An Assessment of the Performance and Management of Advanced Onsite Systems in Florida

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Onsite sewage systems in Florida

There are approximately 2.6 million onsite sewage systems in Florida

Florida Department of Health

Statewide rule

implemented by

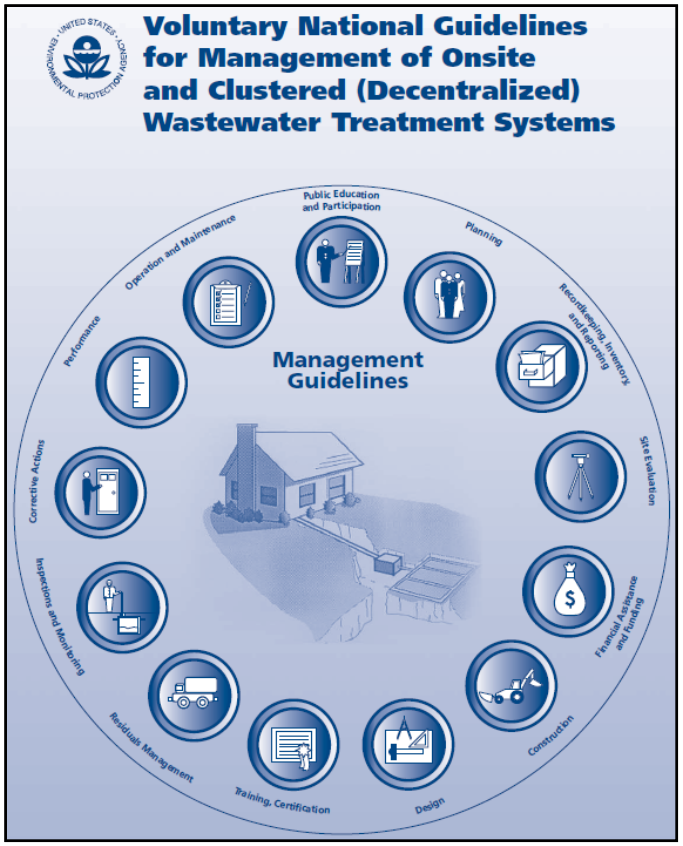
67 county offices

“Advanced Systems”

- Aerobic Treatment Units (ATUs)
- Performance-based Treatment Systems (PBTS)
- Innovative Systems

Management Levels

1. Homeowner Awareness
2. Maintenance Contracts
3. Operating Permits
4. Responsible Management Entity (RME) Operation and Maintenance
5. RME Ownership



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?

EPA Nonpoint Source Pollution program funding - Section 319(h)

Project Objectives

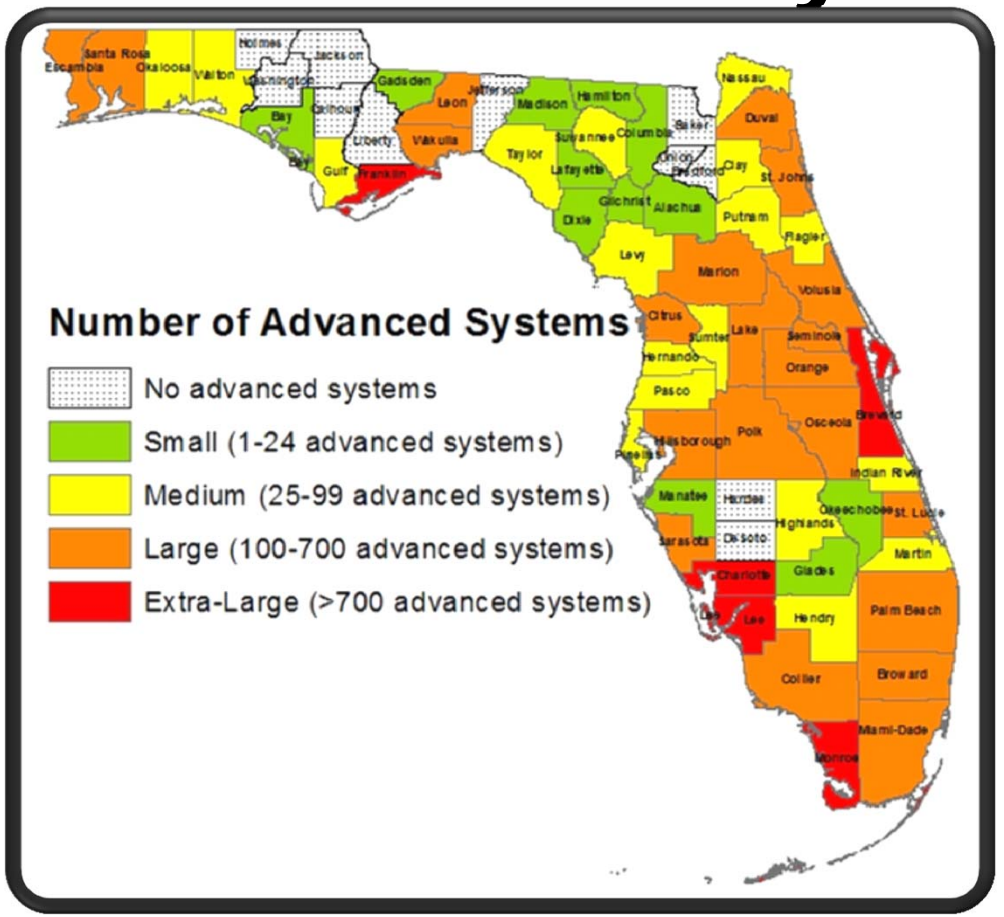
1. Inventory system number, types, and locations
2. Assess operational status of systems
3. Quantify reduced loading of contaminants from systems
4. Survey perceptions of user groups
5. Determine consistent assessment of systems
6. Identify best management practices

Project Objectives

1. Inventory system number, types, and locations

Where are the advanced systems?

