

HUMAN-RELATED RESOURCES

One of the basic principles of this document is that the fragile environmental quality of North Florida is not to be significantly altered. Protection of the natural resources of Alachua County are important for the purpose of preserving the environmental quality of the community. The health, safety, and welfare of the community is enhanced by the protection of environmentally sensitive areas which ensure the provision of potable water, healthful air, productive soils, and the maintenance of wildlife habitats.

Alachua County has experienced steady, if not spectacular, growth. According to the U.S. Census Bureau, Alachua County's population more than doubled since 1970, from 104,764 to approximately 218,000 in 2000. The population increased by 20.0% between 1990-2000, just slightly lower than the 23.5% growth rate for the entire state during the same period. Much of what makes Alachua County so attractive to people is what we are most vulnerable to losing. Our natural beauty and wide open agricultural lands give Alachua County a rural character and contribute to its quality of life. We still have many open spaces and native habitats that harbor diverse species of plants and animals. However, a coherent, broad-based plan for their protection is needed.

The specific impacts of growth can be beneficial or harmful to a community depending on varied factors. Decisions made in the planning process are foremost among them (APA 2000). Patterns of development are of particular significance to the interest of rural communities like we have in Alachua County. A growth-related trend or pattern that has become evident throughout Florida and nationwide involves the phenomenon of "sprawl." Sprawl amounts to an overflow of growth characterized by uncoordinated and unconsolidated land uses that are typically only accessible by car. Sprawling patterns of development are inherently inefficient and require the expenditure of excess taxpayer dollars to provide for infrastructure (like roads, water/sewer lines and electric utilities) and public services (like police, fire and emergency medical) outside of municipal boundaries. Such amenities are incrementally more costly the further out they are provided. In a time of growing awareness of the need for energy conservation, they also result in the use of more fuel as well as other natural resources.

Continued growth pressures are now extending the reach of various forms of sprawl-induced development into traditionally rural areas, which not only has adverse impacts on agricultural land, but on the surrounding natural areas as well. Sprawl's effects on environmental quality and the conservation of natural resources are likewise significant with regard to public health, water supply availability, wildlife protection, and outdoor recreation.

One 1998 real estate industry analysis indicates that many low-density suburban communities will suffer lower land values because of poor planning, increasing traffic, deteriorating housing stock, and loss of exclusivity. It states, "there is no greater risk to land values than unrestrained development" (ERE Yarmouth and RERC, 1998).

One of the hallmarks of the nation's best communities is the thought, planning, and community involvement put into creating and delineating an attractively built environment that relates to and incorporates the area's natural environment. A basic objective of this Plan is to retain, and where required, re-establish a sense of community in Alachua County as growth occurs.

In addition, there are less tangible, but nonetheless real, benefits to the practice of conservation in an urban context. In Ian McHarg's now-classic words:

We need nature as much in the city as in the countryside. In order to endure we must maintain the bounty of that great cornucopia which is our inheritance. It is clear that we must look deep to the values which we hold. These must be transformed if we are to reap the bounty and create that fine visage for the home of the brave and the land of the free. We need, not only a better view of man and nature, but a working method by which the least of us can ensure that the product of his works is not more despoliation....It is not a choice of either the city or the countryside: both are essential, but today it is nature, beleaguered in the country, too scarce in the city which has become precious....(McHarg, 1969)

The values to which McHarg refers are represented in Alachua County by the community's expressed desire, incorporated as policy statements in this document, to preserve open space, trees and native vegetation, maintain tree canopy, maintain or create visual buffers between disparate land uses, protect scenic quality, including the quality of the built environment, scenic corridors, and the quality of the nighttime sky, and generally respect sensitive ecological features during the land development process. These values are as important to the quality of life in this county as are the provision of services, such as transportation, water, and sewer, to the citizens of Alachua County.

Natural features such as the limerock outcroppings, native vegetation, the lakes and springs, and wildlife frame Alachua County's special character and sense of place. Which natural features have some intrinsic value, and how much land should be preserved, are questions that county residents wrestle with as they seek to balance the value of growth and the value of preserving natural areas.

As regional and national development trends come to Alachua County, they often bring a standardized appearance to the built environment. The County will need to ensure that the community's desire to incorporate natural features and native materials into commercial and residential development is fulfilled.

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Energy Conservation

A. Introduction

Alachua County residents and businesses are almost completely dependent on oil and natural gas to meet their primary energy needs. Due to the known finite supply of available fossil fuels and to the continued political volatility of oil rich regions of the world, there has been concern for decades about managing the transition away from our present reliance on fossil fuels.

Although the Growth Management Act and its implementing rule, F.A.C. 9J-5, do not explicitly address the subject of energy conservation in land use planning, such considerations are relevant, and arguably implied, in a number of provisions. The Growth Management Act directs local governments to encourage "the most appropriate use of land, water, and resources, consistent with the public interest..." to plan for "efficient provision of transportation, water, sewerage, schools, parks, recreational facilities, housing, and other requirements and services;" and to "conserve, develop, utilize, and protect natural resources within their jurisdictions (F.S.A. sec. 163.3161(3))." It further calls for the location of public facilities in order to encourage their efficient utilization (F.S.A. sec. 163.3177 (3)(a); planning for bicycle and pedestrian facilities (F.S.A. sec. 163.3177(6)(b); and conservation of natural resources, including air, water, soils, and other natural and environmental resources (F.S.A. sec. 163.3177(6)(b)).

The Growth Management Act implementing rule, F.A.C. 9J-5, echoes the policy language of the statute by calling for conservation and protection of air quality, water resources, native vegetative communities, and natural functions of natural systems, including soils (F.A.C. 9J-5.013). In the area of future land use, local goals and objectives must call for coordination of future land uses with existing topography, soils, and availability of services, prevention of urban sprawl, protection of natural and historic resources, and innovation in land development regulation (F.A.C. 9J-5.006). In the area of transportation planning, local governments must provide for safe, convenient, and efficient transportation systems, including provision for bicycle and pedestrian systems (F.A.C. 9J-5.007). The Housing Element must contain provisions for affordable housing (F.A.C. 9J-5.010). Taken as a whole, these provisions offer support for the need to consider energy conservation in land use planning and building construction at the local level.

B. Energy conservation programs

There is a history of energy conservation awareness at the local governmental level in Alachua County at least since the beginning of the 1980s and at the individual and private sector level for a much longer time. In 1980, then Governor Graham introduced and funded the Local Energy Action Program (LEAP) in Alachua County. The goals of that effort were (1) to develop energy policy recommendations for the Gainesville urban area, and (2) to develop a program for the promotion of community-wide energy conservation efforts. The result of this program was the development over a nine month period of a report containing 166 specific energy policy recommendations designed to help local governmental agencies develop effective energy policy to increase energy conservation and the use of alternative energy sources (Steering Committee, Governor's Local Energy Action Program, 1981).

The LEAP recommendations are grouped into four categories addressing buildings and land use, utilities,

transportation, and government agencies. They are addressed to the Gainesville Regional Utility, City of Gainesville, Alachua County, Regional Transit Authority, Alachua County School Board, University of Florida, major employers in the county, Santa Fe Community College, North Central Florida Regional Planning Council, and every other relevant entity in the county. Most, if not all, of these recommendations are as relevant today as they were in 1981, since the post-recessionary growth years of the middle and late 1980s effectively reduced the drive to modify land planning and site development practices as well as individual lifestyles.

At present in Alachua County, public policy is in a state of flux regarding the use of energy conserving design features. Increasingly, planned unit developments and subdivisions are being required to include design features such as bikeways and pedestrian walkways, and use of canopy trees in landscaping. In addition, housing policies call for performance standards and development regulations encouraging energy conserving site development, as well as passive design features in structures. There are efforts underway to expand multi-modal transportation opportunities throughout the MTPO planning area, consistent with a new vision embraced as the Livable Communities Reinvestment Plan. Please see the Transportation Mobility Element for further discussion of this topic.

The Alachua County Cluster Ordinance, adopted in 1992 (see Alachua County Code, ch. 373), allows clustering of single-family residences on no less than 50% of the required lot area and provides for a density bonus of up to 10% for subdivisions incorporating passive solar design features such as east-west street orientation and certain architectural features.

Energy efficiency in building construction is regulated by the State of Florida through its Energy Efficiency Code for Building Construction ([Florida Statutes](#), Chapter 553, Part VII, as amended). This is a uniform code designed specifically for the Florida climate, which cannot be made more stringent or lenient by individual local governments. Changes to the Code are made through the Administrative Procedures Act process. While the Code is a significant improvement over previously used standard building codes, it has been criticized for not emphasizing passive heating and cooling techniques in building design and construction.

Financial incentives for the installation of energy conserving devices in buildings are available but limited in scope. The Gainesville Regional Utility (GRU) offers free residential and commercial energy audits (informational only), general information on energy conservation, and rebates for natural gas installations that meet certain criteria. In addition, GRU offers two financing assistance programs. The Prime Cash Program, sponsored by the Florida Public Service Commission and promoted by GRU, offers \$500 - \$5,000 reduced interest home loans for energy conserving home improvements. The Commercial Lighting Program, currently being run by GRU as a pilot program for the American Public Power Association, offers GRU customers amortization of lighting efficiency improvements, recommended and installed by GRU, for a period of up to three years. The program is designed just to cover its costs while reducing energy consumption in the commercial sector.

Internally, the county maintains an ongoing energy management program. By rewiring old buildings, installing more energy-efficient devices and other techniques, the county has been able to cut energy consumption at the jail, the courthouse and the administration building by significant amounts over the last decade. The county also adopted Resolution 97-124 establishing a policy for procurement of products with recycled content. A preferred products list is maintained by the Office of Waste Management and Purchasing.

C. Site design utilization of passive energy techniques

One area in which proven planning and design concepts can be utilized to conserve natural resources as well as energy is site design of new development. This approach can save energy in each phase of the land development process: site selection, design/construction, operation, and maintenance. Energy savings are in the form of either embodied energy or end use energy. Embodied energy is the energy consumed during the construction phase of a project, plus the energy consumed in the operation of equipment during that phase. End use energy is that energy consumed during the operation of a completed project, such as heating, cooling, hot water, and lights. (Crandall, 1982)

Embodied energy savings during the site design process include, for example, savings resulting from attention to drainage, grading, roadway or street construction, and structure type. A drainage plan for a development site should allow nature to handle as much of the runoff as possible by utilizing existing drainage courses and water bodies, creating or protecting water impoundment areas over permeable soils, and protecting natural flood plain functions. In this way, the expenditure for drainage piping and ditching can be minimized. Land grading can also be minimized generally by utilizing existing slope conditions for compatible land uses and by preserving natural landscaping. This landscaping, in turn, can affect the heating and cooling requirements of buildings. Embodied energy in roadway design and construction is a significant cost in the development process. Clustering of units can significantly reduce pavement lengths within developments. Some reduction in roadway widths may also be appropriate. Choice of structure type can also affect embodied costs by utilizing common walls and shorter utility extensions and by minimizing necessary grading for foundations.

Once a development site is selected, end use energy savings during the use and operation of individual structures can also be affected through, for example, proper site selection, unit orientation, and roadway layout. Since structure cooling loads in Florida are greater than structure heating loads, minimizing the cooling load should be the main objective in designing new developments to utilize the natural and built characteristics of a given site. Within a development project, individual structure sites should be selected with sensitivity to slopes, angle of solar radiation in relation to slope, vegetation, presence of water bodies, winds, and elevation. Individual units should be oriented to minimize solar incidence (five degrees south, southeast building orientation, with minimal east and west exposure, is preferred) and maximize the potential impact of wind on the structure. Maximum seasonal shading, especially of southern and western exposures, is desirable. Finally, roadway layout can affect end use consumption of structures by allowing for an east-west orientation of structures, minimizing heat build-up through narrower street widths, allowing for structure clustering, and so on.

A significant body of literature is already available on these and related subjects, of which the foregoing is just a sampling. (See Burchell and Listokin, 1982; American Planning Association, 1979; Franklin Research Center, 1979.) However, existing regulations may, in some instances, preclude the application of some of the principles discussed above. For example, existing roadways and lots, coupled with setback requirements, may prevent new structures in existing subdivisions from achieving optimal orientation in relation to the sun. A grid type of street plan maximizes embodied energy in paving materials, while heating the micro-climate and, again, pre-determining the orientation of some units. A flexible site design process, on the other hand, should allow for passive heating and cooling of structures through sensitivity to the site and its natural characteristics, utilizing the principles sampled above.

The Housing Element calls for performance standards in the site plan review process to "encourage innovative approaches for site layout which can reduce costs of land preparation, infrastructure, landscape planting, and energy requirements for homes." Periodic review of development regulations and building codes is directed in order to determine whether modifications are needed to incorporate energy conservation measures in addition to the requirements of the State Energy Code. The Housing Element also calls for consideration of the opportunities offered by passive solar heating and cooling techniques, such as those reviewed above, and consideration of a request for modification of the State Energy Code to credit such techniques. These policies are consistent with conservation policies presented in this element.

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Open Space

A. Introduction

According to 9J-5, FAC, “open spaces” means undeveloped lands suitable for passive recreation or conservation.” Open space and natural features are an integral part of this Element. A wide range of types and sizes of open space and natural features within the County should provide: diverse plant and animal habitat, visual and spatial breaks from urban uses, places for outdoor education and passive recreation, such as hiking, photography, bird watching, bicycling, jogging, or fishing, a system of trails, greenways, and wildlife corridors that are interconnected, and many other uses. The preservation and enhancement of open space and natural features, and their incorporation into the infrastructure of Alachua County, is a function of this element and related ordinances. Public parks and recreation programs are described in the Recreation Element.

The interaction of land, water, plants, and wildlife through the millennia created a place that attracted - and still attracts - people because of its beauty and natural features. Alachua County is a community that values the area’s natural features and has tried to incorporate natural features in the design of the built environment. Maintaining the natural features and open space in an urban area is a difficult task, and one that becomes more complex during periods of rapid population growth. However, providing open space for the benefit of existing and future residents is important.

Urban sprawl has eliminated large quantities of undeveloped open space throughout unincorporated Alachua County. The potential for increasing urban and rural development impacts is great and will not lessen over the short or long term. Policies require the development of an open space network throughout the County, and provide criteria for open spaces to be provided by both the public and private sector to meet the needs of the growing community. Since open space lands may be either privately or publicly owned and range in character from vacant urban lands to large open spaces and forestlands, methods of protecting these lands are often varied and complex. The open space plan must ensure the protection and proper future use of the natural environment including rivers, state parks and wetlands.

B. Functional categories of open space

When open space was included as part of the Recreation and Open Space Element, open space was described by its function as it relates to land use. This approach recognized that, in many cases, open space areas serve more than one land use. In all cases, open space provides relief from development and maintains the balance necessary to insure a healthy natural environment. Three categories of open space include utility open space, green open space, and corridor open space.

Utility open space is identified as land that is utilized for its capacity to be used for production and storage. These include: resource lands, such as agricultural lands and forests; reserve lands that are set aside for future resource use but may serve as wildlife habitat areas due to limited human disturbance (such as Site Balu); and water management areas, such as lakes, rivers, creeks, wetlands, floodplains, aquifer recharge areas, and stormwater systems areas which are unsuitable for development.

Green open space is land primarily serving as preservation, conservation, or recreation lands. These include activity-based urban and rural park areas, such as neighborhood and community parks, botanical gardens, fairgrounds, zoos, and private recreation sites; urban development open space, which are natural areas that provide relief from the intensity of development; protected areas, such as State parks and preserves, geologic sites, resource-based parks, and scenic areas, which afford limited accessibility to protect the site's scenic and natural resource qualities.

Corridor open space is considered as those areas that provide linkages between various activity nodes. Activity nodes consist of residential neighborhoods, shopping areas, and preservation, conservation, and recreational sites. Examples include: right of way spaces, such as certain scenic streets, railroad lines, and utility easements; and scenic and environmental spaces, which possess scenic and environmental qualities such as creeks, rivers or streams and environmentally sensitive habitats. Another example would be the Gainesville-Hawthorne Rail-to-Trail.

Certain open space areas serve many of the functions described under these open space categories. These areas can be described as multi-use open space. Types of multi-use open space areas include rivers and creeks, significant uplands and forests, 100-year floodplains and wetlands. An example would be the Lochloosa Wildlife Management Area.

C. Open space requirements

As part of the Conservation and Open Space Element, open space is addressed in several ways. First, new policies establish the requirement for the provision of 20% pervious open space in all urban developments. Open space is to be comprised of permeable open surfaces, excluding principal structures and impermeable surfaces. No parking areas are included as open area. In addition, new Conservation policies establish a priority for natural resources to be included as protected open space in all developments. This priority applies to open space in rural clustered subdivisions, addressed in the Future Land Use Element. Finally, Alachua County encourages the creation of an open space network linking environmentally viable natural systems through strategies which will:

- Support the preservation of conservation areas while helping to define the overall future land use pattern of the county;
- Enhance the appearance of the County by providing an open space network that will become a visual and functional organizer of recreational activities, natural resources and other open space areas, including public and private lands and water; passive as well as active recreational areas and conservation areas;
- Protect the health and safety of residents by providing safe recreational opportunities in close proximity to residences;
- Increase recreational access opportunities that support eco-tourism, and reduce the need to develop land for parking;
- Encourage alternative to the automobile to conserve scarce resources, comply with federal air quality standards, and provide for bikeable, walkable, and equestrian friendly communities, consistent with Florida Pedestrian System goals.

Linked open space is not a land use designation, but is a program which enables connections consisting of lands designated as conservation, agriculture, or other land categories between lands identified as conservation, recreation, and residential. Various types of open space links or greenways will be included in the program: ecological or wildlife corridors, which connect conservation areas to allow animal migration and primitive hiking where feasible; small ecological greenways which allow connection of upland areas to preserve high quality native vegetation within urban areas; passive recreational greenways which use drainage maintenance areas and/or right-of-way to connect residential areas with parks and conservation areas; and those which use rows to connect residential areas to parks, urban preserve and other open space features.

To implement these wide-reaching policies, the County will need to review all of the diverse contexts in which open space is used, and develop a comprehensive set of planning and management strategies for these areas. At minimum, a new ordinance will be required to address open space in various types of development, as well as a master management plan for the greenways system, as well as other open space in the County. In addition, the County aims to revise its regulations to provide incentives or encourage developers to preserve natural features as open space. Such changes include but are not limited to the following:

- More flexible subdivision lot and street standards to allow including natural features into the subdivision design;
- Planned development standards that are easier to follow and administer;
- A new cluster subdivision option specifically aimed at preserving natural features;
- Flexible minimum residential density standards on sensitive lands to protect natural features.

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Scenic Quality

A. Introduction

Scenic quality is a concept that is difficult to define on account of its broad scope. The Federal Highway Administration, for its purposes, calls it “the heightened visual experience derived from the view of natural and manmade elements of the visual environment of the scenic byway corridor,” whereas the Florida Department of Transportation calls scenic resources the “combinations of natural and manmade features that give the visual landscape remarkable character and significance.” More expansively, scenic quality can be considered as the cumulative impact of the elements of our surroundings that have aesthetic dimensions and which affect sense of place and, ultimately, quality of life. These elements include, but are not limited to, urban sprawl, building design, landscape architecture, vegetation, preservation of rare and endangered landscapes, lighting, and roadway beautification. Alachua County’s Comprehensive Plan uses the term “scenic resources” to mean “shared images of what is special or unique about the County’s landscape.”

Scenic quality is important across the state and at all levels of community, as the Florida Constitution, Article II, Section 7 declares it to be state policy “to conserve and protect its natural resources and scenic beauty.” In a report, the Alachua County Comprehensive Planning Team stated, “A strong sense of place is a valuable asset to any community. . . . [P]rotecting the community’s scenery and heritage that contribute to sense of place not only preserves a community’s character and identity, but is also recognized as a factor in maintaining economic well-being.”

Protection of scenic resources is addressed in the Conservation and Open Space Element of the updated Comprehensive Plan. Objective 5.3 of that element provides the County with a mandate to “Protect the natural resources and scenic quality of the community to preserve and cultivate a unique sense of place while maintaining economic well-being.” This broadens the County’s previous policy (Objective 3.4 of the 1991 Comprehensive Plan) by recognizing that scenic quality is important beyond the bounds of the built environment, i.e., the environment that most of the population lives and works in. Scenic quality is important for preserving those environments valued as natural areas distinct from the built environment.

B. Community design considerations

Most communities value and cultivate their sense of identity. Much regulation is fairly uniform throughout the state and nation. This has produced segments of the built environment that render aspects of communities indistinguishable from one another. Community design standards can help identify, protect, and enhance what is unique about a community, and thus contribute to a sense of identity. Generally, Alachua County’s land development regulations have addressed the fundamentals of land development without addressing the visual quality of resulting products in detail. Community design standards and guidelines can address the community’s quality of life through attention to development’s arrangement, appearance, and impact on the built environment. The proposed plan calls for community design considerations in a variety of contexts.

The character of a community’s commercial areas has a strong impact on the perception of the

community as a whole. In most communities, the cyclical and pervasive pattern of strip commercial use often has eroded local character and contributed to deterioration of older development. This detracts from the livability of the community, especially along older corridors. Encouraging better community design by providing incentivized options and flexibility within the land development code which is one way to ensure that new community development is more sensitive to its surroundings. See the Future Land Use Element for more discussion on this topic.

C. Personal Wireless Service Facilities

In an era of increasing dependence on mobile phones and other wireless devices, the siting of telecommunication towers is a controversial issue gaining prominence in many communities. Despite the widespread use of devices, very few people want to have unsightly utility structures within their view. Additionally, tall communications towers have exacted a toll on bird populations, with millions of birds dying from collisions with the facilities every year. This prompted scientists at the 1998 North American Ornithological Conference to adopt a joint resolution calling for more studies of the problem and for cooperative action between government agencies and the communications industry to reduce avian mortality caused by tower collisions.

Siting expert Ben Campanelli cites statistics that predict a need for as many as a quarter of a million new cellular antenna sites to meet U.S. demand when he writes, “As many as half of these sites will require new towers, especially in suburban and rural areas where few suitable tall structures are available to lease as antenna support platforms.” Locally, however, the phenomenal growth of the cellular industry has been addressed by the development of a Wireless Master Plan. The Wireless Master Plan sets forth a comprehensive and innovative “carrots and sticks” approach to siting cellular antennas and other personal wireless service facilities. It is significantly different than the one-size-fits-all technique used in the vast majority of communities.

The most significant differences in the Alachua County plan and most others are that it explicitly discourages tall towers, discourages co-location of personal wireless service facilities (the use of a common mount by two or more wireless carriers, which frequently results in taller towers), and encourages proliferation of shorter, less visible cell sites. The Wireless Master Plan led to Alachua County Code Chapter 366, which regulates personal wireless service facilities in detail, with an emphasis on protection of visual corridors and minimizing impacts through strategic location, camouflaging, and other techniques. New policy language to address the special needs of PWSFs are included in this proposed plan update under the Future Land Use Element. Policy 5.3.2 of the updated Conservation Element also calls for all infrastructure and utility structures, including communication towers and personal wireless service facilities as well as radio and television antennas, water, sewer, and energy facilities, to be designed and located in a way that minimizes “adverse visual impacts on the landscape and avian mortality.”

D. Glare and light pollution reduction

One specific new policy addresses outdoor lighting and glare, and calls for a comprehensive set of outdoor lighting design standards based on conservation principles that include the maximization of energy and cost efficiency, the use of lighting at appropriate intensities and times, and the minimization of offsite lighting impacts. Light pollution is a growing problem for five commonly recognized reasons. Lighting design techniques can be the culprits of glare, light trespass, clutter, energy waste, and urban sky glow.

- Glare has been defined as “unwanted source luminance” (luminance being “the brightness of an object that has been illuminated by a source”) is a safety hazard frequently encountered by drivers (Shaflik, 1997). Glare comes in three levels: discomfort, disability, and blinding.
- Light trespass is lighting which strays from its intended purpose, often resulting in annoyance for those that are trespassed upon.
- Clutter is a general descriptor for the unpleasant effect that wasted light has on the aesthetics of an area. Clutter may result in confusion (i.e., visual distraction).
- Energy waste is an undesirable result of poor lighting design, which, in addition to diminishing our supply of non-renewable energy and contributing to air pollution, the International Dark-Sky Association calculates as costing the U.S. some \$1.5 billion annually.
- Urban sky glow is the macroeffect of light pollution which diminishes the visibility of objects in the night skies. This concerns many citizens and is an increasing problem for astronomers. As the University of Florida hosts one of the largest graduate astronomy programs in the nation, this is an issue that of local concern.

There is often initial resistance by some segments of the public in communities where light pollution policies have been enacted, most often for security reasons. Despite being widely perceived as a tool for crime prevention in residential and commercial areas, studies have found little evidence to support this notion. The National Institute of Justice has said, “Lighting has received considerable attention. Yet, evaluation designs are weak and the results are mixed. We can have very little confidence that improved lighting prevents crime, particularly since we do not know if offenders use lighting to their advantage. In the absence of better theories about when and where lighting can be effective, and rigorous evaluations of plausible lighting interventions, we cannot make any scientific assertions regarding the effectiveness of lighting. In short, the effectiveness of lighting is unknown.” The International Dark-Sky Association points out that there is a difference between efficient, effective lighting schemes designed to deter crime and lighting schemes that use lighting indiscriminately. IDA recommends using well-controlled lighting and careful positioning that reduces glare and waste such as uplighting and scatter as well as motion sensors that activate lighting only as needed.

Although the current land development code has lighting design requirements as part of its zoning restrictions, there is not a comprehensive lighting ordinance for Alachua County. Policy 5.3.7 of the updated Comprehensive Plan requires such an ordinance in order to preserve the ambiance and quality of the nighttime sky and reduce energy consumption while allowing for public safety and security.

E. Beautification of visual corridors

The examination of existing roadway appearance in unincorporated Alachua County and the impacts of future roadways and road reconstruction on established neighborhoods suggests a number of areas of concern. Many of our road rights-of-way are aesthetically unattractive because of lack of buffering and landscaping. This concern covers both neighborhood commercial and residential arterial and collectors. Another concern is the impact of new road construction and existing road reconstruction on established neighborhoods. Residents fear that the intrusion of new roadways and the intensification of existing roadways will be a detriment to the appearance of their communities. The protection of existing roadways that exhibit attractive or scenic characteristics and the improvement of the appearance of existing and future development are also issues that need to be addressed. Visual corridors are discussed below and identified on Map 45.

1. Scenic roads

Alachua County Code Chapter 344 has as its stated objectives “to promote the convenience and enjoyment of public travel on the highways and roadways of the county; to protect the natural and cultural heritage corridors of the county and to enhance their resource values for the enjoyment of future generations; to protect the public investment in roads from activities, land uses, signs, etc., which impair both the integrity of the road, its capacity for traffic, and its visual qualities; to provide safe facilities for leisure driving, hiking, and biking; to provide access to and protect outstanding visual experiences representative of the county’s variety of landscape resources and cultural attractions; to contribute to the environmental and historical appreciation of the county and education of the residents and visitors; to attract visitors to the county by preserving natural beauty along the scenic roadways; and to expose scenic views and vistas along the roadside.”

