Green For Future Generations

Anderson County Green Infrastructure Plan 2016

Planning & Community Development
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Ordinance #2016-040

An Ordinance to adopt the 2016 Anderson County Green Infrastructure Plan

WHEREAS, Anderson County recognizes the importance of natural resources and its role in the County's economic, environmental and citizens' well-being; and

WHEREAS, Anderson County was awarded a grant through the SC Forestry Commission to assist in the development of an Anderson County Green Infrastructure Plan; and

WHEREAS, the Anderson County Planning staff and Green Infrastructure Advisory Committee held a day long Public Drop-In on May 24, 2016 to solicit citizen participation and input into the process and development of the Green Infrastructure Plan; and

WHEREAS, the Anderson County Planning Commission held a duly advertised Public Session on September 13, 2016, after which time it resolved to recommend the 2016 Anderson County Green Infrastructure Plan to the Anderson County Council for adoption; and

WHEREAS, the Anderson County Council has reviewed the Green Infrastructure Plan and held a duly advertised Public Hearing regarding the Plan; and

WHEREAS, Anderson County Council desires to adopt the 2016 Green Infrastructure Plan.

NOW, THEREFORE, be it ordained by Anderson County Council, in meeting duly assembled, that:

1. The Anderson County Council hereby finds that the 2016 Green Infrastructure Plan, with all maps and materials contained therein is consistent with requirements of the South Carolina Code of Laws Title 6, Chapter 29, Article 3.

2. Should any portion of this Ordinance be deemed unconstitutional or otherwise unenforceable by any court of competent jurisdiction, such determination shall not affect the remaining terms and provisions of this ordinance, all of which are hereby deemed separable.

3. All orders, resolutions, and enactments of Anderson County Council inconsistent herewith are, to the extent of such inconsistency only, hereby repealed, revoked, and rescinded.

4. This ordinance shall take effect and be in full force and effect from and after third reading and enactment by Anderson County Council.

ATTEST: Ordinance 2016-040

Rusty Burns
Anderson County Administrator

Tommy Dunn, Chairman
District Five

Kimberly A. Poulin
Clerk to Council

APPROVED AS TO FORM:

Leon Harmon, Esq.
Anderson County Attorney

1st Reading: October 18, 2016

2nd Reading: November 1, 2016

3rd Reading: November 15, 2016

Public Hearing: November 1, 2016

Acknowledgements

This project would not be possible, without the support of Anderson County Council and Planning Commission. Additionally, this project was partly funded through a SC Forestry Commission Urban & Community Forestry Financial Assistance Grant. Their assistance and support was central in the completion of this plan. Also, many thanks to the Green Infrastructure Center for their *Evaluation and Conserving Green Infrastructure Across the Landscape: A Practitioner's Guide*. This model and guide for South Carolina was funded through the SC Forestry Commission and the US Forest Service Southern Region; and it was the model used for Anderson County's base maps. Much gratitude is owed to our GIS consultants, Unique Places, LLC for their work with us on the base maps. And finally, an immense thank you to our Green Infrastructure Advisory Committee who dedicated many hours and wonderful ideas to this project.

Anderson County Council

Tommy Dunn, Chair, District #5
Ken Waters, Vice-Chair, District #6
Francis Crowder, Sr., District #1
Gracie S. Floyd, District #2
Mitchell Cole, District #3
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Brad Burdette, District #3
Jerry Vickery, District #4
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Green Infrastructure Advisory Committee

William B. West, Jr., Chair
Laura Bain
Juan Brown, MD
Chris Eberhart
Lisa Hallo
Tom Kozel, PhD
Roger McKinley
Kris Yon

Executive Summary

Anderson County's natural resources – its waterways, forests, farmlands and historical/cultural resources are in transition. As the county continues to grow, these assets will face an increased pressure; particularly in the west and northeast sections of the county.

There is no better time to plan for green infrastructure than now. Anderson County may potentially add an estimated 40,000 persons by 2030. Farmland in Anderson County is already becoming increasingly fragmented and developed, which can lead to a loss of resources and county character. (USDA, 2012)

Anderson County's Green Infrastructure Plan: Green for Future Generations is intended to serve as both an educational and policy guide. The plan will explain what green infrastructure is, why it is important and where we go from here. The plan shares the findings of this project through maps containing locations of vibrant and at-risk natural resources, and provides suggestions of how to conserve Anderson's picturesque landscapes. Additionally, spotlights featuring flora, fauna and special places are shown throughout this document.

Through this plan, Anderson County aims to assist landowners who to wish to preserve their land, while continuing to support growth that is vital to our economy. Please read this plan, share it with others, and use this plan as a guide to ensure Anderson County stays Green for Future Generations.

"Here is your country. Cherish these natural wonders, cherish the natural resources, cherish the history and romance as a sacred heritage, for your children and your children's children." – Theodore Roosevelt

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What Is Green Infrastructure?

If you google 'green infrastructure', you will get about 34 million results; and depending on the source, you may get nearly the same number of answers.

Stock Image: Live Oak

Trees are in it for the long haul. In the Southeast, conifers may live 100-150 years. Hardwood may live 150-200 years. Some species can live 300 years and longer. – US Forest Service

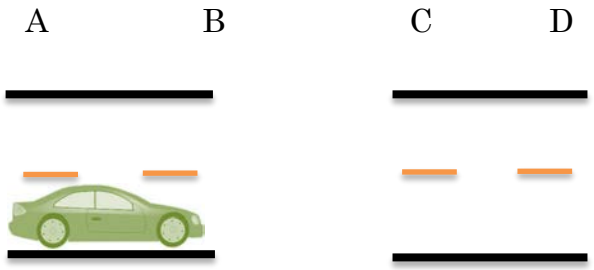
For the purpose of this plan, we chose to give a broad definition to encompass as much as possible. As such we are defining green infrastructure as the underlying natural resources that occur in nature – soil, water, forests, flora and fauna – and the networks they form. The system of networks can also include farmlands, parks, trails, historic areas, churchyards and landscapes. These resources are infrastructure as they supply basic health and economic services, just as roads and sewer; and they are green because they are found in the natural environment. Rivers, lakes and other waterways are sometimes described as blue infrastructure or blue ways.

Larger tracts of natural systems, including its water features, soil, topographic characteristics and estimated number of species present, are called hubs or cores. While larger, more circular tracts provide the greatest benefits, narrower connections or corridors linking these cores, create a network of systems.

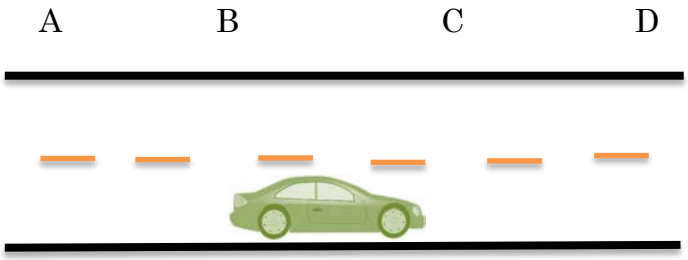
Green infrastructure is a vital component of well-balanced, viable communities; and for many people, it is the reason they live, work, visit and spend money in any given location. Therefore, appropriately located and good quality green infrastructure is an important part of Anderson's future. The key to green infrastructure planning is to consider how individual elements work together to provide an overall system, as opposed to looking at them in isolation. This includes man-made environments, as well as natural assets.

Natural resource connections are just as important for green infrastructure systems to work, as connections are needed to make gray infrastructure work. While value can be gained from assets not connected; additional value can come from a network. For instance, a new subdivision could connect with existing open space for aesthetic and recreational use or isolated hubs could be linked to provide wildlife corridors.

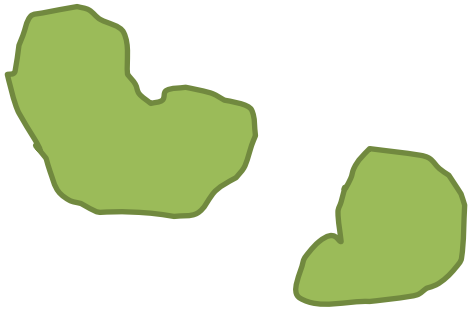
Imagine a route from Point A to Point D; however roads are only available from Point A to B and Point C to D. This missing link from Point B to C prevents the road system from operating as it was designed to.



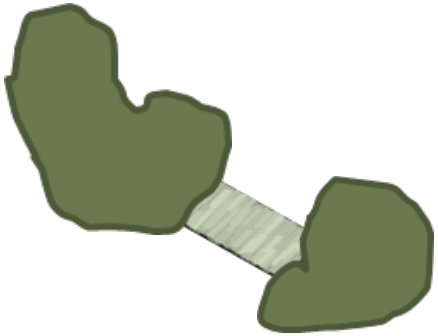
Road Missing Point B to C



Connected Road from Point A to D



Two cores or hubs without a connection



Two cores or hubs with a connection

The same can be said of green infrastructure. Connecting cores or hubs with corridors allows movement of species, as well as maximizing the benefits these natural resources provide. For Anderson County, cores or hubs that are 100 acres or more of undisturbed land are considered a higher priority.

Image: Rocky River Swamp

The Rocky River Swamp is approximately 400 acres of mostly wetlands along the Rocky River. The Rocky River Nature Park is now open to the public and is particularly favored by Anderson University students and birdwatchers. An association of Anderson University, the City of Anderson, Anderson County, Upstate Forever and numerous individuals comprise the Rocky River Conservancy. Their main focus is to restore, protect and revitalize this river and its associated wetlands. The South Carolina Wildlife Federation (SCWF) is recognizing the Rocky River Conservancy as its winner of the Habitat Conservationist Award for 2016. (Rocky River Conservancy, 2016)

It's important to note that green infrastructure is found in both urban and rural areas; and green infrastructure planning is scalable. Natural resources can be found and planned for on smaller one acre lots in a downtown setting, just as well as, large forests on thousands of acres. A landowner may choose to incorporate low-impact development (LID) designs for a smaller parcel, while another landowner may choose to put a large tract of land in a conservation easement.

How did we do this?

In August 2015, Anderson County was awarded an Urban & Community Forestry Financial Assistance Grant through the SC Forestry Commission to assist us in developing a Green Infrastructure Plan along with base and themed maps. All grant participants agreed to use the same model – *Evaluating and Conserving Green Infrastructure Across the Landscape: A Practitioner's Guide*, created by the Green Infrastructure Center, Inc. This model laid out six steps:

- Set Goals: Determine your community's values.
- Review Data
- Map Natural Assets
- Assess Risks
- Determine Opportunities
- Implement Opportunities

To assist us in this endeavor, an advisory committee of eight volunteers was formed to guide the process. Volunteers from various stakeholder organizations, such as the Anderson County Soil and Water Conservation District, the Rocky River Conservancy, the Anderson County Museum Advisory Board, Upstate Forever, and the Anderson County Tree Board were among those chosen to represent on the committee. Additionally, a community open house was held at the Anderson Civic Center on May 24, 2016 to allow the public to view the base maps and give input prior to the writing of this document.

