

Chapter 4: Natural Resources

NATURAL RESOURCES

1.1 Introduction

This section addresses the natural resources and vital areas found in Jackson County, Arcade, Braselton, Commerce, Hoschton, Jefferson, Nicholson, Pendergrass, and Talmo, as defined in the *Minimum Planning Standards and Procedures*, Rules of the Georgia Department of Community Affairs, Chapter 110-3-2, as amended. Under the *Georgia Planning Act of 1989*, natural resources include groundwater recharge areas, rivers, wetlands, protected mountains and river corridors, coastal resources, floodplains, soils, steep slopes, prime agricultural and forest land, plant and animal habitat, major park, recreation and conservation areas, and scenic views and sites. To preserve and protect a community's natural resources, the Department of Natural Resources established minimum protection standards for natural resources, the environment and vital areas of the state, specifically, water supply watersheds, groundwater recharge areas, wetlands, river corridors, and mountains.

1.2 Physiography and Topography

Topography and slope are important considerations in local planning because they provide indicators of suitability and cost of developing particular sites. Local relief and slope characteristics should be considered, particularly along streams of significant slope, flat or low-lying areas, and along ridges, hillsides and streams. Development without regard to slope and relief can damage the natural environment through increased stormwater runoff and soil erosion. In addition, an area's aesthetic quality can be damaged without consideration to topography.

Jackson County, located on the upper fringes of the Piedmont Plateau section of Georgia, is adjacent to Banks, Barrow, Clarke, Hall, and Madison counties (see Location Map 1-1). The county covers 342 square miles, or 218,957 acres, of gently rolling ridges and valleys. Some areas near streams are steep. The floodplains of the rivers and creeks are level to nearly level.

The Mulberry, Middle Oconee, and North Oconee river systems drain the entire county. Jackson County is bisected by two broad ridges that run northwest to southeast. These two ridges extend the length of the county, running from the Hall County line in the north, south toward Clarke County. About half the county's acreage lies between the tops of these two ridges and slopes inward toward the Middle Oconee River. Outside of these ridges, the remaining acreage slopes toward the North Oconee River on the east and the Mulberry River on the west. In most places, the top of the ridge that separates these drainage areas is about 900 feet above sea level. Elevations in Jackson County range from 640 feet above sea level along the North Oconee River near the Clarke County line to 1,100 above sea level just west of Talmo near the Chestnut Mountain area of Hall County.

Jackson County contains eight incorporated towns. Arcade, Braselton, Hoschton, Jefferson, Nicholson, Pendergrass and Talmo all lie in the Oconee River Basin. Commerce, in the northeastern portion of the county, lies largely within the Savannah River Basin.

Arcade is located in south-central Jackson County just south of Jefferson on Highway 129. Elevations within the city range from 800 to 860 feet.

Braselton, located near the Barrow County line in western Jackson, is bisected by highways 53 and 124. The city's elevation is approximately 900 feet above sea level.

Commerce, located in the northeastern part of the county near the Jackson-Banks county line on Highway 441, ranges in elevation from 800 to 960 feet.

Hoschton borders Braselton to the south along Highway 53 in western Jackson County. Its elevation is also approximately 900 feet.

Jefferson, the county seat, is located near the center of Jackson County at the intersection of highways 11, 129 and 15. Elevations range from 765 feet to 800 feet.

Nicholson is located in eastern Jackson County along Highway 441. The city ranges in elevation from 800 to 860 feet.

Pendergrass is located northwest of Jefferson along Highway 129. Its elevation ranges from about 800 to 900 feet above sea level.

Talmo is located northwest of Pendergrass along Highway 129, near the Hall County line. Its elevation ranges from about 900 to 950 feet.

1.3 Geology and Mineral Resources

An inventory and analysis of local geology and mineral deposits are important in determining site-specific development potential as well as opportunities for expansion of extractive industries as part of the local economic base. Geologically, Jackson County is underlain predominately by biotitic gneiss, schist and granite gneiss. Other minerals known to exist in the county are asbestos, beryl, granite and related rock outcrops.

1.4 Soils

The soil maps included in this chapter represent prime agricultural soils and soils suitable for development. Slope severity, depth to bedrock, water table, and limitation for septic tank drain fields determine the soils' suitability for development.

In planning, an accurate analysis of local soil conditions is necessary. Soil properties directly influence the construction of buildings, highways, the installation of septic tanks, and agricultural activities. Local soil surveys are an invaluable land use planning tool because of the information they provide about site-specific development capability. Soil surveys are the primary data sources for determining prime agricultural lands, suitability of building foundations and septic tank drain fields, slope conditions, wildlife suitability, and flood/wetland conditions. The surveys also can aid planners and local government officials in zoning floodplains, determining the suitability of areas for various uses, and in applying the soil and water considerations of subdivision regulations and building codes to specific developing areas. Soil survey maps also help determine other significant physical properties including how much moisture the soil will hold for plants, the rate at which air and water move through the soil, and the kinds and amounts of clay present, all of which are important in drainage, irrigation, erosion control, maintenance of good tilth, and the choice of crops. However, the focus of this plan is to identify soils that present opportunities for or limitations to development and agriculture.

The major threat to soils is erosion, a process that occurs naturally but can accelerate with human activity. Factors influencing erosion are climate, topography, and vegetative cover. The frequency, intensity and duration of rainfall and temperature extremes are the principal characteristics contributing to the volume of runoff from a given area. The topography (size, shape and slope characteristics) of watersheds influences the amount and duration of runoff. The greater the slope length and gradient, the greater the potential for both runoff and erosion. Water velocity will increase as the distance from the top of the slope or the grade of the slope increases. Properties that will determine the erodibility of a soil are texture, structure, organic matter content and permeability. Soils containing a high percentage of fine sands and silt are normally the most erodible. As the soils' clay and organic matter content increases, the erodibility decreases. Clays act as a binder to soil particles thus reducing erodibility. While clays have a tendency to resist erosion, once eroded, they are easily transported by water. Soils high in organic matter resist rain drop impact better because the organic matter also increases the binding characteristics of the soil. Clear, well-graded and well-drained gravels are usually the least erodible soils as the high infiltration rates and permeabilities either prevent or delay runoff.

Vegetative cover is an extremely important factor in reducing erosion from a site. Vegetation will absorb the energy of rain drops, bind soil particles, slow the velocity of runoff water, increase the ability of soil to absorb water, and

remove subsurface water between rainfalls through the process of evapotranspiration. By limiting how much vegetation is disturbed and the exposure of soils to erosive elements, soil erosion is reduced. When vegetation is removed, fertile topsoil is the first to erode. Topsoil erosion eventually results in less favorable growing conditions, reduced crop yields, and decreased livestock productivity. It can take one thousand years to form one inch of topsoil, making soils an essentially non-renewable resource. Methods to control soil erosion include leaving vegetative buffers along streams, contour plowing and terracing, all of which decrease the speed of stormwater runoff and permit more water to soak into the soil.¹ In addition, local governments can control soil erosion from construction, mining, logging and development activities by regulating construction sites.²

Table 4-1 lists soils in Jackson County, total acreage of those soils, and various soil characteristics that pose a limitation to development. The geographic location of these soils is determined through analysis of the soil survey maps.

Table 4-1³

Jackson County Soils								
Symbol	Soil Name	Acres	Percent of Total Acres	Prime Farmland	Steep Slopes	High Water Table	Shallow Depth to Bedrock	Limitation-Septic Tanks
AIB	Altavista sandy loam, 2 to 6 percent slopes	960	0.4	X		X	X	X
ApB	Appling sandy loam, 2 to 6 percent slopes	2,690	1.2	X			X	
ApC	Appling sandy loam, 6 to 10 percent slopes	6,580	3.0				X	
ApD	Appling sandy loam, 10 to 15 percent slopes	2,020	0.9				X	
Au	Augusta loam	460	0.2			X		X
Cc	Cartecay and Chewacla soils	7,930	3.6			X		X
CeB	Cecil sandy loam, 2 to 6 percent slopes	24,390	11.0	X				
CeC	Cecil sandy loam, 6 to 10 percent slopes	22,000	9.9					
CfC2	Cecil sandy clay loam, 6 to 10 percent slopes, eroded	53,780	24.3					
ChE	Chestatee stony sandy loam, 15 to 25 percent slopes	1,050	0.5		X			X
Ck	Chewacla loam, frequently flooded	2,300	1.0					X

¹Manual for Erosion and Sediment Control in Georgia (Atlanta, GA: State Soil and Water Conservation Committee, 1975), pp. 13-14.

²Stokes, Samuel N., et al. 1989. *Saving America's Countryside: A Guide To Rural Conservation*. (Baltimore: Johns Hopkins).

³Soil Survey of Barrow, Hall, and Jackson Counties, Georgia, U.S. Department of Agriculture, Soil Conservation Service, February, 1977.

Jackson County Soils								
Symbol	Soil Name	Acres	Percent of Total Acres	Prime Farmland	Steep Slopes	High Water Table	Shallow Depth to Bedrock	Limitation-Septic Tanks
Cw	Chewacla-Wehadkee complex	5,500	2.5			X		X
GwC2	Gwinnett clay loam, 6 to 10 percent slopes, eroded	4,740	2.1				X	
GwE2	Gwinnett clay loam, 10 to 25 percent slopes, eroded	6,340	2.9		X		X	X
HsB	Hiwassee loam, 2 to 6 percent slopes	780	0.4	X				
HsC	Hiwassee loam, 6 to 10 percent slopes	380	0.2					
HtC2	Hiwassee clay loam, 2 to 10 percent slopes, eroded	160	0.1					
LuE	Louisburg sandy loam, 10 to 25 percent slopes	3,720	1.7		X			
MdB	Madison sandy loam, 2 to 6 percent slopes	1,250	0.6	X				
MdC	Madison sandy loam, 6 to 10 percent slopes	950	0.4					
MdD	Madison sandy loam, 10 to 15 percent slopes	400	0.2					
MdE	Madison sandy loam, 15 to 25 percent slopes	700	0.3		X			X
MIC2	Madison sandy clay loam, 6 to 10 percent slopes, eroded	2,370	1.1					
MID2	Madison sandy clay loam, 10 to 15 percent slopes, eroded	3,250	1.5					
MuD	Musella cobbly clay loam, 6 to 15 percent slopes	400	0.2				X	X
MuF	Musella cobbly clay loam, 15 to 35 percent slopes	500	0.2		X		X	X
PaE	Pacolet sandy loam, 15 to 25 percent slopes	3,940	1.8		X			X
PgE3	Pacolet-Orthents complex, 10 to 25 percent slopes, severely eroded	1,980	0.9		X			X
PTF	Pacolet-Tallapoosa association, steep	770	0.3		X			X
PuD2	Pacolet soils, 10 to 15 percent slopes, eroded	54,720	24.7					X
To	Toccoa soils	2,710	1.2					X
WhB	Wickham sandy loam, 2 to 6 percent slopes	1,720	0.8	X				X
TOTAL		221,440	100.0					

Soils indicated as having a high water table are those for which the water table is less than 6 feet below the surface for a continuous period of more than 2 weeks out of the year. Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether construction of basements is feasible and to predict how septic tank absorption fields and other underground installations will function.

1.4.1 Prime Agricultural Soils

In Georgia, prime agricultural soils are soils best suited for producing food, feed, forage, fiber, and oilseed crops. These soils have the quality, growing season, and moisture supply needed to produce sustained good yields of crops economically if treated and managed, including water management. "Additional soils of statewide importance" are soils that, besides prime agricultural soils, also are important for the production of food, feed, fiber, forage, and oilseed crops. These soils economically produce good yields if drained, protected against flooding, if erosion control practices are installed, or if additional water is applied to overcome drought.

