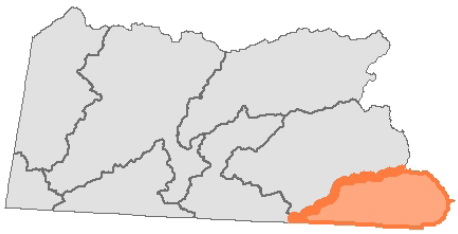
Shooting Creek Watershed

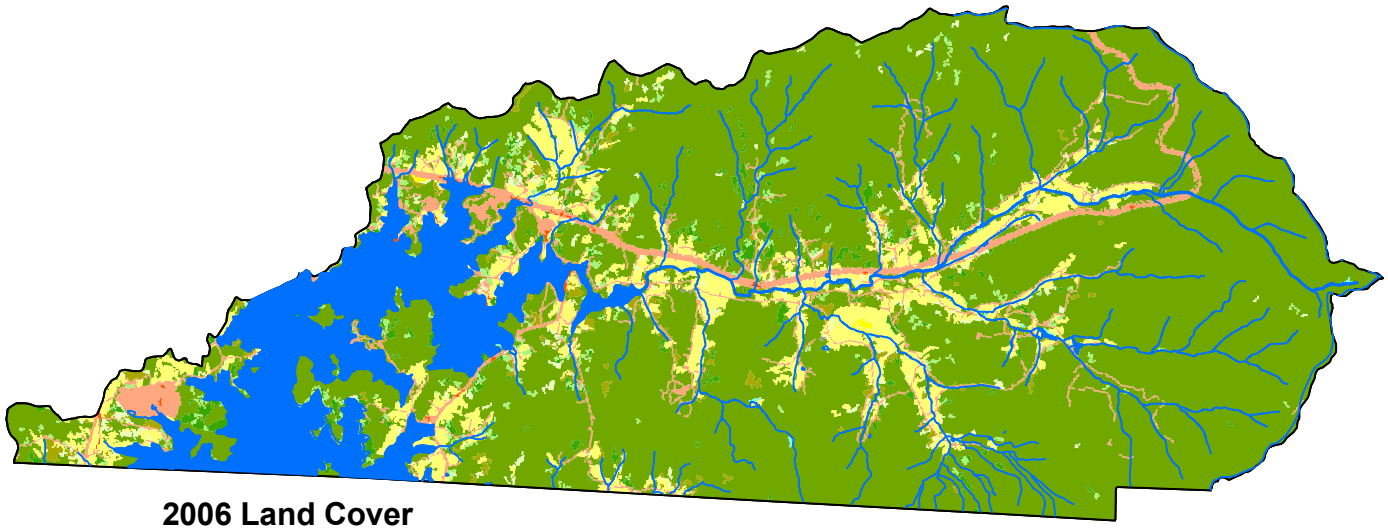


HUC 0602000201

Includes: Major Streams- Shooting Creek, Eagle Fork Creek, Giesky Creek, Pounding Mill Creek, Licklog Creek & Hothouse Branch

Watershed at a Glance

County:	Area	2006 Land Cover:	Permitted Facilities:
Clay	58 sq mi.	Open Water.....8%	NPDES
Municipalities:	**Population:**	Developed.....6%	Wastewater Discharge.....1
none	2000....2,438	Forested.....75%	Wastewater Nondischarge.....1
EPA Level IV Ecoregions:	2010....2,963	Shrub.....1%	Stormwater.....0
Broad Basins, Southern Crystaline Ridges & Mtns.		Agriculture.....10%	Animal Operations.....0



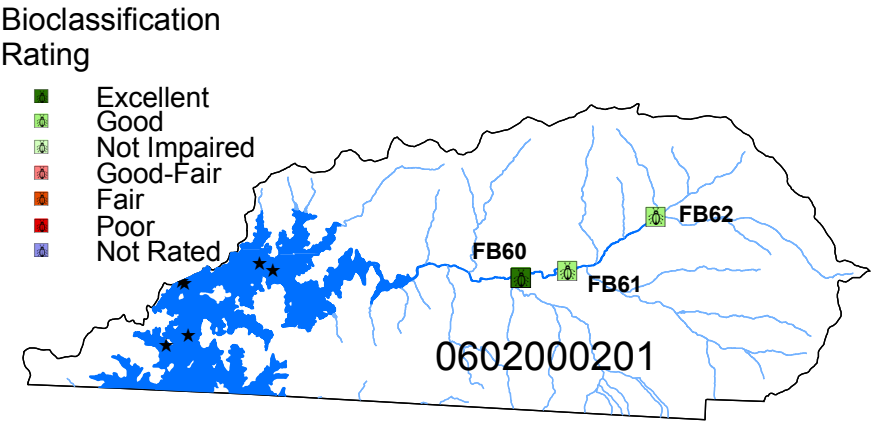
2006 Land Cover

- Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland
- Pasture/Hay
- Cultivated Agriculture
- Woody Wetlands
- Barren Land

