1. Biosolids benefits, risks, and regulations in Florida
2. New biosolids rule (amendments to Chapter 62-640, F.A.C.)
3. Biosolids research

Benefits
- Nutrient source (macro- and micro-)
- Improves soil physical, chemical, and biological properties
- Reclamation of disturbed lands
- Environmental
  - Carbon sequestration
  - GHG mitigation
Risks

- Nutrient accumulation/water quality
- Pathogens
- Odors
- Contaminants of Emerging Concern

National Academic Review (NRC), 1996
- When practiced in accordance with existing federal guidelines and regulations, land application of biosolids presents negligible risk to consumers, crop production and environment
- Part 503 adequate to protect human health and the environment

National Academic Review (NRC), 2002
- No documented scientific evidence that Part 503 has failed to protect human health
- A casual association between biosolids exposure and adverse health outcomes has not been documented
- There are no scientifically documented outbreaks or excess illnesses that have occurred from microorganisms in treated biosolids

RESPONSE TO USEPA OIG REPORT

This research group has more than a 45-year history of biosolids research used to support the regulatory community for promulgation of Part 503 of Chapter 40 of the Code of Federal Regulations (Title 40 CFR Part 503) and other science-based state and federal guidelines and regulations

Regulations are based on the beneficial use and the class of biosolids to minimize potential risks from pathogens, nutrients and other pollutants.

- **Class B** – Treatment significantly reduce pathogens. Minimum quality for beneficial use. Site restrictions are required to minimize potential exposure. Land application.
- **Class A and AA** – Treatment essentially eliminate pathogens. Highest quality for beneficial use. Distributed and marketed as fertilizer.

Source: Maurice Barker, Biosolids Coordinator, FL-DEP

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### Biosolids Regulations

- **Federal** – Title 40 CFR Part 503 (Standards for the Use and Disposal of Sewage Sludge). It consists of general requirements, pollutant limits, management practices, and operational standards for the use and disposal of biosolids.
- **State** – DEP in accordance with Chapter 62-640, Florida Administrative Code (F.A.C.). It was initially developed based on Part 503 but addresses additional items of concern (i.e., NMP, assessment of P movement from each application zone).
- **Local ordinances**: (1/3 of FL counties have developed and implemented local ordinances that are more restrictive than state-level regulations).

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### Timeline

* **June 2018**: Regional Biosolids Symposium (Martin County) FL-DEP announced the creation of a Biosolids Technical Advisory Committee (TAC) to evaluate current management practices and regulations governing land application of biosolids.

* **September 2018 to January 2019**: Four public meetings were held to discuss various topics related to land application of biosolids. The meetings included presentations related to biosolids management and regulations, water quality, innovative technologies, and research.

* **January 23, 2019**: TAC committee was disbanded.

* **March 22, 2019**: FL-DEP began rule making.
June, 2019: DEP hosted public workshops in Tallahassee (June 25), Orlando (June 26), and West Palm Beach (June 27). Recordings available: https://floridadep.gov/water/domestic-wastewater/content/dep-chapter-62-640-fac-rulemaking


Revised rules were mainly focused on phosphorus

Timeline

1. New site permits and site permit renewals
   - Application is not allowed on soils with seasonal high water table within 6 inches of the soil surface or depth of biosolids placement unless the permitee provides reasonable assurance (NMP and water quality monitoring) that land application of biosolids will not contribute to water quality degradation
   - Sites must be enrolled in BMP program

New Biosolids Rule

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New Biosolids Rule

2. Biosolids application rates
   - Soil phosphorus storage capacity (samples may be taken at depths no deeper than the depth of the seasonal high water table)
   - Biosolids water extractable P
   - P adjustment based on soil P storage capacity and biosolids water extractable P
   - Ground and surface water monitoring requirement

<table>
<thead>
<tr>
<th>P storage capacity</th>
<th>P uptake</th>
<th>P adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td>100</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>80</td>
<td>80</td>
<td>0</td>
</tr>
</tbody>
</table>

10

11

12
1. Biosolids benefits, risks, and regulations in Florida
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Peer-reviewed articles (2019-2021)


Rainfall Simulation Study

Runoff and Leachate N and P losses from Bahiagrass Pastures Fertilized with Various Biosolids Sources
Silveira et al. 2019. JEQ 48:1498-1506

Biosolids and fertilizer were surface applied uniformly at a rate equivalent to ~ 114 kg P ha⁻¹, which corresponded to a typical total P load associated with biosolids application based on crop N requirement.

