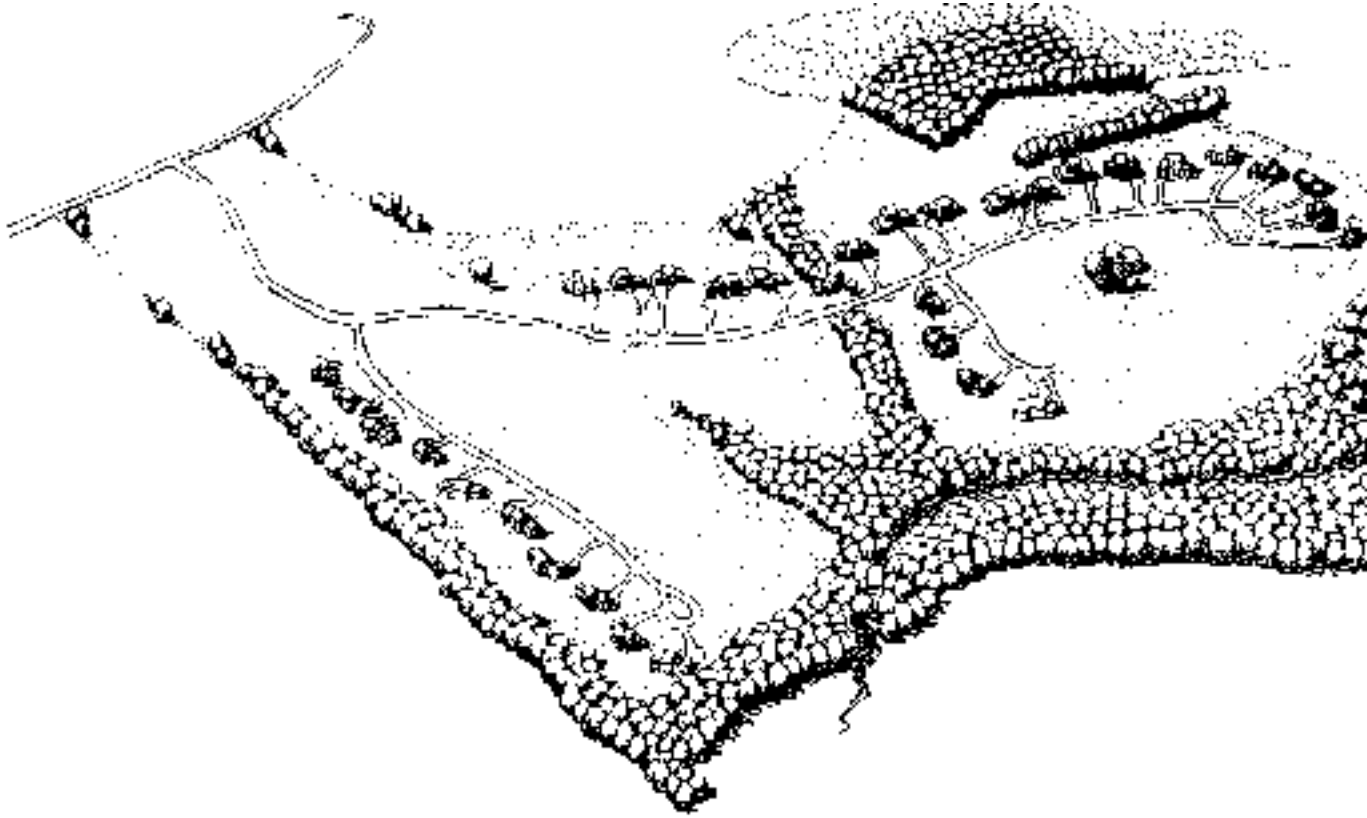


# Conservation Subdivisions: Ecological, Landscape and Construction, and Legal Applications to Cherokee County, Georgia



R. Arendt, 1996 (1)

"A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends to do otherwise." - Aldo Leopold

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## INTRODUCTION - Why conservation subdivisions?

Within the past decade Atlanta has achieved the designation of a city faced with "urban sprawl," and the economic success of the city is now generating the typical effects of rapid urban growth. The city is maturing from its historical boundaries at great speed; from 1990 to

1996 Atlanta grew from 65 longitudinal miles to 110. With this growth the daily driven miles of residents commuting to the urban core increased by 65%. In total, Atlanta motorists drive 100 million miles a day. Not only has the distance of travel increased but so has the time spent en route, thereby decreasing the quality of life for citizens, their families, and the quality of other activities that are traded in for hours spent on the crowded streets. Many Atlanta motorists are frustrated with the congestion and pollution, and accidents and general "road-rage" are on the rise.

Further quality of life problems caused by sprawl are wreaked upon the land it consumes. This is a problem for citizens: their well being, health, and prosperity. Sprawl and its effects are detrimental to a city's economic base as the area loses its attractiveness to new businesses, corporate accounts, potential employees, tourists, and lost or corrupted natural resources to market and utilize. Environmental problems specific to sprawl are automobile air pollution, runoff water pollution, and wildlife habitat degradation. The latter two are realized through basic development, increased paving and impervious surfaces, and general contamination from post-construction land use activities, such as pesticide use, fertilization, erosion, and sedimentation. Habitat isolation and fragmentation are also a problem as roads and communities block animal and plant dispersal. All of these phenomena can affect human health; an example is the tragic and profound rise in childhood asthma as pollution increases in the metropolitan area.

As Atlanta grows northward into Cherokee County, the city is being met with a wealth of unique and innovative development tools that allow the character of the land it joins to remain unspoiled. One small solution within this large dilemma has become the application of conservation subdivisions in the suburbs or sometimes near to urban centers. If utilized correctly, these developments have the potential to alleviate some of the stresses associated with sprawl and may coexist alongside healthy ecological communities. They are aesthetically pleasing and preserve sensitive lands for biodiversity and ecological function.

### **What is a "Conservation Subdivision" to a rural community?**

Conservation subdivisions are generally defined as the clustering of homes or developments to protect environmentally sensitive areas from encroachment. The philosophy behind conservation subdivisions is sustainable growth, and this growth incorporates a land ethic of common space including human, animal, and plant communities. Consumers obviously appreciate this home style, as shown by increased market value of homes in more wooded or "green" neighborhoods, for example. Such development is economically beneficial to developers in addition to market forces because, by concentrating on smaller tracts of land the same amount of development as in a conventionally designed neighborhood, they may reduce the need for extensive infrastructure construction and they may avoid building on lands that are difficult to work with. Overall, this type of development also diminishes the impact on historically intact lands and brings communities closer to a center, thereby reducing the need for travel and its associated problems. Incidentally, within the movement of conservation subdivision construction there are two slightly different but equally valuable trends that are worth distinguishing. These trends include the application of conservation subdivisions to urban areas in the form of clustered communities or village dwellings and the use of conservation subdivisions in less developed areas.

"Clustered communities" or "village dwellings" have "common space" that may incorporate sensitive land but is also meant to compensate for the inhabitants owning their own, smaller parcel. These plans are ideal for application to "brown-space" (areas that have undergone environmental cleanup) and "urban in-fill" areas (previously developed and abandoned lots within a city limits). The functions of a clustered dwelling are typically to reduce travel, promote living efficiency and resource sharing, and thereby foster a deep sense of community and increase the quality of human life. The open space in these developments is usually shared and manipulated to house various amenities such as swim and tennis areas, community gardens, and playing fields.

"Conservation subdivisions" are also applicable to newly developing or more rural areas but are theoretically different from most "cluster communities" in metropolitan areas, since within rural areas ecologically sensitive lands are initially relatively undisturbed and are intended to remain so (figure 1). Conservation subdivisions are also well suited to areas with mitigation (restorable areas like wetlands that developers may "repair" as a legal trade for disrupting another natural parcel) and restoration potential. The function of the open space in a conservation subdivision is primarily to preserve the character of the natural community.

