SUMMARY OF

NATURAL RESOURCE CONCERNS

IN SOUTH CAROLINA

A collaborative effort between South Carolina USDA Natural Resources Conservation Service and the Earth Sciences and Resources Institute at the University of South Carolina.

By Robin W. Kloot, Earth Sciences and Resources Institute at the University of South Carolina, and Pamela J. Thomas, South Carolina USDA Natural Resources Conservation Service

The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

November, 2007

ACKNOWLEDGMENTS

This book is the result of a team effort and contributions have come from many people and they include:

South Carolina USDA Natural Resources Conservation Service

The State Leadership Team—guidance, support and editing

Amy Maxwell—active involvement and advice on all aspects of this publication

Gene Hardee, Dick Yetter, Kellee Melton, George Sullivan, Curt Hobbs and Stephen Henry—technical advice and proofing

Bethel Durant—conservation easement data

Lance Brewington, Emory Holsonback, Ann Bentley, Ruthie Davis, Sudie Daves, Shaun Worley, Matt Barrington, Lee Nicholson—photographic contributions and assistance

Earth Sciences and Resources Institute at the University of South Carolina

Mark Evans—data collection, conservation progress maps and honest critique

Anton Bezuglov and Hal Lindsay—data collection and management

Laurie Barnhill—design and layout for printing

Beth Robles—proofing and editing

Volunteers

Pamela Kloot—final edit and polish

David Smith—piloting for aerial photographs

Wildlife Corridor—Piedmont

"A land ethic … reflects the existence of an ecological conscience, and this in turn reflects a conviction of individual responsibility for the health of the land. Health is the capacity of the land for self-renewal. Conservation is our effort to understand and preserve this capacity."

Aldo Leopold

"The land ethic simply enlarges the boundaries of the community to include soils, waters, plants and animals, or collectively: the land."

Aldo Leopold, 1948.

Lake Murray

About This Publication

This publication is a summary of natural resource concerns in South Carolina. The perspective of natural resource concerns is more specifically, but not exclusively, in relation to agricultural activities in the state.

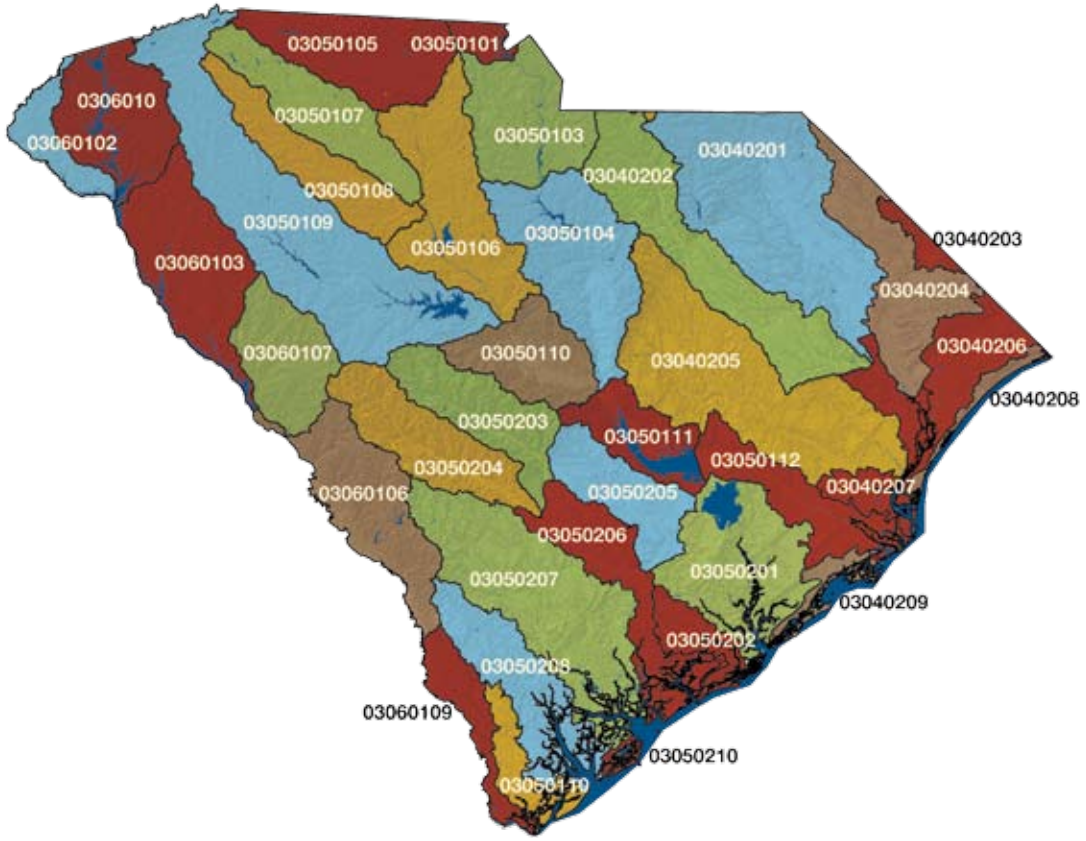
This publication is arranged to address the themes articulated in the United States Department of Agriculture's Natural Resources Conservation Service Strategic Plan for 2005-2010, *Productive Lands, Healthy Environment* (USDA-NRCS 2006). The Strategic Plan addresses the following NRCS Mission Goals, namely:

1. High-quality, Productive Soils
2. Clean and Abundant Water
3. Healthy Plant and Animal Communities
4. Clean Air
5. An Adequate Energy Supply
6. Working Farm and Ranch Lands

According to the NRCS, "The Strategic Plan sets the direction for NRCS and describes our conservation priorities and goals. Bold, forward-looking, and far-reaching, this plan challenges us to reformulate some past approaches and develop and adopt new approaches. This plan will guide NRCS in implementing key overarching strategies, managing agency business lines, meeting customer needs, and developing and strengthening capacity to achieve our mission goals." (USDA-NRCS 2006).

Watershed and Ecoregion Spatial Frameworks

NRCS, along with many state and federal agencies, uses the watershed approach for environmental analyses because of the need to provide a holistic approach to natural resource management and assessment. This publication uses the subbasin, or the eight-digit Hydrologic Unit Area (HUA) defined by an eight-digit Hydrologic Unit Code (HUC), as the primary spatial unit of analysis for prioritizing resource concerns. The recently reconstituted Hydrologic Unit (HU) GIS layer, developed for South Carolina (Eidson *et al.* 2005), was used. There are 39 eight-digit HUA's in the state. Three subbasins, namely the Little, the Rocky and the Upper Pee Dee, cover less than one acre, 554 acres, and 4,419 acres in South Carolina, respectively. These small areas prohibit meaningful subbasin-type analyses and are not assessed separately in this publication. For the sake of analysis, they are considered as integrated with adjacent subbasins, namely the Middle Savannah, the Lynches, and the Middle Pee Dee subbasins, respectively. Consequently, this publication only considers 36 subbasins.



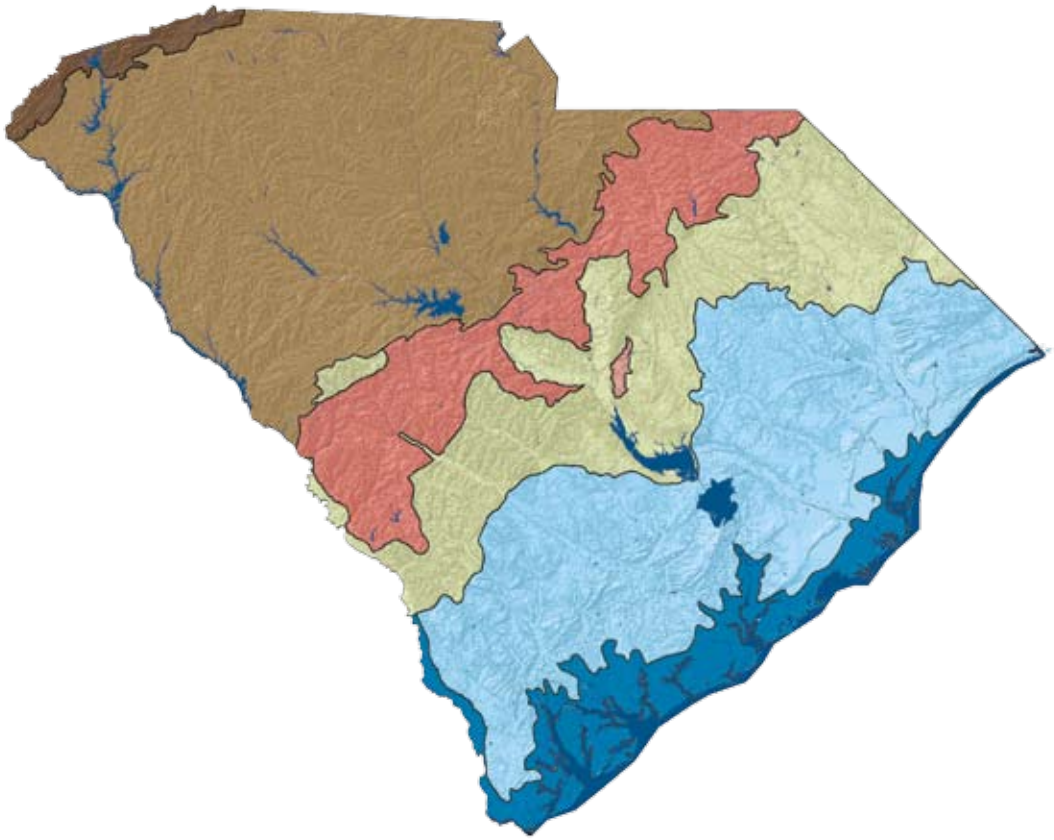
EIGHT-DIGIT HYDROLOGIC UNIT AREAS IN SOUTH CAROLINA

SUBBASINS OR EIGHT-DIGIT HUC'S

Eight-digit HUC and Hydrologic Unit Name	Area (sq. miles)	Land in SC covered by subbasin (%)	Eight-digit HUC and Hydrologic Unit Name	Area (sq. miles)	Land in SC covered by subbasin (%)
03040201 Middle Pee Dee	2,046	6.6 %	03050112 Santee	691	2.2 %
03040202 Lynches	1,386	4.5 %	03050201 Cooper	1,180	3.8 %
03040203 Lumber	122	0.4 %	03050202 Stono	305	1.0 %
03040204 Little Pee Dee	974	3.2 %	03050203 North Fork Edisto	759	2.5 %
03040205 Black	2,060	6.7 %	03050204 South Fork Edisto	867	2.8 %
03040206 Waccamaw	591	1.9 %	03050205 Four Hole Swamp	653	2.1 %
03040207 Lower Pee Dee	485	1.6 %	03050206 Edisto	829	2.7 %
03040208 Coastal Carolina	138	0.4 %	03050207 Salkehatchie/Combahee	1,792	5.8 %
03050101 Upper Catawba	138	0.4 %	03050208 Broad	851	2.8 %
03050103 Lower Catawba	928	3.0 %	03050209 Bulls Bay	189	0.6 %
03050104 Wateree	1,256	4.1 %	03050210 St. Helena Island	53	0.2 %
03050105 Upper Broad	964	3.1 %	03060101 Seneca	929	3.0 %
03050106 Lower Broad	1,288	4.2 %	03060102 Tugaloo	340	1.1 %
03050107 Tyger	808	2.6 %	03060103 Upper Savannah	1,164	3.8 %
03050108 Enoree	731	2.4 %	03060106 Middle Savannah	1,020	3.3 %
03050109 Saluda	2,523	8.2 %	03060107 Stevens	740	2.4 %
03050110 Congaree	689	2.2 %	03060109 Lower Savannah	397	1.3 %
03050111 Lake Marion	548	1.8 %	03060110 Calibogue Sound/Wright River	333	1.1 %

This watershed, or HU approach, will continue to be a critical spatial framework for scientific study and management purposes, but important limitations should be recognized (Omernick and Bailey 1997, Griffith *et al.* 1999). The most notable limitation which applies to this publication is that watersheds, basins or hydrologic units do not consistently correspond to areas with similar geographic characteristics, namely geology, soils, physiography, vegetation, and land use (Griffith *et al.* 1999). Ecoregions, on the other hand, offer a better spatial framework designed to group areas where the aggregate of ecosystem components is different from, or, at least, less variant than, that of other areas (Omernick and Bailey 1997).

This document addresses the limitations of a pure watershed approach by using the watershed and ecoregion spatial frameworks in a complementary fashion. The HU's provide a framework to determine the land/water associations, while ecoregions provide a framework that explains some of the underlying causes of certain phenomena. This strategy is not uncommon and can be successfully applied (Omernik 2003). This document uses the Level III ecoregions developed for North Carolina and South Carolina by Griffith *et al.* (2002). In one case, this document splits the Level III Southeastern Plains into their respective Level IV ecoregions, namely, the Sand Hills and the Atlantic Southern Loam Plains. The profound differences in the soils and the implications on agriculture in these two Level IV ecoregions prompted this exception.



LEVEL III ECOREGIONS IN SOUTH CAROLINA

- Blue Ridge
- Piedmont
- Southern Plains (Sand Hills)
- Southeastern Plains (Atlantic Southern Loam Plains)
- Middle Atlantic Coastal Plains
- Southern Coastal Plains

SOME CHARACTERISTICS OF THE ECOREGIONS IN SOUTH CAROLINA[1]

Level III Ecoregion	Land in SC covered by Ecoregion (%)	Land Covered (Sq. miles)	Urban Land (%)	FSA Farm Fields (%)	All Forests (%)	Wetland (%)
Blue Ridge	2%	465	3.0%	1.9%	87.7%	0.1%
Piedmont	35%	10,794	10.4%	12.9%	57.5%	2.0%
Southeastern Plains (Sand Hills)	12%	3,575	10.2%	11.0%	45.5%	9.1%
Southeastern Plains (Atlantic Southern Loam Plains)	18%	5,637	7.0%	28.1%	24.3%	26.0%
Middle Atlantic Coastal Plain	27%	8,320	5.8%	14.4%	31.9%	32.6%
Southern Coastal Plain	7%	2,134	7.9%	3.0%	23.1%	46.1%

Watersheds and Hydrologic Units

It is important for the reader to understand that while hydrologic units (HU's) are used as a unit of analysis, not all HU's are true topographic watersheds[2] (Griffith *et al.* 1999). Many hydrologic units are, in fact, downstream segments of larger watersheds, e.g., in South Carolina, the Upper Catawba HU becomes the Lower Catawba HU at Lake Wylie and thereafter becomes the Wateree HU at Lake Wateree. Other HU's may be collections of several upstream or adjacent watersheds, e.g., the Lower Broad is fed by the Upper Broad and joined from the west by the Tyger and Enoree watersheds, respectively. In other words, many HU's drain areas that are beyond their boundaries, having implications on interpretation of data collected in each HU and, more importantly, management actions required to address resource concerns.

Watersheds and Counties

A great deal of agricultural data, e.g., Agricultural Census data, are arranged by county. Unfortunately, watersheds, basins and hydrologic units rarely correspond to county boundaries. While this publication does not ignore county-based data sources such as the Agricultural Census, the reader must understand that where data or maps are marked as estimated, the county-based data have been spatially interpolated and reallocated to subbasins, weighted by agricultural (FSA farm field) area. While this method has limitations, ignoring county-based datasets, such as the Agricultural Census, is a less desirable option.

[1] *Urban, forest and wetland coverages were based on the national land-cover dataset (USGS 1991), FSA farm Field data were acquired from the FSA's common land unit layer (FSA 2006).*

[2] *"Watersheds are topographic areas within which apparent surface water runoff drains to a specific point in a waterbody such as a stream or a lake." (Omernick and Bailey 1997).*

Prioritizing Subbasins

Resource allocation requires prioritization. This publication has identified no more than 40% of all subbasins as priorities, given a specific resource concern, e.g. effects of aquatic life use impairments on water quality. Typically, between nine (25%) and 14 (39%) of the subbasins are identified, based on a quantitative attribute, e.g. the number of aquatic life use impairments in the subbasin. The variation in the number of watersheds prioritized is based on classification method used, namely the Jenks Natural Breaks method or the Percentile method. The method used was a matter of professional judgment.

One of the goals of this publication is to allow the resource manager to make high quality decisions in this data-rich, but often information-poor, environment.

COUNTIES OVERLAID BY HUC-8 BOUNDARIES

HUC-8 Boundaries County Boundaries

HIGH QUALITY, PRODUCTIVE SOILS

"History is largely a record of human struggle to wrest the land from nature, because man relies for sustenance on the products of the soil. So direct is the relationship between soil erosion, the productivity of the land, and the prosperity of people, that the history of mankind, to a considerable degree at least, may be interpreted in terms of the soil and what has happened to it as the result of human use."

Hugh H. Bennett and W.C. Lowdermilk, circa 1930's

"Soils are developed; they are not merely an accumulation of debris resulting from decay of rock and organic materials. In other words, a soil is an entity—an object in nature which has characteristics that distinguish it from all other objects in nature."

C.E. Millar & L.M. Turk, 1943

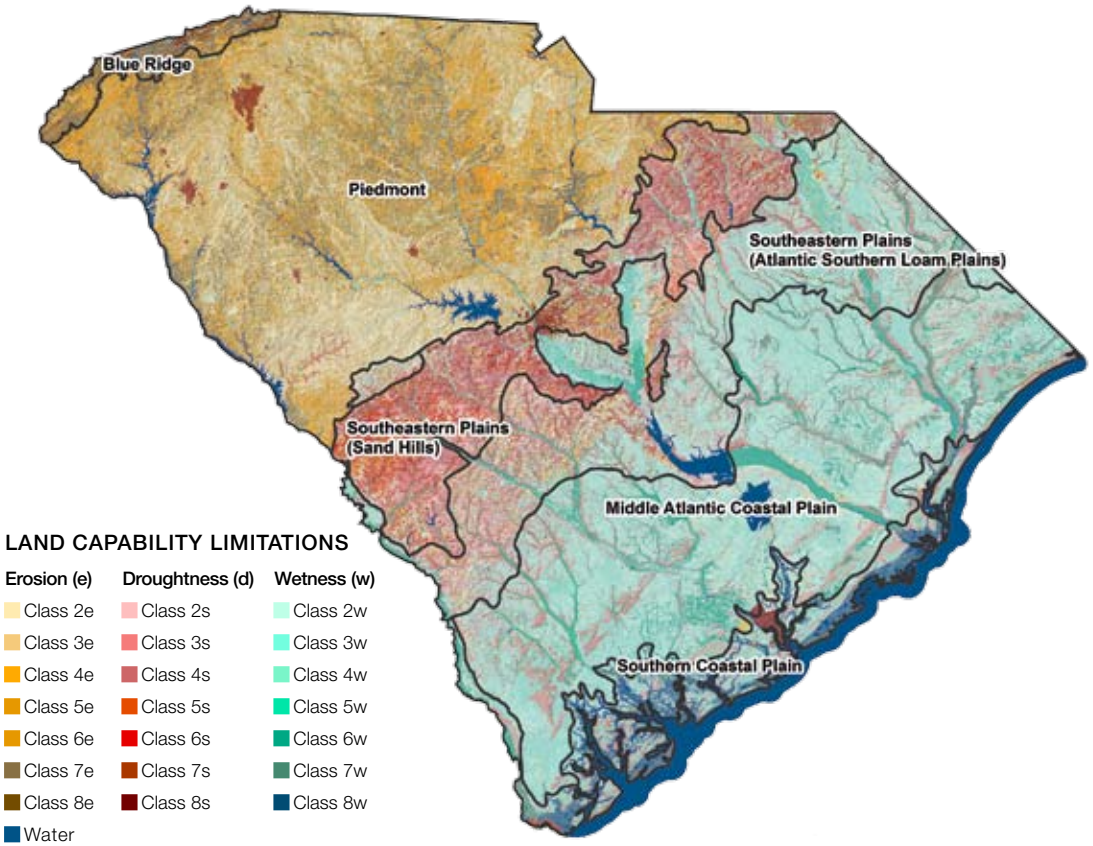
MISSION GOAL*

Soils are protected against damage by erosion and other forms of degradation.

OUTCOME*

The quality of intensively used soils is maintained and enhanced to enable sustained production of a safe, healthy and abundant food supply.

**From the NRCS 2005–2010 Strategic Plan*



SOILS LAND CAPABILITY CLASSES:

Class 1: Slight limitations

Class 2: Moderate limitations that reduce the choice of plants or require moderate conservation practices

Class 3: Severe limitations that reduce the choice of plants or require special conservation practices or both

Class 4: Very severe limitations that restrict the choice of plants or require very careful management or both

Class 5: Little or no hazard of erosion but other limitations, impractical to remove, that limit their use mainly to pasture, range, forestland, or wildlife food and cover

Class 6: Severe limitations that make them generally unsuited to cultivation and that limit their use mainly to pasture, range, forestland, or wildlife food and cover

Class 7: Very severe limitations that make them unsuited to cultivation and that restrict their use mainly to grazing, forestland, or wildlife

Class 8: Soils and miscellaneous areas have limitations that preclude their use for commercial plant production and limit their use to recreation, wildlife, or water supply or for aesthetic purposes

Source: National Soil Survey handbook (USDA-NRCS 2007)

Soils, Ecoregions and Limitations

Ecoregions have proven to be a useful concept to ecologists, and many variants of ecoregions have been developed on the basis of perceived patterns of land use, land surface form, potential natural vegetation, and soils. Soil is an important ecosystem component related to many ecoregion properties; soils and their related properties can, to some extent, be generalized and qualitatively described by ecoregion (Griffith *et al.* 2002). By using land capability classes (LCC) and subclasses identified in the state soil survey (NRCS 2007), it is possible to discuss soils on a semi-quantitative basis. Note that the first four classes (classes 1–4) are limitations of use and necessity for conservation measures increase from 1–4. The remaining classes (5–8) are applicable to land other than cropland, e.g., pasture, woodland, or recreational land. Within each LCC, subclasses signify special limitations in the soil, namely erosion (e), excess wetness (w) and problems with the rooting zone (s) (Helms 1992).

SOILS LAND CAPABILITY SUBCLASSES:

Subclass e is made up of soils for which the susceptibility to erosion is the dominant problem or hazard affecting their use. Erosion susceptibility and past erosion damage are the major soil factors that affect soils in this subclass.

Subclass w is made up of soils for which excess water is the dominant hazard or limitation affecting their use. Poor soil drainage, wetness, a high water table, and overflow are the factors that affect soils in this subclass.

Subclass s is made up of soils that have soil limitations within the rooting zone, such as shallowness of the rooting zone, stones, low moisture-holding capacity, low fertility that is difficult to correct, and salinity or sodium content.

Source: National Soil Survey handbook (USDA-NRCS 2007)

BLUE RIDGE[1]

Most of the soils in the Blue Ridge have limitations due to erosion associated with steep slopes on uplands. Seventy percent of soils in this ecoregion are highly erodible land (HEL) or partially highly erodible land (PHEL). Low soil organic matter in the highly erodible soils is a soil health concern. Hydric soils and wetness are not major resource concerns in this ecoregion with the majority (>98%) of the land classified as not hydric. Less than 1% of land in the ecoregion is prime farmland.

PIEDMONT

Like the Blue Ridge, most soils in the Piedmont region are limited by erosion with 89% of all soils in the ecoregion classified as highly erodible land (HEL) or partially highly erodible land (PHEL) associated with steep slopes on uplands. Low soil organic matter in the highly erodible soils is also a soil health concern. Hydric soils and wetness are not major resource concerns in this ecoregion with the majority (93%) of the land classified as not hydric. About one quarter (23%) of land in the ecoregion is considered prime farmland.

SOUTHEASTERN PLAINS (SAND HILLS)

Soils in this ecoregion are droughty, low-nutrient holding capacity soils formed in thick beds of sand, although some soils contain more loamy and clayey horizons. Droughtiness is a major concern in the sandy soils and low soil organic matter is a soil health concern. Erosion is also a concern on the sloping soils in this ecoregion associated with soil texture. Some of the land in this ecoregion has limitations due to wetness; with much of the wetness associated with hydric and partially hydric soils (30%), almost all of these soils occur in riparian areas. Only 8% of land in the subbasin is considered prime farmland.

SOUTHEASTERN PLAINS (ATLANTIC SOUTHERN LOAM PLAINS)

This ecoregion is a major agricultural zone, with deep, well-drained and moderately well-drained soils, and more prime farmland (31.6%) than any other ecoregion. Erosion is a resource concern only on sloping soils (slopes greater than 2%) in the ecoregion—only 16% of the land is classified as highly or potentially highly erodible. Droughtiness is a slight limitation in the western part of the ecoregion along with low soil water-holding capacity and associated low organic matter in the sandiest soils. Most of the wetness in this ecoregion is associated with hydric and partially hydric soils (52% of soils in the ecoregion) in riparian areas.

SOIL PROPERTIES BY ECOREGION

Ecoregion	Highly and Potentially Highly Erodible Land	Hydric and Potentially Hydric Soils	Prime Farmland	Land of Statewide Importance
Blue Ridge	70%	1%	0.6%	3%
Piedmont	89%	7%	23.0%	22%
Sand Hills	45%	30%	8.0%	20%
Atlantic Southern Loam Plains	16%	52%	31.6%	30%
Middle Atlantic Coastal Plain	4%	83%	20.2%	44%
Southern Coastal Plain	2%	75%	5.6%	19%

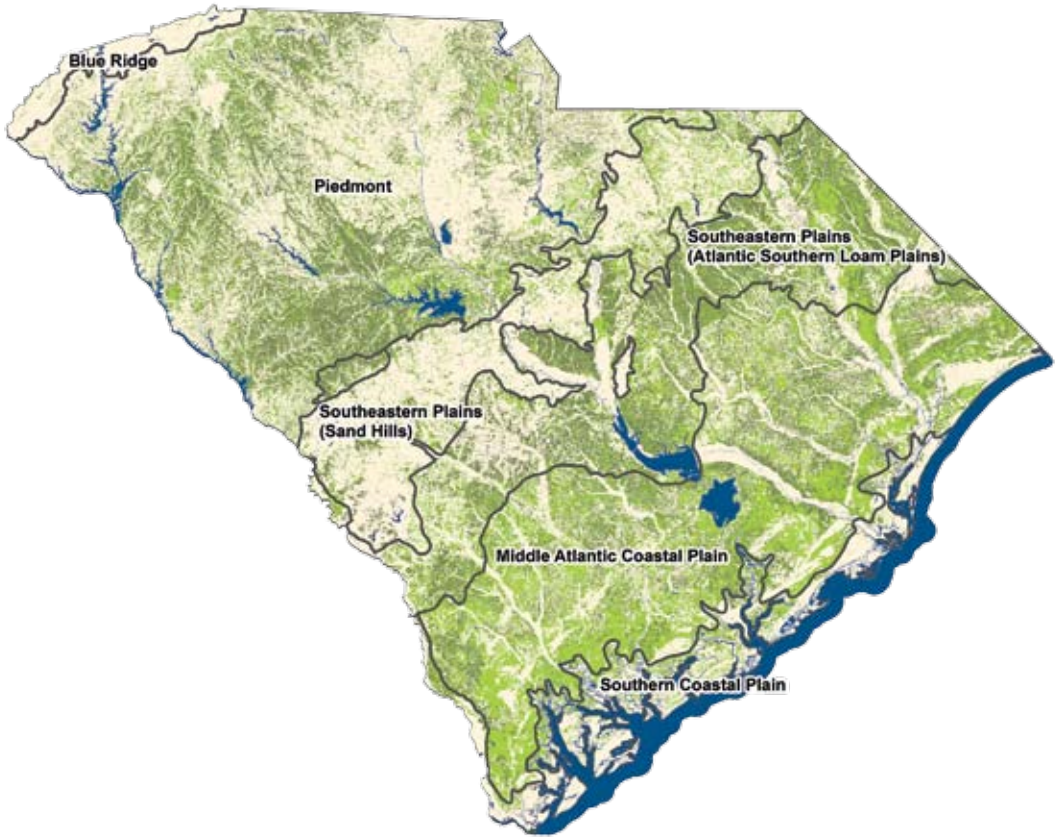
[1]Soils narratives adapted from Dr. P. Thomas, State Soil Scientist, SC USDA-NRCS.

MIDDLE ATLANTIC COASTAL PLAIN

A majority (83%) of land in this Coastal Plain subbasin has limitations due to wetness. Much of the wetness is associated with hydric soils in riparian areas. Droughtiness is a concern in some of the ecoregion, mostly in the sandy soils on stream terraces and along sandy, narrow scarps that occur throughout the ecoregion. Low soil organic matter in these sandy soils is a soil health concern. Erosion is not a major resource concern as 96% of the land is classified as not highly erodible. There is a fair amount of prime farmland (20.2%) in this ecoregion.

SOUTHERN COASTAL PLAIN

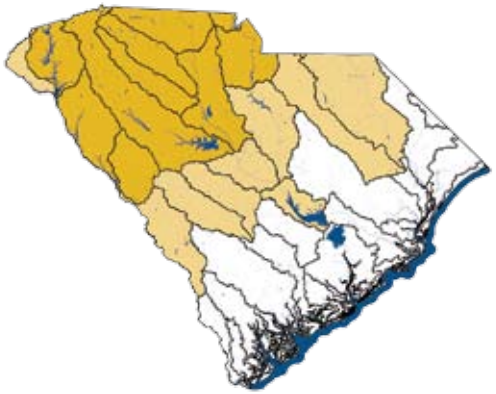
The majority (75%) of land in this Coastal Plain ecoregion has limitations due to wetness. The wetness is associated with hydric and partially hydric soils that occur throughout the ecoregion. Droughtiness is a concern in the sandy soils on stream terraces and in soils with thick, sandy surfaces in some parts of the ecoregion. Low soil organic matter in these sandy soils is a soil health concern. Erosion is not a resource concern as 98% of the land is classified as not highly erodible. Only 5.6% of land in the ecoregion is considered prime farmland.