Figure 1-1: Shooting Creek Watershed Map

Water Quality Monitoring

Figure 1-2: Biological Sample Sites & Ratings



The only ambient water quality stations in this watershed are in Chatuge Lake. Biological samples have been taken throughout the watershed since the 1980's. Basinwide sites were first sampled in 1994 and the most recent basinwide benthic macroinvertebrate sample was taken in 2009 at site FB60 resulting in an Excellent Bioclassification. Site specific information is available in Appendix and the Biological Assessment Report is available here http://portal.ncdenr.org/web/wq/ess/reports. Figure 1-2 shows the most recent benthic site rating in this watershed at sites sampled since 1994.

Biological Monitoring

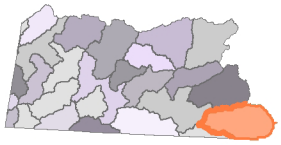
Biocriteria have been developed using the diversity, abundance, and pollution sensitivity of the organisms that inhabit flowing waterbodies in NC. One of five bioclassifications are typically assigned to each water body sampled: Excellent, Good, Good-Fair, Fair and Poor. Not Impaired and Not Rated designations are reserved for samples that were not eligible to be assigned one of the five typical bioclassification categories. Typically, a "Not Impaired" rating is equivalent to a Good-Fair or better bioclassification and a "Not Rated" designation is equivalent to a Fair or worse bioclassification. The reasons for not being able to assign one of these five typical bioclassifications may be a lack of appropriate bio-criteria or atypical sampling conditions (e.g., drought). These bioclassifications are used to assess the various impacts of both point source discharges and nonpoint source runoff. The resulting information is used to document both spatial and temporal changes in water quality, and to complement water chemistry analyses, ambient toxicity data, and habitat evaluations. In addition to assessing the effects of water pollution, biological information is also used to define High Quality or Outstanding Resource Waters, support enforcement of stream standards, and measure improvements associated with management actions. The results of biological investigations have been an integral part in North Carolina's basinwide monitoring program.

Protection and Restoration Opportunities

The following section provides more detail about specific streams where special studies have occurred or stressor sources information is available. Within this document, biological sample site IDs ending in an "F" denote fish community and a "B" denote macroinvertebrate community. Specific stream information regarding basinwide biological samples sites are available in Appendix 1B. Use support information on all monitored streams can be found in Appendix 1A. Detailed maps of each of the watersheds are found in Appendix 1C or by clicking on the following small maps.

To assist in identifying potential water quality issues citizens, watershed groups and resource agencies can gather and report information through our Impaired and Impacted Stream/ Watershed survey found here: http://portal.ncdenr.org/web/wq/ps/bpu/about/impactedstreamssurvey.

Shooting Creek Subwatershed (HUC 060200020105)



This subwatershed drains ~48.5 $mi^{2,}$, with much of the headwaters being within Nantahala National Forest. Shooting Creek [AU# 1-5] is a 5.6 mile tributary to Chatuge Lake. This subwatershed represents nearly a quarter of Lake Chatuge's entire drainage area. The subwatershed is mostly forest with scattered areas of low density housing, row crops and pasture. A road parallels large portions of this waterbody, resulting in impacts to the riparian zone and notable areas of erosion along the stream banks. Shooting Creek is hatchery supported trout waters (Tr) and the DWQ fish community samples taken in Shooting Creek from 2004 & 2009 resulted in a Good-Fair rating. A mixed assemblage of cold, cool, and warm water species were collected and the fish community population appears to be moderately healthy and stable. Macroinvertebrate samples taken at the same location resulted in Excellent bioclassifications. Restoration efforts (installation of rock vanes) have been completed in this reach since 2004 biological samples were taken.

In this subwatershed, there are no discharge permits and one non-discharge permit for a closed laundromat in which the infiltration pond needs to be closed. There are three Significant Natural Heritage Areas: White Oak Stamp, Glade Gap Slopes, and Chunky Gal/Riley Knob are found within the Nantahala National Forest in the headwaters of the Shooting Creek watershed.

