

GHG CASE STUDY:

REDUCING THE AREA AND INPUTS OF MANAGED LANDSCAPES (RESTORATION, FL)

Introduction

Highly managed landscapes contribute to greenhouse gas (GHG) emissions in a variety of ways, primarily *via* the application of irrigation, fertilizers, and pesticides as well as the use of maintenance equipment to cut turfgrass and prune trees and shrubs. Another fact sheet in this series provides details on these four factors.¹ Florida-friendly and low impact landscape design and maintenance can help to minimize the scope and scale of these routine landscape inputs.

Additionally, GHG emissions from landscaping activities can be reduced by limiting the area of landscapes requiring those inputs (i.e., reducing individual landscapes in exchange for creating common recreational space over a smaller collective surface area – see *Figure 1*).

This case study reviews the GHG emissions scenarios for residential landscape areas in a conventional (2006) versus reduced impact (2009) master plan for a proposed community in Volusia County, Florida. Though a terrestrial landscape's above- and below-ground features including plant leaves, woody tissue, roots, as well as the soil itself can sequester (i.e., remove over time) and store

(i.e., “lock” up over time) carbon from the atmosphere, this case study only compares the above-ground GHG emissions contributions from on-going landscape maintenance activities.

Case Study Quick Facts

- Greenhouse gas (GHG) emissions avoided in the Restoration community through combined reduction in area of managed landscapes & resource efficient landscaping standards on remaining urban landscapes:
3,037,606 lbs of CO₂e / yr
for the entire community (5,187 acres; 8,500 mixed residential units; 3.2 million square feet commercial space)

(This equals the combustion of 154,987 gallons of gasoline/year across the entire community or 18.23 gallons per household/year.)

Case Study Background

The master plan for the Restoration community in Edgewater, FL, is a clustered design that includes a mixed-use (i.e., combined commercial and residential) town center with homes located close to jobs and mass transit options. As the plan evolved to its current design, the density in the developed area increased to 6.9 units/acre through a combination of single-family lots, multi-family units and apartments (*Figures 2 and 3*). By making use of vertical space and clustering residential units, individually owned areas needing managed landscapes have been reduced.

¹ See “GHG Case Study: Reducing Landscape Inputs” at http://www.floridaenergy.ufl.edu/?page_id=273.



Figure 1. The use of vertical space to increase density in a clustered development, like in this mixed use center in Baldwin Park, Orlando, Florida, can allow for the overall reduction of managed landscape area by reducing the community's total development footprint while maintaining common recreation spaces. (Image Courtesy: Canin & Associates, Inc.)

Furthermore, Restoration's development order² provides assurances that in addition to the reductions in managed landscape area, the remaining landscaping will be held to standards that will maximize avoidance of GHG emissions. The project commits to a long-term education and enforcement mechanism, with stipulations including the following (Section 18, Landscaping Standards):

- “The Master Developer will, in cooperation with the City, develop landscape standards for the development of Restoration that have the goal of minimal to no added inputs of water and synthetic fertilizers and pesticides and memorialize the agreements relative to the same in the SMMP³ to be processed and approved as a subsequent part of this Development Order.”
- “Conditions conducive to low maintenance landscapes with minimal need for fertilizer, pesticides and irrigation will be maintained and enhanced through landscaping standards that require minimizing soil compaction during construction to the extent practicable, and protecting and conserving existing soils and vegetation or amending and aerating soils as needed before landscape installation.”
- “To ensure homeowners are in compliance with the requirements for minimal⁴ to no added inputs of water and synthetic fertilizers and pesticides, the POA/HOA/CDD* covenants, in providing for long-term funding of conservation measures on-site, shall include provision for a third party field contractor/on-site naturalist for long-term environmental monitoring (including water quality, potable water usage and biodiversity) and education to ensure environmental goals are met. The third party field contractor/on-site naturalist will also monitor the operation and maintenance of landscaping and stormwater management systems. The POA/HOA or CDD shall provide additional community education and/or enforcement through CCRs** of existing or new rules as necessary to correct any deficiency.”

