

TARCOG Top of Alabama Regional Council of Governments



# Green Infrastructure Strategy

A Preliminary Assessment

2012

Top of Alabama Regional Council of Governments

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Green Infrastructure Strategy:  
A Preliminary Assessment

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October 1, 2012



Top of Alabama Regional Council of Governments

## **Green Infrastructure Strategy: A Preliminary Assessment**

This report constitutes the Green Infrastructure Strategy for the Top of Alabama Regional Council of Governments for 2012. It is intended as a companion document of the Comprehensive Economic Development Strategy of the Top of Alabama Regional Economic Development District

**October 30, 2012**

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## About TARCOG

Established by a local initiative in 1968, the Top of Alabama Regional Council of Governments (TARCOG) aims to identify and address common regional issues, opportunities, and challenges of northeast Alabama’s municipalities and counties. TARCOG serves as Substate Planning District Twelve and the Area Agency on Aging. The governments of five northeast Alabama counties, DeKalb, Jackson, Limestone, Madison, and Marshall, and the municipalities located in these counties make up TARCOG. TARCOG helps local governments by obtaining funding for local government assistance, coordinating local governments’ responses to regional issues, and providing a wide range of services to the region’s governments and residents. This document was prepared by the TARCOG Department of Planning and Economic Development.

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# Chapter 1

## Introduction

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### Purpose of this Study Process

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## Purpose of this Study

Over the past few years the Top of Alabama Regional Council of Governments (TARCOG) has completed several planning projects concerning the protection and improvement of water quality in a five county region across Northern Alabama including DeKalb, Jackson, Limestone, Madison and Marshall Counties. TARCOG has built many partnerships during this time with agencies and organizations to implement certain elements of these planning projects. Recently TARCOG grew its partners by organizing the Tennessee Valley Regional Consortium for Sustainable Communities. This Consortium was brought together to propose a plan for sustainable development in the Huntsville, Alabama Metropolitan Statistical Area which consists of Limestone County and Madison County and the municipalities therein. These municipalities include Ardmore, Athens, Elkmont, Lester and Mooresville in Limestone County and Gurley, Huntsville, Madison, New Hope, Owens Cross Roads and Triana in Madison County. Identified in the proposal is the fact that between 2005 and 2035 the number of households in the Huntsville MSA is projected to increase by 30 percent and total employment by 83 percent. The basis for this growth is a diversifying economy, the direct impact of the 2008 Base Realignment and Closure (BRAC) transfers, and the area's solid foundation in aerospace and defense technology (BRAC 2007 Report). The consortium addressed land use and degrading water quality in the proposal and called for the preparation of a green infrastructure strategy. Therefore, this proposal for a green infrastructure strategy would compliment and strengthen the framework for the development of a regional plan for sustainable development.

TARCOG, working cooperatively with local stakeholders, proposed to create a Huntsville Metropolitan Area Green Infrastructure Strategy that would recognize the most critical areas that would benefit from practices that use natural processes to manage storm water. Over the course of the study, it became obvious that there would be many advantages to developing a strategy that would: 1) cover the entire, five county economic development district represented by TARCOG, and 2) serve as a companion strategy to the District's Comprehensive Economic Development Strategy. In addition to providing an element of synergy in the planning process, this approach serves to interject the economics of green infrastructure into the economic development process.

## Process

The first task of the process was to establish the study area. As stated above, it was originally envisioned that the local area to be studied for green infrastructure strategies would be the Huntsville Metropolitan Area which includes Madison County, Limestone County and the municipalities therein. The overall strategy now includes DeKalb, Jackson and Marshall Counties in addition to Madison and Limestone Counties.



The intent of the study was to provide an overall metropolitan strategy for “green infrastructure” that would work in concert with other ongoing sustainability efforts and provide guidance to specific projects and programs that are, or may be, implemented to achieve area objectives.

A Green Infrastructure Advisory Group was convened to provide input from the standpoint of local knowledge of issues pertaining to green infrastructure in general and water quality protection in particular. Among those invited to participate were, city, county and regional planning professionals, Redstone Arsenal, the Land Trust of North Alabama, the Wheeler Wildlife Refuge, the R C & D Council, and the Madison County Watershed Advisory Committee.

The group was convened at a meeting in which Mr. Randall Arendt was invited to present from his perspective of working with other communities around the country. Mr. Arendt is well known in the field and is the author of “Rural by Design” and “Envisioning Better Communities.” He discussed current practices in rural design and green infrastructure and, of particular interest, introduced the green infrastructure program of Lancaster County, Pennsylvania. Those in attendance included Jeffrey Pruitt, Falguni Patel and Scott Griess of the TARCOC Staff as well as Ben Ferrill of the City of Huntsville, Oliver van den Ende and Rob Hurt with the US Fish and Wildlife Service, Russell Fricano of Alabama A & M University, Jerry Gargile and Randy Morgan, a private sector engineer and a landscape architect respectively, and Nathan Willingham of the Northwest Alabama Council of Local Governments. A number of others were invited who were not able to attend.

In the months following the group discussion and Mr. Arendt’s comments, the staff reviewed relevant planning documents in light of green infrastructure strategies. These documents, in particular, included a review of relevant professional literature on the subject of green infrastructure and an examination of a selection of programs taking place in other areas.

The staff investigated local conditions and began the preparation of maps illustrating their findings. Expansion of the maps from the initial two county area to include the broader five county area still needs to be done. The initial maps include conditions related to:

- 1) The location of differences in elevation;
- 2) The location of rivers, streams, lakes, ponds and wetlands;
- 3) The location of ADEM “303d” listed streams;
- 4) The location of aquifers and public water wells; and
- 5) The location of federal and state parks and preserves;

An additional opportunity to gain insight was taken advantage of by virtue of a speaking engagement at the Spring Conference of the Alabama Chapter of the American Planning Association. Joining with Charlene LeBleu of Auburn University and Kimberly Hammond of the University of Alabama, staff member Jeffrey Pruitt presented a session on *“Ecosystems Services: A Practical Application of Green Infrastructure.”* This was done in two parts which included *“Green Infrastructure at the Region and the Sector: A Review of Current Practice”* and *“Green Infrastructure at the Site: Projects and Programs for Implementation.”* Following presentations, attendees were engaged in a discussion related to the subject matter.

In light of both the consultation and local conditions outlined in this report, a green infrastructure strategy for the five county Economic Development District is hereby recommended.

## Chapter 2

# Green Infrastructure Concepts

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### Definition of Green Infrastructure

#### Commonly Accepted Green Infrastructure Concepts

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## Definition of Green Infrastructure

Green infrastructure goes by many definitions, primarily according to the perspective of the person preparing the definition. The concepts involved seem to have been evolving over the years to the point that a new term - natural infrastructure – is coming into use. This concept stresses the economic benefits of green infrastructure in the development process and equates natural infrastructure that is already in place with infrastructure that must be constructed.

According to Benedict and McMahon (2006), green infrastructure is "an interconnected network of natural areas and other open spaces that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits to people and wildlife."

According to the Environmental Planning Handbook by Tom and Katherine Daniels, green infrastructure is the natural areas (woods, wetlands, floodplains and open space), farm and timberlands, and parks in a community or region. They state that capital investment in "green infrastructure" can be as important as traditional infrastructure, such as sewer and water facilities, for attracting economic development and providing a good quality of life in a community. They explain further that planning in America has traditionally meant "planning for development" but that now, communities and regions find that it is also necessary to plan for the preservation of land and for the sustainability of the air, water, and natural environment which provide healthy places to live and work.

## Commonly Accepted Green Infrastructure Concepts

### Water Quality

The Environmental Protection Agency's perspective on green infrastructure is in regard to clean water. Green infrastructure techniques are among the tools used 1) to minimize water runoff and its associated contaminants into water ecosystems and 2) to restore the natural hydrology of watersheds.

### Links and Hubs

According to "Planning and Urban Design Standards" published by the American Planning Association, green infrastructure is a green space network of natural ecosystem functions. Some communities, in addition to investing in man-made "gray" infrastructure, are using existing systems or creating new systems including parks and recreational area as ways to manage storm water, and create wildlife habitat. "Planning and Urban Design Standards" goes on to describe the links and hubs that comprise a green infrastructure network.