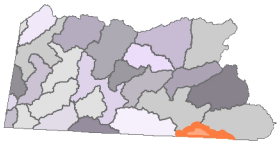
Water Quality Initiatives

In November 2004, Clay County received $184,400 in Emergency Watershed Protection funds from the USDA Natural Resources Conservation Service (NRCS) to repair damage from hurricanes Frances and Ivan. A total of 2,000 linear feet of Eagle Fork Creek, Muskrat Creek, and Shooting Creek were restored using natural channel design techniques. The Projects were administered and supervised by the Clay County Soil and Water Conservation District and Clay County personnel. Additional accomplishments in the Shooting Creek drainage include two restoration projects funded by the North Carolina Agricultural Cost Share Program totaling 500 linear feet of restoration on Geisky and Eagle Fork Creeks.

Recommendations

Within this subwatershed, Shooting Creek Headwaters, Eagle Fork, Giesky Creek, Upper Shooting Cr Embayment, and Licklog Creek are priority catchments for nutrient and sediment erosion reduction BMPs. Local actions are needed to address nonpoint pollution sources in the watershed. DWQ encourages local governments to adopt and enforce local ordinances to protect existing water quality in the watershed. Additionally, new development should avoid building in the floodplain and employ best management practices designed to reduce impacts to water quality. The **Hiwassee River Watershed Coalition** completed a **Watershed Action Plan** in 2007 for Chatuge Lake that includes actions applicable to Shooting Creek. DWQ encourages citizens to volunteer to assist Hiwassee River Watershed Coalition in implementing the plan and also encourages funding organizations to support plan implementation.

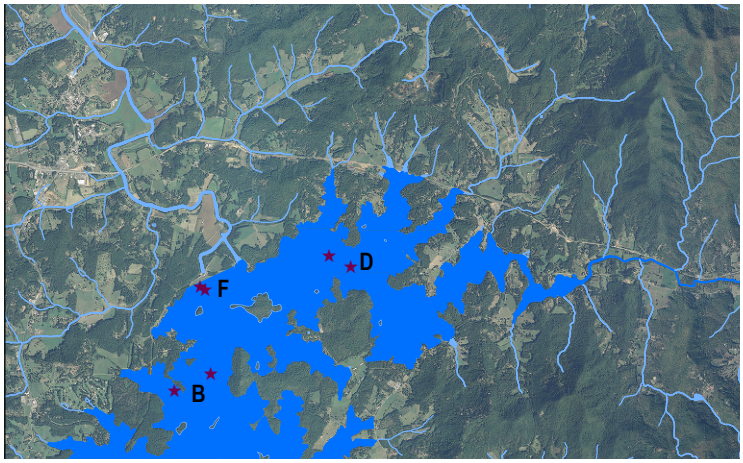
Lake Chatuge (HUC 060200020106)



Lake Chatuge [AU# 1-(1)] is a 7,000 acre reservoir that impounds the Hiwassee River. The lake is situated adjacent to the Nantahala National Forest. Approximately half of the lake lies within the state of Georgia. The lake is owned by the Tennessee Valley Authority (TVA) and was constructed in 1942 for the purpose of storing flood waters for TVA's Hiwassee and Apalachia Reservoirs downstream, as well as mainstream dams on the Tennessee River. Today Lake Chatuge is operated for many purposes, including flood control, augmentation of flows for navigation, hydropower production, protection of aquatic resources, and recreation. Lake Chatuge is classified B (suitable for swimming) and is a popular recreation area. As a result development along the shoreline has occurred contributing to a large increase in impervious surfaces that drain to the lake.

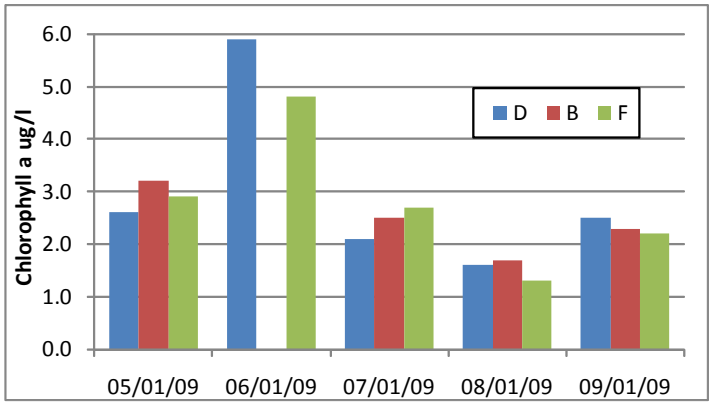
This lake has a maximum depth of 144 feet, and a mean depth of 36 feet. Lake Chatuge is 13 miles long with 130 miles of shoreline. The drainage area of the lake covers 189 mi^2, which is primarily forested. Eller Seep is a Significant Natural Heritage Area near the NC/GA state line near the lake. Major tributaries to the Lake Chatuge include the Hiwassee River and Shooting Creek. There is one discharge permit (USFS Jackrabbit Mountain Recreation Area WWTP, NC0021148) that has had frequent violations for BOD levels. However, this facility is expected to be taken offline in 2012 and the permit will likely be rescinded, when it connects to a regional wastewater sewer system in Towns County, Ga.