PRIME FARMLAND AND FARMLAND OF STATEWIDE IMPORTANCE

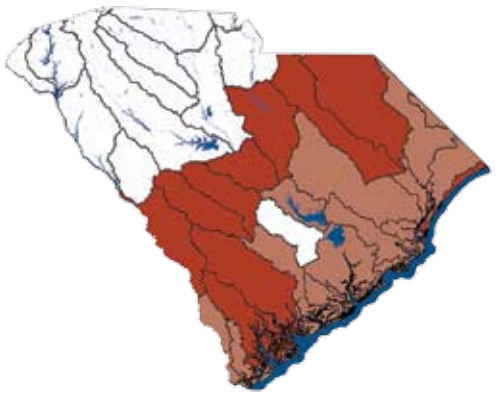
- Water
- Prime Farmland
- Not Prime Farmland
- Farmland of Statewide Importance

Priority Subbasins



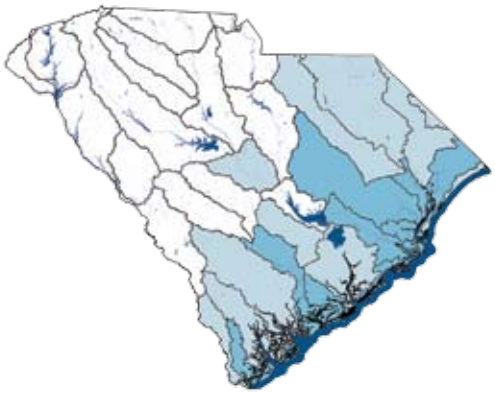
SUBBASIN WITH PERCENTAGE HIGHLY ERODIBLE LAND AND POTENTIALLY HIGH ERODIBLE LAND

<30% 30–80% >80%



SUBBASIN WITH PERCENTAGE SOILS THAT ARE SEVERELY OR VERY SEVERELY LIMITED BY DROUGHTINESS

<10% 10–20% >20%



SUBBASIN WITH PERCENTAGE HYDRIC AND PARTIALLY HYDRIC SOILS

<30% 30–80% >80%

SUBBASIN WITH PERCENTAGE PRIME FARMLAND

<15% 15–25% >25%

SOIL LIMITATIONS (E, S, W) AND PRIME FARMLAND BY SUBBASIN

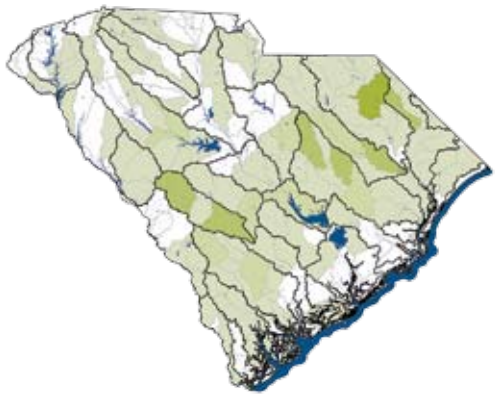
Subbasins	PHEL and HEL (%)	Hydric & Partially Hydric Soils (%)	Droughty Soils with Severe/ V. Severe Limitations (%)	Prime Farmland (%)	PHEL and HEL >80%	Hydric and Partially Hydric Soils >20%	Droughty Soils with Severe/ V. Severe Limitations >20%	Prime Farmland >25%
03060107 Stevens	92	4	7	40	●			●
03050108 Enoree	91	9	1	20	●			
03050107 Tyger	91	8	0	16	●			
03050105 Upper Broad	91	7	0	118	●			
03050103 Lower Catawba	90	8	0	24	●			
03050106 Lower Broad	89	8	2	16	●			
03060103 Upper Savannah	89	8	1	26	●			●
03060101 Seneca	88	2	1	12	●			
03050109 Saluda	87	7	4	30	●			●
03050101 Upper Catawba	87	5	0	22	●			
03040205 Black	18	83	15	30		●		●
03050202 Stono	17	94	10	7		●		
03050112 Santee	16	87	12	18		●		
03050206 Edisto	12	87	12	16		●		
03050209 Bulls Bay	9	91	14	1		●		
03060110 Calibogue Sound/ Wright River	4	83	11	6		●		
03040207 Lower Pee Dee	2	86	14	16		●		
03040206 Waccamaw	1	91	14	22		●		

Subbasins	PHEL and HEL (%)	Hydric & Partially Hydric Soils (%)	Droughty Soils with Severe/ V. Severe Limitations (%)	Prime Farmland (%)	PHEL and HEL >80%	Hydric and Partially Hydric Soils >20%	Droughty Soils with Severe/ V. Severe Limitations >20%	Prime Farmland >25%
03050210 St. Helena Island	0	85	15	0		●		
03050203 North Fork Edisto	63	16	56	16			●	
03050204 South Fork Edisto	66	18	52	19			●	
03060106 Middle Savannah	64	18	52	12			●	
03050110 Congaree	44	32	41	17			●	
03040208 Coastal Carolina	4	76	31	3			●	
03040201 Middle Pee Dee	41	78	28	23			●	
03040202 Lynches	38	60	28	22			●	
03050104 Wateree	67	24	24	15			●	
03050207 Salkehatchie/ Combahee	20	62	22	13			●	
03050208 Broad	12	61	22	11			●	
03060102 Tugaloo	63	1	1	8				
03050111 Lake Marion	30	26	19	29				●
03050205 Four Hole Swamp	19	73	9	34				●
03040203 Lumber	18	72	16	27				●
03040204 Little Pee Dee	14	78	16	30				●
03050201 Cooper	11	79	11	17				
03060109 Lower Savannah	11	70	10	21				

Conservation Progress

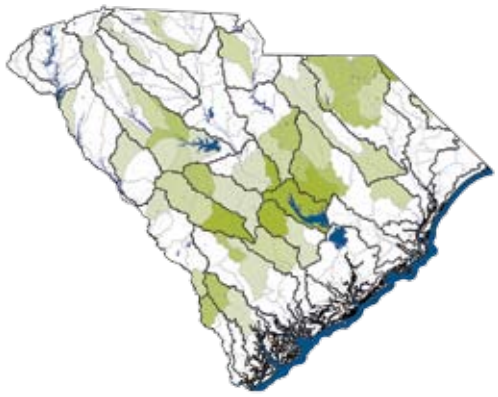
PROGRESS IN KEY CONSERVATION PRACTICES (APPLIED PRACTICES 2004-2006) TO REACH NATIONAL SOIL QUALITY AND PRODUCTIVITY OBJECTIVES

Practice name (units) and number	2004	2005	2006	Total
329 Residue and Tillage Management, No-Till/Strip Till/Direct Seed (ac)	-	-	20,224	20,221
329A Residue Management, No-Till/Strip Till (ac)	43,779	29,446	2,171	75,396
329B Residue Management, Mulch Till (ac)	429	31	-	466
328 Conservation Crop Rotation (ac)	199,890	25,057	15,778	60,824
600 Terrace (ft)	9,725	23,500	3,300	36,525
585 Stripcropping (ac)	342	321	142	805
342 Critical Area Planting (ac)	681	487	172	1,339
327 Conservation Cover (ac)	3,935	3,749	3,936	11,620
340 Cover Crop (ac)	6,720	10,709	6,324	23,753
324 Deep Tillage (ac)	6,695	5,759	5,180	17,633



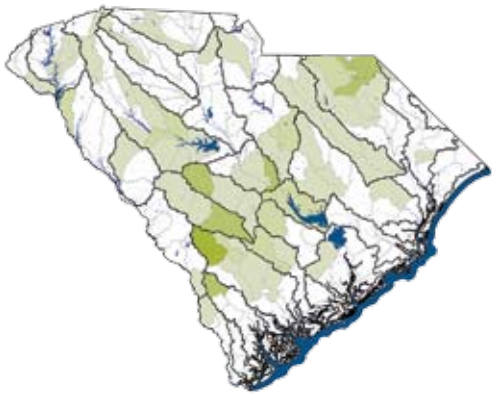
CROPLAND CONSERVATION PLANS

0 <10 10–15 16–25 >25



RESIDUE AND TILLAGE MANAGEMENT (329) APPLIED ACRES

0 <100 100–300 301–700 >1,200



CONSERVATION CROP ROTATIONS (328) APPLIED ACRES

0 <300 300–600 601–1,200 >1,200

Congaree River

CLEAN AND ABUNDANT WATER

"The quality of water and the quality of life in all its infinite forms are critical parts of the overall, ongoing health of this planet of ours, not just here in the Amazon, but everywhere … The hardest part of any big project is to begin. We have begun. We are underway. We have a passion. We want to make a difference."

Sir Peter Blake (1948-2001)

"We're all downstream."

Ecologist's motto adopted by Margaret and Jim Drescher, Windhorse Farm, Nova Scotia

Catawba River

MISSION GOAL*

Water is protected against contamination and managed efficiently to serve many uses.

OUTCOMES*

The quality of surface waters and groundwater is improved and maintained to protect human health, support a healthy environment, and encourage a productive landscape.

Water is conserved and protected to ensure an abundant and reliable supply for the Nation.

**From the NRCS 2005–2010 Strategic Plan*

WATER QUALITY

The quality of the state's water is monitored by the South Carolina Department of Health and Environmental Control (SCDHEC) through its network of Water Quality Monitoring Sites (WQMS). The state has set water quality standards for uses of water that include recreation, aquatic life uses, fish consumption and shellfish harvesting (SCDHEC 2001).

Water quality concerns or impairments that are traditionally associated with agriculture in this state include the following:

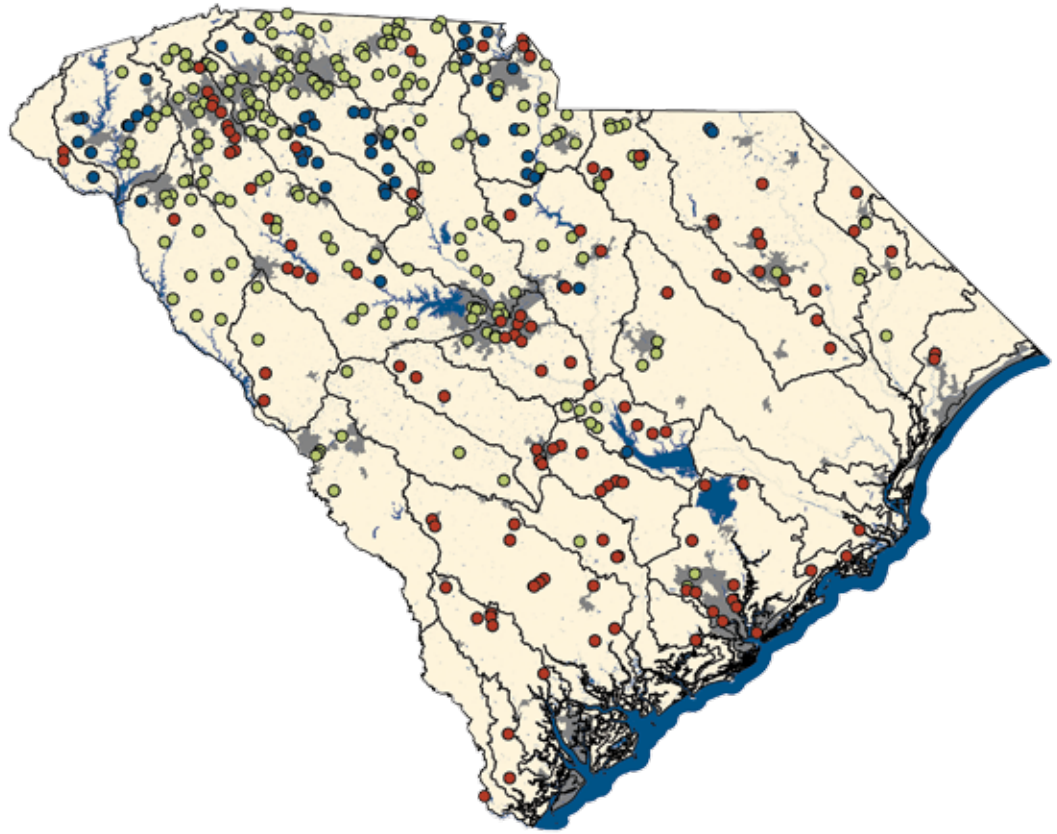
- fecal coliform (FC) bacteria—these affect recreational and shellfish harvesting uses
- dissolved oxygen (DO), pH (i.e., excessively acid or alkaline waters), total nitrogen and phosphorus (TN and TP), biological (benthic life) indicators—these affect aquatic life uses

The state (through SCDHEC) is required to list water quality impairments to the U.S. Environmental Protection Agency (USEPA) annually through the 303(d) list and to prepare a Total Maximum Daily Load (TMDL) plan and thereafter to implement the TMDL (SCDHEC 2007). Once the TMDL is approved, the water body is removed from the 303(d) list, but this does not mean that the water body is not impaired. This is only determined by further monitoring.

Water Quality and Agriculture

Nonpoint source (NPS), or diffuse, pollution is difficult to locate or monitor because it originates over extensive land areas and is usually in transit (often because of meteorological events) before it reaches any receiving waters. Any contaminant loaded into a stream (loading itself is a complex process, peculiar to each contaminant) is additionally subject to complex streamside and in-stream processes. Monitoring agencies typically collect water quality and flow data that are useful for targeting and prioritizing at the watershed scale (10-digit hydrologic unit areas). However, water quality data that typically represent dozens or even hundreds of square kilometers are generally not useful for locating critical lands (i.e., land areas that contribute the most NPS pollution to a watershed) within a watershed. Locating critical lands in large watersheds is crucial because conservation practices, typically measured in linear feet or acres, will be ineffective if not placed correctly. Researchers have made increasing use of geographic information systems (GIS) and remote sensing techniques to assess the influences of terrestrial ecosystems on river water quality, but these effects are complex, scale dependent and confounded by multiple sources and seasonal trends (Kloot 2007).

An analysis on the effect of animal agriculture (Lu and Allen 2003) in South Carolina suggests that on the whole, the link between animal agriculture (cattle, poultry and swine) and water quality (FC, DO, TP and pH) is weak. Cattle populations, however, appear to have a stronger influence on these water quality parameters (FC, DO, TP and pH) than poultry or swine populations. When considering water quality, factors such as human population and other human activities must be considered in addition to agricultural activities.



LOCATION OF FECAL COLIFORM IMPAIRMENTS IN 2006

- FC 303(d) Listed
- FC TMDLs Approved
- FC TMDLs in Implementation
- Major Urban Areas

Fecal Coliform Impairments for Recreational Use

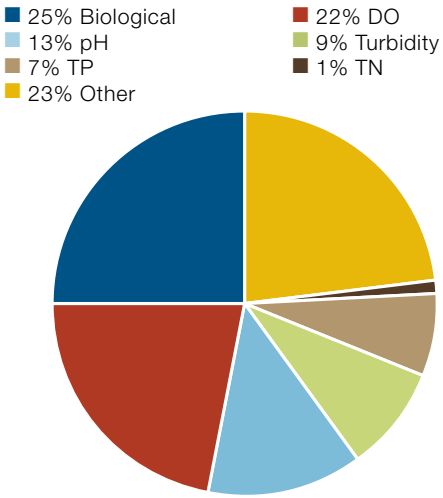
Fecal coliform impairments in 2006 that exceeded recreational (fishable and swimmable) standards were the most numerous in the state. Of all permanent water quality monitoring sites (WQMS), about 42% of the sites were impaired for fecal coliform (recreational standard). This excluded approximately 200 sites on the coast that were impaired for fecal coliform based on the shellfish harvesting standard. Of the recreationally impaired sites, TMDL plans were developed and approved for approximately 210 sites, and there are approximately 60 sites where TMDL implementation is in progress.

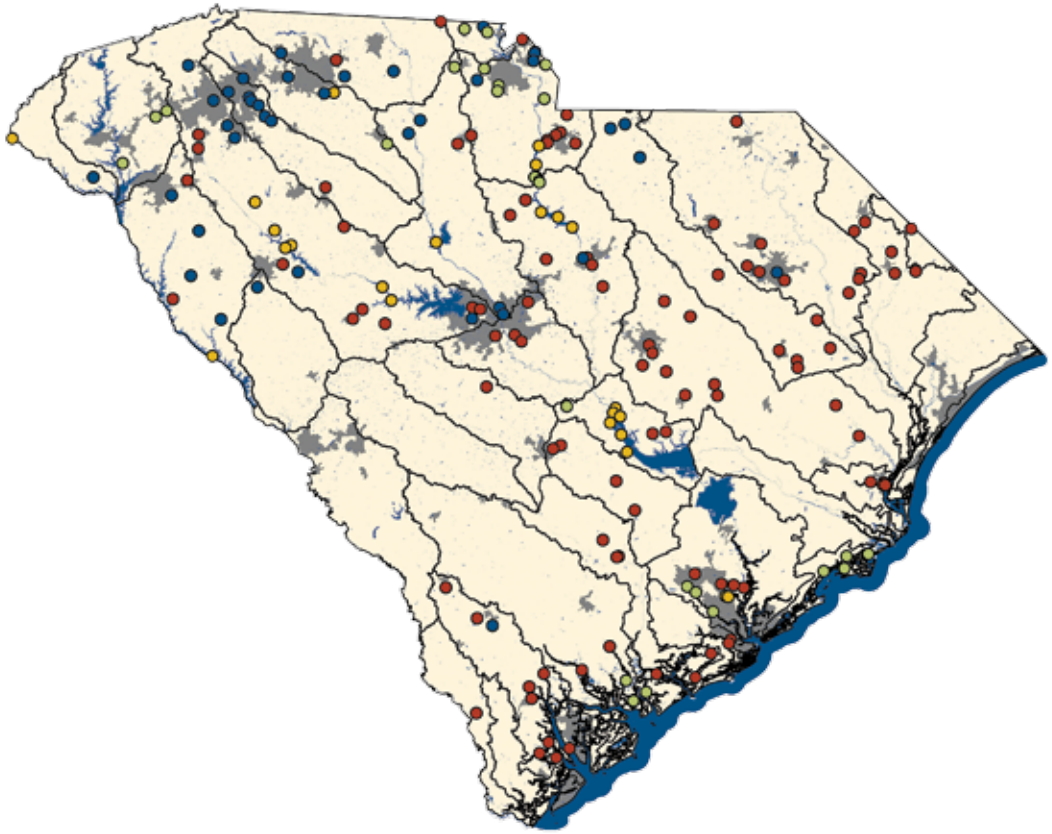
Aquatic Life Use Impairments

Suitability of water for aquatic life use is determined by various biological, toxicological, and physical/chemical standards. In South Carolina, there were 581 aquatic life use impairments for 2006, the four most numerous being biological (or benthic life), dissolved oxygen (DO), pH and turbidity impairments. Impairments from the macronutrients, Total Nitrogen (TN) and Total Phosphorus (TP) are also graphically displayed. Other aquatic life use impairments include free ammonia (NH_3) and metals, e.g., chromium, copper, nickel and zinc.

AQUATIC LIFE USE IMPAIRMENTS

Breakdown of aquatic life use impairments in 2006, total of 581





LOCATION OF SOME AQUATIC LIFE USE IMPAIRMENTS IN 2006

- DO Impairments
- Turbidity Impairments
- TP and TN Impairments
- Biological Impairments
- Major Urban Areas

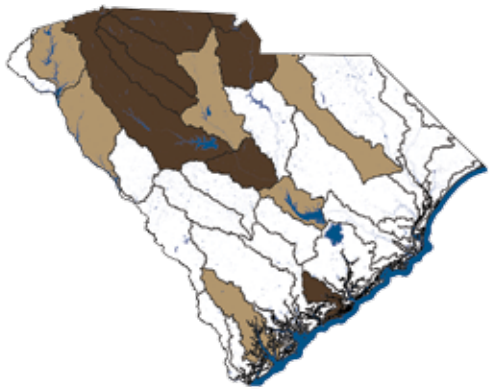

Broad River

Fish Consumption Advisories

In 2005, mercury advisories were issued for 57 water bodies in South Carolina. Higher concentrations of mercury in fish tissue tend to occur in the Coastal Plain of South Carolina with relatively lower concentrations (and therefore fewer advisories) in the Piedmont. Fish advisories for poly chlorinated biphenyls (PCB's) are in effect in Lake Hartwell.

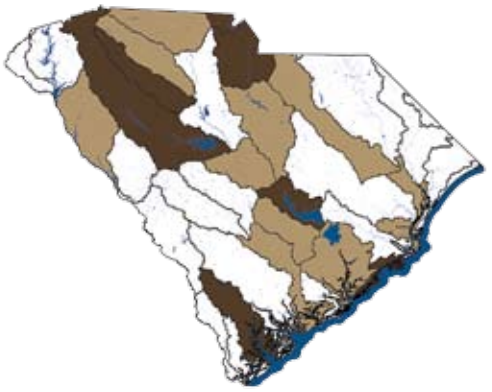
For more details on fish advisories, please refer to the SCDHEC fish advisory website at: http://www.scdhec.gov/environment/water/fish/

Priority Subbasins



FECAL COLIFORM IMPAIRMENTS PER UNIT DRAINAGE AREA (1 million acres)

<15 15–30 >30



AQUATIC LIFE USE IMPAIRMENTS PER UNIT DRAINAGE AREA (1 million acres)

<20 20–30 >30

FECAL COLIFORM AND AQUATIC LIFE USE IMPAIRMENTS PER UNIT (ONE MILLION ACRES) OF SUBBASIN DRAINAGE AREA

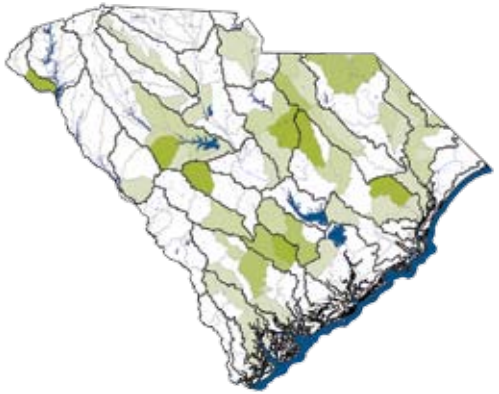
Subbasins	Fecal Coliform Impairments	Aquatic Life Use Impairments	Fecal Coliform Impairments >15	Aquatic Life Use Impairments >20
03050103 Lower Catawba	49	88	●	●
03050111 Lake Marion	28	60	●	●
03050109 Saluda	36	38	●	●
03050108 Enoree	56	36	●	●
03050208 Broad	20	35	●	●
03050101 Upper Catawba	57	34	●	●
03050107 Tyger	52	27	●	●
03040202 Lynches	20	26	●	●
03060103 Upper Savannah	21	24	●	●
03050105 Upper Broad	58	23	●	●
03050110 Congaree	32	20	●	
03050202 Stono	56	15	●	
03060101 Seneca	29	15	●	
03050106 Lower Broad	24	19	●	
03050206 Edisto	13	28		●
03050104 Wateree	12	30		●
03050205 Four Hole Swamp	10	26		●
03050201 Cooper	7	28		●

Subbasins	Fecal Coliform Impairments	Aquatic Life Use Impairments	Fecal Coliform Impairments >15	Aquatic Life Use Impairments >20
03050209 Bulls Bay	0	50		●
03040207 Lower Pee Dee	0	23		●
03060102 Tugaloo	14	18		
03050203 North Fork Edisto	12	10		
03040204 Little Pee Dee	11	10		
03040201 Middle Pee Dee	10	16		
03060107 Stevens	8	11		
03060106 Middle Savannah	8	5		
03050207 Salkehatchie/Combahee	6	18		
03050204 South Fork Edisto	5	7		
03040206 Waccamaw	5	3		
03060109 Lower Savannah	4	12		
03040205 Black	3	17		
03050112 Santee	2	7		
03040203 Lumber	0	13		
03040208 Coastal Carolina	0	0		
03050210 St. Helena Island	0	0		
03060110 Calibogue Sound/Wright River	0	0		

Conservation Progress

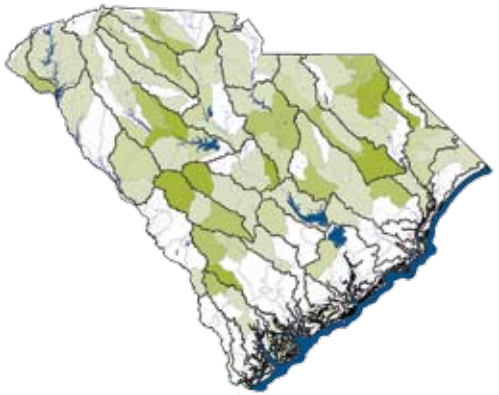
PROGRESS IN KEY CONSERVATION PRACTICES (APPLIED PRACTICES 2004–2006) TO REACH NATIONAL WATER QUALITY OBJECTIVES.[1]

Practice name (units) and number	2004	2005	2006	Total
332 Contour Buffer Strips (ac.)	60	58	258	376
391 Riparian Forest Buffer (ac.)	904	642	353	1,899
741 Grassed Buffer Strip (ac)	-	-	25	25
412 Grassed Waterway (ac)	15	10	4	29
393 Filter Strip (ac)	371	417	157	945
590 Nutrient Management (ac)	48,233	35,062	28,989	11,2284
100 Comprehensive Nutrient Management Planning (no.)	-	87	69	156
410 Grade Stabilization Structure (no)	5	1	3	9
330 Contour Farming (ac)	979	4,012	2,681	7,672
561 Heavy Use Area Protection (ac)	97	2,312	81	2,490
658 Wetland Creation (ac)	30	7	8	45
659 Wetland Enhancement (ac)	124	5,887	1,887	7,898
657 Wetland Restoration (ac)	11,271	3,793	7,053	22,117



CONSERVATION PLANS ADDRESSING CONCERN (NO.) RC: Excessive Nutrients and Organics in Surface Water

0 1 2–3 4 5–6



NUTRIENT MANAGEMENT (590) APPLIED ACRES

0 <200 201–400 401–800 >800

[1]*Conservation progress maps for grazing management, wetland creations, enhancements and restoration is in the chapter entitled "Healthy Plants and Animal Communities."*

WATER MANAGEMENT

Water Withdrawals and Water Consumption

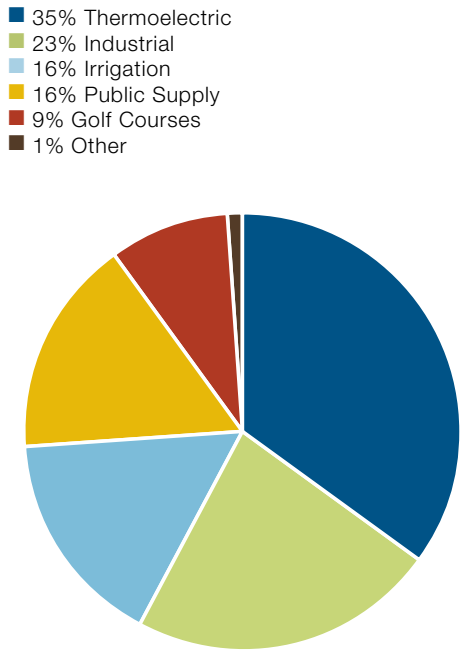
Estimated water withdrawals in the state (SCDHEC 2005) for 2004 were 30,600 acre-feet per day. Approximately 89% of all withdrawals were being used for thermoelectric power plant cooling. A vast majority of the water withdrawn is simply returned to the water body without being consumed. Water that is consumed (known as consumptive use) is the part of the water withdrawn that is evaporated, transpired, incorporated into products and crops, or consumed by livestock or humans. Consumptive use (i.e., water that is lost or no longer available for use) is different from water withdrawal. Estimates of the consumptive percentage of water withdrawn for South Carolina (USGS 1990) for thermoelectric, industrial (and mining), domestic and irrigation activities are estimated at 1%, 15%, 20% and 66%, respectively. Water withdrawals from agriculture and golf course irrigation were a relatively small component (<3%) of water withdrawals for South Carolina in 2005 (SCDHEC 2005). However, by applying the estimated consumptive factors (USGS 1990) to 2005 water withdrawals, agriculture and golf course irrigation make up 16% and 9% of all consumptive use in the state.

Estimated water consumed in crop irrigation was 49,000 ac-ft/year out of 74,000 ac-ft per year withdrawn. This estimate is also an average for the year; the majority of the irrigation water is used in the summer months (May-September).