There are approximately 12,000 advanced systems in Florida



Review advanced system files

Select pure random sample from all systems

900 systems

Select additional systems as needed

14 systems

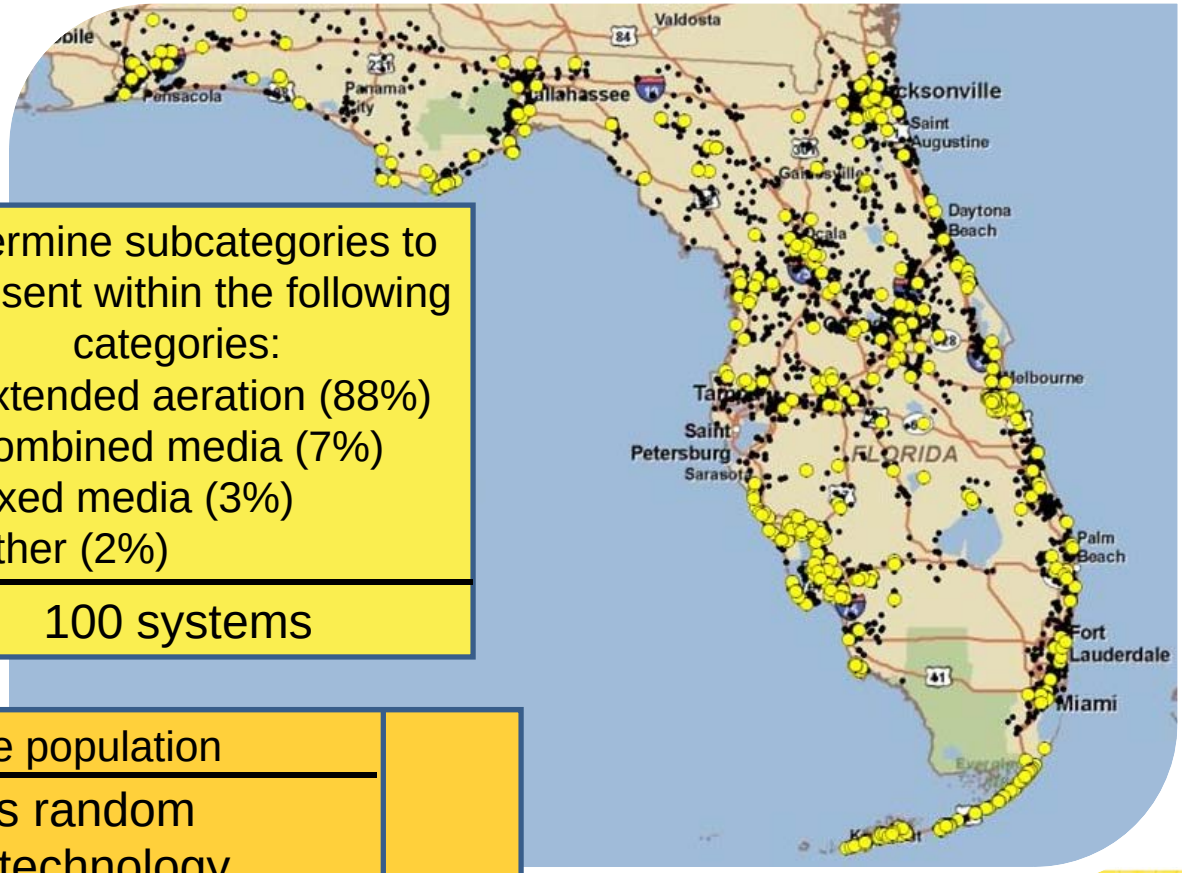
Determine subcategories to represent within the following categories:

- Extended aeration (88%)
- Combined media (7%)
- Fixed media (3%)
- Other (2%)

