

CHAPTER VII. NATURAL RESOURCES

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*An overview of this Chapter can be found in *Chapter 1 – Introduction and Executive Summaries*.

Clemson is located along the banks of Lake Hartwell near the juncture of Oconee, Pickens, and Anderson Counties in the upper part of the Piedmont Plateau. These counties cover the northwestern corner of South Carolina where the terrain transitions from the Blue Ridge Mountains in the northern parts of Oconee and Pickens Counties to a hilly Piedmont Plateau in the southern and eastern sections of Oconee and Anderson Counties.

In the immediate Clemson area, elevation averages 800 feet above sea level. Lake Hartwell now fills the Seneca River Valley with a full pool level of 660 feet above sea level. Elevation quickly rises to near 1,000 feet a few miles to the north of Clemson. Mountaintop elevations further to the north along the North Carolina state line reach more than 3,000 feet above sea level.

The geologically old soils in the Piedmont region are clay and sandy loams, with the Cecil-Hiwassee series soil types predominating in the Clemson area. Severe erosion occurred as water ran off the rolling landscape during the years when cotton was king, removing much of the region's topsoil. Reforestation and land conservation practices that began in the 1930s have minimized severe erosion events and formed new topsoil.

Clemson has a temperate climate with four distinct seasons largely due to the Blue Ridge Mountains to the west and north of Clemson. Moist upslope winds from the south and east increase precipitation as elevation increases. Winds from the west flow down slope and create a rain shadow across the area as descending air warms and dries. The damming effect of the mountain chain funnels cold air into the area on Northeasterly winds.

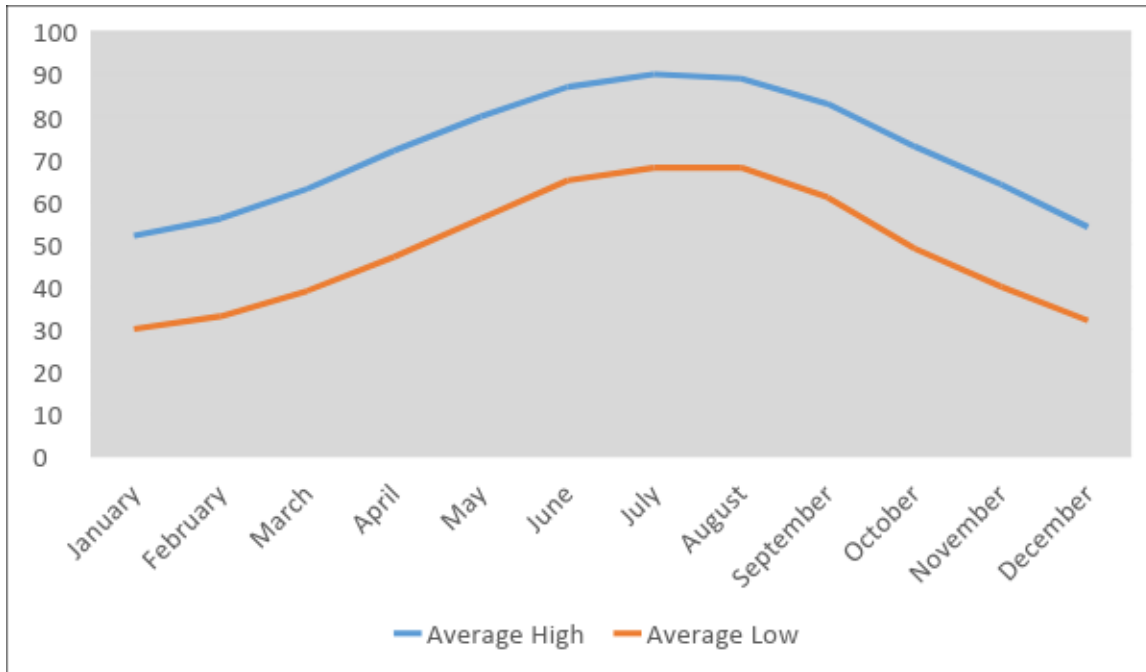
The quality of City of Clemson's natural resources is a major component of the quality of life experienced in the City. A healthy natural environment supports healthier social and economic development. In addition, natural resources impact economic factors that range from tourist activity to insurance rates for homeowners. The Natural Resources element provides a framework for environmental planning in the City and addresses the need for the identification, conservation, and management of sensitive natural resources.

A. CLIMATE

1. AIR TEMPERATURE

The City of Clemson has a temperate climate with air temperatures ranging from an average of 41°F in January to 79°F during the month of July (Figure VII-1). The annual mean temperature is 59.5°F.

FIGURE VII-1. AVERAGE AIR TEMPERATURES IN CLEMSON, 2019



Source: The Weather Channel, 2019

2. PRECIPITATION

Rainfall in the City of Clemson is moderate, with most precipitation occurring in the winter months and averaging 16.24 inches and the least precipitation occurring in spring months and averaging 11.97 inches. Average annual precipitation is 53.6 inches and consists mostly of rainfall with occasional snow and sleet.

The Upstate of South Carolina has experienced several periods of drought over the past decade, most notably in 2007-2008 and again in 2011-2012. These episodes had significant impacts on Lake Hartwell and other local water bodies. In December 2012, Lake Hartwell was approximately 22 feet below full pool. Since that time, Lake levels have fluctuated significantly due to periods of heavy rain and periodic Lake water releases by the U.S. Corps of Engineers via the Lake’s dams. Average rainfall in the Hartwell Basin has varied from 75.41 inches in 2013 to 31.65 in 2007. Both years represent near record high and low annual totals.

FIGURE VII-2. FLASH FLOODING FROM INTENSE RAIN EVENT

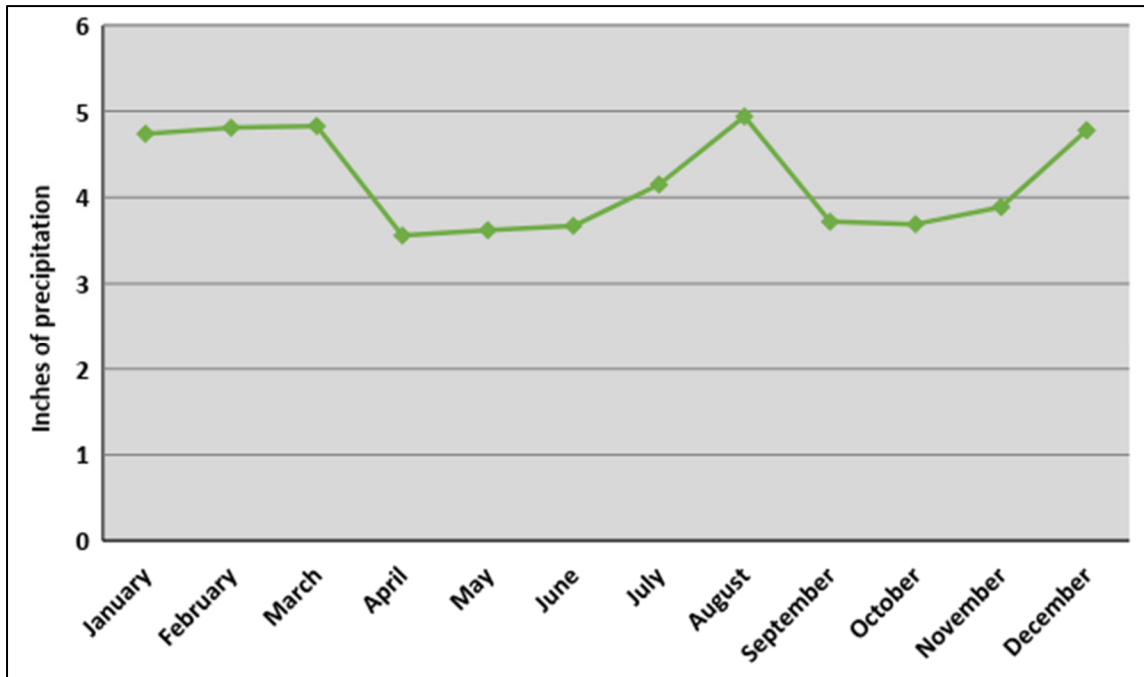


Source: Planning and Codes Administration Department, 2014

The City has experienced several major rainfall events since 2013, most notably in July 2013 and August 2014. The July 13, 2013, event produced up to 8.96 inches of rain in the Clemson area. On August 10, 2014, the City experienced a 4.8-inch rainfall. These events were categorized as “rain bombs” due to the associated flooding and property damage.

The combination of drought and flooding poses unique challenges. Long periods of dry weather cause soils to lose a significant amount of moisture. Subsequently, when heavy rains occur the soils are unable to quickly absorb runoff, resulting in flash flooding. Drought followed by heavy rain followed by drought also causes soil to contract and expand, creating potential for structural damage to foundations. Figure VII-3 illustrates the significant changes in precipitation from month to month in 2019.

FIGURE VII-3. AVERAGE MONTHLY PRECIPITATION IN CLEMSON, 2019 UPDATE



Source: The Weather Channel, 2019

3. AIR QUALITY

The S.C. Department of Health and Environmental Control (SCDHEC) Division of Air Quality Analysis (DAWA) measures the quality of air in South Carolina. This data determines statewide compliance with the standards set in the Clean Air Act (CAA) and the S.C. Pollution Control Act (SCPCA). DAWA gathers ambient data from areas throughout South Carolina.

