



Proposed Changes in Regulations Governing Land Application of Biosolids in Florida

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Popular Press



Investigation: Human waste fertilizes farms,


Ban Sewage Sludge Now!

Blue Cypress Lake erupts with pollution-eating algae linked to municipal sewage treatment

Class B biosolids: DEP discusses water pollution from human waste spread on farmland


Tons Of South Florida Sewage Finds Its Way Into St. Johns River To 'Devastating Effect'

What are "Biosolids"?



- Biosolids are the solid, semisolid or liquid material produced during the treatment of domestic wastewater
- Sewage sludge undergoes pathogen control treatment that meet regulatory requirements
- Sewage sludge that is disposed of by landfill or incineration is NOT considered biosolids


Biosolids Disposal Options



- Transfer to another facility
- Landfill
- Distribution and marketing (fertilizer)
- Incineration
- Bioenergy (potential)
- Land application

Biosolids Management in Florida

- Total Production → 340,000 dry tons/year
- Estimates indicate approximately two-thirds are beneficially used and one third is landfilled

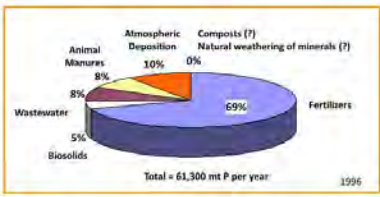


Category	Percentage
Land Application	66%
Landfill	33%
Distribution and Marketing	1%

- Each year, 10,000 - 20,000 dry tons of pellets are imported, distributed and marketed as fertilizer.

Source: Maurice Barker, Biosolids Coordinator, FL-DEP

Phosphorus Imports from Various Sources



Source	Percentage
Fertilizers	69%
Atmospheric Deposition	10%
Animal Manures	8%
Wastewater	5%
Biosolids	5%
Composts (?)	0%
Natural weathering of minerals (?)	0%

Total = 61,300 mt P per year 1996

Reddy, et al., 1999

Source: George O'Connor, Professor, UF/IFAS Soil and Water Sciences Dept.

Biosolids P Contribution

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- Total production = 224,000 dry tons * 2% total P = 4,500 mt (vs. 3,000 mt in 1999)
- Typical biosolids P loads
 - Land application rate ~3 T/A
 - Total P concentration ~2%
 - Typical P load
 - 3 T biosolids/A x 0.02 T P/T biosolids = **0.06 T P/A**

Fertilizer P Inputs

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Source: Reddy et al., 1999

Source: George O'Connor, Professor, UF/IFAS Soil and Water Sciences Dept

Classes of Biosolids for Beneficial Use in Florida

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3 Classes of biosolids:

- **Class B** –Treatment significantly reduce pathogens. Minimum quality for beneficial use. Site restrictions are required to minimize potential exposure.
- **Class A and AA** – Treatment essentially eliminate pathogens. Highest quality for beneficial use
- Class B: Land application; Class AA: Distributed and marketed as a fertilizer
- Regulations are based on the beneficial use and the class of biosolids to minimize potential risks from pathogens, nutrients and other pollutants

Source: Maurice Barker, Biosolids Coordinator, FL-DEP

Biosolids Regulations

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- **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)

Limits for pollutants

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Parameter	Class A monthly average concentration (mg/kg dry weight basis)	Ceiling concentration limits for all biosolids applied to land (mg/kg dry weight basis)
Arsenic (As)	41	75
Cadmium (Cd)	39	85
Chromium (Cr)	1200	3000
Copper (Cu)	1500	4800
Lead (Pb)	300	840
Mercury (Hg)	17	57
Molybdenum (Mo)	NA	75
Nickel (Ni)	420	420
Selenium (Se)	100	100
Zinc (Zn)	2800	7500

In addition to ceiling limits, regulations also include cumulative pollutant loading limits and annual pollutant loading rate

List of parameters required for biosolids land application or distribution and marketing

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Parameter	Units
Total Nitrogen	% dry weight basis
Total Phosphorus	% dry weight basis
Total Potassium	% dry weight basis
Arsenic (As)	mg/kg dry weight basis
Cadmium (Cd)	mg/kg dry weight basis
Copper (Cu)	mg/kg dry weight basis
Lead (Pb)	mg/kg dry weight basis
Mercury (Hg)	mg/kg dry weight basis
Molybdenum (Mo)	mg/kg dry weight basis
Nickel (Ni)	mg/kg dry weight basis
Selenium (Se)	mg/kg dry weight basis
Zinc (Zn)	mg/kg dry weight basis
pH	Standard units
Total Solids (TS)	%
Calcium Carbonate Equivalent (only for biosolids treated by alkaline addition)	mg/kg dry weight basis