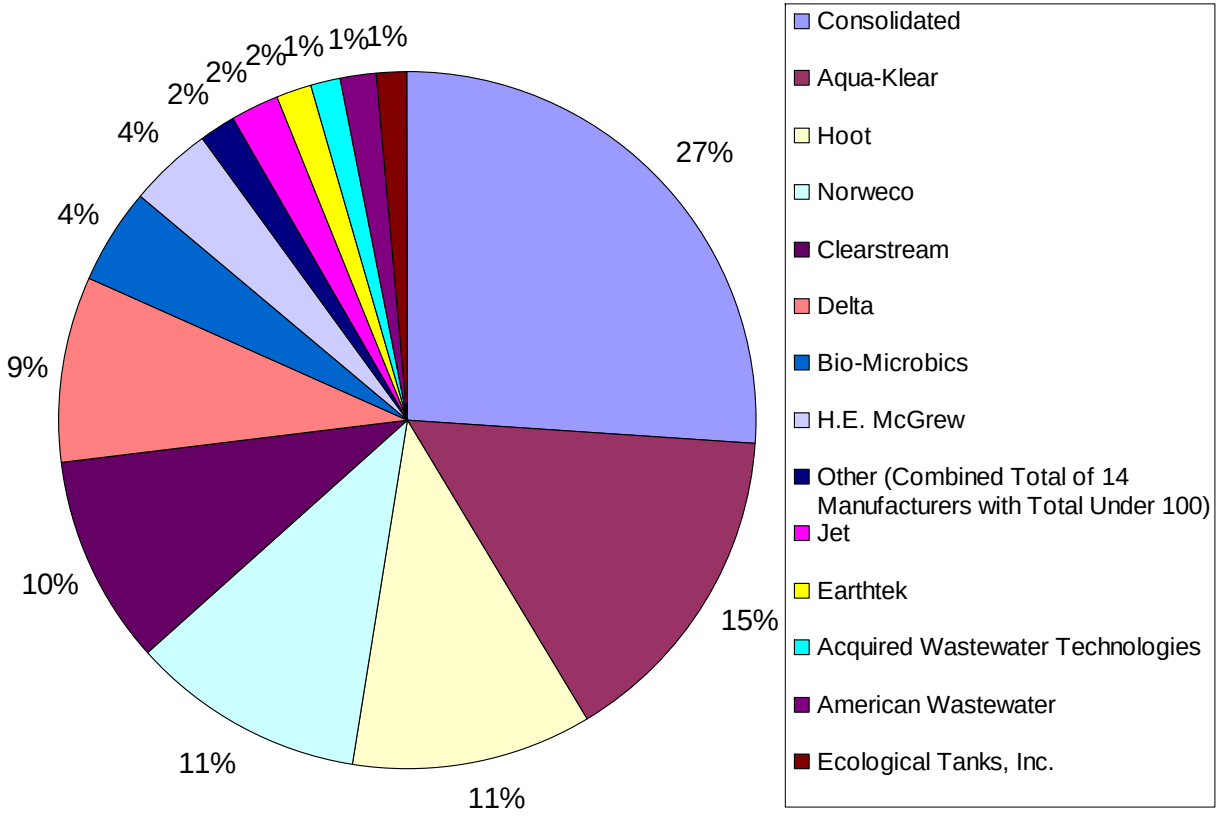
100 systems

Finalize sample population

629 systems random
86 treatment technology

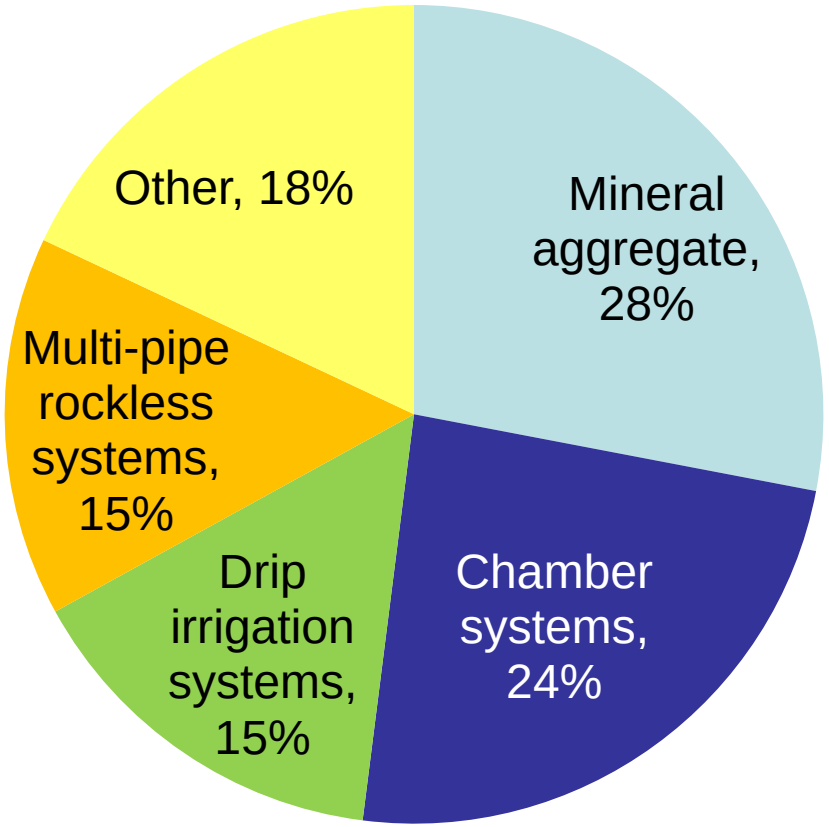


Treatment technology manufacturers



Construction information

- Most for new homes
- 300 gallons per day (gpd) flow / 500 gpd treatment capacity
- 65% have drainfield sidewalls extending above natural grade



