FOSNRS 1: The Florida Onsite Sewage Nitrogen Reduction Strategies (FOSNRS) Study, Project Overview

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Overview

- Florida onsite wastewater systems
- Assessment of system performance
- Current research:
  - Nitrogen removal technologies
  - Fate and transport
There are approximately 2.6 million onsite sewage systems in Florida.
Statewide rule implemented by 67 county offices
Nitrogen from onsite systems depends on:

- System usage
- Treatment level
- Groundwater
- Soil type
“Advanced Systems”

- Aerobic Treatment Units (ATUs)
- Performance-based Treatment Systems (PBTS)
Regulatory requirements for advanced systems

- Florida DOH
  - Biennial operating permit
  - Annual DOH inspection

- Maintenance entity
  - Maintenance contract
  - Two annual inspections
How are these systems working?

- What are the options?
- How effective are they?
- How are systems working day-to-day?
- How are these systems perceived?
Where are Florida’s advanced systems?

There are approximately 12,000 advanced systems in Florida.

Number of Advanced Systems:
- No advanced systems
- Small (1-24 advanced systems)
- Medium (25-99 advanced systems)
- Large (100-700 advanced systems)
- Extra-Large (>700 advanced systems)
Sampling protocol

Three groups of measurements:

1. Initial system assessment
2. System operation evaluation
3. Sample analysis
Sampling
## Sampling results

<table>
<thead>
<tr>
<th>Median</th>
<th>cBOD$_5$ (mg/L)</th>
<th>TSS (mg/L)</th>
<th>TN (mg/L)</th>
<th>TP (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influent (n=42)</td>
<td>95</td>
<td>66</td>
<td>45</td>
<td>7.9</td>
</tr>
<tr>
<td>Effluent (n=301)</td>
<td>5.5</td>
<td>19</td>
<td>30</td>
<td>7.5</td>
</tr>
<tr>
<td>% Removal</td>
<td>94%</td>
<td>72%</td>
<td>33%</td>
<td>6%</td>
</tr>
</tbody>
</table>
Comparison of results aerating and non-aerating systems

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Influent n=42</th>
<th>Aerating n=237</th>
<th>Non-Aerating n=42</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Result</td>
<td>% Removal</td>
<td>Result</td>
</tr>
<tr>
<td>cBOD$_5$ (mg/L)</td>
<td>95</td>
<td>4.6</td>
<td>95%</td>
</tr>
<tr>
<td>TSS (mg/L)</td>
<td>66</td>
<td>18</td>
<td>73%</td>
</tr>
<tr>
<td>TN (mg/L)</td>
<td>45</td>
<td>29</td>
<td>36%</td>
</tr>
<tr>
<td>TKN (mg/L)</td>
<td>45</td>
<td>4.9</td>
<td>89%</td>
</tr>
<tr>
<td>TP (mg/L)</td>
<td>7.9</td>
<td>7.3</td>
<td>7%</td>
</tr>
</tbody>
</table>
Current paperwork + Regular inspections = Satisfactory system operation = Sample results meet standards
Florida Onsite Sewage Nitrogen Reduction Strategies Study

Study cost-effective ways to reduce nitrogen from onsite wastewater treatment systems.
Project Timeline

2008
Study authorized by Florida Legislature

2009-2015
Project executed, funding appropriations ongoing

2015-2016
Anticipated contract completion
Study goals

- Develop passive strategies for nitrogen reduction
- Complement use of conventional systems
- Develop cost-effective and ecologically protective nitrogen reduction strategies
- Evaluate nitrogen transport
Evaluate technologies

- Determine what nitrogen reduction strategies to study
- Bench-scale testing to develop design criteria
Install Full-Scale Systems at Actual Home Sites

Monitoring 7 sites throughout Florida
8 monitoring events over 12-18 months

Passive Nitrogen System

Wastewater from Home

Septic Tank (Primary Treatment)

Stage 1 Unsaturated Biofilter (Nitrification)

Stage 2 Saturated Biofilter (Denitrification)

Subsurface Dispersal (Bacteria Reduction)

Ground Surface

Illustration courtesy of HAZEN AND SAWYER
Environmental Engineers & Scientists
Evaluate nitrogen reduction in Florida soils and groundwater
Model Nitrogen Removal

- Shows treatment in soil and groundwater
- Use for assessment, planning, and siting
- Simple to use
- Calibrate to site specific data

Neitsch et al., 2002
What’s next?

Florida Department of Health
Research Review
and
Advisory Committee
Summary

- Florida onsite wastewater systems
- Assessment of system performance
- Current research:
  - Nitrogen removal technologies
  - Fate and transport
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