INTERBASIN TRANSFER

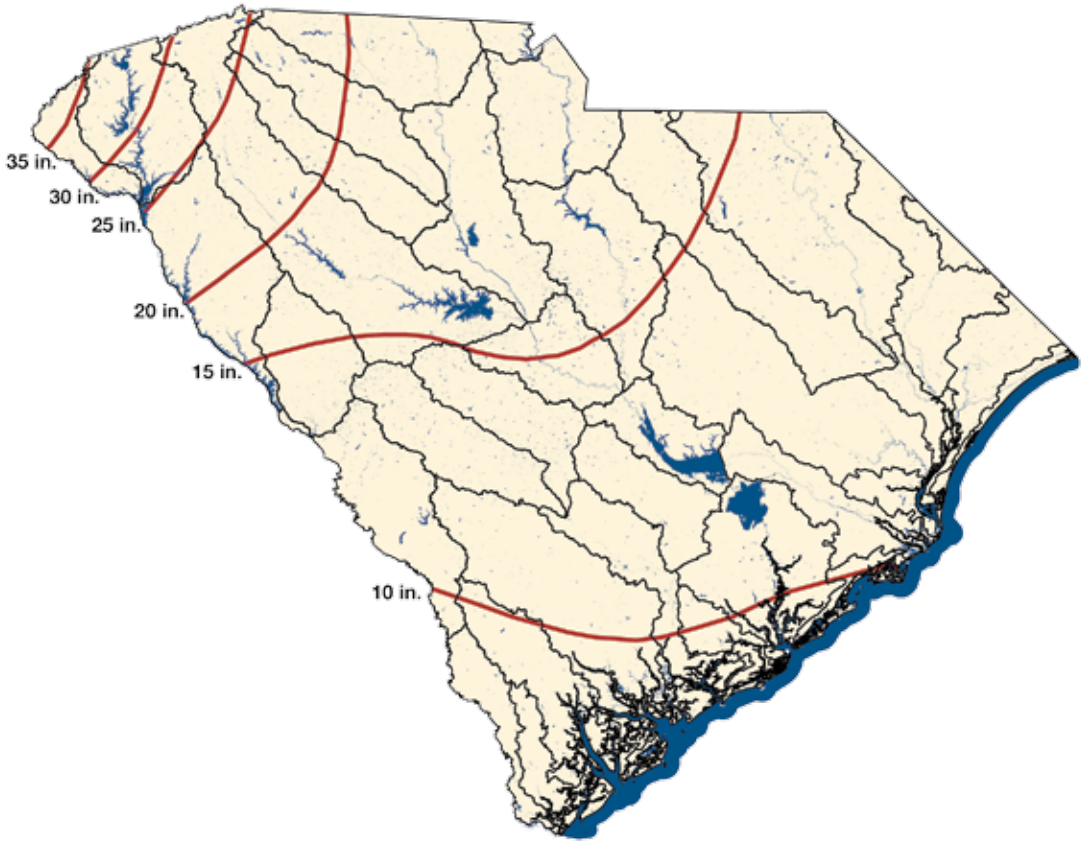
A special case of water losses is the case of interbasin transfer, i.e., where water is pumped from one basin, used and then discharged into another basin. Interbasin transfer generates some of the largest controversies and deepest conflicts between upstream and downstream users in water resource development (Yevjevich 2001). A prime example in South Carolina is the proposal by the communities of Concord and Kannapolis, NC to pump water from the Catawba and Yadkin Rivers to the Rocky River. On June 7, 2007, the South Carolina Attorney General filed an injunction and complaint with United States Supreme Court to stop the proposed interbasin transfer. It is likely that this conflict will continue for some time. It is also likely that South Carolina will see more conflict with neighboring states as urban demands for water continue to increase.

SOUTH CAROLINA ESTIMATED CONSUMPTIVE USE FOR 2004



[2]*Or 134 ac-ft per day*

Congaree Swamp



AVERAGE WATER YIELD (PRECIPITATION LESS EVAPOTRANSPIRATION) IN INCHES PER YEAR FOR 1948–1999.

(Source: SCDNR Water Plan 2004)

Water Inputs and Losses in South Carolina

The problems with water supply in the state relate to when and where water is consumed. Distribution of water yield in the state is uneven; the yield in the extreme south is less than the yield in the extreme northwest.

Distribution of water over time is also uneven. For example, on the Edisto River at Ghivans, SC, mean monthly flows for February and March were 8,350 and 8,469 acre-feet per day (ac-ft/d), respectively, while the means of monthly flow for June and July were approximately 3,253 and 3193 ac-ft/d, respectively. During the drought year of 2002, means of monthly flows for June, July and August were 470, 482 and 479 ac-ft/d, respectively. Conversely, demand for irrigation water is highest (May-September) when supply is at its lowest, and the problem becomes critical in drought years.

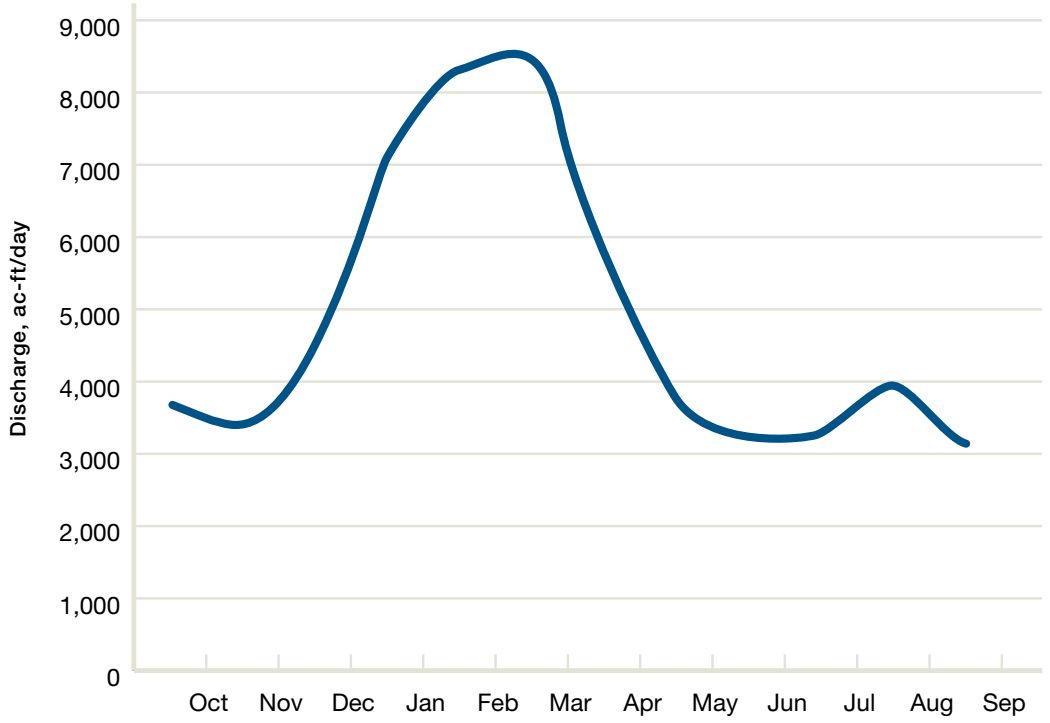
Local conservationists may refer to the National Drought Atlas (USACE 2007) to ascertain the frequency and severity, hence the risks and consequences of a given drought. Given this understanding, conservationists are able to gauge what management actions are appropriate to combat the risks and effects of a given drought.

A more succinct look at droughts can be viewed at the U.S. Drought Monitor which creates a weekly map at: http://www.drought.unl.edu/dm/monitor.html

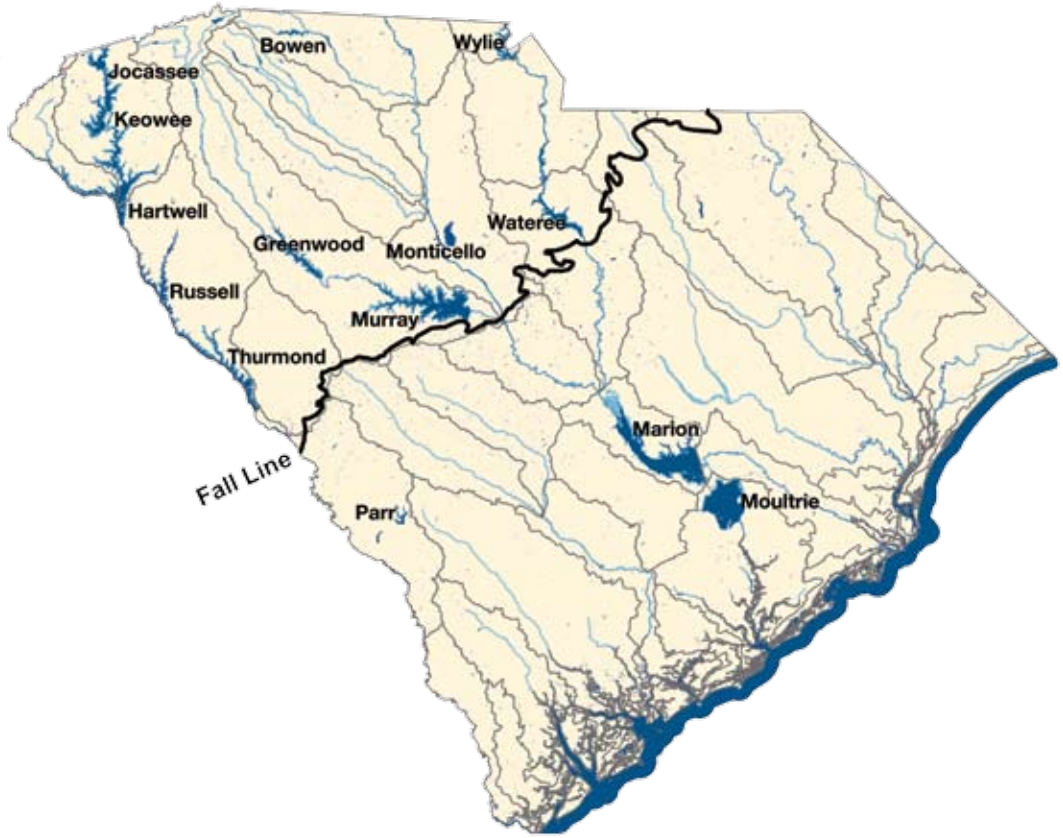
MEAN OF MONTHLY DISCHARGE AT GHIVANS, SC (USGS STN 217500)

Average water yield (precipitation less evapotranspiration) in inches per year for 1948–1999.

(Source: SCDNR Water Plan 2004)



[3]*For the period between January 1990 and December 2005*



MAJOR LAKES AND RIVERS IN SOUTH CAROLINA

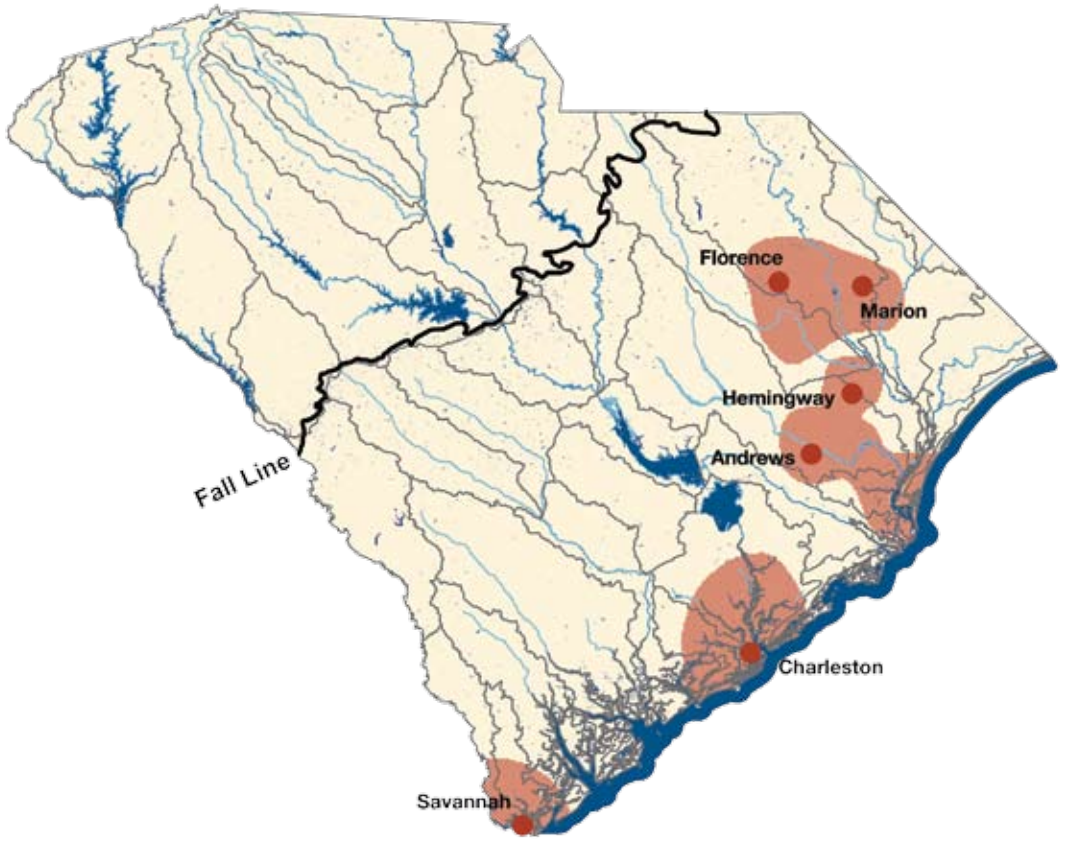
Surface and Ground Water

There are an estimated 1,600 lakes in the state with areas greater than 10 acres; these impound some 15 million acre-feet of water, 95% of which is contained in the 12 largest lakes in the state. Surface water flows are most susceptible to weather, both dry and wet periods. Low flows may impact water quality, fish and wildlife habitats, navigability and recreational use (where applicable) and, in estuaries, may result in salt water intrusion.

Ground water withdrawal occurs across the state, but there are significant differences between ground water wells that are found in the Coastal Plains and in those found in the Piedmont. In the zone below the 'fall line' (commonly referred to as the Coastal Plains), sediment covers base rock and increases in depth from the fall line (edge of the Piedmont) to about 3,800 ft in the southernmost part of the state. An estimated 95% of the state's ground water is held in the permeable clay or sand of these aquifers, which are typically bounded by impermeable clay or rock. Piedmont geology generally consists of hard

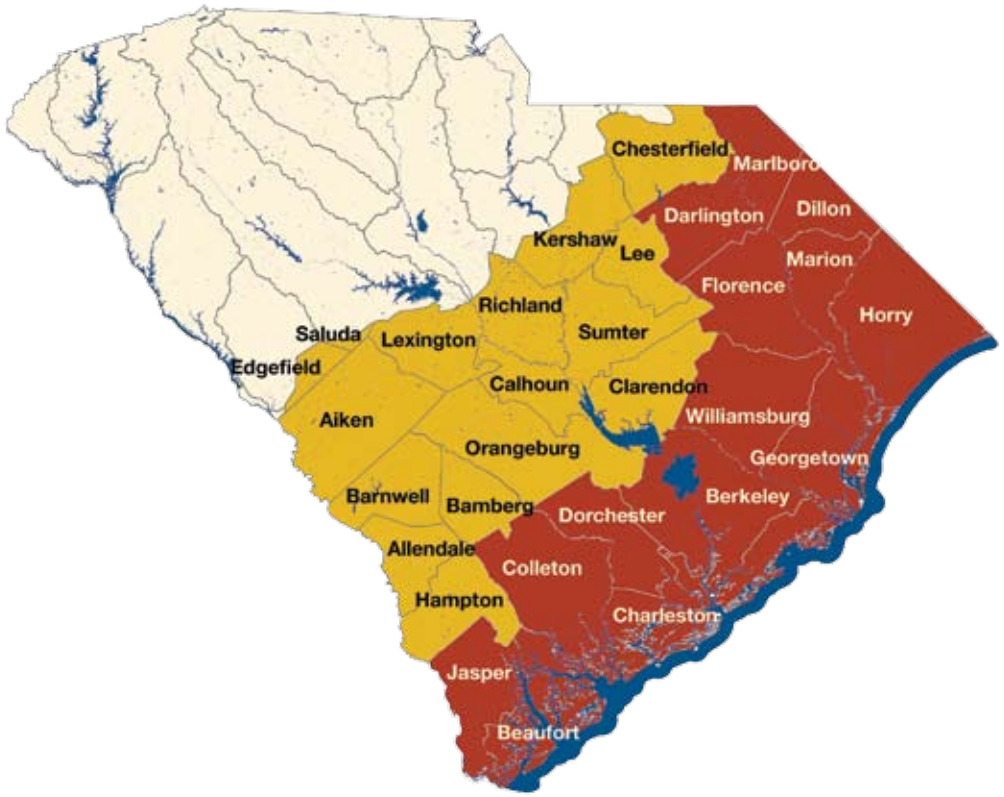
metamorphic and igneous rocks. Ground water in the Piedmont, therefore, typically occurs in (1) shallow aquifer systems stored in clay-rich saporlite or (2) in rock fracture zones. In shallow aquifer systems, sustained yields from the relatively impermeable saporlite (35–100 ft thick) typically do not exceed a few gallons per minute. Yields from fractured rock zones, where connectivity to other underground saturated zones is limited, typically yield between 5 and 15 gallons per minute. Conversely, wells that are located in the permeable sand and limestone aquifers of the Coastal Plains may yield as much as 3,000 gallons per minute. (SCDNR 2004, SCDNR 2007).

Ground water is considered a natural resource; however, pumping at rates that exceed natural recharge rates will cause water levels to decline. Groundwater observations between 2000 and 2005 show water level declines between 2000 and 2002 as a result of the drought experienced between 1998 and 2002. Subsequent to 2002, water level recoveries were indicated, some slight, others close to pre-drought levels (SCDNR 2007). When water is withdrawn from aquifers at a rate higher than it can be replaced, the ground water level begins to drop, forming a "cone of depression" around the zone that has been over-pumped, thus stressing the aquifer. Cones of depression are of particular concern in the Coastal Plains.



LOCATION OF MAJOR CONES OF DEPRESSION

(Source: SCDNR Water Plan 2004)



LOCATION OF CAPACITY USE AREAS AND NOTICE OF INTENT AREAS

Notice of Intent Area
Capacity Use Area

(Source: SCDHEC)

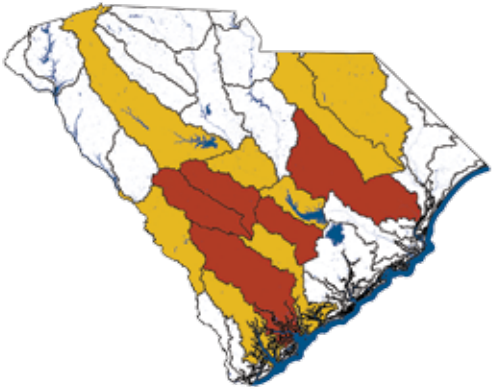
Groundwater Regulations

The Groundwater Use and Reporting Act has designated Capacity Use Areas where permits are required for ground water withdrawals that will equal or exceed three million gallons per month. There are four designated Capacity Use Areas: (1) Lowcountry (Beaufort, Colleton and Jasper Counties), (2) Trident (Berkeley, Charleston and Dorchester Counties), (3) Waccamaw (Georgetown and Horry) and (4) Pee Dee (Darlington, Dillon, Florence, Marion, Marlboro and Williamsburg Counties).

The Notice of Intent Area (all counties not in the capacity use area but located in the Coastal Plains) requires anyone installing a well withdrawing three million gallons or more of ground water per month to place her/his intent on public notice 30 days prior to drilling.

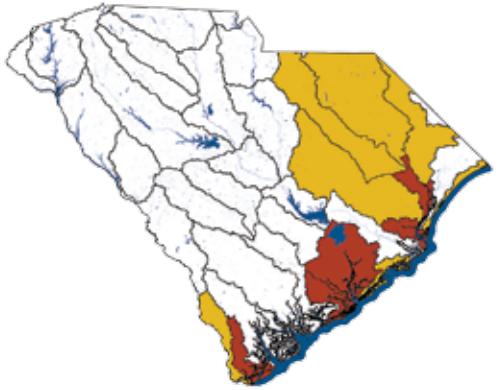
Priority Subbasins—Irrigation Water Usage and Groundwater Depletion

Irrigation water usage is taken from county-based irrigation figures (SCDNR 2004) and estimated by subbasin based on the distribution of agricultural land.



PRIORITY SUBBASIN FOR IRRIGATION WATER USAGE (ac-ft/day)

<15 15–50 >50



SUBBASIN IN CONE OF DEPRESSION (%)

<10% 10%–30% >30%

Low Flow, Turkey Creek

CONES OF DEPRESSION AS PERCENT OF SUBBASIN AREA AND IRRIGATION WATER USAGE (AND ACREAGE) BY SUBBASIN, SORTED BY IRRIGATION WATER USAGE

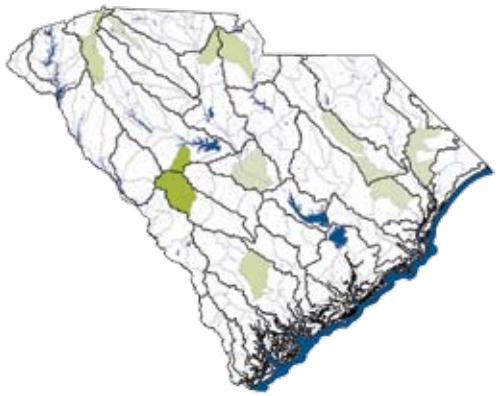
Subbasins	Subbasin in Cone of Depression (%)	Estimated Land Under Irrigation (ac)	Irrigation Land (% of Subbasin)	Irrigation Water Withdrawals (ac-ft/day)	>10% of Subbasin in Cone of Depression	>15% ac-ft/day Irrigation Withdrawals
03050207 Salkehatchie/ Combahee	0%	9,578	0.8%	100		●
03050203 North Fork Edisto	0%	9,501	2.0%	83		●
03050204 South Fork Edisto	0%	8,894	1.6%	78		●
03050205 Four Hole Swamp	0%	8,072	1.9%	77		●
03040205 Black	27%	7,577	0.6%	58	●	●
03050109 Saluda	0%	7,542	0.5%	49		●
03050111 Lake Marion	0%	3,476	1.0%	40		●
03050206 Edisto	9%	2,909	0.5%	32		●
03040201 Middle Pee Dee	29%	4,372	0.3%	25	●	●
03060106 Middle Savannah	0%	3,006	0.5%	23		●
03050208 Broad	3%	3,622	0.7%	22		●
03040202 Lynches	23%	3,401	0.4%	20	●	●
03050110 Congaree	0%	1,757	0.4%	19		●
03060107 Stevens	0%	2,862	0.6%	14		
03040204 Little Pee Dee	12%	2,512	0.4%	14	●	
03050104 Wateree	0%	1,582	0.2%	11		
03050105 Upper Broad	0%	1,504	0.2%	11		
03050107 Tyger	0%	1,311	0.3%	9		

Subbasins	Subbasin in Cone of Depression (%)	Estimated Land Under Irrigation (ac)	Irrigation Land (% of Subbasin)	Irrigation Water Withdrawals (ac-ft/day)	>10% of Subbasin in Cone of Depression	>15% ac-ft/day Irrigation Withdrawals
03060103 Upper Savannah	0%	1,150	0.2%	8		
03050108 Enoree	0%	825	0.2%	8		
03040207 Lower Pee Dee	48%	720	0.2%	8	●	
03050202 Stono	60%	461	0.2%	7	●	
03050106 Lower Broad	0%	685	0.1%	7		
03060101 Seneca	0%	1,128	0.2%	5		
03050201 Cooper	0%	433	0.1%	5	●	
03060109 Lower Savannah	23%	1,095	0.4%	4	●	
03050103 Lower Catawba	0%	775	0.1%	4		
03050112 Santee	9%	388	0.1%	4		
03040206 Waccamaw	4%	283	0.1%	4		
03060102 Tugaloo	0%	327	0.2%	3		
03040203 Lumber	0%	375	0.5%	2		
03060110 Calibogue Sound/ Wright River	48%	720	0.3%	2	●	
03050101 Upper Catawba	0%	159	0.2%	1		
03050209 Bulls Bay	20%	84	0.1%	1	●	
03050210 St. Helena Island	0%	<50	0.1%	1		
03040208 Coastal Carolina	21%	<50	<0.1%	<1	●	

Water Management Conservation Progress

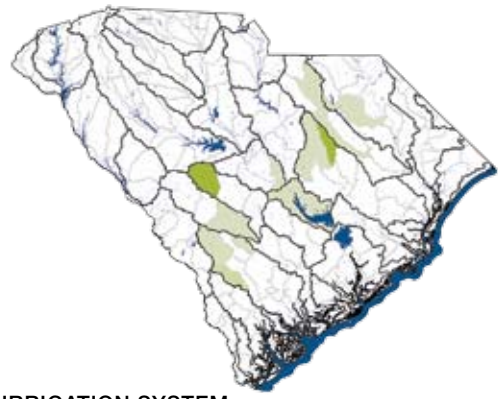
PROGRESS IN KEY CONSERVATION PRACTICES (APPLIED PRACTICES 2004-2006) TO REACH NATIONAL WATER MANAGEMENT OBJECTIVES

Practice name (units) and number	2004	2005	2006	Total
441 Irrigation System, Microirrigation (ac)	15[4]	374	1,050	1,424
442 Irrigation System, Sprinkler (ac)	6,013	2,387	15,715	24,115
449 Irrigation Water Management (ac)	1,997	8,186	3,883	14,066
587 Structure for Water Control (no)	55	60	63	178



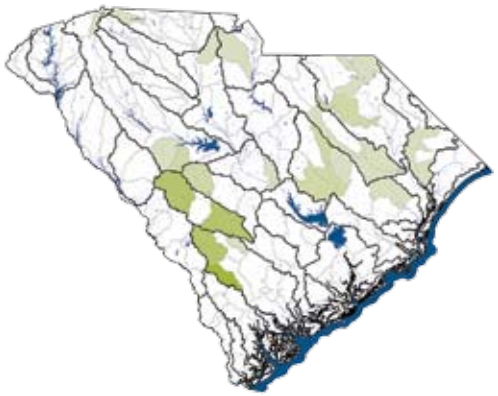
IRRIGATION SYSTEM, MICROIRRIGATION (441) APPLIED ACRES

0 <5 5–40 41–160 >160



IRRIGATION SYSTEM, SPRINKLER (442) APPLIED ACRES

0 <250 250–1,400 1,401–3,600 >3,600



IRRIGATION WATER MANAGEMENT (449) APPLIED ACRES

0 <100 100–300 301–500 >500

[4]*Reported as no. of systems in 2004.*

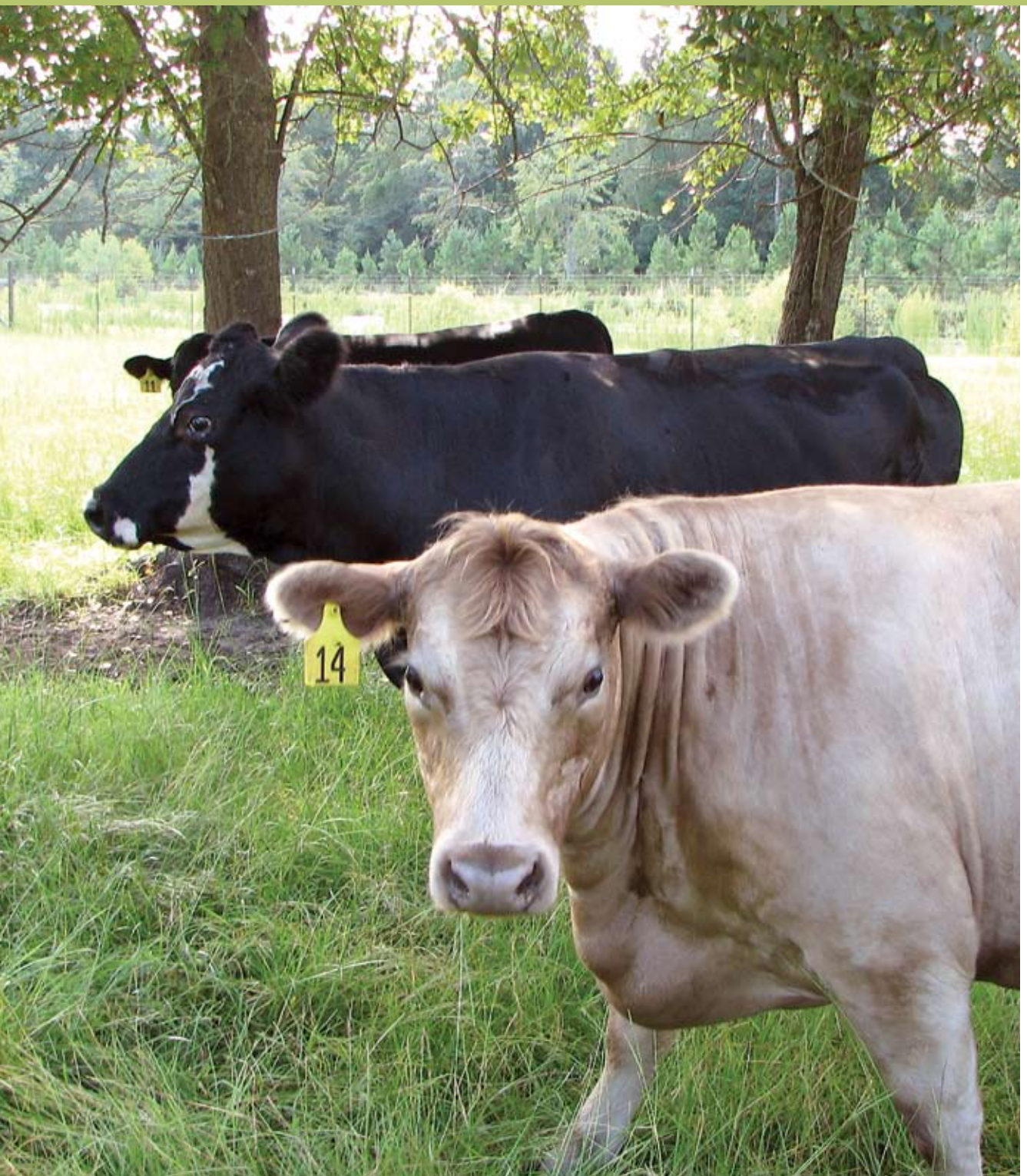
HEALTHY PLANT AND ANIMAL COMMUNITIES

"We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect."

