

# **Green Development**

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**PDH Now, LLC  
857 East Park Avenue  
Tallahassee, FL 32301**

<u>Introduction</u> .....	4
<u>Benefits of sustainable development</u> .....	6
<u>Background</u> .....	7
<u>History</u> .....	7
<u>Drivers for change</u> .....	7
<u>Challenges</u> .....	8
<u>Role of Government</u> .....	11
<u>Municipalities</u> .....	11
<u>Offsetting Density Strategies</u> .....	11
<u>Transfer of Development Rights</u> .....	11
<u>Agricultural and conservation easements</u> .....	12
<u>Land trusts</u> .....	12
<u>Public land acquisition</u> .....	12
<u>Zoning</u> .....	13
<u>Redevelopment</u> .....	13
<u>Site Selection</u> .....	14
<u>Nature in Florida</u> .....	14
<u>Key Questions</u> .....	14
<u>Brownfield, Redevelopment, Infill</u> .....	15
<u>Virgin Land</u> .....	17
<u>Site Design – conceptual</u> .....	18
<u>What are we designing today?</u> .....	18
<u>Certifications &amp; Guidelines</u> .....	23
<u>Transportation – Traffic</u> .....	25
<u>Site Designed – applied</u> .....	28
<u>Ecosystem Preservation</u> .....	28
<u>Restoration</u> .....	28
<u>Evaluation Benefit</u> .....	29
<u>Preserve valuable spaces</u> .....	31
<u>Paved Areas</u> .....	32
<u>Site Enhancement: Creating Passive Amenities</u> .....	33
<u>Preserve, Conserve, and Restore Open Space</u> .....	33
<u>Active Amenities</u> .....	36
<u>Pedestrian structure</u> .....	36
<u>Neighborhood parks</u> .....	36
<u>Community or Regional Park</u> .....	37
<u>Compost/Mulch facility</u> .....	37
<u>Amenity Buildings</u> .....	37
<u>Water Management</u> .....	38
<u>Stormwater Management</u> .....	38
<u>Stormwater From Pre-Existing Developments</u> .....	40
<u>Native Vegetation</u> .....	41
<u>Community pools</u> .....	42
<u>Environmentally Friendly Golf Course</u> .....	42
<u>Rainwater Harvesting</u> .....	43
<u>Horizontal Construction – Development</u> .....	46
<u>Tree Preservation</u> .....	46
<u>Erosion and Sedimentation Control</u> .....	49
<u>Minimize Soil Disturbance</u> .....	51
<u>Materials</u> .....	52

<u>Green Utility Practices</u> .....	52
<u>Vertical Construction – Buildings</u> .....	53
<u>Education</u> .....	54
<u>Development Team</u> .....	54
<u>Corporate Culture</u> .....	55
<u>Community</u> .....	55
<u>Residents</u> .....	55
<u>Signage</u> .....	56
<u>Marketing</u> .....	56
<u>Web</u> .....	56
<u>Management</u> .....	57
<u>Management Plans</u> .....	57
<u>Homeowner Impacts</u> .....	57
<u>Biological Monitoring</u> .....	58
<u>On Site Conservation Plan for a Specific Wildlife Species</u> .....	58
<u>Landscape criteria and management plan for common areas and amenities</u> .....	58
<u>Monitoring program</u> .....	59
<u>FINAL EXAMPLE - GREEN AT LAKEWOOD RANCH:</u> .....	60

## INTRODUCTION

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From 1990-2000 Florida's population grew by 23.5 percent, with an increase of three million people. Approximately 6,000 people move to Florida each week. Over the last five years, the number of new single-family detached homes built each year in the state has grown steadily from 117,310 in 2001 to 185,072 in 2004, making residential construction a primary driver of Florida's economy (U.S. Census Bureau). As a direct consequence of this growth, demand for energy and water is steadily increasing and Florida's natural environment is being rapidly transformed. Growth impacts Florida in many ways, from its schools, transportation system, and affordable housing market, to the quality of life for current and future Floridians. Such development pressures make Florida an excellent target for introducing sustainability as an integrated approach to addressing the state's environmental, economic, and social needs.

Although the term "sustainable" has been defined in several ways sustainability simply stated is "...leaving resources for tomorrow, while living a comfortable life today." Sustainable development is development that allows for economic well-being, environmental protection, and overall quality of life for people today without compromising the ability of future generations to meet these needs.

The basic principles of sustainability are simply defined by decisions that are made based on an equitable balance between environment, society and economics. A concept much more easily described on paper than in practice. Our current societal structure focuses more on economic driving factors – somewhat disregarding, that indeed, all that we have, sell, manufacture, produce, reside in, drive on, ..., at one point, came from nature. Our purpose here is to narrow down a very global topic in terms specifically of sustainable development to focus more on the details of our considering the environment while planning our neighborhoods, communities, towns and future.

I have identified three extremely fundamental reasons I feel making a shift toward more sustainable development is the right thing to do. The wave of sustainable development and green building is here and it is not to be ignored. World wide support for this movement exists and is rapidly increasing.

1. Protect the environment – the beauty that drives "our clients" to Florida to purchase land and homes
2. Protect our environment – our own homes, our communities for the future of our families
3. Protect the long term sustainability of our companies as individuals in the development and construction business – we need to sustain growth and development to sustain our jobs.

So if one of those three is not a driving force for you- stop reading now and go chop down a tree.

A thorough evaluation of the project site is one of the most important steps of the process. Investigate the physical aspects of the site—topography, vegetation, soil type,

surface and underground reservoirs. Research details pertaining to the development potential of the site such as demographics, economic and business characteristics, schools and public services, transportation patterns, and utilities available. The opportunities related to the actual design of the development such as lot size and density, street layout, architectural style should focus on optimizing the most advantageous features while working within the existing natural features of the site. Finally, the design team must comply with all local, state, and federal codes and regulations. The current political, financial, and cultural fabric of a community is likely to present as varied a set of conditions as the site itself. Lines between cities, town, and counties are not necessarily drawn according to natural boundaries such as contours, waterways, vegetation, and soil type. Land use ordinances, local building codes, property taxes, and even public attitudes toward development often differ within miles of one another. The responsibility to initiate and promote green development lies not only with the building community but with those who have control over the politics of land use and development as well.

The following government entities and public agencies have significant influence over the design, layout, and construction methods and materials that typically characterize residential developments. Planning Boards – Local zoning ordinances can have an enormous impact upon the character of developments and neighborhoods. A green building program can provide the forum for a municipality to review existing local laws and perhaps re-evaluate the implications of some of their current ordinances.

## **BENEFITS OF SUSTAINABLE DEVELOPMENT**

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Everyone benefits from an environmentally sensitive approach to growth and development. The following summary lists some of the benefits different constituencies gain from sustainable development:

### **Citizens/Taxpayers**

- More affordable and energy-efficient housing
- Reduced utility costs
- Cleaner water and air
- Reduced commuting time
- Improved quality of life
- Increased durability of housing
- Improved health
- More secure home investments
- Lower infrastructure operating and replacement costs
- More tax resources available for improved schools and public facilities

### **Builders and developers**

- Competitive advantages from building green
- Improved image and public goodwill
- Reduced land and infrastructure costs
- Fewer consumer complaints
- Fewer regulatory hassles
- Healthier construction conditions

### **Lenders/Realtors**

- Expanded markets
- Improved resale values
- Reduced foreclosure risks
- Improved image and public goodwill
- Increased competitive advantages
- Access to secondary market financing incentives

### **Local governments, regulatory and economic development agencies**

- Increased tax base
- Reduced service delivery costs
- Competitive advantage over areas with lower quality of life
- Reduced need for additional roads and infrastructure
- Extended life of existing schools and public facilities
- Reduced need for additional power plants
- Increased life of existing land and water resource base
- Reduced cost of water purification and sewage treatment
- Extended life of existing landfills
- Protected natural resources
- Preserved agricultural resources
- Increased economic diversity
- Increased housing affordability
- Relief from federal regulations

### HISTORY

The “urban sprawl” that typifies the majority of development radiating from our modern urban centers started simplifying as a way of providing affordable individual space to an increasingly individualistic society. A sign of the times was the family automobile, post WWII, the end of rationing and the beginning of the new American dream. At that point in our history, and the growth and development of our country, it is that we did, right or wrong it is our past. The sense of community that we were seeking, with the white picket fence and well manicured lawn was lost when we no longer saw our neighbor every night on the front porch. But today, we know that the growth pattern we established- as Americans- is not sustainable- it is not the most environmentally responsible plan, we know better, and we do possess the inspiration, tools, and willingness to change.

Growth when handled unsustainably can result in degradation of air quality, water resources, open space, natural systems, and general quality of life. The environmental concerns that threaten our communities include:

- Overdrawing groundwater aquifers,
- Fossil fuel dependent economies,
- Large-scale hyper-efficient centralized commercial agribusiness
- Loss of open space
- Sprawling development

Many costs associated with sprawl type development are higher than that for compact development with a major exception, depending on the location and duration of land ownership, being the cost of the land. Many long time land owner, original large family owned farms which currently mainly reside in what are commonly considered rural lands are at a tipping point of turn over for the land development market. Direct costs are higher for permitting, waste disposal, and infrastructure. Environmental problems can produce negative publicity and reduce the attractiveness of a particular development or even an entire community to real estate investors, corporations, and families.

The enviable growth in the southeastern economy has been fueled in part by the rapid conversion of raw land into housing, roads, and businesses during a period dominated by the automobile and sprawl-style development. Developers, environmentalists, and regulators have become increasingly confrontational about the causes and effects of rapid growth and loss of green space. One result is that several national real estate trend setters have downgraded these markets with respect to real estate, one example being the Atlanta market

### DRIVERS FOR CHANGE

The traditional business factors of design and development such as – cost, revenue, net profit, and marketability – play an integral role in any development project. However, when we are working with sustainability net profit is redefined based on additional sets of values beyond traditional business factors. This is known as the triple bottom line; a bottom line which takes into account not only economic considerations, but also

environmental and social factors. The shift to a triple bottom line is, in part, a response to a change in customer and market expectations. This shift in mindset includes:

- Increased environmental awareness
- Measuring impacts, environmental and social, beyond project boundaries
- Improving communities through redevelopment
- Changing corporate culture toward sustainability

Businesses, whether privately held or public companies that answers to investors, are challenged to shift corporate culture toward sustainability. Such a transition will not take place overnight, and for larger companies in particular, their size will provide an additional hurdle to clear along the way. But it is a transition which must and should occur, and one which is already happening as public companies find value in sustainability indexing and a changing mentality and culture among their investors. As you are aware, when we deal with Sustainable we are always dealing with the Environment, Economics, and Sociological issues – in balance – “Green” focuses first, from an environmental standpoint – what we are seeing is that 70-80% of consumers say they are switching their investments to “green” companies; in 2006 20% actually did. It is estimated that in 2007 this will be \$200B worth of investments, 2010 (\$420B), and by 2015 (\$845B).

#### Low-density growth increases infrastructure costs

Low-density sprawl land patterns are one of the most costly development styles to maintain. The miles of streets and public infrastructure must be regularly maintained by local government and taxpayers which often results in unnecessary financial burdens to both.

#### Sprawl causes loss of economic diversity

Studies show that low-density residential development rarely pays for itself in terms of services demanded. In areas of low density, very high housing values are needed to compensate for the “lack of quantity”. This value often exceeds \$500,000-which is not commonly the house value in low density areas. Without high value homes there is not enough tax reserve generated to support even the basic service needs of the more “rural” area.

#### Congestion can result in loss of federal resources

Regulatory penalties are a significant downside to uncontrolled growth. As a result of extremely poor air quality associated with congestion caused by sprawl development, communities such as those in the Atlanta region are currently ineligible for new federal highway funding. Communities that do not yet suffer from the congestion and air quality problems facing Atlanta can avoid loss of resources by implementing more sustainable development patterns.

#### Rapid growth causes loss of farmland and wildlife habitat

The rapid suburbanization of land around cities has had a tremendous impact on the family farm and on wildlife. As fields and woods are converted into subdivisions, habitats can become fractured, natural waterways may lose their ability to support healthy fish populations, and once open pastures and farm fields no longer provide relief from the fast-paced life of our cities.



## CHALLENGES

Increasingly throughout the United States, communities are struggling to deal with a host of environmental concerns surrounding growth and development. A variety of voluntary and regulatory approaches have attempted to address these concerns through grassroots efforts such as regulation, economic incentives and industry-focused campaigns. The complexity, scope and specificity of the environmental issues, the diversity within communities and among stakeholders, require a community-specific approach to solutions, i.e., no one size fits all. Some common challenges noted from past experience follow.

- Conflicting regulatory environment with differing local, state, and federal definitions and standards.
- Fragmented approaches to management and planning; lack of coordination between agencies and departments, e.g., agencies that oversee water, transportation, wildlife, building, energy efficiency, etc. only deal with their specialty area.
- Insufficient flexibility on the part of regulations to meet overall goals
- Environmental protection measures often have a limited focus on water and hydrology, while not adequately addressing the need to keep biological connections intact. For instance, road development is driven by water regulations, yet under road pipes and culverts don't meet the needs of wildlife.
- Habitat fragmentation and loss is growing across the state. For instance, there is a need to protect wetland upland habitat complexes, yet there are no regulatory mechanisms in place to ensure such protection.
- Long-term care of preserved natural areas within residential communities. Issues include: community governance, funding, and who will be responsible for management.
- Conflicts between scenic/amenity values and wildlife/ecosystem values of natural features.
- The ultimate interests of different agencies may vary - among them local building departments, county planning departments, public health departments, highway departments, state soil and water conservation departments, lending agencies, and the community at large.
- Environmental issues vary dramatically from site to site with respect to complexity, scope, and specificity
- Community stakeholder opinions vary significantly from organization to organization and individual to individual – although they may have a great cause, individual passions may drive a specific “fight”
- Some preservation, conservation, and restoration efforts are governed and some are not – some have guidelines, and some do not – here are a number of diverse agencies and institutions trying to assist in the effort however no unified effort that is genuinely helpful.
- Lack of a common language for various stakeholders to come together and begin a dialogue on sustainability and resource efficiency in the built environment.
- Failure to overcome the communication hurdle.
- Lack of buy-in on the part of employees.
- Inability to meet product and size regulations – condensing development onto the appropriate locations within a property.

- Missed opportunities to increase open space or design more compact/dense development.

At this point it is worth stating, from experience, two extreme perspectives noticed when it comes to guiding the green and sustainability movement. When working with research or environmental organizations often their recommendations or guidelines are stated as “protect trees” or create wildlife corridors”. From their perspective this is a perfectly clear directive and they desire the flexibility and freedom of interpretation to decide what that means on a given site, in a given location, provided a site evaluation, based on, no doubt a few months of research, given specific trees and wildlife. At this point usually the engineers have left the meeting rolling their eyes because from a design team, developer, planner, engineering perspective we immediately are asking, what type of tree? How many? What caliper? How wide does the corridor need to be? Define a corridor? Can a stormwater detention pond be in the corridor? Basically “tell me what to do”. This is just a product of our individual professional training. Unfortunately it often causes conflict in meetings because it is perceived as no one is agreeing or getting the answers they need. The answers are there, just be patient and communicate.