Figure 1-3: Chatuge Lake Monitoring Station Locations



DWQ staff monitored Lake Chatuge monthly from May through September 2009, Figure 1-3. Surface dissolved oxygen ranged from 7.0 to 8.9 mg/L with a thermocline generally occurring at a depth of seven meters from the surface. In June, a dissolved oxygen maxima was observed at a depth of approximately six meters from the surface, suggesting the possibility of increased subsurface algal productivity at this depth in the water column. An analysis of a phytoplankton sample collected from Lake Chatuge indicated that the dominant alga was Tabellaria fenestrata, a chain-forming diatom. This diatom is an indicator of cool, clear water, which is present in Lake Chatuge. Chlorophyll a values in June were slightly greater than those observed in May and July (Figure 1-4), but well below the state water quality standard of 40 µg/L (Appendix B). Overall, chlorophyll a values in 2009 did not vary from those previously observed in Lake Chatuge by DWQ staff. Secchi depths were also generally similar to previously observed measurements and ranged from 2.0 to 3.8 meters.

Figure 1-4: Chlorophyll a levels at Lake Stations



Nutrient concentrations in 2009 were consistently low and similar to past observations. The North Carolina Trophic State Score for this lake indicated that productivity is very low (oligotrophic). Lake Chatuge has been consistently oligotrophic since it was first monitored by DWQ in 1981. The 2010 Integrated Report lists Lake Chatuge as Supporting for aquatic life, however bacterial samples were not taken and is therefore the lake is Not Rated for recreation uses.

The Tennessee Valley Authority (TVA) began a monitoring program for its reservoirs in 1990 as a means of collecting data to assess the integrity or

"health" of the aquatic ecosystems of these reservoirs. Based on sampling conducted by the TVA Lake Chatuge was determined to have an Ecological Health Rating of Fair in 2007 and 2008. Chlorophyll a monitored by the TVA rated good at both the forebay and in Shooting Creek, however, trends in chlorophyll a concentrations suggest that levels have been increasing since the TVA first began its monitoring program in this reservoir in the early 1990's (www.tva.com/environment/ecohealth/chatuge.htm).

The TVA data collection has noted a decline in water quality throughout the lake and a steady rise in chlorophyll a levels. The Hiwassee River Watershed Coalition completed a Watershed Action Plan in 2007 for Lake Chatuge to investigate and address the lake's water quality. Specifically, the water quality decline is related to nutrient inputs from pasture lands, developed areas and point sources. The Watershed Action Plan targets reducing both phosphorus and sediment inputs to reduce overall nutrient impacts with the goal of reducing chlorophyll a levels in the lake to <5 ug/l and a 10% reduction in the area of the lake affected by low DO. The modeling completed for the Watershed Action Plan calls for a 30% reduction in phosphorus and nitrogen. The Plan identifies six management strategies to help achieve the 30% reduction:

1. Reduce the Total Phosphorus load from the Hiwassee WWTP by 50%
2. Restrict from streams and/or the lake, and provide appropriate alternative watering for, a minimum of 125 animals (25%) that currently have unrestricted access
3. Improve 40% of pastures considered to be in fair condition to good condition (about 2,500 acres)
4. Improve 50% of the most degraded pasture areas to a minimum of conditions considered fair (about 440 acres)
5. Reduce the Total Phosphorus load by 30% from existing commercial areas (about 1000 acres)
6. Reduce TP load by 5% from existing residential areas (nearly 7,000 acres)

DWQ supports the findings of the Hiwassee River Watershed Coalition study and encourages efforts to implement the actions it identified within the Lake Chatuge Watershed Action Plan to reduce sediment and nutrient loads to the reservoir. Additionally, planning for future wastewater treatment is also needed to protect Lake Chatuge's health.

The Hiwassee River Watershed Coalition (HWRC) is also working to implement activities in the 60% of the Lake Chatuge watershed that falls within the State of Georgia. The HRWC in partnership with Towns County, GA received a NPS 319 grant to hire a watershed coordinator and implement BMPs targeting nutrient reductions.