FIGURE VII-4. AIR QUALITY IMPACTS FROM TRAFFIC CONGESTION

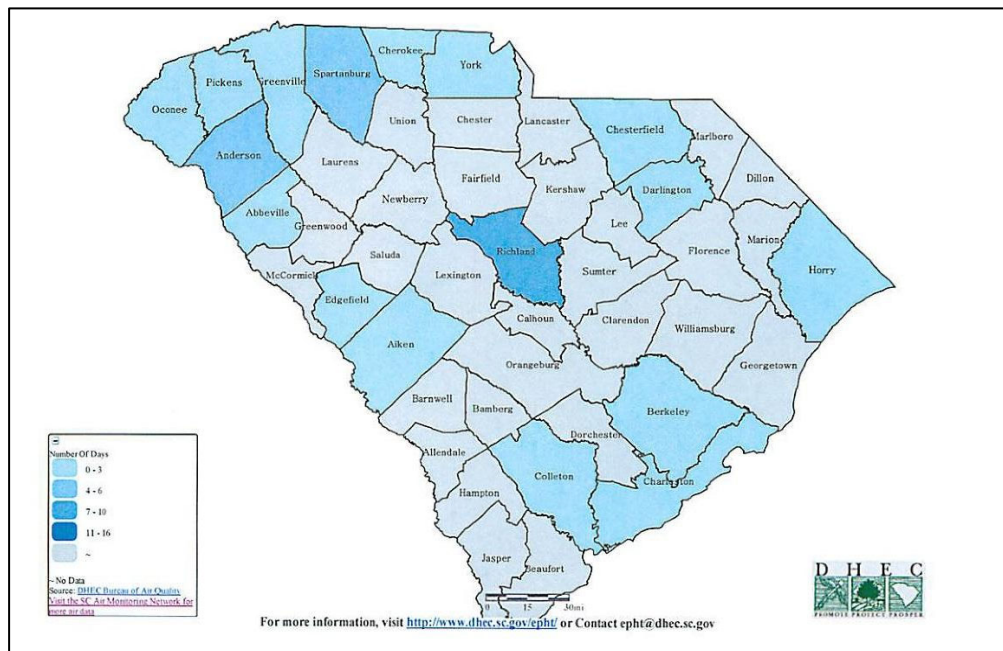


Source: Planning and Codes Administration, 2014

Three air quality monitoring sites are within close proximity of the City of Clemson and are described below.

1. The Clemson Continuous Monitoring Site (CMS) is located on the grounds of Clemson University. This monitor measures ozone concentrations upwind of the Greenville-Spartanburg urbanized area. The sample inlets are 27.4 meters from the nearest road. This site was part of the Greenville MSA Ozone study that was initiated in 2008 and designed to investigate ozone concentration variability across the Upstate and provide information to help refine the monitoring network to better meet monitoring objectives.
2. The Wolf Creek site is located in central Pickens County and was established to gain an understanding of ambient ozone concentrations in central Pickens County. Data from the Wolf Creek site has been collected and compared to Clemson CMS site to determine the most appropriate location to represent ozone concentrations in this area of the region.
3. The Long Creek monitoring site is located on Round Mountain in northwest Oconee County. The Long Creek site was established as part of the Southern Oxidant Study. Due to the elevation, it provides a unique vantage point for monitoring the impacts of transported pollutants. Long Creek has continuous monitors for ozone, PM2.5, sulfur dioxide, and precipitation. The sample inlets are 11 meters from the nearest road. Due to the importance of measuring region-wide sulfur dioxide, PM2.5, and ozone concentrations, coupled with a unique location and co-located monitoring activity, SCDHEC has determined that monitoring at this site should be continued.

MAP VII-1. ANNUAL NUMBER OF DAYS WITH MAXIMUM 8-HOUR AVERAGE OZONE CONCENTRATION WITH ARE OVER THE NATIONAL AIR QUALITY STANDARDS, 2011



Source: S.C. Department of Health and Environmental Control, 2011

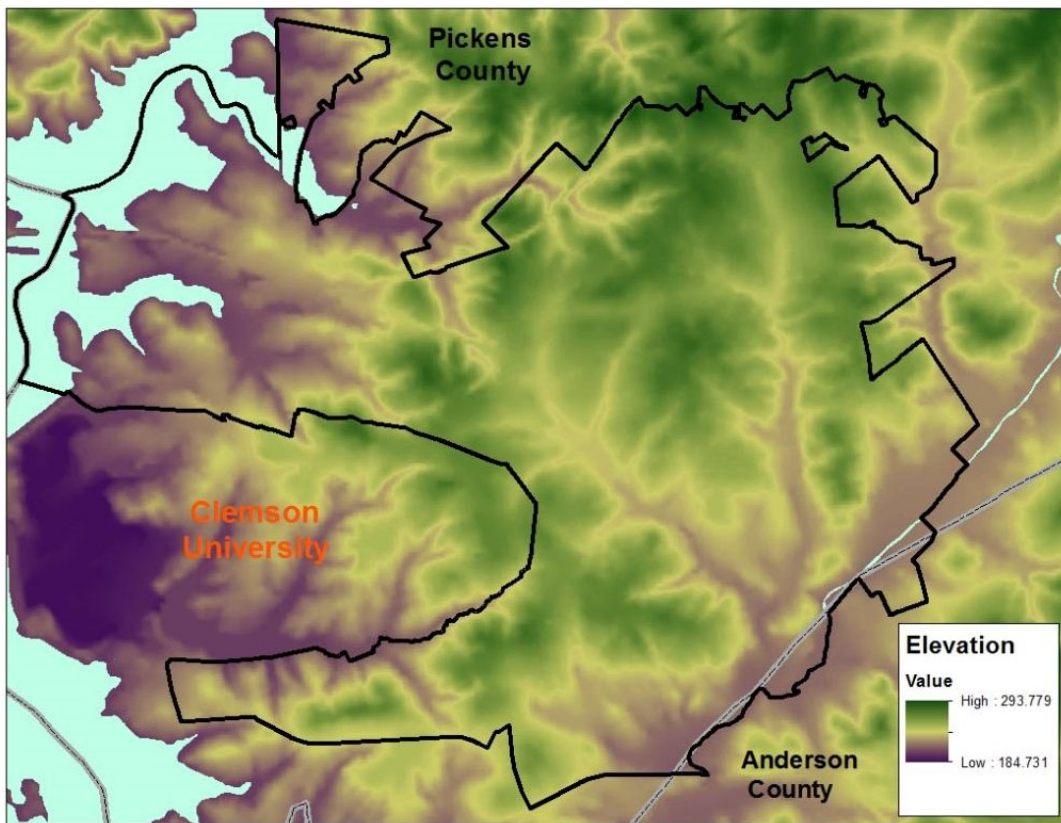
Links to the data collected at the air quality monitoring stations can be found on the SCDHEC website (www.scdhec.gov). This data is continually updated to reflect conditions reported within the last few hours.

B. TOPOGRAPHY

1. SLOPES

The City of Clemson lies in the Piedmont Plateau Topographic Region. Elevations in the City range from 700 feet to approximately 900 feet. The rolling hills of the City are predominately between 10% and 25% in slope. Slopes under 15% are considered low load bearing and appropriate for development. Slope areas greater than 25% are usually considered to be constraints to development. Map VII-2 shows elevation changes within the City. The darkest areas shown in green are higher elevations and the darker purples are the lowest elevations. Slopes can be inferred by reviewing the color gradations.

MAP VII-2. ELEVATION CHANGE



Source: United States Geologic Survey, 1999

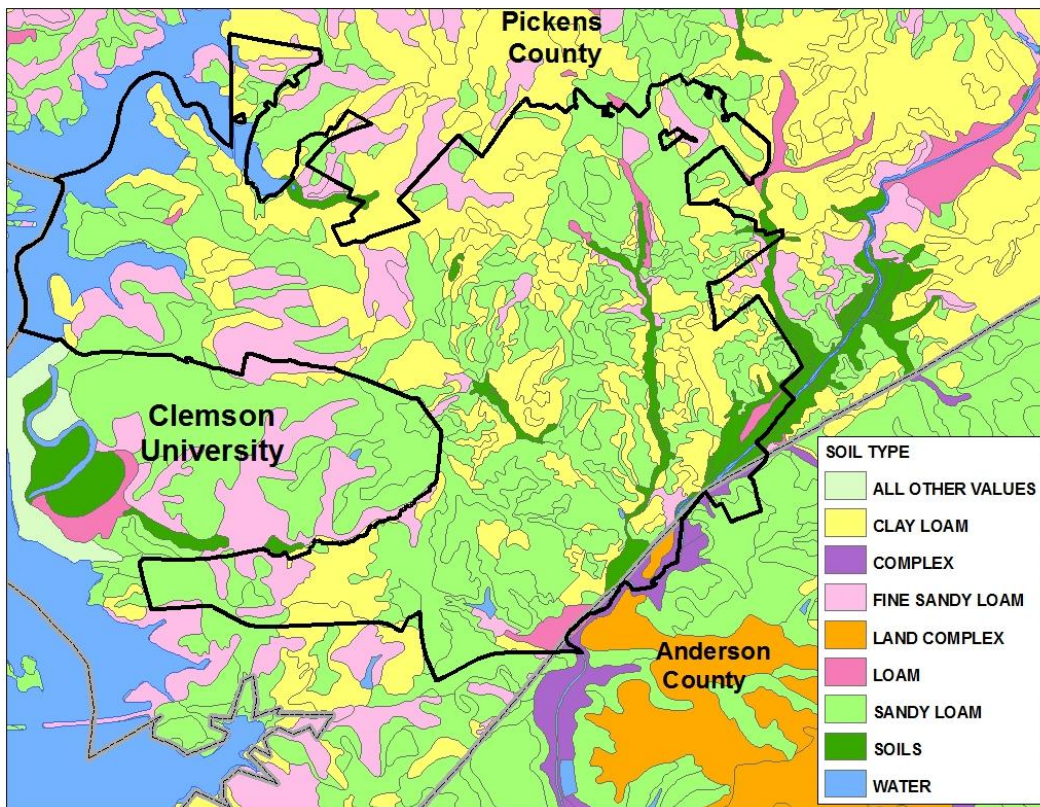
2. SOILS

Although many different soil types exist throughout the City, the majority of soils fall within one of four categories: Cecil Sandy Loam, Cecil Clay Loam, Pacolet Clay Loam and Pacolet Fine Sandy Loam. The distinction between Cecil and Pacolet is very minimal, therefore they are considered nearly identical.

