Florida Fertilizer Ordinances – The Good, the Bad, and the Ugly

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Fertilizer Use in Florida
(Source: FDACS)

- Fertilizer is a multi-billion dollar industry in Florida
- Fertilizer use in Florida increased steadily each year until about 2000
- Use has declined significantly since
- FDACS suggests that decline is due to fertilizer regulation
Fertilizer Use in Florida
(Source: FDACS)

- Fertilizer decrease highly correlated with decrease in farm land

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**Phosphate Use (as P\textsubscript{2}O\textsubscript{5})**
(Multiply x 0.44 to get P)

**Nitrogen Use** (as N)

*Graphs showing correlation between farming area and fertilizer use.*
Comparison of Florida Nitrogen Fertilizer Consumption (tons) by Use from July 2010-June 2011

Mean N composition = 7.4%
Comparison of Florida Phosphorus Fertilizer Consumption (tons) by Use from July 2010-June 2011

- Farm, 42,341
- Lawn Turf, (3% of total) 1,572
- Golf-Athletic, 914
- Garden, 1,481
- Potted Plant, 370
- Nursery, 920

Mean P composition = 2.2%
History of Fertilizer Regulation in Florida

First known regulation of fertilizer in Florida occurred in Wellington in Palm Beach County during 2000
- Large equestrian community on 5+ acre lots
- Limited P content in fertilizer to 2% (as $P_2O_5$)
- Established a minimum setback of 5 ft for fertilizer applications adjacent to waterways
- Deflector shields for broadcast spreaders

Second ordinance enacted in the Town of Windermere (2004) in Orange County
- Limited P content in fertilizer to 3% (as $P_2O_5$)
History of Fertilizer Regulation in Florida

One of first comprehensive ordinances was established in Sarasota County (2007)

- summer blackout period for fertilizer applications
- minimum setback of 10 ft adjacent to waterbodies, with recommended 6 ft maintenance zone
- deflector shields required
- require minimum 50% slow-release fertilizer mixtures
- establish a maximum annual nitrogen application limit
- limits P application rates to 0.25 lb/1000 ft²/application and 0.5 lb/1000 ft²/year
- commercial applicators must complete Sarasota County BMP training
- includes enforcement language
  - Code Enforcement Officers or designated inspectors are empowered to make inspections and issue citations
  - Initial offense receives a Warning Notice
  - Second offense receives a Citation – civil penalty with fine not to exceed $500
City of Sanibel – 2007
- Establishes summer wet season blackout period
- Minimum setback of 25 feet from waterbodies
- Minimum 70% as slow-release form
- Limits soluble nitrogen which can be applied
- P limited to 2% or less (as P$_2$O$_5$)

Ordinance adoptions accelerated in 2008

Model Ordinance for Florida-Friendly Fertilizer Use on Urban Landscapes released during 2008 by FDEP
- Referred to as “FDEP Model Ordinance” or just “Model Ordinance”
- Update released in 2010

Pinellas County Ordinance adopted in 2010
- One of strictest ordinances
- Many of same provisions as Sarasota Ordinance, but also includes:
  - No P applied to any lawn or landscape
  - No retail sale during blackout period
  - Enforcement – Code Violation with fine up to $500
Currently, more than 64 ordinances

- Most regulate residential lawns only
- Some, particularly newer ordinances, also regulate commercial applications
- Most limit application rates
- Most prohibit application adjacent to waterbodies (min. setback variable)
- Most prohibit blowing leaves and debris onto impervious surfaces
- Most recommend slow-release blends
- Prohibit fertilizer applications prior to significant rainfall
- Some provide dedicated enforcement officers while others are “honor system”
- Most require that commercial applicators complete the BMP Education Program
FDACS Urban Turf Fertilizer Rule
(5E-1.003, FAC)

- First statewide regulation of labeling – effective 12/31/07
- Developed by FDACS “in cooperation with manufacturers and IFAS”
- Only applies to labeling of “Specialty Fertilizer” bags (< 49 lbs.)
  - Primarily impacts retail homeowner market

Requirements
- Fertilizer sold for use on lawns urban turf must indicate the fertilizer content
- Provides N application guidelines for turf grasses
- P content cannot exceed 0.5% (as P$_2$O$_5$). Maximum of 0.25 lbs of P$_2$O$_5$ per 1,000 square per application, with no more than 0.50 lbs allowed annually. No additional P applied unless a soil test indicates deficiency
- Labeled rates for nitrogen and phosphorus be followed
- Requires environmental precaution statements
- No enforcement or penalties
- Exemptions
  - Starter or “grow in” fertilizers
  - Commercial industries/applicators
Florida Friendly Landscaping Program