### **Links**

Landscape linkages  
Conservation Corridors  
Greenbelts

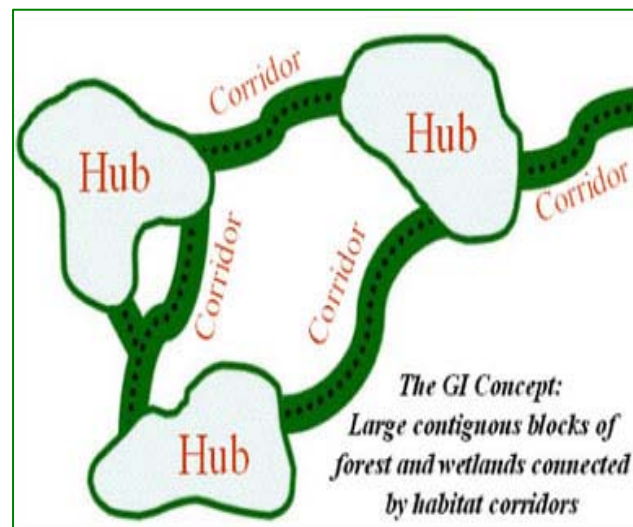
### **Hubs**

Reserves  
Managed native landscapes  
Regional parks and preserves  
Ecological sites such as riparian buffer zones and vegetative buffers  
Urban parks, neighborhood pocket parks  
Cultural/historical/recreational sites/trailheads

This has been taken further in the literature to describe an area's green infrastructure as an interconnected network of natural lands and other open spaces, including forests, streams, and rivers, meadows, farmlands, wetlands, ridge tops, bogs, and caves valuable for their ecological systems and services and for their significant contribution to regional and local economies. This network of natural systems provides the ecological framework for our environmental, social and economic health.

Examples of components of green infrastructure include forests, rivers and streams, wetlands, meadows, balds, recreation lands, including trails and parks, and agricultural lands, including farms and forests.

Examples of benefits of green infrastructure include cleaner air, cleaner water, fertile soils, healthier habitat for fisheries, food, flood control, areas for recreation, tourism, sustainable use of resources, and psychological health and well-being.



### **Ecosystem Services**

Ecosystem services describes the benefits that the environment provides to humans at no cost. That is, benefits we would have to provide for ourselves if our surroundings ceased to provide them. This gets to the heart of the matter when it comes to the benefits of green infrastructure. Examples of commonly understood benefits of green infrastructure include the following.

- Global climate regulation
- Local climate regulation
- Air and water cleansing
- Water supply and regulation
- Erosion and sediment control
- Hazard mitigation and reduction in disaster cleanup costs

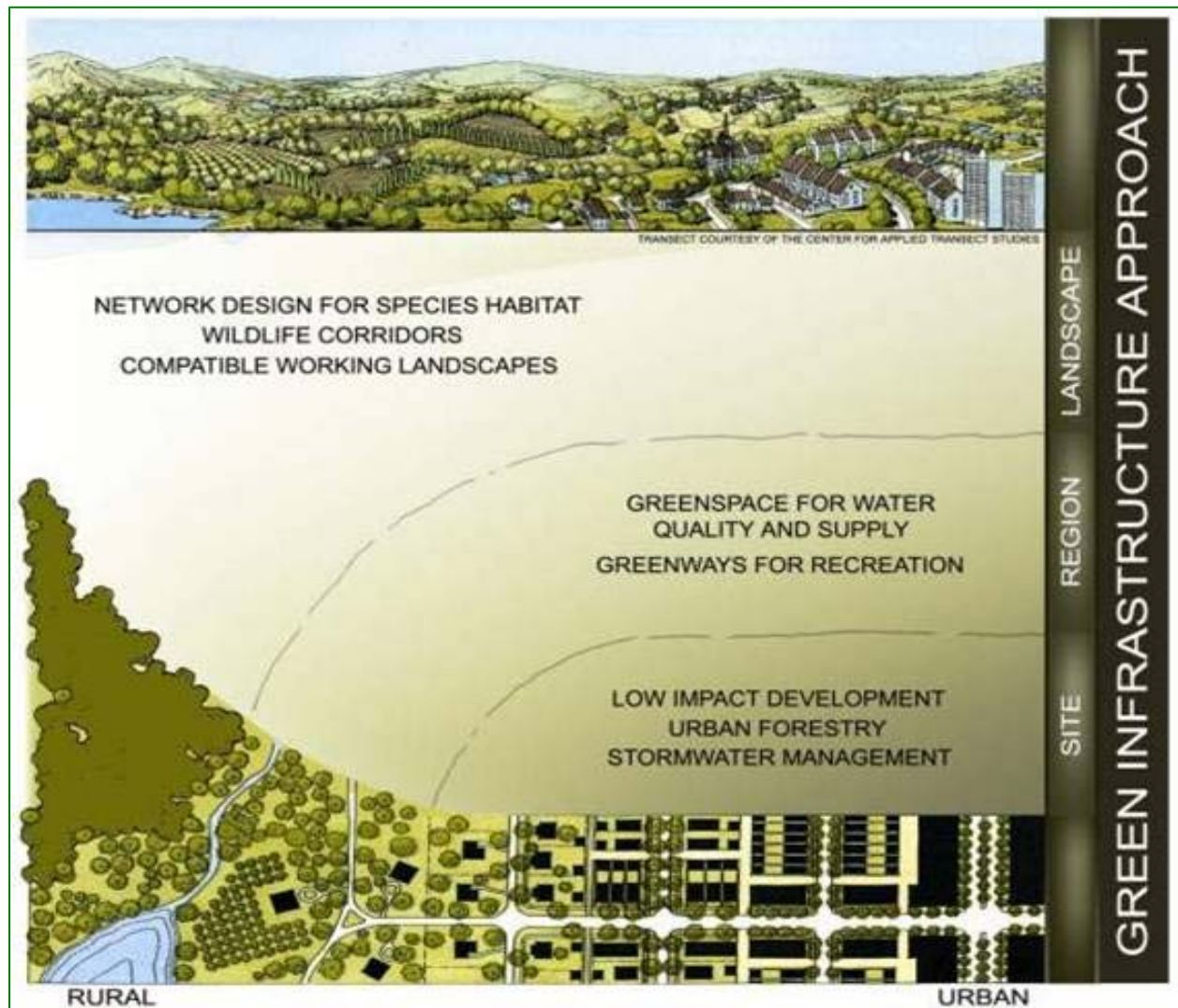
- Pollination
- Habitat functions
- Waste decomposition and treatment
- Human health and well-being benefits
- Food and renewable nonfood products
- Cultural benefits

### **The Transect**

The “transect” approach takes the hub and corridor approach a step further by looking at development practices and storm water management. The “transect” illustrates the continuum from rural to urban development and examines the development patterns prevalent in each area. The “transect” typically includes areas described as:

- 1) natural;
- 2) rural;
- 3) suburban;
- 4) general urban;
- 5) urban center; and
- 6) urban core.

A green infrastructure approach using the “transect” looks at the site, the region and the landscape and considers the appropriate activities for each area. Activities at the site level in the more urban areas could include low impact development, urban forestry and stormwater management. Activities at the regional level could include greenspace for water quality and supply and greenways for recreation. The landscape in rural areas could include wildlife corridors and working landscapes such as farming and forestry.



## Chapter 3

# Green Infrastructure at the Region: A Review of Current Practice

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Asheville, North Carolina  
Lancaster County, Pennsylvania  
Chattanooga, Tennessee

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In the course of this study, the staff of TARCOG reviewed a number of efforts in other parts of the country and selected three for further examination. The three that were selected were interesting in that they represented 1) a multi-county regional approach, 2) a countywide approach, and 3) an approach that emphasized the community, the street and the development site.

### Asheville Area

The green infrastructure program for the Asheville, North Carolina area is called “Linking Lands and Communities” and is administered by the Land-of-Sky Regional Council. The focus of the program is broad-base. That is to say, it does not focus on just one aspect of green infrastructure but on the full spectrum of green infrastructure issues. The scale of the program is regional. It covers four counties in western North Carolina. The program was created through a collaborative process involving broad based partnerships. Over 40 partners throughout the region were involved.