Sandy Loams and Fine Sandy Loams are well drained, aerated, and workable for most of the year. They are very light to handle and quick to warm up in the spring. Unless they have very high organic matter content, they are prone to drying out too quickly and additional watering is needed to support healthy plant growth. This extra watering also helps to wash out plant foods and lime from the soil, contributing to acidity (except for some coastal soils). They are often referred to as “hungry” soils and require feeding to promote optimal growing conditions. However, with careful management they can be among the most productive soil types.

Clay Loams are difficult to work and manage. They usually have good supplies of plant foods and lime. The main drawback to these soils is a high water holding capacity that may contribute to construction delays during periods of heavy rain. During construction it is important to catch the right weather conditions to avoid damage to the soil structure. The use of heavy machinery should be avoided, particularly when the soil is wet.

MAP VII-3. SOIL TYPES

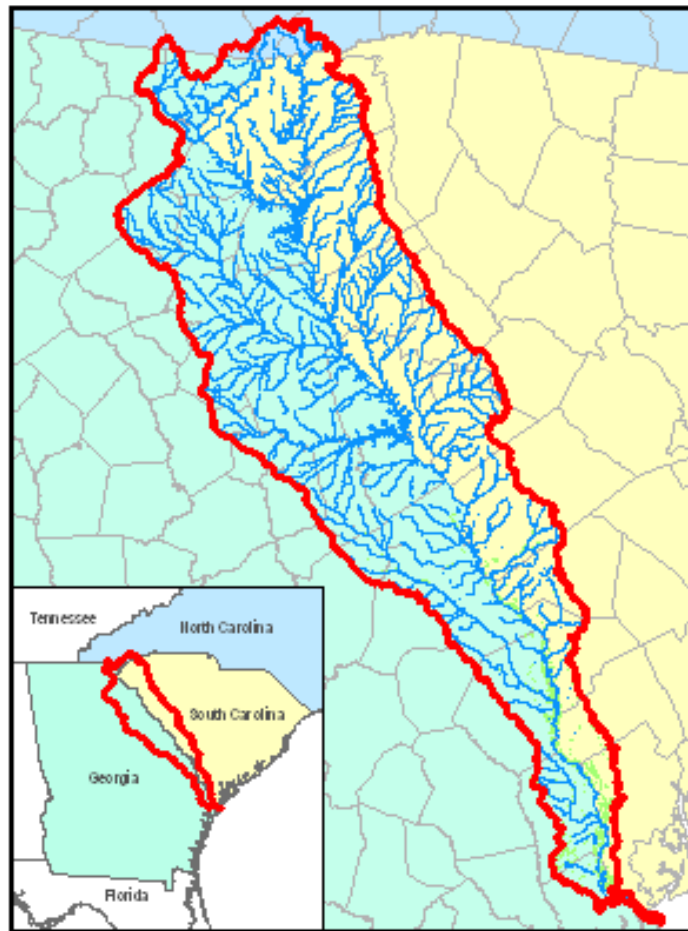


Source: United States Department of Agriculture, 2001

C. HYDROGRAPHY

The City of Clemson is located in the northwest corner of the Savannah River Basin Watershed. A watershed is a natural boundary for the distribution of water resources. Any ground pollution within a watershed may seep into the ground, tainting the ground water for that watershed. The water quality at any given point in a watershed determines the quality of water for the rest of that water resource.

MAP VII-4. SAVANNAH RIVER BASIN



Source: Savannah River Basin Partnership, 2014

1. LAKE HARTWELL

Lake Hartwell is the main water body in the City of Clemson. The Lake straddles the border between Georgia and South Carolina where the Seneca and Tugaloo Rivers join to form the Savannah River. Lake Hartwell was built by the U.S. Army Corps of Engineers (USACE) between 1955 and 1963 as part of a flood control and hydropower project and remains in their control. The Lake is in both Georgia and South Carolina and covers approximately 56,000 acres, with 962 miles of shoreline. One of the Southeast's largest and most popular public recreation lakes, Lake Hartwell provides numerous natural sand beaches along the shoreline and is home to campgrounds, recreation areas, and boat access areas.

FIGURE VII-5. VIEW OF LAKE HARTWELL FROM TWELVE-MILE BEACH



Source: City of Clemson, Planning and Codes Administration Department, 2014

Approximately 6.5 miles of Lake Hartwell shoreline are within the City of Clemson. Public access to the Lake is provided at two locations in the City. *Larry Abernathy Lakefront Park* opened in the summer of 2004 and provides trails, wooden observation and boardwalk areas with swing structures, a parking lot for 15 vehicles, two boat docks that accommodate up to eight non-commercial boats with no overnight stay, a canoe/kayak launch site, picnic tables in a designated picnic area, and benches throughout the entire park. Access into the area is provided by paved walks connecting to Jaycee Park, a parking lot on Keowee Trail Road, a sidewalk to Tiger Boulevard beside Lakeside Apartments, and a paved walk from U.S. Highway 123 across from Lakeview Plaza.

The second access to Lake Hartwell in the City is at *Mountain View Park*, located at the end of Mountain View Lane. Mountain View Park is the only large-scale natural recreation area on Lake Hartwell and features nature trails, a fitness walk, lake access, a boat ramp, and boat trailer parking. The Park preserves a small wooded peninsula that extends into Lake Hartwell.

As a Corps of Engineers owned and maintained reservoir, Lake Hartwell is subject to the rules set by that agency. Both the Corps and SCDHEC have issued fish consumption warnings for portions of the Lake, including several close to the City. These warnings stem from polychlorinated biphenyl (PCB) contamination of the Lake prior to the banning of this material in 1976. The Corps maintains management plans for wildlife, fisheries, forestry, aquatic plant, and environmental stewardship. Copies of the Plan can be found on the USACE Savannah District website (<http://www.sas.usace.army.mil/>).

As previously discussed, Lake Hartwell has been impacted regularly by cyclical periods of drought and heavy rain. While the average Lake elevation is 657.5 feet and full pool is 660 feet, these

levels have fluctuated widely in recent years. The lowest lake level for Lake Hartwell was reached on December 9, 2008, at 637.49 feet. The previous record low at Lake Hartwell was 642.4 feet on December 24, 1981. The highest lake elevation reached was 665.4 feet on April 8, 1964, with a recent high water level of 663.8 feet in July 2013. In recent years Lake Hartwell water levels have fluctuated greatly. On December 24, 2016, the water level was at 649.4, but by January 5, 2016, the water level increased to 664.83. Times of drought, as well as historically heavy rain, have become the new normal in the last decade.

FIGURE VII-6. DROUGHT IMPACTS LAKE HARTWELL, FEBRUARY 2008



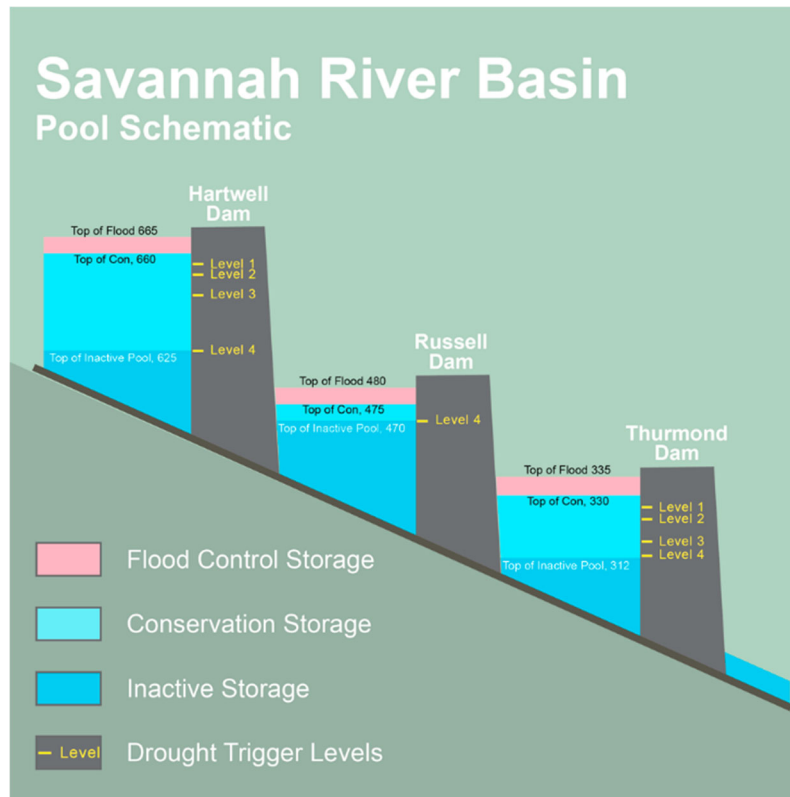
Source: South Carolina Department of Natural Resources, 2008

On July 30, 2012, the USACE Savannah District released findings of an environmental assessment (EA) of drought impacts on the Savannah River Basin. Based on this report, the Corps determined that lower wintertime outflows were needed to allow for improved water storage for future droughts. The EA also added stream flow as an indicator for drought trigger levels. Previously, the Corps of Engineers relied on reservoir levels as an indicator of drought levels, allowing for the wintertime outflows that dropped water levels in Lake Hartwell well below full pool. Stream flow will be considered using the U.S. Geological Survey gauge at the Broad River, located near Bell, Georgia. Because the Broad River is a large, unregulated tributary that flows into the Thurmond reservoir it provides an accurate representation of natural inflow to the Savannah River Basin.

As a USACE reservoir, Lake Hartwell is used for flood management during periods of heavy rain. In 2013, Lake levels exceeded full pool for significant periods of the year. Boat access ramps and other public ingress/egress points were under water during these events. These changes impacted the overall use of the Lake. The City activated a Drought Management Plan and imposed conservation measures to curtail water consumption. Recreational use of the Lake was also impacted, with boating and other activities pushed into sections of the Lake with sufficient depth to allow safe navigation. Trees, building foundations, and other debris left when the original reservoir was filled were exposed and become hazards to the boating public.