- Initiated during 2003 by IFAS and FDEP as a voluntary educational program
- Developed “Florida Yards and Neighborhoods Handbook” (FYN)
  - Provides guidelines for conserving water, reducing waste, and pollution, providing wildlife habitats, and preventing erosion in urban landscapes
  - Provides fertilization recommendations
  - Widely referenced in fertilizer ordinances
  - Emphasizes techniques to reduce fertilizer impacts
- Updated versions of the FYN Handbook issued in 2006 and 2009

- Emphasizes appropriate fertilization practices to reduce nonpoint source pollution, including proper rates, timings, and application of fertilizers.
- Become general guide book for commercial applicators
- Referenced in most fertilizer ordinances
- Manual for the FDEP BMP training program
<table>
<thead>
<tr>
<th>Item</th>
<th>Summary of Ordinance Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackout Period</td>
<td>None</td>
</tr>
<tr>
<td>Weather Restrictions (Prohibited Application Period)</td>
<td>No application if a severe thunderstorm, flood, tropical storm, or hurricane watch or warning is in effect, or if heavy rain (≥ 2 inches in 24 hours) is forecast</td>
</tr>
<tr>
<td>Retail Sale</td>
<td>No restrictions</td>
</tr>
<tr>
<td>Application Amount Restrictions – Phosphorus</td>
<td>Follow <em>Urban Turf Rule</em>; fertilizers labeled for use on sports turf, urban turf, or lawns shall be “no phosphate” (&lt; 0.5%) or “low phosphate” (&lt; 2%); “low phosphate” formulations shall not exceed an application rate of 0.25 lbs P₂O₅/1000 ft² per application and 0.5 lbs P₂O₅/1000 ft²/yr</td>
</tr>
<tr>
<td>Application Amount Restrictions – Nitrogen</td>
<td>Follow <em>Urban Turf Rule</em> guidelines by region and turf type</td>
</tr>
<tr>
<td>Slow-Release Fertilizers</td>
<td>No recommendations</td>
</tr>
<tr>
<td>Other Application Restrictions</td>
<td>No nitrogen or phosphorus first 30 days of new turf or landscape plants</td>
</tr>
<tr>
<td>Grass and Landscape Debris</td>
<td>Must not wash, sweep, blow, or deposit into stormwater conveyances or roadways</td>
</tr>
<tr>
<td>Ordinance Exemptions</td>
<td>Golf courses (must follow <em>Env. Quality on FL Golf Courses</em>); specialized turf (must follow <em>Fla. Green Industries BMPs</em>); Right-to-Farm Act sites, pastures used for livestock grazing</td>
</tr>
</tbody>
</table>
## FDEP Model Ordinance Requirements – cont.

<table>
<thead>
<tr>
<th>Item</th>
<th>Summary of Ordinance Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Maintenance Zone</td>
<td>6 ft from any waterbody, wetland, or seawall (recommended)</td>
</tr>
<tr>
<td>Fertilizer-Free Zone</td>
<td>No fertilizer within 10 ft from TOB of any surface waterbody, wetland, or seawall; 3 feet if a drop spreader or deflector shield is used</td>
</tr>
<tr>
<td>Application Method Restrictions</td>
<td>Broadcast spreaders must be equipped with deflector shields</td>
</tr>
<tr>
<td>Commercial and Institutional Applicators Training, Certification and Licensure</td>
<td>Must obtain Green Industries BMP training within 180 days of ordinance adoption</td>
</tr>
<tr>
<td>Non-Commercial Applicators</td>
<td>Encouraged to follow IFAS FYN recommendations</td>
</tr>
<tr>
<td>Landscape Personnel Training, Certification, and Licensure</td>
<td>All businesses applying fertilizer shall have at least one employee trained in Green Industries BMPs</td>
</tr>
<tr>
<td>Reclaimed Water</td>
<td>No mention</td>
</tr>
<tr>
<td>Enforcement</td>
<td>Guidelines only</td>
</tr>
</tbody>
</table>
Applicability

- Each county and municipal government located within the watershed of a water body or water segment that is listed as impaired by nutrients . . . , shall, at a minimum, adopt the department’s Model Ordinance for Florida-Friendly Fertilizer Use on Urban Landscapes

More stringent ordinances may be adopted, if:

- (a) The local government has demonstrated, as part of a comprehensive program to address nonpoint sources of nutrient pollution which is science based, and economically and technically feasible, that additional or more stringent standards than the model ordinance are necessary in order to adequately address urban fertilizer contributions to nonpoint source nutrient loading to a water body.

- (b) The local government documents that it has considered all relevant scientific information, including input from the department, the institute, the Department of Agriculture and Consumer Services, and the University of Florida Institute of Food and Agricultural Sciences, if provided, on the need for additional or more stringent provisions to address fertilizer use as a contributor to water quality degradation. All documentation must become part of the public record before adoption of the additional or more stringent criteria.