Prime agricultural soils in Jackson County account for 14 percent of all land or 31,790 acres. These soils are dispersed throughout the county, with primary concentrations located northwest of Commerce along Highway 98 in the North Oconee River basin, east of Jefferson and in the Braselton/Hoschton area. Smaller concentrations of prime agricultural soils are located southeast of Arcade in the Mulberry River basin, in and around the community of Center near the Clarke County line and southwest of Jefferson to Barrow County. The soils in Jefferson, Hoschton, Braselton, Commerce, Nicholson and Pendergrass are largely developed. The prime agricultural soils in the remaining cities and in unincorporated areas of Jackson County are largely undeveloped.

As in most counties in the Northeast Georgia region, Jackson County saw a decrease in the number of farms between 1987 and 1992 and also a decrease in the number of acres in farms. Total market value of agricultural products in 1992 was \$88,411,000, an increase of 11.1 percent over the 1987 value of \$79,501,000. However, after taking the effects of inflation into account, the increase was closer to 1.8 percent in terms of real dollars. The 1992 market value for crops was \$1,143,000 and for livestock and poultry it was \$87,268,000.

Most of the county's agricultural income is derived from livestock and poultry which are less dependant on prime agricultural soils. Only 1.3 percent of the county's agricultural income is derived from crop production which is dependent on prime agricultural soils.

In determining the future growth patterns of the county, protection of agricultural areas is an issue. The average farm size in the county is 111 acres. As development pressures increase, many families will divest their agricultural holdings due to increased property taxes or because of a desire to realize the economic value of the property. While it is inconceivable that all agricultural land will remain in production, there are mechanisms to limit agricultural land conversion if there is a desire to protect these lands.

1.4.1.1 Economic Benefits of Farmland Protection

In 1993, the American Farmland Trust (AFT) published a study that concluded that farmland more than pays its own way in property taxes. This study was a cost of community services study conducted in three cities in the northeastern United States that experienced unprecedented growth during the 1980's, which fueled a huge increase in property values. The majority of the development was low-density residential sprawl. Although the higher property valuations resulted in higher assessments, the increased revenues could not cover the increased cost of providing public services to newly developed areas.

The study's methodology included a comparison of annual income and expenses for four different land uses: residential, commercial, industrial, and farm/open land. Expenses were grouped in five classes: general government, public safety, education, human services, and public works.

Two of the towns studied obtained 12.2 and 4.3 percent, respectively of their total revenues from farm and open land, but only 5.0 and 1.4 percent, respectively of their expenditures went to serve these areas. On the other hand, the study revealed that the cost of providing services to residential areas consistently exceeded the income raised by that sector in all three towns. Property tax revenues from the residential sector in all three towns ranged from 69.9 percent to 74.5 percent. Yet the cost of providing services to the residential areas ranged from 86.6 percent to 91 percent of expenditures. The aggregate ratio for the three towns was \$1.12 spent on public services for every dollar raised by residential uses, compared with 33 cents in service costs for every dollar generated by farm and open lands. Although farm and open lands may not raise considerable revenue, they are not a drain on a local government's resources.

The report did warn that, although commercial and industrial sectors were found to offset residential deficits, these sectors may not always be "pure revenue generators." A study by the Vermont League of Cities and Towns, *The Tax Base and the Tax Bill: Tax Implications of Development* (1990), showed that property taxes were highest in towns with the most commercial and industrial development. Commercial and industrial development spurs residential development, which in turn drives up demand for public services.

Generally, most development occurs on farmland because these properties are already cleared, flat, and drained. To counteract this, communities can adopt zoning and land-use controls that provide incentives to protect productive farm land.

The study determined that farm and open lands "proved to be respectable contributors to town income, and economical to serve on a net basis." Farm and open lands tend to be the least expensive to serve.

1.4.1.2 Farmland Protection Techniques

On the local level, a strong rationale for protecting farmlands is based on sound regional land-use planning which has historically sought to control "sprawl development" and its associated economic, social, and environmental costs. Agricultural zoning has become popular as a low cost approach to growth management. It is also the foundation for successful purchase-of-development-rights (PDR) and transfer-of-development-rights (TDR) programs. Enough farms and farmland must be placed under agricultural zoning to create a "critical mass" that can enable farm-support businesses to remain profitable.

Voluntary Covenants: A covenant is a voluntary agreement that limits what can be done with property. These agreements appear in the property deed.

Easements: An easement is the purchase of partial rights of a piece of land. Governments have purchased easements for scenic or aesthetic purposes. Similarly, it might be possible for the government to purchase an easement which would limit the use of land to agricultural production. This limitation could be for a specified period and paid for at a mutually agreed upon price. The purchaser controls and limits use of the land for a specified period. However, the land and all its associated rights ultimately rest with the property owner.

Purchase of Development Rights (PDR): Under PDR, the property owner's development interests are relinquished to the purchaser of the development rights who will control the development use of the land. This land-use management concept is viewed as a means of divesting the development potential of the property so it will remain in its present use. Criticisms of this approach are that the cost of development rights is very expensive. In most cases a public entity purchases the development rights and holds them in trust, thereby, withdrawing them from use.

Transfer of Development Rights (TDR): Under TDR, the development rights are purchased to be used in another location, thereby separating the development rights from the land itself. These rights are not withdrawn as with the PDRs, but are placed in the private market.

Large-Lot Zoning: This is one of the most popular methods used to control residential development and to protect farmland. Generally development is limited to a minimum lot size of 5, 10, 20, or 40 acres. The idea behind this type of approach is that the cost of large lots tends to discourage development or to keep it at a very low density. This type of zoning, however, is not always an effective method for retaining important lands. In areas of intense development

interest, land held in an agricultural zone falls prey rather quickly to conversion. Also, distinctions are not usually made in the land's capability to support agriculture. So, development often occurs on the best agricultural land.

Exclusive Agricultural-Use Zoning: The concept of exclusive farm-use zones contains the same idea as traditional large-lot zoning, only larger districts are zoned for exclusive farm or agricultural use. By designating large areas for exclusive farm use, the idea is that conversion will be more difficult. Also, farm districts are formed on the capability of the soil and location of viable farming operations. Depending on land use requirements, it is possible to have different exclusive farm-use zones for each crop.

Utility Extension Policies: The construction of roads and major utilities such as sanitary sewers and water systems has a substantial effect on the timing and degree of residential, commercial, and industrial development. The expenditure of funds for these purposes can be linked to the preservation of agricultural land. For example, roads and utilities can be prohibited in the best agricultural areas.

Sliding Scale Zoning: Sliding scale zoning is a variation on the low-density agricultural zoning, wherein the number of potential dwellings increases at a slower rate as the farm tract increases in acreage. For example, one dwelling for the first five acres, another for the next 10 acres, a third for the next 20 acres, and a fourth for the next 30 acres, with each additional dwelling requiring 40 or more acres. Thus, a 34-acre farm would yield three dwellings (required to be located on 3 acres, leaving 31 acres in agriculture), while 100 acres would yield 6 houses (on 6 acres), and 235 acres would produce 9 homes.

The primary rationale for the sliding scale variation is that smaller farms are often less suited for long-term agriculture and are frequently held with the expectation of future conversion. Another reason is that it is easier to build local political support by allowing small farmers the opportunity to create several house lots which they would not be able to do under a rigid large-lot zoning scheme.

However, more important than the number of dwelling units, is the location of new development with respect to farming operations and to the areas of most productive soil. Soil quality considerations were incorporated into sliding scale ordinances in several York County, Pennsylvania, townships.

Besides helping to minimize the impact of new subdivisions on adjacent agricultural uses, another virtue of low-density zoning is the opportunity it creates for other land protection techniques to be applied. Protection can become more feasible when a local government is considering a small parcel (20 to 40 acres), particularly under the PDR program.

Open Space Zoning: Open space zoning, or clustering, requires development to be designed to protect identified natural and historic resources. To keep residential areas separate from farming operations, standards could require the provision of a wooded or thickly planted buffer strip along the interface between the two different types of land use. Ownership and management of the agricultural open space created by clustering development may be allowed to remain in the hands of the original farmer. In this way he or she could continue farming the land under permanent conservation restrictions (as the development rights to that part of the property were sold to the developer at the time of subdivision approval) or the farmland could be owned and managed by a land trust or a homeowner's association. Generally, the farmland is owned and managed by a land trust.

1.4.2 Assessment

The most common soil types in Jackson County are Pacolet soils, 10 to 15 percent slopes, eroded, Cecil sandy loam, 6 to 10 percent slopes, eroded, Cecil sandy loam, 2 to 6 percent slopes and Cecil sandy loam, 6 to 10 percent slopes, respectively. These soils make up 70 percent of the county's soils.

Table 4-1 shows which soils are associated with steep slopes (greater than 15 percent). Steep slopes typically require substantial alteration for building development and pose severe limitations to septic tank drain fields. Alterations to steep slopes change the natural character of an area and can create serious erosion problems. Development activities on steep slopes should utilize erosion control measures.

Also included in Table 4-1, are the limitations of the various soils to septic tank drain fields and soils with seasonal high water tables and shallow depths to bedrock. Septic tank drain fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank to a natural soil. Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water tables, depth to bedrock and susceptibility to flooding. County-wide, 42 percent of soils pose limitations to septic tanks.

Agriculture plays an important role in Jackson County's economy. However, the focus of the county's agricultural economy is the poultry and cattle industries and to a lesser extent crop production. Based on the 1996 Existing Land Use Map, agricultural land in Jackson County is evenly dispersed throughout the county's unincorporated areas. Prime agricultural soils in the cities are largely developed.

Jackson County's Zoning Ordinance provides for three agricultural districts: Agricultural-Residential District (A-R), Agricultural-Rural Farm District (A-2), and Agricultural Fringe District (A-3). The A-R District is composed chiefly of open farm areas where some single family residential development is beginning to occur. The allowed uses in this district are intended to encourage a compatible relationship between low-density agricultural and residential development. The district includes eleven permitted uses including site-built single-family homes and manufactured homes, recreation areas, schools and public utility structures. Within the A-R District, single-family dwellings are permitted on lots with a minimum size of 1½ acres. Office buildings and areas designated for vehicle and equipment storage are not allowed.

The A-2 District is made up primarily of open farmland. The regulations for this district are designed to allow for development while maintaining the rural character of the district. Permitted uses in addition to those allowed under A-R zoning include dairy, livestock and poultry production, feed lots, cemeteries, convenience stores, hospitals and nursing homes, kennels, saw mills, travel trailer parks, land fills and mining operations.

The A-3 District includes areas in which some light agriculture, some residential and some light agriculture related commercial development exists. The uses allowed in this district are designed to allow such development to continue. All uses other than agriculture in this area require adequate screening. Additional permitted uses include agriculturally oriented businesses such as tractor and/or farm implement sales.

In addition to these agricultural zones, Jackson County allows for a Planned Commercial Farm District (PCFD) in which large tracts of land (35 or more acres) are to be devoted to intense agricultural production. Land in this district is intended for good faith farming or agricultural uses worthy of protection and preservation and is not intended for small scale farming and idle pasture land which is more appropriately located in other zoning districts. The use of areas designated as PCFD may result in odors, dust, noise or other effects that may not be compatible with single-lot residential development.