2. Scenic corridors

With the update of the Conservation and Open Space Element, the County expands its view to protecting more than just roads, and places importance on the aesthetic qualities of all routes of transportation and visual corridors. A scenic corridor is defined as “a visual opening along a traveled route, such as a road, waterway, bike path, or pedestrian trail, that allows either glimpses or extended views of built or natural resources having historical or cultural significance or scenic beauty.” In policy 3.1.2, County-designated scenic corridors are identified as secondary conservation areas requiring protective measures but offering a range of activities consistent with protection. In policy 6.3.1, scenic corridors are recognized as one of several possible components of a greenways system in the County.

As outlined in policy 5.3.9, the scenic corridor designation is viewed as a catalyst and guideline to be used by the public and private sectors to bring about a coordinated effort in improving or maintaining the aesthetic appearance of County designated visual corridors. The purpose of the designation is to provide a framework for future planning and implementation of standards that can be addressed in the development regulations of Alachua County relating to the aesthetic appearance of identified corridors. The actual planning effort should be led by Alachua County with input from citizens organizations, the development community, and private individuals that would be affected by a scenic corridor designation. The implementation can be accomplished through community organizations, developers, or the county, depending on the specific corridor being addressed.

The scenic corridor designation may be applied to road corridors determined to have scenic qualities of

local or countywide significance. Roadways that function as connectors or linkages in the scenic corridor system may also be considered for designation even though their present characteristics would not normally warrant the designation. The purpose is to preserve and enhance the aesthetic appearance of such facilities with concern for related buffering, landscaping, and control of non-residential uses. Another purpose of the designation is to begin to form a system of connections between parks and recreational areas of the county. Consideration of bicycle and pedestrian access should be considered as part of the scenic corridor development plan.

3. Scenic US 441

In the spring of 2001, the Florida Department of Transportation designated U.S. Highway 441 as the “Old Florida Heritage Highway,” the culmination of efforts on the part of the Scenic 441 Corridor Advocacy Group and the University of Florida Conservation Clinic to recognize US 441 as a road with remarkable scenic, cultural and natural value. The Scenic US 441 Corridor, with its associated loop/spur roads, totals approximately 47 miles from SR 331 to the Alachua/Marion County line. The route’s Corridor Management Plan states “Scenic US 441’s relative proximity and easy access to Interstate 75 at both ends of the corridor offer a unique opportunity to promote this corridor as a touristic resource for less-hurried travelers. This in turn can support the current trend toward contextually appropriate economic development and eco-tourism exemplified by the growing number of antique and bed and breakfast industries along the roadside communities.”

The designation of U.S. 441 as a scenic corridor is part of a state program that is separate and distinct from the County’s program for scenic roads. While many of the scenic and resource protection concerns are similar for both programs, the means of achieving protection are considered under different frameworks.

4. Gateways

Other roadways not designated as scenic corridors but which have significance as gateways into Alachua County should be considered for application of additional landscaping and street tree planting to enhance their appearance. These roadways may be bordered by a variety of land uses. Additional landscaping and street tree plantings can help unify and improve the aesthetics of gateway roadways. A plan for planting shall be developed by the public sector with input from the community. Currently, the City of Gainesville has identified several roadways as gateway streets. The County may wish to work with other municipalities on similar efforts.

5. Street tree planting of non-scenic corridors

New subdivisions will require the planting of street trees in the right-of-way of local roadways between the street and sidewalk, or if there is insufficient right-of-way, a landscaped buffer should be provided within the front yard setback for this purpose. Street trees will be required in addition to those normally required for planting on the actual building site to provide future shade and other climatic benefits, and to help unify and beautify future neighborhoods. Every attempt to preserve existing trees in the right of way shall be explored. In addition, the County has committed to promoting and protecting the visual characteristics of canopy roads and wildflower areas through tree planting programs and tree maintenance practices, in cooperation with other agencies and private landowners.

HUMAN-RELATED RESOURCES

Vegetation Management

A. Introduction

Community trees and forests, and their associated vegetation, are valuable. Besides providing habitat and food for wildlife, vegetation produces oxygen, removes carbon dioxide, absorbs nutrients in waste, purifies the air, and reduces soil erosion. Native vegetation with intact natural soil surface provides the best medium for aquifer recharge, as well as areas which help provide adequate clean water for human and environmental needs. A visible part of the only sub-tropical area in the continental United States, natural vegetation is a strong attraction for many tourists visiting the state and for permanent residents seeking the alternative life styles available.

Community trees and forests provide a business-generating, and a positive real estate transaction appearance and atmosphere. It makes economic sense for the community to spend money on trees when it is clear that this money will be returned to the municipal coffers with interest in increased property values and a healthy economy. The following paragraphs will present information to support the presence of trees and other landscape plants in our communities, and show, in clear economic terms, that trees are good for the community.

B. Importance of trees

1. Environmental benefits

a. Air quality

Trees are an important part of the local and national fight against air pollution and against the progress of global warming. By removing carbon dioxide and other pollutants from the air and releasing oxygen back into the air, trees improve air quality. Air pollution levels are measured by the amount of particulate matter in the air, high levels of which are irritating to the respiratory system. Trees aid in removing particulate matter from the air by trapping particles on the exposed surfaces of twigs and leaves. Among other pollutants, trees filter out ash, dust, pollen, and smoke.

Looking at the overall effects of trees on air quality, in a study of two streets, a street with trees was found to have 100 to 3,000 dust particles per liter compared to a street without trees, where the concentration of dust particles was 10,000 to 12,000 per liter. Therefore, the lack of trees on an urban street resulted in four to 100 times as much dust being present as was present on a street with trees (Nelson 1975).

Another look at air pollution along freeways found that greenbelts could contribute significantly to air quality. The study found that air pollution along freeways is approximately three times higher than that acceptable to man. A greenbelt one-half mile wide on either side of a highway could readjust this air balance by removing significant pollutants from the air (Nelson 1975). Other studies have also found significant cost savings in health and property impacts by reducing air pollution (Conference on Alternative State and Local Policy 1984, and Ridker and Henning 1957).

Trees clean the air by removing carbon-dioxide, a by-product of combustion. Combustion comes from

many places, for example cars and industrial plant emissions. Carbon makes up half the dry weight of a tree. According to the USDA, "One acre of forest absorbs six tons of carbon dioxide and puts out four tons of oxygen. This is enough to meet the annual needs of 18 people." In addition, the amount of carbon stored in a primary (uncut) forest will almost always be greater than that in a restored forest.

b. Climate control

Research has shown that properly placed trees and landscape plantings can save 20 to 25% on energy use in the home (Heisler 1986). In neighborhoods with large trees, there will be a significant effect on temperature and energy use in buildings, particularly during the summer (Norman 1984, DeWalle 1978).

Without the cooling and moderating effect of trees and green spaces in our urban environments, urban areas grow hotter and dryer – a heat island effect. Approximately five to 10 percent of the current electric demand in cities is spent to cool buildings just to compensate for the heat island effect. In Los Angeles, this translates to \$150,000 per hour and in Washington, D.C., close to \$40,000 per hour during peak times. Nationally, the hourly cost may be as high as \$1 million (Rodbell, et al. 1971).

In addition to the increase in temperature, there is an increase in dryness without trees. In Phoenix, Arizona, for example, the construction of a regional shopping center resulted in a 30% increase in pan evaporation rates. A one percent rise increases outdoor water demand by a corresponding one percent. Thus, as the amount of vegetation in our urban areas is reduced, requirements for water and energy increase (Rodbell et al. 1991).

"According to a recent report by the U.S. Forest Service, trees save city governments and homeowners considerable amounts of money over the long run. In the study, which used Chicago as its model, researchers found that if officials planted 95,000 trees and tended them for 30 years, the city would save \$38 million--or an average of \$402 per tree. The reason: Trees help reduce energy use and pollution damage." (Wexler 1998)

Trees promote energy conservation by creating shade, reducing heat gain in and on buildings and paved areas, and reducing the temperature of the microclimate through evapotranspiration. Trees impede direct solar radiation and can channel wind flow around buildings. Additionally, the evaporation of moisture from leaves can reduce the ambient temperature surrounding a building. Strategic use of trees is estimated to result in annual residential energy savings in the U.S. of up to 25%. The USDA reports, "The net cooling effect of a young, healthy tree is equivalent to ten room-size air conditioners operating 20 hours a day."

Quattrochi and Luvall (1999) found that the few urban forests located throughout Atlanta, Georgia had a significant dampening effect on the urban heat island. This is particularly evident in northeast Atlanta where the residential tree canopy is extensive.

Trees provide protection against severe weather. Trees can serve as windbreaks to reduce the effects of tropical storms. In the winter, trees can have an insulating effect. "A home loses a greater amount of heat on a cold, windy day than on an equally cold but still day. About 1/3 of the heat loss is by transfer through the ceilings and walls (conduction). Wind increases heat loss from the outside surfaces of those same walls and from the roof by sweeping the warm air away (convection). Cold-air infiltration through spaces around windows and doors also increases reliance on costly home-heating systems powered by fossil fuels. The use of windbreaks and foundation plantings can substantially reduce the heat-robbing action of winter winds." (A.W. Meerow and R.J. Black, *Enviroscaping to Conserve Energy: A Guide to*

Microclimate Modification.)

c. Soil

Tree root systems are critical in stabilizing soil and topographic features such as creek banks. They also prevent erosion and slow stormwater runoff, thus contributing to soil conservation and flood control. Additionally, trees contribute to the nutrient load of the surrounding soil. It has been stated that 10,886 tons of soil can be saved annually with tree cover in a medium-sized city. (Coder 1996)

Trees function as both windbreaks and soil stabilizers, minimizing soil erosion. On the average, cropland in the United States loses 4.4 tons of soil per acre annually. The agricultural production problems caused by this erosion are estimated to cost \$2 billion annually. In addition, the runoff of sediment carrying herbicides causes an estimated \$13 billion of additional damage to the ecosystem (Clark et al. 1985).

One study by the Maryland Department of Natural Resources in the Gunpowder Falls Basin shows that forestland produces about 50 tons of sediment per square mile per year; established urban and suburban land contributes 50 to 100 tons; farmland, 1,000 to 5,000 tons; and land stripped for construction, 25,000 to 50,000 tons. This sediment enters the tributaries of the Chesapeake carrying nutrients and pollutants that are slowly killing the Bay (Ebenreck 1988).

d. Water

Trees maintain permeable land areas for surface water filtration and aquifer recharge. Trees are a key link in the hydrologic cycle. Their job is transpiration or giving off water vapor into the air for recycling into clouds and rain. Rain is the only means for recharging the aquifer in south-central Florida. Large trees get the job done much better than small trees.

Trees reduce stormwater runoff, storm and flood damage, and associated costs. "The planting of trees means improved water quality, 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." (USDA Forest Service) Trees decrease the amount of water that runs off a site by breaking the impact of the rain and slowing the flow, allowing time for water to infiltrate soil. For instance, a U.S. Forest Service study showed that, in a one-inch rainstorm over 12 hours in Salt Lake City, trees reduced surface runoff by 11.3 million gallons, or 17 percent (Ebenreck 1988). This reduction has implications for the infrastructure costs of storm sewer capacity, the capacity of sewage treatment plants, flooding of rivers and streams, and the loading of sediment and pollutants into rivers and streams. Trees control erosion and reduce non-point-source pollution of surface waters. Consider these remarkable statistics: 37,500 tons of sediment per square mile per year comes off of developing and developed landscapes; trees could reduce this value by 95%. That results in \$336,000 annual control cost savings with trees. (Coder 1996)

e. Habitat

Trees are living systems that interact with other living things in sharing and recycling resources - as such, trees are living centers where living things congregate and are concentrated. Trees protect and maintain natural habitats for wildlife, birds, game, fish, and other aquatic life, as well as for other vegetation..

Providing tree habitat for wildlife pays dividends. Consider the birds and bats for which trees are a haven: they play an important role in natural pest control. While lowest bird diversity is in areas of mowed lawn, highest is in areas of large trees, greatest tree diversity, high native plant populations, and

brushy areas. Native wildlife needs native habitat. A prime example is the red-cockaded woodpecker. This is a non-migratory bird that thrives in mature pine, especially longleaf pine, forests. It is classified endangered on the Federal level and threatened in Florida.

Trees are also essential for providing the habitat of other vegetation. Epiphytes such as bromeliads and some ferns make their homes in the tree branches, while other plants are reliant on the shade, protection, and leaf litter a tree canopy provides.

2. Human-related benefits

a. Noise reduction

Noise is an insidious but often irritating form of pollution for the urban dweller. Sound can be reduced in intensity either by the distance it travels or by colliding with a barrier that absorbs the sound waves or reflects them in another direction. The degree of transmission of the sound is also based on the humidity of the air, with high humidity resulting in low transmission. Trees function in the sound reduction process by modifying humidity and climate, by absorbing sound, and by deflection and refraction. Trees provide “white noise,” the noise of the leaves and branches in the wind and associated natural sounds, that masks other man-caused sounds.

In a study of the economic effects of expressway noise pollution, Roger Vaughn and Larry Hucking (1975) looked at the decline in property values that could be attributed to the level of noise in a neighborhood in Chicago. The estimates ranged from a high of \$18 million to a low of \$8 million.

Trees provide a buffer and screen against noise pollution. “Some researchers estimate that belts of trees 31-meters (100-feet) wide and 14-meters (45-feet) high can reduce high-way noise by almost 50%. Evidence also suggests that people find noise less annoying when the source is obscured by vegetation.” (U.S. Department of Energy)

b. Light pollution control

Trees can potentially aid in reducing light pollution by blocking and controlling light trespass and scatter. They can also reduce the harsh effects of sunlight on the human eye by being used to shade roads and other outdoor areas people frequent and congregate, such as picnic tables and walkways. Thus, by reducing the bad effects of lighting, trees can contribute to the safety and comfort factor of our surroundings. Trees can solve a variety of light and glare problems in the landscape, although planting a tree that will grow to lock the offending light will not solve the discomfort for some time. However, light effects, both day and night, should be considered before removing trees.

c. Human health and well-being

Trees and green landscapes have a profound effect on our health. Spending a day in the woods or lunchtime in the park can leave us feeling invigorated and refreshed, ready to face the pace of society. Trees and planted or natural areas have the ability to relax us, to lower our heart rate, and to reduce stress. According to Dr. Roger S. Ulrich of Texas A&M University, “In laboratory research, visual exposure to settings with trees has produced significant recovery from stress within five minutes, as indicated by changes in blood pressure and muscle tension.”

In a study of patients in a Pennsylvania hospital, Ulrich (1984) found a marked difference between the

convalescing times of patients with views of a landscaped area and those with views of no landscaping or a brick wall. His results showed that patients with a view of trees spent only 7.9 days convalescing and required less potent painkillers, compared to 8.7 days for those overlooking the non-landscaped area. With 8% fewer days spent in the hospital, the national health cost savings could be as large as several hundred million dollars a year according to Ulrich's figures.

In other tests, Ulrich (1979) found that a group of students feeling stressed by exams felt better after viewing 50 slides of natural scenes, while a control group who viewed slides of urban scenes felt worse.

d. Landmarks

Trees are also culturally important as community landmarks and memorial markers. Old trees are reminders of an area's history, a concept echoed by heritage and champion tree programs, which designate large, old trees as local treasures and recognize the need for their preservation. In the Alachua County Tree Protection Code (Chapter 347 ULDC), champion trees are defined as "those trees that have been identified by the Florida Division of Forestry as being the largest of their species within the State of Florida or by the American Forestry Association as the largest of their species in the United States."

e. Property values

Numerous studies have been done about the value of trees to residential property. The studies show that people are willing to pay more for homes that are surrounded with trees and other landscaping. Dr. Lowell Ponte has stated that "Trees can boost the market value of your home by an average of 6 or 7%."

In Manchester, Connecticut, as much as six to nine percent of the total sales price of a house could be attributed to "good tree cover" (Morales 1980). A total of 50 homes were observed in the study. The homes were between four and five years old, with half of the homes having a substantial amount of tree cover and half with no tree cover. Increases in value attributable to the presence of tree cover ranged from \$2,941 (seven percent) in the least desirable neighborhood to \$2,683 (five percent) in the most desirable neighborhood.

A three to five percent increase in the sales price of single-family houses in Athens, Georgia, was associated with the presence of trees (Anderson and Cordell 1982). The results of this study reflect actual real estate market transactions, in which sellers and buyers negotiated final sales prices. During the period from 1978 to 1980, 800 house sales were analyzed from the local Board of Realtors Multiple Listing Services. In this study, the \$46,972 predicted price of the average house includes \$2,100 for the presence of an average of five trees. Therefore, an average of four percent of the price of the average house was attributable to the presence of trees.

In a study of appraisal values, open land with no trees was appraised at \$1,500 per acre (1973 dollars), while land that was two-thirds wooded was appraised at \$2,050 per acre (Payne 1973). A 12-acre tract of land was selected, and different images of the site with varying numbers of trees were prepared. These images were shown to real estate appraisers who were asked to estimate a per-acre value. On average, trees contributed as much as 27 percent of the appraised land value.

In a survey of residents in a Stevens Point, Wisconsin, subdivision, it was found that the presence of trees was the most important factor in influencing the purchase of their property (Vander Weit and Miller 1986). A majority of homeowners stated that more than 10% of the value of their homes could be attributed to vegetation.

In a story on home renovations in Money magazine (April 1986), it was reported that landscaping has a recovery value of 100 to 200 percent “if it is well done and harmonizes with foliage nearby.” Since not all improvements recover their value, this compares to the recovery value of kitchen remodeling at 75 to 125 percent, bathrooms at 80 to 120 percent, a new deck or patio at 40 to 70 percent, and a swimming pool at 20 to 50 percent.

Clearing versus replanting: All of the statistics given above relate as directly to the development of new residential areas as they do to the sales of existing homes. Developers, however, often find it easier to clear-cut new residential lots rather than to try and deal with the requirements of tree preservation. We have seen that trees and landscaping can add thousands to the sales price of a new home. How does this relate to the added costs of preserving trees on the construction site?

In two studies of developers, one in Amherst, Massachusetts, and one in Athens, Georgia, it was found that preserving trees on site was a sound economical decision (Selia and Anderson 1982). In the Amherst study, conducted in 1977, nine builders reported an average cost of about \$1,000 to clear a heavily wooded lot of trees. If some of the trees were to be saved, the partial clearing costs and protection of the remaining trees was higher, averaging about \$1,700. The nine builders reported that they were always able to recover the extra costs of preserving trees in a higher sales price for the house. In the Athens study, nine builders were surveyed about tree removal and preservation practices for 106 houses they had built. The builders reported that public demand was higher for houses with preserved trees and any extra costs incurred in preserving trees were recovered in the final sales price.

C. Human impacts

When natural vegetation is cleared: wind and water erode the soil; the immediate neighborhood suffers from blown dust and sand and poor air quality; and the noise buffering benefits provided by natural vegetation is lost. Urban development practices frequently remove or alter much of the County natural vegetation. In many cases, this is unnecessary and could be avoided. Many species are essential to the integrity and maintenance of the lands they occupy. The natural communities and their value for the planned future of Alachua County is detailed in the Conservation and Open Space Element. Three particular threats associated with urban development are discussed below.

1. Water use

According to the Florida Springs Task Force, more than nearly half of all water withdrawn for public supply in Florida is used to water lawns. More aggressive programs to encourage native landscaping around homes could make a major difference in water consumption. The Task Force recommends implementation of water conservation programs, such as xeriscape landscaping services, free mobile irrigation labs, and rebate programs for rain sensors, micro irrigation, water efficient plumbing fixtures and appliances.

2. Fertilizers

What we apply to the landscape can get into the aquifer. Nutrients in spring water do the same thing fertilizer does for our lawn and garden - it makes things grow; like algae. Non-native, invasive plants that aren't supposed to be there, thrive on nutrient-rich waters and crowd out native species. It also effects wildlife. When nitrate levels in a spring reach 1 part per million (ppm) - a tenth of the level at which nitrates cause human health problems - the spring ecology changes. Depending on the permeability of the soil and how many years the activity has gone on, fertilizers and other chemicals applied to lawns and gardens could be feeding algae and plants in springs that bubble up near the coast. In some areas in can take up to 20 years for extra nutrients and pollution to work its way through the soil.

Landscaping activities can affect the environment through the release of toxic pesticides and excess nutrients, as well as the destruction of wildlife habitat and ecologically sensitive areas. However, proper landscape design and maintenance can help reduce these environmental impacts and can help minimize the effects of other activities as well.

If planted in suitable soil, native plants require very little maintenance. What is a native plant? According to the Checklist of the Vascular Plants of Florida (Wunderlin et al, 1995): A plant is native to Florida if it was present here in 1513, when Juan Ponce de Leon arrived, or if it arrived after 1513 by non-human means such as air, animal or sea drift. Executive Order 13112 defines native species more broadly, "mean[ing], with respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem." Adapted over many centuries to Florida's extremes - heat, humidity, insects, storms, floods, freeze, frost and drought - these plants are "Florida friendly". They commonly re-seed and return year after year.

Why does this matter? Because non-native plants often require much time, effort, topsoil, fertilizer, pesticide, water and mulch. Besides taking more time to maintain and less time to enjoy - these activities are not friendly to Florida's fragile environment. In addition, native plants attract native wildlife. Many native birds and animals require native plants for food (The Right Plants for Dry Places, Suncoast Native Plant Society).

Landscaping focuses on layout, aesthetics, community enhancement, recreational use, etc. It is a significant element in the development process and can be done to be "Florida friendly" - using less water and less polluting fertilizer.

3. Invasive plants

Florida has a problem with invasive, non-native plants. Executive Order 13112, in which the President established the National Invasive Species Council, defines invasive species as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health." Alachua County's Comprehensive Plan regards invasive species as those plant species that are widespread in Florida and have the established potential to invade and disrupt native plant communities; they are localized but have a rapidly expanding population or have shown a potential to invade and disrupt native vegetation in other areas or other countries with climates similar to Florida. The introduction of non-native species of plants that spread to overtake and crowd out native plants is an enormous headache. Getting rid of established invaders is expensive as well.

The state of Florida spent \$94.5 million and \$127.6 million in 1999 and 2000 respectively to control

invasive non-natives, many of which affect agricultural production. (The Nature Conservancy, Florida Chapter News, Summer 2001. Florida spent \$20 million on melaleuca (paper bark) control in natural areas in the last decade. (Foerste, Eleanor, Orlando Sentinel correspondent, November 24, 2001) Nearly \$20 million each year is required to control hydrilla, an aquatic non-native invasive plant in our lakes. (ibid)

Since 1970 laws have been passed to prevent the spread of these "noxious" plants. Many plants are now illegal to cultivate in Florida. Among them are melaleuca (aka Australian paper bark, punktree, naiouli, cajeput tree, broadleaf paper bark, broadleaf teatree, paperbark teatree, bottlebrush tree), Brazilian pepper, Australian pine, Chinese tallow, air potato, cogon grass and tropical soda apple. Numerous communities statewide have instituted ordinances prohibiting invasive plant species.

Why is it so important to protect our environment from invasive non-native plants? This type of vegetation wreaks havoc upon the delicate balance of resources native communities depend on. For example, an infestation of melaleuca can devastate wetlands by altering the hydrology of the system. Leaf litter from stands of melaleuca may alter the soil topography, creating new tree islands, and may increase the evapotranspiration rate of the area, eventually drying up the wetland.

Many invasive non-natives, while pleasant enough in their homelands, become especially tough to fight in Florida. Cogon grass, for instance, can survive on very poor soils and is now frequently found in areas of the state recovering from phosphate mining. Some scientists believe that the cogon grass found in Florida has become much more shade-tolerant than it was originally and that the rhizomes of the plant may actually contain a substance that inhibits the growth of other plants.

D. Protecting trees

1. Regulations

Whether common pine trees or rarer scrub pines, the natural plant associations of Alachua County create tremendous value, not just in aesthetics and wildlife habitat, but in supplying natural environmental protection through natural functions. The purpose of the Alachua County Tree Protection Code is to protect the trees we already have and to encourage replacement of trees removed during development. New policies place greater emphasis on preserving large shade trees and tree stands as opposed to clearing and replacement of trees.

Preservation of natural vegetation in native upland habitat is not simply a question of providing large preserves for plants and animals. The myriad benefits of preserved upland habitat are especially important in the urban setting. For this reason Alachua County has adopted policies which preserve native upland habitat in place within all development. As a result, we look to a greener future with more diversity and fewer environmental crises.

Tree canopy areas are major existing tree canopied areas within developed or less developed areas of the county which, because of the lower level in diversity of plant species and higher level of past or present disturbances caused by development of various types, are not listed as exceptional upland habitat. However, many of these areas contain a significant population of trees of a size and condition to be considered a resource. The tree canopy benefits -- micro-climate moderation, pollution mitigation, mitigation of noise and glare, and habitat maintenance -- can be nearly as good as those provided by the exceptional upland category. For these reasons, tree preservation generally, and preservation of tree canopy areas particularly, are important components of ecologically sound development policy.

A recent University of Florida study compared tree canopy in the cities of Gainesville and Ocala, which are geographically close and similar in many ways (e.g. climate, culture, industry), yet have differing policies and regulations with respect to tree protection (Jensen, 2000). The study found that the urban forest in Gainesville, the city with more stringent tree removal policies and stricter replanting rules, had much greater tree canopy than Ocala. The UF study concludes that greater tree canopy translates into reduced energy consumption. For example, residences in Gainesville use an average of 935-kilowatt hours per month (R. Bauldree, Gainesville Regional Utility, personal communication, 2000). Conversely, Ocala residences use an average of 1,075 kWh per month (J. Henning Ocala Electric Utility, personal communication, 2000). Using the average rate of \$0.07524 / kWh, this results in a yearly savings of \$126.40 per household. Although other factors could be influencing this such as geographic location, it seems clear that urban forestry plays a role in this savings.

The county will require that new development preserve natural vegetation and tree canopy areas to the maximum extent possible. The County shall promote preservation and management of natural communities by encouraging land owners to follow the habitat management guidelines and to prepare a habitat management plan for their property. Beyond providing habitat for wildlife as addressed in previous sections, Alachua County's native vegetation must be managed to maintain its diversity and health for ecological as well as aesthetic reasons. Policies in this section seek to protect native vegetation resources primarily on private land within the county. The planting of invasive, non-native species is specifically prohibited in new developments and public facilities.

Policy 5.4.3 commits the County to protecting trees based on a species specific hierarchy. Trees shall receive priority for protection based on species, in conjunction with other features including size, age, condition, historic association, and uniqueness. Removal or damage of champion trees is prohibited, and removal or damage of specimen trees is to be avoided or mitigated. Specific protections are to be spelled out in the land development regulations. Trees native to Alachua County are identified in Table 16.

Designating trees for protection is only half the battle. The best standards being implemented by the most sympathetic developer can be undermined in an afternoon of careless construction activities on a site. A small trunk wound inflicted by heavy equipment during construction or at any other time can cause major injury to the tree. Trees cannot replace injured tissue (heal) like animals, therefore injury permanently reduces the trees capacity to fight future stress caused by insects, disease or other factors. In addition, many roots are destroyed as heavy equipment operates over the root system. Even one pass over the root system with a bulldozer, earth scraper or other piece of heavy equipment can cause significant root damage. (Edward F. Gilman, "Dispelling Misperceptions About Trees") Bulldozing near a large tree's roots, digging underground trenches, dumping construction wastes close to a tree - all of these actions can result in de facto removal of a tree that was designated for preservation. The death may be slow but it can be just as sure.

