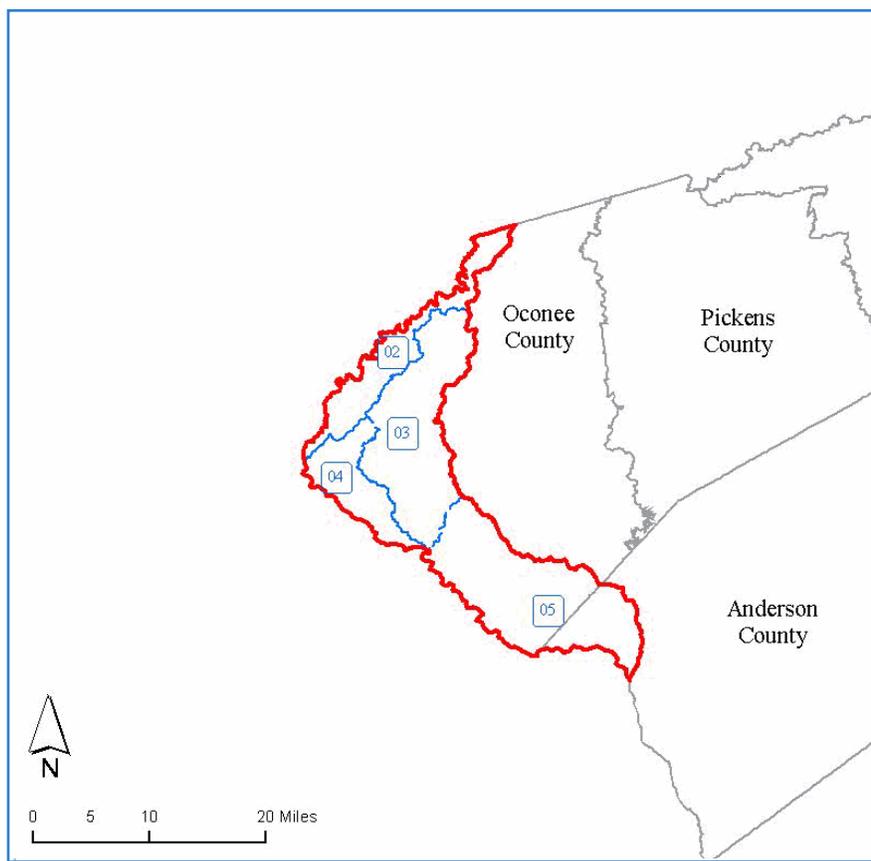


TUGALOO Subbasin

August 31, 2007

An Assessment of the Tugaloo Subbasin

Hydrologic Unit Code (8 Digit): 03060102



WATERSHED (10-digit HUC)
(E.g., 01 = 0306010201)

- 02 Chattooga River
- 03 Chauga River
- 04 Hartwell Lake-Upper Tugaloo River
- 05 Hartwell Lake-Lower Tugaloo River

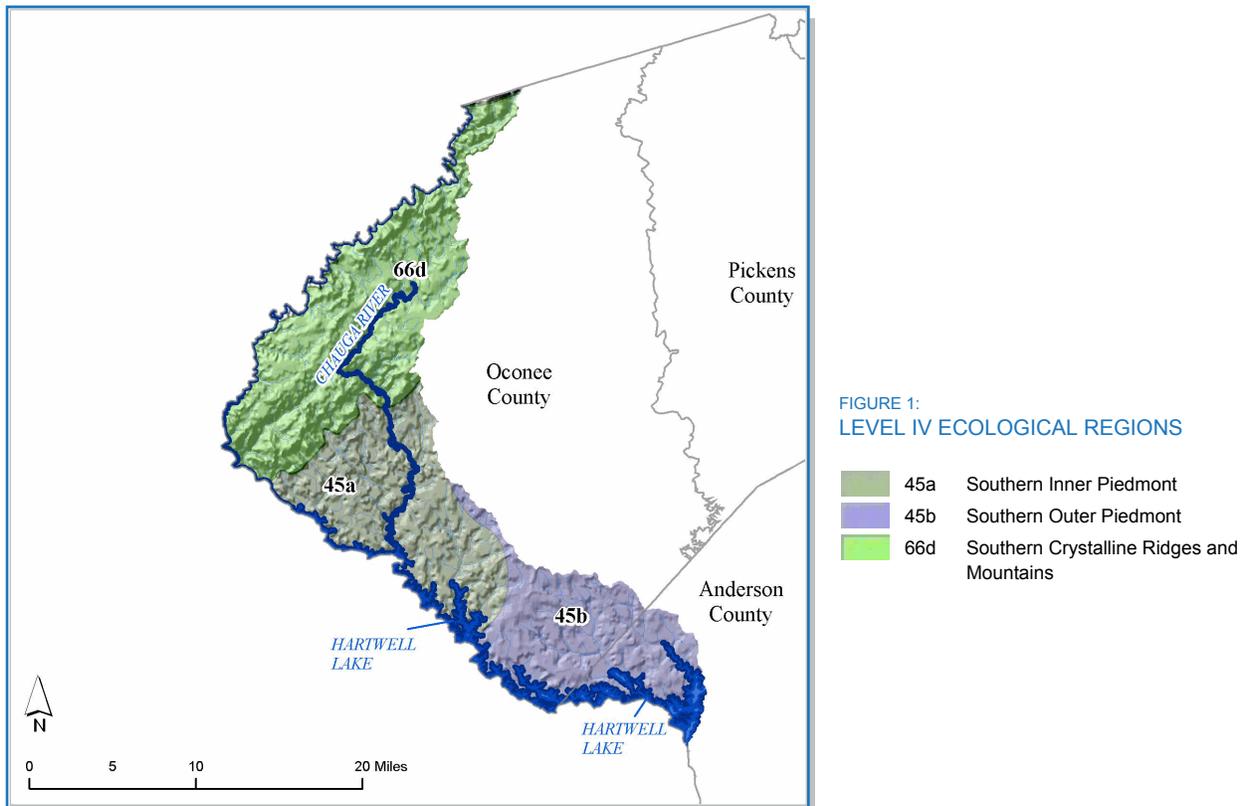


EXECUTIVE SUMMARY

Watershed Description

The Tugaloo River is a short river bordering Georgia and South Carolina and flows through the lakes Tugaloo, and Yonah, and where it exits, Lake Hartwell, where the Seneca River joins the Tugaloo to form the Savannah River. On the South Carolina side, the Tugaloo's main tributaries are the Chattooga, running on the NC/SC state border, and Chauga rivers. The subbasin on the South Carolina side drains 339 square miles or 217,578 acres.