The mere possibility of a high value return for converting farmland acreage into urban development often removes the incentives for farmers to make necessary agricultural and conservation investments. This in turn serves to idle farmland before any real demand for conversion exists. By shifting intensive non-farm development away from farmlands and toward other areas in a community, zoning can effectively reduce development uncertainty in agricultural zones and thus provide added assurance to those who wish to continue farming and encourage reinvestment in agricultural operations. Furthermore, by concentrating urban development adjacent to existing public infrastructure and away from the agricultural activities, infrastructure costs will be diminished while accommodating necessary growth.

This plan supports protection of agricultural resources through voluntary covenants, easements, and open space protection. However, protection should not come at the expense of the agricultural property owner's right to sell their land for conversion to more dense development. Jackson County is currently realizing an increased rate of conversion of A-2 zoned agricultural land to residential subdivisions, particularly in the southwestern portion of the county near the Braselton and Hoschton areas. A-2 zoning requires a minimum lot size of 10 acres, which implicitly imposes conversion restrictions on parcels of A-2 land which contain less than ten acres. Owners of small A-2 parcels who wish to convert their land to residential uses could potentially benefit from an alternative A-3 or A-R zoning. One additional area of interest which should be considered for open space protection is the Middle Oconee River watershed area north of I-85 between highways 82 and 98, due to the potential for changes in stormwater runoff and natural drainage patterns which could result from unchecked conversion to more developed uses. Because there is little row cropping activity in the

county, protection measures should focus less on prime agricultural soils and more on agricultural landscape types and intensive agricultural areas.

1.5 Forest Resources

Georgia contains the largest commercial forest acreage of any state. The forest products industry represents one of the state's largest employers. In addition to the economic values, forests are important parts of the ecological system; they prevent soil erosion, provide wildlife habitat, provide aesthetic qualities, and help maintain watersheds. In Georgia, many landowners are cutting more trees than they are planting. This practice presents a problem in Georgia because it hinders forest regeneration, a time-consuming process, taking from 25 to 40 years for pine forests to reach market age. Timber harvesting, without planning for regeneration, has long term social and economic consequences for areas where it occurs. Therefore, an analysis of forest resources is an important component in this element and in the comprehensive plan as a whole.⁴

Forest resources may be considered in both economic and non-economic terms. The non-economic aspects are those intangible characteristics that assist in defining Jackson County. Forests improve air and water quality, enhance sedimentation control, produce pleasant surroundings and views, and moderate temperatures in urban areas.

⁴Gunter, John E. and Douglas C. Bachtel. 1984. Forest Resources: Problems and Potentials for Georgia. *Issues Facing Georgia*. Volume 2, Number 1, November. (University of Georgia, College of Agriculture, Cooperative Extension Service).

1.5.1 Forest Land by Ownership and Type

Table 4-2

Forest Land Area by Ownership 1989	
Owner	Acres
State	549
County or Municipal	359
Forest Industry ⁵	6,429
Corporate ⁶	16,365
Individuals ⁷	65,461
Farmers ⁸	36,822
Source: Georgia Forestry Commission October 16, 1991.	

Forest land in Jackson County can be further broken down by timber species type classes.

Table 4-3

Forest Land by Timber Type	
Timber Class	Acres
Loblolly and Shortleaf Pine	28,832
Oak and Pine	43,056
Oak and Hickory	50,005
Elm, Ash, and Cottonwood	4,092
Source: Georgia Forestry Commission, October 16, 1991.	

⁵Companies or individuals operating wood-using plants.

⁶A corporation that owns forested land, but is not in the forest industry.

⁷A person who owns forested land but does not farm and is not incorporated.

⁸A person who operates a farm, either doing the work himself or directly supervising the work.

1.5.2 Urban Forest Resources

Jackson County has two moderate-sized towns (Commerce, and Jefferson) and six small communities (Arcade, Braselton, Hoschton, Nicholson, Pendergrass and Talmo). Trees in these locations have different values than those in rural areas. Urban trees absorb carbon dioxide from the air, filter and cleanse the air, cool their surroundings, protect the soil from erosion, reduce noise, and provide a visual break from development.

Most of the towns in Jackson County have been established for a long time and consequently many street and park trees are old. Some are in need of maintenance or removal because of their age and location.

Table 4-4 summarizes the existing undeveloped urban forests within and surrounding Jackson County's incorporated towns (within 0.5 and 1.0-mile radius of town centers).

Table 4-4

Existing Undeveloped Urban Forests		
Incorporated Area	Acres within 0.5 mile	Acres within 1.0 mile
Arcade	100	743
Braselton	140	500
Commerce	58	338
Hoschton	118	718
Jefferson	60	443
Nicholson	160	898
Pendergrass	120	515
Talmo	168	710
Source: Georgia Forestry Commission, October 16, 1991.		

1.5.3 Value of Woodlands

Woodlands are invaluable for timber, wildlife habitat, recreation, and aesthetic enjoyment. Not only do the recreational, aesthetic, and economic benefits of woodlands suffer from poorly regulated use, but other less familiar benefits of forests are also harmed. Woodlands are important moderators of climatic phenomena, such as flooding and high winds, and thus protect watersheds from the siltation and erosion resulting from heavy runoff or wind. The forest floor also acts as a filter to water percolating into groundwater reservoirs, and the forest itself can improve air quality by absorbing some air pollutants. Moreover, woodlands moderate local climatic changes, most significantly by providing more moderate temperatures in contrast to the fluctuation between hot days and chilly nights in open areas such as fields, suburbs, and cities.

The question is not whether woodlands will be developed but how they will be developed. Loss of aesthetics, increased erosion and siltation, lessening of water quality, loss of landscape diversity, increased drainage from flooding, and decreased land values are all possible results of poorly planned woodland development. Cutting the forest can also change the surrounding ecology of wildlife and associated herbs and shrubs completely.

Because of their small size and the proximity of housing and commercial development, most forests in suburban areas are unsuited for the economic uses of commercial forestry; yet, they have values which cannot be measured in board feet. Maintaining overall environmental health, providing watersheds and soils, improving water and air quality, buffering the noise and sights of development, and modifying the climate of the area's environment are some of the woodland's greatest benefits.

1.5.4 Regulation of Woodlands

Without some form of land-use regulation in wooded areas, a community risks the loss of its forest and tree resources and their many public benefits. A community may also find its tax dollars being used to repair the damage to other resources because of the unregulated development of the woodlands. In such cases, communities must absorb the substantial economic costs of woodland destruction, such as increased sedimentation, loss of soils because of erosion, decline in water quality, damage to recreational areas, and lowered property values. The idea of land-use regulation in wooded areas is to prevent these losses and expenses by identifying the specific benefits woodlands provide to the community and implementing measures to assure that woodland development is compatible with the health of forest resources.

Trees within the public domain, such as those growing in community parks and on city streets, are protected. The erosion and sedimentation ordinance offers some protection to forest resources. However, there are few provisions specifically directed to maintaining the health of forests.

The three types of ordinances providing protection for the public resource values of woodlands are tree-preservation ordinances, timber-harvesting ordinances, and woodland protection ordinances. A tree-protection ordinance is concerned with preserving as many yard and street trees as possible as land is developed for residential or commercial use. This policy is implemented by setting standards for tree preservation and requiring permits for cutting mature trees. These ordinances can operate citywide or in a specific tree preservation zone -- usually single-family residential areas. Timber-harvesting ordinances are concerned with regulating commercial forestry practices specifically within urbanizing areas. They limit the lumbering companies to selective cutting and regulate potential nuisance-like uses of the land, such as noise, log hauling, increased erosion, and muddying of surface water. The woodland-protection ordinances identify sensitive wooded areas and propose to preserve not simply trees, but the entire woodland ecology. Communities have adopted both tree-preservation and timber-harvesting ordinances; they have not adopted woodland-protection ordinances.

1.5.5 Assessment

Individuals and farmers own the majority (81.2 percent) of Jackson County's forest resources. As development pressures increase, these lands, like agricultural properties, will convert to residential and commercial land uses. Many of the same mechanisms used to protect agricultural land can be used to protect forested lands.

Tree resources are threatened throughout Jackson County due to the stripping of vegetation prior to development. Commerce has a landscaping ordinance that effectively mitigates the tree removal. Unless other jurisdiction implement a similar ordinance or undertake other measure to protect their respective forest resources, the threat will continue.

Trees are beneficial to a community. They improve the air quality by trapping and holding dust particles that can irritate or damage lungs. Tree leaves absorb carbon dioxide and other poisonous gases and, in turn, replenish the atmosphere with oxygen. One acre of trees will annually absorb the amount of carbon dioxide equivalent to that produced by a car driven 26,000 miles. Trees properly placed will save energy through cooling in the hot months and serving as windbreaks during winter. Air-conditioning costs may be reduced by 30 percent and heating costs, 20 to 50 percent. Noise pollution is reduced. Economic stability increases by attracting and keeping businesses in a community. The National Arbor Day Foundation reports that cities planted with trees are more likely to attract new businesses and are more appealing to tourists. Many commercial retail areas enjoy the business-building benefits of trees. People linger and therefore shop longer in tree-lined areas. Apartments in green and wooded areas rent more quickly and tenants stay longer. Office and industrial park developers find they actually save money during the construction process by saving trees and that the space in a wooded setting is more valuable to sell or rent. Businesses in these wooded developments

find their workers are more productive and absenteeism is reduced. Property values can increase as much as 15 percent in areas with well-tended trees. Trees improve water quality by reducing the impact of rain, resulting in less runoff and erosion. This allows more recharging of the ground water supply. Wooded areas help prevent the transport of sediment and chemicals into streams. Finally, trees create wildlife diversity by providing a local ecosystem and improving the quality of life.

Within urbanized areas, trees mitigate the urban heat island that may be from 3 to 10 degrees hotter than the surrounding region on a summer day. During hot months a heat island creates considerable discomfort and stress and increases air-conditioning bills and the incidence of urban smog. Heat islands are caused by the concentration of large buildings and the paving of streets and parking lots. Research shows that for every degree of increased heat, electricity generation rises by 1 to 2 percent, and smog production increases by 2 to 4 percent.

Trees are as invaluable in small rural communities as they are in large urban cities. However, because of the small tax base, small cities must often rely on innovative funding for tree care programs as well as on volunteers, not only to raise funds, but to provide program leadership and sometimes, even for physical labor.

An approach that works well in small communities is setting up a tree board. With help from the Georgia Forest Commission, tree boards must first conduct surveys of public trees to determine overall program needs. When program needs are determined, priorities are assigned and goals established. A work program is determined which will carry out the goals. Ideally the tree board should serve in a planning and advisory capacity, with qualified city/county employees implementing the plans. However, where qualified city/county employees are not available, the tree board can administer and implement the program.

Mature trees improve the visual character of subdivisions in a way new landscaping cannot. Mature trees add a permanence and sense of continuity to a newly constructed subdivision. Trees function as a visual and sound buffer to adjacent land uses, as a shade source for energy conservation, and as strategic focal points for subdivision design. An inventory of all existing trees above a certain size and of certain species should be undertaken in the site planning process and marked on the preliminary plat. This map of the mature trees should become the basis of design of lots, roads, and other open spaces.

Trees are also susceptible to development in their immediate vicinity. Unless measures are taken during construction to protect them, their life span is shortened. For example, oak trees often die after the soil surrounding the roots is compacted by construction vehicles.

This plan supports protection of forest resources for their environmental and aesthetic value as well as the increased value of development when these resources are protected. It is important to maintain sufficient contiguous forest resources to insure habitat diversity. Clear-cut harvesting prior to development should be prohibited in order to preserve existing, mature trees which will enhance the completed development and would otherwise require a generation or more to replace. Sensible harvesting will also facilitate mitigation of future water quality degradation.