The approach of the “Linking Lands” program involves cumulative examination and grading of three resource assessments of a regional green infrastructure network. These assessments are:

- 1) Wildlife habitat and biodiversity assessment;
- 2) Agriculture assessment; and
- 3) Water quality assessment.

For example, the value of lands for farming or forestry was graded from the least valuable to the most valuable in ten grades according to four key components. The four key components of the agriculture assessment are:

- 1) The presence of existing farm or forest operations;
- 2) Land cover, including vegetation type and extent of existing development;
- 3) Agronomic soils; and
- 4) Land management factors, including land restrictions and proximity to publicly managed lands.

Following the resource assessments, network hubs were identified based on the highest ranking lands within each resource assessment. Then, corridors between the hubs were identified by searching for the shortest distance path between the hubs that had the highest resource value. Two maps are included as examples which illustrate the agriculture assessment and the composite green infrastructure network.



# Agriculture Assessment Map

## Which Lands are Valuable for Farming and Forestry?

Linking Lands and Communities  
in the Land-of-Sky Region



### Value for Farming and Forestry



Note that 1 = Least Valuable  
Note that 10 = Most Valuable

- County Boundary
- Major Roads
- Blue Ridge Parkway
- French Broad River

0 5 10  
Miles

**Important Information for Users of this Map:**  
This map contains modeled data created as part of Land-of-Sky Regional Council's Linking Lands and Communities project. Information on how this map was created is available on the project website. To access this information, visit [www.linklandss.org](http://www.linklandss.org) and click on "Resource Assessments" in the left-hand menu. The web page for each assessment explains how the assessment model was created, and includes links to a fact sheet, conceptual model, data sources & definitions, ranking scheme and input data layers. **LOSC, Renci and A Carroll GIS consider all of this information to be an integral part of this map, and essential to understanding what this map represents and how to interpret it properly.**

A Carroll GIS

**Renci**  
Resource Computing Institute  
at UNC Asheville

Land-of-Sky Regional Council  
Member of Western Piedmont Council of Governments, Limited Liability Corporation

Map Date: June 6th, 2010



# Green Infrastructure Network (Combined Resource Hubs)

Where are High Value Multiple Resource  
Hubs (Wildlife Habitat & Biodiversity,  
Water Quality, Farming &  
Forestry) and Wildlife Habitat  
& Biodiversity Corridors?

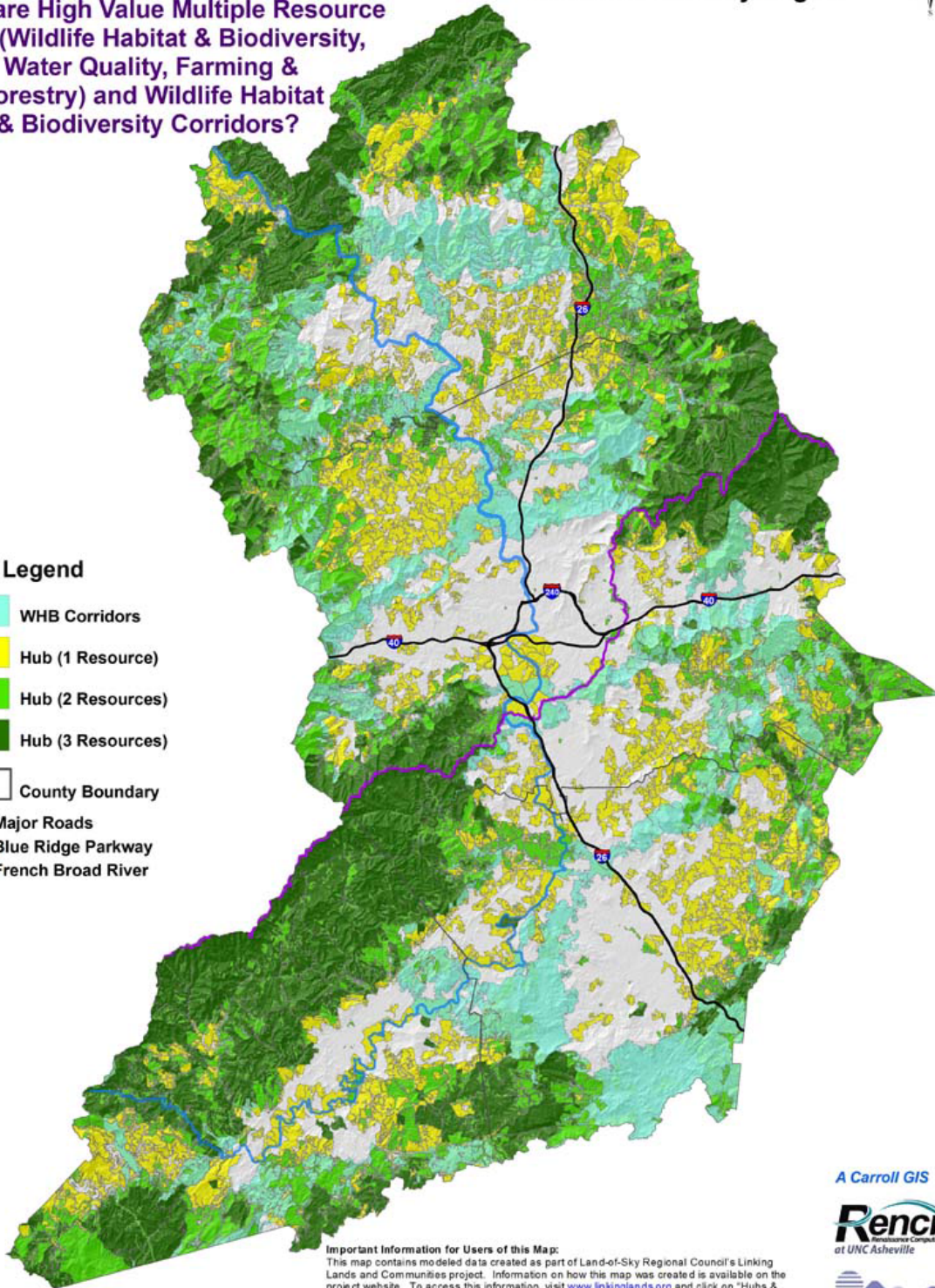
## Linking Lands and Communities in the Land-of-Sky Region



### Map Legend

- WHB Corridors
- Hub (1 Resource)
- Hub (2 Resources)
- Hub (3 Resources)
- County Boundary
- Major Roads
- Blue Ridge Parkway
- French Broad River

0 5 10  
Miles



#### Important Information for Users of this Map:

This map contains modeled data created as part of Land-of-Sky Regional Council's Linking Lands and Communities project. Information on how this map was created is available on the project website. To access this information, visit [www.linkthelands.org](http://www.linkthelands.org) and click on "Hubs & Corridors" in the left-hand menu. The web page for each map explains how the hubs of the Green Infrastructure network were modeled, and how the links or corridors connecting the hubs were created. It includes links to technical documentation. LOSRC, Renci and A Carroll GIS consider all of this information to be an integral part of this map, and essential to understanding what this map represents and how to interpret it properly.

A Carroll GIS

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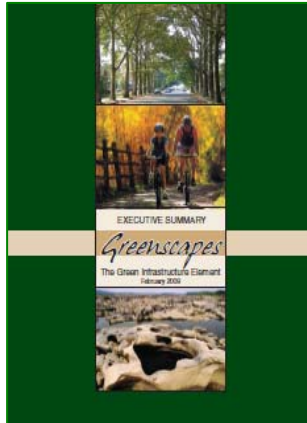
**Land-of-Sky Regional Council**  
Member of Western Piedmont Council of Governments, Inc.

Map Date: June 17th, 2010



## Lancaster County Area

The green infrastructure program for Lancaster County, Pennsylvania is called “Greenscapes.” It is an element of the Lancaster County Comprehensive Plan. This effort was brought to the attention of the TARCOG staff by Mr. Randall Arendt when he visited the Huntsville area in September, 2011.