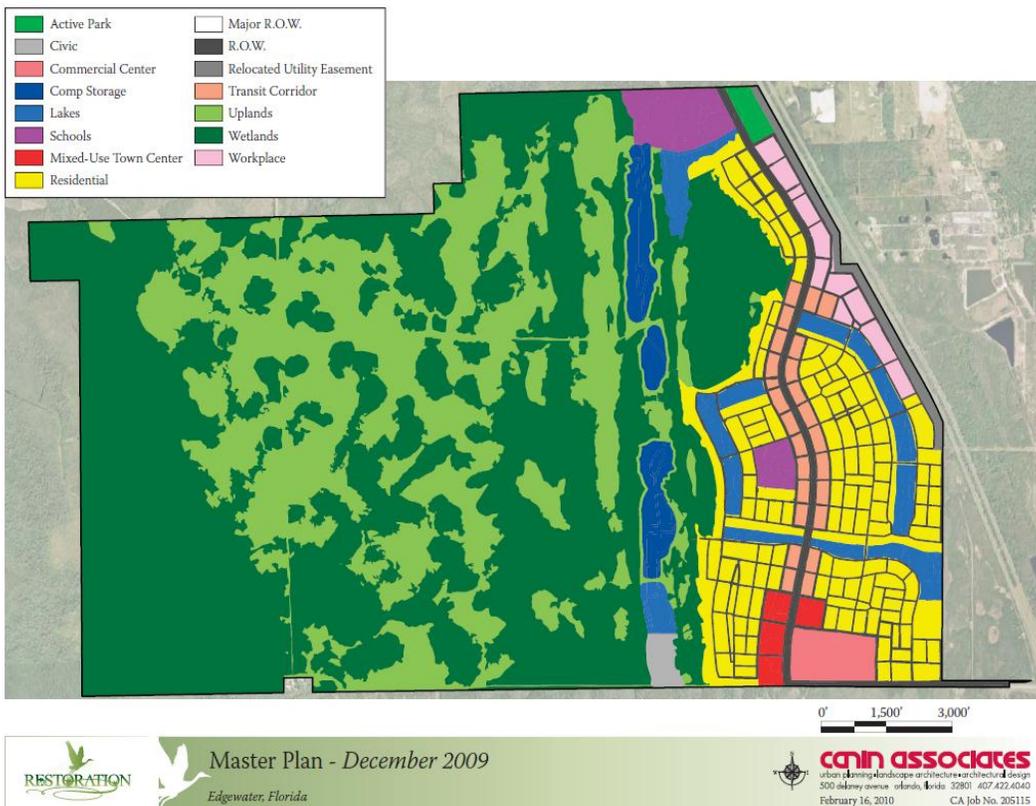
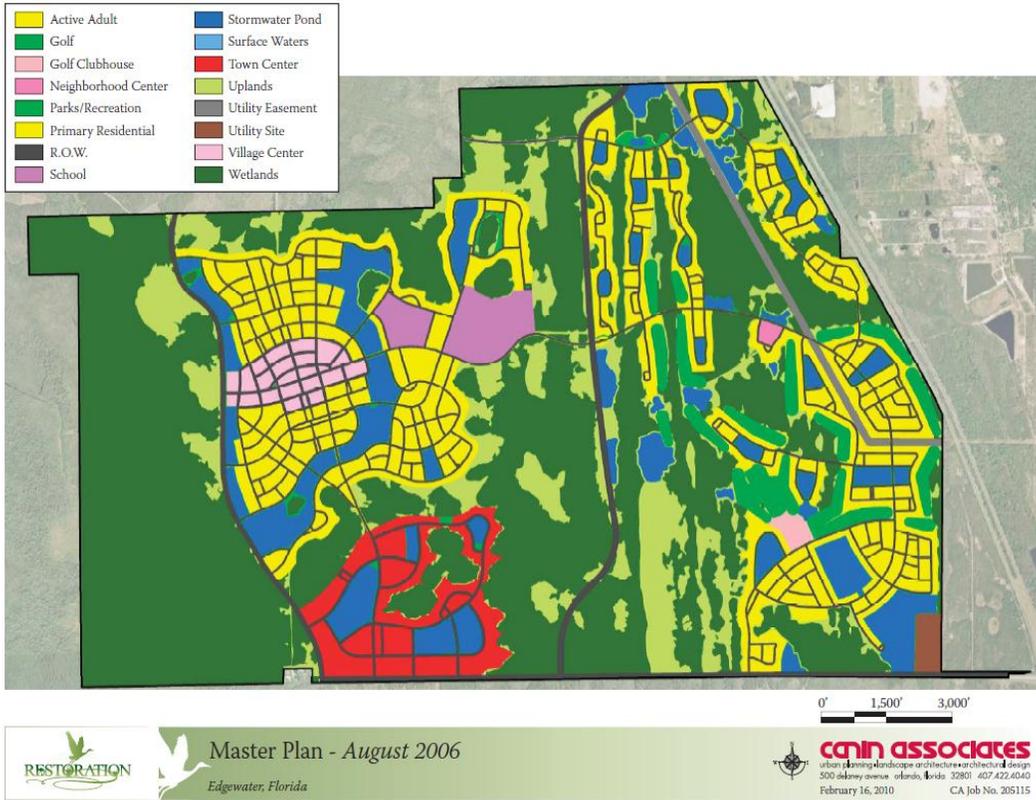
* POA/HOA/CDD (Property Owners' Association/Homeowners' Association/Community Development District)