Trees require particular care in order to stay healthy, and it is the need for this particular care that gives rise to the need for specific tree protection standards.

“Unlike trees in the rural forest, the trees in our communities need care to perform their function safely, particularly when they are young. Today, communities often hire urban foresters or arborists to direct the urban tree care program, but property owners, citizens, tree care firms and municipalities must act together as stewards of community trees.” –Edward F. Gilman, IFAS

Our Tree Protection Code should be revised to address four critical impacts that construction activities might have on a tree:

- impact injuries/accidental cutting - construction fences or barricades around a protective perimeter surrounding one tree or groups of trees is an essential requirement
- excavation - tunneling under major tree roots or masses, if necessary, should be preferred to trenching; if trenches are used, roots should be cut with sharp instruments to reduce potential damage
- grade changes - severe grade changes should be restricted to prevent damage to roots by smothering their water and oxygen supplies
- other hazards - other construction hazards such as dumping of toxic substances or setting of fires to clear vegetation should be addressed.

Another important component of eco-planning is the use and preservation of native and low-maintenance vegetation in the development process. Not only does this approach minimize land clearing, with accompanying erosion problems, it generally results in the most pest and drought resistant landscaping plan possible. Thus, both development and long-term maintenance costs are reduced.

With the goal of wise water management in mind, our policies require water conservation through landscaping. The SRWMD offers the following seven principles of water-efficient landscaping:

- planning and design
- soil analysis
- appropriate plant selection
- practical turf areas
- efficient irrigation
- use of mulches
- appropriate maintenance.

A number of steps can be taken during project planning, design, and operation and maintenance to reduce or avoid the generation of landscaping wastes. These techniques include landscape development and alteration, grass-cycling, composting, and mulching. The planting of native and indigenous trees and plants require less attention and maintenance. Grass cycling is a process in which grass clippings are left in place on a lawn after mowing instead of being raked and bagged. This process improves lawn quality by returning important nutrients from the decaying clippings to the soil and lawn. Composting is a process using microorganisms in the presence of oxygen and moisture to break down organic wastes into a humus-like product that makes a superior soil conditioner or mulch suitable for most landscaping and

gardening uses. Using compost will help reduce reliance on phosphate and nitrogen fertilizers that may be detrimental to the surrounding ecosystems.

Mulching is the practice of spreading or mixing organic material, such as wood chips, leaves, or compost, over soil surfaces. Mulch reduces moisture evaporation from the soil surfaces, reduces soil erosion and compaction from heavy rains, moderates soil temperature, provides optimal conditions for soil enhancing organisms, protects young tree trunks, and provides nutrients as it decays. Furthermore, mulch inhibits weed growth, thereby decreasing the need for constant landscaping care and weed disposal.

Certain kinds of mulch, however, are actually threatening to the environment. For instance, our demand for cypress mulch causes so many cypress trees to be cut down that we're endangering wetlands. Rather than cypress mulch, the County encourages use of another mulch - like pine bark, pine needles, grass clippings, eucalyptus or shredded melaleuca (a bad invasive for Florida).

2. Homeowner stewardship

Your yard is the first line of defense for Florida's fragile environment. The culprit is stormwater runoff. Rain falls on yards, roads and parking lots and then washes into streams and bays, carrying pollutants like fertilizers, pesticides and petroleum products. As a result, the natural systems that attracted us all to Florida in the first place are damaged and dwindling. The decisions we make - from developing a homesite to whether we leave any of our yard natural will determine Florida's future.

Do you want a variety of Florida butterflies and birds in your yard? Native plants are the best choice to guarantee their presence. Native plants, when planted properly in correct locations and soil, need less water and less chemicals - thus stormwater runoff from your property becomes cleaner.

"If even a fraction of America's 38 million gardeners turned a quarter of their landscape into a wild garden (only one tenth of an acre each) there would be a measurable impact .. a tremendously positive gain for America's, and the world's, ecology." (Ken Druse, author, *The Natural Habitat Garden*).

3. Landscaping with fire ecology in mind

Unfortunately, trying to plan for the dual goals of human security and ecological integrity sometimes results in conflicts. Perhaps this is most obvious when trying to foster a natural landscape while protecting the built environment from fire. Fire is a natural part of Florida's environment, and many native ecosystems depend on regular cycles of fire to keep them healthy. As "the lightning capital of the world," Florida is naturally prone to fires, but this natural inclination has been supplemented by arson and carelessness to produce occasional headline-grabbing disasters. In recent years, many agencies have taken on the task of educating Florida's residents and visitors to be fire-conscious, even when planning one's residential landscaping. Some of the techniques advocated as a means for keeping buildings protected from brush fires are seemingly opposite to those techniques espoused for eco-friendly yards and gardens. However, a savvy homeowner can emphasize the strategies that intersect and maximize the benefits both systems have to offer. For example, consider cultivating native plants that are less waxy or resinous, and are thus less flammable, like coontie, oak trees and beautyberry.

Table 16. Native Trees of Alachua County

<u>FAMILY</u>	<u>Common Name</u>	<u>Scientific Name</u>
Pinaceae	Sand pine	Pinus clausa
	Slash pine	P. elliotii
	Spruce pine	P. glabra
	Longleaf pine	P. palustris
	Pond pine	P. serotina
	Loblolly pine	P. taeda
Taxodiaceae	Pond cypress	Taxodium Ascendens
	Bald cypress	T. distichum
Cupressaceae	Southern red cedar	Juniperus silicicola
Arecacdae	Cabbage palm	Sabal palmetto
Salicaceae	Eastern cottonwood	Populus deltoides
	Carolina willow	Salix caroliniana
Myricaceae	Wax myrtle, bayberry	Myrica cerifera
Leitneria-ceae	Corkwood	Leitneria floridana
Juglandaceae	Water hickory	Carya aquatica
	Pignut hickory	Carya glabra
	Mockernut hickory	Carya tomentosa
Betulaceae	Hazel alder	Alnus serrulata
	River birch	Betula nigra
	American hornbeam	Carpinus caroliniana
	Eastern hophornbeam	Ostrya virginiana
Fagaceae	Ashe chinquapin	Castanea pumila
	American beech	Fagus grandifolia
	White oak	Quercus alba
	Bluff oak	Q. austrina
	Chapman oak	Q. chapmanii
	Southern red oak	Q. falcata falcata
	Sand-live oak	Q. geminata
	Laurel oak	Q. hemisphaerica
	Blue jack oak	Q. incana
	Turkey oak	Q. laevis
	Diamond-leaf oak	Q. laurifolia
	Overcup oak	Q. lyrata
	Sand-post oak	Q. margaretta
	Black jack oak	Q. marilandica
	Dwarf live oak	Q. minima
Myrtle oak	Q. myrtifolia	

Fagaceae (contd.)	Water oak Willow oak Swamp chesnut oak Running Oak Shumard oak Post oak Live oak	Q. nigra Q. phellos Q. prinus Q. pumila Q. shumardii Q. stellata Q. virginiana
Ulmaceae	Sugarberry, hackberry Planer tree Winged elm American elm Florida elm	Celtis laevigata Planera aquatica Ulmus alata Ulmus americana americana Ulmus americans floridana
Moraceae	Red mulberry	Morus rubra
Magnoliaceae	Yellow poplar, tulip tree Bull bay, southern magnolia Sweetbay	Liriodendron tulipifera Magnolia grandiflora Magnolia virginiana
Annonaceae	Paw paw	Asimina parviflora
Lauraceae	Redbay Swampbay Sassafras	Persea borbonia Persea palustris Sassafras albidum
Hamamelida-ceae	Sweetgum	Hamamelis virginiana Liquidambar styraciflua
Rosaceae	Red haw Parsley haw May haw, apple haw One-flowered haw Jacksonville haw Southern crab apple Chickasaw plum Carolina laurelcherry Black cherry Flatwoods plum	Crataegus spathulata C. marshallii c. aestivalis C. uniflora C. floridana Malus angustifolia Prunus angustifolia P. caroliniana P. serotina P. umbellata
Leguminoseae	Mimosa Red bud Water locust Honey locust Black locust	Albizzia julibrissin cercis canadensis Gleditsia aquatica Gleditsia triacanthos Robinia pseudoacacia
Rutaceae	Common hop tree, wafer ash Hercules club, Prickly ash	Ptelea trifolia Zanthoxylum clava-herculis
Anacardia-ceae	Winged sumac Poison sumac	Rhus coppalina Rhus vernix

Cyrillaceae	Little-leaf titi Swamp titi	Cyrilla parvifolia Cyrilla racemiflora
Aquifolia-ceae	Carolina holly Dahoon holly Large, sweet gallberry Possum haw Myrtle-leaved holly American holly Yaupon	Ilex ambigua I. cassine I. coriacea I. decidua I. myrtifolia I. opaca I. vomitoria
Aceraceae	Florida maple Box elder Red maple	Acer barbatum Acer negundo Acer rubrum
Hippocastanaceae	Red buckeye	Aesculus pavia
Sapindaceae	Florida soapberry	Sapindus marginatus
Rhamnaceae	Carolina buckthorn	Rhamnus caroliniana
Tiliaceae	American bsswood, linden	Tilia americana
Nyssaceae	Water tupelo Swamp tupelo Ogeechee tupelo Ogeechee lime Black tupelo Blackgum	Nyssa aquatica Nyssa biflora Nyssa ogeche Nyssa sylvatica
Theaceae	Loblolly bay	Gordonia lasianthus
Araliaceae	Devil's walkingstick	Aralia spinosa
Cornaceae	Flowering dogwood Stif cornel dogwood	Cornus florida Cornus foemina
Ericaceae	Staggerbush Tree sparkleberry	Lyonia ferruginea Vaccinium arboreum
Sapotaceae	False buckthorn Gum bumelia Tough bumelia	Bumelia lanuginosa Bumelia tenax
Ebenaceae	Persimmon	Diospyros virginiana
Styracaceae	American snowbell, Storax	Styrax americana
Symplocaceae	Common sweet leaf, horse sugar	Symplocos tinctoria

Oleaceae	Fringe tree, old man's beard White ash Carolina ash, pop ash Florida Ash, swamp ash Wild olive	Chionanthus virginica Fraxinus americana Fraxinus caroliniana Fraxinus pauciflora Osmanthus americana
Rubiaceae	Button bush Maiden's bushes	Cephalanthus occidentalis Pinckneya pubens
Caprifolia-ceae	Possum haw viburnum Walter viburnum Rusty black haw	Viburnum nudum V. obovatum V. rufidulum

HUMAN-RELATED RESOURCES

Agricultural&Silvicultural Practices

A. Introduction

Agriculture plays an integral role in the economy, ecology, and culture of Florida's rural areas and the entire state. When conducted in a sustainable manner, farming and forestry activities contribute to maintenance and protection of ecological values and ecological integrity. However, traditional intensive management practices can negatively impact natural resources within farm and forest ecosystems. In addition, Florida is losing agricultural land to development at a rapid rate. Alachua County's approach to agricultural and silvicultural activities has two dimensions: first is protection of farm and forest land from conflicting urban uses, and second is management of farm and forest practices in an ecosystems context that promotes sustainable use of natural resources. Unlike urban planning which focuses on population projections, infrastructure, job growth and housing needs, rural area planning involves balancing economic development with measures to protect the environment and natural resources.

Agriculture has historically been a prime economic mainstay for Florida. Together with tourism and construction, it serves as the foundation for the Florida economy. In terms of direct economic value, agricultural production in Florida resulted in a gross state product of \$3.57 billion for farms and \$6.69 billion for forestry in the year 2000, according to the Florida Statistical Abstract. The impacts are even greater when value-added products and multiplier effects are taken into account. In terms of employment, the job total for Florida's agricultural sector ranks second in the nation. Government statistics indicate that in 1998, of the state's nearly 35 million acres of land, over 27 million acres (roughly 77%) were classified as agricultural.

According to USDA Forest Statistics for Florida, forests were the major land use in Alachua County in 1995, covering 53% of the land area, mostly in the eastern portion of the County. In addition, as of 1997, there were 1,086 farms representing 198,193 total acres of farmland, or approximately 35% of the total land in the county.

Generations of families in Alachua County have worked the land to produce agricultural commodities of value to Floridians and consumers throughout the nation and world. Threats to the long-term viability of agriculture warrant careful attention to this part of our community. The challenge to Alachua County is to maintain current farm and timber production operations without jeopardizing its most valuable natural assets.

B. Importance of agriculture

There are economic, cultural and environmental reasons for keeping land in agriculture. In Alachua County many of our significant environmental areas are part of agricultural lands. The varied topography and textures of the rural landscapes are not only significant to the local and state economy, but contribute to Alachua County's character and help define its sense of place. However, there are numerous issues to consider. Farmers still want to farm, taxpayers realize that tax bills rise as land is converted because it costs more to provide services to residential areas, and landowners want to maintain their right to cash in on the increased value of agricultural lands caused by urban growth.

1. Economic stability

Though not widely known, it is farmland - not residential and commercial development - that contributes the most to a local government's tax base and saves communities money. Agriculture contributes to the economy directly through jobs, sales, and support services, and by supplying lucrative secondary markets such as food processing. Farmland--timber, livestock, crops--add more than 140 million dollars to the Alachua County economy every year. Numerous studies from around the nation have found that such lands contribute more in tax dollars than they demand in tax-supported services. State and federal finance and tax incentives are provided to assist agricultural operations. But, as Alachua County's population steadily increases, current policies are not controlling or balancing the conversion of farmland, forests, and other rural properties to development. As rural areas are transformed into urban and suburban, taxes also rise to support new infrastructure and public services.

The following statistics are from the 1997 Census of Agriculture. Farm income in Alachua County from crops and livestock for 1997 was reported at over \$50 million. John Reynolds, an agricultural economist at UF/IFAS, says the multiplier effect for agriculture in this county is about 1.5. Alachua County is still a net exporter of agricultural products. Of the total market value of agricultural products sold in 1997, nursery and greenhouse crops comprised approximately 62%, while livestock, poultry and their products comprised approximately 38%. Crops range from vegetables such as beans and peas, broccoli, corn, okra, radish, and potatoes, to fruits such as apples and bananas, blackberries cantaloupe, and grapes, peanuts, pecans, and hay, as well as ornamentals including Christmas trees, daylilies, cut flowers, ground covers, and shrubs. Livestock and poultry includes cattle and calves, hogs and pigs, sheep and lambs, as well as chicken.

According to the USDA Forest Statistics for Florida, the value of standing timber in Alachua County as of 1995 was \$218 million, and the value of the harvest in 1996 was \$14 million. In 1995, there were 900 direct employees and 2,430 indirect forestry employees in Alachua County, with payroll receipts totaling \$31 million. The total value of forest manufacturing and forest value added was \$226 million.

2. Environmental values

Rural areas encompass some of the state's most treasured environmental resources. Wildlife habitat, water resources and recharge areas, and pristine open space contribute to Florida's rural heritage. Preservation of such resources helps ensure their availability for future generations while also providing multiple benefits to current residents.

"The mature forest provides many services that don't always get recognized even though they contribute indirectly to the economy. These services include rebuilding soils, concentrating nutrients, protecting watersheds, reducing erosion, providing aesthetic diversity, making habitat for wildlife, providing recreation areas, cleaning the air and storing gene pools for succession and future uses." H. T. Odum et al. 1988. Environmental Systems and Public Policy. Ecological Economics Program, Phelps Lab, University of Florida.

Silviculture has the potential to be among the most beneficial land uses in north Florida. Potential benefits include the provision of clean air, clean water, maintenance of plant and animal diversity, maintenance and enhancement of game and non-game wildlife, sinks for atmospheric carbon, aesthetically pleasing landscapes, and a multitude of jobs in growing, harvesting, and manufacturing wood products.

According to Sedell and others (2000), 80% of the freshwater resources in the United States originate in forests. Therefore, having healthy forests is critical to having clean water. The Southern Forestry Resource Assessment has concluded that undisturbed forests or woodlands generally provide the best protection of land and water from sedimentation and other pollutants. The tree canopy and litter layer dissipate the energy contained in raindrops. Also, a continuous litter layer maintains a porous soil surface and high water infiltration rates; consequently, overland flow is minimized in the forest. Forests slow stormwater runoff and provide watershed stability and critical habitat for fish and wildlife (Sedell and others, 2000).

However, the U.S. EPA identifies a variety of impacts that forestry activities can have on the environment. Sediment concentrations can increase in waterbodies due to accelerated erosion. Water temperatures can increase due to removal of overstory riparian shade. Slash and other organic debris can accumulate in waterbodies, depleting dissolved oxygen. Organic and inorganic chemical concentrations in the environment can increase due to harvesting and fertilizer and pesticide applications. These inputs may reduce stream oxygen levels and later the microhabitat conditions necessary for the survival, breeding, foraging, or resting activities of many organisms.

A major consideration in many ecosystems is the impact of monoculture forestry that simplifies the ecosystem, leaving it vulnerable to disease and other environmental factors. In addition, air quality can be affected by dust from road construction, site preparation, harvesting, and hauling activities and by particulate release from prescription slash burning. The environmental impacts of road construction and management include erosion, soil and vegetation loss, dust generation, stream sedimentation, and habitat fragmentation.

In addition, farm activities such as grazing cause water quality and quantity impacts, destruction or alteration of wildlife habitats, erosion, sedimentation, and soil compaction. Impacts also result from the use of energy and pesticides, as well as herbicides and fertilizers, and from contaminated agricultural runoff. The use of pollution prevention strategies can reduce these environmental effects, and appropriate management can meet environmental objectives. Sensitive areas, including streambeds, wetlands, ponds, and other riparian zones, are of particular concern. For example, sensitive habitats should be identified and excluded from grazing areas, and controlled watering access for drinking should be provided for livestock. Alternative water sources will keep livestock away from streambanks and riparian zones and prevent the destruction of habitat and pollution of surface water by manure solids, nutrients, and bacteria.

To a large degree, management of forests and farms shapes the environmental impacts of these activities. Agriculture uses are not inherently incompatible with wildlife protection and maintenance of numerous other ecological functions. The Defenders of Wildlife, a non-profit organization dedicated to the protection of wildlife, maintains that conservation efforts on many private lands have been excellent and solutions like tax breaks, conservation easements and cooperative agreements should be pursued. Best Management Practices (BMPs) are currently among the most commonly accepted ways of providing basic environmental protections such as water quality and erosion control. Where BMPs are used for pollution control, land used to produce food crops can have far less impact on the environment than urbanization. Beyond BMPs, management in a holistic or ecosystem context is encouraged to maintain sustainable use of resources for future generations.

Environmentalists, farmers and foresters are coming to realize the strong potential for compatibility between their respective goals. Rural property owners who maintain undeveloped land for their personal purposes also benefit the community by providing environmental services such as water resource

protection. With their valuable contributions to our economy and environment, it is essential that policies in the Comprehensive Plan reflect the importance of protecting our farms and forests.

C. Threats to agriculture

There are numerous social, economic, and environmental threats to agriculture. As described in a 1998 report from Washington, factors threatening agriculture include impacts of development and population growth, lack of awareness of the value of local food production, land prices, low profitability, lack of future farmers, regulatory requirements, and global economic pressure. These are summarized below.

- Impacts of development and population growth: development pressure makes less land available for farming. At the same time, population growth in the county has created conflicts between suburban and rural residents and their farming neighbors. Complaints about farm smells, noise, dust, or conflicts between domestic and farm animals detract from community support farmers feel they once had and make it difficult to market products and pursue farming activities.
- Lack of awareness of the value of local food production: food is so basic to life that many of us are not aware of what is behind the production of the food on our tables. The global food system has resulted in separation from the food we eat and the farms that grow it.
- Land prices: many farms are now more valuable as potential residential or commercial lands. At today's prices most new farmers cannot afford to acquire good farmland, and existing farmers feel economic pressure to sell their land and get out of the farming business.
- Low profitability: most farmers agree it has become difficult to make a living as a farmer. Small-scale farmers are hard pressed to compete with large corporate farms that can sell products on a very large scale at low retail prices. Difficulty finding farm labor and in keeping family members interested in working on the farm also contribute to reduced profitability of farming.
- Lack of future farmers: the high cost of land and low profitability of farming discourage young people from pursuing farming as a career and lifestyle. As farmers retire, it is increasingly likely that rural land will be bought by those who can afford it but have no interest in sustaining commercial agriculture.
- Regulatory requirements: farmers must comply with environmental, health, labor, and building regulations. Compliance can be costly and can discourage efficient farming practices.
- Global economic pressure: multinational corporations control most of the world's food supply making it difficult for small-scale farmers to compete in the conventional marketplace. Both domestic and international trade agreements, whether intentionally or inadvertently, have often strengthened corporate farming at the expense of family operated farms.
- Climatic variability: climatic variability (floods, droughts, extremes of heat and cold) has always been an uncontrollable factor, and is perhaps increasingly significant given the vulnerability of the agricultural industry to the other threats cited.

According to the American Farmland Trust (AFT), nearly every city and large town in America is spreading out onto farmland that is important to our food production system. A 1999 report by the USDA documents the loss of U.S. farmland. During 1992-1997, they found that some 14 million acres of

farmland were taken out of production - nearly 320 acres every hour. The report singled out sprawl development as the prime culprit. AFT attributes this trend to an array of factors echoing those described in the Washington report, and identifying the pressures of growth as the underlying force which creates a formidable challenge to preserving the rural landscape.

The Southern Forest Resource Assessment, which has recently documented and analyzed the many factors affecting the forests of 13 southern states, forecasts that the South will lose 12 million forest acres (8%) to developed uses between 1992 and 2020. The rate at which rural land (both forest and farms) has been developed for urban and industrial uses in the south increased from about 667,000 acres per year between 1982 and 1992 to about 1.1 million acres per year between 1992 and 1997. Urbanization is forecast to continue at the rate of 1.1 million acres per year through the year 2020. The source of new urban uses is both farm and forest land. An additional 19 million forest acres in the south are forecast to be converted to developed uses between 2020 and 2040, with losses concentrated in Florida among other key locations.

One of the fastest growing states in the nation, Florida is ranked fourth for developing its farmland, forests and open spaces, with nearly one million acres converted over a five-year period (USDA's National Resources Inventory 1992-1997). Rural lands constitute the majority of the state, and these areas are particularly subject to the pressures of fast-paced growth. According to Enterprise Florida, between 1990 and 1997 rural population grew by 20% as compared to the state average of 13.4%. As residential development consumes established one-acre lots in the rural area, they are replaced by larger lots, consuming five or more acres of agriculture land for each residence. Growth impacts the environment, local economies and the quality of life for communities. For rural areas, it particularly affects agricultural lands and the viability of agricultural operations.

As urbanization advances into outlying areas, increasing property values encourage the conversion of uses and subdivision of large tracts of land for development. Moreover, the pressure at the edge of the urban cluster to add land for urban uses continues. Our challenge is to accommodate various lifestyle choices while preserving rural character, and to protect our limited natural resources using sustainable practices and smart growth principles to determine when, where, and how growth should occur. Central to this discussion is how to fairly balance concerns for development demands, property rights, rural land value, and viability of family farming operations with the quality of the environment, economy, and rural community.

Because of sprawl, agricultural land is being consumed at a rate higher than the demand created by population growth would suggest. This type of development frequently has adverse impacts on the surrounding natural areas as well. By contrast, well-planned development that is consistent with the character and needs of rural areas can be a welcome form of support. Random development and uncontrolled growth compromise the very qualities of rural towns and areas that local residents and landowners often value most. In addition, farmland loss raises local taxes, as residential land uses pay less in local tax revenues than it costs local government to provide services to their properties. Sprawl-related growth in rural Florida impacts the status of local economies, the tax burden of area residents, and alters what many appreciate as the "rural lifestyle."

Paving farmland limits future options to deal with social, economic, food security, and environmental problems. Scattered development in farming areas removes agricultural land from production both directly and indirectly. Development directly removes the agricultural productivity on which it is built. Indirectly, it has impacts to farming operations which may force them out of production. Traffic, trespassing, pilferage by non-farm residents, complaints about dust, smells, sprays, and noise, a general

rise in land values, and higher property taxes - all may contribute to decreased viability. Much of this scattered development is on important agricultural land, whose physical characteristics are generally excellent for building.

The American Planning Association recommends that agricultural land be protected and preserved in large contiguous blocks in order to maintain a “critical mass” of farms and agricultural land. Saving our farmland is an investment in community infrastructure. The critical mass will enable farm support businesses to remain profitable and sustain local and regional agricultural economies.

D. Management concerns

The traditional approach to management of agricultural lands has at times resulted in damage to some of the County’s most precious natural resources. This is typically the result of management objectives which are oriented towards maximizing agricultural or silvicultural production, rather than the maintenance of other resources such as abundant fish and wildlife resources. Florida’s forests and farmlands are increasingly being valued for non-traditional functions. The following discussion of management concerns is based largely on the Southern Forest Resource Assessment and agricultural fact sheets from the U.S. Environmental Protection Agency.

1. Conversion of native habitat

Clearing natural areas for the planting of crops disrupts the ecological values and ecological integrity of natural systems. In fact, Closing the Gaps identified agriculture as being the single largest land use involving clearing, draining, plowing, cultivation, and altering of wildlife habitat across the state (Cox et.al. 1994). Agricultural and silvicultural operations, by definition, affect the structure and distribution of vegetation and forest conditions. The degree and permanency of the disruptions depend on how farming and forestry operations are conducted, or managed.

Livestock grazing can change the species composition of native ecological communities and significantly impact riparian areas. Grazing strips the banks of rivers and streams, which in turn leads to erosion and degradation of aquatic ecosystems. Harvesting in new areas leads to changes in local forest conditions that can have significant adverse effects on wildlife habitat and landscape aesthetics.

Many bird species that depend on open habitats such as grasslands, prairies, savannas, glades, and barrens are now in serious decline in the eastern United States. Declines are partially explained by the conversion of pastureland to cultivated row crops, the switch to “clean pastures” dominated by non-native, cool-season grasses and the loss of fencerows as new agricultural technologies favor bigger fields.

Across the south, the area of natural pine has declined from about 72 million acres in 1953 to about 35 million acres in 1999. Planted pine has increased from about 2 million acres in 1953 to more than 32 million acres in 1999. Data for the 1980s and 1990s show that new pine plantations come from land that was previously hardwood or mixed pine-hardwood forests (47%), natural pine forests (28%), and agricultural fields (25%). The Southern Forest Resource Assessment forecasts the area in pine plantation to rise to approximately 54 million acres of southern forests in 2040.

According to a recent IFAS study, the area of pine plantations (4.6 million acres, or 32% of all forestland) continues to increase in Florida, consistent with regional trends. In fact, Florida contains the highest proportion of pine plantations of any southern state. In the last 10 years, area of natural pine stands decreased by 20% to 2.8 million acres, with most reductions in longleaf pine (IFAS 1999).