Ultimately, seven statements were adopted by the committee to act as this plan's guiding principles.

- Integrate green infrastructure ideas at the outset of plans
- Secure resilience in water and flood management
- Protect and enhance biodiversity and native species
- Conserve and augment linkage with Anderson's landscapes and historic environments and that of our neighbors
- Enable contact with and access to nature
- Secure local food supply and protect the agricultural economy
- Generate economic growth and attract tourism investment

Snapshot of Anderson County

It's important to understand the place and growth of Anderson County before looking to its future. Here are a few statistics regarding Anderson, as well as highlights from the recent 2016 Comprehensive Plan update.

People

Anderson County has grown at a consistent rate since the 1960s. According to the 2010 Census, Anderson County's population was 187,126 and is an estimated 195,000 today. The Powdersville/Piedmont region in the northeast section of the County reported a 34% growth rate from 2000 to 2010. Pendleton, Williamston/Pelzer/West Pelzer and Anderson areas all reported 12% to 13% population growth for the same time period. This trend is expected to continue countywide, potentially adding another 40,000 persons by 2030. With this growth comes a need for additional housing. Anderson County's housing units increased nearly 16% from the 2000-2010 Census. Nearly 68% of these are single-family detached housing, and an estimated 20% being single-family manufactured homes. (US Census Bureau, 2010) While land is available, the cost of new lines of infrastructure (water, sewer, roads) and the potential loss of green infrastructure must be considered in the development planning stages.

SC State Butterfly, Eastern Tiger Swallowtail: Stock Image

"Beautiful and graceful, varied and enchanting, small but approachable; butterflies lead you to the sunny side of life. And everyone deserves a little sunshine." – Jeffrey Glassberg

Health

Health is important to everyone; and it is now recognized that many determinants of health are outside the traditional health care segment. Healthy food and exercise have been recognized and remain highly important health factors. However, social, economic and environmental factors such as access to nature and air and water quality are now recognized for their role in health. In 2016, Anderson County ranked 9th of South Carolina's 46 counties in overall health factors. (Robert Wood Johnson Foundation, 2016) This report looks at multiple factors, such as low birthweight, obesity, access to exercise, unemployment, air pollution, water quality, long commutes to work, crime rates and many more.

Furthermore, the American Lung Association finds that approximately 9% of persons under the age of 18 have pediatric asthma; approximately 8% of adults 18 and over have asthma; and roughly 6% of the population has Chronic Obstructive Pulmonary Disease (COPD). Additionally, Anderson County's population has an estimated 23% of persons under the age of 18 and an estimated 17% of persons 65 or older. Each of these percentages references an at-risk group for air quality sensitivities, which make the State of the Air grade all the more important. (American Lung Association, 2016) Anderson County has remained steady at a grade of C for the last two years, improving from a grade of D in the 2014 State of the Air Report.

2016 State of the Air Grades, Upstate SC

Upstate County	State of the Air Grade
Abbeville	B
Anderson	C
Cherokee	D
Greenville	B
Greenwood	DNC
Laurens	DNC
Oconee	A
Pickens	A
Spartanburg	C
Union	DNC

**DNC – Did not collect data. No monitor stationed in county.*
Source: American Lung Association

Economy

Anderson County's vast growth in the late 1800s and early 1900s was mainly due to manufacturing, thanks to William Whitner for his contributions to the transmission of electricity over distances. Today, Anderson's location, quality of life and workforce have helped propel the County to one of the strongest economies in the state. In terms of employment the three largest sectors in Anderson County are Services, including Healthcare (31%), Public Administration/Education (21%) and Manufacturing (20%). (US Census Bureau, 2010) Anderson County also boasts an unemployment rate of 5.1% for the month of July 2016. (US Bureau of Labor Statistics, 2016) From 2009 to 2015, Anderson County announced a total of $2.784 billion of investment and 3,865 new jobs.

Tourism is another important segment in Anderson's economy. According to the County Parks, Recreation and Tourism (PRT) Office and the Visitor's Bureau, Anderson County welcomes over 1 million visitors in a given year; and this is expected to increase due to expanded facilities along Lake Hartwell. Anderson County is known for its historical and cultural assets too. Currently, there are five historic districts, fourteen buildings/properties on the National Register and 39 historical markers in Anderson County, in addition to the Savannah River National Scenic Byway. Regarding recreation, the Anderson County Master Recreation Plan lists 36 parks and recreation facilities.

Environment

Anderson County consists of 755 square miles (~483,802 acres) situated in the Southeast-Piedmont region. For centuries, there has been a deep connection between people and the land. Wise stewardship along with strategic development of the land is prudent.

The preservation of land is one way to ensure its legacy for landowners who wish to participate in this voluntary program. The National Conservation Easement Database lists 33 easements within Anderson County's boundaries preserving ~4,366 acres, less than 1% of the land in Anderson County (NCED, 2016).

The SC Department of Natural Resources (SCDNR), US Army Corps of Engineers (USACE) and other agency owned properties also play a role in land conservation. The Fant's Grove Wildlife Management Area (WMA) is one such example. Owned primarily through Clemson University, it encompasses ~8,540 acres, roughly 395 acres within Anderson County near Pendleton. The USACE also leases approximately 834 acres to the DNR for annual hunting programs; and this land in included in the Fant's Grove WMA. The only other WMA in the County is near Hwy 24 and Hwy 243 close to Townville. The Beaverdam Creek Wildlife Management Area, created for wintering waterfowl habitat, is leased to and managed by SCDNR from the Army Corps of Engineers (USACE). According to the USACE,

Honey Bee: Gardener's World

Honey bees (*Apis mellifera*) are the pollinators of choice for American farmers, pollinating over 130 fruits and vegetables. According to USDA honey bees pollinate an estimated $15 billion worth of crops annually. In South Carolina, the Clemson Extension Service states annual cash receipts of crops pollinated by honey bees are estimated at $25 million. Additionally, SC boasts ~2,500 beekeepers managing ~30,000 honey bee colonies. Honey bee colonies have been declining at a staggering pace of late (USDA and EPA). In 1947, there were an estimated 6 million hives in the US. This number has dropped to ~ 2.5 million today. Two steps we all can take include planting pollinator-friendly plants and following the manufacturer's guidelines when using pesticides.

the Corps holds ~6,998 acres of land in Anderson County. This is includes islands and miles of shoreline managed by the USACE.

Another land use closely associated with conservation is agricultural uses. Anderson County has a rich agricultural heritage, though it is potentially declining. Anderson County lost 14,043 acres of farmland from the 2007 to 2012 USDA Agricultural Census, an 8% decrease. The number of farms in Anderson County decreased by 152 farms, or 9%, in the same 5 year timeframe. (USDA, 2012) Even with these numbers, Anderson County continues to rank highly in SC for cattle, sheep, forage, oats, chicken broilers and horse/ponies. Recent trends, such as Certified SC Grown, Fresh on the Menu, Farm to School, and other buy local and organic movements could provide opportunities to slow or even turn the recent decline in the industry.

Lake Hartwell, Broadway Lake, Lake Seccession and other waterways make up around 5.4% of the County's total acreage. As such, water is a valued resource in Anderson County and its quality is key. The SC Department of Health and Environmental Control (SCDHEC) is responsible for ensuring water quality standards are met. As of 2014, 22 impaired waters in Anderson County were on the 303(d) list. The 303(d) list is named after the 303(d) section of the Federal Clean Water Act, which requires states to develop a list of impaired waters. For a water to be deemed impaired, it must not meet water quality standards set by the state. These waters are then prioritized by SCDHEC for the development of a TMDL (Total Maximum Daily Load).

A TMDL is a pollution budget, and it calculates the maximum amount of pollutant that can occur within a waterbody. Once a site is in an approved TMDL, it is removed from the 303(d) impaired waters list. An additional 22 sites are in an approved TMDL. As of May 2016, 19 of these sites were Not Supported opposed to Fully Supported. If the site is Fully Supported, the water is now meeting water quality standards. (SC DHEC, 2016)

In the 2008 Groundwater Contamination Inventory, 155 contamination incidents were reported in Anderson County. Most of these were caused by petroleum products. Other sources were volatile organic compounds and metals; such as arsenic, barium, cadmium, lead, mercury, selenium, or a combination of these. (SC DHEC, 2008)

The proceeding information was only a brief overview of conditions in the County. Additional information regarding Anderson County can be found in the 2016 Comprehensive Plan, available at www.andersoncountysc.org.

Why Care About Green Infrastructure?

Anderson County has a beautiful and unique natural environment, with a strong regional identity acting as an economic driver for the area. Over the years, the natural and built environments have contributed to our prosperity, such as our agricultural, manufacturing and aquatic recreational heritage. This remains true today.

Green infrastructure benefits everyone, every day, whether environmental, economic, psychological or social. Often, we take these assets for granted, assuming they will remain forever. Usually, it's not until they are threatened or gone before we step forward. It's important to recognize that land is a finite resource and should be consumed wisely. Below is a brief listing of benefits associated with nature resources.

Flood Prevention and Stormwater Mitigation

A number of serious flood events in recent years have focused attention on flood prevention and stormwater mitigation. Three main ways that trees, woodlands and other vegetation can help alleviate floods are delaying flood currents downstream, catching stormwater runoff and allowing rainfall to soak into the soil (Woodland Trust, 2012). Furthermore, it is said that 100 mature trees can capture up to 139,000 gallons of rainfall each year, reducing stormwater runoff and flooding (US Forest Service, 2016). Tree canopies can also help lessen soil erosion by reducing the impact of rain on barren surfaces and improving soil strength and stability.

Wetlands and floodplains are another of nature's flood prevention frameworks. A one acre wetland can typically hold an estimated 1 million gallons. Just as importantly, wetlands can hold this water for several weeks, while it is slowly released, possibly preventing loss of life and property (EPA, 2006).

Improving Water Quality

Clean water is essential for the health and survival of all forms of life. Water quality can be impacted by stormwater runoff, pollutants, septic tank or sewer malfunctions and more. Trees can absorb rainfall and filter many pollutants through both its canopy and roots (Urban Forestry Network). Floodplains, riparian woodlands and wetlands can diffuse pollution predominantly through sediment retention and nutrient removal (EPA, 2006).

Improving Air Quality

Trees absorb pollutants, both gases and particles; help lower air temperatures, which can reduce the formation of ozone; and produce oxygen through photosynthesis. Broadleaved trees are shown to absorb more SO_2 (sulfur dioxide), NOx (nitrous oxide) and ozone (O_3) than conifers. Conifers are better able to capture PM_{10} (particulate matter, sized 10 micrometers or smaller) than broadleaved trees (Broadmeadow, 1996). Additionally, some studies show street trees may reduce a child's risk of developing asthma (Lovasi, Quinn, Neckeman, Perzanoqski, & Rundle, 2008).