Land Application of Biosolids

- FL-DEP is responsible for permitting and compliance activities of > 2,000 domestic wastewater treatment facilities in the state
- Each person in FL generates ~ 100 gallons of domestic wastewater per day. Most of the wastewater is treated by large centralized treatment facilities
- FL-DEP permits the treatment facilities and land application sites. Haulers are the most common site permittees
- Nutrient management plan and site management are required
- Currently, there are ~140 permitted land application sites in Florida.

Source: Maurice Barker, Biosolids Coordinator, FL-DEP

Map of Biosolids Land Application Sites

[Biosolids Site Map \(2018\)](#)

Source: Maurice Barker, Biosolids Coordinator, FL-DEP

Florida Biosolids Regulations

- **Chapter 62-640, F.A.C.**
 - Effective in 1991, revised in 1998 and 2010
 - Key differences with federal rules:
 - Nutrient Management Plan (added in 2010)
 - Phosphorus provisions
 - Additional management requirements and site restrictions to minimize potential impacts (site slopes, setbacks, depth to ground water, etc.)

Land Application of Class B Biosolids

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- Site management: site slope, storage, seasonal high ground water table, setbacks, signage, cumulative application limits, public access, and harvesting restrictions, etc.
- Nutrient Management Plan (site-specific):
 - ✓ Application rates based on crop nutrient requirement
 - ✓ Phosphorus Assessment (FL P Index)
 - ✓ Soil fertility testing, all nutrient sources, nitrogen mineralization, realistic annual yield goals, biosolids calcium carbonate equivalency, method of land application
- NMP must be signed by [certified nutrient management planner](#) (CNMP) or P.E.

Main Components of NMP

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- Aerial maps and soil survey maps identifying application zones
- Guidance for implementation, site operation, maintenance, and record keeping
- Results of soil, plant tissue, water, biosolids and fertilizer analyses, as applicable
- Listing and quantification of all nutrient sources for each application one
- Biosolids N availability (current and previous application)
- Current and planned crop production, rotation, and expected yield goals
- Recommended N and P application rates, calculations, and method of application
- Calcium carbonate equivalency for alkaline-treated biosolids
- Determines frequency of soil testing and application rates for at least a 5-yr period
- Additional requirements for specific geographic areas of the state (Lake Okeechobee, St. Lucie River, Caloosahatchee River watersheds, Lake Apoka, Green Swamp, Everglades Agricultural area)

P-Index

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- The Florida Phosphorus Index (P-Index) is a site-specific evaluation tool to assess the potential risk of P movement from each application zone to surface and ground waters
- It is based on the phosphorus source, application rate, site characteristics, soil type, and management practices
- Published by the Florida Natural Resource Conservation Service (NRCS) and developed in cooperation with other stakeholder agencies. UF IFAS has published guidance on the P-Index for each individual county in Florida that can be used by permittees http://edis.ifas.ufl.edu/topic_series_florida_phosphorous_index
- The P-Index helps evaluate if biosolids application rates should be based on crop N or P requirement

P-Index

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Table 1 (Part A): P transport Potential Due to Site Transport Characteristics

Site Characteristics	Phosphorus Transport Rating	Value (Example)
Soil Erosion (Based on the Revised Universal Soil Loss Equation, this value is typically "1". Some NMPs use "0" for no surface outlet which means no overland flow from a 2 year – 24 hour rainfall event (about 5 inches of rain over 24 hours).)	No Surface Outlet = 0 <5 T/A* = 1 5-10 T/A = 2 >10-15 T/A = 4 >15 T/A = 8	1
Runoff Potential (Based on soil type, slope, drainage, etc. This value can be found in the county IFAS P-Index guidance or soil surveys. "0" is used for no surface outlet.)	Very Low=0 Low =1 Medium= 2 High =4 Very High =8	4
Leaching Potential (Based on soil type and characteristics. This value can be found in the county IFAS P-Index guidance or soil surveys.)	Very Low = 0 Low = 1 Medium = 2 High =4 Very High =8	4
Potential to Reach Water Body (Based on discharge factors. For biosolids, this should be either "0" for no direct discharge or "1" for discharge via a buffer area.)	Very Low = 0 Low = 1 Medium = 2 High = 4	1
	Sum for Table 1 (Part A): Site and Transport*	10