Aldo Leopold, A Sand County Almanac, 1949

"There can be no greater issue than that of conservation in this country."

President Theodore Roosevelt
Confession of Faith Speech
Progressive National Convention
Chicago, IL, August 6, 1912



MISSION GOALS*

Agricultural crops and livestock are healthy and well managed.

Natural plant communities are vigorous and varied and shelter healthy and complex communities of animals.

OUTCOMES*

Grasslands, rangelands and forest ecosystems are productive, diverse and resilient.

Working lands and waters provide habitat for diverse and healthy wildlife, aquatic species, and plant communities.

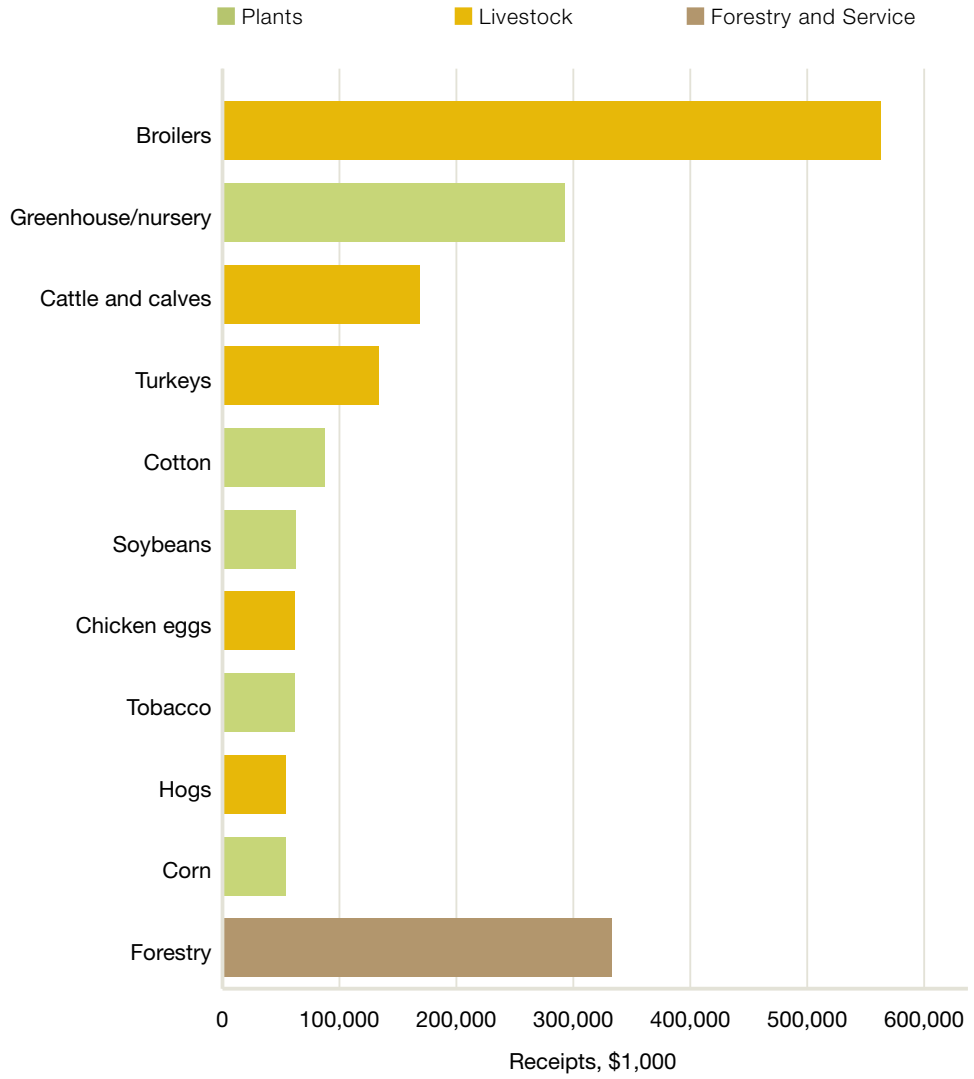
Wetlands provide quality habitat for migratory birds and other wildlife, protect water quality, and reduce flood damage.

**From the NRCS 2005–2010 Strategic Plan*

Plants and Animals of Economic Importance

The USDA's Economic Research Service (USDA-ERS) reports that the top ten agricultural commodities in the state accounted for 72% of the state's agricultural output of $2.1 billion. Of these top ten commodities, five were livestock-based and five were plant-based, accounting for $1.05 billion and $496 million in receipts, respectively (USDA-ERS 2006). Forestry and services accounted for $352 million or 16% of the state's agricultural output.

LEADING COMMODITIES FOR CASH RECEIPTS, 2005




Longleaf Pine

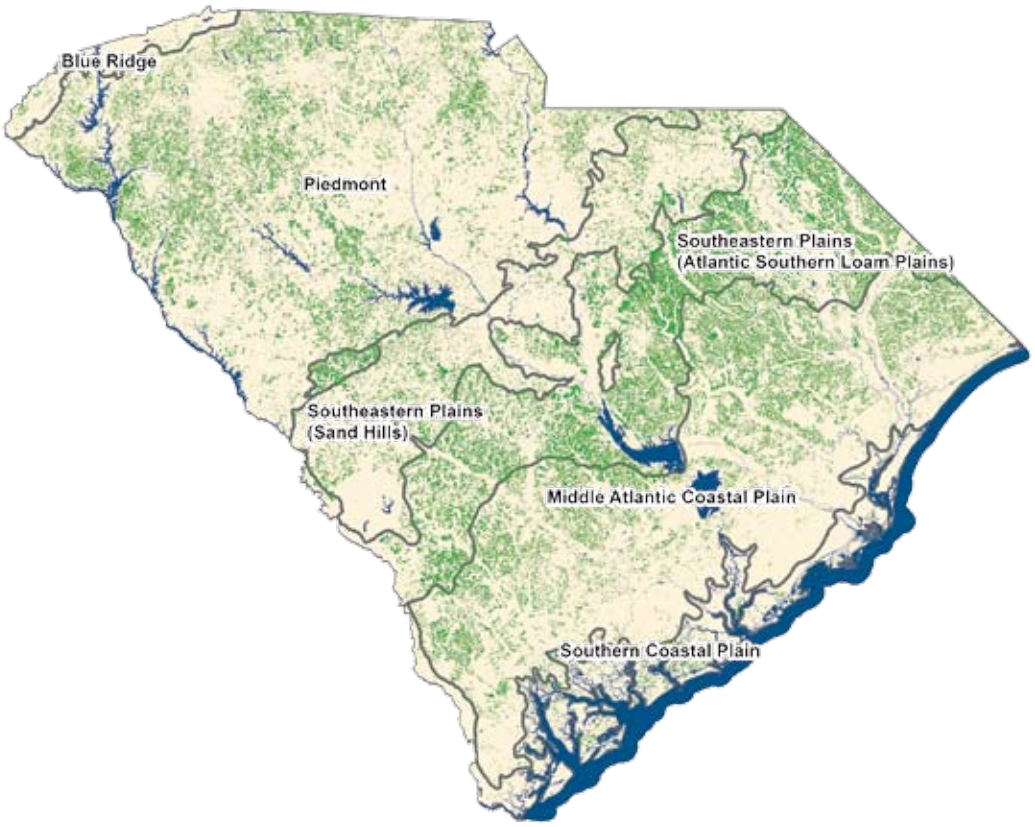
PLANTS OF ECONOMIC IMPORTANCE

Priority Subbasins

The five most important plant-based commodities for the state in 2005 (USDA-ERS 2006) were nursery green house floriculture and sod, cotton, soybeans, tobacco and corn.

It must be noted that there are some subbasins where other crops have a much greater impact on the economy, land-use, and the environment than the five major crops listed in this section. For example, South Carolina is second in the nation for peach production, much of it occurring on "the Ridge," a 30 mile long fertile plateau that extends from Trenton to Batesburg. Another peach growing area is found in the Greenville/Spartanburg area in the northwest of the state. Peaches were the 12th leading agricultural commodity in the state, accounting for $31.6 million of receipts in 2005. The Saluda, South Fork Edisto, Stevens Creek, Upper Broad, and Tyger are the main peach producing subbasins. Tomatoes, the 15th leading commodity in the state, accounted for $14 million in receipts–the Salkehatchie/Combahee, Black, Edisto, North Fork Edisto, Saluda, Lynches and South Fork Edisto are subbasins that rank high in vegetable acres harvested. In each of the Saluda, Upper Savannah, Lower Catawba, Upper Broad, Seneca and South Fork Edisto subbasins, land used for all hay, silage and forage exceeds 15,000 acres. (NASS 2002, USDA-ERS 2006).

Forestry acreages by county were acquired from the Clemson Forestry Survey (Clemson 2001). Data reflecting acres for nursery, green house floriculture and sod were acquired from the 2002 Agricultural Census (NASS 2002). Data reflecting acres harvested by county for cotton, soybeans, tobacco and corn were available for more recent dates (2006) and were acquired from the National Agricultural Statistics Service (NASS) Quickstats page (NASS 2006). Estimates of the harvested acres by eight-digit subbasin have been calculated from county data, weighted by agricultural land-use acreage, provided by the Farm Service Agency (FSA 2006).

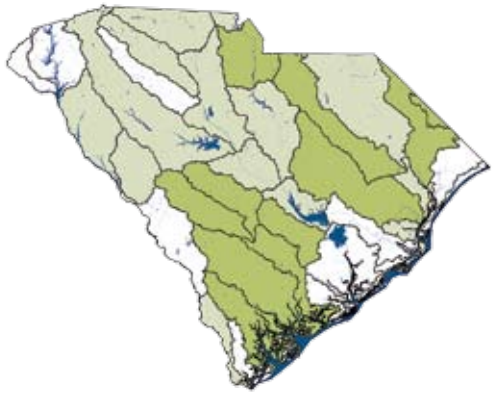


DISTRIBUTION OF FARM FIELDS THAT INCLUDE FIELDS USED FOR ROWCROPS, ORCHARDS, FORAGE AND HAY, AND PASTURE

FSA Farm Fields

Ecoregion Boundary

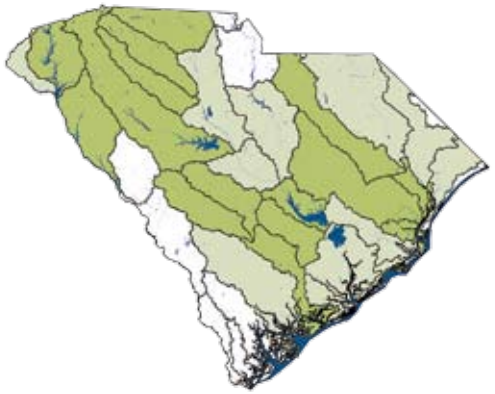
Tomatoes—Coastal Plain



ESTIMATED PRIVATE FOREST COVER AS A PERCENTAGE OF SUBBASIN DRAINAGE AREA

□ <45% ■ 45–60% ■ >60%

(Source: Clemson 2001)



ESTIMATED NURSERY, GREENHOUSE, FLORICULTURE AND SOD ACRES BY SUBBASIN

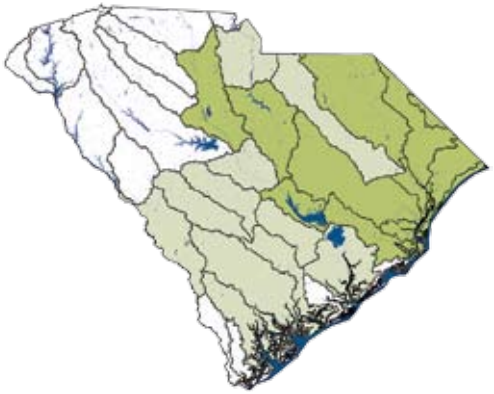
□ <200 ■ 200–2,200 ■ >2,200

(Source: NASS 2002, FSA 2006)

ESTIMATED HARVESTED COTTON AS A PERCENTAGE OF CROPLAND (FSA FARM FIELD ACREAGE) BY SUBBASIN

□ <1% ■ 1–10% ■ >10%

(Source: NASS 2002, FSA 2006)



ESTIMATED HARVESTED SOYBEAN AS A PERCENTAGE OF CROPLAND (FSA FARM FIELD ACREAGE) **BY SUBBASIN**

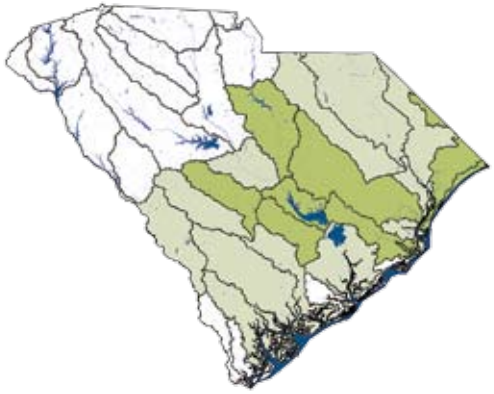
□ <2% ■ 2–13% ■ >13%

(Source: NASS 2002, FSA 2006)

ESTIMATED HARVESTED TOBACCO AS A PERCENTAGE OF CROPLAND (FSA FARM FIELD ACREAGE) **BY SUBBASIN** (NASS 2002, FSA 2006)

□ <0.5% ■ 0.5–1.5% ■ >1.5%

(Source: NASS 2002, FSA 2006)



ESTIMATED HARVESTED CORN AS A PERCENTAGE OF CROPLAND (FSA FARM FIELD ACREAGE) **BY SUBBASIN** (NASS 2002, FSA 2006)

□ <5% ■ 5–12% ■ >13%

(Source: NASS 2002, FSA 2006)

LAND COVERED BY ACRES OF PRIVATE FORESTLANDS (PERCENTAGE OF SUBBASIN AREA) AND ACRES OF NURSERY, GREENHOUSE, FLORICULTURE AND SOD BY SUBBASIN

Subbasin	Private Forests (% of Subbasin)	Nursery, Greenhouse, Floriculture and Sod (Ac.)	Private Forest Coverage >60%	Nursery, Greenhouse, Floriculture and Sod >2,200 ac
03050204 South Fork Edisto	90	4,338	●	●
03050205 Four Hole Swamp	71	7,689	●	●
03050206 Edisto	70	6,120	●	●
03040202 Lynches	68	2,252	●	●
03040205 Black	64	16,005	●	●
03050203 North Fork Edisto	64	6,598	●	●
03050103 Lower Catawba	80	<50	●	
03050207 Salkehatchie/Combahee	73	2,132	●	
03040204 Little Pee Dee	71	956	●	
03040203 Lumber	67	109	●	
03050208 Broad	61	199	●	
03050109 Saluda	54	11,663		●
03040207 Lower Pee Dee	60	9,010		●
03060103 Upper Savannah	57	6,676		●
03050107 Tyger	50	6,124		●
03060101 Seneca	42	5,436		●
03050105 Upper Broad	54	4,309		●
03050111 Lake Marion	46	3,666		●
03050108 Enoree	42	3,179		●
03050110 Congaree	49	2,196		
03050202 Stono	31	2,012		
03040201 Middle Pee Dee	47	2,006		
03050112 Santee	33	1,917		
03050104 Wateree	50	1,137		
03050106 Lower Broad	58	775		
03040206 Waccamaw	43	624		
03060102 Tugaloo	44	584		
03050201 Cooper	27	375		
03050209 Bulls Bay	9	370		
03060107 Stevens	52	105		
03060106 Middle Savannah	31	77		
03060109 Lower Savannah	48	65		
03040208 Coastal Carolina	2	<50		
03050210 St. Helena Island	23	<50		
03060110 Calibogue Sound/Wright River	37	<50		
03050101 Upper Catawba	60	<50		

HARVESTED ACRES FOR COTTON, SOYBEANS, TOBACCO AND CORN BY SUBBASIN

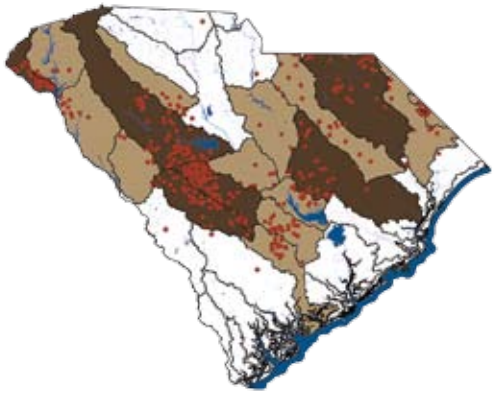
Subbasin	**Cotton** (% Cropland)	**Soybeans** (% Cropland)	**Tobacco** (% Cropland)	**Corn** (% Cropland)	**Cotton >10 % of Cropland**	**Soybeans >13 % of Cropland**	**Tobacco >1.5 % Cropland**	**Corn >12 % of Cropland**
03040203 Lumber	15	35	3	13	●	●	●	●
03050112 Santee	11	17	2	13	●	●	●	●
03040205 Black	11	25	1	21	●	●		●
03050111 Lake Marion	18	18	0	21	●	●		●
03040204 Little Pee Dee	14	31	3	12	●	●	●	
03040206 Waccamaw	5	30	6	14		●	●	●
03040208 Coastal Carolina	5	33	6	16		●	●	●
03040201 Middle Pee Dee	23	20	1	10	●	●		
03050203 North Fork Edisto	15	7	0	13	●			●
03050205 Four Hole Swamp	20	8	0	14	●			●
03040202 Lynches	14	12	1	12	●			
03050110 Congaree	19	11	0	11	●			
03050206 Edisto	14	7	0	12	●			
03050104 Wateree	4	49	0	14		●		●
03040207 Lower Pee Dee	10	17	3	10		●	●	
03050106 Lower Broad	4	57	0	2		●		
03050101 Upper Catawba	5	2	0	0				
03050103 Lower Catawba	4	5	0	1				
03050105 Upper Broad	1	0	0	0				

Subbasin	**Cotton** (% Cropland)	**Soybeans** (% Cropland)	**Tobacco** (% Cropland)	**Corn** (% Cropland)	**Cotton >10 % of Cropland**	**Soybeans >13 % of Cropland**	**Tobacco >1.5 % Cropland**	**Corn >12 % of Cropland**
03050107 Tyger	0	1	0	0				
03050108 Enoree	0	1	0	0				
03050109 Saluda	1	2	0	2				
03050201 Cooper	7	5	0	8				
03050202 Stono	2	1	0	4				
03050204 South Fork Edisto	10	7	0	10				
03050207 Salkehatchie/ Combahee	8	8	0	11				
03050209 Bulls Bay	0	0	0	3				
03050210 St. Helena Island	0	0	0	3				
03060101 Seneca	0	1	0	0				
03060102 Tugaloo	0	2	0	0				
03060103 Upper Savannah	0	0	0	0				
03060106 Middle Savannah	6	10	0	11				
03060107 Stevens	0	2	0	1				
03060109 Lower Savannah	1	2	0	3				
03060110 Calibogue Sound/ Wright River	2	0	0	4				

ANIMALS (LIVESTOCK) OF ECONOMIC IMPORTANCE

Priority Subbasins— The five most important livestock-based commodities for the state in 2005 (USDA-ERS 2006) were broilers, cattle and calves, turkeys, chicken eggs and swine (hogs and pigs).

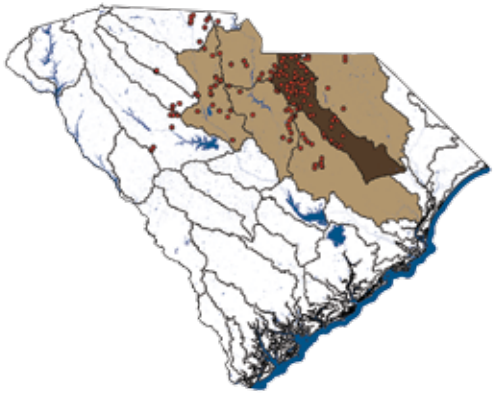
The most recent animal production data (for 2006) are available by county (NASS 2006), but much of the county data are merged by multi-county district. For confined livestock, (broilers, turkeys, chicken eggs and swine) live weights for each subbasin were estimated from design counts by SCDHEC-permitted animal feeding operations (SCDHEC 2006). Cow and calf data by county was acquired from 2002 Agricultural Census data (NASS 2002).



ESTIMATED BROILER LIVE WEIGHT BY SUBBASIN

Broiler House

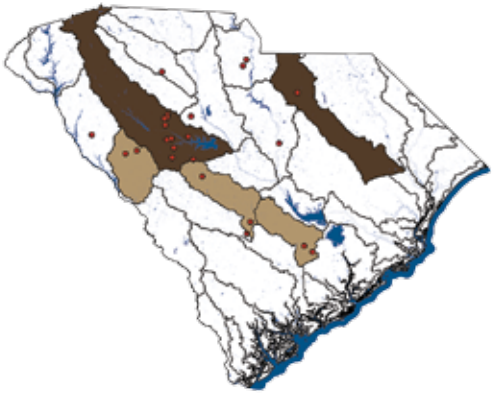
<1,000 1,000–7,500 >7,500



ESTIMATED TURKEY LIVE WEIGHT BY SUBBASIN

Turkey House

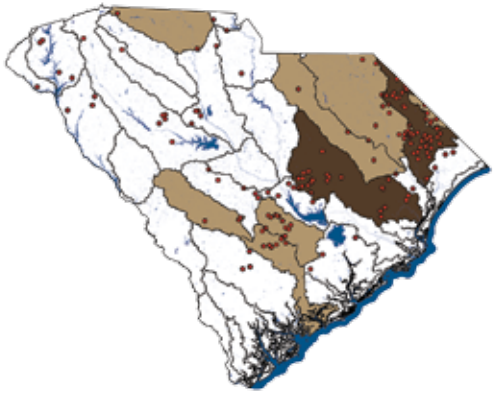
<10,000 10,000–20,000 >20,000



ESTIMATED LAYER LIVE WEIGHT BY SUBBASIN

Layer House

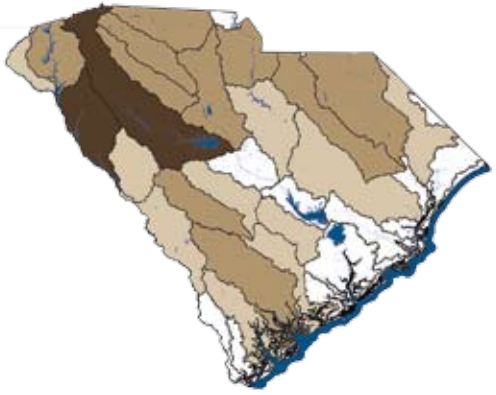
<500 500–1,000 >1,000



ESTIMATED SWINE LIVE WEIGHT BY SUBBASIN

Swine House

<1,000 1,000–5,000 >5,000



ESTIMATED CATTLE LIVE WEIGHT BY SUBBASIN

<5,000 5,000–15,000

15,001–30,000 >30,000

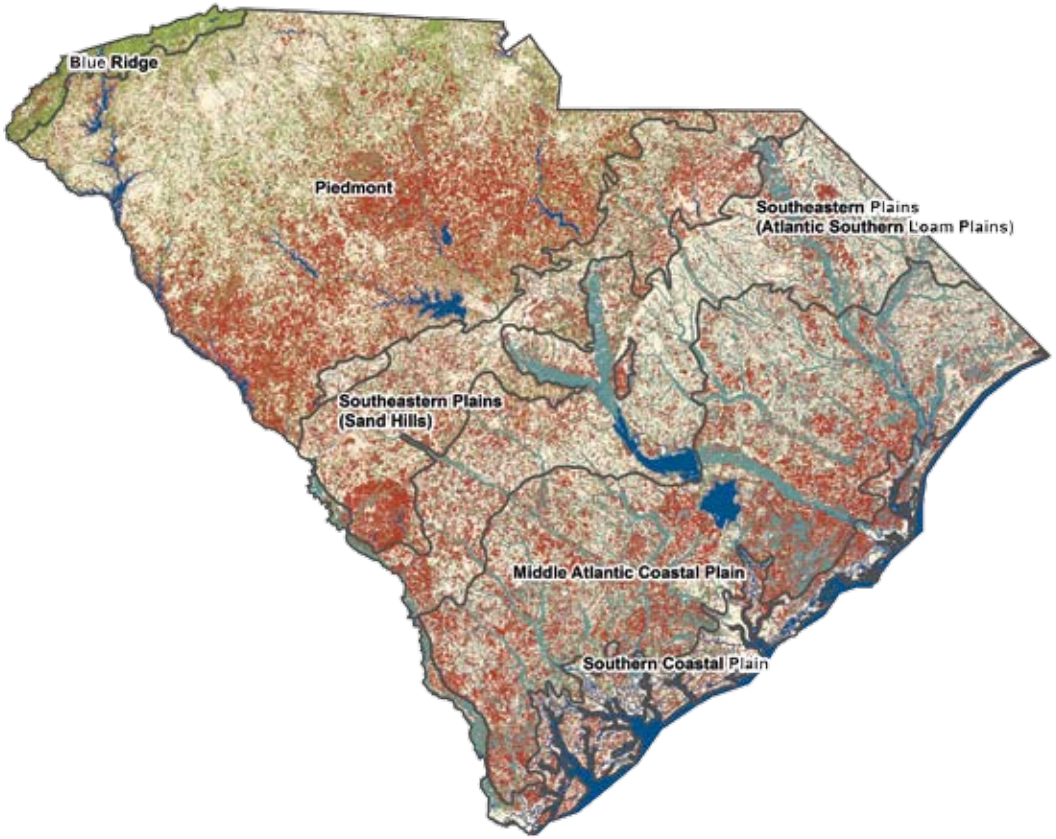
THE FOUR CONFINED ANIMALS OF MOST ECONOMIC IMPORTANCE (LIVE WEIGHTS IN 1,000 LBS, OR AU) BY SUBBASIN

Subbasin	Broiler AU	Turkey AU	Layer AU	Swine AU	Broiler Live wt. >20,000 AU	Tky Live Wt. >10,000 AU	Layer Live Wt. >500	Swine Live Wt. >1,000
03040201 Middle Pee Dee	8,803	15,634	0	4,533	●	●		●
03040205 Black	8,477	15,164	0	8,859	●	●		●
03040201 Middle Pee Dee	8,803	15,634	0	4,533	●	●		●
03040205 Black	8,477	15,164	0	8,859	●	●		●
03040202 Lynches	3,654	68,824	7,076	1,556		●	●	●
03050204 South Fork Edisto	13,445	0	60	1,059	●			●
03050109 Saluda	16,682	5,916	9,996	930	●		●	
03050203 North Fork Edisto	26,685	0	659	381	●		●	
03050205 Four Hole Swamp	5,984	0	803	2,424			●	●
03060102 Tugaloo	12,448	0	0	60	●			
03050103 Lower Catawba	316	12,478	440	30		●		
03050104 Wateree	1,245	16,779	320	0		●		
03050106 Lower Broad	756	18,657	400	114		●		
03060107 Stevens	2,455	0	800	0			●	
03040203 Lumber	2,760	0	0	2,739				●
03040204 Little Pee Dee	4,178	0	0	21,353				●
03050105 Upper Broad	120	6,868	0	3,293				●
03050206 Edisto	3,348	0	0	2,313				●
03040206 Waccamaw	232	0	0	273				
03040207 Lower Pee Dee	692	0	0	986				

Subbasin	Broiler AU	Turkey AU	Layer AU	Swine AU	Broiler Live wt. >20,000 AU	Tky Live Wt. >10,000 AU	Layer Live Wt. >500	Swine Live Wt. >1,000
03040208 Coastal Carolina	0	0	0	0				
03050101 Upper Catawba	0	1,224	0	17				
03050107 Tyger	0	3,264	400	0				
03050108 Enoree	1,859	1,836	0	15				
03050110 Congaree	2,192	0	0	9				
03050111 Lake Marion	4,860	0	0	522				
03050112 Santee	184	0	0	0				
03050201 Cooper	76	0	0	119				
03050202 Stono	0	0	0	0				
03050207 Salkehatchie\ Combahee	157	0	0	940				
03050208 Broad	0	0	0	0				
03050209 Bulls Bay	0	0	0	0				
03050210 St. Helena Island	0	0	0	0				
03060101 Seneca	4,307	0	0	216				
03060103 Upper Savannah	2,230	0	380	122				
03060106 Middle Savannah	438	0	0	0				
03060109 Lower Savannah	0	0	0	0				
03060110 Calibogue Sound/ Wright River	0	0	0	0				

CATTLE AND CALF POPULATIONS BY SUBBASIN

Subbasin	Estimated Cattle and calves (#)	Cattle and calves (#) >15,000
03050109 Saluda	82,530	●
03060103 Upper Savannah	44,918	●
03050103 Lower Catawba	26,347	●
03060101 Seneca	26,121	●
03050105 Upper Broad	24,243	●
03050207 Salkehatchie/Combahee	19,901	●
03050204 South Fork Edisto	18,416	●
03050106 Lower Broad	18,233	●
03050108 Enoree	15,748	●
03050107 Tyger	15,608	●
03040202 Lynches	15,226	●
03040201 Middle Pee Dee	15,095	●
03040205 Black	14,874	
03060107 Stevens	12,517	
03060102 Tugaloo	12,106	
03050203 North Fork Edisto	11,916	
03050208 Broad	10,163	
03050205 Four Hole Swamp	8,673	
03040204 Little Pee Dee	8,198	
03050104 Wateree	6,760	
03060106 Middle Savannah	6,074	
03050206 Edisto	6,053	
03050101 Upper Catawba	4,028	
03060109 Lower Savannah	3,751	
03050111 Lake Marion	3,729	
03050110 Congaree	3,232	
03040206 Waccamaw	3,179	
03050201 Cooper	1,801	
03050112 Santee	1,275	
03040207 Lower Pee Dee	1,140	
03040203 Lumber	808	
03050202 Stono	551	
03060110 Calibogue Sound/Wright River	337	
03050209 Bulls Bay	<100	
03050210 St. Helena Island	<100	
03040208 Coastal Carolina	<100	



GENERAL DISTRIBUTION OF NATIVE VEGETATION (WETLANDS, EVERGREEN FORESTS, DECIDUOUS AND MIXED FORESTS) BASED ON THE NATIONAL LAND-COVER DATASET (NLCD) FOR SOUTH CAROLINA

- Water
- Wetlands
- Evergreen Forests
- Deciduous and Mixed Forests
- Other

NATIVE PLANT COMMUNITIES

"Healthy, vigorous plant communities on rangeland, native and naturalized pasture, and forest lands protect soils quality, prevent soil erosion, provide sustainable forage and cover for wildlife, provide fiber, improve water quality, provide diverse habitat for wildlife, and sequester carbon" (NRCS Strategic Plan 2005–2010).