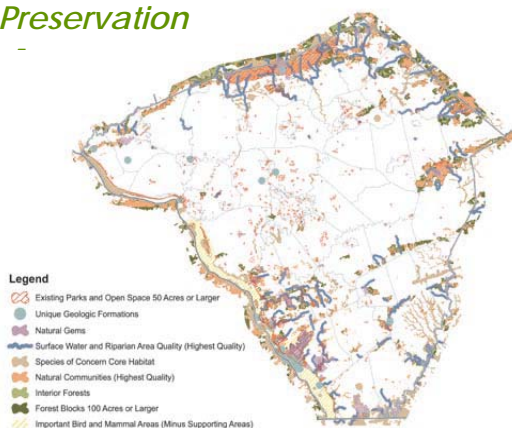
The focus of this effort is largely agriculture. About 63% of the landscape within Lancaster County is in agricultural use. The scale of the project is countywide. Rather than the resource assessment approach of the Asheville program, the Lancaster program emphasizes four strategies. These strategies are:

- 1) Preservation;
- 2) Conservation;
- 3) Restoration; and
- 4) Recreation.

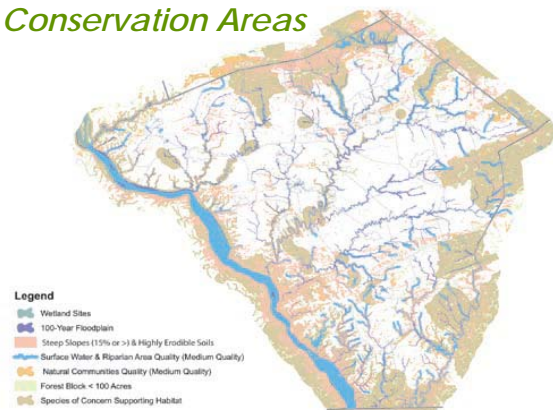
The areas within the county to be set aside for each of the four strategy areas were mapped and then consolidated into one overall “Green Infrastructure Concept Map.” The four “strategy” maps are shown. This was then followed by a set of key initiatives that were considered necessary to accomplish the goals for the program. The key initiatives of the Lancaster County strategy were:

- 1) Education and communications;
- 2) Technical assistance;
- 3) Funding;
- 4) Capital planning and development; and
- 5) Partnership.

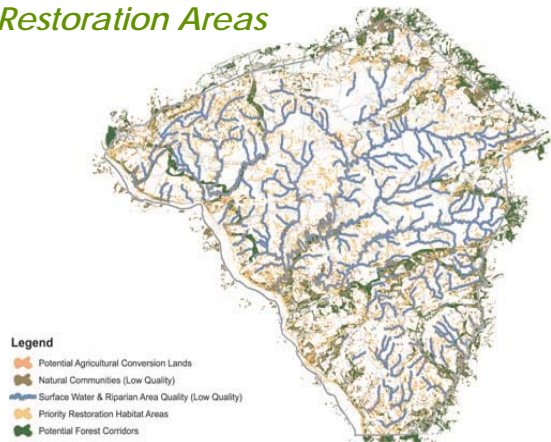
### *Preservation*



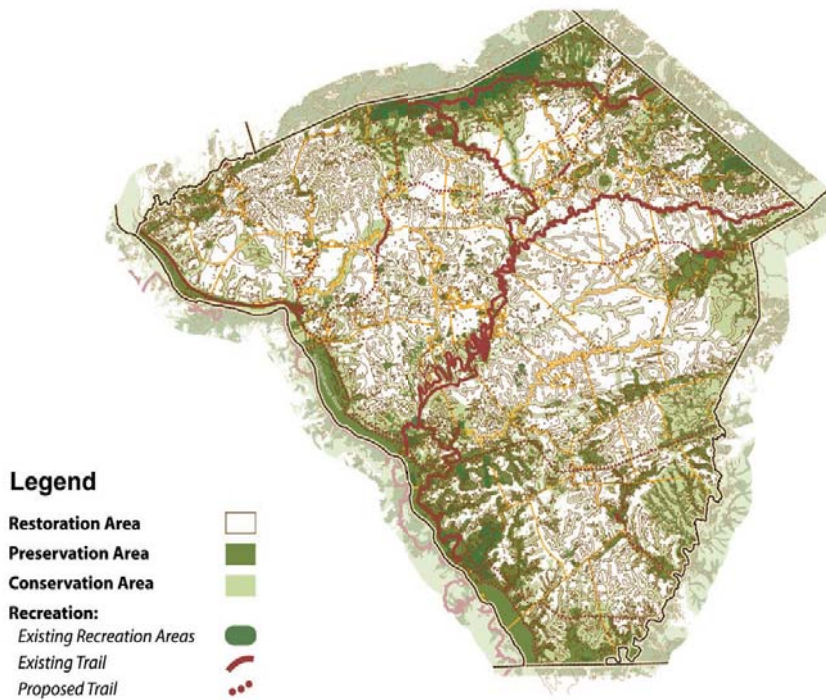
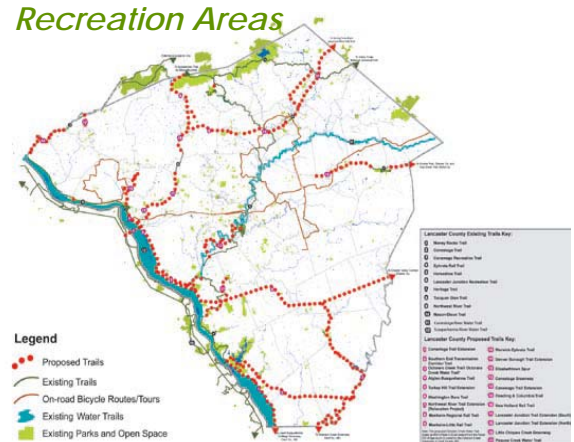
### *Conservation Areas*



## Restoration Areas



## Recreation Areas



## Green Infrastructure Concept Map

## Chattanooga Area

In the Chattanooga area, the Southeast Tennessee Development District has prepared a “Green Infrastructure Handbook.” The focus of the handbook is water quality. The approach of the handbook is based on scale. The handbook illustrates and explains practices that can be applied at the scale of the community, the street and the site.

With regard to the community, the handbook explains the benefits and methods of:

- Compact development
- Mix of uses
- Street network
- Infill
- Transfer of development rights
- Form-based codes
- Open space development

With regard to the street, the handbook explains the benefits and methods of:

- Complete streets
- Permeable pavement
- Urban forests
- Green parking
- Narrow streets
- Street planters and curb extensions
- Eliminating curbs and gutters

With regard to the site, the handbook explains the benefits and methods of:

- Green roofs
- Rain barrels and cisterns
- Rain gardens
- Native landscaping
- Lawn care
- Constructed wetlands
- Bioswales and vegetated swales
- Structural soil

## Chapter 4

### Green Infrastructure in the TARCOG District

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Location and Geography of the District
Environmental Overview
The Little River Watershed Initiative
The Comprehensive Economic Development Strategy
Green Infrastructure in the Enabling Acts

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#### Location and Geography of the District

The Economic Development District represented by the Top of Alabama Regional Council of Governments is situated in northeast Alabama in the southern foothills of the Appalachian Mountains and the southernmost area of the Tennessee River Valley. Centered on the Huntsville Metropolitan area, it is in proximity to the larger metropolitan areas of Nashville, Chattanooga, Atlanta, Birmingham, and Memphis. The district consists of the five counties of DeKalb, Jackson, Limestone, Madison and Marshall. The total land area of the District is approximately 3,796.7 square miles. The following paragraphs contain a more detailed description of the location and geography of each of the five counties.

##### DeKalb County

DeKalb County covers much of the Appalachian foothills section of northeast Alabama. To its north is Jackson County and to its east is Georgia. Its western border is shared with Marshall County. South of DeKalb is Cherokee and Etowah Counties. The County stretches from the northeast to the southwest and covers a total land area of 777.9 square miles. DeKalb resides on top of Sand Mountain and is split between a western region of elevated plateau and an eastern region of mountainous ridges and canyon features. Transportation networks are more uniform and consistent in the western region to Fort Payne and Interstate 59. East of these locations Lookout Mountain has fewer and less well-connected roadways. The county seat and principal population center is Fort Payne. No major bodies of water are found in DeKalb County, but the Little River Canyon area acts in a similar fashion to that of a major river in that it prevents east to west travel except in a few locations.