The subbasin lies in the Blue Ridge (66) and Piedmont (45) ecoregions (Figure 1). A brief description of the Level III ecoregions in this watershed is available in this document's appendix. A more detailed description of the Level III and Level IV Common Resource Areas (Ecological Regions) is available online (See Griffith *et al.* 2002 in References section.).



EXECUTIVE SUMMARY

Land Use/Land Cover

There is a negligible amount of urbanized area, the closest sizeable communities being Walhalla and Clemson to the east of the subbasin. The Sumter National Forest covers much of the Blue Ridge Ecoregion area, while the Piedmont area is covered by farmland, much of it devoted to pasture and hayland (Figure 2, Table 2).

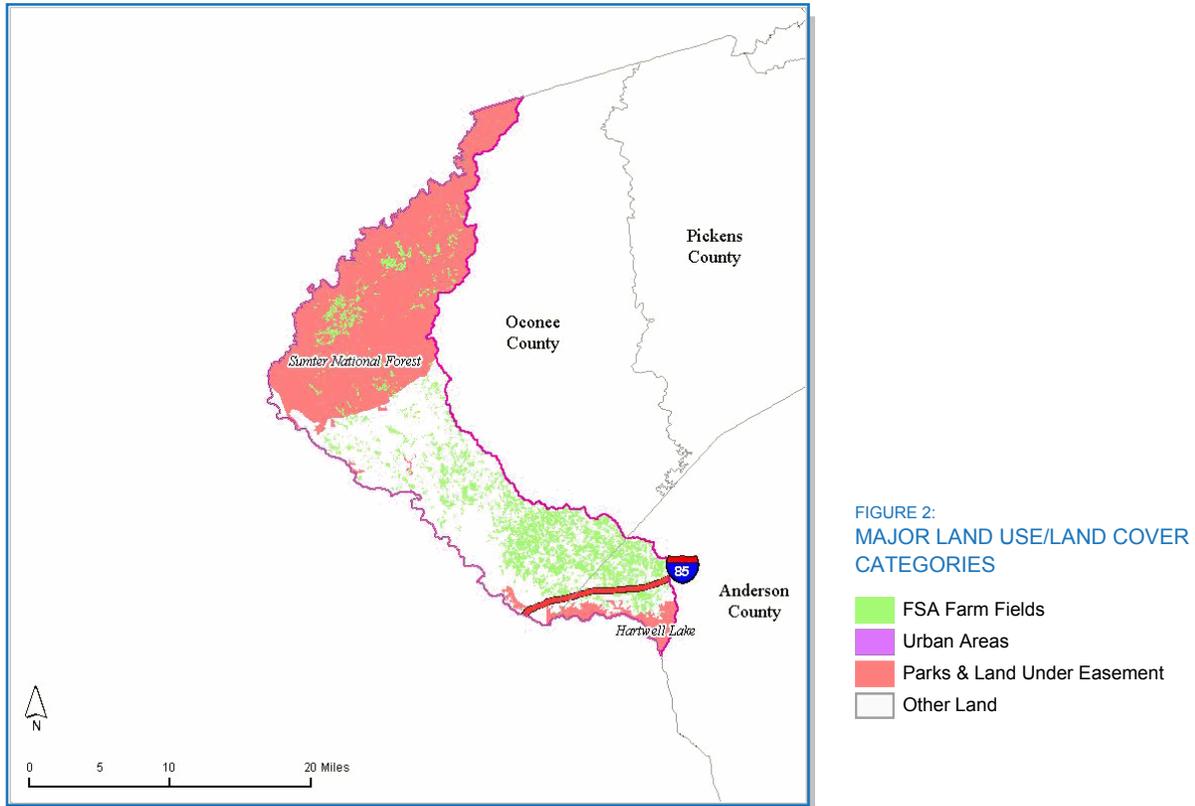


Table 1: MAJOR LAND USE/LAND COVER CATEGORIES

	Acres	% of Watershed
Watershed (Total)	217,578	-
Urban Area	-	-
Parks/Land Under Easement (not NRCS)	103,890	48%
Farm Service Agency Designated Farm Fields	33,617	15%

Table 2: AGRICULTURAL LAND USE: FSA ACREAGE AND ESTIMATED FARM FIELD USE FROM THE 2002 AG CENSUS (NASS Whole County Data Used. Cropland includes: Field Crops, Orchards, and Specialty Crops.)

County	FSA Fields (Acres)	% Pasture (Estimated)	% Cropland (Estimated)	% Hayland (Estimated)
Anderson	6,828	44%	23%	34%
Oconee	26,789	40%	19%	41%

EXECUTIVE SUMMARY

Summary of Resource Concerns

The following is a summary of resource concerns for the watershed. Each resource concern has a more detailed analysis provided in its corresponding section.

Soils

Land capability limitations are dominated by erosion in this subbasin that is typical of an area within the Piedmont and Blue Ridge Mountains; highly erodible and potentially highly erodible soils comprise 88% of the subbasin and are the key resource concerns.

Water Quantity

Awaiting SCDNR's 2007 state water assessment.

Water Quality

Biological (benthic invertebrate) and fecal coliform impairments.

Plant Condition

The most prominent crops in the subbasin include orchard crops (Oconee County is the top producer of apples in the state), forage, corn silage and oats.

Fish, Wildlife, and Native Plants

According to SC DNR's "Comprehensive Wildlife Conservation Strategy: 2005 - 2010" (see SCDNR 2005 in References section), the following applies to this subbasin: Biologists have identified habitat protection as one of the most important actions to ensure the protection of South Carolina priority species. Loss and fragmentation of habitat have been identified as a major threat to many of the species listed as threatened and endangered in South Carolina.

Domestic Animals

Grazing animal populations are significant in the lower reaches of the subbasin; Anderson County is also a top producer of horses in the state. Confined livestock is dominated by poultry where Oconee County is a top ranked producer of both broilers and layers in the state.