Health

Clean and abundant water and air are necessary for life; and these have been discussed in the previous sections. Additional health benefits relate to physical, social and psychological aspects. Access to nature is shown to improve mental health, reduce stress, improve heal time, and lower obesity rates (Bratman, Daily, Hamilton, Hahn, & Gross, 2015) (Ulrich, Simons, Losito, Firorito, Miles, & Zelson, 1991) (Frankin, 2012) (Stanis, Oftedal, & Schneider, 2014).

While all of us share in these benefits, adolescents are particularly impacted by nature. Studies have shown nature helps improve cognitive functions, reduces stress and reduces attention deficit symptoms in children (Dadvand, Esnaola, & Forns, 2015) (Kuo & Taylor, 2004) (Taylor & Kuo, 2008).

It has also been noted that well-maintained trees can lead to a decrease in crime, specifically domestic violence. (Kuo & Sullivan, 2001) Finally, the natural environment can bring communities together offering a stronger community – a stronger sense of place (Weinstein, Przybylski, & Ryan, 2009) (Selub & Logan, 2012).

Economic Values

Nature, trees in particular, is associated with increased economic values. A homeowner can save up to 56% on annual air-conditioning costs with strategically placed trees. Large front yard trees can add to a home's sale price and property value (US Forest Service, 2016). In residential developments, studies show costs can be higher for tree conservation lots, up to 5.5%; however, developers can recover these extra costs of conservation through higher sales prices and faster sales for houses connected with nature (Seila & Anderson, 1982) (Hardie & Nickerson, 2004). Increased tourism and retail spending is also related to nature and a high quality tree canopy (Wolf, 2009).

Proper green infrastructure can also help save money. Functioning natural systems can reduce stormwater runoff and help improve water quality, saving man-made mitigation costs. It is suggested by the EPA that tree shade can also prolong the life of street payment, decreasing maintenance costs (EPA, 2014).

Educational Values

In addition to the improvement in cognitive thinking as mentioned previously, nature provides great learning opportunities to all ages. Visits to nature reinforce studies in school age children's curriculums, including science, social studies and even math. Outdoor classrooms are another recent trend as studies show children who connect with nature as a part of daily learning support creative problem solving skills, social relations, self-discipline and improve academic performances (Wirth & Rosenow, 2012).

University students and adults are also provided numerous educational opportunities. An example is the Rocky River Swamp in Anderson, where Anderson University biologists are afforded a chance to interact in field work for real life lessons opposed to only text book cases. This same property allows adults, children, friends and family to enjoy recreational amenities while continuing to learn something new.

Where Is Our Green Infrastructure?

Together with Unique Places, LLC, a base map of prioritized core habitats was developed for Anderson County. This base map includes our natural systems, with a weighted score of those assets, as compiled by the Green Infrastructure Center, Inc. (Firehock, 2015).

List of Metrics Used to Rank Habitat Cores

Characteristic (Weight)	Description
Area (0.4)	The raw surface area of a core is the single most important variable for supporting ecosystem functions
Thickness (0.1)	Core thickness measures the radius of the largest circle that can be drawn within each core, without going outside the core. Interior habitat is important for many species and this metric is also a measure of fragmentation.
Stream Density (0.1)	Streams within interior forests are more likely to contain pristine aquatic conditions than unforested streams; in addition to providing valuable habitat, a source of water and improving water quality. The greater the density of surface waters the more aquatic habitat is likely, which relates to greater potential for more diverse species of flora and fauna.
Species Richness (0.1)	Predicted (modeled) number of species present, on average. Weight is less than actual observations (RTE Element Occurrences)
RTE Species Diversity (0.1) (RTE-Rare, Threatened, Endangered)	The number of unique species observed in the core. Only observations since 1980 are included.
RTE Species Abundance (0.05) (RTE-Rare, Threatened, Endangered)	The raw number of observations. Weighted less than the number of unique species observed (since there may be many observations of a single species.) Only observations since 1980 are included.
Percent Wetland Cover (0.05)	Wetlands are some of the most productive ecosystems and provide a number of benefits, including wildlife and fish habitat, water filtration and erosion and flood control.
Topographic Diversity (0.05)	There are higher diversity of communities where there is vertical stratification of land.
Soil Diversity (0.03)	Contributes to a potential diversity of plant communities.
Compact Ratio (0.02)	The compactness ratio is the ratio between the area of the core and the area of a circle with the same perimeter as the core. This is one measure of "roundness"; as a circular core functions better than an elongated core because the depth to its interior is more consistent and it has less edge compared to the interior (all other things being equal).

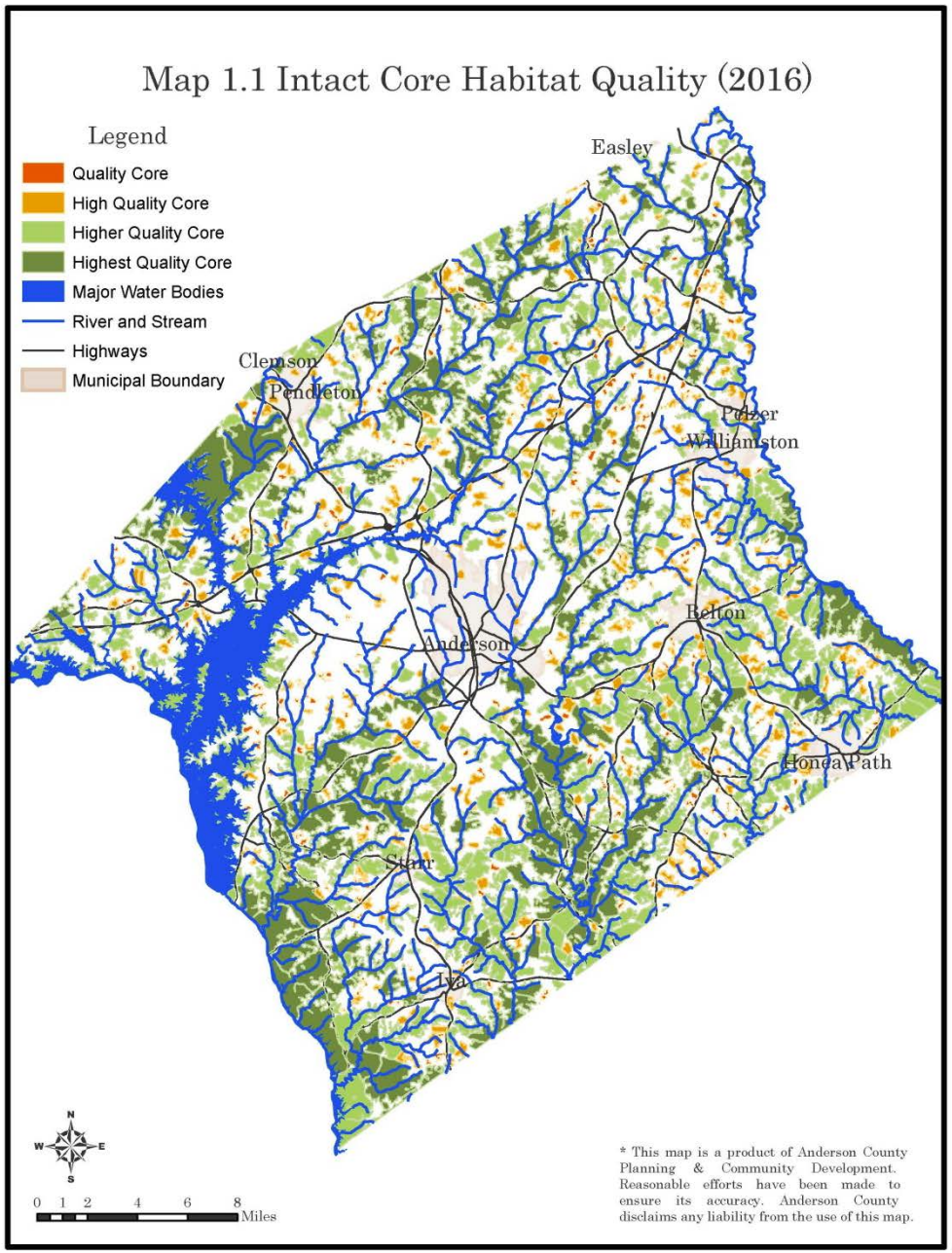
Maps

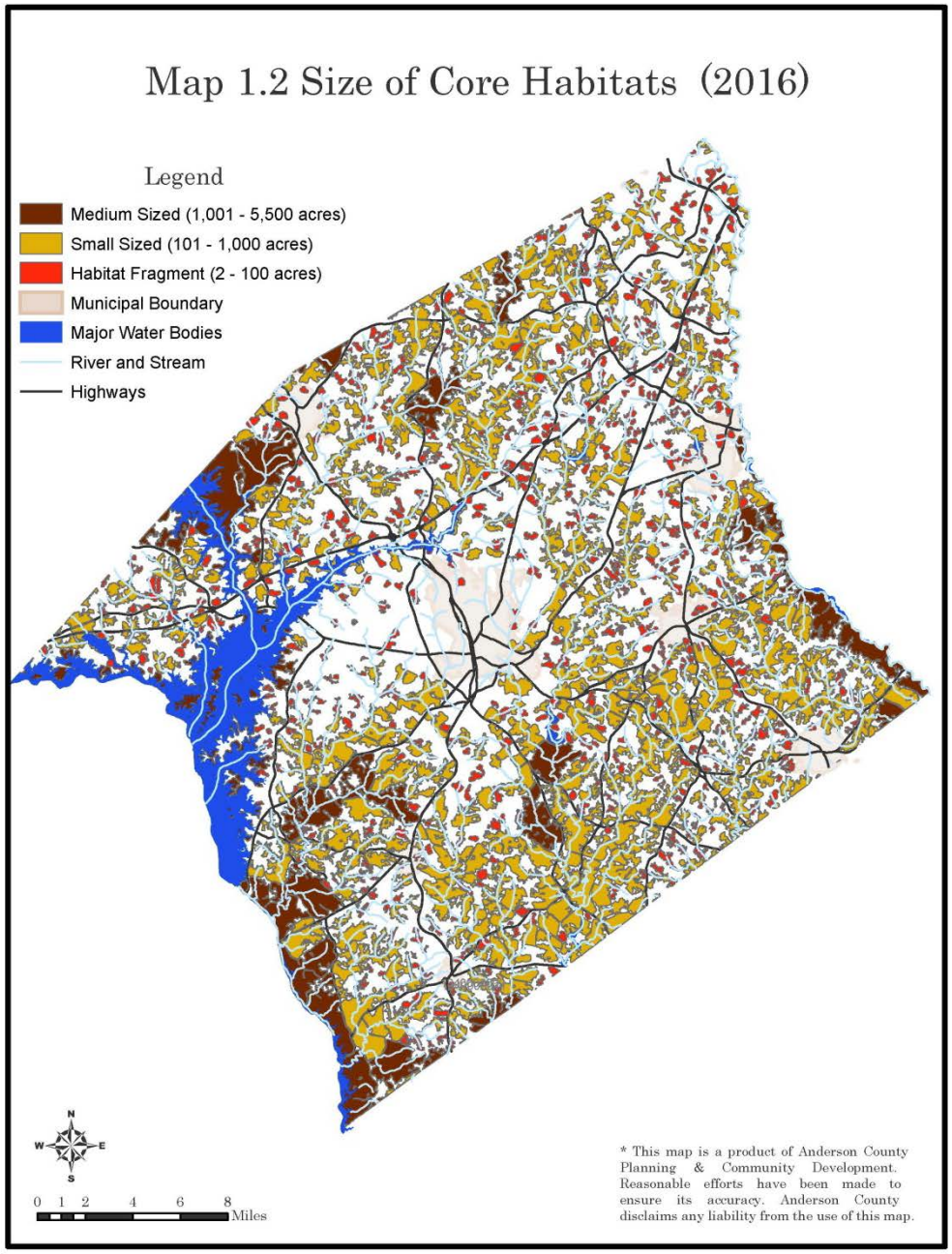
The following maps cover a variety of topics, such as water, agricultural operations and historical or cultural landmarks.