Attempts to create an administrative “ceiling” for ordinances
Summary of County and Municipal Urban Fertilizer Ordinances **Stronger** than the FDEP Model Ordinance

<table>
<thead>
<tr>
<th>Region</th>
<th>City/Location</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sarasota County:</strong></td>
<td>City of Sarasota</td>
</tr>
<tr>
<td></td>
<td>Northport</td>
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<tr>
<td></td>
<td>Venice</td>
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<tr>
<td></td>
<td>Longboat Key*</td>
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<tr>
<td><strong>Lee County:</strong></td>
<td>City of Sanibel</td>
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<td></td>
<td>City of Fort Myers</td>
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<td></td>
<td>Fort Myers Beach</td>
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<td></td>
<td>Bonita Springs</td>
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<td></td>
<td>City of Cape Coral</td>
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<tr>
<td><strong>Pinellas County:</strong></td>
<td>Bellaire</td>
</tr>
<tr>
<td></td>
<td>Bellaire Beach</td>
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<tr>
<td></td>
<td>Bellaire Bluffs</td>
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<td></td>
<td>Bellaire Shore</td>
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<td></td>
<td>Clearwater</td>
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<td></td>
<td>Dunedin</td>
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<tr>
<td></td>
<td>Gulfport</td>
</tr>
<tr>
<td></td>
<td>Indian Rock Beach</td>
</tr>
<tr>
<td><strong>Pinellas County (County-wide):</strong></td>
<td>Indian Shores</td>
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<tr>
<td></td>
<td>Kenneth City</td>
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<tr>
<td></td>
<td>Largo</td>
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<td></td>
<td>Madeira Beach</td>
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<td></td>
<td>North Redington</td>
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<td></td>
<td>Beach</td>
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<tr>
<td></td>
<td>Oldsmar</td>
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<tr>
<td></td>
<td>Pinellas Park</td>
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<tr>
<td><strong>Manatee County:</strong></td>
<td>Bradenton</td>
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<td></td>
<td>Palmetto</td>
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<td>Bradenton Beach</td>
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<td>City of Anna Maria</td>
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<td>Holmes Beach</td>
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<td><strong>Charlotte County:</strong></td>
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<td></td>
<td>Stuart</td>
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<tr>
<td><strong>Martin County:</strong></td>
<td>Sewalls’ Point</td>
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<td><strong>Indian River County:</strong></td>
<td>Indian River Shores</td>
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<tr>
<td></td>
<td>Sebastian</td>
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<tr>
<td></td>
<td>Vero Beach</td>
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<tr>
<td></td>
<td>Orchid</td>
</tr>
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<td><strong>St. Lucie County:</strong></td>
<td>Port St. Lucie</td>
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<tr>
<td></td>
<td>St. Lucie Village</td>
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<td></td>
<td>Ft. Pierce</td>
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</tbody>
</table>
Summary of County and Municipal Urban Fertilizer Ordinances **Stronger** than the FDEP Model Ordinance

| **Brevard County** | Rockledge | Satellite Beach | Melbourne Village  
|                   | Titusville | Cocoa Beach     | Cocoa             
|                   | Cape Canaveral | Grant-Valkaria  | Indian Harbor Beach  
|                   | Malabar | Indialantic | Palm Bay |

| **Manatee County:** | Bradenton | Bradenton Beach | Holmes Beach  
|                    | Palmetto | City of Anna Maria | Longboat Key* |

| **Charlotte County:** | Punta Gorda | Stuart |

| **Martin County:** | Sewalls’ Point |

| **Orange County:** | Unincorporated areas only – Commercial exemption |

| **City of Naples** | **Town of Monteverde** |
| **City of Tampa** | **Multiple other ordinances in progress** |

**Ordinances Without Rainy Season Application Ban but Other Stronger Provisions**

| **Marion County** | **City of Crystal River** | **City of Wellington** |
Contentious Issues

1. Blackout period
2. Retail sales
3. Application rates
4. Slow release formulations
5. Enforcement
6. Fertilizer-free and low maintenance zones
7. Reclaimed water irrigation
8. Grass and Landscape Debris
1. Blackout Period

**Issue** – Eliminating fertilizer application during summer rainy season

Summer rainy season is characterized by
- Frequent rainfall
- Saturated soils
- Increased runoff potential

No research has been published that specifically addresses impacts of the blackout period

Opinions are based on inferences from IFAS research on turf grass fertilization
- Research designed to maximize growth, vigor, and color of turf grass

**Model Ordinance** - prohibits fertilization during the “Prohibited Application Period”
- when more than 2” of rain is expected

Research opposing the blackout period

- Erickson et al., 2010; Trenholm et al., 2011 - fertilizer losses occur when fertilizer is applied before the turf root system is established
- Sartain (2002) - reported lower root mass in warm-season grasses in early spring with maximum root mass recorded from May through August
- Erickson et al. (2001) - reported higher nitrate runoff under “extreme hurricane conditions” than dry conditions from St. Augustine grass turf growing on a 10% slope
- Sartain, 2010 – turf grass accumulates the largest quantity of nutrients during the time of most active growth during the summer months

Research opposing the blackout period – cont.