Longleaf pine ecosystems, also known as the sandhill community, once covered about 20% of the original Florida landscape, including much of the panhandle and the northern two-thirds of Florida's peninsula (Cox et.al. 1994). As of 1994, only 851,000 acres remained in all of Florida. Our once common sandhill have been reduced to several disparate patches covering less than 10% of their former area. Nationwide, longleaf forests occupy only 2% of their original range today. The herb layer of these forests is one of the most diverse in the world. They are home to several threatened or endangered species, such as the red-cockaded woodpecker, gopher tortoise, fox squirrel, pocket gopher, pine snake, and gopher frog, and several species with high rates of endemism. Conversion to other pine species, as well as removal of original stands followed by fire exclusion, are among the major causes of loss and decline in these systems..

The Southern Forest Resource Assessment highlights the prevalence and importance of endemism with respect to aquatic species, in which a species' range is limited to a narrow geographic area. Northern Florida has a concentration of rare reptiles, amphibians, snails, and crayfish which are predominantly endemic. These are areas where aquatic ecosystems are especially susceptible to structural changes in aquatic and adjacent terrestrial ecosystems. As a result, local actions can have substantial impacts on local species persistence, so that in some cases altering even small amounts of habitat can have significant adverse effects. This potentially disproportionate impact of small actions places a high value on disseminating information on the locations and natural histories of endemic species.

Landscape configuration and fragmentation at fine scales may be critical for some species, especially amphibians, even in heavily forested areas. Where the persistence of certain species requires access between terrestrial habitat and ponds or wetlands, roads and certain kinds of management practices can isolate these two habitat components. Spatial configuration of forest habitat is also an important factor in the recovery of the black bear subspecies of conservation concern in Florida.

2. Management intensity

From 1988 to 1998, agriculture has been identified as the primary source of water quality impairment in the South (Southern Forest Resource Assessment 2001). In addition, agriculture historically has been the major factor in wetland loss and degradation. Although the passage of the Food Security Act of 1985 "Swampbuster" provision prevented the conversion of wetlands to agricultural production, certain exempted activities performed in wetlands can degrade wetlands:

- harvesting food, fiber, or forest products;
- minor drainage;
- maintenance of drainage ditches;
- construction and maintenance of irrigation ditches;
- construction and maintenance of farm or forest roads;
- maintenance of dams, dikes, and levees;
- direct and aerial application of damaging pesticides; and
- ground water withdrawals.

These activities can alter wetlands hydrology, water quality, and species composition. Excessive amounts of fertilizers and animal waste reaching wetlands in runoff from agricultural operations can cause eutrophication.

a. Toxic compounds

Irrigation ditching can increase contamination of wetlands receiving irrigation drainage water, particularly

where soil is alkaline or contains selenium or other heavy metals (Deason 1989). Pesticides and fertilizers used during silvicultural operations can enter wetlands through runoff as well as through deposition from aerial application. Fertilizers may contribute to eutrophication of wetlands, and toxic compounds may bioaccumulate in fish and other aquatic organisms (Kennish 1992).

b. Grazing

Grazing livestock can degrade wetlands that wildlife use as a food and water source. Urea and manure can result in high nutrient inputs. Cattle traffic may cause dens and tunnels to collapse. Overgrazing of riparian areas by livestock reduces streamside vegetation, preventing runoff filtration, increasing stream temperatures, and eliminating food and cover for fish and wildlife. As vegetation is reduced, streambanks can be destroyed by sloughing and erosion. Streambank destabilization and erosion then cause downstream sedimentation (Kent 1994b). Sedimentation reduces stream and lake capacity, resulting in decreased water supply, irrigation water, flood control, hydropower production, water quality, and impairment of aquatic life and wetland habitat (USEPA 1993b).

The economic losses attributed to the reduced quality and quantity of water and habitat from overgrazing of riparian wetland vegetation is more than \$200 million nationwide (USEPA 1993b). The depletion of vegetation from riparian areas causes increased water temperatures and erosion and gully formation, prevents runoff filtration, and eliminates food and cover for fish and wildlife (USEPA 1993b). If stocking of livestock is well managed, grazing can coexist with wetlands, benefiting farmers and increasing habitat diversity.

c. Forestry

The South as a region produces more wood products than any other single nation. According to the University of Florida, North Florida has the world's largest concentration of intensively managed plantations of southern pines (2000). In 1997, an estimated 543 million cubic feet of timber was harvested in Florida, of which 87% was softwoods (including pine, cypress, and cedar), and the remainder was hardwoods such as oak, maple, gum and poplar. Approximately 368 million cubic feet of longleaf slash pine was harvested throughout the state (UF 2000).

Forest structure in plantations differs from that found in naturally regenerated stands. Their management is designed to focus site potential to maximize the growth of trees of a single species, and trees are spaced to maximize fiber production over a 20 to 30 year period.

A large watershed study was conducted in north central Florida in the slash pine flatwoods, an ecosystem where much commercial forestry is practiced (Riekerk 1989). This study sought to determine the hydrological and water quality impacts of two harvesting and site preparation methods of varying intensities. The high intensity system consisted of machine harvesting, including stump removal, followed by slash burning, windrowing, disking, bedding and machine planting without regard to buffer zones. The low intensity treatment consisted of manual harvesting followed by slash chopping, bedding, and machine planting only outside of buffer zones. The hydrology of these two treatments was compared to that of an undisturbed forest that went unharvested.

The study showed that silvicultural practices significantly affect the hydrology of pine flatwoods (Riekerk 1989). Water table levels rose and daily runoff increased in the first year, somewhat in proportion to the size of the clear-cut in each watershed. This was due to the reduction in evapotranspiration following forest harvesting. In addition, the more intensive treatment removed all vegetation, reduced infiltration

and increased storm flow. This effect lasted a decade or more after harvesting. The forest operations resulted in smaller, more temporary effects on water quality. Suspended sediment levels increased more with the more intensive harvest and site preparation methods, as did nutrient levels, returning to normal within two years after treatment. IFAS suggests that the significant hydrological effects can be managed by partial cutting rather than clearcutting, or by clearcutting smaller areas each year within the watershed (Moore 1999).

Another impact of forest management practices on the water resource is an indirect one resulting from soil compaction. The use of heavy machinery for harvesting and site preparation activities can increase surface runoff by compacting surface soil. This soil compaction reduces soil pore space, which lowers the internal movement of water, decreases the amount of soil water storage, and decreases infiltration. The excess water which cannot infiltrate the soil will puddle or run off. Excessive puddling will inhibit vegetation regrowth following harvesting, and increased runoff can contribute to downstream flooding.

If BMPs are used and careful monitoring occurs, silviculture and timber removal may only minimally affect some wetland functions. Habitat and community structure, however, still may be seriously degraded.

Drainage, clearing, haul road construction, rutting, and ditching of forested wetlands, all may affect wetlands in some way, although the impact may only be temporary. Adverse effects of timber harvest can include a rise in water table due to a decrease in transpiration, soil disturbance and compaction by heavy equipment, sedimentation and erosion from logging decks, skid trails, roads, and ditches, and drainage and altered hydrology from ditching, draining, and road construction (Shepard 1994). By utilizing BMPs, hydrology and biogeochemical processes of wetlands may be altered for only one to three years following timber harvest (Shepard 1994).

The Southern Forestry Resource Assessment has concluded that the intensity of forest management has various effects on wildlife suitability. Timber harvesting, especially clearcutting, as well as afforestation of agricultural fields restarts successional processes. Depending on management decisions such as density of stocking, use of herbicides, and prescribed burning, these actions can disrupt, benefit, or have little effect on wildlife. Low intensity management can result in increased species richness and species diversity during the first few years after planting. Many wildlife species, such as migratory birds, thrive in these early successional communities when insects and seeds are abundant. After canopy closure, plant diversity generally decreases and wildlife use declines. Uneven aged management that encourages several age classes of trees can sustain benefits for many, but not all wildlife species due to the resulting stratified forest canopy. Very dense stocking and use of herbicides can limit vegetative diversity throughout the entire rotation, which correlates to low value for wildlife habitat.

Gauging the effects of forest management on mobile wildlife populations requires insights into the overall landscape structure of forests within the region. Although this type of analysis is relatively new, several studies have examined the effects of forest fragmentation on wildlife species, especially birds. The Southern Forestry Resource Assessment summarizes some of these effects:

- o Studies have documented declines in migratory bird species from isolated forest patches, especially where agricultural and urban uses represent substantial components of the landscape. However, in heavily forested areas-70% or more forest-these negative effects do not occur.
- o Forest fragmentation and negative edge effects are most prevalent where agriculture and development dominate the landscape. In these areas, forest operations may impact fragmentation effects on wildlife.
- o In heavily forested areas, forestry practices may provide important benefits for forest breeding bird species through provision of early successional habitats. This is especially true for areas where existing hardwood forest structure is dominated by closed canopy stands and sparse understories or where dense pine stands and fire suppression exclude pine specialists.

Large woody debris, such as branches or leaves which fall from trees along streams, is very important in many aquatic ecosystems. It forms pools and traps floating leaves to provide shelter and deep pools for fish and other aquatic organisms. Leaf detritus derives from floating leaves and needles, which fall from the plants, trees, and shrubs alongside streams, rivers and lakes. Many organisms feed on leaf detritus as well as use it for shelter in aquatic habitats.

Natural stream systems have an optimum range of organic matter inputs to which the stream organisms and the stream function are adapted. Inputs of large woody debris can be substantially increased if harvesting occurs on the bank immediately adjacent to a stream channel, or if logging slash is dropped into a stream. This can interfere with stream channel flow, both velocity and amount, cause stream bank erosion, and drastically alter habitat conditions.

Increased organic matter, whether large woody debris or leaf detritus, can also affect dissolved oxygen levels. When these materials are introduced into a stream, increased decomposition by microorganisms requires oxygen. This depletes the oxygen available for a healthy stream habitat. On the other hand, when stream banks are harvested and most of the vegetation is removed right up to a stream bank, the source of natural organic matter inputs disappears. This will have a negative impact on stream biological health, eliminating a source of food and shelter for aquatic organisms.

E. Stewardship strategies

1. Management solutions

Adverse effects on water quality, hydrology, wildlife, habitat, and other aspects of the environment can be minimized or eliminated by careful management of farm and forestry operations. Management techniques described below include best management practices, wildlife enhancement, ecosystems management, sustainable agriculture, and adaptive management strategies.

a. Best Management Practices

One of the fundamental and most widely accepted ways to ensure that agriculture and forestry operations will protect environmental quality is adherence to agricultural and silvicultural BMPs. Numerous federal and state agencies have published BMPs on a variety of topics. They include BMPs targeted primarily at water quality for agrichemical handling and farm equipment maintenance, and cow/calf operations, as well as broader conservation BMPs for silviculture and croplands. See Insets 17 and 18 for a general overview of Silvicultural BMPs and select agricultural BMPs.

b. Wildlife enhancement

As reported in a recent IFAS publication on vegetation management, low-intensity site preparation-- combinations of herbicides, low-cost mechanical treatments, and/or fire-- can have several advantages for wildlife (IFAS 1998). The stumps and unburned logging debris that remain scattered on the land rot, providing food and habitat for many insects, reptiles, amphibians, and small mammals, all of which are also prey for birds and other animals. Mushrooms and other fungi that grow on the rotting wood are food for larger wildlife. Residual hardwoods can be left standing (all would be knocked down during intensive mechanical site preparation) to provide homes for cavity-dwelling wildlife. There is even the option of leaving a few living oaks or other mast-producing hardwoods as a perennial source of food for wildlife. However, landowners still might have to make special efforts to protect these individual trees or shrubs from broadcast herbicide treatments and prescribed fires (IFAS 1998).

Farm and forest management can be augmented with techniques to directly enhance wildlife habitat. Forestry techniques include: leaving mature trees in a stand to enhance structural diversity, application of streamside management zones to retain landscape diversity, and retention of snags to provide nesting habitat. In addition to following BMPs, additional wildlife benefits may be obtained with natural regeneration techniques such as seed-tree cuts and shelterwoods, and with management practices such as mid-rotation thinning and prescribed burning. BMPs that reduce sedimentation and maintain streamside vegetation are especially important in protecting species that depend on streamside habitats, such as crayfish, amphibians, snails, and insects. Conversely, forest practices or other activities that disturb habitats along streams can have a significant adverse impact on certain aquatic species.

Although forestry herbicide use has increased dramatically, on some tracts satisfactory stand establishment can be achieved without herbicides or mechanical site preparation. On cutover sites with little competing vegetation, a pre-planting burn--a hot summer fire to minimize stump sprouting--may be all the site preparation that is necessary. In other situations, even with only a minimal investment in site preparation, crop trees may be able to establish themselves adequately without using herbicides. Crop tree growth in such cases is, nonetheless, generally slower than it would have been with the correct application of herbicides as a site preparation treatment or release treatment.

Inset 17: Description of Silvicultural Best Management Practices (2000)

The most fundamental way to ensure that forestry operations will protect water quality is to follow the Silviculture Best Management Practices described in a manual published by the Florida Department of Agriculture and Consumer Services, Division of Forestry (2000). This manual establishes practices that are designed as “the minimum standards necessary for protecting and maintaining the State’s water quality as well as certain wildlife habitat values, during forestry activities. As such, they represent a balance between overall natural resource protection and forest resource use.”

Florida’s first BMP manual for silviculture was published in 1979 in response to the Federal Clean Water Act of 1972. Those original BMPs were designed exclusively to protect Florida’s streams and lakes from potential sources of pollution associated with forestry activities. In 1993, the BMPs were substantially revised to include new provisions for protecting wetlands, wildlife habitat, and overall ecosystem integrity. Most recently, in the 2000 revision, a new BMP has been added to recognize wetlands that have a flow component, and to treat the wetland flow-way similar to a stream.

*The BMPs recognize that the area immediately adjacent to streams, lakes and other waterbodies is especially important in the overall strategy to protect water quality during silviculture operations. To mitigate adverse effects, the **Special Management Zone (SMZ)**, also known as a buffer zone, applies to all streams, sinkholes, and lakes two acres and larger. This is an area along a stream or other waterbody, which may be selectively harvested with certain restrictions, but may not receive mechanical or chemical site preparation activities. This area therefore continues to capture nutrients, provide stream bank stability, shade, large woody debris and leaf detritus, and dissipate the energy of surface water flow into the stream.*

The purpose of the SMZ is to reduce or eliminate forestry-related inputs of sediment, chemicals, logging debris, nutrients, and water temperature changes. These buffer zones were found to be particularly effective and important in protecting water quality attributes (Ahtiainen 1992, Shaffer 1995, Wang 1996). In Florida, the SMZ has three principal components: the Primary Zone, the Secondary Zone, and the Stringer.

*The **Primary Zone** applies to perennial waters and varies in width from 35 to 200 feet per side depending on the type and size of waterbody. There are significant timber harvesting restrictions in this zone. The purpose of the Primary Zone is to maintain streamside shade and reduce disturbance to ground cover and litter. This ensures that surface water will infiltrate into the naturally porous undisturbed forest soil, which acts as a biological filter.*

*The **Secondary Zone** applies to all intermittent waterbodies and also may serve as an add-on to a Primary Zone in some cases. It is always at least 35 feet wide and may be wider depending on the local soil type and slope percent. This zone has no timber harvesting restrictions, however no mechanical site preparation is permitted. The purpose of the Secondary Zone is to minimize upslope site disturbance.*

The **Stringer** applies only to intermittent streams and consists of mature trees left on or near the banks. These trees serve to help minimize heavy equipment operations near the waterbody and reduce the risk of sedimentation and bank damage. The 1993 manual of Silviculture Best Management Practices (listed under References) should be consulted for more detail. You can call your county forester or the Division of Forestry at (850) 488-4090 to get this manual.

BMPs, which specifically pertain to hydrologic impacts of forest management practices, include the BMPs for roads, wetlands, and wet weather operations. These BMPs address actions, which will avoid impounding or diverting normal water flow, and will help prevent soil compaction. Compaction can be reduced by limiting heavy equipment operations to times when conditions are dry in other words, suspend logging during wet weather. In wetlands, compaction can be reduced by concentrating designated skid trails to as small an area as possible. Wet soils are much more susceptible to damage from logging equipment than well-aerated dry upland soils.

Forest roads produce most of the sediment from forestry operations, even when well maintained, so the BMPs emphasize their careful placement and management, with broad base dips and roadside ditch turnouts that divert runoff to porous forest lands, and frequent culverts.

These impacts can be prevented by applying BMPs to forestry operations, including limiting heavy equipment operations in buffer zones and to dry conditions, taking adequate steps to minimize chemical or nutrient contamination of runoff, and preventing runoff from entering waterways. By practicing responsible forest management, understanding the processes and planning in the landscape context, detrimental impacts can be minimized. Maintenance of water quality will support high quality habitat for aquatic organisms and help protect the water resources of Florida.

Inset 18: Description of Agricultural Best Management Practices

BMPs for Agrichemical Handling and Farm Equipment Maintenance (1998)

The purpose of this document is to familiarize farmers, farm managers, and farm workers about Best Management Practices (BMPs) and pollution prevention actions that can be implemented at farm maintenance areas to further protect the environment and improve the efficiency of the farm. Farm maintenance areas are those sites where pesticides are mixed and loaded into application equipment; tractors and other pieces of farm equipment are serviced; or pesticides, fuel, fertilizer, and cleaning solvents are stored. These are the areas of the farm where accidental pollution of soil, surface water, or ground water is most likely to occur. Proper handling and disposal practices at these sites can help avoid serious environmental problems, protect the farm's water supply, reduce exposure of the owner to legal liability for contamination and cleanup (including penalties and fines), and foster a good public image for agriculture.

This document recognizes that, in addition to all of the crop-based factors, users of agrichemicals need to consider the soil's susceptibility to leaching, the distance to the water table, the slope of the land, and the distance to surface waters, especially sinkholes, which provide a direct pathway to ground waters.

Certain kinds of management practices, implemented at these farm maintenance areas, can prevent the contamination of soil, surface water, and ground water by the materials stored and handled at these sites. This document describes a number of "Best Management Practices" (BMPs) which can be put into practice through proper design and operation of the maintenance facilities and equipment. However, while this document covers a number of specific BMPs, it cannot address each and every situation that may have the potential for causing pollution. Three guiding principles are provided to help the individual landowner develop BMPs for their own situation.

1. **Isolate** all potential contaminants from soil and water.
2. **Do not** discharge any waste material onto the ground or into surface water bodies.
3. Develop and implement a **Conservation Plan** and an **Integrated Pest Management (IPM) Program** to maximize efficient use of irrigation, fertilizers, and pesticides. Seek the assistance of your county extension agent or independent consultant and the USDA NRCS to develop specific plans for your farm.

Water Quality BMPs for Cow/Calf Operations (1999)

In 1997, the Florida Cattlemen's Association began the process that resulted in this manual, which describes the water quality BMPs for cow/calf operations in Florida. The practices are designed to meet state water quality standards, but expressly do not address other resource issues such as protection of wetlands or water conservation.

CORE4 (1998)

In January 1998, the NRCS through the National Conservation Buffer Initiative sponsored a Conservation Buffer Conference in San Antonio, Texas. During this conference several national experts expressed concern about the long-term functioning of conservation buffers without a systems approach to address nutrients, pesticides, and sedimentation.

The CORE4 concept was established by the Conservation Technology Information Center (CTIC) and supporting organizations as an information and marketing plan to promote the voluntary approach to conservation emphasizing conservation tillage, pest management, nutrient management, and conservation buffers. These key practices significantly reduce nonpoint sources of pollution from cropland as well as provide opportunities for many other conservation benefits when applied as a system. These few practices do not, however, exclude consideration for other practices or systems designed to protect the natural resources related to cropland agriculture.

CORE4, to a large degree, is the result of a public survey and a series of public forums designed to capture the opinions and suggestions of farmers and ranchers, as well as other groups with a vested interest in reducing nonpoint sources of pollution on a voluntary basis. The concept is presented as a "common-sense" approach, meaning an easily understood system of conservation practices that solve many of the natural resource concerns associated with cropland agriculture.

NRCS is supporting the CTIC/CORE4 marketing plan in a cooperative effort with many other conservation partners. The objective is to focus on cost-effective systems that can be planned and installed with limited technical and financial assistance. In addition to improving water quality, these practices can improve soil quality, air quality, wildlife habitat, and aesthetics. Carbon sequestration is another benefit expected from the widespread application of these practices. Although written from a national perspective, where appropriate, the guidance should be tailored to fit local conditions.

When one of the landowner's objectives is wildlife management, the goal may be to increase game species to be hunted or simply to provide habitat for as many wild animals as possible. In either case, vegetation management includes favoring those plants and plant communities that provide wildlife habitat--including food, water, nesting places, and cover.

In the view of the landowner who wants a forest that supports an abundant and diverse wildlife population, many plants other than pine trees are "crop" plants. A variety of food sources should be available in each season. The following practices tend to favor wildlife (UF 2000):

- Plan and plant small, elongated or irregularly shaped harvest areas rather than large, contiguous ones. Wildlife utilize the abundant foraging opportunities of recently cutover areas, but may not venture far from the cover of adjacent forested terrain.
- Retain several living mast-producing hardwoods (oaks, hickories, southern magnolia, etc.) on each acre during site preparation and stand establishment. This may entail marking some merchantable trees so that loggers do not cut them.
- Retain hardwood or mixed hardwood and pine stands on some upland areas. These are valuable mast production areas and also provide nesting sites and cover for wildlife.
- Use herbicides to kill some hardwoods that remain after a stand is harvested but leave them standing to serve as nesting and foraging sites for birds, reptiles, amphibians, and small mammals.
- Apply different understory control treatments to different pine stands to encourage a variety of wildlife food plants. For example, a herbicide treatment in one stand might control understory hardwoods and encourage grasses, forbs, and smaller shrubs such as blueberries and blackberries. Frequent (every 2 to 3 years) cooling season prescribed burns in another stand would produce an understory with many small hardwoods, resprouting from rootstocks not killed by the fire. This tender new growth is attractive to and accessible to wildlife. Less intensive vegetation management in nearby areas or parts of the same stand allows development of wildlife cover and a midstory of hardwoods important to some bird species.
- Manage pines so that some sunlight, water, and nutrients are available for the growth of understory plants. That is, thin the pine stands as early as possible within budget and time constraints. The response in growth of wildlife food plants will be especially good if an understory burn precedes or follows the thinning.
- Plan for longer rotations with one or more thinnings. Do not use whole-tree chipping at harvest, but instead leave branches and tops on the site where they will host mushrooms, other fungi, insects, and small vertebrates.
- Take advantage of road and power line right-of-ways where more sunlight reaches low-growing plants. High-nutrient forage plants for wildlife can be seeded here.

Even where there is need for maximum economic yield of pine timber from a property, conditions favorable for many wildlife species can be maintained by having more, smaller stands of different ages rather than a few large stands nearly the same age. Even though the habitat diversity within any given

stand is lower than it would be in a natural pine community, hardwood hammock, or mixed pine hardwood stand, the between-stand diversity will favor many wildlife species. The interface or "edge effect" between contrasting environments will also be important for wildlife that need a variety of habitats for food and cover.

c. Ecosystems management

A good solution to slowing or halting the documented species and community declines is to implement an ecosystems approach to management at the landscape level to limit further habitat fragmentation. The following discussion is based on "An Ecosystem Approach to Natural Resources Management" (Barnes, 1999). Various terms have been coined to describe this new management philosophy, including managing for biodiversity, ecosystems management, holistic management, or an ecological approach to management. The ultimate goal of managing land at the landscape level is to provide for sustainable use of our natural resources. This means that the desired ecological conditions or flow of benefits from the land can be maintained over time, recognizing a fundamental need to sustain high quality soils, pure air and water, and vigorous native plant and animal populations.

The U.S. Forest Service has been a leader in the emergence of the ecosystems management concept, with a focus on multi-use management dating back to the 1950s. The essential elements of the most recent policy shifts have been summarized as follows:

- the maintenance and enhancement of biodiversity;
- a wider spatial and temporal scale used for the protection and enhancement of ecosystem integrity;
- management using landscape attributes, including habitat connectivity, avoidance of fragmentation, protection of waterways, and identification and protection of critical habitats;
- more intensive planning and coordination, and cooperation, with partners, more spatially detailed data obtained through GIS programs, and more sophisticated silvicultural techniques (low-impact logging);
- a shift in species composition to mature forest benchmarks;
- development of older forest stands or extensive units of mature forest that will have few, if any, roads;
- providing for larger populations of scarce creatures, such as top-level carnivores (bears and panthers), forest or grassland interior species (migrant songbirds), and species that require old growth forests (red-cockaded woodpeckers).

The focal point of this new system is examining and understanding the interdependent relationship of plants, animals, and ecological processes (such as gene flow, fire, etc.) that link them with the physical environment and the needs of people.

Historical definitions of an ecosystem excluded human beings. We now know that both natural processes and human activities over time shape the diversity and productivity of any ecological system. An

ecosystems approach recognizes that humans, as part of ecosystems, need to be included in the decision-making process. This means we must forge partnerships to create opportunities for public participation and work more effectively with diverse audiences, other agencies, and non-governmental organizations in their attempts to manage ecosystems that cross land ownership and jurisdictional boundaries.

The funding required for government to own and protect all natural resources and to afford both public and private benefits does not exist and will never exist. When landowners combine their private values with responsible stewardship, a landscape-level private stewardship plan can work. Effective conservation often requires collaboration, giving rise to multiple-owner consortiums.

The time has come to carefully examine traditional management and move to holistic management. There are no simple answers, but ecosystems management is a dynamic process and requires a strategy that develops, enhances and protects the ecological and socioeconomic values of the resource while maintaining private ownership. For this system to work, it will require a variety of tools.

d. Sustainable agriculture

The concept of sustainable agriculture was formulated to integrate the goals of agricultural productivity and efficiency with maintaining and enhancing both the natural resource base and the quality of life. While farmers have always considered impacts on the environment and quality of life in their decision-making processes, sustainable agriculture provides a focus and a framework where holistic production decisions can be developed and evaluated. The evaluation of production decisions within a sustainable framework includes indices not normally accounted for in traditional agriculture research and education programs, such as the quality of life, human health, maintenance of resource base (including biodiversity), off-site environmental effects, and long-term natural resource viability. While still evolving in concept and practice, sustainable agriculture research and education can provide information to guide farmers, consumers, and policymakers in decision-making (Jordan, 2001).

Sustainable agriculture does not refer to a prescribed set of practices. Instead, it challenges producers to think about the long-term implications of practices and the broad interactions and dynamics of agricultural systems. A key goal is to understand agriculture from an ecological perspective - in terms of nutrient and energy dynamics, and interactions among plants, animals, insects, and other organisms in agroecosystems - then balance it with profit, community, and consumer needs. Farming methods that improve the sustainability of one farm may not be appropriate to a different farm or region. Each practice must be evaluated in a given farming system for its ability to achieve a set of economic, social, and environmental goals.

However, there are some common sets of practices among farmers trying to take a more sustainable approach, in part through greater use of on-farm or local resources. Each contributes in some way to long-term profitability, environmental stewardship, and rural quality of life. These include: Integrated Pest Management, rotational grazing, soil conservation, water quality/wetlands, cover crops, crop/landscape diversity, nutrient management, agroforestry, and marketing.