As a general rule I would say that most of us are not looking for the government to increase their rules and regulations surrounding the development and construction process. One of the most critical roles the government agencies play at this point, is to incentivize the sustainability movement, something Sarasota County has done extremely well. In addition to incentives, an interagency review of current regulations for cohesiveness, may also assist in resolving any contradicting guidelines or requirements that can be confusing when planning a sustainable community.

Developers can take a leadership role in promoting a new corporate culture of sustainability, and thus improve resource efficiency within Florida's built environment. Finally, city, county, and Florida's state governments have an important role to play, in tandem with developers, in enabling and encouraging resource efficient design and development. That role can include: public land acquisition for open space/natural area protection; regulation; providing incentives; and removing code impediments to the implementation of resource efficient communities.

### **MUNICIPALITIES**

Municipalities can identify key natural areas and resources within the community in order to develop and follow a plan for sustaining large-scale conservation areas. Current practices rely or require each development to establish, create or restore natural areas, however, rarely is there ever a connectivity established beyond the berm of the property line. This results in disconnected natural areas that do not function or provide, on a regional scale, the desired result. Municipalities can, through incentives, encourage developers to adopt sustainability principles into their projects. Incentives may include a reduction in the cost or time involved in the permitting process. Incentivized participation in a third-party program such as the Florida Green Building Coalition (FGBC) Green Development Certification may also help to achieve long-term sustainability goal of the community.

### **OFFSETTING DENSITY STRATEGIES**

To encourage protection of open space or to create watershed buffers and greenways, some communities are negotiating with developers seeking land use changes or zoning variances. In exchange for greater density on one portion of their land, developers agree to permanently set aside open space. The same number of units overall are achieved on less land.

### **TRANSFER OF DEVELOPMENT RIGHTS**

Transfer of Development Rights (TDR) allows a developer to increase the density of development on one piece of land by paying to preserve open space in another part of the district. Generally, TDR programs are established under local zoning ordinances. In the context of farmland protection, TDR is used to shift development from agricultural areas to designated growth zones closer to municipal services. The parcel of land where the rights originate is called the "sending" parcel. When the rights are transferred from a sending parcel, the land is restricted with a permanent conservation easement. The parcel of land to which the rights are transferred is called the "receiving" parcel.

### RURAL LAND STEWARDSHIP

The Rural Land Stewardship Area (RLSA) encourages the protection of the environmental, retention of agriculture, and diversification of the rural economy by application of an incentive-based system. This incentive based system allows a landowner to obtain land-based Stewardship Credits from designated Stewardship Sending Areas (SSAs) which protects natural resources and agriculture, and allows the landowner to utilize those credits in Stewardship Receiving Areas (SRAs), where new communities are permitted.

Communities and Organizations Dedicated to Sustainable Growth Seaside, Florida sparked a “new movement” in city planning known as New Urbanism. The Congress of New Urbanism was formed by Peter Katz, Peter Calthorpe, Andreas Duany, and Elizabeth Plater-Zyberk. In this case architects, planners, and developer won approval to build 370 homes on only 45 acres of land (about 10 units per acre when roads are subtracted ) in exchange for agreeing to set aside 30 acres for natural areas and trails. However, many area residents fought this new subdivision because it varied from their concept of how to slow growth by lowering density. Today seaside is one of the most popular and sought after neighborhoods with homes averaging \$750 per square foot upon resale.

Other states using TDRs include New Jersey, Maryland, and California.

### AGRICULTURAL AND CONSERVATION EASEMENTS

Agricultural or conservation easement purchase programs enable landowners to separate and sell away their right to develop land from their other property rights. The easement buyer receives the right to ensure that the land remains either agricultural or otherwise undeveloped. After selling an easement, the landowner retains all other rights of ownership, including the right to enjoy its natural beauty, prevent trespass, sell, bequeath, or otherwise transfer the land. Land developers can use easements as a way to permanently set aside portions of their developments as open space in exchange for increased density on a portion of their parcel. Generally, there must be a nonprofit or governmental entity available to “purchase” or accept conservation easements in order to permanently protect and maintain the easement.

### LAND TRUSTS

An effective private sector strategy to preserve open space is through the creation of land trusts established to acquire and protect open or wild lands in perpetuity. Land trusts usually operate in a particular area that is exposed to growth pressures or the threat of losing a locally valued natural asset. Land trusts can either seek to own property outright or purchase conservation easements from willing sellers. One example is the Nature Conservancy is a large national land trust that owns and protects hundreds of thousands of acres of wild lands on behalf of its many members and contributors.

## **PUBLIC LAND ACQUISITION**

Many communities faced with rapid growth and water quality concerns resort to outright purchases of valuable open lands. While often costly, a permanent revenue source tied to real estate transfer taxes (or another source) can be effective. At the same time, local government concern about loss of the property tax base is usually unwarranted. The value of land adjacent to permanently protected natural areas typically increases in value. In the long run, the entire area benefits from quality-of-life improvements that can set a city or county apart from its competitors.

## **ZONING**

Currently, many communities frustrated by rapid growth have adopted a land use plan that restricts housing development to a very low density level (such as 2-acre lots) in the hope of preventing urbanization of the area. Unfortunately, the result is an escalation of sprawl as houses become more spread out and infrastructure and roads eventually fill the county to its borders. Little or no open space is preserved for public enjoyment or environmental services.

While the concept of a conservation subdivision may appeal to many developers, many current zoning codes may prohibit them. It is important to gain community understanding of the goals of open space preservation. A change in the zoning to what some call “open space zoning” may be required. Encourage changes to zoning regulations that can create incentives for open space preservation.

Incentives can include

- Streamlined zoning and permitting review process
- Allowance for an increase in density
- Reduced impact or other “hook-up” fees
- Tax benefits

### The Trend

Today, hundreds of communities across the country are looking at new land use plans that reduce reliance on the automobile. Whether in areas that can justify high density with transit or in smaller towns and urbanizing areas, a well planned approach that results in central places and pedestrian access to community facilities should be the primary organizing principle. By creating incentives for compact development in less environmentally sensitive areas, communities encourage preservation of open space. Preservation can be encouraged using Environmental Performance Zoning, which establishes areas the community wants to protect in exchange for permitting higher density on less sensitive sites. Benefits include

- Clearly defined open space, “no build” areas of the community
- Well-defined development patterns designed to encourage more pedestrian-friendly communities
- A basis for establishing TDR and other land preservation incentive programs
- Improved watersheds and wildlife habitat
- Improved opportunities for shared community spaces and recreation.

## **REDEVELOPMENT**

Cities and regional governments can also create incentives to encourage development in or near the central city and on lands that require cleanup, known as brownfield site.

The U.S. Environmental Protection Agency (EPA) is trying to streamline the regulatory and legal barriers that have inhibited the redevelopment of these sites. Many urban core cities are creating so-called Empowerment Zones, Enterprise Zones, and local Tax Increment Finance districts to encourage in-fill and brownfield redevelopment.

### **NATURE IN FLORIDA**

Florida's natural ecological, geographical, and climatic features give a builder and developer many natural advantages when it comes to sustainable development. Natural features that can benefit our communities:

- Sunlight
- Water systems
- Wind direction and frequency
- Materials

### Environmental problems

There are several environmental problems associated with the construction and land development industries including waste, non-point source pollution, habitat disturbance, hazardous materials, and erosion. Sustainable development and "Green" design and construction minimize these effects and provide homes and communities that are healthy, efficient, durable, and provide a connection to the environment while protecting our natural resources.

### Bioregions

It is important to remember that Florida is a large state and its extremities have large character differences. This affects the availability of materials and products, as well as design strategies. In general, Florida's summers are long, warm and humid, and its winters tend to be mild with occasional intrusion of cool to cold weather from the north. Rain is abundant and, with the exception of the northwestern portion, the state has two seasons, a short (four-month) "wet" season and long, relatively dry season.

### Wind speed direction and Frequency

Wind direction and frequency are important factors in designing and planning a community from a durability and comfort standpoint. In recent years, appropriately so, a significant amount of our focus has shifted to durable storm proof designs – of which long lasting structures are indeed the most sustainable.

It is important to consider Florida's climactic, ecological, and geographic character in order to understand and appreciate the issues and strategies relative to residential construction. All of these factors play a critical role in achieving efficient comfort levels using passive and sustainable techniques in construction.

### **KEY QUESTIONS**

By asking the following questions, those responsible for carrying out development and consumers selecting places to live can ultimately create a sustainable future for our communities:

- Does the development maximize use of existing infrastructure and minimize new infrastructure?
- Does the development minimize dependence on the automobile and promote other forms of transportation?
- Will the development form a livable and long-lasting community?
- Does design promote social interaction and places for random encounters?

- Were natural habitats, watersheds, and fertile soil resources preserved during and after construction?
- Were productive farmlands and cultural resources preserved?
- Are homes and other buildings in the development energy efficient?
- Were building materials used efficiently?
- Were renewable building resources used?
- Were construction waste products recycled during construction?
- Were healthy building materials used?
- Are buildings sturdy, adaptable, and of high quality?

### **BROWNFIELD, REDEVELOPMENT, INFILL**

Vast amounts of inner city land were skipped over in the rapid suburbanization of America. Some inner city land is avoided because of perceptions about schools and crime; other locations may have environmental problems that are difficult and costly to overcome. Rural areas are often easier to develop than the abandoned, idle, or underused commercial or industrial lands, or brownfield, of cities and have less negative associations in the eyes of developers. The result is the destruction of open space and a resulting abandonment of the inner city.

Inherent benefits to these projects are that they do not require the expansion of existing infrastructure. Some adjustments or additions may be necessary but for the most part roads, utilities and other necessity are pre established. Redevelopment, infill and brownfield sites are often also in close proximity to means of public transportation; this results in multiple community benefits such as not increasing traffic congestion, fewer new roadways are needed, saving public lands; and the potential for increasing local jobs.

One example of a successful redevelopment project is Baldwin Park.

, demolition and planning and has resulted in a true mixed-use community in the center of “strip mall” Orlando. The redevelopment process involved demolition and recycling of 256 buildings comprising 4,500,000 square feet, 25 miles of roads, and 200 miles of underground utilities that resulted in 600,000 tons of clean concrete for reuse.





Baldwin Park



### Redevelop/ Infill

Many available project sites, if they are located in urban areas, will contain previously impacted or developed property. This may be something as small as a single Mom & Pop store with a few parking spots to some sites where the entire property is a preexisting concrete nightmare. Depending on the previous developments date, style, architecture, and current land values, redevelopment may be a profitable alternative. If we are talking redevelopment versus Brownfield we may assume the site is not contaminated. The challenge here is – do you or can you incorporate what exists on the site into a new plan or is designing around the current site more environmentally detrimental and constraining. One option is to remove and recycle the existing structures and infrastructure if needed to create a well planned comprehensive environmentally responsible community.

Redevelopment and/or infill can be cost-effective since utilities, streets, sidewalks, etc. are already in place. In addition, construction costs and resource use may be reduced given that existing building shells and/or foundations may be usable as well.

## Brownfields

The repair of damaged areas can also apply to the clean-up of industrial or commercial areas to create a cleaner, healthier place for human habitation. There is indication that Superfund liability may be easing. The EPA has funded site assessments and the development of remediation plans prior to cleanup. Federal tax incentives are available and some communities have established revolving loan funds to finance the environmental clean up. This may be an opportunity for developers to work in cooperation with local agencies rather than in conflict. As with any property, developers must simply balance the advantage of a Brownfields site—most typically prime location and government subsidy—with the disadvantages of a contaminated site. Not all Brownfields properties are created equal; developers are encouraged to neither ignore the obstacles nor the opportunities these sites can present.

### **BROWNFIELD**

Just twenty years ago, Chattanooga, Tennessee, was considered one of the dirtiest cities in America. A concerted effort begun in 1984 has completely turned Chattanooga around. The city made use of former brownfield sites, lining a once foul river with parks, an aquarium, and new commercial and residential development. Led by a tremendously diverse group of citizens, business leaders, government agency heads, nonprofit groups, and professional planners and designers, Chattanooga has put a new plan into play for the 21st century that it believes will make the city into the environmental showcase of the South.

### **VIRGIN LAND**

The alternative to redevelopment and infill is virgin land – or at least land without many structures on it. Many of these land parcels that are currently “in play” for development were previously used for agriculture or ranching. They most often either were formerly citrus which has succumbed to canker or freeze or improved pasture having owners that are no longer interested in ranching and farming. There are the rare finds or the unique spots on these tracts that have survived undisturbed – we all know them when we see them, we recognize their value and plan around featuring them in the communities we develop.

### Agricultural Lands

Although commercial agriculture has certainly contributed to the decline of natural ecosystems and species diversity, farming is central to the economy and way of life of many communities. Many counties are struggling to find a pattern of development, one that equitably resolves potentially competing forces of urban renewal farm level preservation and residential development. Two approaches to agricultural land preservation are to incorporate land available for farming to the community. The second in use in Florida is the Rural Land Stewardship Program.

An important component in a sustainable future is keeping the understanding, importance, and respect for agriculture alive in future generations. One way to do this is to dedicate an area of your planned community for some agricultural use. This can be something as small as an herb garden for the community chef to an organic farm in partnership with the community and local school.

## AGRICULTURE

According to a recent report of the American Farmland Trust, a nonprofit organization working on preserving threatened agricultural lands in the United States, 79% of the nation's fruits, 69% of its vegetables, and 52% of its dairy goods are now produced on high-quality farmland threatened by sprawl. With the U.S. population expected to jump 50% by the mid-21st century and high-quality farmland projected to shrink 13% within the next 60 years, the nation could become a net food importer instead of a net food exporter.

### WHAT ARE WE DESIGNING TODAY?

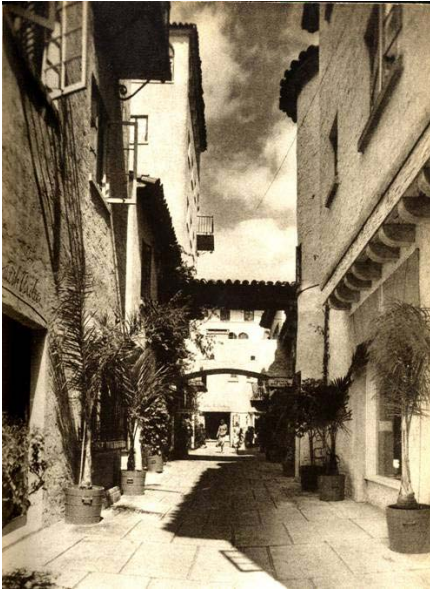
Where the design team and planners will travel with respect to community feel, aesthetics, density, features, and functionality of the project is driven by the business decisions that the project will, in theory, work. Someone has done their homework and has an idea that we can get so many units on the site, this age group is likely to live here, this is the amount they are willing to pay, so how do we pattern all the normal components of a community into a functioning sustainable development?