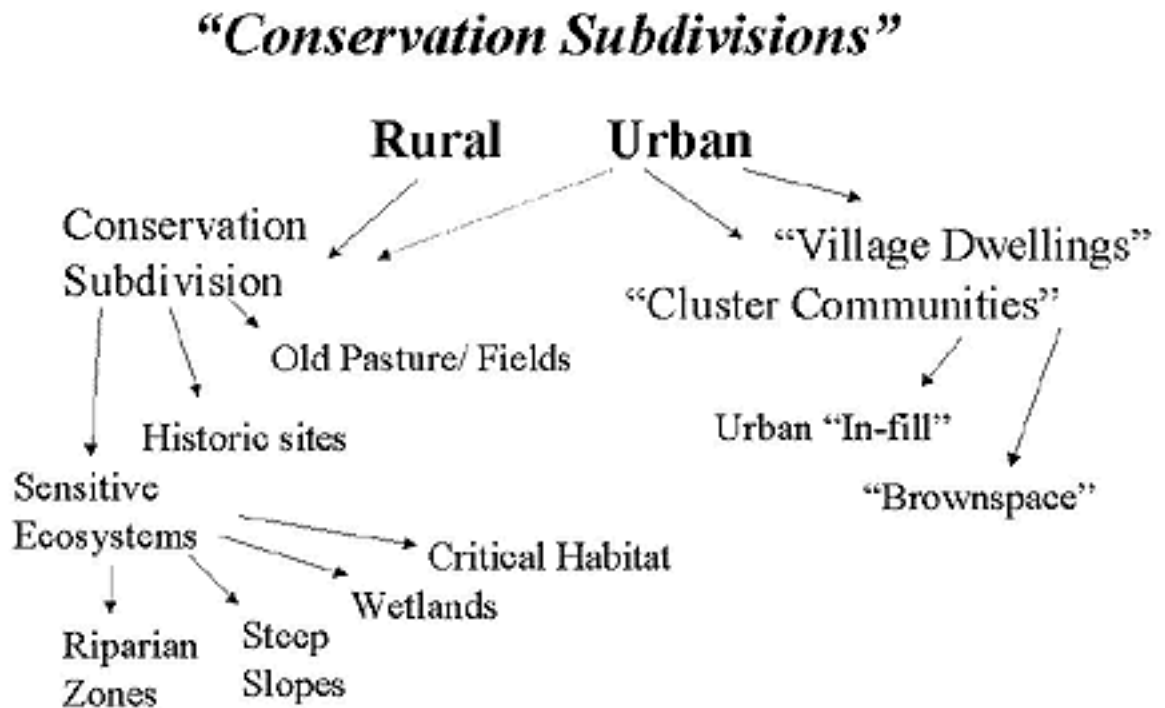


Figure 1: There are theoretical differences between application of conservation subdivisions to urban and more rural areas.

Both "village dwelling" and "rural conservation subdivision" development styles may preserve sensitive land in association with conservation easements; however, there is oftentimes a distinction between the two developments and the potential uses for the protected land. The philosophy of a conservation easement is to value the land for its inherent ecological utility and free it to function without great human interference in perpetuity. The priorities for creating a conservation subdivision are often incongruent with the goals of the urban village-style neighborhood. Conservation subdivision open spaces are not just open for amenities and recreation, but are set aside for the primary purpose of ecological conservation. In these developments, conservation becomes more than the leftover greenspaces in between construction, and they are not simply given this label because they enjoy aesthetically green landscaping. Conservation subdivision developers actively choose and design to augment conservation strategies, purposely supporting healthy habitat; they do not merely receive credit for not developing the entire parcel. Although "conservation-space" or "open-space" in true conservation subdivisions can be enjoyed as a commons, it is subject to different rules of development than the common, highly traveled and manipulated areas of a village dwelling. If

a conservation easement is going to be granted on a certain tract within a conservation subdivision there are rules, both ecological and legal, that must be adhered to.

## **General Ecological Guidelines to Landscape Application**

In order that conservation subdivisions be created in respect to the goals stated above, it is necessary to equip ourselves with an understanding of the systems and theories of preservation. The following text outlines the ecological concepts that should be applied to developing a true "conservation subdivision" and provides a hypothetical example of an ideal community. (The ecological definitions presented below are applied to the sustainable development of sensitive lands and are no means adequate as complete scientific surveys. For further information beyond the scope of this review please see Meffe and Carroll 1997 (2) and Arendt 1996 (1).)

### **Terrestrial Protection and Conservation**

Although the focus of the Cherokee County/ Etowah Alliance is to protect the Etowah River, understanding the connectivity of the land to aquatic habitat is essentially significant to the success of the program. In addition, for areas that are not directly adjacent to the river but are still worthy of designation as conservation parcels, there are terms that pertain specifically to the goal of terrestrial preservation. The following ecological principles are typically used in reference to terrestrial habitat, especially to conserve habitat and biodiversity.

#### **1. Habitat Degradation and Biodiversity**

Habitat degradation is the corruption of landscapes in such a way that that plants, animals, and other biotic entities, dependent on them for their survival, are no longer able to persist in these areas. Habitat degradation affects the great assortment of inhabitants, the "biodiversity," of the targeted ecosystem. While biodiversity is often referred to and understood in the context of the Endangered Species Act, species extinction, and the intrinsic dilemma of species loss, a less immediate and obviously personal reason for biodiversity protection is the necessity of species' genetic variability. Degraded habitats often look alike, having unattractive "weedy" plant species that are aggressive, invasive, and seem to grow at the expense of other plants (i.e. blackberry bushes, poison ivy, kudzu, duckweed, and privet). The animals of degraded habitat such as rats, raccoons, deer, zebra mussels, and some insects are often "pests," or their populations grow out of hand and persist in great numbers without the presence of many others species in the animal community. This could pose a problem as a single disease or environmental change could wipe out the uniform stock of life that has come to exist in a specific place. When a community is robust and diverse it can fend off disease, many exotic introductions, and possible climate changes, much like a healthy person can evade a cold.

Aside from the argument that yet unstudied species could hold some anthropocentric value still undiscovered the homogenization (both within a species and within the total community) and loss of key species could also result in a loss of community and/or ecosystem function. As in a human community where some people are better suited for a particular occupation than others, roles such as water and nutrient filtration, pollution accumulation and degradation, food, shelter, and partnerships between both animals and plants are better or crucially served by specific species in the natural community.

The benefit of conserving suburban land for such interactions is obvious and relatively easy. By keeping impact minimal on essential habitats through home and infrastructure placement, architectural style and materials used (see section on construction and landscaping guidelines), as well as leaving adequate buffer between well traveled human and intact natural communities, these systems may coexist without sacrifice to each other.

## **2. Isolation and Fragmentation**

Isolation refers to the small patches of land that become fragmented from a continuous expansion of habitat by barriers of human development, such as roads bisecting parks, that many animals will not cross and plants are often incapable of crossing. Isolation and fragmentation also take place in the natural world, as in the event of floods, fires, ice ages, and volcanic eruptions, where ranges of species are divided or cut off. Unfortunately, humans do this much more quickly and at a greater scale than nature, and what we are left with are small areas where few larger animals or diverse communities can persist. Many populations remain viable only if individuals have the option of mobility, or "dispersal." Typically, species will move from a "source" of quality land in the event of habitat destruction or degradation, or crowding. Isolation and fragmentation reduce the chances for genetic exchange between different populations of the same species, can contribute to local or regional extinctions, and can alter regional biodiversity by eliminating native species and encouraging the spread of exotics. Native populations or individuals need quality alternative habitat to move into, especially since human development is not going to cease.