Economic and Social Factors

The subbasin is one of the few in the state where cropland acreage has remained on average the same between 1997 and 2002, i.e., no cropland loss was recorded for this period.

EXECUTIVE SUMMARY

Progress on Conservation

Table 3:
A SUMMARY OF NRCS APPLIED CONSERVATION TREATMENTS (ACRES)
 (See Appendix for NRCS Conservation Practices used for Conservation Treatment Categories.)
 (Applied practice data is reported on a fiscal year basis commencing on October 1st)

Conservation Treatments	2004	2005	2006	Total
Buffers and Filter Strips	3	-	-	3
Conservation Tillage	-	-	84	84
Erosion Control	9	8	117	134
Irrigation Water Management	-	-	-	-
Nutrient Management	587	431	665	1,682
Pest Management	587	431	691	1,708
Prescribed Grazing	352	42	499	893
Trees and Shrubs	123	3	-	126
Wetlands	37	1	8	46
Wildlife Habitat	13	47	31	91

Table 4:
LANDS REMOVED FROM PRODUCTION BY FARM BILL PROGRAMS (WHOLE COUNTY DATA SHOWN)

County	Conservation Reserve Program (ac) 2005	Conservation Reserve Program (ac) 1986 - 2005	Grassland Reserve Program (ac) 2005	Farmland & Ranch Protection Program (ac) 2005	Wetland Reserve Program (ac) 2005
Anderson	6,382	170,526	-	-	183
Oconee	559	8,287	46	1,078	-

Table 5:
APPROVED TOTAL MAXIMUM DAILY LOAD (TMDL)
 (See SCDHEC 2007 (a) in Reference Section.) - SCDHEC Contact: Matt Carswell - (803) 898-3609

TMDL Document	Number of Stations	Parameter of Concern	Status	WQMS ID Standard Attained
Beaverdam Creek	1	Fecal Coliform	Completed & Approved	-

Table 6:
OTHER PLANS, ASSESSMENTS, AND PROJECTS IN THE WATERSHED

Organization	Description	Contact	Telephone
SCDHEC	Watershed Water Quality Assessment: Savannah River Basin (2003)	Richelle Tolton	803-898-4213

EXECUTIVE SUMMARY

Other Watershed Considerations

The Chattooga River is protected along a 15,432-acre corridor as a national Wild and Scenic River. 39.8 miles of the river have been designated *wild*, 2.5 miles *scenic*, and 14.6 miles *recreational* for a total of 56.9 miles.

The Chattooga is one of the very few commercially-rafted class V rivers in the Southeast.

RESOURCE CONCERNS

Soils

The Tugaloo subbasin contains two major land resource areas the Blue Ridge (Southern Crystalline Ridges and Mountains) which makes up about 40% in the upper part of the subbasin and the Piedmont region which comprises the remaining 60%. Most of the land (88%) in this subbasin has limitations due to erosion (Table 7). Most of the erosion is associated with steep slopes on uplands in the subbasin (Figure 4, Table 9). Most of the Blue Ridge area consists of very steep slopes with limitations so severe that the land unsuitable for cultivation. Low soil organic matter in the highly erodible soils is a soil health concern. Hydric soils and wetness are not major resource concerns in this subbasin with 99% of the land classified as not hydric (Figure 5, Tables 7 and 10). Only 24% of the land in the Tugaloo subbasin is either prime farmland (13%) or statewide important farmland (11%) and occurs mostly in the lower part of the subbasin (Figure 3, Table 8).

Table 7:
LAND CAPABILITY CLASSES (See NRCS 2007 [a] and [b] in References section.)

Percentages are based on the whole watershed (217,578 ac).

Land Capability Class 1	Acres		Percent			
1 - Slight limitations	28		0%			
% Land by Subclass Limitation						
Land Capability Classes 2-8	Erosion (e)		Wetness(w)		Droughtiness (s)	
	Acres	Percent	Acres	Percent	Acres	Percent
2 - Moderate limitations	18,424	8%	9,371	4%	-	-
3 - Severe limitations	22,614	10%	1,215	1%	-	-
4 - Very severe limitations	26,693	12%	455	0%	-	-
6 - Severe limitations; unsuitable for cultivation; limited to pasture, range, forest	50,249	23%	-	-	-	-
7 - Very severe limitations; unsuitable for cultivation; limited to grazing; forest, wildlife habitat	76,316	35%	-	-	1,569	1%