### Traditional Neighborhood Designs

As the name implies, Traditional Neighborhood Designs (TND's) suggests a return to the kinds of neighborhoods built before the Second World War, when the automobile did not dominate the landscape. With TND, towns and cities are composed of neighborhoods in which people can live, work, and play. All neighborhoods have well-defined town centers and provide a mixture of amenities that include parks, bikeways, sidewalks, and walkable shopping areas. The following are basic TND principles:

- All lots are readily accessible to local retail and recreation on foot or by bicycle (a distance not greater than ¼ mile).
- Housing types are mixed and in close proximity to one another.
- Street networks are interconnected, blocks are short (around 200 feet), and street widths are minimized.
- Building setbacks from the street are reduced and building fronts incorporate porches and other gathering places.
- Civic buildings are given prominent sites throughout the neighborhood.
- Parking areas and garages are placed at the back of buildings or lots.
- Neighborhoods are a minimum of 50 acres and less than 200 acres.

TND has the potential to use less than a third of the land area required for the average suburban developments. A typical 350-home subdivision requires approximately 100 acres for building lots, streets, and utilities, with no significant amount of open space preserved. A development of the same size using a TND model preserves about 20% of the land for open or natural areas and more than doubles the number of residents.



The two pictures I think of when people say New Urbanism

### Transit Oriented Developments

Most early American cities grew along trolley or rail lines. The automobile changed that pattern in the 1950s, when the era of low-density sprawl development began. Planners are revisiting development where transit links communities and permits higher-density developments that make the most efficient use of land and use the least energy.

#### CASESTUDY TRANSIT

The Metropolitan Atlanta Rapid Transit Authority (MARTA) is preparing to build an entire new “town” around one of its major transit stations. This new “24-hour” city will include office, retail, hotel, apartment, and condominium space built around a rail station with direct access to downtown Atlanta and the airport. Car ownership will be optional. The potential energy savings and pollution reduction are dramatic.

### Cluster Development

Clustering buildings not only leaves larger areas of open space for wildlife habitat, native vegetation, and/or recreational use, but can also foster an increased sense of community in a tighter knit neighborhood. In connection with this is the idea of allowing multiple dwellings on a single property. This also can preserve open lands and reduce utility installation costs as well as minimize total site disturbance.

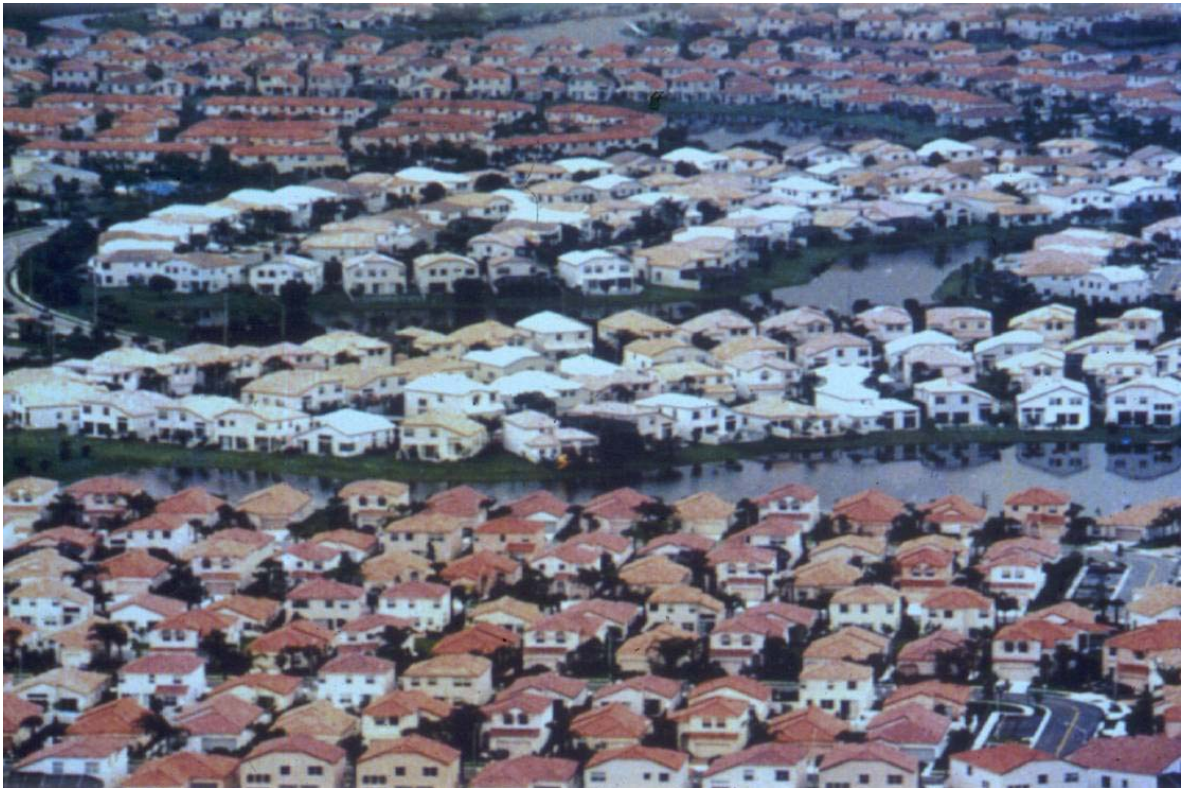
Clustered development can reduce infrastructure costs by reducing roadways, the length of utility lines, and the amount of earth moved. At the same time, the remaining large areas of open space can add value to the property. Market studies as well as numerous real-life examples have shown that people do place value on items such as these, which enhance quality of life. It can be difficult, however, at the local level to fight the “large lot” zoning ethic. Local zoning ordinances may limit opportunities for cluster development in some areas due to minimum lot size, building setbacks, and permissible number of dwelling units. The developer or builder may have to expend more effort

either to change these laws or obtain variances. However, at the same time, leaving large areas of land undisturbed is likely to be viewed favorably by planning officials and community members.

### Compact Development

#### *Benefits*

According to recent studies, the cost per dwelling unit for streets, utilities, and schools drops dramatically when density increases from rural to urban densities. Streets can cost 1/13 as much, utility systems cost 1/18 as much, and school construction costs 1/4 as much. Even small increases in density can cut infrastructure costs by as much as 35%. A change from 3 units per acre to 12 units per acre can yield • a 35% reduction in infrastructure costs (\$27,500 per unit vs. \$42,500 per unit for streets, utilities, and schools) and • a 10% reduction in total energy costs per household, or about \$500 less including home and transportation costs



Ok, I get the compact but where is the environment? Green space?

### Conservation Community

An alternative to conventional development is an offsetting density strategy, which enables developers to limit development to less environmentally sensitive portions of the site in exchange for increased density on the built-out sites. Lot sizes from 10,000 to 20,000 square feet ( $\frac{1}{4}$  to  $\frac{1}{2}$  acre) yield two to three buildable units per acre. Thus, a 40-acre subdivision could yield up to 120 homes. If the average lot size is decreased to 3,200 square feet (40 x 80 feet), the yield per acre increases to around eight units per acre. With the higher-density development, and with the total yield for the site limited to

120 homes, 25 acres of the 40-acre site are preserved. Developments that use this strategy are called conservation communities.

#### POLLUTION PREVENTION

Denser, mixed-use development requires far less transportation energy, resulting in less ground-level air pollution and fewer greenhouse gas emissions—as much as 15 tons less carbon dioxide per year for each family. If we combine transportation, home, and a portion of community facility needs (office, shops, etc.), the typical low-density household uses nearly 40% more energy per year than a high-density urban household, resulting in 40% more air pollution.

#### Master Planned Communities

Local governments will probably take years to enact major land use planning changes. In the meantime, “business as usual” solutions will continue to consume open space, harm wildlife habitat, and degrade quality of life. Creative developers have an opportunity to show leadership by incorporating liveable community features into their current plans.

Today, developers have exciting new planning options to choose from when creating their own communities. Many master-planned communities are incorporating an array of New Urbanist principles into their designs. Examples of these new urban communities include

- Blount Springs, Birmingham, Alabama
- Legacy Park, Atlanta, Georgia
- New Manchester, Douglas County, Georgia
- Seaside, Florida
- Celebration, Florida
- Harbor Place, Memphis, Tennessee
- Kentlands, Gaithersburg, Maryland
- Mount Laurel, Alabama

These planned communities are setting new standards for more compact, pedestrian-oriented development. Selling points for these communities include the friendly feel of the neighborhoods and the passive recreation opportunities that abound in the shared open spaces. Less emphasis is placed on private yards and golf courses. The new planned communities can greatly reduce the environmental impact of development on the land.

Benefits include:

- Tangible models of pedestrian-friendly communities
- Increased opportunities for transit linkage
- Reduced infrastructure cost to local governments
- Increased potential for mixed-income development
- A more stable tax base

## Smart Growth

Why is it when I hear the words Smart Growth I expect to see them as **S#!&\* G#\$&\*!** as if they are bad words. In the development and engineering world it seems this, after years, is a general feeling. Maybe it is just a lack of specific quantitative measures that I so desperately seek as an engineer that makes me feel this way...

The interactions of zoning, development, transportation, public facilities, taxation, and utility infrastructure that shape our communities and our lives are complex. Without a community plan to direct growth and develop sustainably, environmental and economic systems will suffer. In contrast, smart growth planning enables communities to plan for growth that enhances their economic, environmental, and social wellbeing.

## *PLACE<sup>3</sup>S*

More and more communities across America are seizing opportunities to plan for their future. One interesting method that has been developed jointly by the Washington, Oregon, and California State Energy Offices is called **PL**Anning for **C**ommunity **E**nergy, **E**conomic, and **E**nvironmental **S**ustainability or **PLACE<sup>3</sup>S**. Using energy and pollution as the measuring sticks, this highly comprehensive modeling system allows communities to see what differences are made by more versus less compact development, or by changing the mix of housing, jobs, and retail development. Benefits of smart growth planning include

- Increased community awareness and consensus about solutions to sprawl
- Comparison of infrastructure cost, energy use, and pollution for different development types
- Recognition of the regional value of forests, agricultural lands, and open space
- Opportunities to effectively promote pedestrian and bicycle options to local government

## Mixed Use Development/Communities

Allowing and encouraging multiple uses within a neighborhood can benefit a community economically as well as enhance the quality of life. Pressure on existing infrastructure may be reduced by minimizing private automobile use. People are able to travel by foot or bicycle more often. With the potential for the workplace to be closer to home, commute time may be reduced.

## *Historic Problems*

Modern zoning ordinances separate land uses to “protect” citizens from commercial or industrial land uses incompatible with residential neighborhoods. Such zoning has helped create modern sprawl, making an automobile necessary for even the shortest trips.

Most shopping is located on busy arterial streets that cannot be reached safely on foot from a residential area. Even pedestrian access from one strip center to the other is difficult or impossible. Offices and entertainment are even further removed. Multifamily housing is built as far away as possible from single family to “protect” property and family values. The result is congestion, visual clutter, loss of free time, and social inequity.



## *Benefits*

Mixing housing, retail space, and offices reduces energy use, land consumption, stormwater runoff, urban heat island effects, and vehicle miles traveled. Including restaurants, coffee shops, dry cleaners, and other services in the mix creates a more urban setting. The ultimate goal of mixing uses is to create a destination place that begins to function like a traditional town center. In particular, when jobs and housing are evenly mixed and closely located,

- Energy use can go down by 2.7 trillion Btu per acre per year, a savings of about \$25,000 annually
- Approximately 240 less tons of carbon dioxide per acre is generated each year
- Vehicle trip miles are reduced by at least 50%, greatly reducing air pollution

Note that very few authorities will let you claim a 50% internal capture for this type of design.

Costs to municipalities, developers, and residents can be lower with respect to initial infrastructure costs, ongoing maintenance and repair, and transportation. While mixed use developments may provide greater opportunities for families to live, work, and recreate within a small community, the actual reduction in automobile use will depend on the relationship between job centers and non-vehicular systems and the personal preferences and behaviors of residents.

## **CERTIFICATIONS & GUIDELINES**

### FGBC (Florida Green Building Coalition)

Located in the appendices of this book you will find the checklist for several Green Development Certification programs. Where applicable the entire checklist is included such as the FGBC checklist which in its entirety is entirely specific to the horizontal land development process. Many other programs combine both the land development and building components in those instances only the portion of the checklist that is applicable to the horizontal land development is included.

The goal of the Florida Green Building Coalition (FGBC) Green Development Standard is to recognize those developers who have *far exceeded* the minimum Florida law requirements. The standard requires substantial environmental stewardship beyond typical practice. Through planning and dedication to green development the design team works to ensure compliance with the FGBC requirements. This level of planning can only be done through knowledge of the site as well as applying best management practices regarding wildlife preservation, stormwater, transportation, landscaping, and utilities.

This standard was developed by the Florida Green Development Working Committee of the Florida Green Building Coalition, Inc. The committee had active participation from one or more architects, builders, consultants, developers, ecologists, educators, energy raters, government agencies, landscape architects, planners, Realtors, researchers, and water-management district personnel. More information may be found at [www.floridagreenbuilding.org](http://www.floridagreenbuilding.org).

The Standard requires a minimum number of points are achieved in the following categories:

Category 1: Protect Ecosystems and Conserve Natural Resources: Requires extensive preservation, conservation, restoration, and mitigation.

Category 2: Circulation: Addresses the environmental impacts of transportation, motor vehicle emissions, pervious surface, runoff and pollution prevention and requires locating residences where there are schools, shopping and office areas nearby; providing adequate alternatives to the private automobile. Requirements also address green road design should assure close access to destinations, pedestrian structure, building orientation, street trees, minimal street lighting and green road construction materials.

Category 3: Green Utility Practices: Requires the minimization of environmental consequences due to the installation of utilities regarding land use, tree plantings, and irrigation . The standard sets forth stringent requirements for natural resource conservation.

Category 4: Amenities: Provide beneficial impact on the environment relative to typical practice. Nature parks and common preservation areas provide for common areas of intense use instead of many parcels trying to provide many less-efficient amenities.

Category 5: Covenants and Deed Restrictions: Developers can exercise considerable influence and control over purchasers by incorporating environmentally sound practices into covenants and restrictions for individual purchasers.

Category 6: Provide Educational Information to Help Achieve and Promote Green Living Practices: Requires educating all members of the development team, builders and future occupants through workshops, signs and written material about green practices which leads to increased awareness and environmental benefit on-site.