An important component of providing for forest resource protection is education. Comprehensive plan participants noted the need to educate developers about the aesthetic and economic value of trees, particularly the economic value beyond their harvest value. The Natural Resources Conservation Service is in the process of developing a brochure from homebuilders to discuss these issues. Distribution of such a brochure throughout the county to homebuilders and the real estate community would assist with this educational need.

An important incentive for good development is recognizing those developers that are doing a good job. An example is an annual recognition through the Chamber of Commerce or Board of Realtors. However, should the recognition and education initiative fail to spur better development that protects forest resources, the county and cities may consider developing and implementing a tree ordinance.

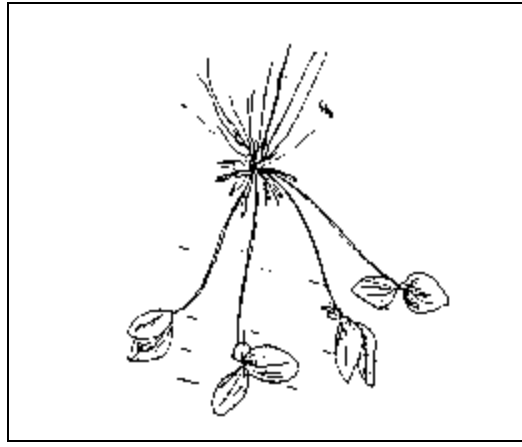
1.6 Habitat

The Department of Natural Resources, Freshwater Wetlands and Natural Heritage Inventory (FWNHI) section has compiled a list of rare element occurrences for Jackson County.⁹ A rare element occurrence is a "species of concern . . . considered sufficiently rare or the status unknown so as to warrant the collection of occurrence information."¹⁰ This information is available on a county-wide basis only.

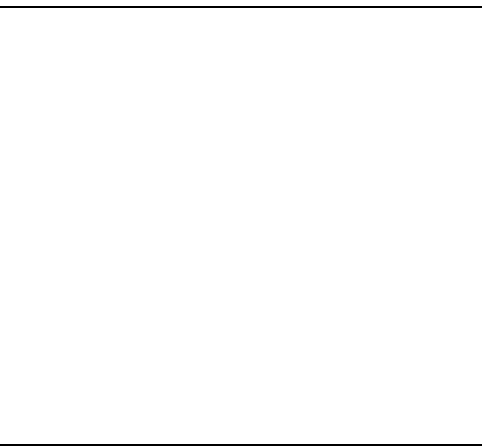
Jackson County has three plant species and one animal species included by the FWNHI on its list of rare element occurrences.

Amphianthus pusillus, commonly named "Little Amphianthus," "Pool Sprite," or "Snorkelwort," is an annual aquatic herb found in shallow, flat-bottomed depression pools of granitic outcrops. These pools are usually less than a foot in depth, entirely rock-rimmed and dry in the summer after the spring rains have evaporated.

Amphianthus has both floating and submerged leaves attached by delicate, lax stems. The submerged leaves are arranged in a basal rosette, lanceolate, and less than 1 cm. long. The flowers are small, white to pale violet, inconspicuous, and found both among the submerged basal leaves and between the floating surface leaves. The fruit is a small capsule, 2-3 mm. broad, and 1 mm. long. The flowering period is March - April, fruiting period is April - May. This plant is endangered in Georgia and threatened in the United States.



Amphianthus pusillus



Isoetes tegetiformans

Isoetes tegetiformans, common name "Mat-forming Quillwort" was last observed in the Chestnut Mountain quadrant in June 1987. The habitat of this perennial aquatic fern ally is the shallow, flat-bottomed depression pools of granite outcrops, and is closely associated with *Amphianthus pusillus*. The pools occur in natural solution pits that are entirely rock-rimmed and have accumulated 2-4 cm. of soil. This is an obscure plant evident only when in masse as a greenish mat of clustered, quill-like leaves. The leaves, which arise as plantlets, form an arched elongate, prostrate stem 3-35 mm. and 6-8 mm. wide. The spores are produced in an elliptical, veiled cavity, 1 mm. long on the flared inner surfaces of the leaf bases. Although green plants may be found following wet periods throughout the year, mature spores are most likely, though sporadic, from May to October. Spores are brownish when mature. *Isoetes tegetiformans* is classified by the state as threatened and is proposed for endangered listing under the Wildflower Preservation Act of 1973. The plant is further classified by the federal government as endangered under provisions of the Endangered Species Act of 1973.

⁹Georgia's Protected Plants, (Atlanta: Georgia Department of Natural Resources, 1977).

¹⁰Freshwater Wetlands and Natural Heritage Inventory, letter to Joe Tichy, Northeast Georgia Regional Development Center, December 1, 1989.

Isoetes melanospora, common name "Black-spored Quillwort," was last observed in the Chestnut Mountain quadrant in March 1986. The habitat of this perennial aquatic fern ally is restricted to the shallow, flat-bottomed depression pools of granite outcrops, and is closely associated with *Amphianthus pusillus*. The pools occur in natural solution pits or manmade quarry holes, and are generally completely dry in the summer after the spring rains have evaporated. This is a very inconspicuous plant from 2.5-8 cm. tall. The leaves, which arise spirally from a bulbous (corn-like) base, are bunched, linear, slender-tipped, 1-2 mm. wide, up to 8 cm. long, pale towards the base, and green above. The spores are produced in the leaf base in a cavity that is about 5 mm. long. Identification of this species is often difficult due to the size of the plant and the nature of the key morphological characteristics. Spores are produced sporadically from May to October and are black when wet and gray when dry. This plant is classified by the state as threatened. The plant is further classified by the federal government as endangered under provisions of the Endangered Species Act of 1973.



Isoetes melanspora

Condylura cristata, common name "Star-nosed mole," was last observed in the High Shoals quadrant in September 1950. This animal is not presently listed as protected in the state; however, it is ranked as imperiled in the state because of its rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.

1.6.1 Assessment

It is unknown whether these resources are presently affected by incompatible land uses or other human activities. Currently, only federal and state regulations offer any protection to these plants. All three plants are associated with granite rock outcrops. Naturally occurring granite rock outcrops are a significant natural resource due to their visual aesthetics and the habitat which they provide for endangered plant species. The "Star-nosed mole" has no protection under federal or state regulations, but is considered imperiled in Georgia due to its rarity.

State and Federal regulations currently provide adequate protection for these rare species. Site evaluations of proposed developments should be performed by a representative of the Department of Natural Resources or other appropriately trained individual in order to determine whether these plants are located within a proposed development site which includes their habitats. If any of the plants are found within the proposed development, the site plan should insure protection of their habitats. In the alternative, several environmental studies have been conducted for Jackson County which could be consulted for this information in lieu of a site visit.

1.7 Parks and Recreation Areas

Major federal, state, or regional parks and recreation areas are identified because of their significant contribution to quality of life. However, no state or national parks are located in Jackson County. (Local parks and recreation areas are identified in the Community Facilities section of this plan). The University of Georgia's Thompson Mills Forest located in western Jackson County, has been designated the state arboretum by the Georgia General Assembly. The 318-acre forest was deeded to the university in 1980 by Lenox Thornton Thompson of Roswell for use by the School of Forest Resources as a teaching and research facility.

Since 1980, the forest has served as a site for the study of trees and natural plant communities. The forest includes more than 100 indigenous species in addition to approximately 80 native trees grown from seeds collected within the state. Numerous habitats include floodplains and swampy areas fringing the Mulberry River, fertile stream bottoms, numerous ravines with steep slopes and dry ridges, and an extensive granite outcrop that harbors threatened plant species. A preliminary study of wild flowers in the arboretum has identified more than 150 species ranging from *Amphianthus* to Sundrops.

Several miles of foot trails wind through the forest, bordered by more than 150 species of native trees and shrubs with permanent, color-coded labels. Approximately 85 percent of Georgia's 213 native trees are now included in the arboretum, with more trees being planted each year. In addition, more than 138 species of exotic conifers in 27 genera have been established with flowering trees representing 79 genera.

The pinetum now contains all native conifers of Georgia, and more than 100 exotic taxa of gymnosperms from 27 different countries. A collection of this magnitude is considered invaluable to students and researchers. The arboretum is open on week days by appointment only.

The Freshwater Wetland and Natural Heritage Inventory identifies two "significant areas" in Jackson County. A "significant area" includes a broad range of sites, National Natural Landmarks, and all state Registered Natural areas, in addition to areas determined worthy of being listed based on files from the Department of Natural Resource's Heritage Trust and Natural Areas Programs. Significant areas in Jackson County include the North and Middle Oconee rivers.

1.7.1 Assessment

Jackson County has no authority over the State Arboretum. The North and Middle Oconee Rivers are addressed in Section 4.9.

1.8 Scenic Views and Sites

The Natural Resources Committee identified the following scenic views and sites in Jackson County:

1. Hurricane Shoals Park
2. Crows Lake
3. Georgia Forestry Arboretum
4. Booker Farm
5. Sell's Mill
6. Middle Oconee River Swamp
7. Jimmy Johnson Farm
8. Terry Farm
9. 4-W Farm
10. Mulberry River
11. Indian Creek area
12. Donald Child Farm
13. Aaron McKinney Farm
14. Wayne Miller Farm
15. Allen Creek
16. Walnut Creek
17. Chetham Farm/Parks Farm
18. Craven land
19. McMullen Farm
20. Minix (Blackwitch) Farm
21. Bob Wood (Hallelujah) Farm
22. Braswell Farm
23. North Oconee River
24. Price Mountain
25. Barbara Lizenby Farm
26. John Long Farm
27. John Braezeale Farm
28. Doug Makemson Property
29. Walter Harris Property
30. Tripp Rogers Property

31. Shields-Ethridge Farm
32. Williamson-Maley-Turner Farm

1.8.1 Assessment

As Jackson County and its cities develop, identified scenic views and sites may be destroyed or severely impacted unless development, sensitive to these sites, is accomplished. However, since most of the sites are located in unincorporated Jackson County, the responsibility for requiring sensitive development will largely be up to Jackson County.

The Comprehensive Plan supports protection of identified scenic views and scenic areas. While it is recognized that many of these areas will ultimately develop, this plan supports sensitive development that does not negatively impact the scenic resources. Development in scenic resource areas should be limited to small businesses and low-density residential development that promotes resource protection through conservation design techniques which include open space and resource protection.

This, however, cannot be accomplished unless Jackson County amends its development regulations. This seems unlikely since the Commission Chair expressly noted his reservation about utilizing open space and conservation design, two protection mechanisms, as unrealistic because of his concern about takings issues. Additionally, fee simple acquisition is an unavailable tool due to lack of commitment from the Chair.

1.9 Rivers and Streams

1.9.1 Middle Oconee River

The Middle Oconee River is formed by the confluence of Pond Fork, Opossum Creek and Allen Creek in Jefferson County. The river flows south, 20 miles to the Barrow County line where it then flows through Clarke County on the west side of Athens and joins the North Oconee River south of Athens to form the Oconee River. The Middle Oconee forms 1.8 miles of the northern boundary of Jackson County.

The Middle Oconee averages approximately 1-3 feet deep and 50-75 feet wide and has a shifting sand bottom. The river has a slow to moderate flowing form in some areas, with isolated riffles and in other areas is rapidly flowing with an abundance of small falls, riffles and pools. The floodplain is narrow and the banks of the river are steep and well vegetated with overhanging trees and shrubs. Upland hardwoods occur on ridges and slopes. The most frequent overstory trees are white oak and southern red oak. Hop hornbeam, dogwood, sourwood, silverbells, and black cherry are the common understory trees. Shrub species include sparkleberry, hawthorn, blackjack oak, fringe tree, red mulberry, and wooly azalea.