Project Objectives

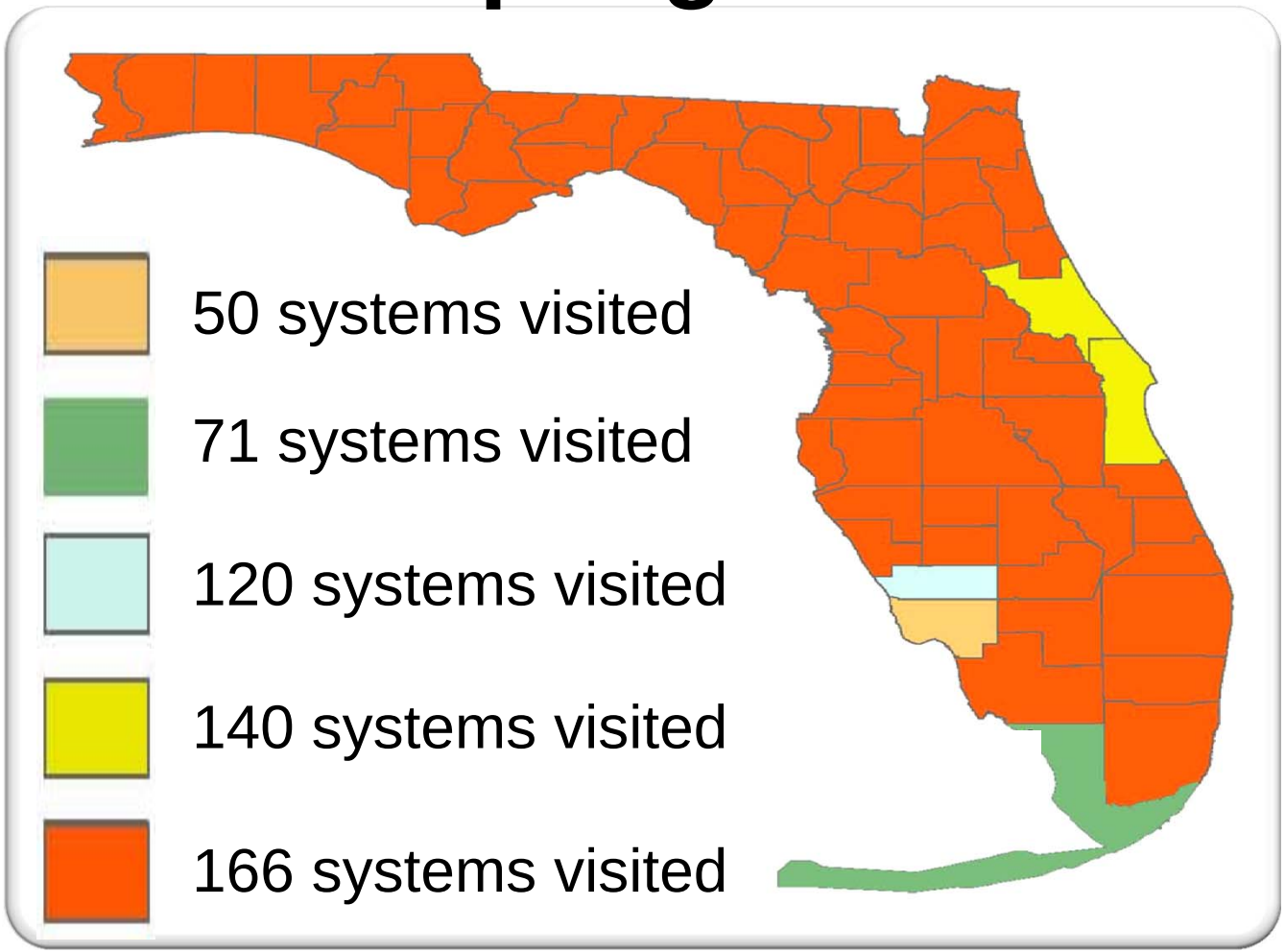
2. Assess operational status of systems

Sampling protocol

Three groups of measurements:

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

Sampling team



Initial system evaluation

- Power is on
- No sewage on the ground
- Aeration occurring
- Alarms are off
- Changes to site conditions


The exception!

Vacancy and system operation

(all randomly selected visited systems)

Occupancy Status	Switched off	Power indicator off	Aeration off
Vacant (n=89)	54%	54%	59%
Non-Vacant (n=445)	6%	17%	14%

Issues for non-vacant systems

n=454 non-vacant systems based on permit review
# of non-operational systems = 127 (28%)

Reason for non-operational status	Number	Percent of total non-operational systems
Power switched off	54	43%
Power indicator off	79	62%
Aeration not working	73	57%
Sanitary nuisance	20	16%
Alarm issue	19	15%

Project Objectives

3. Quantify reduced loading of contaminants from systems

Sampling






Sampling results

Median	$cBOD_5$ (mg/L)	TSS (mg/L)	TN (mg/L)	TP (mg/L)
Influent (n=42)	95	66	45	7.9
Effluent (n=301)	5.5	19	30	7.5
% Removal	94%	72%	33%	6%

Effluent standards

Permitting Level	$cBOD_5$ mg/L	TSS mg/L	TN mg/L	TP mg/L	Fecal cfu/100 mL
Baseline	120-240	65-176	36-45	6-10	NA
ATU	≤ 25	≤ 30	NA	NA	NA
Secondary	≤ 20	≤ 20	NA	NA	≤ 200
Advanced Secondary	≤ 10	≤ 10	≤ 20	≤ 10	≤ 200
Advanced Wastewater	≤ 5	≤ 5	≤ 3	≤ 1	Below Detection

Treatment standard exceedances

System Type	$cBOD_5$	TSS	TN	TP	Fecal
PBTS (random)	37% (n=30)	50% (n=30)	70% (n=23)	28% (n=18)	50% (n=4)
PBTS (other)	36% (n=22)	50% (n=22)	93% (n=14)	42% (n=12)	88% (n=8)
ATU (random)	22% (n=267)	36% (n=275)	NA	NA	NA
ATU (other)	14% (n=7)	25% (n=8)	NA	NA	NA