- Trenholm – studies in Citra and Jay to evaluate leaching during winter season conditions

- St. Augustine grass fertilized monthly using urea
- Urea is rapidly converted to ammonia in soil
- Application rates of 0.13, 0.25, 0.5, 1.0, and 2 lbs N/1000 ft²/month
  - Corresponding to rates of 1.5, 3, 6, 12, and 24 lbs/1000 ft²/year

Concluded that N uptake was greater (less leaching) during fall than winter

Research in support of blackout period

- **Soldat and Petrovic (2008)** - nutrient losses are most likely when fertilizer is applied just before or during heavy rainfall
- **Bowman et al., 1998; Morton et al., 1988; Snyder et al., 1984** – demonstrated correlation between nutrient leaching and excessive irrigation or rainfall
- **Harper and Baker (2007)** – inter-event dry period during wet season is 1.7 days
  - Summer rainfall is unpredictable
  - No way to predict if heavy rainfall will occur during next 2 days
- **Bowman et al. (1998), Morton et al. (1988), and Snyder et al. (1984)** - demonstrated a correlation between nutrient leaching and excessive irrigation or rainfall

Publications in support of blackout period

- FDEP-IFAS FYN Handbooks - recommended avoiding nitrogen application during the summer rainy months for 20 years
  - 1994 Edition: “Use iron instead of nitrogen to make your lawn green during the summer.”
  - 1996 Edition: “When applying fertilizer, use a maximum of one pound of nitrogen per 1,000 square feet no more than twice per year (March and October).”
  - Editions 2003 & 2006: “…to prevent pollution…In the summer when turf is actively growing, apply an iron source instead of a nitrogen fertilizer to green the lawn up without increasing growth.”
  - 2009 Edition: “Apply an iron source instead of a nitrogen fertilizer. To green the lawn without increasing growth in the summer, use chelated iron or iron sulfate.”

  - “Use Fe and/or Mn instead of N to enhance turf grass color on soils having a pH greater than 7.0, especially during times of enhanced rainfall.”

- General Recommendations for Fertilization of Turfgrasses on Florida Soils – SL21 (Sartain)
  - “fertilization with N in the summer is not always desirable since this often encourages disease and insect problems. …the addition of iron (Fe) to these grasses provides the desirable dark green color, but does not stimulate excessive grass growth which follows N fertilization.”

Recommendation
2. Retail Sales

- **Issue** – Prohibiting retail sales of fertilizer during blackout period
  - One of the most contentious issues related to fertilizer regulation
  - Currently effective in Pinellas County, Tampa, and City of Crystal River (fast release only)

- **Arguments in support of retail ban**
  - Without a retail ban, the program is essentially voluntary
    - Success of the fertilizer ban dependent on homeowner education and participation
    - Many homeowners would likely purchase fertilizer if it is available

- **Arguments in opposition of retail ban**
  - Opposed by the fertilizer industry
  - Inconvenience to sales outlets
    - Signage, roping off banned types
3. Application Rates

- **Issue** – how much and how often?
- **Fertilization guidelines in Florida developed by FDACS based on turf grass research**
  - Fertilization guidelines are based on optimizing plant growth, color, and vigor
  - Do not consider the potential nutrient leaching or water quality impacts of the fertilization.

- **Phosphorus**
  - Soils in Florida typically contain abundant phosphorus
  - *Sartain (2007)* - phosphorus fertilizer is generally not recommended, except:
    - Initial grow-in periods for newly established turf grasses (not to exceed an application rate of 1.0 lb of $\text{P}_2\text{O}_5$ per 1000 ft$^2$)
    - When a soil test indicates that supplemental phosphorus is necessary
    - *Liu et al. (2008)* - provided guidelines for the statewide fertilizer labeling rule, which recommends no more than 0.25 lb per 1000 ft$^2$ phosphorus per application

**Nitrogen**
- Soils in Florida contain low available nitrogen sources
  - Sandy soils have little affinity for retaining large amounts of N
- Recommended nitrogen application rates were developed by FDACS
- Outlined in the Urban Turf Rule (5E-1.003 FAC)
- FYN Handbook has recommended using the lowest of recommended rates for over 10 years
  - **2003 Edition** – use the lowest of the range recommended
  - **2006 Edition** - “Over-fertilizing can cause pest problems, excessive growth and water use
- Nutrients can seep through the ground into the aquifer and be washed off by rainfall
- **Trenholm and Unruh (2007)** - current recommended fertilization rates provide the best aesthetic quality, vigor, and physiological functioning in St. Augustine grass in central and northern Florida.
4. Slow Release Formulations

**Issue** – fertilizer composition and percentages of slow vs. quick release forms

**Nitrogen**
- N available in inorganic (ammonia & nitrate salts), organic (urea), and slow-release forms
- Plants uptake inorganic N
  - Ammonia
  - Nitrate
- Organic N must be broken down by soil bacteria into inorganic N

