: (1 or 0)	(Number of sources) > 10 Score: (1 or 0)	(Number of sources) > 20 Score: (1 or 0)
Watershed Area Outside Stream Zone	(Number of sources) > 20 Score: (1 or 0)	(Number of sources) > 40 Score: (1 or 0)	(Number of sources) > 80 Score: (1 or 0)

For each category, score "1" if the number of contaminants exceeds the indicated threshold, or score "0" if the number of contaminants is less than the threshold. Total the scores (1 or 0 for each category). Therefore, the highest possible score is a 9.

Determine the **Contaminant Rating** for each surface water source in a Water Supply Watershed II or III as follows:

Higher (9 - 6)
Moderate (5 - 3)
Lower (<= 2)

Table 4. Determination of Contaminant Rating for Surface Water Sources in WS - IV and V Watersheds

Potential Contaminant Sources in:	Number of Higher Risk PCSs	Cumulative Number of Higher and Moderate Risk PCSs	Cumulative Number of Higher, Moderate and Lower Risk PCSs
Critical Area	(Number of sources) > 1 Score: (1 or 0)	(Number of sources) > 5 Score: (1 or 0)	(Number of sources) > 10 Score: (1 or 0)
Protected Area Within 1000 Foot Stream Zone	(Number of sources) > 5 Score: (1 or 0)	(Number of sources) > 10 Score: (1 or 0)	(Number of sources) > 20 Score: (1 or 0)
Protected Area Outside Stream Zone	(Number of sources) > 20 Score: (1 or 0)	(Number of sources) > 40 Score: (1 or 0)	(Number of sources) > 80 Score: (1 or 0)
Stream Zone from Protected Area to 25 Mile or Watershed Boundary	(Number of sources) > 20 Score: (1 or 0)	(Number of sources) > 40 Score: (1 or 0)	(Number of sources) > 80 Score: (1 or 0)

For each category, score "1" if the number of contaminants exceeds the indicated threshold, or score "0" if the number of contaminants is less than the threshold. Total the scores (1 or 0 for each category). Therefore, the highest possible score is a 12.

Determine the **Contaminant Rating** for each surface water source in a Water Supply Watershed IV or V as follows:

Higher (12 - 9)
Moderate (8 - 4)
Lower (<= 3)

Inherent Vulnerability Rating Methodology

The inherent vulnerability of a well or surface water source refers to the characteristics or existing conditions of the well or surface water source and its delineated assessment area. Several factors were evaluated for both groundwater and surface water sources and included in the inherent vulnerability rating of each public water supply source. Each drinking water source was assigned an inherent vulnerability rating of higher, moderate or lower.

Inherent Vulnerability Rating for Wells

The characteristics included for assigning an inherent vulnerability rating for wells are aquifer rating, unsaturated zone rating and well integrity/well construction rating. The aquifer rating is an assessment of the water transmitting characteristics of the aquifer. The unsaturated zone rating is an assessment of the likelihood that contaminants from surface and shallow sources will follow the path of aquifer recharge and reach the water table. The well integrity/construction rating is an assessment of the quality of the construction of the well. A brief description of each factor follows:

Aquifer Rating

The aquifer rating is a qualitative assessment of the water transmitting characteristics of the aquifer. Relative differences in aquifer vulnerability were based on a review of relevant literature, expert opinions, and confirmed with historical data. Factors considered in rating aquifer vulnerability include hydraulic conductivity, degree of confinement, dilution, and sorption potential. The attenuative capacity of the unsaturated zone is not considered in the determination of aquifer ratings. Table 5 summarizes the aquifer-rating scheme used for these assessments.

Well depths determined whether a well was considered unconfined, deep confined or shallow confined for these assessments. Wells less than or equal to 70 feet deep were considered to be withdrawing water from an unconfined or surficial aquifer. Wells greater than 70 feet but less than 180 feet deep were considered to be withdrawing water from a shallow confined aquifer. Wells greater than 180 feet deep were considered to be withdrawing water from a deep confined aquifer.