Descriptions of the native plant community are taken from more comprehensive descriptions found in the South Carolina Department of Natural Resources' 2005 Comprehensive Wildlife Conservation Strategy for 2005–2010 (SCDNR 2005).

BLUE RIDGE

Appalachian oak and oak pine forest are important to wildlife as the most extensive cover type in the Blue Ridge ecoregion. Scattered throughout the ecoregion are wet places embedded within primary habitat types, such as cold water streams, waterfalls, waterslides and bogs.

Distinct habitat types in the Blue Ridge ecoregion include the following: Appalachian oak and oak-pine forest; low elevation basic mesic forest; high elevation forest; riverbanks, streambanks and alder zones; moist or wet types due to unique landform; vertical or horizontal rock outcrop.

PIEDMONT

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

Distinct habitat types in the Piedmont ecoregion include the following: oak-hickory forest; river bottoms; Piedmont small stream forest; cove forest; grasslands and early successional habitat.

SAND HILLS

In the Sand Hills, plants are a complex of xeric pine and pine-hardwood forest types adapted to sandy soils, typically found in fluvial sand ridges. Historically, a canopy of longleaf pine and a sub-canopy of turkey oak prevail. This was interspersed with scrub oak species and scrub-shrub cover. Management that includes burning encourages the development of longleaf pine-wiregrass communities. Upland areas consist of forests dominated by hardwoods, primarily oaks and hickories. These hardwoods are typically found on fire-suppressed upland slopes near river floodplains or between rivers and tributaries. Vegetation composition is similar to the dominant composition of the Piedmont—the oak-hickory forest. Representative canopy trees include white oak *(Quercus alba)*, black oak *(Quercus velutina)*, post oak *(Quercus stellata)*, mockernut hickory *(Carya tomentosa)*, pignut hickory *(Carya glabra)*, loblolly pine *(Pinustaeda)*, flowering dogwood *(Cornus florida)*, and black gum *(Nyssa sylvatica)*.

In the river bottoms of the Sand Hills, one frequently finds hardwood-dominated woodlands with moist soils that are usually associated with major rivers dissecting the ecoregion. This forms a floodplain on underlying sediments extending into the Coastal Plains. Characteristic trees in this habitat are similar to that of the coastal plain river bottoms.

Distinct habitat types in the Sand Hills ecoregion include the following: Sandhills pine woodland; grassland and early successional habitats; seepage slopes; ponds and depressions (dominated by cypress/tupelo swamps and Carolina Bays); Blackwater stream systems and river bottoms.

Angel Tree, Charleston

COASTAL PLAINS (INCLUSIVE OF ATLANTIC SOUTHERN LOAM AND MID ATLANTIC COASTAL PLAINS)

Upland areas consist of forests dominated by hardwoods, primarily with oaks and hickories. These hardwoods are typically found on fire-suppressed upland slopes near river floodplains or between rivers and tributaries. Vegetation composition is similar to the dominant composition of the Piedmont—the oak-hickory forest. Representative canopy trees are the following: white oak *(Quercus alba)*, black oak *(Quercus velutina)*, post oak *(Quercus stellata)*, mockernut hickory *(Carya tomentosa)*, pignut hickory *(Carya glabra)*, loblolly pine *(Pinustaeda)*, flowering dogwood *(Cornus florida)*, and black gum *(Nyssa sylvatica)*.

In the river bottoms of the Coastal Plains, one frequently finds hardwood-dominated woodlands with moist soils usually associated with major river floodplains and creeks. Characteristic trees include these: sweetgum *(Liquidambar styraciflua)*, loblolly pine *(Pinus taeda)*, water oak *(Quercus nigra)*, willow oak *(Quercus phellos)*, laurel oak *(Quercus laurifolia)*, cherrybark oak *(Quercus pagoda)* and American holly *(Ilex opaca)*. The Cypress-tupelo swamp subtype typically near river bottoms. occurs on lower elevation sites as seasonally flooded swamps. It is usually transected by tannic-acid rivers and creeks and contains oxbow lakes and pools. Dominant trees are bald cypress *(Taxodium distichium)* and water tupelo *(Nyssa aquatica)*, swamp gum *(Nyssa biflora)*, Carolina ash *(Fraxinus caroliniana)*, water elm *(Planera aquatica)* and red maple *(Acer rubrum)*.

Distinct habitat types in the Coastal Plains include the following: pine woodland; sandhills pine woodland; upland forest; grassland and early successional habitat; ponds and depressions (dominated by cypress/tupelo swamps and Carolina Bays); hardwood slopes and stream bottoms; blackwater stream systems and river bottoms.

COASTAL ZONE (INCLUSIVE OF THE MIDDLE ATLANTIC COASTAL AND SOUTHERN COASTAL PLAIN)

Coastal Plain pine and hardwood forests typically extend into the Coastal Zone but vary due to coastal influences or land management practices characteristic of the Coast. The types of forest include Pine Woodland, Bottomland Hardwoods, Upland Oak-hickory forest, Southern Mixed Hardwood Forest, Marl Forest and Calcareous Cliff, and Cypress-tupelo swamp types. Cypress-tupelo swamps within the Coastal Zone may be influenced more by tidal activity than by river flows, but the water is typically fresh. Trees characteristic of the forests of the immediate Coastal Zone, barrier islands and inland dune systems include live oak *(Quercus virginiana)*, laurel oak *(Quercus laurifolia)*, cabbage palmetto *(Sabal palmetto)*, southern magnolia *(Magnolia grandiflora)*, and southern red cedar *(Juniperus silicicola)*. These evergreen-dominated forests are salt-tolerant and often support shrub thickets with yaupon holly, red bay and wax myrtle.

Distinct habitat types in the Coastal Zone include the following: forested habitats of the Coastal Plain; maritime forest; early successional habitats of the Coastal Plain; ponds and depressions; managed impoundments; tidal fresh and brackish systems; estuarine systems and isolated nonforested uplands.

Threatened and Endangered Native Plant Species

For the sake of space, this document only considers federally-listed threatened and endangered (T&E) species (USFWS 2007) which are used as key indicators of the state's plant health and diversity. Biologists have identified habitat protection as one of the most important actions to ensure the protection of South Carolina priority species. Loss and fragmentation of habitat have been identified as a major threat to many of the species listed as threatened and endangered in South Carolina.

THREATENED AND ENDANGERED NATIVE PLANT SPECIES IN SOUTH CAROLINA

Common Name	Alternative Name	Scientific Name
Bunched Arrowhead	-	*Sagittaria fasciculata*
Canby's Cowbane	Canby's Dropwort	*Oxypolis canbyi*
Chaffseed	-	*Schwalbea americana*
Confederate Wakerobin	Confederate Trillium	*Trillium reliquum*
Dwarfflower Heartleaf	-	*Hexastylis naniflora*
False Poison Sumac	Michaux's Sumac	*Rhus michauxii*
Jones' Pitcherplant	Mountain Sweet Pitcherplant	*Sarracenia rubra ssp. Jonesii*
Little Amphianthus	-	*Amphianthus pusillus*
Miccosukee Gooseberry	-	*Ribes echinellum*
Persistent Wakerobin	Persistent Trillium	*Trillium persistens*
Piedmont Mock Bishopweed	Harperella	*Ptilimnium nodosum*
Roughleaf Yellow Loosestrife	Roughleaf Loosestrife	*Lysimachia asperulifolia*
Schweinitz's Sunflower	-	*Helianthus schweinitzii*
Seaside Amaranth	Seabeach Amaranth	*Amaranthus pumilus*
Small Whorled Pogonia	-	*Isotria medeoloides*
Smooth Purple Coneflower	Smooth Coneflower	*Echinacea laevigata*
Southern Spicebush	Pondberry	*Lindera melissifolia*
Swamppink	Swamp-pink	*Helonias Bullata*
Wishbone Blue-eyed Grass	Reflexed Blue-eyed-grass	*Sisyrinchium dichotomum*


Foxgrape—Native

Known or Possible Distribution of Threatened and Endangered Native Plant Species

The South Carolina Distribution Records of Endangered, Threatened, Candidate and Species of Concern (USFWS 2006) are provided by county. Any subbasin that intersects with an affected county for each species from the USFWS distribution records is shown in the distribution maps in this section.

Priority Subbasins—Native Plant Species

NUMBER OF THREATENED AND ENDANGERED NATIVE PLANT SPECIES BY SUBBASIN

<0–1 1–3 4–6

BUNCHED ARROWHEAD

CANBY'S COWBANE

CHAFFSEED

CONFEDERATE WAKEROBIN

DWARFFLOWER HEARTLEAF

FALSE POISON SUMAC

JONES' PITCHERPLANT

LITTLE AMPHIANTHUS

MICCOSUKEE GOOSEBERRY

PERSISTENT WAKEROBIN

PIEDMONT MOCK BISHOPWEED

ROUGHLEAF YELLOW LOOSESTRIFE

SCHWEINITZ'S SUNFLOWER

SEASIDE AMARANTH

SMALL WHORLED POGONIA

SMOOTH PURPLE CONEFLOWER

SOUTHERN SPICEBUSH

SWAMP-PINK

WISHBONE BLUE-EYED GRASS

THREATENED AND ENDANGERED NATIVE PLANT SPECIES BY SUBBASIN, RANKED BY HIGHEST NUMBER OF SPECIES IN THE SUBBASIN

Subbasin	Bunched Arrowhead	Canby's Cowbane	Chaffseed	Confederate Wakerobin	Dwarfflower Heartleaf	False Poison Sumac	Jones' Pitcherplant	Little Amphianthus	Miccosukee Gooseberry	Persistent Wakerobin	Piedmont Mock Bishopweed	Roughleaf Yellow Loosestrife	Schweinitz's Sunflower	Seaside Amaranth	Small Whorled Pogonia	Smooth Purple Coneflower	Southern Spicebush	Swamppink	Wishbone Blue-eyed Grass	All Species
03050109 Saluda	●						●	●			●				●			●		6
03060106 Middle Savannah		●		●				●			●					●				5
03050101 Upper Catawba					●			●					●		●	●				5
03040204 Little Pee Dee		●	●			●						●								4
03040202 Lynches	●		●					●								●				4
03040201 Middle Pee Dee			●			●						●	●							4
03060102 Tugaloo										●					●	●		●		4
03050104 Wateree						●						●	●			●				4
03050201 Cooper		●	●														●			3
03040203 Lumber			●			●						●								3
03050112 Santee		●	●														●			3
03050202 Stono		●	●											●						3
03050107 Tyger	●				●															3
03050105 Upper Broad					●										●				●	3
03040205 Black		●	●																	2
03050208 Broad		●															●			2
03050108 Enoree					●															2
03050103 Lower Catawba													●		●					2

THREATENED AND ENDANGERED NATIVE PLANT SPECIES BY SUBBASIN, RANKED BY HIGHEST NUMBER OF SPECIES IN THE SUBBASIN (CONTINUED)

Subbasin	Bunched Arrowhead	Canby's Cowbane	Chaffseed	Confederate Wakerobin	Dwarfflower Heartleaf	False Poison Sumac	Jones' Pitcherplant	Little Amphianthus	Miccosukee Gooseberry	Persistent Wakerobin	Piedmont Mock Bishopweed	Roughleaf Yellow Loosestrife	Schweinitz's Sunflower	Seaside Amaranth	Small Whorled Pogonia	Smooth Purple Coneflower	Southern Spicebush	Swamppink	Wishbone Blue-eyed Grass	All Species
03040207 Lower Pee Dee												●		●						2
03060101 Seneca							●									●				2
03040206 Waccamaw			●									●								2
03050110 Congaree		●																		1
03050206 Edisto		●																		1
03050205 Four Hole Swamp		●																		1
03050111 Lake Marion		●																		1
03060109 Lower Savannah																	●			1
03050203 North Fork Edisto											●									1
03050207 Salkehatchie		●																		1
03050204 South Fork Edisto											●									1
03060107 Stevens									●											1
03050209 Bull's Bay																				0
03060110 Calibogue Sound																				0
03040208 Coastal Carolina																				0
03050106 Lower Broad																				0
03050210 St. Helena's island																				0
03060103 Upper Savannah																				0

DISTRIBUTION OF WETLAND SYSTEMS OF INTEREST TO CONSERVATION AGRICULTURE IN SOUTH CAROLINA BASED ON THE NATIONAL WETLANDS INVENTORY

- Water
- Riverine (R)
- Palustrine Forested (PFO)
- Palustrine Emergent (PEM)
- Palustrine Scrub/Shrub (PSS)
- Palustrine Aquatic Beds (PAB)
- Other

WETLANDS

In terms of percentage of wetland coverage, South Carolina ranks fifth in the nation, preceded only by Alaska, Florida, Louisiana and Maine. With 23% of total land area in the state designated wetland, this translates to roughly 4.5 million acres of coverage, mostly comprised of freshwater (SCDHEC 1998, Dahl 1999).

Of particular interest to agricultural conservation are the riverine and palustrine (shallow freshwater) systems which may be described as follows (based on the Cowardin *et al.* 1979 classification of wetlands):

RIVERINE SYSTEMS

The riverine system includes deepwater habitats contained within freshwater channels (salt content <0.5 parts per thousand) that either contain moving water (periodic or continuous contains) or connect two bodies of standing water.

PALUSTRINE SYSTEMS

Palustrine freshwater (salt content <0.5 parts per thousand) systems are non-tidal wetlands smaller than 20 acres and less than 6.6 ft deep. They are typically dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and farmed wetlands. Classes within the palustrine systems include the following:

Palustrine Forested (NWI Code: PFO) The palustrine forested class makes up the majority (about 70%) of all wetlands in the state (Dahl 1999)—forested wetlands comprised primarily of woody vegetation 20 ft tall or taller.

Palustrine Scrub/Shrub (NWI Code: PSS) These wetlands are characterized by species that include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. About 12% of the state's wetlands consist of this type (Dahl 1999).

Palustrine Emergent (NWI Code: PEM) Emergent wetlands are characterized by herbaceous vegetation which is present for most of the growing season in most years and comprises about 4% of the state's wetlands (Dahl 1999).

Palustrine Aquatic Beds (NWI Code: PAB) Aquatic beds are dominated by plants that grow on or below the surface of the water for most of the growing season in most years and comprise about half of one percent (~0.5%) of the state's wetlands (Dahl 1999).

Congaree Swamp

Charleston

Priority Subbasins–Wetlands

ESTIMATED PERCENTAGE
OF TOTAL LAND AREA IN
SUBBASINS COVERED BY WETLANDS

<10% 10–25% >25%

SUBBASINS RANKED BY ESTIMATED PERCENTAGE OF SUBBASIN LAND COVERED BY WETLANDS

Subbasin	Tot. Wetland Area (% of Subbasin)	Wetlands Covering > 25% of Subbasin
03040203 Lumber	40	●
03050112 Santee	39	●
03040206 Waccamaw	38	●
03040204 Little Pee Dee	35	●
03060109 Lower Savannah	35	●
03040207 Lower Pee Dee	31	●
03040205 Black	27	●
03050202 Stono	27	●
03050201 Copper	26	●
03040201 Middle Pee Dee	25	●
03050206 Edisto	25	●
03050207 Salkehatchie/Combahee	24	
03050205 Four Hole Swamp	23	
03040208 Coastal Carolina	22	
03060110 Calibogue Sound/Wright River	22	
03050208 Broad	21	
03040202 Lynches	21	
03050209 Bulls Bay	20	
03050110 Congaree	19	
03050111 Lake Marion	18	
03050104 Wateree	14	
03060106 Middle Savannah	14	
03050204 South Fork Edisto	14	
03050203 North Fork Edisto	12	
03050210 St. Helena Island	5	
03050108 Enoree	3	
03050107 Tyger	3	
03050106 Lower Broad	3	
03050109 Saluda	2	
03060107 Stevens	2	
03060103 Upper Savannah	2	
03050105 Upper Broad	2	
03050103 Lower Catawba	1	
03060102 Tugaloo	1	
03060101 Seneca	0	
03050101 Upper Catawba	0	

INVASIVE SPECIES

Terrestrial Invasive Species

The following species are considered by conservationists in the state to be a concern within the agricultural environment. Information about their distribution (by county) was acquired from the NRCS's National Plants Database (USDA NRCS 2007). Any subbasin that intersects with an affected county for each species from the Plants Database is shown in the distribution maps in this section. Descriptions of the invasive species and their impacts are adapted from the Invasive.org website (Invasive.org 2007).

ASIATIC DAYFLOWER

Asiatic Dayflower, *Commelina communis L.*

This annual or perennial herb prefers moist, highly fertile soils.

ASIATIC WITCHWEED

Asiatic Witchweed (or Witchweed), *Striga asiatica*

This parasitic plant can infest agricultural crops such as corn and sorghum. The host plant's nutrients are depleted and its energy spent supporting the parasitic witchweed, reducing yields.

BASKETGRASS

Basketgrass, *Oplismenus hirtellus (L.)*

Also known as wavy basketgrass, this is a creeping or rambling perennial grass, highly tolerant of shade. Seeds are sticky and can be carried by humans and animals.

NO DISTRIBUTION MAP AVAILABLE IN SC

Benghal Dayflower (or Tropical Spiderwort), *Commelina. Benghalensis*

This annual or perennial herb prefers moist, highly fertile soils. It infests croplands and displays resistance to Roundup® and is most troublesome to cotton, soybeans and peanuts. It is also found on roadsides, irrigation ditches, field borders and wet pastures.

CHINABERRY

Chinaberry, *Melia azedarach*

This deciduous tree can reach 50 ft, invades disturbed areas and is commonly found along roads and forest edges. It has the potential to grow in dense thickets, restricting the growth of native vegetation.

CHINESE TALLOW

Chinese Tallow (Popcorn Tree), *Triadica Loureiro*

A deciduous tree capable of reaching 60 ft in height, it has the ability to invade high quality native forests, to displace native plants and to alter soil conditions because of high tannin contents in leaf litter.

Chinese Tallow


Privet

CHINESE/ASIAN WISTERIA

Chinese/Asian Wisteria, *Wisteria sinensis*

Chinese Wisteria is a deciduous woody vine capable of growing to 70 ft long. Chinese Wisteria can displace native vegetation and kill trees and shrubs by girdling them. It has the ability to change the structure of a forest by killing trees and altering the light availability to the forest floor.

CHINESE/EUROPEAN PRIVET

Chinese/European Privet, *Ligustrum sinense, Ligustrum vulgare*

A thick evergreen shrub that may grow to 30 ft, this plant forms dense thickets in fields and the understory of woods. It shades and out-competes native species.

JAPANESE HONEYSUCKLE

Japanese Honeysuckle, *Lonicera japonica*

This evergreen or semi-evergreen vine forms in a variety of habitats that include forest floors and canopies, roadsides, wetlands, and disturbed areas. It can girdle saplings and forms a dense canopy that shades everything underneath.

JAPANESE STILT GRASS

Japanese Stilt Grass (Nepalese Browntop), *Microstegium vimineum*

An annual commonly invading flood plains, this grass is also found in ditches, forest edges, fields, and trails. It is very shade tolerant and can displace vegetation native to floodplains.

KUDZU

Kudzu, *Pueraria DC*

This climbing deciduous vine prefers open, disturbed habitats like old fields, right-of-ways and forest edges, growing over and smothering all other vegetation, including trees.

MULTIFLORA ROSE

Multiflora Rose, *Rosa multiflora*

This thorny perennial shrub forms thickets in pastures, fields and forest edges, restricting livestock and wildlife movement and displacing native vegetation.

Japanese Stilt Grass

Kudzu

SILKTREE (MIMOSA)

NO DISTRIBUTION MAP AVAILABLE IN SC

Silktree (Mimosa), *Albizia julibrissin*

A small tree that invades any type of disturbed habitat (old fields, stream banks, and roadsides) and, once established, is difficult to remove.

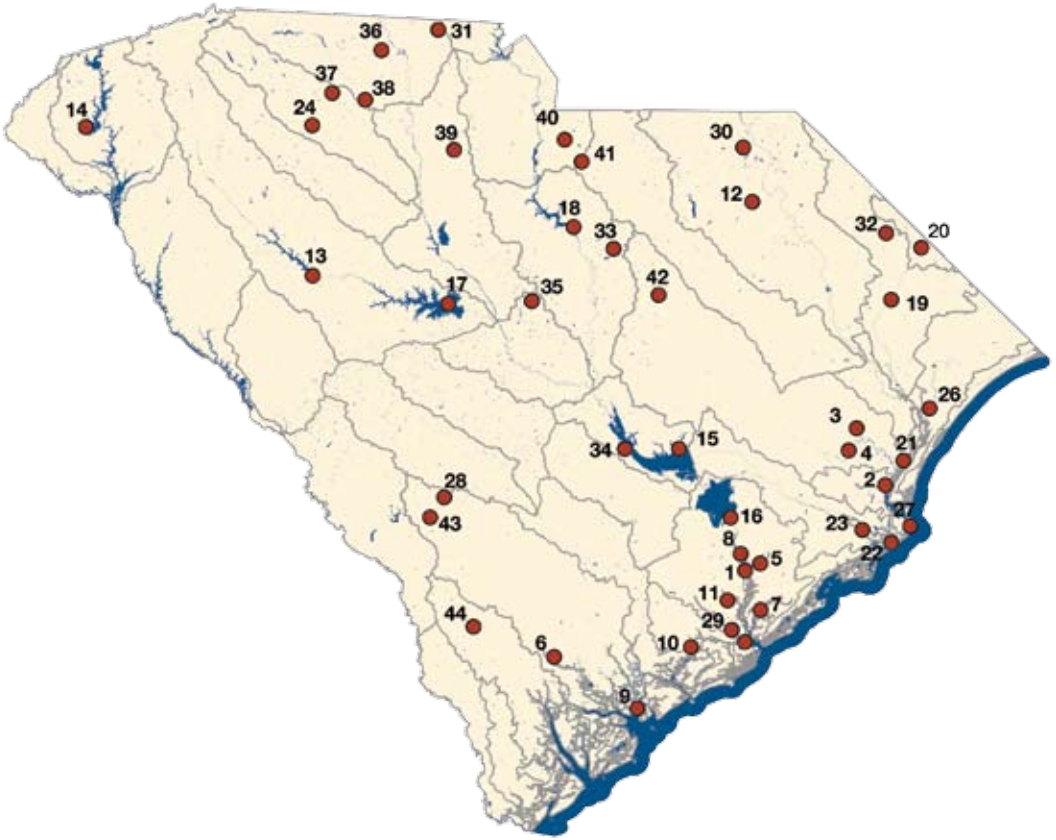
Tropical Apple Soda, *Solanum viarum*

This large, thorny, perennial shrubby forb invades pastures, fields, and parks forming thick stands that can be impenetrable to livestock and wildlife.

Invasive Aquatic Species

Aquatic plants typically cause adverse impacts on native plant and animal populations, disrupt natural ecosystem functions, and impair beneficial human use of waterways, thus imposing monetary (e.g., clogged water intake for power plants, factories and farms) and environmental costs (impacting native plant and animal species) on society. The South Carolina Department of Natural Resources (SCDNR) has identified 44 problem areas that will receive treatment in 2007. The sites are based on an aquatic plant survey conducted by the S.C. Department of Natural Resources staff and public input (SCDNR 2007a).

The identified problem areas listed are open to access and use by the public and are therefore considered eligible for some type of public funding. Acres of infestation (coverage) are approximations based on observations made in 2006 (SCDNR 2007a).



TREATMENT SITES THAT HAVE BEEN IDENTIFIED BY SCDNR FOR 2007

● All 2007 SCDNR Treatment Sites

SCDNR SITES LISTED IN THE SCDNR 2007 ANNUAL AQUATIC PLANT MANAGEMENT PLAN (SCDNR 2007a)

Waterbody (SCDNR Site No.)	**Species Identified**	**Coverage (ac)**
Back River Reservoir (1)	Hydrilla, Water Hyacinth, Water Primrose, Fanwort	380
Adjacent to Winyah Bay (2)	Phragmites	300
Black Mingo Creek (3)	Alligator Weed, Parrotfeather	30
Black River (4)	Alligator Weed	50
Bonneau Ferry (5)	Water Hyacinth, Water Primrose, Frog's Bit, Lotus, Cattails, Cutgrass, Pennywort, Parrotfeather, Fanwort, Coontail	50
Combahee River (Borrow pit) (6)	Hydrilla, Water Primrose, Water Hyacinth	5
Charleston Harbor (7)	Phragmites	485
Cooper River (and adjacent ricefields) (8)	Hydrilla, Water Primrose, Water Hyacinth	3,000
Donnelley/Bear Island WMA (9)	Cutgrass, Frog's Bit, Cattails, Phragmites	50
Dungannon Plantation Heritage Preserve (10)	Cutgrass, Frog's Bit, Cattails, Water Primrose, Swamp Loosestrife	20
Goose Creek Reservoir (11)	Water Hyacinth, Water Lettuce, Water Primrose, Hydrilla	60
Lake Darpo (12)	Water Lily, Milfoil	15
Lake Greenwood (13)	Hydrilla, Slender Naiad	100

Waterbody (SCDNR Site No.)	**Species Identified**	**Coverage (ac)**
Lake Keowee (14)	Hydrilla	10
Lake Marion (15)	Alligator Weed, Brazilian Elodea, Hydrilla, Water Primrose, Slender Naiad	1,000
Lake Moultrie (16)	Alligator Weed, Water Primrose, Brazilian Elodea, Hydrilla, Slender Naiad	150
Lake Murray (17)	Hydrilla, Illinois Pondweed, Water Primrose, Alligator Weed	200
Lake Wateree (18)	Hydrilla, Cutgrass	50
Little Pee Dee River (19)	Alligator Weed	100
Lumber River (20)	Alligator Weed	40
Pee Dee River (21)	Water Hyacinth, Phragmites	50
Santee Coastal Reserve (22)	Phragmites	1,200
Santee Delta WMA (23)	Phragmites	25
Tyger River WMA (24)	Water Primrose, Hydrilla	90
U.S.Naval Weapons Station (25)	Frog's Bit, Water Primrose, Water Hyacinth, Phragmites	210
Waccamaw River (26)	Water Hyacinth, Phragmites	50
Yawkey Wildlife Center (27)	Phragmites	100
Barnwell State Park (28)	Waterlily	3
Charles Towne Landing State Park (29)	Duckweed, Alligator Weed, Pennywort, Cyanobacteria	4

SCDNR SITES (CONTINUED)

Waterbody (SCDNR Site No.)	**Species Identified**	**Coverage (ac)**
H. Cooper Black Recreation Area (30)	Spatterdock	2
Kings Mountain State Park (31)	Slender Naiad	4
Little Pee Dee State Park (32)	Spikerush, Cowlily	15
N.R. Goodale State Park (33)	Waterlily, Watershield	60
Santee State Park (34)	Coontail	10
Sesquicentennial State Park (35)	Waterlily, Watershield	10
Lake Cherokee (36)	Water Primrose	5
Lake Edwin Johnson (37)	Water Primrose, Hydrilla, Pondweed	10
Jonesville Reservoir (38)	Water Primrose, Pondweed	25
Mountain Lakes (39)	Water Primrose, Alligator Weed, Parrotsfeather	5
Lancaster Reservoir (40)	Water Primrose, Alligator Weed	8
Sunrise Lake (41)	Pondweed	15
Lake Ashwood (42)	Waterlily	2
Lake Edgar Brown (43)	Water Primrose, Coontail	60
Lake George Warren (44)	Cattails, Water Primrose, Coontail	20

Algae—Piedmont pond

Aquatic Invasive Species Management Plan

The South Carolina Aquatic Invasive Species Management Plan (SCDNR 2007b) considers the following seven species as being a particular problem to South Carolina:

- Hydrilla, *Hydrilla verticillata*
- Water Hyacinth, *Eichhornia crassipes*
- Common Reed, *Phragmites australis*
- Water Lettuce, *Pistia stratiodes*
- Brazilian Elodea, *Elodea densa*
- Alligator Weed, *Alternanthera philoxeroides*
- Water Primrose, *Ludwigia hexapetala*
- Giant Salvinia, *Salvinia molesta*

A description of each of these species and their respective locations in the 2007 annual aquatic plant management plan (SCDNR 2007b) follows:

HYDRILLA MANAGEMENT SITES, 2007

● SCDNR Treatment Sites

WATER HYACINTH MANAGEMENT SITES, 2007

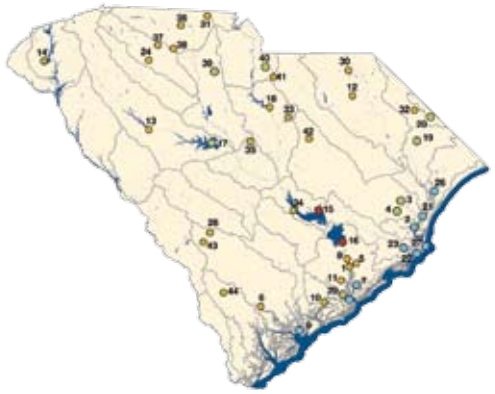
● SCDNR Treatment Sites

Hydrilla, *Hydrilla verticillata*

This introduced submersed perennial has spread to 11 public waterbodies and over 55,000 acres throughout the state. The largest populations have occurred in Lake Marion, Lake Moultrie, Lake Murray, the Cooper River, Goose Creek Reservoir, and Back River Reservoir. Hydrilla reproduces rapidly and forms large growths at the water surface where dense surface mats displace beneficial native species. This plant increases mosquito breeding sites, impairs boating activities, clogs municipal and industrial cooling water intakes, decreases oxygen levels, thus reducing water quality, and decreases lakefront property value. Hydrilla is the most problematic aquatic plant in the state with over $14.7 million spent since 1982 in controlling over 58,000 acres statewide (SCDNR 2007b).