#### LEED Neighborhood Design – Pilot Program

The LEED Neighborhood Development program is currently in their pilot phase. This rating system is designed, according to the US Green Building Council, to certify exemplary development projects that perform well in terms of smart growth, new urbanism, and green buildings. Projects may constitute whole neighborhoods, fractions of neighborhoods, or multiple neighborhoods. The pilot phase of this program is currently underway. In my initial review of the program I identified two challenges from most communities, which I commonly deal with, in Florida. Two of the REQUIRED prerequisites seemed to “disqualify” most of my projects. First, if you have a residential density less than 10 units per acre you can not impact more than 5% of any wetlands on your site – no on site mitigation, no off site mitigation you can not touch anything over 5% of your total wetland area. The second required prerequisite is that the minimum residential density is 7 units per acre – which in some communities is possible but depending on the amount of preserve you set aside you may not achieve that density.

#### Audubon International

Audubon International is an independent non-profit environmental organization whose vision is “to foster more sustainable human and natural communities through research,

education, and conservation assistance.” The organization’s mission statement provides a more focused description of that vision: *To educate, inspire, and assist millions of people from all walks of life to protect and sustain the land, water, wildlife, and natural resources around them.* To use the organization’s tag line, Audubon International “helps people help the environment...where they live, work, and play.”

The three programs involved are:

- Audubon Cooperative Sanctuary Programs – A program for existing facilities; Promote ecologically-sound land management and the conservation of natural resources through education and certification programs that are tailored to a diversity of land uses within communities, including: corporate and business properties, golf courses, cemeteries, schools, residential communities, resorts, and individual properties. Participation helps people plan, organize, implement, and document a comprehensive environmental management program and receive recognition for their efforts.
- Audubon Signature Program – A program for new developments; Education and certification programs that provide comprehensive environmental planning assistance to *new developments*. The programs assist owners and developers in applying sound environmental conservation and sustainable development practices while planning, designing, building, and managing the development.
- Sustainable Communities Program – A more comprehensive umbrella program which encompasses environmental stewardship but also more explicitly deals with sustainability and more complex issues such as long-term strategic planning for communities; Assists municipalities in merging economic development with the protection and enhancement of a community’s environmental and social characteristics. Audubon International serves as a catalyst for citizen-driven planning and community action and facilitates partnerships with governmental agencies, businesses, academic institutions, and other organizations that provide local support and assistance to reach the goals envisioned by the community. Working at this level enables municipalities to take a *big picture* approach to community growth and environmental protection.

## **TRANSPORTATION – TRAFFIC**

About 35% of the state’s primary energy use goes towards transportation, and motor vehicles emit several pollutants that EPA classifies as known or probable human carcinogens. EPA estimates that mobile (car, truck, and bus) sources of air toxics account for as much as half of all cancers attributed to outdoor sources of air toxics. Surfaces for transportation and parking of vehicles decrease pervious surface areas and lead to runoff that has to be controlled to prevent pollution to our water bodies. Sustainable communities should be located or designed so that access to basic needs are within walking distance. Ideally the desire is a safe 5 minute walk to schools, shopping, offices, and daily services but realistically we know most do not want to live in that kind of density.

### Road Design

For many communities and municipalities, the costs for the construction and maintenance of streets and related infrastructure constitute the largest portion of their budgets. In developments or subdivisions where road maintenance will be taken over by

the city, local authorities are very particular about the design and specifications for streets. There are several reasons for this:

- Ease and cost of regular maintenance such as street cleaning.
- Cost and frequency of repair.
- Potential liability in the case of accident or injury.

The reality for most projects in Florida is that traffic is a rate limiting step, the one thing everyone in the room tunes in for – although not that exciting. Our rapid growth and lack of alternatives to the automobile are constraining our abilities to achieve the next level of advances in land planning. There is a desire for infill from a sustainable approach but this would increase traffic on currently overcrowded roads. Creating new communities “inland” from either coast could reverse the current traffic patterns and relieve some of the congestion however this is considered “sprawl” by many.

### Street trees

In addition to creating one fine looking neighborhood –again my opinion- street trees provide several community benefits beyond aesthetics. Trees provide shade for sidewalks, a necessity in the Florida heat to encourage pedestrians and bicycle use in lieu of the automobile. The shade also reduces the heat island effect of solar radiation on concrete (sidewalks), asphalt (roadways) and pavers making for a cooler community (see section in Horizontal Development Specific to Tree Protection for more information). Trees can also assist with traffic calming, reducing air pollution, and saving energy by shading buildings.

#### TREES – COOL COMMUNITIES

Cool Communities is an action-oriented energy-reduction program of the nonprofit group American Forests. Cooperative federal support is provided by the EPA, the Department of Energy (DOE), the Forest Service, the Department of Defense, and other agencies. Cool Communities mobilizes government agencies, businesses, and citizens to create positive, measurable change in energy consumption and the urban environment through strategic tree planting and light-colored surfacing, and to increase public awareness of these issues. In 1992, seven model communities of various climates and sizes were selected to initiate the program. Using information from the EPA’s guidebook, *Cooling Our Communities*, and American Forests’ tree-planting handbook, *Growing Greener Cities*, local advisory groups in each community have been reducing energy use, planting trees, lightening surfaces, and providing examples for other communities to develop similar environmental improvement campaigns. American Forest research has revealed the following information: • In metropolitan Atlanta, Georgia, vegetation provides more than \$1 billion in stormwater management benefits. • By reducing airborne carbon, trees provide a value of \$9.2 million in Austin, Texas. • In Dade County, Florida, \$14.4 million in energy savings could be achieved by planting just one tree at each residence.

## Lighting

From an aesthetic standpoint we light our communities for atmosphere and security, however lighting accounts for 20% to 25% of all electricity consumed in the United States. As seen in this evening satellite image of North America light pollution of our night skys is no longer isolated to urban areas. Many communities are implementing Dark Sky requirements as well as meeting appropriate standards to protect wildlife from invasive lighting. In addition since the energy use is significant and energy costs are showing no sign of declining it is appropriate to consider a life cycle cost approach to community lighting versus just a traditional initial cost fixture approach. The true cost to the developer and the future residents of the community include the associated electric bill no doubt conveyed through an association. If the selection of an incrementally more expensive fixture or bulb can result in reduced energy consumption not only have we reduced the associations bills ( and developers carrying the costs until conveyed) but we are saving energy, reducing CO<sub>2</sub> emissions and just doing the right thing. Motion sensors and solar lighting are other great alternatives to consider.



North America Night Sky

## Parking

Historically, parking lots are an oasis that create a giant heat island – but with well planned mixed use communities parking is integrated throughout the community and shaded, to reduce the heat island effect. Parking paces are shared between commercial, residential, civic and religious institutions parallel parking is more common as are angled spots which provide opportunities to use alternative pervious materials in smaller more affordable quantities than if trying to hardscape a large parking lot, These parking designs are also more conducive to shading with trees as most are adjacent to sidewalks versus other parking spots where we are most likely already planting trees.

### HEAT ISLAND

#### The Heat Island Effect in a Parking Lot

*NASA has been documenting the heat island effect for a number of years. For example, heat-sensitive photographs of a shopping mall in Huntsville, Alabama, show that the mall and other buildings, parking lots, and roads are very warm during the day, and the*

*parking lot is still “glowing” at night. By contrast, wooded areas and even small tree islands in the parking lot appear as cool spots. The difference has to do with how materials absorb and release heat. Asphalt absorbs heat from the sun and quickly releases it as heat radiation. Temperatures in the parking lot in the summer of 1994 were as high as 120° F during the day, while tree islands in the lot were 89° F— a difference of 31° ! Nearby wooded areas were another 4° F lower than the parking lot tree islands, at 85° F.*

“Parking lots exert a powerful undertow on local economies by taking up space that could be put to more profitable uses,” says John Shaw, assistant professor of urban and regional planning at the University of Iowa. Shaw cites several sources, including Richard Wilson and the Washington, D.C.-based COMSIS Corporation, that say each unused parking space wastes \$600 to \$900 a year in land development costs; vacant spaces in parking structures cost more. And these figures do not include potential tax revenues that are lost to parking each year.”

### Connections

To reduce the number of vehicle miles traveled it is important to have as many through streets and access points as possible. Multiple connections in and out of the community can save energy and reduce pollution for the community residents, visitors and staff. Connections through the community should be open access and to multiple arterial roads.

### Orientation

Since we are the sunshine state it is worth considering solar orientation in the design of the community. This process is often forgotten or just brought up so late that too many other features are planned to make it practical, but when properly considered the resulting energy savings, community wide, can be significant. The designers must consider the size, location, and type of buildings as well as adjacent buildings. Ideally we know that the buildable lots should be designed to face within 30-degrees of due north or due south.

**ECOSYSTEM PRESERVATION**

Protecting existing ecosystems not only pertains to isolated natural features, but to areas large enough to sustain multiple layers and levels of wilderness and wildlife. By protecting woodlands, prairies, wetlands, streams, and waterways, species diversity of both vegetation and wildlife is maintained. It is essential that open spaces be large and interconnected enough to support such diversity. While it is impossible to define universally what constitutes “large enough”, the importance of buffers and “green corridors” should be considered



Protecting and preserving habitat

**Benefit**

The financial costs of implementing measures to preserve existing natural features and wildlife will depend upon specific characteristics of the project, the property, and of surrounding landscape. It is difficult to identify “costs” associated with a reduced number lots vs. “benefits” associated with ecosystem preservation or enhanced value of the site. Several of the resources listed at the end of this section contain case studies documenting the increased desirability and value resulting from implementation of the above measures.

**RESTORATION**

Many “natural” or green areas are far from their uncultivated state. For instance, agricultural lands in the Midwest have replaced much of the tall grass prairie. Restoration of such areas can be undertaken as part of a development project. This can result in both the reintroduction of native species and the enhancement of quality of life issues for those people who live nearby.

The issues surrounding the cost, availability, and practicality of ecosystem enhancement are similar to those of ecosystem preservation discussed above.

### Advantages

The major advantages for both the developer and the homebuyer include

- Reduction in infrastructure costs
- Increased access to pocket parks and larger open spaces
- Improved sense of community and shared security
- Reduced cost of maintaining private yards
- Improved marketability of homes
- Tax benefits from conservation easements

For the jurisdiction and larger community, advantages include

- Reduction in street and infrastructure maintenance costs
- Reduction in stormwater impacts and improved watershed protection
- Improvements in biodiversity and natural cooling affects
- Contribution to overall community open space goals

### **EVALUATION BENEFIT**

To maximize the goal of preserving sensitive habitat while building on more suitable portions of the site, developers must first know what should be left undisturbed and permanently protected. To “do the least harm,” developers should begin by knowing the land intimately. The physical characteristics of the land can then guide buildings placement within the site.

Benefits include:

- Protection of watersheds
- Preservation of wildlife
- Reduced tree loss
- Preservation of cultural resources
- Preservation of agricultural land
- Increased lot values
- Reduced energy use in buildings

#### Step One: Identifying Conservation Areas

The first step consists of identifying primary conservation areas that are already excluded from development due to regulations (i.e., wetlands, steep slopes, floodplains), and then secondary conservation areas containing other open space worthy of protection from clearing, grading, and development (i.e., mature woodlands, wildlife habitats, prime farmland, scenic areas, and historic buildings).

#### Step Two: Locating House Sites

The second step involves identifying the approximate sites of houses, which are strategically placed to maximize enjoyment of the conservation areas. In a full-density plan, the number of house sites will be equal to that permitted under the relevant zoning. Reducing density to create a “limited development” plan is also an option, which in an upscale development might produce the same economic benefit for the landowner.

#### Step Three: Aligning Streets and Trails



The third step consists of a logical alignment for local streets and informal footpaths to connect various parts of the neighborhood, with special attention to creating opportunities for passive recreation and for neighbors to socialize.

#### Step Four: Drawing in the Lot Lines

The final step is to draw in the lot lines with an understanding that most buyers prefer homes in attractive parklike settings and that views of protected open spaces will ensure faster sales at premium prices.

Each of the following site elements should be carefully considered and mapped to cause the least environmental harm and create the greenest possible development:

#### Topography

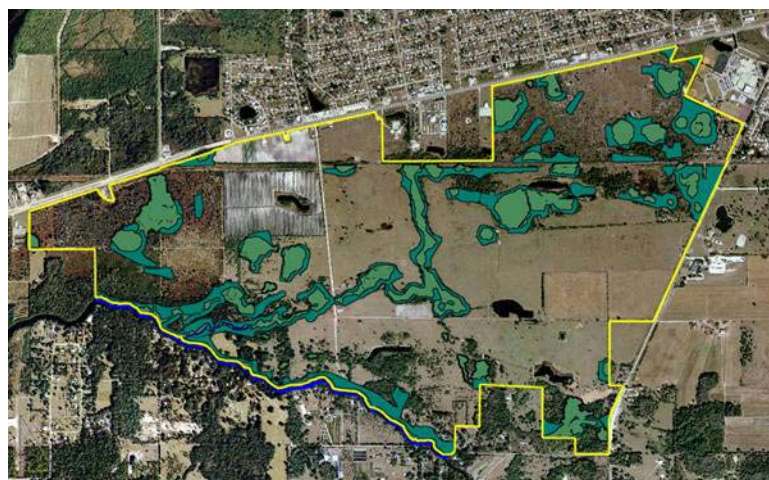
A topographical survey will reveal those areas that are either too steep or too flat to become the best sites. Slopes in excess of 30% are difficult to develop, and even a 15% slope is undesirable for soil types that erode easily. Some flat areas of the site may also best be designated for gardens, parking, and passive recreation. A field surveyor can perform an accurate survey of the site. Money can be saved by not surveying those areas that are obviously inappropriate for development.

#### Soil

Basic knowledge of soil conditions is essential when considering the degree to which stormwater will infiltrate, bearing capacity, and vegetation survivability.

#### Hydrology

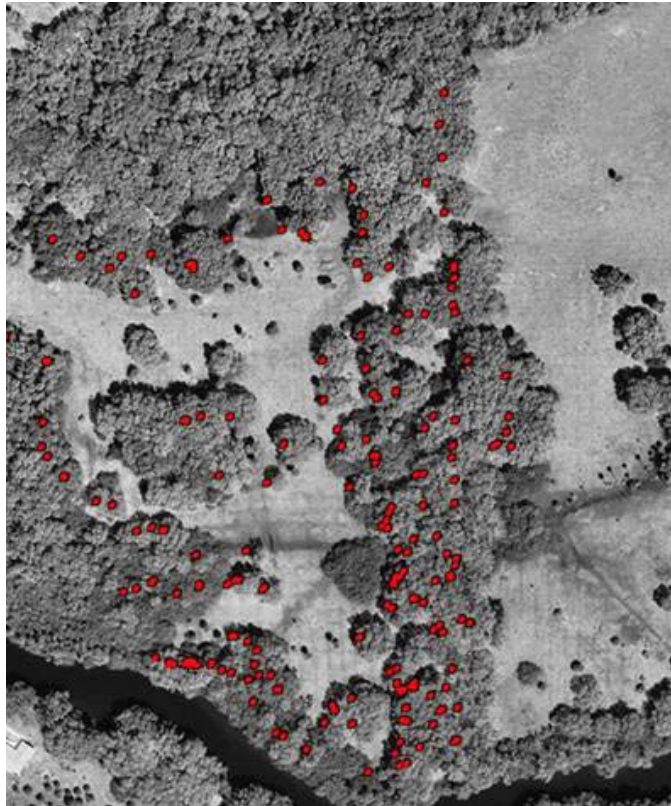
Developing a site map with surface water and wetland features is critical to the site planning process. In addition, hydrological studies including annual rainfall amounts and peak flow rates may be required to determine how the total area of planned impervious surfaces will affect stormwater management. Recent depth and water recharge rate data for local wells can provide good information about the viability of wells on site.