<table>
<thead>
<tr>
<th>Inorganic N Sources (Quick release)</th>
<th>Organic N Sources (Slow release)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advantages</td>
<td>Advantages</td>
</tr>
<tr>
<td>Disadvantages</td>
<td>Disadvantages</td>
</tr>
<tr>
<td>Low Cost</td>
<td>Slow, controlled release</td>
</tr>
<tr>
<td>Burn danger</td>
<td>More expensive</td>
</tr>
<tr>
<td>Highly available N</td>
<td>Less leaching potential</td>
</tr>
<tr>
<td>High leaching potential</td>
<td>Slow response</td>
</tr>
<tr>
<td>Adds salinity</td>
<td>Low burn potential</td>
</tr>
<tr>
<td>Frequent applications</td>
<td>Infrequent applications</td>
</tr>
</tbody>
</table>
4. Slow Release Formulations – cont.

**Nitrogen – cont.**

- During 2012, FDEP released a study titled “Warm-Season Trufgrass N Rates & Irrigation BMP Verification” (DEP WM 869), conducted by IFAS
  - Study site located in Ft. Lauderdale, conducted using St. Augustine grass
  - Evaluated N leaching as function of timing and N source
- “all SRNS tested would be capable of sustaining adequate turf quality for the 120-d fertilizer ‘black out’ period”
- “Regardless of the application rate or timing frequency the SRNS tested had significantly ($P<0.05$) lower levels of NO$_3$-N leaching”
  - Generally less than 1% of applied mass
- In contrast, urea applied solely or in combination at 1 lb soluble N/1000 ft$^2$ produced significantly ($P<0.05$) greater leaching with total losses of 7.9%
4. Slow Release Formulations – cont.

Publications in support of slow release formulations

- FDEP-IFAS FYN Handbooks - recommended use of slow-release N for 20 years
  - 1994 Edition: “... a basic fertilizer that contains slow-release, water insoluble nitrogen and other essential nutrients is the most environmentally safe and cost-effective alternative”
  - 1996 & 2003 Editions: use “fertilizers that have a high percentage of slow-release nitrogen”
  - 2006 Edition: use “fertilizers that have a high percentage of slow-release nitrogen in them. These products have less potential to leach or run off into Florida’s waterways than quick-release sources.”
  - 2009 Edition: “Look for fertilizers with slow-release nutrients ” and “If using a quick release product, apply only up to 0.5 pound of nitrogen per 1000 square feet.”

  - “It is recommended that no more than 0.5 pounds of water-soluble N per 1,000 square feet be applied in a normal application. Total N should be limited to 1 lb/1000 ft².”

- General Recommendations for Fertilization of Turfgrasses on Florida Soils – SL21 (Sartain)
  - “use a blended fertilizer product containing no more that 50% of the total N in soluble form with the rest of the nitrogen originating from a slow-release N source.”

Recommendation
5. Enforcement

- **Issue** – If, who, and how to enforce regulations
  - **If:**
    - 13 of 47 ordinances provide for enforcement
  - **Who:**
    - Current ordinances list a variety of people
      - Code enforcement personnel
      - Any County/City personnel
      - Law enforcement personnel
      - Designated personnel
      - Fire Marshall
  - **How:**
    - Most issue citation
      - Series of warnings
      - Fine
      - Appeals possible
5. Enforcement – cont.

- Without enforcement, the entire ordinance is voluntary
  - Relies on a willing and educated public
- Sociological issue rather than a scientific issue
- Many municipalities fear concept of “fertilizer police”
- **Model Ordinance** –
  - If fines are imposed, they have to be consistent with other fines
  - “Funds generated by penalties imposed under this section shall be used by (Municipality/County) for the administration and enforcement of section 403.9337, Florida Statutes, and the corresponding sections of this ordinance, and to further water conservation and nonpoint pollution prevention activities”

- **Recommendation**
6. Fertilizer-Free and Low Maintenance Zones

- **Issue** – fertilizer applications near waters and wetlands
- **Fertilizer-free**
  - Zone in which no fertilizer is applied
- **Low Maintenance** –
  - an area a minimum of ten (10) feet wide adjacent to water courses which is planted and managed in order to minimize the need for fertilization, watering, mowing, etc.

- **Model Ordinance** –
  - Fertilizer shall not be applied within ten (10) feet of any pond, stream, watercourse, lake, canal, or wetland or from the top of a seawall, unless a deflector shield, drop spreader, or liquid applicator with a visible and sharply defined edge, is used, in which case a minimum of 3 feet shall be maintained.
  - Effectively a 3 ft zone
  - Recommendation based on preventing direct discharge of fertilizer, not as a treatment buffer

Fertilizer-free zones are universally recommended in guidance documents

- **FDEP-IFAS FYN Handbooks** – recommended fertilizer-free zones since 2006
  - **2006 Edition**: “To protect a freshwater resource from nutrient and pesticide runoff, designate a maintenance-free zone of at least 10 feet between your lawn or landscape and the water body.”
  - **2009 Edition**: “Never fertilize within 10 feet of any water body.”

