Environmentally Sensitive Area Planning

in

Walton County, Georgia:

A Pilot Study on the Development of Performance Standards

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LAR 740/741
Fall 1993

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Section One: The Walton County Landscape

The site considered for this study is located in the Yellow River watershed of western Walton County, situated in the Piedmont Plateau of Northeast Georgia, and is currently under development pressure from the nearby Atlanta metropolitan area. Historically, Walton County has been an agrarian community, but due to its proximity to Atlanta, it is rapidly being transformed into a bedroom community; the population has increased dramatically over the past thirty years.

The development patterns occurring in the landscape are similar to numerous other rural communities whose farms have been subdivided into residential housing. Forests, pastures and croplands are giving way to the standard road networks and conventional single family residential development. With the rise in population and commuter traffic, commercial and service industries are appearing along road and highway frontages in typical strip development. The regulatory tools currently available to guide and control development in Walton County are limited primarily to the zoning and subdivision regulations established in the 1980's.

The previous study, ***Environmentally Sensitive Areas: Walton County, Georgia,*** *by DeMeo, Ditto and Wehlau, 1992*, identified critical Environmentally Sensitive Areas, (ESAs), made an assessment of the ESA types, and conducted an evaluation of community attitudes toward the use of ESAs. The study scope focused on ecologically critical areas and natural hazard critical areas. These areas were mapped and development options and management guidelines for the areas described.

Our current intent is to continue the process begun in the previous study and to focus on the development of guidelines for the management of various landscape types. Using the research and critical area analysis of the former study, this study shall construct a systematic classification of management classes and landscape types for the subject area. General and specific guidelines will be written for individual landscape types, the guidelines shall be tested on two sites of approximately 200 acres within the study area, and potential methods for implementation of these guidelines shall be identified. The overall objective of this research shall be to provide a rational and ecologically based set of guidelines providing for sustainable development through the conservation and protection of ESAs and through the implementation of creative and economical development solutions.

Limitations effecting the study included manpower and project duration, therefore, a number of assumptions were made in order to facilitate the project. First, the landscape types which were studied, were limited to six of the twenty landscape types identified. Secondly, for each landscape type guidelines were prepared for only the two or three most ecologically significant criteria identified in the functional ecological models. We assumed that, based on a priority matrix, designing guidelines for these primary criteria would resolve most of the issues involved in the lesser criteria. Thirdly, we assumed the data collected and identified by the previous study to be generally accurate based upon limited field verification. Fourthly,

we assumed that all data represented in maps, reports and previous study represented accurate field conditions without conducting field verifications.

Section Two - Regional Landscape Planning and Design

Background:

Landscape planning was first known to occur in the United States as early as 1641 with the Great Ponds Act of the Massachusetts Bay Colony. In the interim, Frederick Law Olmsted traveled to England and saw the English gardens that were developed as a effort to relieve development pressures and urban blight brought on by the industrial revolution. Olmsted adopted the idea embodied in England's urban parks and implemented it on the outskirts of New York City, a place now known as Central Park. Olmsted's Central Park now serves the purpose that London's Victoria Park served in the 19th century; a pastoral retreat from the rigors of urban congestions and pollution.

Until recently in the United States, however, no single discipline existed that saw the importance of linking various landscapes to sustain ecological integrity in the face of human development. Landscape Ecology, a recognized profession in Europe[1] has been used there by planners and government officials alike in an attempt to link people to nature. Traditional planning methods in the United States have followed another approach by protecting specific environmentally sensitive areas such as riparian corridors, granite outcrops, and wetlands, while allowing development to envelop and fragment them. This political delineation of boundaries for zoning, property allocation, and flood protection, however, disregards ecological processes that give the landscape its natural character. Despite good intention, this practice severs the life-line that sustains environmentally sensitive areas, thus threatening the very resource in need of protection.

River corridors or floodplains, for example, are currently protected against development under most land development ordinances. Protection from encroachment, however, only addresses part of the problem. Rivers and streams, for example, provide the backbone for lush riparian ecosystems and clean water for human use are linked to the surrounding landscape by water. As water flows over the land, it collects and dumps toxic pollutants into the lowland river corridors. Because river corridors are a product of their surroundings, an interest should be taken in what goes on around river corridors. In sum, traditional planning methodology makes decisions in the absence of ecological context.

Recently in the United States, *landscape ecological planning* has evolved by linking the politics of traditional regional planning with the design and ecology of landscape architecture. This is a practical discipline which studies the interrelationships between various ecosystems, both natural and human, in an effort to guide land use decisions. The model defines *landscape* as the setting for understanding the interrelationships between life and land, i.e. the landscape is the "interface between human and natural processes." Landscapes and human populations change over time and a need arises to manage this change to "bring human actions in tune with natural processes." Thus, landscape ecological planning is derived to accommodate human needs while protecting significant natural and cultural resources that sustain life.[2]

Principles and Approach:

Ecology is the operative word for proponents of landscape ecological planning who define it as "the study of the relationship of all living things, including people, to their biological and physical environments.[3] This definition infers that there is some linkage or relationship between various ecosystems, both human and natural. Although this no novel concept it should be a point of emphasis in modern land planning practices.

The approach of this study model, therefore, is to seek the best fit between natural and cultural processes. Ian McHarg describes the fittest organisms as those which require "the minimum of work and adaptation."[4] Arthur Johnson elaborates on this theory in the following way:

> The fittest environment for any organism, artifact, natural and social ecosystem, is that environment which provides the energy needed to sustain the health or well-being of the organism/artifact/ecosystem. Such an approach is not limited by scale. It may be applied to locating plants within a garden as well as to the development of a nation.[5]

To expound upon Johnson's statement, we need to understand that the landscape is a series of interacting ecosystems. As with the riparian corridor, they are all connected by flows of energy. Each ecosystem imports and exports energy and materials from their neighbors, ideally conducting a natural symbiosis that sustains life. This process occurs at all scales from a population of microscopic insects to the world's human population of 5.6 billion. In fact, the higher the position occupied on the energy pyramid, the more the occupant relies on those functional processes below to sustain life. Therefore, in an effort to sustain human life, the boundaries we superimpose upon the landscape should consider the flows of energy, or functional processes, which connect one ecosystem with the next.

By breaking various components of the landscape down into *landscape elements*,[6] we may thus derive an ecologically based understanding of the landscape. The natural landscape is the result of the existing geology, topography, and climate. As Arthur Johnson puts it, the elements comprising the natural landscape require little work and adaptation. They have evolved into a state of efficiency within the given context. Because geologic, topographic, and climatologic contexts vary from place to place, the natural landscape is heterogeneous. It consists of many different elements including forests, fields, desert uplands, and even the riparian corridor. Cultural features also contribute to the landscape such as houses and roads. Collectively, the arrangement of natural and cultural landscape elements comprises *landscape structure.*

Landscape elements receive and process energy from the sun and act as a catalyst for the movement of energy and materials from one ecosystem to the next. This flow of energy and materials between ecosystems, or individual landscape elements, is termed *landscape function.* As aforementioned, over time, the movement of energy and materials will produce change in the landscape structure, yielding new functional characteristics. This process is termed *landscape change*, and can happen on a geologic time scale, occurring so slowly that humans

may not notice, or rapidly, causing great attention such as an earthquake or hurricane. The goal of understanding and using the above vocabulary lies in the effort to find the best fit between human and natural processes. James Thorne asserts that the fundamental goal in ecologically sustainable design should be to maintain ecological integrity, also termed "ecological health." Ecological integrity is characterized by "1) natural levels of plant (primary) productivity, 2) a high level of native biological diversity, 3) natural (usually very low) rates of soil erosion and nutrient loss, and 4) clean water and healthy aquatic communities."[7]

Method

Eugene Odum is the founder of modern, or the new ecology, who's theoretical basis has been attacked by proponents of pure ecology who study ecosystems in their natural state, bereft of human influence. Mr.Odum's platform, however, is a more realistic approach to planning and design in the landscape as defied above. He presents a classification model that is founded on compartmentalization of the landscape in terms of ecological function. He classifies four different landscapes based on the role they play in sustaining ecological process. As we shall see, some landscapes play a more vital role than others.

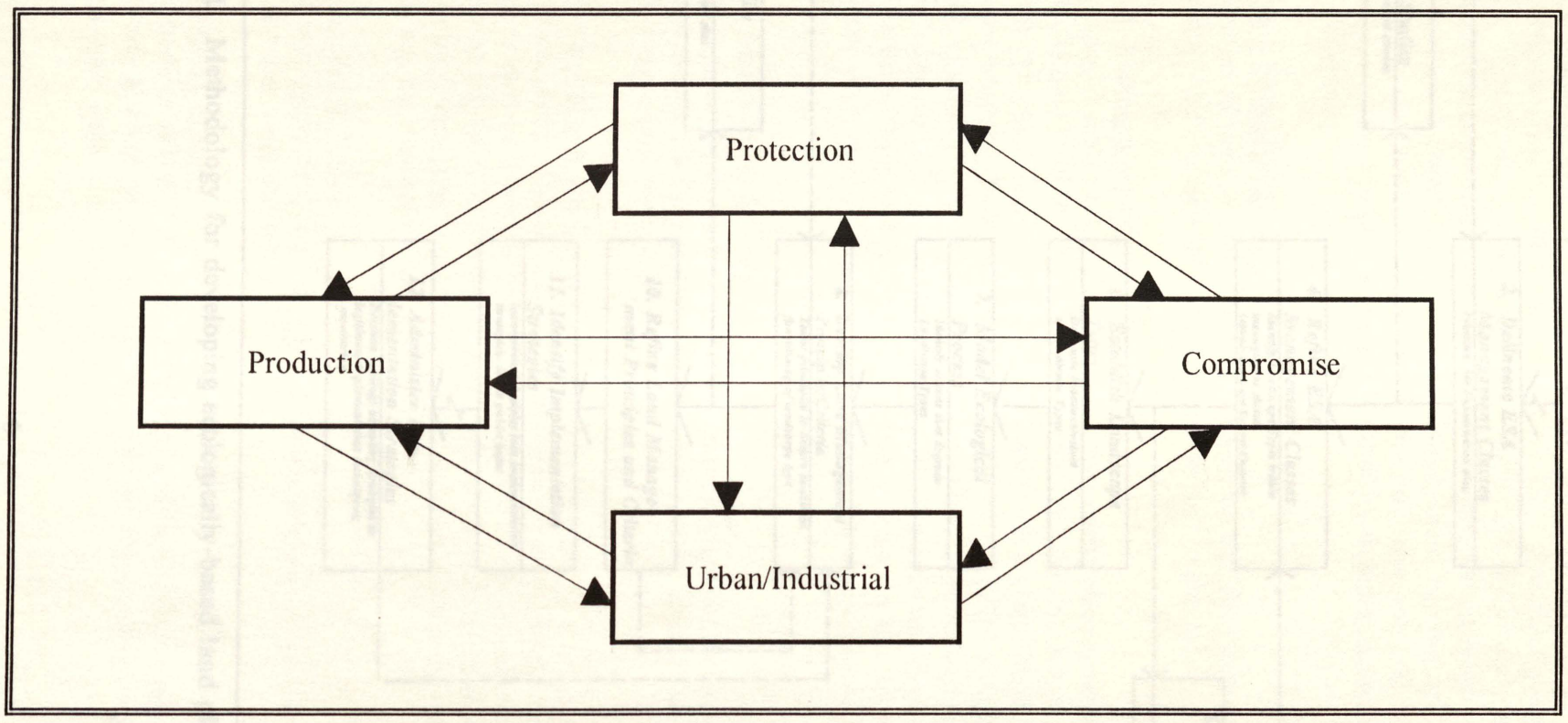
1. Protection landscapes: These landscapes are comprised of riparian zones and large forested areas which play a crucial functional role.

2. Production landscapes: These landscapes are made-up of landscape types that are used for commodity such as cropland, pasture land, and commercially managed forest.

3. Compromise landscapes: These landscapes represent a set of ecological conditions that cannot be classified into one of the other categories listed here.

4. Urban Industrial: These landscape do not play a vital role in the functioning of the landscape. This, however, is not to limit the influence it might have on the landscape.

Odum's conceptual model is an appropriate framework for ecological planning in the Yellow River Watershed because it recognizes the ecological functions that are carried out by different land uses. Secondly, it recognizes human influences on the ecosystem and that the interactions between compartments are characterized by biogeochemical energy transfers between landscapes that can be of either natural or synthetic origin.[8] Hendrix and others point out a fundamental weakness of the Compartmental Model is its supposition of a closed system where biological production equals biological respiration. Hendrix and others, in their study added inputs and outputs to Odum's compartmental model to account for flows of energy and material flow between various landscape types. The following flow chart (figure 1) is a graphic depiction of the methodology used for developing ecologically-based land planning principles which utilized a combination of Odum's, Hendrix et.al., and the ABC methods.



Odum's Model for Landscape Classification

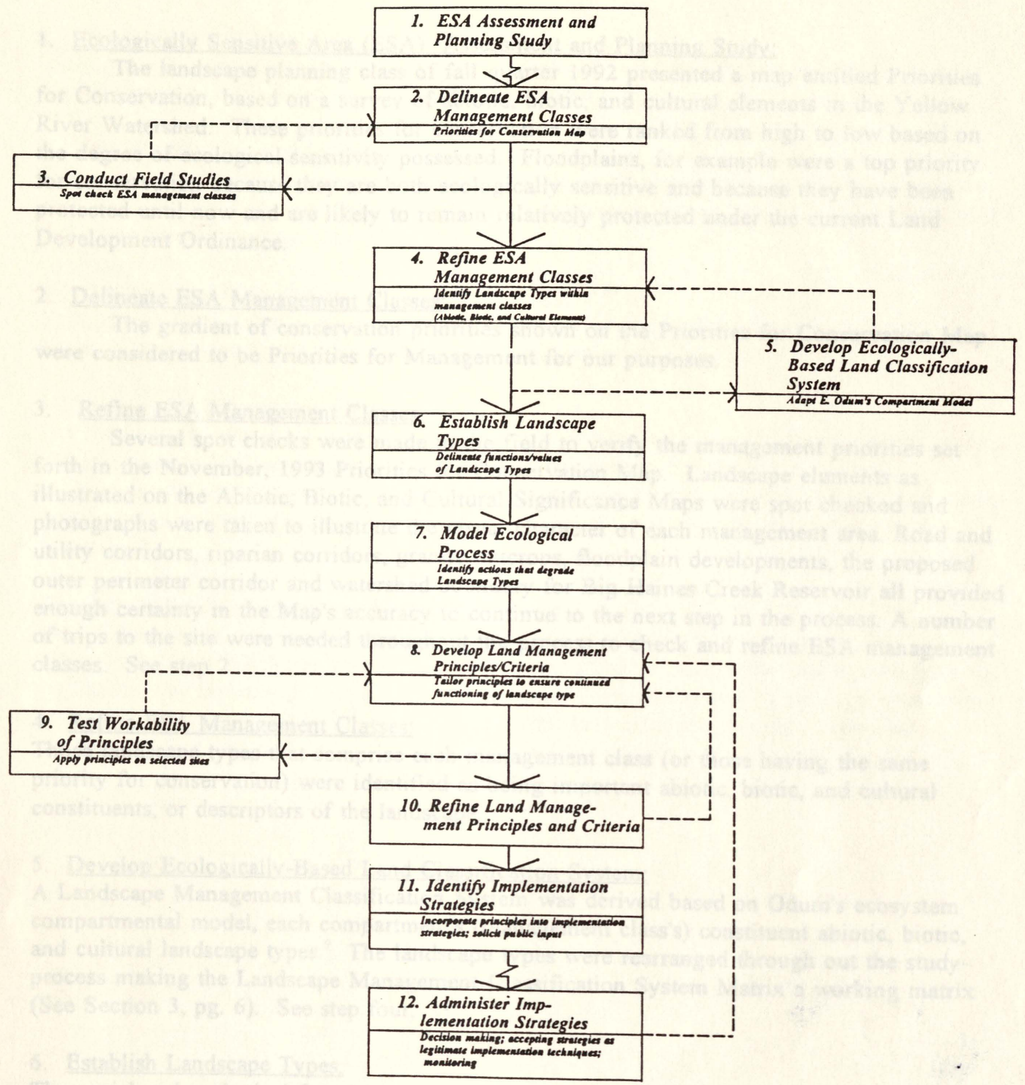


Figure 1: Methodology for developing ecologically-based land planning principles.

1. Ecologically Sensitive Area (ESA) Assessment and Planning Study:

The landscape planning class of fall quarter 1992 presented a map entitled Priorities for Conservation, based on a survey of abiotic, biotic, and cultural elements in the Yellow River Watershed. These priorities for conservation were ranked from high to low based on the degree of ecological sensitivity possessed. Floodplains, for example were a top priority for conservation because they are both ecologically sensitive and because they have been protected until now and are likely to remain relatively protected under the current Land Development Ordinance.

2. Delineate ESA Management Classes:

The gradient of conservation priorities shown on the Priorities for Conservation Map were considered to be Priorities for Management for our purposes.

3. Refine ESA Management Classes:

Several spot checks were made in the field to verify the management priorities set forth in the November, 1993 Priorities for Conservation Map. Landscape elements as illustrated on the Abiotic, Biotic, and Cultural Significance Maps were spot checked and photographs were taken to illustrate the visual character of each management area. Road and utility corridors, riparian corridors, granite outcrops, floodplain developments, the proposed outer perimeter corridor and watershed boundary for Big Haines Creek Reservoir all provided enough certainty in the Map's accuracy to continue to the next step in the process. A number of trips to the site were needed throughout the process to check and refine ESA management classes. See step 2.

4. Refine ESA Management Classes:

Those landscape types that comprise each management class (or those having the same priority for conservation) were identified as being important abiotic, biotic, and cultural constituents, or descriptors of the landscape.

5. Develop Ecologically-Based Land Classification System:

A Landscape Management Classification System was derived based on Odum's ecosystem compartmental model, each compartment's (management class's) constituent abiotic, biotic, and cultural landscape types.[9] The landscape types were rearranged through out the study process making the Landscape Management Classification System Matrix a working matrix (See Section 3, pg. 6). See step four.

6. Establish Landscape Types:

The social and ecological functions as well as the commonly held values associated with the listed landscape types were delineated.

7. Model Ecological Process:

An effort was made to identify the human or natural processes that maintain the structure and how they may be disrupted by various human activity. The potential results of a given disruption of process were identified.

8. Develop Land Management Principles/Criteria:
Here, general management guidelines were formulated that assist the natural functioning of the landscape types in relation to human development.

9. Test Workability of Principles:
Two sites in the Yellow River Watershed were selected that contain myriad landscape types such as river corridors, activity nodes, etc., so that as many design principles could be applied to a given site to see how they interrelate.

10. Refine Land Management Principles and Criteria:
Throughout the site design process, design criteria were constantly refined based on newly found discrepancies highlighted in the design application. See step 8.

11. Identify Implementation Strategies:
The final step of our study was to identify various tools to integrate the above design criteria with the current Walton County Land Development Ordinance. See section 6 for a description of possible tools be used. The next step would be to solicit public input to tailor these implementation strategies to the needs and desires of the people the Yellow River Watershed.

12. Administer Implementation Strategies:
This is the time of the local decision makers to implement the chosen strategies for ecologically sensitive development and time for the public to accept the chosen strategies as legitimate. The last and perpetual step is to monitor the effectiveness of the implementations and to alter the strategies to keep in tune with changing environmental and economic conditions. See step 8.

Section Three: Commentary on Landscape Types

In order to develop a planning system for Walton County that can be used as a planning guide by other counties, it was necessary for us to study other landscape planning methods. These methods we reviewed can be broken down into three distinct categories: 1) Landscape characteristic based methods, 2) Individual attributes methods and 3) Ecological entity based methods.

Landscape characteristic based methods are derived from the traditional McCargian landscape analysis. Individual landscape characteristics are mapped, such as soil type, slope or aspect, and these individual characteristics are then overlaid to result in a composite constraints map. Landscape development is then planned around these constraints. The Medford Plan is an excellent example of this type of planning method. One drawback to this method is it does not show how these different landscape characteristics interrelate to one another.

Individual attribute based planning methods rely on one attribute or a group of similar attributes to arrive at planning principles. Examples of this type of method are the visual resource method and the rare and unique landscape planning method. The visual resource method is based on visual attributes (viewsheds) to result in planning guidelines. The rare and unique landscape planning method relies on attributes of a landscape that would identify them as "rare". As stated above, both of these methods rely on one or a combination of similar landscape attributes. If your planning goal is to find rare and unique landscapes or visual management, these planning methods are well suited to that purpose. Our planning goals involved more than this and therefor, we continued our study.

The ecological entity based planning methods are the ones we found to be most useful in the development of our planning method. These planning methods identify certain ecological entities and cycles, such as river corridors, large forested areas, hydrologic cycle, and work to preserve the ecological function of these entities and cycles. Specifically, we used a system the Dr. Eugene Odum developed to classify the landscape into different management classes. Dr Odum developed a system that classifies the landscape into four management classes. These are Protection (those landscape types that are vital to the functioning of the ecosystem), Production (those landscape type used for agricultural production). Urban (those landscape types already developed with little contribution to the health of the ecosystem) and Compromise (any landscape type that does not fall into one of the above categories). In addition to these four landscape management classes, we added a fifth, Conservation. This landscape management class would deal with landscape types that are vital to the functioning of the ecosystem, but may allow for some human use to a certain extent.

To organize landscape elements within these landscape management classes, we had to make additions to the method developed by Dr. Odum. This was done using a landscape element organization developed in the ABC planning method. This method breaks done landscape types into three categories: 1) Abiotic, 2) Biotic and 3) Cultural. Abiotic elements include geology, hydrology and other non-living resources. Biotic elements include hardwood trees,

endangered flora and fauna and other living resources. Cultural elements include areas of historic or cultural importance.

The combination of Dr. Odum's method along with the ABC method allowed us to classify the Walton County information in a way that best fit the circumstances of the study. The following matrix expresses the combination of these methods.

Revised 12/6/93

Landscape Management Classification System

LAR 740/741

Management Classes	Landscape Types	Districts	Landscape Elements																							
			Abiotic									Biotic											Cultural			
			Reservoir Watershed	Aquifer Recharge	Open Water	Floodplain	Granite Outcrop	Steep Slopes	Erodible Soils	Riparian Corridors		Emergent Wetlands	Shrub/Scrub Wetlands	Forested Wetlands	Unmanaged Coniferous	Mixed Hardwood	Hardwoods	Forested Links	Endangered Fauna	Endanger Flora		Historic Significance	Cultural Significance	
Protection																										
	River Corridors																									
	Granite Outcrops																									
Conservation																										
	Large Forested Areas																									
	Ecotones																									
	Cultural Areas																									
Productive																										
	Commercially Managed Forest																									
	Cropland																									
	Pasture																									
	Open Space																									
Compromise																										
	Transportation Corridors																									
	Rural Commercial																									
	Rural Residential < 1 d.u. / 2 acres																									
	Utility Corridor																									
	Activity Nodes - Rural																									
Urban/Industrial																										
	Industrial																									
	Commercial																									
	Residential > 1 d.u. / 2 acres																									
	Combinations																									
	Road Corridors in Combination with Industrial, Commercial and Residential																									
	Activity Nodes																									

d.u. = Dwelling Unit

Source of Classification Scheme: Odum E.P., 1969., The Stategy of Ecosystem Development. Science, 164:262-279.
Hendrix, W.G., Fabos, F.Gy. and Price, J.E., 1988. An Ecological Approach to Landscape Planning using Geographic Information Sytem Technology. Landscape Urban Plann., 15:211-225.
Abiotic, Biotic and Cultural Planning Method

endangered flora and fauna and other living resources. Cultural elements include areas of historic or cultural importance.

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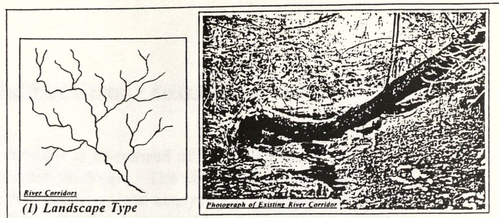
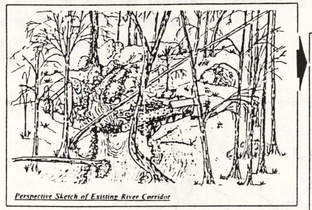
River Corridors

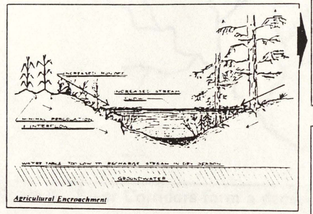
(1) Landscape Type



Photograph of Existing River Corridor



Perspective Sketch of Existing River Corridor



Agricultural Encroachment

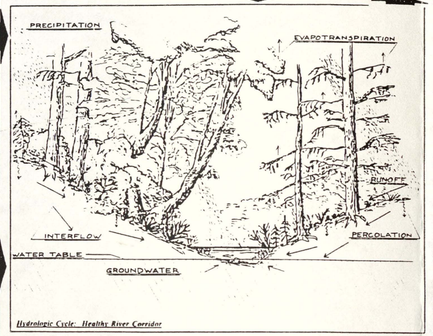
(2) Critical Issues

Current development patterns do nothing to reinforce the structure and functional processes of riparian ecosystems. Streams and rivers at one time were elements of expansive natural systems, however, modern land development practices have carved that large system into a matrix of patches and corridors. Rather than function naturally, the relative health and biological integrity of the river system has become dependent upon the health of the surrounding landscape.

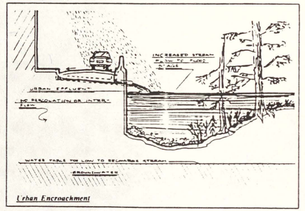
Clearing land for agriculture and development can cause accelerated soil erosion, soil compaction, alteration of natural drainage patterns and flow rates, and fragmentation of existing vegetative communities. The subsequent effects are unhealthy plant and animal communities and poor water quality for human use.

(3) Functional Model of Ecological System

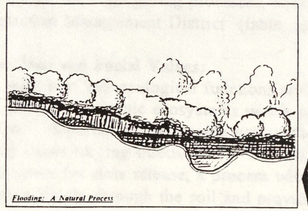
Water quality and maintenance of the hydrological cycle are the primary management objectives for River Corridors. Because rivers are a product of the surrounding landscape elements and processes, their relative health should parallel the health of the contributing uplands.



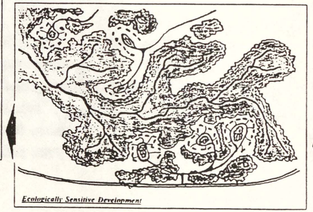
Hydrologic Cycle - Healthy River Corridor



Urban Encroachment



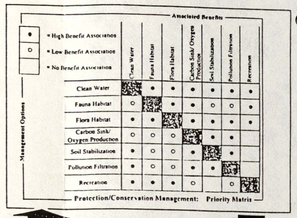
Flooding: A Natural Process

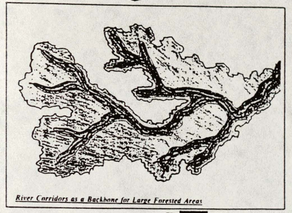


Ecologically Sensitive Development

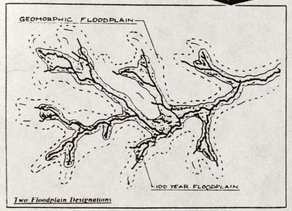
(4) Priority Matrix

Water is the common element connecting uplands to riparian zones. Therefore, by managing water quality and the hydrologic cycle wisely, a healthy infrastructure for plant, animal and human use can be maintained in the riparian zones.

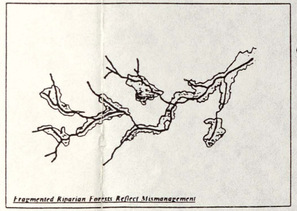




River Corridors as a Backbone for Large Forested Areas



Two Floodplain Designations



Fragmented Riparian Forests Reflect Mismanagement

(5) Management Principles

The geomorphic floodplain accounts for the stream's natural meander over the millennia. Restricting development from this zone protects the ecological functions of the stream more effectively the conventional 100 year floodplain. Creative development can be nestled into the natural environment, allowing the natural flooding process to occur unhindered.

(6) Conclusions

It is of no surprise that human populations settle in river valleys and around lakes. We benefit from these ecosystems as do other biological organisms. We use them for recreation, spiritual enjoyment, drinking water, transportation, and energy. Because of our ability to restructure our landscape in a great degree, however, our once held symbiosis with riparian ecosystems has turned in a newly found domination over them. Due to the total human and biological functions served by this delicate and dynamic landscape type, River Corridors should be protected from the encroachment of development.

Total Acres in District:

Source: USGS 7.5 Minute Series Topographic Quadrangle Maps: Loganville, Milstead, 1994 with photorevision in 1993.

YELLOW RIVER WATERSHED

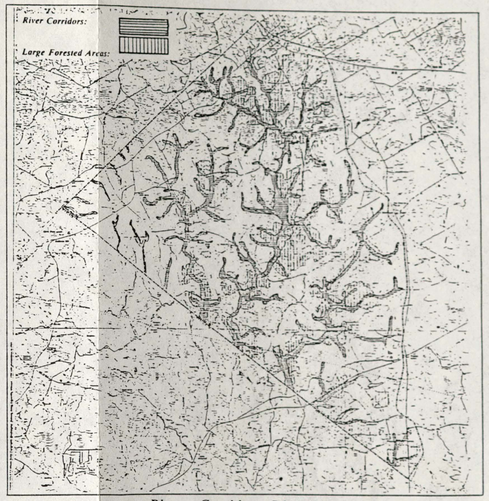
Walton County, Georgia

Protection Management Class

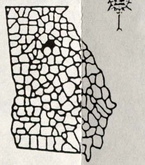
River Corridor

A river corridor is comprised of a strip of land on either side of, and including, any perennial or intermittent stream. River corridors make up a dendritic pattern on the land, collecting surface runoff and groundwater from the surrounding upland areas.

The more the surrounding landscape is disturbed, the greater the movement of water and upland pollutants to the river. Therefore, any change in the surrounding landscape could expect to produce change in the riparian ecosystem. These changes are usually undesirable when one considers the extent to which both human and animal populations rely on good water quality for survival. In an effort to mitigate the destructive inputs from the surrounding landscape and to promote their life giving processes, river corridors comprise a landscape type within the Protection Management District.



River Corridor Distribution
In Conjunction with Adjacent Large Forested Areas



SCALE 1:24000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

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School of Environmental Design, The University of Georgia
Fall Quarter, 1993

Sheet

Section Four: Landscape Types - River Corridor

1.1 Definition:

A river corridor is comprised of a strip of land on either side of, and including, any perennial or intermittent stream. The characteristic riparian vegetation in river corridors[10] distinguishes it from other upland ecosystems. Therefore, river corridors will be referred to from this point forward as riparian corridors because of the important role the vegetation plays in maintaining the health of the system.

Riparian corridors make up a dendritic pattern on the land, collecting surface runoff and groundwater from the surrounding upland areas.

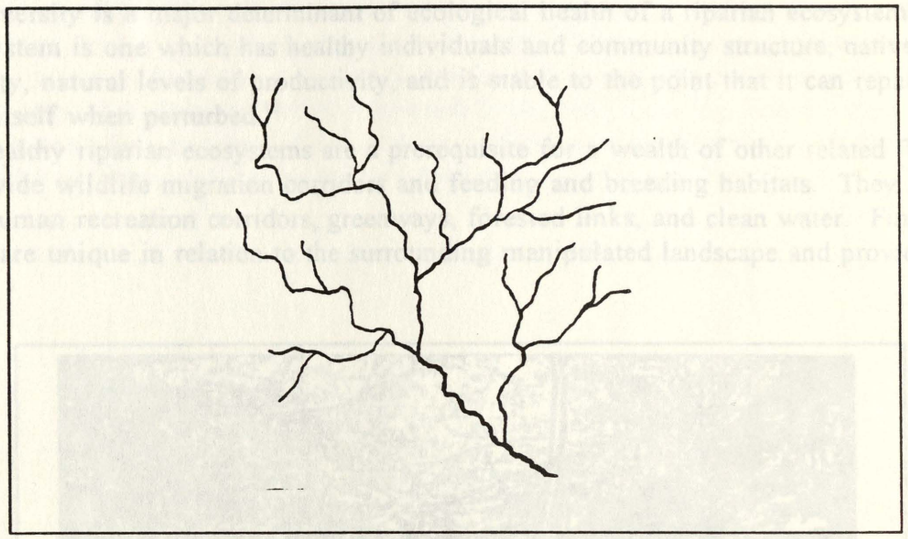


Figure 2: River Corridors form a dendritic pattern on the land.

The more the surrounding landscape is disturbed, the greater the movement of water and upland pollutants to the river. Therefore, any change in the surrounding landscape could expect to produce change in the riparian ecosystem. These changes are usually undesirable when one considers the extent to which both human and animal populations rely on good water quality for survival. In an effort to mitigate the destructive inputs from the surrounding landscape and to promote their life giving processes, River Corridors comprise a landscape type within the Protection Management District (table, pg. 10).

1.2 Ecological Functions and Social Values:

There are a wealth of key ecological functions and social values associated with riparian corridors. They are dynamic ecosystems which serve the primary function of hydrologic regulation.[11] Riparian zones provide natural floodwater storage and their vegetation physically slows surging floodwaters. The soil and vegetation together work like a sponge which holds water for slow release, a process which moderates both floods and droughts. Water seeps slowly through the soil and provides stream flow in the drier months.

Floods occur naturally, but the disruption of the above processes increases the intensity of flooding and invariably causes substantial damage to downstream human infrastructure.

Riparian ecosystems also act as a vegetative buffer which effectively filters non-point source pollutants carried in from the surrounding uplands. Although sediment and nutrients are vital to healthy functioning of streams, excessive amounts can smother or stimulate aquatic life to undesirable levels.

Large overstory vegetation shades the stream from sunlight, thus regulating water temperature. Slight changes in water temperature can have adverse effects on desirable fish species such as trout while encouraging undesirable species such as carp. All native riparian vegetation contributes to and stabilizes stream habitat diversity and as a result, supports a diversity of inhabitants.

Diversity is a major determinant of ecological health of a riparian ecosystem. A healthy system is one which has healthy individuals and community structure, native biodiversity, natural levels of productivity, and is stable to the point that it can repair and maintain itself when perturbed.[12]

Healthy riparian ecosystems are a prerequisite for a wealth of other related functions. They provide wildlife migration corridors and feeding and breeding habitats. They also provide human recreation corridors, greenways, forested links, and clean water. Finally, these corridors are unique in relation to the surrounding manipulated landscape and provide visual contrast.

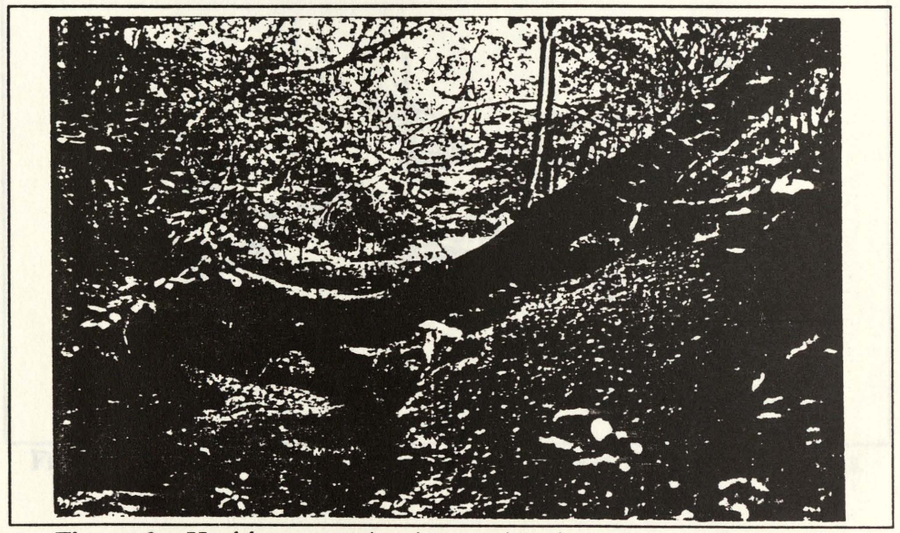


Figure 3: Healthy vegetation is a major determinant of a riparian ecosystem's ecological health.

If the structure of the riparian ecosystem is perturbed, one could expect its ecological process to deteriorate to the point that it no longer to supports natural or human use.

1.3 Current Development Patterns

Current development patterns do nothing to reinforce the structure and functional process of riparian ecosystems. Streams and rivers at one time were elements of expansive natural systems, however, modern land development practices have carved that large system into a matrix of patches and corridors.[13]

Rather than function naturally, the relative health and biological integrity of the river system has become dependent upon the health of the surrounding landscape. As a result, rivers and their corridors are no longer solely natural elements to be left alone, but require active planning, design, and management to see that they continue to function properly.

Human development affects rivers and their corridors in a number of ways. First, clearing of the land removes crucial elements from the landscape, thus disrupting or accelerating natural processes that sustain life. Next, human land use adds man-made elements to the system in the form of pollutants which further disrupt or accelerate natural processes. Ironically, by clearing the landscape for human use, the resultant landscape is less able to mitigate large scale outputs of man-made pollutants. Clearing land for agriculture and development can cause accelerated soil erosion, soil compaction, alteration of natural drainage patterns and flow rates, and fragmentation of existing vegetative communities.

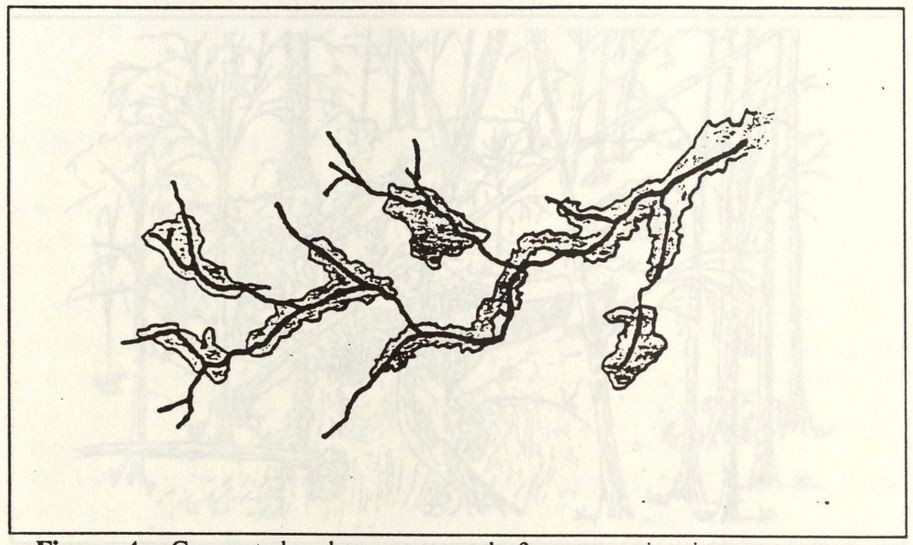


Figure 4: Current development trends fragment riparian ecosystems.

The subsequent effects are unhealthy plant and animal communities and poor water quality for human use. Although the topography of riparian corridors and their floodplains is conducive to development and farming, encroachment upon riparian zones severely limits the ecosystem's potential to mitigate the inputs and repair itself. This defines an unhealthy ecosystem.

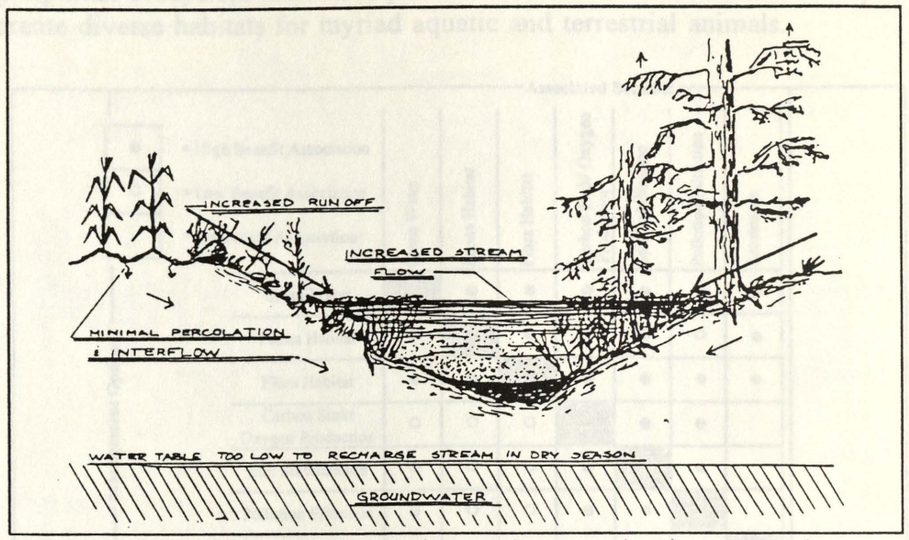


Figure 5: Agricultural encroachment destroys riparian vegetation.

Figure 6: Severely eroded banks indicate altered upland drainage.

1.4 Objectives:

Water quality and maintenance of the hydrologic cycle are the primary management objectives for river corridors. Because rivers are a product of the surrounding landscape elements and processes, their relative health should parallel the health of the contributing uplands. Water is the common element connecting uplands to riparian zones. Therefore, by managing water quality and the hydrologic cycle wisely, a healthy substructure for biological and human use can be maintained in the riparian zones. Other important factors contributing

to a healthy riparian ecosystem are native plant communities which sustain the hydrologic cycle and create diverse habitats for myriad aquatic and terrestrial animals.

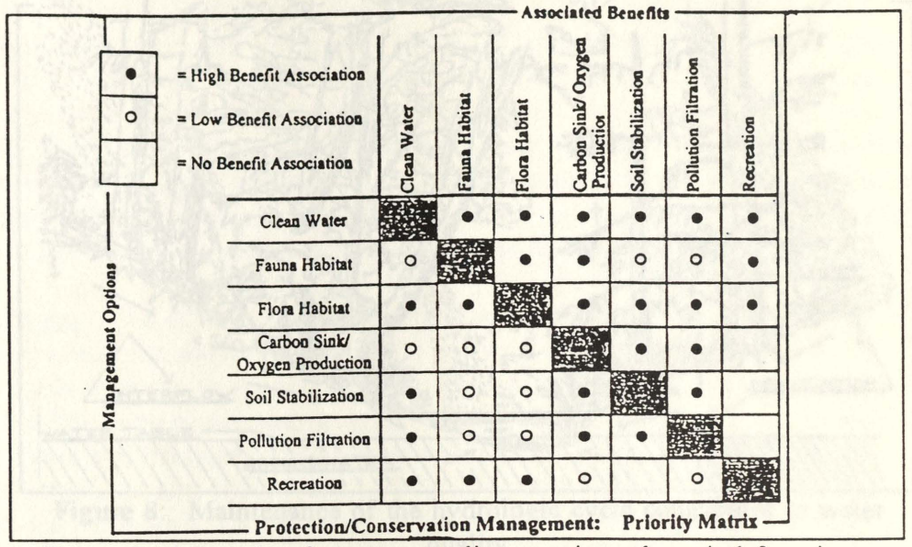


Figure 7: Managing for water quality sustains other vital functions.

2. Nature of Human Impact on River Corridors

2.1 Impacts on Ecological Function

The hydrologic cycle is the ecological process by which water moves through the environment. Water falls to the earth in the form of precipitation and in a natural Piedmont ecosystem, vegetation intercepts the precipitation and lessens its erosive powers. The water then trickles to the ground and moves in four different directions: 1) over the ground (runoff); 2) into and through the ground (infiltration and interflow); 3) evaporate; 4) or be taken directly by plants. The amount of runoff that occurs is dictated by the type of ground surface receiving the precipitation.

With the aid of plant leaves and roots and porous soils, significant amounts of water will infiltrate the soil and flow slowly, underground, to an aquifer or riparian water storage area (wetland). This process of interflow is crucial to the maintenance of the hydrologic cycle as it sustains stream flow in the driest months while filtering pollutants from the water.

Runoff is what remains after soil infiltration. Although some is evaporated and some is taken up by plants, the majority will reach a river or stream more quickly than with interflow. When runoff occurs at accelerated rates, interflow is reduced, thus lowering the water table and its contribution to stream flow. This lowered water table also has implications for human use: dried-up wells and the need to dig deeper ones for irrigation and drinking water. Not only does increased runoff not contribute to ground water recharge but in large quantities it is potentially destructive. First, it transports accumulated pollutants, discharging them into rivers and streams in toxic quantities. Secondly, accelerated runoff

causes streams to reach flood stage more rapidly and frequently, posing greater threats to human and natural structures.

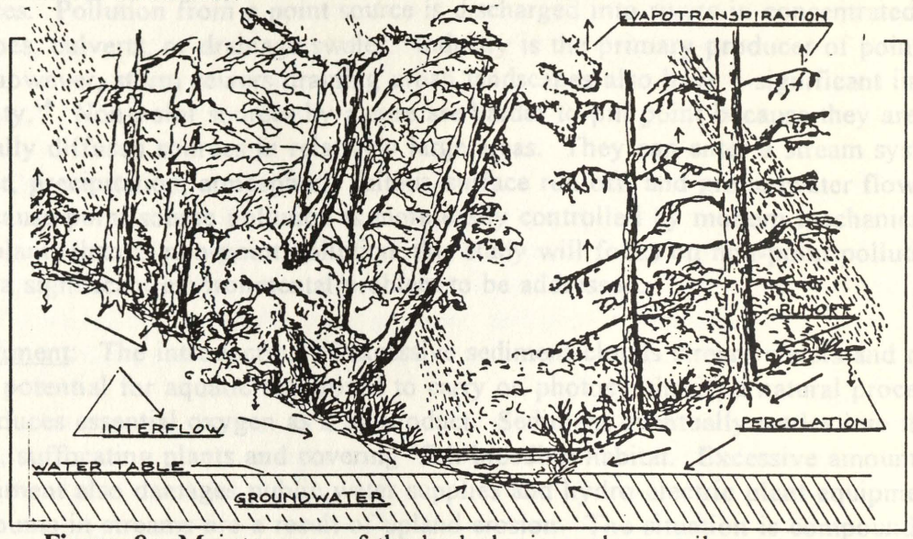


Figure 8: Maintenance of the hydrologic cycle contributes to water quality.