Florida HEALTH

Comparison of results aerating and non-aerating systems

Parameter	Influent n=42	Aerating n=237		Non-Aerating n=42	
		Result	% Removal	Result	% Removal
$cBOD_5$ (mg/L)	95	4.6	95%	38	60%
TSS (mg/L)	66	18	73%	23	65%
TN (mg/L)	45	29	36%	47	-4%
TKN (mg/L)	45	4.9	89%	42	8%
TP (mg/L)	7.9	7.3	7%	8.7	-10%

Florida HEALTH

Field screening of samples

- Option to perform in situ sample screening
- Saves expense of sample analysis
- Results were favorable for:
  - Apparent color & turbidity ($cBOD_5$ & TSS)
  - Nitrate (nitrate+nitrite)
  - Ammonia (TKN)

Variability of performance

- Repeat visits to sites
- Influent and effluent results stay within a factor of two
- Variations in loading influence both influent and effluent
- Variability does not affect treatment effectiveness estimates

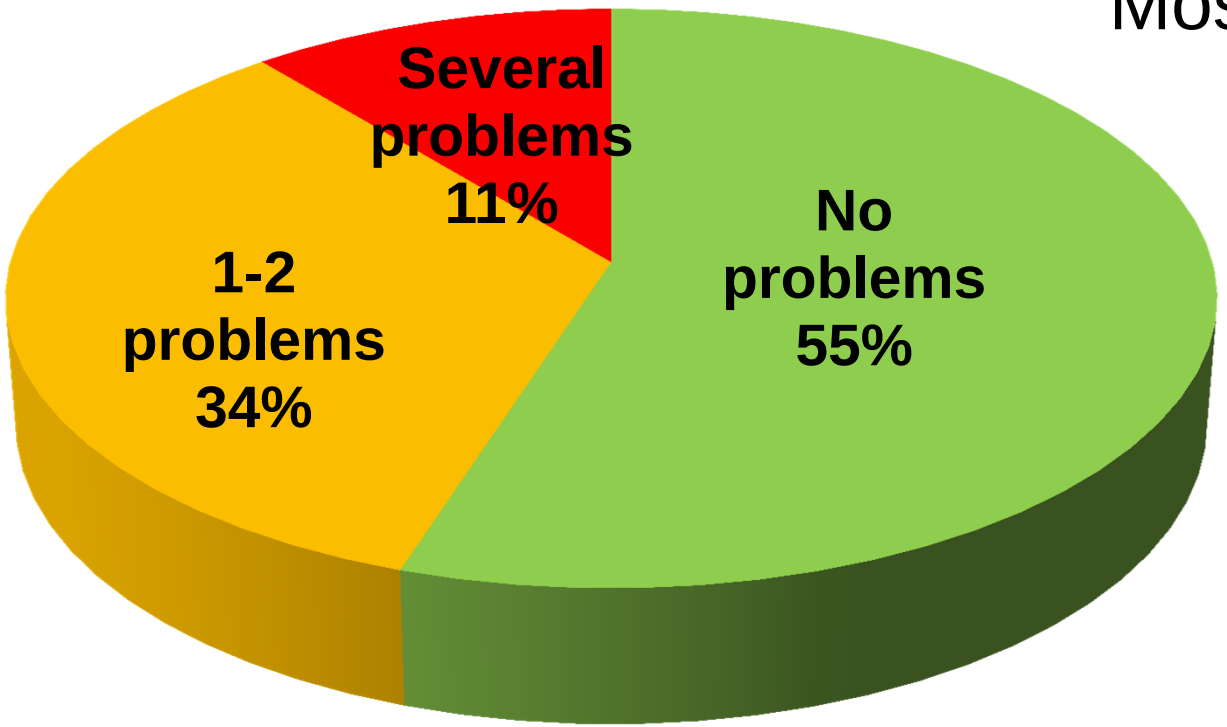
Project Objectives

4. Survey perceptions of user groups

Survey of stakeholders

- Homeowners
  - 3,800 surveys sent
  - 660 completed surveys (17%)
  - Most from full-time residents with the system
  - Most systems served less than 4 people
- Maintenance entities, installers, engineers, manufacturers
- Florida Department of Health at County Offices