** CCR (Covenants, Conditions and Restrictions)

² For more information on development orders, visit, <https://www.flrules.org/gateway/chapterhome.asp?chapter=9J-1>, and on growth management and comprehensive planning visit, <http://www.dca.state.fl.us/fdcp/DCP/complanning/index.cfm>

³ Site Mitigation and Management Plan

⁴ Despite the progressiveness of some development order language, terminology such as “minimal” may allow too much subjectivity and interpretation to make the language meaningful, measurable, and enforceable. Whenever possible, more definitive and objective language and metrics should be used.



Figures 2 and 3. The more conventional, larger development footprint of the August 2006 Master Plan (shown at top) versus the more clustered, smaller development footprint of the December 2009 Master Plan (shown at bottom).

GHG Emissions Analysis Results

Compared to the 2006 master plan design for Restoration, the revised design represents 40% less developed area, 55% less total landscaped area on the site, and 50% less area along roads and medians (*Tables 1 and 2*). Accounting only for that reduction in area of managed landscaping in the residential portion of the current plan as compared to the original plan and using the methodology described in the complementary fact sheet in this series, 835,068 lbs CO₂e/yr will be avoided (1,475,855 lbs CO₂e/yr for the total landscaped area on the site). In addition, the landscaping standards from the development order, if applied and enforced appropriately, should result in fewer GHG emissions from the remaining landscapes, specifically at least 67.1 lbs. CO₂e/1000 ft²/yr less than conventional turf management practices (1,252,161 lbs CO₂e/yr for the project).⁵

Table 1. Changes in developed and preserved areas of Restoration from the 2006 to 2009 Master Plans.

	Acres		Percent of Site Area		Percent Change
	2006	2009	2006	2009	
Impervious Area	1018	715	20%	14%	- 30%
Stormwater/Lakes	408	275	8%	5%	- 33%
Landscaped Area	947	428	18%	8%	- 55%
Total Developed Area	2373	1418	46%	27%	- 40%
Preserved Wetlands	2283	2505	44%	48%	+ 10%
Preserved Uplands	532	1264	10%	24%	+138%
Total Site Area	5187				

Table 2. Changes in landscaped area and associated GHG emissions from the 2006 to 2009 Master Plans.

Type of Landscaped Area	Landscaped Area (Acres)		GHG Emissions from landscaped area (lbs CO ₂ e/yr)		GHG Emission Reductions (lbs CO ₂ e/yr)	% Reduction 2006-2009
	2006	2009	2006	2009		
Residential Area	471.7	229.3	1,625,007	789,939	835,068	51.4%
Non Residential, Mixed-Use, Civic	86.3	76.6	297,304	263,887	33,417	11.2%
Right-of-Way Area	135.5	67.9	466,798	233,916	232,882	49.9%
Parks, Recreation, Easements	253.0	54.6	871,585	188,097	683,488	78.4%
Total Landscaped Area	946.5	428.4	3,260,693	1,475,838	1,784,855	54.7%

⁵ Assumes no emissions from fertilizers, pesticides or potable water use and a 20% reduction in mowing frequency.