A map of properties in a conservation easement was not produced as many property owners wish to remain anonymous.

Map 1.1 is our county base map, with prioritized core habitats. The various colors represent the quality and importance of each core. The darkest green represents areas which ranked the highest through the metrics listed on the previous page, while areas denoted by the orange color represents a quality core at the lower end of the scale.

Countywide, approximately 22,234 acres were ranked a quality core or higher. This equates to roughly 5% of properties in Anderson County. Around 9,114 acres were ranked the highest quality core, representing less than 2% of the county.





Map 1.2 shows the overall base map by the size of each core, as opposed to the quality. Overall, Anderson County does not consist of many larger tracts of woodlands as defined by this plan.

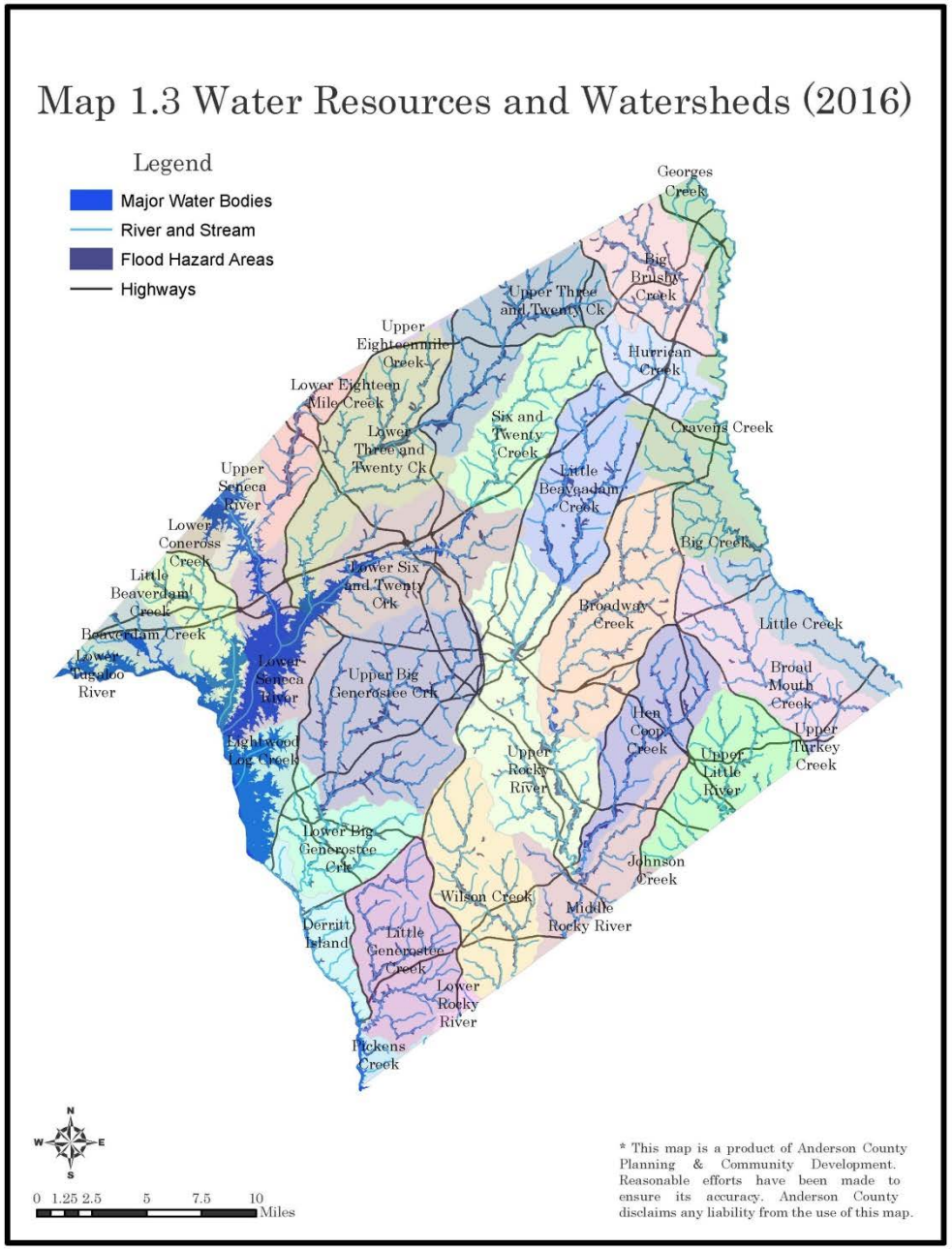
Primarily, the largest habitats in the County are located along waterways, namely the Saluda River, Rocky River, Savannah River and off Lake Hartwell, near Eighteen Mile Creek. The three largest areas are also shared with neighboring jurisdictions.

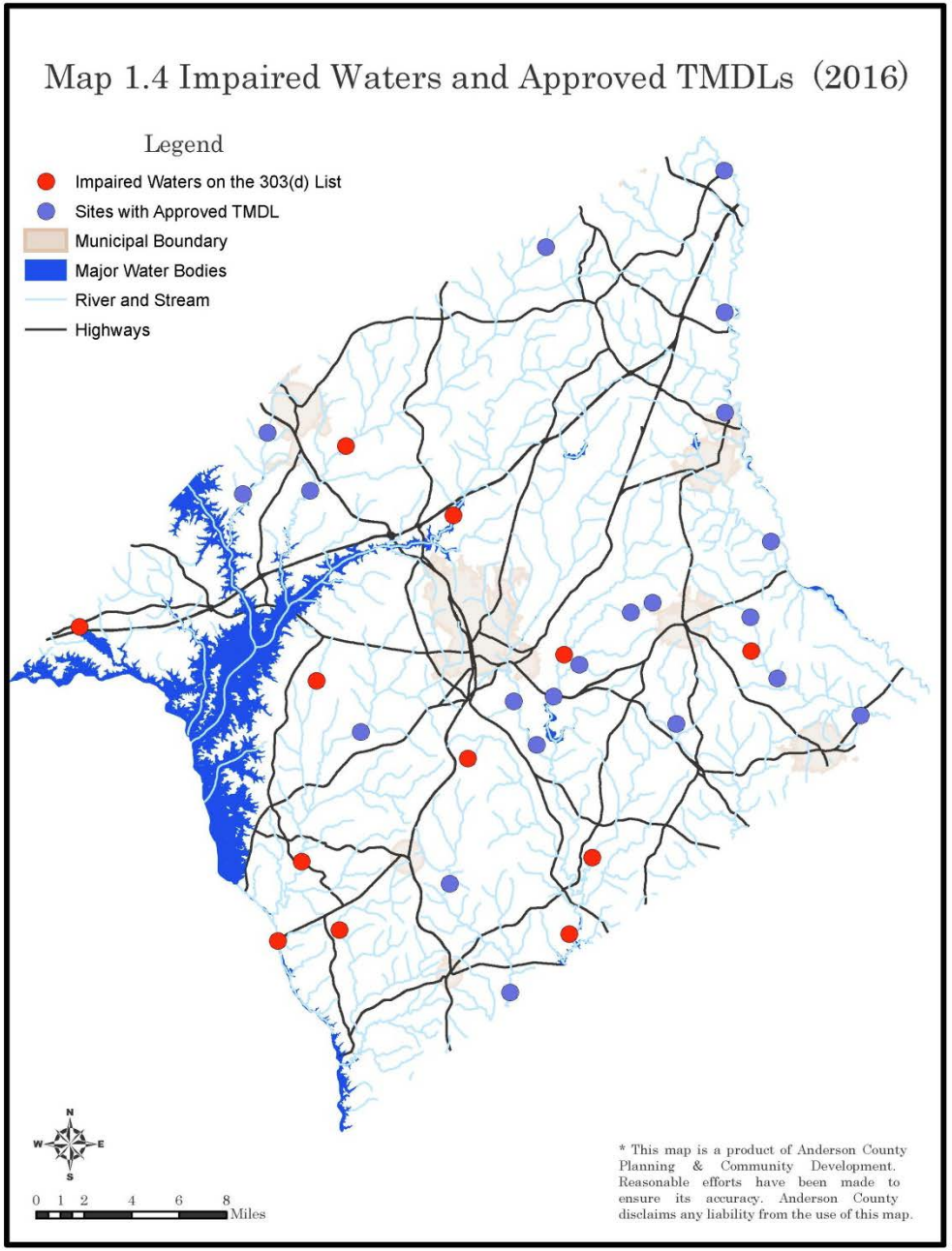
The largest intact core with one owner belongs to the Fant's Grove Wildlife Management Area in the western portion of the County. This land is primarily owned by Clemson University with its WMA managed by the SC Department of Natural Resources.

Map 1.3 is the first of seven themed maps. It highlights the hydric soils within the County and their respective sub-watershed.

Hydric soils in Anderson County are primarily Cartecay-Chewacla or a Toccoa-Cartecay complex. These are also called floodplains and are classified as special flood hazard areas by FEMA. Development within a floodplain is a highly regulated process and is often discouraged.

Due to the proximity to quality cores within the County and the interconnectivity of the rivers, waterways were selected as the County's areas of opportunities.





Map 1.4 indicates the 22 impaired waters on SCDHEC's 303(d) list as of 2014 as well as sites that are covered under an approved TMDL as of May 2016. This map can and should be updated with new information as it becomes available.