Wetland and upland identification

### Trees and vegetation

A tree and vegetation survey of a site are key components of site assessment. Large trees are difficult to replace and add considerable aesthetic, sales, and cooling value to a development. Some areas of the site may contain concentrations of undisturbed native species worthy of preservation. Arborists and other professionals can be contracted to survey the types, sizes, and health of trees and other vegetation. It is up to the developer to decide the level of detail an arborist is asked to capture. In some cases, local tree ordinances require a tree survey followed by a plan for tree protection and replacement.



Tree location in Oak canopy

### Wildlife habitats

Evaluation of wildlife habitats should be done as part of the survey of native vegetation and wetlands. Habitat fragmentation is one of the most significant contributors to the rapid extinction of plant and animal species and loss of biodiversity. Maintaining healthy greenways and buffers through subdivisions and especially along creek and river banks is the key to both protecting and enhancing wildlife populations.

### Identify and protect threatened and endangered species.

Construction can remove essential habitat requirements for these species or drive them away through disturbance. Conduct a survey before construction begins to detect any threatened or endangered species that live on the site.

### Historical/cultural artifacts

Most parts of the country have seen previous human habitation. There may be opportunities to preserve elements of the past. Stone walls, chimneys, and even abandoned gravesites can be incorporated into a preservation plan and enhance the interest and marketability of a development.

### **PRESERVE VALUABLE SPACES**

Upon completing the site evaluation key parts of the site that should be preserved due to their unique characteristics should be apparent preserving the most biodiverse areas, referring to the number of species within a given area, including plants and animals

### **PAVED AREAS**

A planning rule of thumb is that approximately 22%-27% of the available land area in a typical single family neighborhood is related to vehicles. Streets, parking areas, signage, and stormwater management require one quarter of the property that could otherwise be used more directly by and for the people who live there. When streets are narrower and somewhat curved, motorists slow down. Large areas of asphalt and concrete are costly for the developer as well as for the environment. In addition to the direct costs associated with the paving itself—excavation, asphalt, cement—there are also the associated costs of stormwater management and control.

An evaluation of existing development projects shows that the amount of land required for paved areas and associated uses can be reduced by as much as 50%. Not only do such reductions bring lower economic costs but also leave more land for other uses and/or amenities.

### Road design

Designing short narrow roads, with many stops, and other traffic calming methods creates a pedestrian friendly community. Altering the road materials at intersections is also a common feature to identify pedestrian crossings. Below is a table reproduced as a guideline from Dan Burden's Street Design Guidelines for Healthy Neighborhoods. Please refer to these guidelines for additional information. Also note that in many instances the street widths noted here are narrower than the required county minimums.

*Healthy Neighborhood Street Design*

Street Type	Max Width	Max Design Speed	Max Corner Radius	Max Centerline Radius	Curb	Median	Max Street Length	Vehicle Volume	Walk Way	Bike Lanes	Trees	2-Way Traffic	Parking
Trail	8-14'	20 mph	n/a	95'	no	n/a	n/a	n/a	n/a	n/a	yes	yes	no
Alley	10-12'	10 mph	15'	50'	no	n/a	400'	200	no	no	no	yes	no
Lane	16-18'	20 mph	15'	990'	option	no	600'	200	both	no	yes	option	1 side
Street Sides	26'	20 mph	15'	90-120'	option	no	1,320'	600	both	no	yes	yes	2
Avenue	varies	30 mph	15-25'	250'	yes	option	n/a	3-20K	both	yes	yes	yes	option
Main Street	varies	15-25 mph	15-25'	600'	yes	option	2,600'	3-10K	both	option	yes	yes	option
Boulevard	varies	30-35 mph	25'	500'	yes	yes	n/a	20-40K	both	yes	yes	yes	option
Parkway	varies	45+ mph	25'	1,000'+	no	yes	n/a	20-60K	no	trails	yes	yes	no

## **SITE ENHANCEMENT: CREATING PASSIVE AMENITIES**

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Passive amenities in general – as I will refer to them – are open natural spaces – as nature originally intended – no supplemental irrigation – no exotic vegetation – no rectangular “lakes”. If man has created it in a few years it better not look like man created it ... got it...

Conventional subdivision developments divide the entire site into individually maintained yards that can fracture wildlife habitat and increase pollutant loading into groundwater. In addition, many fast-growing rural areas have moved toward large-lot zoning, creating a development pattern that promises sprawling “farmettes.” While very-low-density strategies (2 to 5 acres per unit) can provide short-term relief from sprawl, the long-term result is often fragmented habitats, eventual pressure to “in-fill” anyway, and guaranteed dependence on the automobile.

### **PRESERVE, CONSERVE, AND RESTORE OPEN SPACE**

#### Wetlands and Uplands

Preserving wetlands is dictated by state and federal guidelines – county requirements vary with respect to additional preservation that may be required. A fairly common requirement surrounding wetland preservation is that they are surrounded by a 25’ upland buffer. However, there are much more stringent requirements, for example in Martin County where all uplands are required preserves. In addition to simply preserving the “required” wetlands an equally important step is restoring and or creating a functional wetland habitat. Isolated wetland areas, although which may be required to preserve, do not recreate the intended results of a functioning ecosystem. Although the initial preservation of the land allocated to the wetland is critical, the ongoing health and management of the wetlands will determine the long term environmental benefits.

#### *Wetland Management Plan Components*

The management plan should address how:

- exotic species will be removed and kept from being reestablished;
- prescribed berms or other management activities which replicate the appropriate ecosystem will be conducted;
- significant wildlife species will be protected;
- people will be educated to respect wildlife;
- interference from domestic animals will be addressed.
- the site will be monitored for detrimental changes
- the maintenance will be perpetually funded
- appropriate persons (volunteers, contractors, etc) will be selected to perform the maintenance.

#### Protecting Trees

Trees are a valuable asset. They increase property values. Bank America Mortgage surveyed 1,350 real estate agents. Almost all, 84% of those surveyed, felt that a home with trees would “be as much as 20% more salable than a home without trees” (Petit et al., 1995, p. 17). Indiana developer C.P. Morgan indicates that “his wooded lots sell for an average of 20% more than similarly sized non-wooded lots” (Petit et al., 1995, p. 19).

## *Benefits*

They also help reduce energy use. In Florida, a building surrounded by trees can use up to 40% less cooling energy than a treeless site.

## *What Trees Should You Save?*

There are no absolute rules for deciding which trees to save, but there are some guidelines.

- Groups of trees stand a greater chance of survival and provide more environmental benefits than single trees.
- Leaving shrubs and under-story plants along with the trees improves wildlife habitat.
- It is often wise to concentrate on saving young, healthy trees (a trunk diameter of less than 12 inches), especially on small lots. Young, healthy trees often withstand construction damage better than older, mature trees. Hire a certified arborist to help select these trees.
- Finally, long lived trees such as live oak provide benefits to the site longer than short-lived species such as laurel and water oak.

Although you have to work around the trees during the development process you are saving landscaping costs. When trees are left standing, but not protected adequately, you pay twice- once to remove the trees when they die a few years after construction and again to plant new trees.

With minimum disturbance to the site, existing vegetation and wildlife can be preserved. Additionally, water runoff and erosion can be minimized.

## Protecting Wildlife Habitats

Preserving habitat can increase the value of your site. Many sectors of the population value opportunities to interact with nature and observe wildlife in their surroundings. Couples with children, for example, often appreciate wildlife for its educational merit for their children. Older people value chances to observe and feel that they are a part of a natural system.

## Maintain Diversity

Maintain the greatest possible diversity of native plants. Insects, mammals, and birds eat many plant parts such as leaves, twigs, bark, roots, fruits, nuts, and seeds. Larger animals depend on the insects, small mammals, and birds as their food source. To keep these highly desirable, large species present you must preserve the food sources for many smaller, less noticeable animals. Different species of plants have different parts available as food for these animals at different times of the year. Diets of many wildlife species also change seasonally. Tall trees, under-story trees, tall shrubs, small shrubs, and ground cover are all important parts of the food supply system.

Preserve both plant and non-plant elements to provide cover for animals. Wildlife species need protection from predators and weather. By protecting some animals from being eaten, cover helps maintain the entire food web from generation to generation. Cover requirements are almost as diverse as food requirements. You need to leave not only vegetation, but dead trees and burrows. Some 48 species in Florida use underground burrows for nesting, sleeping, and hiding. Dozens of birds, mammals,

reptiles, and amphibians use tree cavities for nesting and sleeping. Generally, if you leave stumps no more than 10 feet tall, they will not present liability hazards.

### Water Supply

Fresh unpolluted water is essential for most wildlife. Many species need to drink water. Others require standing water to complete part of their life cycles. A single water source on one construction site may be critical to all wildlife living in the entire area. There are several things that you can do to make sure wildlife have the fresh, unpolluted water that they need.

A pond with gently sloping sides allows many species to choose different depths to satisfy their needs. Preserving small depressions that retain water only after heavy rains is critical to satisfying some wildlife water requirements.

### Native Vegetation

Maintain native conditions in uplands next to wetlands to assure access to the habitats required for different stages in the life cycles of many species. Tree frogs, for example, lay eggs in water and the tadpoles live in water for weeks before they emerge. However, the adults spend the rest of their lives in trees.

Do not disturb emergent and shoreline vegetation in and next to aquatic areas because they provide food and cover requirements for many wildlife species. Emergent vegetation, such as cattail, is rooted in shallow water but has most of its growth above the surface of the water.

### Wildlife Corridors

Leave travel corridors from uplands to water supplies on or adjacent to the site to allow access by many different species. Corridors should follow natural features that contribute to the value of the corridor and are best if they include dry and wet areas. Ponds and berms can be used as part of the corridor widths; however, the berms should be planted with native Florida species.

### Space

Animals need enough space to find the food, cover and water that they need to survive. Space needs vary greatly from species to species. A Florida panther needs 100 square miles, but an Acadian Flycatcher needs only three-quarters of an acre. Most species cannot satisfy their spatial needs on one construction site. Arranging the natural areas on several sites so that they are next to one another preserves larger, intact, better quality habitats. This reduces the overall impacts of construction. Many species also have vertical space requirements. The Hooded Warbler nests close to the ground, but feeds in under-story trees, for example. Maintain diversity of plants on the site to meet vertical space needs.

### Restore native wildlife habitat

Restore and maintain land area from a previously developed, disturbed, invaded by exotics, or pasture use to appropriate habitat including soils, plants, and water features.

Often differentiation between communities is ultimately the job of the amenities. In the previous section we discussed the more natural passive amenities – preserves, wildlife habitats, and passive natural parks. In this section we look at amenities meant for interaction with the community – either residents or other community members and what we can do to improve upon the environmental features of those amenities.

### PEDESTRIAN STRUCTURE

Our goal is to encourage movement – non vehicular – throughout the site – in a safe and comfortable manner. Installing sidewalks, preferably on both sides of the street – as well as connecting all amenity features – whether active or passive (where they will not interfere with the restored or preserved environment). Consider altering the sidewalk or trail materials from concrete to rubberized asphalt, boardwalks, gravel, pavers, mulch, or dirt depending on the pedestrian path and its purpose. Keep in mind a minimum width of 4 feet is preferred. Also consider the demographic of the community. Ask yourself will there be baby carriages? Bicycles? Roller bladders? Wheelchairs? Golf carts? ...using these paths?



Boardwalk for residents through preserve

### NEIGHBORHOOD PARKS

Neighborhood parks that are within a 5 minute walk are an excellent community addition. Consider altering the contents for each park to make them destinations within in the community. When adding any structures to the park such as benches gazebos, playground equipment, or trashcans, make sure to include recycle bins. Many new environmentally friendly materials are readily available to either build or purchase for these structures in your community parks. Make sure to include shade trees and



minimize turf in the park. If activities are not specifically centered on a use that would specifically require turf consider an alternative groundcover to conserve water. Keep any hardscape as light in color as possible to assist in reducing any heat island effects. These parks are also great areas to consider small community garden plots, educate about vegetation, or just provide residents a common space to interact.

### **COMMUNITY OR REGIONAL PARK**

Community or regional parks should be a minimum of 10 acres. Community parks specifically should contain recreational facilities such as ball fields, court recreation, playgrounds and water body access whereas regional parks may also contain some civic facilities.

### **COMPOST/MULCH FACILITY**

Depending on the size of your development a great community amenity as well as a regional amenity (if space permits) is a compost/mulch facility. Yard waste and compostable items from the community can be collected centrally to produce fertilizer which residents can access if needed. If space permits a large mulching facility may be of great benefit to the county especially during hurricane season.



Land Clearing Debris, Mulch Treatment and Distribution

### **AMENITY BUILDINGS**

Community amenity buildings should be designed, constructed, and certified green to set a leading example for the community and region in sustainability. The most common standards used for commercial buildings are the U.S Green Building Council's LEED certification and the Florida alternative, the Florida Green Building Coalition

Green Commercial Designation. Both programs cover similar key concepts of green buildings with the major difference being that Florida's has some specifics to Disaster Mitigation for our climate such as hurricanes and termites.

One of the greatest influences on Florida's climatic character is the fact that it is a peninsula surrounded by large bodies of water. Nearly 90% of Florida's perimeter adjoins bodies of water. The heating and cooling of these ocean waters create breezes and often drastic temperature swings in its coastal areas. The State also lies in southerly latitudes (24°30'N to 31°N.Lat.), and has approximately 4, 400 square miles of shallow lakes and other standing water systems that afford cool winds within the states interior regions (The Bureau 1979). Although Florida is surrounded by water and has an abundance of inland water systems, it often has a water shortage problem due to evaporation rates and runoff. Florida summers are well known for their afternoon showers, which dump several inches of rain daily. Due to the temperature and soil conditions much of this water is never retained. Run off occurs in areas where several acres of land have been covered by buildings and paving materials. This problem can be overcome and/or managed by reducing our daily water use. On average 50% of residential water consumption in Florida, is due to either lawn or garden irrigation.

Based on the design conditions given we begin our design already knowing that the normal annual rainfall exceeds the absorption capacity of the soil, even prior to development. Many times our planned development is surrounded by existing developments and infrastructure that may be sending stormwater to our site, any impervious surface and or construction activities are going to make coping with stormwater worse.