RESOURCE CONCERNS

Prime Farmland

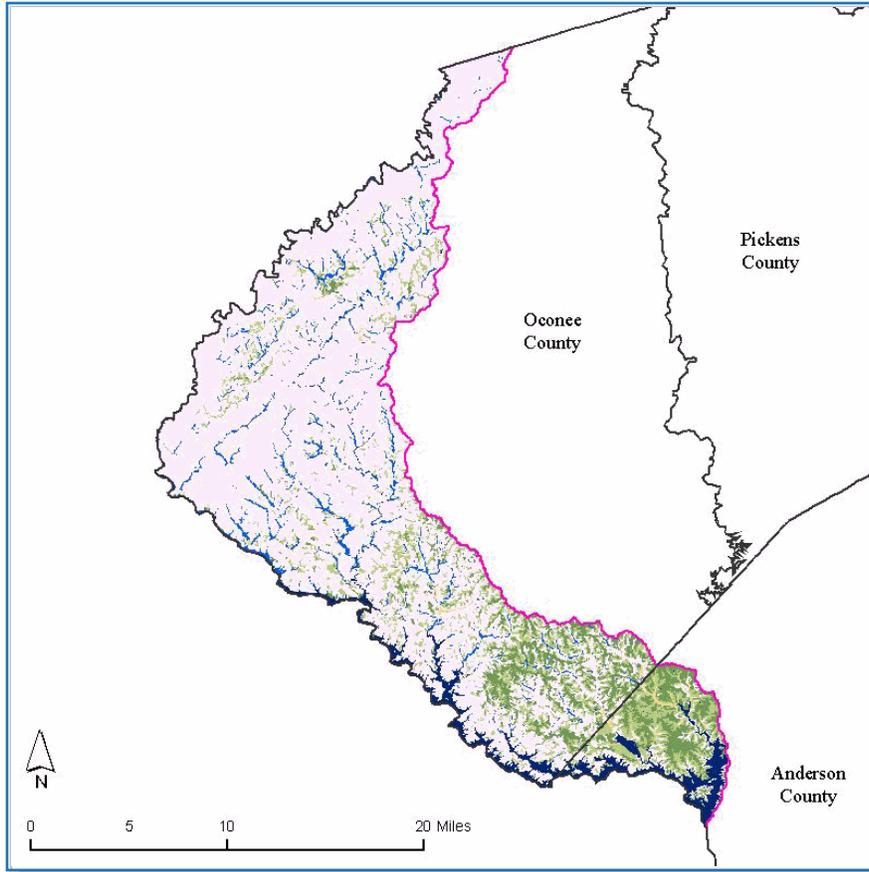


FIGURE 3:
PRIME FARMLAND
(See NRCS 2007 [a] and [b] in
References section.)

Table 8:
PRIME FARMLAND

Prime Farmland Categories	Acres	Percent of Land
All areas are prime farmland	18,453	8%
Farmland of statewide importance	22,872	11%
Not prime farmland	166,205	76%
Prime farmland if drained	0	0%
Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	1,398	1%
Prime farmland if irrigated	0	0%
Prime farmland if irrigated and drained	0	0%
Prime farmland if protected from flooding or not frequently flooded during the growing season	8,363	4%

RESOURCE CONCERNS

Highly Erodible Land

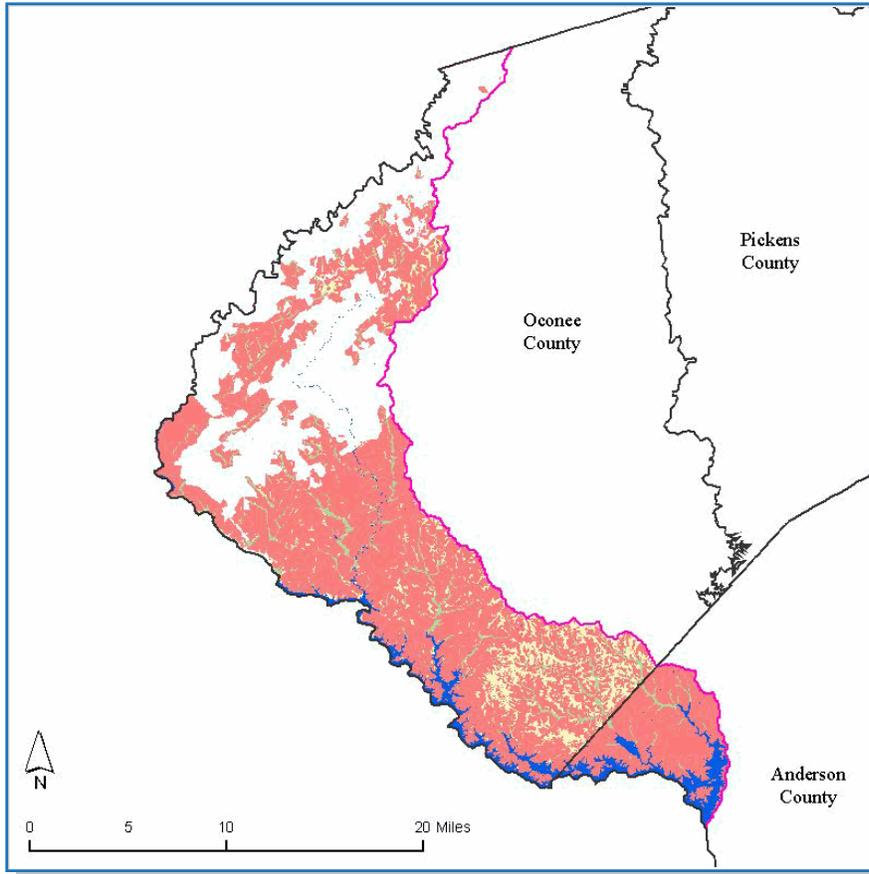


FIGURE 4:
HIGHLY ERODIBLE LAND
(See NRCS 2007 [a] and [b] in
References section.)

Table 9:
HIGHLY ERODIBLE LAND

Highly Erodible Land Categories	Acres	Percent of Watershed
Highly erodible land	123,266	57%
Not highly erodible land	8,252	4%
Potentially highly erodible land	13,518	6%