Pine-dominated sites are found on high ground. Shortleaf pine is found primarily in natural stands with a tangled understory/shrub layer of dogwood, sweet gum, red maple, sourwood, sparkleberry, and blackjack oak. Ground cover includes trumpet creeper, smilax briers, poison ivy, muscadine and spotted wintergreen. Loblolly pine occurs mostly in plantations which after crown closure have only a sparse understory of dwarfed sweet gum, dogwood, blackjack oak and sourwood. Ground cover at this stage is very thin with mainly trumpet creeper, smilax briers and spotted wintergreen.

A substantial portion of the upland habitat consists of mixed hardwood/pine. Species in this area are similar to those described as upland hardwoods with the inclusion of significant numbers of shortleaf pine. Understory and ground cover are similar to that described for upland hardwoods.

Wildlife species around the Middle Oconee River are similar to those found in other rivers in Northeast Georgia. Deer, beaver and wood ducks are often seen in the area.

1.9.2 Mulberry River

Several creeks join to form the Mulberry River in Hall County. The river then flows through Gwinnett County and is the border between Barrow and Jackson counties until it flows into the Middle Oconee River north of Athens. The river forms 21.3 miles of the southwest boundary of Jackson County.

This river is about 15-20 feet wide and has a narrow floodplain for the majority of its length. Some sections have been channelized and some sections have been dammed by beavers. The river flows through forests, pastures, and croplands; there are no urbanized areas in the floodplain.

The upland portions of the river basin are classified as oak-pine with species characteristic of that type forest. The steep slopes are vegetated with swamp chestnut oak, white oaks, red oaks and hickories with an understory of dogwood and other typical Piedmont vegetation. The seasonally flooded bottomlands or palustrine forested wetlands are dominated by maple, yellow poplar, sweet gum, elm, privet, and hop hornbeam.

This area provides habitat for deer, squirrel, rabbit, quail, woodcock, various songbirds and some turkeys. According to Natural Resources Conservation Service personnel, it is a very good waterfowl area.

1.9.3 North Oconee River

The headwaters of Curry Creek are in Jackson County, north of the town of Jefferson. It joins the North Oconee in Jackson County, flows through the northeastern side of the county for 29 miles and then flows through the northeastern side of the City of Athens until it joins the Middle Oconee River to form the Oconee River south of Athens.

The floodplain of Curry Creek is fairly narrow and shoals and rapids are numerous. Beaver dam ponds are also common. Land use is predominantly woodland interspersed with agricultural and consists of dairy and livestock farms and poultry operations. Rural residences are scattered throughout the countryside.

Vegetation types are oak-pine, bottomland hardwoods and hardwood swamps. The area provides very good wildlife habitat for deer, squirrel, cottontail rabbit, swamp rabbit, raccoon, mink, muskrat, and beaver. The hardwood swamps and beaver ponds are an excellent waterfowl wintering area. Many other resident and migrant birds use this area including mourning dove, hawks, owls, quail, kingfisher, woodpeckers and many species of songbirds.

1.9.4 River Corridor Protection

The protection of river corridors is critical to protecting the quality of surface waters against nonpoint source pollutants. The enactment of the Clean Water Act and its subsequent amendments, encouraged the clean up of point source contaminants by requiring states to establish and enforce water quality standards. However, as a result of the cleanup of concentrated pollution from specific sites, nonpoint source pollutants have increased in relative importance and now account for more than 50 percent of the pollution in U.S. waters. Nonpoint source pollutants include sediment, nutrients, pesticides, animal wastes and other substances that enter our water supply as components of runoff and ground water flow.

The establishment and maintenance of streamside forests are the most crucial elements in the protection of river corridors. The streamside forest functions as a filter by removing sediment -- probably the most common and most easily recognized of nonpoint source pollutants -- and other suspended solids from surface runoff. Cropland erosion accounts for about 38 percent and pasture and range erosion about 26 percent of sediment that reach the nation's waters each year. Sediment suspended in water can reduce or block the penetration of sunlight and adversely affect the growth and reproduction of beneficial aquatic plants. Sediment deposited on the stream bottom can interfere with the feeding and reproduction of bottom dwelling fish and aquatic insects, weakening the food chain. Large deposits of sediment can overflow stream channels and floodplains, increasing the potential for flooding.

Streamside forests can be effective in removing excess nutrients from surface runoff and shallow groundwater and in shading streams to optimize light and temperature conditions for aquatic plants and animals. Streamside forests

also can ameliorate the effects of some pesticides, and directly provide dissolved and particulate organic food needed to maintain high biological productivity and diversity in the associated stream.

O.C.G.A. §12-2-8 requires the Department of Natural Resources to develop minimum planning standards and procedures for the protection of river corridors in the state, and requires local governments to use these minimum standards in developing and implementing local comprehensive plans. The primary method mandated for the protection of river corridors is the establishment of natural vegetative buffer areas bordering each protected river. Local governments are required to develop river corridor protection plans that will maintain the integrity of this buffer area. The minimum standards call for a one hundred-foot buffer on each side of the river channel; however, nothing prohibits local governments from establishing standards that are more restrictive than the minimum standards established by the Department of Natural Resources. It should be noted that the River Corridor protected by the vegetative buffer area and other criteria comprises only a relatively narrow strip within the Environmental Corridor identified by the DNR and described in the previous section.

A "protected river" includes any perennial river or watercourse with an average annual flow of 400 cubic feet per second as determined by the U.S. Geological Survey. In Jackson County, the Middle Oconee River meets the criterion necessary to be considered a protected river. However, since the North Oconee and Mulberry Rivers serve as a water source for cities in Jackson, Clarke and Barrow counties this plan recommends that river corridor protection criteria be established for these rivers as well. Additionally, their tributaries should be considered for corridor protection since water quality protection is in the best interest of Jackson County.

It is important to identify the resources within the Middle and North Oconee and Mulberry rivers and their tributaries. These resources include wildlife, wetlands, scenic views, and archaeological and historic resources. Wildlife, wetlands, and scenic views are discussed in other parts of this chapter. It is not known whether any archaeological resources exist within the river corridors as the location of such resources is restricted in compliance with the National Historic Preservation Act of 1966 and Executive Order 11593. Therefore, in order to adequately evaluate whether a proposed project will endanger such resources, the local government should contact Mr. Dave Hally, Archaeology Department, University of Georgia.

The most recent historical survey for Jackson County was completed in 1976. According to this survey, only one site may potentially be located within the river corridor. This site contains a c. 1850 single story frame house and is located on the northeast side of Highway 330 where it crosses the Middle Oconee River.

1.9.5 Tributaries

Tributaries are the major link between a river and its watershed, transporting not only water but also sediment and dissolved matter introduced by both natural processes and human activities. By transport through the network of tributaries, any pollutants generated within the watershed can potentially effect the health of the main river.

The DNR criterion for river corridor protection provides protection for the Middle Oconee River in Jackson County. However, the condition of all rivers and their tributaries is important to the overall health of the county's river system and, therefore, there is a need to protect tributary waters as well as trunk streams. Because tributaries are so closely linked to the landscape, their inclusion in the overall protection plan amounts to the adoption of a watershed protection approach. This differs from the river corridor approach in that fewer intensive protection measures must be extended throughout the watershed rather than concentrated solely within the narrow riparian zone, though vegetated buffer areas along tributaries may be an important element in watershed protection. This approach does not lessen the importance of the river corridor, which is critical to preserving the wildlife habitat, scenic beauty, and floodplain functions along the river, but adds a critical element to the effort to insure that the waters throughout the Oconee and Mulberry systems can support aquatic life, fishing, and the recreational uses of the river.

Watershed protection involves assessing current conditions within the watershed, identifying potential threats to the waters of the rivers and streams, and adopting measures necessary to protect the waters from those threats. Each of these elements is discussed below.

1.9.6 Current Water Quality

According to U.S. Geological Water Data Report GA-94-1, there are no water quality monitoring stations in any stream segment in Jackson County. However, a ground water monitoring station is located in northwest Jackson County as part of the Comprehensive State Groundwater Management Plan. Based on the 1992-93 DNR Water Quality Report, the North Oconee River has been identified as "not supporting or partially supporting (its) designated uses" of drinking water and fishing. The 1993 Georgia Watershed Agricultural Nonpoint Source Pollution Assessment cites western Jackson County, from the Middle Oconee River west to the Barrow County border and north along the Hall County border, as having a high potential for pollution from agricultural runoff. Agricultural nonpoint source pollution in this area would impact water quality in the upper and middle Mulberry and middle and lower Oconee watersheds.

Environmental Working Group's study, *Dishonorable Discharge -- Toxic Pollution of Georgia Waters*, looks at pollutant discharge into Georgia's waters. According to the report, factories and other industrial facilities dumped more than 19.2 million pounds of toxic substances directly into Georgia's waters between 1990 and 1994. This information was based on new analysis of the federal Toxic Release Inventory (TRI). The TRI provides a rough estimate of a small portion of the toxic chemicals that flow into America's waters. The TRIs reported in this study are based on TRI reported toxic releases to waterways and "transfers" of toxins to publicly owned treatment works (an industrial facility that dumps toxic chemicals into the local sewer). Georgia ranked 8th among the states in toxic water pollution reported over the five-year period. Because of weaknesses and loopholes in federal pollution laws, most, if not all of these toxic discharges are perfectly legal.

According to the report, these figures substantially underestimate toxic releases to waters and the environment because the TRI requires reporting of only about 340 of the 73,000 chemicals in commerce. The TRI also exempts certain industries from reporting, including utilities, sewage treatment plants, municipal incinerators, and manufacturing facilities with fewer than ten employees.

More than twenty-eight million pounds of toxic materials were flushed to sewage treatment plants in Georgia from 1990 to 1994, 16th in the nation. The EPA estimates that 25 percent of all discharges nationwide flow through sewage treatment plants untreated. Applying this 25 percent estimate to Georgia raises the amount of toxics dumped to the state's water to an estimate 26.3 million pounds. Discharges reported in the report include only those wastes released by companies physically located in Georgia.

According to a 1995 EPA report, more than 93,000 acres of lakes surveyed and 1,600 miles of rivers had elevated levels of toxic chemicals. The pollution that fouls these waterways costs the state's economy millions of dollars in tourism, fishing, and development revenues that otherwise could be earned on or near these waters were they not so polluted.

The Environmental Working Group estimates that an accurate estimate of the total load of toxic pollution in many rivers and lakes over the past five years might be 20 times greater than the amount reported in this study.

Leading to the difficulty in establishing the level of toxicity of Georgia's waters is the fact that EPA does not include "transfers" of toxic chemicals to sewer systems as an official "release" of a toxic chemical. At the same time the EPA estimates that 25 percent of all toxic chemicals transferred to sewers from industrial facilities pass through treatment and into the waterways that receive wastewater.

Current pollution control laws like the Clean Water Act (CWA), the Resource Conservation and Recovery Act (RCRA), and the Toxic Substances Control Act (TSCA) do little to move the nation toward reducing the toxic pollution cited in this report. One of the more glaring exemptions may be the so-called "domestic sewage exclusion" under RCRA, whereby toxic contaminants sent to sewage treatment plants escape otherwise applicable federal hazardous waste regulations. Another major source of toxic pollution of water is agricultural pesticides. The runoff of pesticides from agricultural fields is not regulated under any federal law and is not tabulated by the TRI.

1.9.7 Threats to Riverine Water Quality

Water quality threats in Jackson County include sedimentation, agricultural runoff, and industrial discharge. Generally, citizens believe that the county fails to provide adequate enforcement of its Erosion and Sedimentation ordinances. These beliefs are reinforced by the current state of the North Oconee River and the high incidences of nitrogen and phosphorus runoff in Jackson County.