### **STORMWATER MANAGEMENT**

Successful stormwater management can be one of the most challenging design features within a community. Our on site solutions include: minimizing paved areas, using permeable materials wherever possible, and creating natural swales with native vegetation which significantly reduce the investment in stormwater management infrastructure.

#### Manage Stormwater Naturally

Modern development dramatically increases the amount of impervious surface area throughout the Southeast. Low-density development and the dominance of the automobile results in the paving of a half million acres for roads, parking lots, and driveways each year. A typical subdivision today covers up to 40% of the land with impervious surfaces. Two thirds of this area is devoted to the automobile.

Impervious roofs and pavements prevent natural absorption, storing, and routing of stormwater. Most subdivisions use a combination of pipes and culverts to collect and move water. This method has the cumulative effect of increasing stream flow, causing downstream erosion, and flushing out aquatic life.

#### *Benefits*

Allowing water to infiltrate into the ground improves water purity, recharges aquifers, and improves the "base" flows of area streams and rivers, while reducing peak flows, flooding, and pollutant transfer.

## Design Impacts

### *Impervious Surface*

Reduce land area devoted to automobiles. Consider the possibility of reducing road widths, rethinking offsets, and using shared parking this may also require collaborations with government entities to allow “changes from the norm”.

### *Create natural stormwater pathways.*

Capture stormwater where it runs off of streets and drives and allow it to infiltrate in planted ditches or vegetated swales. Rain gardens are also a great alternative to the traditional berm. In areas that may be conducive to aquifer recharge – such as high sandy soil consider specifically designated preserve areas.

### *Dry Detention*

Dry detention areas are common but rarely used for “dual use”. Consider that neighborhood ball fields and parks could be used much of the year and serve as stormwater detention during major storm events in summer. Applying dual use in a non traditional manner assist in freeing up valuable land for preserve or other beneficial community features.

### *Landscape to minimize runoff and promote natural infiltration on home sites.*

Landscape to keep stormwater on site as long as possible so that it can be absorbed into the ground. The following design measures can make a big difference:

- Leave as much land as possible on the site undisturbed.
- Ensure that healthy ground cover is established over all disturbed soils.
- Recreate natural areas using hearty native plantings (the deeper the roots the more water will be absorbed).
- Mulch all trees and shrubs.
- Divert water away from steep slopes and disturbed areas with dikes, swales, and ditches into areas that have established plant materials or other absorbent cover.
- Break long slopes with ditches, swales, and terraces (or checkdams).

### *Use structural systems that encourage infiltration.*

Design systems that slow runoff and allow water to infiltrate directly or move to landscaped areas. Consider the following systems:

- No gutters; water is evenly disbursed into gravel “Dutch drains” installed along the drip line allowing water to infiltrate away from foundation
- Gutters with downspouts diverted into water harvesting pools or cisterns (see section on rainwater harvesting)

### *Build parking lots that absorb water.*

A technique that is growing in popularity is the use of porous pavements (concrete or asphalt) or pavers that allow stormwater to infiltrate directly into parking lots and drives. Porous pavements are made with either concrete or asphalt that is mixed with small, consistently sized gravel aggregate. Depending on soil types, this strategy will vary in cost and effectiveness. While materials can cost more than for standard concrete, asphalt or pavers installing porous materials may lessen the need for stormwater management infrastructure. Note here that historically the counties are not giving credit for pervious materials arguing that “someone” in the future could pave over the material

and make it impervious. And I hear from contractors that they don't work but have several examples from Rinker of the material in place and functioning property.



Turfblock parking lot

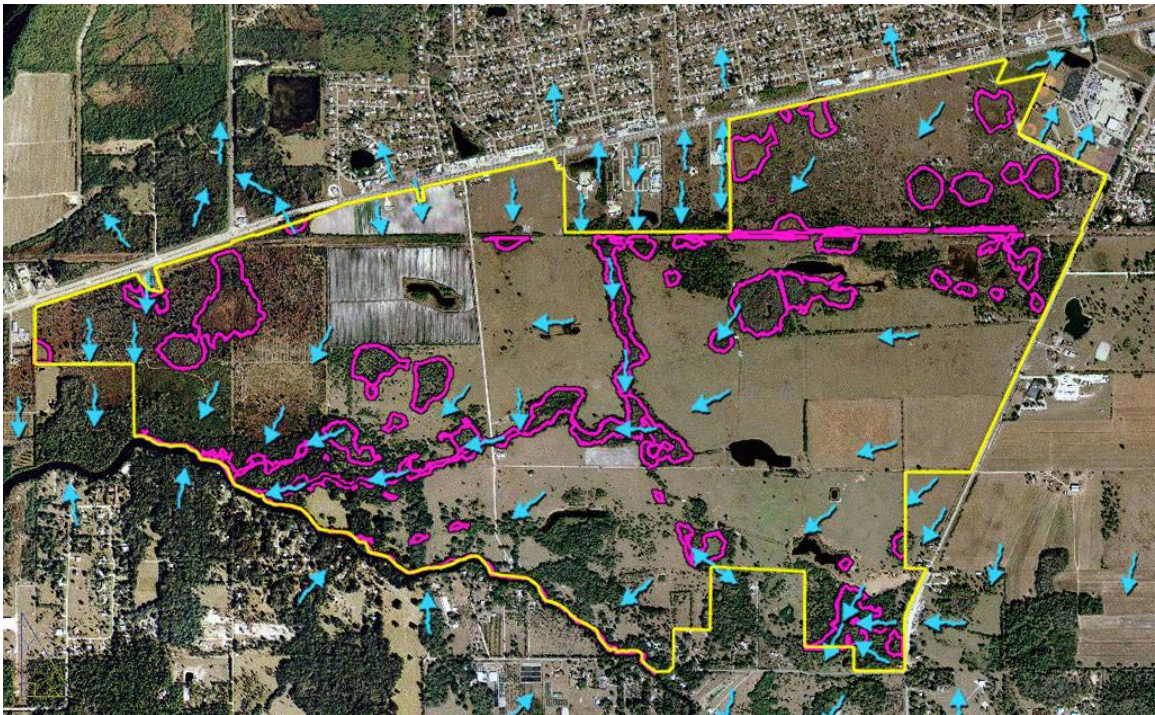
Support local government efforts to establish stormwater utilities.

In order to more directly meet the costs associated with best stormwater management practices, many local governments need to consider charging property owners for the long-term cost of maintaining a healthy stormwater system. Local governments should also try to establish incentives for better on-site management practices.

- Gutters with additional downspouts (more may be needed to break up flow volume) that are directed into planted areas or gravel drainage basins
- No curbing along sidewalks and driveways to allow water to flow onto planted zones or infiltration basins
- Porous pavements on driveways and parking pads
- Grass pavers that take auto weight but allow grass to grow
- Infiltration basins that capture excess stormwater from driveways, walks, and less porous areas of the yard
- Subsurface basins installed below parking lots to enable stormwater to be stored and absorbed slowly into surrounding soils

#### **STORMWATER FROM PRE-EXISTING DEVELOPMENTS**

A fundamental function of sustainability is thinking at a community level. There are older communities or infrastructure – we all know the areas – that simply flood during the lightest of rains. It's about being a good neighbor. I'm not necessarily saying that the municipality shouldn't consider our generosity but it the right thing to do for the community. Standard practice is to design for no net increase with minor changes especially if we can reduce impervious area, achieving additional stormwater capacity is achievable



Collecting water from neighboring sites

### **NATIVE VEGETATION**

In an effort to reduce housing costs, developers and builders often do not consider the long-term benefits of carefully placed yard trees and native drought tolerant landscaping. Let me state up front – because there was no other obviously blatant way to say this – WE SHOULD NOT BE USING POTABLE WATER TO IRRIGATE VEGETATION – if potable water is the only option available then maybe you need to reconsider having vegetation – I hear they are making great Astroturf these days.

The University of Florida Extension service offers a program called Florida Yards and Neighborhoods. Historically this program was directed at homeowners to assist them in improving the quality and reducing the quantity of stormwater runoff from their homesite. The program evolved into a comprehensive 9 guiding principals that include selecting appropriate native drought tolerant vegetation through reducing ongoing yard maintenance and waste. Listed below are the 9 principals.

1. Right plant, right place
2. Water efficiently
3. Fertilize appropriately
4. Mulch
5. Attract wildlife
6. Manage yard pests responsibly
7. Recycle yard waste
8. Reduce stormwater runoff
9. Protect the waterfront

The program has recently been expanded to include a statewide builder developer program where the FYN representative will work with either or both builders and

developers on a community to assist with the design and selection of vegetation throughout the completion of the development.

#### Increased ground-level ozone (smog)

Increasing temperatures in the summer elevate pollution because hotter temperatures speed the chemical reactions that lead to ozone formation. The ozone increase leads to increased respiratory illness. A recent Centers for Disease Control study indicated that emergency room admissions can increase by a third on high ozone alert days because of asthma and other respiratory conditions.

#### Wasted and polluted water

Poorly planned landscaping also results in yards filled with high maintenance vegetation that requires extensive watering, as well as costly fertilizers, herbicides, and pesticides. Every year, Americans spend more than \$25 billion maintaining nearly 50,000 square miles of lawn— an area the size of the state of New York. Runoff from the nearly 6 million tons of fertilizer, as well as 34,000 tons of herbicides, insecticides, fungicides, and various other pesticides degrades streams, wildlife habitats, and groundwater.

#### *Benefits*

Proper selection and placement of native plant materials can greatly reduce the need for water, chemicals, and maintenance labor. Significant savings over time will result from a yard plan that may cost a bit more on the front end but pays long-term benefits to homeowners and the environment. Together with shade trees, this ecological approach to landscape design and installation can be marketed by builders and realtors as a valuable feature of the home.

#### Select and locate trees appropriately.

The shade, cooling and aesthetic benefits from trees are hard to dispute, however Florida is faced with many other considerations. As a developer you must also weigh the long term health and safety of the community from our states natural disasters: hurricanes, fires and termites. Firewise standards, hurricane experience and termite expectations might lead you to keep trees as far from your buildings as possible however you would no longer realize any energy savings as a result of their shade. Appropriate vegetation selection of healthy tree species and proper maintenance are all that is needed to ensure a long term sustainable community.

#### **COMMUNITY POOLS**

Although community pools are common in multi-family areas make sure to include a community pool targeted at the single family residents as well. Reducing the number of individual pools will help each homeowner save on energy, water and maintenance costs. 1,000-2,225 gallons of water are lost each year from evaporation alone in the average swimming pool. Water is such a valuable resource any means of conservation is significant. Consider locating the community pool at the regional park as well so that the resource is available for the entire community.

#### **ENVIRONMENTALLY FRIENDLY GOLF COURSE**

It's possible so stop laughing- that is, if the green golf course is compared to a traditional golf course. As a general rule, since golf courses have a high percentage of turf they require above normal amounts of water, fertilizer and pesticides- which as a

general rule is not good. However, we would recommend that a third party certification such as Audubon Internationals certified programs which require that a course, in the planning stages, must successfully complete and implement a natural resource management plan to the Audubon Signature Program's specifications. Existing golf courses can qualify under the Audubon Cooperative Sanctuary Program for Golf Courses. Alternatively, it is possible to design a course that has 40-percent or less of its total acreage in maintained area (irrigated or chemically-treated or concrete or buildings).

## **RAINWATER HARVESTING**

### Cisterns

Irrigation for yards, gardens, parks, and golf courses consumes large quantities of potable water each year. The practice wastes water that required chemicals and energy to purify and deliver. At the same time, impervious surface areas have dramatically increased stormwater runoff that overloads streams, increases pollution, and decreases groundwater recharge. Incorporating rainwater harvesting means that stormwater runoff can become a valuable water resource. Water that would otherwise run off roofs and landscapes can be captured, stored, and delivered for many low volume needs.



Functional Cisterns– not pretty but also not yet camouflaged

### Create water reuse ponds.

One of the most common practices in development – creating “Lakes” (stormwater retention ponds) so we can get fill dirt and create more desirable waterfront lots. With surface water use permits we use the stormwater retention ponds to irrigate. Stormwater runoff can be captured and stored in a pond, then pumped to irrigate pervious areas such as golf courses, cemeteries, gardens, community open space, and turf. When water is reapplied to the watershed from a water reuse pond, groundwater recharge takes place and soil organisms can break down pollutants. Without onsite reuse, normal detention ponds cannot reduce the volume of runoff delivered downstream.





Man made retention pond – see first paragraph – creating passive amenities!

#### Create a household graywater collection system.

Another way to save even more water would be to recycle graywater. Graywater is the water that has been used in the shower, clothes washer, and dishwasher and is not contaminated with human waste. Graywater often can be used without treatment for subterranean irrigation of landscapes (just be sure to use low-nitrate, natural detergents). For use involving human contact, graywater *must* be treated. Some barriers to the use of greywater are health department and code inspector unfamiliarity. Also our sandy soils make subterranean mitigation often difficult due to maintenance.

#### Create a constructed wetland for polluted and wastewater treatment.

Constructed wetlands are ecological alternatives to traditional municipal and onsite wastewater treatment systems. In addition, constructed wetlands can improve water quality below parking lots and waste disposal areas. Constructed wetlands typically do not replace all the functions of natural wetlands. Rather, they mimic the water purification capabilities of natural wetland systems and minimize water pollution prior to its entry into streams, lakes, and other waters. Although an out of the box idea, there are several successfully functioning “living machines” in the state of Florida. The one at Corkscrew Swamp Nature Preserve has been operational for 13 years and visitor tours actually began through the living machine

#### Create a rooftop rainwater collection system.

Collected rainwater has been used in many parts of the world since people began living in communities. While producing drinking water in this manner may be something to consider, at a minimum rooftop water can be easily collected and used as a substitute for well or city water for landscape irrigation. By code each new home is required to install a rain sensor that will shut off the irrigation system during rain events. Unfortunately – even when functioning properly the average Florida home uses approximately equal to 36% of their total water for landscape irrigation. Newer

technology – soil moisture sensors are at a “tried and true” state in product development where they are yielding approximately a 59% reduction in water usage – the cost is only approximately \$300. Meters can be used to encourage water conservation by holding homeowners accountable for the actual water they use, additionally withdrawal limits may be established with a tiered pricing structure i.e., the more you use the more you pay



Rooftop collection system

#### SIDEBAR

##### **Rethinking the American Lawn**

The United States pumps an average of 82 billion gallons of groundwater every day, while the daily recharge rate is only 61 billion gallons. In some urban areas of the South, 40 to 60% of the water supply is used for landscape watering. During summer months, landscape watering can easily account for up to 80% of water use. Use of local plants can minimize the need for landscape watering. For example, the most recognized species of turf grass, Kentucky bluegrass, is not actually native to the United States (despite its name) and requires 35 to 40 inches of water per year. It is widely grown in areas that receive less than half that amount in rainfall. The EPA has calculated that the use of native prairie grasses in the Midwest as opposed to Kentucky bluegrass can save as much as \$4,690 per year per acre in watering and chemical inputs. While turf

coverage can help prevent soil erosion and does contribute to water infiltration and cleaner air, other solutions are available that do even more and have no environmental downsides. A goal should be to reduce the need for water by as much as 80%. The amount of chemicals saved usually equals the reduction in water usage.