Conclusions

By reducing the area of managed landscapes, up to 79 lbs CO₂e/1000 ft²/yr can be avoided through the elimination of potable irrigation water, fertilizers, pesticides and mowing equipment (see *GHG Case Study: Reducing Landscape Inputs (Lathrop and Associates, Inc., Office Retrofit)*).⁶ By applying the resource-efficient landscaping standards that are written into Restoration's development order on the remaining landscaped area after clustering the development footprint, an additional 67 lbs of CO₂e/1000 ft²/yr can also be avoided.⁷ GHG emissions from landscape maintenance activities for the landscaped area in Restoration's original design using conventional practices are estimated at 3,260,968 lbs CO₂e/yr. Therefore, by both reducing landscaped area and reducing energy-intensive landscaping inputs on remaining landscaped areas, Restoration can reduce GHG emissions to 223,362 lbs CO₂e/yr, representing a total of 3,037,606 lbs CO₂e/yr avoided, which is equivalent to over 154,987 gallons of gasoline consumed annually or approximately 35,329 tree seedlings grown for 10 years.⁸

What You Can Do!

Although this case study has thus far focused on landscape management practices, the concept of clustering development, a core component of smart growth⁹, has many related principles. Some of these principles include the preservation of natural habitat, the creation of more walkable communities, and an increase in the availability and proximity of common open space, such as parks, playgrounds, and ball fields. There are extensive benefits of parks and open space including environmental, social, economic, and human health. For example, one study found nearby natural areas protect children from the impact of life stress,¹⁰ while others suggest preserved natural areas and other common green spaces can increase property values¹¹. You can learn more by visiting some of the links listed in the next section of this fact sheet and searching for articles and reports that might interest you.

For example, you can educate yourself about the value of protecting functional ecosystems by visiting the Green Facts site on "Ecosystem Change" or the more detailed source documents from the Millennium Ecosystem Assessment (MEA). The MEA, "a four year international scientific assessment of the consequences of ecosystem change for human well-being... conducted by 1,360 natural and social scientists from 95 countries," categorizes ecosystem services into 4 broad types: supporting services, provisioning services, regulating services, and cultural services. These services and the benefits they provide to human and non-human species alike are spread across different scales from local to global. Human well-being could not exist without these services, yet humans also contribute to both the direct and indirect drivers of change in these foundational ecosystem services.

But most importantly, the best thing you and your family can do is go out and visit a local park or natural area and enjoy the fun and fresh air. You never know who you might meet or what you might see. It can be good for your wellbeing and by supporting your local parks you are, in a sense, voting with your action and showing the value and need for these precious places.

⁶ This (79 lbs of CO₂) is equivalent to avoiding the combustion of 4 gallons of gasoline (Source: <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>).

⁷ This (67 lbs of CO₂) is equivalent to avoiding the combustion of 3.4 gallons of gasoline (Source: <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>).

⁸ All equivalencies calculated using: <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

⁹ <http://www.epa.gov/smartgrowth/>

¹⁰ Wells, N. M. and G. W. Evans (2003). "Nearby Nature: A Buffer of Life Stress among Rural Children." *Environment and Behavior* 35(3): 311-330. <http://dx.doi.org/10.1177/0013916503035003001>

¹¹ See *The Economic Benefits of Parks and Open Space* (by The Trust for Public Land at http://www.tpl.org/tier3_cdl.cfm?content_item_id=1145&folder_id=727) and *Saving Land Lowers Taxes* (by Robert Levite of the University of Massachusetts Extension Service at <http://www.opacumlt.org/Economics.htm>).

Additional References and Resources

Green Facts – Facts on Health and the Environment

<http://www.greenfacts.org/en/ecosystems/index.htm>

Millennium Ecosystem Assessment

<http://www.maweb.org/en/index.aspx>

Smart Growth Online – Preserve Open Space, Farmland, Natural Beauty, and Critical Environmental Areas

<http://www.smartgrowth.org/about/principles/principles.asp?prin=6&res=1920>

The Trust for Public Land – Benefits of Parks

http://www.tpl.org/tier2_cl.cfm?folder_id=725

UF/IFAS Extension – Solutions for Your Life: Outdoor Recreation

http://www.solutionsforyourlife.com/hot_topics/environment/outdoor_recreation.html

Acknowledgements

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This is a fact sheet in The Carbon Challenge Series for the Florida Energy Systems Consortium (FESC). The goal of the consortium is to become a world leader in energy research, education, technology, and energy systems analysis. For more information, go to <http://www.FloridaEnergy.ufl.edu>