Water Hyacinth, *Eichhornia crassipes*

Water hyacinth is a free-floating plant with the largest concentration found in water bodies near Charleston such as the Back River Reservoir, Cooper River and Goose Creek Reservoir. A population can completely dominate a water body, forming floating mats that exclude native species, cover coves and shoreline areas, prevent public and boating access to lakes, and clog industrial, municipal and electric power plant water intakes. Large infestations inhibit water flow, causing upstream flooding during heavy rains. Water hyacinth is the second most problematic invasive aquatic plant in South Carolina. Since 1985, over 14,000 acres of water hyacinth have been treated in South Carolina's public waterways at a cost of over $1.3 million. Annual treatments help keep this prolific plant



WATER HYACINTH MANAGEMENT SITES FOR BRAZILIAN ELODIA, PHRAGMITES AND ALLIGATOR WEED, 2007

Brazilian Elodia Phragmites
Alligator Weed Other

in check in most areas (SCDNR 2007b).

Common Reed, *Phragmites australis*

Phragmites is a tall grass that grows up to 10 ft tall and forms dense monotypic stands. The variety that occurs in South Carolina originated in Europe. Phragmites is most problematic in the waters near Georgetown. The coverage of this plant is not fully known in South Carolina, but estimates are that it exceeds 3,000 acres and it is spreading. It is more commonly found in freshwater impoundments along the coast and in estuaries and marsh ecosystems. It is not good waterfowl food, and it outcompetes native plants that provide food and habitat for waterfowl (SCDNR 2007b).

Water Lettuce, *Pistia stratiodes*

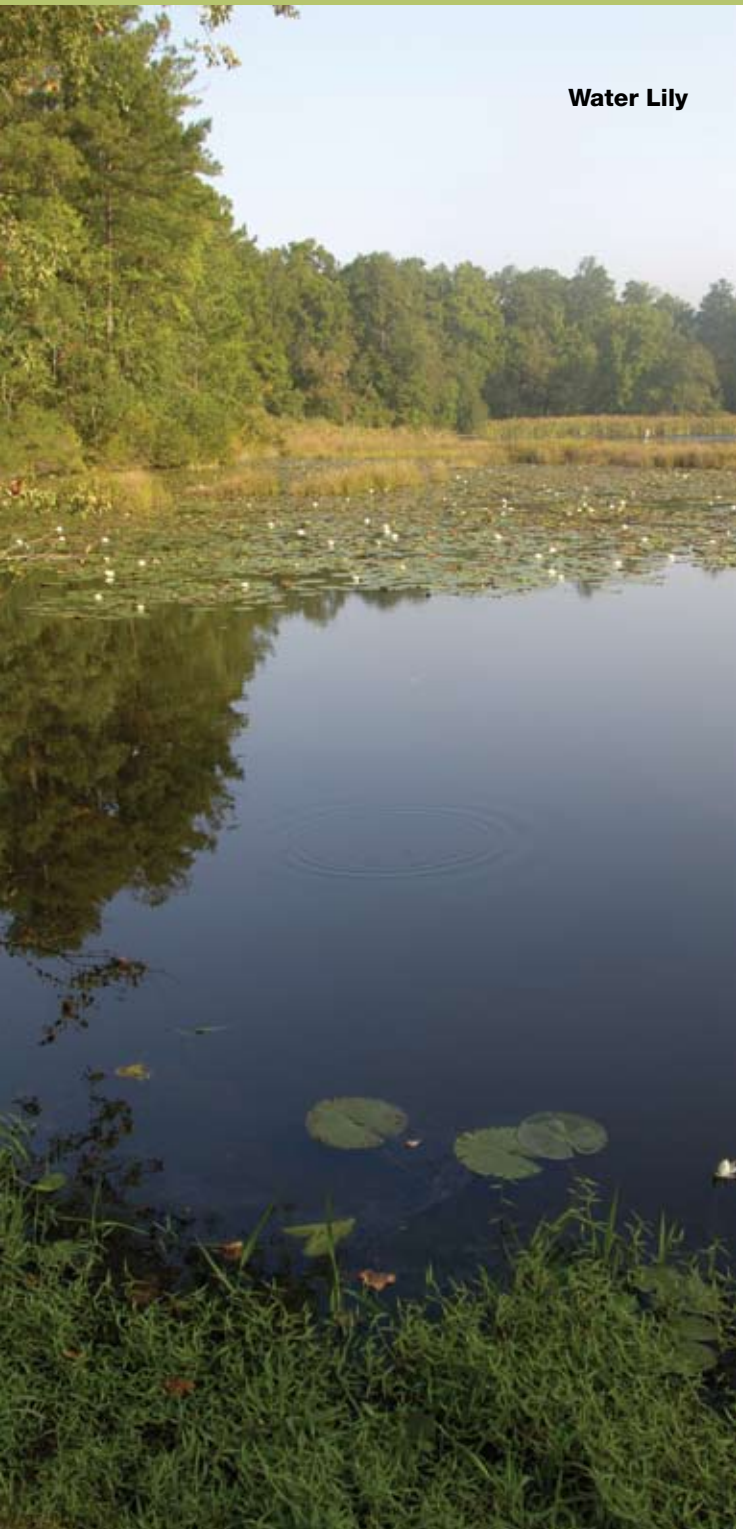
Water lettuce is a free-floating perennial and is present in Goose Creek Reservoir, north of Charleston. Water lettuce forms large floating mats that impair water flow, public access and use of waterways, and clog water intakes. Large populations can completely cover the water surface in small lakes and small coves of large lakes, degrading water quality and impacting native plants and animals. This species reproduces rapidly from a single plant and is easily spread to other water bodies by man (SCDNR 2007b).

Brazilian Elodea, *Elodea densa*

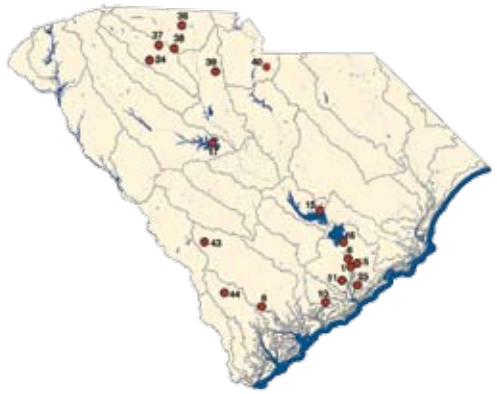
Brazilian elodea was the most problematic submersed aquatic plant in South Carolina prior to the introduction of hydrilla in 1982. After introduction into a lake, it grows rapidly and creates dense mats that choke out native plants that do not grow as quickly. It impedes boating, fishing, swimming, water skiing and other aquatic activities. The mats are unsightly, trap sediment, and provide poor habitat for fish. It will form a monotypic stand that can become so dense that water movement is restricted and can cause fluctuations in water quality. This plant spreads readily through fragmentation (SCDNR 2007b).

Alligator Weed, *Alternanthera philoxeroides*

Alligator weed is an aggressive, emergent perennial found throughout South Carolina but most problematic in waters of the northern Pee Dee Basin. Alligator weed spreads rapidly by fragmentation. Biological control agents introduced many years ago, such as alligator weed fleabeetles and stem borer moths, keep populations in most of the state under control. Alligator weed displaces native vegetation, disrupts navigation, recreation, and water flow by the formation of impenetrable mats. It decreases uptake for agricultural, municipal and industrial purposes and expands human health risks with increases in mosquito breeding habitats (SCDNR 2007b).



Water Lily



WATER PRIMROSE MANAGEMENT SITES, 2007

● SCDNR Treatment Sites

Water Primrose, *Ludwigia hexapetala*

Water primrose is an emergent perennial that grows to 3 ft tall with stems that may be many feet long when floating on the water. It is found throughout the state in man-made impoundments but is most problematic from the fall line to the coast. There are problem populations in Back River Reservoir, Goose Creek Reservoir, and the Santee Cooper lakes. This shoreline plant is very difficult to control due to extensive underground rhizomes where new shoots can float on the water surface and extend far from shore. Adverse impacts include restricted public access to waterways and use of shoreline areas, impaired navigation in small channels, restricted water flow, formation of free-floating mats, and clogging of water intakes (SCDNR 2007b).

Giant Salvinia, *Salvinia molesta*

Giant salvinia is a small, free floating, introduced aquatic fern. Giant salvinia was first found in South Carolina in 1995 in a private pond in Colleton County and later in Jasper County. In both cases, the populations were eliminated. Populations of giant salvinia in North Carolina and Georgia provide a close source for new infestations in South Carolina. Its rapid growth characteristics, doubling its biomass every seven days, could make this one of the most problematic plants ever. Giant salvinia can impact irrigation systems, navigable waters, fisheries, electric power production, and municipal and industrial water intakes, having the potential to influence water quality and disturb natural aquatic vegetation (SCDNR 2007b).

FISH AND WILDLIFE

According to SCDNR's "Comprehensive Wildlife Conservation Strategy 2005–2010" (SCDNR 2005), there are 1,240 species of fish and wildlife that have immediate conservation needs. Without attention, many of these species will become endangered or even extinct. For the sake of space, this document only considers a small portion of these species, namely the threatened and endangered (T&E) species (USFWS 2007). These species can be used as key indicators of the state's wildlife health and diversity. Biologists have identified habitat protection as one of the most important actions to ensure the protection of South Carolina priority species. Loss and fragmentation of habitat have been identified as a major threat to many of the species listed as threatened and endangered in South Carolina.


Carolina Heelsplitter

THREATENED AND ENDANGERED FISH AND WILDLIFE SPECIES (USFWS 2007)

Common Name	Scientific Name	Status
Bachman's Warbler	*Vermivora bachmanii*	Endangered
Bog Turtle	*Clemmys muhlenbergii*	Threatened, Similarity of Appearance
Carolina Heelsplitter	*Lasmigona decorata*	Endangered, Critical Habitat
Eastern Indigo Snake	*Drymarchon corais couperi*	Threatened
Flatwoods Salamander	*Ambystoma cingulatum*	Threatened
Green Sea Turtle	*Chelonia mydas*	Threatened
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Endangered
Kirtland's Warbler	*Dendroica kirtlandii*	Endangered
Leatherback Sea Turtle	*Dermochelys coriacea*	Endangered
Piping Plover	*Charadrius melodus*	Threatened, Critical Habitat
Red-Cockaded Woodpecker	*Picoides borealis*	Endangered
Shotnose Sturgeon	*Acipenser brevirostrum*	Endangered
West Indian Manatee	*Trichechus manutus*	Endangered
Wood Stork	*Mycteria americana*	Endangered

Known or Possible Distribution of Threatened and Endangered Fish and Wildlife Species

The South Carolina Distribution Records of Endangered, Threatened, Candidate and Species of Concern (USFWS 2006) are provided by county. Any subbasin that intersects with an affected county for each species from the USFWS distribution records is shown in the distribution maps in this section. The range of the piping plover and the marine vertebrates (green, leatherback, Kemp's Ridley sea turtles and the West Indian Manatee) is restricted to all the coastal subbasins.

BACHMAN'S WARBLER

BOG TURTLE[1]

CAROLINA HEELSPLITTER

EASTERN INDIGO SNAKE

FLATWOODS SALAMANDER

KIRTLAND'S WARBLER

RED COCKADED WOODPECKER

WOOD STORK

SHORTNOSE STURGEON

[1]*In the Blue Ridge ecoregion.*

Selected Fish Species of Concern

SCNRCS's State Wildlife Biologist has also identified a number of native fish species of concern, namely: Bluebarred Pygmy Sunfish, *Elassoma okatie;* Broadtail Madtom, *Noturus spp.;* Carolina Darter, *Etheostoma collis;* Carolina Pygmy Sunfish, *Elassoma boehlkei;* Margarets River Cruiser, *Macromia margarita;* Robust Redhorse, *Moxostoma robustum;* and the Savannah Lilliput, T*oxolasma pullus.* The known or possible distributions for these fish species of concern have been acquired from the Naturserve website (Natureserve 2006).

BLUEBARRED PYGMY SUNFISH

BROADTAIL MADTOM

CAROLINA DARTER

CAROLINA PYGMY SUNFISH

MARGARETS RIVER CRUISER

ROBUST REDHORSE

SAVANNAH LILLIPUT

Priority Subbasins—Fish and Wildlife

NUMBER OF THREATENED AND ENDANGERED SPECIES BY SUBBASIN

Excluding Marine Species (green sea turtle, Kemp's Ridley sea turtle, leatherback sea turtle and West Indian manatee)

<2 2–3 >3

THREATENED AND ENDANGERED FISH AND WILDLIFE SPECIES BY SUBBASIN, RANKED BY HIGHEST NUMBER OF SPECIES IN THE SUBBASIN[2]

Subbasin	Carolina Heelsplitter	Shortnose Sturgeon	Bachman's Warbler	Bog Turtle	Eastern Indigo Snake	Flatwoods Salamander	Kirtland's Warbler	Red Cockaded woodpecker	Wood Stork	Piping Plover	All Species
03050201 Cooper		●	●			●	●	●	●	●	7
03050202 Stono		●	●			●	●	●	●	●	7
03050208 Broad		●			●	●	●	●	●	●	7
03060109 Lower Savannah		●			●	●	●	●	●	●	7
03050112 Santee		●				●	●	●	●	●	6
03050206 Edisto			●			●	●	●	●	●	6
03050207 Salkehatchie					●	●	●	●	●	●	6
03050209 Bulls Bay			●			●	●	●	●	●	6
03060110 Calibogue Sound					●	●	●	●	●	●	6
03040206 Waccamaw		●					●	●	●	●	5
03050210 St. Helena's island						●	●	●	●	●	5
03040205 Black		●					●	●	●		4
03040207 Lower Pee Dee							●	●	●	●	4
03040208 Coastal Carolina							●	●	●	●	4
03050205 Four Hole Swamp		●				●		●	●		4
03040201 Middle Pee Dee		●						●	●		3
03040202 Lynches	●							●	●		3
03040203 Lumber							●	●	●		3

[2]*This excludes the marine species.*

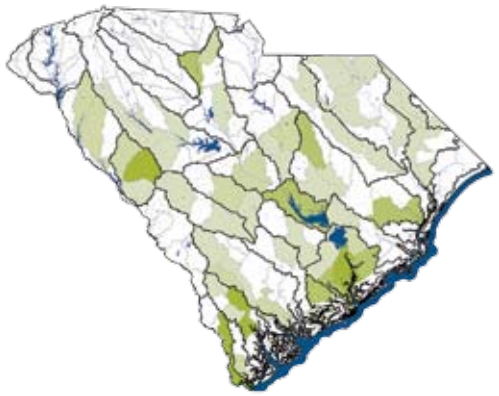
THREATENED AND ENDANGERED FISH AND WILDLIFE SPECIES BY SUBBASIN, RANKED BY HIGHEST NUMBER OF SPECIES IN THE SUBBASIN (CONTINUED)

Subbasin	Carolina Heelsplitter	Shortnose Sturgeon	Bachman's Warbler	Bog Turtle	Eastern Indigo Snake	Flatwoods Salamander	Kirtland's Warbler	Red Cockaded woodpecker	Wood Stork	Piping Plover	All Species
03040204 Little Pee Dee							●	●	●		3
03050109 Saluda				●				●	●		3
03050111 Lake Marion						●		●	●		3
03050203 North Fork Edisto						●		●	●		3
03050204 South Fork Edisto						●		●	●		3
03060106 Middle Savannah		●						●	●		3
03060107 Stevens	●							●	●		3
03050103 Lower Catawba	●							●			2
03050108 Enoree				●				●			2
03060103 Upper Savannah								●	●		2
03050101 Upper Catawba	●										1
03050104 Wateree								●			1
03050105 Upper Broad				●							1
03050106 Lower Broad								●			1
03050107 Tyger				●							1
03050110 Congaree								●			1
03060101 Seneca				●							1
03060102 Tugaloo				●							1

Healthy Plant and Animal Communities Conservation Progress

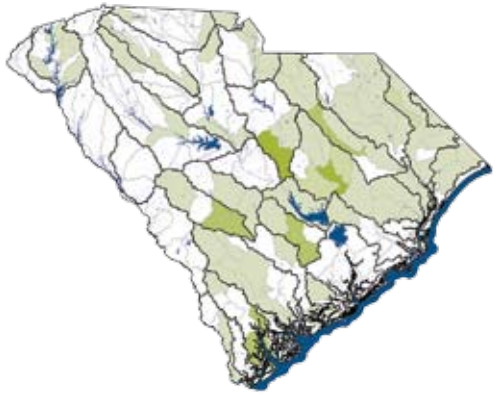
PROGRESS IN KEY CONSERVATION PRACTICES (APPLIED PRACTICES 2004-2006) TO REACH NATIONAL HEALTHY PLANT AND ANIMAL COMMUNITY OBJECTIVES

Practice name (units) and number	2004	2005	2006	Total
338 Prescribed Burning (ac)	8,636	8,307	11,101	28,044
472 Use Exclusion (ac)	6,090	4,667	12,162	22,919
528 Prescribed Grazing (ac)	141	3,881	5,886	9,908
595 Integrated Pest Management (ac)	35,552	31,398	21,512	88,462
643 Restoration and Management of Declining Habitats (ac)	19	-	3	22
644 Upland Wildlife Habitat Management (ac)	5,441	4,684	5,199	15,324
645 Wetland Wildlife Habitat Management (ac)	17,278	18,815	18,238	54,331
657 Wetland Restoration (ac)	11,270	3,793	7,052	22,115
658 Wetland Creation (ac)	30.2	7.3	8.4	45.9
659 Wetland Enhancement (ac)	124	5,887.3	1,886.5	7,897.8



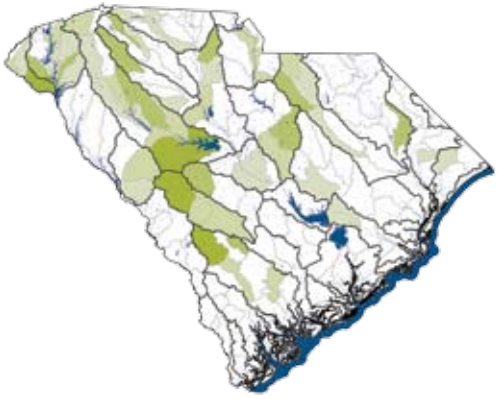
PRESCRIBED BURNING APPLIED ACRES BY 10-DIGIT HYDROLOGIC UNIT AREA

0 <150 150–300 301–600 >600



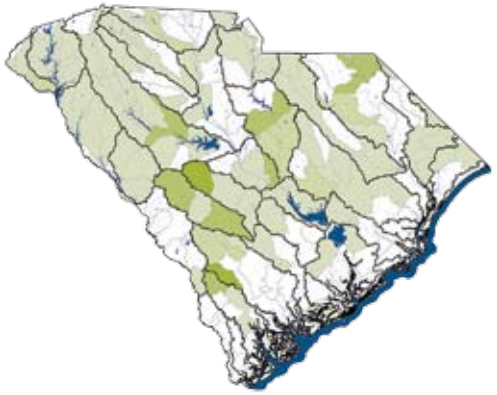
USE EXCLUSION APPLIED ACRES BY 10-DIGIT HYDROLOGIC UNIT AREA

0 <200 200–400 401–15,000 >15,000



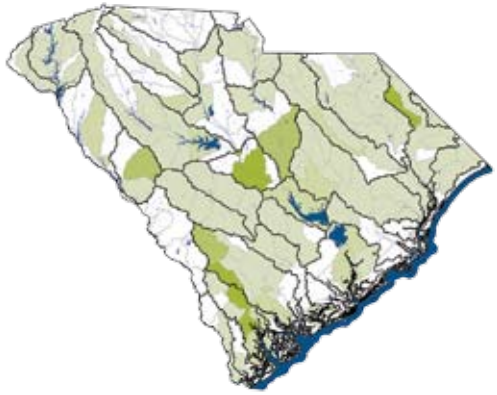
PRESCRIBED GRAZING APPLIED ACRES BY 10-DIGIT HYDROLOGIC UNIT AREA

0 <50 50–100 101–250 >250



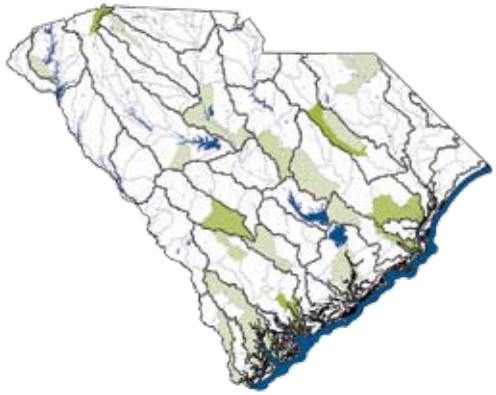
INTEGRATED PEST MANAGEMENT APPLIED ACRES BY 10-DIGIT HYDROLOGIC UNIT AREA

0 <300 300–600 601–13,000 >13,000



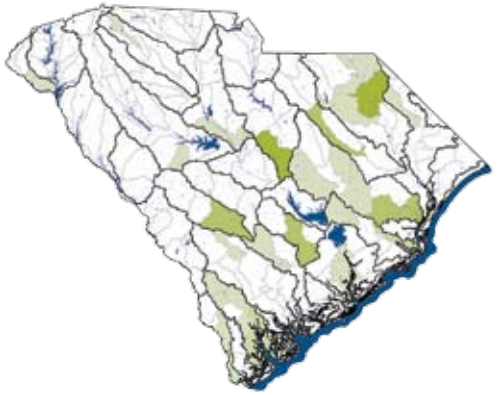
UPLAND WILDLIFE HABITAT MANAGEMENT APPLIED ACRES BY 10-DIGIT HYDROLOGIC UNIT AREA

0 <250 250-500 501-1,000 >1,000



WETLAND WILDLIFE HABITAT MANAGEMENT APPLIED ACRES BY 10-DIGIT HYDROLOGIC UNIT AREA

0 <100 100–200 201–500 >500



WETLANDS CREATION, ENHANCEMENT AND RESTORATION APPLIED ACRES BY 10-DIGIT HYDROLOGIC UNIT AREA

0 <250 250–500 501–1,000 >1,000

CLEAN AIR

"Water and air, the two essential fluids on which all life depends, have become global garbage cans."

Jacques Cousteau

Peach Orchard—"The Ridge"

MISSION GOAL*

The air is clear and free of harmful substances.

OUTCOME*

Agriculture makes a positive contribution to local air quality and the Nation's efforts to sequester carbon.

**From the NRCS 2005–2010 Strategic Plan*

AIR QUALITY

Agricultural emissions that affect air quality are associated with wind erosion, prescribed burns, animal confinement and chemical drift.

Animal production can affect air quality through the emission of gases, odors, dust, microbes, and insects. These are produced or emitted inside and near animal production facilities and when waste products are land-applied. Gases that are commonly associated with animal production include hydrogen sulfide (H_2S), ammonia (NH_3), and volatile organic compounds, or VOC's (MEQB 2002). Existing and new practices that reduce emissions at the source or mitigate dispersion of these pollutants will help to reduce public concern over emissions from animal agriculture.

Pesticides failing to reach target pests in agricultural areas are subject to aerial drift, moving into adjacent ecosystems, causing undesired impacts on nontarget species, producing complex effects on ecosystem processes (Pimental and Edwards 1982). Some pesticides can persist in nontarget ecosystems and the environment for years, while others are short-lived but acutely toxic. Many pesticide residues are hormone mimics or immunosuppressants that may have significant implications for public health (Matson *et al.* 1997).

In the USA, agriculture emits a fraction of the nation's greenhouse gases, but there are opportunities within agriculture to mitigate these emissions through carbon sequestration, increased methane oxidation in soils, reduction of methane production in animals, and methane capture from animal manures.

Lake Murray

Greenhouse Gases

Agriculture plays a significant role in the fluxes of the greenhouse gases (GHG's): carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Carbon dioxide may be stored or released from soil and above-ground production. Nitrous oxide is produced through nitrogen mineralization in agricultural soils, and methane is produced through enteric fermentation, especially in ruminants. Methane and nitrous oxide are emitted as animal manure breaks down and as farm field residues are burned (Robertson *et al.* 2000, USEPA 2007a).

In the USA, the agricultural sector contributed to about 8% of all greenhouse emissions, the most significant being nitrous oxides from soils (5%), followed by methane from animals (2%), and both nitrous oxide and methane from animal manure (1%) (USEPA 2007 a). For the same period, carbon sequestration by land use change and forestry was estimated at 11% of all GHG emissions (USEPA 2007a). Note that methane and nitrous oxide are 21 times and 310 times more potent as global warming agents than carbon dioxide, respectively (IPPC 2006), hence their relative importance in agriculture. These gases are said to have Global Warming Potentials (GWPs) of 21 and 310, respectively.

While agriculture plays a relatively small role in emitting GHG's in the United States, there is potential for this sector to play a larger role in mitigation. One possibility is for significant CO_2 mitigation through the increase of soil organic matter (SOM) using no-till practices (Slesinger 1999). Soil carbon storage can be offset by the release of nitrous oxide and suppression of microbial methane oxidation through the addition of conventional fertilizer and lime. Mitigation strategies of the future will thus need to be focused on careful management of cover crops and residues to reduce the need for nitrogen fertilizer and liming without reducing yields (Robertson *et al.* 2000).

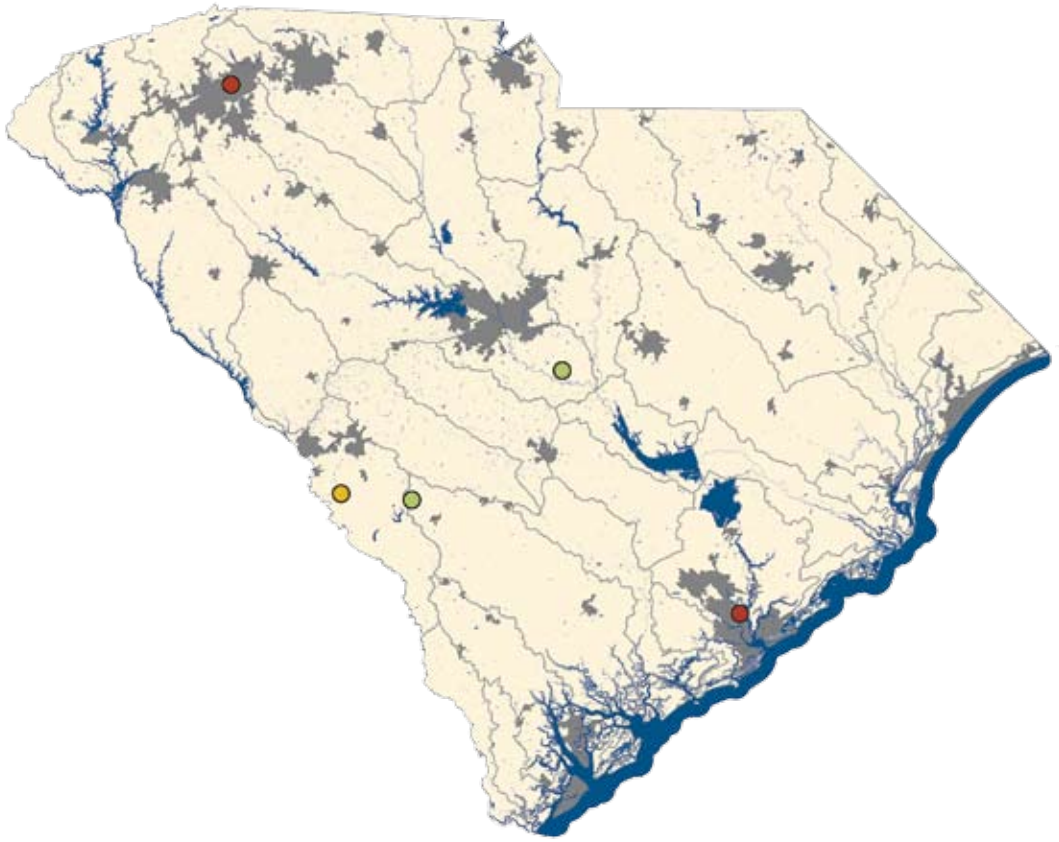
Upland soils are a global sink for methane removal from the atmosphere through biological oxidation (IPCC 2001). Suwanwaree and Robertson (2005) suggest that strategies to increase the soil's ability to oxidize methane (GWP of 21) will provide significant GHG mitigation benefits from agriculture.