- **South Florida Water Management District - Florida-Friendly Landscaping**
  - establish a 10-30 foot no fertilizer, no pesticide zone along the shoreline

- **Southwest Florida Water Management District - Stormwater Systems in Your Neighborhood**
  - Plant a buffer zone (minimum of 10 feet) of low-maintenance plants between your lawn and shoreline to absorb nutrients and provide wildlife habitat

**Recommendation**
7. Reclaimed Water Irrigation

- **Issue** – additional nutrients contributed by reuse irrigation
- Wastewater reuse in the U.S. is a large and growing industry
  - Reuse is uniformly accepted by governmental, industrial, and environmental groups
  - Reuse systems have received many awards
  - Florida generates 1 bgd of reuse, largest in U.S.
Reuse Characteristics

The chemical characteristics of reuse water are highly variable, depending on location and level of treatment.

Characteristics of secondary effluent – minimum level of treatment
- Nitrogen ~ 4-20 mg/l, mostly as NO$_3^-$ and Organic N (2-15 times higher than urban runoff)
- Phosphorus ~ 2-15 mg/l (8-60 times higher than runoff)
- On average, secondary reuse water is similar in characteristics to septic tank leachate
- No requirement to measure nutrient levels, except NO$_x$
- Approximately 2/3 of WWT plants in Florida provide secondary treatment

Characteristics of tertiary effluent – adds nutrient removal
- Nitrogen - < 3 mg/l
- Phosphorus - <1 mg/l
- Tertiary reuse is similar in characteristics to HDR stormwater runoff
- Approximately 1/3 of WWT plants in Florida provide tertiary treatment

Impact assessments for reuse only give a cursory look at nutrient impacts
- Most simply state that the presence of nutrients will increase the value of the water
Comparison of Mean Stormwater Characteristics of Basin Areas with and without Reuse Irrigation

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Without Reuse&lt;sup&gt;1&lt;/sup&gt;</th>
<th>With Reuse&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Enrichment By Reuse (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>mg/L</td>
<td>40.5</td>
<td>58.1</td>
<td>44</td>
</tr>
<tr>
<td>Ammonia</td>
<td>µg/L</td>
<td>87</td>
<td>537</td>
<td>520</td>
</tr>
<tr>
<td>NOx</td>
<td>µg/L</td>
<td>218</td>
<td>456</td>
<td>109</td>
</tr>
<tr>
<td>Total N</td>
<td>µg/L</td>
<td>1,526</td>
<td>2,355</td>
<td>54</td>
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<tr>
<td>SRP</td>
<td>µg/L</td>
<td>192</td>
<td>241</td>
<td>25</td>
</tr>
<tr>
<td>Total P</td>
<td>µg/L</td>
<td>376</td>
<td>569</td>
<td>51</td>
</tr>
<tr>
<td>BOD</td>
<td>mg/L</td>
<td>4.8</td>
<td>7.7</td>
<td>59</td>
</tr>
</tbody>
</table>

1. Geometric mean values

Conclusion: Reuse irrigation increases concentrations of nutrients in runoff
# Loading Comparison – Secondary Reuse vs. Fertilizer (DACS Recommendations)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Fertilizer Load</th>
<th>Reuse Irrigation Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>App. Rate</td>
<td>Annual Load</td>
</tr>
<tr>
<td></td>
<td>(lbs/1000 ft²-yr)</td>
<td></td>
</tr>
<tr>
<td>Nitrogen</td>
<td>2-5¹</td>
<td>17.3 kg N</td>
</tr>
<tr>
<td></td>
<td>Assume 3.5</td>
<td></td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0.5³ (as P₂O₅)</td>
<td>1.08 kg P</td>
</tr>
</tbody>
</table>

1. DACS recommended rate for St. Augustine grass in Central Florida
2. Assumptions:
   a. Irrigated area of 0.25 acre
   b. Reuse applied at rate of 3/4 inch, 2 times/week
3. DACS Consumer Fertilizer Task Force maximum recommendation
## Loading Comparison – AWT Reuse vs. Fertilizer (DACS Recommendations)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Fertilizer Load</th>
<th>AWT Reuse Irrigation Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>App. Rate (lbs/1000 ft²-yr)</td>
<td>Annual Load</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>2-5¹ Assume 3.5</td>
<td>17.3 kg N</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0.5³ (as P₂O₅)</td>
<td>1.08 kg P</td>
</tr>
</tbody>
</table>

1. DACS recommended rate for St. Augustine grass in Central Florida
2. Assumptions:
   a. Irrigated area of 0.25 acre
   b. Reuse applied at rate of ¾ inch, 2 times/week
3. AWT criteria: TN = 3 mg/l, TP = 1 mg/l