In designing conservation subdivisions, special care should be taken to minimize intrusion into and sectioning of the open space. Walking trails are relatively low impact as far as construction, noise and other disturbances, and may be tolerated by natural communities far easier than streets, backyards, and swim and tennis amenities.

## **3. Corridors**

Corridors are necessary avenues for species dispersal into quality habitat and away from disturbed areas. It is not always possible or desirable to protect large, continuous tracts of land, but by connecting two sizeable adjacent areas with an effective corridor the operational size of each individual parcel is greatly increased. The effectiveness of corridors for all species is debatable because some corridors are too narrow for the species that require great amounts of interior habitat (see concept 4). Often the area set aside for corridors is not wide enough to provide for safe and successful travel for all species. Special care should be taken to furnish sufficient corridor width so that these avenues do not become "death traps" to their mobile inhabitants.

Conservation subdivisions aim to increase the functional habitat area for many species, and species movement within and between these neighborhoods is crucial if protection is desired on a long-term basis. Corridors between adjacent developments or reserves in close proximity are likely to be more effective than longer, more narrow corridors, and the wider and less disturbed a corridor is the more useful it will become to the biota inside.

## **4. Edge**

Edge is a concept that pertains to the outer boundary of a habitat and the species that are able to succeed there. The less "thick" or more irregular a patch of conserved land is, the more "edge" habitat is created, and the less balanced an ecosystem becomes. Because of sunlight, wind, and the proximity to disturbed land these transitional areas have unique characteristics as opposed to "interior habitat." Edge is a good habitat for many animals, such as American game species like white-tailed deer, but interior habitat is crucial for many others, such as passerine birds. The thick growth of typical weedy species described above ("pricker-bushes," privet, etc) at the margin of well sunlit land is preferable to many species and may provide many of the functions desirable from a preserved system. However, reduction of edge where possible provides a more balanced conservation unit by increasing the biodiversity of an area, which in turn increases the chances that the unit will persist through the long-term.

Reducing fragmentation will simultaneously reduce many edge-effects in a conservation subdivision. In addition, the more regular and greater area of a "core" of undisturbed land the better it will function as interior habitat to a wide diversity of local species (figure 2).

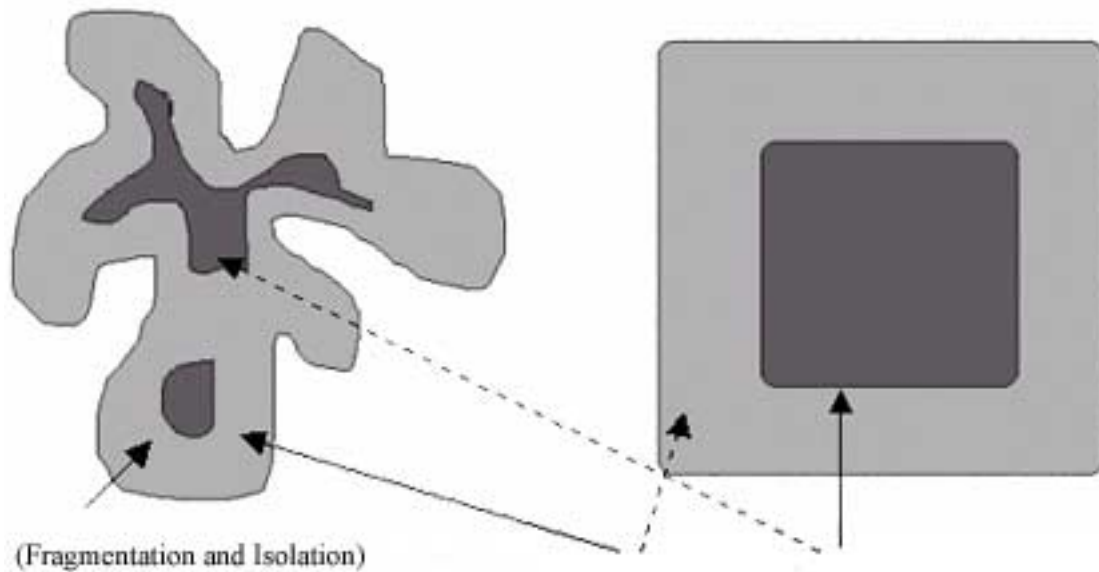


Figure 2: Edge versus Interior Habitat

## 5. Management

If restoration is deemed necessary or a specific habitat (as in Habitat Conservation Plans) or community is desired, this means that specific goals have been outlined for an area and that management might be necessary. Before deciding if management is the answer on a particular tract, wanted endpoints must first be defined and then the compatibility of these goals with realistic management options analyzed. Often, but not always, choices must be made and ideas about the parcel forgone in exchange for others. For example, there is a degree of incompatibility in management for timber harvest, management for forest restoration, exotic species eradication, and management for the myriad of endangered species that may benefit from protected or restored lands.

In these proposed, low-impact neighborhoods it is possible that the lands preserved are preserved for a specific reason, and there should be agreement in the inception phase of protection as to why the particular parcel is to be considered, (i.e. to protect the red cockaded woodpecker, to reduce erosion into the river, or to promote growth of a hardwood forest). Protection is oftentimes an active process, and occasionally must be planned for in the establishment of the conservation subdivision. It is desirable for the homeowners to understand that, in order to achieve a healthy forest, it is possible that this forest must be first burned to reduce sapling crowding and fallen vegetative matter. (See following section on "conservation easements" and management plans.)

## Aquatic Protection and Conservation

People are becoming increasingly familiar with the rationale behind the conservation of riverine habitat and function. Several key points follow below that are prominent to the Etowah Alliance in order to conserve water quality and aquatic habitat. If aquatic protection is

adhered to when designing a subdivision along a riverine ecosystem, the system may remain healthy for both the human, plant and animal residents.

### **6. The River Continuum Concept (3)**

The River Continuum Concept describes the longitudinal connection of each portion of the river as it meanders the landscape as well as the influence of terrestrial systems abutting the shores. Because upstream inputs become downstream sustenance (or pollution) and downstream habitat can be crucial to upstream dispersal and reproduction, it is necessary to see the river as a sum of all of its parts. Damming a river or its tributaries arrests the flow of nutrients, insects, and algae from the smaller headwaters to the larger body in addition to stressing the lower river reaches through water level, temperature, and chemical changes.

A subdivision's section of a river is dependent on its upstream neighbor and in turn provides for the health of the downstream ecosystems. Leaving woody debris and leaf litter along the shore and within the channel of all rivers, tributaries, and creeks provides structure and food for resident faunal communities. Arrested use of pesticides will ensure that food webs, such as trout and bass fisheries that are dependent on insects, are not disrupted or imbalanced as these chemicals are washed off of lawns and gardens. In the same manner, restricted fertilization will decrease the chance for algal blooms that could choke the more quiet waterways. Placing housing and infrastructure away from such sensitive areas is ideal since their creation and use is unavoidable.

### **7. Riparian Zone Protection**

Riparian zone protection refers to the maintenance of a buffer of natural vegetation along the banks of a waterway and between a development. Depending on the goals of preservation, the effective width of a riparian zone varies (4), but its functions are still essential and include: holding back bank erosion, slowing overland sedimentation transport from insults above, filtering runoff chemicals, moderating stormwater floods, providing nourishment and habitat for aquatic species, as well as furnishing unique semi-terrestrial upland habitat. Native trees, shrubs, and groundcover act as a virtual sponge to protect the sensitive aquatic ecosystem below.

