Energy, Water and Land Development: A Florida Case Study

Pierce Jones, Director
Program for Resource Efficient Communities
Program for Resource Efficient Communities

We promote application of design, construction and management practices that minimize environmental degradation and make more efficient use of energy, water and other natural resources in master planned residential communities.
Florida Land Development: Context
Florida Land Development
Population

- 1980   10,000,000
- 2005   17,000,000
- 2030   28,000,000
Florida Land Development

Building Permits: Single-Family Detached

- 2003  155,000
- 2004  185,000
- 2005  208,000
- 2006  146,000
- 2007  70,000
Florida Land Development

Welcome to The Bonita Bay Group

The Bonita Bay Group™ offers exceptional community living with its environmentally sound development philosophies and innovative designs. Residents enjoy traditional neighborhood gathering spots, recreational facilities and access to community parks that blend seamlessly with surrounding habitats.

Distinctive Lifestyle Experiences

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Florida Land Development
Oakland Park
Florida Land Development
Oakland Avenue Lot

**FRONT YARD**
- Trees: minimum of 2 canopy trees and 2 accent trees
- Shrubs: 20% minimum
- Groundcover: 15% minimum
- Turf: 60% maximum

**SIDE YARD**
- Trees: minimum of 1 canopy tree and 2 accent trees
- Shrubs: 30% minimum
- Groundcover: 0% minimum
- Turf: 70% maximum

**ALLEY YARD**
- Shrubs: 30% minimum
- Groundcover: 0% minimum
- Turf: 70% maximum
Florida Land Development
Conventional Practice
Florida Land Development
Conventional Practice
Martin’s Crossing Homeowners Association

Community Landscape Maintenance Standards
Effective 12/2/09

Single family home policy:
All shrub and tree beds are to be maintained with regularly installed red mulch, as required, in adequate quantity/thickness to prohibit weed growth and provide an appealing appearance. All beds are to be maintained weed free. If any mulch other than red is to be used, it requires prior approval from the Architectural Review Board (ARB) via the normal application and approval process. As a reminder: in ground vegetable gardens are strictly prohibited.
Florida Land Development
Lake County
Development Impacts: Water Supply
Water Supply

Florida Freshwater Withdrawals
(in million gallons per day)

- Ground water
- Surface water

1950 '55 '60 '65 '70 '75 '80 '85 '90 '95 2000

Source: U.S. Geological Survey

Tampa Bay Water Desalinization Facility
Florida Land Development
Conventional Practice
BAYONET POINT — "He's in prison for God knows how long because we can't afford to sod the lawn," said his sobbing daughter, Jennifer Lehr.

Prudente has owned a home in the deed restricted community since 1998. The covenants require homeowners to keep their lawns covered with grass.

Free from jail, Joseph Prudente, 66, inspects his new lawn with pride Sunday. Prudente, who says he barely has enough to pay the mortgage, was jailed for having a brown lawn.
Swiftmud says old sod can't be replaced

Marlene Sokol, Times Staff Writer
In Print: Saturday, November 22, 2008

Homeowner, get used to that sickly looking lawn. Local water managers are saying not to resod until summer. That means no sheets of green turf off a flatbed.

"Anything that causes you to need more water is unacceptable," said Robyn Felix, Southwest Florida Water Management District spokeswoman.

The agency's order, issued more than three weeks ago, has created confusion for local government, an enforcement issue for homeowner associations, and panic among small businesses that install turf.

Baldomero Moreno, left, and Erasto Osoric, who work for Curasod, lay sod Friday at a new home in Wesley Chapel.
Tampa Bay Water makes last withdrawal from tapped out reservoir

By Craig Pittman, Times Staff Writer
In Print: Saturday, March 14, 2009

Get used to having a brown lawn for a while. As of this week, Tampa Bay Water has virtually drained its 15 billion-gallon reservoir.