RESOURCE CONCERNS

Hydric Soils

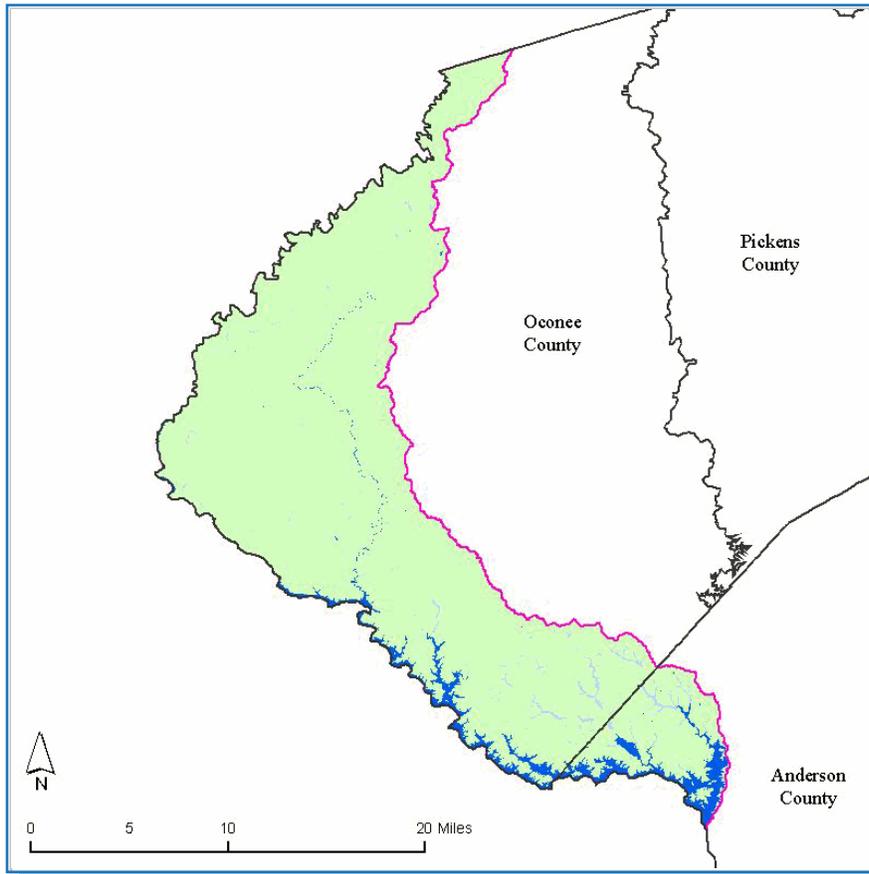


FIGURE 5:
HYDRIC SOILS
(See NRCS 2007 [a] and [b] in
References section.)

Table 10:
HYDRIC SOILS

Hydric Soils Categories	Acres	Percent of Watershed
All Hydric	0	0%
Not Hydric	215,180	99%
Partially Hydric	2,111	1%

RESOURCE CONCERNS

Water Quantity

Narrative awaiting SCDNR's new state water assessment.

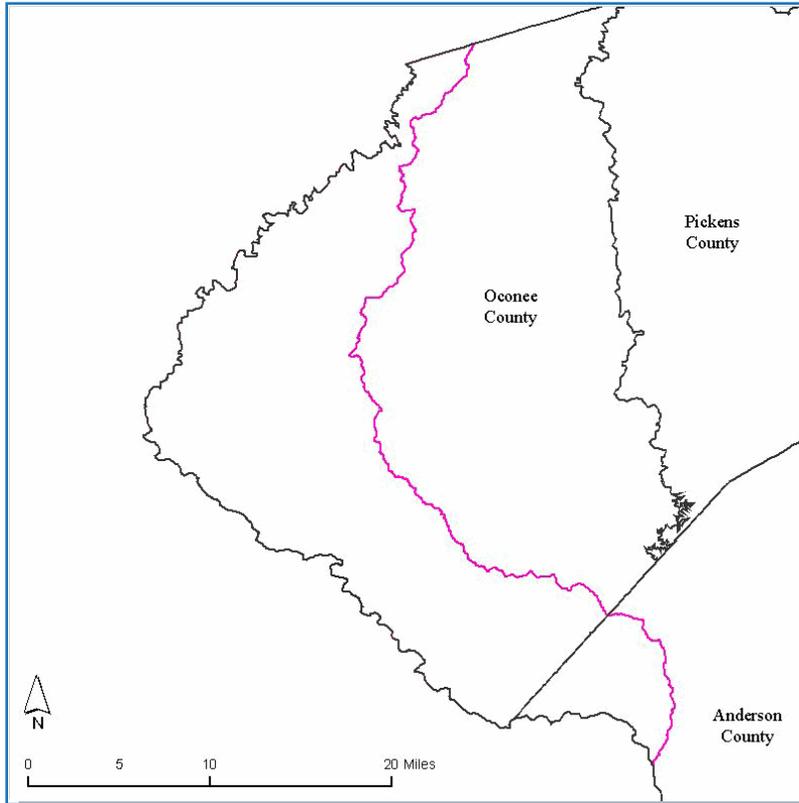


FIGURE 6:
WATERSHED RELATIVE TO CAPACITY
USE AREAS, NOTICE OF INTENT
AREAS, AND CONES OF DEPRESSION

Table 11:
CAPACITY USE, NOTICE OF INTENT, AND CONES OF DEPRESSION AREA IN WATERSHED
(See SCDHEC 2007 [c] and SCDNR 2004 in References Section.)

Area	Percent of Watershed
 % Watershed in Cone of Depression and Capacity Use (CU) Area	0%
 % Watershed in SCDHEC Capacity Use (CU) Area	0%
 % Watershed in SCDHEC Notice of Intent (NOI) Area	0%

RESOURCE CONCERNS

Water Quantity Cont.

Table 12:
INDICATORS OF IRRIGATION WATER USAGE (WHOLE COUNTY DATA ARE USED)
(See NASS 2002 and SCDNR 2004 in References Section)

County	Total Irrigated Water Used MGD	Total NASS Cropland (ac)	Cropland Under Irrigation (ac)	Percent Cropland Under Irrigation	Water Use Gal/Ac/Day for Irrigated Land
Anderson	1.61	87,393	996	1.1	1,616
Oconee	1.44	31,949	545	1.7	2,642