The most common reason for impairment is aquatic life due to BIO or the current conditions of macroinvertebrates. Macroinvertebrates are organisms that lack a spine and form an important part of the aquatic food chain. Locations with the designation include sites along Three & Twenty Creek, Broadway Creek, Big Generostee Creek, Big Brushy Creek, Big Creek, Broad Mouth Creek, Hen Coop Creek and Charles Creek. Aquatic life impairments are also caused by PH, hydrogen ion concentrations; DO, dissolved oxygen; Turbidity; TN, total nitrogen; and TP, total phosphorus. Locations include sites along Beaverdam Creek (near I-85, Exit 11), Cupboard Creek, Broadway Creek, Rocky River, Lake Secession, Eighteen Mile Creek and fingers of Lake Hartwell.

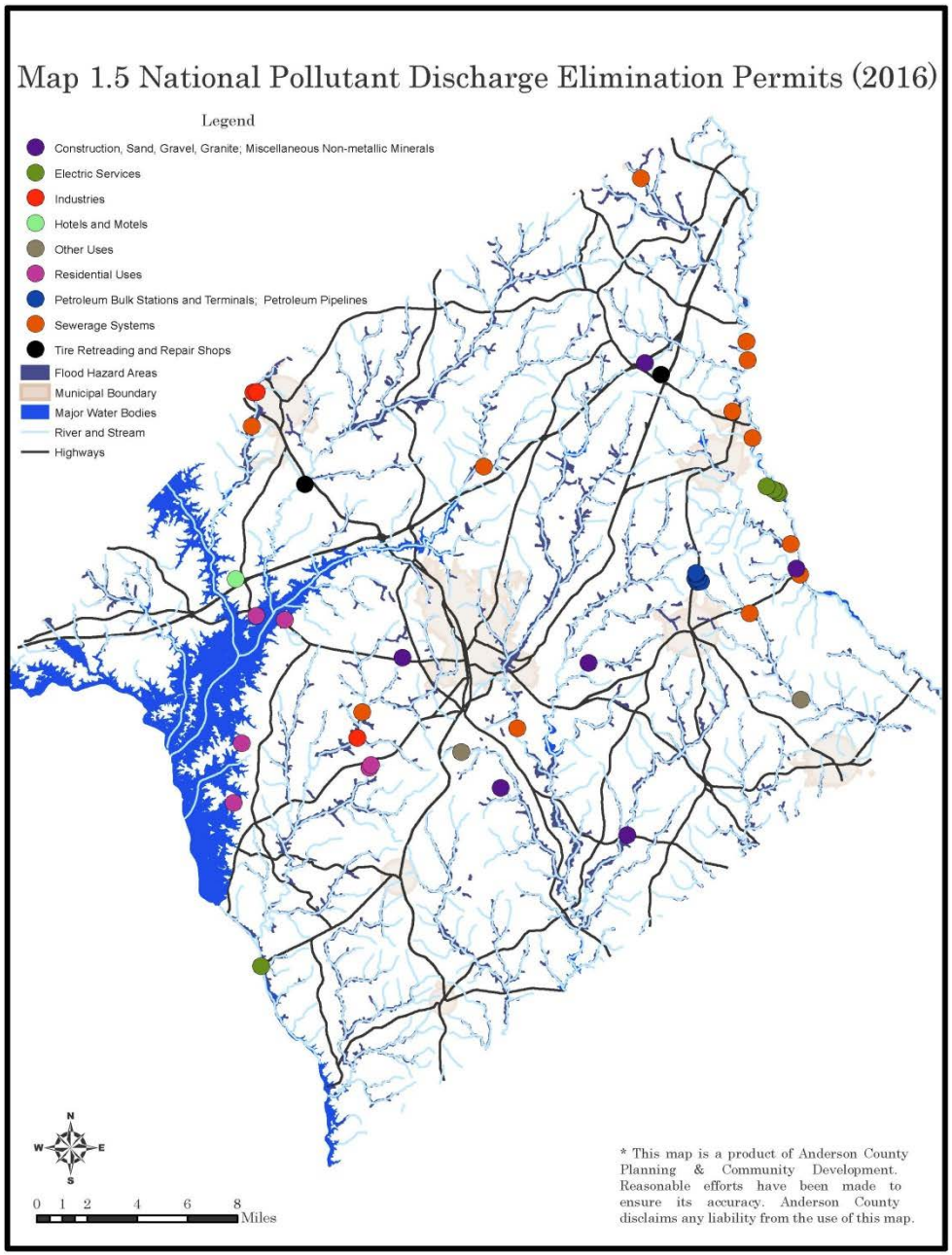
Another impaired use is recreation (swimming). Four sites are on the list for this impairment, caused by E.coli. Sites are along the Beaverdam Creek (near I-85, Exit 11), Betsy Creek, Devils Fork Creek and Big Generostee Creek. The final use of impairment is fish consumption caused by PCB, polychlorinated biphenyls and HG, mercury. Lake Russell and Lake Hartwell remain on this list.

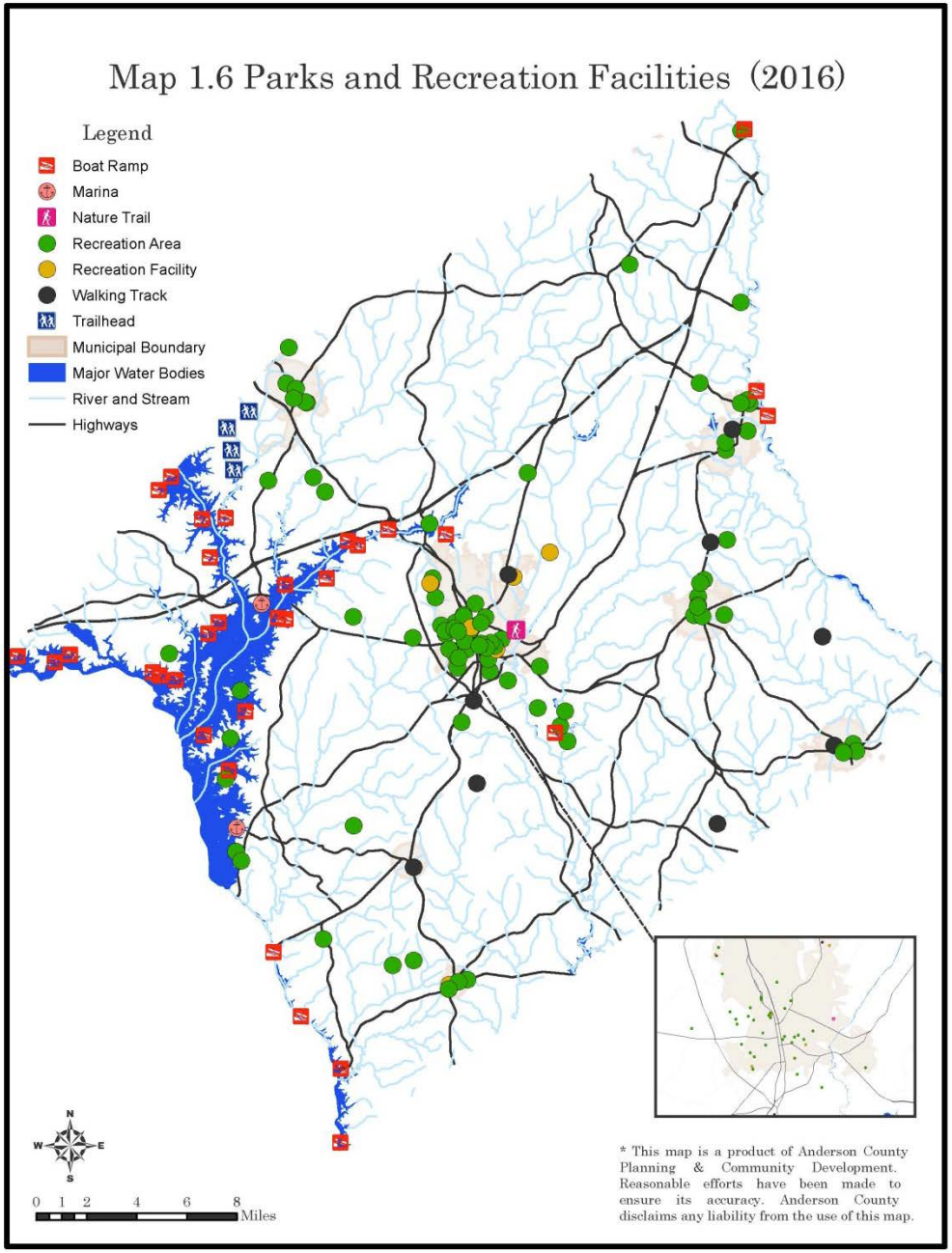
Map 1.5 pinpoints all National Pollutant Discharge Elimination System (NPDES) permits provided by the SCDHEC GIS Clearinghouse.

The NPDES permit program was created through the Clean Water Act, Section 402. Typically, permits relate to discharges from wastewater treatment systems, discharges used as cooling water in industries, and stormwater discharges such as construction activities.

Permits will contain any effluent limitations on pollutants of concern, monitoring frequencies, reporting requirements and best management practices.

In Anderson County, wastewater treatment systems, both public and private, make up the majority of the permits shown. Utility services, such as electric facilities and petroleum pipelines cover the second most permitted use. The remaining sites fall within the categories of industrial, construction or other commercial uses.