There are economic considerations to account for if building within a floodplain, and the state of Georgia delineates a 100-foot buffer zone between development and a trout stream or large river. But these requirements are often not specific or adequate enough to address a particular site. Seth Wenger has previously made recommendations to the Etowah Alliance for riparian zone protection improvements, and a true conservation subdivision should take these into account, especially if attempting to develop lands with unique ecological characteristics, landforms, species, or steep terrain. For example, a buffer should be a minimum of 50 feet if the purpose is water quality, an ideal width is 100 feet, and if terrestrial habitat is a priority, 300 feet should be considered. (For further information see (4).)

## **Summary: the ideal conservation subdivision**

The ideal conservation subdivision would incorporate as many of the above philosophies as possible. It would prevent habitat degradation by diminishing fragmentation and providing a more continuous landscape with reduced edge. If some fragmentation were necessary, the conservation area would provide sufficient corridors between areas both within and outside of the property. Depending on the goals of the community, the requirements of the easement and legal designation, as well as the level of initial perturbation, the most appropriate management option should be researched and selected. In protecting riverine areas, ample riparian area should be left in its natural state without any impoundment construction. Measures should be taken in the upland developed areas to reduce insults such as fertilizers,

pesticides, bare land that contributes to sedimentation, and paved areas that contribute to stormwater runoff and contamination.

## **General Guidelines for Construction and Landscape Design**

A well-designed conservation subdivision allows landowners to meet their financial goals while simultaneously meeting conservation objectives. The following text is a summarization of valuable tools for creating and implementing this style of development and is taken from Arendt (1, 5). Once the subdivision is properly laid out, it is appropriate that the developed lands merge peaceably with the natural conservation areas. Specific techniques and suggestions for this integration of human-inhabited and undisturbed natural lands in a conservation subdivision are essential to promote holistic conservation. Many of these suggestions are part of Article 23-III of the Cherokee County Code and are further explained and reiterated in the following text as well.

### **Construction of Conservation Subdivisions**

To successfully implement this type of development in an ecologically sound manner, two broad stages of development should be involved. The first deals with analysis and collection of information, and the second deals with organizing this information and with making judgments about the development's layout.

#### **1. Background Stage Identification of Conservation Areas**

The Background Stage is the first step and involves a thorough analysis and mapping of the site's special features: those landforms that offer opportunities for construction as well as those involving constraints on development. Too often efforts are limited to identifying only the legally unbuildable areas; and unfortunately, this method neglects essential ecosystems, sensitive areas, or other important landforms not yet regarded by the State but applicable to a conservation subdivision design.

Floodplains, wetlands, slopes, and the habitats of threatened or endangered wildlife species are classified as Primary Conservation Areas. These special features receive the most attention by developers because their alteration is legally, technically, or financially prohibitive. For example, slopes between 15 and 25% require special site planning and should be avoided because of high potential for erosion and consequent sedimentation of water bodies.

There are six general Secondary Conservation Areas that should be taken into account and are included in the first step of conservation subdivision design. The first of these is wildlife habitats of less legal significance than those in the primary conservation areas but nonetheless important for the ecological reasons of biodiversity and community function described previously. Soils are also important land characteristics, especially where on-site sewage disposal is proposed.

Soils suitable for filtering septic effluent are one of the most significant resources on a parcel of land not connected to a main city sewer system. In the case that sewage is discharged off site, soil information is useful for showing where basements may be built or where wetlands can be expected. (Soil survey maps are available from the USDA Natural Resource Conservation Service.)

A third area that should be taken into account is intact woodlands or forests. These areas may be ranked, for example, as large or mature stands or stands with unusual species, to woods that are young, diseased, or degraded by invasive weeds and vines. Farmland as secondary conservation areas rank from "prime" to "of local significance." Farmland is easily converted to wildlife meadows where species of native grasses, wildflowers, and shrubs can provide cover,



food and habitat for birds and small mammals. Historic, archaeological, and cultural features rank from inclusion on a federal list to much-altered older structures. The latter buildings may be missing many original features but may nonetheless be locally significant and worth preservation or restoration.

Traditionally, only a few houses in a conventionally designed subdivision have waterfront lots. Conversely, with conservation subdivisions, each lot is capable of having aesthetic views of meadows, woods, water, etc. Views into and out of the site are economically important to the developer as well as aesthetically valuable to the potential homeowner.

The final secondary conservation area of potential importance to consider when designing a conservation subdivision is aquifers and their recharge areas. "Aquifer" refers to underground water reserves occupying space between gravel, sand or other soil particles. These areas are "recharged" with water seeping down through low points, frequently wetlands, or through coarse sand or gravel deposits. Often stormwater retention ponds are in high groundwater areas, and runoff entering them can recharge the underlying aquifer. Therefore, buffering with drainage swales to remove dissolved pollutants (typically excess nutrients from lawn fertilizer and agriculture) should be required.

Since these secondary features are sometimes not as obvious or well understood as the primary conservation areas, the recommended approach for identifying them involves the landowner. He or she may be one of the key information resources available to developers and their site designer; and in most cases would have personal knowledge of the woodlands, locations of larger trees, animal habitats, seasonal wetlands--subtle places that can easily be missed during the site analysis.

### **Integrating the Information Layers**

Once the crucial and special features have been identified, located, and evaluated in terms of their significance to the surrounding ecosystems, they each should be drawn onto tracing paper and layered together. In this way, the overall pattern of potential conservation areas can be seen. All buildable land is in the areas not listed under "Primary Conservation Areas," and special consideration is given to the secondary areas as far as potential for further conservation or siting of compatible amenities and structures.

Maximum legal development density should be calculated on the basis of a zoning ordinance once physical constraints of the site are taken into account. Primary Conservation Areas, like wetlands for example, should be excluded from the yield plan. The number of dwellings ordinarily allowable on the property is then adopted as the number to be included the conservation design.

The quality of the design depends to a great degree upon the accuracy and completeness of the information in the background stage. This stage is where the majority of time and effort is typically spent in the design process of a conservation subdivision. Once this information is acquired and the various layers are over-laid, the overall pattern of open space and appropriate development is usually obvious. This is in opposition to conventional development where the lot lines and lot size are the primary concern and is completed frequently without regard to the elements described above.

## **2. Design Stage**

The following four-step subdivision design process is easily completed if it follows a through background stage. Once the open space is outlined, its size and location become the central organizing element driving the rest of the design.

### **Step 1. Identify all potential conservation areas**

The information gathered in the background stage is used in this first step to identify and work around primary conservation areas. From the list of secondary areas, those that are most sensitive environmentally, most significant historically or culturally, most scenic, or those which possess other unique attributes are also blocked from potential development. Taken together, these areas typically cover less than half the buildable land, leaving the rest for development. With a legal conservation subdivision designation the land is specially zoned for neutral density, so that homes may be concentrated onto smaller lots, thus preserving the landowner or developer's equity.

## **Step 2. Locate house sites**

It is this step where the skills of the landscape architect and the real estate developer are very important. It is in everyone's interest, both the buyers' and sellers', that the most attractive sites and the number of sites with views of water or open spaces are maximized. To open vistas to water, "view tunnels" can be created by trimming lower limbs of trees, thereby removing a minimum number of trees and having a nominal impact on a riparian area. Although it is often difficult to give each house a view of a major open space, it is possible to give nearly every house a view of a commons, an attractively landscaped retention pond, etc. In addition, these residents will live only a short walk from a larger open space through trails in woodlands and around meadows.

## **Step 3. Designing street alignments and trails**

Environmental considerations for designing trails and streets include avoiding large trees, mature tree stands, or wildlife habitats. When preservation of large trees is involved, the entire area under the outer drip line should be kept undisturbed by temporary fences to avoid compaction of the shallow root zone. From a speed control and aesthetic perspective, long, straight streets should be avoided. Curving roads, short segments connected by bends, or curvilinear segments terminating in frequent intersections where a perpendicular turn is necessary make it difficult for motorists to speed. To reduce overall traffic and the impact of roads, increase sense of community, and provide safe channels for recreation, it is recommended that communities make provisions for non-automotive transportation among neighboring communities such as bicycle and walking trails.