Homeowner reported problems

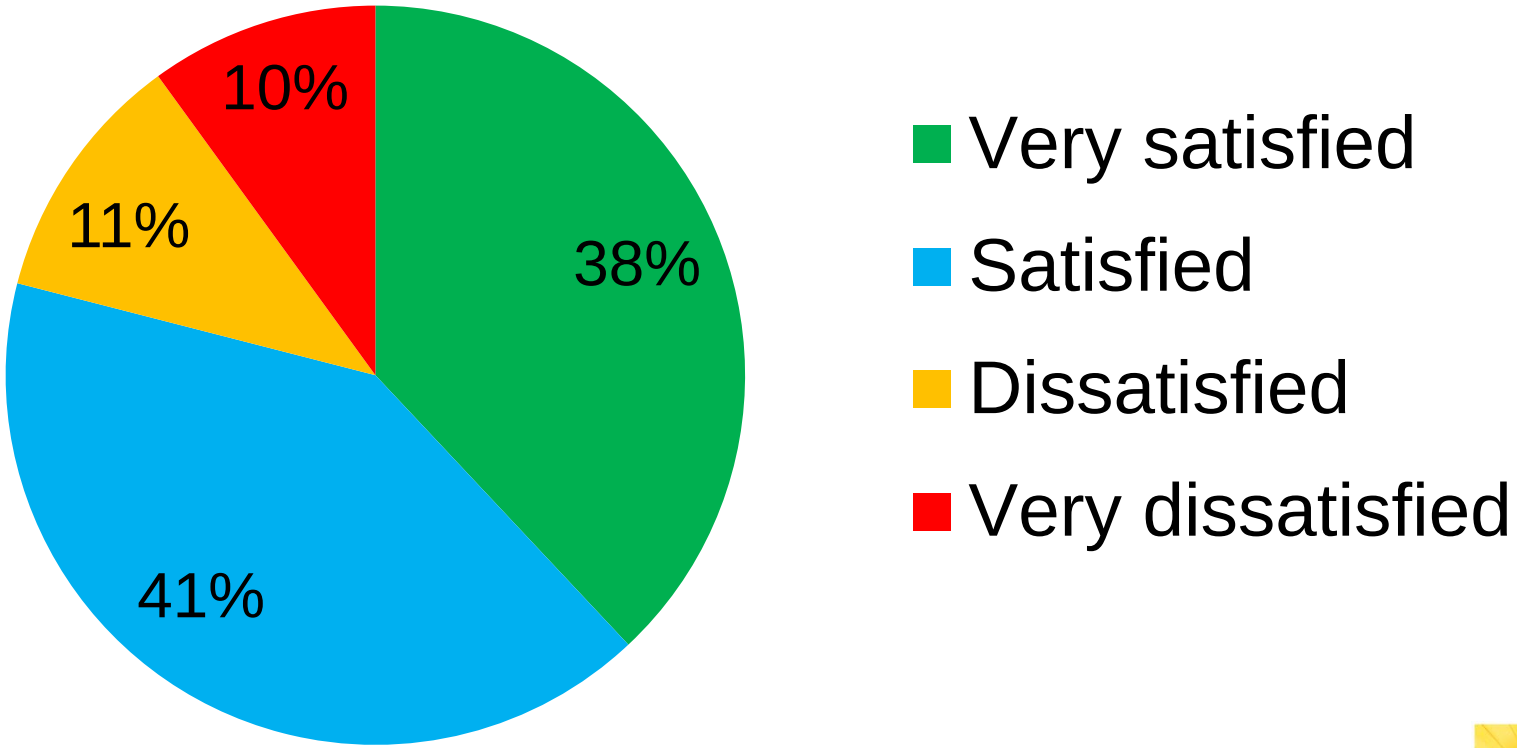


Most were mechanical:

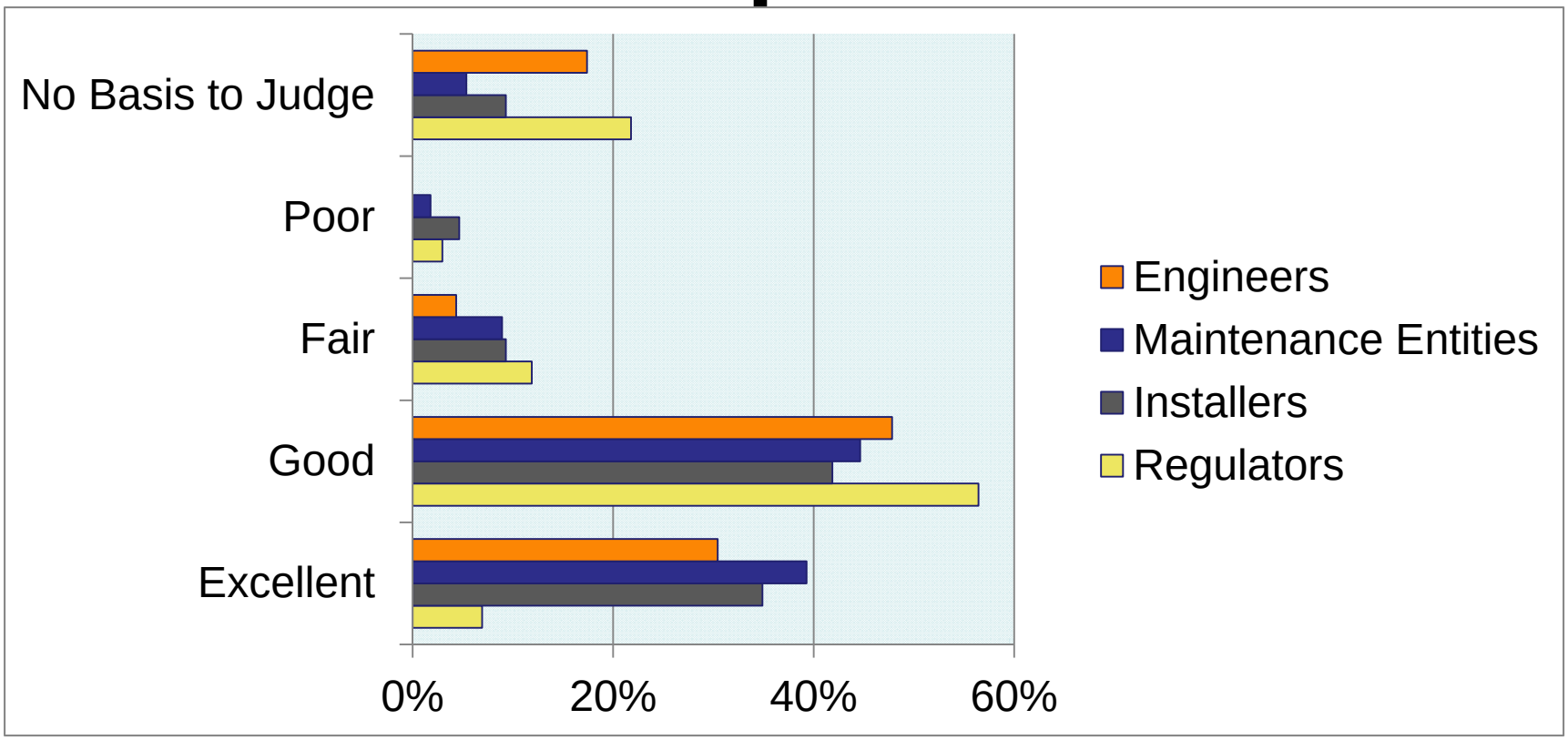
- Pump failures
- Electrical problems
- Faulty alarms
- Bad motors