##### Jackson County

Jackson County forms the far northeast corner of Alabama. It is entirely bordered on the north by Tennessee, on the east by Georgia, on the west by Madison County, and on the south by Marshall and DeKalb Counties. Jackson County is the seventh largest county in Alabama by land area, and has a total land area of 1,078.7 square miles. This area is divided into three physical regions. In the northwest, the Cumberland Plateau creates hilly terrain where transportation routes chiefly follow small river and creek valleys. Central to the county, the Tennessee River and floodplain cut through Jackson County in a southwesterly direction. This relatively flat terrain is the path of Jackson County's primary transportation route, U.S. Highway 72, as well as the location of its principal population centers. Only two bridges allow access across the river to Jackson County's third physical region. The Sand Mountain area of the county

is notably elevated from the river but is flat on top. A consistent network of county roads ties the small towns of this area together.

## Limestone County

Limestone County is the westernmost county in the District. To its north is the Tennessee state line and it borders Lauderdale County to the west and Madison County to the east. Lawrence and Morgan Counties form the southern boundary, sharing the Tennessee River with Limestone County. Within its boundary Limestone County has 568.1 square miles of land that tends to gently rise to the north. The county is largely covered by fertile floodplain, and this gentle terrain results in a road system dominated by long, straight routes on a north-south and east-west orientation based on early township and range lines. Only the section northwest of the Elk River varies largely from this pattern. Limestone County is roughly cut into four quadrants by its two principal roadways. Interstate 65 halves the county as it runs from north to south and US Highway 72 bisects the county as it travels from west to east towards Madison County. Four feeder roads link the county seat, Athens, with outlying communities: US Highway 31 through Tanner, State Road 99 from the Lester area, Highway 127 from Elkmont, and Highway 251 from Ardmore.

## Madison County

Madison County is located in the north central portion of the District. To its north is the Tennessee state line and it borders Limestone County to the west and Jackson County to the east. Marshall and Morgan Counties form the southern boundary, sharing the Flint and Tennessee River with Madison County.



Within its boundary Madison County has 804.9 square miles of land. It is mostly flat on northern and western portions of the county, while southern and eastern portions of the county contain Monte Sano Mountain, Keel Mountain, and Green Mountain. It is the only urban county in the TARCOG region. Huntsville and Madison are the largest cities in the county. The major north-south routes include US 231/US 431 dividing Huntsville in half. State Route 53 is also a major diagonal route connecting Huntsville to north-western portion of the county. Interstate 565 and

US highway 72 connect the county to Interstate 65 in Limestone County. State Route 255 is also a major north-south commuting route that connects the north-central portion of the county to Redstone Arsenal.

## Marshall County

Marshall County is the southernmost county in the District and is bordered by six other counties. The dominant feature within Marshall County is Lake Guntersville, the largest reservoir on the Tennessee River. Area measurements reinforce the importance of the lake as a physical feature; while Marshall County contains the smallest land area of any county in the TARCOG region, at 567.1 square miles, it holds the largest amount of water area at 56.1 square miles. Sloping terrains ring the central lake region, but in the southeast corner of the county a steep rise onto Sand Mountain tapers off to relatively flat terrain on top. This portion of the county remains geographically distinct from the areas west of Lake



Guntersville. Four municipalities contain much of the county population: Arab in the southwest; Guntersville, the county seat, is placed on a peninsula in the Lake; Albertville and Boaz both extend across Sand Mountain following US Highway 431. Primary roads within the county include US Highways 231 and 431, and State Roads 75 and 79. The area with the least consistent road network is found surrounding Grant in the northern corner of Marshall County.

## Environmental Overview

### Land Cover

Information on land use and land coverage is available from the 2007 Alabama Watershed Assessment of the Alabama Soil and Water Conservation Committee. In the Assessment, the land within the District is grouped into nine different categories. These categories are principle row crops, other crops, pasture, hay land, forest, urban, water, mined land, and other.

District Land Cover in 2007						
	TARCOG	DeKalb	Jackson	Limestone	Madison	Marshall
Principle crops	11.0%	4.2%	6.6%	30.4%	15.6%	2.4%
Other crops	1.3%	0.0%	1.3%	0.0%	2.1%	3.1%
Pasture	10.0%	6.9%	11.2%	28.1%	3.1%	3.8%
Hay land	4.1%	0.8%	1.8%	10.7%	5.4%	4.0%
Forest	44.8%	47.3%	64.2%	19.5%	34.6%	44.8%
Urban	6.9%	3.0%	5.3%	7.5%	12.4%	6.7%
Water	5.3%	0.5%	6.0%	3.9%	0.9%	16.8%
Mined Land	0.3%	0.4%	0.8%	0.0%	0.1%	0.0%
Other	16.3%	37.0%	2.9%	0.0%	25.7%	18.5%

The land within the five county District differs very much in type and use. The highest percentage of land in the District is forest. However, the land cover indicates the importance of agriculture to Limestone County and to a lesser extent to Madison County. The percentages of land cover for the District and for the counties within the District are as follows.

### Waterways

According to the Army Corps of Engineers website, the US is linked by a network of inland waterways consisting of over 25,000 miles of navigable rivers and harbors. This network includes water passages along the Atlantic and Gulf Coast. It is utilized by both commercial and private vessels, linking ports in twenty states, extending from the Great Lakes to the Gulf of Mexico. The Tennessee-Cumberland Rivers system is a major part of our nationwide network of waterways. The Tennessee River is joined with the Cumberland by the Ohio River and the Barkley Canal. They are operated as a unit, linking communities and industry in the Tennessee River valley with our nationwide system of waterways and ports, providing a year-round water route of nearly 1200 miles. The Tennessee River is navigable from the Ohio River, near Paducah, Kentucky, to Celina, Tennessee, a distance of 381 miles. A series of fourteen locks and dams on the twin rivers system help move traffic up and down the rivers in stair steps. The Tennessee River falls 500 feet on its way to the Ohio River. Over fifty million tons of commodities are shipped annually via the Tennessee River, and approximately 180 ports and terminals on the Tennessee support industries that provide thousands of beneficial jobs for valley residents.

Most of the goods shipped on the Tennessee River are giant bulk material, such as raw materials, fuels, and aerospace and defense production materials. Commodities such as coal make up 50% of all cargo shipped by barge on the Tennessee-Cumberland Rivers system. Crude materials, such as building products, iron and steel, are the next most frequently shipped items by barge. Petroleum, chemicals and farm products are also transported via the Tennessee River. Barge transportation requires less energy than any other type of transportation. According to the Army Corps of Engineers, one gallon of fuel will move one ton of freight fifty miles by barge, making it an ideal method of transportation and distribution of low cost shipping of raw materials, fuels, and other bulk items that support our Defense and Aerospace cluster.

## Water Quality

The Tennessee River, its watershed, tributaries, and abundant wetlands, is by far the most cherished resource in the District. It is the source of our region's food supply, water supply, power supply, transportation routes, recreation, relaxation, and livelihood. In fact, recreational boating on the Tennessee River contributes over \$25 million to the valley economy each year, and overall water-based recreation generates in excess of \$2 Billion in annual revenues throughout the Tennessee Valley Region. The importance of collaboration and planning to the overall quality of life within the Tennessee Valley



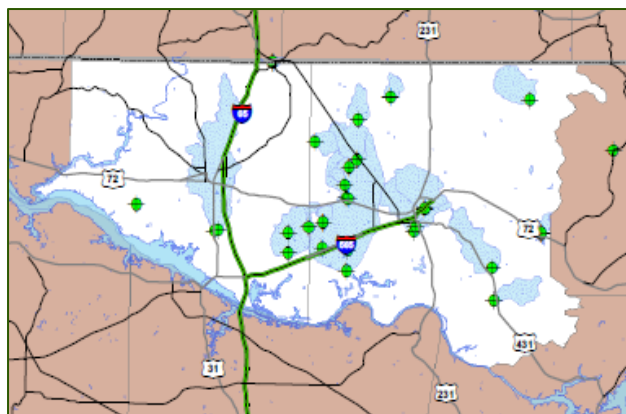
watershed should never go understated. Watershed awareness is crucial to the planning process. Any development that happens within the Tennessee River watershed impacts every resident that lives within the basin who utilizes the river's vast resources. Understanding watershed management and watershed integrity is crucial to the planning and economic development process. Any activity that happens upstream will affect residents living downstream, and vice versa. The watershed does not respect geopolitical boundaries. It is important to involve, engage, and educate every interest living within

the watershed the important role they share toward the integrity of their watershed and the quality of their drinking water and food supply. The Tennessee River also has traditionally provided jobs and supported the livelihoods of those living within its basin. It is a shared resource. It gives us a regional identity and a sense of place. According to a joint study by the U.S. Geological Survey and the Tennessee Valley Authority (TVA), the Tennessee River is the most intensively used river system in the country. Approximately 97 percent of the water currently withdrawn from the river is returned to the system for use downstream, making the region one of the lowest overall water consumers in the United States.

