

Advanced Treatment Onsite Wastewater Systems

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Several of these slides are thanks to

Eberhard Roeder

Bureau of Onsite Sewage Programs

FL Dept. of Health, Division of Environmental Health

and

Mark Hooks

Wakulla Spring Groundwater Map

www.floridasprings.org

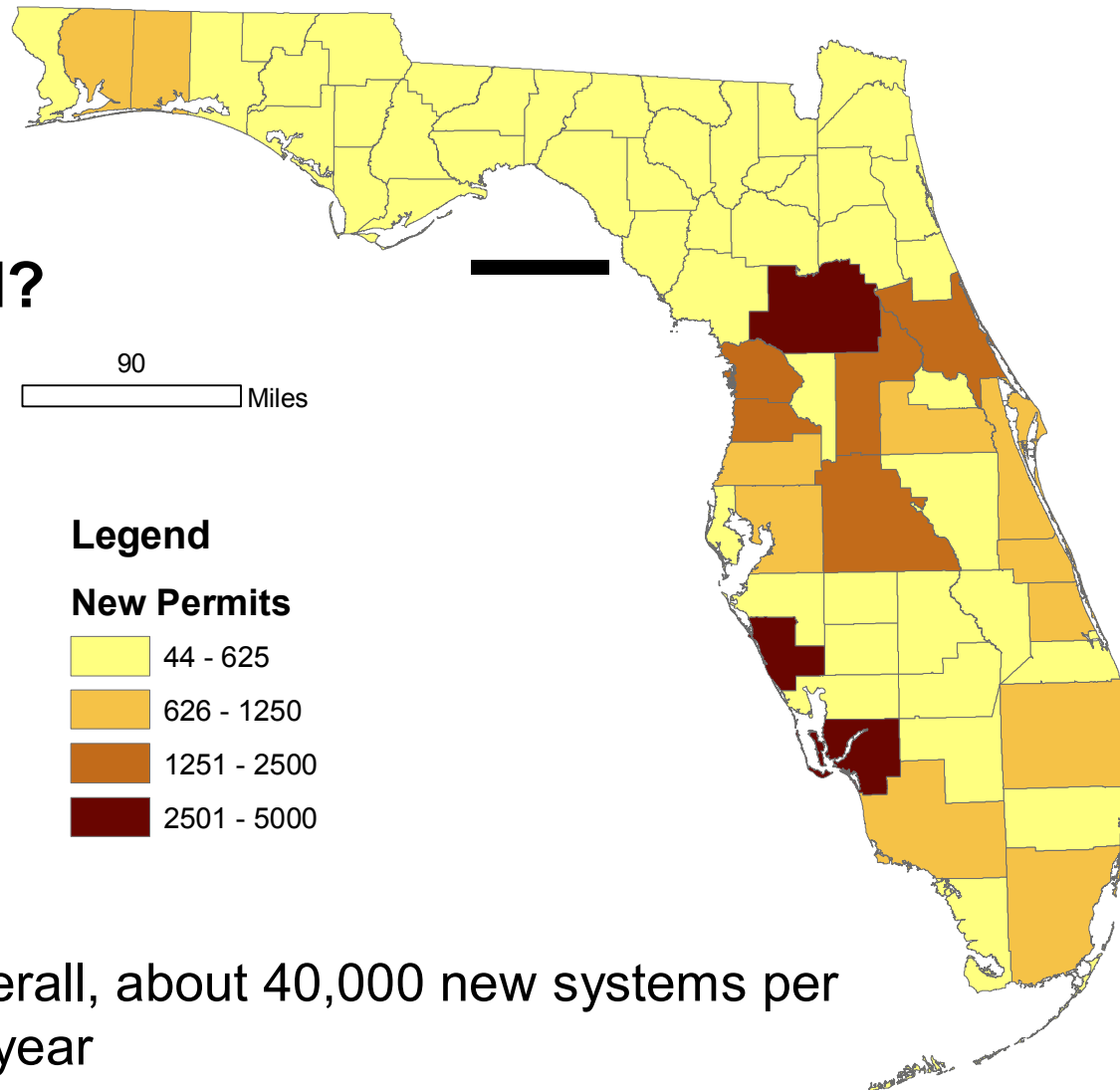
The springshed is an area of land extending hundreds of square miles from southern Georgia to the Gulf of Mexico.



The blue arrows show the direction of groundwater flow in the springsheds. Water entering the aquifer north of the Springs flows south and reemerges at Wakulla Spring.