Drought conditions also impact electrical production. The average annual generation from the Hartwell Powerplant is approximately 470,000 megawatt hours. Megawatt hours produced in 2008 were only 217,423 during a period when Lake levels reached historic lows.

FIGURE VII-7. SAVANNAH RIVER BASIN, POOL SCHEMATIC



Source: U.S. Army Corps of Engineers, Savannah District, 2014

Over the coming decades, demand for water from the Savannah River Basin is projected to increase drastically as both Upstate South Carolina and Northeast Georgia (including the Atlanta metro area) seek additional sources to support their growing populations. Because Lake Hartwell is in both states, water rights and the equitable distribution of this limited resource are likely to become a political battle. Both states have developed plans for long-term management of the Lake, however any plan should be monitored as demand grows. Evolving demands must be weighed against the environmental impacts they will undoubtedly have on the ecosystem. As the only municipality in the State currently located on Lake Hartwell, the City of Clemson has a vested interest in the outcome of the issues involved.

While Lake Hartwell is a major focal point among the City's visual and natural resources, there is very little public or commercial development on the shores of the Lake within the City of Clemson. Development along Lake Hartwell and within the City's corporate limits is 95% residential. Despite limited commercial frontage, the City's economy benefits significantly from activities associated with the Lake. Events such as fishing tournaments and spring break rowing practices bring thousands of visitors to the area each year.

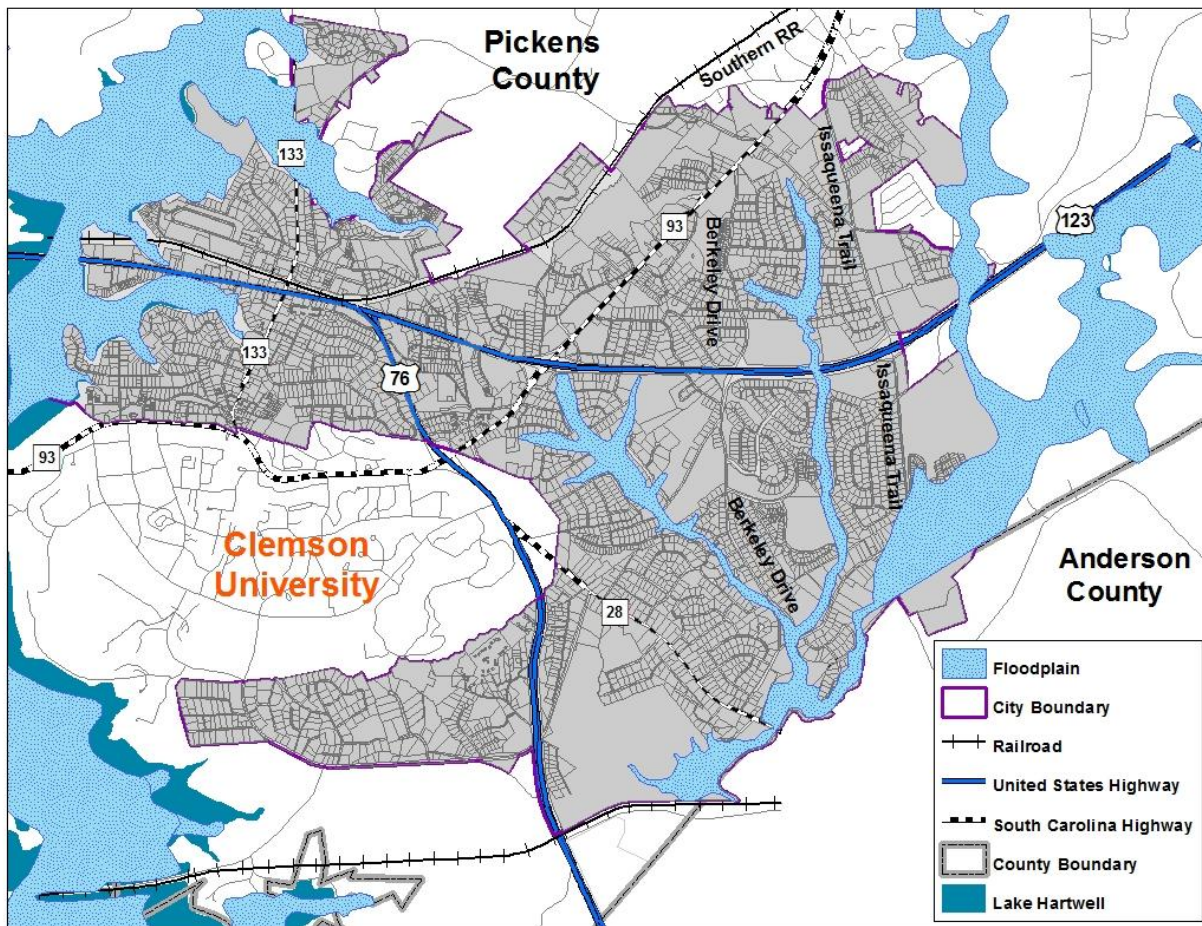
2. CREEKS, RIVERS, AND STREAMS

Eighteen Mile Creek drains into Lake Hartwell along the east section of the City of Clemson. The Creek is protected by a naturally occurring riparian buffer, as are most of the streams and creeks within the City. A riparian buffer is a vegetated area along either side of a waterbody that helps to protect both water quality and the overall waterway environment. Many people live along Eighteen Mile Creek, even though it is in the 100-year floodplain. A number of tributaries drain into Eighteen Mile Creek within the City of Clemson.

3. FLOOD ZONES

Flood Insurance Rate Maps (FIRM) produced by the Federal Emergency Management Agency (FEMA) indicate the City of Clemson has two flood zones within the 100-year flood plain. Within flood Zone 'A' no base flood elevation has been determined. The zone consists of Lake Hartwell and areas close to the Lake. There are three additional areas within the City in Zone 'A' that are at the terminus of several tributaries. A base flood elevation has been determined within Zone 'AE' and is indicated on the FIRM. There are five large areas within the City located within the Zone 'AE.' The City of Clemson has adopted a *Flood Damage Prevention Ordinance* that requires structures to be constructed with the first finished floor elevated at least one foot above the base flood elevation. The vast majority of the City is located within Zone 'X.' Areas within Zone 'X' are outside of the 500-year flood plain. Updates of the FIRM are managed by FEMA and are shown on Map VII-5.

MAP VII-5. FLOODPLAINS IN CLEMSON



Source: City of Clemson, Planning and Codes Administration Department, 2014

4. WATER QUALITY

Two legislative acts were adopted to protect the State's water bodies from contamination and pollution. The *Federal Clean Water Act* (CWA) and the *South Carolina Pollution Control Act* (PCA) work together to make polluting state waters a criminal activity. These regulations are administered by the South Carolina Department of Health and Environmental Control (SCDHEC) and make it illegal for any person to "throw, drain, run or allow to seep or otherwise discharge into the environment" any contaminants. When a polluted liquid, solid, or gas is flowing directly out of a pipe or other vessel of distribution into the water, it is referred to as "point source" pollution. Point source pollution is often visible. Per the CWA, residents can report "point source" pollution violations to the local environmental organization.

In 2013, the Clemson area experienced higher than normal annual rainfall. As a result, lake levels exceeded full pool for significant periods of the year. The heavy run-off of rainwater into Lake Hartwell and the inundation of areas previously above the water line, which were in some cases areas exposed by prior droughts, resulted in an increase in organic matter in the Lake including both algae and decaying plant material. The increase of organic matter impacted the taste and

smell of the water pulled from Hartwell by the Anderson Joint Regional Water Authority (AJRWA) and supplied to the City as drinking water. Resolution of this problem required system modifications but was not yet been fully corrected as of October 2014.

D. RECREATIONAL AND OTHER OPEN SPACES

1. BEACHES

Although no established beaches along Lake Hartwell exist within the City limits, there two public beaches are just outside of the City. West of the City of Clemson, the Foothills Area YMCA includes both a beach and a marina. Along S.C. Highway 133 and just outside of the City limits is the Twelve-Mile Recreation Area operated by the U.S. Army Corps of Engineers. The Twelve-Mile Recreation Area offers a beach, picnic area, and a launch ramp.