Since 1988, the Sustainable Agriculture Research and Education (SARE) program has been the USDA's primary means of studying and spreading information about sustainable agriculture. The program has funded hundreds of projects that help advance knowledge about sustainable practices and systems nationwide. In each of its first ten years, the program has divided approximately \$11 million among four regions of the U.S. SARE administers a wide variety of grants that cover the breadth of sustainable agriculture.

The state university and land grant system has established sustainable agriculture programs. Numerous non-governmental efforts are also focused on sustainable agriculture. For example, AFT works to prevent loss of farmlands and to promote sustainable practices.

A broad array of policy options and programs can be identified that affect sustainable agriculture. However, one major area must be addressed before all of the individual efforts can be truly effective: there exists an incompatibility between sustainable agriculture and “industrial agriculture” (Jordan 2000). Until the costs that intensively managed, industrial agriculture imposes on the environment and rural people are recognized, agriculture will not be a sustainable enterprise in Alachua County.

e. Adaptive management

Adaptive management planning is another approach which may be combined with a best management practices approach to increase the likelihood that management can achieve complex objectives like ecosystem sustainability. Where “best” management practices presumes that one practice, or suite of practices, is most suited to every site, adaptive management presumes that not enough is known to identify a single best practice. In fact, there may be several to many best practices, depending on the adequacy of existing knowledge and whether objectives are open to multiple interpretations.

An over-simplified description of adaptive management is learning while doing, where feedback is used to adjust subsequent decisions. The rate of learning depends on the relative proactiveness of the feedback mechanism. In passive approaches, learning is advanced when the questions and anticipated outcomes are clearly defined and monitoring plans are written before management begins. This approach requires patience to allow sufficient time for learning. Scientists and citizens continue to offer criticism from outside; they may also help to frame questions, anticipate outcomes, and help design and implement a monitoring plan. However, when a commitment to monitoring wanes, the strategy reverts to a reactive one, in which change is driven by forces external to the management system, including Congress, lawsuits, public reactions, and research findings. Crisis management tends to emerge, and creating and maintaining a long-term strategy becomes extremely difficult.

Concepts of best practices can be combined with active adaptive management when sets of best practices can be distributed across comparable stands or landscapes in ways that we can learn from them in order to manage sustainably. Examples are pilot studies in Oregon and Florida which are being conducted to compare suites of best practices, prescriptions, or policies - all thought to work well - by managing under an experimental design. Management experiments become the focus of monitoring and evaluation, and create incentives to continue monitoring over time to help avoid slipping back to a reactive mode. Such studies are undertaken in Alachua County in conjunction with the University of Florida.

This approach, while contributing to the advancement of science and our understanding of ecological processes, does risk harm to the environment due to the nature of experimental uncertainty. In some cases, more intensive and riskier treatments, are performed in Alachua County. This requires balance in our natural resource protection goals.

When the principal objective is growing timber across diverse landscapes, existing knowledge (e.g., site index, thinning response) seems generally acceptable for most sites. As more complex objectives are identified such as sustaining ecosystems that include people, wildlife, plants, ecosystem processes, and their interactions, the adequacy of knowledge and certainty of applicability to individual sites decreases exponentially. Adaptive management may provide an alternative if best practices can not be safely based

on existing knowledge and assumptions of generality. However, this alternative must be explored in a sustainable context while minimizing significant adverse impacts to natural resources.

On a more direct level, through day-to-day observations and occasional consultations with foresters, wildlife biologists, and other natural resource management professionals, landowners gain a working knowledge of the tradeoffs involved with each management decision. They learn how to tailor each operation, including vegetation management, to fit the conditions of a given stand, and the multiple objectives for which the entire holding is managed. It is challenging and educational, and can reward the landowner emotionally as well as financially, to gain, apply, and refine this knowledge of complex ecological interrelationships. The astute landowner blends years of first-hand observation with technical specialists' knowledge to develop a deep understanding of the life of the land and its relationship with human society.

2. Incentives and stewardship programs

A number of stewardship programs have been established to promote good land-use practices, proactive thinking on the part of companies and private landowners with regards to ecosystems management and sustainable agriculture, and financial incentives for participation.

USDA has initiated several programs that rely on education, financial assistance, and technical assistance to encourage farmers to adopt environmentally benign practices. Four of these are described below.

- EQIP (Environmental Quality Incentives Program) - Encourages farmers and ranchers to adopt practices that reduce environmental and resource problems. Producers who enter into 5- and 10-year contracts are offered technical assistance, education, cost sharing, and incentive payments.
- WHIP (Wildlife Habitat Incentives Program) - Provides cost sharing to landowners for developing habitat for upland wildlife, wetland wildlife, threatened and endangered species, and fish and other types of wildlife.
- WRP (Wetland Reserve Program) - Provides easement payments and restoration cost-shares to landowners who return previously converted, or presently farmed, wetlands to wetland conditions.
- CRP (Conservation Reserve Program) - offers annual rental payments, incentive payments for certain activities, and 50% cost-share assistance to establish approved trees and vegetative cover on eligible cropland to improve soil, water, and wildlife resources. Contract duration is 10-15 years.

In addition, the NRCS provides conservation technical assistance to farmers for planning and implementing soil and water conservation and water quality practices. Extension education provides landowners and farm operators with information and recommendations on soil conservation and water quality practices.

Voluntary forest incentive programs that subsidize tree planting have a long and successful history in the south, and recent programs focus on multiple values produced from forests. Several conservation programs specific to forestry are summarized below. However, future funding of forest incentives is likely to vary depending on shifts in state and federal priorities.

- FRIP (Florida Reforestation Incentives Program) - this program provides reimbursement for a maximum of 60,000 pine seedlings.
- FIP (Forestry Incentives Program) - incentives for planting, natural regeneration, and timber stand improvement; 65% cost-share per practice not to exceed \$10,000 per year
- ACP (Agricultural Conservation Program) - incentives for tree planting, site preparation for natural regeneration, and timber stand improvement; 65% cost-share per practice not to exceed \$3,500 per year
- Forest Legacy Program - offers conservation easements and land purchases to protect forest lands of national or state importance that are considered to be threatened
- Florida Stewardship Program - provides technical assistance to help non-industrial landowners develop natural resources management plans to protect and enhance their timber, fish and wildlife habitat, water quality, wetlands, and recreational and aesthetic values of their property.

3. Forestry certification programs

Forest certification is a means of determining, based on different criteria, the sustainability and environmental well-being of a forest and its lands. Increasing public awareness of environmental issues has kindled extensive public involvement in resource management decisions and policies. A key component of the response to public concerns in the 1990s was the development of programs by government agencies, nongovernment organizations, and industry or landowner associations to encourage and verify sustainable management of forest resources.

Five voluntary programs now exist in the United States, each with a different method for assessing and certifying that forests are managed sustainably with environmentally responsible practices. Certification is usually based on a set of standards to which a landowner's management practices and systems are compared. The Florida Forestry Association's Forest Certification Task Force has researched the five certification programs and developed a comprehensive matrix to compare the components of the programs. This matrix is attached as Table 17. In addition, some notable features of these programs are described below.

a. Forest Stewardship Council (FSC)

The Forest Stewardship Council is a not-for-profit, non-governmental organization created in 1993 by certifiers, forest products businesses, and environmental groups to monitor certification and prevent a confusing proliferation of standards. FSC does not perform certifications, rather, it accredits third-party certifiers and endorses regional forest certification standards. To serve as a guiding framework for the development of regional standards, the FSC approved in 2001 global Principles and Criteria for Forest Management, a set of thresholds for environmentally appropriate, socially beneficial, and economically viable forest management.

The Forest Management Trust and Tall Timbers Research teamed in 1996 for the development of Forest Certification Standards for the Southeastern U.S. and has recently been engaged in the process of harmonizing its indicators and verifiers with those in the national standards. This process began with the invitation of approximately 3600 stakeholders to three sub-regional information meetings. The regional Working Group that developed the standards was formed from stakeholders elected at the sub-regional information meetings and others selected from under-represented interest groups and/or sub-regions based on the results of the elections. The 18-member Working Group included non-industrial private landowners, foresters, ecologists, social scientists, forestry professors, environmental activists, a geographer, a soil scientist, and a certifier. After publication of the national standards, the Working Group worked to make its draft standards consistent with the national standards. As of the summer of 2001, the harmonized draft standards have been reviewed and approved by the national office of the FSC, and released for public comment. Some representative principles and policies are shown in Inset 19.

As a follow-up to developing the Forest Certification Standards for the Southeastern U.S., the Trust has developed a regional handbook and four regional workshops on forest certification. The purpose of these efforts is to educate landowners, resource managers, forest product companies, and other stakeholders on the certification process and the certification standards for the Southeast. In addition to describing the certification process, the handbook describes the benefits and costs of certification, as well as ways to minimize the costs of certification (e.g., group certification, resource manager certification).

b. Sustainable Forestry Initiative (SFI)

The American Forest and Paper Association (AF&PA) recently began a stewardship initiative to incorporate the protection of natural resources. The forest and paper industry's national trade association, AF&PA represents more than 250 companies and related associations that engage in or represent the manufacture of pulp, paper, paperboard and wood products. AF&PA requires all member companies to comply with the SFI program, which specifically targets water-quality improvement by implementing BMPs, approved State water-quality programs, and adherence to state and federal water protection laws.

The County recognizes this program as a major step towards achieving BMPs compliance. However, in comparison with FSC, SFI offers fewer wildlife habitat protection and ecosystems and landscape-level safeguards. For example, program rules allow an average of 120 acres (the size of 116 football fields) to be cut clear of trees. Under FSC, clear cuts larger than 40 acres are discouraged. The industry's rules also put no constraint on the use of timber management chemicals such as herbicides, while FSC rules call for minimal to no use of chemicals. Nevertheless, the SFI initiative indicates a very positive, fundamental shift in the way timber companies do business by pushing for certification.

Inset 19: Examples of FSC Principles and Criteria

FSC Principle 6: Environmental Impact

Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and, by so doing, maintain the ecological functions and integrity of the forest.

- 6.2 *Safeguards shall exist which protect rare, threatened and endangered species and their habitats (e.g. nesting and feeding areas, dens). Conservation zones and protection areas shall be established, appropriate to the scale and intensity of forest management and the uniqueness of the affected resources.*
- 6.3 *Ecological functions and values shall be maintained intact, enhanced or restored, including:*
- 1) *Forest regeneration and succession.*
 - 2) *Genetic, species, and ecosystem diversity.*
 - 3) *Natural cycles that affect the productivity of the forest ecosystem.*
- 6.3.1 *Landscape level ecological issues should be addressed in the management plan, consistent with the scale of the operation. The following is an example of a way to verify compliance with the indicator:*
- * Ecological connections and/or corridors to adjacent properties are maintained or improved. Cooperation with adjacent landowners is in place where possible.*
- 6.3.2 *Forest management should restore a range of age-classes in uneven-aged stands in accordance with management objectives. The retention or development of old/large trees is encouraged.*
- 6.3.6 *Clearcutting shall not be used in primary and natural forests.*
- 6.3.8 *Clearcutting may be employed in plantations, degraded semi-natural forests, and other forests lacking the characteristics of native ecosystems. The maximum size of clearcuts in these forest areas shall be 40 acres....*
- 6.3.10 *Forest management activities shall maintain species and ecosystem diversity.*
- 6.3.12 *Locally threatened ecosystems or communities (i.e. prairies and isolated wetlands) shall not be adversely affected by conversion of non-forest land to forest.*
- 6.4 *Representative samples of existing ecosystems within the landscape shall be protected in their natural state and recorded on maps, appropriate to the scale and intensity of operations and the uniqueness of the affected resources.*

- 6.5 *Written guidelines shall be prepared and implemented to: control erosion; minimize forest damage during harvesting, road construction, and all other mechanical disturbances; and protect water resources.*
- 6.6 *Management systems shall promote the development and adoption of environmentally friendly non-chemical methods of pest management and strive to avoid the use of chemical pesticides.*
- 6.10 *Forest conversion to plantations or non-forest land uses shall not occur, except in circumstances where conversion:*
- 1) *entails a very limited portion of the forest management unit; and*
 - 2) *does not occur on high conservation value forest areas; and*
 - 3) *will enable clear, substantial, additional, secure, long term conservation benefits across the forest management unit.*

FSC Principle 9: Maintenance of High Conservation Value Forests

Management activities in high conservation value forests shall maintain or enhance the attributes which define such forests. Decisions regarding high conservation value forests shall always be considered in the context of a precautionary approach.

FSC Principle 10: Plantations

Plantations...should complement the management of, reduce pressures on, and promote the restoration and conservation of natural forests.

- 10.2 *The design and layout of plantations should promote the protection, restoration and conservation of natural forests, and not increase pressures on natural forests. Wildlife corridors, streamside zones and a mosaic of stands of different ages and rotation periods, shall be used in the layout of the plantation, consistent with the scale of the operation. The scale and layout of plantation blocks shall be consistent with the patterns of forest stands found within the natural landscape.*
- 10.6 *Measures shall be taken to maintain or improve soil structure, fertility and biological activity. The techniques and rate of harvesting, road and trail construction and maintenance, and the choice of species shall not result in long term soil degradation or adverse impacts on water quality, quantity, or substantial deviation from stream course drainage patterns.*

c. American Tree Farm System

A nationwide community of 66,000 non-industrial private forest landowners, the American Tree Farm System is the oldest certifier of sustainable forests in the United States. Its members are joined in their commitment to excellence in forest stewardship. The Tree Farm System is a program of the American Forest Foundation, a non-profit organization that develops, funds and administers programs which encourage the long-term stewardship of our natural resources.

In 2000, the AF&PA and American Tree Farm system formally recognized each other's respective standards for sustainable forest management. In a Mutual Recognition Agreement, AF&PA recognizes Tree Farm as a credible standard for sustainable forestry on smaller ownerships, including non-industrial forest landowners, and the American Tree Farm System recognizes the SFI program as an independent standard for the forest products industry, larger ownerships and licensees. The Mutual Recognition Agreement acknowledges that the intent, outcome and process of both the SFI program and Tree Farm are substantively equivalent and that the credibility and reputation of each program will be maintained by the programs' respective systems already in place. The Agreement allows Tree Farm and the SFI program to collaborate further to broaden the practice of sustainable forestry on private lands and to educate non-managing landowners about the benefits and support for practicing sound forestry.

d. Forest Stewardship Program (FSP)

The USDA Forest Service initiated a Forest Stewardship Program, similar to the SFI program, that provides educational and technical assistance to landowners interested in active management of their forests for multiple resource benefits. Another program, the Stewardship Incentive Program (SIP), provides cost-share support for nonindustrial private forest landowners to help them develop and implement Forest Stewardship Plans. Funding through SIP is based on landowner adherence to the plan for a minimum of 10 years. Technical and planning assistance by natural resource professionals is available through the program.

e. Green Tag Forestry

Green Tag Forestry is a "third-party" certification that was developed by the National Forestry Association in cooperation with the Association of Consulting Foresters and the National Woodland Owners Association. It is national in scope and the only program that is intended solely for use by private forest landowners. The program complements those sponsored by American Tree Farm and FSC. It is also similar in some respects to the forest industry's SFI and state/federal Forest Stewardship Incentive Programs.

Green Tag Forestry has ten criteria that outline its approach to forest management. There are forty-six indicators that define successful conformance within each criteria. The ten criteria include forest planning and management; forest health, inventory, and natural diversity; logging, post-harvest evaluation and reforestation; road construction, stream crossings, and protection of special sites; product utilization and aesthetics; chemical utilization; community and social relations; economic viability; record keeping and tracking; and commitment to sustainability.

A Green Tag Forest is a woodland whose stewardship has been certified as incorporating good forestry practices that assure a balance of natural diversity and sustainable forest productivity. Green Tag certification is available in all fifty states. The program provides recognition to landowners who practice responsible and sustainable woodland stewardship. This recognition may bring a market premium as a “green-certified” forest product.

4. Changing ownership and strategies

Management of public land includes protecting biodiversity through ecosystem or landscape-level management. About 11% of the South’s forests are in a public ownership, and these areas tend to be concentrated in mountainous areas (Southern Forest Resource Assessment, 2000). For some rare communities, public lands are critical to conservation. Often, however, rare plant communities and critically imperiled species do not occur on public land. The management of private forests, therefore, will have a substantial impact on the persistence of many species of concern in the South.

The search for workable methods to achieve conservation takes place in an era of great change in the way Americans own and manage land. Changing patterns of land ownership affects both farm and forest lands and their management in the 21st century. America’s forests, for example, are now in the hands of almost 10 million owners, with almost 94% owning 100 acres or less. Recent surveys show that the fastest growing segment is the 10 acre to 100 acre sizes.

It is clear that one-on-one technical assistance programs, as well as many of the past cost-sharing programs, may be increasingly inappropriate to the situation. The small landowners are too numerous, too inattentive to forest management, and too scattered for limited public programs to reach, and the big owners either don’t need or won’t use them. This makes it difficult to speculate on how ecosystem wide consideration can be applied to a watershed full of ownerships averaging 17 acres.

Getting either of these audiences to use professional technical assistance, to prepare and implement plans for their own operations that are reasonably consistent with the needs of the whole watershed or landscape in which they exist, and to follow reasonable rules of conduct, looks increasingly beyond the capacity of a voluntary system whose supply of assistance is set by political priorities rather than by consumer demand.

Shrinking agency professional ranks coupled with rapidly increasing numbers of small landowners, increasing concentration into huge production units, and growing public demand for more effective control of off-site environmental impacts simply does not add up. Farm and Forest (1998) predicts that, in the 21st century, the consumer demand will be established by the community rules set down by general government, and the response to that demand will be by private businesses who can grow and shrink in response to the market.

Table. 17 Florida Forestry Association’s Comparison of Forest Certification Programs

	American Tree Farm System	Sustainable Forestry Initiative^a (SFI)	Forest Stewardship Council (FSC)	Green Tag Forestry	Forest Stewardship Program (FSP)
Developed By	American Forest Foundation	American Forest and Paper Association (AF&PA)	Forest Stewardship Council (341 members in 51 countries) established policies and guidelines	National Forestry Association (NFA) in cooperation with the National Woodland Owners Association and Association of Consulting Foresters.	National Association of State Foresters in conjunction with U.S. Forest Service (USFS).
Date of Inception	1941	1994	1993	1998	1990
Type Organization	Nonprofit educational foundation	Independent not-for-profit trade organization	Self-appointed, independent not-for-profit organization.	Independent not-for-profit	Government.
Funding Sources	Contributions, grants, magazine sales, logo item sales.	The members fund individual programs and provide support to statewide and national activities.	Government and foundation grants, accreditation fees, membership fees	Fees for auditing services.	Federal and state funding.
Focused On	Nonindustrial private forests in the United States.	Industrial forests primarily; promotes sustainable forestry practices on nonindustrial forests in the United	Small woodlands, industrial forests, and public forests on a worldwide basis.	Nonindustrial private woodland owners in the United States.	Nonindustrial private landowners in the U.S.
Mission Statement	To ensure sustainable forests in the U.S. To provide outreach to landowners with information, education, and voluntary verification of sustainable practices.	To promote sustainable forestry principles that constitute the AF&PA’s members’ commitment to sustainable forestry and the measures by which the public can benchmark this commitment.	To improve forest practices through market-based incentive programs.	To identify and recognize landowners whose stewardship incorporates good forestry practices that assure a balance of natural diversity and sustainable forest productivity.	To assist private forest landowners to more actively manage their forests by providing technical assistance, educational assistance, and recognition for their efforts.
Objectives	A Tree Farm is a privately owned forest dedicated to producing renewable and sustainable crops of forest products while protecting the soil, water, range, aesthetic, recreation, wood, fish and wildlife resources. Multiple-use management approach to the growing of renewable forest resources while protecting environmental benefits. Strive to increase public understanding of all benefits of productive forestry.	To practice sustainable forestry to meet the needs of the present without compromising the ability of future generations to meet their own needs. Accomplished by practicing a land stewardship ethic which integrates the reforestation managing, growing, nurturing, and harvesting of trees for useful products with the conservation of soil, air and water quality, fish and wildlife habitat, and aesthetics. Support for research, promotion, and education as part of the continuous improvement process. In this way AF&PA will perceptibly improve the performance of member companies, and will set new standards for the entire forest industry as well as for	Market-driven program that uses higher and more rigorous standards and a certification assessment process that is more rigorous than other programs. Emphasis is on natural forest management. Supports environmentally appropriate, socially beneficial, and economically viable management of the world's forests by evaluating and accrediting forest management capacity worldwide.	To provide private landowners recognition of their responsible and sustainable woodland ownership. Such designation may bring a market premium as “green certified forest products.” The program complements those sponsored by the American Tree Farm and the International Forest Stewardship Council. Emphasis on quality logging practices.	To encourage management for multiple resources, increase public awareness of the importance of forestlands, and improve cooperation among natural resource agencies to meet state conservation and management needs and opportunities.
Key Elements of Program	Broaden the practice of sustainable forestry, reforestation, water quality, wildlife habitat, forest aesthetics, protect special sites, biodiversity, slash disposal and utilization, prudent use of chemicals, outreach, public reporting, public involvement.	To use responsible practices; to protect forest health and productivity; to protect special sites; to continuously improve the practice of forest management.	Compliance with laws and FSC principles; tenure and use rights and responsibilities; indigenous peoples' rights; community relations and worker's rights; benefits from the forest; environmental impact; management plan; monitoring and assessment; maintenance of natural forests; plantations.	Forest security, general management and planning, tree harvesting, road construction, skidding/forwarding, post harvest evaluation within one year, product utilization, chemical applications, community relations, employee relations, economic viability, optimizing forest potential, record keeping and tracking.	Timber growth and harvesting, fish and wildlife habitat enhancement, soil and water conservation, recreation and aesthetic enhancement. Woodland livestock grazing may also be included as one of a landowner's management objectives if a portion of the property is used for that purpose.

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Benefits of Certification	Free visits every five years by professional resource managers, <i>Tree Farmer</i> magazine, state and local workshops, state newsletters, national convention. Feedback on forest management practices. Signage provided as recognition for good forest stewardship on private lands.	To meet the needs of humanity for essential wood and paper products while protecting and enhancing other forest values. Affiliation with internationally recognized environmental program. Recognition for good forest stewardship.	Independent review of operations, improvement of management over time, marketplace access and differentiation in the market place as an environmentally responsible company, empowerment of consumer to choose environmentally sensitive product.	Independent review of operations, improvement of management over time, marketplace access and differentiation of product (based on aspects of production), empowerment of consumer to choose environmentally sensitive product. Keep nonindustrial lands in a productive and healthy condition for present and future owners to increase the economic and environmental benefits of the land. Signage provided as recognition for good forest stewardship on private lands.	Keep nonindustrial lands in a productive and healthy condition for present and future owners to increase the economic and environmental benefits of these lands.
Types of Certification	Forest Certification only---Pioneer and Certified	Forest Certification only	Forest Certification and Chain-of-Custody Certification for processing facilities	Forest Certification and Chain-of-Custody Certification for processing facilities	Forest Certification only
Program Requirements	Voluntary, must have at least 10 acres and be willing to harvest trees to participate.	Required of all AF&PA members, open to nonmembers as well.	Interested landowners and companies that manage forestlands or produce forest products.	Must be member of the National Woodland Owners Association.	Individuals and noncommercial landowners with at least 25 acres who agree to actively implement the management plan for at least ten years.
Audit Mechanism	Third-party. Certified Tree Farms require onsite inspections.	Companies can choose between first, second, or third-party verification. Under the optional Voluntary Verification Process, companies can choose to apply a rigorous and internationally consistent self-verification approach to document conformance to SFI standards.	Independent, accredited third-party against published standards. Onsite inspection required.	Onsite third-party audits are conducted by specially trained consulting foresters.	Third-party. Forest Stewardship Plan prepared and implementation monitored by state forester designee with field program reviews by USFS.
Number of Certified Forests to Date	70,000 nonindustrial private landowners.	> 135 forest products companies participating	> 550 certification certificates issued to forest companies, state and local public forests, small private landowners, and wood products manufacturers and retailers.	21 woodlands as of 12-99.	123 certified Forest Stewardship Landowners as of 3-00 in Florida
Acreage in Certified Forests	25 million acres.	56 million acres representing 90% of U.S. industrial timberlands	4.6 million acres in United States, 40 million acres total in 30 countries	51,116 acres in seven states.	97,938 acres in Florida

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Standards Setting Process	Periodic review by independent third party of forest conservation experts. Report presented to national operating committee. Standard creation of modification is proposed through working groups within the national operating committee. Working group's proposals presented to all state leadership and other stake-holders during series of regional meetings. Consensus is reached at the regional level and presented to national operating committee. Standards crafted into final form and distributed to all state programs.	The SFI standards apply only to members of the AF&PA. The requirements of the Initiative are recommended by the SFI Task Group, composed of members of the AF&PA, and accepted and approved by the association's board of directors.	Multi-stakeholder, open, transparent and consensus-based process. Principles and Criteria for Forest Management developed by diverse group including landowners, professional resource managers, forest ecologists, forest products companies, and representatives from the environmental and community organizations. Processes occur at the international, national, and regional levels.	Developed by the association's membership, in cooperation with the National Woodland Owners Association and in consultation with individual members of the Association of Consulting Foresters. The original certification criteria were formulated by a national team of foresters and resource specialists. Designed as a U.S. program, Green Tag Forestry interacts with the Canadian Federation of Woodlot Owners and the Pan European Forest Certification.	Basic policy and appropriations authority set in the 1990 Farm Bill. National standards and guidelines developed by USFS in consultation with state foresters. Further implementation measures developed by individual state committees. State committee membership stipulated by federal guides to include: USFS, Natural Resource Conservation Service (NRCS), Farm Service agencies and Extension Service, local governments, soil and water conservation districts, consulting foresters, environmental non-government organizations, forest products industry, forest landowners, land trust organizations, conservation organizations, state fish & wildlife agencies, others as deemed appropriate.
Monitoring and Assessment	Foresters and other trained natural resource professionals audit member Tree Farms on a five-year basis. Management plan is reviewed with landowner. Property is physically inspected in accordance with program standards, guidelines, and performance measures.	Each member organization establishes its own policies and procedures for complying with the Principles and Implementation Guidelines. The CEO of the member organization must annually stipulate that their organization is in substantial compliance with the SFI. At that time, the organization is required to submit its data to the Association for the annual SFI Progress Report. The SFI Expert Review Panel, a group of independent forestry experts, reviews the annual report, evaluates the program, and makes recommendations to the board of directors for changes that clarify and improve the program.	Accredited certifiers verify organization's compliance on the ground to international/regional (if available) standards for forest management and against organization's forest management system. For chain-of-custody, production process monitored to ensure no contamination of noncertified wood into the certified production process.	NFA accredits individual foresters to certify against the standard. Landowner must seek professional advice at appropriate times. Post-harvest evaluation required. Green Tag recognizes six forest management regions in the U.S.	Agency representative or consultant contacts the State Forest Stewardship Coordinator to request a certification inspection. Inspection team consists of the Florida Division of Forestry (DOF) and Fish & Wildlife Conservation Commission (FWC) Stewardship Coordinators. Representatives from the NRCS or Cooperative Extension Service may be involved if a significant portion of the landowner's management program involves correcting soil erosion or water quality problems, woodland grazing, or some alternative resource. The landowner is encouraged to participate.
Marketing Opportunity	No product labeling	No product labeling at this time, can use SFI logo on company materials.	Yes, FSC logo on promotional materials. On-product and off-product labeling permitted dependent upon percentage of certified wood in final product. Labeling monitored by certifier.	Yes, Green Tag logo on promotional materials. On-product and off-product labeling permitted dependent upon percentage of certified wood in final product. Labeling monitored by Green Tag	No product labeling

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Cost of Certification	No charge for certification by professional forester volunteers. \$15 subscription to Tree Farmer magazine is required.	Membership in AF&PA is on a graduated scale based on the type of organization and the size of the organization within the type. For example, nonindustrial forest landowners do not have the same dues structure as industrial forest landowners. Costs for AF&PA SFI State Implementation Committees, Best Management Practices training, logger training programs, etc., are supported by member contributions to the state programs.	Membership fees : Northern individual--\$75; Non-governmental Organization (NGO) \$150, for-profit organization with >15 employees \$300; for-profit with <15 employees \$150. Southern individual \$38; NGO \$75; for-profit with <15 people \$75; for-profit with >15 people \$150. Certified operations pay annual program fees to FSC for use of the logo. Certifiers pay annual accreditation fees to FSC. Highest cost to landowner due to effort involved in meeting the higher certification standards and the costs associated with third-party assessment team. Possible to group several small landowners together to minimize costs.	\$150 one-time registration fee paid to NFA. The review cost is estimated by the Green Tag certifying forester with the landowner before field examinations are conducted, and are payable directly to the certifying forester. These costs range from @ \$0.10 to \$1.25/ac., depending on number of acres and completeness of forest management plan, maps, and records. Small tracts (20-75 acres) may be higher. Periodic accreditation fees at time of recertification.	Cost share variable depending on who/how plan prepared. Other implementation costs borne by landowner. Administration, audit, etc. borne by government.
Duration of Certification	A five-year management history is accepted minimum. Tree Farms are reinspected every five years to verify adherence to standards.	SFI is not a certification program. The membership must reevaluate their compliance annually. The owner/CEO must stipulate each year that the organization was in substantial compliance with the program during the previous operating year.	Certificates are in place for five years, with annual audits.	Five years. Periodic audits required.	Established by state committees.
Dispute/Resolution Process	Appeals process through state committees.	Contact AF&PA directly or the SFI State Implementation Committee.	Initial complaint addressed to certifier by complainer; if unresolved it moves to the Secretariat; if still unresolved it moves to board; if still unresolved to Dispute Resolution Committee for final decision.	Initial complaint addressed to evaluating forester. If unresolved, complaint goes to National Forestry Association.	Forwarded to USFS for exceptions
Standards	Performance measures only. Ten standards and guidelines reviewed and approved in 1998. Places few limitations on landowners to achieve goals. States can develop standards more specific than national standards.	Combination of a performance program and environmental management system. Sustainable Forestry Initiative is based on a set of seven principles and a series of implementation guidelines consisting of 12 objectives and 29 performance measures last updated in 1998. The guidelines are suitably flexible to accommodate the wide variety of forest types, soil conditions, and other natural features across the U.S. Each participant will define its own policies, programs, and plans to implement and achieve the SFI Principles and Objectives. More protective of landowners rights to manage on a sustainable basis.	Combination of an environmental management system and performance measures. Ten principles of sustainable forestry. Standards go beyond general principles and criteria to include 56 specific indicators of good forest management. Standards emphasize both management plans and field performance. Address a variety of environmental, social, and economic issues. Places more limitations on landowners than other programs.	Combination of a performance program and environmental management system. Ten Principles, with specific objectives and performance measures to recognize regional silvicultural differences.	The plan is essentially an environmental management system. Minimum standards are established in six resource areas, with specific requirements based on whether the resource area is a primary or secondary objective of the landowner. To qualify for cost sharing, landowners must meet certain performance standards.