A design approach proven to be of value in land conservation and real estate marketing is the use of single loaded streets. This term describes streets with houses located on only one side of the street and therefore providing a nicer view to the homeowner than the neighbors' garage or carport. "Dead-end" and "cul-de-sac" streets should be minimized for easier and safer access for school buses, fire engines, and other large service vehicles. This will also help avoid the case of certain streets becoming "collectors" of the entire community's traffic.

## **4. Draw in the lot lines**

This fourth step, along with the street pattern described in step 3, are usually the first items to be planned in a conventional development, but become the least important element in the development design process of a conservation subdivision. Lots where houses are located off-center will allow for larger side yards. The issue of lot depth is related to the presence or absence of open space along rear lot lines, with open space visually extending the perceived depth of the yard. The most efficient use of a lot occurs when the house is "off-center and up front." Smaller-scale lots have become popular due to the reduction of yard maintenance responsibilities, and the siting of homes near to open space can make up for the ill-perceived "clustering" of neighbors into developable lands.

## **Construction Guidelines**

Whereas the design process above focuses on siting and parceling of the land, the following section provides suggestions and examples of how to implement the design in an environmentally benign manner and how to construct the neighborhood in ways consistent with the goals of conservation subdivisions.

## **1. Streets**

The minimum paved width of all local streets is typically listed by existing development provisions to be 24 feet. In actuality, the paved width of each street should be determined by street category and traffic volume. Limiting pavement width reduces construction as well as maintenance costs and encourages more cautious driving. In addition, narrower, landscaped streets are more aesthetically pleasing. Emergency access is not hindered since reduced width is applied only to streets with little traffic and minimal on street parking, especially in single-loaded streets. A table for determining pavement width by street category and traffic volume is included in the booklet "Land Development Provisions to Protect Georgia Water Quality" (10, p. 18-20).

A typical existing provision for cul-de-sacs may read that they should be terminated by circular turnarounds of a 60- to 90-foot paved diameter. In reality, a turning radius of at least 20 feet and a paved lane of 16 feet on "rural" and 18 feet on "urban" roads are sufficient. In addition, the center of this turnabout should not be paved. When a 60-foot diameter area is paved it creates an 11,000 sq. ft. impervious circle, or 1/4 acre of runoff. As well as being unattractive and environmentally insulting, it serves as a "heat island" in the front yards of homes nearby (11, p. 45).

Paving provisions generally specify an asphalt or concrete impervious surface cover. Recently developed, porous pavements are good alternatives for streets; unfortunately, however, maintenance cost limits acceptance of these innovations by most local governments. In many technical respects porous surfaces are superior because they drain, produce better traction and visibility, and produce less noise and glare. The cost of the material is currently about 10% higher than conventional materials, but demand is likely to reduce this markup in the near future. Porous pavement is also part of the runoff treatment and drainage system by helping to eliminate the necessity for costly specialized stormwater retention and treatment structures (10, p. 22).

## **2. Stormwater Management: alternatives to curb and gutter systems**

A typical zoning provision reads that all streets shall be provided with curb and gutter on both sides. Curb and gutters collect runoff, protect pavement edges, prevent vehicles from moving into pedestrian space, and organize street cleaning and parking. However, they collect and concentrate pollutants and prevent stormwater runoff from being naturally treated through contact with soil and vegetation. Omitting curbs from both sides of a street saves construction cost of \$15 per foot.

Ideally runoff from all roofs, pavements, and overflow from permeable pavements should be passed immediately through vegetated swales or infiltration basins. In densely populated or trafficked areas where curbs are necessary, curbs should be notched to drain into vegetated swales (11, p. 24). A series of concave vegetated surfaces are designed and located to collect and hold runoff from small storms and thereby controlling stormwater on site. Catch basins located at the high edge of the swale collect the cleaner runoff from larger storms and provide flood protection. Swales are gently sloping and shallow, holding water for only a few hours or days. Although a concern to many homeowners, mosquitoes are not a problem with vegetated swales since their water retaining capabilities are ephemeral and mosquitoes need at least 72 hours to breed. Also, when filled with water they reflect the sky, clouds and leaves above, making an attractive landscape element. Specifics for construction of vegetated swales to assure effective runoff treatment and infiltration are spelled out in the Georgia water quality booklet (11, p. 43, 54-55).

### **3. Site Preparation: tree and soil protection**

Most site preparation greatly alters the topsoil and often obliterates native flora and fauna that depend on these functional habitats. Because of this dependence, plants and animals serve as good indicators of ecological distress, and their presence and numbers can be used to test authenticity of a restored habitat or the extent to which one has been degraded.

Land development provisions normally do not address the limiting of clearing, grading and disturbing areas surrounding the construction site. These adjacent areas, especially if encompassing sensitive habitat, should be fenced or ribboned off (10, p. 30). Trees should be fenced past the drip line, with a heavy layer of mulch further out. A fact to consider when altering ground level near trees is that a very high percentage of their roots is in the top 12 to 18 inches of soil. Frequently, trees are killed with only the depth of a driveway cut beside them. Severe root-damage occurs when slabs or continuous footers are poured or when any width of trenching is done. The tree may continue to live off stored nutrients for a few years, and the connection is not made when the tree eventually dies that construction was the cause. Soil compaction is another factor that is not immediately recognizable. Pore space is needed around roots for air and for water; therefore, when compacted regularly by even small vehicles, severe damage is done. In addition, tree protection development provisions should prohibit cutting certain types or sizes without commensurate replanting.

Limiting clearing, grading, and disturbance protects the soil surface more directly than does protection of isolated trees. Erosion and sediment control during construction are clearly defined in the "Field Manual for Erosion and Sediment Control in Georgia" (12) and is mandated and enforced under state law.

### **Landscaping Guidelines**

Proper landscaping will increase the aesthetic quality of the manipulated lands as well as integrate them into the natural, surrounding landscape.

#### **1. Use permeable surfaces**

In any development, a certain amount of impervious surface must be used, but a proper selection of surfaces and plant materials can improve infiltration potential. Walkways, patios, driveways, and community parking areas are all places where permeable materials may be utilized by the individual homeowner or the developer. The application of these materials to such areas will help to retain stormwater onsite and reduce dependence on an extensive stormwater drainage system and the huge infrastructure costs that they bring. Examples are pavers set in sand, mulch for parking areas, wooden decks instead of concrete patios, etc.

#### **2. Keep drainage onsite**

The construction of dry wells, cisterns, holding ponds and swales are low maintenance aesthetically pleasing alternatives to typical drainage sewer systems. As described before as a substitute for curb and gutter systems, swales are also applicable to individual lots. Traditionally, landscape surfaces are graded to have a slight convex slope. Thus water runs off a central high point into a surrounding drainage system. Concave vegetated surfaces need not be deep to make a significant contribution to overall surface storage capacity and stormwater quality. A square lawn of 50 feet on one side, sloping 2% towards the center will create a low point six inches below the outside rim. This six-inch slope spanning 25 feet is barely noticeable and is similar to standard grading practice. This area creates a storage capacity of 413 cubic feet. If adjacent sidewalks, rooftops and roads are designed to sheet drain into this concave lawn, their runoff can gradually infiltrate into the soil.

#### **3. Plant trees**

Trees surrounding a home contribute greatly to the efficiency of the heating and cooling system. Deciduous trees help cool homes in the summer months. In the winter, these trees lose their leaves and allow the home to be warmed by solar heat, especially if along southern exposure windows. Passive solar heat is an excellent resource for heat as well as for water heating.