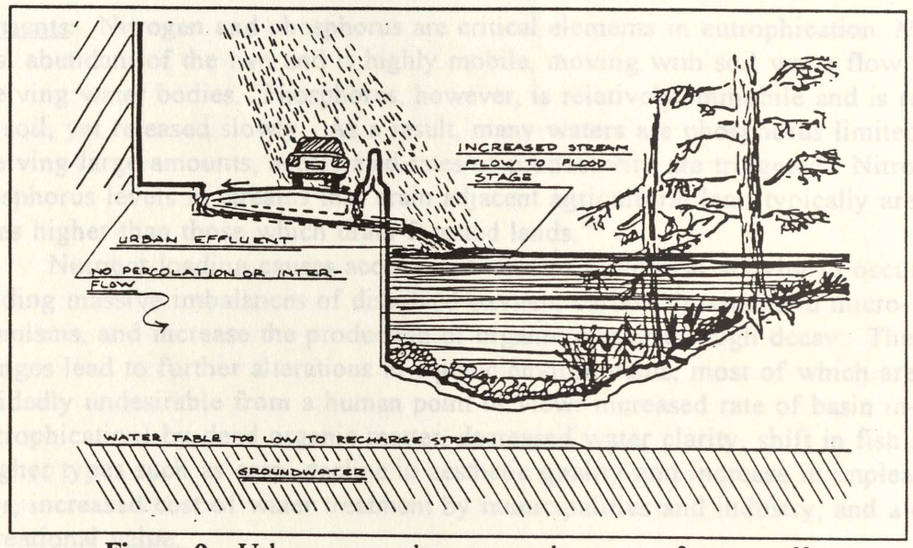


Figure 9: Urban encroachment accelerates surface runoff.

The term "accelerated" is used here to indicate an artificially increased rate of natural process stimulated by large scale human activity in the uplands. This activity adversely affects water quality, native riparian plant communities, and wildlife populations.

Water Quality:

Water pollution in streams and rivers comes from two basic sources: point and non-point sources. Pollution from a point source is discharged into rivers in concentrated form via effluent pipes, culverts, or drainage swales. Industry is the primary producer of point source pollution, however, storm sewers draining urban landscapes also have a significant impact on water quality.[14] Non-point sources by nature are harder to pin point because they are derived from spatially diffused sources in relatively large areas. They can enter a stream system via storm water, precipitation, atmospheric fallout, surface run off, and groundwater flow.

Because point source pollution is more easily controlled by modern mechanical treatment plants than is non-point pollution, this study will focus on non-point pollution sources as a significant environmental problem to be addressed.

Sediment: The introduction of excessive sediment clouds stream waters and reduces the potential for aquatic autotrophs to carry on photosynthesis, a natural process which produces essential oxygen as a by-product. Sediment eventually settles into the stream bed, suffocating plants and covering fish breeding habitat. Excessive amounts of sediment also damages public water supplies and hydro-electric plant equipment. High amounts in streams are a result of upland erosion. The situation is compounded because particles act as vehicles for the transport of toxic chemicals from uplands to the stream.[15]

Nutrients: Nitrogen and phosphorus are critical elements in eutrophication. Nitrogen is most abundant of the two and is highly mobile, moving with soil water flow to receiving water bodies. Phosphorus, however, is relatively immobile and is retained in the soil, yet released slowly. As a result, many waters are phosphorus limited and by receiving large amounts, accelerated rates of productivity are triggered. Nitrogen and phosphorus levels in streams that drain adjacent agricultural land typically are 5-10 times higher than those which drain forested lands.[16]

Nutrient loading causes accelerated rates of biological activity to occur, yielding massive imbalances of dissolved oxygen, carbon dioxide, and micro-organisms, and increase the production of organic matter through decay. These changes lead to further alterations in aquatic environments, most of which are decidedly undesirable from a human point of view: increased rate of basin in-filling (eutrophication) by dead organic matter, decreased water clarity, shift in fish species to rougher types such as carp, decline in aesthetic quality and increase in unpleasant odor, increased cost of water treatment by municipalities and industry, and a decline in recreational value.

Biological Oxygen Demanding Organic Material (BOD's): Fast moving streams are generally more aerated than deep sluggish streams. Therefore, photosynthetic oxygen production is not as important as in deep, slow moving rivers and lakes. Stream fish are sensitive to slight reductions of dissolved oxygen and a high influx of BOD's from human sewage, slaughter house wastes, pulp mills, and canaries can result in the decline or total destruction of desirable fish populations.

Thermal Pollution: Warm water inputs to a stream are also sources of pollution. Warm water has a decreased capacity to dissolve oxygen. Most fish are extremely sensitive to slight and sudden artificial temperature changes in water. Also, artificially warm water causes direct mortality in some fish, increases potential for the invasion of destructive organisms, and causes undesirable changes in algae populations. As a non-point source these inputs come mostly from parking lot sheet run-off.

Native Plant Communities:

Native plant communities exist because they are the plants most suited for the given environment. They help stabilize soils, reduce the erosive energy of floodwaters and overland flow, filter pollutants, help regulate the hydrologic cycle by assisting in infiltration, store carbon and give off oxygen in the form or water, and provide valuable forage and habitat for wildlife. Riparian vegetation can be damaged or depleted in a number of ways:

Trampling or Grazing: Foot traffic and/or animal grazing can damage delicate riparian plants and compact the mucky soil, thereby reducing their resiliency and ability to filter pollutants. Weakened or depleted native plants give exotic, invasive plants an opportunity to establish themselves. These plants can take over native plants and may not support the proper animal species.

Pollution: Excessive inputs of non-point source pollutants such as pesticides and herbicides can affect the health of riparian plants and have impacts similar to those listed above.

Construction Impacts: Any sort of land manipulation with large equipment destroys or removes plant material and its ability to perform the functions listed above.

Animal Habitat:

Many animal species use riparian zones as migration routes, and feeding and breeding habitats. They help regulate nutrient cycles by eating terrestrial plants and depositing those processed nutrients near or in the stream. The converse is true of birds that eat aquatic animals. Wildlife relies on healthy terrestrial and aquatic riparian plant communities for survival.

Devegetation: Any sort of devegetation of native plants reduces the forage potential for wildlife and may force them to go elsewhere, thus putting unnecessary stress on wildlife.

Human activity in riparian zones: Human activity such as hiking, recreation, or vehicular transportation can disrupt the migration routes of wildlife through a corridor, causing unnecessary energy to be expended in avoiding these activities.

2.2 Impacts on Visual Quality

The modern landscape is a mosaic of human development patterns superimposed on natural landscape elements. These natural elements, such as patches of open space and dendritic river corridors provide visual contrast to the built environment. Their aesthetic value should be a contributing factor in their preservation.

Human encroachment: The encroachment of human development is fragmenting river corridors causing discontinuity and choppy, synthetic patterns to emerge in the edges of the corridors. Undulating edges and interconnectivity should be encouraged so that human development may nestle within the natural landscape rather than superimpose itself on the landscape.

3. Response to Impact: Land Planning/Design Principles

3.1 River Corridor Protection Districts:

From this point forward, all River Corridors will comprise a district for the purposes of management. The intent is to stop development and land disturbance within these zones as well as to mitigate the effects of encroaching development. River corridors will also act as a backbone for large forested areas to assist in the protection of interior plant and animal habitat and to provide connectivity for these natural areas. Restoration of already disturbed areas within these zones will also be a consideration.

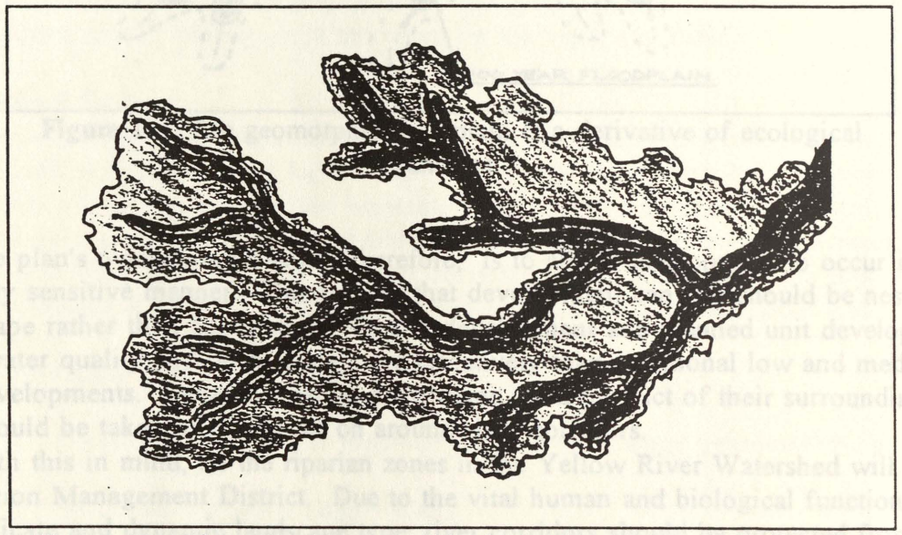


Figure 10: River Corridors provide the backbone for Large Forested Areas.

Several problems arise when trying to demarcate river corridors for protection because there are several ways of delineation depending on the elements to be protected. Currently, the emphasis for protection is on human infrastructure such as buildings, roads, and

agriculture. This is a spatially derived compromise between politics and economics which delineates the 100 year floodplain as a protected area for human safety. This, however, does little to protect the ecological function of floodplains.

A more ecologically sensitive way of corridor protection is a geophysical delineation based on ecological function. This is the preferred designation of a river corridor because it accounts for the natural meandering span of the stream, its associated riparian forest, and the area over which the streams shallow groundwater system spreads. Therefore, the lateral limits of centuries of meandering demarcates the river corridor based on ecological function. This corridor is the geomorphic floodplain.[17]

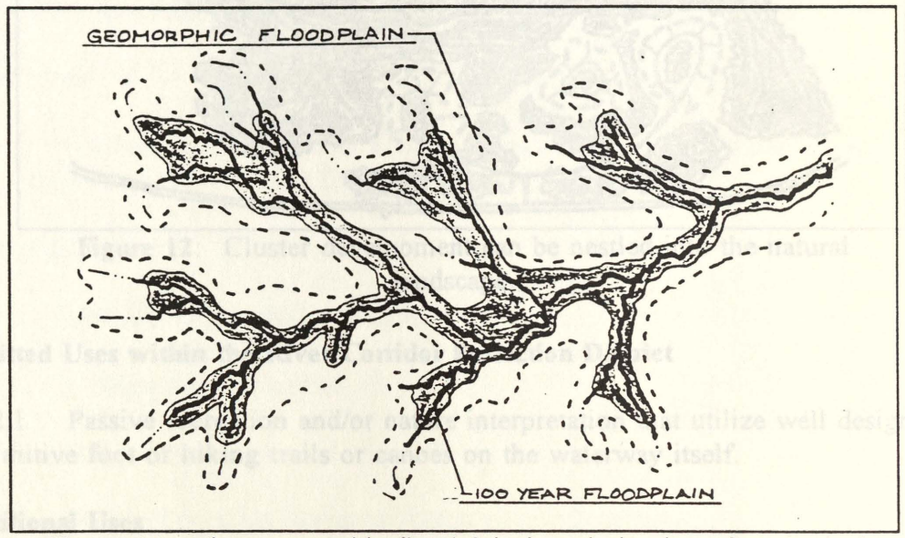


Figure 11: The geomorphic floodplain is a derivative of ecological function.

The plan's overriding principle, therefore, is to allow development to occur in an ecologically sensitive manner. This implies that development can and should be nestled into the landscape rather than dominate it. Cluster development and planned unit developments preserve water quality and open space more effectively than traditional low and medium density developments. Because riparian ecosystems are a product of their surroundings, an interest should be taken in what goes on around river corridors.

With this in mind, all the riparian zones in the Yellow River Watershed will comprise the Protection Management District. Due to the vital human and biological functions served by this delicate and dynamic landscape type, river corridors should be protected from the encroachment of development in an effort to mitigate impacts of human development. To do this successfully, however, restrictions on the use of river corridors are necessary.

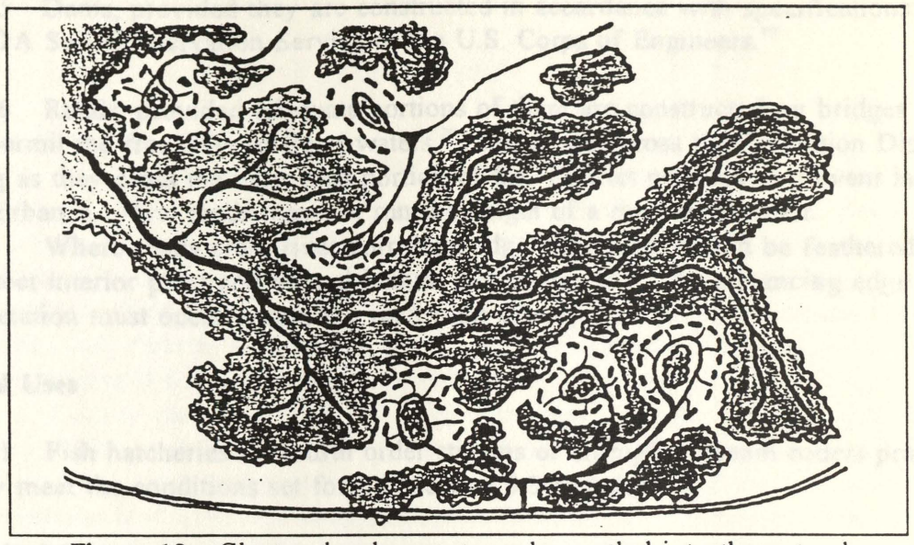


Figure 12: Cluster development can be nestled into the natural landscape.

3.2 Permitted Uses within the River Corridor Protection District

3.2.1 Passive recreation and/or nature interpretation that utilize well designed primitive foot or hiking trails or canoes on the waterway itself.

3.3 Conditional Uses

The following uses are permitted in the River Corridor Protection District provided they 1) disturb as little adjacent topsoil and vegetative cover as possible, 2) protect large desirable trees, 3) do not clear under desirable trees with construction equipment, 4) operate construction equipment as nearly as possible on the contour of the land, 5) protect fish and wildlife habitat when feasible.[18] In addition, restoration guidelines should be followed to help mitigate the impact of such installations and uses (see section 3.8 Vegetative Restoration).

3.3.1 Canoe launches and boat ramps.

3.3.2 Outlet installations for secondary or tertiary sewage treatment and discharge.

3.3.3 Sealed public water supply wells.

3.3.4 Utility transmission lines so long as they cross the narrowest portion of the District possible to prevent large scale disturbance. Utility line corridors should use their own right of way for the maintenance of an advancing edge (see figure 13) into the existing Protection District to protect interior plant and animal habitat.

3.3.5 Dams, provided they are constructed in accordance with specifications of the USDA Soil Conservation Service of the U.S. Corps of Engineers.[19]

3.3.6 Roads, provided adequate portions of them are constructed on bridges or piers to permit the free flow of flood waters.[20] Roads may cross the Protection District so long as they cross the narrowest portion of the District possible to prevent large scale disturbance. New roads may not run the length of a riparian corridor.

Where roads cross river corridors, edge vegetation should be feathered to protect interior plant and animal habitat (see figure 13) . An advancing edge of vegetation must occur within the road right of way.

3.4 Special Uses

3.4.1 Fish hatcheries on fourth order streams or on higher stream orders provided they meet the conditions set forth in section 3.3 above.[21]

3.5 Prohibited Uses

3.5.1 Feed lots or pasture/grazing land.

3.5.2 Outdoor plant nurseries.

3.5.3 Orchards

3.5.4 Managed wildlife sanctuary, preserve or arboretum.

3.5.5 Forestry, lumbering and associated storage or mill structures.

3.5.6 Fences

3.5.7 Sewage lagoons

3.5.8 Any building or impermeable surface except where provided for in conditional uses, section 3.3.

3.6 Exemptions

Any agricultural field used for crop farming prior to 1994 that is consistent with the conditions set forth in Management Techniques for Croplands, section 3.1, pg. 42 for the Landscape Type, Croplands.

3.6.1 Fences used to enclose conditional use facilities such as fish hatcheries and sewage treatment plants, section 3.3.

3.7 Principles Guiding Land Use

3.7.1 Management of Ecological Function:

Water Quality

There are many human activities that affect water quality in riparian ecosystems. They occur in the form of non-point source pollutants produced from agriculture, urbanization, forestry practices, transportation, recreation, flood control and withdrawals for water supply. The best way to mitigate non-point source pollutants is to eliminate them at their source; in upland situations. For those non-point pollutants that do reach riparian ecosystems, a wide vegetative buffer is needed to stop them from entering the stream in high concentrations.

Each of the above land uses have their own characteristic effects on water quality. This implies a need for the establishment of varying widths of vegetative buffers along rivers and streams depending upon the type and intensity of the surrounding land use. It is unreasonable at this point to make specific design and/or management suggestions for the mitigation of non-point source pollutants in all riparian ecosystems. It is suggested that river corridors be studied on a stream specific basis whereby specific design suggestions can be made based on the relative health of the stream in its context. Local land use experts such as foresters, engineers, agronomists, ecologists, and landscape architects can be utilized to meet these ends. Other more objective and comprehensive techniques are available, such as The Index of Biotic Integrity, however, they are often prohibitively expensive.[22]

There are three levels of pollution control to consider when managing for water quality: control of pollutant production, control of pollutant removal from site and control of pollutant transfer through system. The control of pollutant production has to do with the type and amount of application in upland sites. These should be regulated to protect ecological functions which sustain human life.

The various tools for managing pollutant removal from the site and transfer through the system are: increased setbacks to allow vegetative buffers to function naturally, easements which limit removal of vegetation in floodplains, designation of areas adjacent to stream corridors (such as large forested areas) as permanent open space within development projects, sediment basins, and filter berms.

Once upland site application has been taken care of, a healthy and extensive riparian ecosystem can aid in mitigating pollutant transfer through the environment. Vegetative buffers are known to remove over 90% of sediment provided the following design criteria are met: continuous groundcover; buffer is 50-100 feet wide; gentle gradients less than 10%; and shallow run-off depths not exceeding height of the groundcover. On hilly terrain, vegetative buffers should be located on upland surfaces and integrated with depression storage and soil filtration measures such as berms and dry wells.[23] There is a lack of consensus, however, on how wide these strips should be. Arbitrarily set political boundaries are usually ineffective in protecting the ecological function of riparian zones (see figure 11).

Native Plant Communities:

Restrictions can be placed on human and livestock use of riparian zones and other adjacent land uses which affect vegetation. Edge vegetation should be feathered from the ground layer vegetation up to shrub layer before reaching the drip line of the canopy trees just inside the Protection boundary (see figure 13). This reduces the amount of light that enters the forest allowing for more interior plant and animal habitat, a primary objective in the management of large forested areas.

Wildlife Habitat:

It is assumed that managing for water quality will promote healthy plant communities which will support native wildlife. Human use of riparian zones, however, can be restricted or designed so as not to disturb wildlife activity.

3.8 Guidelines for Management:

The following design and management guidelines bear the above principles in mind and only seek minimal protection for existing riparian zones with the understanding that further technical and professional attention should be given to specific corridor conditions. Design and management suggestions to supplement these minimum guidelines are included.

3.8.1 Ecological Function:

Streams Outside Existing Floodplain Protection District:

These are smaller perennial or intermittent streams that lie outside the existing 100 Year Floodplain Protection District.[24] These streams are shown in figure 9 and shall maintain a vegetated buffer strip on either side of the stream in accordance with The Georgia Planning Act of 1989[25]expressed in the following text.

Those streams that lie outside a seven mile radius of public water intake or a reservoir boundary shall have a vegetative buffer of at least 50 feet, and a 75 foot setback for septic tanks, drain fields or impervious surface. Septic tanks, drain fields or impervious surface shall be constructed within a 75 foot setback area on both sides of the stream. Those streams that lie within a seven mile radius of public water intake or reservoir boundary shall maintain a vegetative buffer of 100 feet on either side of the stream and a 150 foot setback for septic tanks, drain fields and impermeable surface.[26]

Streams within the Existing Floodplain Protection District:

The majority of the Watershed's perennial rivers and streams lie within the Floodplain Protection District for a 100 year flood. The area of protection shall be the area within the 100 year floodplain. Should the 100 year floodplain ever come closer than fifty feet to a stream, the above setbacks shall take precedence over the floodplain demarcation.

Adjacent Land Use:

Agriculture: Agriculture has the greatest pollution effects of all non-point source human activities.[27] Floodplains have fertile alluvial soils and have been popular areas for farming for millennia. However, nitrogen and phosphorus levels in streams that drain adjacent agricultural land typically are five to ten times higher than those which drain forested land.[28] Soil absorption measures are most effective means of removing pollutants from surface run off.

Therefore, current cropland farming in any River Corridor will be allowed to remain under the conditions and management suggestions set forth in Management Techniques for Croplands (section 3.1, pg. 42). These include contour and no till farming, filter berms and minimum buffers when adjacent to rivers to help mitigate soil erosion, and the transfer of pesticides and herbicides. In addition, riparian buffers should be increased to a minimum of 99 feet when adjacent to cropland.[29]

Native Plant Communities:

Buffers: Under this management plan native plants within the Floodplain Protection District shall be protected.

Vegetative Restoration: Vegetative restoration should be guided by natural process and function of riparian plant communities. Native and endemic plants should be used as they require little to no maintenance and support local wildlife species.[30]

Diverse layering of vegetation is suggested. Various tree and shrub covers and ground layers provide the diversity necessary to support animal populations and shade the stream. The Black Willow (*Salix nigra)* tree works well in stream bank stabilization as does River Birch *(Betula nigra)*.

Ground layer vegetation should be able to withstand sediment inundation. These plants characteristically have thick root systems capable of withstanding surging floodwaters. River Cane (*Arundinaria gigantea)*, and River Oats (*Chasmanthium latifolium)* are good for this purpose.

Exotic plants may be removed without the use of chemicals or heavy machinery.

Treatment of Edge Vegetation: Where landscape types that necessitate land clearing abut a River Corridor Protection District line, trees may be cleared to the drip line of those trees standing just within the District boundary. In addition, shrub and ground layer vegetation shall be feathered away from the District into the abutting land use so as to minimize the amount of edge effect on the riparian forest.

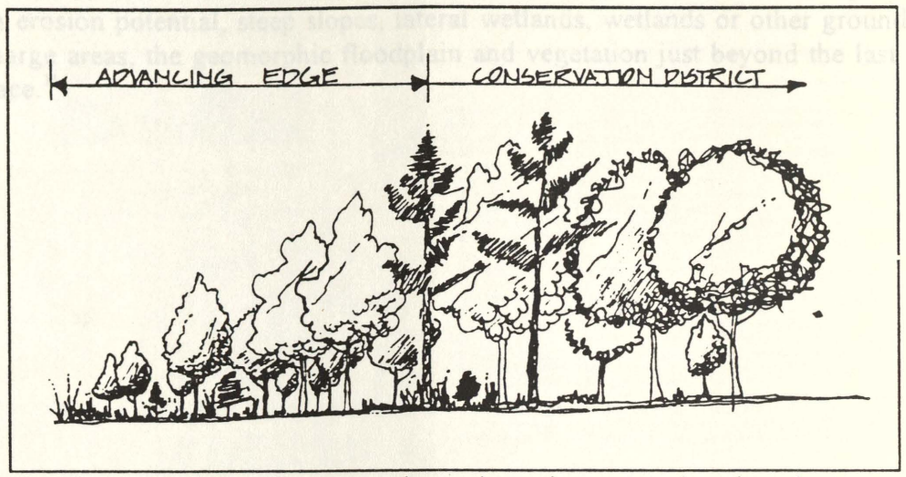


Figure 13: An advancing edge reduces impact on interior plants communities.

Wildlife Habitat:

No special provisions will be made for wildlife habitat because prioritizing management for vegetative buffers and water quality it is assumed that wildlife will have healthy habitat. If one were to manage for wildlife habitat, however, water quality and native plants may not be the natural result (see figure 7).

It should be noted, however, that different types of annual species have specific habitat, niche and migratory requirements. Additional study should be undertaken to identify which species have what types of requirements and to develop appropriate plans for sustaining such habitats.

Sport fishing:

Streams may be stocked with game fish, trout etc..

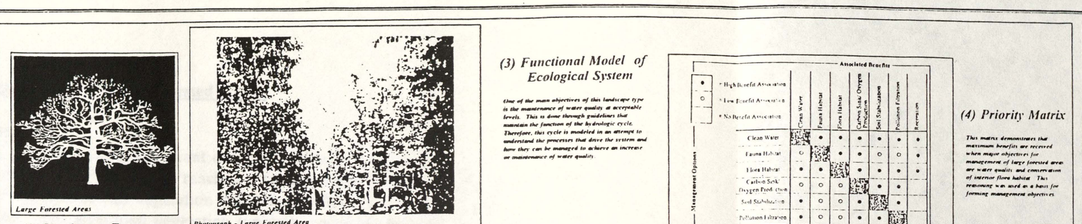
3.8.2 Visual Quality:

It is assumed that by following the guidelines and suggestions set forth for the management of ecological function, visual quality will reflect a healthy natural system which contrasts adjacent human development, provides scenic views, and buffers non-scenic views.

3.8.3 General Notes on River Corridor Design:

There are many other critical areas to be included in the River Corridor Protection District because they contribute to its proper functioning. After specific studies have been completed on the relative health of the riparian ecosystem and the nature of the surrounding human impacts these areas may then be charted and included

in the preservation district: intermittent tributaries, gullies and swales, any areas with high erosion potential, steep slopes, lateral wetlands, wetlands or other groundwater recharge areas, the geomorphic floodplain and vegetation just beyond the last river terrace.[31]

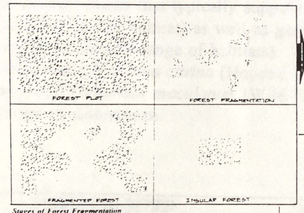


Large Forested Area

Photograph - Large Forested Area

(1) Landscape Type

Perspective Sketch of Existing Forested Area

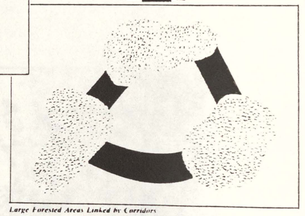


Stages of Forest Fragmentation

(2) Critical Issues

Current development trends in Walton county are occurring with little guidance. This tends to large areas of forest being "cut up" into smaller isolated parcels. This process is known as forest fragmentation. When this forest fragmentation occurs, benefits that are normally obtained from larger continuous forested tracts are lost. Negative impacts that will result from this fragmentation include: increased water runoff, increased soil erosion, a decrease in water quality, and a decrease in the amount of interior forest habitat. To minimize this fragmentation, remaining large forested areas can be connected by forested corridors. This will allow the movement of species between fragment islands resulting in a larger overall habitat area.

Hydrologic Cycle - Large Forested Area



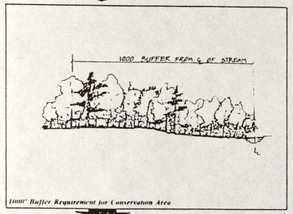
Large Forested Areas Linked by Corridors

(3) Functional Model of Ecological System

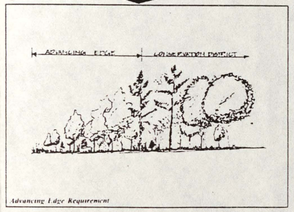
One of the main objectives of this landscape type is the maintenance of water quality at acceptable levels. This is done through guidelines that maintain the function of the hydrologic cycle. Therefore, this cycle is modeled in an attempt to understand the processes that drive the system and how they can be managed to achieve an increase or maintenance of water quality.

(4) Priority Matrix

This matrix demonstrates that maximum benefits are received when major objectives for management of large forested areas are water quality and conservation of interior flora habitat. This reasoning was used as a basis for forming management objectives.



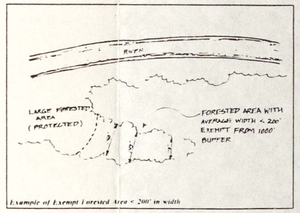
1000' Buffer Requirement for Conservation Area



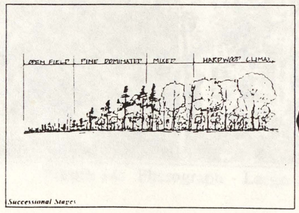
Advancing Edge Requirement

(5) Management Principles

The management principles demonstrated here are major guidelines used to achieve the management objectives (water quality and conservation of interior forest habitat). They are designed to allow for economic development while preserving the ecological function of the large forested areas district.



Example of Exempt Forested Area < 200' in width



Residential Buffer Requirement

Successional Stages

(6) Conclusions

The guidelines shown here, as well as others, where developed in an attempt to conserve large forested areas in Walton county. If implemented, these guidelines will result in the maintenance of water quality at an acceptable level and the conservation of interior forest habitat. Maintenance of water quality will be achieved through a decrease in stormwater runoff and soil erosion, and increased pollution filtration and water infiltration. The conservation of interior forest habitat will allow flora and fauna species, that require this habitat to survive, a haven during increased development in Walton county. Managing for interior habitat also provides other benefits such as passive recreation, outdoor educational opportunities, preservation of cultural heritage and a continued rural feeling presently experienced in the county.

Total Acres in District:

Source: USGS 7.5 Minute Series Topographic Quadrangles: Between, Jersey, Loganville, Milstead, 1994 with photorevision to 1993

YELLOW RIVER WATERSHED

Walton County, Georgia

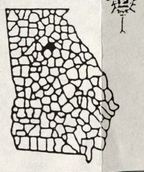
Conservation Management Class

Large Forested Areas

Tracts of native woodland sufficient enough in size to support interior plant communities. These forest have reached a mature stage of growth that is characterized by complex, multi-layered vegetation. This dominant vegetation typically consists of a deciduous tree overstory including trees such as: Quercus alba (White Oak), Carya glabra (Pignut Hickory) and Quercus falcata (Southern Red Oak). Typical mid-story trees include Cornus florida (Flowering) and Oxydendron arboreum (Sourwood). The shrub layer can be composed of many species, but primary visual species include Calycanthus americana (American Beauty berry), Rhododendron canescens (Piedmont Azalea) and Viburnum acerifolium (Mapleleaf Viburnum). Major ground layer species include Parthenocissus quinquefolia (Virginia Creeper), Vitis rotundifolia (muscadines) and Lonicera japonica (Japanese Honeysuckle). In Walton County, the remaining large forested areas are concentrated around the Little Haynes Creek and Sandy Creek river corridors.

Large tracts of native woodlands provide multiple benefits to the citizens of Walton County. One of the primary benefits received is water quality. This is obtained through filtration and soil stabilization functions provided by the existing vegetation. Pollution filtration is achieved through absorption of pollutants by vegetation root systems. Soil stabilization is again achieved through root systems. Established root systems hold soil in place, therefore decreasing soil erosion. Recreational opportunities can be realized through a system of trails, wildlife observation, and botanical observation. Outdoor education may also be realized through field trips and outdoor class exercises. Interior flora and fauna habitat will be maintained through the conservation of large continuous areas of forest land. This habitat is crucial as particular species require this uninterrupted habitat for existence. The regions natural heritage and regional identity is also preserved with the conservation of these areas.

Large Forested Areas
In Conjunction with Adjacent River Corridors



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Fall Quarter, 1993

Sheet

1. Landscape Type - Large Forested Areas.

1.1 Definition:

Tracts of native woodland sufficient enough in size to support interior plant communities. These forest have reached a mature stage of growth that is characterized by complex, multi-layered vegetation supporting interior plant and animal communities. The dominant vegetation typically consists of a deciduous tree overstory including trees such as *Quercus alba* (White Oak), *Carya glabra* (Pignut Hickory) and *Quercus falcata* (Southern Red Oak). Typical mid-story trees include *Cornus florida* (Dogwood) and *Oxydendron arboreum* (Sourwood). The shrub layer can be composed of many species, but primary visual species include *Calycanthus americana* (American Beautyberry), *Rhododendron canescens* (Piedmont Azalea) and *Viburnum acerifolium* (Mapleleaf Viburnum). Major ground layer species include *Parthenocissus quinquefolia* (Virginia Creeper), *Chimaphila maculata* (Spotted Wintergreen) and Vitus rotindifolia (Muscadine)[32]. In Walton County, the remaining large forested areas are concentrated around the Little Haynes Creek and Sandy Creek river corridors.

Interior Community - A community in which the understory is characterized by shade tolerant plants that typically support specialist species (species able to survive only in this habitat) as well as generalist species (species that are able to survive in a broad range of habitats). Typical interior species in Walton county include *Wilsonia citrina* (Hooded Warbler), *Hylocichla mustelina* (Wood Thrush) and *Geranium maculatum* (Wild Geranium). These communities are intolerant of disturbance.

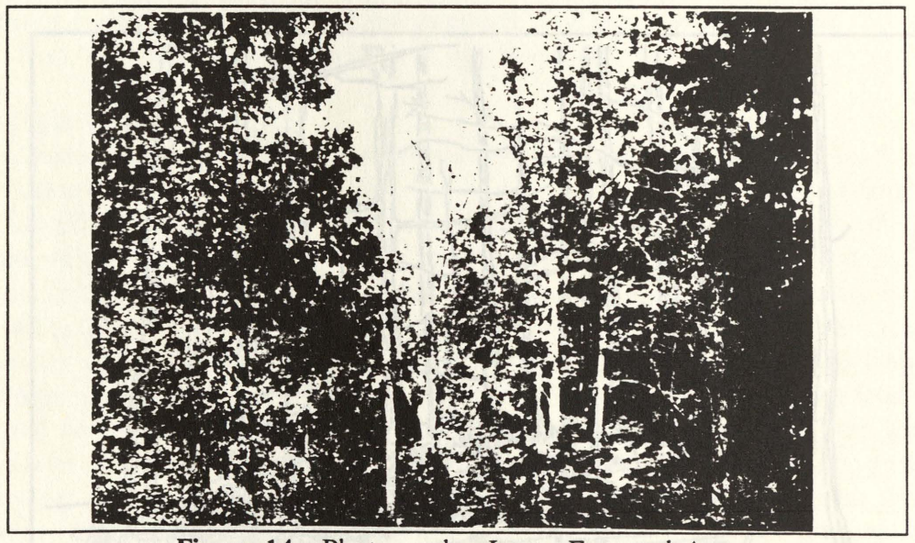


Figure 14: Photograph - Large Forested Area

1.2 Ecological Functions and Social Values:

Ecological functions:
Large tracts of native woodlands provide multiple benefits to the citizens of Walton County. One of the primary benefits received is water quality. This is obtained through filtration and soil stabilization functions provided by the existing vegetation. Pollution filtration is achieved through absorption of pollutants by vegetation root systems. Soil stabilization is again achieved through root systems. Established root systems hold soil in place, therefore decreasing soil erosion. Recreational opportunities can be realized through a system of trails, wildlife observation, and botanical observation. Outdoor education may also be realized through field trips and outdoor class exercises. Large forested areas will also contain interior flora and fauna habitat. This will be maintained through the conservation of large continuous areas of forest land. This habitat is crucial as particular species require this uninterrupted habitat for existence[33].

Social Values:
Large Continuous areas also preserve the regions natural heritage and regional identity. These areas help contribute to the rural feeling currently experienced in Walton County[34].

1.3 Current Development Patterns:

Current development trends in Walton county are occurring with little guidance. This leads to large areas of forest being "cut up" into smaller isolated pieces . This process is known as forest fragmentation[35]. When this forest fragmentation occurs, benefits that are normally obtained from larger continuous tracts are lost.

Fiqure 15: Existing Large Forested Area

Negative impacts that will result from this fragmentation include increased water runoff, increased soil erosion, a decrease in water quality and a decrease in the amount of interior forest habitat. Forest fragmentation also leads to a loss of the "rural feeling" currently experienced in Walton County.

1.4 Primary Objectives:
The primary objectives of the management of this landscape type are to increase or maintain an acceptable level of water quality and the conservation of interior flora and fauna habitat. Increased water quality will be achieved through a decrease in runoff and soil erosion; and increased pollution filtration and water infiltration. The conservation of interior habitat will allow flora and fauna species, that require this habitat to survive, a haven during increased development in Walton county. Managing for interior habitat also provides other benefits such as passive recreation, outdoor educational opportunities, preservation of cultural heritage and a continued rural feeling presently experienced in the county.

2. Nature of the Impact

2.1 Ecological Function:
Current development that occurs in large forested areas, as stated above, tends to lead to forest fragmentation. Development that occurs in this landscape type can be characterized by large areas of impervious surfaces, removal of the majority of tree cover, and intense manipulation on the ground topography. This has an negative impact on large forested areas by disrupting major ecological cycles that normally occur in this landscape type. The major cycles that relate most directly to the previously stated primary goals of management, and the ones that will be focused on in this text, are the hydrologic cycle and the food web.

Hydrologic Cycle:
The factors characterizing the conventional development listed above all lead to perturbation of the hydrologic cycle. The hydrologic cycle is a process through which water is cycled throughout our environment[36]. This process is essential to maintain as it is one of the most important factors for life and quality of life. Large impervious surfaces do not allow water to infiltrate in the ground. Typically this water is collected in storm sewers and carried off site. This leads to a decrease in water availability on site, thereby altering the cycle. Removal of tree cover also disrupts the hydrologic cycle in two ways. First, loss of trees and therefore tree roots lead to increased soil erosion. Second, loss of tree cover reduces shade cooling the ground. This results in a dramatic increase of temperature in the surrounding area. Increased temperature results in higher evaporation rates, which in turn results in less water available. Intense manipulation of ground topography for development compacts the

existing soil. This leads to decreased water infiltration and increased water runoff on the soil surface. Both of these factors combine to result in increased soil erosion.

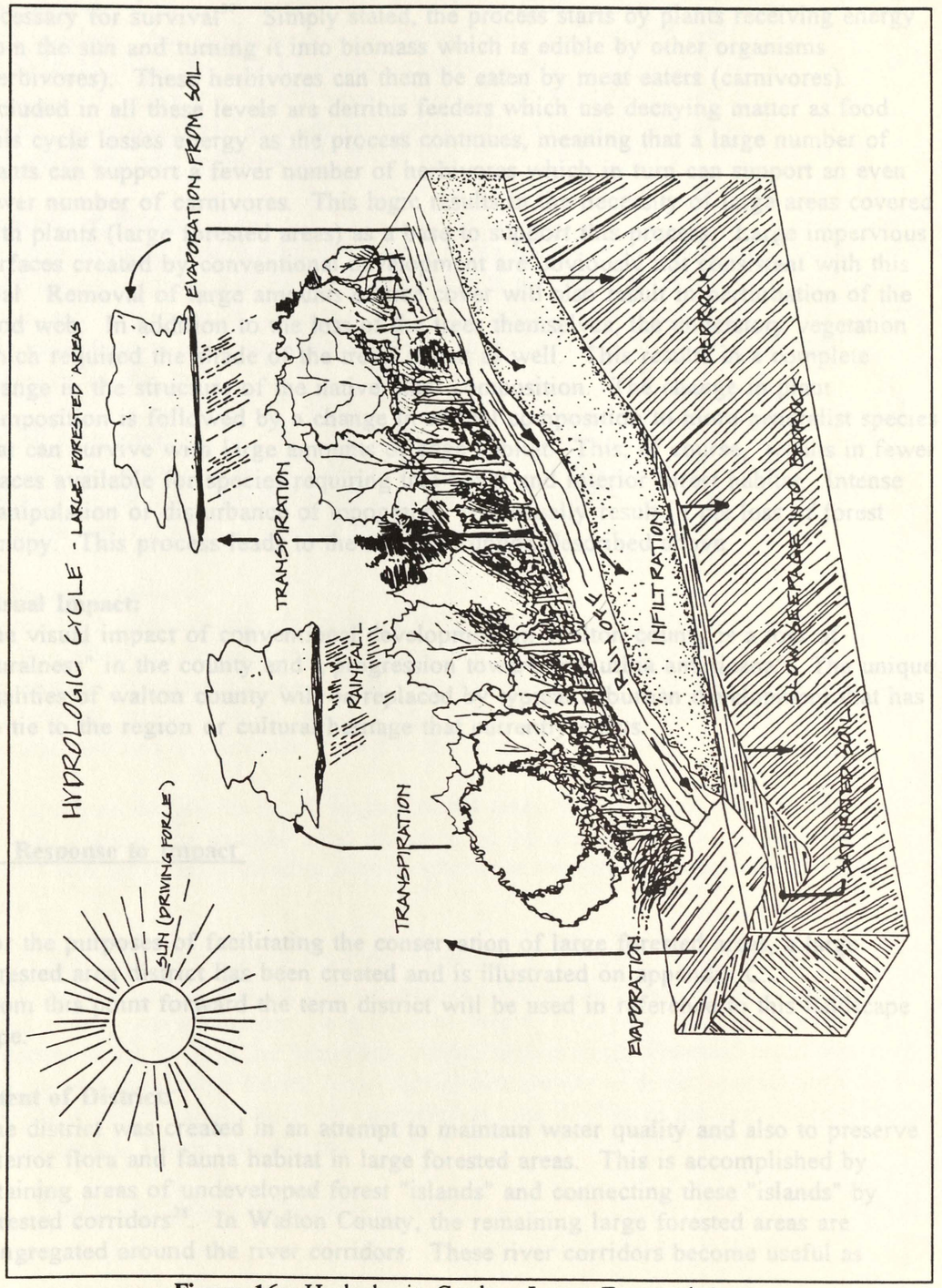


Figure 16: Hydrologic Cycle - Large Forested Areas

Interior forest Habitat:
The factors characterizing conventional development also disrupt the food web process. The food web is a process by which all organisms receive nourishment necessary for survival[37]. Simply stated, the process starts by plants receiving energy from the sun and turning it into biomass which is edible by other organisms (herbivores). These herbivores can them be eaten by meat eaters (carnivores). Included in all these levels are detritus feeders which use decaying matter as food. This cycle losses energy as the process continues, meaning that a large number of plants can support a fewer number of herbivores which in turn can support an even fewer number of carnivores. This logic results in the necessity of large areas covered with plants (large forested areas) as a base to support this process. Large impervious surfaces created by conventional development are obviously not consistent with this goal. Removal of large amounts of tree cover will also result in perturbation of the food web. In addition to the loss of the trees themselves, the understory vegetation which required the shade of the trees, is lost as well. This results in a complete change in the structure of the native plant composition. The change in plant composition is followed by a change in animal composition to more generalist species that can survive with large amounts of edge habitat. This, of course, results in fewer spaces available for species requiring tree cover and interior forest habitat. Intense manipulation or disturbance of topography will usually result in the loss of forest canopy. This process leads to the same disruption described above.

Visual Impact:
The visual impact of conventional development in Walton county is a loss of "ruralness" in the county and a progression toward "suburbia americana". The unique qualities of walton county will be replaced by typical suburban development that has no tie to the region or cultural heritage that currently exists.

3. Response to Impact

For the purposes of facilitating the conservation of large forested areas, a large forested area district has been created and is illustrated on appendix C.
From this point forward the term district will be used in reference to this landscape type.

Intent of District:
The district was created in an attempt to maintain water quality and also to preserve interior flora and fauna habitat in large forested areas. This is accomplished by retaining areas of undeveloped forest "islands" and connecting these "islands" by forested corridors[38]. In Walton County, the remaining large forested areas are congregated around the river corridors. These river corridors become useful as

connections between the forest islands. The forest islands and corridors provide filtration and soil stabilization functions which, in turn, maintain an acceptable level of water quality. The forest islands also provide a source of habitat for interior flora and fauna species. The habitat islands are connected by the forested corridors (river corridors) to allow the transfer of species between the larger island habitats. In managing for water quality and habitat, many other benefits are derived. These include: recreational and educational opportunities, pollution filtration, oxygen production and soil stabilization.

Management Class:
The large forested area district was placed in the conservation management class. This was done recognizing that forested areas provide many benefits, one of them being human use. Although the district is not in the protection management district, criteria were developed in order to conserve the ecological and social values described previously in this text.

Overall Approach:
The overall approach used to accomplished the previous stated goals is the conservation of large forested areas connected by corridors. This will allow for increased water quality as well as the maintenance of interior forest habitat.

Ecological Function:
Several land planning and management principles can be utilized to minimize the negative effects of development discussed in section 2. Specifically, 1) the maintenance of forested areas as buffers to maintain water quality 2) the conservation of islands of interior habitat connected by forested corridors 3) the management of abutting landuses to minimize impact in the conservation areas.

The conservation district for all large forested areas located in appendix C shall be contained within the hatched areas indicated on the map. River corridors in this district will serve as connecting corridors between the large forested conservation areas.

A one thousand foot setback from the center line of all water bodies containing a one hundred year flood plain hall be used as a protection areas to achieve the goals stated above. River corridors, which are defined by 100 year floodplain, shall be protected as set forth in the protection district requirements. Forested areas that are designated in the Large Forest Area District that are not in direct contact with the river corridor, but fall within the 1000' conservation area shall have the same requirements for connecting conservation areas[39].

Use of these areas shall be as follows:

Permitted Uses:

a. Permitted uses within this conservation area shall be limited to the following:

1. Nature Trails
2. Wildlife observation
3. Botanical observation
4. Outdoor educational programs
5. small scale (< 20 ac.) secondary spray irrigation waste water treatment

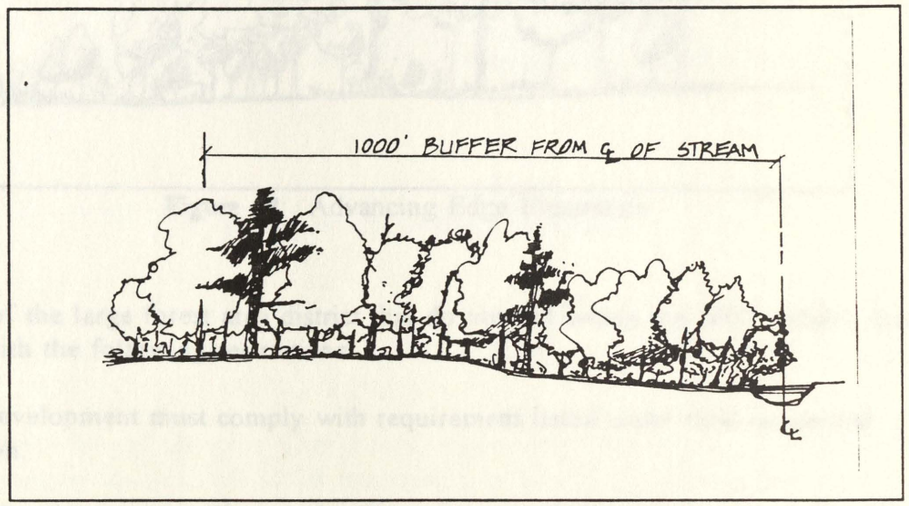


Figure 17: Illustration of 1000' setback

Conditional Uses:

1. New Utility transmission lines shall avoid contact with large forested areas wherever possible. If a crossing must occur, it shall occur in the shortest linear distance possible. The crossing shall incorporate an advancing edge as illustrated in figure 18[40]. This edge shall be located on R.O.W. to minimize impact to the interior woodland. Understory vegetation should be left in the R.O.W. where practical.