FIGURE VII-8. VIEW FROM THE YMCA BEACH



Source: City of Clemson, Planning and Codes Administration Department, 2014

2. U.S. ARMY CORPS OF ENGINEERS PROPERTIES

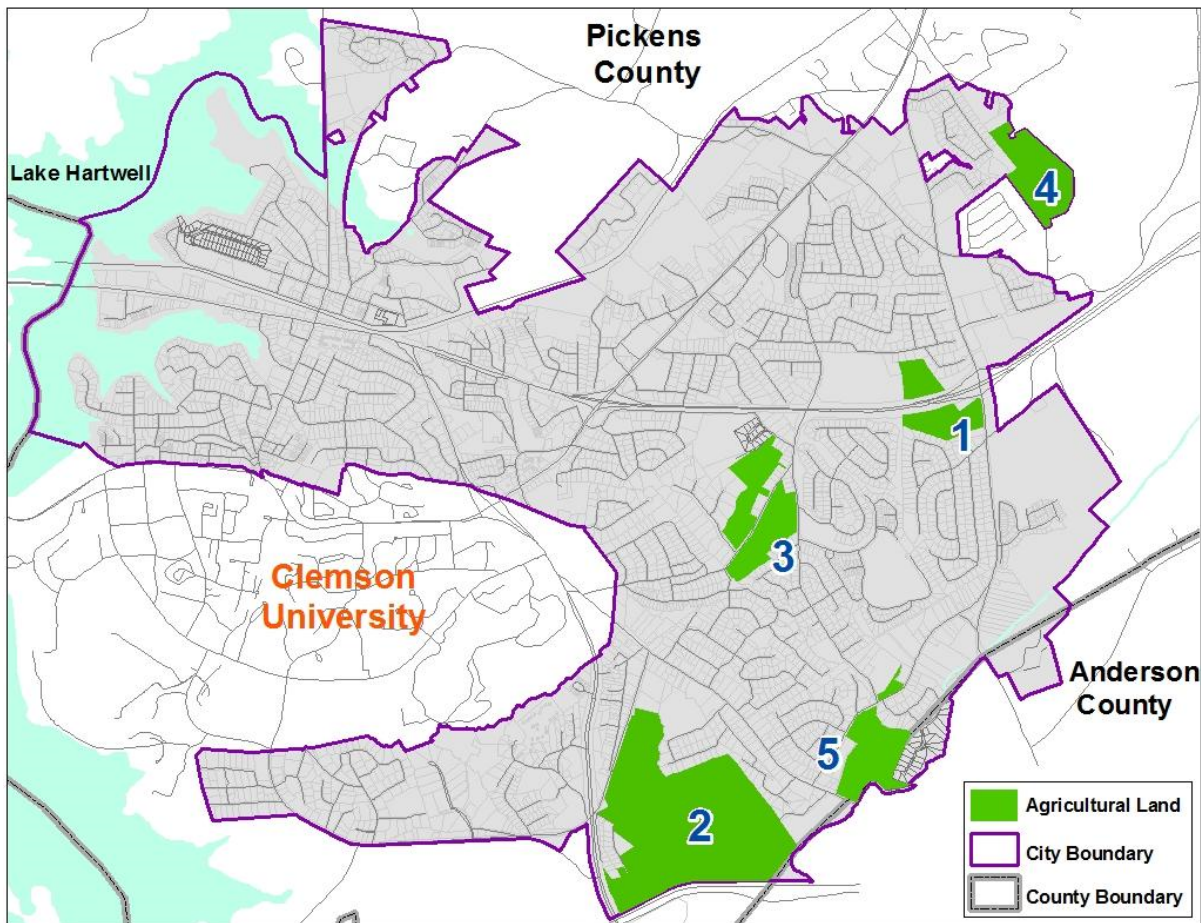
In addition to management of the Twelve-Mile Recreation Area, the U.S. Army Corps of Engineers controls all property along the Lake Hartwell shoreline. The Corps easement ranges from five to 15 feet along the shore of the Lake.

3. AGRICULTURAL LANDS

Although no land within the City limits is currently zoned for agricultural use, several properties located primarily in the eastern section of the City are classified as non-conforming agricultural uses. These properties are zoned for uses other than agricultural and have been grandfathered as agricultural lands (Map VII-6). These include:

1. An existing horse farm is located in the southeast section of the City, just off Issaqueena Trail adjacent to the off-ramp of U.S. Highway 123. The 33.5-acre tract is split into two parcels and divided by U.S. Highway 123.
2. The Pacolet-Milliken Corporation (PMC) owns a large tract located in the southern section of the City off U.S. Highway 76 and Old Stone Church Road. The parcel is currently planted in timber and is subject to periodic harvesting. The City and the Town of Pendleton have entered into a master planning agreement with PMC. Beginning in early 2015, a public engagement process was initiated to solicit public input into the development of a master plan for the entire 354-acre tract, of which 226 acres is already in the City. As detailed in the *Land Use Element*, a portion of this tract totaling 142.3 acres and located adjacent to the City presents an annexation opportunity for the City. However, there is no agricultural land designated in the Pacolet-Milliken Planned Development.
3. Approximately 58 acres of pasture lands that flank both sides of Clarendon Drive are zoned low density residential. The property is owned by a trust.
4. A 41-acre tract on Vickery Drive that is zoned for low density residential is being used as pasture lands.
5. An historic 40-acre farm exists along Issaqueena Trail and Pendleton Road. A prominent feature of this tract is its barn, which is included in the National Register of Historic Properties. Horses are kept on the property. A large portion of the tract is used for timber production, most of which is located in a flood plain. The property is divided into several parcels that are located on both sides of the Pickens and Anderson County boundary.

MAP VII-6. LAND CURRENTLY IN AGRICULTURAL USE, 2014



Source: City of Clemson, Planning and Codes Administration Department, 2014

E. BIOLOGICAL RESOURCES

1. SENSITIVE HABITATS

Although no sensitive habitat areas have been documented within the City of Clemson, many less formal, less protected habitats exist. The wetland areas on the north side of the City off S.C. Highway 133 and Clemson Street are home to many species. The rivers, creeks, and Lake Hartwell provide important natural habitat for many plants and animals.

Although a formal wildlife inventory in the City limits has not been conducted, Clemson University has performed a campus-wide study that contains a list very similar to the plants and animals found within the City. A list of plants and animals identified on University property can be found at http://www.clemson.edu/cafls/cef/plants_and_animals.html.

2. URBAN FOREST

The City of Clemson has taken a series of steps to ensure protection of the urban forest.

1. A tree survey of the U.S. Highway 123 corridor was performed to establish an inventory, determine the condition of the current tree canopy, and set a tree planting baseline.
2. Trees were planted along College Avenue and U.S. Highway 123 in the 1990s as part of a multi-year streetscaping effort by the City. The most recent planting occurred in 2011.
3. The City Horticulturist sought and obtained “Tree City USA” status for the City in 2004.
4. The City celebrates Arbor Day.
5. The City amended the Zoning Ordinance in 2014 to establish new tree preservation standards for development within commercial districts. The standards include tree surveys and evaluation to determine the suitability of preserving trees under specific situations. The Ordinance was also updated to encourage retention of open space and areas suitable for tree plantings.
6. The Subdivision Regulations approved in 2018 increased the protections for the tree canopy on both residential and commercial properties.

FIGURE VII-9. KEITH STREET IN DOWNTOWN CLEMSON



Source: Planning and Codes Administration, 2014

3. LOCALLY GROWN/PRODUCED FOOD

The last decade has seen an increase in the awareness of the health and nutritional benefits of locally grown and/or produced food. Issues include access to fresh food, environmental impacts of where and how food is produced, sustainability, and the nutritional quality of available food. City zoning regulations allow private gardens for non-commercial horticulture and private greenhouses. Some residents have proposed allowing produce grown on a property to be sold from the property, provided the size of the garden is restricted and an appropriate buffer between the neighbors is included. The keeping of livestock is regulated and requires approval from the City's Board of Zoning Appeals as a special exception. The keeping of poultry and beekeeping have now been made legal within the City. The City of Clemson benefits from its proximity to Clemson University, with its recognized agricultural programs and services. Information on available resources for area residents through Clemson Extension is provided at <https://www.clemson.edu/extension/>.

Several local food initiatives have emerged in recent years. These include:

1. The Clemson Farmer's Market was launched in 2010 as a City of Clemson project, utilizing the parking lot in front of Cross Point Church. The Market is now operated under a partnership among the City, the Clemson Area Chamber of Commerce, and Patrick Square. The Market operates on Thursday afternoons from May through September at the Patrick Square Village Green. Items sold include locally grown produce, locally produced meats and other specialty foods, and homemade crafts and art. First Friday specialty markets include entertainment and educational programs offered by the Osher Lifelong Learning Center (OLLI).

FIGURE VII-10. CLEMSON FARMERS MARKET



Source: City of Clemson Planning and Codes Administration, 2014

2. The *Clemson Student Organic Farm* (SOF) is devoted to intensive production of organically grown crops such as seasonal vegetables, herbs, and cut flowers. Since its inception, the SOF mission has been to explore more profitable and environmentally friendly farming practices through research, education, and public service. The SOF began providing shares in its member-based vegetable share program in 2012, with weekly pickups available at the farm.
3. The *Clemson Campus Supported Agriculture* (CSA) program began in the summer of 2002 as a public outreach effort. The program is modeled after the Community Supported Agriculture concept where members buy seasonal shares in exchange for weekly supplies of produce and cut flowers. The [CSA information page](#) provides additional information on this program.
4. The *Upstate Food Co-op* is “a member-owned volunteer organization that incorporated as Share Food Co-op in 1978 and reincorporated as Upstate Food Co-op in 2003 for the purpose of providing natural and organic food to its members.” The Co-op sells commonly used bulk items, beverages, produce, prepackaged products, and refrigerated and frozen products, as well as culinary and medicinal herbs and supplements. More information can be found at <http://www.upstatefoodcoop.com/>.
5. The *Clemson Area Food Exchange* (CAFE) is an online marketplace of locally grown and produced food. The goal of CAFE is to make it possible for farmers to work together to meet the growing demand for local, sustainably-produced food in Upstate South Carolina. Farmers benefit from the marketing, selling, packaging, and delivering of their produce and prepared foods. The marketplace brings fresh, healthy, locally grown and produced food to buyers in a cost-effective manner on a weekly basis. Clemson residents pick up their orders at the Arts Center on Butler Street in the City. More information is found at <http://clemsonareafoodexchange.com/Default.aspx>.

F. PARKS AND RECREATION AREAS

The City of Clemson has 96.15 acres of land set aside for parks and recreational areas. Table VII-1 lists the City’s parks and recreational areas, including location, classification, and size. Park locations are shown on Map VII-7.