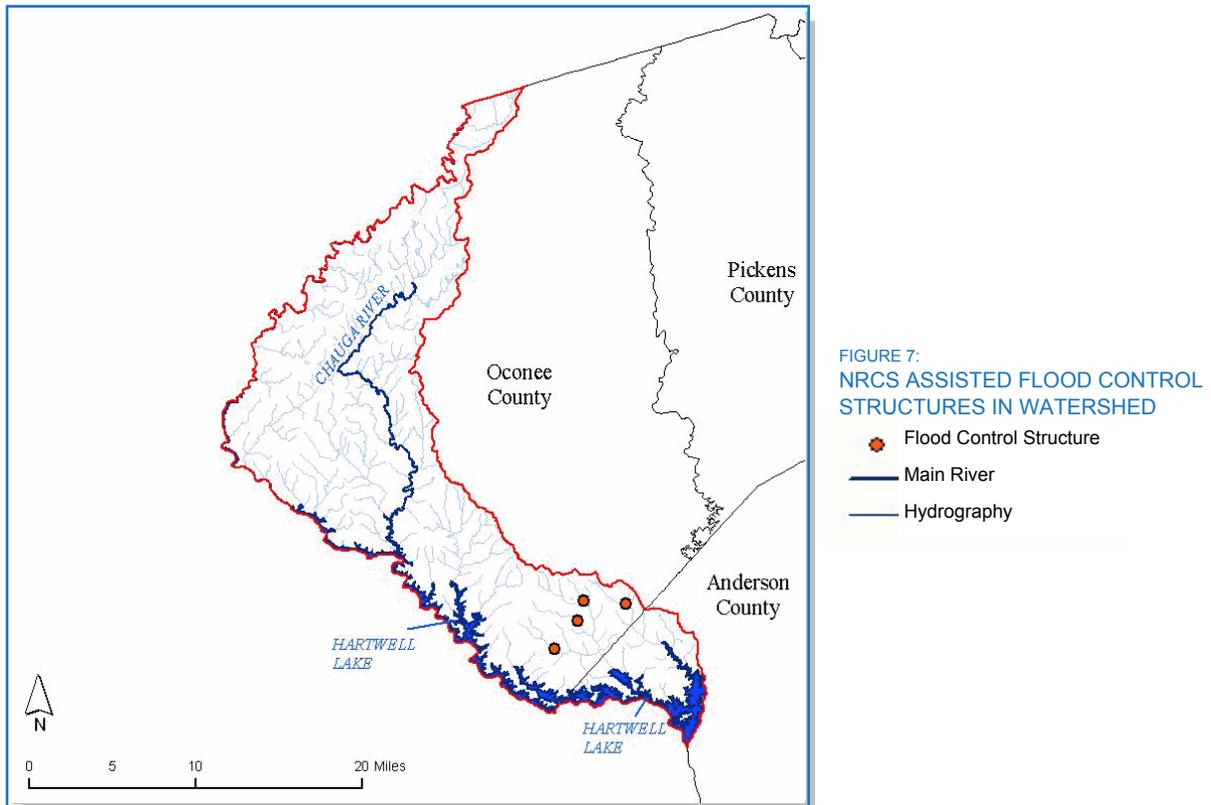


Table 13:
NRCS IMPLEMENTED FLOOD CONTROL STRUCTURES

Number of Structures (in Watershed)	Maximum Storage (AcFt)	Number of Structures by Hazard Class			
		High	Low	Significant	Unclassified
4	6,976	0	3	0	1

RESOURCE CONCERNS

Water Quality

The number of surface water quality impairments is shown in Table 15 resulting in a "303(d)" listing of that Water Quality Monitoring Site (WQMS). Table 5 indicates what progress has been made to address surface water quality through the Total Maximum Daily Load (TMDL) process. Once a TMDL plan is approved, the WQMS is removed from the 303(d) list even though the standard may not have been attained. Note that standards for total nitrogen, total phosphorus, and chlorophyll-a only exist for lakes; therefore, no stream in the state can be listed for any of these three parameters. There are biological (benthic invertebrate) and fecal coliform impairments in the subbasin.

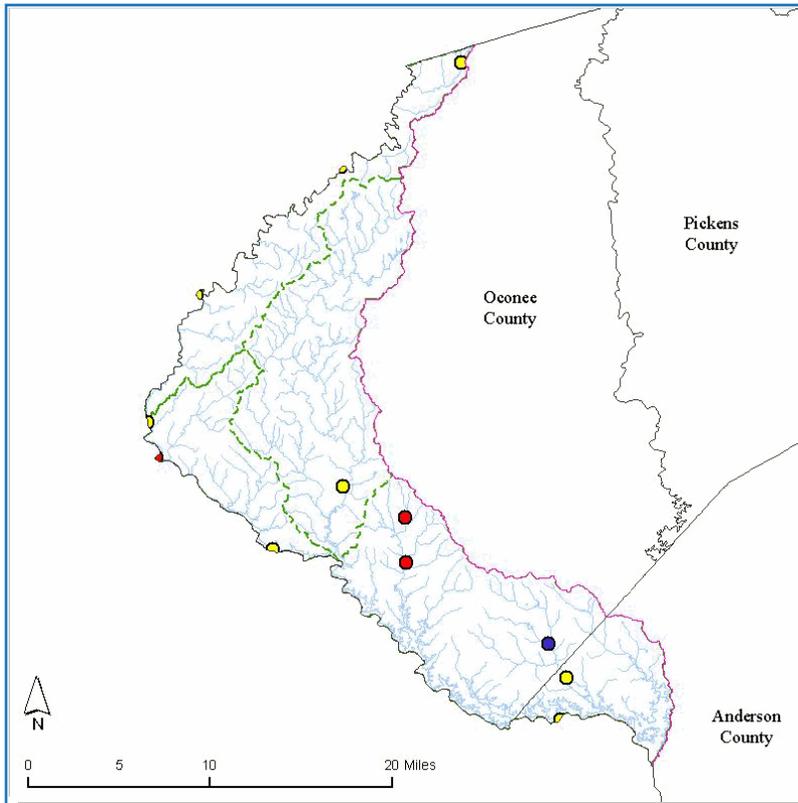


Table 14:
WATER QUALITY MONITORING SITES

Permanent Water Quality Monitoring Sites (WQMS)	12
Random Water Quality Monitoring Sites (WQMS)	11

FIGURE 8:
PERMANENT WATER QUALITY MONITORING SITES

- WQMS (No Impairment)
- WQMS (303d Listed)
- WQMS (Approved TMDL)
- ▲ Waste Water Treatment Plant
- Hydrography
- Hydrologic Unit Code 10 Boundary

Table 15:
NUMBER OF MONITORING SITES SHOWING SURFACE WATER QUALITY IMPAIRMENTS
(See SCDHEC 2006 in References for the state 303(d) list.)

Recreational Use Standard		Fish Tissue Standard		Shellfish Harvest Standard	
Parameter	Impairments	Parameter	Impairments	Parameter	Impairments
Fecal Coliform	3	Mercury	2	Fecal Coliform	NA
		PCB's	0		
Aquatic Life Use Standard					
Parameter	Impairments	Parameter	Impairments	Parameter	Impairments
Biological	3	Dissolved Oxygen	0	Total Phosphorus	1
Chlorophyll A	0	Ammonia Nitrogen	0	pH	0
Chromium	0	Nickel	0	Turbidity	0
Copper	0	Total Nitrogen	0	Zinc	0

RESOURCE CONCERNS

Plant Condition

Plants of Economic Importance

Plants of economic importance are shown in Table 16. The crops shown in this table are from NASS data where the top five crops, by acres, in each county are displayed. The timber statistics (see Clemson Extension Forest Services 2003 in References) indicate the relative importance of the timber industry within the state and the importance of the timber industry compared to agriculture within the county.