2. New roads shall also avoid large forested areas wherever possible. Again, if a crossing must occur, the shortest linear distance across the forest shall be utilized. The crossing shall incorporate a advancing edge as illustrated in figure 18. This edge shall be located on R.O.W. to minimize impact to the interior woodland.

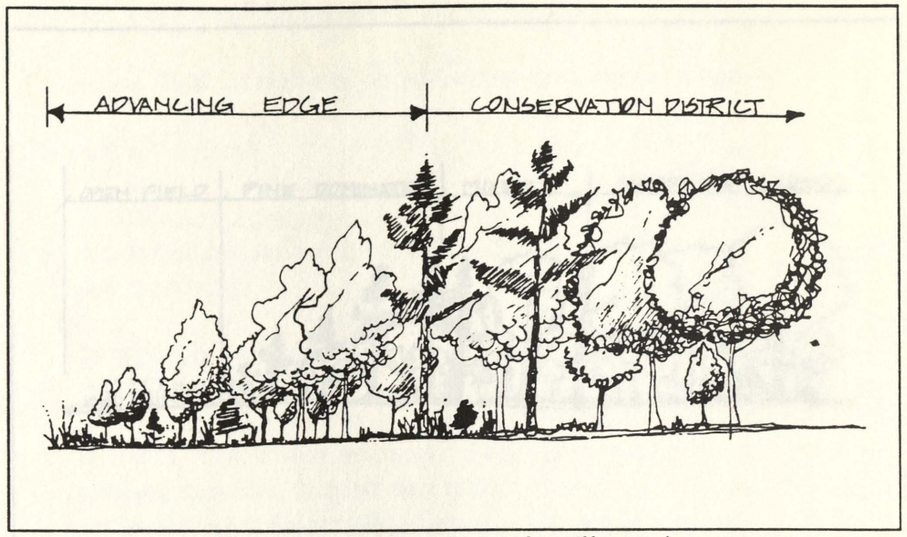


Figure 18: Advancing Edge Illustration

2. Patches of the large forest area district that do not fall within the 1000' setback can be developed with the following restrictions:

a. Development must comply with requirement listed under rural residential section.

b. When development ares are directly abutting the large forested conservation area, a 100' vegetative buffer must be maintained between the edge of the developed area and the edge of the 1000' conservation area. If possible, this area should use existing native vegetation to accomplish buffer requirements. Where this is not existing, or not possible, the 100' buffer area should be: 1)allowed to proceed through vegetational succession eventually resulting in a forested buffer 2) planted with native vegetation to construct this buffer. This buffer should incorporate and use a advancing edge (figure 18) to minimize impact into the conservation district. A listed of suggested plant material is contained in the appendix. This is necessary due to increased runoff from developed areas as well as invasion from aggressive exotic species that may out compete native species.

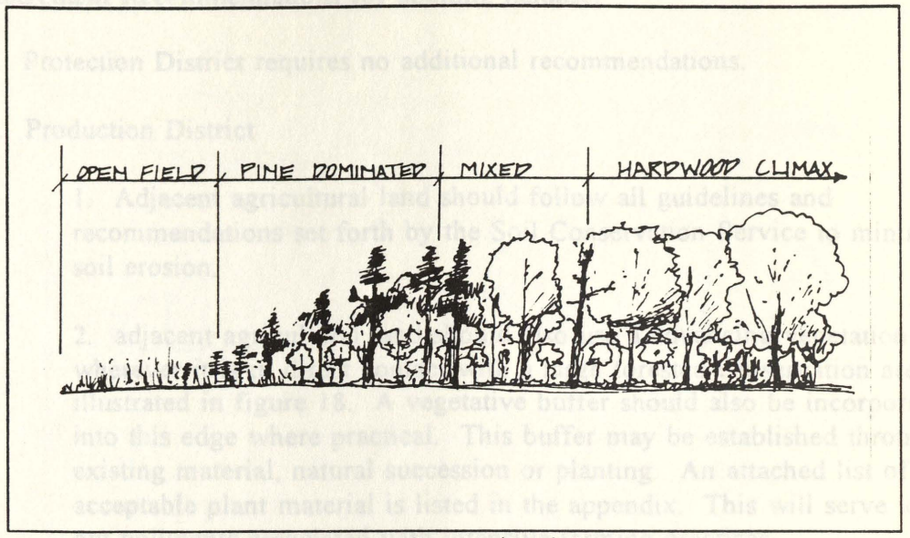


Figure 19: Successional Stages

Exemptions:

1. Exempt from the conservation district requirements are forested areas that fall within the 1000' conservation area, but which are equal to or less than 200' in width. This width must be taken along three represented width and averaged to result in a average width figure. These areas may be developed as represented in number 2 above.

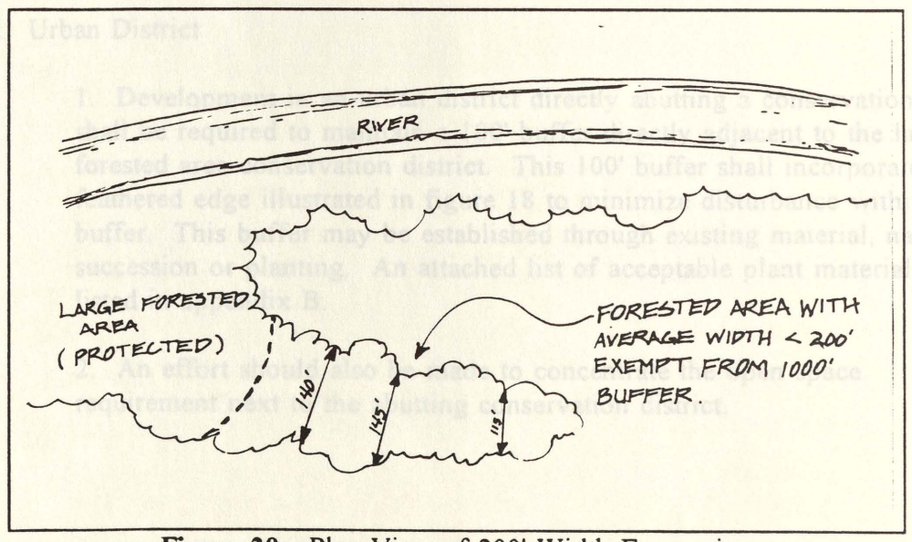


Figure 20: Plan View of 200' Width Exemption

Best Management Recommendations for abutting landuse.

a. Protection District requires no additional recommendations.

b. Production District

1. Adjacent agricultural land should follow all guidelines and recommendations set forth by the Soil Conservation Service to minimize soil erosion.

2. adjacent agricultural land should also use a advancing vegetation edge wherever it is in direct contact with a large forested conservation area as illustrated in figure 18. A vegetative buffer should also be incorporated into this edge where practical. This buffer may be established through existing material, natural succession or planting. An attached list of acceptable plant material is listed in the appendix. This will serve to filter out pollutants associated with intensive farming practices.

c. Compromise District

1. Development directly adjacent to large forested conservation areas should concentrate as much of the 50% open space requirement, set forth for development in that district, next to the conservation edge as possible.

2. A feathered vegetative edge should be incorporated into the edge of the compromise district that abuts the conservation district. A representative advancing edge is illustrated in figure 18. This buffer may be established through existing material, natural succession or planting. An attached list of acceptable plant material is listed in appendix B.

d. Urban District

1. Development in an urban district directly abutting a conservation zone shall be required to maintain a 100' buffer directly adjacent to the large forested area conservation district. This 100' buffer shall incorporate a feathered edge illustrated in figure 18 to minimize disturbance within the buffer. This buffer may be established through existing material, natural succession or planting. An attached list of acceptable plant material is listed in appendix B.

2. An effort should also be made to concentrate the open space requirement next to the abutting conservation district.

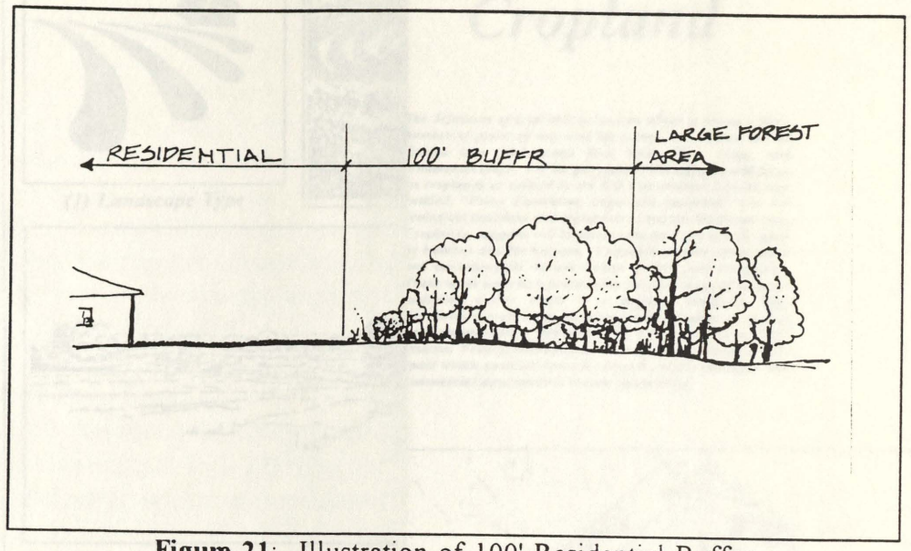
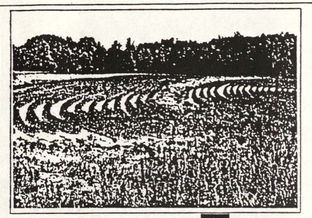


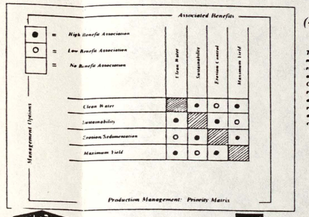
Figure 21: Illustration of 100' Residential Buffer

(1) Landscape Type



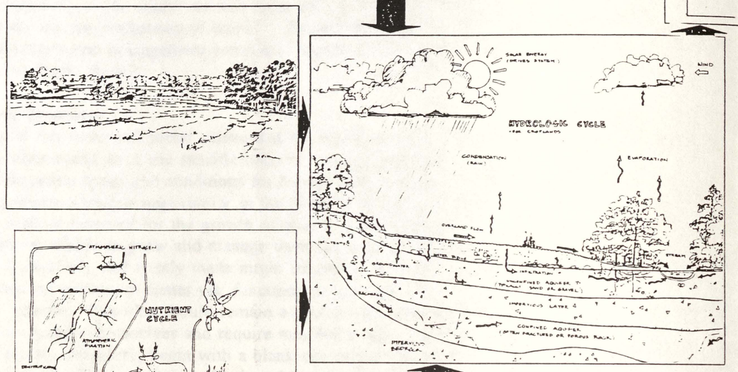
(3) Functional Model of Ecological System

The most important ecological process for the successful preservation of Croplands as well as harmonic interaction within other systems is the hydrologic process. Since water serves as a dynamic linkage of systems upon which all life depends, preserving water quality is important for both the user of the landscape type and all those connected to the land by water.



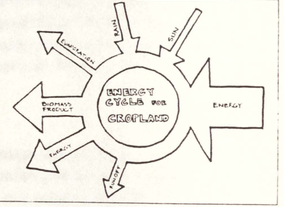
(4) Priority Matrix

The Matrix is helpful in determining management priorities. It shows the relationships between clean water and the other primary goals of Croplands. There is a strong relationship between clean water and sustainability, while the relationship between sustainability and maximum yield is not as critical.



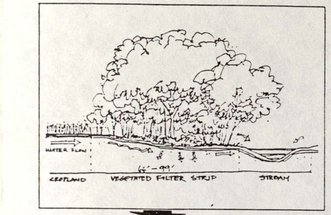
(2) Critical Issues

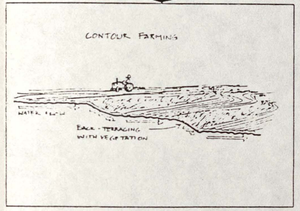
The nutrient cycle is an important cycle to understand as it is an integral part of the ecological processes of Croplands. The maintenance of this system is vital to the growth of crops. The concept of the energy cycle is another important model to fully understanding the ecological processes of Croplands because it is the driving force for all other systems. The amount of energy as an input component in the energy output is important for establishing a sustainable system.

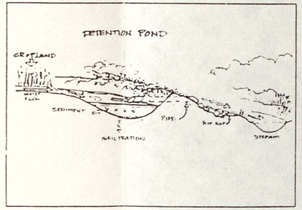


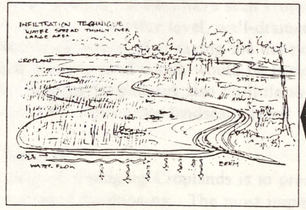
(5) Management Principles

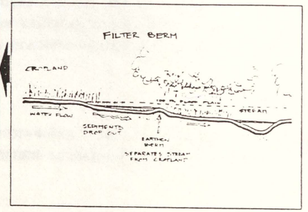
Management for ecological quality for croplands means primarily management for water quality. Management practices will be to ensure water quality protection from point and non-point source pollution for cropland areas, all public open water and reservoirs should be drinkable and swimmable by human beings. The surrounding wetland are aimed at controlling the water flow off of croplands and in aiding infiltration of water back in to the ground system. The majority of losses are carried on soil particles and therefore the farm property is to keep the sediment load confined to the source.











(6) Conclusions

The utilization of the techniques suggested should lead to a preservation of water quality which will secure the health and well-being of the riverbend and all associated land. In addition these implements will aid in creating a more sustainable agriculture which is more beneficial in the long run for both land and farmer.

Total Acres in District:

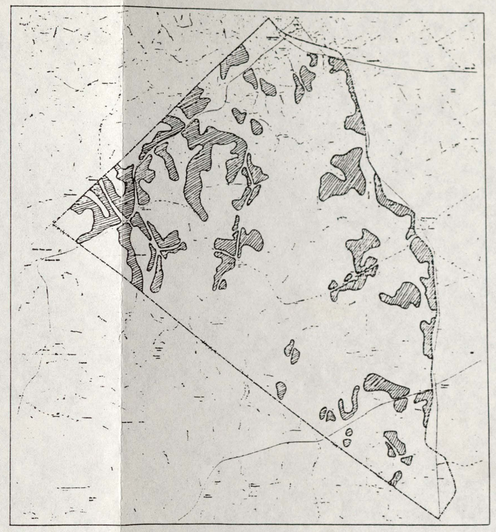
YELLOW RIVER WATERSHED

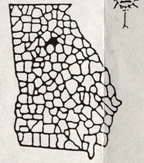
Walton County, Georgia

Production Management Class

Cropland

The definition of croplands is land on which is grown a large number of plants of any kind for human use. These can be divided into food crops, feed crops, fiber crops, and ornamental crops. For the purposes of this study,we will focus on croplands as defined by the Soil Conservation Service map entitled, "Prime Farmlands, Loganville Quadrant" The key ecological functions and social values that the landscape type, Croplands, supports will be determined on a site specific basis by humans and for humans. Croplands provide prime space and conditions for human and/or animal food production. These lands serve as a prime space for fiber crops as well, not including timber which is a different landscape type. Croplands provide an opportunity for the creation of varying and complimentary ecosystems to existing or pre-existing systems. Finally, croplands provide aesthetically pleasing open space which contrasts dense forestlands, stream corridors, and commercial developments to lend visual relief.





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Fall Quarter, 1993

Sheet

1. Landscape Type - Croplands

1.1 Definition

Croplands are resource production critical areas essential to supporting local or regional economy. These can be divided into food crops, feed crops, fiber crops, and ornamental crops. For the purposes of this study, we will focus on prime farmlands which are the resources necessary for the production of crops.[41] Prime farmlands that are located in the Protective and Conservation management zones are exempted as well as Commercially Managed Forest or Pastureland.[42]

1.2 Ecological Functions

The key ecological functions and social values that the landscape type, Croplands, supports will be determined on a site specific basis by humans and for humans. Croplands provide prime space and conditions for human and/or animal food production. Croplands also provide a unique opportunity in the realm of human use landscapes in that they are spaces used or reserved for the growth of plants. The selection of the plants used and the conditions available to grow and manage them are subject to human choice. These choices, if creatively and wisely made might culminate in a cropland which replicates a natural ecosystem, or better yet, functions as apart of or in harmony with surrounding ecosystems. This idea should remain a goal for all cropland management as natural ecosystems sustain themselves and require minimal energy input for growth and maintenance. Farmers, therefore, begin with a blank canvas on which they can paint anything they aspire to. The possibility of being able to introduce a naturally functioning ecosystem to a world where ecosystems are being depleted daily is an opportunity which should be utilized. Finally, croplands provide aesthetically pleasing open space which contrasts dense forestlands, stream corridors. and commercial developments and lends visual relief.

1.3 Current Development Patterns

Current development patterns have been established through the expansion of our world through a need to find space for a rapidly increasing human population. The economy of providing space usually deals with maximum space for minimum investment. Current development patterns do little to reinforce the functions and values of Croplands. Instead, developers for the past several decades have seen croplands only as a prime development site because these lands usually offer level, well-drained soils which seldom require extensive land forming activities, thus saving the developer a great deal of time and money. In addition to using land which would be better utilized for farming as residential housing, Current development patterns also do little to preserve the open space providing mental and physical relief from other landscape types.

1.4 Primary Objective

The primary objective of managing Croplands is to preserve key ecological processes essential to their sustained functioning. The most important ecological process for the

successful preservation of Croplands as well as harmonic integration within other systems is the hydrologic process (Figure 22). Since water serves as a dynamic linkage of systems upon which all life depends, preserving water quality is important for both the users and all those land-based resources connected to the land by water. For example, loss of topsoil through erosion accounts for up to 80% loss in soil fertility. The nutrient cycle is important, but as this cycle is largely dependant upon and driven by the hydrologic cycle, it will be of less significance in developing management criteria. The concept of the energy cycle is another important process in fully understanding the ecological processes of Croplands, but because the energy cycle is driven primarily by the sun, it remains a more difficult process to manage.

The secondary objective of managing Croplands is to provide for sound principles upon which future development can be based. These principles will be based upon the truth that the model of ecology provides the best model for developing "best" management practices.

Figure 22: Ecological Process

2. Nature of Human Impact on Croplands

Croplands by definition are humanly impacted landscapes; they are comprised of land-based resources- soil and water- that have already experienced some degree of disturbance. It is the degree of disturbance which must be addressed. Specifically, which human actions are the most disruptive to the resources? The key impacts for the Productive landscapes can be divided into two kinds: ecological and visual.[43] The former explains human impact on the environment, while the latter explains human impact on other humans.

2.1 Ecological Impacts

Ecological impacts can be viewed in terms of inputs and outputs, the same way ecological systems are viewed.

2.1.1 Inputs

Inputs in this case consist of those human actions which enter an ecosystem and cause a disturbance to the structure and functioning of the system. In most circumstances related to Croplands, input resulting from human disturbance begins with clearing of the land. This process causes a number of problems which stress or alter the hydrologic cycle with which we are concerned.

2.1.1.1 Soil Erosion and Sedimentation

The major problem caused by clearing the land is soil erosion and sedimentation. As the natural vegetative layer is removed, the exposed land is immediately susceptible to these conditions, especially if heavy rains are encountered during the process.

2.1.1.2 Soil Compaction

Another major problem in the process of clearing the land is soil compaction. Modern clearing techniques require heavy machinery which compacts the soil which becomes impervious to water, nutrients, and oxygen. Only with more major disturbance with more major machinery in the form of tractors and plows, can farmers make the soil useable again.

2.1.1.3 Drainage Alteration

The alteration of pre-existing drainage ways and flow rates is another major human impact. In the maintenance of Croplands, farmers must make sure that their plants get even and constant distribution of water. Excess water which can be harmful to a crop is channeled quickly off the land, often directly into an adjoining stream.

2.1.1.4 Fragmentation

The creation of croplands, while providing useful open space, is often haphazard with little thought given to the surrounding landscape. What occurs in many situations is fragmentation. Other landscape types are split up and divided into unproductive or useless spaces.

2.1.2 Outputs

Outputs from human ecological impact occur in the form of pollutants.

2.1.2.1 Sediment

Sediment, though a natural product, becomes a pollutant when it is concentrated in streams and other non-desirable areas of the landscape. Sediment from erosion can fill up stream beds, thereby raising the floodplain. It can cause streams to become cloudy, choking off fish and sunlight needed for photosynthesis.

2.1.2.2 Chemical Pollution

Chemical pollution is a major problem for croplands to the amounts of man-made products applied to the landscape in the form of fertilizers, herbicides, fungicides, and pesticides. If too much of these substances are applied or before a large rain, they can easily become a toxic part of the hydrologic cycle.

2.1.2.3 Nutrient Loading

Nutrient loading is another major impact as these substances, natural and synthetic, promote accelerated rates of biological activity to occur, causing many problems like eutrophication.

2.2 Visual Impacts

Visual Impacts can occur from the creation of croplands as well as the development of croplands. The conversion of land for crop use often means the clearing of an already established landscape type. An established landscape type is normally an aesthetically pleasing one for humans. The loss of this landscape could mean the loss of an important buffer. Farm equipment can cause disturbing noise for humans and animals alike. On the other hand, a well-established cropland provides an aesthetically pleasing open space.[44] The development of croplands into other human uses can be even more disturbing from a visual point of view than its initial creation.

3. Response to Impact: Land Planning/Design Principles

The Croplands described in this report are located in the Yellow River Watershed in the western portion of Walton County. The Processes used for delineating the management zones as seen in appendix C are described as follows: In order to make best use of the Prime Farmlands Map, the general patterns of prime farmland occurrence were first recognized. From this the major areas of concentration of croplands were then outlined.[45] This information was then laid over (using a transparent rendering) the delineated zones for the Landscape Types of River Corridors and Large Forested Areas.[46] The resulting areas were then outlined to be classified as Croplands and managed as such.

3.1 Management of Ecological Impact

Since the sustained functioning of the land-based resources that support croplands is primarily dependant on the hydrologic cycle, the land planning principles we propose will focus on sustaining the hydrologic cycle in croplands by mitigating the impacts outlined in sections 2.1 and 2.2. The measures outlined are aimed at controlling the water flow off croplands and in

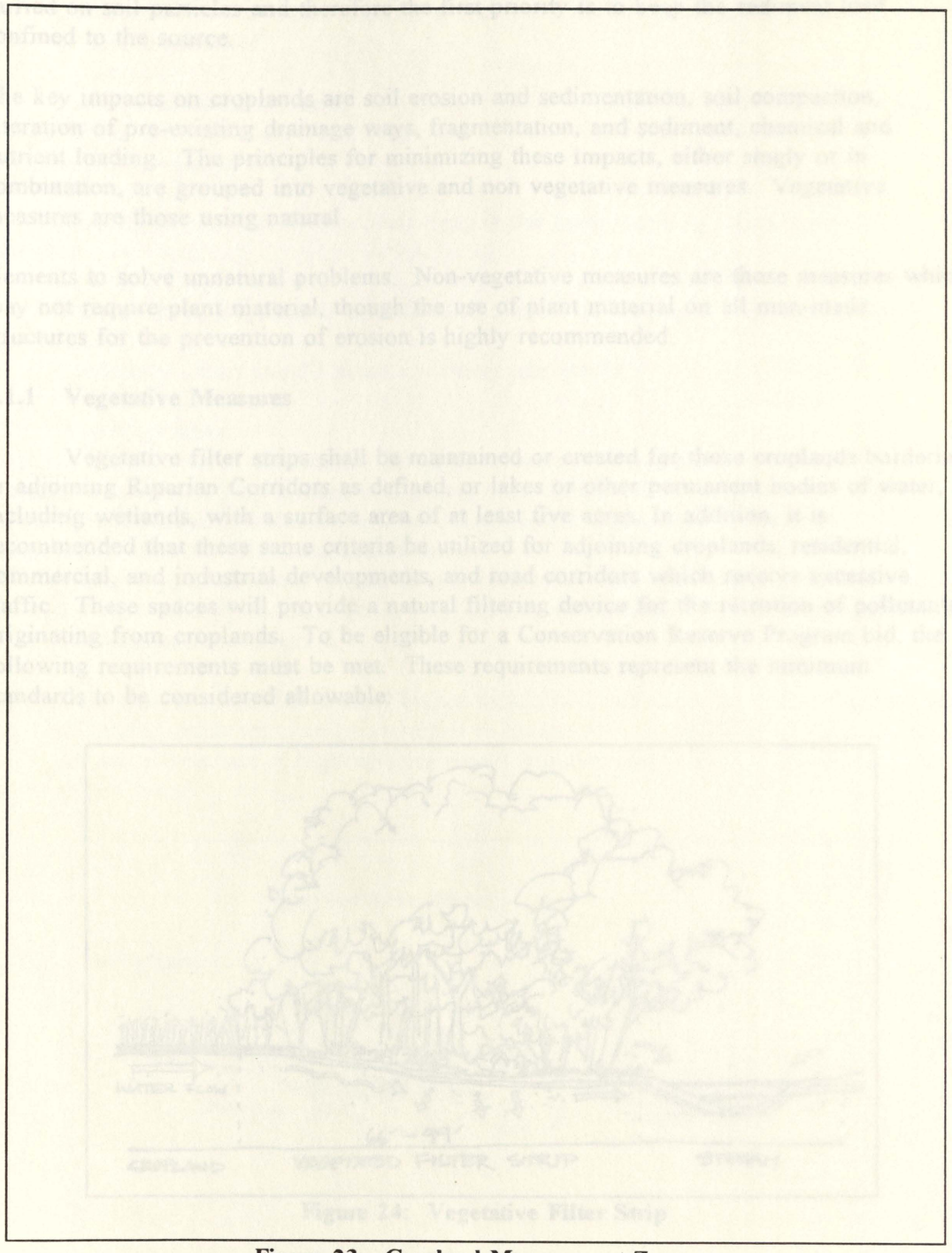


Figure 23: Cropland Management Zones

aiding infiltration of water back into the ground system. The majority of toxins are carried on soil particles and therefore the first priority is to keep the sediment load confined to the source.

The key impacts on croplands are soil erosion and sedimentation, soil compaction, alteration of pre-existing drainage ways, fragmentation, and sediment, chemical and nutrient loading. The principles for minimizing these impacts, either singly or in combination, are grouped into vegetative and non vegetative measures. Vegetative measures are those using natural

elements to solve unnatural problems. Non-vegetative measures are those measures which may not require plant material, though the use of plant material on all man-made structures for the prevention of erosion is highly recommended.

3.1.1 Vegetative Measures

* Vegetative filter strips shall be maintained or created for those croplands bordering or adjoining Riparian Corridors as defined, or lakes or other permanent bodies of water, including wetlands, with a surface area of at least five acres. In addition, it is recommended that these same criteria be utilized for adjoining croplands, residential, commercial, and industrial developments, and road corridors which receive excessive traffic. These spaces will provide a natural filtering device for the retention of pollutants originating from croplands. To be eligible for a Conservation Reserve Program bid, the following requirements must be met. These requirements represent the minimum standards to be considered allowable:

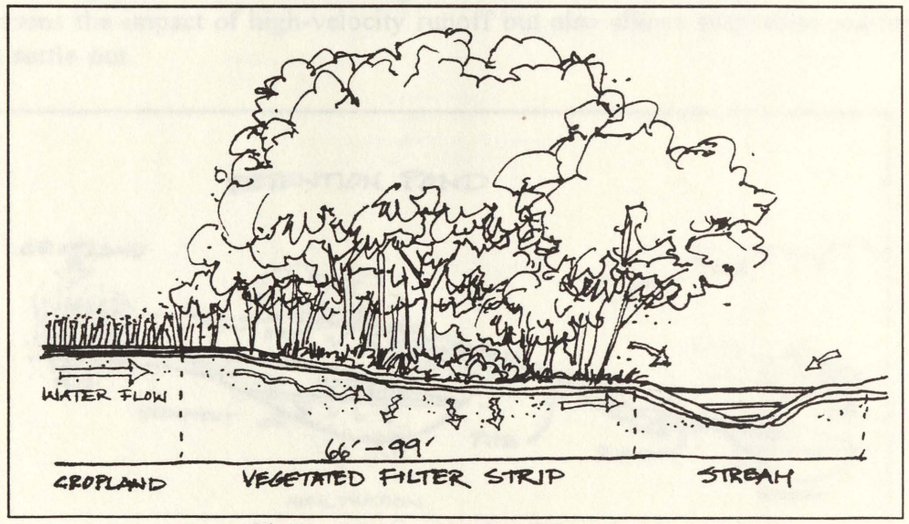


Figure 24: Vegetative Filter Strip

* Land parallel to a stream must be at least 66 feet wide and no more than 99 feet must be left undisturbed.

* Plants used in establishing a vegetative filter strip should be of a native variety such as White Oak (*Quercus alba*), Dogwood (*Cornus florida*), or Sweetshrub (*Calycanthus Floridus*).

* Planting ornamental, nut, or fruit trees is not permitted a specified in the CRP standards.

* Only crops appropriate to the soils and climate of the region should be grown.[47]

* Secondary Crops should be grown where applicable.[48]

3.1.2 Non-Vegetative

Tillage is the process of penetrating the earth to loosen the soil there by integrating air, nutrients, and water. This process also makes soils susceptible to erosion. According to the site-specific conditions, zones will be developed to implement Conventional, Conservation, and No till agricultural practices.

* Waterways or channels should be constructed to catch the overland flow of water, slow its velocity by means of a very shallow grade and deliver it to an appropriate intermediate containment.

* Detention ponds and Sediment basins should be constructed as an excellent means of storing extra water and allowing it to escape at a controlled rate. This not only lessens the impact of high-velocity runoff but also allows suspended sediment time to settle out.

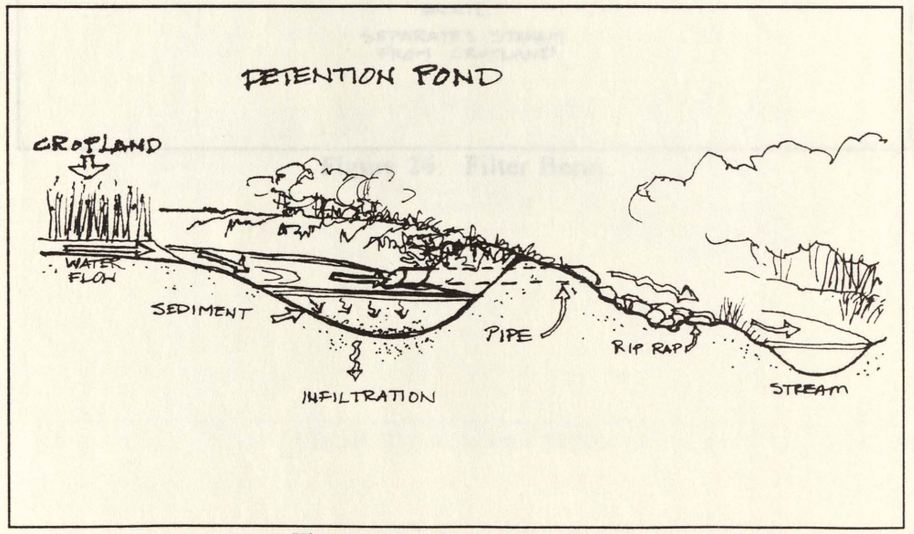


Figure 25: Detention Pond

* Retention ponds can be constructed to save runoff water for future use.[49]

* Filter berms provide a raised barrier used to separate Riparian Corridors from Croplands. This separation would prevent the possible contamination of stream waters by Cropland runoff. See Figure 26.

The height and length of the berm should be based on the objective to contain Cropland runoff while allowing periodic flooding of the bordering stream, especially when located in floodplain areas.

* Infiltration basins provide shallow dispersal of storm or irrigation water for the purpose of allowing water to percolate into the ground. See Figure 27.

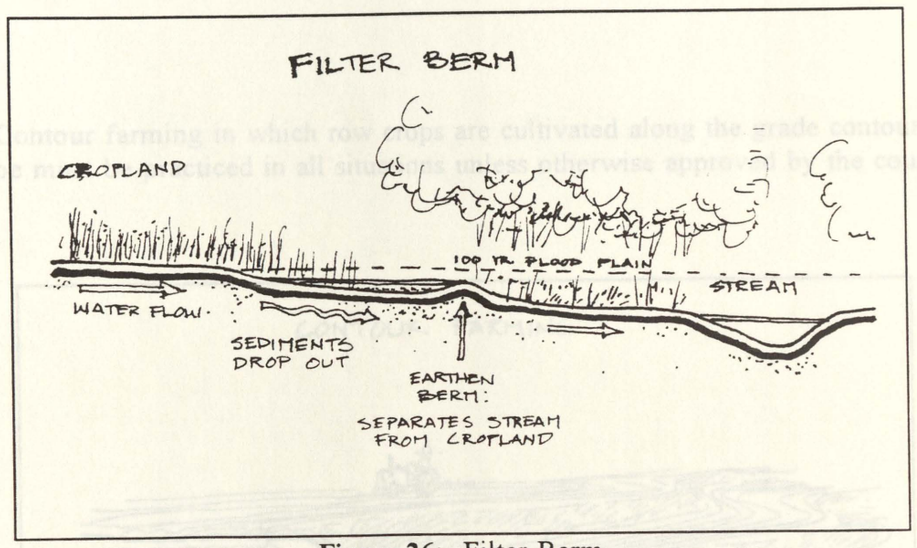


Figure 26: Filter Berm

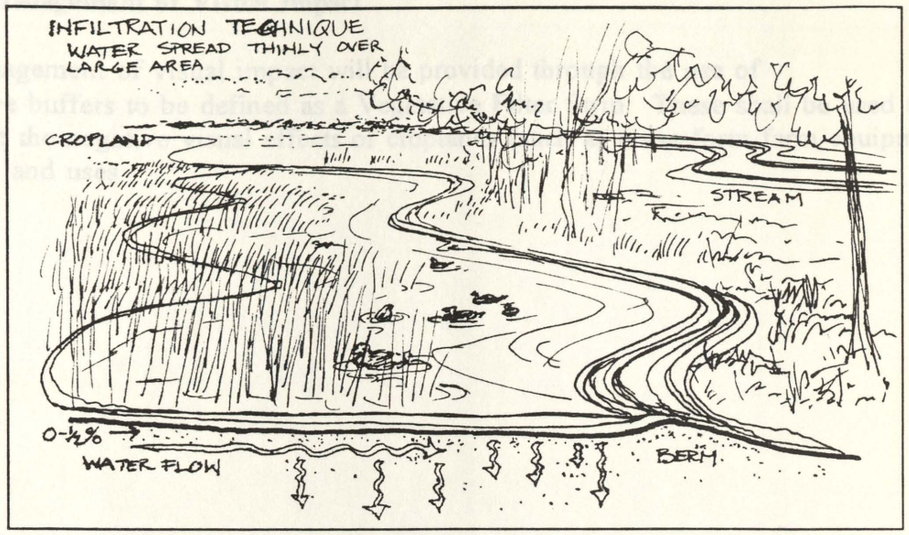


Figure 27: Infiltration Technique

* Contour farming in which row crops are cultivated along the grade contours of the landscape must be practiced in all situations unless otherwise approved by the county.

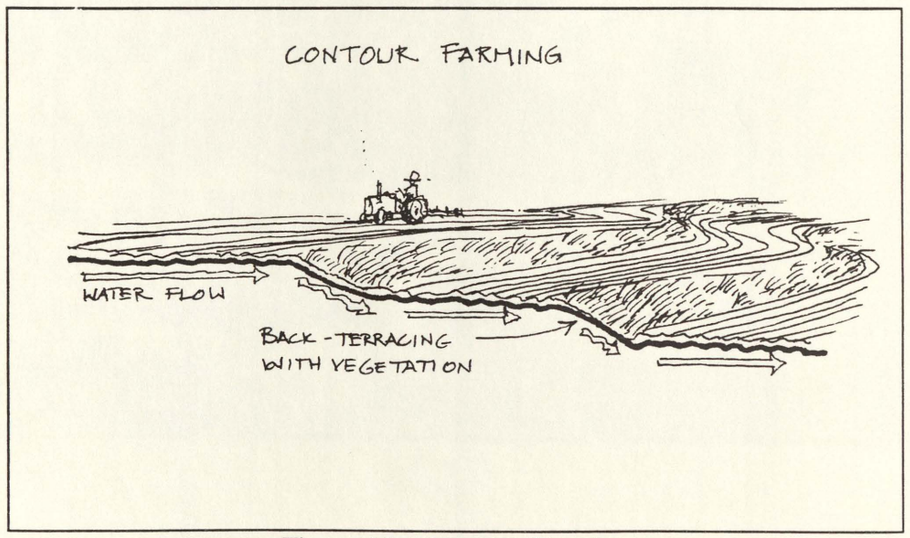
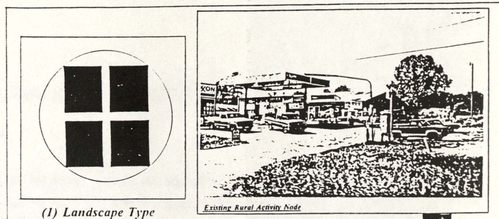


Figure 28: Contour Farming

3.2 Management of Visual Impact

The management of visual impact will be provided through the use of vegetative buffers to be defined as a Vegetative Filter Strip. These shall be used to minimize the negative visual effects of croplands (such as noise form farm equipment) for abutting land uses

Figure 8: Cropland

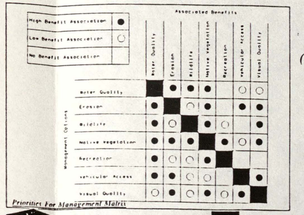


Existing Rural Activity Node

(1) Landscape Type

(3) Functional Model of Ecological System

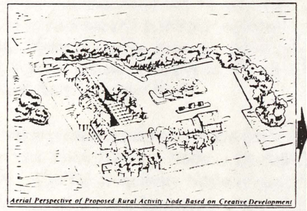
Commercial development gives little consideration to the landscape structure or function of the specific site. It typically results in deforestation, disruption of animal and vegetative communities, increases runoff, increased erosion, increased sedimentation, increased pollutants, alteration of natural drainage patterns, and ultimately in the degradation of water quality. Developing guidelines which will limit the impact of development on the site and its surroundings is necessary in order to be ecologically sensitive.



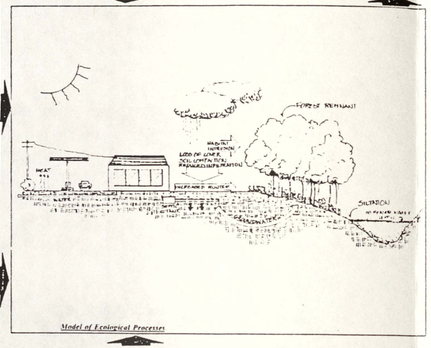
Priorities For Management Matrix

(4) Priority Matrix

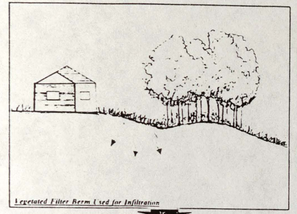
There are many environmental benefits for managing for water quality and trees/vegetation. Managing for water quality can help control erosion, and runoff, as well as benefit plant and animal communities. Managing for trees/vegetation, however, can help improve scenic quality. By managing for both water quality and trees/vegetation, both the ecological integrity, and the rural character can of the site can be maintained.



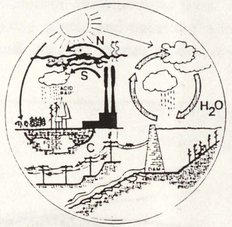
Aerial Perspective of Proposed Rural Activity Node Based on Creative Development



Model of Ecological Processes



Vegetated Filter Berm Used for Infiltration

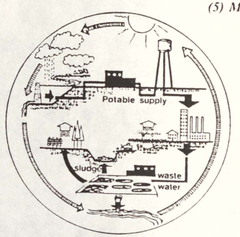


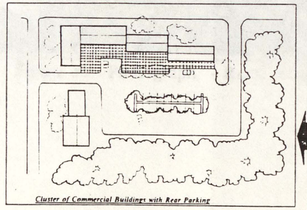
(2) Critical Issues

As traffic becomes increasingly congested on the more traveled roads, drivers are seeking alternate routes to reach their destinations. Many of these alternate routes are the formerly less-traveled, scenic roads. The resulting increase in traffic on these rural roads makes them prime areas for commercial development -- anyone their natural features. If local zoning continues to encourage new commercial development to occur in a linear pattern along both sides of the road, the loss of Walton County's rural character, and ecological integrity, will be the result.

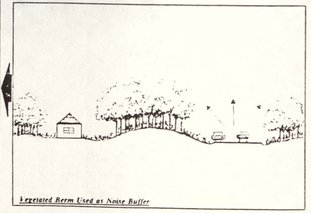
(5) Management Principles

The primary objective of the Rural Activity Node District is to maintain ecological and visual integrity, while allowing for development to occur. By using various infiltration techniques, the management of water quality (hence ecological integrity) can be accomplished. Visual qualities can be managed by commercial clustering which will help limit the sprawl of commercial development. Placing parking on the rear and using buffers will also help improve the visual quality of the site. There are many other techniques can help guide future development.

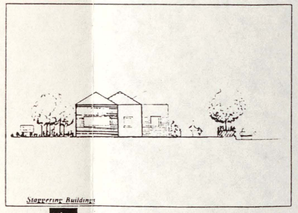




Cluster of Commercial Buildings with Rear Parking



Vegetated Berm Used as Noise Buffer



Staggering Buildings

(6) Conclusions

In establishing a Rural Activity Node District several objectives can be met. First, this district will limit commercial development to restricted zones, thus preventing the potential for commercial sprawl. Second, guidelines designed specifically for this district can manage for ecological quality, and visual quality. Third, commercial uses can be limited to those which are of necessity.

Total Acres in District:

YELLOW RIVER WATERSHED

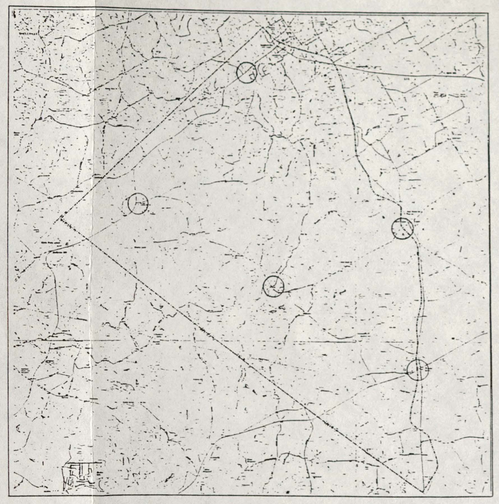
Walton County, Georgia

Compromise Management Class

Rural Activity Node

A Rural Activity node can be defined as Low density commercial development which occurs around principle intersections along frequently traveled scenic roads. These nodes typically occur in less developed areas of town near visually appealing natural features (Pasture, farmland, forests, etc.).

Using Odum's compartmental model as a basis for developing an ecologically-based land classification, the Rural Activity Node is classified as part of the Compromise Management Class. The Rural Activity Node is placed in this management class because it is neither an all natural landscape or an all developed landscape. It is a combination of both. Therefore, development must be managed in a manner which is sensitive to the surrounding scenic and natural features.



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Fall Quarter, 1993

Sheet

1. Landscape Type - Rural Activity Node

1.1 Definition:

No pre-existing definition for rural activity node exists in the Walton County Land Development Ordinance, so for the purposes of this study a definition was formulated.[50] A Rural Activity node can be defined as low density commercial development which occurs around principle intersections along frequently traveled scenic roads. These nodes typically occur in less developed areas of town near visually appealing natural features (Pasture, farmland, forests, etc.). See Figure 30 for an example of a typical Rural Activity Node.

Using Odum's compartmental model as a basis for developing an ecologically-based land classification, the Rural Activity Node is classified as part of the Compromise Management Class. The Rural Activity Node is placed in this management class because it is neither an all natural landscape or an all developed landscape. It is a combination of both. Therefore, development must be managed in a manner which is sensitive to the surrounding scenic and natural features. See Figure 31 for an example of the ditribution of Rural Activity Nodes in the western section of Walton County.