TABLE VII-1. CLEMSON PARKS AND RECREATION AREAS

Park Name	Classification	Location	Size
Armory Softball Field	Athletic	U.S. Hwy. 76/Old Stone Church Road	2 acres
Ashley Dearing Park	Neighborhood park	Berkeley Drive	4 acres
Catherine Smith Plaza	Mini park	College Avenue	0.5 acres
Central-Clemson Indoor Recreation Center	Indoor swimming pool, heated therapy pool, two basketball courts, aerobics room, workout facility	130 Commons Way, Central	2.66 acres
Clemson Park	Neighborhood park	Frontage Road	4.5 acres
Earl Anderson Park	Neighborhood park	Lancelot Drive	3 acres
Gateway Park	Linear park	S.C. Hwy. 93	3.15 acres
Jaycee Park	Mini park	College Avenue	0.5 acres
Larry Abernathy Lakefront Park	Trail/shoreline	Keowee Trail/ U.S. Hwy. 123	8 acres
Mountain View Park	Neighborhood park/Natural area	Mountain View Lane	34 acres
Nettles Park	Athletic	Nettles Road	33 acres
Old Stone Church	Athletic	Old Stone Church Road/U.S. Hwy. 76	1 acre
Rotary (Abel) Park	Mini park	Abel Road	0.5 acre
Shanklin-Sams	Mini park	North Clemson Avenue	2 acres

Source: City of Clemson, Planning and Codes Administration Department, 2014

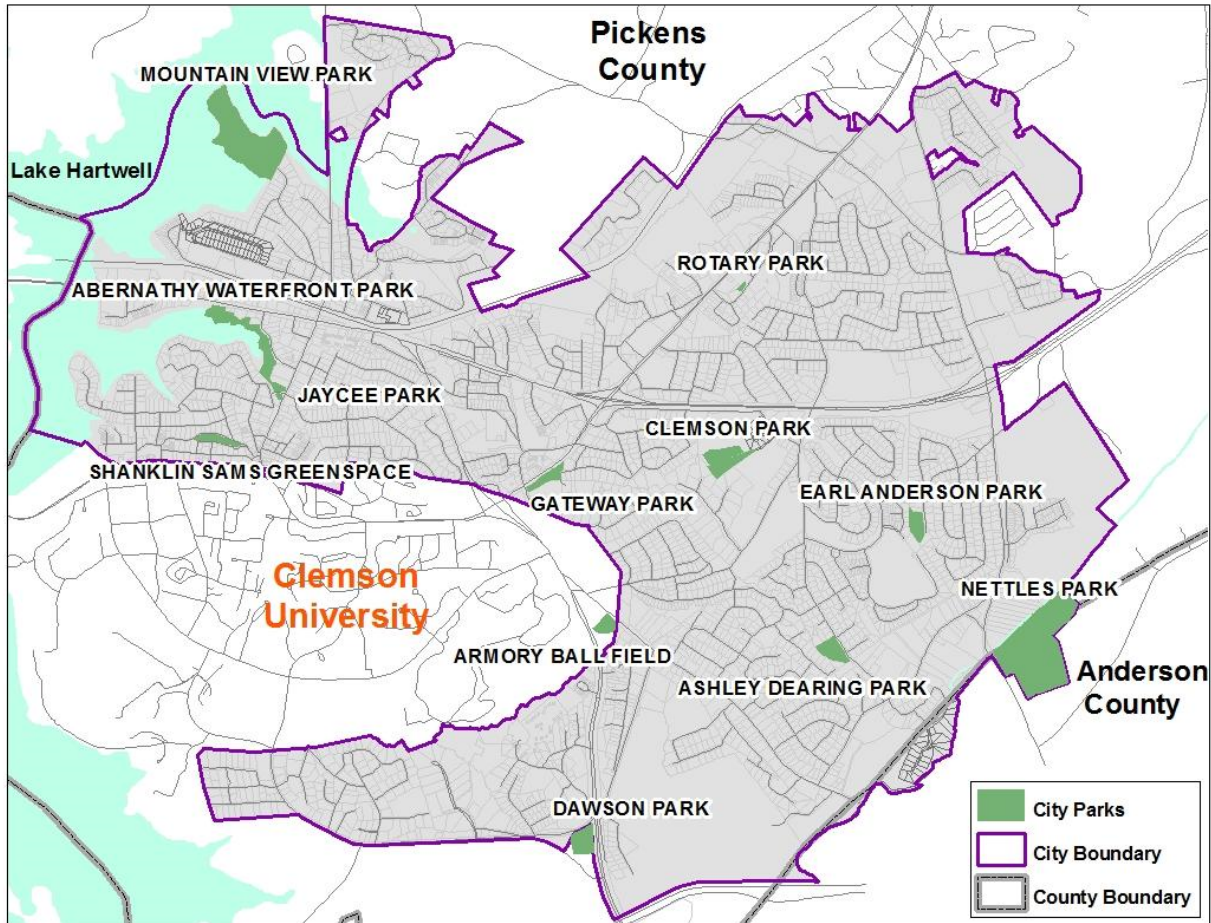
FIGURE VII-11. VIEW OF THE LARRY ABERNATHY LAKEFRONT PARK



Source: Planning and Codes Administration, 2014

The City adopted a *Comprehensive Parks and Recreation Plan* in 2000, with an update completed in 2012. The plan provides budgetary projections for FY 2012/2013 through FY 2017/2018 based on an up-to-date inventory of the City’s facilities, an assessment of necessary improvements required at each, and a plan for upgrading and/or updating these important facilities. Funding for the proposed improvements is earmarked from a variety of sources, including hospitality tax/fees, tax increment financing, grants, and other sources. A copy of the plan may be viewed on the Parks and Recreation page of the City of Clemson website (www.cityfclemson.org).

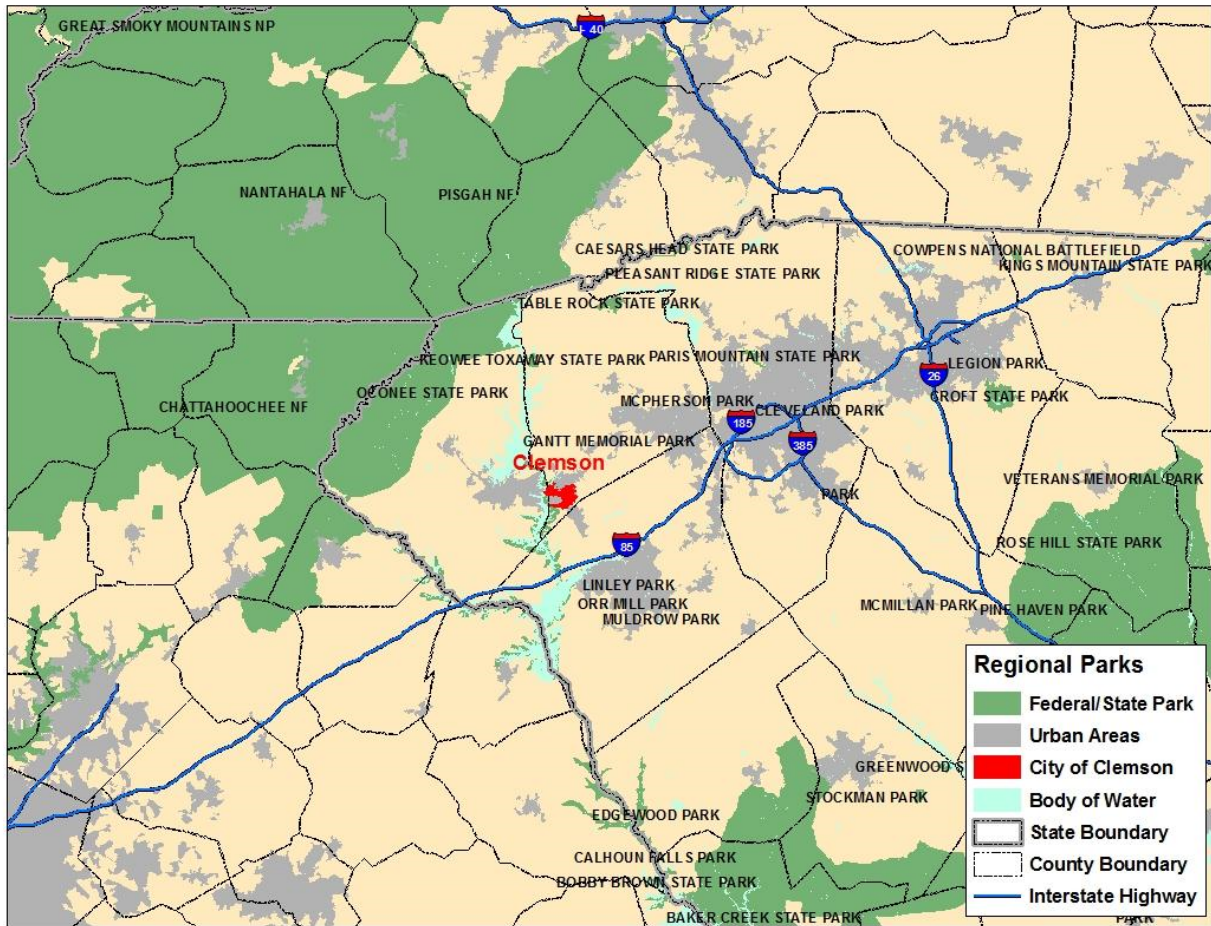
MAP VII-7. LOCATION OF PARKS AND RECREATION AREAS, 2014



Source: City of Clemson, Planning and Codes Administration Department, 2014

There are many other State and Federal park lands and facilities within the region. These are shown on Map VII-8.

MAP VII-8. FEDERAL AND STATE PARKS IN THE REGION, 2014



Source: S.C. Department of Natural Resources, 2014

G. SCENIC ROADWAYS

Several scenic roadways travel through Clemson. Pendleton Road (S.C. Highway 28), extending from U.S. Highway 76 to the Town of Pendleton, features numerous historical buildings, homes, and sights. While traveling on Issaqueena Trail, near the U.S. Highway 123 Overpass, there is a commanding view to the east of the rolling hills near Clemson. When leaving the City on U.S. Highway 123 or S.C. Highway 93, there is a scenic view of Lake Hartwell from the bridges. College Avenue also has scenic value, with many iconic stores and buildings showcasing the past and present relationship of the community with Clemson University. S.C. Highway 93 just east of College Avenue offers a nice view of Clemson University’s historic Bowman Field and Tillman Hall.

FIGURE VII-12. VIEW FROM DOWNTOWN AND COLLEGE AVENUE



Source: Planning and Codes Department, 2014

FIGURE VII-13. VIEW ALONG ISSAQUEENA TRAIL



Source: Planning and Codes Department, 2014

FIGURE VII-14. VIEW ALONG PENDLETON ROAD



Source: Planning and Codes Department, 2014

H. SUMMARY FINDINGS

The following key findings are likely to have significant impact on the natural resources of the City of Clemson in the future.