From now until the summer rainy season, it must rely on its two remaining sources of water: its sometimes troubled desalination plant and the dwindling supply in the underground aquifer. "It's going to be a long couple of months waiting for the rainy season," Tampa Bay Water spokeswoman Michelle Robinson said Friday.
Water Supply

TBW Carbon Footprint by Supply Type (mtons CO$_2$e)

<table>
<thead>
<tr>
<th>Year</th>
<th>Desalinated</th>
<th>Surface Water</th>
<th>Groundwater</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>15,722</td>
<td>31,255</td>
<td>0</td>
</tr>
<tr>
<td>2007</td>
<td>22,494</td>
<td>30,159</td>
<td>0</td>
</tr>
<tr>
<td>2008</td>
<td>75,823</td>
<td>13,747</td>
<td>26,459</td>
</tr>
<tr>
<td>2009</td>
<td>70,774</td>
<td>15,823</td>
<td>28,812</td>
</tr>
</tbody>
</table>
Water Supply
TBW Summary 2006 to 2009

- Water supply decreased 3% (6 MGD)
- Desal water added to blend (17 MGD)
- Energy use increased 109% (93 GWh)
- Energy costs increased 138% ($9,900,000)
- GHG emissions increased 95% (74,000 mtons CO$_2$e)
Florida Land Development
Pasco County
Development Impacts: Water Quality
Controlling Eutrophication: Nitrogen and Phosphorus

Daniel J. Conley, Hans W. Paerl, Robert W. Howarth, Donald F. Boesch, Sybil P. Seitzinger, Karl E. Havens, Christiane Lancelot, Gene E. Likens

The need to reduce anthropogenic nutrient inputs to aquatic ecosystems in order to protect drinking water supplies and to reduce eutrophication, including the proliferation of harmful algal blooms and “dead zones” in coastal marine eco-systems has been widely recognized. …a cascading set of consequences has been set in motion, arising from massive increases in fixed N additions to the biosphere, largely through the production of fertilizers and increases in fossil fuel emissions. P levels have also significantly increased because of fertilizer use, as well as from wastewater.
Water Quality
St Johns River
Water Quality

2005 Fertilizer Consumption (Tons/yr):

- Clay 1,190
- Nassau 1,540
- Duval 3,970
- St Johns 22,780
Water Quality

2005 Fertilizer Consumption (Tons/yr):

- Clay 1,190 5,230
- Nassau 1,540 2,040
- Duval 3,970 23,500
- St Johns 22,780 3,480
Florida Land Development
Conventional Practice
Development Impacts:
Landscaping
Landscaping Impacts
Conventional Practice
Landscaping Impacts
Greenhouse Gas Accounting (Groundwater)

- **Mowing:**
  15 lbs CO$_2$e/1000ft$^2$/yr

- **Fertilizer:**
  29 lbs CO$_2$e/1000ft$^2$/yr

- **Pesticides:**
  1 lbs CO$_2$e/1000ft$^2$/yr

- **Irrigation:**
  34 lbs CO$_2$e/1000ft$^2$/yr
  (Groundwater)
Landscaping Impacts
Greenhouse Gas Accounting (Desal)

Mowing: 15 lbs CO\textsubscript{2}e/1000ft\textsuperscript{2}/yr

Fertilizer: 29 lbs CO\textsubscript{2}e/1000ft\textsuperscript{2}/yr

Pesticides: 1 lbs CO\textsubscript{2}e/1000ft\textsuperscript{2}/yr

Irrigation: 579 lbs CO\textsubscript{2}e/1000ft\textsuperscript{2}/yr

(Dusal)
Restoration’s Two Designs: Quantifying Impacts
Restoration Case Study

• This 5,187-acre master plan evolved significantly over its 4-year permitting process.

• Designs were for 8,500 dwelling units.

• It is fully entitled based on the 2009 design.

• Restoration is entitled to create a mixed-use, transit oriented community with 3.5 million ft\(^2\) of commercial space.
Restoration 2009

Reduced Impact Practice
Restoration 2009
Transit Ready Corridor
Restoration 2009
Reduced Impact Design

• The largest lots are 60’ wide
• Compact homes (45’x 70’) 375 ft² landscaped area
• Less than 25% of residences with lots designed for any turf
## Restoration 2009

C&D Cottages

<table>
<thead>
<tr>
<th>Type</th>
<th>Bldg. Sq.Ft.</th>
<th>Lot Size</th>
<th>Lot Sq.Ft.</th>
<th>DU/AC (including streets)</th>
<th>Driveway Orientation</th>
<th>Parking Spaces per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-1</td>
<td>1,260</td>
<td>41 x 63</td>
<td>2,583</td>
<td>7.5</td>
<td>Rear</td>
<td>2</td>
</tr>
<tr>
<td>C-2</td>
<td>1,015</td>
<td>41 x 63</td>
<td>2,583</td>
<td>7.5</td>
<td>Rear</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>1,464</td>
<td>41 x 63</td>
<td>2,583</td>
<td>7.5</td>
<td>Rear</td>
<td>2</td>
</tr>
<tr>
<td>D*</td>
<td>1,464</td>
<td>43 x 63</td>
<td>2,709</td>
<td>7.5</td>
<td>Rear</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: Does not include on-street guest parking. *Indicates corner lot.