Flow-weighted runoff soluble reactive P (SRP) mass as affected by P sources
Cumulative P mass loss in runoff and leachate

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Treatment Total P TDP SRP</th>
<th>TDP</th>
<th>SRP</th>
<th>Total P TDP SRP</th>
<th>TDP</th>
<th>SRP</th>
<th>Percentage of P added</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>13c 11c 10c 7c 7b 21c</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bradenton</td>
<td>25c 21c 19c 30c 20b 55c</td>
<td>2.4c</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broward</td>
<td>11c 11c 6c 15c 12c 26c</td>
<td>1.1c</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fertilizer</td>
<td>813a 500a 441a 301a 301a 362a</td>
<td>21.8a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GreenEdge</td>
<td>29c 25c 23c 25c 17b 5c</td>
<td>2.8c</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sevdal</td>
<td>18c 10c 18c 17b 26b 1.5c</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orlando</td>
<td>157b 145b 139b 53 10b 209b</td>
<td>9.2b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miami</td>
<td>15c 10c 10c 18c 17b 26b</td>
<td>1.9c</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St Pete</td>
<td>78c 61c 51c 26 26b 104c</td>
<td>4.6b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tampa</td>
<td>23c 21c 19c 20 14b 43c</td>
<td>2.4c</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>SE</td>
<td>12 19 41 18 18</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

M. Silveira, Soil and Water Science, UF/IFAS Range Cattle REC

Agronomic and Environmental Impacts of Biosolids Application to Bahiagrass Pastures Pastures in Florida

Funding source: FCA Beef Enhancement Funds (2016 to current)

Water Quality Impacts
Cumulative mass of N and P leached during the 3-yr study

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Total N load kg ha⁻¹</th>
<th>Total N mass leached kg ha⁻¹</th>
<th>% applied N</th>
<th>Total P load kg ha⁻¹</th>
<th>Total P mass leached kg ha⁻¹</th>
<th>% applied P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0</td>
<td>11 b‡</td>
<td>-</td>
<td>0</td>
<td>0.3</td>
<td>-</td>
</tr>
<tr>
<td>Biosolids</td>
<td>720</td>
<td>9 b</td>
<td>1</td>
<td>414</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>Inorganic fertilizer</td>
<td>480</td>
<td>77 a</td>
<td>16</td>
<td>414</td>
<td>0.5</td>
<td>0.2</td>
</tr>
</tbody>
</table>

M. Silveira, Soil and Water Science, UF/IFAS Range Cattle REC

Conclusion

- Repeated application of biosolids at levels to meet crop N requirement showed no impacts on N and P leaching compared with control treatment
- Biosolids resulted in significant lower risks of N and P losses via leaching than inorganic fertilizer
- Prudent nutrient management is possible even on biosolids-amended Spodosols with high water tables

THANK YOU!

Maria Silveira
Email: mlas@ufl.edu
Phone: (863) 735-1314
## Agronomic Response

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Bahiagrass Herbage Accumulation (lb/A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>5376 b, 4500 c</td>
</tr>
<tr>
<td>Class AA</td>
<td>9375 a, 9239 ab</td>
</tr>
<tr>
<td>Class B (anaerobically digested)</td>
<td>8553 a, 10112 a</td>
</tr>
<tr>
<td>Class B (aerobically digested)</td>
<td>9324 a, 8429 b</td>
</tr>
<tr>
<td>Inorganic fertilizer</td>
<td>8991 a, 10873 a</td>
</tr>
</tbody>
</table>

### Biosolids P application rates

**Biosolids PWEP is less than 14%:**
1. SPSC > 40 mg/kg: biosolids PWEP may be used to adjust application rate by dividing the crop P requirement by the PWEP
2. SPSC 20-40 mg/kg: crop P requirement may be doubled
3. SPSC 0-20 mg/kg: crop P requirement may be increased by 50%
4. SPSC < 0 mg/kg: application rate can not be adjusted

**Biosolids PWEP is 14% or greater:**
Application rate can not be adjusted unless SPSC is greater than 40 mg/kg, in which case the crop P requirement may be increased by 50%