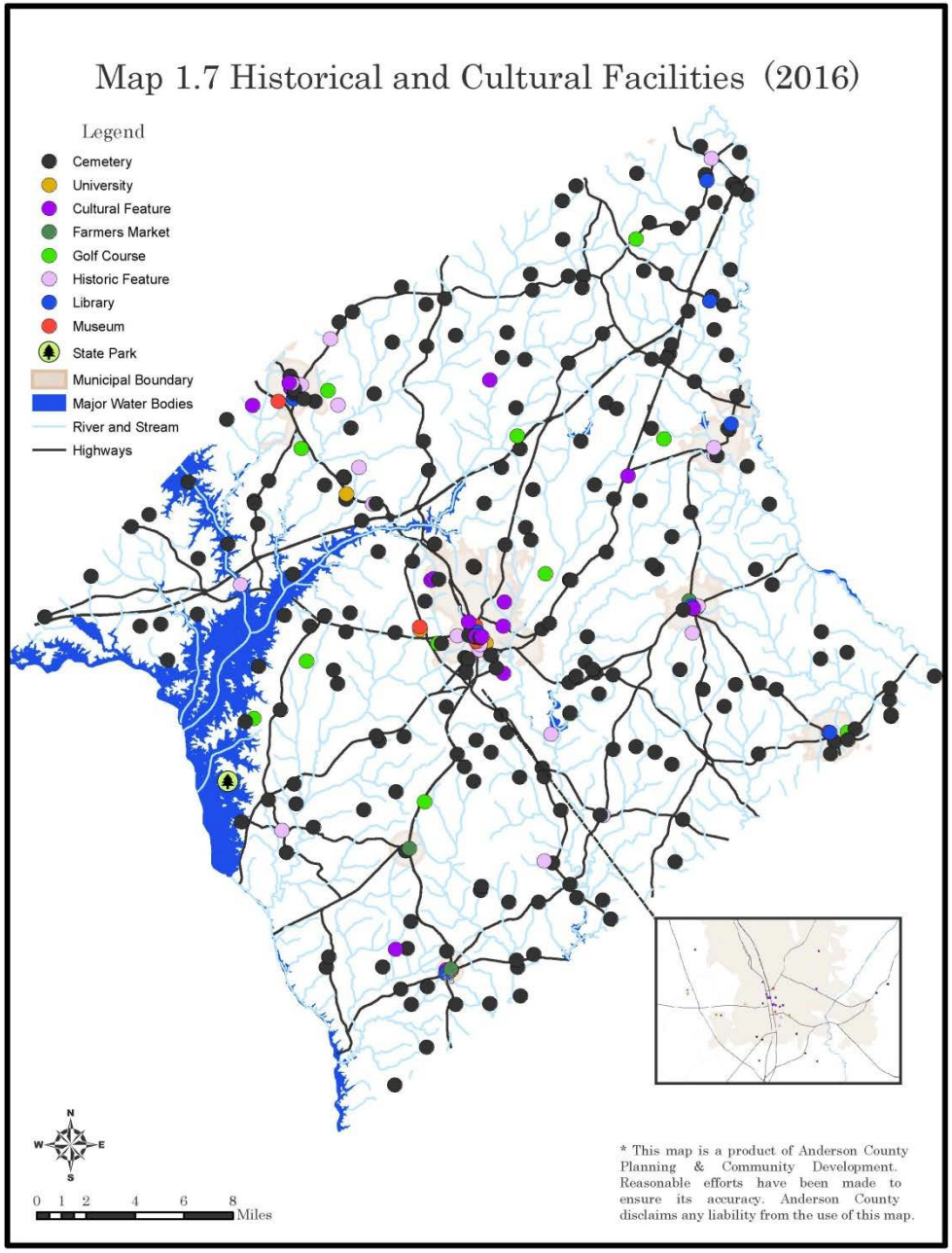
Map 1.6 highlights various recreation facilities available within Anderson County. These facilities are provided by multiple agencies, such as the Army Corps of Engineers, municipalities within the County and Anderson County itself.

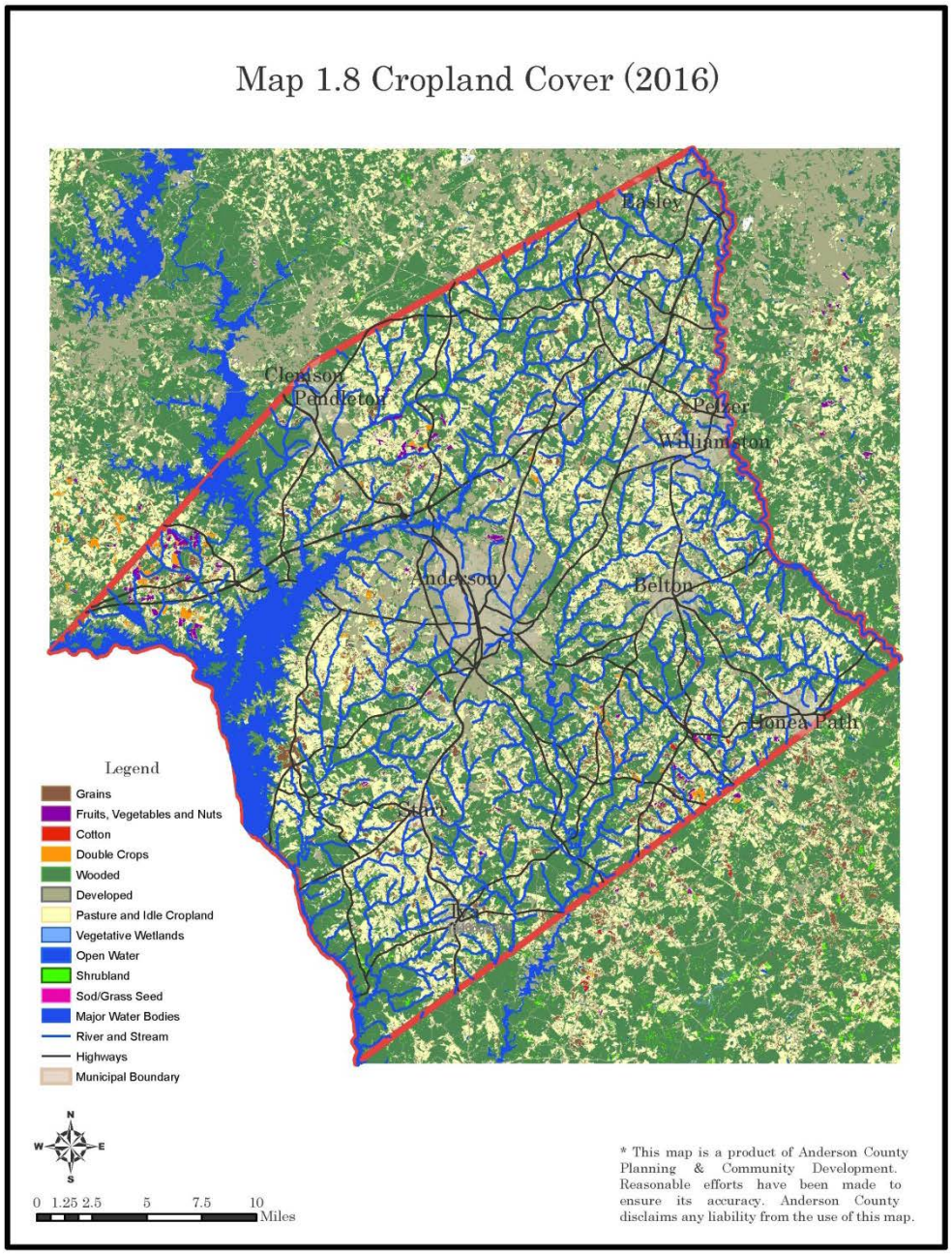
Parks (recreation areas) and boat ramps are plentiful around Lake Hartwell. The trailheads indicated are associated with Fant's Grove WMA and the nature park references the Rocky River Nature Park near downtown Anderson.

There has been local interest in multi-use trails over the past few years, likely due to the popularity and success of the Swamp Rabbit Trail and Doodle Trail in nearby counties. Efforts within several municipalities and grassroots organizations are being discussed that could eventually connect a system of walk and bike paths throughout the Upstate.

Map 1.7 features numerous historical and cultural attractions throughout the County. These play a role in the green infrastructure network, as many feature a buffer or limit development on the property.

Cultural features include places, such as history or art museums; while historic features will include historical markers and places listed on the National Registry. Cemeteries, both active and historic, make up the majority of this map. These areas often vary in size though most are in undeveloped regions. Golf courses are included due to their size and open space available for connections.





Map 1.8 illustrates the cropland cover in Anderson County and in our neighboring jurisdictions, according to the USDA National Land Cover database. Agricultural lands in the County are comprised of mostly pasturelands, both idle cropland and livestock.

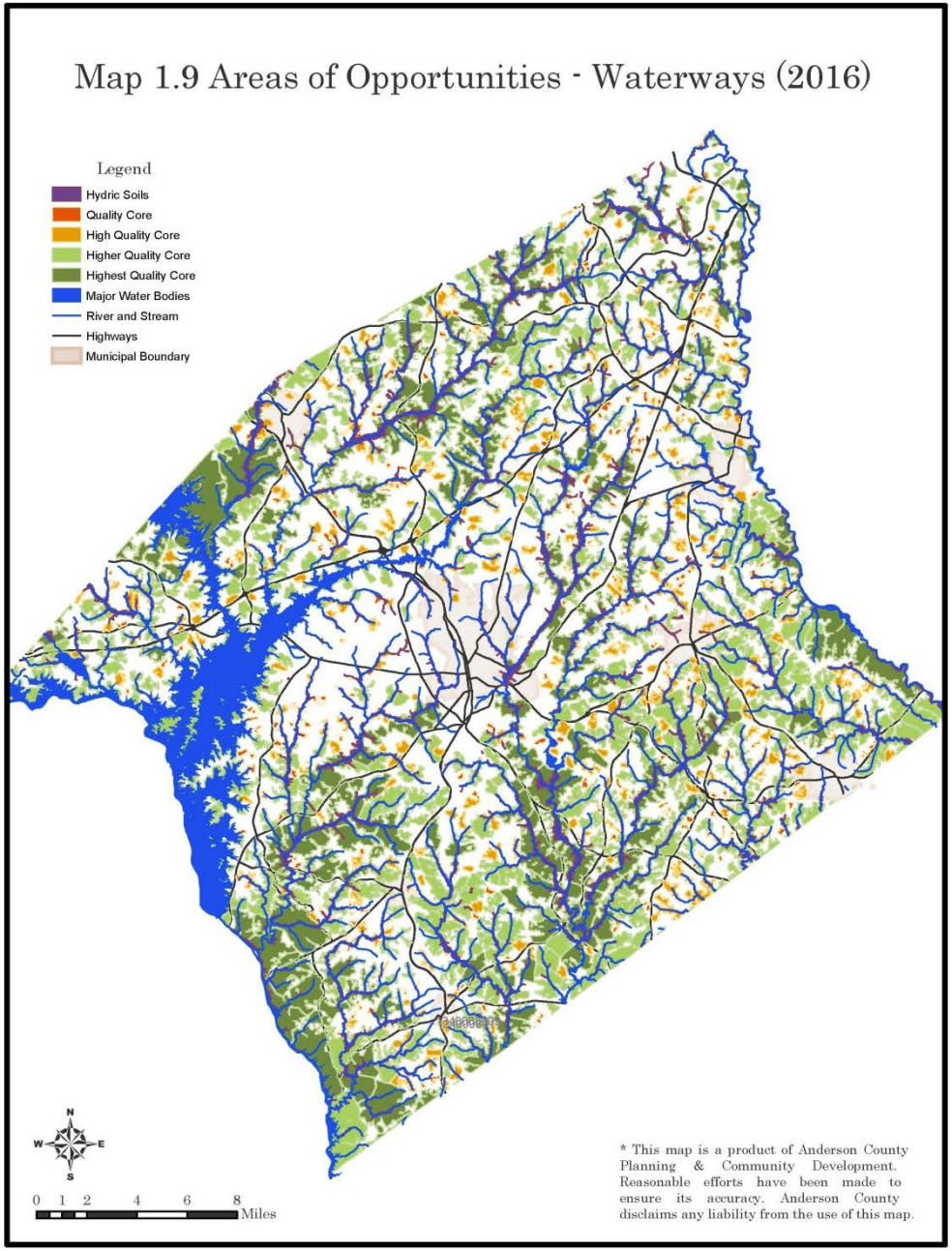
Timberlands and crops fill out the remaining areas. Grains, such as hay, alfalfa, oats and other forage are plentiful, making Anderson County number one in the state for total acres of forage land use.