Conclusion: Fertilizer use may not be necessary when reuse is used for irrigation
Annual fertilizer requirements for St. Augustine lawns supplied by reuse irrigation as a function of irrigation rate and frequency

Based on proposed DACS recommendations

Conclusion – Fertilizer applications should be adjusted to account for nutrients in reuse irrigation water

Reuse Application Rate – 2 Times/week
Proposed DACS Fertilizer Rates
- concerns over salinity and increasing salt content in soils and potential impacts on vegetation
- significant amount of nutrients in reclaimed water may be available to plants
- nutrient content of reclaimed water used for irrigation should be incorporated into landscape management plans

Conclusions –
- Reuse irrigation can provide a significant portion, if not all, of plant nutrient requirements
- Nutrients contributed by irrigation water should be considered when adopting a fertilizer regime
8. Grass and Landscape Debris

- Nutrients are rapidly released from vegetation after entering water

- Nutrient leaching from grass and landscape debris has the potential to contribute large nutrient loadings to waterbodies

- **Model Ordinance** - Must not wash, sweep, blow, or deposit grass and landscape debris into stormwater conveyances or roadways

- Blowing leaves and debris into the street is a needless and irresponsible practice

- Virtually all fertilizer ordinances include this prohibition

**Recommendation**

Release of P from leaves submerged in lake water (Harper, 1982)
Success of Fertilizer Ordinances

Little definitive information is available regarding the success of fertilizer ordinances in reducing nutrient loadings to surface waters

Lee County study during 2012 by Ryan and Lasso de la Vega
  – County fertilizer ordinance adopted in 2009 which contains a 4 month wet season fertilizer ban
  – Used data collected from 9 County ponds under “pre” (2004-2008) and “post” conditions (2009-2011)

Sarasota County evaluated changes in water quality in Roberts Bay before and after implementation of a fertilizer ordinance in 2007
## Results of Pre- and Post-Fertilizer Ordinance Nutrient Concentrations in Lee County Wet Detention Ponds

<table>
<thead>
<tr>
<th>Pond Watch ID</th>
<th>Location</th>
<th>Pond Area (acres)</th>
<th>Pond Area (acres)</th>
<th>Total Phosphorus Concentration (mg/l)</th>
<th>Total Nitrogen Concentration (mg/l)</th>
<th>Percent Change Pre vs. Post (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Wet Season Pre</td>
<td>Post</td>
<td>Dry Season Pre</td>
</tr>
<tr>
<td>1</td>
<td>Stone Bridge</td>
<td>1.0</td>
<td></td>
<td>0.118</td>
<td>0.056</td>
<td>0.072</td>
</tr>
<tr>
<td>4</td>
<td>Peppertree Pointe</td>
<td>5.3</td>
<td></td>
<td>0.193</td>
<td>0.099</td>
<td>0.139</td>
</tr>
<tr>
<td>14</td>
<td>South Pointe South</td>
<td>5.0</td>
<td></td>
<td>0.223</td>
<td>0.288</td>
<td>0.206</td>
</tr>
<tr>
<td>35</td>
<td>Corkscrew</td>
<td>18.5</td>
<td></td>
<td>0.046</td>
<td>0.022</td>
<td>0.034</td>
</tr>
<tr>
<td>37</td>
<td>Wellington</td>
<td>6.4</td>
<td></td>
<td>0.140</td>
<td>0.144</td>
<td>0.089</td>
</tr>
<tr>
<td>42</td>
<td>Wyldewood Lakes</td>
<td>0.5</td>
<td></td>
<td>0.160</td>
<td>0.154</td>
<td>0.172</td>
</tr>
<tr>
<td>47</td>
<td>South Wind</td>
<td>7.8</td>
<td></td>
<td>0.093</td>
<td>0.051</td>
<td>0.070</td>
</tr>
<tr>
<td>54</td>
<td>Candlewood Lake</td>
<td>15.5</td>
<td></td>
<td>0.112</td>
<td>0.069</td>
<td>0.056</td>
</tr>
<tr>
<td>57</td>
<td>Calusa Creek</td>
<td>10.0</td>
<td></td>
<td>0.160</td>
<td>0.113</td>
<td>0.077</td>
</tr>
</tbody>
</table>

- lower wet season P in 7 of the 9 ponds with 4 statistically different
- lower wet season N in 7 of the 9 ponds with 2 statistically different
- County found explanations for lack of differences in 3 ponds
Changes in Water Column Concentrations of Nitrogen in Roberts Bay Before and After Implementation of the Urban Fertilizer Ordinance in Sarasota County and Venice
Changes in Water Column Concentrations of Phosphorus in Roberts Bay Before and After Implementation of the Urban Fertilizer Ordinance in Sarasota County and Venice
## Costs of Fertilizer Losses