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Management Plan	Must have a written and active forest management plan. Includes management recommendations for five- and ten-year planning horizons.	Must have a written forest management plan	Must have a written management plan that is implemented and up-to-date. The long-term objectives and the means of achieving them shall be clearly stated. Management plan shall be periodically revised to incorporate the results of new scientific or technical information, as well as to respond to changing environmental, social, and economic circumstances.	Landowner states personal management objectives in a written plan. Management plan covers ten years of future management and must be updated periodically. A complete and current forest inventory is maintained.	Must have a written forest management plan that includes the landowner's chosen objectives (primary or secondary) for the major resource areas. Landowners do not have to wait for certification until they have performed all practices described in their Forest Stewardship Management Plans.
Sustainability	Promote the growing of renewable forest resources while protecting environmental benefits.	Ensure long-term forest productivity and conservation of forest resources through prompt reforestation, soil conservation, afforestation, and other measures.	The rate of harvest of forest products shall not exceed levels which can be permanently sustained.	Landowner accepts responsibility as ultimate steward of the land. Good forest management is based on the premise that degradation should not occur as a result of land management activities.	Landowners must practice active multiple-use forest management based upon their own objectives as described in their Forest Stewardship Plan. Every benefit does not have to be obtained from every acre. Some areas may provide only one benefit, while other areas may provide many uses. When the property is considered as a whole, however, the landowner must demonstrate active management for each of the stated objectives.
Reforestation	Prompt restocking of harvested areas and idle areas where tree growing is the land use objective by natural seeding, sprouting, or replanting. Site preparation should assure that regeneration is successful by removing residual or competing vegetation. Must achieve satisfactory restocking within five years following harvest.	Reforest after final harvest by planting or direct seeding within two years, or by planned natural regeneration methods within five years.	Tree planting methods should avoid soil damage while providing for seedling survival. A percentage of the forest management area (ranging from 10-20% depending on size) shall be maintained or restored to a natural forest cover.	Site is regenerated within two years or less.	Regeneration planned in advance of timber harvest and completed within three years after final harvest unless there is to be a land-use change. Proper stocking levels established at the time of regeneration. Tree species favored and managed that are best adapted to specific sites. Encourage cost-effective treatments which minimize site disturbance and destruction of wildlife habitat.
Protection	Forest practices must protect from fire, diseases, insects, and destructive grazing.	Protect forests from damaging agents such as wildfire, pests, and diseases to maintain and improve long-term forest health and productivity.	Make effort to prevent illegal and unauthorized activities. Paint and post boundaries, use gates, make periodic inspections. Safeguards shall exist which protect rare, threatened and endangered species and their habitats.	Boundary lines are known and marked. Landowner holds clear title and has considered easements.	Active protection of all stands from wildfire and major outbreaks of insects or disease. Cooperate with state agencies responsible for the prevention and control of illegal hunting or fishing and other detrimental practices or influences. Litter controlled, unsightly areas eliminated, and steps taken to neutralize any hazardous materials that may be present on the site.

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Water Quality	Must follow state Best Management Practices (BMPs) and other practices required by local, state, or federal regulations.	Protect the water quality in streams and lakes by implementing riparian protection measures based on soil type, terrain, vegetation, and other applicable factors. Must follow state BMPs or other practices required by local, state, or federal regulations.	Written guidelines to control erosion and minimize forest damage during harvesting and road construction to protect water resources. Must follow state BMPs or other practices required by local, state, or federal regulations.	Must follow state BMPs. Wetlands are identified and respected. Roads are planned and constructed to minimize loss of productive land without degrading nonforest areas. Roads and landings are "put to bed" with drainage and seeding. Appropriate size culverts are used. Stream bank grades are rocked.	Follow BMPs on forestlands to maintain water quality and minimize soil erosion. Construct firebreaks and access roads so as to minimize soil erosion. Maintain adequate cover to minimize soil particle detachment and transport. Protect areas prone to erosion from destructive silvicultural operations that would damage the ground cover and treating areas which have sustained previous damage.
Wildlife Habitat	Management practices must protect and enhance fish and wildlife habitat while considering floral and faunal diversity.	Enhance the quality of wildlife habitat by developing and implementing measures that promote habitat diversity.	Where nonforested land serves as exceptional wildlife habitat, conversion to forest cover is discouraged.	Appropriate retention of wildlife den trees and perch sites. Recreation and wildlife trails left free of debris following harvest.	Enough suitable habitat deliberately created, maintained and improved to support suitable populations of desired species. Natural diversity and abundance of nongame wildlife species achieved and maintained. Some provision made on some part of the property for species dependent on mature timber and/or cavity trees.
Forest Aesthetics	Follow forest practices that demonstrate concern for the aesthetic effects of forest activities.	Minimize the visual impact of clearcutting and other forest operations.	No specific requirement for forest aesthetics.	Effort made to achieve good utilization. Appropriate concern for vistas.	Contribute to the overall aesthetic appearance of the surrounding landscape as a whole. Retain large attractive specimen trees and trees with good fall colors. Plant or maintain native flowering trees, shrubs and wildflowers that are best adapted to
Protect Special Sites	Recognize and protect recreational, historical, biological, archaeological and geological sites of special interest.	Manage company lands of ecological, geologic, or historic significance in a manner that recognizes their special qualities.	All sites and features of special cultural significance should be identified and protected. Representative samples of existing ecosystems shall be protected in their	Native American heritage sites are respected. Conservation easements may be used, if appropriate.	Identify and protect unique archeological or historical sites. Identify and maintain scenic areas and unique geological features such as rock outcrops, sinkholes, small ponds,
Biodiversity	Management practices must enhance the health and productivity of the woodland while considering biodiversity on a landscape or watershed basis. Acceptable forest management practices includes the range of even and/or uneven age management	Contribute to biodiversity by enhancing landscape diversity and providing a variety of plant communities.	Forest management practices shall maintain species and ecosystem diversity. Uneven-aged natural stands shall not be converted to even-aged stands. Forest conversion to plantations or nonforest land shall not occur except under limited conditions.	Recognition of a balance between productivity and natural diversity. Inventory of significant flora and fauna is completed. Special attention to rare or endangered species, if present.	Unique plant communities protected and maintained. This includes periodic prescribed burning of fire-dependent vegetation communities and use of native plants favored over nonnatives.

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Slash Disposal and Utilization	Utilize in an environmentally and/or economically sound manner all severed and/or damaged materials on a harvest site. Consider harvest contract wording that addresses utilization and slash hazard reduction	Employ appropriate forest technology, and harvesting and manufacturing processes to minimize waste and ensure efficient utilization of trees harvested.	Forest management should minimize waste associated with harvesting and onsite processing operations and avoid damage to other forest resources.	Residual material either laid down or chipped.	No requirement
Use of pesticides and fertilizers	Use of herbicides, pesticides, and fertilizers must meet all applicable label requirements, laws, and regulations.	Continue prudent use while following all applicable label requirements, laws, and regulations.	Promote the use of environmentally friendly nonchemical methods of pest management and strive to avoid the use of chemical pesticides. If chemicals are used, ecological structures, functions, and components of a forest's diversity must be maintained.	Encourages use of nonchemical methods of pest and herbaceous control. Maintain records of chemical applications. Label guidelines and approved applications are followed.	Apply nutrients and pesticides according to label recommendations. Limit pesticide use and nutrient additions to the amounts and types necessary to protect water quality and the integrity of all forestland resources. Minimize off-site effects from pesticides and nutrients applied on the landowner's property. Harvest pine straw no more often than once every four years from the same stand, or every two years if fertilization is applied.
Forestry Contractors	Ensure that contractors are made aware of special requirements. Encourage using contractors having completed training, are insured, and comply with all state and federal regulations.	Encourage BMP training for operational contractors. Supportive of logger education.	Local contractors are given opportunities to provide services and supplies. Employment conditions are the same for local and nonlocal employees doing the same job. Contractors are appropriately skilled. Forest management must comply with all state and federal labor laws.	Landowner must seek professional forestry advice at appropriate times. Certified chemical applicators used when required.	The DOF makes available lists of forestry contractors (logging, tree planting, etc.) for landowners use.
Clearcutting/Timber Harvest	Harvesting practices must maintain or improve forest productivity, health and growth while protecting the associated resources. Harvest practices should be prescribed based on tree conditions, tree types and anticipated reforestation method, and desired species. Clearcutting, shelterwood cuts, thinnings, improvement cuts, and precommercial thinning are all acceptable practices as long as they are implemented properly.	Minimize the visual impact by designing harvests to blend into the terrain by restricting clearcut size and/or by using harvest methods, age classes, and judicious placement of harvest units to promote diversity in forest cover. Average size of clearcuts limited to 120 acres. Replant and wait three years or until trees are 5' tall before clearcutting adjacent stands.	Minimize damage to the forest during harvesting and other operations. Clearcutting is strongly discouraged, but allowed as long as it is on a scale that maintains a diversity of physical structures in the forest, responds to the silvicultural needs of dominant species, and does not compromise a forest's ecology. Clearcutting is limited to 40 acres (some exceptions are possible up to a maximum of 80 acres). Clearcutting not allowed in natural forests	Clearcuts are used only when the most appropriate silviculture. Certified loggers are used when available. Minimize soil disturbance and damage to residual trees. Leave trees are clearly marked and protected. Professional forester oversees harvest including a final harvest inspection before releasing logging bond. Post-harvest site inspection required 1-3 years following harvest.	Timber harvests conducted in a manner that enhances other resources. Size and shape of harvested areas compatible with other objectives. Rotation age can be defined, or determined in the future. Stands thinned as needed to maintain vigor. Timber is harvested before biological maturity of the stand but with some provision made on some part of the property for species dependent on mature timber and/or cavity trees.
Indigenous Peoples' and Workers' Rights	No requirement	No requirement	Forest management shall not threaten or diminish, either directly or indirectly, the resources or tenure rights of indigenous peoples. Must recognize and respect the interests and rights of workers and local communities.	No requirement	No requirement

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Information Available to Public		Monitor, measure, and publicly report progress in fulfilling commitment to sustainable forestry. SFI annual progress report aggregates information for all participants.	Public summary reports for each certified forest.	Forest records are private information, and may be available for public review at the discretion and choice of the landowner. Landowners have option of listing the availability of their timber in the nationwide Green Tag Forestry database.	The DOF considers forest records public information. There have been no requests to date for any landowner's information under the FSP.
Public Involvement	Encouraged to increase public understanding of all benefits of productive forestry.	Encourage landowners to reforest following harvest and use BMPs by providing information on the environmental and economic advantages of these practices. Recommend communications with local communities regarding practices. Encourage landowners to use qualified resource professionals and trained loggers. AF&PA encourages public participation and reporting of questionable practices by toll free number	Notification to potentially affected adjacent landowners or communities should be given prior to commencement of significant forest operations.	Landowners are fully informed of their rights and responsibilities as forest stewards. Communication maintained, as appropriate, with community officials. Encourage participation in forestry and landowner organizations.	There is no requirement to notify adjacent landowners about significant forest operations. DOF provides information to help landowners find and use locally experienced forestry consultants, wildlife biologists, loggers, and tree planting contractors.
Website	www.treefarmssystem.org	www.afandpa.org	www.fscus.org (U.S.) www.fscoax.org (International) www.foresttrust.org (Southeast U.S.)	www.greentag.org (website under construction)	www.sfrc.ufl.edu/extension/ffws/fsp.htm
Contact	American Forest Foundation Washington, DC 888-889-4466	American Forest and Paper Association Washington,DC 202-463-2700	Forest Management Trust Gainesville, FL 352-846-2240	National Forestry Association Vienna, VA 888-50-FOREST	Florida Dept. of Agriculture Division of Forestry 850-414-9907
Other websites:	www.fscfacts.com www.sfcw.org				

F. Regulatory framework

1. State approach

a. State Comprehensive Plan

Planning decisions, policies and approaches at the state, regional and local levels all affect Florida's rural areas. At the state level, the Florida Department of Community Affairs (DCA) has lead responsibility for planning matters, including implementation of the Growth Management Act adopted by the Legislature in 1985. Responsibility for the State Plan rests with the Governor's office along with other broad duties in planning and growth management. Local governments develop and implement local comprehensive plans (pursuant to the Growth Management Act) and regulations.

F.S. 163.3177(10(b)) requires each local government to review the state comprehensive plan goals and policies and to address those which are relevant to the circumstances or conditions within its jurisdiction.

The State Comprehensive Plan is set forth in Chapter 187, F.S., and includes 25 state-level goals plus corresponding policies. It establishes the goal to protect and acquire unique natural habitat and ecological systems, such as wetlands, virgin longleaf pine forests, and to restore degraded natural systems to a functional condition. Policies include the promotion of agricultural practices which are compatible with the protection of wildlife and natural systems, as well as the conservation of forests and wildlife to maintain their environmental, economic, aesthetic, and recreational value, and the encouragement of the multiple use of forest resources, to provide for timber production, recreation, wildlife habitat, watershed protection, erosion control, and maintenance of water quality. The State Comprehensive Plan also espouses the goal to maintain and strive to expand food, agriculture, ornamental horticulture, forestry, and related industries in order to compete in the national and international marketplace. One of the specific policies associated with this goal is to conserve soil resources to maintain the economic value of land for agricultural pursuits and to prevent sedimentation of state waters.

b. Right to Farm Act

A recent amendment to the Florida Right to Farm Act [823.14(6), F.S.] expressly prohibits a local government from adopting any ordinance, regulation, rule or policy to prohibit, restrict, regulate, or otherwise limit an activity of a bona fide farm operation on land classified as agricultural land pursuant to 193.461 F.S., where such activity is regulated through implemented best management practices developed by FDEP, FDACS, or the water management districts and adopted under Chapter 120 as part of a statewide or regional program. There is currently uncertainty about which activities fall within the scope of the preemption.

c. Silvicultural Best Management Practices

Applicability

The Silvicultural BMPs manual establishes practices that are designed as “the minimum standards necessary for protecting and maintaining the State’s water quality as well as certain wildlife habitat values, during forestry activities. As such, they represent a balance between overall natural resource protection and forest resource use” (FDACS 2000).

As indicated in the foreword to the 2000 revision, BMPs were developed specifically for silviculture and are intended to be applied on all such operations. However, they are not intended for use during tree removal or land clearing operations associated with development or other activities that have non-forestry objectives.

The BMPs are intended for implementation on all silvicultural operations regardless of whether or not the operation is subject to other regulatory standards or permits. “Anyone who desires to conduct silviculture activities that are not in compliance with this manual must necessarily seek and obtain a permit from the appropriate local, state, and/or federal government agency prior to conducting the operation. In addition, the maintenance of state water quality standards is required during all silviculture operations.”

Implementation of silviculture BMPs is primarily done through an educational format, designed to transfer BMP technology to forest practitioners through workshops and field demonstrations. Currently, DOF personnel conduct 10-15 workshops annually, involving approximately 500 participants per year. In addition, DOF provides BMP training directly to loggers through the Florida Forestry Association’s Master Logger Program. To date, over 600 loggers have become Master Loggers, and over 200 of those have completed an additional six-hour BMP Continuing Education Course.

Compliance with BMPs

Since 1981, biennial monitoring has been conducted to determine compliance with BMPs. In 1999, the DOF completed its tenth statewide compliance survey. The survey is conducted throughout the state, on a random sample of recent forestry operations. Evaluations are conducted in the field by the County Forester, with oversight by the DOF’s Watershed Specialist. County Foresters were responsible for contacting landowners prior to visiting each survey site to authorize access and solicit their participation during the survey process.

Through 1997, over 1500 individual forestry operations have been evaluated, with an average statewide compliance of 92% (DOF, 1999). The 1999 survey included 199 sites: 117 sites on private non-industrial forestland, 72 on industrial forest land, and 10 on public forest lands. The range of compliance scores was 57% to 100% statewide. Nine instances of noncompliance constituted a significant risk to water quality. These were associated with stream crossings, timber harvesting, SMZs, site preparation, waste disposal, and wet weather operations. Recommendations for bringing these sites into compliance with BMPs were adhered to based on follow-up site evaluations by DOF.

Historically, the most chronic and long-term sediment problems associated with silviculture are directly attributable to forest roads. According to the 1999 survey, the most common incidence of noncompliance in this category was failure to stabilize fill material associated with the crossing. In addition, most noncompliance with respect to timber harvesting and site preparation was associated with harvesting

practices within SMZs and with pushing logging debris into wetland edges. The installation of windrows in wetlands has also been identified as an area of concern.

Each of the types of non-compliance identified in the 1999 compliance survey has been observed in Alachua County and has been reported to ACEPD in the form of complaints from citizens, even if not directly observed during biennial compliance audits.

Although the state reports generally high rates of implementation, compliance rates vary depending on the ownership and BMP category. The Southern Forest Resource Assessment has found that overall BMP compliance tends to be highest on public and industrial private land and lower on nonindustrial private land. Direct landowner assistance improves proper BMP implementation.

Further, activities that fail to follow BMPs potentially have adverse environmental effects on soils, water quality and quantity, native vegetative communities, and wildlife, comparable to effects of many traditional development activities. For example, the major potential non-point source pollutant resulting from silvicultural activities is sediment from roads and skid trails. Other impacts on water quality include increases in peak flows during storms, increases in nutrient concentrations (primarily nitrogen and phosphorus), increases in herbicides/fertilizers and derivative products, and thermal pollution (increased stream temperature). Elevated levels of organics and nutrients may result from leaching of disturbed or exposed soils. Fertilizer applications may alter stream chemistry in managed forests, depending on the type of fertilizer used and how it is applied. Forest cover, riparian habitat, and streambank management are vital to maintaining and increasing water quality (Southern Forest Resource Assessment, 2001).

Effectiveness of BMPs

The importance of BMP compliance is clear. Many states have studied the effectiveness of BMPs and found their use significantly improved stream water quality. Effectiveness measures included such attributes as protection of nitrate and suspended sediment levels, water temperatures, and aquatic habitat conditions.

A BMP effectiveness study has recently been completed in Florida. Four sites were selected across northern Florida, and each site was associated with a stream adjacent to intensive silviculture treatment. A stream bioassessment was conducted before and after treatments which included clearcut harvesting, intensive mechanical site preparation and machine planting. All applicable BMPs were followed, including a primary special management zone along the treatment section of the stream. Treatments were conducted on only one side of the stream within the treatment area at each site. According to the BMP manual, roads, primary skid trails, clearcut harvesting, and mechanical site preparation were prohibited within the primary SMZ. Timber harvesting was limited to 50% of the stand, with no harvesting of trees in the streams or on the immediate stream banks.

One year after the first bioassessments and following the treatments, no significant difference in the stream condition index was observed that could be attributed to treatments using BMPs. However, because only one post-treatment bioassessment was conducted, less than a year after treatments, there is some question about BMP effectiveness over longer periods. The study has been extended to include additional bioassessments at 2 and 3 years beyond the initial sampling, and possibly some additional treatments. The primary SMZ is considered the most crucial BMP for protecting water quality and ecosystem health. Specifically, harvesting timber without observing a primary SMZ would likely result in elevated water temperatures, increases in sediment delivery and turbidity, and altered inputs of detritus and woody debris (Adams et al., 1995).

The study concluded that where BMPs were properly applied, water quality, aquatic habitat, and overall stream ecosystem health were protected. As stated in the forward, although many of the relationships between silviculture activities and impacts to natural resources have been well quantified, many others have not (FDACS 2000).

2. Local approach: Alachua County

A varied menu of policy tools is available to Alachua County to address these issues. Selecting the most effective and efficient set of tools for a specific issue should be an ongoing process. However, in view of the state mandate, ignoring agricultural activities and their potential impacts to the environment is not an option. With loss of natural systems functions comes loss of agricultural viability. Comprehensive Plan policies are designed to provide minimum standards for protection of water quality and quantity, native vegetative communities, wildlife and habitat, as well as sustainable agriculture.

Recognizing that agricultural and silvicultural activities are so integral to the economy as well as to the environmental quality of Alachua County, a specific objective and set of policies on agricultural and silvicultural activities have been created. The County seeks to encourage the sustained productive use of farm and forest lands as a means of maintaining economic balance, conserving natural resources, and providing open space within the County.

Policies under Objective 5.5, in conjunction with policies under Section 6 of the Future Land Use Element, seek to protect the County's agricultural resources by encouraging productive use of farm and forest land, carefully managing the farm and forest ecosystem, protecting farm and forest resources, discouraging the development of land uses that conflict with farm and timber land management, and encouraging participation in various certification and conservation programs. In addition, policies require BMPs and encourage environmental stewardship through a combination of strategies such as participation in voluntary certification programs, land acquisition, and education and outreach.

The choice between regulatory or voluntary programs is a difficult one. Agriculture and forestry have traditionally depended on voluntary programs based on education, technical and financial assistance. A voluntary approach avoids the problems inherent in regulating potential non-point sources. However, voluntary change is most effective when it produces significant personal economic benefits. Adoption of practices that do not significantly improve profitability or solve management problems will be modest, at best, in a voluntary program (Smith 2000).

Farm and Forest predicts that much of the role of encouraging good conservation management will shift to local general government and its land use regulations in the 21st century. Consistent with this forecast, the Southern Forest Resource Assessment points out that, although direct regulation of forestry is limited in the rural south, a proliferation of local regulations affects land use and forest management in urbanizing areas. According to the report, local regulations nearly doubled between 1992 and 2000, and the number of regulations affecting forest treatments are expected to continue to expand in high growth areas. USDA's technical and financial assistance programs are overwhelmed by the sheer numbers of owners involved, and all indications point to a worsening situation in that regard.

Ownership trends in Alachua County mirror national trends in loss of medium sized ownerships. From 1992 to 1997, the number of small farms (less than 50 acres) has increased in Alachua County from 607 to 629, while the number of large farms (greater than 50 acres) has decreased from 482 to 457 (1997 Census of Agriculture). In Alachua County, nonindustrial private landowners are the most numerous and own the largest forest area at 57%, while industrial owners own 41%, and public land comprises 2% of

the forest ownership as of 1995 (IFAS, 2000). Landowner studies show convincingly that, as plot sizes get smaller, management attention wanes and the use of professional management advice declines (Farm and Forest, 1998).

A landscape comprised of fragmented ownership patterns is a complicated setting in which to achieve any kind of coordinated land management strategy. According to Farm and Forest, we may have the science to understand what needs to be done, but we clearly lack the social institutions needed to apply what is known. Both soil and water conservation and private land forestry need a new strategy for the 21st century.

The policies proposed in this plan consider development impacts to the functions of existing natural systems supporting farmlands that go beyond the boundaries of a particular piece of property. If the County, through its permitting function cannot anticipate the costs of clean air, soil characteristics and water, then it should not permit activities that do not replace or repair lost functions. In essence, this is a “level of service” or “concurrency” concept applied to the rural and open spaces of our County - the “green” infrastructure. Proper stewardship of the resources supporting farming is the responsibility of the entire community. The land provides a greater value to the community as a whole than simply the crops produced. Thus, the community must address how the land is used and preserved for both individual economic growth and the well-being of the entire community.

The County will continue to work with various agencies and landowners to promote ecosystem management and preservation activities. Specific strategies are discussed below. These include intergovernmental coordination, working partnerships, BMPs compliance and effectiveness, education and outreach, technical assistance, enforcement of existing County regulations, certification and incentives, and farmland protection strategies.

a. Intergovernmental coordination

The County should take steps to improve coordination with agencies that are already involved in the regulation of agricultural and silvicultural activities in order to eliminate duplication while at the same time addressing local concerns. Relevant agencies may include the state Department of Agriculture and Consumer Services (FDACS), Division of Forestry (DOF), Department of Environmental Protection (FDEP), water management districts, Army Corps of Engineers (COE), Natural Resources Conservation Service (NRCS), and other appropriate agencies.