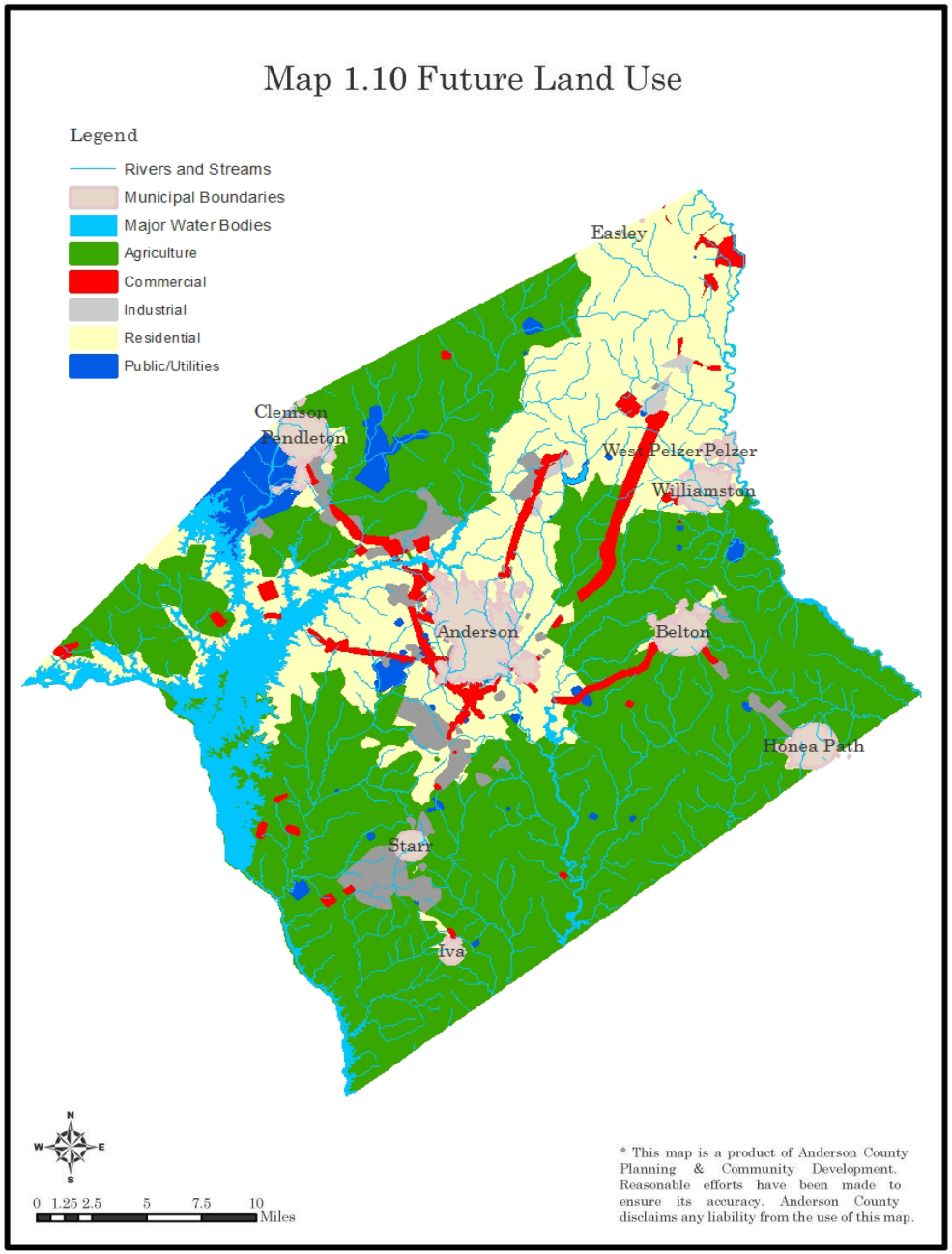
Other crops, such as fruits, vegetables and nuts are scattered through the County, though at less frequency than forage.

Map 1.9 features areas of opportunities, specifically the waterways of Anderson County. Throughout the process, the Green Infrastructure Advisory Committees searched for a common denominator that could link many of our cores together. One solution was our rivers.

Rocky River, Three & Twenty Creek, Little Generostee Creek, the Saluda River and the Savannah River were identified as specifically opportunistic, though all rivers and creeks are displayed here.

As water features play such an important role in the overall function of natural systems, it was a clear choice. Waterways within an intact hub are more likely to contain pristine aquatic conditions. Additionally lakes, rivers and streams provide valuable habitat settings with a source of water. The surrounding floodplains and wetlands provide productive ecosystems, offering wildlife and fish habitat, water filtration and flood control. As water features weigh higher in the core quality metric calculation, the areas surrounding our rivers are more likely to be higher quality hubs.





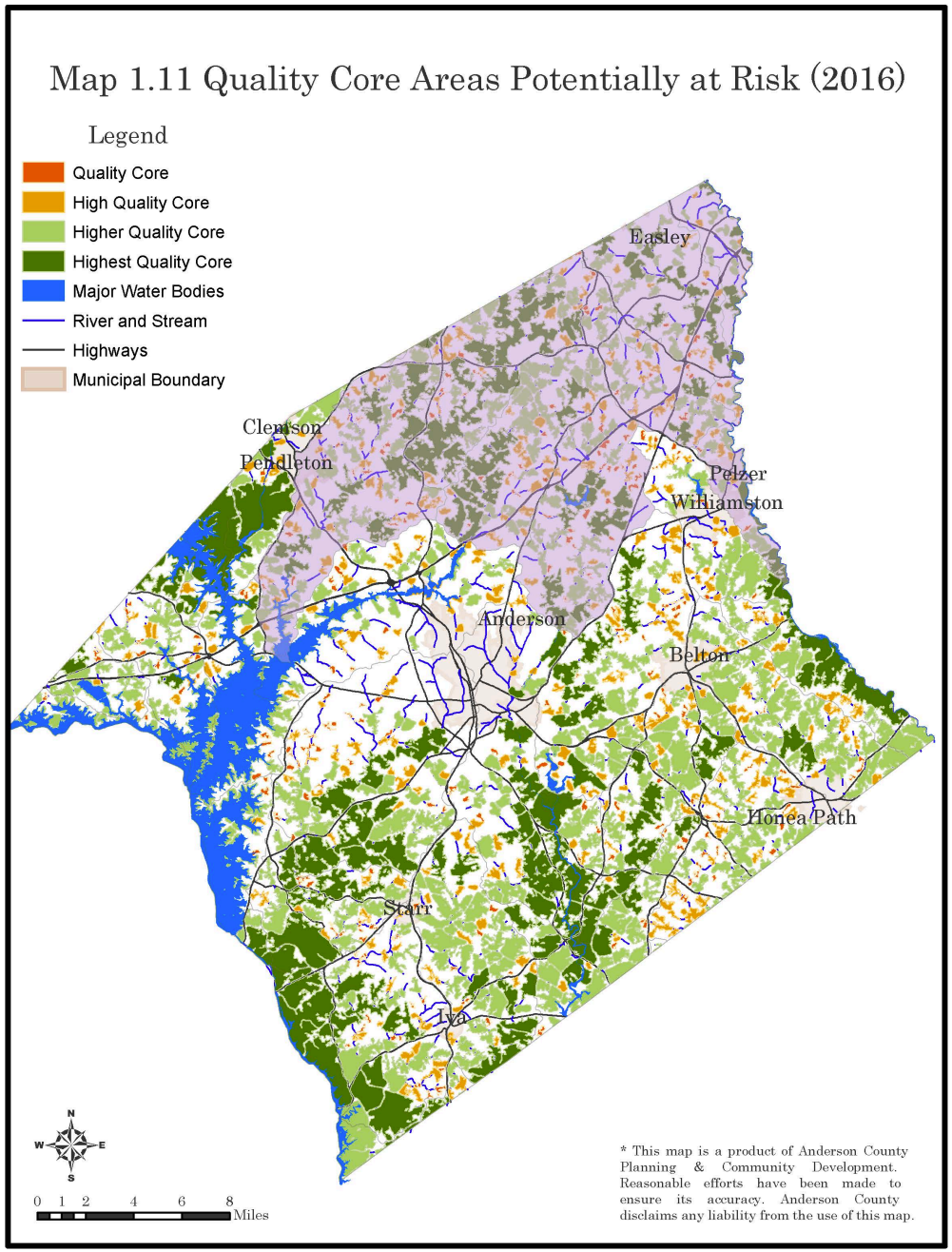
Map 1.10 shows the Twenty Year Future Land Use Map for Anderson County. Modifications to this latest future land use map, as adopted in the 2016 Comprehensive Plan, incorporated results from the green infrastructure plan process. As such, areas of prioritization were reflected in proposed future land use, whenever possible.

This map helps guide growth and future development throughout the county.

Map 1.11 illustrates sub-watersheds potentially facing increased development pressure. The sub-watersheds include Lower and Upper Three & Twenty Creeks, Six & Twenty Creek, Hurricane Creek, Big Brushy Creek, George's Creek, Little Beaverdam Creek and Cravens Creek. These sub-watersheds house twenty-five creeks and rivers, including Big and Little Beaverdam Creeks, Big and Little Brushy Creeks, Dorr Branch, Charles Creek and George's Creek among others.

Please note that eight voting precincts (Three & Twenty, Five Forks, and portions of Bowling Green, Hammond School, Hopewell, North Point, Mount Tabor and Fork 1) are within these sub-watersheds and have zoning implemented. The vast majority of zoned properties within these areas are R-A (Residential – Agricultural) and R-20 (Single-Family Residential, with a minimum lot size of 20,000 square feet). Both designations are considered low density single-family residential.

These areas were identified through a layering of current infrastructure and recent development patterns. Infrastructure considered included proximity to major roads, sewer lines, schools, fire stations and hospitals. Applications for subdivision and commercial permits over the last five years were used for development patterns.



Where do we go from here?

Throughout this process, an overarching goal developed – Be a Healthy Community. A healthy community is comprised of healthy people, a healthy economy and a healthy natural environment. Therefore, all suggested strategies, including the seven guiding principles, fall under this all-encompassing goal.

This Plan is meant to show to the community the importance of green infrastructure and to provide a way to be involved. Community involvement is imperative for long-term success. Below is a listing of suggested strategies for individuals and organizations to consider.

Just as there is a central goal, there is also a central strategy – education. More individuals who know the importance of natural resources, lead to a greater chance for success. Therefore wide distribution and promotion of this plan is recommended. Educational efforts should engage area groups, such as developers, garden clubs, civic organizations, the equestrian community and other stakeholder committees. Schools and children's organizations are also recommended for future involvement.

Categorized by the seven guiding principles, the following recommendations, in no particular order, are suggestions of projects or policies that could be undertaken by a jurisdiction, business, school or individual.