*T/A = Tons per Acre per Year
If the sum for Table 1 is 0 (Zero), then change the sum to 1 (one)

P-Index

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Table 2 (Part B): P Potential Due to Source and Management

Phosphorus Source Management	Phosphorus Loss Rating	Value (Example)
Fertility Index Value (Based on the soil test results for available P)	Soil Fertility Index x 0.025 (<u> </u> ppm P x 2 x 0.025)	1.25 (25 ppm P)
P Application Source and Rate # (Based on the type of material. The initial evaluation should be conducted at an N based rate. Note that the phosphorus is in P2O5, so multiply a TP value by 2.3 to get the P2O5 value)	0.05 x (<u> </u> lbs P2O5/acre) for fertilizer, manure, or compost 0.015 x (<u> </u> lbs P2O5/acre) for biosolids 0.10 x (<u> </u> lbs P2O5/acre) for waste water	5.17 (2.5% TP at 3 dry tons per acre)
Application Method (Based on how the biosolids are applied)	0 = No Surface Outlet or solids incorporated immediately or injected 2 = Applies via irrigation or solids incorporated within 1 day of application 4 = Solids incorporated within 5 days of application* 6 = Solids not incorporated within 5 days of application	6
Waste Water Application (This doesn't appear to be calibrated for reuse)	0.020 x <u> </u> acre inches/acre/year	0
	Sum for Table 2:	12.42
	Phosphorus Source:	
	P Index Value:	124.2
	Sum Table 1 x Sum Table 2	

From soil test results
Initial evaluation should be N-based rates
* Solids include fertilizers, composts, biosolids, and manure and other animal wastes

Biosolids Technical Advisory Committee (TAC)

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- In June 2018, the FL-DEP announced the creation of a Biosolids Technical Advisory Committee (TAC) to evaluate current management practices and regulations governing land application of biosolids.
- Members (7) of the TAC included stakeholders representing environmental groups, large and small utilities, waste haulers, university researchers and consultants. (<https://floridadep.gov/sites/default/files/Biosolids-TAC-Members.pdf>)
- Four public meetings were held during September 2018 and January 2019 at FL-DEP Central District Office in Orlando, FL to discuss various topics related to land application of biosolids. (<https://floridadep.gov/water/domestic-wastewater/content/dep-biosolids-technical-advisory-committee>)
- The members of the committee were charged with answering the following questions:
 1. What are the current options for biosolids management in the state?
 2. Are there better ways to manage biosolids to improve the protection of our water resources?
 3. What research gaps exist and need to be examined to build upon and improve biosolid management?

Biosolids Technical Advisory Committee (TAC)

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- In January 23, 2019, the TAC committee was disbanded. Based on the deliberation of the TAC and public comments, the following recommendations are currently being further evaluated by the FLDEP for implementation:
 1. Modifications in the permitting process to minimize nutrient transport
 - Establish the rate of biosolids application based on site specifics, such as soil characteristics/P sorption capacity, water table, hydrology, site use, distance to surface water. Some of these parameters may be contemplated in the draft revised Phosphorus-index
 - Evaluate the percentage of water extractable phosphorus in all biosolids to inform the appropriate application rate; and
 - Establish criteria for low, medium and high-risk sites that guide application practices and required water quality monitoring.

Biosolids Technical Advisory Committee (TAC)

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- Increase frequency of inspection
- Develop site specific groundwater and/or surface water monitoring protocols to detect nutrient migration
- Develop and conduct biosolid and nutrient management research on nutrient run-off through surface and groundwater flow. This should be done with various application rates, various types biosolid application and different geologic conditions
- Promote innovative technology pilot projects for biosolids processing that could provide a wider range of beneficial end products

The bill s. 403.08715, F.S. provides legislative intent to regulate biosolids management to expedite the implementation of the biosolids TAC recommendations and the implementation of biosolids processing innovative technologies

Current Research Efforts

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- Agronomic and environmental impacts of land application of biosolids to bahiagrass pastures in Florida (Funded by FCA)
- Field-scale assessment of biosolids-P fate in the upper St. Johns River Basin (Funded by SJRWMD)
- Impacts of co-application of biosolids and biochar on soil C and microbial community structure (Funded by FCA)
- Rainfall Simulation Study - Runoff and Leachate P and N losses from Biosolids- and Fertilizer-Amended Soils

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THANK YOU!

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