Economies throughout the Tennessee Valley Region depend on the river system for low-cost power generation, municipal & industrial water supply, efficient waterborne transportation, recreation, tourism, environmental preservation, and jobs. Approximately one hundred thirty-seven municipalities, fifty-eight industries, and seven mining companies in the Tennessee Valley rely on withdrawals of water from the Tennessee River System. Water is also withdrawn for TVA power-plant cooling and for irrigation purposes.

Clean drinking water and water quality is an essential quality of life issue for economic development now and in the future. In fact, it has been stated that it will not be the depletion of the oil supply we will

be worrying about in the future, it will be clean water. Water quality is also important to economic development, in that prospective businesses have already analyzed the study area and site selection process based on quality resources and strong natural infrastructure. The wetlands and migratory

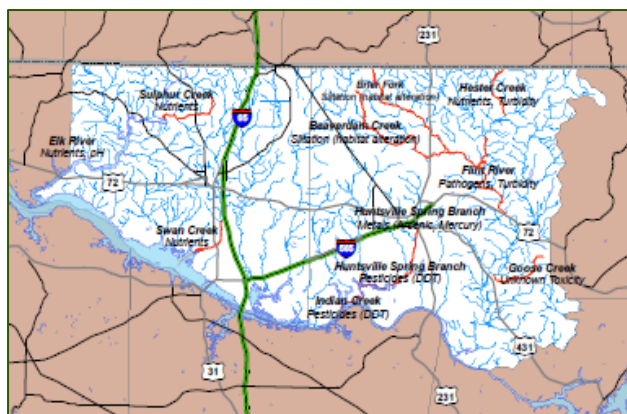


ecological corridors that span our vast region serve as natural water filtration and purification systems and should be protected and preserved as much as possible. If this vital natural infrastructure is sick, threatened or weakened, potential for economic growth and attraction may be lost.

Another serious environmental concern in recent years has been the drastic impact drought has had on the agricultural industry, especially affecting corn and grain crops throughout the region and the dropping water levels causing

groundwater recharge rates to drop significantly. According to the University of Alabama, the underground aquifers in our region are not recharging at the rate they once were, affecting everything from our drinking water, farming irrigation techniques, water recharge zones, ecosystem biodiversity, and many other things intrinsically dependent on this vital life source.

As expressed earlier, over fifty million tons of commodities are shipped annually down the Tennessee River. Approximately one hundred-eighty ports and terminals on the Tennessee support industries that provide thousands of beneficial jobs for valley residents. Unfortunately, however, this robust economic and industrial activity from TVA power generation, the maintenance of the lock and dam system for hydroelectric power, and other riparian impacts, has adversely affected the water quality of the Tennessee, systematically transforming its ecosystem from a river environment to a lake environment and devastating our mollusk and mussel reserves, which was once one of the most bio diverse in the



world. It is vital to the long-term sustainable economic development of the District that we work closely with environmental resource management experts to protect and maintain this valuable resource now and for future generations.

The streams listed on the following table are those within the District which have been listed by the Alabama Department of Environmental Management for a variety of contaminants under Section 303(d) for 2010. Several of these streams have management plans in place that

are under implementation. Contamination can affect the desirability of a stream for any number of economic activities, particularly recreational activities such as swimming and fishing.



Streams Listed Under Section 303(d) for 2010

Stream	County	Uses	Causes
Riley Maze Creek	Marshall	Fish & wildlife	Toxicity, siltation
Tibb Creek	Marshall	Fish & wildlife	Toxicity, siltation
Warren Smith Creek	Jackson	Fish & wildlife	Siltation
Guess Creek	Jackson	Fish & wildlife	Unknown toxicity, organic enrichment, pathogens
Hester Creek	Madison	Fish & wildlife	Nutrients, turbidity
Beaverdam Creek	Madison	Fish & wildlife	Siltation
Brier Fork	Madison	Fish & wildlife	Siltation
Flint River	Madison	Fish & wildlife	Turbidity
Goose Creek	Madison	Fish & wildlife	Unknown toxicity
Huntsville Spring Branch	Madison	Fish & wildlife	Pesticides, metals
Indian Creek	Madison	Fish & wildlife	Pesticides
Hughes Creek	Marshall	Fish & wildlife	Siltation
Mill Pond Creek	Marshall	Fish & wildlife	Siltation
Swan Creek	Limestone	Fish & wildlife	Nutrients
Elk River	Limestone	Swimming, fish & wildlife	Nutrients, pH
Sulphur Creek	Limestone	Fish & wildlife	Nutrients

## Threatened and Endangered Species

There are at least eighteen threatened or endangered species within the District. While the fact that these species are threatened or endangered is cause for concern, it also illustrates the biodiversity of the District which can be turned to opportunities for study and research. These species and their location within the five counties are shown in the following table.

Threatened and Endangered Species in the TARCOG District

Species	Status	DeKalb	Jackson	Limestone	Madison	Marshall
Gray Bat	Endangered	x	x	x	x	x
Indiana Bat	Endangered		x			
Bald Eagle	Threatened		x	x	x	x
Wood Stork	Endangered			x		
Red Cockaded Woodpecker	Endangered					x
Flattened Musk Turtle	Threatened					x
Slackwater Darter	Threatened			x	x	
Boulder Darter	Endangered			x		
Palezone Shiner	Endangered		x			
Snail Darter	Threatened				x	x
Mussels*	Varies	x	x	x	x	x
Anthony's Riversnail	Endangered		x	x		
Price's Potato-bean	Threatened				x	x
Morefield's Leather Flower	Endangered				x	
American Hart's Tongue Fern	Threatened		x			
Harperella	Endangered	x				
Kral's Water Plantain	Threatened	x				
Green Pitcher Plant	Endangered	x	x			

## The Little River Watershed Initiative

TARCOG's Little River Watershed Initiative began in mid-2004 when the former mayor of the Town of Mentone called TARCOG to inquire about strategies or programs to protect the quality of water in the West Fork of Little River. The West Fork flows through the Town and merges with the East Fork to form Little River. Little River flows through Little River Canyon and eventually empties into Weiss Lake which is an impoundment of the Coosa River. The Coosa River flows into the Alabama River which empties into the Gulf of Mexico. The Little River and its "Forks" pass through the areas of the town of Mentone, the City of Fort Payne, DeSoto State Park, and Little River Canyon National Preserve. Little River is designated as an Outstanding National Water Resource. Officials of both the town of Mentone and the Little River National Preserve have expressed concerns of increased sedimentation and water quality

and believe the increase in sedimentation is due to increased development of roads and subdivisions surrounding the river area.



With financial assistance provided by the Alabama Department of Environmental Management (ADEM), TARCOG began a one year project to develop a watershed management study. The first orientation meeting of stakeholders was held at the Mentone Community House on January 28, 2005. It was followed up by a community workshop on June 9, 2005 and publication of the West Fork Little River Watershed Management Study. In the following

year and subsequent years, the West Fork study expanded to encompass the entire Little River Watershed and the initial focus on water quality became more comprehensive with regard to the use of land. At the same time, ADEM continued to provide annual financial assistance to the program. In recent years, technical assistance has been provided by the Southeast Regional Water Quality Assistance Network. In 2008, TARCOG, along with other regional councils in Alabama, entered into a partnership agreement with the Alabama Forestry Commission (AFC). Although the AFC agreement is not specifically directed toward the Little River Watershed Initiative, the partnership was a great complement to those efforts. AFC representatives have become active members of the Little River stakeholder group. The initial stakeholder group, which was intended for a one-time project, now meets regularly. This group has evolved into the Friends of the Little River.