Guiding Principle #1 - Integrate green infrastructure ideas at the outset of plans
Guiding Principle #2 - Secure resilience in water and flood management
Guiding Principle #3 - Protect and enhance biodiversity and native species
Guiding Principle #4 - Conserve and augment linkage with Anderson's landscapes and historic environments and also that of our neighbors
Guiding Principle #5 - Enable contact with and access to nature
Guiding Principle #6 - Secure local food supply and protect the agricultural economy
Guiding Principle #7 - Generate economic growth and attract tourism investment

Coordinate with adjoining jurisdictions and stakeholder agencies on future growth and natural resources issues. *GP #1, GP #2, GP #4, GP #7*

Continue participation in the Tree City USA Program. *GP #1, GP #3, GP #4, GP #5, GP #7*

Help pollinators by planting flower hedges on agricultural lands; native flowers in yards, landscaped areas and roadsides; and strive to keep these areas free of pesticides. *GP #3, GP #4, GP #6*

Consider a riparian buffer. Buffers could be uniform, such as 50 feet on all waterways or a range between 25 and 50 feet dependent upon land use. *GP #1, GP #2, GP #3, GP #4, GP #5*

Promote the importance of walking and biking and its role in health, recreation and air quality. *GP #4, GP #5, GP #7*

Promote the County's natural resources to attract tourism. *GP #1, GP #4, GP #5, GP #6, GP #7*

Consider requirement of new developments to connect in both green and gray infrastructure. *GP #1, GP #2, GP #3, GP #4, GP #5, GP #7*

Coordinate, promote and support conservation easement efforts through other agencies. *GP #1, GP #3, GP #4, GP #5*

Consider a land conservation bank for landowners who wish to permanently protect lands. *GP #1, GP #3, GP #4, GP #5, GP #6*

Begin a TDR (Transfer of Developmental Rights) or PDR (Purchase of Developmental Rights) program. *GP #1, GP #2, GP #3, GP #4, GP #5, GP #6, GP #7*

Collaborate with area organizations (Soil and Water Conservation District and area garden clubs) to create a certified rain gardens program. *GP #2, GP #3, GP #4, GP #5*

Develop a community wide challenge to register their "Acts of Green". Acts of Green could include participation in programs relating to green infrastructure (rain gardens, LID techniques, LEED certifications, conservation easements, etc.) *GP #5*

Encourage or incentivize developers to build conservation developments, unique to each site. *GP #1, GP #2, GP #3, GP #4, GP #5, GP #7*

Encourage or incentivize industries to plan for undisturbed open space or participate in the SC WAIT (Wildlife and Industry Together) program or comparative. *GP #1, GP #2, GP #3, GP #4, GP #5, GP #7*

Encourage the use of Low Impact Development (LID) techniques for mitigation purposes when conservation is not possible. *GP #1, GP #2, GP #3, GP #4, GP #5, GP #7*

Support and assist in local efforts to create and connect multi-use paths throughout the County. *GP #1, GP #4, GP #5, GP #7*

Consider the development of additional zoning classifications for lands with or without a residential dwelling and lands in a conservation easement, such as Natural, Conservation or a Planned Agricultural District. *GP #1, GP #3, GP #4*

Adopt an Anderson County-specific Landscape using native plants and encourage developers and homeowners to participate. *GP #2, GP #3, GP #4, GP #5, GP #7*

Support agritourism, local farmer's markets and encourage participation in Buy SC Grown programs. GP #3, GP #5, GP #6, GP #7

Review Green Infrastructure yearly with an update every 5 years. GP #1, GP #2, GP #3, GP #4, GP #5, GP #6, GP #7

Increase open space (undisturbed space) requirements in Land Use Chapter of the Code of Ordinances. *GP #1, GP #2, GP #3, GP #4, GP #5, GP #7*

Include results of the green infrastructure prioritization process and its guiding principles in all County documents, such as the Future Land Use Map, Wastewater and Road Studies and the upcoming Master Recreation Plan. *GP #1, GP #2, GP #4, GP #7*

Develop special area plans as detailed in the latest Comprehensive Plan. *GP #1, GP #2, GP #3, GP #4, GP #5, GP #6, GP #7*

Update the Master Recreation Plan. *GP #1, GP #4, GP #5, GP #7*

Create Anderson County-specific scenic corridors. *GP #1, GP #3, GP #4, GP #7*

Create a tree-planting program, such as Neighborwoods. *GP #2, GP #3, GP #4, GP #5, GP #7*

Consider a tree canopy ordinance. *GP #1, GP #2, GP #3, GP #4, GP #5, GP #7*

Consider an ordinance that prevents clear-cutting and scrapping of land without approved site plans. *GP #1, GP #2, GP #3, GP #4*

Designate Highway 24 as a "Gateway to Anderson" corridor. *GP #1, GP #4, GP #5, GP #7*

References

American Lung Association. (2016). *2016 State of the Air*. Chicago: American Lung Association.

Bratman, G., Daily, G., Hamilton, J., Hahn, K., & Gross, J. (2015). Nature Experience reduces rumination and subgenual perfrontal cortex activation. *Proceedings of the National Academy of Science*.

Broadmeadow, M. a.-S. (1996). *Urban woodland and the benefits for local air quality*. London: DOE Research for Amenity Tree Series No. 5.

Dadvand, P., Esnaola, M., & Forns, J. (2015). Green Spaces and Cognitive Development in Primary Schoolchildren. *PNAS*, 7937-7942.

EPA. (2006, May). *Economic Benefits of Wetlands.* Retrieved July 2016, from US Enviornmental Protection Agency: https://nepis.epa/gov/Exe/ZyPDF.cgi/2000D2PF.PDF?Dockey=2000D2PF.PDF

EPA. (2006, May). *Wetlands: Protecting Life and Property from Flooding.* Retrieved July 2016, from US Environmental Protection Agency: http://www.epa.gov/sites/production/files/2016-02/documents/flooding.pdf

EPA. (2014, June). *Reducing Urban Heat Islands: Compendium of Strategies, Trees and Vegetation.* Retrieved July 2016, from US Environmental Protection Agency: https://www.epa.gov/sites/production/files/2014-06/documents/treesandvegcompendium.pdf

Firehock, K. (2015). *Evaluating and Conserving Green Infrastructure Across the Landscape: A Practitioner's Guide, South Carolina.* Charlottesville: The Green Infrastructure Center, Inc.

Frankin, D. (2012, March 1). Nature that Nutures. *Scientific American*.

Hardie, I., & Nickerson, C. (2004). *The Effect of a Forest Conservation Regulation on the Value of Subdivisions in Maryland.* College Park: Department of Agricultural and Resource Economics.

Kuo, F., & Sullivan, W. (2001). Aggression and Violence in the Inner City: Effects of Environment Via Mental Fatigue. *Environment and Behavior*, 543-571.

Kuo, F., & Taylor, A. (2004). A Potential Natural Treatment for Attention-Deficit/Hyperactivity Disorder: Evidence From a National Study. *Amercian Journal of Public Health.*

Lovasi, G., Quinn, J., Neckeman, K., Perzanoqski, M., & Rundle, A. (2008). Children living in areas with more street trees have lower prevalence of asthma. *Journal of Epidemiology and Community Health*, 647-649.

NCED. (2016). Retrieved August 2016, from NCED, National Conservation Easement Database: http://conservationeasement.us

Robert Wood Johnson Foundation. (2016). *2016 County Health Rankings.* University of Wisconsin Population Health Institute.

Rocky River Conservancy. (2016). *About Us: Rocky River Consevancy*. Retrieved August 2016, from Rocky River Conservancy: http://rockyriverconservancy.org

SC DHEC. (2008). *Groundwater Contamination Inventory.* Columbia: SC Department of Health and Environmental Control.

SC DHEC. (2016). *Sites Covered Under an Approved TMDL and Attainment Status as of 5/31/16.* Columbia: SC Department of Health and Enviornmental Control.

Seila, A., & Anderson, L. (1982). Estimating Costs of Tree Preservation on Residential Lots. *Journal of Aroriculture*, 182-185.

Selub, E., & Logan, A. (2012). *Your Brain on Nature: The Science of Nature's Influence on Your Health, Happiness and Vitality.* Mississauga, Ontario: Wiley & Sons.

Stanis, S., Oftedal, A., & Schneider, I. (2014). Association of Outdoor Recreation Availability with Physical Activity and Weight Status in Minnesota Youth. *Preventive Medicine*, 60.

Taylor, A., & Kuo, F. (2008). Children with Attention Deficits Concentrate Better after Walk in the Park. *Journal of Attention Disorders*, 402-09.

Ulrich, R., Simons, R., Losito, B., Firorito, E., Miles, M., & Zelson, M. (1991). Stress Recovery During Exposure to Natural and Urban Environments. *Journal of Environmental Psychology*, 201-230.

Urban Forestry Network. (n.d.). *Trees Increase Water Retention and Quality*. Retrieved August 2016, from Urban Forestry Network: http://urbanforestrynetwork.org/benefits/water.htm

US Bureau of Labor Statistics. (2016). *2015 Annual Unemployment Rates.* US Bureau of Labor Statistics.

US Census Bureau. (2010). *2010 Census.* US Census Bureau.

US Forest Service. (2016). *Trees.* Retrieved July 2016, from US Forest Service: http://www.fs.fed.us/learn/trees

USACE. (n.d.). *US Army Corps of Engineers, Savannah District.* Retrieved July 2016, from Natural Resources - Wildlife Management: http://www.sas.usace.army.mil/About/Divisions-and-Offices/Operations-Division/Hartwell-Dam-and-Lake/Natural-Resources/

USDA. (2012). *2012 Census of Agriculture.* USDA, Natuonal Agricultural Statistics Service.

Weinstein, N., Przybylski, A., & Ryan, R. (2009). Can Nature make Us More Caring? Effects of Immersion in Nature on Intrinsic Aspirations and Generosity. *Personality and Social Psychology Bulletin*, 1315-1329.

Wirth, S., & Rosenow, N. (2012). Supporting Whole-Child Learning in Nature-Filled Outdoor Classrooms. *National Association for the Education of Young Children*, 42-48.

Wolf, K. (2009). Strip Malls, City Trees and Community Values. *Arboriculture & Urban Forestry*, 33-40.

Woodland Trust. (2012). *Trees Can Help Reduce Flooding and Improve Water Quality.* Grantham: The Woodland Trust.

Figures 1.1 Three and Twenty Creek Area *Photo Credits: Callie Nickles and Kris Yon*

Figures 1.2 Natural systems *Photo Credits: Celia Boyd Myers*

Figures 1.3 Scenic and rural landscapes *Photo Credits: Celia Boyd Myers*

Figures 1.4 Forested woodlands *Photo Credits: Celia Boyd Myers*

Figures 1.5 Farmland and agricultural landscapes *Photo Credits: Celia Boyd Myers*