#### **4. Use native plants**

Increasing habitat diversity usually means replacing expansive, closely mowed lawns with creative landscaping. A quarter-acre lot, with variety in form and height of plantings will attract a larger number and variety of birds than the same lot with uniform plantings. A benefit to using native plants in landscaping is their benefit to the surrounding ecosystems. Almost all native plants are important as food or shelter for native animals. Native animals are important to the plants for fertilization and distribution (or dispersal) of seeds. In addition, animals aid plants and their propagation by dividing roots when they dig for food aerating the soil.

Choosing the proper vegetation for the climate zone and ecosystem type will not only increase functional habitat for many species, but it will reduce costs involved with maintenance. A large number of plants will survive moist soils and periodic inundation as occurs in swales, drainage areas, or even standing water. Many other native plants can withstand drought and full sun. Native plants need little to no water after established, little pruning maintenance, and no pesticides, fungicides, or fertilizers. In fact, if wildflowers are fertilized, it is the weeds that become healthier and more dominant.

With mulch similar to that normally occurring in the forests, plants concentrate the majority of their small absorbing roots in the upper six inches of the soil. If the soil is exposed or bare, it can become so hot that surface roots will not grow in the upper eight to ten inches. The common practice of removing all leaf litter and detritus creates a hard, crusted soil surface of low permeability and high heat conduction. The use of mulch or forest litter to cover bare soil protects the surface root zone from temperature extremes while improving water retention and infiltration (7, p. 54).

The above recommendations will help alleviate the stresses of development on ecosystems and help promote healthy vegetation, reduce erosion, and provide for a healthy, well-balanced community.

## **Legal Tools to Preserve and Protect Common Space in Conservation Subdivisions**

Before choosing which legal tool is right for a development, it is important to understand the purpose behind the conservation subdivision. The conservation subdivision is a zoning alternative used to balance residential growth with the need to protect our natural resources and environmentally sensitive habitats. Therefore, local governments permit developers to cluster homes on smaller lots in less environmentally sensitive areas of their master-plan developments. This allows developers to utilize the benefits of a density neutral subdivision while protecting and preserving the open space, forested areas, and other resources.

There are a variety of legal tools that can be used to protect and preserve the common space of conservation subdivisions. The two most common tools are dedication of the land and conservation easements. Nonetheless, the best tool for protecting the environmental interests of the subdivision should be determined on a case by case basis.

When choosing a legal tool, the developer should consider each variable that will affect his ability to protect the subdivision's common space in perpetuity, long after he is dissociated

with the development. First, the developer should consider the local zoning ordinances. Many local governments now have conservation subdivision zoning provisions in their ordinance that proscribes the tools that can be used to protect the common space. For example Article 23 of Cherokee County's zoning ordinance addresses conservation subdivisions. Second, state property law can play a major role in selecting a legal tool. Some states have adopted the Uniform Conservation Easement Act, making conservation easements a more appealing tool. Georgia has adopted most of the model provisions and codified them beginning at 44-10-1 of the Official Code of Georgia. Third, the size of the subdivision plays an important role in selecting which legal tool will be most effective. Larger subdivisions with a Home Owners Association (HOA) have more options than smaller subdivisions with less economic and organizational resources. Finally, the existing state of the environmentally sensitive areas is important. Common space that requires extensive maintenance or revitalization may call for one legal tool, while an open field requiring little maintenance may call for another.

### **The Most Common Options**

The following discusses methods for protecting the common space of a conservation subdivision.

#### **1. Dedication of common space to the local government or a land trust**

Dedication of the common space involves transferring the title of the property to a second party through a charitable donation or bargain sale. A charitable donation is an outright gift in exchange for federal income tax deductions. A bargain sale occurs when the land is sold for less than fair market value. Bargain sales are advantageous for the seller who receives cash and a federal income tax break for the difference between fair market value and the sale price.

The advantages of dedicating the land include transferring the ongoing maintenance costs and management duties to another party. Therefore, this technique can be a useful option for small developments without a HOA. The development can relieve itself of the economic burdens associated with owning the land while retaining the benefits of the open space. Additionally, the developer can receive a substantial sum of money and/or deduction in their taxes pursuant to the transfer of title.

Conversely, there are some disadvantages associated with land dedication. First, the developer and subsequent homeowners will lose all control over that part of the open space. Thus, they must have a substantial degree of trust in the entity to whom they transfer the land. Typically, that entity will be the local government or a land trust. Sometimes it is difficult to strike a bargain with these entities unless the land is of particular interest to them. Furthermore, local governments are reluctant to take the land because of the financial burden and liability of owning the land. This burden can be magnified because the government believes the land will only benefit the adjacent neighborhood. Thus, we need to educate government officials as to the value protecting common space can have to the entire community. Finally, dedicating the land to the local government typically results in public access to the land. This is a primary deterrent for many HOAs.

The disadvantage of landowners losing control over the land can be alleviated by the seller placing a conservation easement on the land prior to conveying it to another party. As explained in the next section, conservation easements are a powerful legal tool whereby the landowner can ensure that the land remains protected according to their intent at the time of sale or donation.

The problems associated with local governments or land trusts raising funds to purchase or maintain the land can also be minimized through federal, state, and private funding. In order to protect our natural resources, the federal and state governments provide grants for entities that want to purchase land for conservation purposes. These funds can minimize the burdens

imposed on land trusts and local governments and make them more willing and able to take land. Appendix A lists some federal and state departments and agencies, and private groups with funds available for the purchase of land for conservation purposes.

Under certain circumstances, land dedication can be the best option. For instance, a small development built along the banks of the Etowah River may not have the resources to maintain and restore the habitat of the common space. Additionally, the local government's master plan may call for acquiring easements along the Etowah River to create a "greenway." In such a situation, both the homeowners and the government have the economic incentive to transfer the title. The homeowners can save on future maintenance costs and the local government, with federal and state assistance, can purchase the title rather than merely an easement to use the land. Furthermore, the homeowners can be sure the land will be preserved pursuant to the objectives of the county's master plan.

## **2. Conservation Easements**

Conservation easements are a very effective tool for protecting the common space of a conservation subdivision. Conservation easements are legally binding agreements that combine the benefits of homeowner participation in the maintenance of the common space with an enforceable right to restrict the use of the land. The biggest advantages of conservation easements are that they last in perpetuity and are well accepted in the courts. They are quickly becoming the legal protection tool of choice in many states.

Georgia, in particular, has encouraged the use of conservation easements by adopting many provisions of the Uniform Conservation Easement Act (UCEA). This act defines conservation easements and sets forth the rules courts must follow when deciding an easement's validity. By enacting the UCEA, the state is implicitly encouraging the use of conservation easements as a protective tool. The state is also making this tool easier to use by enumerating the requirements lawyers must consider when constructing a valid easement.

Furthermore, several local governments have followed the state's lead by enacting conservation subdivision zoning ordinances that encourage the use of conservation easements to protect the common space of subdivisions. Cherokee County's ordinance, for example, allows the developer to incorporate a HOA which holds title to the common space. As the property owner, the HOA collectively owns the "bundle of rights" associated with owning land, including how it can be used. The rights held by the HOA can be limited by a conservation easement placed on the land by the developer. Cherokee County's ordinance provides for the conservation easement to act as a negative restriction on the HOA's property rights. By granting a conservation easement, the developer agrees to limit how he, and subsequently the HOA, will use the property in exchange for certain economic and intrinsic benefits. The economic interests include income tax breaks for the developer and an increase in property resale values of the homes adjacent to the protected common space.