Table 5. Aquifer Rating Based on Water Transmitting Characteristics

Aquifer/Ground Water Source	Rating
Coastal Plain Aquifers:	
Deep Confined (e.g., Kinston area)	Lower
Shallow Confined (e.g., Pamlico Co.)	Moderate
Unconfined (e.g., Castle Hayne Outcrop area)	Higher
Piedmont and Mountain Aquifers:	
Triassic Basins (e.g., Sanford-Durham)	Moderate
Fractured Rock Aquifers	Higher
Other:	
Metamudstones and Meta-argillites of the Carolina Slate Belt	Higher
Areas with Wells Cased to Less Than 20 Feet	Higher
Groundwater under the Direct Influence of Surface Water	Higher
Sand Hills Area	Higher

Unsaturated Zone Rating

The state, in cooperation with the United States Geological Survey (USGS), developed the unsaturated zone rating methodology. The USGS Water-Resources Investigations Report 99-4283, "Methods of Rating Unsaturated Zone and Watershed Characteristics of Public Water Supplies in North Carolina" describes the methodology. The unsaturated zone rating is the combination of selected factors that contribute to the likelihood that contaminants from surface and shallow sources will follow the path of aquifer recharge and reach the water table. Contributing factors, in the form of GIS spatial data layers, include land use/land cover, vertical hydraulic conductance of the unsaturated zone, and land-surface slope. Vertical hydraulic conductance measures the capacity of the unsaturated zone to transmit water from land surface to water table. Land-surface slope and land cover influences the amount of precipitation that infiltrates into the subsurface. Land use describes the activities that take place on the surface or in the shallow subsurface and the type of contaminants that may be present as a result of those activities (i.e., "non-point source" potential contaminant sources).

Well Integrity/Construction Rating

The integrity of well construction can vary widely, depending on details such as casing depth, grouting depth, well materials and driller knowledge. However, these details are not always available for assigning SWAP assessment ratings. In 1994 and 1999 there were important rule changes that greatly improve the quality of the well construction

standards. Therefore, the SWAP assessments use well construction and approval dates as a surrogate to construction details to assign a well construction / integrity rating. For wells that construction and approval date is not available, the well construction/integrity rating defaults to Higher.

Table 6 summarizes the characteristics evaluated and rated for the inherent vulnerability for each PWS well. Each well was assigned an inherent vulnerability rating of higher, moderate or lower:

Table 6. Inherent Vulnerability Rating of Wells

Inherent Vulnerability Factors	Higher Vulnerability	Moderate Vulnerability	Lower Vulnerability
Aquifer Rating	10	5	-1
Unsaturated Zone Rating	10	5	1
Well Integrity/Construction Rating	5	3	1
Totals	25-18	17-15	14-1

Inherent Vulnerability Rating for Surface Water Sources

The inherent vulnerability of a surface water source refers to the characteristics and existing conditions of the source and the delineated assessment area (watershed). The characteristics included for assigning an inherent vulnerability rating are water supply watershed classification, surface water source location, raw water quality, and the watershed characteristics rating. The watershed classification is based on the size of the watershed, development activities, and allowable waste treatment and disposal practices. The surface water sources were characterized based on whether they are located in streams, large multi-purpose reservoirs, or small water supply reservoirs. The raw water quality rating is based on recorded turbidity and total coliform values over a twelve month period. The watershed characteristics rating is an assessment of the likelihood that contaminants will follow the path of overland flow or shallow subsurface flow to a surface water source. A description of each factor follows:

Watershed Classification

In North Carolina, all surface water sources are located in water supply watersheds that are classified as either WS-I, II, III, IV, or V. The Water Supply Watershed Protection rules required that all local governments having land use jurisdiction within water supply watersheds adopt and implement water supply watershed protection ordinances, maps and a management plan. All of these ordinances are in place and have been deemed to be in compliance with the statutory requirements. The inherent vulnerability ratings for watershed classification are based on differences between watershed classes, including size of the watershed, development activities, and allowable waste treatment and disposal practices.