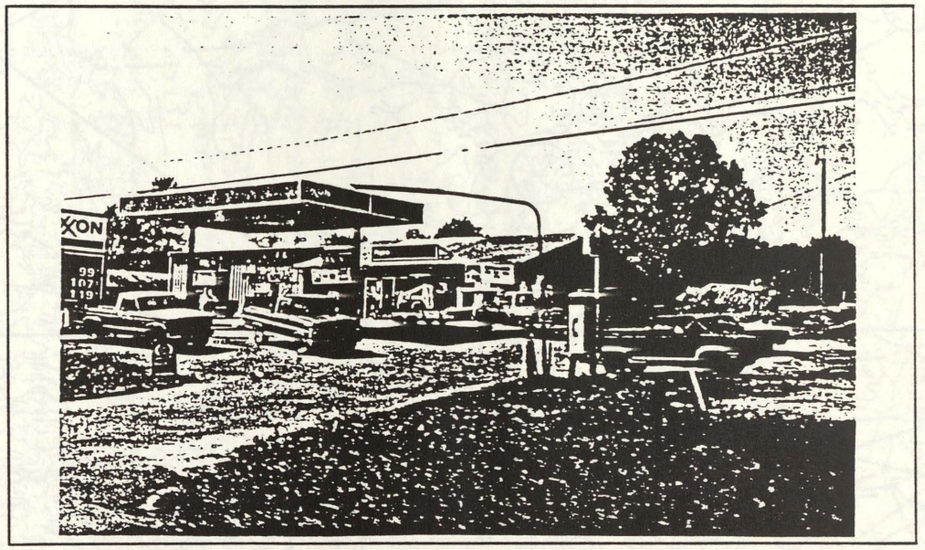


Figure 30: Photograph - Rural Activity Node

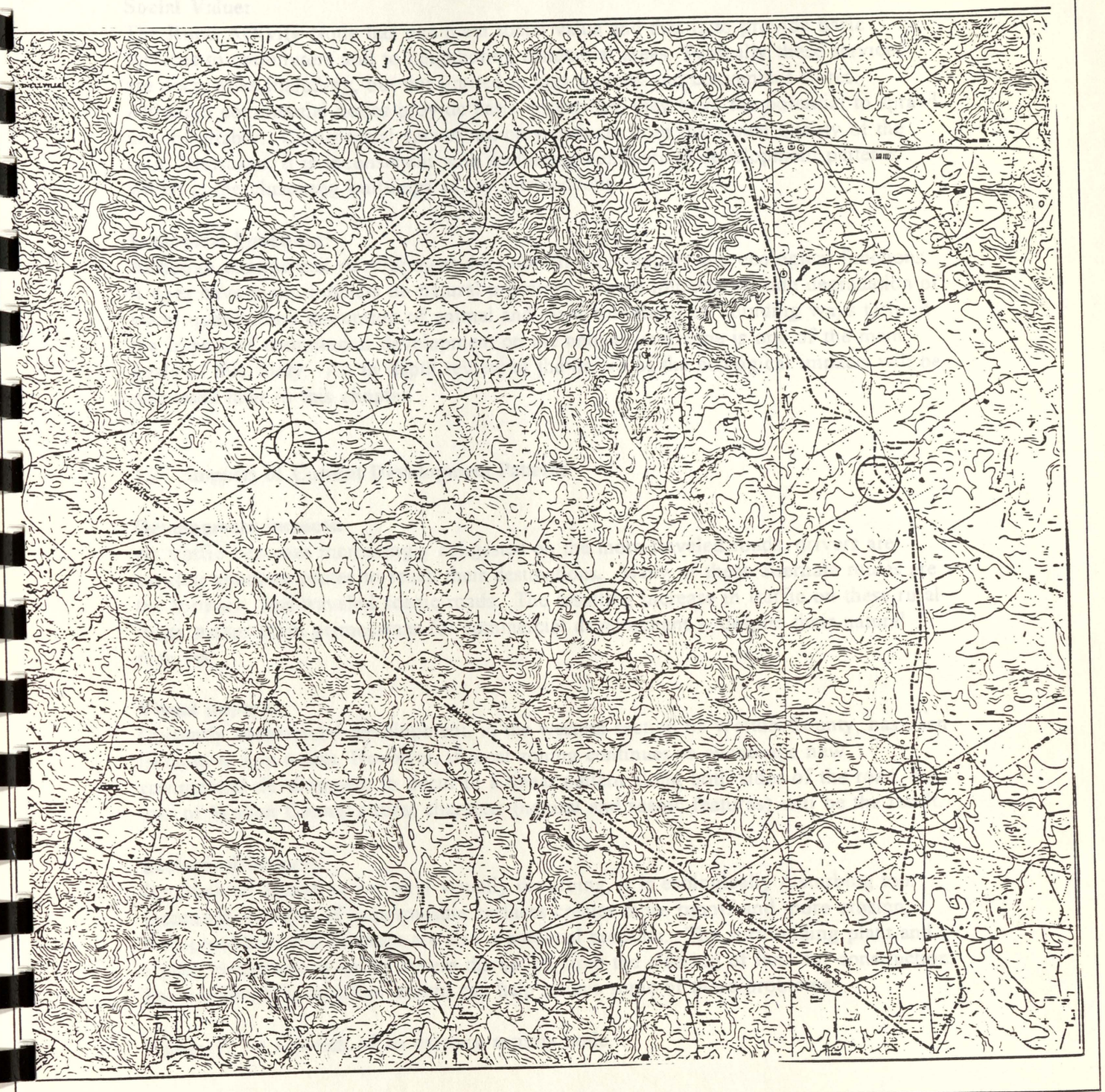


Figure 31: Distribution of Rural Activity Node Landscape Type

1.2 Key Social Values and Ecological Functions

Social Value:
The Rural Activity Node has one main social value and that is to provide basic services to commuters and to neighboring residential areas. Typically these services are necessities including, but not limited to, gas stations and convenient stores. Although commercial nodes provide basic necessities, they have the potential to sprawl uncontrollably. Commercial sprawl not only detracts from the visual quality of the rural landscape, it is inconsistent with traditional commercial development patterns which is the clustering buildings at key intersections.

Ecological Functions:
Although commercial development does not directly support any ecological functions, it does have many impacts on natural processes. These impacts include degradation of water quality, and disruption of animal and plant communities. Finding ways to limit the impact of commercial development on the natural landscape is one of the main goals of this study. An in depth review of the nature of the ecological impacts will be discussed later in this chapter.

1.3 Impacts of Current Development Patterns

Development impacts:
As traffic becomes increasingly congested on the more traveled roads, drivers are seeking alternate routes to reach their destinations. Many of these alternate routes are the formerly less-traveled scenic roads. The resulting increase in traffic on these rural roads makes them prime areas for commercial development -- despite their natural features.

Visual impacts:
Currently commercial development, in the western section of Walton County, has been isolated to key nodes. However, if local zoning continues to encourage new commercial development to occur in a linear pattern along both sides of the road, the loss of Walton County's rural character (natural and scenic features) will be the result.

Ecological impacts:
Commercial sprawl is not only visually disturbing, it is ecologically disturbing too. Increased amounts of impermeable surfaces creates more runoff and more erosion. Non-point source pollutants are also a potential problem. The surrounding plant and animal communities suffer severe disruption from the clearing of land for construction. Environmentally sensitive design can help relieve some of these problems.

Figure 32 is a sketch of an existing activity node.

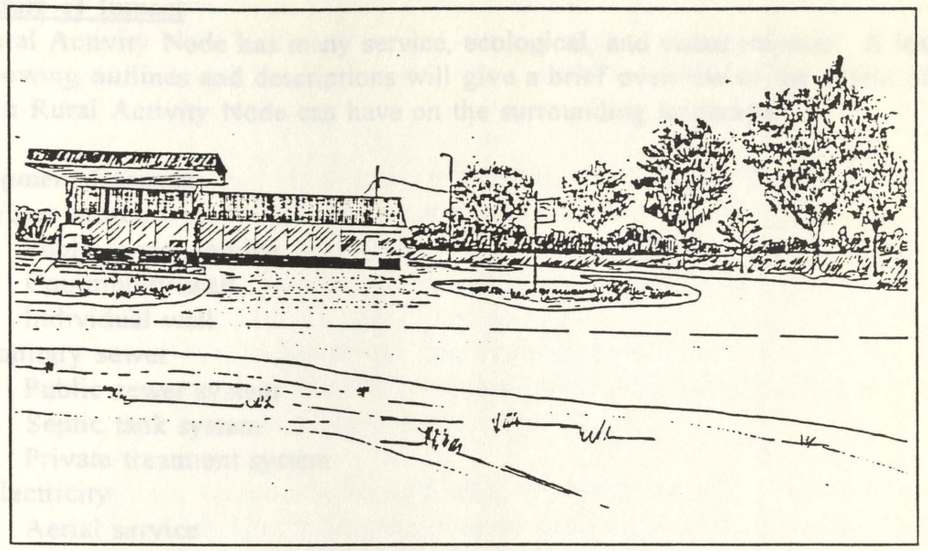


Figure 32: Rural Activity Node Landscape Type

1.4 Primary Objectives

Planning for future development has become a major concern for Walton County. They realize the need to allow for future development, yet they want to protect their scenic rural character. As part of our Human Ecological Planning course, sustaining ecological integrity of the site must also be a major consideration. As a result, it is the primary objective of this study to design guidelines which will help maintain the rural character of Walton County and help sustain ecological quality, while allowing for development to occur. The guidelines suggested in this section of the study can be used to guide future development of Rural Activity Nodes in away that is harmonious with Walton County's rural landscape, and which conserve significant ecological quality.

The first objective is to break the standard pattern of linear development by maintaining the compact and centralized activity node. This kind of development will help preserve the visually important rural landscapes in between nodes. Nodal commercial development requires new businesses to be grouped at major intersections, rather than being lined up along the entire length of a highway. Although the idea of limiting commercial development to areas adjacent to key nodes may seem unusual to modern day society, it is not a novel idea for rural development. It actually follows a long tradition, in which rural development has been grouped at road junctions, with open fields and pasture beside and behind them.[51]

2. Nature of Impact

The Rural Activity Node has many service, ecological, and visual impacts. A look at the following outlines and descriptions will give a brief overview of the extent of impact a Rural Activity Node can have on the surrounding landscape.

Development Impacts:

1. Water source
   a. Public water service
   b. Community well
   c. Individual well
2. Sanitary sewer
   a. Public sewer system
   b. Septic tank system
   c. Private treatment system
3. Electricity
   a. Aerial service
   b. Underground service
4. Natural gas
5. Telephone
   a. Aerial service
   b. Underground service
6. Transportation access
   a. Public paved roads
7. Parking access
   a. Public paved roads
   b. Access for large trucks
8. Solid waste collection
9. Storm water collection/control
10. Storm water piping system for roadways

*If the commercial use is a gas station, underground storage tanks for gasoline will need to be an additional consideration.

How electricity, water, and sewage treatment will be supplied must be considered before construction can begin. Water lines currently service the western section of Walton County so there will be no need for wells. Waste products, however, will have to be treated by septic tanks or on-site treatment since no sewer lines currently service this section of the county. If sewage is treated by septic tanks, sites which have adequate percolation must be chosen for development. Electricity is already provided by the city to most of this section of the county.

Visual Impacts:

The visual impact of the Rural Activity Node must also be a consideration when developing design guidelines. Rural Activity Nodes can have many negative impacts

between commercial structures and traditional rural buildings can be a major visual problem. However, with proper design guidelines and the establishment of review boards, commercial development could become a visually appealing element in the rural landscape.

Scale: Most new structures do not relate to the scale of traditional buildings. Restrictions placed upon the size, height and total floor space allowed within any commercial structure can help provide harmony in scale. Lot sizes which remain consistent with pre-existing lot dimensions also help maintain harmony.

Facade: Harmony in facade design will help maintain rural character. Implementing a review board to help establish minimum requirements for the design of the exterior of buildings can be the first step towards maintaining harmony.

Signage. Signage can become detrimental when it overpowers other visual elements of the surrounding landscape. Excessive size and quantity of competing signs has become a severe problem in most commercial districts. A comprehensive sign ordinance can help provide standards for new signs.

Parking: Parking can also visually detract from the scenic landscape. Strict requirements that parking be placed on the side or rear of the lot can be implemented. Issues like noise, lighting and circulation must also be taken into consideration.

In order to design a Rural Activity Node which is ecologically and visually sensitive, strict guidelines for development need to be developed and implemented. These following guidelines should help limit the impact of the Rural Activity Node on natural environment.

Ecological Impacts:

1. Clearing of land
   a. For commercial building
   b. For equipment access
   c. For parking
2. Compaction of soil
   a. For building construction
   b. For paving and utility construction
   c. Due to general activity on the site
3. Damage to edge vegetation
   a. Due to vehicular activity
   b. Due to forest opening
4. Soil erosion and sedimentation
5. Localized chemical pollutants (paint, solvents, etc.)
   a. Will affect water quality
6. Alteration of natural drainage pattern and flow rates

6. Alteration of natural drainage pattern and flow rates
   a. Increase in total runoff
   b. Artificial concentrations of flow
   c. Flow concentrations result in higher sediment loads which will affect water quality
   d. Concentrations reduce capacity of land to absorb pollutants
7. Fragmentation of existing vegetative community
   a. Typically all vegetation is removed
   b. Only rear and occasional side lots remain undisturbed
   c. Introduction of exotics into native setting
8. Disruption of animal habitats

Commercial development gives little consideration to the landscape structure or function of the specific site. Commercial construction typically results in severe deforestation and forest fragmentation, severe disruption of animal and plant communities, intensive runoff, increased erosion and sedimentation, increased pollutants, alteration of natural drainage patterns, and ultimately in the degradation of water quality. The increased runoff rates are also associated with increases in sediment load, and possible increases in water elevations in nearby streams.

Construction of a commercial development begins with the clearing of the land to construct the building and provide parking facilities. As a result, the amount of existing vegetation remaining is usually minimal to almost nothing. Side and rear areas of the lot may have some remnant vegetation, however, there will still be a severe disruption of plant and animal communities -- including a noticeable increase in edge communities. The introduction of exotics after the construction phase is complete will also have a negative impact on the surrounding landscape. Runoff and erosion can also become a major problem on the construction site because clearing the land alters natural drainage patterns and flow rates. Runoff and erosion problems can also result in increased sediment loads downstream. Building construction, parking lot construction and general activity on the site results in soil compaction. Vehicles and chemicals used during construction result in non-point source pollution. Not to mention that the introduction of gasoline storage tanks becomes a potential hazard.

Even after the construction phase is complete, many of these same problems persist. The introduction of impermeable surfaces (e.g. pavement and building) reduces the amount of infiltration thus increasing the amount of runoff. The increase in runoff can result in erosion and sediment load increases. Non-point source pollution from vehicles also becomes a problem -- runoff from parking lots is usually laden with a variety of contaminants that can have severe adverse impacts on downstream water.[52] Figure 33 illustrates the major impacts of construction. Figures 34 and 35 indicate processes associated with electricity and effluent.

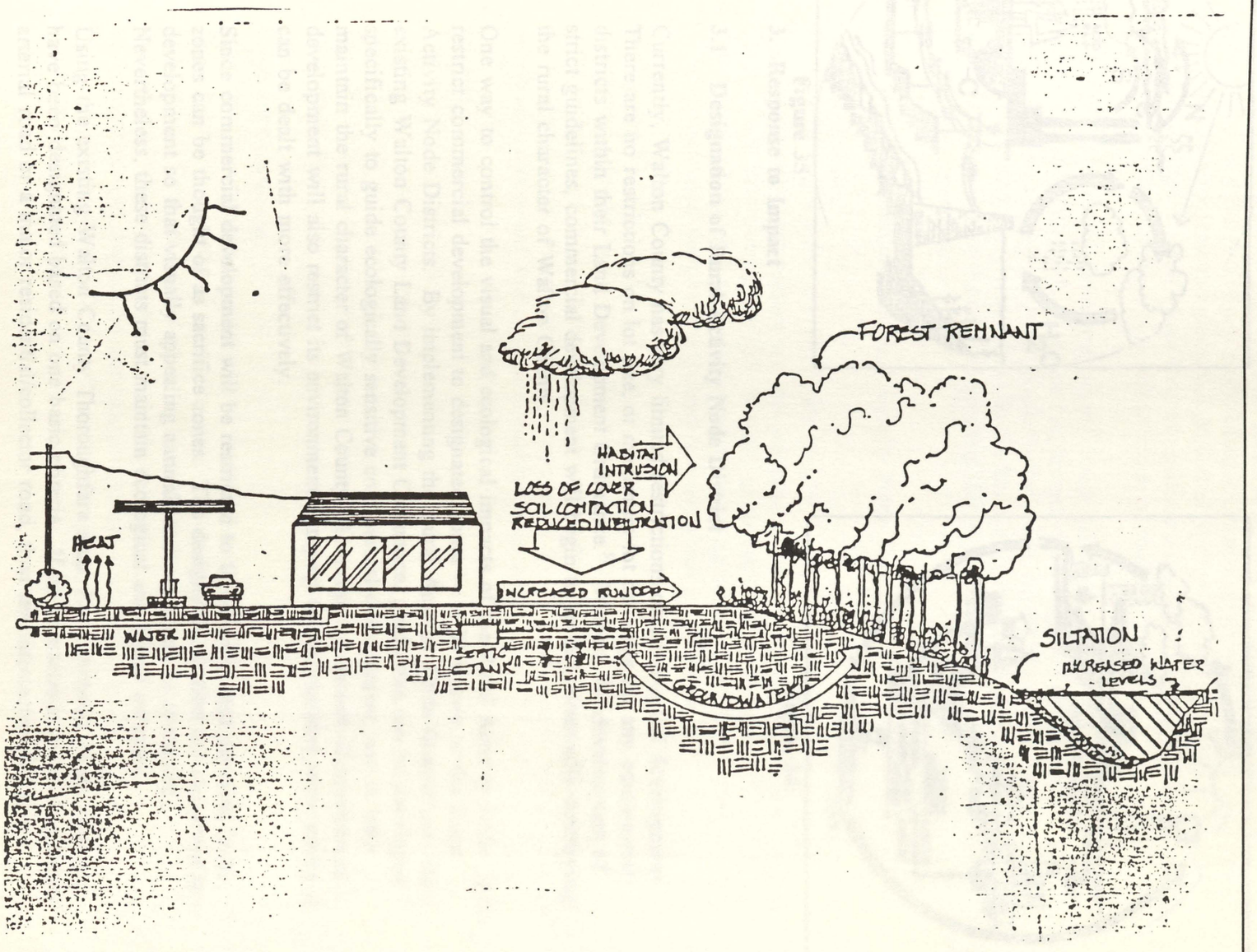


Figure 33: Sketch of Human Impacts and Natural Processes

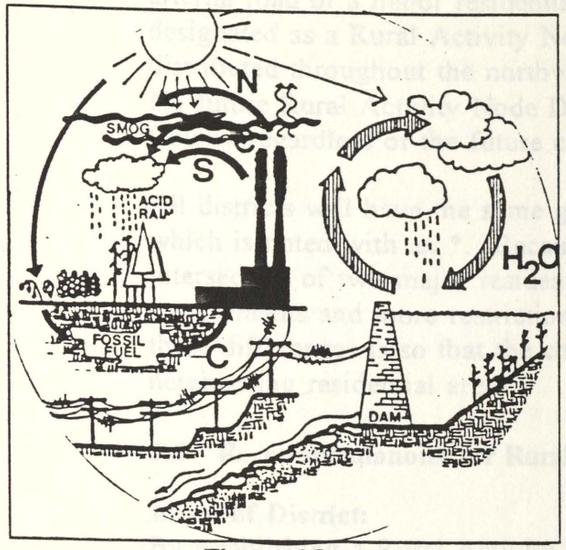


Figure 35:

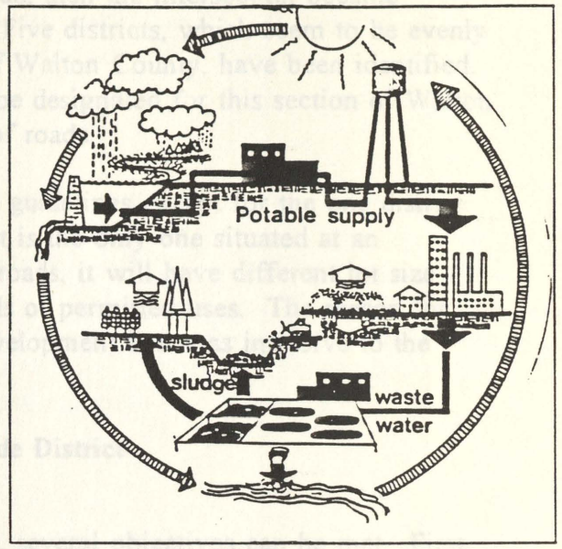


Figure 34:

3. Response to Impact

3.1 Designation of Rural Activity Node District

Currently, Walton County has very limited restrictions on commercial development. There are no restrictions on lot size, or maximum lot coverage for any commercial districts within their Land Development Ordinance.[53] Without the development of strict guidelines, commercial development will begin to sprawl, eventually destroying the rural character of Walton County.

One way to control the visual and ecological impacts of the Rural Activity Node is to restrict commercial development to designated zones -- to be known as the Rural Activity Node Districts. By implementing the Rural Activity Node District into the existing Walton County Land Development Ordinance, guidelines can be developed specifically to guide ecologically sensitive commercial development, and to help maintain the rural character of Walton County. Limiting the sprawl of commercial development will also restrict its environmental impact to concentrated areas where it can be dealt with more effectively.

Since commercial development will be restricted to these designated districts, these zones can be thought of as sacrifice zones. The designated districts are sacrificed to development so that visually appealing natural landscapes can be preserved. Nevertheless, these districts must maintain ecological and visual integrity.

Using the existing Walton County Thoroughfare map, Rural Activity Node Districts have been designated based on one basic criteria. If an intersection involved a major arterial road or a major residential/collector road, then the intersection became

arterial road or a major residential/collector road, then the intersection became designated as a Rural Activity Node District. Five districts, which seem to be evenly distributed throughout the northwest section of Walton County, have been identified. No future Rural Activity Node Districts shall be designated for this section of Walton County regardless of the future classification of roads.

All districts will have the same general design guidelines except for the one district which is noted with an *. Because this district is the only one situated at an intersection of two major residential/collector roads, it will have different lot size requirements and more restrictions on the kinds of permitted uses. The reason for these differences is so that the commercial development is not as intrusive to the neighboring residential areas.

3.2 Recommendations for Rural Activity Node District

Intent of District:
By establishing a Rural Activity Node District, several objectives can be met. First, this district will limit commercial development to restricted zones, thus preventing the potential for commercial "strips". Second, guidelines designed specifically for this district can manage for ecological quality (including water quality), and visual quality. Third, commercial uses can be limited to those which are of necessity.

Management Class:
The Rural Activity Node is part of the Compromise management class, therefore it must be managed in a manner which allows for some development to occur within natural landscapes. However, for the purposes of this study, the development must be sensitive to the visual and ecological quality of the surrounding landscape.

Overall Approach:
The overriding principle governing the recommendations for the Rural Activity Node District is to promote commercial clustering and to limit commercial development to designated areas. Clustering requires that new commercial development be sited in groups. This will maximize open space and preserve scenic views of the surrounding rural landscape.

Required Conditions:
All business, servicing or storage shall be those whose operations or processes are not objectionable by reason of odor, dust, bright lights, smoke, noise, vibration, or congestion. Uses are limited to those which will serve as convenience centers to serve the needs of their immediate neighborhoods, commuters and maintain economic compatibility. All businesses, servicing or storage shall be conducted within a completely enclosed building except where the nature of the activity makes it impossible, as for example: the sale of automobile fuel at service stations.[54]

Permitted Uses:
Rural Activity Node Districts require that permitted uses must be of necessity. Necessity was based on the threshold populations suggested by Steiner.[55]

(1) Art and/or antique shops.

(2) Automobile gas stations.

(3) Bakery, confectionery shops, ice cream parlors.

(4) Barber and/or Beauty shops.

(5) Laundry and dry cleaning, self-service laundries, shoe repair shops.

(6) Drug stores.

(7) Dress making and tailoring shops.

(8) Cafes, grills, lunch counters, and restaurants, but not including night clubs, bars, taverns, and drive-in restaurants.

(9) General stores supplying groceries, fruit, vegetable, and meat markets, delicatessens, catering, catering and supermarkets.

(10) Hardware store.

(11) Neighborhood convenient store.

(12) Banks

Conditional Uses:

(1) Automobile Service Stations are allowed if cars can be wholly stored within a building, or extra lot is sufficiently buffered. However, they are not allowed in the * District.

Special Uses:

(1) Temporary uses including the sale of Christmas trees, sale of seasonal fruit and vegetables from roadside stands. However, such uses are not permitted for a period exceeding 2 months in any calendar year.

(2) Fast food restaurants are allowed except in the * district.

Prohibited Uses:

(1) Any use which requires more than 4,000 square feet of building space. Uses which require 4,000+ square feet of space can be located in urban areas like Loganville. They do not need to be located in rural areas of Walton County.

3.3 Design Guidelines

Development Character:

General Design Principles: The character of the Rural Activity Node is important to consider so that it be compatible with rural characteristics. By requiring buildings to be clustered, limiting the size of buildings, and limiting lot coverage, the character of the development will remain consistent with rural development patterns.

Specific Guidelines:

Building guidelines:

A. Clustering. A mandatory clustering of buildings shall be required in this node. Clustering will prevent the linear sprawl of the commercial development. Clustering can also help screen the parking in the rear. Buildings can be attached or detached, but buildings which are attached can help screen the parking better. See Figure 36 for an example of clustering.[56]

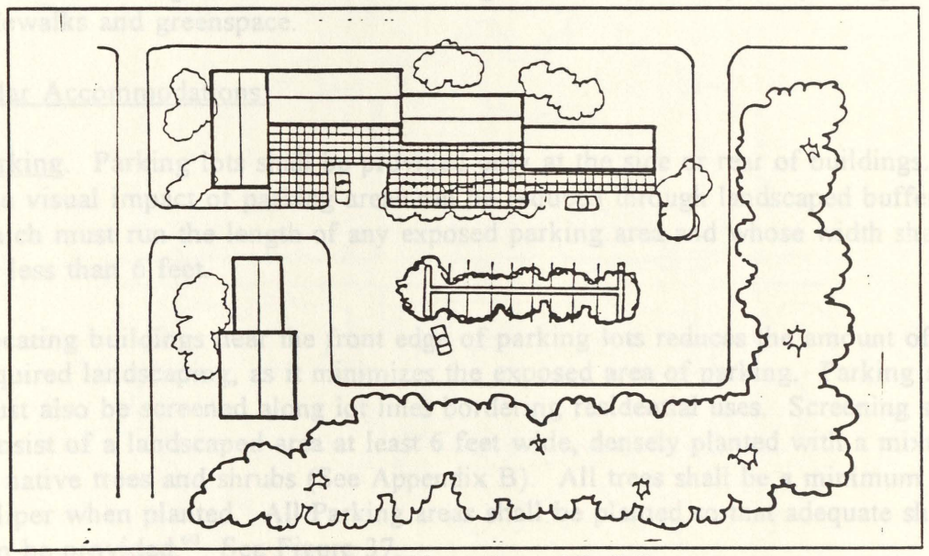


Figure 36: Clustering of Buildings

B. Maximum Building Area Per Node. 12,000 square feet of building space will be allowed per Rural Activity Node District.[57]

C. Maximum Building Coverage for Each Corner of the Node. A maximum of 60% of the total building area allowed for the entire node can occur on any one corner of the node.[58]

D. Maximum Lot Frontage. 500' is the maximum allowed per corner of the node.

E. Lot Coverage. The maximum lot coverage should be no more than 70%. The other 30% should remain vegetated landscape to help satisfy the buffer requirements.[59] This vegetated buffer should also be used to help control runoff and prevent erosion.

F. Setbacks. In rural areas, where existing structures are typically located at various distances from the roadway, front setbacks may vary to a greater degree. The minimum front setback for the principle building shall be 10 feet from the existing right-of-way line. The maximum front setback for the principle building shall be 75 feet from the existing right-of-way line. By allowing for minimum and maximum front setbacks for the principle building, the developer can vary the distances of buildings from the roadway -- typical of rural conditions. In all instances, parking shall be excluded from the areas between the principle building and the roadway(s). Only vegetation can exist within the setback zone.

G. Maximum Separation Between Buildings. 160' is the maximum separation between buildings. This will allow enough room for two bays of parking, sidewalks and greenspace.

Vehicular Accommodations:

A. Parking. Parking lots shall be provided only at the side or rear of buildings. The visual impact of parking areas can be reduced through landscaped buffers which must run the length of any exposed parking area and whose width shall be no less than 6 feet.

Locating buildings near the front edge of parking lots reduces the amount of required landscaping, as it minimizes the exposed area of parking. Parking areas must also be screened along lot lines bordering residential uses. Screening shall consist of a landscaped area at least 6 feet wide, densely planted with a mixture of native trees and shrubs (See Appendix B). All trees shall be a minimum of 2" caliper when planted. All Parking areas shall be planted so that adequate shade can be provided.[60] See Figure 37.

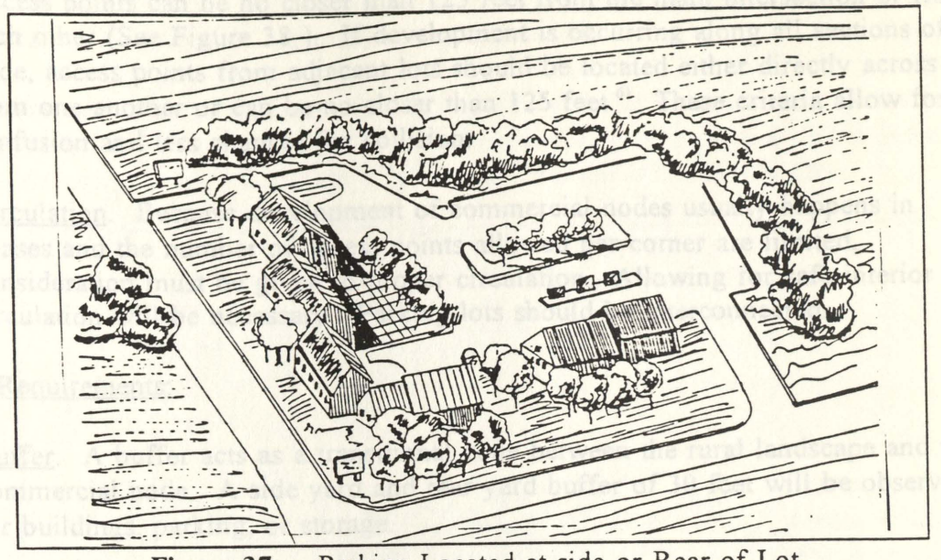


Figure 37: Parking Located at side or Rear of Lot

B. Access. Access control will be a necessity. The parking lot should have limited access. A maximum of 3 access points should be allowed for each corner of the node. By limiting the amount of access points, confusion and congestion will be reduced. Each access point should be highly visible from the roadway. A strong visual connection is necessary to avoid accidents.

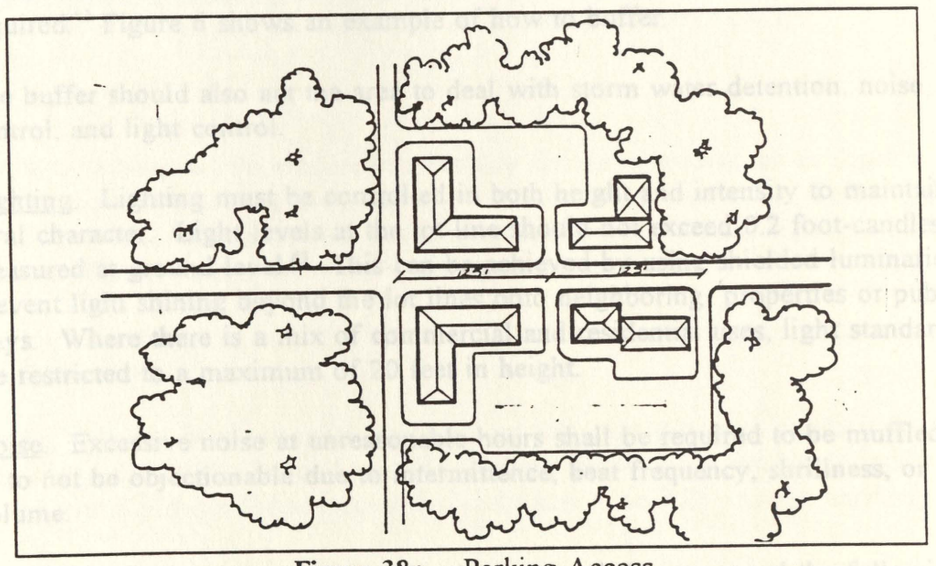


Figure 38: Parking Access

Access points can be no closer than 125 feet from the main intersection or from each other (See Figure 38). If development is occurring along all sections of the node, access points from adjacent lots should be located either directly across from one another or can be no closer than 125 feet.[61] These criteria allow for less confusion and less chances for collision.

C. Circulation. Because development of commercial nodes usually happens in phases and the number of access points allowed per corner are limited, consideration must be given to proper circulation. Allowing for safe interior circulation will be necessary. Parking lots should be interconnected.

Other Requirements:

A. Buffer. A buffer acts as a transitional zone between the rural landscape and the commercial node. A side yard and rear yard buffer of 30 feet will be observed for buildings, parking, or storage.

In cases where the expansion or reconstruction fails to meet the above setback requirements, increased screening shall be provided to lessen the effect on adjoining lots. In no case shall the expansion of the existing use be allowed to extend closer than 10 feet to any lot line. Where the lot borders a residential uses, setbacks between 10 feet and 20 feet will require a solid wooden fence (no less than 5 feet in height) to form a visual screen. Landscaping in the form of deciduous and evergreen trees and shrubs (See Appendix B) will be required on both side of the fence. For side and rear yard setbacks between 20 feet and 30 feet an increased number of shrubs, growing to a mature height of 5 feet, will be required.[62] Figure 6 shows an example of how to buffer.

The buffer should also act the area to deal with storm water detention, noise control, and light control.

B. Lighting. Lighting must be controlled in both height and intensity to maintain rural character. Light levels at the lot line should not exceed 0.2 foot-candles, measured at ground level.[63] This can be achieved by using shielded luminaries to prevent light shining beyond the lot lines onto neighboring properties or public ways. Where there is a mix of commercial and residential uses, light standards are restricted to a maximum of 20 feet in height.

C. Noise. Excessive noise at unreasonable hours shall be required to be muffled so as to not be objectionable due to intermittence, beat frequency, shrillness, or volume.

Sound from any source controlled by this bylaw shall not exceed the following limits at the property line of the rural activity node district: 65 dB(A)'s during the

day. p.m. and 55 dB(A)'s in the evening. These are generally accepted noise levels for this kind of commercial development.[64]

Noise can be controlled through the vegetative buffer or using earth berms in which new grading should fit in with the existing landscape and slopes should not exceed a 3:1 ratio.[65] See Figure 39 for an example of a noise buffer.

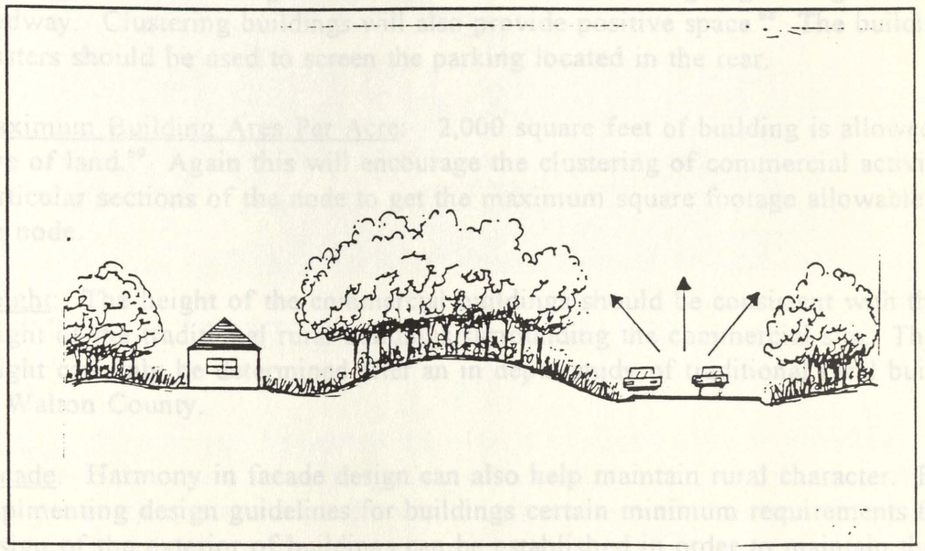


Figure 39: Vegetated Filter Berm

D. Other Recommendations. If the node is a T intersection, the two corners formed by the intersection can be designated for commercial development.

Visual Quality:

General Design Principles: To manage successfully for visual quality, an in depth study of traditional building practices and materials will need to be conducted. Compatibility of scale, materials, form, and other building relationships will help insure successful integration of new buildings into the existing landscape.[66]

Specific Guidelines:

A. Scale: Most new commercial structures are incompatible with traditional buildings and rural surroundings. Restrictions placed upon the height, and total floor space allowed for any commercial structure can help provide harmony in scale.[67]

B. Optimum Floorspace Per Unit: The optimum floor space for any single building can be 1,500 sq. ft. to maintain harmony in scale with rural buildings. An increase in floor space (max. 4,000 sq. ft.) for a particular commercial use can be obtained by breaking the exterior roof line and staggering the outer walls of the building -- making the building appear as two buildings from the outside. The buildings must be arranged in a cluster that forms a strong edge along the roadway. Clustering buildings will also provide positive space.[68] The building clusters should be used to screen the parking located in the rear.

C. Maximum Building Area Per Acre: 2,000 square feet of building is allowed per acre of land.[69] Again this will encourage the clustering of commercial activity to particular sections of the node to get the maximum square footage allowable from the node.

D. Height: The height of the commercial buildings should be consistent with the height of the traditional rural buildings surrounding the commercial site. The height can only be determined after an in depth study of traditional rural buildings of Walton County.

E. Facade: Harmony in facade design can also help maintain rural character. By implmenting design guidelines for buildings certain minimum requirements for the design of the exterior of buildings can be established in order to maintain the proportions and characteristics of traditional buildings. A Site Plan Review Board can help enforce these guidelines

New construction should be compatible with surrounding properties, in terms of formal characteristics such as height, massing, roof shapes and window proportions. In order to provide suitable design guidelines, an in depth study of the rural buildings in Walton County will need to be done. The following are aspects of design that should be considered.

F. Materials: Whenever possible traditional materials and colors should be used to help new buildings by compatible with existing buildings.[70]

G. Height: One story buildings with pitched roofs/Gabled roofs should be used to compliment the architecture of rural homes.[71]

The following picture is of a rural home which neighbor one particular Activity Node District. A kind of architecture which compliments this style should be used. See Figure 40 example of rural residence.

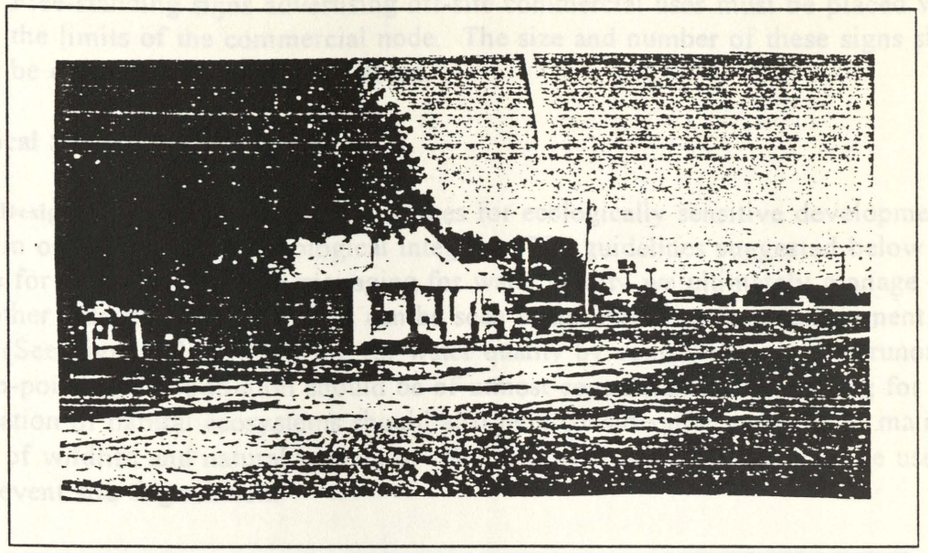


Figure 40: Rural Home Near Existing Activity Node

H. Signage: Signage can be detrimental when it overpowers the surrounding landscape. Excessive size and quantity of competing signs has become a severe problem in most commercial districts. Signs should fit the character of a rural community. A comprehensive sign ordinance can provide standards to govern new signs.[72]

Restriction of sign size and numbers of signs allowed will reduce visual conflicts, and helps achieve the above objective. Providing guidelines regarding material, size, lettering, message etc. of the signs will also help promote harmony among signs. See the examples below.

Signs in this district shall be of wood or metal.

To be compatible with the landscape, signs must be kept small and relatively unobtrusive.

To ensure legibility, a high degree of contrast between the background and the letters is preferable.

No single business may display more than two signs. One free-standing sign is allowed for each entry to node.

Signs should be located where they can be most visible, thus reducing size.

Free-standing signs advertising off-site commercial uses must be placed within the limits of the commercial node. The size and number of these signs should be determined by a review board.

Ecological Sensitivity:

General Design Principles: Providing guidelines for ecologically sensitive developments is crucial in order to maintain ecological integrity. The guidelines suggested below manage for water quality. By managing for water quality we ultimately manage for many other natural processes. This can be seen in the Priorities for Management Matrix (See Figure 41). Managing for water quality by controlling erosion, runoff, and non-point source pollution should be of utmost consideration. Managing for the preservation of natural ecosystems should also be a consideration in order to maintain quality of wildlife and natural resources. The following measures can also be used to help prevent site degradation.

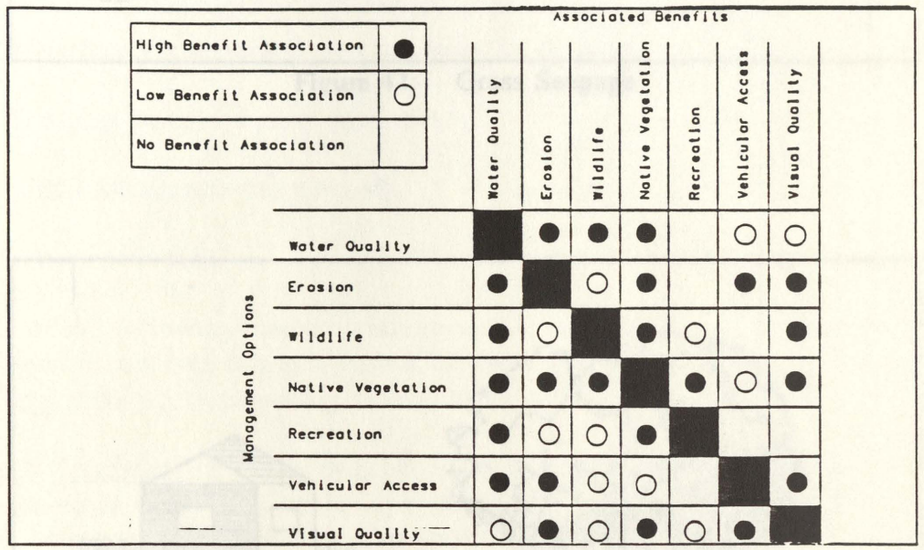


Figure 41: Mangement Matrix

Specific Guidelines:

A. Surface Water Runoff. Surface water run-off must be minimized and should be detained on site if possible in order to control the harmful effects of increased runoff. Vegetated drainage swales can be used to provide the maximum opportunity for rain water to infiltrate the soil. Grass seepage areas can also be used to help infiltration[73] (Figures 42 and 43).

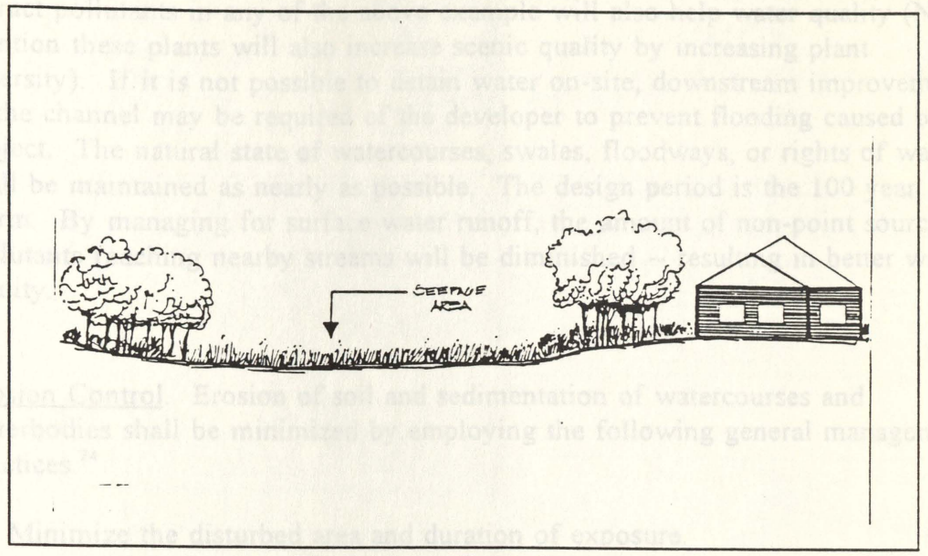


Figure 42: Grass Seepage

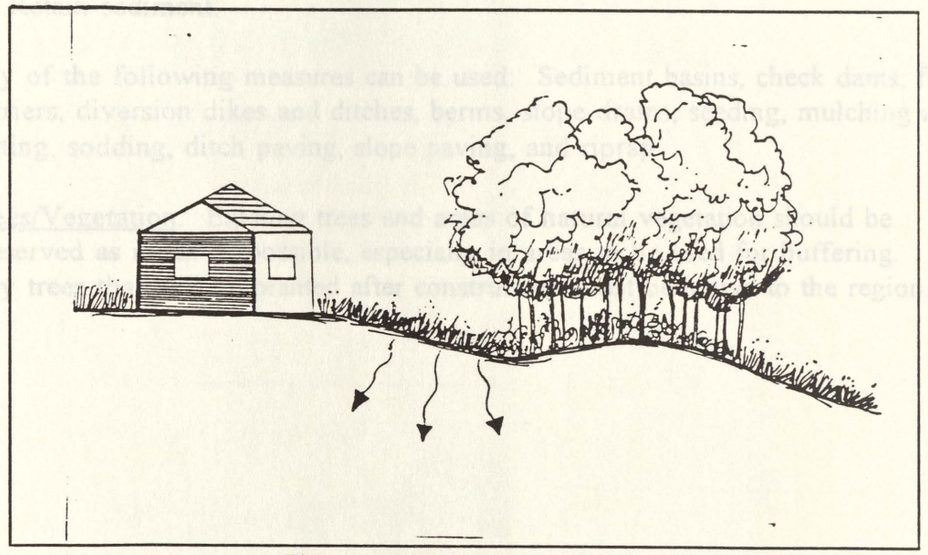


Figure 43: Vegetated Berm

The use of floodplain or wetland trees and shrubs at the edge of depressions and swales can also impede runoff and facilitate infiltration. Using plants which extract pollutants in any of the above example will also help water quality (Not to mention these plants will also increase scenic quality by increasing plant diversity). If it is not possible to detain water on-site, downstream improvements to the channel may be required of the developer to prevent flooding caused by the project. The natural state of watercourses, swales, floodways, or rights of ways shall be maintained as nearly as possible. The design period is the 100 year storm. By managing for surface water runoff, the amount of non-point source pollutants reaching nearby streams will be diminished -- resulting in better water quality.

B. Erosion Control. Erosion of soil and sedimentation of watercourses and waterbodies shall be minimized by employing the following general management practices.[74]

Minimize the disturbed area and duration of exposure.

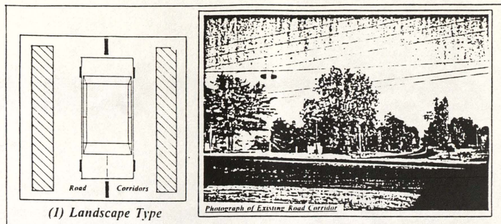
Stabilize disturbed areas immediately.

Retain or accommodate runoff.

Retain sediment.

Any of the following measures can be used: Sediment basins, check dams, filter barriers, diversion dikes and ditches, berms, slope drains, seeding, mulching and netting, sodding, ditch paving, slope paving, and riprap

C. Trees/Vegetation. Existing trees and areas of natural vegetation should be preserved as much as possible, especially in areas to be used for buffering. Any trees that will be planted after construction must be native to the region.