The most prominent crops in the subbasin include orchard crops (Oconee County is the top producer of apples in the state), forage, corn silage and oats.

Native Plant Species

According to SC DNR's "Comprehensive Wildlife Conservation Strategy: 2005 - 2010" (see SCDNR 2005 in References section), the following applies to this subbasin: Appalachian oak and oak pine forest are important to wildlife as the most extensive cover type in the Blue Ridge ecoregion. Scattered throughout the ecoregion are wet places embedded within primary habitat types such as cold water streams, waterfalls, waterslides and bogs.

The Piedmont ecoregion plant community historically consisted of oak and hickory-dominated forest with associated tree species varying by slope and soil moisture. This was the primary potential vegetation type in the Piedmont. Due to land disturbances however, today the majority of these sites exist mostly in closed canopy pine-dominated forests.

Table 16:

WHOLE COUNTY DATA OF PLANTS OF ECONOMIC IMPORTANCE IN SUBBASIN (See: USDA NASS 2002 & Clemson University Forest Extension Services 2003 in References section)

Plant	Counties
All Wheat for grain	Oconee, Anderson
Apples	Oconee
Corn for grain	Oconee
Corn for silage	Anderson
Forage - land used for all hay and haylage, grass silage, and greenchop	Anderson, Oconee
Oats	Anderson
Soybeans	Anderson, Oconee

Table 17:

FEDERALLY LISTED THREATENED AND ENDANGERED PLANT SPECIES IN WATERSHED (See USFW 2006 in References section.)

Common Name	Latin Name	Status
Georgia aster	<i>Aster georgianus</i>	Supported Proposals to List
Smooth coneflower	<i>Echinacea laevigata</i>	Endangered
Small whorled pogonia	<i>Isotria medeoloides</i>	Threatened
Persistent trillium	<i>Trillium persistens</i>	Endangered

RESOURCE CONCERNS

Fish and Wildlife

For additional information, the SC Department of Natural Resources has completed a "Comprehensive Wildlife Conservation Strategy: 2005 - 2010" (see SCDNR 2005 in References section).

In 2005, mercury advisories were issued for 57 water bodies in South Carolina. Higher concentrations of mercury in fish tissue tend to occur in the Coastal Plain of South Carolina with relatively lower concentrations (and therefore fewer advisories) in the Piedmont. For more details on fish advisories, please refer to the SCDHEC fish advisory website at:

<http://www.scdhec.gov/environment/water/fish/>

Table 18:

FEDERALLY LISTED THREATENED AND ENDANGERED WILDLIFE SPECIES IN WATERSHED
(See USFW 2006 in References section.)

Common Name	Latin Name	Status
-------------	------------	--------

Table 19:

FEDERALLY LISTED THREATENED AND ENDANGERED AQUATIC SPECIES IN WATERSHED
(See USFW 2006 in References section.)

Common Name	Latin Name	Status
None Listed		

RESOURCE CONCERNS

Domestic Animals

Grazing animal populations are significant (Table 20), and also associated with the lower reaches of the subbasin that are covered by the Piedmont ecoregion. Note that Anderson County is also a top producer of horses in the state. Confined livestock is dominated by poultry, where Oconee County is a top ranked producer of both broilers and layers.

Table 20:
WHOLE COUNTY GRAZING ANIMAL POPULATION DATA FROM 2002 AG. CENSUS
 (See NASS 2002 in References section. "D" in table = "Cannot be disclosed".)

County	Cows/Calves	Grazing/Forage (ac)	County Rank in State
Anderson	40,505	38,017	1
Oconee	19,828	12,787	8

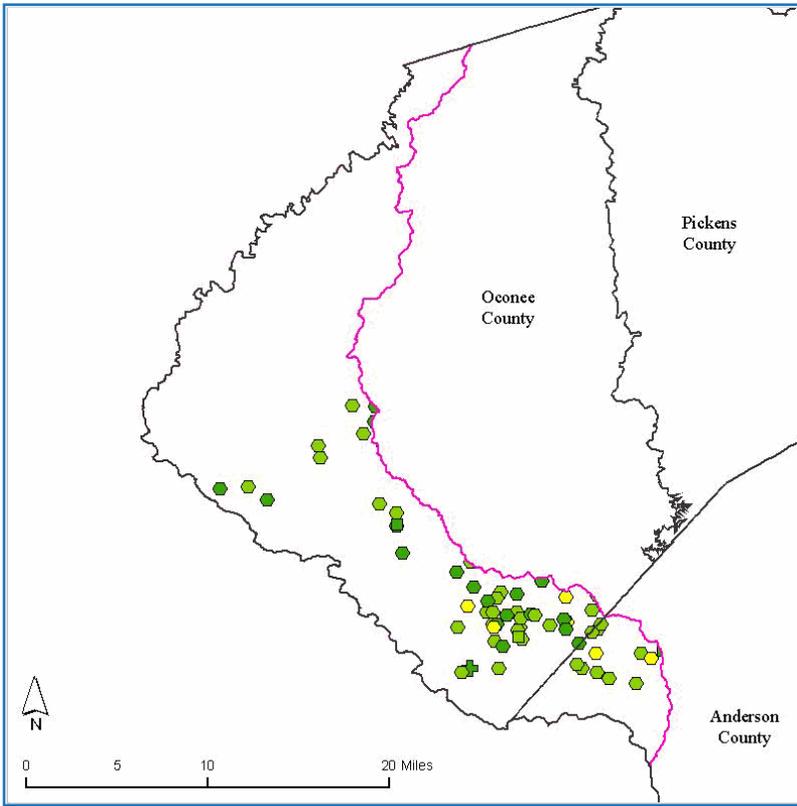


Table 21:
CONFINED ANIMAL POPULATION [As given by SCDHEC] (Au = Animal Unit = 1,000 lbs)

Beef Live Weight (Au)	-
Dairy Live Weight (Au)	350
Horse Live Weight (Au)	-
Poultry Live Weight (Au)	12,448
Swine Live Weight (Au)	60
Turkey Live Weight (Au)	-

FIGURE 9:
TYPE AND SIZE OF CONFINED ANIMAL OPERATION

Permit Design Count (Live Weight AU)	Symbol	Animal Type
0 - 163	Green square	Beef
164-372	Light green square	
373 - 680	Yellow square	
681 - 1360	Orange square	
1361 - 7076	Red square	
	Black square	Dairy
	Black triangle	Other
	Black circle	Poultry
	Black cross	Swine
	Black star	Turkey

ECONOMIC & SOCIAL FACTORS

The number of full-time farmers is *lower* than the state average of 47% and farm sizes are *smaller* than the state average of 197 ac (Table 22); both parameters suggest below-average levels of participation in conservation programs. Farm sizes have *decreased* by an estimated 18% between 1997 and 2002, higher than the 13% across the state for the same period. The subbasin is one of the few in the state where cropland acreage has remained on average the same; the SC average cropland loss is estimated at 8%.