### TREE PRESERVATION

#### Public Perception

The public is often concerned about new housing developments. A focus group study conducted by the Greater Atlanta Home Builders Association found that many respondents “perceived that builders were primarily, if not solely, responsible for clear-cutting trees during land development.” The public as a general rule does not make the distinction between builder and developer.

#### Site Impacts

Sprawl style developments, with enormous amounts of land area cleared for roads, parking areas, and low-density commercial development, are responsible for a major percentage of tree loss and permanent coverage of soils. Those trees not cut typically receive three main types of damage during construction: physical, chemical, and hydrological. Physical damage to roots occurs most often from grading, excavation, and trenching. Roots can also suffocate from compaction of the soil by foot and vehicular traffic, or by adding soil over the top of the root system, especially in areas with clay soils.

Physical damage to foliage can also occur if large trees or major limbs are removed, leaving more delicate understory trees to suffer sun scalding, wind, and storm damage. Spilled paints, thinners, cement, muriatic acid, fuel, and other fluids can cause chemical damage during construction. Spills can cause long-lasting changes in the soil or be directly toxic to roots. Hydrological damage to trees is caused by altering established patterns of water drainage or flow. Normal water sources can be cut off by grade changes and barriers such as drives and walks, leading to possible drought stress. Just as much damage can be done by redirecting excessive amounts of water into trees areas, resulting in saturated soils and root suffocation.

#### On Site

There are several important things that you can do to save trees.

- Study your site management plan and see if you can find ways to reduce the number of trees that will be removed during construction. Remove trees if equipment must operate under the drip line.
- Build a fence around trees that you want to save. Flagging does not work. It gets torn down and it is too easy to push aside. Wood and chain link fences are effective. Make sure the fence is at or beyond the dripline of the tree. A tree’s root system can cover an area as much as six times that of the canopy. A protected area that extends to the dripline is the minimum area needed to protect the tree. Irrigate trees damaged by construction and provide loose soil for root exploration. Heavy fertilizing may make the problem worse by forcing undesirable top growth, which the reduced root system cannot support.
- Do not allow vehicles, heavy machinery, materials, or soil to be stored under the canopy. All of these, and even constant foot traffic, can compact the soil, which

hinders its ability to absorb moisture and air. Tree roots penetrate compacted soil poorly.

- Flag or prune lower branches that may be damaged by machinery.
- Put trenches outside the dripline. If this is impossible, tunnel under major roots rather than through them. Digging a trench through a tree's root system is very damaging. The deeper and closer the trench to the tree trunk, the more harm it causes. Directional boring and micro-tunneling equipment is available and easy to use. Utility contractors who install gas lines, for example, use the equipment regularly.
- Do not store or spread any amount of soil beneath the canopy and be sure that grade changes do not channel water toward trees that you want to save. Both of these will suffocate and kill roots.
- Lowering the grade around trees is also harmful. Most roots are within 12 inches of the soil surface and any soil removal may damage them.
- Construct tree wells to compensate for unavoidable grade changes. The wells must be constructed at the dripline to be effective, unless they are specially designed with adequate ventilation. (Note that it is the change in grade over the roots – either addition of soil or removal of soil that impacts the tree survivability). It is essential to involve a certified arborist in constructing a well.



Constructed Fence for tree protection

### Tree Saving Plan

- Carefully identify the species and size (caliper) of all trees that will remain after construction. Prior to construction, prune unhealthy branches and those that will need to be removed for construction purposes.
- Create a tree protection plan and indicate “tree save” areas. Each tree save area should be as large as possible, but at minimum retain a radius of 2 feet for each inch of trunk diameter. So a 10-inch-diameter tree will have a 20-foot-radius tree save area around it. If groups of trees are saved, the outer perimeter of the tree save area should be as large as possible.

- Clearly indicate the types of barricades that will be used on site. For especially significant trees that are close to grading and construction areas, consider specifying temporary cyclone fencing to ensure avoidance.
- Place penalties and incentive clauses in contracts to encourage contractor and worker involvement in tree protection.
- Inspect the tree save areas prior to start of grading or construction. Every worker on site must be aware of the importance of the trees to the owner.
- Mulch tree save areas and fertilize with appropriate amounts of phosphorus and potassium. Water regularly during construction. If an area that will suffer root damage is identified in advance, root pruning and fertilization should occur several months ahead of time to encourage compensating root growth prior to construction.
- Reroute utility trenches around tree save areas. If rerouting is not possible, bore holes through tree root areas rather than trenching.
- Where grade levels will be changed near trees, specify retaining walls and tree wells, preferably located at the same distance from the trunk as the tree-protection barrier (2 feet per inch of trunk diameter).
- Avoid storing or using chemicals within tree save areas.
- Avoid changes to stormwater routing that will either add to or subtract from normal water flows to the tree save areas.
- Avoid exposing understory trees whenever possible or do so only when trees are dormant.



Saving Specimen Trees

### Transplant Trees.

In some cases, transplanting small trees makes sense. Here are a few tips to follow:

- Trees up to 2 to 3 inches in diameter can generally be dug by hand.
- Trees up to 10 to 12 inches must be dug with a commercial tree spade.

- If possible, replant trees immediately, feeding, watering, mulching, and staking to provide support. If trees cannot be replanted immediately, create a holding area where they can be “healed in” in soil or mulch (compost or small bark is better than straw) and watered frequently. Partial shade helps reduce wilting.

Since up to 90% of the tree’s feeder root system is lost during transplanting, it is always best to move trees when they are dormant in winter. The greatest root growth in trees is stimulated by a hormone secreted as leaf buds begin to swell in early spring. Digging afterwards may result in the tree not regrowing roots as vigorously.



Tree Relocation

#### **SIDEBAR**

Something else to consider... In Florida, it is common practice to burn trees and other plants that must be removed during construction. This causes air pollution. It also creates greenhouse warming gases. For example, burning generates large quantities of carbon dioxide, a major greenhouse warming gas. Using this plant material as mulch is a much better practice for the environment. It can either be saved and used during landscaping on the site, or sold to businesses that market mulches. Using plant waste as mulch is a good example of reusing and recycling materials.

#### **EROSION AND SEDIMENTATION CONTROL**

The Florida Department of Environmental Protections (DEP) says that sediment is the major water pollutant from construction. Sediments cause on-site impacts such as gullies on slopes, road washouts, and clogged sewers. They can also damage the natural environment around the site by filling stream channels, which may cause flooding. Sedimentation degrades natural waterways, habitat, and plant life when not properly controlled. Sediments have a secondary impact when their movement helps

transport chemical pollutants off-site into larger water sources. Sites with excessive erosion and inadequate sediment control invite criticism, stop work orders, and fines for failure to comply. Many new best management practices, that are reasonably priced, are currently available for construction sites.

- Limit the amount of soil disturbance on the site.
- Clearly indicate on plans which areas of the site will be graded, identify erosion control measures, and indicate on plans where these measures are to be installed.
- Install temporary silt fencing in line with site contours so that not more than  $\frac{1}{4}$  acres is protected for each 100 lineal feet of fencing. On steep slopes and during rainy seasons doubling and reinforcing silt fencing may be required to do the job.
- Use temporary sedimentation catchers, or silt ponds, to catch and trap bulk sediment during construction.
- Immediately after grading, install temporary slope stabilization measures, including blown straw with binder and hydro-seeding with fast-growing temporary grass.
- Create appropriate protection for drain inlets, including concrete blocks covered with erosion-control material oriented to allow water through while filtering out sediment. The entire assembly must be surrounded with gravel.



Installed – and not damaged – silt fence

According to the *Erosion and Sediment Control Handbook* (Goldman, 1986), erosion control and sediment control are two different things. Erosion occurs when water or winds remove soil particles. It is a natural process, but human activities often accelerate erosion. Erosion control prevents the loss of soil by water or wind. Sediments are the soil particles. Avoiding erosion in the first place is best, but is not always possible. When erosion does occur, controlling sediment movement is critical. The *Handbook* lists eight erosion and sediment control principles. They are:

1. Fit development to the terrain. The more the site is altered, the more likely erosion will occur. Reduce the disturbance of the land surface during grading to



- minimize erosion. For example, build roads that run parallel to the slope, not up and down.
2. Time grading and construction to reduce erosion. Grade only the area needed for immediate operations to reduce the soil exposed at any one time.
  3. Save existing vegetation when possible. The most effective defense against erosion is natural vegetation. Undisturbed soils are much more stable than disturbed soils. Replanting vegetation is less effective because the plants may take months or years to establish.
  4. Plant vegetation and mulch denuded areas. Seeding temporary or permanent vegetation and applying mulch helps protect the soil. The plants should be fast growing, low maintenance, adapted to local conditions, and inexpensive. Annual grasses such as ryegrass, oats and rye are good choices. Perennial grasses, such as St. Augustine grass, generally require more water and nutrients. Slopes that will be planted should not be too steep (preferably 3:1 or flatter), not too compacted. Seeds can wash away if the surface is too smooth. Plants establish slowly in compacted soil. Mulch helps plants establish by protecting roots, reducing the soil temperature, conserving moisture, and discouraging weed growth. Straw, wood fivers and jute netting can be used. You can make mulch by grinding or chipping branches and brush that are cut down on the site.
  5. Divert runoff away from denuded areas. Keep runoff from reaching exposed soil. Dikes or ditches can help divert runoff from up-slope areas.
  6. Minimize length and steepness of slope. The steeper and longer a slope, the greater the velocity and damage from runoff. Construct terraces or discontinuous ditches to help break up the length and steepness of the slope. Concrete channels are smooth. They increase the velocity of runoff. Lining drainage ways with grass or riprap helps reduce runoff velocity. Vegetation helps as well.
  7. Trap sediment on the site. Sediment barriers can keep soil particles on the site and prevent water pollution when erosion does occur. Sediment basins and traps (double-staked straw bales and sturdy silt fences) all help prevent sediment movement.
  8. Maintain control measures. Erosion and sediment control measures must be maintained regularly. Assign someone the task of regularly inspecting and repairing erosion control systems, especially after rains and storms, which often cause damage.

### **MINIMIZE SOIL DISTURBANCE**

Disturbing healthy soil contributes to greater erosion and risks damage to sensitive tree and other plant root systems. In addition, overly compacted soil prevents adequate absorption of water and nutrients, causing stress to both established and newly planted landscape materials. Taking preventive measures in advance of construction greatly reduces erosion and increases the survival rate of trees and landscape plantings. Erosion control actions can be included in the demolition, grading, and foundation excavation plans.

The following steps should be included in plans prior to start of clearing, grubbing, and other site preparation activities:

- Carefully plan grading activities to minimize “borrow and fill” and to minimize creation of artificial slopes greater than 30%.
- Phase grading into manageable sections of the site to minimize the amount of time earth is exposed to wind and rain.

- Clearly establish site access and staging areas at portions of the property where soil disturbance will occur for building sites, drives, and parking. Avoid areas planned to be left natural or overseeded.
- Fence and isolate hazardous material storage areas to prevent contamination and to encourage organized removal of hazardous wastes to appropriate disposal sites.
- Minimize the number of roads into the site, limit stream crossing, and locate roads across the slope, not up and down.
- Avoid filling sections of the site that function as drainage or water recharge areas.
- Use appropriately sized grading equipment to minimize the weight placed on sensitive soils, especially when it is necessary to work close to mature trees.
- Save excavated topsoil and protect it from rain and wind with tarps for later use.
- Place all mineral soils that will be used for back fill in a separate location and protect them from rain and wind with tarps.
- Carefully specify control measures in contracts and establish penalties for failure to adequately protect specified areas of the site.

## **MATERIALS**

Specifying of materials and products from local and regional sources has several benefits that result in a stimulated local and regional economy a reduction in pollution caused by transportation from distant sources, an increase in the availability of local and regional environmental material and products encouragement of the formation of local and regional environmental businesses, a promotion of the awareness of the origin of the materials and products used in our projects, and an increase in the opportunity for regional control over resources.

### Reuse or Recycle Materials on Site

Although soil removed for retention areas is often used on site, other resources are not commonly reused. Consider working with a mulching facility so that land clearing debris and trees cleared from the site can be treated and used on site for mulch. If redeveloping a site consider deconstructing or salvage from the building for reuse. If this is not possible recycle any construction waste. Contact any local demolition projects and concrete suppliers to determine if any salvaged concrete is available for use as road base. If your area has a construction waste recycling firm consider them as a resource for sub base materials as well. Concrete, below 6000 psi, contains approximately 22% fly ash which is a post industrial waste product. Asphalt as well may contain Recycled Asphalt Pavement (RAP)

## **GREEN UTILITY PRACTICES**

Minimizing impacts from the installation of infrastructure and utilities. What can be done to minimize the land required for utilities; can they be decentralized, what renewable resources can replace traditional utilities? As in many other situations this is where being innovative is not always welcome with the utility companies and or local government.

Working utilities around natural site features to preserve trees – placing utilities underground for durability during hurricane events. Work with utility companies on joint trenching agreements to minimize site impacts of underground utilities.

### Deliver Green Power

Consider signing a contract for the delivery of green power which comes from renewable resources such as wind and solar. Have your development's power demand delivered with green power either produced on-site or purchased as part of a green-pricing agreement with a utility.

## **VERTICAL CONSTRUCTION – BUILDINGS**

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As an entire course is dedicated to Green Construction what will be said here is limited. As a developer, encourage, demonstrate and or require the use of green buildings on your site. The two most popular standards and the Florida Green Building Coalition – more information may be found at [www.floridagreenbuilding.org](http://www.floridagreenbuilding.org) and the U.S. Green Building Council – more information can be found at [www.usgbc.org](http://www.usgbc.org)

Educating all members of the development team, builders, community members, and future occupant's on sustainable development and about green practices that can lead to increased awareness and environmental benefit. Education for these groups will vary depending on the level of detail desired. Customized trainings, workshops, signs, brochures, and on site materials can all be used to educate and promote sustainable building practices.

### **DEVELOPMENT TEAM**

Encourage each member of the development team (e.g., planner, engineer, architect, landscape architect, builder, marketing staff, administrator, sales) to earn continuing education in a green development or green construction course. The team will also benefit from cross training if each professional understands the sustainable demands required of their teammates.