To this end, the County will officially request and encourage the water management districts, as well as state and federal agencies, to give notice to and coordinate with the County on any pending, contemplated, or proposed actions regarding agricultural and silvicultural activities in Alachua County. The County will request to be copied automatically on permit applications, approvals, compliance and enforcement issues, and other significant contact with these agencies, in a timely manner which affords the County an opportunity to provide meaningful and constructive input regarding activities affecting natural resources within Alachua County. The County will encourage state and federal agencies to address adverse impacts on citizens and communities of the County, including environmental, health, safety, private property, and economic impacts.

The County will coordinate with agencies involved in the regulation of farming and timber harvest operations to ensure that County conservation goals are achieved. This includes participating in compliance audits, site visits and inspections conducted by DOF, DEP, FFWCC, and the water management districts in Alachua County. It is hoped that, through this participation, we may cultivate a

dialogue that includes information-sharing on local natural resources concerns. In addition, the County will look to these agencies as preliminary sources of information when questions arise as to particular activities on a given site in Alachua County.

The County will work closely with agencies involved in the management of forest ecosystems and coordinate with state and federal agencies, private landowners, and private conservation groups in habitat preservation and protection of listed species, to ensure consistency in efforts and encourage joint planning and development of areas to be preserved.

b. Working partnerships

The County must take steps to develop working partnerships with owners and operators of farm and forestry lands and associated products businesses in Alachua County. Both formal and informal mechanisms should be developed to exchange information on local issues and concerns and create solutions that are supportive of farming and forestry while being protective of natural resources within Alachua County over the long term.

The Alachua County Forestry and Agricultural Coalition has already taken significant steps to reach out to the community and embrace the partnership concept. The Coalition is a consortium of agricultural and silvicultural land owners, operators, and resource personnel that formed in the spring of 1999 in response to a local land clearing issue. Members include the Alachua County Farm Bureau, Alachua County Cattlemen's Association, Florida Forestry Association, Rayonier, Inc., Loncala, Inc., The Timber Company, Natural Resource Planning Services, Inc., F&W Forestry Services, Inc., and numerous individual farmers and foresters.

The Coalition was one of four groups of stakeholders that participated in the Alachua County Consensus Project in the spring and summer of 2000 as part of the Comprehensive Plan Update process. As part of the Consensus Project, staff provided assistance to each of the four emergent stakeholder groups and asked them to consider policies contained in a series of six Issue Papers. The Coalition met together for long hours over several months, working through their concerns, and presented findings for their group in writing. Staff later met with the Coalition to clarify information, ask questions, and collect the ideas presented by the participants. The results identify stakeholder positions and ideas.

The diverse ideas emerging from the issue paper phase of the Comprehensive Plan update offer staff new perspectives and possibilities. Moreover, the potential exchange between the Coalition and other stakeholder groups, representing environmental, development, and social concerns, provides an opportunity for deeper understanding of what is best for the community as a whole. This is especially true when the discussion extends beyond special interests and the bureaucratic process.

The Coalition's continued participation in the Comprehensive Plan update, and willingness to work with County staff and other members of the community in a new forum, represents a tremendous step towards transforming a potentially adversarial climate into one where participants can seek creative solutions to the issues facing Alachua County. We hope to continue to build this partnership in follow up to the Comprehensive Plan update. As one certain step, we will proactively seek input from a broad range of members in the agricultural and silvicultural communities during the drafting of local environmental and land development regulations.

c. BMPs compliance and effectiveness

The County should take steps to improve compliance with and effectiveness of BMPs in Alachua County. For example, the County should request that BMPs workshops be held regularly in Alachua County on a periodic basis. By encouraging attendance of landowners, farmers and loggers who work in Alachua County, and targeting local issues for presentation, we can help owners and operators help themselves, and improve stewardship of natural resources in the process. We should also ensure through certification that loggers have appropriate skills and training to comply with Silvicultural BMPs, and prevent bad actors who knowingly fail to comply with BMPs from conducting business in Alachua County. Along similar lines, we can recommend that logging contracts contain damage liability clauses and requirements to conform to BMPs.

Another avenue to pursue will be participating in meetings and field visits of various BMPs technical advisory committees. Although, for instance, the silvicultural technical advisory committee meets only every two years, the meetings still afford the opportunity to provide input regarding local issues the County may feel are inadequately addressed in the statewide BMPs.

Finally, the County will work with the FDACS, as well as other agencies and landowners to continue to evaluate the effectiveness of BMPs with regard to farming forest management practices, such as clearcutting, that have potential visual and environmental impacts; use of prescribed burning; protection of biological, soil, and water resources; and protection of old growth forests in Alachua County. If the BMPs are determined to be inadequate, we will collaborate on strategies to address inadequacies.

d. Education and outreach

One challenge to the County, in implementing these policies, is to educate and inform the public concerning the benefits of conservation through a direct education and outreach program. While the County can't force people to take advantage of educational opportunities, it remains obligated to make the information available to people in an easily understandable format. Although it contains policies focusing on public participation, the Comprehensive Plan adopted in 1991 makes little reference to the need for public education and information, a necessary antecedent to meaningful input. Proposed policies in section 2 of the Conservation Element address this concern.

There are numerous outreach efforts that have an established track record in Alachua County, such as the County Extension Office, IFAS, DOF, and the county and state Farm Bureaus. These entities offer educational and outreach programs, as well as technical assistance, that are intended to enhance environmental quality. We aim to coordinate with and participate in these established efforts.

Stewardship management plans and multi-resource practices can help enhance forest and ecosystem health across the entire landscape. According to the USDA, the 9.9 million non-industrial private forest landowners control 48% of the nation's forests, but less than 10% of them have a written management plan. As part of our efforts to develop partnerships and cooperative efforts, the County will encourage forest owners to consult with professional foresters in the management of their forests. Consulting foresters provide technical assistance on all phases of forest management for a specified fee or under contract. Lists of individual consultants, consulting firms, and forest industry consultants are available. In addition, County extension agents are foresters and agricultural experts who provide educational programs for landowners, answer forestry questions, distribute publications, and refer landowners to other forestry related services and industries.

e. Existing County regulations

Existing County regulations incorporate four basic concepts of a program that addresses silvicultural activities and natural resources protection:

- Mandatory compliance with statewide BMPs as the minimum standard.
- Signed agreement to comply with statewide BMPs on file for wetlands activity.
- Forest management plan required subject to County review.
- Notice of activity required prior to harvesting, site prep, land clearing.

This approach incorporates procedures aimed at addressing local concerns with BMPs implementation. Rather than prescribing additional technical standards other than those included in BMPs, the focus on BMPs compliance and effectiveness fills temporal and spatial gaps in, rather than duplicating, statewide compliance and effectiveness efforts. Where statewide compliance is evaluated every two years, audits are conducted on less than a handful of sites within the north central Florida region, and the technical advisory committee meets every two years to discuss BMPs effectiveness, Alachua County may address local concerns which affect natural resources in Alachua County as the concerns arise.

Tree removal or land clearing operations associated with development or other activities that have non-forestry objectives, for which BMPs are not intended, are considered development activities subject to the policies in this element and applicable land development regulations.

In working with landowners on BMPs, the County may wish to discuss techniques that are recognized as preferred or suggested within the BMPs for attaining natural resource protection goals. For instance, there are higher levels of protection recognized in the BMPs for special management zones and forested wetlands. Certain sites may have such special resource characteristics that harvesting using alternatives to clearcutting is required in order to protect the resource.

f. Certification and incentives

The County will encourage and support conservation programs on private farms and forests, to the extent that these programs remain viable, funded options in Alachua County. The County will facilitate and encourage qualified landowners to enroll in various certification and conservation programs, including the TDR program. The County will discourage the development of land uses that conflict with agricultural and silvicultural activities.

The County will also take proactive steps to create enhanced opportunities for private service providers. As opposed to public programs, where the supply of assistance is set by political decisions in a highly competitive public policy setting, private supply can respond to increased demand and higher prices. Where local forestry and erosion and sediment control legislation demands a plan prepared by a qualified professional, private consultant businesses will thrive. Those demands aren't likely to be filled by NRCS technicians and state foresters, whose numbers couldn't begin to respond to the need.

The Forest Management Trust in Gainesville is in the process of preparing a proposal that would have the County (and possibly other public and private partners) fund a "scoping study" for FSC certification of all public lands within Alachua County, and may allow for private landowners to piggyback onto this effort for a modest fee. The results of this scoping should be an analysis of potential benefits, as well as a checklist of what each landowner would need to do to be eligible for FSC certification and how much the direct and indirect costs of doing so might be.

g. Farmland protection strategies

State and local governments have taken the lead in encouraging farming and protecting farmland for more than 40 years. All states provide property tax relief for owners of agricultural land and protection from nuisance lawsuits for farmers. Many states have additional programs that are designed to prevent farmland conversion and improve the economic viability of farms. In most jurisdictions, agricultural uses are allowed by right in virtually any land use or zoning district, provided minimum lot or acreage requirements are met. Some local communities also use comprehensive land use planning and farm-friendly zoning ordinances to control growth in agricultural areas. Some counties and towns also have purchase of agricultural conservation easement (PACE), agricultural districts, and other programs to protect farmland.

Some farmland protection tools rely on regulations. The advantage of regulatory strategies is that they can be put in place relatively quickly, and do not require governments to spend a lot of money. But new land use regulations are often controversial, and laws can always be changed--they don't guarantee that farmland will be protected in the long term.

Other programs give farmers economic incentives to keep their land in agriculture. These programs are voluntary, and they are usually more popular than regulations. But they may also be more expensive, and they may not be able to protect large blocks of land. For an overview of the different farmland protection tools and techniques, see Inset 20.

The rural area encompasses unique farmlands and wetlands. It is to be preserved primarily for agricultural use if possible. If not, it may be developed only at low residential densities. To preserve the area for agricultural use, several programs are offered, including unique development options targeted to achieve the goal of farmland protection and agricultural perpetuation. It is through this combination of public action and private development that a viable program for the protection of farmlands and the perpetuation of agriculture will occur.

Identification of prime farmland

As described in several locations in this data and analysis, much of the area in Alachua County is used for agriculture, and agriculture is the most significant industry in the region. Though the importance of farmland and farmland protection is recognized by federal and state law, local planning and zoning has in the past neglected the issue of prime agricultural land and the conflicts that arise between expanding development and successful farming.

The USDA defines prime farmland as the land best suited to food, feed, forage, fiber, and oilseed crops. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment. The County *Soil Survey* not only contains yield data for crops and pasture, but also specifically identifies soils considered prime farmland. Consequently, the county *Soil Survey* provides a preliminary definition of prime agricultural land.

However, problems created by direct and indirect effects of development indicate that, within the context of land use planning and zoning, the definition of prime agricultural land must be based on more than the traditional measures of soil productivity and crop yields. Instead, prime or select farmland should be defined by a combination of productivity and location. In the rural and urban fringe areas of today, the distance to residential development is becoming an increasingly important spatial characteristic affecting production.

Prime agricultural land differs from other agricultural land designations in that it generally consists of highly productive soils. However, moderate and low productivity soils should be designated prime if such soils lie within, or are surrounded by contiguous areas identified as prime farmland. The inclusion of these soils may act to discourage development on the less productive or sloping soils of an otherwise prime agricultural area. Should such development occur, remaining prime agricultural land may no longer satisfy the requirements of a prime designation. Productivity is also a secondary factor when considering prime land designations in a rural area with confined feeding operations. Furthermore, "unique" farmland within metropolitan areas can be considered prime if it provides a community with demanded farm produce (often higher-valued crops such as fruits and vegetables), open space, scenic values, or related amenity benefits. Such benefits are important in a planning and zoning context since they are public goods and can contribute to a community's "quality of life."

The Earth Resources section of this data and analysis contains discussion of the identification of important agricultural soils in Alachua County, as well a maps of these soils. These include prime agricultural soils, as identified by the U.S. NRCS, and important agricultural soils, as determined by soil capability classes in combination with soil potential.

Regulatory strategies

While zoning is the primary method used to influence urban land use, relatively little zoning is practiced in rural and urban-fringe areas. Current planning and zoning practices provide only a weak device for retaining land in agriculture. Fortunately, unconventional zoning methods such as urban growth boundaries and clustering do exist to preserve prime agricultural land.

A comprehensive plan can form the foundation of a local farmland protection strategy by identifying areas to be protected for agricultural use and areas where growth will be encouraged. Policies in the Future Land Use Element of this plan provide for an urban growth boundary, designed to conserve natural resources and provide affordable housing and adequate public services.

Today, Alachua County joins the ranks of the many Florida counties looking for innovative planning measures to encourage cluster development and avoid the proliferation of five-acre ranchettes across the rural landscape. The conventional approach to development results in an entire development parcel being covered with house lots and subdivision streets. Clustering allows a substantial portion of every development tract in the rural area to be preserved as productive farmland or unbuilt open space, without decreasing the development potential for both landowner and developer.

Policies in the Future Land Use Element, as well as the Conservation Element, require clustered development approaches in order to facilitate the location of homes and associated buildings on specific portions of a geographic area or site, while leaving the remaining land for agricultural use, natural resource protection, or open space. Resource planning must occur early in the process to avoid sprawl and unintended inefficiencies in resource use. See the Future Land Use Element for further discussion of this topic.

Incentives

Public and private programs which provide landowners with voluntary incentives to maintain rural lands in low intensity agriculture and preserve natural communities need to be continued and expanded to encourage the participation of both small and large landowners. Many programs are not well promoted, involve burdensome paperwork and processing, and do not provide the monetary compensation necessary

to attract land owners. Incentive programs should target ecologically important areas, and information about the array of programs available, and how to navigate through them, should be made more widely and easily available to land managers.

Inset 20: Incentives for Farmland Protection

Tax Incentives

Differential assessment laws direct local governments to assess agricultural land at its value for agriculture, instead of its full fair market value, which is generally higher. Differential assessment laws are enacted by states and implemented at the local level. With a few exceptions, the cost of the programs is borne at the local level.

Differential assessment programs help ensure the economic viability of agriculture. Since high taxes reduce profits, and lack of profitability is a major motivation for farmers to sell land for development, differential assessment laws also protect the land base. Finally, these laws help correct inequities in the property tax system. Owners of farmland demand fewer local public services than residential landowners, but they pay a disproportionately high share of local property taxes. Differential assessment helps bring farmers' property taxes in line with what it actually costs local governments to provide services to the land.

Right-to-Farm Laws

Right-to-farm laws are a state policy assertion that commercial agriculture is an important activity. The statutes also help support the economic viability of farming by discouraging neighbors from filing lawsuits against agricultural operations. Beyond these protections, it is unclear whether right-to-farm laws help maintain the land base.

A local right-to-farm ordinance can serve as a formal policy statement that agriculture is a valuable part of the county or town economy and culture. Some require that a notice be placed on the deed to all properties in agricultural areas, cautioning potential buyers that they may experience noise, dust, odors and other inconveniences due to farming and ranching operations. Local ordinances help educate residents about the needs of commercial agriculture and reassure farmers that their communities support them.

Rural Land Stewardship Areas

In 1995, the Legislature created a section of state law dealing with "innovative planning and development strategies" (S. 163.3177, F.S.). That law was expanded in the 2001 Legislative Session to provide for the designation of Rural Land Stewardship Areas. Under this program, FDACS is authorized to test a new concept involving clustering development in rural areas and using the purchase of development and density rights to preserve the land around the development. The method referred to in the legislation involves the use of transferable rural land use credits. These credits can only exist inside a designated Rural Land Stewardship Area.

A local government may apply to the Department of Community Affairs for the establishment of Rural Land Stewardship Areas. Five such areas are authorized to be designated under this pilot program. Those approved will be subject to a joint agreement between the DCA and the local government.

According to the law, a stewardship area shall not be less than 50,000 acres and shall not exceed 250,000 acres in size. Designation of the receiving areas will take place by way of Local Comprehensive Plan amendments which will also be reviewed by the Department of Community Affairs.

One of the stated purposes of this legislation is to acknowledge the problem inherent with scattered development by attempting to use both innovative planning tools and transferable development rights to stop sprawl or spot development. The pilot is further aimed at exploring the potential for protecting environmentally sensitive lands and better preserving agricultural areas through this approach. The market will in large measure determine how successful it may be from a land preservation standpoint.

Among the unknowns of this new concept is what effect existing federal or state land conservation programs will have on the stewardship areas. No county has requested such a designation at this time, but Alachua County will investigate participation among its farmland protection strategies..

Transferable development rights (TDRs)

In addition to zoning, a county or local government can utilize transferable property rights to provide a more lasting means of preserving prime or select agricultural land. A program for transfer of development rights (TDR) allows landowners to sell their development rights to a developer. In turn, the developer may use them to develop qualified lands at higher densities than allowed under existing zoning laws. A TDR program allows local governments to steer development to desirable areas (such as those with sufficient infrastructure) while assuming little financial burden.

Purchase of development rights (PDRs)

Under a similar program for purchase of development rights (PDR), landowners can sell conservation easements to governmental agencies or nonprofit organizations. PDR involves the purchase of a deed restriction on qualified farmland that restricts the future use of the land to agricultural or open space uses, either permanently or for a specified period of time. While the farmer retains the right to sell or transfer the land, it remains subject to the deed restriction precluding any future development or activities that may negatively impact its agricultural viability. An owner of agricultural land may also donate a conservation easement to a governmental agency or charitable organization and receive a charitable deduction (see 26 U.S.C.. § 170 (h)(4)(A)).

Acquiring the financial resources needed to purchase development rights is the greatest hurdle for implementing a PDR program. Importantly, a planning commission/ordinance committee must carefully establishment criteria from which to determine a farm's eligibility for participation in the program. Criteria should specifically target key parcels that would preserve the county's agricultural potential and open space amenities.

Cooperative state-local PACE programs have some advantages over independent state or local programs. Cooperative programs allow states to set broad policies and criteria for protecting agricultural land, while county or township governments select the farms that they believe are most critical to the viability of local agricultural economies, and monitor the land once the easements are in place. Involving two levels of government generally increases the funding available for PACE. Finally, cooperative programs increase local government investment in farmland protection.

Conservation easements

Agricultural conservation easements are designed specifically to protect farmland. Grantors retain the right to use their land for farming, ranching and other purposes that do not interfere with or reduce agricultural viability. They hold title to their properties, and may restrict public access, sell, give or transfer their property, as they desire. Producers also remain eligible for any state or federal farm program for which they qualified before entering into the conservation agreement. Conservation easements limit land to specific uses and thus protect it from development. These voluntary legal agreements are created between private landowners (grantors) and qualified land trusts, conservation organizations or government agencies (grantees). Grantors can receive federal tax benefits as a result of donating easements. Grantees are responsible for monitoring the land and enforcing the terms of the easements.

Easements may apply to entire parcels of land or to specific parts of a property. Most easements are permanent; term easements impose restrictions for a limited number of years. All conservation easements legally bind future landowners. Land protected by conservation easements remains on the tax rolls and is privately owned and managed. While conservation easements limit development, they do not affect other private property rights.

Agricultural conservation easements are a flexible farmland protection tool. Private land trusts and other conservation organizations educate farmers about the tax benefits of donating easements, and state and local governments have developed programs to purchase agricultural conservation easements from landowners. In addition, agricultural conservation easements can be designed to protect other natural resources, such as wetlands and wildlife habitat.

Florida Rural Family Lands Act

The Florida Rural and Family Lands Protection Act was approved by the 2001 Florida Legislature as a state-level voluntary program aimed at offering financial payments to landowners for conservation agreements or easements. The purpose of the program is to prevent agricultural land from inappropriately converting to a development land use category. Environmentalists support the program as a means of protecting open space, fish and wildlife habitat. The agricultural community supports it as a way to preserve agricultural land and to help support farmers. The program, although authorized by law, has not yet been funded.

Once funded, landowners will be able to receive financial payments for one of the following arrangements: a protection easement lasting in perpetuity, a 30-year protection easement, or a 5-10-year protection easement. The easements are attached to the landowner's property deed. The easements may restrict the construction of buildings, roads, billboards, other advertising, or utilities; subdividing the property; dumping; or any activities that adversely affect the hydrology of the land, soil conservation, fish or wildlife habitat. The Act also requires that the landowner grant the state an option to purchase the property at the conclusion of the agreement or an extension of up to five years with the right to purchase attached.

The program is created through F.S. 570.70 and 201.15. The FDACS is given the responsibility for implementing the program. However, until funding is provided, FDACS is not prepared to enter into any agreements, although rule development is underway.

Voluntary agricultural districts

A landowner friendly form of exclusive agricultural zoning is the voluntary creation of agricultural districts. Agricultural districts are voluntarily designated areas where farming is the primary land use and other uses are discouraged or restricted. The benefits which farmers obtain by voluntarily joining an agricultural district may include differential assessment, protection against nuisance ordinances, and limits on public investments for nonfarm improvements.

This strategy stabilizes the agricultural land base by keeping large tracts of land relatively free of non-farm development. This can reduce the likelihood of conflicts between farmers and their non-farming neighbors. Communities can use agricultural districts to conserve a "critical mass" of agricultural land, enough to keep individual farms from becoming isolated islands in a sea of residential neighborhoods. Maintaining a critical mass of agricultural land can ensure that there will be enough farms to support local agricultural service businesses. By restricting the development potential of large properties, agricultural districts limit land speculation and help keep land affordable to farmers and foresters. Finally, agricultural districts help promote orderly growth by preventing sprawl into rural areas, and benefits farmers and non-farmers alike by protecting scenic landscapes and maintaining open space.

Mitigation ordinances

Mitigation ordinances are a new farmland protection technique. In 1995, city officials in Davis, Calif., enacted an ordinance that requires developers to permanently protect one acre of farmland for every acre of agricultural land they convert to other uses. Generally, developers place an agricultural conservation easement on farmland in another part of the city, although mitigation may also be satisfied by paying a fee. While most of the regulatory farmland protection techniques restrict the property rights of farmers, the Davis mitigation ordinance makes developers pay for farmland protection.

HUMAN-RELATED RESOURCES

Wildfire Mitigation

A. Introduction

During the last half of the 20th century, several growth-related issues have severely impacted the threat of wildfire on the public and its improved properties as well as wildland areas. As the population of Florida increased due to the migration of people from other areas, new development pushed into agricultural and native vegetation areas of our state. This happened not only because more space was needed for urbanization, but also because these new residents wanted to live among Florida's year round natural green foliage. Prescribed fire activities to manage natural fuels in these areas became unpopular as new residents did not understand the importance of fuels management and fire in Florida's ecology. New residents appreciated neither the smoke from natural or prescribed fire or the initial appearance of newly burned areas. The result was an approach to more often extinguish natural fire quickly and minimize the use of prescribed fire. We now have a large developed area of Florida with a "wildland/urban interface", where improved properties meet the natural environment (wetlands, grasslands, brushlands, and woodlands) and each is threatened (urbanization by wildfire, and wildlands by the increased opportunity for ignitions and destruction). The current interface exposure and wildfire potential far exceed the capabilities of local government and wildland fire agencies to both control and suppress wildfire while simultaneously protecting interface structures and residents.

B. Wildfires of 1998

In 1998 the threat of wildfire devastation hit home when wildfires in the vicinity of Waldo burned some 7,000 acres. This was one in a month-long array of firestorms that swept northeast Florida in June and July, causing hundreds of injuries and damaged homes, thousands of evacuations, and total damages of approximately 640 million dollars throughout this part of the state. FEMA declared Waldo and many other areas in northeastern Florida "disaster areas," making funds available to assist with fire fighting and response costs. Every year since has seen significant wildfire events in various parts of the state, as an extended drought has led to dry fuels that ignite easily and are difficult to extinguish.

Both FEMA and the Florida SDEM have offered that beginning in the near future disaster monies in the aftermath of severe community destruction will be available only to communities who have developed the Local Mitigation Strategy (LMS) and have begun mitigating the hazards. The wildland/urban interface is one of the most significant hazards in Alachua County and continues to grow along with new development and the urban sprawl that places humans and structures closer to forested wildlands.

C. Local approach: Alachua County

1. Local Mitigation Strategy

During 1998 and 1999, Alachua County spearheaded a cooperative effort with five of nine participating municipalities to develop a county-wide LMS. Participating municipalities were the Cities of Alachua, Archer, Hawthorne, Micanopy, and Waldo. The completed LMS was delivered to DCA on October 31, 1999.

The LMS identified as one of eight mitigation strategies the need to address the wildland/urban interface to prevent a replay of the wildfires of 1998. In follow-up, the County has begun a series of initiatives to mitigate the wildfire and interface problem through the implementation of Firewise principles, natural fuels management, and public education and information practices.

2. Firewise

New policies in the Comprehensive Plan require the application of Firewise principles in the planning, design, construction, and future maintenance of new development. These principles are intended to provide “passive” protection for homes and improved properties through the use of setbacks, firewise landscaping, structure design, exterior construction materials, structure siting on the property, and the maintenance of these features for the long-term protection of residents and property.

In the summer of 2002, the DOF is expected to complete a statewide wildfire hazards mapping and modeling project. This project will determine where moderate to high wildfire hazard areas exist based on features such as plant community type and development stage, canopy cover, hydrology, soils, slope, aspect, and elevation. Alachua County will use this information as the foundation for our mapping and ranking of wildfire hazard areas within the County. Firewise principles and land use controls will be applied in these areas in order to mitigate the potential wildfire hazard.

3. Natural fuels management

Wildfires will always be a natural phenomenon where there is frequent lightning and vegetation capable of igniting, and Florida certainly has ample quantities of both. We know that fire is a very important component of maintaining the health of natural systems. For thousands of years, wildfires have shaped the ecology of Florida. In addition to mimicking natural ecological processes, prescribed burning reduces the risk and severity of wildfire by replicating the frequent surface fires that once eliminated fuel build-up in the forests.

Although Florida is a national leader in prescribed burn acreage, the number of acres of private forest lands that are burned has been declining. Contributing factors include forestry economics, liability concerns, landscape fragmentation, regulatory process, fuel buildup, and loss of traditional knowledge. The Florida Prescribed Burning Act of 1990 provided liability protection for approved prescribed burning. However, this has not proved to be a sufficient incentive to increase prescribed burning on private forest lands.

In Alachua County, we do not attempt to prevent fire completely, and we recognize that not all wildfires are bad. The County has set the example to all by taking on natural fuels management on County lands, and by providing assistance to private land-owners and the commercial sector with appropriate practices to control the accumulation of natural fuels through prescribed burning, mechanical reduction/removal, and other appropriate measures.

4. Public Education

In addition, the County seeks to maintain a long term public education and information program for the public about the benefits of Firewise principles and the use of prescribed fire to the public both in terms of personal and home safety and the environment. On October 4, 2001, the County co-sponsored a “Firewise Communities in Florida” workshop in cooperation with the Florida Division of Forestry. This workshop brought together local policymakers, growth planners, developers, builders, financial institutions, citizens, and fire officials to discuss fire safe planning and development in the interface. The County will continue with similar outreach and education efforts to people who live and work in hazard areas.