Notable Waters

Table 1-1 lists waterbodies identified as needing additional protection and potential restoration actions. The fourth and fifth columns of this table list potential stressors and sources that may be impacting a stream based on in-field observations, monitoring data, historical evidence, permit or other violations, and other staff and public input. In many cases, additional study is needed to determine exact source(s) of the impact. The last column includes a list of recommended actions.

Table 1-1: Notable Waterbodies

Stream Name	AU#	Class.	Stressor	Source	Status	Actions Needed
Eagle Fork Creek	1-5-6	C;Tr	nutrients, sediment	?	Not Rated	BMPs
Giesky Creek	1-5-7	C;Tr	nutrients, sediment	?	Not Rated	BMPs
Licklog Creek	1-10	C	nutrients, sediment	?	Not Rated	BMPs
Shooting Creek	1-5	C;Tr	nutrients, sediment	?	Supporting	BMPs

AU # = Assessment Unit # or stream segment/reach

Class. = Classification (e.g., C, S, B, WS-I, WS-II, WS-III, WS-IV, WS-V, Tr, HQW, ORW, SW, UWL)

Stressor = chemical parameters or physical conditions that at certain levels prevent waterbodies from meeting the standards for their designated use.(e.g., low/high DO, nutrients, toxicity, habitat degradation, etc.)

Source= development, agriculture, WWTP, NPS,

Status = Impaired, Impacted, Supporting, Improving

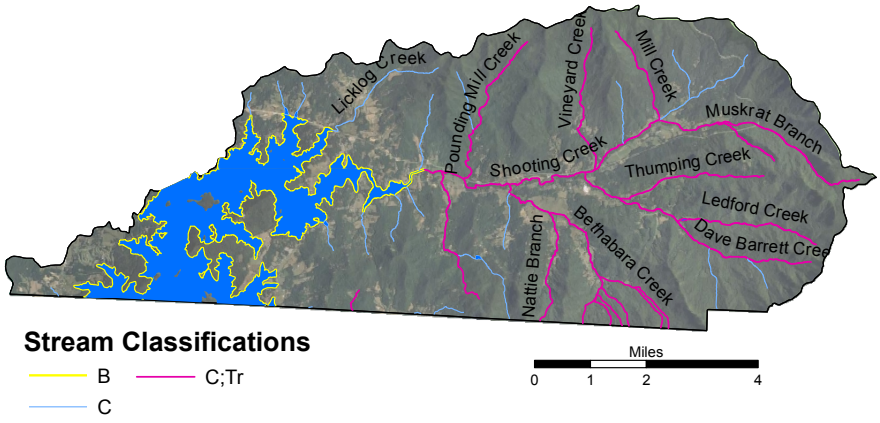
Actions Needed = R= restoration, P= protection, SC= stormwater controls, SS= stressor study, E= education, LO= local ordinance, BMPs, SSP= species protection plan, F= forestry BMPs, Ag= Agriculture BMPs, NMC= nutrient mgnt controls, S&E soil and erosion control, M= monitoring

Waterbody Classifications

All surface waters in the state are assigned at least one primary classification and they may also be assigned one or more supplemental classifications, Figure 1-5 . A list of classifications with a description of their requirements can be found in Chapter 2 of the Supplemental Guide to Basinwide Planning.

Trout (Tr) Waters

Figure 1-5: Stream Classifications



Shooting Creek and several of its tributaries are classified as Trout (Tr) waters. Tr are protected for natural trout propagation and maintenance of stocked trout. There are no watershed development restrictions associated with the trout classification; however, the NC Division of Land Resources (DLR), under the NC Sedimentation and Pollution Control Act (SPCA), has requirements to protect trout streams from land disturbing activities. Under G.S. 113A-57(1), "waters that have been classified as trout waters by the Environmental Management Commission (EMC) shall have an undisturbed buffer zone 25 feet wide or of sufficient width to confine visible siltation within the twenty-five percent of the buffer zone nearest the land-disturbing activity, whichever is greater." The Sedimentation Control Commission, however, can approve land-disturbing activities along trout waters when the duration of the disturbance is temporary and the extent of the disturbance is minimal. This rule applies to Tr streams as well as unnamed tributaries flowing to the classified trout water stream. Further clarification on classifications of unnamed tributaries can be found under Administration Code 15A NCAC 02B .0301(i)(1) or the following link: http://portal.ncdenr.org/c/document_library/get_file?uuid=f4f0b765-7892-4681-885b-95f4ef26f806&groupId=38364.