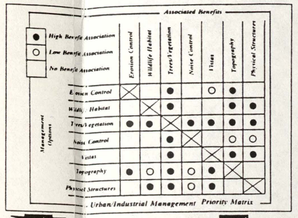


(1) Landscape Type

Photograph of Existing Road Corridor

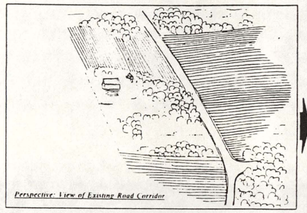
(3) Functional Model of Ecological System

While roadways do not directly support key ecological functions, they do impact numerous natural processes, including plant and animal life, drainage patterns, and topography



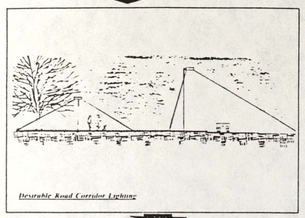
(4) Priority Matrix

The priority matrix relates management options with their associated benefits



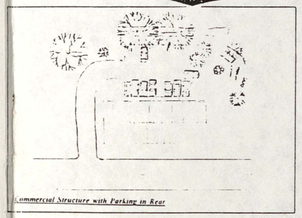
Perspective View of Existing Road Corridor

Diagram of Natural Processes



Desirable Road Corridor Lighting

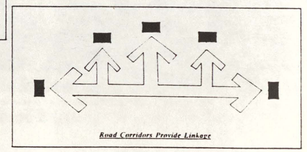
Supplemental Street Tree Planting



Commercial Structure with Parking in Rear

(2) Critical Issues

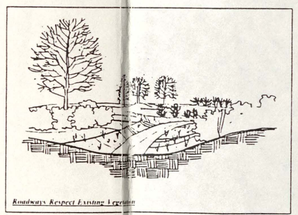
Issues related to development along arterial road corridors



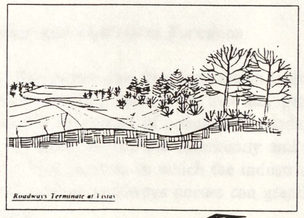
Road Corridors Provide Linkage

(5) Management Principles

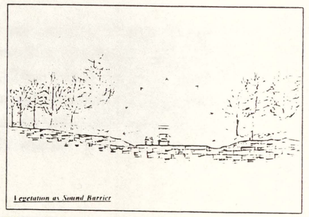
Principles for ecological development along Walton County's arterial road corridors



Roadways Respect Existing Vegetation



Roadways Terminate at Vistas



Vegetation as Sound Barrier

(6) Conclusions

By using ecologically sound design principles, development can occur along Walton County's arterial roadways without major disruption to the natural surroundings

Total Acres in District: 638

Source: USGS 7.5 Minute Series Topographic Quadrangle Maps: Monroe, Jersey, Loganville, Milstead. 1994 edit photorevised to 1993

YELLOW RIVER WATERSHED

Walton County, Georgia

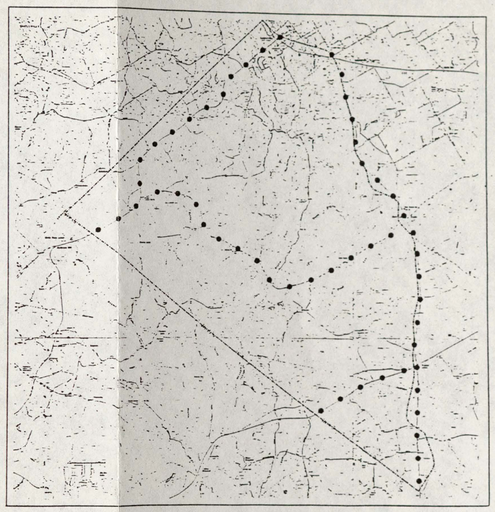
Urban/Industrial Management Class

Road Corridors

In Conjunction with Industrial, Commercial, and Residential

This landscape district can be defined as the network of arterial roadways within Walton County and their relationship to the industrial, commercial, and residential development that occurs along them. By integrating this district with the current Walton County Land Development Ordinance, ecologically sound development can take place which preserves the integrity and character of the existing natural surroundings.

The establishment of the Road Corridor District in Combination with Industrial, Commercial, and Residential Development is important for a number of reasons. First the areas where such development is to take place can be identified for use in the overall planning of Walton County's land use. Second, the character of development in these specific areas can be controlled, thereby limiting its impact on ecological processes as well as preventing conflicts between structures, signage, and other developmental features. Third, development can be concentrated in these districts, leaving the remaining land areas along Walton County's road corridors in their natural state.



SCALE 1:24000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Prepared by LAR 740/741
Dr. Forster O. Ndubisi
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School of Environmental Design, The University of Georgia
Fall Quarter, 1993

Sheet

1. Landscape Type - Road Corridors in Combination with Industrial, Commercial and Residential Development

1.1 Definition

In order to properly develop guidelines for the regulation of development along Walton County's roadways, the areas to which they will be applied must be combined into a landscape type. This landscape type can be defined as the network of arterial roadways within Walton County and their relationship to the industrial , commercial, and residential development that occurs along them. This landscape type is part of the Urban/Industrial Management Class derived from Odum's compartmental model, as it represents areas that have no positive impact on natural processes.

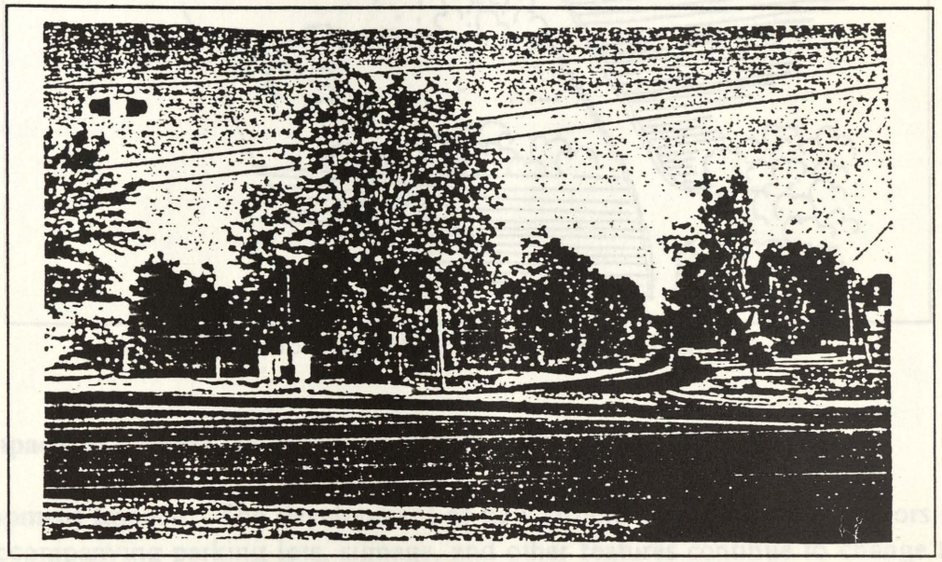


Figure 44: Photograph of Existing Road Corridor

1.2 Social Values and Ecological Functions

Social Values: Roadways and their interaction with the land uses that occur alongside them are socially valuable in that they provide a connective network of corridors for the transportation of people and goods. This connectivity allows for a high level of interaction within the community and makes surrounding communities easily accessible. The patterns in which the industrial, commercial, and residential development along these roadways occurs can greatly impact their ability to serve these social values.

Ecological Function: While roadways do not directly support key ecological functions, they do impact numerous natural processes and site elements, including plant and animal life, drainage patterns, topography, and surrounding physical structures. The purpose of this study is to investigate these impacts and develop guidelines which will allow for development while maintaining the integrity of the surrounding ecological processes.

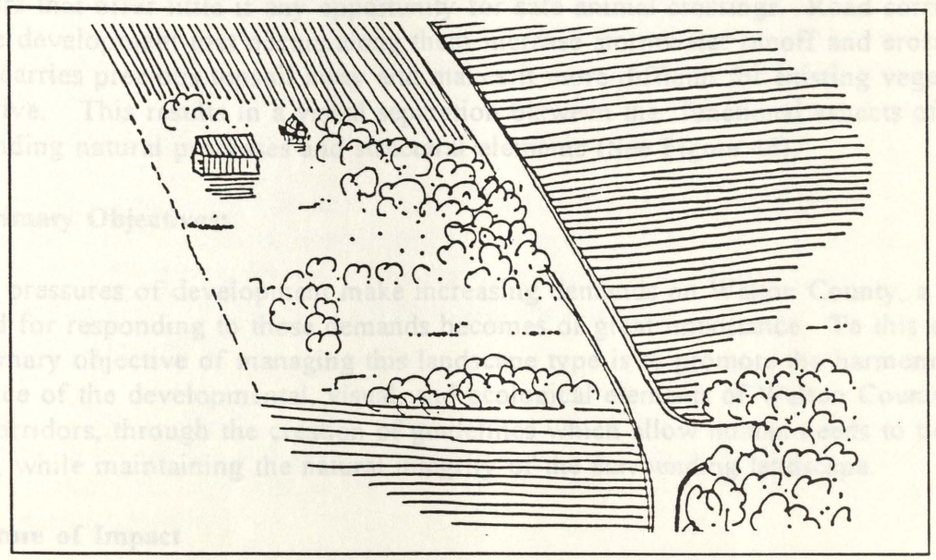


Figure 45: Sketch of Existing Road Corridor

1.3 Impacts of Current Development Patterns

Development Impacts: The development of new structures along road corridors and their accompanying parking lots, signage, and other features continue to change the character of Walton County. Traffic along these corridors is intensified and congestion occurs in areas where industrial, commercial, and residential development is concentrated. With this comes the need for utility lines which occupy space along road corridors, as well as amenities for pedestrian circulation. If these elements are not properly organized and arranged, conflicts can be created which will intensify congestion and possibly create safety hazards.

Visual Impacts: Current development patterns are highly disruptive to the visual and scenic quality of Walton County's arterial roadways. The linear pattern of this development obstructs views of the surrounding landscape from the road, making passage through such areas less pleasant. Furthermore, certain structural aspects of current development such as building facades, signage, lighting, and utility lines dominate the immediate view of passersby, blocking the existing natural features along

roadways. The removal of large numbers of trees and other plant material also impacts the visual experience of road corridors, making them less inviting.

Ecological Impacts: The ecological impacts of current development patterns are considerable. Trees and vegetation, of critical importance in such natural processes as photosynthesis and nutrient recycling, are removed en masse as development along road corridors increases. Wildlife life communities are fragmented by long road corridors that offer little if any opportunity for safe animal crossings. Road corridors and the development that occurs along them increase stormwater runoff and erosion, which carries precious topsoil away and makes it more difficult for existing vegetation to survive. This results in a visual separation between the functional aspects of the surrounding natural processes and structural elements (See Figure 46).

1.4 Primary Objectives:

As the pressures of development make increasing demands on Walton County, a sound method for responding to those demands becomes of great importance. To this end, the primary objective of managing this landscape type is to promote the harmonious existence of the developmental, visual, and ecological elements of Walton County's road corridors, through the creation of guidelines which allow human needs to be served, while maintaining the natural integrity of the surrounding landscape.

2. Nature of Impact

2.1 Road corridors in combination with Industrial, Commercial, and Residential development have a considerable number of impacts. These impacts are briefly described in the following lists:

Development

Physical Structures: Roadside development, especially commercial, has impacted downtown business districts by drawing business and customers away from them. As a result, considerable traffic congestion has been created, and the scenic quality of the surrounding landscape has been reduced. Furthermore, the construction of new buildings with varying characteristics has also been an impact. Some of these characteristics include:

Scale: Most structures currently built along road corridors are not consistent with pre-existing traditional structures and the landscape that surrounds them. The size of modern commercial buildings often overwhelms the smaller, more intimate dimensions of older structures. Contemporary residential buildings also tend to be in opposition with older structures in their size and shape.

Facade: Site character is often negatively impacted by building facades that do not compliment the character of pre-existing traditional structures and surrounding site characteristics. While subtle differences in facade features indeed distinguish various site elements, large disparities in style diminish a structures ability to fit with its surroundings.

Signage: A major contemporary issue, signage can greatly impact the character of roadside development. While of critical importance in industrial, commercial, and residential corridors, modern signage has a tendency to bypass its function as an informative and directional device, overwhelming motorists and the surrounding landscape. The competitive nature of advertising results in large numbers of oversized and unattractive signs that dramatically interrupt the harmony of a site.

Setbacks: The interesting character often created by the varying setbacks of pre-existing traditional structures is often ignored as modern structures are erected in a monotonous and uniform fashion. This creates a stiff, linear pattern, often concentrated around intersections, which makes the experience of traveling these road corridors less enjoyable.

Screening: Clearly visible storage areas, dumpsters, refuse collection sites, and other outdoor areas containing unsightly elements related to sight development, clearly detract from site quality. The impact of such elements should be minimized to the greatest extent possible.

Noise: Excessive noise is created by traffic and machinery using road corridors and can be extremely detrimental to the ability of those inhabiting and using the site to enjoy it as well. Noise is also created by commercial establishments such as nightclubs and repair shops and can have a negative impact on sight quality.

Pollution: The impact of emissions from vehicles, as well as commercial establishments can have a negative impact not only on the ecology of a site, but on its economy as well. High levels of undesirable noxious fume, gases, and vapors lower property values as well as the personal enjoyment of inhabitants and passersby.

Access\Circulation: As commercial and residential development increases along major road corridors, so does congestion and the accident rate. Without proper controls, traffic corridors will continue to impact site quality in a negative way.

Parking: Most parking lots tend to be very large and poorly placed, greatly detracting from site quality. Even when attempts are made to reduce this impact through the use of plant material, it is often of poor quality and not indigenous to the sight. A major problem is that parking lots are usually located in the front of buildings found along road corridors, diminishing the more pleasing aspects of the site.

Lighting: Lighting associated with roadway corridors can impact site character by creating unattractive visual patterns which do not compliment existing site features.

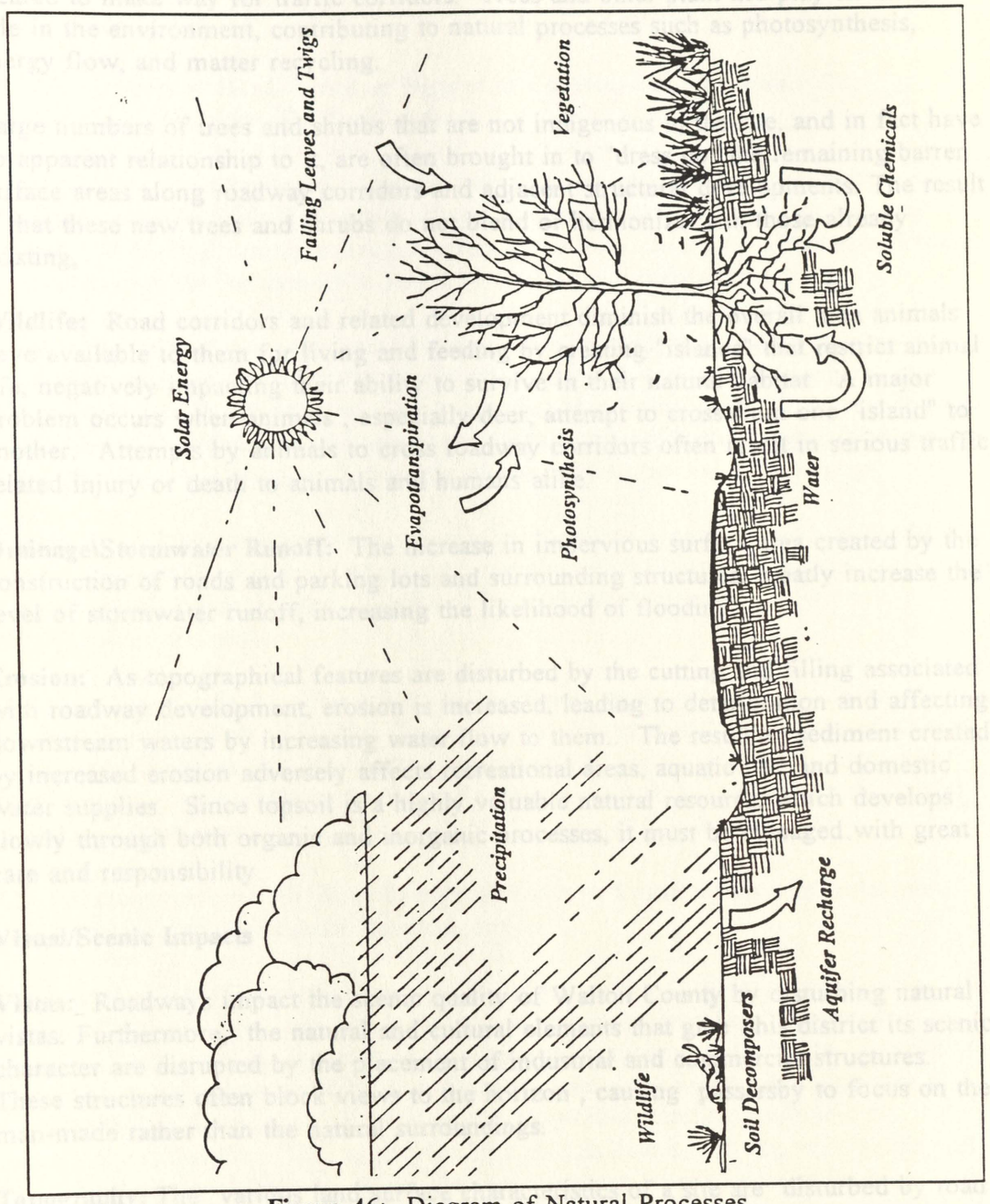


Figure 46: Diagram of Natural Processes

Ecological Impacts

Trees/Vegetation: Trees and other plant life surrounding areas of roadway development are impacted in a number of ways. Initially, large areas of forest are cleared to make way for traffic corridors. Trees and other plant life play an integral role in the environment, contributing to natural processes such as photosynthesis, energy flow, and matter recycling.

Large numbers of trees and shrubs that are not indigenous to the site, and in fact have no apparent relationship to it, are often brought in to "dress up" the remaining barren surface areas along roadway corridors and adjacent structural developments. The result is that these new trees and shrubs do not blend or harmonize with those already existing,

Wildlife: Road corridors and related development diminish the overall area animals have available to them for living and feeding by creating "islands" that restrict animal life, negatively impacting their ability to survive in their natural habitat. A major problem occurs when animals , especially deer, attempt to cross from one "island" to another. Attempts by animals to cross roadway corridors often result in serious traffic related injury or death to animals and humans alike.

Drainage\Stormwater Runoff: The increase in impervious surface area created by the construction of roads and parking lots and surrounding structures, greatly increase the level of stormwater runoff, increasing the likelihood of flooding.

Erosion: As topographical features are disturbed by the cutting and filling associated with roadway development, erosion is increased, leading to deterioration and affecting downstream waters by increasing water flow to them.. The resulting sediment created by increased erosion adversely affects recreational areas, aquatic life, and domestic water supplies. Since topsoil is a highly valuable natural resource, which develops slowly through both organic and inorganic processes, it must be managed with great care and responsibility.

Visual/Scenic Impacts

Vistas: Roadways impact the scenic quality of Walton County by disturbing natural vistas. Furthermore, the natural and cultural elements that give this district its scenic character are disrupted by the placement of industrial and commercial structures. These structures often block views to the horizon , causing passersby to focus on the man-made rather than the natural surroundings.

Topography: The various land surface characteristics of a site are disturbed by road corridors, impacting its attractiveness and stability. Land areas disturbed in such a manner become vulnerable to erosion, and often become unsuitable for plant growth.

The effect on natural processes, however, is not as readily noticeable as the reduction in visual quality. The disruption of topographical site features often creates a scarred landscape, greatly diminishing

3. Response to Impact

3.1 Designation of Road Corridors District in Combination with Industrial, Commercial, and Residential Development

At present, there are few restrictions on industrial, commercial, and residential development along Walton County's arterial road corridors. In order for the rural character of Walton County to remain intact, guidelines must be developed which can be used to regulate the manner in which further development occurs.

A useful method of managing this development is through the creation of a district which encompasses the industrial, commercial, and residential areas along the arterial road corridors of Walton County. By integrating this district with the current Walton County Land Development Ordinance, ecologically sound development can take place, that preserves the integrity and character of the existing natural surroundings.

The road corridors designated for inclusion in this district can be found on the Walton County Thoroughfare map. Arterial road corridors with abutting industrial, commercial, or residential land usage will be included in this district, and are highlighted on the map.

The guidelines set forth in this section of the report apply generally to industrial and residential land use along Walton County's arterial road corridors, and specifically to commercial development. For further information on commercial and residential development criteria, refer to the Rural Residential and Rural Activity Node district sections of this report.

3.2 Recommendations for Road Corridor District in Combination with Industrial, Commercial, and Residential Development

Intent of District: The establishment of a Road Corridor District in Combination with Industrial, Commercial, and Residential Development is important for a number of reasons. First, the areas where such development is to take place can be identified for use in the overall planning of Walton County's land use. Second, the character of development in these specified areas can be controlled, limiting its impact on ecological processes as well as preventing conflicts between structures, signage and other developmental features. Third, development can be concentrated in these districts, leaving the remaining land areas along Walton County's road corridors in their natural state.

Management Class: The Road Corridor District in Combination with Industrial, Commercial, and Residential Development is part of the Urban/Industrial Management Class, which includes areas that have no positive role in the areas natural processes. Therefore, since this district negatively impacts these processes from the start, it is important that they be minimized through the proper application of ecologically and culturally sensitive guidelines.

Overall Approach: The recommendations made for the Road Corridor District, in Combination with Industrial, Commercial, and Residential Development are intended to be used to limit the growth along these corridors to concentrated areas, thus minimizing the impacts on the surrounding natural landscape.

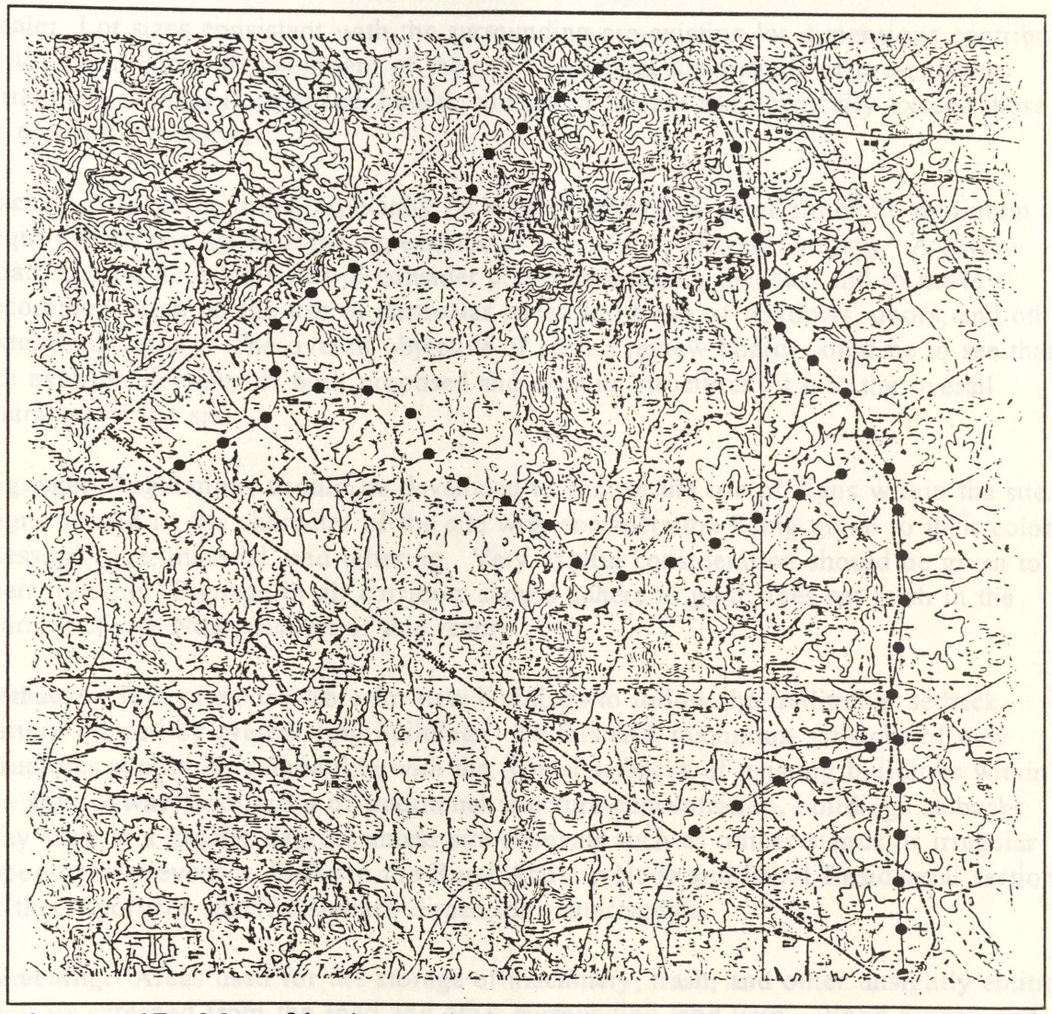


Figure 47: Map of landscape district.

3.3 Design Guidelines

Any development along Walton County's arterial road corridors must follow management principles related to developmental, ecological and, visual character set forth in this report.

Developmental Character: The character of development along Walton County's road corridors is an important consideration if it is to contribute to the existing natural and cultural elements.

Physical Structures

Scale: Lot sizes consistent with the surrounding pre-existing lot dimensions contribute to the harmonious development of the site. Structural dimensions of pre-existing structures, such as floor space, height, and width, should not drastically exceed those of existing structures.

Facade: Facade controls, especially on historic structures, should include minimum requirements for the exterior appearance of any new or altered building. A review board should be established to consider proposed building facades, and to make recommendation on the use of particular styles and types of windows, doors, and other exterior materials. The overall objective of such a review board would be to see that the exterior elements of both proposed and existing structures fit into the overall character of the site.

Signage: Regulations should be developed to control the use of signs within the site. Signs should fit the character of the site with consideration being given to their color, message, size, material, and lettering. Very careful consideration should be given to their lighting. Signage in all corridors should adhere to guidelines set forth in the Rural Activity Node section of this report.

Setbacks: It is most desirable for new buildings to follow the traditional setback pattern created by pre-existing buildings. To this end, maximum setbacks of new structures should be compatible with the typical setbacks of existing buildings within the site. Away from areas of traditional structure concentration, buildings setbacks may vary to a greater degree, unless site elements such as timber stands or irregular topography prevent it. Refer to the Rural Activity Node and Rural Residential sections of this report for specific setback dimension requirements.

Screening: Areas used for the storage of machinery, trash, and other unsightly entities shall be screened from the road and other surrounding land uses. Wood fences, and evergreen hedges of more than five feet in height are suitable screen.

Noise: Excessive noise levels shall be controlled through the use of sound buffers. Noise created by traffic and commercial establishments can be reduced using the following methods:

Earth Berms: Reduction of noise originating from traffic, construction, or commercial establishments can be achieved through the use of carefully designed earth berms which can be either temporary or permanent features of the landscape. The slope of such berms will depend on the type of vegetation used on them.

Vegetation: Areas covered with grass or other types of groundcover are more absorptive than hard, paved surfaces, which tend to reflect sound. Plantings such as hedges or screen plantings do no significantly reduce sound levels. Significant sound reduction, however, can be achieved though the use of trees with an understory of shrubs.

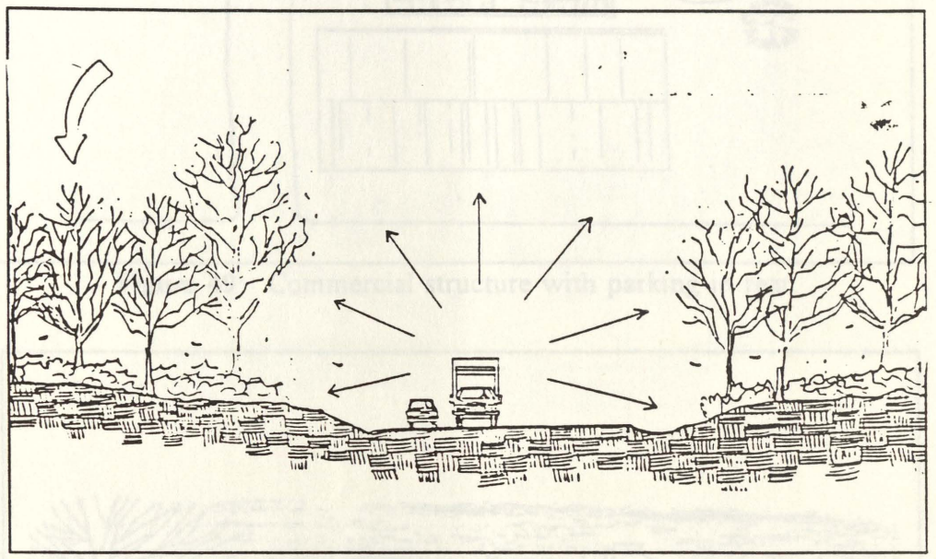


Figure 48: Vegetation as a sound barrier.

Fumes/Pollution/Litter: The emission of any undesirable and/or injurious dust, fumes, vapors, gases and other forms or pollution is not allowed. Exhaust fans, vents chimneys, and other emission devices attached to structures located along road corridors shall be controlled with regard to location and height.

Access/Circulation: Adequate points of ingress and egress shall exist around all structures along major road corridors.

Parking: Parking lots shall exist only at the side and rear of buildings. Landscape buffers shall be employed to reduce the visual impact of parking facilities. Parking lots with more than ten spaces shall contain at least one tree (minimum 2" caliper

trunk) for every eight spaces. Each tree shall be surrounded by at least 40 sq. ft. of permeable surface area.

Where parking lots border institutional or residential uses, screening shall consist of landscaped areas a minimum of six feet in width. Wherever possible, native plant material shall be used, and existing vegetation included.

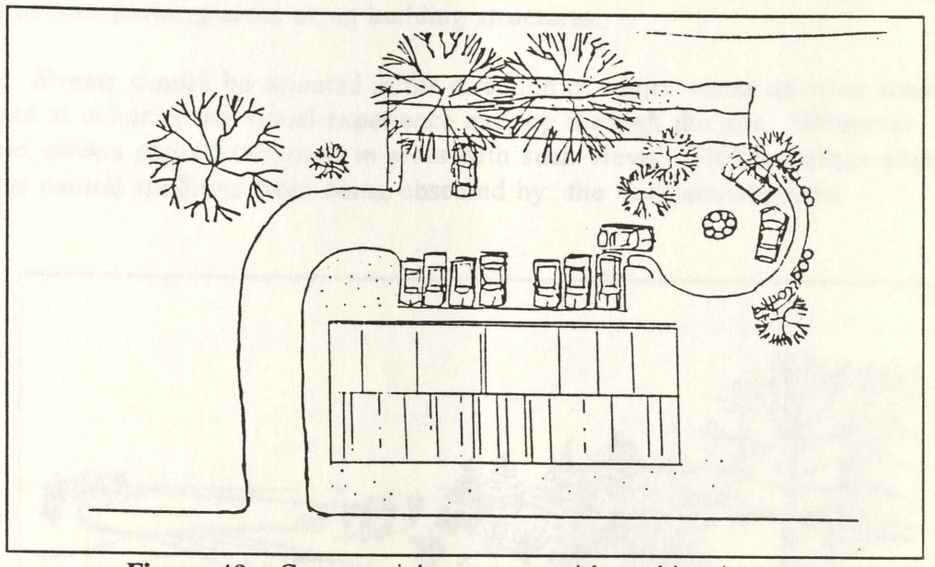


Figure 49: Commercial structure with parking in rear.

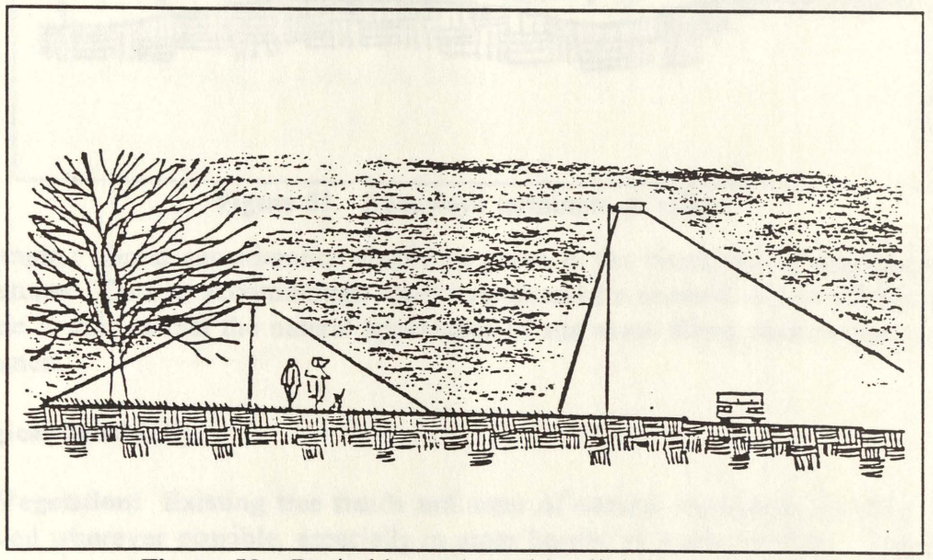


Figure 50: Desirable road corridor lighting.

Lighting: In order to maintain the traditional character of the site, both the height and intensity of lighting shall be controlled and should in no instance exceed 0.2 foot-candles, measured at ground level. Luminaries should be employed to prevent light from intruding into neighboring land uses or affecting traffic along road corridors.

Glare: No land use along major road corridors shall produce extreme glare originating from lights in parking areas or on building structures.

Vistas: Streets should be oriented in the direction of major vistas or other scenic elements to enhance the visual experience moving through the site. Wherever possible, streets should terminate in areas with such views. This technique prevents the sites natural qualities from being obscured by the built environment.

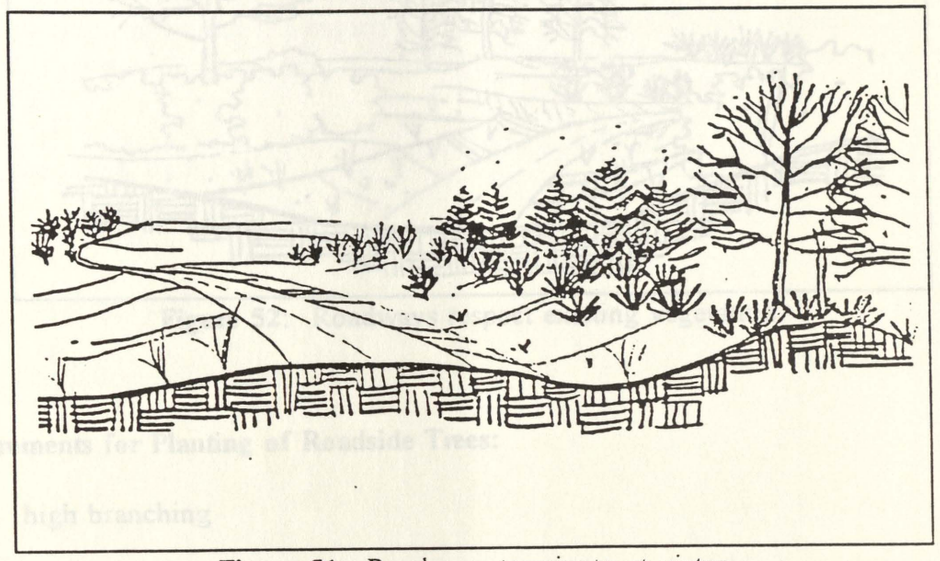


Figure 51: Roadways terminate at vistas.

Topography: Great consideration should be given to the disruption of topographical site features. Cuts to accommodate roadways should be minimized and efforts should be made to ensure that the natural appearance of site areas along road corridors is maintained.

Ecological Sensitivity

Trees\Vegetation: Existing tree stands and areas of natural vegetation should be preserved wherever possible, especially in areas bordering road corridors. The location of buildings, parking lots and driveways should be such that existing trees and vegetation are minimally disturbed. Special consideration should be given to existing trees with calipers of over five inches. Furthermore, trees should be added where they will best compliment existing stands. The rural character of the sight should be

reinforced by the addition of trees every 30 to 50 feet along major roadways. In order to create a grand appearance, these trees should not be coniferous or ornamental and should correspond with trees indigenous to the site. Examples of appropriate trees include Winged Elm (*Ulmus alata*), Willow Oak (*Quercua phellos*), and Sweet Gum (*Liquidambar styraciflua*).

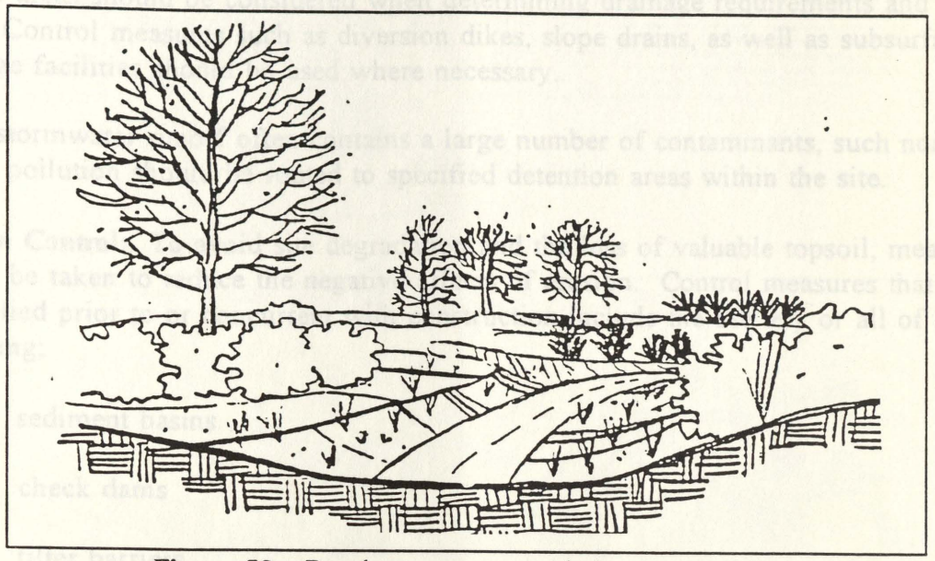


Figure 52: Roadways respect existing vegetation.

Requirements for Planting of Roadside Trees:

a. high branching

b. low maintenance

c. heat, wind, and pollution tolerant

d. low water requirements

e. native

f. produce no undesirable fruit or nut

Wildlife: Areas known to have concentrations of various animal population should be avoided when constructing roads and related elements. Where road corridors do encroach on such populations, provisions should be made to minimize traffic conflicts. Signage should be used to designate crossing areas, and such areas should not only

have reduced speed limits, but be free of structural features limiting or hindering crossing opportunities.

Drainage/Stormwater Runoff: Every opportunity should be taken to ensure that the proper accommodations for drainage and stormwater runoff are made. Site factors that influence drainage such as slope, soil characteristic, precipitation rates, and impervious surface areas should be considered when determining drainage requirements and runoff rates. Control measures such as diversion dikes, slope drains, as well as subsurface drainage facilities should be used where necessary.

Since stormwater runoff often contains a large number of contaminants, such non-point source pollution should be routed to specified detention areas within the site.

Erosion Control: To avoid site degradation and the loss of valuable topsoil, measures should be taken to reduce the negative affects of erosion. Control measures that could be applied prior to or concurrent with construction include the use any or all of the following:

a. sediment basins

b. check dams

c. filter barriers

d. diversion dikes and ditches

e. berms

f. slope drains

g. seeding, mulching, and netting

h. sodding

i. ditch paving

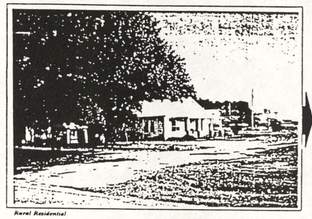
j. slope paving

k. riprap

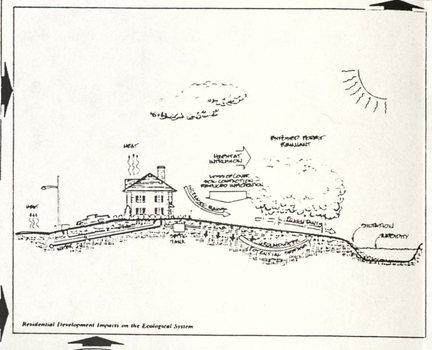
Residential development pervasively result in rising land and service costs, increasing development densities and transforming the rural character of the landscape.

Suburban Development

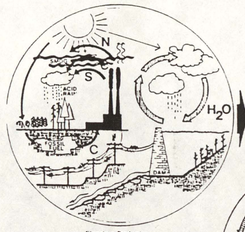
(1) Landscape Type



Rural Residential



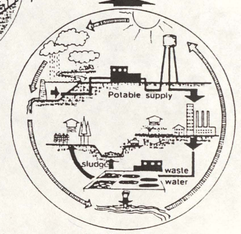
Residential Development Impacts on the Ecological System



Electricity Production

(2) Critical Issues

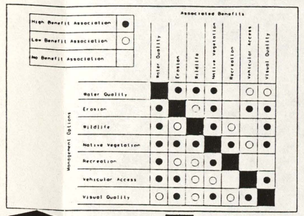
Expansion of residential development increases demands for energy and water. A corresponding increase in wastes, pollutants and waste water occurs. A comprehensive strategy for management of the environment should include consideration of off-site impacts.



Water / Waste Water Cycle

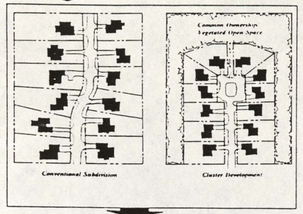
(3) Functional Model of Ecological System

Primary impacts of development activity is reduction or fragmentation of forest area and an increase in storm water runoff. These actions in turn result in further damage to habitats off site.



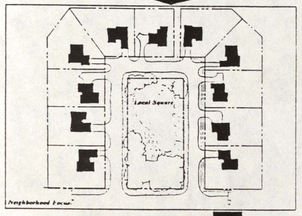
(4) Priority Matrix

Managing for Water Quality, Native Vegetation and Visual Quality, will result in conservation of most of the ecological functions.



Conventional Subdivision

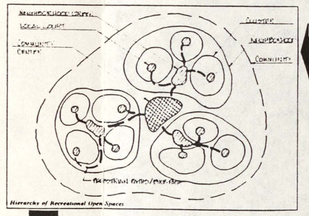
Cluster Development



Neighborhood Focus

(5) Management Principles

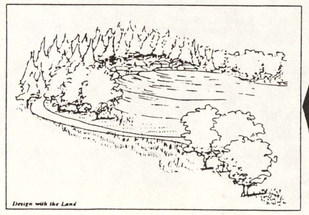
The clustering of units provides a framework for open space and pedestrian circulation. A hierarchy of roads will reduce pedestrian/vehicular conflicts and meet social needs.



Hierarchy of Recreational Open Spaces

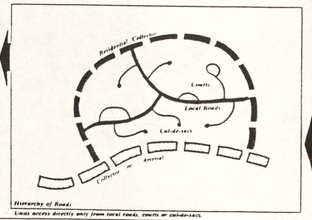
(6) Conclusions

Implementation of these management principles will provide a residential development pattern which meets social needs and satisfies development pressures, while maintaining the visual quality of the existing Walton County landscape and preserving the essential functioning of the ecosystem.



Design with the Land

Road designed with the contour of the land
Units placed behind a ridge
Public view and open space protected.



Hierarchy of Roads

Local access directly only from local roads, courts or cul-de-sacs.

Source: USGS 7.5 Minute Series Topographic Quadrangles: Bostwick, Jersey, Loganville, Milledgeville, 1956 with photorevision to 1981.

YELLOW RIVER WATERSHED

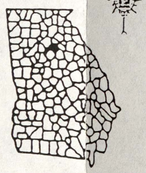
Walton County, Georgia

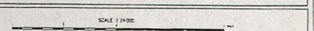
Urban/Industrial Management Class

Residential

Residential development is identified in the future land use plan to be the predominant land use of western Walton County. The plan provides for low to medium density residential development. One of the major concerns of local residents regarding the development of the county, is retension its rural character.

Based upon Odum's compartmental model, the residential landscape type is classified under two management classes. Rural Residential, units on 2 acre lots or greater, is classified within the Compromise management class. In the Urban/Industrial management class, "Residential" is defined as being units on less than 2 acre lots. Within the study area, rural residential landscape does exist. However, due to the availability of public water supply on nearly every road within the study area, future development is most likely to occur in character with the Urban/Industrial management class.





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Fall Quarter, 1993

Sheet

1.0 Landscape Type: Residential

1.1 Definition:

Residential development is identified in the future land use plan to be the predominant land use of western Walton County. The plan provides for low to medium density residential development. One of the major concerns of local residents regarding the development of the county, is retention its rural character[75].

Based upon Odum's compartmental model, the residential landscape type is classified under two management classes. Rural Residential, units on 2 acre lots or greater, is classified within the Compromise management class. In the Urban/Industrial management class, "Residential" is defined as being units on less than 2 acre lots. Within the study area, rural residential landscape does exist. However, due to the availability of public water supply on nearly every road within the study area, future development is most likely to occur in character with the Urban/Industrial management class[76].