- Clemson should continue to be proactive and vigilant in protection and replanting of the tree cover in commercial developments.
- Clemson is valued in part for being a bio-diverse ecosystem and is served by a wide variety of outdoor recreational opportunities.
- City residents are served by multiple Farmer's Markets operated by the City, University, and community partners that provide access to locally grown food.
- A greenway network that connects natural areas and other major destinations would be of long-term and widespread community value.
- The City has, and continues to, modify its ordinances to promote the proper placement and protection measures necessary for the long-term survival of its tree canopy.
- The City owns and maintains 12 parks and recreational facilities. The *Parks and Recreation Plan* provides the City with a framework for future parks and recreation needs.

I. ISSUES AND TRENDS

- There is increased interest in growing and/or purchasing locally grown produce. The City should explore additional methods to encourage locally sourced product access and entrepreneurial opportunities for its residents.
- The City should protect its attractive tree canopy.
- The City should evaluate its landform grading and development regulations to ensure that resulting developments complement the natural features and enhance the natural beauty of the community.
- There are opportunities to raise awareness among citizens and community leaders regarding the benefits of protecting the City's natural resources.
- There is an increased interest in the benefits of utilizing native plant species in landscaping where feasible. Such benefits include reduced maintenance costs through better pest, disease, and drought resistance, and through the expansion of vegetative habitats for local fauna species.
- Increased development pressures in the City accelerate the need for adopting proactive measures to minimize the impacts of stormwater during construction.
- As the only City located along the shores of Lake Hartwell, the City of Clemson has received an MS4 designation from SCDHEC. This designation requires the City to develop, fully implement, and monitor a stormwater management program.
- The City owns 12 parks and recreational facilities and is contiguous to Clemson University and within close proximity to several State facilities. However, there is a priority need to develop organized linkages that tie these resources together into a cohesive greenspace and recreation network.

J. GOALS, OBJECTIVES AND STRATEGIES FOR IMPLEMENTATION

NATURAL RESOURCES ELEMENT VISION			
<i>“The City of Clemson should be known as a community whose informed stewardship of its natural resources seeks a thoughtful balance between the built and natural environment, contributes to a healthy community, promotes sustainable habitats for future generations, and helps the citizens of Clemson and beyond recognize, appreciate and enjoy these resources.”</i>			
Goals/Objectives/Strategies	Accountable Agencies	Time Frame for Completion	Status
Goal VII.1. Sustain a healthy community through maintaining a sustainable ecosystem.			
Objective VII.1.1. Promote conservation of natural resources.			
<u>Strategy VII.1.1.1.</u> Hire a consultant to identify, inventory, and develop a report on significant natural features in the City.	City Council Administration Planning and Codes	Short-Term	
<u>Strategy VII.1.1.2.</u> Assess the current conditions of the City’s natural resources through regularly scheduled inventories.	Friends of the Environment (FOTE) Planning and Codes	Ongoing	
<u>Strategy VII.1.1.3.</u> Utilize the City website and <i>Community Connections Newsletter</i> and other forms of public communication to provide natural resources tips for the public.	City Horticulturist Planning and Codes FOTE	Ongoing	
<u>Strategy VII.1.1.4.</u> Establish a green “think tank” to provide ecological recommendations to the Mayor, Council, and Planning Commission.	City Council Administration Planning and Codes FOTE	Short-Term	
Objective VII.1.2. Restore and improve natural habitat communities.			
<u>Strategy VII.1.2.1.</u> Create protection plans to maintain and support the City’s natural features.	Planning and Codes	Long-term	
<u>Strategy VII.1.2.2.</u> Promote and provide incentives for the use of native and/or adaptive plant materials in new public and private landscaping projects.	City Horticulturist Planning and Codes	Ongoing	
<u>Strategy VII.1.2.3.</u> Maintain and enhance habitat diversity for wildlife through native plantings and protection of waterways.	SCDNR FOTE Planning and Codes Engineering City Horticulturist	Ongoing	
<u>Strategy VII.1.2.4.</u> Promote the preservation of wildlife habitats in backyards, parks, and public spaces.	City Horticulturist Planning and Codes FOTE	Ongoing	
<u>Strategy VII.1.2.5.</u> Protect natural resources as an integral part of the development process through codes and education.	City Council Planning Commission Planning and Codes	Ongoing	

Goals/Objectives/Strategies	Accountable Agencies	Time Frame for Completion	Status
<u>Strategy VII.1.2.6.</u> Develop and implement an invasive species eradication program.	City Horticulturist Clemson University SCDNR	Mid-term	
Objective VII.1.3. Ensure that City ordinances reflect a high priority for environmental concerns.			
<u>Strategy VII.1.3.1.</u> Explore zoning incentives to encourage developers to provide additional open space amenities beyond the minimum requirement, such as density bonuses in cluster subdivisions and occupancy increases in multi-family and tract development.	City Council Planning Commission Planning and Codes	Ongoing	
Objective VII.1.4. Raise citizen awareness of the benefits and opportunities of producing locally-grown food.			
<u>Strategy VII.1.4.1.</u> Expand and improve the community garden to include on-site education and Produce Swap Days.	City Horticulturist	Ongoing	
<u>Strategy VII.1.4.2.</u> Develop educational home-gardening programming for dissemination on-line and at various events.	Clemson Extension Parks and Recreation	Ongoing	Not necessary Done by CU
<u>Strategy VII.1.4.3.</u> Research community regulation strategies for backyard poultry and their potential application for Clemson.	City Council Planning Commission Planning and Codes	Short-Term	Completed 9/21/15
<u>Strategy VII.1.4.4.</u> Revise the Zoning Ordinance to allow non-noxious agriculture production on lands zoned for low density residential uses, with standards to ensure residential protection.	City Council Planning Commission Planning and Codes	Mid-Term	
Goal VII.2. Protect, maintain, and enhance the City's tree canopy, including trees on public and private properties.			
Objective VII.2.1. Preserve existing trees and forests in the City.			
<u>Strategy VII.2.1.1.</u> Hire a consultant to conduct a tree canopy inventory of trees on public property using manual and/or GIS technology.	City Council Planning Commission Planning and Codes	Short-Term	
<u>Strategy VII.2.1.2.</u> Develop criteria for identifying, designating, and recognizing historic/landmark trees located on public and private property.	Consultant City Horticulturist Planning and Codes	Short-Term	
<u>Strategy VII.2.1.3.</u> Develop and adopt a <i>Grand Tree Ordinance</i> to identify and preserve significant specimens.	City Horticulturist Planning Commission	Short-term	
<u>Strategy VII.2.1.4.</u> Provide means for the City Horticulturist to consult with a certified arborist quarterly as needed.	City Council Consultant	Ongoing	

Goals/Objectives/Strategies	Accountable Agencies	Time Frame for Completion	Status
<u>Strategy VII.2.1.5.</u> Revise the <i>Land Development Regulations</i> to ensure planting of new trees and the retention of existing trees as an integral part of land development.	City Council Planning Commission Planning and Codes	Ongoing	
Objective VII.2.2. Invest in the reforestation of the City.			
<u>Strategy VII.2.2.1.</u> Develop a site appropriate list of canopy trees.	City Horticulturist Extension Service	Short-Term	
<u>Strategy VII.2.2.2.</u> Propagate trees from local specimens for both public and private plantings. This will include a greenhouse and/or irrigation, as well as plant rescues.	City Horticulturist	Ongoing	
<u>Strategy VII.2.2.3.</u> Provide educational materials for citizens and City staff to learn the value of proper tree selection and placement.	City Horticulturist Extension Service	Ongoing	
<u>Strategy VII.2.2.4.</u> Develop and adopt a comprehensive tree plan for all public property.	Consultant Planning Commission City Horticulturist	Mid-term	
Objective VII.2.3. Preserve and improve the quality of the growing environment for street trees.			
<u>Strategy VII.2.3.1.</u> Develop cultural (plant conditions) criteria and guidelines for the selection of street trees.	City Horticulturist	Short-Term	
<u>Strategy VII.2.3.2.</u> Increase the amount of space allotted for planting street trees and or alternative planting methods such as silva cells, similar products, and irrigation.	Planning and Codes	Short-Term	
<u>Strategy VII.2.3.3.</u> Select street trees for diversity and suitability.	City Horticulturist	Short-Term	
<u>Strategy VII.2.3.4.</u> Select efficient planting locations.	City Horticulturist	Ongoing	
<u>Strategy VII.2.3.5.</u> Review the status, condition, and applicability of all tree grates on public property and establish new standards for both public and private use.	City Horticulturist Planning and Codes	Short-Term	

Goals/Objectives/Strategies	Accountable Agencies	Time Frame for Completion	Status
Goal VII.3. Maintain and improve the quality and quantity of surface water.			
Objective VII.3.1. Manage stormwater as a resource rather than a problem.			
<u>Strategy VII.3.1.1.</u> Provide incentives to encourage the use of stormwater best management practices – porous pavements, green roofs, bio retention, etc. – beyond what is required by SCDHEC.	City Council Engineering Planning and Codes	Ongoing	
<u>Strategy VII.3.1.2.</u> Collaborate with the Clemson Extension Service to develop educational materials for homeowners to implement low impact stormwater strategies on their properties.	Clemson Extension Engineering	Short-Term	
<u>Strategy VII.3.1.3.</u> Monitor rainfall for to improve stormwater management across the City.	Engineering	Ongoing	
<u>Strategy VII.3.1.4.</u> Conduct a quantitative and qualitative survey of existing stormwater infrastructure to improve the City’s GIS database and stormwater management program.	Engineering Public Works	Short-Term	
<u>Strategy VII.3.1.5.</u> Decrease the amount of impermeable surface allowed onsite to foster environmentally responsible development by formalizing permeability ratios within codes for quantification of impact of best management practices.	Engineering Public Works Planning and Codes	Short-Term	
Objective VII.3.2. Preserve and enhance the existing network of streams, ponds, and lake watersheds and their aquatic habitats.			
<u>Strategy VII.3.2.1.</u> Review existing zoning and land development regulations on the management of riparian zones and revise as needed to provide additional safeguards.	Planning Commission Planning and Codes Engineering	Short-Term	
<u>Strategy VII.3.2.2.</u> Track sanitary sewer overflow events to identify choke points and possible stormwater interconnects as the basis for strategic improvements and repairs to the infrastructure to reduce the release of untreated sanitary sewer waste into surface water.	Public Works Utilities Engineering	Ongoing	
<u>Strategy VII.3.2.3.</u> Create a monitoring system to establish a baseline of stream flow and health to track improvements over time.	Engineering	Long-Term	