D. Sources of information on wildfire in Florida

FireWise: the National Wildland Urban Interface Fire Protection Program: <http://www.firewise.org/>

Prescribed Fire Information from Florida Division of Forestry's Fire and Forest Protection Bureau: <http://flame.fl-dof.com/Env/fire.html>

Florida **Fire Weather** from Florida Division of Forestry's Fire and Forest Protection Bureau: http://flame.fl-dof.com/fire_weather/nws/

Florida Division of Forestry's **Wildland Fire Information:** <http://www.fl-dof.com/fire2001/index.html>

Florida Division of Forestry's **Wildfire Season Forecast:** http://flame.fl-dof.com/fire_weather/lr_outlook/seasonal.html

"**Fight Fire with Fire!**" is a web site designed for Floridians to learn how to protect themselves and their homes from the threat of wildfire. <http://www.prescribed-fire.org/>

A Guide for Prescribed Fire in Southern Forests, USDA, Forest Service Southern Region, 1989; Tech. Pub. R8-TP 11 by Dale D. Wade, Southeastern Forest Experiment Station; and James D. Lunsford, Fire Management, Southern Region, USDA Forest Service: <http://flame.fl-dof.com/Env/RX/guide/>

USDA **Forest Service's** Fire site: <http://www.fs.fed.us/fire/>

National Interagency Fire Center's site (all federal agencies responsible for fire management . Bureau of Land Management, Bureau of Indian Affairs, US Fish and Wildlife Service, National Park Service, US Forest Service, National Oceanic and Atmospheric Administration, Office of Aircraft Services, and National Association of State Foresters): <http://www.nifc.gov/>

Fire in Florida's Ecosystems: A fire ecology instructional package for Florida educators (training and materials) <http://pandionsystems.com/FIFE/>

Woods on fire (from the Why Files): This edition of The Why Files examines the role of fire in natural systems, and the role of science in understanding wildfires. http://whyfiles.org/018forest_fire/

Tall Timbers Research Station the originators of fire ecology research & education. Check out their Fire Ecology Literature Database! <http://www.talltimbers.org/>

For the latest KBDI (the Keetch Byram Drought Index . an index of fuel moisture): http://flame.fl-dof.com/fire_weather/kbdi/

HUMAN-RELATED RESOURCES

Hazardous Materials

A. Introduction

In 1983, the Florida legislature enacted the Water Quality Assurance Act to protect the state's water resources. One problem threatening these resources was improper management of hazardous wastes. This legislation required each county to conduct a local hazardous waste assessment. Alachua County responded with a report entitled Hazardous Waste Management Assessment for Alachua County, prepared in May 1987. Issues related to hazardous waste management at that time included the following: (1) improper management of wastes, estimated at 23% of all wastes, by improper landfilling, dumping or burying, disposal in a public sewer or septic tank; (2) the need for facilities for treating, storing, or transferring hazardous wastes generated by small quantity generators, including recycling and educational opportunities; (3) the presence of 29 identified abandoned dump sites, most of which were once used for municipal refuse; (4) known contamination sites with groundwater monitoring efforts in place; (5) other known and potential contamination sites identified by FDOT, FDEP, and ACEPD, including both petroleum and non-petroleum sites; (6) five existing sanitary landfills, only one of which is currently active (the Southwest Landfill).

Alachua County has taken an aggressive approach in responding to these issues over the last decade through the establishment and implementation of the Alachua County Hazardous Materials Management Code, the development and administration of the facility inspection program, state tanks compliance and petroleum remediation programs, the household hazardous waste collection program, and the brownfields program, and the cultivation of a coordinated interdepartmental approach to hazardous materials and solid waste in Alachua County.

B. Hazardous Materials Management Code

The Alachua County Hazardous Materials Management Code (HMMC) sets the framework for regulation of hazardous materials in Alachua County. The HMMC was initially adopted on April 15, 1991 and revised on January 25, 2000. The primary objectives of the HMMC are to:

- * Regulate the management of hazardous materials to prevent discharges to the environment.
- * Provide uniform standards for the proper storage, handling and monitoring of hazardous materials on a county-wide basis.
- * Provide Alachua County with legal authority to establish environmental monitoring, remediation, and closure requirements for contaminated sites.

The first two objectives are currently being achieved through an active enforcement and inspection program for the storage, management and disposal of hazardous materials. The third objective has been achieved through ACEPD's role in the monitoring, remediation, and closure of contaminated sites, as discussed later in this section.

Basic provisions of the HMMC include: siting prohibitions, construction standards, and management standards. The HMMC is applicable to all facilities within the county that transport, handle, or store hazardous materials. Facilities are classified according to their type of business. There are currently six classes within the HMMC (AA, A, B, C, D, T). There are over 1,000 regulated facilities in Alachua County (See Map 46).

The HMMC applies to commercial and governmental facilities only and does not apply to residential properties with the exception of the hazardous materials release reporting and remediation requirements. Residential underground fuel tanks are not regulated by this code. Before use of natural gas and electric heat pumps became common, homes were heated with kerosene or No. 2 fuel oil. As homeowners converted to other forms of heating, their fuel-containing tanks may have been improperly abandoned, creating a potential source for groundwater contamination. ACEPD has been unsuccessful in attempts to obtain funding for a Household Fuel Oil Recovery Program.

1. Facility Inspection Program

Current compliance with the HMMC is enforced through an on-going facility inspection program and response to citizen complaints. Inspections are performed at private, local, state, and federal facilities with the exception that the HMMC is currently not enforced at the University of Florida campus due to university officials’ claim of exemption. Inspection frequency is determined on size and complexity of operation. Future and potential hazardous materials compliance issues are identified through the participation of ACEPD staff in Alachua County and City of Gainesville development review processes.

Alachua County through the ACEPD has integrated the state required Small Quantity Generator (SQG) inspection and reporting program into the HMMC inspection program. Currently our database includes 1,0250 CESQG (Conditionally Exempt Small Quantity Generators), 47 SQG (Small Quantity Generators), and 8 LQG (Large Quantity Generators). Approximately 40% of the generators are inspected annually. Representative amounts and types of wastes generated by large and small quantity generators are listed in Tables 18 and 19 below.

Table 18. Hazardous Wastes Reported Amounts By LQGs in Alachua County (1995)

Generator	Pounds*
Eveready Battery Company, Inc.	3,012,209
PCR, Inc.	960,749
Beazer East, Inc. (Cabot Carbon/Koppers)	394,630
University of Florida	160,464
Bear Archery, Inc.	72,289
Hunter Marine Corp.	66,970
Metal Container Corp.	43,659
Farchan Laboratories, Inc.	37,708
Gainesville Raceway	26,853
US Dept. of Agriculture	2,626
Perma-Fix of Florida, Inc.	636

Source: FDEP Database

* Includes production and service process waste, cleanup waste and pollution control waste.

Table 19. Reported Amounts By Waste Types For SQGs in Alachua County (1996-1997)

Code	Description	Facilities	Pounds	Percent
A0	Toxic pesticide wastes d,u list	6	1,533	0.01
B0	Pesticide waste mixtures/waters	22	81,990	0.49
C0	Empty pesticide containers D, U listed	26	4,162	0.02
D0	Wastewaters with tc organics - e.g. benzene	14	49,648	0.30
D1	Condensate h2o from dry-cleaners	1	801	0.00
D2	Petroleum contact waters- pcw	5	203,070	1.22
E0	Sludges & solids with tc organics -also soils	13	59,575	0.36
F0	Dust and solids with heavy metals	24	1,699	0.01
G0	Wash, rinse & other wastewater w heavy metals	22	15,037	0.09
* G1	Spent anti-freeze w/ low lead (< 5 ppm)	184	* 614,282	3.69
H0	Sludges with heavy metals	3	67	0.00
I0	Waste ink-flashpoint<140 f and heavy metals	3	1,117	0.01
I1	Waste inks - flashpoint < 140 f	8	19,243	0.12
I2	Waste inks - contains heavy metals	1	315	0.00
	Ignitable paint wastes - flashpoint < 140 f	64	101,716	0.61
J1	Used paint thinner	44	16,269	0.10
K1	Paint stripper- > 10 % methylene chloride	4	425	0.00
L0	Spent solvents (Mix/other)	44	84,733	0.51
L1	Halogenated solvents-contains chlorine or fluoride	8	2,562	0.02
L2	Non-halogenated solvents-e.g. mineral spirits	30	14,627	0.09
L3	Mineral spirits-parts cleaner	273	178,585	1.07
L4	Spent acetone	12	26,510	0.16
L5	Spent methyl ethyl ketone(mek)	1	369	0.00
L6	1,1,1 trichloroethane or methylene chloride	4	8,466	0.05
M0	Solvent distillation bottoms	6	8,317	0.05
M2	Dist. Bottoms-non-halogenated	2	8,306	0.05
M3	Perchloroethylene still bottoms	12	10,392	0.06
M4	Absorbents with halogenated solvents	1	120	0.00
M5	Absorbents with listed non halogenated solvent	329	749,560	4.50
M6	Absorbents contaminated w/oil	10	8,420	0.05
N0	Dry cleaning filters	23	11,086	0.07
N1	Used perchloroethylene	1	203	0.00
O0	Reactive wastes - with cyanides or sulfides	5	287	0.00
O1	Cyanide wastes	2	52	0.00
O2	Sulfide wastes	1	0	0.00
P0	Acidic or alkaline wastes - ph<2 or ph>12.5	207	231,759	1.39
Q0	Spent plating wastes-from metal-plating, etc.	1	1	0.00
R0	Discarded gasoline, diesel or other fuels	24	49,520	0.30
S0	Photographic wastes-prim.fixant solution	210	168,745	1.01
S1	Photographic silver recovery cannister	3	115	0.00
T0	Other ignitable wastes - not I0,J0,L0 or R0	6	3,342	0.02

V0	Discarded unused or off-spec commercial chem	9	4,923	0.03
* W0	Lead-acid batteries	343	* 2,447,905	14.69
W1	Mercury oxide batteries	1	250	0.00
W2	Rechargeable batteries: pb-acid or nicads	4	4,625	0.03
W3	Fluorescent lamps	6	356	0.00
* Y0	Used oils & other lubricants	519	* 2,946,844	17.68
Y1	Metalworking (cutting) oils	1	30	0.00
* Y2	Crushed oil filters	384	* 8,504,762	51.04
Y3	Hydraulic oil	10	9,045	0.05
Y4	Used oil contaminated w/ halogenated haz waste	1	76	0.00
Z1	Carburetor cleaner	8	1,530	0.01
<u>Z2</u>	<u>Benzene, toluene, or xylene - spent</u>	<u>2</u>	<u>5,670</u>	<u>0.03</u>
TOTALS			16,663,042	100.00

Source: ACEPD SQG Database

* Predominantly recycled wastes.

2. On-Call Program

Alachua County, through the staff of the ACEPD, maintains a 24-hour a day, 7-day a week capability for notification of hazardous materials incidents. ACEPD has on-site response capabilities related to environmental concerns to provide technical assistance in the event of chemical and fuel spill incidents. This capability is primarily directed toward assuring that the appropriate clean-up of spills occurs through contact with principle responsible parties and insurance companies and environmental consultants. Cleanup costs are handled directly by the responsible party. For large spills and discharge incidents, ACEPD coordinates with and seeks the assistance of the FDEP Emergency Response Team, which assumes primary responsibility for clean-up and containment of large hazardous materials discharges. ACEPD staff responds to an average of 40 incidents each year. Most of these incidents were caused by traffic accidents involving commercial vehicles and usually involved spills of automotive fuel (diesel or gasoline).

Alachua County maintains good working relations with appropriate State and Federal environmental regulatory agencies. The ACEPD continues to maintain an active role in coordinating with state agencies and enforcement of state environmental regulations through referrals to FDEP and contractual agreements with FDEP for specific functions.

C. State Tanks Compliance and Petroleum Remediation Programs

Two programs of particular importance to the protection of the county's groundwater resources which have continued and increased in importance since 1991 are the enforcement and remediation requirements of the State Tanks Program and the Petroleum Contaminated Sites Remediation Program. These programs are funded by annual appropriations by the state legislature. The recent funding level for the State Tanks program has been stable in the last few years. The tanks program deals with the enforcement of construction and monitoring standards for existing and new underground tanks primarily for petroleum products. State funding for the petroleum cleanup(remediation) program was drastically reduced beginning in 1995 but has since stabilized at a lower funding level. The remediation program deals with cleanup of soils and groundwater that have been contaminated by petroleum products.

1. State Tanks Compliance Program

Alachua County through the ACEPD is contracted with the State of Florida to enforce Florida Administrative Code (FAC) Rules 62-762 and 62-761, governing regulated tank systems. This includes aboveground tank systems greater than 550 gallons and underground storage tank systems greater than 110 gallons that contain regulated substances, including petroleum product (gasoline, diesel, kerosene), oil of any kind, ammonia, chlorine, pesticides and derivatives thereof, and hazardous substances as defined in Section 101 (14) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

The focus of both rules is to prevent the release of regulated substances into the environment by providing standards for the construction, installation, maintenance and removal of the regulated storage tank systems. All new underground storage tank systems (tanks and associated piping) are required to be provided with secondary containment (primarily in the form of double walled construction) in order to improve the detection and containment of a release. All existing systems within the state and county are required to have been replaced with a double walled system as of December 31, 1998, unless the system is constructed of corrosion resistant materials, whereas replacement is not required until December 31, 2009.

All new aboveground tanks and underground integral piping are also required to be provided with secondary containment. Existing systems are required to have provided secondary containment as of December 31, 1999.

The rules prohibit the installation of a tank system within 50 feet of any potable water supply well. Additionally, effective July 13, 1995, pursuant to FAC Rule 62-521, no new storage tank system is allowed to be installed within 500 feet of a community water system or non-transient non-community water system. Before a system is closed, replaced or otherwise provided with secondary containment, a closure assessment must be performed to determine if a release has occurred by sampling soil and groundwater in locations where a release is most likely to have occurred. There is an obligation to report releases once they are discovered and undertake certain corrective actions following criteria found in FAC, Rule 62-770.

ACEPD inspects each facility at least one time per year and is onsite during installation and closure activities as well as during investigations of releases. There are approximately 275 facilities in Alachua County regulated by the state tank rules, as shown on Map 47.

2. Petroleum Contaminated Sites Remediation Program

Alachua County through the ACEPD is also under contract with Florida Department of Environmental Protection Bureau of Petroleum Storage Systems (FDEP) to manage the assessment and remediation of petroleum contaminated facilities in accordance with the requirements and provisions of Sections 376.3071 through 376.3073, F.S., and Chapters 62-770 and 62-771, F.A.C. Primary responsibilities include project management, review of hydrogeological and engineering related documents, analysis/interpretation of scientific and technical data, contract procurement, and fiscal support for the various FDEP petroleum cleanup programs. In addition, two subcontractors have been procured to perform cleanup activities for the state-administered cleanup program.

The number of reported petroleum contaminated sites has grown statewide and is anticipated to continue to do so, as more contaminated facilities are identified. Contaminated sites in the state program are scored based on several factors including the extent of contamination and potential endangerment to drinking water and other critical natural resources. Priority for clean-up actions is given to those sites with the highest scores on a statewide basis. Currently, there are approximately 310 petroleum contaminated sites in Alachua County - up from the original 60 sites reported - in all phases of cleanup. Since the establishment of the petroleum program in the County in 1988, seventy-eight facilities have been cleaned up, and 104 facilities have been prioritized for clean up. The number of facilities being cleaned up has been increasing steadily with time, and with the program heading in the direction of risk based corrective actions and natural attenuation, the number is expected to continue to increase.

Due to the more aggressive inspection and enforcement provisions of the County's HMMC and the increased identification and reporting of contaminated sites generated by the implementation of the state's Petroleum Contamination Cleanup Program, the number of petroleum contaminated sites within Alachua County has *increased* since 1991. Again this increase is not due to more pollution occurring within the county but due to a higher level of reporting and enforcement.

Updated locations of known petroleum cleanup sites are shown in Map 48.

D. Non-Petroleum Sites

In addition to the petroleum based contamination sites, several other several other contamination and potential contamination sites have been identified by FDEP and ACEPD in Alachua County. These fall under the non-petroleum based category of sites. Abandoned dump sites that are known to be contaminated are described below. Existing landfills and construction and debris landfills are discussed as sources of potential contamination. Additionally, ACEPD monitors the cleanup of contaminated dry-cleaning facilities under the FDEP Drycleaning Solvent Cleanup Program. The location of non-petroleum based cleanup sites is shown in Map 49.

For more information on these sites the ACEPD has background data and reports which give detailed accounts of each site. This information is available on request.

1. Abandoned Dump Sites

Dump sites are considered abandoned if they do not meet the FDEP requirements contained in Chapter 62-7 Florida Administrative Code. These sites are publicly or privately owned and were typically in use before enactment of federal or state regulations for hazardous waste management.

Information regarding abandoned dump sites was obtained from various sources. These included County staff (Public Works, Codes Enforcement, and Planning Departments and County Commissioners), County special use zoning permit files, the FDEP Sites List, citizens' reports, the FDEP Groundwater Pollution Source Inventory files and FDOT.

A total of twenty-nine dump sites have been identified in Alachua County. Many of these sites were used for landfilling by small municipalities such as Alachua, Archer, Waldo, Hawthorne, Newberry, High Springs, LaCrosse, Windsor, Orange Heights, and Arredondo. Although these sites have not been extensively investigated, they are generally less than ten acres in size and were used primarily for municipal refuse. The potential for industrially generated hazardous waste is felt to be minimal. Municipal refuse may contain unregulated hazardous waste in the form of commercial products (i.e., household pesticides, paints, or solvents). Groundwater or surface water monitoring is not currently being conducted at these sites. Also, several "old dump" sites are used by residents of Alachua County and the City of Gainesville. After cursory inspections, these old dumps appear relatively small in size and were used primarily for municipal refuse.

There are numerous sites that have some type of groundwater monitoring program in place or underway. Many of these sites are under investigation by the FDEP. Some have conducted groundwater monitoring and are presently under enforcement action by the DEP. Several sites are currently on the Department of Environmental Protection Sites List.

Many small dump sites are located throughout the County. ACEPD receives information regarding dumping primarily in the form of complaints. These small dump sites are primarily a litter problem. County staff inspect the sites and usually refer them to codes enforcement. The owner of the dump site property is responsible for cleaning up the site.

For more information on these and other sites the ACEPD has background data and reports which give more detailed accounts of each site. This information is available on request.

2. Existing Sanitary Landfills

A total of five solid waste facilities were permitted for operation in Alachua County. One site, the Southwest Landfill near Archer, is active. The Southwest Landfill is designed to accept only non-hazardous waste. Three of the four remaining sites are former county landfills which are now closed. All four of the county landfills have groundwater monitoring plans approved by FDEP. The fifth site is an inactive industrial landfill owned by Gates Energy Products (formerly General Electric Company).

More detailed information on solid waste operations, disposal and recycling can be found in the Alachua County Solid Waste Element.

3. Construction & Demolition Debris Landfills

The FDEP has established standards for the construction, operation, and closure of public and private solid waste management facilities to minimize their threat to public health and the environment. These standards are contained in Chapters 62-701 through 62-722, FAC, implementing various sections of Ch. 403, Florida Statutes. Rule 62-701.730, FAC, contains standards and permitting requirements applicable to disposal and recycling of construction and demolition (C&D) debris. C&D debris is defined broadly as discarded materials generally considered to be not water soluble and non-hazardous in nature resulting from renovation, demolition, and construction activities. Thus, these facilities are not required to construct liners or leachate collection systems. FDEP requirements for C&D landfills were originally adopted in 1989 and amended in 1993, 1996, and 1997. Recent amendments tightened the requirements for C&D operations. New C&D operators may no longer operate under a general permit but must obtain a specific permit. Current operators must submit a groundwater monitoring plan and a hydrogeological investigation, have trained spotters on site, provide financial assurance, and meet other requirements. Any operators found to be accepting C& D debris after 4/1/98 must comply with these new requirements. FDEP inspects facilities approximately three times a year to enforce these regulations.

Current C&D operators that do not want to comply with the new State C&D regulations may restrict their operations to acceptance of “clean debris,” defined as “any solid waste which is virtually inert, which is not a pollution threat to ground water or surface waters, is not a fire hazard, and is likely to retain its physical and chemical structure under expected conditions of disposal or use. The term includes brick, glass, ceramics, and uncontaminated concrete including embedded pipe or steel.” (The term “uncontaminated” is not defined in the rule.) Clean debris is not considered solid waste and is not regulated by the State of Florida. As a result of these recent amendments, it appears that many private C&D operators may opt to receive only those wastes classified as clean debris.

Alachua County has also regulated C& D landfills since at least 1980 (Alachua County Code, sec. 393.13, last amended in 1992). The ordinance requires a Special Use Permit for any excavation and/or filling of land in the unincorporated county, with specified exceptions. Filling is allowed with construction and demolition (C&D) debris, as defined in the ordinance. Excavation & fill operations are generally not allowed in Conservation areas, defined generally as wetlands, floodplains, surface waters, and areas adjacent to water bodies. Land use guidelines are otherwise very general, favoring location in rural/agriculture areas and discouraging location adjacent to existing residential areas. Maximum depth of excavation areas is 15 feet above the Floridan Aquifer in areas where the aquifer is unconfined. Design and operation standards also apply. Inspections are carried out weekly by the Office of Codes Enforcement to determine compliance with SUP conditions but not to conduct environmental (for example, soil or water) testing of any kind. A substantial revision of the county’s C&D ordinance was proposed in 1994, but was not adopted.

E. Household Hazardous Waste Collection Program

The County has taken a proactive approach to hazardous waste management with the development of a Household Hazardous Waste (HHW) Collection Program. Household Hazardous Waste (HHW) is any discarded, useless or unwanted chemical, material, substance, or product that is or may be hazardous or toxic to the public or the environment, and is commonly used in or around households. In general, HHW is waste produced through the use of household products that are either ignitable/flammable, explosive/reactive, corrosive, or toxic. These types of wastes, when generated through household use, are not regulated by the EPA as hazardous wastes and can therefore be combined with other solid waste for sanitary landfilling. These wastes, however, are often identical to wastes generated by area businesses, which are prohibited from sanitary landfilling and are regulated stringently by EPA. Because of the large volume of hazardous wastes generated annually by homeowners, it can present acute or chronic health hazards and have a negative impact on the environment, particularly if improperly disposed of.

The purpose of the County's program is to minimize the amount of HHW entering the solid waste stream to reduce the environmental hazards associated with local landfills and to prevent the release of hazardous materials to the soils, air, groundwater, or surface water in the County. Public education and resource conservation through beneficial reuse and recycling of collected materials are also important program goals.

In 1986, Alachua County initiated its Household Hazardous Waste Collection Program with a three-day collection event called "Amnesty Days." Another collection event was held in 1988 and funding was obtained from Florida Department of Environmental Regulation to establish permanent collection sites. Starting in 1990, semi-annual, three-day collection events were instituted during the months of September and April. An average of over 4,100 cars were served and 292,000 pounds of materials were collected annually through the program for the 1991-1999 period.

This program has grown such that the county established a permanent HHW Collection Center at the Leveda Brown Environmental Park and Solid Waste Transfer station site in October 1999. The center, located at 5125 NE 63rd Avenue is open Tuesday thru Friday from 8:30am to 5:30 pm and Saturday from 8:00am to Noon. The HHW collection center was established to provide convenient, efficient, and environmentally protective mechanism for the collection, disposal and re-use/recycle of household chemicals and hazardous wastes generated by residents and small businesses. Materials collected at the center include: poisons, flammable liquids, corrosives, used motor oil and filters, brake fluid, transmission fluid, automotive batteries, antifreeze, gas, paints and other surface coatings, aerosol containers, dry cell batteries, fluorescent lamps, cleaning products, pool chemicals, propane tanks and end of life electronics (e-scrap). Alachua County manages HHW at the Household Hazardous Waste Collection Center and at five Rural Collection Centers (shown on Map 50). Hazardous materials collected at the RCC are limited to fluorescent lamps, used oil, oil filters, paint, batteries, flammable liquids, e-scrap and aerosol cans. Additionally, selected items can be disposed at several local businesses.

In the first two years of operation at the HHW collection center, the HHW program provided services to over 26,000 customers. This includes over 7,800 drop-off customers, 600 small businesses and 1,100 re-use/recycle customers at the HHW Collection Center and over 17,000 customers at the five RCCs. Over 1,348,000 pounds of hazardous waste, recyclables, reuse products and solid waste were processed and properly disposed during that time period.

Additional HHW program services and functions include: 1) Collection and processing of HHW from the five Rural Collection Centers (RCCs), 2) mobile HHW collection events in the County's smaller cities and neighborhoods, 3) operation of a re-use/recycle area for household chemicals and paint, 4) a recycled latex paint give-away program, 5) community outreach events and 6) assistance to neighboring counties for HHW collection events. For additional discussion on the County Household Hazardous Waste Management Program and Small Business Hazardous Waste Management, consult the Solid Waste Element, or contact the ACEPD.

HHW received through the County's program is managed in accordance with federal and state hazardous waste regulations and the Department of Transportation (DOT) requirements. ACEPD staff involved with Hazardous Materials have a 40-hour OSHA training and 8-hour annual refresher. Businesses meeting EPA's definition of Conditionally Exempt Small Quantity Generators (CESQG) are encouraged to use the HHW Collection Center. The businesses are charged a fee for disposal costs, and are provided a waste disposal receipt as required by state and local environmental laws.

Since 1993, Alachua County has also been serving as a host County for Gilchrist, Dixie, and Lafayette Counties under Florida's cooperative collection center grant program. Columbia County was added to the program in 2000. Per interlocal agreement, Alachua County receives HHW from each of these counties and is reimbursed for its expenses by Florida Department of Environmental Protection (75%) and the benefitting county (25%). ACEPD has also received competitive matching grant funding for three unique and innovative projects. The first involved an educational campaign and establishment of collection sites for fluorescent lamps and mercury-containing devices. The second focused on the collection of canceled, suspended, and unusable pesticides from the agricultural community. The third was for the collection, processing and de-manufacturing of end-of-life electronic equipment (e-scrap).

F. Brownfield Initiatives

"Brownfields" is a term coined to describe parcels of land where known or suspected contamination presents a barrier to reuse and redevelopment. Recent federal legislation is removing many barriers to redevelopment due to the threat of environmental liability. In 1997, the Florida Legislature passed a brownfields incentive program to encourage the redevelopment of contaminated properties. This program does not provide significant state funding for local brownfield sites except on a demonstration project basis. However, incentives include tax breaks and regulatory relief for qualified sites.

The County's involvement with brownfield sites is currently focused on one site. ACEPD is involved in an advisory and technical oversight role in the East Gainesville Sprout Project (EGSP), a City of Gainesville economic redevelopment effort focused on the rehabilitation of the Depot Avenue/South Main Street/Downtown corridor. This project has received funding from the U.S. EPA and the State of Florida as a brownfields pilot project.

As part of this EGSP effort, a cooperative electronic database / GIS system has been developed by the University of Florida Geoplan Center. The GIS compiles environmental data about the East Gainesville Sprout Project area from ACEPD, FDOT, SJRWMD, FDEP and City of Gainesville sources into a single information bank for inventory and analysis purposes. Additionally, this information resource is to provide summary economic development information over the Internet for all interested parties.

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