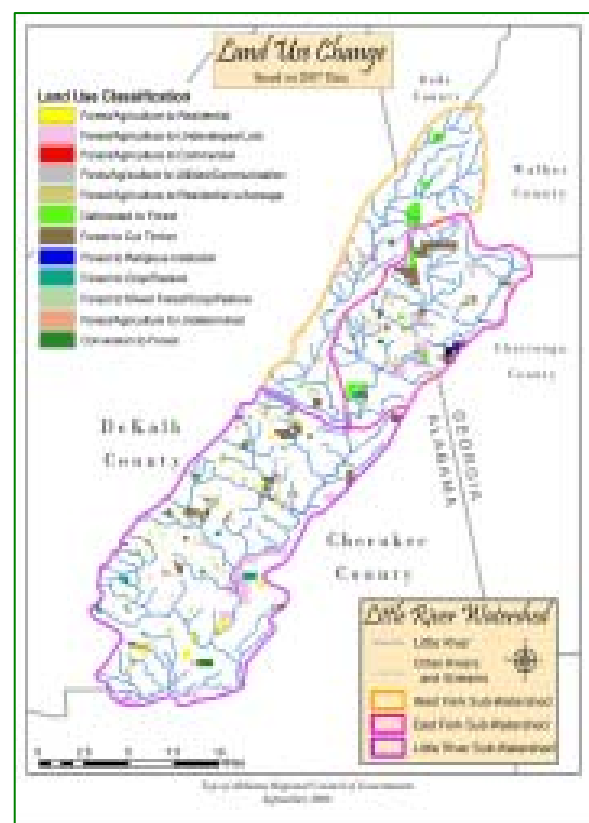
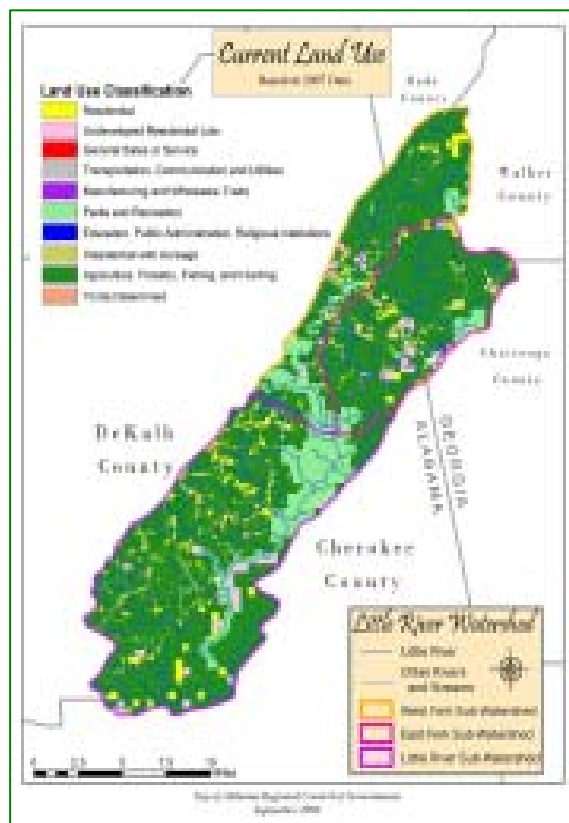
TARCOG has prepared several published documents associated with the Little River Watershed Initiative. These include the following:

- West Fork Little River Sub-Watershed Study – 2005;
- Little River Sub-Watershed Study – 2006;
- East Fork Little River Sub-Watershed Study – 2007; and
- Little River Land Use and Protection Program – 2008.
- Watershed Disturbance Reporting Program – 2009
- Rural Design Guidelines – 2010

Over the years, TARCOG has developed a list of implementation activities that it uses to direct its efforts in the Watershed. This list is organized by fifteen major headings which are:

- 1) Develop a Watershed Plan;
- 2) Land Conservation;
- 3) Establish and Maintain Aquatic Buffers;
- 4) Better Site Design;
- 5) Erosion and Sediment Control;
- 6) Establish Stormwater BMP's;
- 7) Reduce Non-stormwater Discharges;
- 8) Establish Watershed Stewardship Programs;
- 9) Education;
- 10) Septic Tank Management;
- 11) Land Use Study;
- 12) Establish Watershed Facilitator;
- 13) Institute Continuous Water Quality Monitoring;
- 14) Update Subdivision and Zoning Regulations; and
- 15) Initiate a Litter Campaign.

Some of these activities have been completed, some are underway and many are yet to be started. As with any such effort, the lack of funding is the primary hurdle to overcome in order to move forward. In the meantime, TARCOG tries to maintain communications with local partnerships to address small projects until such time as more substantial funding is forthcoming.



# The Comprehensive Economic Development Strategy

In the course of performing the research for this Green Infrastructure Strategy, it became apparent that one opportunity that could be taken advantage of would be to begin to incorporate the concepts of green infrastructure into the District Comprehensive Economic Development Strategy (CEDS). The District CEDS is a five year plan for economic development for the five counties of DeKalb, Jackson, Limestone, Madison and Marshall in northeast Alabama. The most recent CEDS for the TARCOG District was prepared in 2012 for the period of 2013 to 2017. The CEDS is a broad based plan that goes beyond traditional industrial attraction activities and expands into the realm of sustainable economic prosperity.

## Sustainable Economic Prosperity

The District CEDS was developed with the concept of sustainability in mind. Sustainability may be described in many ways. In this case, the concept recognizes the interrelationships between the economy of the District, the prosperity of the people, and the quality of the environment, as well as the ability of the area to continuously prosper over time.

The Economic Foundations of the CEDS comprise a vision of sustainable economic prosperity for the District. This vision for sustainable economic prosperity was prepared in consideration of a number of guiding principles. These guiding principles serve as an underpinning for five strategic economic sectors that are considered the foundation to growing and continuing the economic prosperity of Northeast Alabama. The guiding principles are discussed in the CEDS in relation to: 1) Sustainable Economic Prosperity including the interrelationships of the economy, the environment, and the community; 2) Economic Resiliency; 3) Economic Diversification and the importance of cluster strategies; 4) The Importance of Scale including global awareness; 5) The Importance of Place; 6) Community Livability; 7) Program Adaptability; and 8) Jobs Strategies.

In order to build a sustainable and resilient regional economy, it is necessary to lay a strong foundation based on the assets or strengths that are already at hand. For the Economic Development District represented by the Top of Alabama Regional Council of Governments, five strategic economic sectors were identified as the foundation for a prosperous and sustainable future. Those five sectors are:

- 1) Agriculture and Forestry;
- 2) Commerce and Place Making;
- 3) Science, Technology and Defense;
- 4) Manufacturing, Distribution and Logistics; and
- 5) Travel and Tourism.

The goals for agriculture and forestry and for travel and tourism have particular relevance to green infrastructure. They were stated in the CEDS as follows.

## Goal for Agriculture and Forestry

The desire of the District for its future is that its farms and forestlands are economically viable and provide a sustainable return to landowners, farmers, and farm workers. They provide a wide variety of products to the local economy as well as produce traded goods for other areas outside the region. The District's agricultural areas and productive forests function in concert with

nature and provide opportunities for educational pursuit and recreational respite in attractive rural countrysides.

## Goal for Travel and Tourism

The desire of the District for its future is that the area has realized much of the economic potential of its tourism and recreational resources without degrading the characteristics that made them attractive in the first place. The watersheds, mountains, streams, lakes and wetlands are not only noted for their pristine and untouched beauty, but are home to one of the most unique and diverse ecosystems on the planet. The District's towns, cities, countrysides, and wilderness areas offer unmatched beauty and recreational opportunities.

The following chart constitutes a matrix of the five goals and 25 objectives of the District Comprehensive Economic Development Strategy. Four of the objectives contained in the CEDS directly address green infrastructure issues and an additional four objectives are supportive. As stated in the CEDS, the four objectives that directly address green infrastructure are:

**1.3. *Protect Rural Character and the Urban/Rural Interface.*** Preserve the environmental integrity and rural character of communities developed on previous farmland. Use preservation strategies on the fringe of cities and towns to provide identity and quality of life to the entire region. Protect communities from natural disasters, and protect vital wetlands and migratory corridors to preserve the ecological integrity of the natural infrastructure.