Figure 53: Photograph - Residential Landscape Type

1.2 Key Social Values and Ecological Functions:

Social Values:

The residential landscape type provides for a collective living space for individuals and families in a setting where compatible land uses occur. The residential landscape type is intended to provide for a sense of place, belonging and "home", a private space and a community space, a place for rest and occasionally for work, a space for human interaction and for recreation, and a sense of security. Another factor, convenience, often plays a

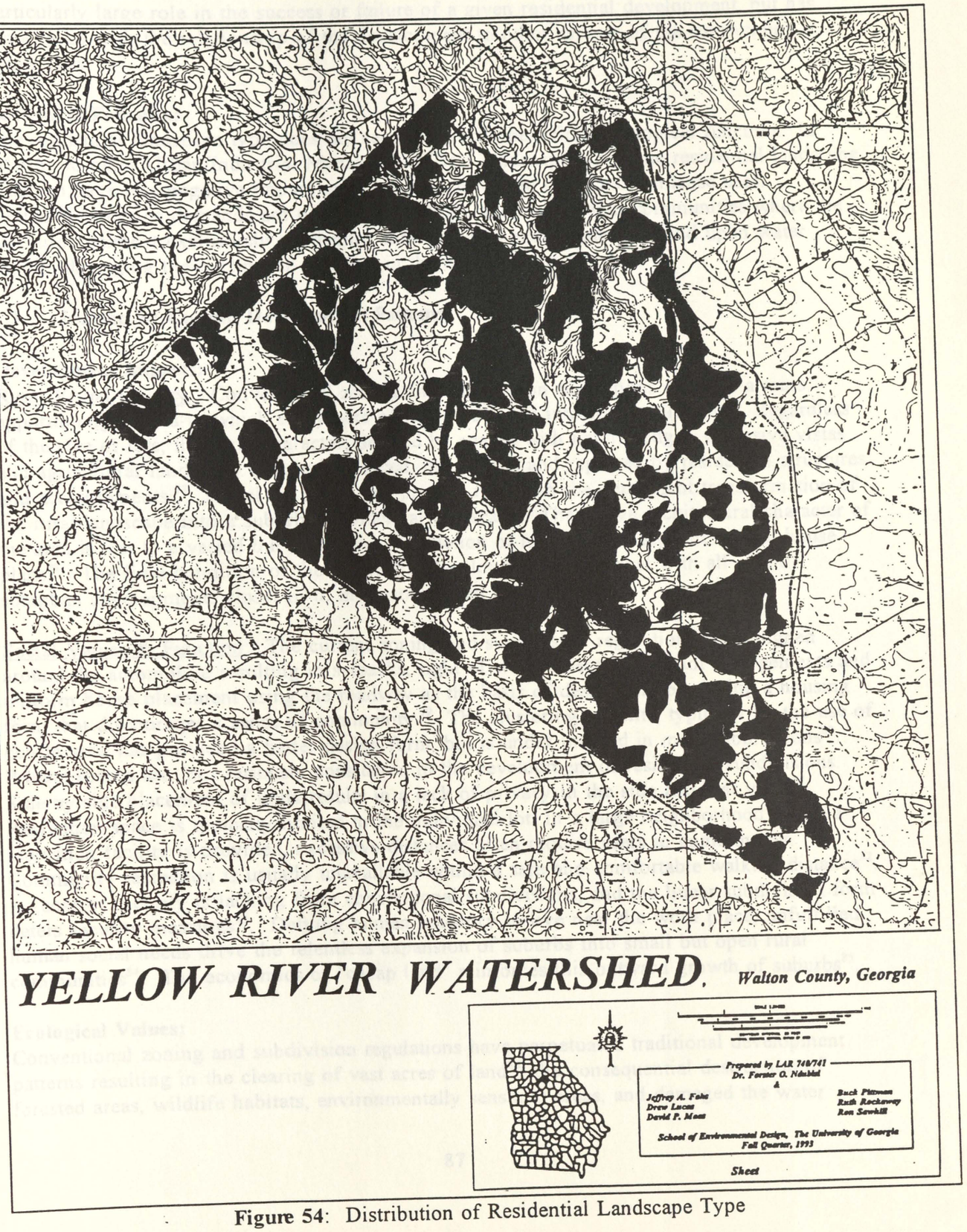


Figure 54: Distribution of Residential Landscape Type

particularly large role in the success or failure of a given residential development, but has more to do with the relationship of the development to other aspects of the surrounding community.

Ecological Function:
The residential landscape type does not serve a directly beneficial ecological function. In relation to other Urban/Industrial Management Class landscape types, the residential landscape type can have less negative impact upon water quality than other more intense uses. Residential service demands are typically very high, and in bedroom communities where the land use is almost exclusively residential, may place an exaggerated demand upon water supply, damaging the cycling of nutrients in the environment.

1.3 Impacts of Current Development Patterns

Development Impacts:
Rural Visual Quality: Conventional zoning and subdivision regulations result in a mass apportioning of lots in which every acre of land is divided into fee simple units. Regardless of the size of lots, the rural character, defined by spaces with natural edges, extensive vistas and agricultural landscape queues is reduced, interrupted and replaced by residential structures and accoutrements.[77] Parcel by parcel this process results in the permanent transformation of the rural landscape into a suburban residential landscape. The native architectural character of the area is lost to a varied but repetitious installation of national and stylistic typical house plans[78]. The final condition of the residential development is identical with all of the suburban developments closer in to the metropolitan center.

Social Values & Function: The current zoning and subdivision regulations are designed around the automobile resulting in setbacks, right of ways, street widths, lot arrangements and uniform house placement using the roadway as the basis of design and producing a housing form that discourages a sense of community.[79] The clustering of units, typically by the use of cul-de-sacs, has provided a better design form, but is under utilized in most subdivisions[80]. Private spaces are not seriously considered in the development of residential subdivisions. Side by side placement of units results in a lack of privacy in the side and rear yards[81]. Recreation space is typically limited to the individual lot; in a large neighborhood where a recreation facility is provided, excessive distances often require users to come by car. Community recreation is usually unavailable within a safe and comfortable walking distance[82]. A sense of security is lacking from conventional subdivisions, and the linear subdivision form deters security measures[83]. Defying human tendency to live near the work place, unfulfilled human social needs drive the relentless expansion of suburbs into small but open rural communities[84]. The economics of "cheap land" reinforces this outward growth of suburbs[85].

Ecological Values:
Conventional zoning and subdivision regulations have perpetuated traditional development patterns resulting in the clearing of vast acres of land[86], the consequential destruction of forested areas, wildlife habitats, environmentally sensitive areas, and damaged the water

quality of local streams through the introduction of non-point source pollutants and erosion[87]. Energy and money are wasted due to excessive road widths, lengths and an over-extensive utility system[88].

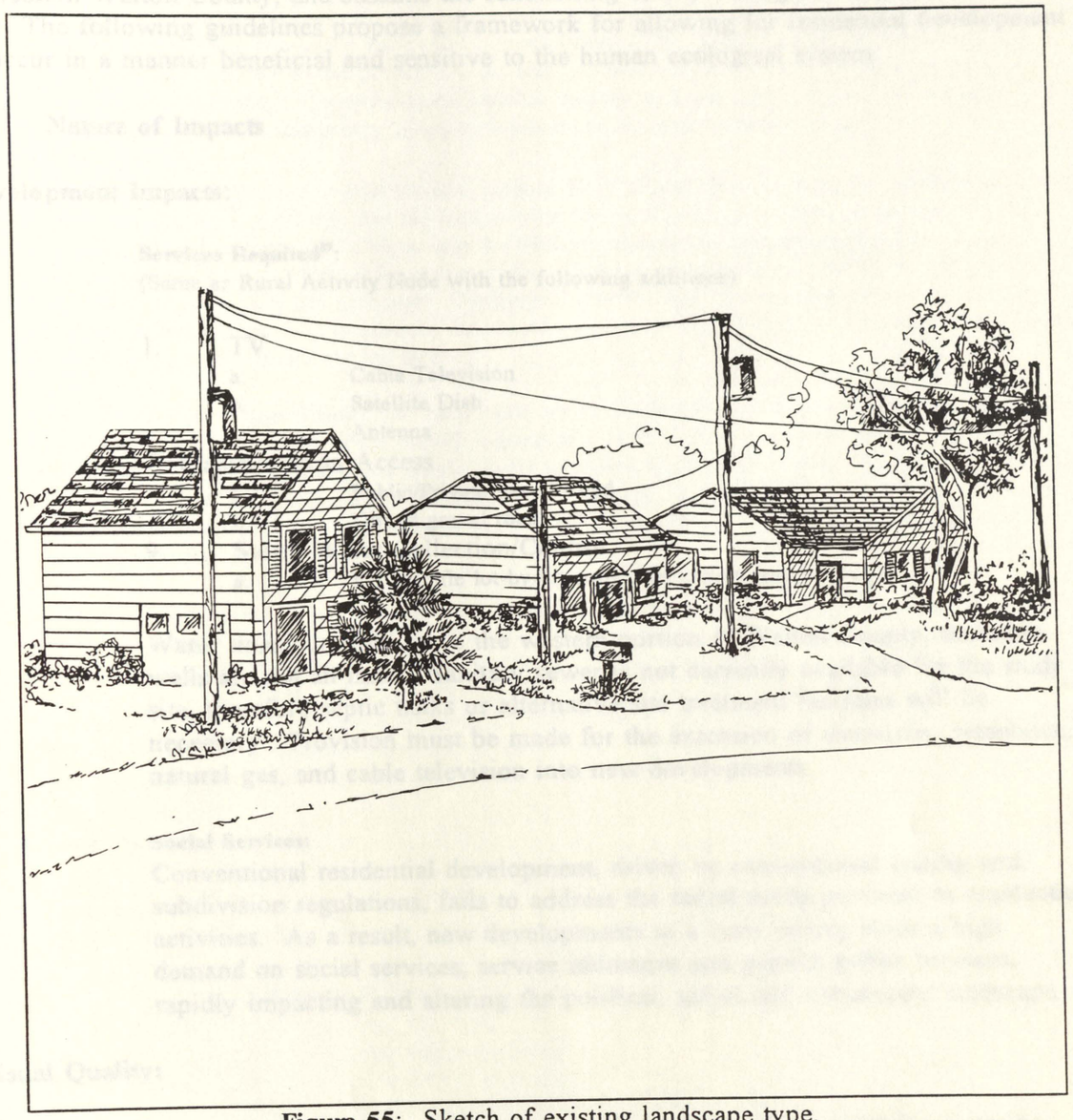


Figure 55: Sketch of existing landscape type.

1.4 Primary Objective of Management

The primary management objective for the residential landscape type is to provide for a development character which meets the human social needs, protects the rural visual character of western Walton County, and sustains the functioning of key ecological functions within the site. The following guidelines propose a framework for allowing for residential development to occur in a manner beneficial and sensitive to the human ecological system.

2.0 Nature of Impacts

Development Impacts:

Services Required[89]:
(Same as Rural Activity Node with the following additions)

1. TV
   - a. Cable Television
   - b. Satellite Dish
   - c. Antenna

7. Transportation Access
   - a. Public/Private paved Road
   - b. Dirt or gravel road

9. Storm Water Collection/Control
   - a. No specific lot-by-lot collection system (swales only)

Water lines currently serve the western portion of Walton County, therefore wells are not an issue. Sanitary sewer is not currently available for the study site, therefore septic tanks or alternative site treatment facilities will be necessary. Provision must be made for the extension of electricity, telephone, natural gas, and cable television into new developments.

Social Services:
Conventional residential development, driven by conventional zoning and subdivision regulations, fails to address the social needs pertinent to residential activities. As a result, new developments in a rural setting place a high demand on social services, service industries and general public services, rapidly impacting and altering the political, social and community landscape.

Visual Quality:

The visual impacts of residential development upon the rural landscape must be of major concern in the development of construction guidelines for housing. An explosion of housing units in a landscape defined by its openness quickly converts rural lands to suburbs, introduces volumes of automobiles and proliferates streets. Other issues involve the appearance of the units themselves and how best to integrate them into the local historical architecture.

Scale: The scale of housing refers to the visual appearance of size or mass in the landscape. The existing housing in rural areas tends to be small to medium size homes, while the development trends from the Atlanta suburbs typically include houses of much greater size.

Facade: The facades of existing structures communicate a sense of the communities values. The rural facade is appealing because it expresses the sensibilities of the "simple" rural life-style through it architectural form, the materials used and the way in which they are used. Such facades are in tune with their surroundings. Introduction of suburbia into this existing rural fabric with Georgian, Williamsburg and Contemporary mixed-style mansions corrupts the environment.

Location: Rural housing had the singular purpose of providing a residence for the worker and family at the work place. The priority was the land, not the house. The location of the home was determined based upon the farmer's lands, views into the farm for supervision and protection purposes, and placement upon areas which drain well and take advantage of breezes, sun and shade. One home would be located on a 250 acre farm. Contemporary residential development has an entirely different set of purposes which do not relate to the immediate lands surrounding it. The priority in residential development is the house not the land.

Automotive Accommodations: The rural landscape is typified by low volume roads providing access to large acreage farms. Such roads provide expansive views and have a minimum of driveways and intersections. Typical residential developments subdivide the land and equally space structures resulting in repetitive limited views and a plurality of driveways and intersecting roads. Because of the increased population, the volume of vehicles escalates and vehicles visibly parked along the streets becomes commonplace.

Open Space : Open space is the primary constituent of the rural landscape. Open space includes fields, forests, pastures and unmanaged lands. The rural landscape differs from wilderness in that the landscape includes occasional structures and the evidence of human management. Rural open space is defined by forest edges, hedgerows, fences, and tillage limits. The conventional residential landscape is defined by structures, roads and driveways. Open space is contained in lots and exists only in reference to the immediate structures. Placement of units along the front yard setback in regular order results in an architectural tunnel of space, confining views to a linear format.

Ecological Sensitivity:

Ecological Impacts of Construction[90]:

(Same as Rural Activity Node with the following modifications)

1. Clearing of land
   - a. for residence
   - b. for equipment access
   - c. for storage of materials
   - d. for road construction
   - e. for utility construction
   - f. for "landscaping" purposes

Residential development respects the character of the land only to the extent of routing storm water runoff and providing for basements and driveways. Development and construction methods require the clearing of land for a matrix of roads and right of ways, houses, driveways and septic tank drain fields. Often the front yards are cleared for marketing

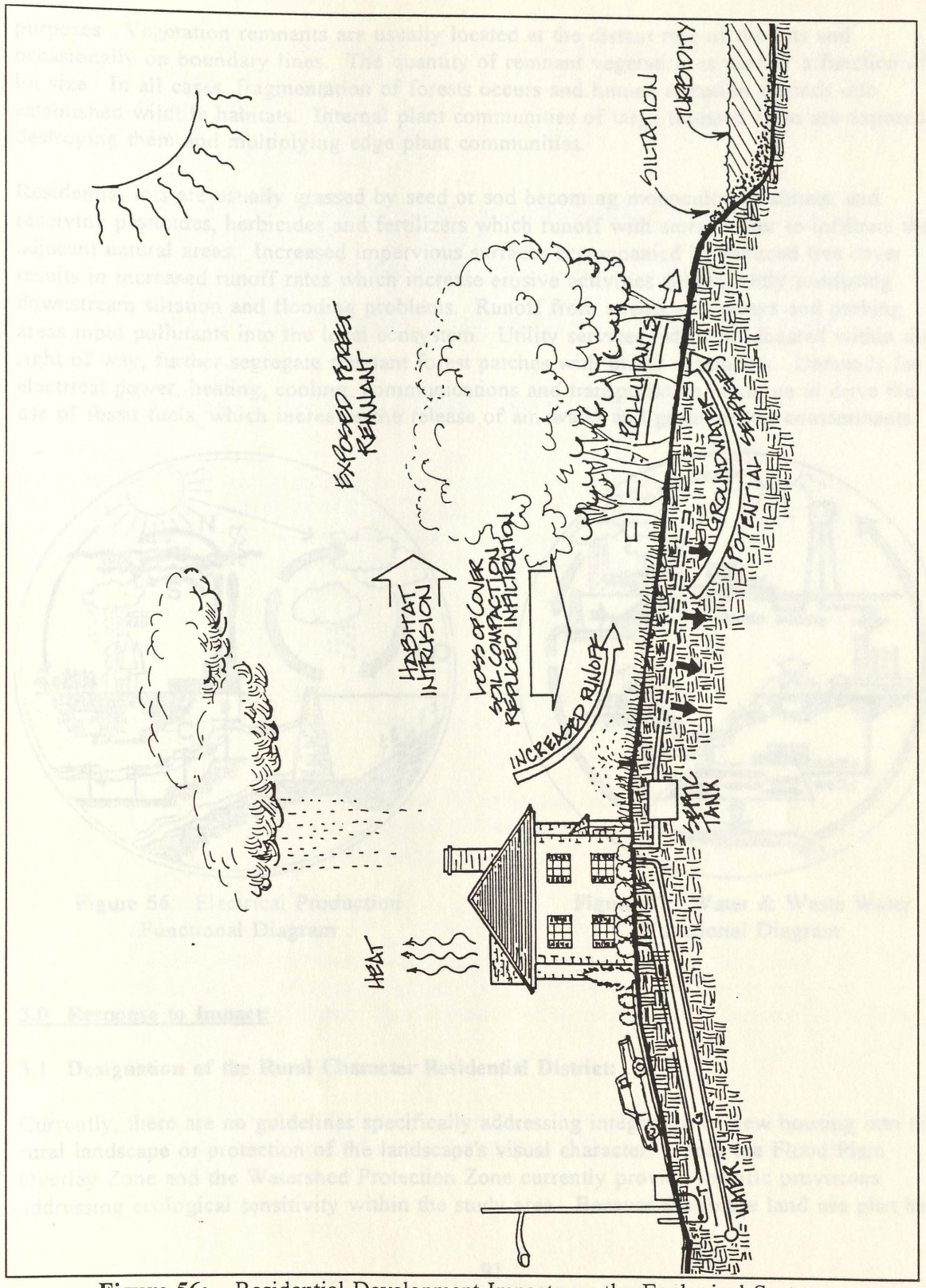


Figure 56: Residential Development Impacts on the Ecological System.

purposes. Vegetation remnants are usually located at the distant rear of the lots and occasionally on boundary lines. The quantity of remnant vegetation is usually a function of lot size. In all cases, fragmentation of forests occurs and human intrusion extends into established wildlife habitats. Internal plant communities of large forested areas are exposed, destroying them and multiplying edge plant communities.

Residential lots are usually grassed by seed or sod becoming monoculture habitats, and receiving pesticides, herbicides and fertilizers which runoff with storm water to infiltrate the adjacent natural areas. Increased impervious surfaces accompanied by reduced tree cover results in increased runoff rates which increase erosive activities subsequently producing downstream siltation and flooding problems. Runoff from streets, driveways and parking areas input pollutants into the local ecosystem. Utility services, when not located within the right of way, further segregate remnant forest patches with utility easements. Demands for electrical power, heating, cooling, communications and transportation continue to drive the use of fossil fuels, which increases the release of air, water and groundwater contaminants.

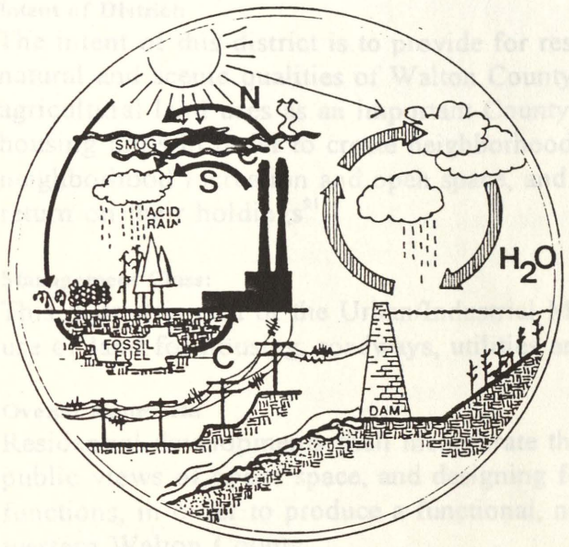


Figure 56: Electrical Production Functional Diagram

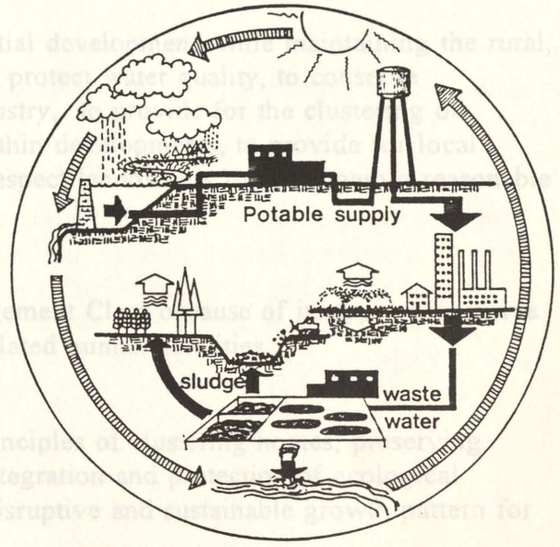


Figure 57: Water & Waste Water Functional Diagram

3.0 Response to Impact:

3.1 Designation of the Rural Character Residential District:

Currently, there are no guidelines specifically addressing integration of new housing into the rural landscape or protection of the landscape's visual character. Only the Flood Plain Overlay Zone and the Watershed Protection Zone currently provide specific provisions addressing ecological sensitivity within the study area. Because the future land use plan has

established low to medium density residential use as the intended land use for this portion of the county, the Rural Character Residential District is established as a refinement to that plan, defining the format and method for such development. This district shall serve as an overlay district upon the current residential districts. The criteria for establishing the boundary limits of this district include the following:

1. The district excludes proposed protection and conservation districts
2. The district is limited to the study site
3. The district includes only those lands identified in the Future Land Use Plan as residential uses.
4. The district excludes areas within established Corporate Limits Lines.

3.2 Recommendations for the Rural Character Residential District:

Intent of District:
The intent of this district is to provide for residential development while maintaining the rural, natural and scenic qualities of Walton County, to protect water quality, to conserve agricultural land uses as an important County industry, to provide for the clustering of housing units in order to create neighborhoods within developments, to provide for local neighborhood recreation and open space, and to respect landowners rights to gain a reasonable return on their holdings[91].

Management Class:
This district is part of the Urban/Industrial Management Class because of its typical intensive use of land for housing, roadways, utilities and related human activities..

Overall Approach:
Residential developments shall incorporate the principles of clustering homes, preserving public views of opens space, and designing for integration and protection of ecological functions, in order to produce a functional, non-disruptive and sustainable growth pattern for western Walton County.

Required Conditions:
All new residential subdivisions, lots and homes shall conform to the regulations and guidelines stated herein. All uses permitted within this district shall comply with the necessary provisions of this district upon initiation of certain facility expansions or certain activities.

Permitted Uses:
Same as underlying districts with the following modifications:
These additional uses are permitted within the existing R-1 Single Family Residential district:

1. Crop Farming
2. Truck Gardening or Farming

3. Grazing and Pasture Land
4. Home occupations subject to zoning ordinance provisions.

These additional uses are permitted within the R-2 Two Family Residential district:

1. Crop Farming
2. Truck Gardening or Farming
3. Grazing and Pasture Land

Conditional Uses:
Same as any underlying districts as defined by the Official Zoning Map and Land Development Ordinance of Walton County.

Special Uses:
On-site sewage treatment facilities subject to the provisions of "On-site sewage treatment facilities guidelines" below.

Prohibited Uses:
All uses not specifically permitted by the underlying zone and the modifications above, shall be considered prohibited.

Exemptions:
Existing land uses are exempt from the above requirements until such a time as the existing land use has been discontinued for 90 days or more. Expansion of existing building square footage or pavements by 20 percent or more from the date of enactment of this ordinance will require compliance with these guidelines and the guidelines for the appropriate landscape type. Unplatted expansions of existing subdivisions shall be considered new developments and are subject to the requirements of this section.

3.3 Design Guidelines:

Development Character

General Design Principles: Residential development shall be organized to provide residents with interconnected small neighborhoods or clusters within the overall subdivision[92]. Roads, driveways, structure placement, utility placement and recreation areas shall be coordinated together to produce a development that satisfies the basic human needs associated with residence and protects the open space typical of the rural landscape[93]. A hierarchy of streets shall be used to provide adequate controlled and safe access to the development, driveways should be shared and the use of courts and cul-de-sacs encouraged[94].

Specific Guidelines:

Building Guidelines:

A. Lots: Lots may be reduced from the 1 acre minimum dictated by the zoning ordinance based upon the following criteria:

1. Lots served by on-site sewage treatment facilities such as spray irrigated effluent or wetlands treatment of effluent may be reduced to 1/4 acre in size.
2. Lots sharing septic tank facilities and dedicated drain field areas may be reduced to 1/2 acre in size.

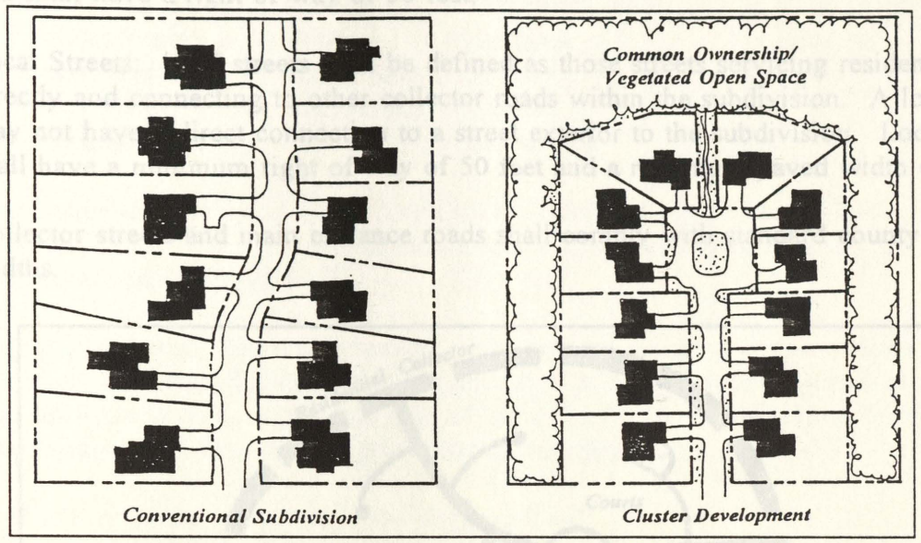


Figure 58: Comparison of conventional and cluster subdivisions.

B. Units: A minimum of 70 percent of the total number of units in the development shall be grouped together into small clusters by any of the following methods:

1. Grouping around a common court.
2. Grouping around a common cul-de-sac
3. Grouping together on shared driveways
   a. Ninety (90) percent of the units in 1/4 acre lot areas shall share driveways with at least one other lot.
   b. Sixty (60) percent of the units in 1/2 acre lot areas shall share driveways with at least one other lot.
   c. Thirty (30) percent of the units in 1 acre lot areas shall share driveways with at least on other lot.

Vehicular Guidelines:

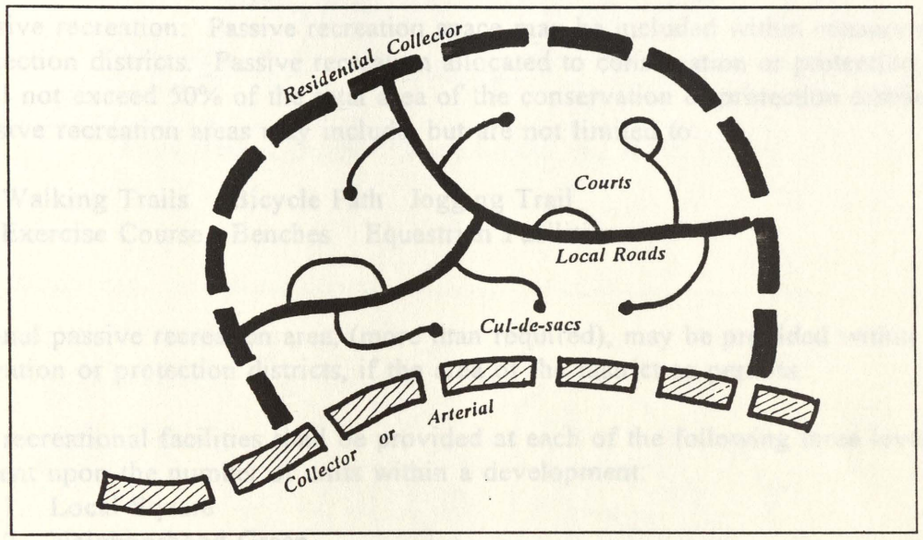
A. Courts:
   1.Two-way courts shall have a minimum pavement width of 20 feet and a right-of-way width of 40 feet.

2.One-way courts shall have a minimum pavement width of 15 feet and a right of way width of 30 feet.
3.The minimum centerline curve radius shall be 50 feet.

B. Cul-de-sacs: Cul-de-sacs shall comply with the standards of the Walton County Subdivision Regulations, with the following exception: a cul-de-sac of 1000 feet or less shall have a right of way of 50 feet.

C. Local Streets: local streets shall be defined as those streets servicing residential units directly and connecting to other collector roads within the subdivision. A local street may not have a direct connection to a street exterior to the subdivision. Local streets shall have a minimum right of way of 50 feet and a minimum paved width of 22 feet.

D. Collector streets and main entrance roads shall comply with standard county design widths.



Hierarchy of Roads **Figure 59**

Units access directly only from local roads, courts or cul-de-sacs.

Open Space

A. Recreation space: The total recreational open space shall not be less than 20% of the total residential development area.[95] The recreation space shall be provided in a succession of spaces similar to the community hierarchy including areas for active and passive recreation, as well as pedestrian circulation areas.

B. Active Recreation: Recreation space shall be provided at a minimum rate of 900 square person. Based on an average of 3 person per unit this yields a design factor of 2,700 square feet per unit. Recreation space must be allocated to active recreation, and as such may not be included within conservation or protection districts. Active recreation includes, but is not limited to:

Children's Play Area	Baseball	Basketball
Football/Soccer	Croquet	Handball
Shuffleboard	Playground	Softball
Volley Ball	Racquetball	Tennis
Swimming	Picnic	Bar-B-Que

Suggested standards for quantity, area and parking demand are shown in Table 1. Active recreation facilities should be located throughout the community in a variety of configurations and compositions[96].

C. Passive recreation: Passive recreation space may be included within conservation or protection districts. Passive recreation allocated to conservation or protection districts shall not exceed 50% of the total area of the conservation or protection district[97]. Passive recreation areas may include, but are not limited to:

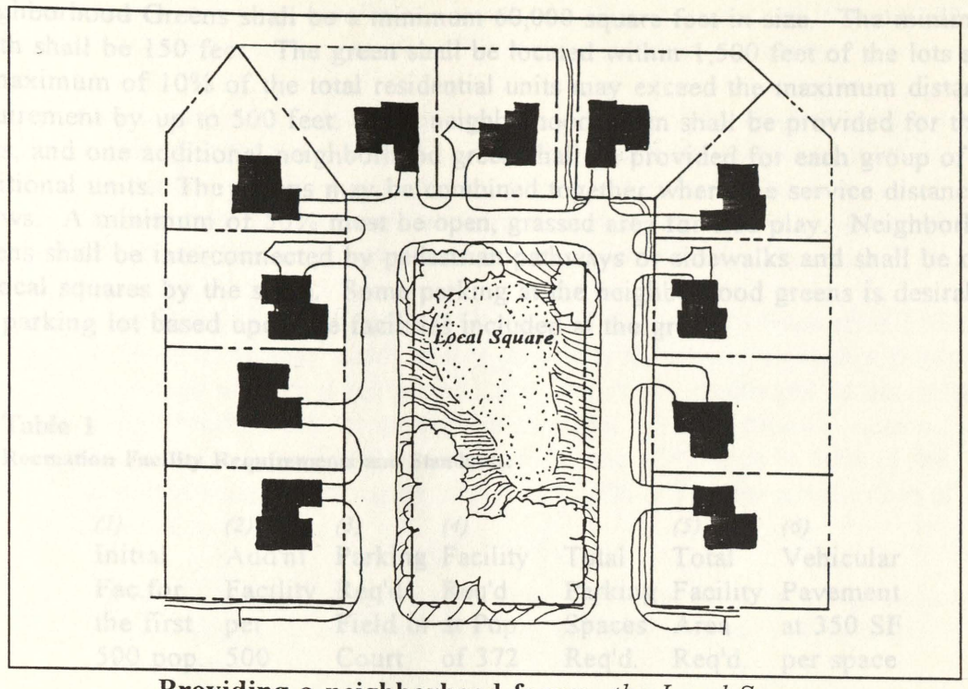
Walking Trails	Bicycle Path	Jogging Trail
Exercise Course	Benches	Equestrian Facilities

D. Additional passive recreation area, (more than required), may be provided within conservation or protection districts, if the area of the district so permits.

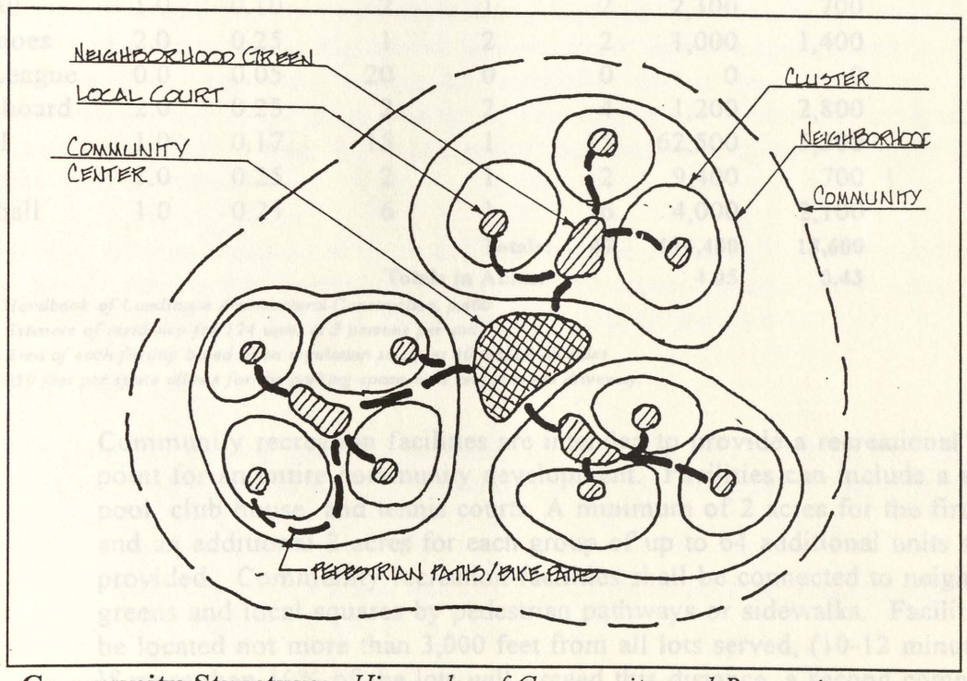
E. Active recreational facilities shall be provided at each of the following three levels dependent upon the number of units within a development:

1. Local Square
2. Neighborhood Green
3. Community Recreation Facility

F. Local squares: Local squares shall be a minimum of 2,500 square feet[98], and shall provide a minimum of 300 square feet per unit served[99]. All lots served shall be within 750 feet of a local square[100]. A maximum of 10% of the total residential units may exceed the maximum distance requirement by up to 250 feet. Local squares shall be interconnected by pedestrian pathways or sidewalks. Local squares shall serve a maximum of 16 units. The local square is intended for active recreational activities, but passive uses may be included.



Providing a neighborhood focus: *the Local Square*



Community Structure: *Hierarchy of Community and Recreation spaces.*

G. Neighborhood Greens shall be a minimum 60,000 square feet in size. The minimum width shall be 150 feet. The green shall be located within 1,500 feet of the lots served.[101] A maximum of 10% of the total residential units may exceed the maximum distance requirement by up to 500 feet. One neighborhood green shall be provided for the first 32 units, and one additional neighborhood green shall be provided for each group of up to 32 additional units. The greens may be combined together where the service distance criteria allows. A minimum of 50% must be open, grassed area for free play. Neighborhood greens shall be interconnected by pedestrian pathways or sidewalks and shall be connected to local squares by the same. Some parking at the neighborhood greens is desirable. Size the parking lot based upon the facilities included at the green.

Table 1
Recreation Facility Requirements and Standards:

	(1) Initial Fac.for the first 500 pop.	*(2)* Add'nl Facility per 500	*(3)* Parking Req'd/ Field or Court	*(4)* Facility Req'd at Pop. of 372	Total Parking Spaces Req'd.	*(5)* Total Facility Area Req'd.	*(6)* Vehicular Pavement at 350 SF per space
Baseball	0.0	0.17	15	0	0	0	0
Croquet	0.0	0.25	2	0	0	0	0
Football	1.0	0.17	10	1	10	88,000	3,500
Handball	1.0	0.10	2	1	2	2,300	700
Horseshoes	2.0	0.25	1	2	2	1,000	1,400
Little League	0.0	0.05	20	0	0	0	0
Shuffleboard	2.0	0.25	2	2	4	1,200	2,800
Softball	1.0	0.17	15	1	15	62,500	5,300
Tennis	1.0	0.25	2	1	2	9,400	700
Volleyball	1.0	0.25	6	1	6	4,000	2,100
				Totals:	**47**	**176,400**	**18,600**
				Totals in Acres:		**4.05**	**0.43**

1, 2, 3 Handbook of Landscape Architectural Construction, p.400
4. Estimate of residency for 124 units at 3 persons per unit
5. Area of each facility based upon regulation size plus 10 feet on all sides
6. 350 feet per space allows for the parking space, aisle and minimal driveway.

H. Community recreation facilities are intended to provide a recreational focal point for an entire community development. Facilities can include a swimming pool, club house, and tennis courts. A minimum of 2 acres for the first 64 units and an additional 2 acres for each group of up to 64 additional units shall be provided. Community recreation facilities shall be connected to neighborhood greens and local squares by pedestrian pathways or sidewalks. Facilities should be located not more than 3,000 feet from all lots served, (10-12 minute walk). If more than 10% of the lots will exceed this distance, a second community

recreation facility should be considered. Developments of less than 64 units are not required to provide a Community Recreation Facility.

I. Open, covered shelters for gatherings, picnics, or for shaded watching of children's play areas should be included within the recreation plan[102]. At least one shelter of a minimum 400 square feet must be included within a development with a Community recreation facility. This shelter must not necessarily be located at the community recreation facility.

J. Local Squares, Neighborhood Greens and Community Recreation Facilities may be located together, combined or otherwise distributed in such a fashion to take advantage of natural topographical or vegetative conditions, to accommodate design needs and to best meet the expected needs of future residents. Areas intended for these facilities shall not exceed 15% slope in 80% of the designated use areas, and shall slope at 10% or less for a minimum of 50% of the total area.

Note: All recreation space allocations for Local Squares, Neighborhood Greens and Community Recreation Facilities are exclusive of parking area requirements.

Visual Quality

General Design Principles: New residential development shall be designed to integrate the constructed systems and structures into the existing landscape. If streets, lots and units are placed in locations which do not disturb the visible countryside, the same quantity of residential development can occur without the landscape transformation typical of conventional development. The preserved visual character of the land which attracted the people and the development initially, can be maintained and continue to benefit the population and potentially the land values.

Primary public viewing locations shall be defined as those public right-of-ways abutting the site, from which existing and created views into the site occurs. Secondary viewing locations include on-site roadways from which views into on site open spaces occurs.

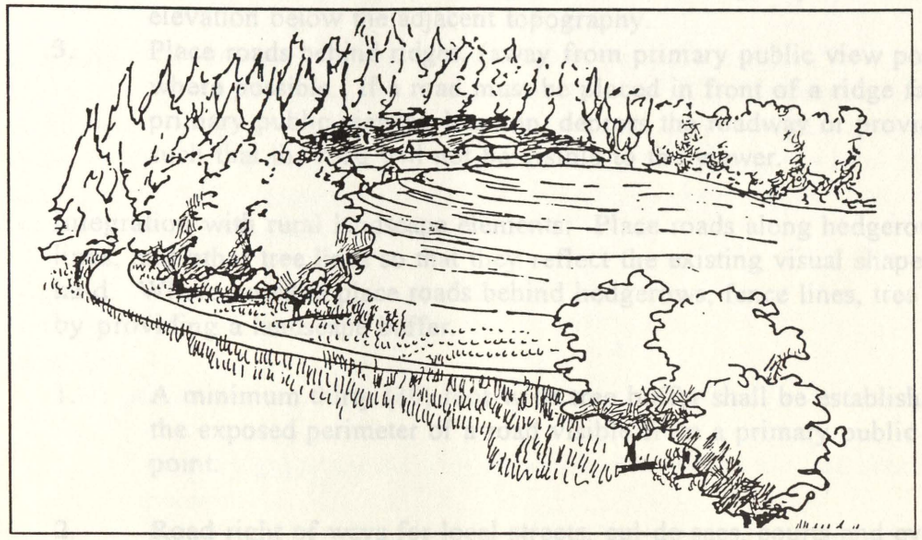
Specific Guidelines:

Building Guidelines: Houses shall be integrated into the landscape in such a manner as to limit their impact upon the character of the rural open space. Methods to accomplish this include but not be limited to:

A. Scale: Maintain a visual equality of scale between new housing and the existing residential fabric.

B. Facade: Select styles and materials consistent with the surrounding historic architectural character to maintain harmony and unity in the rural environment[103]

C. Location: Locate housing units in such a manner as to de-emphasize their importance. Place homes behind visual barriers (ridges, tree lines, etc.), and cluster them into small communities within a buffered space to reduce the visual and physical impact upon the surrounding lands.



Design with the Land

D. A minimum thirty (30) foot wide undisturbed tree buffer shall be maintained along exterior property lines common to the overall development. Where existing trees do not occur, a planted buffer shall be established, maintaining the thirty (30) foot width.

E. A minimum thirty (30) foot wide undisturbed buffer shall be maintained along the periphery of open spaces visible from a primary public view point..

F. Structures shall be located within fringe woodlands leaving a minimum existing thirty (30) foot buffer of trees between the buildings and the primary public view point. Where this is not possible, installation of a thirty (30) foot tree buffer shall be required..

G. All residential units shall provide carports, garages or designated parking areas which enable the parked vehicles to be hidden from direct street view. Entrances into parking areas which are not fully enclosed shall be from the side or rear.

Vehicular Guidelines:

A. Integration into the Topography:

1. Design roads longitudinally along the contours of the land.
2. Do not place roads on the tops of ridges or across hilltops. Where a road must be placed on a ridge or cross a hilltop, depress the road elevation below the adjacent topography.
3. Place roads behind ridges, (away from primary public view points), where possible. If a road must be placed in front of a ridge facing a primary public viewing location, depress the roadway or provide a berm such that the road will not be visible to the viewer.

B. Integration with rural landscape elements: Place roads along hedgerows, fence lines, and other tree lines so that they reflect the existing visual shape of the land. Where possible place roads behind hedgerows, fence lines, tree lines, or by providing a landscape buffer.

1. A minimum thirty (30) foot wide tree buffer shall be established along the exposed perimeter of a road visible from a primary public view point.
2. Road right of ways for local streets, cul-de-sacs, courts and eyebrows may be reduced to 50 feet.
3. Vehicles shall be stored out of sight from primary public view points.

Open Space: Since the nature of the rural landscape is the open space it contains, open space must be considered a primary element and tool in the preservation of the existing rural landscape character.

A. Open Space should be concentrated into large community spaces and not divided piecemeal into separate lots. These spaces should be organized along the primary public viewing area.

B. Open space shall not include areas within single family residential lots, lots identified for commercial, institutional or industrial uses. Agricultural uses are permitted. The placement of new agricultural service structures should take into consideration the natural views of the site from the public viewing point. Building permits for such structures are subject to site plan review, but in no case shall the functionality of the structure in relation to farm operations be impaired..

C. Areas designated as open space and shall be platted and recorded. Open space may include agricultural areas, resource protection areas, and non-paved recreation areas.

D. Buffers: Where open spaces cannot be maintained along primary public view points due to site constraints, tree buffers should be installed to provide a natural barrier and a sense of open space.

Environmental Sensitivity

General Design Principles: Residential structures shall be chosen and located to fit the land, thereby reducing land disturbance, and they shall be oriented to take advantage of solar angles[104]. Roads shall be minimized in both length and width, and right of ways reduced to the minimum acceptable. Driveways should be shared, thereby reducing the total number of driveways by nearly 50%[105]. Vegetative open space should be preserved in order to maintain high air quality and healthy wildlife habitat[106] [107].

Specific Guidelines:

Building Guidelines

A. Unit designs should be selected based upon the topographical conditions of the site[108]:
   1. Slab on grade should only be used where slopes are less than five (5) percent.
   2. Split foyer or partial basement structure should be used on sites with 5-10 percent grades. It can be adapted to flat sites as well.
   3. Full split-level units with walkout basements or bottom floor parking should be utilized when the slopes range from 10 to 15 percent.
   4. Where cross-slopes are an issue, utilize the side to side split level house. It can easily accommodate two to four feet of change.

B. Cluster units on land that is most suitable for building. Avoid excessive slopes.

C. Maintain trees as close to the house as possible[109]. Shading is an essential element of sensible environmental design in the southern building zone, reducing energy consumption and thereby reducing contaminants produced in energy production[110].

D. Provide wind breaks on the north and west sides of the home to diminish winter winds[111].

E. Provide large overhangs on southern and western house exposures.

F. Maintain or place deciduous trees along the southern and western sides of the house to provide critical shade in the summer and to permit greater solar penetration in the winter[112].

G. House orientation may vary from typical front door facing the street, in order to best utilize the sun angles.

Vehicular Guidelines

(see Development Character Vehicular Guidelines for roadway and driveway requirements). (see Rural Activity Node Guidelines for Storm water runoff, Erosion and Vegetation guidelines).

Open Space

A. Open space shall be provided at a rate of 1 acre per single family unit[113].

B. Open space shall be provided at a rate of 1 acre per two-family unit[114].

C. Maximum lot coverage requirements shall not exceed the rates required by the Walton County Development Ordinance[115].

D. Requirements for vegetated open space shall be determined by the following formula[116]:

"O" = (U x o) - (A x (1-C)), where:

U = the total number of **Units**
o = the required amount of **open space per unit**
A = the total lot **Acreage**
C = the maximum site **Coverage**
O = the total vegetated **Open Space** required

This formula provides the total additional open space requirements for a development based upon total lot area less available open space in the lots. This open space shall exclude parking areas and other impervious man-made surfaces. Use of the open space areas is not prescribed, the intention is that oxygenation needs be fulfilled and the beneficial impacts for storm water infiltration, ground water recharge and visual quality result. See endnotes for example calculation of open space requirement for Site A[117].