Citizens remain concerned about future industrial runoff threats and current and future pollution from agricultural runoff. The *Georgia Watershed Agricultural Nonpoint Source Pollution Assessment*, August 1993, states that "present evidence indicates that nitrogen and phosphorus from agricultural runoff are the principal nutrient pollutants." According to the report, the amount of nitrogen and phosphorus in agricultural runoff in Jackson County ranks sixth in the eleven-county NEGRDC region.

1.9.8 Current Protection Measures

A number of measures which help protect the Oconee and Mulberry River systems are already in place in the form of local, state, and federal laws, regulations, and programs. These measures are discussed below.

1.9.8.1 Agriculture

Georgia law prohibits the direct discharge of animal waste into the waters of the State. Confined animal operations are managed in accordance with a cooperative agreement between the U.S. Natural Resource Conservation Service (NRCS, formerly the Soil Conservation Service) and the EPD. Large operations must obtain a Land Application System permit from the EPD. The NRCS reviews wastewater systems for large new or expanded operations to assure compliance with design criteria and forwards a certification letter and engineering drawings to EPD for review and, if appropriate, issuance of a permit. The EPD is responsible for taking corrective action where operations have an adverse impact on water quality.

Beyond the prohibition against direct discharge of animal waste and the permitting system for large operations, measures for reducing the impact of animal operations, and agriculture in general, on water quality are purely voluntary. Programs promoting the proper management of animal waste and other sources of agricultural nonpoint pollution are conducted by the Georgia Soil and Water Conservation Commission (GSWCC), the constituent Soil and Water Conservation Districts, and the interrelated activities of such federal agencies as the NRCS, the Agricultural Stabilization Conservation Service (ASCS), and the Extension Service. Using grant funds provided by the EPD, the GSWCC has conducted a statewide non-regulatory program to promote the adoption of best management practices for the protection of water quality.

In Jackson County, as anywhere, the adoption of best management practices (BMPs) by farmers is dependent upon their awareness of the practices, the perceived need for their adoption, and the cost of adopting them. As the GSWCC and other agencies have conducted extensive education programs along with training and demonstration projects, the limiting factor in the adoption of BMPs for the protection of water quality seems to be cost.

Adoption of measures to limit the access of cattle to streams are voluntary but are promoted by the NRCS along with other best management practices. Among the measures promoted by the NRCS are reinforced stream crossings to minimize disturbance of the stream banks and bed, fencing to confine cattle to designated crossings, and alternative water sources to eliminate the need to give cattle access to streams for drinking. Again, cost appears to be the limiting factor in the widespread adoption of these measures.

1.9.8.2 Forestry

The Georgia Forestry Commission (GFC) has conducted a statewide non-regulatory program to promote the adoption of best management practices. The GFC has a statewide coordinator and has appointed and trained a forester in each of its twelve districts to act as a District Coordinator for the implementation of BMPs. The Commission also offers assistance to landowners in applying BMPs, including a model contract for timber sales and harvesting.

Recommended forestry BMPs include the establishment of Streamside Management Zones (SMZs) within which activities such as the use of vehicles, the aerial application of pesticides, and the use of fire are prohibited. Any type of cutting, including clear cutting, is permitted within the SMZ. BMPs also include the proper construction and use of stream crossings, roads, skid trails, and log decks.

Compliance surveys in recent years indicate that awareness and usage of BMPs has increased significantly, particularly among the larger commercial operations in the industry. The most recent survey showed that compliance exceeded 85 percent in virtually every category. Compliance was generally lowest in the Piedmont region and on sites located on individually owned property as opposed to public lands and lands under forest industry ownership. Of the approximate 125,000 acres of forest land in Jackson County, 100,000 are owned by farmers and other individuals compared with 6,400 owned by the forest industry. Publicly owned forest land in the county is negligible.

1.9.8.3 Zoning and Flood Damage Ordinances

Currently, only Jackson County and the city of Jefferson participate in the National Flood Insurance Program. In exchange for eligibility for flood insurance and for federal emergency management agency funds, local governments participating in the program must adopt minimum standards regulating construction within the 100-year flood boundary. In order to participate, jurisdictions must adopt Flood Damage Prevention Ordinances, the purpose of which is, in part, to control the alteration of natural floodplains, stream channels, and natural protective barriers which are involved in the accommodation of flood waters, and to prevent or regulate the construction of flood barriers. The ordinance requires that a permit be obtained prior to development within the 100-year flood plain. In order to obtain a permit, the developer must show that all structures are either flood proof or built above the 100-year flood level. The effect of the ordinance is to eliminate most residential and commercial construction in the flood prone areas.

1.9.8.4 Erosion and Sediment Control

Jackson County and the Cities of Jefferson, Braselton, Hoschton, and Commerce have adopted Erosion and Sediment Control ordinances which meet the criteria set forth by the Department of Natural Resources in the *Manual for Erosion and Sediment Control in Georgia*. Activities exempt from the provisions of the ordinances include surface mining, quarrying, the construction of individual single-family homes, agriculture and agricultural buildings, and timber harvesting. Arcade and Talmo have erosion and sedimentation control ordinances in place, although they are outdated and fail to comply with current DNR criteria. At the current time, Nicholson has adopted no such ordinances. Pendergrass is unsure whether their ordinance meets DNR criteria.

1.9.8.5 Subdivision Regulations

Subdivision regulations can help reduce the negative impact on water quality of such things as increases in impervious areas, increased runoff and the supply of pollutants which accompany residential development. Such regulations include requirements for open space, minimum lot size, and vegetative buffer strips along streams. Subdivision regulations may also stipulate that runoff characteristics following development be kept similar to pre-development characteristics through the use of structures such as retention ponds.

The regulations for Jackson County require new subdivisions with 30 or more lots of less than 3/4 acre per lot to set aside 4 percent open space for parks, playgrounds or other recreational purposes. Typically, open space set asides should average from 10 to 50 percent of the total acreage developed in order to insure sufficient space for all residents to enjoy recreational activities. The stormwater portion of the ordinance requires preparation and implementation of a stormwater drainage plan sufficient to collect any stormwater or surface water, either existing or resulting from the subdivision development. These drainage facilities must be located within the road right-of-way or in permanent drainage facilities which are compatible with the existing road drainage system.

The Jackson County Regulations require an adequate storm drainage system for major subdivisions, but "adequate" is likely to be interpreted to mean effective in removing storm water without regard to the impact on streams. For subdivisions traversed by a stream, an easement is required along each side of the channel to allow for the protection or future alteration of the drainage. A minimum easement width is not specified.

1.9.8.6 Regulation of On-Site Sewage Disposal

Guidelines for the proper design, siting, and maintenance of septic systems can be an important means for ensuring that tanks and absorption fields do not become a source of contaminants for streams. This is particularly true of rural counties where the majority of residences use on-site disposal. Jackson County Subdivision Regulations require the connection of homes in any new subdivision to a public sewer system if such a system is located within a distance of 1500 feet.

1.9.9 Potential Protection Measures

A number of measures, if adopted or promoted by the local governments of Jackson County, could provide additional protection to the waters of the Middle and North Oconee and Mulberry rivers and their tributaries. These are discussed below.

1.9.9.1 Monitoring Water Quality

Long-term water quality data is essential to monitoring the various threats to clean water as well as the effectiveness of protection measures. Ideally, a monitoring program would begin with a comprehensive assessment conducted by water-quality experts to establish the current condition of the streams. Periodic monitoring would follow the initial assessment to detect long-term trends and to detect problems requiring immediate attention. The only feasible source of long-term data for tributary streams is a volunteer monitoring program. The Georgia EPD has an Adopt-a-Stream Program which assists local governments and private groups in establishing local programs. Volunteers are trained to monitor selected streams through biological and chemical testing. The local government can use data to establish trends in water quality and to identify specific problems. A local sponsor, such as the Clean and Beautiful Commission or Parks and Recreation Department, may supply test equipment and help coordinate training. Waste water treatment facilities can assist by performing test procedures, such as fecal coliform counts, that cannot be done in the field by volunteers.

Cooperation as well as direct participation by local farmers would be very helpful in determining the effectiveness of BMPs in protecting water quality. Periodic monitoring could be of direct benefit to farmers when results show that current BMPs are sufficient and that no additional efforts are required to reduce the impact of their operations on local streams.

1.9.9.2 Promotion of Agricultural Best Management Practices

The main barrier to the adoption of BMPs by poultry farmers appears to be cost. The dedication of local funds to supplement state and federal cost-sharing programs would make BMPs more attractive to county farmers. Also important is knowing what BMPs are most appropriate for a given operation. The recently created state Pollution Prevention Assistance Division, in cooperation with the Cooperative Extension Service, is currently developing an on-site pollution prevention assessment program for production farms. These assessments will identify opportunities to reduce waste generation and environmental damage as well as to increase the efficiency and profitability of farms.

1.9.9.3 Public Education

Citizens can assist city and county inspectors in monitoring violations of local ordinances if they are aware of the requirements set forth in the ordinances. This is particularly true of construction projects subject to the provisions of an erosion and sedimentation control ordinance. Failure to implement effective sediment control measures is often easily detected and can be reported by citizens if they know a violation is occurring and if they know who to contact.

1.9.9.4 Zoning

Local governments have available to them a number of zoning tools which can contribute to the protection of water quality. Zoning ordinances can promote preservation of sensitive areas by offering alternatives to the rigid development plans dictated by traditional land use regulations. Planned unit development allows developers to use more

creative approaches to site planning which can reduce the amount of cut and fill necessary during construction, makes better use of natural drainage, and preserve larger areas of the natural landscape. Cluster development in particular is often used to preserve larger areas of open space than is possible in more conventional developments. By clustering buildings on smaller lots, sensitive natural areas such as stream corridors can be preserved for wildlife habitat and recreational use by the community.

Cluster development, like large-lot zoning, can help control storm runoff by reducing the proportion of impervious surfaces in an area; however, because cluster development has lower site preparation and utility extension costs, it provides more affordable housing and is therefore less exclusionary than large-lot zoning.

Overlay zoning involves the creation of special zones with a set of additional restrictions which may partially or completely overlay one or more previously established land use zones. Overlay zones can be used to protect areas identified as particularly sensitive due to their natural characteristics such as steep slope and proximity to streams or lakes.

1.9.9.5 Subdivision Regulations

Subdivision regulations can be used to minimize the impact of stormwater runoff on streams. Requirements that runoff are limited to pre-development rates have been used to prevent the water quality problems which result when land is built up and paved over. Requirements of this sort mean that the proportion of rainfall that infiltrates the ground should be similar after development. This allows some flexibility for the land owner or developer. Runoff control technologies fall into three general categories: infiltration areas with natural vegetation; retention basins; and detention basins. Retention basins are structures that encourage infiltration and thereby decrease the *volume* of runoff. Conventional detention basins, in contrast, are generally designed for flood control and decrease the *rate* of runoff. Because they have short residence times, conventional detention basins have limited water quality benefits. Vegetated infiltration areas or retention basins are better techniques for water quality protection.

The ordinance of one county which has taken steps to reduce the impact of development states “. . . no greater rate of runoff is permitted than that of the site in its natural condition.” All calculations are based on the 100-year, 24-hour storm. A variation on this control is to require infiltration of a specific amount of initial storm runoff. Large amounts of contaminants from paved areas generally move in the “first flush” of runoff, and infiltration can help filter this highly concentrated runoff. Orange County, North Carolina, requires infiltration of the first 0.5 inch of stormwater runoff. The Triangle J Council of Governments in the Raleigh-Durham-Chapel Hill area of North Carolina recommends infiltration of the first 2 inches of runoff, and has published guidelines for calculating the vegetated area required to achieve this. Approval of a site plan that shows measures designed to meet these runoff requirements can be a prerequisite to issuance of building permits.