Beef and dairy cattle, by virtue of their size and numbers, were estimated to have produced 95 % of the 2005 CH4 from enteric fermentation (USEPA 2007a). In other words, 5% of CH_4 from enteric fermentation was produced by livestock species other than cattle such as horses, sheep, swine and goats. There is potential to reduce methane from ruminants through the manipulation of feed intake and implementing techniques to alter ruminal microflora (Johnson and Johnson 1999). Biogas or methane capture methods, potentially employed on large dairy or swine operations (see page 104), are another way of increasing the producer's revenue stream through greenhouse gas credits and through energy production. Additional benefits of methane capture from manures is the reduction of odors and related pests.

South Carolina Air Quality

South Carolina Department of Health and Environmental Control monitors a number of gases, including nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), carbon monoxide (CO), ozone (O_3), total suspended particulates (TSP), and particulate matter at various sizes PM_{10} and $PM_{2.5}$ (10 µm and 2.5 µm, respectively). Although these pollutants are commonly associated with urban and industrial activities, three common pollutants will be discussed in this section as indicators of air quality in the state. General information on nitrous oxide, total suspended solids, and particulate matter is adapted from the information provided by the USEPA's "Six Common Air Pollutants" site (USEPA 2007b).

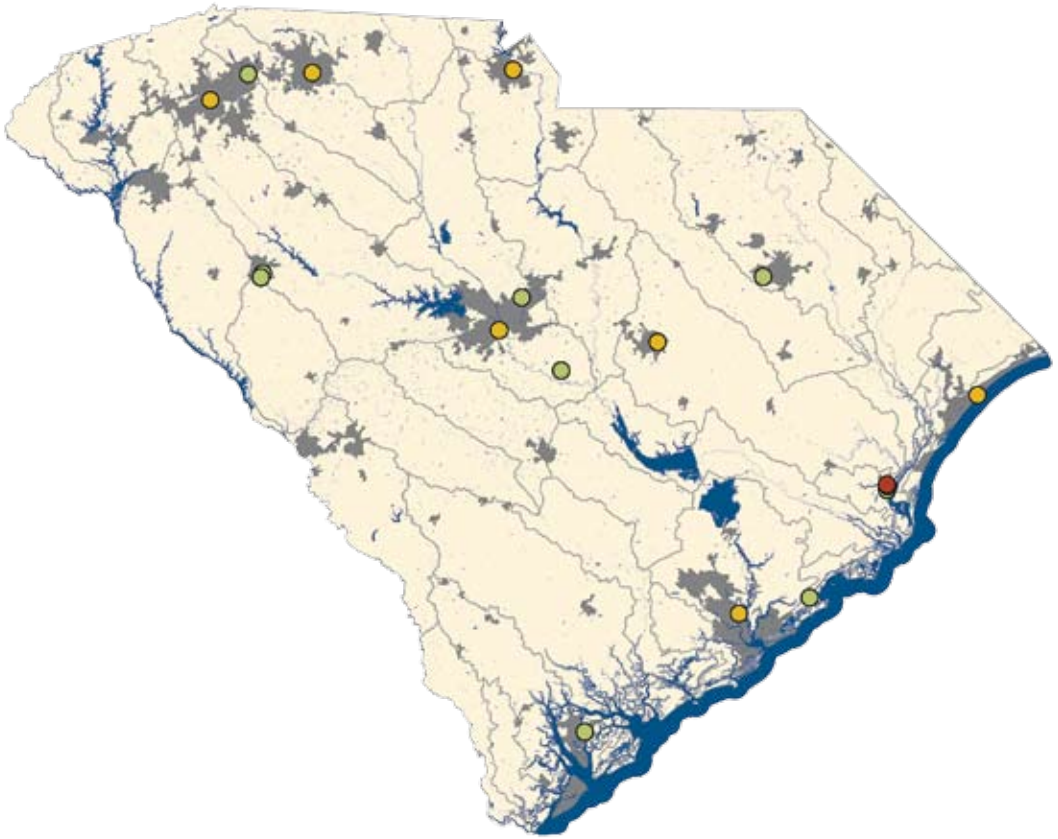
Nitrogen dioxide (NO_2, one of the NO_x gas species) is generated from fuel burned at high temperatures. The primary manmade sources of NO_x are motor vehicles, electric utilities, and other industrial, commercial, and residential fuel-burning sources. The USEPA standard for nitrogen dioxide is an annual mean not to exceed 0.053 parts per million (ppm). The highest recorded annual mean for the state was 0.012 ppm in Greenville.



MEAN NITROGEN DIOXIDE LEVELS FOR 2006

- <0.00250
- 0.0025–0.005
- >0.005
- Urban Areas

(Source: SCDHEC 2006 Air Quality Report)



GEOMETRIC MEAN OF TOTAL SUSPENDED PARTICLES (TSP) FOR 2006

- <25
- 25–40
- >40
- Urban Areas

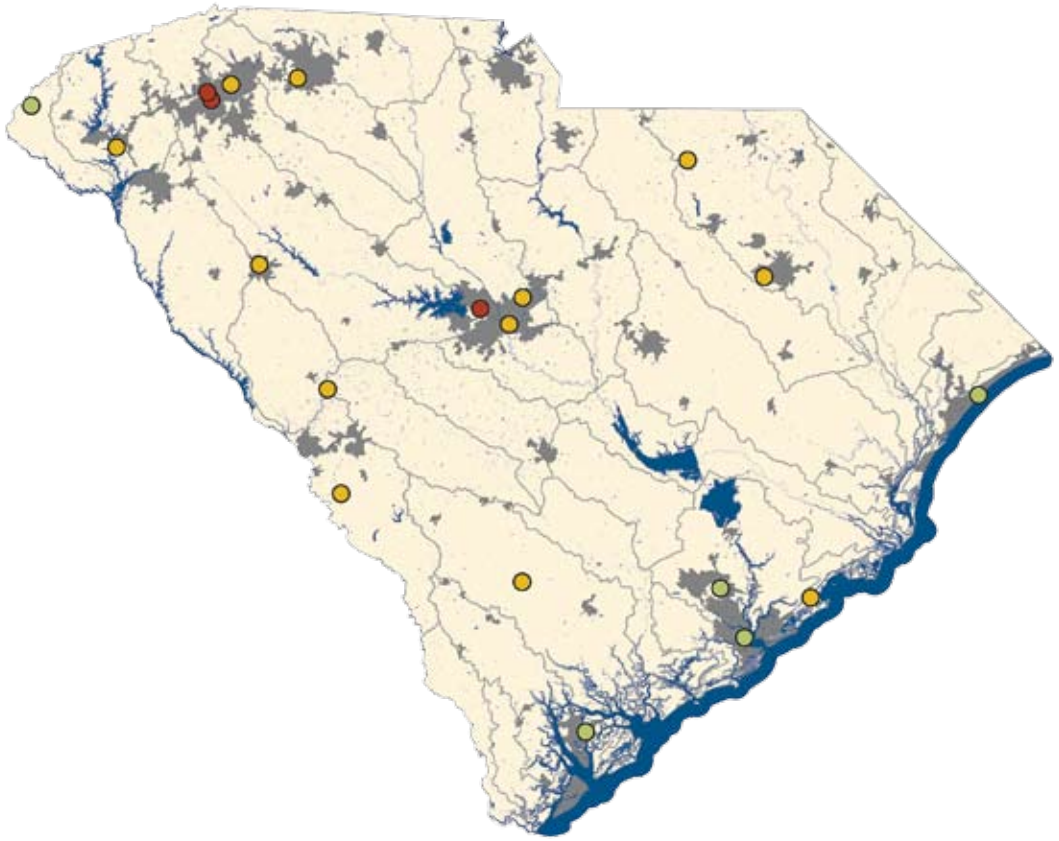
(Source: SCDHEC 2006 Air Quality Report)

Total suspended particulates (TSP's) range in size from 0.1 micron or micrometer (µm) to 45 µm. Larger particles usually settle out unless stirred up by wind, but smaller size particles (usually < 10 µm) tend to stay in suspension. Most particulate matter (~99%) is filtered out (MDEP 2007). The USEPA standard for TSP's is an annual geometric mean that is not to exceed 75 µg/M3. The highest annual geometric mean for the state was recorded in Georgetown (62.9 µg/M3), still within the USEPA standard.

Particulate matter, or PM, is a complex mixture of extremely small particles and liquid droplets that may include acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. The USEPA is concerned about particles that are 10 micrometers in diameter or smaller because these are typically inhalable and generally find their way into the lungs.

Inhalable coarse particles (PM_{10}), such as those found near roadways and dusty industries, are larger than 2.5 µm but smaller than 10 µm. Inhalable fine particles, such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles react in the air. Fine particles ($PM_{2.5}$) are the primary cause of reduced visibility (haze) in parts of the United States, including many of our treasured national parks and wilderness areas.

The USEPA standard for $PM_{2.5}$ is an annual mean not to exceed 15 µg/M3. Four sites in the state exceeded this: three in Greenville and one in Irmo. On the whole, $PM_{2.5}$ tended to be lower on the coast than inland.



MEAN PARTICULATE MATTER, $PM_{2.5}$, 2006

- <12.5
- 1.25–15
- >15
- Urban Areas

(Source: SCDHEC 2006 Air Quality Report)

Conservation Easement—Coastal Plain

Air Quality Strategy for NRCS in South Carolina

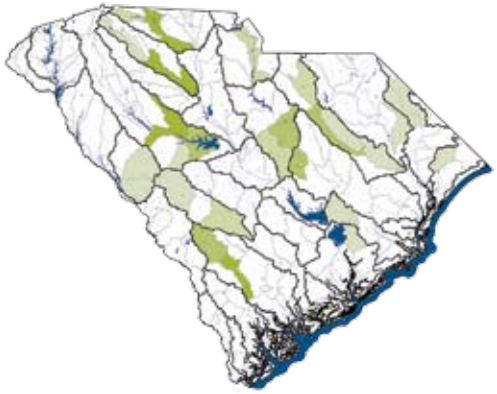
Existing conservation practices that incorporate air quality include windbreaks and buffers, integrated pest management, prescribed burning, and comprehensive nutrient management planning to minimize the emission and transport of gases, odors, microbes and insects.

While NRCS revises, modifies and adapts conservation standards to better address air quality issues, particularly GHG, existing conservation practices (e.g., residue and tillage management, conservation cover, cover crops, and tree and pasture/hay planting) are already known to increase carbon storage potential and enhance the soil's ability to oxidize methane. Since GHG's are not bound by watersheds, these practices can continue to be used to address other resource concerns and, in doing so, contribute to reduction in GHG emissions.

Air Quality Conservation Progress

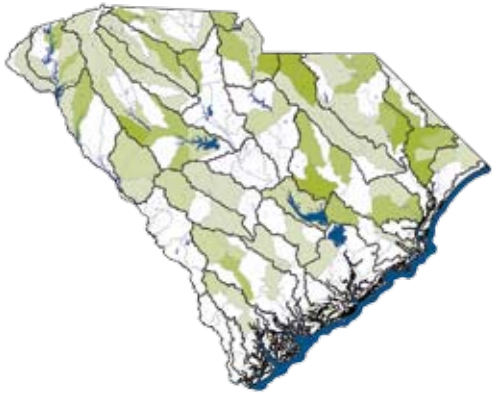
PROGRESS IN KEY CONSERVATION PRACTICES (APPLIED PRACTICES 2004-2006) TO REACH NATIONAL AIR QUALITY OBJECTIVES

Practice name (units) and number	2004	2005	2006	Total
100 Comprehensive Nutrient Management Planning (no.)	-	87	69	156
327 Conservation Cover (ac)	3,935	3,749	3,936	11,620
328 Conservation Crop Rotation (ac)	199,890	25,057	15,778	60,824
329 Residue and Tillage Management, No-Till/Strip Till/Direct Seed (ac)	-	-	20,224	20,224
329A Residue Management, No-Till/Strip Till (ac)	43,779	29,446	2,171	75,396
329B Residue Management, Mulch Till (ac)	429	37	-	466
340 Cover Crop (ac)	6,720	10,709	6,324	23,753
422 Hedgerow Planting (ft)	5,000	350	6,944	12,294
449 Irrigation Water Management (ac)	1,997	8,186	3,883	14,065
484 Mulching (ac)	27	138	38	203
490 Forest Site Preparation (ac)	3,370	1,780	1,233	6.383
512 Pasture and Hay Planting (ac)	4,808	5,487	4,023	14,318
528 Prescribed Grazing (ac)	141	3,881	5,886	9,908
590 Nutrient Management (ac)	48,233	35,062	28,989	112,284
595 Integrated Pest Management	35,552	31,398	21,512	88,462



TREE AND SHRUB SITE PREPARATION APPLIED ACRES BY 10-DIGIT HYDROLOGIC UNIT AREA

0 <20 20–40 41–100 >100



PASTURE AND HAY PLANTING APPLIED ACRES BY 10-DIGIT HYDROLOGIC UNIT AREA

0 <30 30–60 61–100 >100

AN ADEQUATE ENERGY SUPPLY

"Our universe is a sea of energy—free, clean energy. It is all out there waiting for us to sail upon it."

Robert Adams

VENTURE GOAL*

An Adequate Energy Supply

OUTCOME*

Agricultural activities conserve energy and agricultural lands are a source of environmentally sustainable biofuels and renewable energy.

**From the NRCS 2005–2010 Strategic Plan*

ENERGY CONSUMPTION

This section is adapted from the Congressional Research Service's Report to Congress, "Energy use in Agriculture: Background and Issues" (Schnepf 2004).

U.S. agriculture has become increasingly mechanized and requires timely energy supplies to ensure smooth and efficient operation. In the U.S., agriculture's share of total energy consumption is small (about 1%), but energy costs typically contribute up to 15% of total farm production expenses, suggesting that changes in energy consumption and costs will have significant impacts on the profitability of the U.S. agriculture sector.

Energy input for agricultural operations includes direct energy usage and indirect energy usage.

Direct energy use is associated with operating the following:

- farm machinery and trucks—typically powered by diesel
- small vehicles—typically powered by gasoline
- equipment for such operations as irrigation, drying and curing products, and heating or cooling agricultural buildings, typically powered by diesel, natural gas (NG), low pressure (LP) gas, or electricity
- general overhead such as lighting of barns and sheds—typically powered by electricity
- transportation of supplies to the farm or goods to market—typically powered by diesel or gasoline.

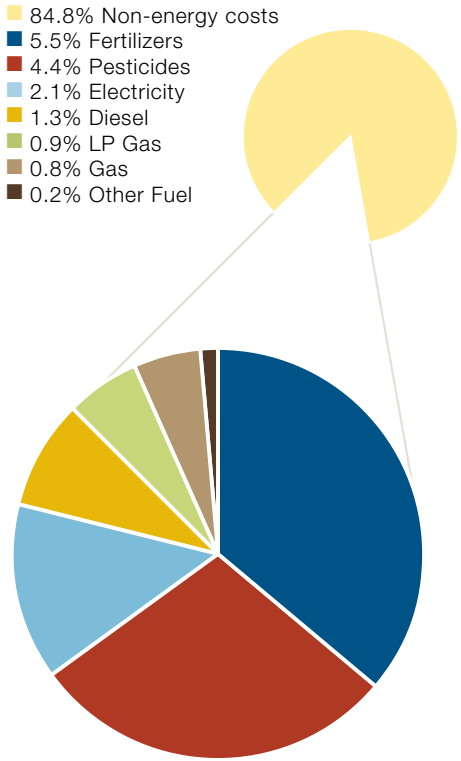
In the Southeastern United States, direct energy costs account for 5% of total farm production costs.

Indirect energy use is associated with the energy used to manufacture fertilizers and pesticides, of which the agricultural sector is the largest consumer in the United States. In the Southeastern United States, indirect energy costs account for 10% of total farm production costs.

ENERGY, PERCENT OF PRODUCTION COSTS

Energy Costs as a Percentage of Total Production Costs in Agriculture in the Southeastern United States

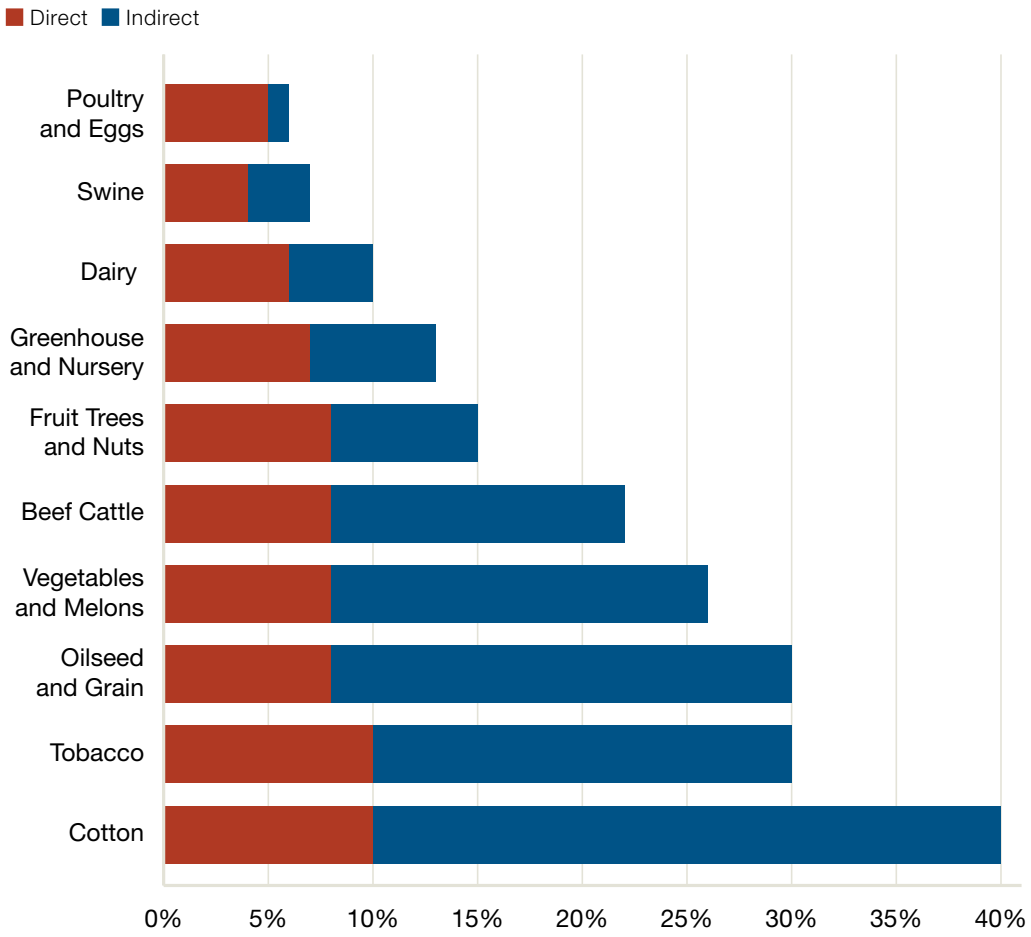
(Source: Schnepf 2004)



ENERGY COST PERCENTAGE BY ACTIVITY, 2002

Direct and Indirect Energy Costs as a Percentage of Total Production Costs in Agriculture in the United States

(Source: Schnepf 2004)



The impact of energy on agricultural production costs varies by commodity. Higher indirect costs for chemicals, fertilizers and tillage elevate the share of energy usage in field crop production. Confined operations typically require the least amount of energy input because most of the production takes place in specialized buildings. Beef cattle production costs in the West are likely to be comparatively higher than those of the Southeast due to the greater amounts of energy required to farm substantially larger acreages.

Energy Use Tools—South Carolina Examples

A number of energy estimation tools have begun to appear on the Internet and some of these are already displayed by NRCS as energy awareness tools (NRCS 2007). South Carolina energy-usage conditions were examined through runs made on three energy efficiency awareness tools: tillage, nitrogen, and irrigation. The results are displayed graphically as a percentage of original costs for conventional management. The tools are dependent on assumptions and may be simplistic, but provide some indications of the potential of energy cost savings. Additional benefits to alternative tillage and fertilization strategies include soil improvements, greenhouse gas emission reductions[1], and reductions in water usage.

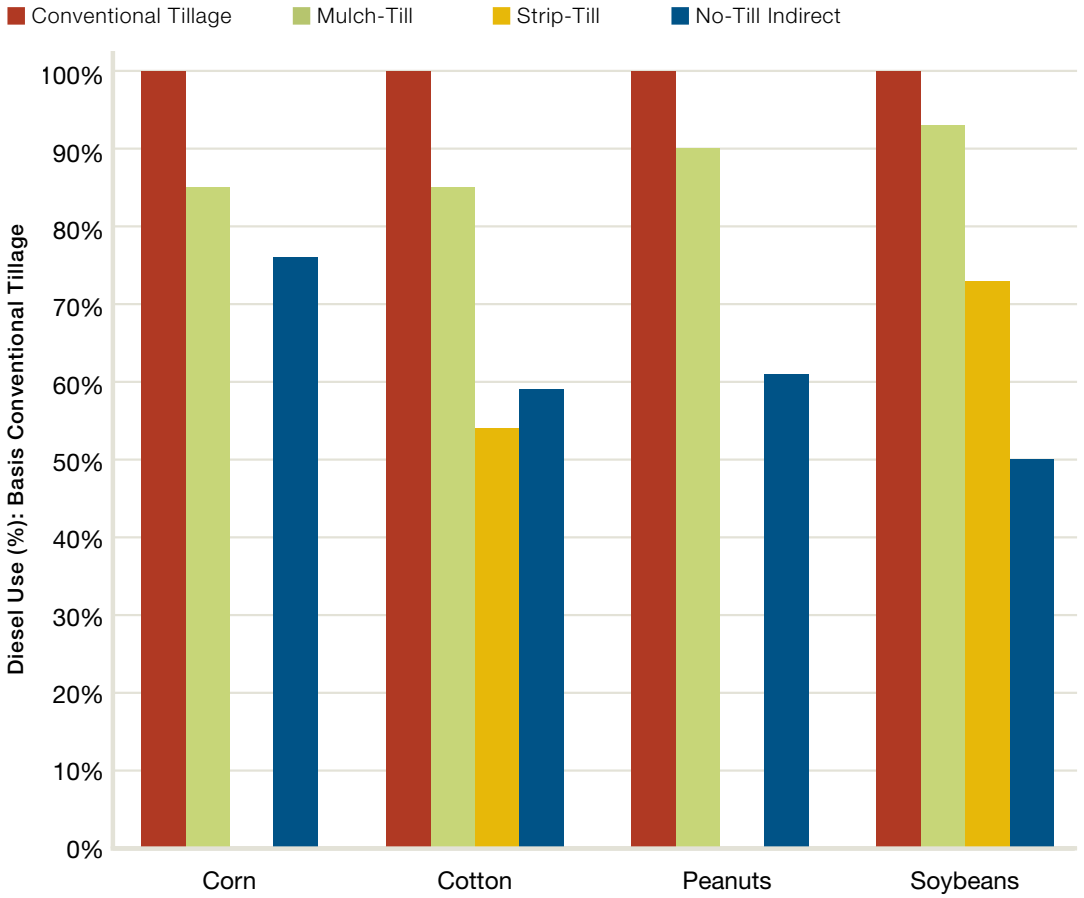
Tillage

Tillage is a large direct energy input for crop producers, mainly in the form of diesel fuel to operate equipment. The NRCS energy awareness tool (NRCS 2007) estimated diesel fuel usage by comparing conventional tillage and alternative tillage systems. The crops covered for South Carolina were identified by NRCS agronomists who estimated the fuel use associated with common tillage systems. The Energy Estimator provides some guidance to conservationists and producers as to the magnitude of diesel fuel savings under different levels of tillage.

DIESEL USE COMPARISONS TO CONVENTIONAL TILLAGE

Energy Estimator Runs on Alternative Tillage for South Carolina Conditions.

(Source: NRCS Energy Estimator)



[1]*Especially N_2O emissions where this gas is 310 times more powerful than carbon dioxide in terms of greenhouse gas potential.*

Nitrogen Fertilizer Use

Nitrogen fertilizer is one of the most substantial indirect costs associated with cropping and improved pasture systems. The NRCS energy awareness tool (NRCS 2007) indicated nitrogen fertilizer costs for several South Carolina systems operating under a conventional nitrogen management system (single application broadcast). These were compared to the tool's projected costs for three nitrogen management alternatives. Factors considered included availability, cost and efficiency of nitrogen materials, timing of fertilizer application, fertilizer placement, and the use of a nitrogen loss inhibitor. Fertilizer recommendations were taken from Clemson Extension's fertility recommendations (CU 2001).

Factors apparently not considered were additional fuel costs for incorporation and split application.

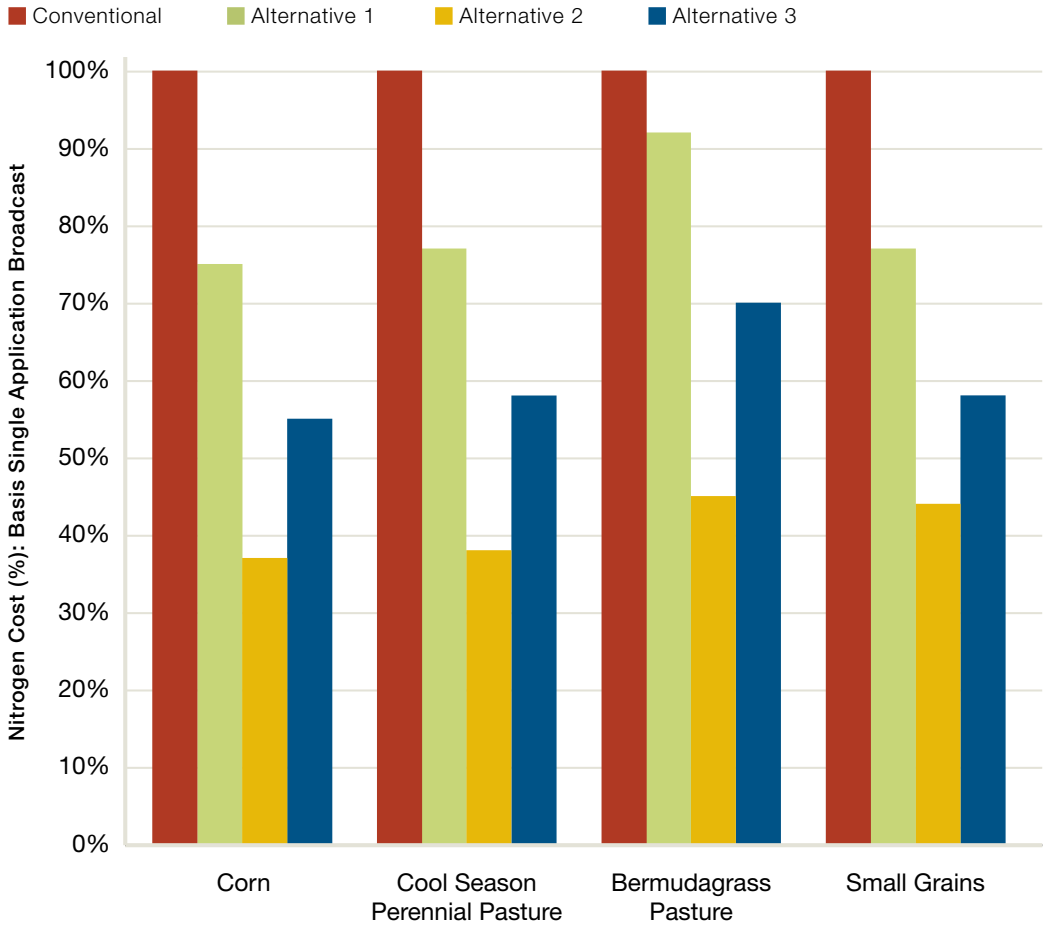
ALTERNATIVES FOR NITROGEN APPLICATION COST COMPARISONS

	Alternative 1	**Alternative 2**	**Alternative 3**
Form of Nitrogen	Ammonium Nitrate	Anhydrous Ammonia	UAN
N Efficiency Enhancer?	N	Y	Y
Corn for Grain	Split Spring Application, Incorporation	Split Spring Application, Incorporation	Split Spring Application, Incorporation
Cool Season Fescue Pasture	Fall/Spring Application, Surface band/Sidedress	Fall/Spring Application, Incorporate	Fall/Spring Application, Surface band/Sidedress
Bermudagrass Pasture	Spilt Spring Application, Surface band/Sidedress	Spilt Spring Application, Incorporate	Spilt Spring Application, Surface band/Sidedress
Small Grains	Fall/Spring Application, Surface band/Sidedress	Fall/Spring Application, Incorporate	Fall/Spring Application, Surface band/Sidedress

NITROGEN APPLICATION COST COMPARISONS

Energy Estimator Runs on Nitrogen Management Alternatives for South Carolina Conditions

(Source: NRCS Energy Estimator)



Irrigation—Southeastern Plains

Irrigation

Irrigation systems may also be targeted for energy savings. In this example, a system irrigating corn with a well lift of 175 ft with an electric pump at a pressure of 30 psi was considered the benchmark and entered into the NRCS energy awareness tool (NRCS 2007). The tool indicated potential energy cost savings based on specific irrigation system modifications. A separate curve was plotted for a scenario where a pumping plant evaluation was conducted. Energy costs were based on reduced water pumped for irrigation by installing a flow meter, scheduling irrigation, and maintaining and upgrading the system.