9.7 acres
73 units
Restoration’s Two Designs - Roads

Life Cycle Analysis (50 year life)

<table>
<thead>
<tr>
<th>Inputs</th>
<th>2006 Plan</th>
<th>2009 Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miles:</td>
<td>72</td>
<td>39</td>
</tr>
<tr>
<td>Lane miles:</td>
<td>186</td>
<td>103</td>
</tr>
<tr>
<td>Impervious area, ft²</td>
<td>17,000,000</td>
<td>10,000,000</td>
</tr>
<tr>
<td>Landscaped area, ft²</td>
<td>6,000,000</td>
<td>3,000,000</td>
</tr>
<tr>
<td>Cost</td>
<td>$383,623,680</td>
<td>$238,180,800</td>
</tr>
</tbody>
</table>

GHG Emissions

- Mtons CO2e/yr: 13,031 7,176

Road construction costs avoided: $145,000,000
## Vehicle Miles Traveled Analysis

### Inputs

<table>
<thead>
<tr>
<th></th>
<th>2006 Plan</th>
<th>2009 Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trips</td>
<td>68,000</td>
<td>68,000</td>
</tr>
<tr>
<td>Internal trip length, miles</td>
<td>1.75</td>
<td>0.38</td>
</tr>
<tr>
<td>Onsite trip capture</td>
<td>20%</td>
<td>50%</td>
</tr>
<tr>
<td>Total daily travel, miles</td>
<td>594,000</td>
<td>349,000</td>
</tr>
<tr>
<td>Gasoline, gallons/day</td>
<td>29,254</td>
<td>17,216</td>
</tr>
</tbody>
</table>

### GHG Emissions

<table>
<thead>
<tr>
<th></th>
<th>2006 Plan</th>
<th>2009 Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mtons CO2e/yr</td>
<td>98,900</td>
<td>58,200</td>
</tr>
</tbody>
</table>

Gallons/yr not consumed: 4,400,000
Fuel costs/yr avoided: $13,000,000
Restoration’s Two Designs - Housing

Development Order: 8,500 Dwelling Units (DU)

- Required use of Energy Star reflective roofing products; Pre-plumbing and pre-wiring to roof deck for solar thermal and photovoltaics
- Ductwork and air handlers in conditioned space
- All residential units will achieve a HERS Index Score of 70 or less to meet the USDOE Builder Challenge program

Metric tons CO2e/yr avoided: 78,000

KW-hrs/yr not consumed: 51,000,000
Utility costs/yr avoided: $6,120,000
Restoration 2009
Development Order: Low Impact Practices

• “…no use of potable water in common areas…..”

• “….requirements for minimal to no added inputs of water and synthetic fertilizers and pesticides…..”
## Restoration’s Two Designs - Landscaping

### Resources Accounting

<table>
<thead>
<tr>
<th>Inputs</th>
<th>2006 Plan</th>
<th>2009 Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscaped Area - acres</td>
<td>988</td>
<td>428</td>
</tr>
<tr>
<td>Pesticides lbs</td>
<td>2,240</td>
<td>345</td>
</tr>
<tr>
<td>Fertilizer lbs N</td>
<td>135,000</td>
<td>18,400</td>
</tr>
<tr>
<td>Mowing gal gas</td>
<td>33,000</td>
<td>4,460</td>
</tr>
<tr>
<td>Irrigation mgal</td>
<td>988</td>
<td>63</td>
</tr>
</tbody>
</table>

### GHG Emissions


Annual landscape costs avoided: ~$4,000,000
## Restoration’s Two Designs – Local Food

### Fresh Vegetables for 20,000

<table>
<thead>
<tr>
<th>Vegetables</th>
<th>lbs./capita</th>
<th>Acres</th>
<th>Fertilizer</th>
<th>Irrigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potatoes</td>
<td>35.6</td>
<td>21.5</td>
<td>4,305</td>
<td>13,750,000</td>
</tr>
<tr>
<td>Lettuce</td>
<td>26.9</td>
<td>21.5</td>
<td>4,291</td>
<td>13,700,000</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>20.8</td>
<td>21.3</td>
<td>4,225</td>
<td>.....</td>
</tr>
<tr>
<td>Corn</td>
<td>9.2</td>
<td>10.2</td>
<td>.....</td>
<td>.....</td>
</tr>
<tr>
<td>Broccoli</td>
<td>5.6</td>
<td></td>
<td>.....</td>
<td>.....</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
<td>.....</td>
<td>.....</td>
</tr>
</tbody>
</table>
What’s it take to produce all of the community’s potatoes, lettuce, tomatoes, cucumbers, squash, celery, cauliflower, snap beans, cabbage, sweet corn, broccoli, peppers and sweet potatoes?