The relative importance of crop and livestock commodity groups in the watershed is shown in Tables 24 and 25; a *qualitative* indication of the relative importance of timber is provided on Table 16.

For more economic and farm information from the 2002 Agricultural Census, more detailed reports for all South Carolina counties can be found at:

<http://www.nass.usda.gov/census/census02/profiles/sc/index.htm>

Table 22:
2002 FARM CENSUS DATA (WHOLE COUNTY DATA SHOWN) (SC average farm size = 197 ac)

County	Total Number of Farms	% Full Time Farmers	% Farms > 180 (ac)	Average Farm Size (ac)
Anderson	1,644	46%	15%	108
Oconee	878	40%	13%	89
Weighted Avg*	1,031	42%	13%	93

Table 23:
2002 FARM CENSUS ECONOMIC DATA (WHOLE COUNTY DATA SHOWN) (Results in \$1,000)

County	Market Value of Ag Products Sold	Market Value of Crops Sold	Market Value of Livestock, Poultry, and Their Products	Farms with sales < \$10,000
Anderson	37,046	14,916	22,130	1,352
Oconee	56,398	-	-	713
Weighted Avg*	52,528	2,983	4,426	841



Table 24:
VALUE OF CROP COMMODITY GROUPS - COUNTY RANK IN STATE
(See NASS 2002 in References section. "D" in table = "Cannot be disclosed".)

County	Value of All Crops	Grains & Oilseeds	Tobacco	All Cotton	Vegetables & Melons	Fruits, Nuts, & Berries	Nursery, Etc.	Christmas Trees & Woody Crops	Hay & other Crops
Anderson	17	26	-	30	20	16	6	7	3
Oconee	(D)	29	-	(D)	28	11	(D)	8	(D)

Table 25:
VALUE OF LIVESTOCK AND POULTRY COMMODITY GROUPS - RANK IN STATE
(See NASS 2002 in References section. "D" in table = "Cannot be disclosed".)

County	Value of Livestock, poultry	Poultry, Eggs	Cattle & Calves	Milk & Dairy	Hogs & Pigs	Sheep & Goats	Horses, etc.
Anderson	15	19	1	5	18	1	3
Oconee	(D)	5	8	15	(D)	20	20

* Weighted averages are estimated based on agricultural land use area.

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APPENDIX

Level III Common Resource Area (Ecological Region) Descriptions

Piedmont (45)

The Piedmont is an erosional terrain with some hills; the soils are generally finer-textured than those found in coastal plain regions with less sand and more clay. Piedmont soils are moderately to severely eroded; most of this region is now in planted pine or has reverted to successional pine and hardwood woodlands, with some pasture; spreading urban- and suburbanization is apparent. The Piedmont of South Carolina is divided into five level IV ecoregions: Southern Inner Piedmont (45a), Southern Outer Piedmont (45b), Carolina Slate Belt (45c), Triassic Basins (45g) and Kings Mountain (45i).

Blue Ridge (66)

The Blue Ridge is part of one of the richest temperate broadleaf forests in the world, with a high diversity of flora and fauna. Elevations generally range from 900-3000 feet, with Sassafras Mountain, the highest point in South Carolina, reaching near 3560 feet. The ecoregion in South Carolina falls within one level IV ecoregion: Southern Crystalline Ridges and Mountains (66d).

NRCS Conservation Practices used for Conservation Treatment Categories in Table 3

Report Category	Practice Codes
Buffer and Filter Strips	332, 391, 393, 412
Conservation Tillage	324, 329, 329A, 329B, 344, 484
Erosion Control	327, 328, 330, 340, 342, 561, 585, 586
Irrigation Water Management	441, 449
Nutrient Management	590
Pest Management	595
Prescribed Grazing	528, 528A
Trees and Shrubs	490, 612, 655, 656, 66
Wetlands	657, 658, 659
Wildlife Habitat	644, 645

Hydrologic Unit Numbering System

In 2005, the NRCS in cooperation with the U.S. Geological Survey, the South Carolina Department of Health and Environmental Control, and the U.S. Forest Service updated the South Carolina part of the USGS standard hydrologic unit map series. The report, "Development of a 10- and 12- Digit Hydrologic Unit Code Numbering System for South Carolina, 2005", describes and defines those efforts. The following is from the Abstract contained in that report: "A hydrologic unit map showing the subbasins, watersheds, and subwatersheds of South Carolina was developed to represent 8-, 10-, and 12-digit hydrologic unit codes, respectively. The 10- and 12-digit hydrologic unit codes replace the 11- and 14-digit hydrologic unit codes developed in a previous investigation. Additionally, substantial changes were made to the 8-digit subbasins in the South Carolina Coastal Plain. These modifications include the creation of four new subbasins and the renumbering of existing subbasins." The report may be obtained at http://www.sc.nrcs.usda.gov/technical/HUC_report.pdf. See Table 2 in the report for a cross-reference of old to new 8-digit HUC.

This subbasin profile uses the new HUC 8 numbering system with its modified and newly created subbasins. The NRCS reports implemented practices by 8-digit Hydrologic Unit Code. All NRCS reported Conservation Practices were reported using the older numbering system. 2005 and 2006 data were converted to the new HUC 8 numbering system through the Latitude and Longitude data reported with the applied practice. The use of these differing numbering systems has resulted in some NRCS implemented practices being credited in this report to an 8-digit HUC as reported by the NRCS but not correctly credited in the new numbering system. Likewise, the newly created 8-digit HUC will not be credited with the 2004 applied practices.