- Foster a common belief that new developments can be designed, constructed, and managed in ways that fit into the natural environments in which they take place, so that the built environment does not degrade the natural environment.
- Maintain open lines of communication between the project team, the development team, and government agencies.
- Maintain awareness of not just environmental impacts, but also social impacts to surrounding communities.
- Ensure that support and direction for integrating sustainability into development come from the top down.
- Harness the role of amenities. Good environmental planning and design can be marketed is a valuable amenity to home buyers. Developers should increasingly seek to capture the value of "green" features.
- Create a well-documented master plan including illustrations that promote sustainable aspects of the development.
- Include environmental builder specifications in all subcontracts.
- Produce detailed sales and promotion materials that feature conservation aspects of the development.
- Develop subdivision covenants that establish ground rules for the maintenance of shared open lands and individual lots.
- Create a Homebuyer's Environmental Instruction Guide that explains the unique environmental aspects of the subdivision and special maintenance considerations.



Staff Training

Establish goals that are simple and attainable.

- Make sustainability understandable to employees.
- Provide a central source of information.
- Make it business compatible.
- Show there is a return on investment.
- Nurture the shift toward day-to-day acceptance among employees.

#### **CORPORATE CULTURE**

Sustainable effort needs to extend beyond the development into the corporate office – plan for and evaluation of the corporate practices with respect to recycling and, purchasing to see what simple changes can be made to forward the companies sustainability vision.

#### **COMMUNITY**

Establish weekly or monthly educational sessions open to the community on a series of different environmental topics. Include site tours wherever possible to connect the community with nature.



Community Charrette

## **RESIDENTS**

As developer or development association, such as homeowners association may find it beneficial to provide a dedicated ecologist working on-site to conduct research and provide tours to residents and visitors. A series of rotating lectures for residents can educate them about sustainable site practice. Similarly, as a developer or development association provide contact to a dedicated “green” landscape specialist, “green” design/construction specialist, and/or “green” interior design specialist to assist residents.

## **SIGNAGE**

The development may continue to function for hundreds of years, long after initial sales and construction. Long-lasting outdoor signs can be used to educate every generation that lives there of the environmental consequences of their actions. Install signage with the following identifiers:

- Signs that show where stormwater drains
- Signs that indicate the environmental benefit of pedestrian transportation
- Signs that indicate wildlife corridors and/or indicate the indigenous wildlife at the time of development
- Signs that educate about the need/benefit of conserving water
- Signs that educate about the need/benefit of conserving energy
- Signs that indicate the benefit of outdoor lighting that does not brighten the sky
- Signs that educate about the types of native plants and any environmental benefits
- Signs that educate about minimizing impact on preserved, created or restored areas and how to enhance the environment.

- Signs that educate on how to create and maintain habitats for native species in their yards.
- Any other signs that are for environmental education (bird nests, butterfly gardens, organic gardening. etc.).

Signs should be made of long-lasting green materials.

### **MARKETING**

All marketing efforts from a sales person's business card to your most expensive television ad must include your sustainable message.

### **WEB**

The website should provide information specific to the sustainable practices on site as well as other resources for residents and website visitors.



### MANAGEMENT PLANS

Integrating sustainability into residential development means that the “job” is not finished upon completion of a given project. With planning, site selection, design and construction complete, the challenge becomes how to transfer the initial commitment to sustainability into a long-term reality via land management practices and a transfer of value and responsibility from the developer to the owner, resident, or managing body.

Without appropriate management plans in place:

- Designated natural areas that are set aside without provision for long-term monitoring or management may experience a decline in their ecological value, especially if invasive species are present.
- Lack of clarification of roles and responsibilities and failure to designate persons responsible for natural area management, especially as oversight of the development shifts from developer to community association or managing board.
- Maintaining the commitment of the ownership once the developer’s primary responsibilities have been fulfilled.
- Sustaining an ethic of stewardship towards the land in the face of a demographic shift and a population influx in Florida. Of particular concern are homeowners moving to Florida from other parts of the country, who don’t understand Florida’s unique ecology, plants, or management considerations.
- Lack of an adequate budget for long-term natural area management. • Public perceptions and expectations for resource efficient communities don’t match the reality of what’s happening “on the ground”.

### HOMEOWNER IMPACTS

Homeowners impact the long term success of a sustainable development in numerous ways: homeowner attitudes either support or derail efficient resource management; home landscaping may complement or negatively impact natural or preserved areas; homeowner expectations for maintenance and landscaping of both privately owned and common areas and the interaction of highly manicured vs. natural areas can impact water use, chemical use, and ecological connections throughout the development; and homeowner financial support for long term management of preserve areas is critical. Generating long-term buy-in from homeowners is key to the long term functioning of a resource efficient community. Likewise, future property managers must be knowledgeable about and trained in natural resource management if conservation goals are to be achieved. Property managers, natural resource managers, community associations, and, in the case of golf/residential developments, golf course superintendents need to understand ecological goals for the property and carry out management practices in support of those goals.

### **Case Study**

Case Examples securing homeowner “buy in.”• Baldwin Park: During the residential redevelopment of Baldwin Park, sustaining water quality was a high priority throughout the process. Twenty five percent of the site is made up of lakes, with another fifth comprised of parks and open space. Developers worked to sell the quality of the lakes to potential homeowners (in effect, marketing a green amenity), thus helping to transfer a sense of value to the residents with regards to water quality in the lakes.

### **BIOLOGICAL MONITORING**

Conduct long-term biological monitoring. Long-term monitoring (e.g., water quality testing, wildlife surveys, natural community monitoring) provides valuable feedback about the ecological functioning of the property. This information helps managers to tailor maintenance practices and conservation management measures to ensure that initial goals and standards are being met and maintained over time.

#### Manage technology.

Use advances in technology to your advantage (i.e., improved irrigation systems resulting in decreased water consumption), while at the same time be aware that unmanaged technology will not fix a problem. Technology requires knowledgeable human input to achieve the best performance.

#### Periodically check perceptions and reality:

Is the community still meeting its goals for sustainability?

### **ON SITE CONSERVATION PLAN FOR A SPECIFIC WILDLIFE SPECIES**

Several different state listed species (e.g., gopher tortoises) may occur on the property and require some mitigation. Also, some wildlife species on or near the property may not be listed but are of importance to the community and county. In many instances, an on site conservation strategy (that includes management and habitat preservation) is the best strategy for a particular wildlife species. For example, with gopher tortoises, the developer can bury them, (pay money to a mitigation bank), transport them to another site, or provide on site habitat and management. By far, the best solution is to provide habitat and management on site. Transporting and burying the tortoises is usually detrimental to the species.

In addition, many developments are situated next to critical wildlife habitat and management plans need to be implemented that protects these habitats. Develop a management plan that helps protect nearby wildlife. For example, a developer retains a large buffer between homes and a breeding colony of waterbirds and through education and deed restrictions, pets are not allowed near the colony. The plan should include some type of monitoring – whether by the homeowners or a consultant.

### **LANDSCAPE CRITERIA AND MANAGEMENT PLAN FOR COMMON AREAS AND AMENITIES**

In addition to using as many native and drought tolerant species on site as possible, rain gauges, meters, soil moisture sensors and the assistance of the Florida Yards and Neighborhoods personnel it is important to have a long term management plan for the landscape within the community. Make sure all contracts with landscape companies

require that any personnel that will be on your site attend a course to learn about appropriate use of pesticides and fertilizers as well as the application of mulch. Often the incorrect usage of these products damages and kills plants requiring their replacement, which is an additional expense as well as environmentally detrimental for the community.

#### **MONITORING PROGRAM**

A monitoring program should be set up by the developer, allowing homeowners to monitor wildlife, energy, water use, and water body quality. Monitoring will help the neighborhood keep track of environmental variables over time. Results will give residents an important feedback about how various management strategies affect environmental parameters. Post this data on the neighborhood/development web site.

## FINAL EXAMPLE - GREEN AT LAKEWOOD RANCH:

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Green Building is Smart Building—it means energy-efficiency, environmental responsibility, sustainability, healthy indoor air and economic viability. Green Building meets the highest quality standards for construction.

The Florida Green Building Coalition (FGBC) has awarded Lakewood Ranch the “Green” designation for 9,000 acres of future development. This means the development, part of the much larger Schroeder-Manatee Ranch, has met a rigorous set of requirements, and home builders are required to commit to certain sound practices.

- ❖ Green Building fits with the Schroeder-Manatee Ranch (SMR) commitment to stewardship of the land. All divisions of SMR practice wise use of resources and care for our natural surroundings. The company is committed to creating a safe, clean environment for residents and employees.
- ❖ Water conservation is critical in Florida. SMR has its own irrigation system that uses non-potable water.
- ❖ SMR maintains and provides wildlife corridors. Mesic hammocks protect Sherman’s Fox Squirrels and nest boxes are provided for Southeast American Kestrels. Green corridors provide safety for wildlife as they roam. The upland buffers around the wetlands in Schroeder-Manatee Ranch are 35 to 50 feet; only 15 feet are required by the state!
- ❖ SMR has restored wetland areas that had been damaged by an adjacent property owner. Long Swamp is now a thriving 400-acre ecosystem. The wetland provides sanctuary to major waterfowl and is once again providing the environmental functions expected for this type of ecosystem.
- ❖ SMR hires outside environmental scientists to study the impact of development. SMR, consultants and government agencies monitor the ongoing activity.

### WITHIN LAKEWOOD RANCH:

- ❖ All common areas, linear parks, nature parks and community parks throughout Lakewood Ranch are planted with 80 percent native and drought-tolerant plants.
- ❖ Recreation parks are designed so that they flood during the rainy season, preventing excess water from damaging other areas. The parks stay dry about ten months of the year, during the most in-demand times.
- ❖ As construction is underway, trees are protected as much as possible and relocated whenever practical. The trees are then placed along streets, providing a canopy over roadways. The tree relocation efforts enjoy an 80 to 90 percent survival rate!

- ❖ There are approximately 685 acres of conservation areas, 91 acres of nature parks and 20 miles of soft path nature trails with bridges over the river or creek systems to connect the communities.
- ❖ A 38-acre Gopher Tortoise Preserve has been established along the banks of the Braden River. The preservation also protects a variety of other species.
- ❖ All utilities in the neighborhoods and main roadways are buried underground within the 10' utility easement.
- ❖ Lakewood Ranch, in cooperation with SWFWMD, has generated an irrigation watering schedule that applies only to this development. The schedule was developed to spread water use more evenly across the villages and to provide more control of water consumption by the districts.
- ❖ There are four regional parks from 13 to 85 acres. The parks have amenities such as baseball and soccer fields, tot lots, inline skating rink, covered pavilions, basketball and tennis courts and a dog park. Community pools are sprinkled throughout select villages, eliminating the construction of individual pools.
- ❖ Ongoing resident education keeps the people of Lakewood Ranch up-to-date on environmental efforts, wise water use, earth-friendly products and services, energy-smart ideas, and so on. The residents' website, [www.lakewoodranchresidents.com](http://www.lakewoodranchresidents.com), contains a section that highlights Green Building at Lakewood Ranch. There are links to services and products that can be helpful to homeowners.

# Green Development Examination

(as revised May 18, 2009)

1. What are four natural features that can benefit our communities
  - a) Trees, Wildlife, Water, Shade
  - b) Sunlight, Water Systems, Wind Direction and Frequency, Materials
  - c) Sunlight, Animals, Wind, Water
  - d) Animals, Weather, Soil, Solar Energy
  
2. The average Florida Home uses \_\_\_% of their total water usage for irrigation
  - a) 42%
  - b) 59%
  - c) 36%
  - d) 50%
  
3. One of the REQUIRED prerequisites for LEED ND is
  - a) All access to community must be gated
  - b) The minimum residential density is 7 units per acre
  - c) Wetland impacts greater than 5%
  - d) All roads must have sidewalks
  
4. A Florida Yards and Neighborhoods program encourages reducing stormwater runoff through:
  - a) Planting the right plant in the right place
  - b) Recycling yard waste
  - c) Fertilizing appropriately
  - d) All of the above

5. Environmental problems associated with land development include:
  - a) Non point pollution
  - b) Habitat disturbance
  - c) Erosion
  - d) All of the above
  
6. Pedestrian walkways should be
  - a) Maximum of 5' wide
  - b) Minimum 4' wide
  - c) Minimum of 3' wide
  - d) Maximum of 8' wide
  
7. Redevelopment or infill can be cost effective because
  - a) Streets and utilities are already in place
  - b) You don't need to build anything
  - c) The site is already impacted
  - d) There are no existing buildings
  
8. In a study done on the Heat Island effect the temperature change from a asphalt lot to a tree island in that lot was
  - a) -31degrees
  - b) 36 degrees
  - c) 85 degrees
  - d) -10 degrees
  
9. Healthy Neighborhood street designs states that
  - a) Maximum street length for an alley is 700'
  - b) Maximum width of a lane is 12'
  - c) Maximum speed on a Trail is 20 mph
  - d) Maximum speed on a Trail is 40 mph
  
10. A Basic TND principal is
  - a) Lots are at least ¼ mile from retail and recreation areas
  - b) Civic buildings are all grouped together in one area
  - c) Neighborhoods are a minimum of 50 acres and less than 200 acres.
  - d) Banks are on site

11. PLACE<sup>3</sup>S stands for
  - a) PLAnning for Community Energy, Economic, and Environmental Sustainability
  - b) PLAnning for Community Electric, Economic, and Environmental Stability
  - c) PLAcEs for Community Energy, Ecology, and Environmental Sustainability
  - d) PLAcEs for Civil Engineering, Environment and Ecology
  
12. An environmentally friendly Golf Course
  - a) Has 50% of its land irrigated
  - b) Is impossible
  - c) Can achieve a third party certification from a Audubon International certified program
  - d) Will have 18 holes
  
13. When transplanting trees
  - a) Trees up to 12" can be dug by hand
  - b) 90% of the trees root system is lost
  - c) The best time is in the summer
  - d) None of the roots are lost
  
14. New best management practices for erosion state that
  - a) You should limit soil disturbance on site
  - b) Rocks preserve the site
  - c) Silt fence does not need to be installed
  - d) Drain inlets should not be surrounded by gravel



15. In regards to the Gopher Tortoise the most preferable means of mitigation is
- a) Buried on site
  - b) Relocation to another site
  - c) Provide onsite habitat and management
  - d) Do nothing
16. How much of the states primary energy goes to transportation
- a) 35%
  - b) 15%
  - c) 23%
  - d) 22%
17. Pedestrian crossways
- a) Are unnecessary
  - b) Can be indicated by using different materials
  - c) Cause traffic delays
  - d) Are expensive to create
18. Neighborhood parks should
- a) Have a dark colored hardscape
  - b) Be more than a 5 minute walk
  - c) Be completely covered in turf
  - d) Have shade trees and minimize turf
19. Evaporation accounts for up to a loss of between \_\_\_gallons of water and \_\_\_ gallons of water in an average swimming pool annually.
- a) 2225-3000
  - b) 1000-2250
  - c) 950-1500
  - d) 440-950
20. Lakewood Ranch
- a) Has a 43 acre gopher tortoise preserve
  - b) Has approximately 685 acres of conservation areas
  - c) Is in Miami
  - d) Has above ground utilities in the 10' easement