Goals/Objectives/Strategies	Accountable Agencies	Time Frame for Completion	Status
Strategy VII.3.2.4. Develop a strategy to reinforce waterways as a regional resource through cooperation with surrounding watershed communities and jurisdictions.	Pickens County Natural Resources Conservation Service Administration Engineering	Ongoing	
Goal VII.4. Promote pollution prevention practices to achieve sustainable use of natural resources, and to protect the environment and the health of City residents and visitors.			
Objective VII.4.1. Improve the City’s air quality.			
Strategy VII.4.1.1. Regularly monitor and report on City air quality compliance with Federal regulations.	Planning and Codes	Ongoing	
Strategy VII.4.1.2. Promote public transit, cycling, and pedestrian movement as alternatives to automobile transportation.	City Council Planning Commission Planning and Codes FOTE	Ongoing	
Strategy VII.4.1.3. Place a high priority on low-emission systems when purchasing and maintaining public vehicles.	City Council All City Departments	Ongoing	
Strategy VII.4.1.4. Promote and encourage green development practices for private developers.	City Council Planning Commission Planning and Codes	Ongoing	
Objective VII.4.2. Improve City recycling efforts.			
Strategy VII.4.2.1. Add more recycling bins to public parks and the downtown area.	Public Works	Short-Term	
Strategy VII.4.2.2. Explore incentives to promote more recycling on the part of citizens and businesses.	Public Works	Short-Term	
Strategy VII.4.2.3. Explore the development of a community composting program/facility.	Public Works	Short-Term	
Strategy VII.4.2.4. Explore making larger home recycling bins available to those who need them.	Public Works	Short-Term	
Objective VII.4.3. Increase the use of solar energy.			
Strategy VII.4.3.1. Provide the public and City officials with current data and research on solar power applications.	City Council Planning and Codes	Short-Term	
Strategy VII.4.3.2. Explore the use of solar energy in all City capital projects.	City Council Administration	Ongoing	
Strategy VII.4.3.3. Explore incentives to encourage citizens to use solar energy.	City Council Administration	Ongoing	
Strategy VII.4.3.4. Work with surrounding communities to ensure an ongoing “solar friendly” relationship with local energy providers.	FOTE ACOG Local Energy Providers	Ongoing	

Goals/Objectives/Strategies	Accountable Agencies	Time Frame for Completion	Status
<u>Strategy VII.4.3.5.</u> Explore the feasibility of solar energy use on City equipment and machinery.	All City Departments	Ongoing	
<u>Strategy VII.4.3.6.</u> Be proactive in seeking and maintaining opportunities for solar fields in public and private development.	Planning and Codes	Ongoing	
<u>Strategy VII.4.3.7.</u> Require all developments over two acres in size to provide evidence of having explored solar energy options as part of the approval process.	City Council Planning Commission Planning and Codes	Mid-Term	
Goal VII.5. Protect and preserve the City's existing soils.			
Objective VII.5.1. Promote soil conservation practices to reduce erosion and control sediment.			
<u>Strategy VII.5.1.1.</u> Encourage development that is compatible with the area's underlying geology and topography and encourage slope preservation.	Planning and Codes Engineering	Ongoing	
<u>Strategy VII.5.1.2.</u> Determine the adequacy of current codes and enforcement mechanisms relating to slope requirements and revise as needed.	Planning and Codes Engineering	Short-Term	
<u>Strategy VII.5.1.3.</u> Develop and distribute educational materials for homeowners interested in implementing erosion control on their property.	Clemson Extension Service Engineering	Short-Term	
<u>Strategy VII.5.1.4.</u> Monitor and enforce erosion practices on construction sites such as silt fence installation and upkeep.	Engineering	Ongoing	
Goal VII.6. Protect and expand high quality, inviting passive park spaces.			
Objective VII.6.1. Increase green space connectivity in the community to promote wellness, alternative transportation, and socialization.			
<u>Strategy VII.6.1.1.</u> Use sidewalks and trails to connect public and private spaces.	City Council Planning and Codes Parks and Recreation Homeowners Assoc.	Ongoing	
<u>Strategy VII.6.1.2.</u> Develop a Blueways or "water path" program that informs and connects people to amenities, points of interest, and attractions near water features and public launch points.	USACE SCDNR Planning and Codes	Short-Term	

Goals/Objectives/Strategies	Accountable Agencies	Time Frame for Completion	Status
Objective VII.6.2. Maintain a balance of active and passive park use based on the usability and appropriateness of the land.			
<u>Strategy VII.6.2.1.</u> Maintain the land-to-people ratio recommended by National Park and Recreation Association (NRPA) of 6.25 to 10.5 acres per 1,000 residents, while recognizing that the student population residing within City limits may contribute to an underestimate of the needed acreage to accommodate park demand.	Planning and Codes Parks and Recreation	Ongoing	
<u>Strategy VII.6.2.2.</u> Inform residents and visitors of park options and resources so that services are used and valued, to include signage about perimeter trail systems in active parks.	Parks and Recreation	Ongoing	
<u>Strategy VII.6.2.3.</u> Provide park facilities within ten minutes walking distance of every resident in the City.	Parks and Recreation	Long-Term	
<u>Strategy VII.6.2.4.</u> Develop new, or renovate existing, parks to include a high variety of park facilities from small pocket parks (Rotary Park) and active and passive neighborhood parks (Clemson Park) to community-wide active park facilities (Nettles Park).	Parks and Recreation	Long-Term	
Goal VII.7. Protect and maintain high quality, active parks.			
Objective VII.7.1. Encourage use of parks and recreational amenities so that citizens achieve desired health and social benefits.			
<u>Strategy VII.7.1.1.</u> Follow and support the existing master plan for Parks and Recreation at the City and County levels.	Parks and Recreation	Ongoing	
<u>Strategy VII.7.1.2.</u> Provide workout stations for adults surrounding children’s playgrounds so that parents and caregivers can exercise while monitoring their children at play.	Parks and Recreation	Mid-Term	
<u>Strategy VII.7.1.3.</u> Create a Downtown destination park intended to attract families such as Shanklin-Sams Park.	Parks and Recreation	Mid-Term	
Objective VII.7.2. Monitor park growth opportunities as demand for specific uses increase and implementation is feasible.			
<u>Strategy VII.7.2.1.</u> Monitor current use within the City park system and respond to trends via the strategic and master plan process, with an update planned for 2018.	Parks and Recreation	Ongoing	

Goals/Objectives/Strategies	Accountable Agencies	Time Frame for Completion	Status
<u>Strategy VII.7.2.2.</u> Repurpose parks as needed to respond to current and future recreational needs and model new initiatives.	Parks and Recreation	Ongoing	
Goal VII.8. Increase community awareness, appreciation, and stewardship of Clemson’s natural resources.			
Objective VII.8.1. Educate citizens regarding ecological issues and stewardship practices that lead to improved livability and quality of life.			
<u>Strategy VII.8.1.1.</u> Educate the public, City decision-makers, community groups, schools, and City staff through social outreach programs and activities such as <i>Clean Sweep</i> and other clean-up efforts.	City Staff FOTE Clemson University	Ongoing	
<u>Strategy VII.8.1.2.</u> Increase public involvement through activities such as Arbor Day and Earth Day, particularly engaging school-aged children.	School District Churches/Civic Groups Clemson University Parks and Recreation	Ongoing	
<u>Strategy VII.8.1.3.</u> Develop a parks and recreation newsletter to promote natural resource-based activities and events.	Parks and Recreation	Short-Term	
Objective VII.8.2. Institutionalize a City-wide focus on preserving and protecting Clemson’s natural resources.			
<u>Strategy VII.8.2.1.</u> Designate one City Council member as a “champion” for natural resources in the City of Clemson.	City Council Administration	Ongoing	
<u>Strategy VII.8.2.2.</u> Designate a Planning Commissioner as a “champion” for natural resource initiatives.	City Council Planning Commission	Ongoing	
<u>Strategy VII.8.2.3.</u> Conduct an annual audit of progress in meeting the objectives of the Natural Resources Element of the <i>2024 Comprehensive Plan</i> .	Planning and Codes Planning Commission	Ongoing	
<u>Strategy VII.8.2.4.</u> Develop a “Friends of the Environment” citizen group charged with serving as local advocates for environmental stewardship.	City Council FOTE	Short-Term	
Objective VII.8.3. Increase community appreciation of the City’s natural resources.			
<u>Strategy VII.8.3.1.</u> Establish a “Community Beautification” program that recognizes residents, developers, and business persons who have improved properties within the City and have gone above and beyond code requirements.	FOTE	Mid-Term	
<u>Strategy VII.8.3.2.</u> Support and involve community and neighborhood organizations in voluntary efforts to enhance community appearance such as a “Plant Bulb Swap Day.”	Chamber of Commerce	Mid-Term	

Goals/Objectives/Strategies	Accountable Agencies	Time Frame for Completion	Status
Strategy VII.8.3.4. Promote and protect Clemson’s natural resources as community amenities and sources for tourism, including lakefront properties within the City limits.	City Council Chamber of Commerce	Ongoing	