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Phosphorus</th>
<th>Nitrogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watershed area</td>
<td>acres</td>
<td>42,720</td>
<td>42,720</td>
</tr>
<tr>
<td>Pervious percentage</td>
<td>%</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Application rate</td>
<td>lb/1000 ft^2/yr</td>
<td>0.5</td>
<td>3</td>
</tr>
<tr>
<td>Fertilizer participation rate</td>
<td>% of area</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Fertilizer leachate</td>
<td>% of total</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Annual rainfall</td>
<td>inches</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Pervious C value:</td>
<td>- -</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Annual runoff volume</td>
<td>ac-ft</td>
<td>14,240</td>
<td>14,240</td>
</tr>
<tr>
<td>Annual P mass applied</td>
<td>kg</td>
<td>73,696</td>
<td>442,176</td>
</tr>
<tr>
<td>Annual P Mass leached</td>
<td>kg</td>
<td>1,842</td>
<td>4,422</td>
</tr>
<tr>
<td></td>
<td>lb</td>
<td>4,062</td>
<td>9,750</td>
</tr>
<tr>
<td>Runoff P Conc. Increase</td>
<td>mg/L</td>
<td>0.105</td>
<td>0.252</td>
</tr>
<tr>
<td>Unit P removal cost</td>
<td>$/lb</td>
<td>1,000</td>
<td>3,000</td>
</tr>
<tr>
<td>P removal BMP cost</td>
<td>$</td>
<td>4,062,491</td>
<td>29,249,939</td>
</tr>
</tbody>
</table>
Legislation

There are bills or amendments filed concerning fertilizer use or rainy season bans filed each year.

- Bills filed in 2010, 2011, and 2012
- All attempt to reign in ability of local governments to regulate fertilizer

**Florida Statute 576 – Agricultural Fertilizers (2013)**

- 576.181 Administration; rules; procedure
  - (5)(a) Except as otherwise provided in paragraph (b), the department (DACS) has exclusive authority to regulate the sale, composition, packaging, labeling, wholesale and retail distribution, and formulation, including nutrient content level and release rates, of fertilizer. This subsection expressly preempts such regulation of fertilizer to the state.

- (b) An ordinance regulating the sale of fertilizer adopted by a county or municipal government before July 1, 2011, is exempt from this subsection, and the county or municipal government may enforce such ordinance within its respective jurisdiction.

**Municipalities can no longer regulate**

- Sales periods
- Formulation (slow vs. quick release)
- Nutrient content
- Consideration of reuse loadings
# Summary of Issues

<table>
<thead>
<tr>
<th>Issue</th>
<th>Analysis</th>
<th>Recommendation</th>
</tr>
</thead>
</table>
| 1. Blackout period | - Large rain events are difficult to predict  
                   | - Most research supports ban  
                   | - Larger runoff potential during wet season | - Include blackout period |
| 2. Retail sales | - Potential for uninformed applicators to apply during blackout period  
                   | - Creates an “honor system”  
                   | - Inconvenience to retailer seems minimal  
                   | - Without sales ban program is voluntary | - As directed by DACS |
| 3. Application rates | - Recommended N application rates appear to be appropriate  
                   | - P application is generally not necessary  
                   | - Use minimum N amount (within range) to obtain desired color and vigor  
                   | - No P application unless indicated by testing | - As directed by DACS |
| 4. Slow-release | - Research indicates higher leaching potential for soluble fertilizers  
                   | - Addition of slow release fertilizers provides controlled release over long period of time | - As directed by DACS |
| 5. Enforcement | - Enforcement increases education and awareness | - Recommend an enforcement component |
### Summary of Issues – cont.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Analysis</th>
<th>Recommendation</th>
</tr>
</thead>
</table>
| 6. Fertilizer-free zones             | - Recommended set backs are designed to minimize direct deposition of fertilizer into water  | - Information on required set back distances is limited  
                                             - Not intended to provide treatment for runoff     | - Recommend minimum of 10 ft  
                                             - Necessary distance may be much higher          |
| 7. Reclaimed water                   | - Nutrients contributed by reuse irrigation are generally ignored  
                                             - Reuse irrigation can reduce or eliminate fertilizer requirements | - Reuse nutrient loadings should be considered in the overall management plan  
                                             |                                                                                             | - Guidelines should be provided by the utility    |
| 8. Clippings and debris              | - Improper management of vegetation clippings and debris has the potential to significantly impact loadings to receiving waters | - Strict limitations on discharges of clippings and debris should be part of any fertilizer ordinance |
| 9. Public education                  | - Any fertilizer regulation is dependent on participation from the public  
                                             - Public education is essential                   | - All fertilizer programs should include a strong educational component |
Options for Developing a Fertilizer Ordnance

As a result of Statute 576.181, the most strict ordinance available to a municipality is:

- Model Ordinance with the following options
  - Choice of blackout period
  - Level of enforcement
  - Set back distance
Questions?