There are additional potential energy savings through implementing recommendations from and evaluation of pumping plant efficiency. Based on the results of this evaluation, a producer can more readily discover and address energy deficiencies, some of which may include the following:

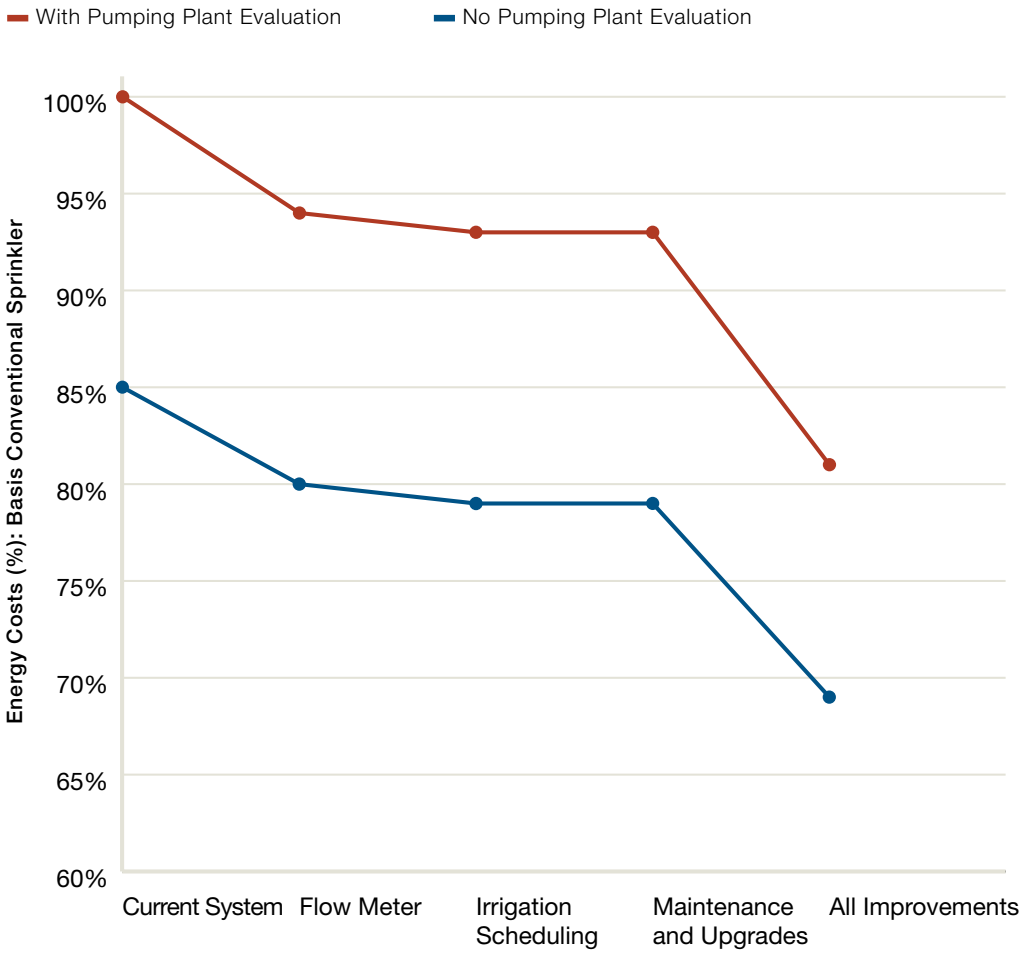
- Engines and motors that are over- or under loaded
- Natural gas pressure at carburetor too high or too low
- Natural gas leaks
- Pumping plant valve problems
- Pipeline installations that are faulty
- Electric motors improperly wired
- Electric control panels that are damaged or improperly installed
- Spark plugs, spark plug wires, cooling systems or engine faults that require maintenance
- Pump bearings or impellers that need replacing
- Irrigation system changes from a low pressure to a higher pressure system without changing or updating pump

If the current system is at or above the standard efficiency, improvements may not be cost effective.

ENERGY COMPARISONS: IRRIGATION

Energy Estimator Runs on a South Carolina Irrigation System and Potential Energy Savings for System Improvements.

(Source: NRCS Energy Estimator)



RENEWABLE ENERGY

This section is adapted from the Congressional Research Service's Report to Congress, "Agriculture-Based Renewable Energy Production" (Schnepf 2004).

While the agricultural sector uses only 1% of U.S. energy, it produces less than half of 1% of the U.S.'s energy, most of which is accounted for by ethanol. Other sources of renewable energy from this sector include biodiesel, methane from anaerobic digesters, and wind generation.

Ethanol

Ethanol (ethyl alcohol) can be made by fermenting simple sugars and then distilling the produced alcohol. Typical feedstocks for the process include sugar cane and sugar beets while corn starch is easily converted to sugar for fermentation. In the U.S., corn makes up 98% of all ethanol feedstock. An estimated 1.6 billion bushels of corn (14.4% of the 2005 corn crop) was used to produce ethanol in 2005/6 resulting in 2% of U.S. gasoline motor vehicle consumption. As ethanol plant capacity expands, it is expected that 20% of the corn harvest will be used for ethanol production. The increase in demand for corn from ethanol production has caused corn prices to rise, affecting the domestic animal feed market, increasing the acres of corn planted, crowding out other crops, and reducing corn exports. If the entire U.S. corn harvest (11.5 billion Bu) were used just to make ethanol, it would supply an estimated 15% of U.S. gasoline consumption, suggesting that the potential for corn to be a major gasoline substitute is limited.

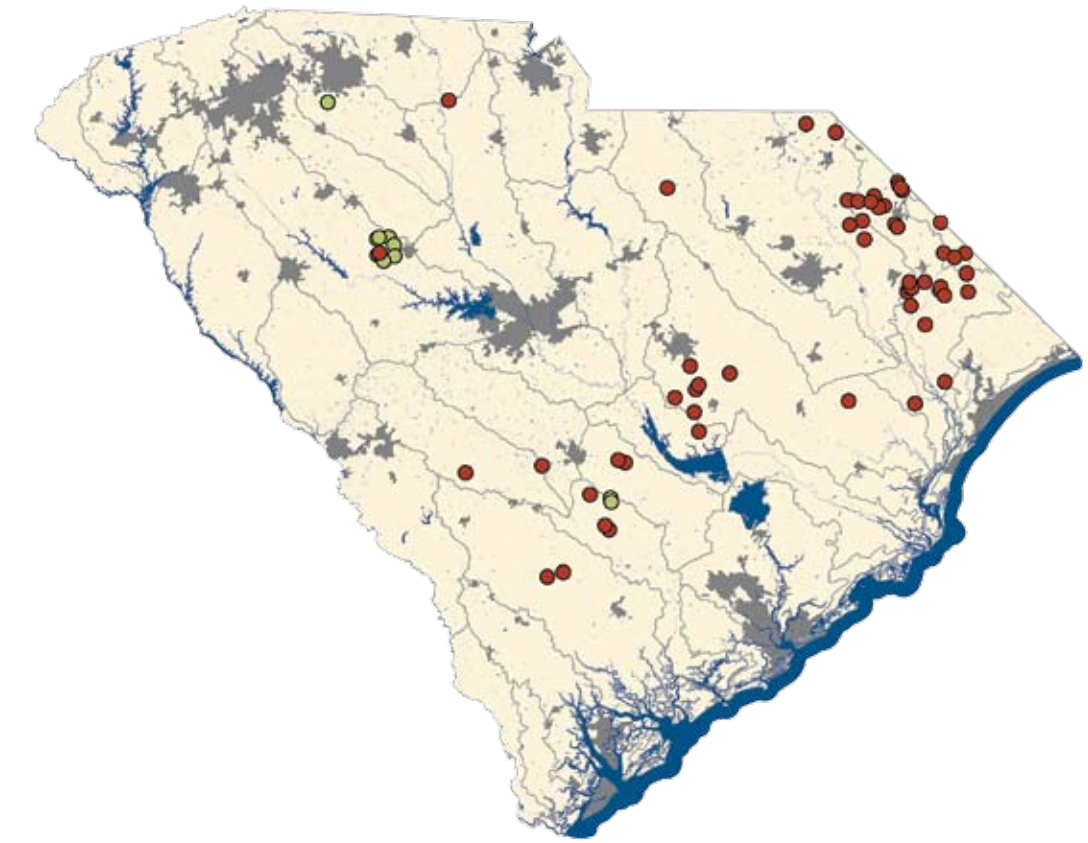
Ethanol from cellulosic grasses or fast growing woody crops appears to be attractive because many of these crops are inexpensive to grow and can be grown on lands other than cropland. The long-run advantage of cellulosic plant usage for ethanol production is the potential to substitute 30% or more of current gasoline needs without compromising U.S. agriculture's ability to meet food, feed and export demands. An example of one of these plants is switchgrass, which has received much attention because it can be grown on marginal lands and requires little attention (fertilization or irrigation), yet still produces good yields. There is, however, no installed commercial production in the U.S., mainly because current technology to convert cellulose to sugar for fermentation (dilute or concentrated) is prohibitively expensive. It is anticipated that research into alternative hydrolysis methods, e.g., cellulase enzymes and thermal hydrolysis, have the potential to reduce the costs of hydrolysis. Until hydrolysis technology improves to reduce these costs, cellulose sources remain a potential rather than a real feedstock for ethanol production.

As of August 29, 2007, there were no ethanol manufacturing plants in South Carolina. The closest known ethanol plant in production is in Loudon, TN, with a design capacity of 67 million gallons a year (mgy). Construction is underway for an additional capacity of 138 mgy in Obion and Loudon, TN and 100 mgy in Mitchell County, GA. Production in the Southeast is relatively small compared to U.S. production capacity which was rated at 6778 mgy as of August 29, 2007. Construction projects in the industry are anticipated to add 6651 mgy to the U.S. ethanol production capacity (RFA 2007).

Biodiesel

Biodiesel production, 90% of which comes from soybeans, has recently expanded rapidly from one million gallons in 1999 to 75 million gallons in 2005. In contrast to ethanol, however, biodiesel makes up just 0.08% of the diesel fuel used in the U.S. for transportation. As new biodiesel plants, now under construction, begin producing, the increased demand will continue to place upward pressure on soybean prices. Long term supply of biodiesel, therefore, faces problems similar to those of corn ethanol, stemming primarily from the fact that there is a finite amount of cropland in the U.S. required to supply feed, food and export needs in addition to new demands for energy.

The only known biodiesel production facility in the state that uses soybeans as a feedstock is Carolina Biofuels, located in Taylors, SC, where production is expected to grow to 30 million gallons per year. The Carolina Soya plant in Estill, SC, is expected to invest in a refinery that will produce oil that will be used for biodiesel, among other uses.



OPERATIONS IN THE STATE WHERE BIOGAS PRODUCTION MAY BE VIABLE

- Dairy
- Swine
- Urban Areas

Biogas (Methane)

Biogas or methane (CH_4) gas can be produced from anaerobic digesters that use animal manures as feedstock. The product gas, usually 60% to 70% methane, can be used for cooking and heating as well as the production of electricity. Apart from energy benefits, anaerobic digesters improve waste management through odor reduction, greenhouse gas reduction, and better nutrient recycling. With current technology, the viability of methane production appears to be economically feasible for larger operations, i.e., dairies with 500 or more cows and swine operations with 2,000 or more pigs. There are an estimated 69 operations in South Carolina that meet such criteria.

Wind

Wind-generated electricity in the U.S. accounts for about 0.1% of total electricity consumption. The share of wind generated electricity in agriculture is much higher, about 9 % of direct energy use. The cost of wind power has fallen by 90% in the past 20 years; this fact, coupled with rising fossil fuel prices, has helped to improve wind energy's competitiveness with other power plants, especially those fired by natural gas. For wind turbines to be economically viable, average annual wind speeds need to exceed 16 miles per hour while the minimum wind speed to operate a turbine at any time is 10 miles per hour. Unfortunately, the only place in the state where such conditions exist is in the Blue Ridge Mountains, and a very narrow strip along the coast.

Conservation Progress—Energy Supply

PROGRESS IN KEY CONSERVATION PRACTICES (APPLIED PRACTICES 2004-2006) TO REACH NATIONAL AIR QUALITY OBJECTIVES

Practice name (units) and number	2004	2005	2006	Total
329 Residue and Tillage Management, No-Till/Strip Till/Direct Seed (ac)	-	-	20,224	20,224
329A Residue Management, No-Till/Strip Till (ac)	43,779	29,446	2,171	75,396
329B Residue Management, Mulch Till (ac)	429	37	-	466
449 Irrigation Water Management (ac)	1,997	8,186	3,883	14,066

WORKING FARM AND RANCH LANDS

"The land belongs to the future … that's the way it seems to me … I might as well try to will the sunset over there to my brother's children. We come and go, but the land is always here. And the people who love it and understand it are the people who own it—for a little while."

Willa Cather, *O Pioneers!* 1913

VENTURE GOAL*

Working Farm and Ranch Lands

OUTCOME*

Connected landscapes that sustain a viable agricultural sector and natural resource quality.

**From the NRCS 2005–2010 Strategic Plan*

Background

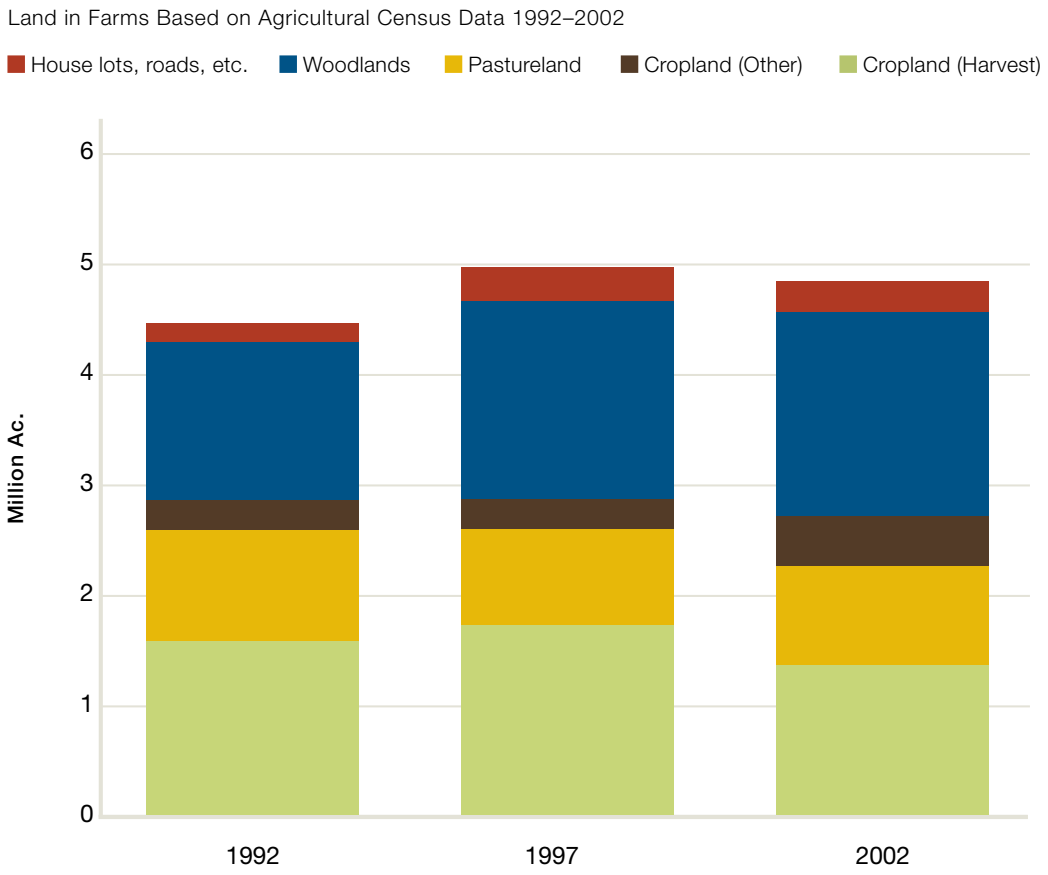
The *NRCS 2005–2010 Strategic Plan* states that about one fifth of the U.S.'s prime agricultural land is at risk for development because of its proximity to the 100 largest cities in the nation. The Strategic Plan further states that fragmentation of privately owned land, especially forest land, is occurring as parcels are often being divided into areas smaller than 100 acres. Small, privately owned forest land is less likely to be actively managed for wood fiber production or other benefits. Forest land and its surroundings that are not actively managed tend to become overstocked and increase susceptibility to disease and fire.

Trends in Agricultural Land Use

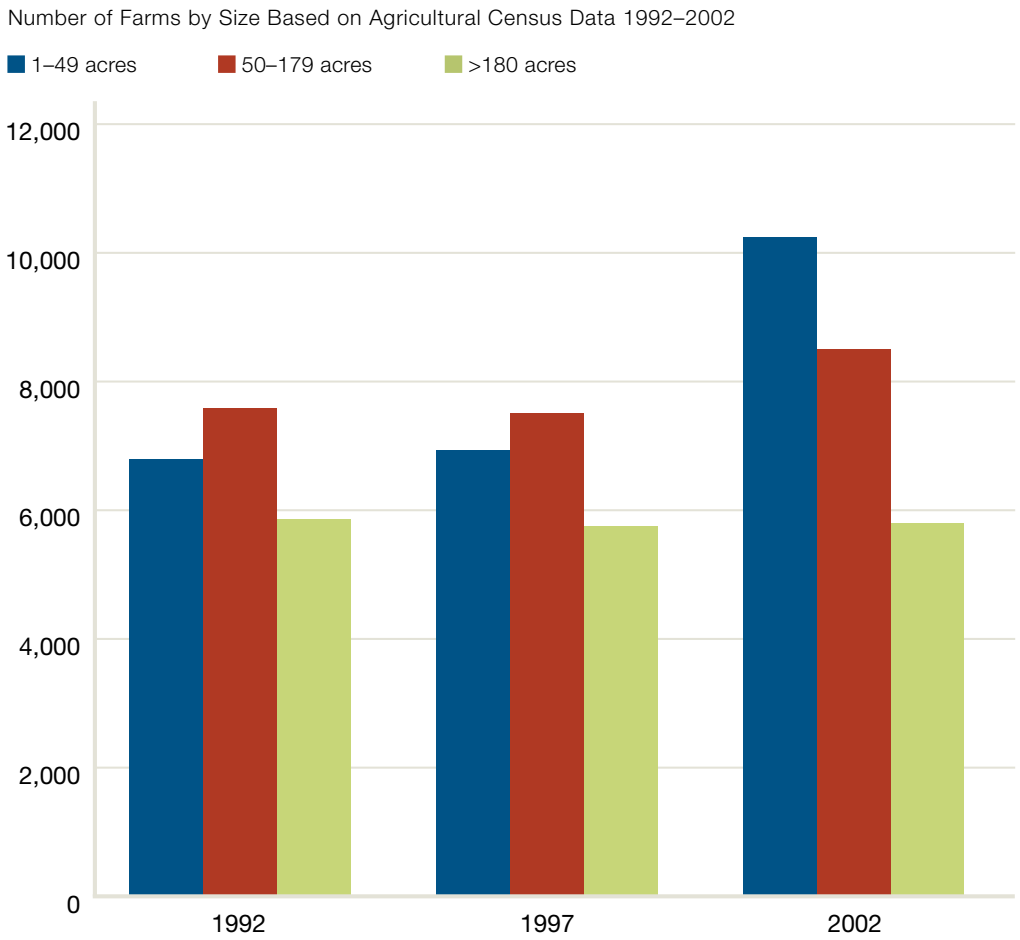
In the period between 1945 and 1992, Alabama, Georgia and South Carolina experienced some of the largest losses of cropland in the U. S. This was due to a rapidly increasing population and marginal farmland better suited to alternative land uses such as forest land (Tweeten 2007).

Agricultural Census data for 1992-2002 (NASS 2002) show an increase in total farmland (380,000 acre or 8.5%) as a result of an increase in woodland (420,000 acres), pastureland (170,000 acres), and house lots, ponds and roads (110,000 acres). Conversely, the amount of cropland in the state was reduced by 320,000 acres, of which 220,000 acres were harvested cropland.

LAND IN FARMS



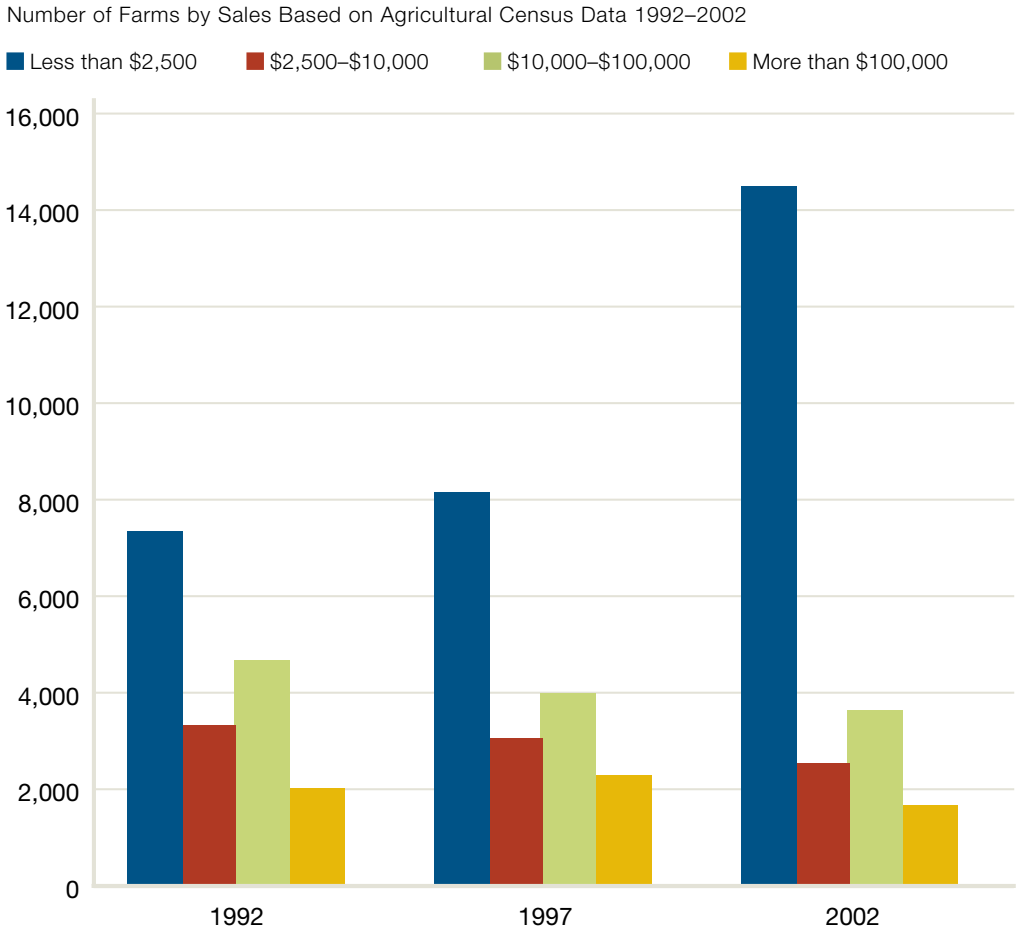
NUMBER OF FARMS BY SIZE



Between 1992 and 2002, the number of farms in the state increased by 21%. This increase is largely attributable to small farms where there has been a 50% increase in the number of farms less than 50 acres in size. Parallel to this observation is the 97% increase in the number of farms with sales that are less than $2,500 a year. This is contrasted with a decline in number of farms in all categories with sales over $2,500 a year for the same period.

Farms with sales lower than $2,500 appear to be more abundant in subbasins that are close to urban areas, while the distribution of small farms (less than 50 acres) appears to follow the same trend. The proportion of producers whose primary occupation is farming bears an almost inverse relationship to the percentage of farms with less than $2,500 in sales. These trends suggest a proliferation of small farms close to urban areas whose owners derive little or no income from the farmland, resulting in the fragmentation of existing farm land.

NUMBER OF FARMS BY SALES

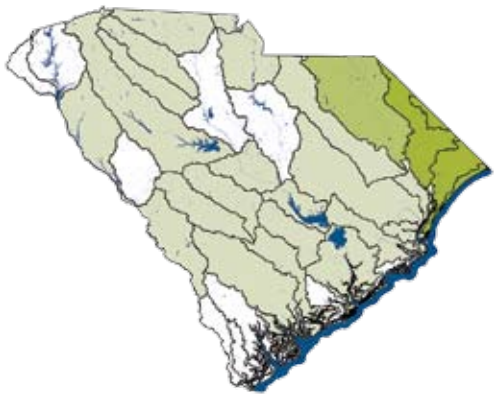


Note that the maps may be misleading with respect to the area around Myrtle Beach (Coastal Carolina and Waccamaw subbasins) because the Agricultural Census data are by county with the majority of these subbasin lands in Horry County. In reality, it is expected that farms with less than $2,500 in sales and owned by people whose primary income is not farming are clustered around Myrtle Beach.

While urbanization is a concern, especially in the coastal areas, the 1992–2002 census data suggest that the shift in cropland has not been limited to urban land but other land uses such as recreation, wetland and forest use. This trend appears to be typical of a national trend observed by Tweeten (1998) who suggests the cause of this land use change is due more to a lack of farm profitability than pressures of urbanization.

SUBBASIN WITH PERCENTAGE OF FARMLANDS WITH LESS THAN $2,500 IN SALES BASED ON AGRICULTURAL CENSUS DATA 1992–2002

<55 55–60 >60



SUBBASIN WITH PERCENTAGE OF PRODUCERS WHOSE PRIMARY OCCUPATION IS FARMING BASED ON AGRICULTURAL CENSUS DATA 1992–2002

<45 45–50 >50

PRIORITY SUBBASINS—FRAGMENTATION OF FARMLAND

Subbasin	Pct Farms with Sales <$2,500	Pct Farms Smaller than 50 Ac.	Farms with Sales <$2,500 >61%	Farms Smaller than 50 Ac. >45%
03050202 Stono	62	60	●	●
03050201 Cooper	66	57	●	●
03060101 Seneca	64	56	●	●
03050112 Santee	63	47	●	●
03050107 Tyger	63	47	●	●
03060110 Calibogue Sound/Wright River	63	47	●	●
03050206 Edisto	62	46	●	●
03050110 Congaree	62	46	●	●
03050104 Wateree	61	43	●	
03050205 Four Hole Swamp	62	36	●	
03060109 Lower Savannah	67	29	●	
03050209 Bulls Bay	61	65		●
03050210 St. Helena Island	47	61		●
03060102 Tugaloo	59	54		●
03050105 Upper Broad	60	46		●
03050109 Saluda	58	44		
03050108 Enoree	60	43		
03050101 Upper Catawba	59	43		

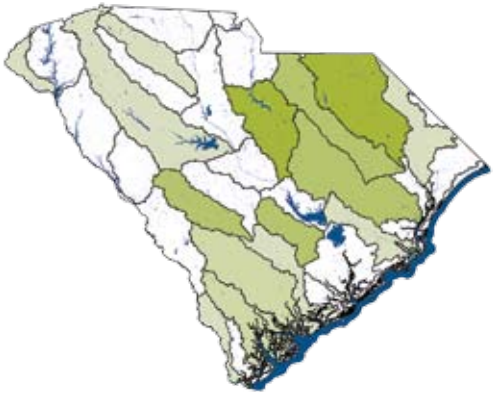
Subbasin	Pct Farms with Sales <$2,500	Pct Farms Smaller than 50 Ac.	Farms with Sales <$2,500 >61%	Farms Smaller than 50 Ac. >45%
03040207 Lower Pee Dee	58	42		
03040208 Coastal Carolina	54	42		
03050203 North Fork Edisto	59	41		
03040206 Waccamaw	52	41		
03060103 Upper Savannah	59	40		
03050103 Lower Catawba	61	38		
03050208 Broad	61	37		
03050106 Lower Broad	61	36		
03060106 Middle Savannah	60	36		
03050204 South Fork Edisto	58	36		
03060107 Stevens	58	36		
03040202 Lynches	55	36		
03050207 Salkehatchie/Combahee	61	33		
03040205 Black	60	33		
03050111 Lake Marion	58	33		
03040204 Little Pee Dee	46	32		
03040201 Middle Pee Dee	52	30		
03040203 Lumber	40	26		

Milking Parlor

Conservation Progress—Working Farm and Ranch Lands

PROGRESS IN KEY CONSERVATION PROGRAMS

Program	2005	2006	2007	Total
Conservation Reserve Program (CRP)	12,379	12,194	16,731	41,304[2]
Farm and Ranch Lands Protection Program (FRPP)	4,018	970	1,100	6,088
Grassland Reserve Program (GRP)	318	564	100	982
Wetlands Reserve Program (WRP)	6,751	5,649	7,163	19,563



WETLANDS RESERVE PROGRAM ACRES RETIRED BY SUBBASIN, 2006

0 <500 500–1,500 1,501–2,200 >2,200

CONSERVATION RESERVE PROGRAM ACRES RETIRED BY SUBBASIN, 2006

0 <700 700–1,500 1,501–3,200 >3,200

[2]The number of active CRP acres in the state for 2006 was 207,410 acres.

Dairy Operation—Piedmont

Brewback Soil

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