Surface Water Source Location

All surface water sources are located in streams, large multi-purpose reservoirs (Class 3), or small water supply reservoirs (Class 1 or 2). The inherent vulnerability ratings for surface water source location are based on differences between the reaction time for a water plant in the case of a contamination event or spill in a stream versus a reservoir and includes the allowable activities on surface water reservoirs (i.e., single use versus multiple uses allowed).

Raw Water Quality

The likelihood of the presence of Cryptosporidium and other water-borne microorganisms increases when turbidity is high. Therefore, turbidity and total coliform bacteria are good indicators of raw water quality. The Area Wide Optimization Program (AWOP) within the PWS Section has developed a ranking system for surface water treatment

plants based primarily on these two parameters. This ranking system, with some minor modifications, has been adopted by SWAP in order to assign a raw water quality rating to each surface water source.

The AWOP ranking system is based on the treatment plant's raw, settled and finished water turbidity and coliform levels along with violations of MCLs and treatment techniques. Raw, settled and finished water samples are collected daily and compiled in a monthly report, commonly referred to as a MOR (monthly operating report). The AWOP ranking system first totals the number of months in a year that specific levels of turbidity and coliform are exceeded and/or the number of months certain violations occur. The monthly totals are then multiplied by a weighting factor to balance the relative importance of these parameters. These numbers are then totaled for the year and are considered the water treatment plant's total score.

Because the purpose of SWAP is to assess sources of drinking water supply and not how well water plants treat their water, SWAP only uses the raw water scores for turbidity and coliform from the AWOP ranking system. The total raw water quality scores were divided into three categories of vulnerability: Higher, Moderate and Lower. The AWOP ranking system is for surface water treatment plants and not individual surface water sources. Therefore, in the case where more than one source is used by a treatment plant, the plant's raw water quality rating was initially assigned to all of the plant's sources. Upon review by the regional office staff some of the ratings were then adjusted based on their extensive knowledge of the surface water sources in their area.

Watershed Characteristics Rating

The state determined the watershed characteristics ratings of each surface water source in cooperation with the USGS. The USGS Water-Resources Investigations Report 99-4283, "Methods of Rating Unsaturated Zone and Watershed Characteristics of Public Water Supplies in North Carolina" describes this methodology. The watershed characteristics ratings were based on the combination of selected factors that may contribute to the likelihood that contaminants follow the path of overland flow and reach the surface water source. Contributing factors, in the form of GIS spatial data layers, include average annual precipitation, land cover, land use, land-surface slope and groundwater contribution. Precipitation is the source of water transported overland to a stream or lake. Land-surface slope and land cover influence the amount of precipitation that infiltrates into the subsurface. Land use describes the activities that take place on the surface or in the shallow subsurface and the type of contaminants that may be present as a result of those activities (i.e., non-point source potential contaminant sources). Ground-water contribution is the effect of ground water on surface-water quantity and quality. For these assessments the ground-water contribution is derived from the unsaturated zone rating described in the ground water inherent vulnerability section of this report. Table 7 includes the characteristics that were evaluated and rated for the inherent vulnerability for each surface water source:

Table 7. Inherent Vulnerability of Surface Water Sources

Surface Water Source Characteristics	Higher Vulnerability	Moderate Vulnerability	Lower Vulnerability
Watershed Classification	WS-IV, WS-V 10	WS-III, WS-II 5	WS-I 1
Intake Location	Direct Stream 8	Class 3 Reservoirs 4	Class 1 and 2 Reservoirs 2
Raw Water Quality (water plant data)	5	3	1
Watershed Characteristics Rating	10	5	1
Totals	33 - 21	20 - 13	12 - 5

Susceptibility Rating Methodology

The state assigned a susceptibility rating for each drinking water source that was based on two components, a contaminant rating and an inherent vulnerability rating. Using the results of the evaluations of contaminant rating and inherent vulnerability rating for each public drinking water source, a susceptibility rating of higher, moderate or lower was assigned to each source according to the table below:

Table 8. Susceptibility Rating for Public Water Supply Sources by Combining the Inherent Vulnerability and Contaminant Ratings

	Inherent Vulnerability Rating		
Contaminant Rating	**Higher**	**Moderate**	**Lower**
Higher	H	H	M
Moderate	H	M	M
Lower	M	M	L