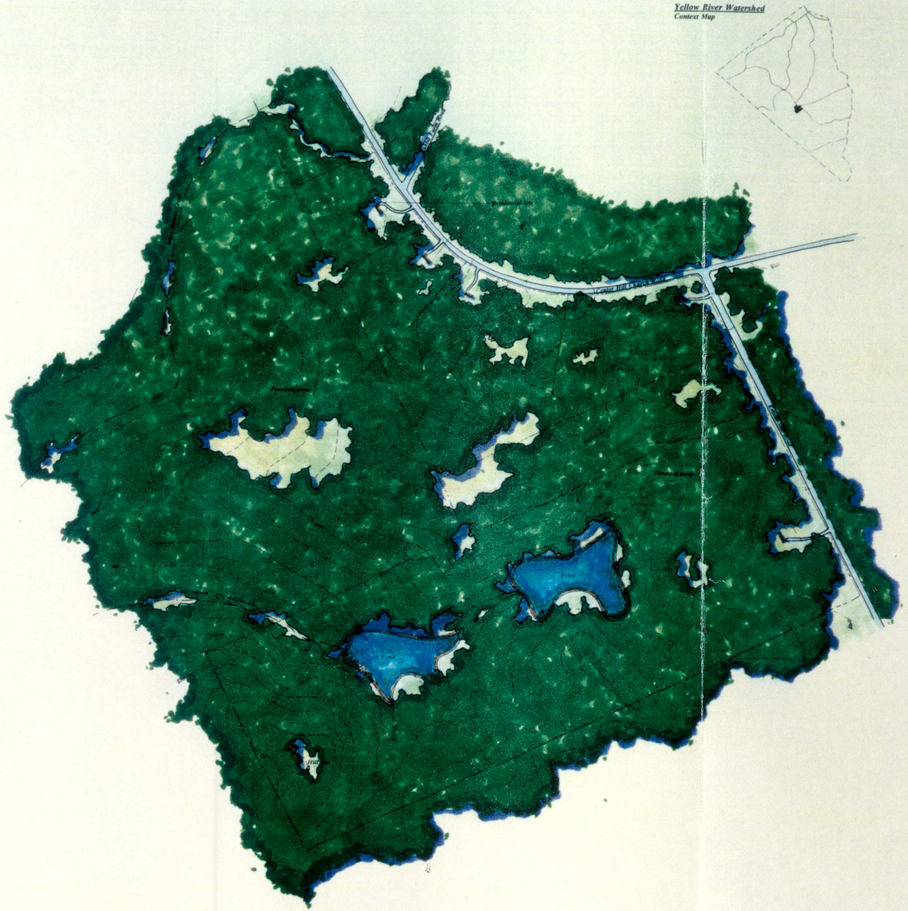
Section Five: Commentary on Site Design

Two sites were chosen in the Yellow River Watershed to demonstrate the performance standards outlined in the previous sections. These sites allowed us to demonstrate the majority of the performance standards due to the broad range of landscape types inherent in each site. For each site, three maps were produced: existing conditions, conditions with conventional development and conditions after creative development. The creative development scenario is an attempt to apply the developed performance standards, allowing the ecological function of the site to remain intact while allowing development to occur.

Site A is centrally located in the study area at the intersections of Center Hill Church Road and Emmit Still Road. At present Site A consists of a small number of residential lots carved out of large forested areas. Topography is rolling with a high point of 900 feet. Center Hill Church Road is highly traveled and acts as a connector between County Road 20 and State Road 81. The area is currently zoned rural residential and has public water but no public sewerage. This restricts future development to one acre lots with septic tanks without the installation of a public sewer system. This area is a quiet peaceful area, yet due to close proximity to Center Hill Church Road is it faced with eminent development pressures. Site A emphasizes Rural Activity Nodes, PUD's, and conservation of Large Forested Areas and preservation of a River Corridor.

Site B is located in Northeast corner of the study area at the intersection of County Road 20 and Sharon Hill Church Road. At present, Site B contains one acre residential lots with 60 and 80 foot setbacks from Sharon Hill Church Road and County Road 20, respectively. These residential lots have public water, but no public sewerage. Future residential development would be restricted to one acre lots or larger, unless public sewerage were installed. These lots border a relatively steep and heavily wooded river corridor. One small lawn mower repair and sales store is the extent of the commercial development, which is surrounded by croplands. Because this site lies partially within the corporate boundary of Loganville, the future development pressure of this area is high. Site B emphasizes Road corridor development, Activity Nodes, cluster development, preservation of River Corridor and conservation of Cropland.

Refer to the following maps for existing, conventional and creative design scenarios for site A and B. Specific design parameters for each site are included on the individual maps.



YELLOW RIVER WATERSHED

Walton County, Georgia

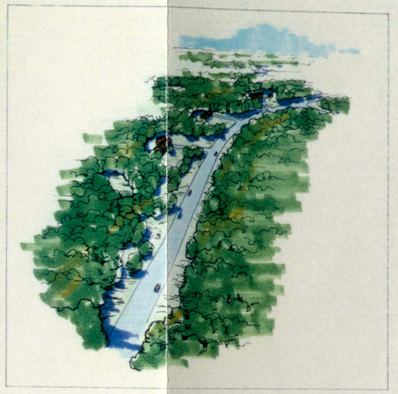
Site A

Before Development

At present, Site A consists of a small number of large residential lots carved out of large forested areas. Two ponds exist deep within the forested areas. The topography is rolling with a high point of 900 feet.

Center Hill Church Road is a relatively high traveled road as it connects State Road 81 with County Road 20. The area is currently zoned rural residential and has public water but no public sewerage. This restricts future development to one acre lots with septic tanks without the installation of a public sewer system.

This area is a quiet, peaceful area, yet due to its proximity to Center Hill Church Road, is faced with immanent development pressures.



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Fall Quarter, 1993

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YELLOW RIVER WATERSHED

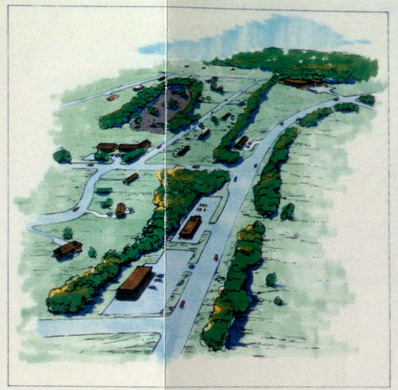
Walton County, Georgia

Site A

After Conventional Development

Landuse Data

Developed Land		
Residential Lots:		
1 Acre Lots (Existing)	= 0 Units	= 0 Acres
1/2 Acre Lots (Proposed)	= 51 Units	= 29.7 Acres
1 Acre Lots (Proposed)	= 28 Units	= 31.2 Acres
2 Acre Lots (Proposed)	= 26 Units	= 63 Acres
Subtotal	105 Units	124 Acres
Office/Commercial Lots:		
Commercial (4,400 ff)	= 1 Unit	= 0.66 Acres
Convenient Store/Gas Station (7,000 ff)	= 2 Unit	= 1.7 Acres
Office Sites (13,525 ff Buildings)	= 2 Units	= 4.0 Acres
Road Right-of-ways		26.95 Acre
Subtotal Developed Land		157.31 Acres
Total Acreage		188 Acres
Total Density		1.18 Units/Acre
Total Linear Feet of Road		16,775 ff



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YELLOW RIVER WATERSHED

Walton County, Georgia

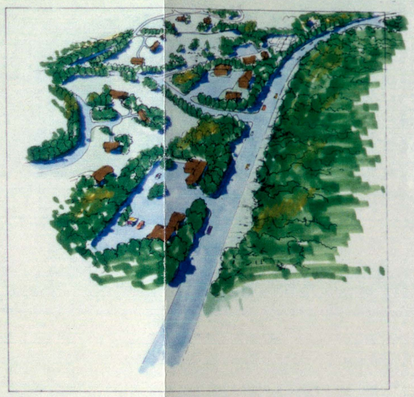
Site A

After Creative Development

Landuse Data

Developed Land

Residential Lots		
1 Acre Lots	= 25 Units	= 26.3 Acres
1/2 Acre Lots	= 43 Units	= 25.5 Acres
1/4 Acre Lots	= 55 Units	= 16.4 Acres
Subtotals	123 Units	68.0 Acres
Office Park Care Complex		4 Acres
Retail Activity Node		4 Acres
Community Recreation Facility		4 Acres
Road Right-of-ways		21.3 Acres
Sewage Treatment Facility		2 Acres
Total Developed Land		101.3 Acres
Recreation Open Space		
Local Square	94 Acres	.84 Acres Required
Neighborhood Greens	6.6 Acres	5.3 Acres Required
Miscellaneous Areas/Pedestrian Trails	10.1 Acres	
Protection/Conservation Lands	66.66 Acres	
Subtotal Open Space	84.5 Acres	6.1 Acres Required
Percent Open Space	45%	38.1% Required
Total Acreage	188 Acres	
Total Density	.68 Units/Acre	
Total Linear Feet of Road	15,680 lf	



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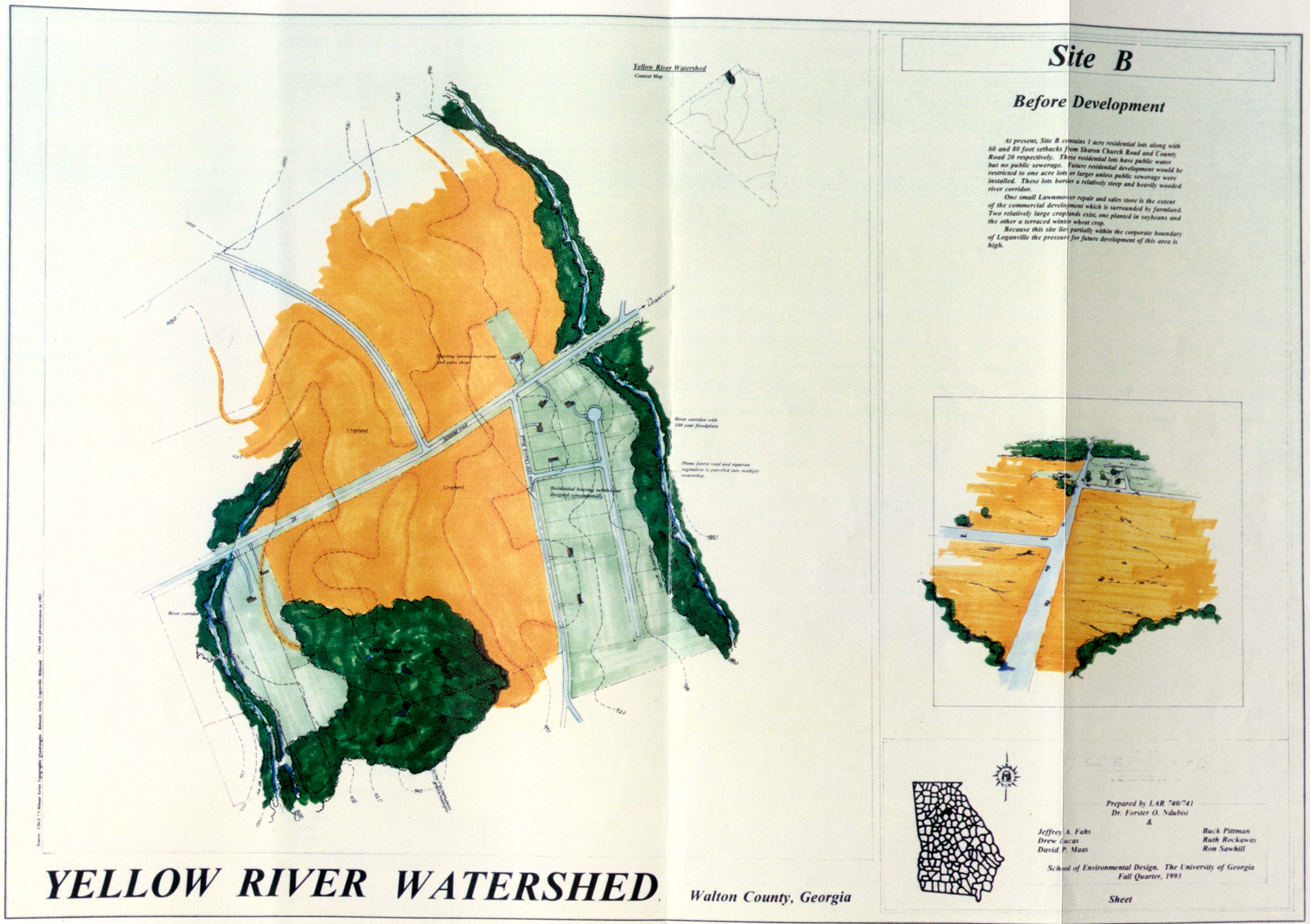
Yellow River Watershed
Context Map
Existing lawnmower repair and sales shop
Cropland
Cropland
Jackson Road
Sharon Church Road
River corridor with 100 year floodplain
Prime forest land and riparian vegetation is parcelled into multiple ownership.
Residential housing subdivision designed conventionally
Site B
Before Development
At present, Site B contains 1 acre residential lots along with 60 and 80 foot setbacks from Sharon Church Road and County Road 20 respectively. These residential lots have public water but no public sewerage. Future residential development would be restricted to one acre lots or larger unless public sewerage were installed. These lots border a relatively steep and heavily wooded river corridor.
One small Lawnmower repair and sales store is the extent of the commercial development which is surrounded by farmland. Two relatively large croplands exist, one planted in soybeans and the other a terraced winter wheat crop.
Because this site lies partially within the corporate boundary of Loganville the pressure for future development of this area is high.
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YELLOW RIVER WATERSHED

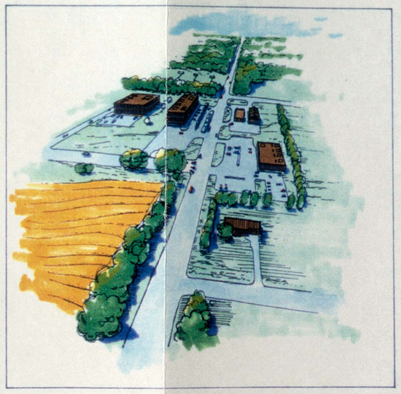
Walton County, Georgia

Site B

After Conventional Development

Landuse Data

Developed Land		
Residential Lots:		
1 Acre Lots (Existing)	= 7 Units	= 10.3 Acres
1 Acre Lots (Proposed)	= 73 Units	= 90.7 Acres
Subtotal	80 Units	101 Acres
Industrial/Commercial Lots:		
Grocery (20,000 sf.)	= 1 Unit	= 3.2 Acres
Convenient Store/Gas Station (3,750 sf.)	= 1 Unit	= 2.3 Acres
Industrial Sites (25,000 sf Buildings)	= 3 Units	= 12.5 Acres
Road Right-of-way		13.5 Acre
Subtotal Developed Land		132.5 Acres
Total Acreage		182.5 Acres
Total Density		.79 Units/Acre
Total Linear Feet of Road		8,085 lf



SCALE 1:24000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

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YELLOW RIVER WATERSHED

Walton County, Georgia

Site B

After Creative Development

Landuse Data

Developed Land

Residential Lots:		
1 Acre Lots	43 Units	= 67.4 Acres
1/2 Acre Lots	0 Units	= 0 Acres
1/4 Acre Lots	0 Units	= 0 Acres
Subtotal	43 Units	67.4 Acres
Industrial Complex		10 Acres
Rural Activity Node		5 Acres
Community Recreation Facility		9 Acres
Road Right-of-way		10.4 Acres
Sewage Treatment Facility		0 Acres
Total Developed Land		92.8 Acres

Recreation Open Space

Local Square	7.4 Acres	30 Acres Required
Neighborhood Greens	3.2 Acres	2.75 Acres Required
Miscellaneous Areas/Television Trails	48.96 Acres	
Protection Conservation Lands	9.2 Acres	
Productive Croplands	28 Acres	
Subtotal Open Space	89.7 Acres	-7.55 Acres Required
Percent Open Space	49%	-4% Required
Total Acreage	182.5 Acres	
Total Density	1.56 Units/Acre	
Total Linear Feet of Road	9,650 lf	

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Section Six: Implementation Tools and Strategies

After the design phase is complete and the proposed guidelines have been accepted, the final step is finding means for implementing the proposed guidelines. Typically, deciding on implementation tools coincides with the development of guidelines or the detailed designs. However, in this section, implementation tools will be discussed as a separate issue. It is important to explain how these tools work and how they have been applied to this study.

To help demonstrate how some of the implementation tools can be applied, a Matrix, which can be seen in appendix C, has been generated. Along the left hand side of the Matrix are existing legislation and vehicles for land management. These tools have been divided up into four groups: Federal legislation, State legislation, Local ordinances, and Private incentives. These are the tools which typically lead to conventional development. Nonetheless, these are the tools which provide the framework within which new guidelines must be developed.

Across the top of the Matrix are components of the landscape structure and function which have been identified by using the ABC Method discussed earlier. In this study, guidelines were developed for only a handful of these components. However, these are the guidelines which led to the creative designs of sites A and B.. These are the guidelines which need to be implemented. But which tools for implementation will be most effective? The Matrix can answer these questions.

The Matrix shows how the existing legislation and vehicles for land management affect the individual components of each landscape structure and function listed. In essence, this matrix suggests which implementation measures apply to which components of the landscape. For example, the Clean Water Act specifically applies to wetlands and reservoir watersheds -- so guidelines developed for these components could be implemented using the Clean Water Act as a basis for justification. .

Although federal and state legislation can be useful implementation tools, the study presented in this paper leans towards using local ordinances and private incentives as means for implementing the proposed guidelines. The reason for this choice is simple. Federal and state legislation typically apply to federal/state land and federal/state dollars. Therefore, it would be most effective to use local ordinances and private incentives as means for implementing these guidelines.

Finding the best tool to implement guidelines is a crucial step if the project is to come to completion. After researching various implementation tools thoroughly, certain tools are clearly the best choice for each landscape type. Although the tools discussed below are not the only tools which could be used, they will be the most successful for the purposes of this study.

River Corridors have been grouped with the protective management class. As explained earlier, it is an ecologically sensitive area that needs to be protected. Under existing

legislation, the river corridor is protected by the 100 year floodplain. Only limited development (e.g. roads, bridges) can occur within these zones. However, the guidelines developed for river corridors, in this study, takes the protection of river corridors one step further by including the geomorphic floodplain as part of the protection area, as well as suggesting guidelines for development around the floodplain. The driving principle behind these guidelines is to limit disturbances in the river corridor. The most effective way to implement these guidelines would be by implementing an overlay zone.

An overlay zone is one zone which has been placed over an already existing zone. Overlay zones require that guidelines for both zones must be fulfilled in order to develop on that piece of property. So if a piece of land is zoned as a residential area but a certain section of it has a river corridor, then, in that specific section of the property, both the guidelines developed for river corridors as well as those developed for residential areas must be followed.

For Large Forested Areas, the same kind of overlay zoning is most effective. Large forested areas are part of the conservation management class. Therefore, conservation -- not protection -- of these areas is most important. Guidelines which suggest minimum buffer requirements and discourage fragmentation try to protect the habitat of the interior forest. Development is allowed in these areas as long as the guidelines for the large forested areas are met. By implementing an overlay zone, these guidelines can be executed.

The same goes for croplands. Overlay zones are the most effective means of implementing the guidelines. Croplands are part of the productive management class. In this case, however, guidelines are suggested so that the adverse affects of cropland management (e.g. tilling, chemicals, etc.) will not disturb the surrounding landscape. Infiltration techniques like detention ponds and vegetated berms as well as the use of contour farming were recommended. Using an overlay zone is the most effective method for managing croplands.

Rural Activity Nodes, however, are somewhat different than the previous three landscape types. First, it is not a natural landscape. Second, it is part of the compromise management class. Therefore, development must be allowed to occur. However, it should only be allowed in a manner which is sensitive to the landscape. The best method for implementing the guidelines suggested for the rural activity node is to designate an area within which commercial development can occur. This is otherwise known as zoning. Zoning has become a popular regulatory technique used in the United States. It is a land-use control which seeks to regulate kinds of land-uses. By designating a Rural Activity Node District, not only can commercial development be restricted to designated zones, but guidelines designed specifically to deal with issues regarding rural commercial development (e.g. ecological, and visual impacts) can be implemented.

For residential development, subdivision regulations are suggested as the most effective tool for implementing related guidelines. Residential development is part of the Urban/Industrial management class. Thus, guidelines which manage for more intense development have been developed. Guidelines which manage for many social and visual issues have also been

suggested. By making these guidelines part of the existing subdivision regulations, communities which meet the needs of the residents, as well as the ecological needs of the surrounding environment, will be designed.

Roads are the last component of the landscape considered in this study. Research regarding this landscape type led to specific guidelines to help protect vistas, vegetation, and the surrounding landscape. For roads, performance standards are the best method for implementation. Standards which apply to any road being built must be followed so that the roads do not disturb the scenic or ecological aspects of the surrounding landscape.

Overlay zones, zoning, subdivision regulations and performance standards were the most useful and effective tools for implementing the proposed guidelines. However, these are not the only tools which can be used. Using private incentive would be another very effective tool since most of the land in the western section of Walton County is under private ownership. Providing tax incentives for owners is one private incentive. Transfer of development rights (TDR) is another incentive. TDR would allow an owner to sell their development rights. This land can no longer be developed -- in a sense this land is now protected. However, the owner who bought the development rights can increase the amount of development on their land. By using private incentives like the ones above, the community affected by the proposed guidelines can benefit by helping to implement them.

Although many other tools could have been used, the ones described above are thought to be the most effective tools for implementing the proposed guidelines.

Section Seven - Conclusions

This study in the Yellow River Watershed was a systematic, holistic, ecologically based approach to Environmentally Sensitive Area (ESA) Planning. Traditional land planning practices and other ESA methodologies have focused primarily on critical areas without giving much regard to other areas, issues, or cultural interpretations of the landscape.

A mixture of Frederick Steiner's *Landscape Ecological Planning Mode*l, *Abiotic, Biotic, and Cultural Resource Survey* performed in Canada, and Hendrix', Fabos', and Price's implementation of Eugene Odum's *Compartmental Model* was utilized to meet these ends.

This study has illustrated that ESA based guidelines can be applied to specific sites in a creative manner; open space can be maintained and natural areas can be protected while creating quantifiable savings in construction costs. Even by redefining boundaries based on ecological function, development need not to be consigned to typical strip commercial, or block-by-block residential sub-division development. By taking this approach the vernacular patterns and character of the visual landscape may also be preserved.

Further Work to be Done

Due to time and resource limitations, a number of details were left for further work. First, only six of a total of twenty landscape types were evaluated. These types could be evaluated for a more comprehensive understanding of the natural and social interrelationships that make up the Yellow River Watershed.

Secondly, some of those landscape types that were evaluated by this class should be studied further before implementation. The relative health of river corridors, for example, should be ascertained with the help of modern tools such as the Biotic Integrity Index, or at the minimum, professionally informed input from landscape architects, engineers, agronomists and foresters to set an educated boundary for the protection of riparian corridors. In addition, prime agricultural lands should be surveyed and evaluated to determine the need for possible adjustments to the minimum sized cropland to be preserved. a survey of the local architectural character for residential and commercial structures should be documented guide future architectural implementations.

While we identified the various legislative and local vehicles for implementation of these guidelines, further work could to be done to find specific methods for their integration into existing Walton County guidelines. Because The Yellow River Watershed is largely in private ownership, a challenging task will be to construct programs for the initiation of private incentives as a means to implementation of ESA guidelines..

Finally, by involving a local developer in this concept it would help to promote the use of such guidelines in other geographical areas. Perhaps a pilot study would suffice that shows the benefits of environmentally sensitive area planning in a small scale planned development.

This would give a more realistic view of the benefits and/or deficiencies involved in the concept.

Endnotes:

1. Naveh, Z., and A.S. Lieberman. 1984. *Landscape Ecology: Theory and Application*. New York: Springer-Verlag

2. Ndubisi, F.O. In press. Landscape ecological planning: An evolutionary perspective.

3. Steiner, F. 1991. *The Living Landscape: An Ecological Approach to Landscape Planning*. New York: McGraw Hill.

4. (McHarg, Ian. 1981. Human ecological planning at Pennsylvania. Landscape Planning 8:109-120. pp.112-13.

5. Forman, R.R., and M. Godron. 1986. Landscape Ecology. New York: John Wiley and Sons, Inc..

6. Forman, R.R., and M. Godron. 1986. Landscape Ecology. New York: John Wiley and Sons, Inc..

7. Thorne, J.F. 1993. Landscape ecology: A foundation for greenway design, in Smith and Hellmund. 1993. The Ecology of Greenways: Design and Function of Linear Conservation Areas. Minneapolis: University of Minnesota Press.

8. Hendrix,W.G., F.G. Fabos, and J.E. Price. An ecological approach to landscape planning using geographic information system technology. Landscape and Urban Planning 15:211-225.

9. The landscape types are based on the study conducted by Hendrix, W.G., J.Gy. Fabos, and J.E. Price. 1988. An ecological approach to landscape planning using geographic information system technology. *Landscape and Urban Planning*, 15:211-225. p.217.

10. Large trees in riparian zones are tolerant of water inundation. In the Georgia Piedmont, Sycamore (*Platanus occidentalis*), Black Willow (*Salix Nigra)*, and American Beech *(Fagus Grandifolia*) tower over mid-story trees such as Ironwood (*Carpinus caroliniana*), and Hop Hornbeam *(Ostrya virginiana*). Some of the characteristic shrub layer vegetation is: Sweetshrub (*Calycanthus floridus*), Piedmont Azalea *(Rhododendron canescens*), and Wild Hydrangea (*Hydrangea arborescens)*. And finally, typical ground layer vegetation is comprised of River Oats (*Chasmanthium latifolium)*, Galax (*Galax urceolata)*, and New York Fern (*Thelypteris novaboracensis)*.

11. Smith and Hellmund. 1993. *The Ecology of Greenways: Design and Function of Linear Conservation Areas*. Minneapolis: University of Minnesota Press.

12. Karr, J., K. Fausch, P.L. Angermeirer, P.R. Yant, and I.J. Schlosser. 1986. Assessing biological integrity in running waters: A method and its rationale. Illinois Natural History Survey, Special Publication #5, Champaign, IL.

13. For a complete discussion on matrix, patch and corridor as crucial landscape patterns which affect ecological structure and function see: Ahern, J. 1991. Planning for an extensive open space system: Linking landscape structure and function. *Landscape and Urban Planning*, 21:131-145.

14. The Federal Clean Water Act of 1972 has focused mainly on the control of point source pollution because it is well defined and concentrated, e.g., industrial effluent discharged to stream.

15. Owen, O.S. 1985. *Natural Resource Conservation*, 4th ed. New York: MacMillan Press.

16. Marsh, W.M. 1991. *Landscape Planning: Environmental Applications*, 2nd ed. New York: John Wiley and Sons, Inc..

17. Smith and Hellmund, see endnote 2.

18. Georgia State Soil and Water Conservation Commission. 1979. *On-Site Erosion Control: Management Practices for Construction Activities*. (p. 35).

19. Existing provision from the Walton County Land Development Ordinance, section 7.11.1.

20. See endnote 11 above.

21. In general, lower stream orders (smaller streams and/or headwaters) are affected to a greater extent than are higher stream orders by the inputs from surrounding land. Less stream flow means less ability to mitigate toxic inputs.

22. For further information on The Index of Biotic Integrity and other tools that measure ecological health, see Smith and Hellmund, endnote 2, p. 87.

23. Marsh, W.M., see endnote 7 above. 1991.

24. The 100 Year Floodplain Protection District is a political boundary set by The Federal Emergency Management Agency which administers the National Flood Insurance Protection Plan. Participating communities qualify for flood relief so long as specified restrictions are followed for development within this boundary. The Yellow River Watershed area participates in this program and is subject to FEMA's restrictions. These restrictions may be found in the Walton County Land Development Ordinance, section 7.11.1.

25. See p. 9

26. Existing provision from the Walton County Land Development Ordinance, section 7.11.1.

27. For further information on the effects of farming practices on water quality, see: Smith, R.A., R.B., Alexander, and M.G. Wolman. 1987. Water-quality trends in the nation's rivers. *Science*, 235:1607-10.

28. Marsh, W.M., see endnote 7.

29. The Soil Conservation Service administers the Conservation Reserve Program (CRP) which compensates farmers for natural area set-aside. One such measure compensates farmers who maintain a natural buffer between cropland and stream banks so long as it is no less than 66 feet and no greater than 99 feet. See a Soil Conservation Service Extension Office for further details on CRP.

30. For further notes and suggestions on restoration, see Smith and Hellmund, endnote 2, p.98.

31. For a detailed listing of Ecological Greenway Design Methods, see Smith and Hellmund, endnote 2, p. 154-159. For further information on site specific study and river corridor design implications, see pp. 98,99.

32. These plants were identified from a list of plant species occurring in the Georgia Piedmont. This plant species list was developed by Professor Darrel Morrison for a class at the University of Georgia entitled "Native Plant Communities of the Southeast".

33. Many justifications can be quoted for reasons why large areas of interior forest should be conserved. The following is a list of some of the more relevant ones.

> ...However, greenways may not fully capture habitat diversity if they are not connected to large patches of upland vegetation, since some species require very large patches or are sensitive to edge conditions of narrow greenways. ...Because of fragmentation, extensive interior areas are rare in human-dominated landscapes. Therefore, interior species often become the focus of conservation biologists who are managing landscapes for biodiversity. (Thorne, 1993)
>
> J.M. Diamond remarked that "conservation should not treat all species equal but must focus on species and habitats threatened by human activity." ...In designing greenways, the two most important objectives for wildlife are to provide a high quality corridor for native species present, especially those that are sensitive, and to maintain enough functional connectivity along

the entire length of the corridor to allow for safe passage. (Noss, 1993)

> ...an important goal is to provide habitat for the specialist species which typically require more substantial contiguous interior habitat. (Ahern, 1991)

> The process of urbanization results in greater habitat fragmentation and disturbance, and increases the isolation of islands from one another and from the surrounding rural landscape, which typically brings about a reduction in species richness. A major conservation goal should be to design and implement strategies to reduce the loss of species richness. (Adams and Dove, 1989)

34. Greenways are a prime opportunity to conserve a region's natural heritage, particularly in places where land development has isolated - or threatens to isolate - remaining fragments of nature in floodways...or in remnant patches of upland vegetation. (Thorne, 1993)

35. Harris et. al. in their article entitled "Forest Fragmentation and the Conservation of Biological Diversity" describes the different stages of forest fragmentation. Following their definition, forest fragmentation refers to " a landscape that was formerly forested but now consists of forested tracts that are segregated and sometimes isolated in a matrix of non-forested habitat".

36. The hydrologic cylce was chosen because it is primary to the ecosystem. Like, geology, due to its primary function, it is more stable. The hydrologic cycle is common information in all texts concerning forest ecology. Packham explains this cycle in relation to the food web and nutrient cycling process. If more information on the scientific intricacies of this process is desired, Packham's text as well as Kimmin's text should be referenced.

37. The food web is also a common process explained in most texts. Again if more detailed information is desired, Kimmin's and Packham's text should be referenced.

38. The use of islands of forest habitat connected by forested corridors is suggested for several purposes. First, forested buffers have been proven to increase water quality (Ahern, 1991). Second, these large forested islands provide areas of interior forest habitat that can support species with such needs. Third, the connecting corridors allow an avenue of travel between the larger islands of habitat. This travel allows for the transfer of genetic material from one island to the next preserving the genetic integrity of the interior species genetic pool. These connecting corridors also act as an escape route from areas that are under the process of development. The conservation of these areas also allows for a tremendous recreational potential to be realized by the citizens of Walton County. These areas would allow for a system of trails, wildlife observation areas, outdoor educational areas and plant observation areas to be maintained. Harris in his book "The Fragmented Forest: Island

biogeography Theory and the Preservation of Biotic Diversity" and Noss and Thorne in "The Ecology of Greenways: Design and Function of Linear Conservation Areas" discuss these ideas in more detail.

39. The 1000' buffer requirement is an attempt to retain large areas of interior forest undeveloped. This is accentuated by including the river corridor in this 1000' buffer, due to the fact that it is already protected. The additional forested area allows for upland habitat as well, and also provides an area in which interior flora and fauna can continue to exist. If the remaining large forested areas in Walton county were not located around the river corridors, different recommendation would have been made. The buffer area was determined in part by many interviews with specialists from many fields including wildlife biology, habitat management, ecology, and restoration. The overwhelming opinion was the bigger area conserved, the better. 100 acre blocks were recommended as a absolute minimum to retain interior habitat of migratory birds. Harris offers an example of feasible habitat sizes and numbers for Siuslaw National Forest ranging from 108 forested "islands" at a minimum of 50 ha in size to 10 forested islands of 300 ha - 393 ha in size (Harris, 1987). Adams and Love quote Tilghman (1987a) as recommending >25 ha of large woodlands to maintain high bird species diversity (Adams and Dove, 1989). Harris and Akins suggest corridor widths for faunal movement in Florida as follows: 30-300 feet for movement of individual animals when their habitat is well known and the corridor is expected to function for weeks or months; 300-3000 feet when the movement of an entire species is being considered and much is known about its biology; > 3000 feet when little is known about species biology and the corridor is expected to function over decades and centuries. Clearly the jury is still out on "how much is enough" land to conserve for interior habitat conservation, but with much evidence pointing toward very large acreage necessary, the 1000 foot buffer requirements viewed as a minimum for interior habitat conservation.

40. "When the limit of edge maintenance occurs outside the dripline area, an advancing edge is produced which essentially maintains the entire remnant forest edge as interior habitat" (Ahern, 1991).

41. As defined by the Soil Conservation Service map entitled, "Prime Farmlands, Loganville Quadrant" (Georgia). For a further and more accurate definition of these spaces, it would be useful to include information concerning land which is already being farmed as well as the land-based opinions of local farmers about land important to them for safeguarding.

42. Grandfather and other site specific clauses will lend an exemption from the exclusion of land used as cropland in these areas. Commercially Managed Forests and Pastureland, though in the same Productive Management Class as Cropland, will generate separate management priorities and criteria and will, therefore, not be fully addressed in this report.

43. The term "Visual" is used to describe those impacts occurring in the sensory realm. For instance, noise pollution is a good example of an impact which, though not a visual one in reality, would fall into the Visual Impact category.

44. This notion of the pastoral feel so instilled by 18th century England into the American mind is a widely recognized and accepted phenomenon. This has been responsible for the development of the "typical" suburban landscape in America which is comprised of a lawn with trees and shrubs.

45. Areas less than five acres were omitted as they were seen as insignificant for commercial cropland production. This is a generalization made necessary for the sake of time. It is possible that croplands of this size could be useful and productive and it is recommended that further research be conducted in this direction, especially on a site-specific basis. Where cropland was fragmented by roadways thus causing the pieces to be less than five acres, these lands were also excluded. Cropland was excluded from Commercial Nodes (as defined in the Management class), and corporate limits of existing townships as well as these areas are already designated for residential, commercial, or industrial development.

46. The two types are of a Protective and Conservation Management Class respectively and therefore take precedence over Cropland.

47. The planting of crops inappropriate to a region or soil type can be detrimental. As an example, the overplanting and mismanagement of cotton Has caused severe erosion, abandoned croplands and many other problems.

48. Winter crops should be planted for topsoil protection from wind and water erosion, especially if soil is tilled in the fall. Many crops can be grown together harmoniously and with beneficial results, i.e., corn, bean, and squash.

49. Retention ponds differ from detention ponds in that they are designed to retain water indefinitely, while detention ponds are designed to contain water which is then released at a controlled rate.

50. Yaro, Robert D., Randall G. Arendt, Harry L. Dodson, and Elizabeth A. Brabec. 1988. *Dealing with Change in the Connecticut River Valley: A Design Manual for Conservation and Development.* Center for Rural Massachusetts, University of Massachusetts, Amherst. pp. 174 and 179.

Used the Connecticut River Study's Scenic Road District and Nodal commercial development as a basis for the definition of the Rural Activity Node.

51. Yaro et al. 1988. *Dealing with Changed in the Connecticut River Valley: A Design Manual for Conservation and Development.* Center for Rural Massachusetts, University of Massachusetts, Amherst. p. 179.

52. Harris, Charles H., and Nicholas T. Dines. 1988. *Time Saver Standards for Landscape Architecture.* McGraw-Hill Publishing Company, New York. p. 730-3.

53. Northeast Georgia Regional Development Center. June 1991. *A Joint City/County*

Comprehensive Plan for Walton County and the Cities of Between, Good Hope, Jersey, Loganville, Monroe, Social Circle, Walnut Grove. pp. 63-66.

54. Northeast Georgia Regional Development Center. June 1991. *A Joint City/County Comprehensive Plan for Walton County and the Cities of Between, Good Hope, Jersey, Loganville, Monroe, Social Circle, Walnut Grove*. p. 47.

55. Steiner, Frederick . 1991. *The Living Landscape: An Ecological Approach to Landscape Planning*. McGraw-Hill, Inc., New York. p. 201.

56. Stokes, Samuel N., and A. Elizabeth Watson. 1989. *Saving America's Countryside: A Guide to Rural Conservation*. The Johns Hopkins University Press, Baltimore. p. 144.

"Clustering development is the grouping of buildings and lots on a small portion or tract, which can be an effective way to allow limited development in natural areas. One of the major impacts zoning and subdivision ordinances has been the creation of sprawling developments laid our with little regard for natural, agricultural, scenic or historic resources, with little variety in design and density, and with little open space."

57. Determined by average areas required for six of the most typical permitted uses.

58. This will prevent development from occurring on just one corner of the node.

59. Since commercial development is going to be limited to specific areas, it is only fair that these areas are allowed to be fully developed. This District is to be sacrificed for the preservation of other areas. The 30% left undeveloped is for buffering and for dealing with runoff.

60. Yaro et al. 1988. *Dealing with the Change in the Connecticut River Valley: A Design Manual for Conservation and Development*. Center for Rural Massachusetts, University of Massachusetts, Amherst. p. 134.

61. Alexander, C., Sara Ishikawa, and Murray Silverstein. 1977. *A Pattern Language: Towns, Buildings, Construction*. Oxford University Press, New York. p. 264

62. Yaro et al. 1988. *Dealing with Change in the Connecticut River Valley: A Design Manual for Conservation and Development*. Center for Rural Massachusetts, University of Massachusetts, Amherst. p. 134.

63. Yaro et al. 1988. *Dealing with Change in the Connecticut River Valley: A Design Manual for Conservation and Development*. Center for Rural Massachusetts, University of Massachusetts, Amherst. p. 136.

64. Yaro et al. 1988. *Dealing with Change in the Connecticut River Valley: A Design Manual for Conservation and Development*. Center for Rural Massachusetts, University of Massachusetts, Amherst. p. 139.

65. Harris, Charles W., and Nicholas T. Dines. 1988. *Time Saver Standards for Landscape Architects*. McGraw-Hill, Inc., New York. p. 660-15.

66. Murtagh, William J. 1990. *Keeping Time: The History and Theory of Preservation in America*. A Sterling/Main Street Book, New York. p. 139.

67. Stokes, Samuel N., and A. Elizabeth Watson. 1989. *Saving America's Countryside: A Guide to Rural Conservation*. The Johns Hopkins University Press, Baltimore. p. 159.

68. Alexander et al. 1977. *A Pattern Language: Towns, Buildings, Construction*. Oxford University Press, New York. p. 522.

69. By limiting the amount area of building surface per acre it will limit the amount of total building coverage for the whole node.

70. Stokes et al. 1989. *Saving America's Countryside: A Guide to Rural Conservation*. The Johns Hopkins University Press, Baltimore. p. 158.
"It is not necessary for new buildings to imitate a particular historic architectural style. In fact, it is usually preferable for a new building to appear as a product of its own time as long as it is compatible in form, scale, and color with existing buildings."

71. Stokes et al. 1989. *Saving America's Countryside: A Guide to Rural Conservation*. The Johns Hopkins University Press, Baltimore. p. 158.
"Roof pitches, height...and building layout are some of the elements that help define the characteristic building forms of a community...The size of new buildings and the proportions...are also important in determining their compatibility with existing buildings and the natural environment."

72. Stokes et al. 1989. *Saving America's Countryside: A Guide to Rural Conservation*. The Johns Hopkins University Press, Baltimore. p. 228.
Several states have implemented strong sign controls to protect scenic quality.

73. Harris, Charles W., and Nicholas T. Dines. 1988. *Time Saver Standards for Landscape Architects*. McGraw-Hill, Inc., New York. p. 330-9 - 330-10.

74. *On-Site Erosion Control: Management Practices for Construction Activities*. 1988. State Soil and Water Conservation Commission of Georgia. p. 2
Recommended by On-Site Erosion Control.

75. Walton County ESA Study, 1992.

76. Based upon the water distribution map and the zoning ordinance, the minimum lot size is 1 acre where public water is available but public sewage treatment is not available.

77. Dealing With change in the Connecticut River Valley: A Design Manual for Conservation and Development, 1990. Page 50. Five new homes on twenty to thirty acre lots resulted in the destruction of farmland and rural character due to the unfortunate placement of buildings and driveways on the land. Large lot zoning could greatly contribute to rural character destruction.

78. Ndubisi, Forster. 1992. Planning Implementation Tools and Techniques. p.26. Regarding the effectiveness of Subdivision Regulations both strengths and weakness are discussed. Weaknesses included: "Large scale application of minimum subdivision standards may result in monotonous designs." "Subdvision regulations ordinances frequently fail to protect the destinctiveness of the land and the natural environment because of the rigidity of criteria set in the ordinance."

79. Concept of Community: The current residential development pattern is one in which typically there is a subdivision of land into adjacent lots served by a common vehicular circulation system. The design structure dictated by subdivision and zoning regulations has encouraged the production of a landscape type organized around the automotive vehicle rather than around the characteristics and needs of people and community. Fronts of lots are determined by street access. Setbacks dictate the placement of homes based upon a uniform distance from the street or right of way. Housing construction based on these criteria results in a relatively uniform placement of housing units facing the street. No interaction between residents is encouraged by the form, and no sense of community is articulated. The form implies little more than a numerical ordering of similar apartments. As a result, the neighborhood to which we ascribe ourselves, (typically of 100 lots or more), is little more than a location name and is not descriptive of social relationships.

80. One example of clustering can be found in the cul-de-sac. By grouping homes around and facing onto the cul-de-sac, (and thus towards one another), its form does suggest and provide a structure for community development. This, and its companion characteristic of low vehicular traffic, is the major reason that homes on cul-de-sacs are prized. The paved cul-de-sac becomes a gathering and play space. This is positive in the sense that a common space is provided, but that humans interact in a space designed for vehicles is a tribute to man's ability to adapt to inferior conditions, and not to design quality.

81. Private spaces are typically not considered in the development of residential subdivisions. A function of the zoning ordinance, front, side and rear yards are established uniformly and in relationship to the street. The front yard serves as nothing more than the unused formal living room located behind the typically inaccessible front door of most homes. Its primary design purpose is to provide extra parking space off of the public right of way in order to keep vehicles from blocking emergency vehicle access. Side yards are established for fire protection purposes.

The rear yard is the only yard intended for human use. In reality, when lots are lined up in a row, the rear yards of each lot are located within the viewing fields of the adjacent homes. These regulations and their resultant design configurations require the construction of fences, walls and/or walls of vegetation between adjacent homes to provide a sense of privacy. Therefore, the conventional "yard" design criteria further reinforce community separation.

82. Recreation is typically limited to the individual's own residential lot and possibly to a neighborhood pool/tennis facility. For a subdivision to warrant pool or tennis facilities it will typically include 100 homes or more. In such a development the single facility is often within driving distance but not walking distance for most residents. No local block gathering place or park is provided for daily use. Recreation activities like walking and jogging are forced to occur on the streets. Neither the surface nor the width of the roadway are designed for recreation purposes. Vehicular design criteria are typically not appropriate for pedestrian or human recreational use, and use of the streets for such purposes presents dangerous conflicts..

83. A sense of security has been lost from nearly all traditional residential developments. Recent additions of extensive walls, gate houses, and fences at subdivision entrances are marketing responses to that subconscious need. Home electronic security systems are typical. The neighborhood watch program is intended to help neighborhoods survey and patrol their own areas, but the linear street patterns make visual security measures very difficult.

84. Convenience, which encourages people to live closer to work and activity areas, becomes less important when the other needs are not being fulfilled. The human needs for private space, recreation space and smaller communities drives the suburbs to relentlessly expand into former rural lands. The resultant effect is an ever growing commuter volume swelling rural roads and extending arterial highways.

85. Economics reinforces the growth of suburbs. To provide adequate lot area for privacy and recreation, to acquire a location in a community small enough to provide a sense of neighborhood, to acquire an adequate sense of security and to be located close to metropolitan activity areas, the individual monetary expense is typically prohibitive. Therefore, to move to rural areas where land costs are lower, taxes are lower, and the community is smaller and more "tightly knit" is the only alternative. Unfortunately, with development comes the subsequent change of the rural landscape, an increase in land costs, services, taxes, and a loss of the area's original characteristics which made it attractive..

86. George Washington observed two centuries ago that: "Our lands... were originally very good; but use and abuse have made them quite otherwise... we ruin the lands that are already cleared, and either cut down more wood, if we have it, or emigrate into Western country." (Gallion, A.B., Eisner, S. The Urban Pattern. 1975.) The residential expansion typical of suburban sprawl reiterates the pattern of two centuries ago.

87. Conventional zoning and subdivision regulations encourage the complete partitioning of the land into fee simple units. These parcels are then individually cleared, shaped, developed and landscaped. The former vegetative communities are at least disrupted if not entirely destroyed. Remnants of forested areas may remain, but their widths and qualities are insufficient for much of the former wildlife. Water quality, a key ecological factor, is effected by residential development when lands are cleared of forest cover and replaced with homes, driveways, roads and lawns increasing the storm water runoff rates, accelerating erosion, and impacting downstream flood levels and water quality. Conventional zoning and subdivision regulations by dividing into lots the entire land area encourage the disruption of existing drainage channels. Lot widths and densities do not have a natural relationship to the land and its topography. While some lot lines may fall along natural drainage areas, the majority do not. Subsequently additional drainage channels must be created, and storm water volumes and flows concentrated and conducted through areas not naturally formed to sustain such use..

88. Conventional zoning and subdivision regulations typically are designed around the provision for rational and effective services. The density of development identified for a parcel results in an even distribution of services and utilities across the entire parcel. This distribution is not necessarily the most economical nor the most environmentally beneficial. An extensive road system results in a longer than necessary length of utility lines and wires. Setbacks that are too deep only increase the cost of utility service.

89. **Services Required:**

1. Water
   a. Public Water Service
   b. Community Well
   c. Individual Well
2. Sanitary Sewer
   a. Public Sewer System
   b. Septic Tank System
   c. Private Treatment System
3. Electricity
   a. Aerial Service
   b. Underground Service
4. Natural Gas
5. TV

a. Cable Television
b. Satellite Dish
c. Antenna

6. Telephone
   a. Aerial Service
   b. Underground Service
7. Transportation Access
   a. Public/Private paved Road
   b. Dirt or gravel road
8. Solid Waste Collection
9. Storm Water Collection/Control
   a. Rural cross-section (ditches)
   b. Storm water piping system for roadways
   c. No specific lot-by-lot collection system (swales only)

90. **Effects of Construction Activities:**
(Same as Rural Activity Node with the following modifications)

1. Clearing of land
   a. for residence
   b. for equipment access
   c. for storage of materials
   d. for road construction
   e. for utility construction
   f. for "landscaping" purposes
2. Compaction of soils
   a. for building construction
   b. for paving and utility construction
   c. due to general activity on the site
3. Damage to edge vegetation
   a. due to vehicular activity
   b. due to forest opening
4. Soil Erosion & Sedimentation
5. Localized chemical pollutants (paint, solvents, etc.)
6. Alteration to natural drainage pattern and flow rates
   1. Increase in total runoff quantity (cfs)
   2. Artificial concentrations of flow
   3. Flow concentrations result in higher sediment loading capacity
   4. Concentrations reduce capacity of land to absorb pollutants
7. Fragmentation of existing vegetative community
   1. Typically all undergrowth is removed
   2. Only rear and occasionally sides of lots remain undisturbed
   3. Introduction of non-native, hybridized, and/or monocultures into native plant environment.
8. Disruption of animal habitats

91. Since most of the lands affected by the development pressure from the Atlanta metropolitan area are privately owned, the only way to prevent degredation of the environmental and visual character of the land for all residents of Walton County, is to apply additional restrictions or specific guidelines to control that development for the

good of all. This principle has been accepted and supported by the Supreme Court for over seventy-five years, providing a strong legal basis for local government controls: Village of Euclid, Ohio v. Ambler Realty Company, 272 U.S. 363 (November 22, 1926), Supreme Court Justice Sutherland. "Until recently urban life was comparatively simple; but with the increase and concentration of population, problems have developed, and constantly are developing, which require additional restrictions in respect to the use and occupation of provate lands in communities. Regulations, the wisdom, necessity and validity of which, as applied to existing conditions, are so apparent that they are now uniformly sustained, a century ago, or even a half century ago, probably would have been rejected as arbitrary and oppressive."