The above type of protective measure is called a performance standard. That is, it prescribes how the developed area should “perform.” Application of performance standards generally allows more intensive development in areas along development corridors. Commercial development, for example, could be allowed as long as runoff is controlled and meets specified standards.

1.9.9.6 River Corridor Protection

Jackson County has not adopted specific protection criteria for its rivers. Currently, only the Middle Oconee River meets the Department of Natural Resources’ river protection criteria. The County should adopt the minimum criteria established by the State under the River Corridor Protection Act for the North Oconee and Mulberry Rivers as well. Additional protection for tributaries could be provided by extending the corridor beyond the main rivers. The corridor width could be varied according to the size of the tributary (e.g., 25 feet for first-order streams, 50 feet for second-order streams, etc.).

1.9.9.7 Conservation Easements

A conservation easement is a legally binding agreement between a property owner and a governmental agency or land trust that restricts the type and amount of development and use that may take place on the property.¹¹ The use of conservation easements is growing rapidly in popularity due to the benefits they provide to both the land owner and the public. Easements benefit property owners by ensuring that the land is protected for future generations while remaining in private hands and by allowing for deductions on federal and state income taxes. Property taxes may also be reduced as well since restricting development rights may diminish the fair market value of the land. Benefits to the public include the preservation of the scenic and wildlife value of the land, outdoor recreational opportunities, the attraction of tourism and commerce to the local area, and in the case of river corridors, protection of water quality. A major strength of conservation easements is their flexibility: the type of development and public uses allowed on the property can be tailored to the wishes of the landowner, the natural features of the property, and the goals of the land trust.

1.9.9.8 Greenway Development

Greenways are linear strips of land which serve to protect and enhance remaining natural and cultural resources which may provide for recreational activities such as hiking. Land making up the greenway may be acquired through a variety of means including government acquisition, conservation easements, management agreements with landowners, and land leases. Frequently a combination of methods is necessary. Greenways do not have to be developed as a single project; with a long-term goal in mind, local governments and private groups can work together to create a greenway a piece at a time as resources and land become available.

Land for a river greenway could come from a number of sources. Under the recently announced River Care 2000 Program, the state plans to acquire lands associated with rivers through purchase or conservation easements. These state-acquired lands will be managed as parks, historic sites, natural areas, wildlife management areas, or greenways. Also as part of the River Care 2000 program, the Department of Natural Resources will cooperate with private land trusts, local units of governments and state and federal agencies to help protect river corridors. For example, the DNR will give higher priority to state acquisition projects in river segments where local agencies and organizations are actively protecting river corridor lands through land-use regulation or acquisition. The DNR may purchase some river corridor properties and lease them to local governments or land trusts, if doing so will leverage considerable non-state investment for the project, or if it is necessary to make a local project possible. The DNR may also contract with local governments to acquire lands on the state's behalf.¹²

1.9.9.9 Water Supply Watershed Protection

Two jurisdictions in Jackson County currently make use of surface water intakes for public water supply. The city of Jefferson has a public water system intake along Curry Creek and Commerce has one along Grove Creek in neighboring Banks County. Nicholson has a city water system which is supplied entirely by a system of wells. Other cities in Jackson County also depend largely on wells, although Braselton and Hoschton supplement their water supply from Gwinnett County and Winder, respectively.

The Georgia Department of Natural Resources (DNR) rules for environmental planning criteria require local governments within a water supply watershed (i.e., an area upstream of a government-owned public drinking water intake) to develop a water supply watershed protection plan that meets the state's minimum requirements. No such protection plan currently exists in Jackson County. Although Jefferson residents have asked for such an ordinance, city officials have not yet acted upon this request. However, Commerce is currently working with DNR officials and neighboring Banks County to develop an ordinance which would provide the required watershed protection for the Grove Creek reservoir. Commerce's public water intake on Grove Creek is located in Banks County, necessitating that the

¹¹Georgia Environmental Policy Institute, "Conservation Easements for Natural Resource Protection," Athens, GA, 1994.

¹²Department of Natural Resources, "River Care 2000 Program: Program Description," September 25, 1995.

Banks County government assume the actual enforcement responsibility. The ordinance is expected to be finalized with six to nine months.

1.9.10 Assessment

According to citizens involved in developing this plan, Jackson County's enforcement of its Erosion and Sedimentation Ordinance is inadequate. Residents are also concerned with nonpoint source pollution including agricultural runoff and contamination from animal waste. This concern is warranted given that the results of the sole groundwater monitoring station in the county identify the North Oconee River as not supporting or partially supporting its designated uses. Further, the 1993 Georgia Watershed Agricultural Nonpoint Source Pollution Assessment cites western Jackson County as having a high potential for pollution from agricultural runoff. Measures to protect water quality are generally inadequate.

In Jackson County, only the Middle Oconee River meets the DNR "protected river" criteria. This plan supports Jackson County and its cities amending their respective zoning ordinances to provide for river corridor protection for other major rivers and streams (3rd order streams) in accordance with the DNR criteria with the exception that the minimum lot size should be increased from two acres to five acres. A 25-foot vegetative buffer should be required adjacent to all perennial first order streams (this is currently required through the Erosion and Sedimentation Act), 2nd order streams should be protected with a 50-foot vegetative buffer, and 3rd order streams with a 100-foot buffer.

In addition to the above buffer, the county should consider the downstream impact of development activities in the county and not allow an activity that may impair water quality.

Athens-Clarke County is in the process of development a greenway along the Oconee River. This comprehensive plan supports the development of a similar resource in Jackson County and tying it into the Athens-Clarke County greenway. Floodplains and wetlands should be included in the area designated as part of a greenway in an effort to protect the maximum habitat and insure better water quality. However, before the county can consider developing a greenway, county staff needs to undertake an education initiative concerning the benefits of a greenway. Property owners need a financial incentive to participate in a greenway and the county needs to obligate funding for the project. The county needs to pursue this course of action and begin both the education initiative and identification of areas suitable for inclusion as part of a greenway so that these areas are not lost to development.

1.10 Protected Mountains

The Environmental Planning Criteria provides for the protection of all land that lies above a 2,200 feet elevation and has a slope of 25 percent or greater for at least 500 feet horizontally. No land in Jackson County meets this criterion.

1.11 Coastal Resources

The Environmental Planning Criteria provides for the protection of coastal resources that are vulnerable to the impacts of development. This includes beaches, coastal marshes and estuaries. No land in Jackson County meets this criterion.

1.12 Floodplains

Flood hazard boundary maps were prepared for Jackson County (unincorporated areas), Arcade, Braselton, Commerce, Hoschton, Jefferson, Pendergrass, and Talmo. Jackson County has participated in the National Flood Insurance Program since 1990, and Jefferson since 1987. Braselton joined the program in 1991, but has since withdrawn. Arcade, Commerce, Nicholson, Pendergrass, and Talmo do not participate in the program.

All of Jackson County is drained by tributaries of the Oconee River except a small area near Commerce which drains to the Savannah River. Cities are generally located along the ridges dividing Jackson County's watersheds, except Jefferson which is on Curry Creek. Structural flood damage has been known to occur to roads, bridges, and culverts in the Jefferson area, along Curry Creek. Curry Creek is a tributary of the North Oconee River. According to a Flood Plain Information Report published in June 1975, the Corps of Engineers found no economically feasible means of reducing flood damage in this area. The report was completed on flooding along Curry Creek and its tributary in Jefferson, but most of the damage was along the tributary and the flooding was found to be caused by inadequate drainage structures. The damage to structures from flooding along Curry Creek was insufficient to justify a Federal flood control project. A study of the Pendergrass area was included in the Upper Oconee River Basin Georgia Expanded Flood Plain Information Study, which found the flood damage potential in that area to be low.

1.12.1 Assessment

Generally, floodplains are not impacted by development and existing floodplain management is adequate for current and future development.

This plan recommends that cities in Jackson County not currently participating in the National Flood Insurance Plan should consider doing so. The cities and county should continue prohibiting development in floodplains unless that development complies with local regulations and those of the Flood Insurance Program. In addition, consideration should be given to adopting a Watershed Protection Overlay District as a part of the county's land development ordinance. Such an ordinance should comply with the DNR planning criteria for water supply watersheds, as well as address commercial land use and require compliance with agricultural Best Management Practices.

1.13 Environmental Planning Criteria

Environmental Planning Criteria prepared by the Georgia Department of Natural Resources, established minimum standards for local governments to protect water supply watersheds, groundwater recharge areas, wetlands, and river corridors. This protection is essential to public health, safety and welfare.

1.13.1 Water Supply Watersheds

The criteria to protect existing and planned surface sources of drinking water define four classes of water supply watersheds: 1) larger than 100 square miles supplying reservoirs; 2) smaller than 100 square miles supplying reservoirs; 3) larger than 100 square miles supplying water withdrawals; and 4) smaller than 100 square miles supplying water withdrawals. Georgia has several major rivers that divide the state into large drainage basins. These drainage basins are also water supply watersheds for many local governments. Jackson County is located primarily within the Oconee river basin, with a small portion of northeastern Jackson lying within the Savannah river basin.

The criteria for protection of large water supply watersheds are less stringent than those for small water supply watersheds because large drainage basins are less vulnerable to contamination by land-use development. No minimum protection criteria exist for stream corridors of watershed tributaries to water supply intakes, except that the stream corridors of perennial tributaries within a 7-mile radius upstream of a water supply reservoir are protected through maintenance of a 100-foot vegetative buffer and exclusion of impervious surfaces, septic tanks and septic tank drain fields within 150 feet of stream banks. Large water supply watersheds within Jackson County include the Savannah River Watershed, the Middle Oconee River Watershed, the North Oconee River, and a small portion of the Mulberry River Watershed.

Criterion for the protection of small water supply watersheds is divided between areas within and outside a 7-mile radius upstream of an intake or reservoir. Areas within the 7-mile radius are protected as follows: 1) maintenance of a 100-foot vegetative buffer on both sides of the stream as measured from the stream banks; 2) no construction of an impervious surface within a 150-foot setback on both sides of the stream as measured from the stream bank; and 3) a prohibition on septic tanks and related drainfields within the 150-foot setback area. Areas outside the 7-mile radius

are subject to the same protection criteria as areas within the 7-mile radius except that the buffer requirement is 50 feet rather than 100 feet.

A 150-foot vegetative buffer must be maintained around all reservoirs in addition to stream buffers and setbacks. Additionally, only uses that minimize disturbance of the natural terrain and vegetation, such as hiking trails and picnic areas, are permitted in buffer areas. The purpose behind requiring buffers and setbacks is to leave an area of natural vegetation that will act to slow water flow and trap sediment and other contaminants carried in runoff before they reach the water supply stream or reservoir.

Runoff is reduced by limiting impervious surface coverage around the watershed so rainfall can be absorbed into the ground instead of running off into streams or reservoirs. A higher rate of runoff contributes to pollution of the water-supply stream.

Additional criterion prohibits the siting of new hazardous waste treatment or disposal facilities along small water supply watersheds. Sanitary landfills are permitted only if they have synthetic liners and leachate collection systems. New facilities that handle hazardous materials under DNR guidelines must perform their operations on impermeable surfaces that have spill and leak collection systems. Impervious surface areas located within a watershed are limited to 25 percent of the watershed's total area or existing use, whichever is greater.