The party to whom the easement is granted (i.e., land trust, local government) monitors the use of the land to ensure compliance by the grantor. If the grantor should violate the provisions or purpose of the easement, the grantee has the power to enforce the easement through a court ordered injunction. Typically, the grantee takes the easement because they have an interest in guaranteeing that the natural habitat of the common space remains protected and preserved. Additionally, they usually require a financial grant from the landowner to cover the monitoring and enforcement expenses associated with the easement.

A major downfall in most conservation subdivision zoning ordinances is the absence of a provision requiring the use of an Ecosystem Management Plan. Because conservation easements act as a negative restriction on land use, they prevent action but they typically do not require it. Thus, a conservation easement stops a developer from building on a particular parcel of land but it does not force a HOA to plant hardwood seedlings to promote the revitalization of a forest or to mow a meadow to keep it a scenic pasture. Ecosystem

Management Plans (EMP) solve this very problem. By requiring the developers to follow EMPs, the local government can require the maintenance and/or restoration of the common space. Therefore, if affirmative action is necessary, conservation subdivision zoning schemes should require the adoption of a EMP as a condition of zoning approval. This will give the local government more leverage in the courts to promote the intent of conservation zoning. It should also be noted that EMP should be subject to review to account for changing circumstances. An example of the EMP program used in Lower Meridian Township, Pennsylvania, has been included in Appendix B.

A conservation easement's effectiveness and enforceability can depend on to whom it is granted. For the purpose of protecting a conservation subdivision's open space, there are three possible choices but only two recommended choices. Conservation easements can be granted to the HOA (not recommended), to the HOA with second party enforcement, or to a second party outright. The following is a discussion of the advantages and disadvantages of each of these options. The recurring theme in the following discussion will be the need to reduce conflicts. Reducing the conflicts is the best way to insure that an easement's purpose will be fulfilled as the dynamic circumstances of land ownership continue to evolve.

First, the developer could grant a conservation easement solely to the HOA. This act would place a negative restriction on the land thereby preventing future development. Granting the easement to the HOA allows the HOA to retain almost exclusive control over the land. This prevents outside interests from imposing their ideas of how the land should be maintained, restored, or preserved. However, enforcement may be a problem under this scenario. As long as the HOA and/or its members continue to abide by the easement, this tool will remain effective. If a homeowner violates the easement, the HOA will have standing to enforce the easement. Additionally, if the HOA fails to enforce the easement, individual homeowners will have standing to force the HOA to fulfill its duties.

Problems arise when the HOA and the landowners both have a reason to violate the easement. This problem becomes very complex after the developer has disassociated himself with the development and given title to the common space to the HOA. Under this scenario, the HOA owns title to the common space and the conservation easement protecting the common space. Thus, no one is in position to effectively enforce the easement because all parties to the agreement are agreeing to violate its provisions! This problem is a result of the parties' conflicts of interest. The conflict exist because one entity, the HOA, is forced to look out for the interests of its members, itself, and the environment. Quite often, the easiest way out of conflict is to ignore the easement. Alternately, the parties to the easement can decide to terminate it. This would leave the local government as the only possible entity with power to protect the common space. The local government may successfully claim that although it is not a party to the agreement, it has standing to enforce its zoning provisions which include a requirement to maintain open undeveloped space. Government politics change however, and it may not want to discourage further development. For this reason, this alternative is discouraged and has been prohibited by Cherokee County. Cherokee County requires that a second party be given enforcement rights over all conservation easements.

Additionally it should be noted that this hypothetical scenario will not invoke the doctrine of merger. The doctrine of merger arises if the interest or rights to the land are separated and later reunited in one legal entity. In our situation, the problem could arise if the HOA owns the title to the property and is the holder of the conservation easement. Theoretically, their interests could merge, thus extinguishing the conservation easement.

This problem can be solved through provisions in the conservation easement expressing an intent to avoid merger. Recently, the courts have been reluctant to apply the merger doctrine. Rather, courts look to the intent of the parties and treat these cases as an equitable proceeding based on notion of fairness. By explicitly expressing the intent that the land interest should not merge the parties can prevent the court from applying this doctrine (9).



The second and third alternatives may seem very similar, but in effect they can have very different impacts. Both granting the conservation easement to the HOA with second party enforcement and granting it outright to a second party, solve many problems associated with the first alternative. They both add an outside "watchdog" with an interest in the easement. This prevents it from being violated to facilitate the interests of the HOA and its members. Both alternatives provide for a separate right of enforcement should the HOA and its members decide to ignore the easement's provisions.

There are three major differences between the second and third alternative. They each create different financial responsibilities, different public perceptions, and different levels of enforcement power for the second party. First, by retaining some interest in the enforcement of the conservation easement, the HOA may have to provide a smaller grant to the second party's enforcement and monitoring fund. The HOA will be the primary enforcer and monitor of the easement and thus is responsible for solving most of the problems associated with enforcement. Thus, local governments or land trusts could be expected to require less funding for their reduced duties.

Additionally, this may encourage the subdivision community to participate in the maintenance and restoration of the common space. The residents may feel more in control of the land and have a stronger interest in protecting and preserving it if they feel empowered to enforce the conservation easement. Community involvement, either physically or financially, is necessary to ensure the success of a conservation easement. Thus, anything that encourages involvement should be encouraged.

Conversely, the third factor, the level of enforcement power held by the second party, favors using the third alternative. This factor revolves around the notion that it is "easier to ask for forgiveness than to get permission!" (10). As any child will tell you, it is easier to sneak a cookie from the cookie jar and then say, "I am sorry," than it is to ask their mother first. This analogy also applies in the conservation easement context. If the easement is granted to the second party outright, any changes made to the common space must first be reviewed by the second party. Thus if the HOA wants to engage in selective timbering, they must first get permission from the land trust or other easement holder.

Alternately, if the HOA has an enforcement interest in the conservation easement, they do not have to receive permission for their activities concerning the common space. It is assumed that they will adhere to the easement's provisions. Thus when they fail to adhere to the provisions, whether intentional or by mistake, they have already acted and can only ask for forgiveness.

The "permission/forgiveness" argument also applies to the second party's standing in court actions. Courts are more likely to defer to the judgement of a second party if they are the primary enforcement agent. Thus, they may be more successful in enjoining potential resource endnagering activities if the HOA is not an enforcement entity. If the HOA is an enforcement entity, the courts are more likely to presume their actions are valid and within the bounds of the conservation easement.

That the HOA and its members would be united in their intent to violate the conservation easement may seem far-fetched, but it is a real possibility. See *Village of Los Ranchos de Albuquerque v. Shiveley*, 791 P.2d 466 (1989) (preventing homeowners from selling protected common space for development). Typically, problems arise in the early stages of development when developers still control the HOA. Many developers do not relinquish control of the HOA until 50-75% of the development's lots have been sold. During this early stage the developer, in essence, is the HOA, the landowner, and the enforcer of the easement. Because of the many unexpected variables associated with developing land, the developer's pecuniary interests may conflict with his continued interest in protecting the sensitive habitat.

Eliminating potential conflicts is the most powerful rationale for granting the conservation easement solely to a second party. Therefore, if problems should arise, the third alternative, granting the conservation easement solely to a second party, involves the least number of conflicts and is the most effective means to protect the environment through a conservation easement.

### **Additional Tools: Covenants Conditions and Restrictions**

In the past developers have relied on the Covenants, Conditions and Restrictions (CCRs) of a community association's Declarations to protect and maintain common space. These CCRs are a necessary element of every successful conservation subdivision and should be included in every HOA agreement. Although CCRs can be effective in restricting some uses of common space, they are not a good option for protecting the common space of conservation subdivisions on their own.