Homeowner satisfaction

How would you describe your overall satisfaction with your advanced onsite sewage system (septic system)?



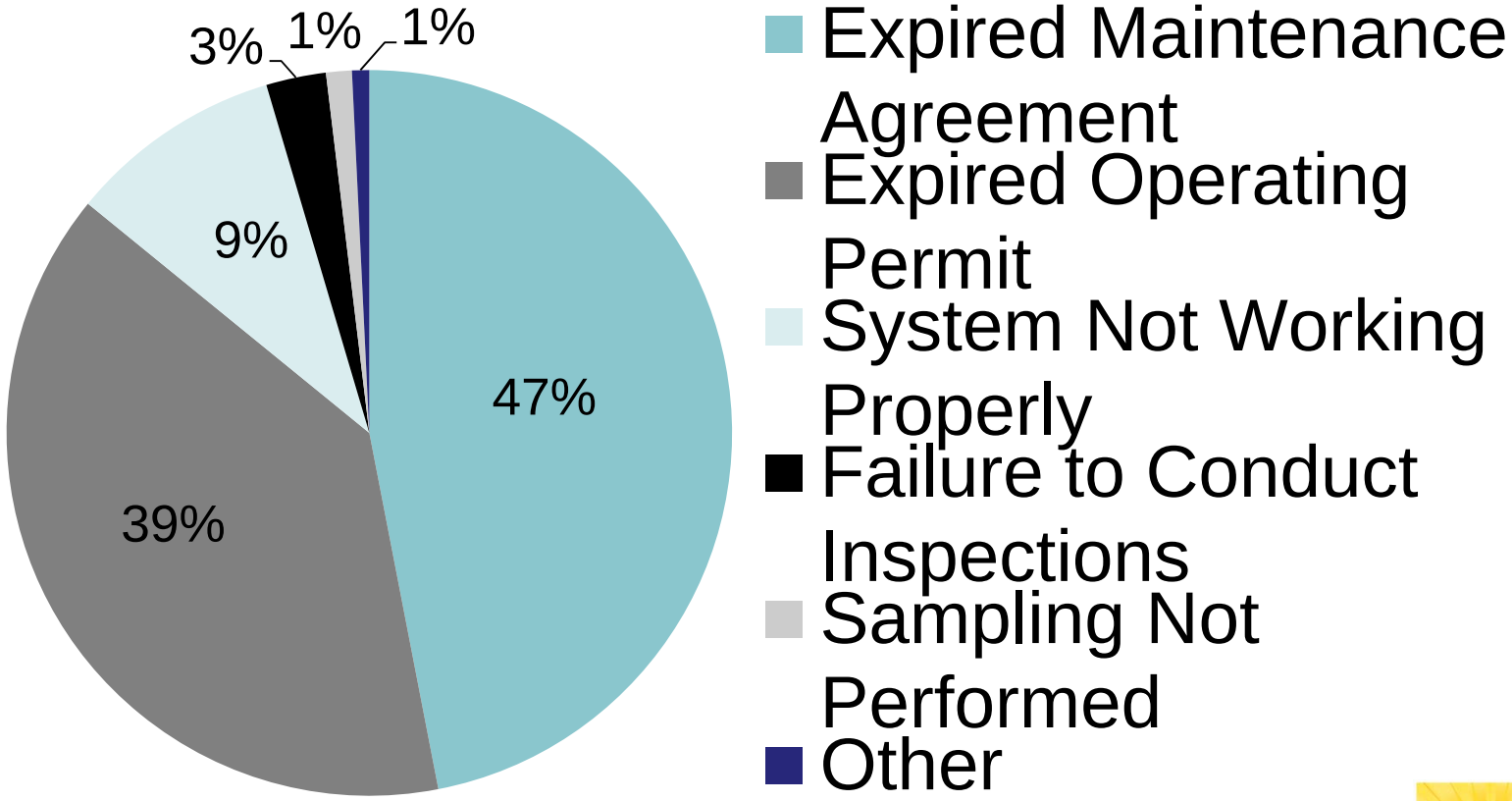
Overall perception of treatment performance



Project Objectives

5. Determine consistent assessment of systems

Permitting violations requiring enforcement (n=262)



Current paperwork

+

Regular inspections

=

Satisfactory system operation

=

Sample results meet standards

Monitoring protocol

- Up-to-date paperwork
- Field evaluation to check:
  - Power/on
  - No alarms on
  - Aeration on – bubbles and mixing
  - No sewage on the ground
- Good as-built drawing: show sample location
- Easy access to treatment units
- Clear and consistent sampling requirements
- Regular inspections

Project Objectives

6. Identify best management practices

What is a “best” management practice?