**5.1. *Protect Natural Infrastructure.*** Protect the natural infrastructure of the District, including the resources and natural beauty that serve as the infrastructure for many of the District's tourism, travel, and recreational opportunities.

**5.2. *Support Environmental Education.*** Support efforts that educate the public and stakeholder communities about the economic value of natural infrastructure and environmental resources.

**5.4. *Foster Place Commitment.*** Foster a sense of connection and loyalty to the community and its places by protecting and preserving our natural resources as well as our towns, cities, neighborhoods and countrysides.

Those objectives in the CEDS that are supportive of green infrastructure strategies are:

**1.1. *Support Local Growers.*** Support and improve supply chain dynamics and infrastructure needs for local food production and marketing.

**1.2. *Promote Farm to School Education.*** Promote educational opportunities in the local schools to highlight the benefits of healthy food choices and better nutrition.

**1.4. *Integrate Urban and Rural Economies.*** Use agriculture and forestry initiatives to better integrate urban and rural economies and to provide economic diversity, resiliency, and educational opportunities.

**1.5. *Promote Local Products.*** Actively and aggressively partner with and assist organizations that are designed to finance and promote the use of locally grown products.

## Economic Foundations

Agriculture and Forestry	Commerce and Place Making	Science, Technology and Defense	Manufacturing, Distribution and Logistics	Travel and Tourism
Support Local Growers	Plan Transportation Corridors	Promote Industrial/ Institutional Collaboration	Facilitate Intermodal Transportation	Protect Natural Infrastructure
Promote Farm to School Education	Develop Training Partnerships	Strengthen Education and Research	Support Retraining for Advanced Manufacturing	Support Environmental Education
Protect Rural Character and the Urban/Rural Interface	Support Complete Neighborhoods	Leverage Competitive Advantages	Assist with Preparedness Programs	Create a Regional Identity
Integrate Urban and Rural Economies	Involve Business in Hazard Mitigation	Position for Base Realignment and Closure	Promote Economic Diversification	Foster Place Commitment
Promote Local Products	Promote Downtowns and Business Districts	Foster a Culture of Funding	Expand Financing Alternatives	Promote Local Arts and Culture

These objectives directly address green infrastructure

These objectives support green infrastructure

## Green Infrastructure in the Enabling Acts

The Standard City Planning Enabling Act is contained within the Code of Alabama and has remained largely unchanged since its inclusion in 1935. The Act contains many parts however Section 11-85-4 of the Code of Alabama specifies the contents of a Master Regional Plan. Significantly, the contents include a number of green infrastructure components which are indicted below in italics.

### Section 11-85-4: Master Regional Plan

Any regional planning commission is hereby authorized and empowered to make, adopt, amend, extend, and add to a master regional plan for the physical development of its region. Such plan shall be based on comprehensive studies of the present and future development of the region with due regard to its relation to neighboring regions and the state as a whole and to neighboring states.

Such plan, including maps, charts, diagrams, and descriptive matter, shall show the commission's recommendations for the physical development of the region and may include, among other things, the general location, extent and character of streets, parks and other public ways,

grounds and open spaces, public buildings and properties, and public utilities (whether publicly or privately owned or operated) which affect the development of the region as a whole or which affect more than one political subdivision of the state within the region, *the general location of forests, agricultural, and open development areas for purposes of conservation, food and water supply, sanitary and drainage facilities, or the protection of future urban development* and a zoning plan for the control of the height and area or bulk, location, and use of buildings and premises and of the density of population.

Such master plan shall be made with the general purpose of guiding and accomplishing a coordinated, adjusted and harmonious development of the region and of public improvements and utilities which do not begin and terminate within the boundaries of any single municipality or which do not relate exclusively to the development of any single municipality and which will, in accordance with the present and future needs of the region and the state, best promote health, safety, morals, order, convenience, prosperity and general welfare, as well as efficiency and economy in the process of development.

Additionally, the Top of Alabama Regional Council of Governments is organized as a regional planning and development commission in accordance with the provisions of the Code of Alabama. Section 11-85-56 of the Code of Alabama specifies the general powers and duties of such a commission which includes an examination of certain green infrastructure elements. Among others, the powers and duties of such a commission include the following.

#### **Section 11-85-56: Powers and Duties Generally.**

A regional planning and development commission established pursuant to this article may perform the following:

- (1) Carry on continuous, comprehensive planning for the region, assessing needs, resources, and development opportunities and formulating goals, objectives, policies, and standards to guide physical, economic, and human resource development.
- (2) Prepare a regional plan consistent with state comprehensive planning and reflecting plans and programs of the participating governmental units which shall set forth policies for the development of the region in accordance with present and future needs and resources including policies for patterns of urbanization, for the use of land and resources for commerce, industry, recreation, transportation, forestry, and agriculture, for the development of human resources and for administrative measures in support thereof.
- (3) Prepare an annual regional development program to implement the policies contained in the regional plan, which program shall contain an analysis of the current status of regional development in relation to the regional plan and prior regional development programs, a review of trends affecting regional development, schedules of major program expenditures and activities, and capital improvements together with financing plans and recommendations for new programs or elimination or change of existing programs and for changes in administrative organization or procedures.
- (4) Prepare and publish studies of the region's resources.

## Chapter 5

### Recommendations for Green Infrastructure in the District

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Study Area Expansion  
Synergistic Planning  
Education and Communications  
Partnership  
Funding

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In an attempt to move forward in advancing the concepts of green infrastructure in the five county District, the following five, broad areas of activity have been identified. These activities are short term in nature and need to occur immediately. Furthermore, each and every one of them is necessary in order to have an impact. Without all of them, the chances of achieving a critical level of activity that that will support real projects are significantly diminished.

***Study Area Expansion.*** Expand the study area of this green infrastructure strategy beyond the Huntsville Metropolitan Area to the entire TARCOG Economic Development District to take advantage of the opportunities that arise in the broader area and to the partnerships that may be available to advance green infrastructure concepts. Utilize study methods such as that used by the Land-of-Sky Regional Council in Asheville, North Carolina to examine the resources of the District in more detail.

***Synergistic Planning.*** Continue to stress the use of the Comprehensive Economic Development Strategy to address green infrastructure issues, particularly in regard to the economic advantages and benefits of green infrastructure in community development and land development. Use economic development to lend additional gravity to green infrastructure concepts. Interject green infrastructure concepts into town and city planning as opportunities arise within the five counties and 47 municipalities of the District.

***Education and Communications.*** Reinstitute the periodic seminars on green infrastructure practices that TARCOG once hosted in the Little River Watershed area including, if funding is available, the “Little River Symposium for Green Infrastructure and Watershed Protection.” Dedicate a page on the TARCOG Web Site for green infrastructure educational purposes.

***Partnership.*** Maintain existing partnerships among organizations engaged in environmental protection and community planning and expand partnerships in the other such organizations, particularly those in the private sector. In particular, explore relationships with universities and foundations that express similar interests. Expand relationships with area agricultural interests in a similar manner as has been done in the past with forestry interests.

***Funding.*** Explore opportunities for additional funding for green infrastructure planning and project implementation. Look beyond traditional, public sources of funding to private sources in an attempt to leverage available monies.





## Appendix

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### Selected Resources

U.S. Environmental Protection Agency

<http://cfpub.epa.gov/npdes/greeninfrastructure/gicasestudies.cfm>

The Conservation Fund

<http://www.greeninfrastructure.net/>

Asheville, North Carolina (Land-of-Sky Regional Council)

<http://www.nado.org/land-based-sustainable-development-strategies-in-western-north-carolina/>

<http://www.linkinglands.org/>

Lancaster County, Pennsylvania

[http://www.co.lancaster.pa.us/planning/lib/planning/greenscapes\\_exec\\_sum.pdf](http://www.co.lancaster.pa.us/planning/lib/planning/greenscapes_exec_sum.pdf)

Chattanooga, Tennessee (Southeast Tennessee Development District)

<http://www.sedev.org/downloads/GreenInfrastructureHandbook.pdf>