92. Structural Elements:

a. Group homes into clusters around courts, cul-de-sacs or shared drives to produce small neighborhoods. Group neighborhoods together within sections of the development to develop community social interaction.

b. Where possible, new developments should include a minimum of 64 units in order to provide for adequate children play interaction.

c. Locate recreation areas centrally on each level of development, the cluster of homes, a neighborhood, and the community development.

d. Provide for pedestrian circulation by means of trails, bike paths, jogging paths, etc. These trails should be accessible from all portions of the development.

93. Open Space

a. Open space serves a variety of social needs: common use area, social interaction and recreation activity. Open space must be integrated into and between clusters of houses and neighborhood groups.

b. Both active and passive recreational needs can be satisfied through adequate provision of open space.

c. Natural Resource Protection and conservation areas can serve as some of the recreational open space, but not all. Passive activities can occur within such districts, but they are not intended for intensive uses.

d. Recreational open space needs to be provided on several levels: the housing cluster, the neighborhood and the community.

e. The recreational spaces at each level need to be interconnected for pedestrian access to make them usable.

f. In general, recreational space and facilities need to be readily available to all residents and not centralized in such a manner as to exclude or discourage use by more distant residents.

g. The spaces at each level should be sized appropriately to encourage use, and should be visible and inviting.

94. Roads & Driveways

a. Provide a controlled hierarchy of streets such that individual units do not gain direct access onto collector streets, but have access from the lowest traffic volume streets.

b. Use shared driveways to limit the number of curb cuts along the access road.

c. Use courts and cul-de-sacs off of local streets to lower traffic volumes at unit access points. Where possible, use courts rather than cul-de-sacs because two points of access are available in a court.

95. Steiner, F. 1992. The Living Landscape. p. 245-247. Bucks County, Pennsylvania, Performance Zoning open space calculation requirements. Existing ordinance requires 20 percent of "unrestricted lands" to be designated for open space. Restricted lands include areas within rights of way, protection lands, previously approved subdivisions, utility easements and rights of way, and land which are not contiguous with the whole. The total open space requirement for the entire development is actually 40 percent including restricted lands. - For our purposes it seems simpler to use the 20 percent calculation based upon the total residential lot areas, thereby eliminating "restricted lands" from the calculation.

96. Alexander, C., A Pattern Language. 1977. p.363-366 "Scatter places for team and individual sports through every work community and neighborhood: tennis, squash, table tennis, swimming, billiards, basketball, dancing, gymnasium...and make the action visible to passers-by, as an invitation to participate."

97. Steiner, F., The Living Landscape, p. 247. "While some of the open space required by the zoning district may be resource protection land, the intent is to provide for usable public or common open space as near to each unit as possible. Thus, there is a need for specific guidelines ensuring that a minimum amount of land not restricted...(by ordinances, situation or resource protection guidelines)...is retained for this purpose." (Bucks County, Pennsylvania, Performance Zoning Criteria).

98. McKeever, J.R. (ed.), ULI Community Builders Council. 1968. p.167-169. "Suggested area standards for parks and recreation, based on the National Recreation and Park Association's recommendations are:...Neighborhood Play Lot - minimum usable size is 2,500 square feet."

99. Alexander, C., A Pattern Language. 1977. p.311-313 "Make a public square much smaller than you would at first imagine; usually no more than 45 to 60 feet across, never more than 70 feet across. 'This applies only to its width in the short direction. In the long direction it can certainly be longer." "...a place begins to seem deserted when it has more than about 300 square feet per person. ...it only takes 4 people to give life to a square with a diameter of 35 feet, and only 12 to give life to a square

with a diameter of 60 feet." "Two people with normal vision can communicate comfortably up to 75 feet. They can talk with raised voice, and they can see the general outlines of the expression on one another's faces. This 75 foot maximum is extremely reliable."

100. Alexander, C., A Pattern Language. 1977. p.305-309. "The only people who make full, daily use of parks are those who live less than three minutes from them. Build one open public green within three minutes' walk - about 750 feet- of every house and workplace." His specific reference was in regard to what is classified herein as neighborhood greens, but the intent is similar. The setting for the reference work was inside the city. This study involves land uses on a much less dense basis, and therefore, some additional allowances for distance were integrated.

101. Alexander, C., A Pattern Language. 1977. p.305-309. "Make the greens at least 150 feet across, and at least 60,000 square feet in area. " The location of the greens within the study site is double the distance suggested by this reference text, but smaller squares are provided at the interval suggested by the author.

102. Alexander, C., A Pattern Language. 1977. p.348-352 " In every neighborhood and work community, make a piece of the common land into an outdoor room - a partly enclosed place, with some roof, columns, without walls, perhaps with a trellis; place it beside an important path and within view of many homes and workshops."

103. To create performance standards for facade design, a detailed architectural study of Walton County should be conducted in order to provide the basis for such standards. Otherwise, compliance enforcement of architectural facade requirements is unlikely.

104. Residential structures should be selected and constructed to fit the land. Proper selection of the foundation type plays a particularly important role in reducing site grading costs. Use of split-level homes, drive under garages, etc., to take advantage of sloped sites, can result in less land disturbance and a greater site area savings. Units should be oriented to take advantage of solar angles, and vegetation should be utilized to moderate external structural temperatures and low sun angle incidence. Units should be placed as close to the street as practicable to reduce utility line lengths and to reduce the disturbance of land for yard areas which are typically unused.

105. Roads and driveways are primary concerns in protecting the environmental quality of a site. Roads should be kept to a minimum width, reduced where possible, and right of ways limited to what is necessary for utilities, storm

drainage and safety. Reduction of road widths by two feet will save 1/4 acre of paving per mile. Storm water runoff should be conducted to storage and infiltration areas where sediments and pollutants can be removed and the storm water can reenter the local ecosystem at a natural rate. Driveways should be shared to reduce the amount of paving within a subdivision by up to 50 percent. Courts should be utilized to reduce the overall length of streets, utilities and site disturbance.

106. Vegetation is the primary element defining open space in the rural environment. Vegetation purifies the air, removes dust, smoke, pollutants, even pollens like ragweed; it modifies air temperature, relative humidity and reduces sound levels. Perhaps most importantly, vegetation produces life giving oxygen by recycling carbon dioxide, a waste product of human respiration.

107. Robinette, G. Plants/People/And Environmental Quality. 1972. p. 55-56. "Plants function as air cleansing agents to oxygenate and remove gaseous particles and odors from the atmophere. Plants of adequate sizes and types are effective as air cleansers. " "Meldau found that 2.5 acres of beech wood are able to extract about 4 tons of dust per year from the atmosphere and bind it into the humus layer." Reductions of smoke concentrations, Sulfur Dioxide and nitric oxide are also documented.

108. National Association of Home Builders, Planning for Housing. 1980. p.35.

109. Robinette, G. Plants/People/And Environmental Quality. 1972. p. 100. Deciduous trees in particular interfere with solar radiation and reflected radiation resulting in a temperature reduction not only in its shade, but also immediately adjacent to the tree.

110. Robinette, G. Plants/People/And Environmental Quality. 1972. p. 96. Temperature control is a primary concern in the south. Forests depress maximal air temperatures as well as maximal soil temperatures. An 8 degree reduction in temperature between the crown and ground level in a beech tree stand has been documented.

111. Robinette, G. Plants/People/And Environmental Quality. 1972. p.99. Evergreens adjacent to the exterior wall of a structure create a dead air space which insulates the wall from temperature loss. "With a 70°F. constant house temperature, the amount of fuel saved by a building protected from the wind is 22.9 percent...with good protection on three sides of the building, the fuel savings might run as high as 30 percent." p. 82. Maintaining trees in the form

of a belt or forest block close to the house and active use area will provide the best form of wind protection. The thickness of the belt is not as important as its density, and for most applications a density of 60 percent is optimum. Wind velocities are reduced 55 to 36 percent within an area from 0 to 150 feet of a 30 foot high buffer.

112. Robinette, G. Plants/People/And Environmental Quality. 1972. p.70. Trees are among the most effective solar radiation control devices available. Deciduous trees not only absorb 70 to 95 percent of the radiation falling upon them, but also result in a dramatic moderation of the air temperature beneath them. In temperate climates, the winter leafless condition permits absorption of solar radiation by structures sheilded in the summer.

113. It has been determined that on an annual basis approximately one-third of an acre of vegetation, (trees, shrubs and grass), is required to provide the annual oxygen supply for one human. Based on a household of 3 persons per unit, one acre of vegetation is required for oxygen supply. We propose that single family developments should provide adequate open space for oxygen production.

Robinette, G. Plants/People/And Environmental Quality. 1972. p.52-53. A lengthy quote from a study by Aloys Bernatzky 1969 was included in the document. Several quantities in the sections quoted did not appear to relate directly, and further research into their correlation should be performed. The central reference to an area of 30 to 40 square meters of vegetation was used and accompanied by a diagram showing a vegetated square with 40 meters on each side. For the purposes of this study, we have used the higher number illustrated by the diagram. Conversion of the 40 x 40 meter square to feet results in an area slightly greater than 1/3 acre. A 40 meter by 40 meter square of plants can supply the oxygen requirements for one man on an average annual basis.

114. Duplex development results in a doubling of households and an increase in the maximum site coverage to 33 percent. These increases result in a marked decrease in available open space as compared to an equivalent single family lot. Requiring 2 acres of open space per duplex, (which would meet the scientific criteria of 1/3 acre per person assuming 3 person per unit), would result in a high land area requirement. Such a requirement may not be desirable from a development standpoint. We propose that the same 1 acre of open space be required for the duplex development. Recognizing that the site coverage allowed reduces on-site open space, only a slight increase of open space must be provided on a per lot basis. This approach should be applied in

tandem with a requirement to limit the size and number of duplex zones and to provide for adequate open space in agricultural reserves or public open space reserves.

115. The Walton County Land Development Ordinance establishes the maximum coverage for a single family lot as 25 percent. Based upon the size of the lot, 75 percent of the lot will be vegetated and can fulfill some or all of this open space need. The smaller the lot, however, the more additional land in a development will need to be set aside to provide for adequate open space.

116. This formula has been developed by this author based upon the criteria adopted in the previous paragraphs. Please note that the open space requirement resulting from this formula is primarily a requirement for vegetation and not for human use space. This open space requirement is intended only to reflect environmental considerations and not human social or psychological needs. It is likely that this provision will benefit these other considerations as well.

117. Site A Required Open Space Calculations:

"O" = (U x o) - (A x (1-C)), where:

U = the total number of **Units**
o = the required amount of **open space per unit**
A = the total lot **Acreage**
C = the maximum site **Coverage**
O = the total vegetated **Open Space** required

Site A includes a total of 123 single family units on lots ranging in size from 1/4 acre to over 1 acre. The required amount of open space is 1 acre per unit. The total lot acreage amounts to 68 acres (see table below). Maximum lot coverage as specified in the Walton County Land Development Ordinance is 25%.

Therefore: **"O" = (123 x 1ac) - (68ac x (1-0.25))**
"O" = 123ac - (68ac x 0.75)
"O" = 123ac - 51ac
"O" = 72ac

The total open space requirement is 72 acres of land. As described in the report text, this land can include buffers, recreations space and conservation land. The only stipulation is that it be vegetated open space and that it be protected from further

development. Site A provides 87.7 acres of open space, exceeding the requirement by 15.7 acres.

SITE A - CREATIVE DEVELOPMENT

USE	QTY	UNIT	PER LOT	UNIT	TOTAL	UNIT
RES. 1 ACRE LOT	25	EA	1.00	AC	26.3	AC
RES. 1/2 ACRE LOT	43	EA	0.50	AC	25.3	AC
RES. 1/4 ACRE LOTS	55	EA	0.25	AC	16.4	AC
TOTAL RES. LOTS	123	EA			68.0	AC
OFFICE/DAY CARE					4.0	AC
RURAL ACTIVITY NODE					5.0	AC
SEWAGE PLANT					2.0	AC
ROAD R/W					21.3	AC
TOTAL DEVELOPED AREA					100.3	AC

OPEN SPACE	ACTUAL	UNIT
LOCAL SQUARE	0.94	AC
NEIGHBORHOOD GREEN	6.60	AC
COMMUNITY REC. FAC.	4.00	AC
MISCELLANEOUS LANDS (BUFFERS ETC.)	9.50	AC
PROTECTION/CONSERVATION	66.70	AC
TOTAL OPEN SPACE	87.70	AC
TOTAL ACRES	188.00	AC
PERCENT OPEN SPACE	47.0%	OF TOTAL
AVERAGE DENSITY	0.65	UN/AC
LINEAR FEET OF ROAD	15,680	LF

Appendix A

Summary of
1992 Walton County ESA Study

Summary of
Environmentally Sensitive Areas: Walton County, Georgia
by DeMeo, Ditto and Wehlau, 1992

The 1992 study provided the background information and served as the inventory basis for the 1993 study. Some of the information provided by the earlier study has been incorporated into the preceding text. This summary provides a more complete abstract of the 1992 data.

Introduction

This study presents an application of Human Ecological Planning to Environmentally Sensitive Areas (ESAs) in the western portion of Walton County, Georgia. Its purpose was to identify ESAs, evaluate them on the basis of local community values, and link them to the Walton County Comprehensive Plan in order to accomplish sustainable development. The comprehensive plan is the basis for planning and establishment of regulatory controls and incentives for development practices in the county.

Background

The study site is located in the Yellow River watershed of western Walton County, situated in the Piedmont Plateau of Northeast Georgia. The study site is located less than 40 miles from Atlanta, whose expanding metropolitan area is exerting development pressure upon the site. The adjacent county, Gwinnett, is one of the nation's fastest growing counties. Historically, Walton County has been an agrarian community, but due to the availability of employment in nearby Atlanta, the population has increased dramatically, 14.3% in the 1960's, 33.4% in the 1970's and 23.6% in the 1980's. An anticipated impact of the development pressures of Atlanta is the construction of the Outer Perimeter which is proposed to traverse the study site. At this time, the new perimeter is not expected to provide local interchange access into Walton County, thereby utilizing and potentially damaging county natural resources while providing no local long term economic or transportational benefits. These development pressures are of special concern within the study site which serves as a major watershed for nearby public water reservoirs and for unique geological outcrops of granite and their associated highly specialized plant communities.

Status of ESA Protection in Walton County

Federal, state and local laws, ordinances and programs are reviewed for applicability to the study site. Of particular note are the National Environmental Protection Act of 1969, the National Endangered Species Act and the Clean Water Act. Section 404 of the latter act is the basis for wetlands protection, permitting, and mitigation. The most far reaching act for the State of Georgia is the Comprehensive Growth Strategies Act of 1989 which requires comprehensive planning at the local, regional and state levels. Environmental aspects of this act include specific standards for the protection of wetlands, groundwater recharge areas and watersheds. At a local level, zoning and subdivision regulations are currently the only tools

for regulating development within ESAs. In general, these tools have not been appropriately designed for natural resource protection and will require "fine tuning" to make them effective.

Inadequacies in existing legislation and protection tools exist. Some of these are due to imprecise legal considerations, vague definitions, lack of enforcement mechanisms, and lack of real penalties. Acquisition of sensitive lands has financial considerations which limit and often deter fee simple, easement or covenant holdings. Typically ESAs do not respect political or jurisdictional boundaries, complicating the drafting, enactment and enforcement of protection measures. There is also a deep-seated cultural bias against placing public controls upon private lands which must be worked out within the community. While all ESAs do not have equal significance, functional , structural and cultural values will be lost if ESAs are not regulated.

Goals and Objectives of Study

The goal of the study was to develop a plan for the study area which provided for the protection of ESAs and directed development toward sustainable uses by management guidelines and local regulation improvements. Specific objectives included identification of critical ESAs, assessment of ESA types, and evaluation of community attitudes toward use of ESAs. The study scope focused on ecologically critical areas and natural hazard critical areas. These areas were mapped and development options and management guidelines for the areas described.

Limitations effecting the study included manpower and project duration, and more fundamentally a lack of consensus in the literature regarding criteria for defining and designating ESAs. Subject to these limitations, the study focused on only two ESA types and restricted its evaluation to the political boundaries of Walton County and the boundaries of the Yellow River Watershed within the county. Several assumptions were made regarding base data validity, philosophical approach and the general applicability of limited local opinion survey data.

Assessment of ESA Methodology

ESAs were defined as "Landscape elements or places which are vital to the long term maintenance of biological diversity, soil, water or other natural processes both on site and in a regional context", and therefore, "relates site specific biophysical conditions directly to land uses that can irreversibly degrade a valued ecosystem service or good." Four types of ESAs were identified: Perceptual and Cultural Critical Areas, Resource Production Critical Areas, Ecologically Critical Areas and Natural Hazard Critical Areas. The latter two were the focus of the study.

Criteria were then selected in order to operationalize the ESAs. The landscape attributes inherent to the criteria were then mapped. These maps were then analyzed based upon an overlay system in order to determine relationships between the elements. Recognizing inherent limitations in the overlay technique, the maps were combined to generate significance maps in order to evaluate intrinsic values of each ESA.

The Applied Human Ecological method was adopted because it "strives to find the best fit between natural and socio-cultural processes as the basis for guiding land-use allocation." Steiner's planning method is described step by step. Limitations of this method are identified and discussed, primarily focused upon the lack of a resource survey methodology. The ABC method was adopted for resource survey purposes because of its independent analysis approach and subsequent integration of abiotic, biotic and cultural information. The combination of these two methods, termed the Modified Assessment Method, is utilized to take advantage of the cultural involvement and implementation strengths of the former with the detailed and unbiased resource inventory of the latter.

Assessment of ESAs in Walton County

The key issues identified by Walton County in the comprehensive plan as regards protection of natural resources includes the protection of upstream water quality, drinking water, ground water recharge areas and wetlands and the allowance of passive recreation in ESAs. Walton County's established one natural resources goal: "Define site development review process to provide for and consider information on proposed developments in ESAs." The lack of inclusive ESA mapping, lack of a direct protection mechanism and lack of zoning and enforcement regulations has rendered the review process useless.

The study included a regional inventory and analysis of the structural geology, regional climate, hydrology system, wildlife species and existing and proposed land use maps. At the local level an inventory and analysis included soils, physical shape of the land, hydrological characteristics, vegetative units, wildlife habitats and future land use. These maps were combined to generate significance maps. The ESAs identified which currently receive protection under existing laws were rated highest for protection. Areas of multiple occurrences of ESAs received the next level of protection. One result of this evaluation disclosed that a large area of the county designated as Rockdale County's water supply watershed and three stream corridors were rated the most significant to protect. Large forested units were ranked as the next most significant.

By overlaying the ecological significance map and the future land use map, an analysis of the relationship between ESAs and Walton County's Comprehensive Plan were made. From this analysis planning concepts were developed. The ecological significance map indicates that there are large tracts of land between stream corridors in which only a few ESAs are located. Using higher density development in these areas between the stream corridors would minimize the impact on ESAs.

Landscape Plan

The landscape plan is a combination of the best elements of the concept plans. The plan reveals the character of the area as if protection of the ESAs was part of the future planning process. The landscape plan also provides flexible guidelines for policy making official.

There are various strategies to manage for development at the local level. The following are proposed programs, some or all of, which can be implemented in Walton County for the protection of ESAs.

1) Development Regulations: Overlay Zoning, Special Purpose Ordinance, Minimum Lot Size, Performance Zoning, and Cluster development/Planned Unit Development.
2) Private Incentives: Preference Assessment, and Deed Restriction.
3) Land Acquisitions: Fee Simple, Conservation Easements, and Transfer of Development Rights.

All plans must be legally, politically, and financially acceptable or it cannot be implemented. Among other considerations, "key elements of an ESA planning and management strategy include: the development of a municipal staff expert in environmental planning and the use of environmental education to foster public awareness" .

Education and Citizen Involvement
Citizen participation is an essential to the overall planning process. Representatives from all community groups should be invited to public meetings where planning information is presented. Public meetings, which included both public and private representation, were conducted as part of the Walton County Comprehensive Plan. Additional citizen participation was acquired through private interviews. These interviews presented preliminary findings resulting from the regional and local inventory and analysis, and ESA locations were presented. Each participant was then asked to rank their perception of the value of each ESA type relative to use. The participants also prioritized possible strategies for effective protection of ESAs. From these results, a user group ESA value matrix was generated. The results obtained from these interviews were used during the detailed study phase in which an ecological significance map was compiled.

Detail Designs
Detailed designs represent a synthesis of the previous planning studies. The detailed designs should illustrate the existing conditions of the area, the most likely conditions of the area if current development trends continue, and the probable conditions of the area if an alternative development scenario, based on creative design, is used..

Plan and Design Implementation
Implementation requires agreement upon and documentation of specific strategies, tactics and procedures to realize goals and policies. An implementation matrix is useful to help delegate responsibility.

Administration and Evaluation
This phase represents the completion of the human ecological approach. Administration involves monitoring and evaluating the implementation process and making amendments or

adjustments as needed. Administration and implementation measures can be accomplished through the use of commissions and review boards.

Conclusions

The purpose for managing ESAs is to ensure long-term maintenance. To do so requires an in depth understanding of the site, which can only be obtained from inventories and analyses. Implementing an extensive open space system can help diminish the probability of habitat fragmentation. To determine which patterns of landscape structure are optimal becomes the next step.

In terms of landscape design, planned unit development (PUD) allows for the most flexible use of land by permitting mixed uses and varied densities for the same parcel of land. It is a promising tool for ecologically based planning.

Land should be managed in such a way that it benefits society. The protection of Environmentally Sensitive Areas is one aspect of environmental management. The protection of these ESAs will serve as genetic reserves, supply products and help maintain essential ecological process.

Appendix B

Native Plant Lists

LAR/BOT 403/603

Revised 9/92

PLANTS OF PIEDMONT LOWLAND FORESTS (floodplains and streamsides)

* denotes non-native species

TREES:

Acer leucoderme	Chalk Maple
Acer negundo	Box Elder
Acer rubrum	Red Maple
Asimina triloba	Paw Paw
Betula nigra	River Birch
Carpinus caroliniana	Musclewood
Carya cordiformis	Bitternut Hickory
Carya ovata	Shagbark Hickory
Celtis laevigata	Hackberry
Cornus florida	Flowering Dogwood
Fagus grandifolia	American Beech
Fraxinus americana	White Ash
Fraxinus pennsylvanica	Green Ash
Halesia carolina	Carolina Silverbells
Liquidambar styraciflua	Sweetgum
Liriodendron tulipifera	Tulip Poplar
Magnolia acuminata	Cucumbertree Magnolia
Magnolia virginiana	Sweetbay Magnolia
Morus rubra	Red Mulberry
Nyssa sylvatica	Blackgum
Ostrya virginiana	Hophornbeam
Pinus taeda	Loblolly Pine
Platanus occidentalis	Sycamore
Populus deltoides	Eastern Cottonwood
Quercus alba	White Oak
Quercus lyrata	Overcup Oak
Quercus michauxii	Swamp Chestnut Oak
Quercus nigra	Water Oak
Quercus phellos	Willow Oak
Salix nigra	Black Willow
Tilia americana	Basswood
Toxicodendron vernix	Poison Sumac
Ulmus americana	American Elm
Ulmus rubra	Slippery or Red Elm

SHRUBS:

Alnus serrulata	Tag Alder
Aralia spinosa	Devil's Walking Stick
Arundinaria gigantea	River Cane
Calycanthus floridus	Sweetshrub
Cephalanthus occidentalis	Buttonbush
Cornus amomum	Silky Dogwood
Cornus stricta	Swamp Dogwood
Hamamelis virginiana	Witchhazel
Hydrangea arborescens	Wild Hydrangea
Ilex verticillata	Winterberry
Itea virginica	Virginia Sweetspire
Kalmia latifolia	Mountain Laurel
Leucothoe racemosa	Swamp Leucothoe
Ligustrum sinense*	Chinese Privet
Lyonia ligustrina	Maleberry
Rhododendron canescens	Piedmont Azalea
Rhododendron viscosum	Swamp Azalea
Sambucus canadensis	Elderberry
Vaccineum corymbosum	Highbush Blueberry
Viburnum nudum	Swamphaw

VINES:

Berchemia scandens	Rattan Vine
Bignonia capreolata	Crossvine
Campsis radicans	Trumpetcreeper
Clematis virginiana	Virgin's Bower
Decumaria barbara	Climbing Hydrangea
Lonicera japonica*	Japanese Honeysuckle
Smilax spp.	Greenbriar
Toxicodendron radicans	Poison Ivy
Vitis rotundifolia	Muscadine

FLOWERING HERBACEOUS PLANTS:

Allium canadense	Wild Onion
Ambrosia trifida	Giant Ragweed
Arisaema dracontium	Green Dragon
Arisaema triphyllum	Jack-in-the Pulpit
Asarum arifolium (Hexastylis)	Heartleaf, Wild Ginger

Asarum shuttleworthii	Shuttleworth Wild Ginger
Aster spp.	Aster
Bidens spp.	Beggarticks
Boehmeria cylindrica	False Nettle
Carex spp.	Sedge
Chasmanthium latifolium	River Oats, Upland Sea Oats
Cyperus spp.	Sedge
Desmodium spp.	Tick Trefoil
Dioscorea batatas	Cinnamon Vine
Dioscorea villosa	Wild Yam
Elephantopus tomentosus	Elephant's Foot
Eupatorium fistulosum	Joe Pye Weed
Galax urceolata	Galax
Galium aparine	Bedstraw
Gentiana saponaria	Soapwort Gentian
Geum canadense	White Avens
Helenium autumnale	Sneezeweed
Hypericum mutilum	St. John's Wort
Juncus spp.	Rush
Laportea canadensis	Wood Nettle
Lobelia cardinalis	Cardinal Flower
Lobelia puberula	Blue Lobelia
Lysimachia ciliata	Fringed Loosestrife
Matelea carolinensis	Spiny Pod
Melothria pendula	Creeping Cucumber
Microstegium vimineum*	Eulalia Grass
Mitchella repens	Partridgeberry
Oxalis violacea	Violet Wood Sorrel
Phryma letpostachya	Lopseed
Pilea pumila	Clearweed
Podophyllum peltatum	Mayapple
Polygonum sagittatum	Arrow Vine
Polygonum spp.	Smartweed
Ranunculus spp.	Buttercup
Rudbeckia laciniata	Cutleaf Coneflower
Saururus cernuus	Lizard's Tail
Sisyrinchium angustifolium	Blue-eyed Grass
Solidago spp.	Goldenrod
Stellaria media	Chickweed

Thalictrum thalictroides	Rue Anemone, Windflower
Tipularia discolor	Cranefly Orchid
Trilliim cuneatum	Sessile Trillium
Valerianella radiata	Corn Salad
Verbesina alternifolia	Crown-beard
Vernonia gigantea	Ironweed
Viola spp.	Violet
Xanthorhiza simplicissima	Yellowroot

FERNS:

Athyrium filix-femina	Southern Lady Fern
Botrychium dissectum	Coarse-lobed Grape Fern
Botrychium virginianum	Rattlesnake Fern
Onoclea sensibilis	Sensitive Fern
Osmunda cinnamomea	Cinnamon Fern
Osmunda regalis	Royal Fern
Polystichum acrostichoides	Christmas Fern
Thelypteris hexagonoptera	Broad Beech Fern
Thelypteris novaboracensis	New York Fern
Woodwardia areolata	Small or Netted Chain Fern

LAR/BOT 403/603

Revised 9/92

PLANTS OF UPLAND PIEDMONT FORESTS

TREES:

* denotes non-native species

Acer leucoderme	Chalk Maple
Acer rubrum	Red Maple
Amelanchier arborea	Serviceberry
Carpinus caroliniana	Musclewood
Carya glabra	Pignut Hickory
Carya tomentosa	Mockernut Hickory
Cercis canadensis	Redbud
Cornus florida	Flowering Dogwood
Diospyros virginiana	Persimmon
Fagus grandifolia	Beech
Fraxinus americana	White Ash
Fraxinus pennsylvanica	Green Ash
Ilex opaca	American Holly
Juglans nigra	Black Walnut
Juniperus virginiana	Eastern Red Cedar
Liquidambar styraciflua	Sweetgum
Liriodendron tulipifera	Tulip Poplar
Magnolia acuminata	Cucumbertree Magnolia
Morus rubra	Red Mulberry
Nyssa sylvatica	Blackgum
Ostrya virginiana	Hophornbeam
Oxydendrum arboreum	Sourwood
Pinus echinata	Shortleaf Pine
Pinus taeda	Loblolly Pine
Prunus serotina	Black Cherry
Quercus alba	White Oak
Quercus coccinea	Scarlet Oak
Quercus falcata	Southern Red Oak
Quercus marilandica	Blackjack Oak
Quercus nigra	Water Oak
Quercus prinus (Q.montana)	Chestnut Oak
Quercus rubra	Northern Red Oak
Quercus stellata	Post Oak
Quercus velutina	Black Oak
Sassafras albidum	Sassafras

Ulmus alata	Winged Elm
SHRUBS:	
Aesculus sylvatica	Painted Buckeye
Aralia spinosa	Devil's Walkingstick
Asimina parviflora	Dwarf Paw Paw
Callicarpa americana	Beautyberry
Calycanthus floridus	Sweetshrub
Ceanothus americanus	New Jersey Tea
Chionanthus virginicus	Fringetree
Crataegus spp.	Hawthorn
Euonymus americanus	Strawberry Bush
Hamamelis virginiana	Witchhazel
Hypericum spp.	St. John's Wort
Ilex decidua	Possumhaw
Ligustrum sinense*	Chinese Privet
Rhododendron canescens	Piedmont Azalea
Rhododendron flammeum	Oconee Azalea
Rosa carolina	Carolina Rose
Satureja georgiana	Georgia Basil
Symplocos tinctoria	Sweetleaf, Horsesugar
Vaccineum arboreum	Sparkleberry
Vaccineum corymbosum	Highbush Blueberry
Vaccineum pallidum	Upland Low Blueberry
Vaccineum stamineum	Deerberry
Viburnum acerifolium	Mapleleaf Viburnum
Viburnum prunifolium	Blackhaw Viburnum
Viburnum rufidulum	Rusty Blackhaw
VINES:	
Campsis radicans	Trumpetcreeper
Decumaria barbara	Climbing Hydrangea
Gelsemium sempervirens	Carolina Jessamine
Lonicera japonica*	Japanese Honeysuckle
Lonicera sempervirens	Trumpet Honeysuckle
Parthenocissus quinquefolia	Virginia Creeper
Smilax spp.	Greenbriar
Toxicodendron radicans	Poison Ivy
Vitis rotundifolia	Muscadine

FLOWERING HERBACEOUS PLANTS:

Arisaema triphyllum	Jack-in-the-Pulpit
Asarum arifolium (Hexastylis)	Wild Ginger, Heartleaf
Carex spp.	Sedge
Chimaphila maculata	Spotted Wintergreen, Pipsissawa
Chrysogonum virginianum	Green and Gold
Desmodium spp.	Tick Trefoil
Elephantopus tomentosus	Elephant's Foot
Euphorbia corollata	Flowering Spurge
Galium spp.	Bedstraw
Geranium maculatum	Wild Geranium
Heuchera americana	Alumroot
Hepatica nobilis	Liverleaf
Houstonia purpurea	Summer Bluet
Penstemon australis	Beard Tongue
Phlox carolina	Carolina Phlox
Phlox divaricata	Blue Woodland Phlox
Potentilla canadensis	Cinquefoil
Prunella vulgaris*	Heal-all
Pycnanthemum incanum	Mountain Mint
Ranunculus spp.	Buttercup
Sanguinaria canadensis	Bloodroot
Scutellaria spp.	Skullcap
Smilacina racemosa	False Solomon's Seal
Tipularia discolor	Cranefly Orchid
Tradescantia virginiana	Spiderwort
Trillium catesbaei	Catesby's Trillium
Uvularia perfoliata	Bellwort
Polygonatum biflorum	Solomon Seal

FERNS:

Asplenium platyneuron	Ebony Spleenwort
Botrychium dissectum	Coarse-lobed Grape Fern
Botrychium virginianum	Rattlesnake Fern
Polypodium polypodioides	Resurrection Fern
Polystichum acrostichoides	Christmas Fern
Pteridium aquilinum	Bracken Fern

Appendix C

Miscellaneous Maps

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Review and Evaluation of Legislation, Local Ordinances and Vehicles for the Conservation and Protection of Environmentally Sensitive Areas in western Walton County, Georgia

LAR 740, Fall, 1993

School of Environmental Design
The University of Georgia
Athens, Georgia

Federal Legislation

National Environmental Protection Act, 1969
Requires preparation of environmental impact statements for all Federal and Federally funded development projects. Specific protection is aimed at endangered species.

National Endangered Species Act, 1973
Establishes legal basis for protection of endangered and threatened species, both plant and animal, by protection of critical habitat necessary to their sustainance.

Clean Water Act (Section 404)
Primary importance is the delegation of authority to the Environmental Protection Agency and the Corps of Engineers to review, permit and/or disallow development activity in areas which may disturb wetlands, to provide opportunity for mitigation measures, and to oversee all wetlands whether public or privately owned.

North American Wetlands Conservation Act, 1989
Establishes a council to oversee wetlands conservation projects, provides monies to initiate projects, requires a biennial report to congress on the status of national wetlands and conservation projects; amends the Emergency Wetland Resources Act to evaluate the wetlands areas of 1780 versus 1980 and report on the total loss of wetlands. Fish and Wildlife Commission responsible to the established council for carrying out the acts of this act. Aimed primarily at migratory bird habitat, but broadly based for all wetlands.

Emergency Wetlands Resources Act, 1986
Based upon international migratory bird treaties to which the United States is partner, this act promotes the conservation and encourages the protection of wetlands by means of acquisition in fee simple, by easement or by other means. Establishes the criteria of what is a wetlands (hydric soil, hydrophytic vegetation, periodic inundation). Funding is based on fees assessed for permits, admissions, etc., for various places and activities overseen by the Department of the Interior. Established the wetlands inventory program.

Federal Water Pollution Control Act, 1972
Establishes requirements for protection of water resources by protections and limitations on waste disposal, protection of wetlands, protection of watersheds. Directs the preparation and development of comprehensive programs for preventing, reducing, or eliminating the pollution of navigable, surface, and ground waters for the purpose of protection and propagation of wildlife, recreational purposes, public water supply purposes, agricultural or industrial usage, and others.

State Legislation

OCGA 12-2-8 Promulgation of Minimum Standards and Procedures for the Protection of Natural Resources, Environment and Vital Areas of the State, 1992.
Establishes minimum standards for protection of river corridors, mountains, watersheds for public water supply, ground water purity and wetlands.

OCGA 12-16-1 Environmental Policy Act of 1991
State version of the federal NEPA legislation. Requires preparation of environmental impact statements for all government and government funded development projects. Primary protection is devoted to endangered species.

OCGA 50-8-7Georgia State Planning Act 1989
Mandates preparation of a comprehensive plan for all local governments by 1994. The environmental portions of the planning requires implementation of criteria for protection of wetlands, groundwater recharge areas and watersheds.

OCGA 12-7-1 Erosion and Sediment Control Act 1975
Establishes minimum protection requirements and a plan review process for the protection of soil, water and air. Protection can include floodplains, steep slope areas and the general functional integrity of a stream corridor by preventing increase of sedimentation.

OCGA 12-5-20 Water Quality Control Act, 1964
State version of the Federal Clean Water Act providing protection for wetlands, watersheds, water bodies, streams and rivers. Establishes maximum allowable discharges of effluent (both quantity and quality).

OCGA 12-5-440 Metropolitan River Protection Act 1972
A very powerful act, it establishes special regulations for development in the vicinity of watersheds and river corridors, but it is limited to Standard Metropolitan Districts containing one million or more people. This act does not currently apply to Walton County.

OCGA 12-3-90 Georgia Natural Areas Act
Directs DNR to identify natural areas to be preserved, secure their preservation, and make recommendations for their proper use. Funding is lacking.

OCGA 12-3-70 Non-Game Wildlife Conservation & Wildlife Habitat Acquisition
Establishes a voluntarily supported program of acquisition and conservation of wildlife habitat. Funding is by gift, one mechanism includes a gift allocation on the Georgia Income Tax Form.

OCGA 48-5-7.4 Bona fide Conservation Use Property Act
Provides for a land owner to covenant conservation use of their land in return for reduced taxation levels.

Local Ordinances

Traditional Zoning Ordinance
Currently employed by Walton County, establishes zoning districts and minimum standards, setbacks, and uses within that district. Allows for rezoning of districts based upon public review and political decision. Legal strength is established by means of the comprehensive plan and future land use map.

Watershed Protection Overlay District
Overlay districts add additional regulations or requirments to the standard zoning districts on which it is overlaid. The Overlay district does not change the former districts use designations but adds additional requirements to development.

Subdivision Regulations
Establish minimum development criteria for subdivisions, (typically residential, but also industrial and commercial) both for roads, placement of utilities, rights of way, drainage easements, etc. Applies to those items to be constructed which can be or will by transferred to the local government's ownership.

Soil Erosion and Sediment Control Ordinance
Identifies standards for controls and a permit agency to review, permit, inspect and enforce construction activities related to land disturbance. The ordinance applies to land disturbance based upon minimum lot size and or distance to nearest state water.

Storm Water Management Ordinance
Typically a vehicle for control of increased storm water runoff, establishing requirements for detention, retention, etc. Could be tailored to more appropriate storm water controls than typical detention ponds.

Flood Protection Ordinance
Establishes restrictions for development within floodplains and floodways.

Overlay Zoning
Method for delineating special districts based upon natural or cultural conditions and applying specific development criteria within those districts. Operates well within a traditional zoning based system.

Special Purpose Ordinance
Establishes specific legal requirements or statutes and can be tailored to any particular need. Very flexible, but must be constructed carefully to avoid loopholes and probable legal challenge.

Local Ordinances (continued)

Performance zoning
Establishes development standards based upon fixed criteria, allowing for flexibility in development, lack of limitations regarding use, but limitations based upon spatial requirements, natural/environmental needs, infrastructure conditions, etc.

Planned Unit Development
Allows for creative development strategies on a given site. Typically provides the developer a great amount of flexibility and provides the governing officials and public the greatest amount of input during the planning process. Front end costs are high to the developer due to the detailing necessary during the planning process, but end results can overcome initial costs. Sometimes this planned development gets a bad name because of failure to allow flexibility within the plan - particularly for long-term development projects. The term of development can ride through several economic and market changes requiring interior plan modifications.

Private Incentives

Preferential (Tax) Assessment
Allows a land owner to have his property assessed for its current use rather than for its value on the open market as a development prize. Limits tax revenues to the government, but maintains property in a less developed condition.

Deed Restriction
Establishes restrictions within the deed of a property which will restrict subsequent owners from certain rights of that property. Can be a useful tool for conservation, but must be initiated by the individual owner.

Land Acquisition

Fee Simple
Acquisition of full title to property including development and maintenance rights.

Conservation Easement
Acquisition of an easement typically restricting certain uses and rights of the landowner, but typically not entailing major maintenance costs. Does require enforcement.

Transfer of Development Rights
Allows for a land owner to sell to another land owner his development rights, thereby restricting his property from development and allowing another property to be more heavily developed.

Summary

Based upon the above legislation, ordinances, and methods we established a matrix cross referencing the various controls available with landscape elements. The "x" axis of the matrix includes natural resource elements grouped into their ABC categories (Abiotic, Biotic and Cultural). The elements selected were those identified and mapped in the natural resource inventory conducted by the 1992 LAR 740 team. Applicability of the control measure for each element is identified as applicable, somewhat applicable and not applicable. Those measures which are applicable require little tailoring to be applied to our study site. Those measures which are somewhat applicable typically indicate they are applicable only in the presence of specific criteria, and do not apply in all situations. Those which are not applicable either do not function for the particular element, or are prevented from functioning due to certain limitations. Further evaluation of each type of control may be required once districts and specific conditions are established or known. The matrix also identifies which controls are in place and currently in use in Walton County.

Note:
Two districts established by Walton County: the Agriculutural District and the Agricultural Protection District, have been included in the zoning ordinance but no geographical districts have been identified on the zoning map, thereby rendering them useless at the present time. Wording within the ordinance regarding their protection for agricultural use until other development is identified also effectively limits their strength as a conservation measure. Possible rewriting of these regulations and establishment of actual geographic districts could produce a very effective control measure..

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(14)

YELLOW RIVER WATERSHED

Walton County, Georgia

Management Districts

Landscape Management Classification System

Management Classes	Landscape Types	Districts	Landscape Elements: Abiotic: Reservoir Watershed	Abiotic: Active Railway	Abiotic: Open Water	Abiotic: Floodplain	Abiotic: Chatta Chattooga	Abiotic: Steep Slopes	Abiotic: Fragile Soils	Abiotic: Riparian Corridors	Biotic: Georgetic Wetlands	Biotic: Streambank Wetlands	Biotic: Forested Wetlands	Biotic: Unmanaged Coniferous	Biotic: Forest Hardwood	Biotic: Grasslands	Biotic: Scenic Lake	Biotic: Managed Pasture	Biotic: Managed Pines	Biotic: Managed Hardwoods	Cultural: Historic Significance	Cultural: Cultural Significance
Protection	*River Corridor*																					
	Granite Outcrops																					
Conservation	*Large Forested Areas*																					
	Limestone																					
	Cultural Areas																					
Productive	Commercially Managed Forest																					
	Cropland																					
	Pasture																					
	Open Space																					
Compromise	Mineral Extraction																					
	Transportation Corridors																					
	Rural Commercial																					
	Rural Residential 1 d.u./2 acres																					
	Utility Corridor																					
	Activity Nodes - Rural																					
Urban/Industrial	Industrial																					
	Commercial																					
	Residential 1 d.u./1 acre																					
	Commercial																					
	Road Corridors in Combination with Industrial, Commercial and Residential																					
	Activity Nodes																					

d.u. = Dwelling Unit

Legend

- *River Corridor District*
- *Large Forested Area District*
- *Cropland District*
- *Rural Activity Node District*
- *Residential District*
- *Road Corridors in Conjunction with Industrial, Commercial, and Residential District*

SCALE 1:24000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

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Fall Quarter, 1993

Sheet

● *High Benefit Association*

○ *Low Benefit Association*

No Benefit Association

1 – Only applies to federal agencies and federal land
2 – Applies only to state agencies
3 – Provides framework to evaluate these resources
4 – Can includes grounds (e.g. Battlefields)
5 – No funding for it
6 – Check Qualifications
7 – Set minimum lot sizes and setbacks along with stream buffer

	ABIOTIC								BIOTIC								CULTURAL							
									WETLANDS			WOODLANDS				ENDANGERED SPECIES		AGRICULTURAL						
	Reservoir Watershed	Aquifer Recharge	Open Water	Floodplain	Granitic Rock Outcrop	Steep Slopes	Erodable Soils	Riparian Corridors	Emergent Wetlands	Shrub/Scrub Wetlands	Forested Wetlands	Unmanaged Coniferous	Mixed	Hardwood	Forest Links	Wildlife	Remnant Plant Community	Clear Cut/ Young Pine	Pasture	Cultivated/ Exposed Earth	Managed Conifer Forest	Utility Easements	Historic Sites
FEDERAL LEGISLATION																								
National Environmental Protection Act 1969[1]	○	○	○	●			○	○		●		○			○	●	●	○	○	○	○			●
National Endangered Species Act 1973																●	●							
Clean Water Act (section 404)	●									●														
North American Wetlands Conservation Act 1989										●														
Emergency Wetlands Resources Act 1986										●														
Federal Water Pollution Control Act 1972	●	●	●	●						●														
STATE LEGISLATION																								
OCGA 12-2-8 Promulgation of Minimum Stds. & Procedures for Protection of National Resources, Environment and Vital Areas of the State 1992	●	●		○				●		●							●							
OCGA 12-16-1 Environmental Policy Act of 1991[4]	○	○	○	●			○	○		●		○			○	●	●	○	○	○	○	○		●
OCGA 50-8-7 Georgia State Planning Act 1989[3]																								
OCGA 12-7-1 Erosion and Sediment Control Act 1975				●		●	●	○												●				
OCGA 12-5-20 Water Quality Control Act 1964	●	●	●					●		●														
OCGA 12-5-440 Metropolitan River Protection Act 1972																								
OCGA 12-3-90 Georgia Natural Areas Act				●	○			○		○						●	●							
OCGA 12-3-70 Heritage Trust Act 1975[5]																								●
OCGA 12-3-600 Non-game Wildlife Conservation & Wildlife Habitat Acquisition[5]																●								
OCGA 48-5-7.4 Bona fide Conservation Use Property Act		●						●		●						●	●							
OCGA 12-8-1 Waste Management Act[6]																								
LOCAL ORDINANCES																								
Traditional Zoning Ordinance				●														●	●	●	●			
Watershed Protection Overlay District[7]	●																							
Subdivision Regulations				●																				
Soil Erosion and Sediment Control Ordinance							●	●																
Storm Water Management Ordinance																								
Flood Protection Ordinance				●																				
Overlay Zoning	○	○	○	○	○	○	○	○		○		●			○	○	○	○	○	○	○	○	○	○
Special Purpose Ordinance																								
Performance Zoning	●	●		●	●	●	●	●		●		●			●									
Planned Unit Development	○	○	○	○	○	○	○	○		○		○			○	○	○	○	○	○	○	○	○	○
PRIVATE INCENTIVES																								
Preferential (Tax) Assessment																								
Deed Restriction																								
LAND ACQUISITION																								
Fee Simple	○	○	○	○	●	○	○	○		○		○			○	○	○	○	○	○	○	○	○	○
Conservation Easement	●	●	●	●	●	●	●	●		●		●			●	●	●	●	●	●	●	●	●	●
Transfer of Development Rights	○			○	○					○		○			○									