1. Complete, accurate, and current documentation
2. System operating conditions
3. System sampling results
4. User group recommendations

Major categories of BMPs

1. Recordkeeping practices
2. System maintenance practices
3. Enforcement practices
4. Fiscal practices
5. Communication practices

Recordkeeping practices

1. Central data location
2. Complete and accurate system file
3. Recording sample/performance information
4. Synchronization between data sources
5. Online billing system

System maintenance practices

1. Increased homeowner awareness/education
2. Statewide standardized form with maintenance and inspection requirements
3. Quality maintenance inspections performed routinely
4. Access to system interior and monitoring locations

System maintenance practices (continued)

5. Access to appropriate equipment for inspections
6. Sufficient access to resources
7. Clear monitoring/sampling requirements
8. Notification of system malfunctions
9. Consistency between regulator and maintenance entity
10. Keep track of vacant properties

Enforcement practices

1. Effective, standardized, and consistently applied enforcement procedure
2. Document systems in property records
3. Consistent pre-notification for payments
4. Standard timeframe for non-compliance letters
5. Build relationships between regulators and local government
6. Simplify the current rule

Fiscal practices

1. Ensure adequate staffing
2. Reduce cost of systems
3. Adjust payment schedules
    - installment billing
    - automatic payments

Communication practices

1. Training and education for all user groups
2. Open communications between user groups

Recommendations

1. Continue analyzing data
2. Implement database and website enhancements
3. Develop statewide standardized form
4. Evaluate low cost and effective nutrient reduction technologies

Recommendations (continued)

5. Develop a homeowner awareness and education campaign
6. Select a pilot county to implement the best management practices
7. Standardize enforcement procedures
8. Conduct workshops to discuss BMPs

What's next?

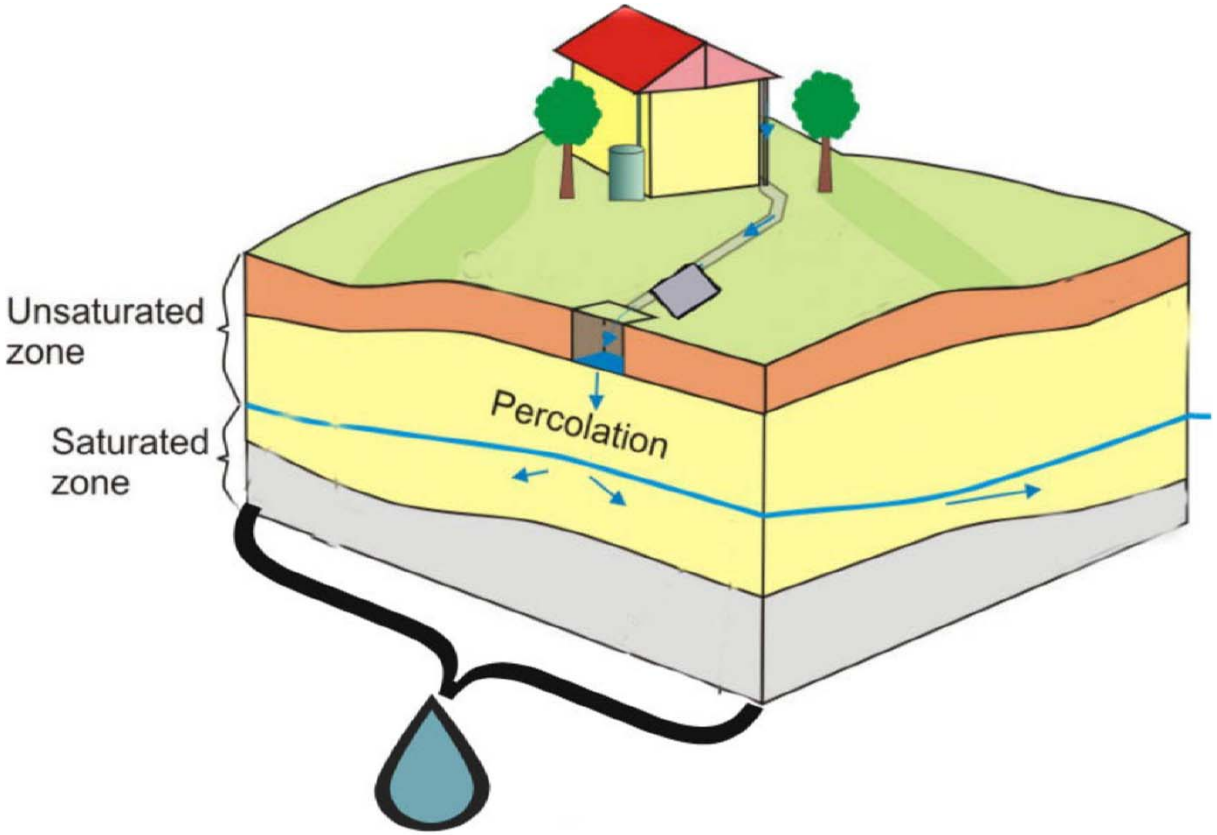
Florida Department of Health

Research Review

and

Advisory Committee

Florida Onsite Sewage Nitrogen Reduction Strategies Study



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

Original image source:
http://www.bgs.ac.uk/science/landUseAndDevelopment/images/urban_geoscience/suds/soakaway.jpg

Thank you!

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http://www.floridahealth.gov/healthy-environments/onsite-sewage/research

Division of Disease Control & Health Protection