CCRs are provisions included in the documents that govern community associations. CCRs are agreed to by all members of the community association and are enforced by the community association's board of directors. CCRs act as a constant reminder of the negative use restrictions and affirmative duties imposed upon the homeowners. The problem with relying solely on the CCRs is threefold. First, CCRs are typically dynamic in nature and can be changed by a vote of the community association's members. Second, the term of the covenants is subject to each state's common law. Finally, enforcement of the CCRs can be problematic.

The dynamic nature of CCRs make them an ineffective alternative for protecting the common space in perpetuity. CCRs, like other provisions of a HOA agreement, can be amended or terminated by a vote of the HOA's members and sometimes the board of directors. Because landownership changes over time, we cannot guarantee that subsequent landowners will have the same environmental interest in protecting the common space. The new landowners may want to build a community pool and clubhouse or dam a stream to create a lake. This type of development would be prohibited under the original HOA but could be allowed if the CCRs were amended and there were no other legal impediments (i.e., conservation easement). This simple example illustrates why CCRs should be used in conjunction with another legal tool.

Secondly, CCRs are an ineffective tool because they do not last in perpetuity. In Georgia, CCRs expire after twenty years unless they are renewed by the community association (11). The protection of common space from development is too important to have it hinge on whether the HOA remembers to extend its CCRs for another year. As a side note, the HOA agreement can contain an automatic renewal clause, but this can be amended by 51% of the membership vote (12).

Finally, the HOA has the sole power to dictate how well the covenants are enforced. If the HOA does not enforce all violations of the covenant, a selective enforcement defense may arise. Thus, if several homeowners are not prohibited from constructing sheds in the common space adjacent to their back yards, a subsequent landowner may claim she is allowed to build a tennis court in the common space adjacent to her backyard because the HOA has consented to the activity.

Due to the inherent limitations of CCRs, they should not be relied on to protect the common space of conservation subdivisions. That is not to say a highly skilled draftsman could not come up with an effective set of CCRs to adequately protect the common space for a limited period of time. Rather, CCRs are less effective than the other tools available to developers and should only be used in conjunction with another legal tool such as a conservation easement.

## **Assessment of Current Cherokee County Conservation Subdivision Regulations: Guidelines for administering the ordinance or proposed revisions**

The intent of the descriptions above is to describe the theories behind and practices leading to the goal of sustainable growth. This is presented in a way that individual developers can make decisions based on science and current Georgia codes as to the siting, construction, and preservation of planned communities. It is not sufficient to "take what we can get" as far as environmental regulations if the needs of the landscape and the goals of application are disregarded. Although it is inherently a political process, these elective suggestions may aid in the creation of worthwhile programs. Cherokee County Article 23 describing conservation subdivisions is a worthy document, but there is potential for abuse of this designation if goals are not delineated; at this time it is possible for an unscrupulous developer to capitalize on certain loopholes within the code. It is suggested that the suggestions presented to the Etowah Alliance in April 1998 be re-reviewed in the light of the information presented above. Specific recommendations, to be taken in addition to the ones already recommended by the previous group, follow:

1. If the land is somewhat disturbed, the easement shall not just provide for stewardship, but also should mandate active restoration or occasionally simple maintenance. A required or stipulated management plan should be included so as to allow and promote the regeneration of less natural areas.
2. Since the designation of conservation subdivision allows developers to concentrate housing, or proceed with "neutral density" zoning, it confers the economic advantage of situating the same levels of development as would conventional design onto a smaller portion of land. It also reduces the necessary and costly infrastructure construction, especially if more difficult areas to develop are avoided. In addition, such neighborhoods have received great market success and sell rapidly.

This Article should not be a tool so that maximum construction may be situated onto the only developable lands on a parcel. A developer should not get credit towards this legal designation and be able to advertise the large tract conserved for land that is non-developable in the first place, (such as steep terrain, floodplains, wetlands, the legal riparian zone, land adjacent to undesirable land uses such as landfills, livestock farming, etc.). In this case, these subdivisions may actually promote development on sensitive lands (or dangerously close to sensitive lands) where it otherwise would not occur, and oftentimes the lands left open are the more undesirable portions of the plot rather than sensitive and worthy ecosystems.

The developer should not be able to utilize the "conservation subdivision" title without actually preserving a portion of the open space, and that space should be clearly defined and measured. As the code reads, the developer has the option of reducing lots by 2% if he so chooses, thereby leaving merely 2% of the land in "open space" and receiving all the benefits of a conservation subdivision title. An acceptable alternative to the current situation is the subtraction of legally designated primary conservation areas and other undevelopable lands when calculating the total area of conservation space. Otherwise, if these areas are to be included in the open space calculation, we strongly recommend codification of a minimum percentage of open space to be considered as a stipulation to a developing neighborhood with this title.

3. Many of the suggestions in Appendix 23-III and in the section of this manuscript on construction and landscape guidelines should not be regarded as purely optional. Their addition to the developed areas aid the integration of human development into the natural surroundings and further promote the ideal of sustainable growth without harm or infringement onto the conserved landscape.

- a. The suggestion of only 10 to 50% of the conservation space to be utilized for active recreation should be required, and perhaps lessened, if the ideas of degradation, fragmentation, isolation, and others described above are to be implemented into subdivision design. Also, the idea that "no less than three contiguous acres of 4:1 length-to-width ratio of land to count as part of the 50% open space, unless it is a water body or linking trail" is valid and should be reconsidered. This ratio will reduce edge in the open space and promote greater interior and functional habitat. Alongside that recommendation is the notion that none of the open space should be paved with any substance that is not permeable.
- b. The suggestion for linking open spaces in adjoining developments should be strongly regarded noting the value of corridors and increasing conservation space amongst human development.
- c. The use of BMPs and innovative materials and design ought to be implemented, at least as covenants or restrictions, so the goals and actions of the development are not hypocritical.

## **END NOTES & REFERENCES**

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10. Wayne S. Hyatt, Athens, Georgia (March 8, 1999).
11. O.C.G.A. § 44-5-60 (1993).
12. O.C.G.A. § 44-5-60 (1993).

13. CHARLES A. FLINK & ROBERT M. SEARNS, GREENWAYS, A GUIDE TO PLANNING, DESIGN, AND DEVELOPMENT 87-97 (These sources were selected because of their particular value to entities wishing to purchase land for conservation purposes.)

14. Pitz, A. D. Steckel, H. Harper, A. Hausmann, and M. Thayer. 1993. Design and Management Handbook for Preservation Areas in lower Merion Township, Montgomery County, Pennsylvania. Chapter 5: Stewardship Matrix & Guidelines. Natural Lands Trust, Inc, PN.

## **APPENDIX A**

### **Potential Funding Sources (13)**

- \* Bureau of Land Management - provides grants for forest restoration, riparian habitat restoration, and other programs benefiting the public land.
- \* State Fish and Game Agency - provides direct funding for wildlife and fishing programs; wildlife viewing facilities and interpretive programs; land acquisition for wildlife programs; may assist greenway as access to existing wildlife refuge.
- \* State Rivers Programs - provides direct funding; technical assistance; restoration; funding for protective buffers along rivers
- \* American Forestry Association - The Global Relief Heritage Forest Program - provides funding for planting tree seedlings on public land. Emphasis is on diversifying species, regenerating the optimal ecosystem for the site, and implementing the best forest management practices. Contact the American Forestry Association, P.O. Box 2000, Washington, D.C. 20013.
- \* World Wildlife Fund - Innovation Grant Program - provides grants from \$5000 - \$7500 to local and regional nonprofit organizations or their public agency partners to help communities implement innovative solutions to problems caused by unmanaged growth. Recent Guidelines include projects focused specifically on wildlife, wetlands, and habitat protection. Contact the WWF/Innovation Grants, c/o Sonoran Institute, Suite D 6842 E, Tanque Verde, Tucson, AZ 85715.

## **APPENDIX B**

### **Stewardship Matrix & Guidelines (14)**