- Land ~140 acres (~golf course)
- Fertilizer ~26,000 lbs (20% of 2006 Plan use)
- Irrigation ~90,000,000 gal (10% of 2006 Plan use)

Retail value of fresh vegetables: ~$4,000,000
**Restoration’s Two Designs - Summary**

**Better Practices:**
- Greater density and retention of natural areas
- Energy-efficient, vertical development
- Mixed-use, transit-oriented community design
- Reduced investment in new infrastructure

**Benefits:**
- Greatly reduced initial costs (~$200,000,000)
- Reduced homeowner costs (~$400/month)
- Reduced community financial risk
Florida Land Development

The New Normal

- Florida’s resources are clearly becoming limiting
- Landscape irrigation with potable water is fundamentally irrational
- Landscape fertilization in impaired watersheds is fundamentally irrational
- Preserving and properly valuing agricultural and natural lands is not optional
- For land owners and developers efficient land use and management practices are essential tools for addressing strategic risk management
Post Script:
Ag, Local Food and Edible Landscapes…
Farmers seeking high profits add acreage, harvest 'rottenest' land

By A. G. SULZBERGER
updated 12/31/2011 5:50:00 AM

WHITTEMORE, Iowa — A splash of green on a solid beige horizon, the golf course at the edge of this tiny town promised residents nine modest holes of refuge from corn country. Decades earlier the spot had been farmed, too, but the rocky soil was so poor, the saying went, that you couldn’t raise hell there with a fifth of whiskey.

But this year, over a chorus of objections, the greens and fairways were plowed under. The course had been losing money, and crop prices had been breaking records, so the new owner did the type of quick calculation that is quietly reshaping the region and determined that it was more valuable as farmland. The first harvest took place this fall.
Putters to ploughshares: in MPCs 'agriculture's the new golf'

Posted on: September 12, 2011
Source: Wall Street Journal

The Wall Street Journal's Ruth Simon reports on momentum growing among developers who're eschewing costly golf courses for something simpler, stuff that grows. The model for many of these developments is Prairie Crossing, a community built around a 100-acre organic farm in Grayslake, Ill. In recent years, Prairie Crossing has morphed from oddity to inspiration. Its developers have fielded so many queries from firms considering similar projects that they organized a two-day seminar last fall."
Florida growers diversify with peaches
Florida’s climate enables its peach growers to meet early market windows but also presents horticultural challenges.

MERCY OLMSTEAD July 2011

Florida is known for citrus, Disney World, and alligators, but less well known is that it has a growing peach industry producing excellent quality fruit. The stone-fruit breeding program at the University of Florida has more than 50 years of breeding experience producing high-quality, low-chill peach, nectarine, and plum varieties.

Dr. Ralph Sharpe, Dr. Wayne Sherman, and currently Dr. Jose Chaparro, have directed their efforts to take advantage of Florida’s unique climate to meet early market windows. And, although their varieties have been grown worldwide, Florida’s ability to produce true tree-ripe fruit is gaining the attention of domestic consumers.
NEW ORLEANS (AP) - Thanks to drought in parts of the South and big demand from China, the average retail price for a pound of pecans rose from $7 in 2008 to $9 last year, and it's expected to be about $11 this year, said Jeff Worn, vice president of South Georgia Pecan Co., which processes 40 million to 50 million pounds of pecans a year in Valdosta, Ga.

Pecans are the only major tree nut native to the U.S., which produces about 80 percent of the world's crop. The harvest season begins in the fall in Georgia and Florida and ends in February in New Mexico. Georgia is usually the biggest pecan producer.
Olive Production: Citrus Growers Explore Alternative Crops for Grove Land

By Kevin Bouffard
February 3, 2012

LAKE ALFRED | “The way to know if olive trees will work for you is to plant them (olive trees) and see how they grow,” said Paul Vossen, a University of California extension agent and an authority on growing olives. Vossen spoke to about 150 attendees at a seminar on the “Potential for Producing Olives in Florida”. Jackie Burns, director of the UF/IFAS Citrus Research and Education Center in Lake Alfred, organized the seminar in response to requests from citrus growers exploring alternative crops for their grove land.
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