Small water supply watersheds for existing intakes include the Jefferson intake of the Curry Creek Reservoir and the Commerce intake on Grove Creek. Proposed small water supply watersheds include the Little Curry Creek Reservoir, which would be located adjacent to the existing Curry Creek Reservoir, near Jefferson, the proposed Bear Creek Reservoir, and the Sandy Creek Watershed which is a water supply for Athens-Clarke County.

1.13.1.1 Assessment

Small water supply watersheds throughout the county are subject to potential water quality degradation unless watershed protection is implemented and enforced. Historically, city and county officials have shown little concern for watershed protection, although concerned citizens have begun to voice their opinions in favor of watershed protection. This plan supports protection of watersheds according to, at a minimum, the DNR watershed protection criteria, but encourages the county and cities to address watershed protection beyond the minimum requirements necessary to protect drinking water. Additionally, DCA will mandate that local governments with jurisdiction over these resources adopt watershed protection ordinances. Enforcement of these ordinances should provide adequate protection.

1.13.2 Groundwater Recharge Areas

Groundwater recharge areas, as defined by state law, are any portion of the earth's surface where water infiltrates into the ground to replenish an aquifer. Probable "significant recharge areas" have been mapped by the Department of Natural Resources. Mapping of recharge areas is based on outcrop area, lithology, soil type and thickness, slope, density of lithologic contacts, geologic structure, the presence of karst, and potentiometric surfaces. Standards have been issued for their protection, based on their level of pollution susceptibility, soil type, and slope.

In the Piedmont geologic province, rocks have little primary soil. Therefore, significant recharge areas in these provinces are generally those with thick soils and slopes of less than 8 percent. The areas are not mapped at a scale which corresponds to county maps and are difficult to locate with certainty. Other recharge areas include those soils with a rapid percolation rate. Criteria for protection of these areas include restrictions on siting landfills and hazardous waste facilities, on above ground chemical or petroleum storage tanks, agricultural waste impoundment sites, septic tank drain fields, slow rate land treatment, stormwater infiltration basins, and waste treatment basins. Ordinances which enforce the environmental planning standards must be adopted by local governments which have "significant recharge areas" within their jurisdictions.

Jackson County and most of its smaller cities' water supply comes from groundwater. Groundwater recharge areas are found throughout the county, with at least one significant area located along the county line at its point of convergence with Clarke and Madison Counties. Protection of these sources is of crucial importance. If polluting substances seep into the ground in a recharge area, these pollutants are likely to be carried into the aquifer and

contaminate the groundwater, thus making it unsafe to drink. The intent of the recharge protection criteria is to prevent the contamination of groundwater.

Criteria for protection of these areas include:

1. no issuing of permits for land disposal of hazardous wastes or for new sanitary landfills not having synthetic liners and leachate collection systems;
2. requirements of permeable pads for facilities that treat, store, or dispose of hazardous waste;
3. secondary containment for new above ground chemical or petroleum storage tanks having a minimum volume of 660 gallons (tanks for agricultural purposes are exempt provided they comply with all Federal requirements);
4. lining requirements for agricultural waste impoundments; and
5. lot size requirements in accordance with the Department of Human Resources' Manual for On-Site Sewage Management Systems, for new homes and new mobile home parks served by septic tank drain systems.

Ordinances that enforce the environmental planning standards must be adopted by local governments which have significant recharge areas within their jurisdiction.

1.13.2.1 Assessment

Jackson County has currently adopted no DNR Recharge Area Protection criteria. However, there is concern throughout the state about recharge area mapping. These areas are mapped at a gross scale making it difficult to identify the location of these areas with a specific parcel. However, this mapping concern should not restrict the county and applicable cities from reviewing development applications based on existing recharge area maps. Jackson County has and will continue to see rapid development. Since most of the county relies on wells for drinking water, it is imperative that the recharge areas and ultimately drinking water sources, are protected from contamination. Jackson County and its individual municipalities should attempt to comply with the DNR recharge area protection criteria and undertake any necessary amendments to local regulations. Trying to avoid burdensome regulations, protection criteria should allow the developer to have the option of having a certified professional undertake the necessary testing to determine with accuracy the location of the recharge area if the developer wishes to develop a parcel in a method inconsistent with the stated protection criteria.

1.13.3 Wetlands

Freshwater wetlands are transitional lands between terrestrial and aquatic systems which are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The ecological parameters for designating wetlands include hydric soils, hydrophytic vegetation, and hydrological conditions that involve a temporary or permanent source of water to cause soil saturation.

Estimating the value of wetlands is difficult as they have both an aesthetic and economic value. Wetlands are beneficial socioeconomically, as well as to fish and wildlife. The benefits to fish and wildlife is the provision of food and habitat, and through food chain support. Socioeconomic benefits include flood protection, erosion control, groundwater recharge, pollution abatement, sediment filtering, and the provision of a variety of harvestable natural products. The economic value of wetlands can be illustrated with the following examples: A single 2,300-acre Georgia floodplain wetland naturally provides pollution control benefits worth an estimated \$1 million each year. The 552,000-acre Green

Swamp complex near Tampa, Florida, stores water for eventual aquifer recharges with an estimated value of \$25 million annually.¹³

It is estimated that more than 54 percent of the wetlands that originally existed in the United States have disappeared due to unplanned development in wetland areas. A net loss of wetlands has continued in many states in recent years, with nearly 90 percent of the losses occurring in the Southeast. The Southeastern states have also seen the clearing, or conversion, of large areas of forested wetlands. A recent survey showed that as of the mid-1980s the state of Georgia had a total wetland area of 7.7 million acres, covering 20% of the landscape. This total included 367,000 acres of estuarine wetlands and 7.3 million of freshwater wetlands. The state suffered a net loss of 78,000 acres from the mid-70s to the mid-80s. Over the same period 500,000 acres of forested wetlands were converted, that is, cleared but otherwise unaltered.

The Fish and Wildlife Service of the U.S. Department of the Interior has mapped wetlands for Jackson County. Wetlands were identified by an analysis of aerial photographs based on vegetation, visible hydrology, and geography according to "Classification of Wetlands and Deepwater Habitats of the United States." The photographs typically reflect conditions during the specific year and season that they were taken. Thus, a detailed, on the ground, and historical analysis of a single site may result in a revision of wetland boundaries established through photographic interpretation. Additionally, some small wetlands and those obscured by dense forest cover may not be included. These maps are the most commonly used.

The State of Georgia has provided criteria in §391-3-16(3)(c) "Criteria for Wetlands Protection" which describes for local government minimal considerations for wetlands protection in the land use planning process with regard to wetlands identified in the Department of Natural Resources freshwater wetlands' database. Those minimal considerations are as follows:

1. Whether impacts to an area would adversely affect the public health, safety, welfare, or the property of others.
2. Whether the area is unique or significant in the conservation of flora and fauna including threatened, rare or endangered species.
3. Whether alteration or impacts to wetlands will adversely affect the function, including the flow or quality of water, cause erosion or shoaling, or impact navigation.
4. Whether impacts or modification by a project would adversely affect fishing or recreational use of wetlands.
5. Whether an alteration or impact would be temporary in nature.
6. Whether the project contains significant state historical and archaeological resources, defined as "Properties On or Eligible for the National Register of Historic Places."
7. Whether alteration of wetlands would have measurable adverse impacts on adjacent sensitive natural areas.
8. Where wetlands have been created for mitigation purposes under Section 404 of the Clean Water Act, such wetlands shall be considered for protection.

It is critical to understand that all freshwater wetlands identified by DNR are protected by federal law and are subject to the same minimal land-use planning considerations defined by the state of Georgia.

¹³U.S. Fish and Wildlife Service and U.S. Environmental Protection Agency, Southeast Wetlands: Status and Trends, Mid-1970's to Mid-1980's.

Wetlands in Jackson County are predominately palustrine wetlands, traditionally called by such names as marsh, swamp, bog, fen, and prairie wherever they are found throughout the United States. In Jackson County, the most extensive palustrine wetlands are found in the floodplains of the rivers and streams. Jackson County is also rich in riverine systems, which include most wetlands and deep water habitats contained within a channel. Water is usually, but not always flowing in the riverine system. Most of the perennial streams and rivers in the county are classified as riverine systems.

Although all wetlands are protected under the law, the quality, extent, or present use of some wetlands may qualify them for special consideration regarding mitigation requirements if they are to be altered or degraded. That is, some wetlands may be so valuable in their present condition as to be irreplaceable or to require significant mitigation acreage and effort. Characteristics which often increase the value of a wetland include their extent or linkage with other wetlands, the presence of mature hardwoods that would require decades to regrow, the presence of rare plant or animal species, and seasonal flooding which may provide critical habitat and nesting grounds for migratory birds. The wetlands in Jackson County with these characteristics are shown in Maps 4-32 through 4-41. It should be noted that field assessments are necessary to determine mitigation requirements and to confirm the true value of a wetland as wildlife habitat. These maps should therefore not be viewed as complete and precise but as a general picture of those wetlands in the county which warrant special consideration when new development is being planned. It is also important to remember that all wetlands in the county are protected by federal law.

The following areas contain wetlands of special significance in part for their wildlife habitat and wildlife corridor value.

- ! Middle Oconee River (entire river corridor)
- ! North Oconee River (entire river corridor)
- ! Curry Creek (entire creek corridor)
- ! Little Curry Creek (entire creek corridor)

Wetland classifications providing significant wildlife habitat value:

- ! seasonally flooded deciduous forest
- ! temporarily flooded beaver pond
- ! semi-permanently flooded deciduous forest
- ! semi-permanently flooded deciduous scrub-shrub
- ! semi-permanently flooded deciduous scrub-shrub beaver pond
- ! permanently flooded river corridor

1.13.3.1 Assessment

Federal and state regulations offer some protection to Jackson County's wetlands. Because of the value of wetlands generally, their specific value to Jackson County's water quality and concern about adequacy of enforcement at the federal and state level, this comprehensive plan supports protection of wetlands.

A local ordinance should be adopted that requires consideration of the eight issues as required by the DNR Wetlands Protection criteria and detailed in section 4.13.3 of this chapter. In addition, the local ordinance should allow the following uses provided there is no long term impairment of wetland function: wildlife and fisheries management, wastewater treatment, recreation, and natural water quality treatment or purification.

Wetlands protection is easily achieved through open space design, which allows full density but requires clustering of building units on more suitable land in order to protect environmentally sensitive areas.

Insert Map 4-1 Developable Soils, Jackson County

Insert Map 4-2 Developable Soils, Arcade

Insert Map 4-3 Developable Soils, Braselton

Insert Map 4-4 Developable Soils, Commerce

Insert Map 4-5 Developable Soils, Hoschton

Insert Map 4-6 Developable Soils, Jefferson

Insert Map 4-7 Developable Soils, Nicholson

Insert Map 4-8 Developable Soils, Pendergrass

Insert Map 4-9 Developable Soils, Talmo

Insert Map 4-10 Prime Farmland, Jackson County

Insert Map 4-11 Prime Farmland, Arcade

Insert Map 4-12 Prime Farmland, Braselton

Insert Map 4-13 Prime Farmland, Commerce

Insert Map 4-14 Prime Farmland, Hoschton

Insert Map 4-15 Prime Farmland, Jefferson

Insert Map 4-16 Prime Farmland, Nicholson

Insert Map 4-17 Prime Farmland, Pendergrass

Insert Map 4-18 Prime Farmland, Talmo

Insert Map 4-19 Natural Heritage Inventory and Protected River Corridors

Insert Map 4-20 Scenic Views and Corridors

Insert Map 4-21 Georgia River Basins

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