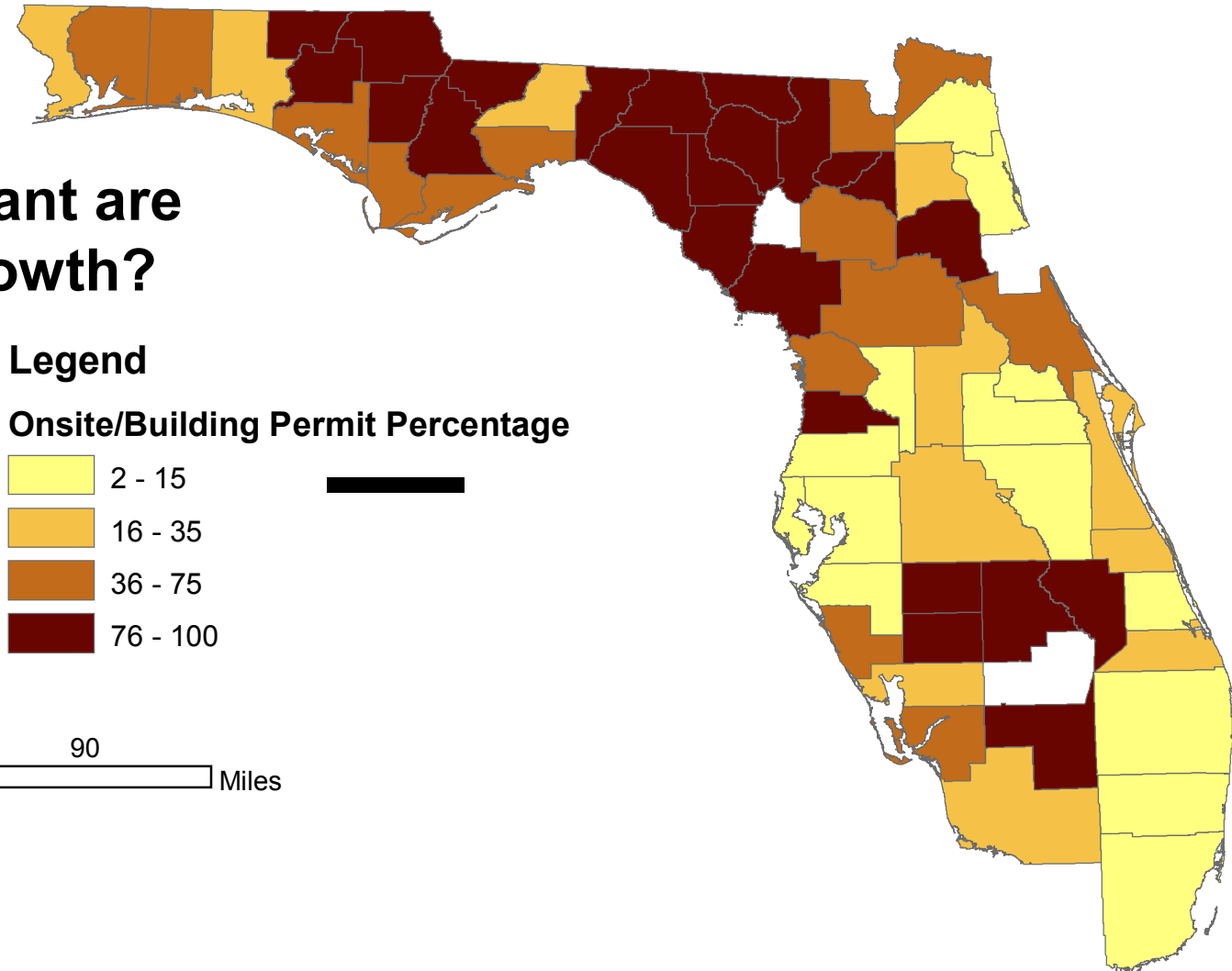
Annual Number of New OSTDS Permits (Average of FY 2002/03 to 2004/05)

How many are
being installed?



Prevalence of Onsite Systems in New Construction

How important are they for growth?



Septic System Terms and Types

- Septic Tank, Drainfield, Leach Field
- ATU - Aerobic Treatment Unit
- PBTS - Performance Based Treatment System

How long do they last?

- Average drainfield system in Florida lasts 17 years
- Studies have shown systems can last over 100 years with routine maintenance.
- Maintenance is missing!!!
- US-EPA 1997 report to Congress states that “*Adequately managed* decentralized wastewater systems are a cost-effective and long-term option for meeting public health and water quality goals...”

History of Florida Regulation

- Regulated since 1920's
- Setbacks to surface waters and wells since the beginning
- 1983 – major upgrade to keep drainfields out of the water table
- Except for ATUs and PBTS, only focuses on installation, not maintenance.

Nitrogen and Onsite Sewage Systems?

- About 20-25 pounds of Nitrogen per year per household comes out of the average septic tank--equal to one large bag of fertilizer.
- Reduction in drainfield varies: about a quarter is removed



Estimated contributors of anthropogenic nitrogen to Wakulla

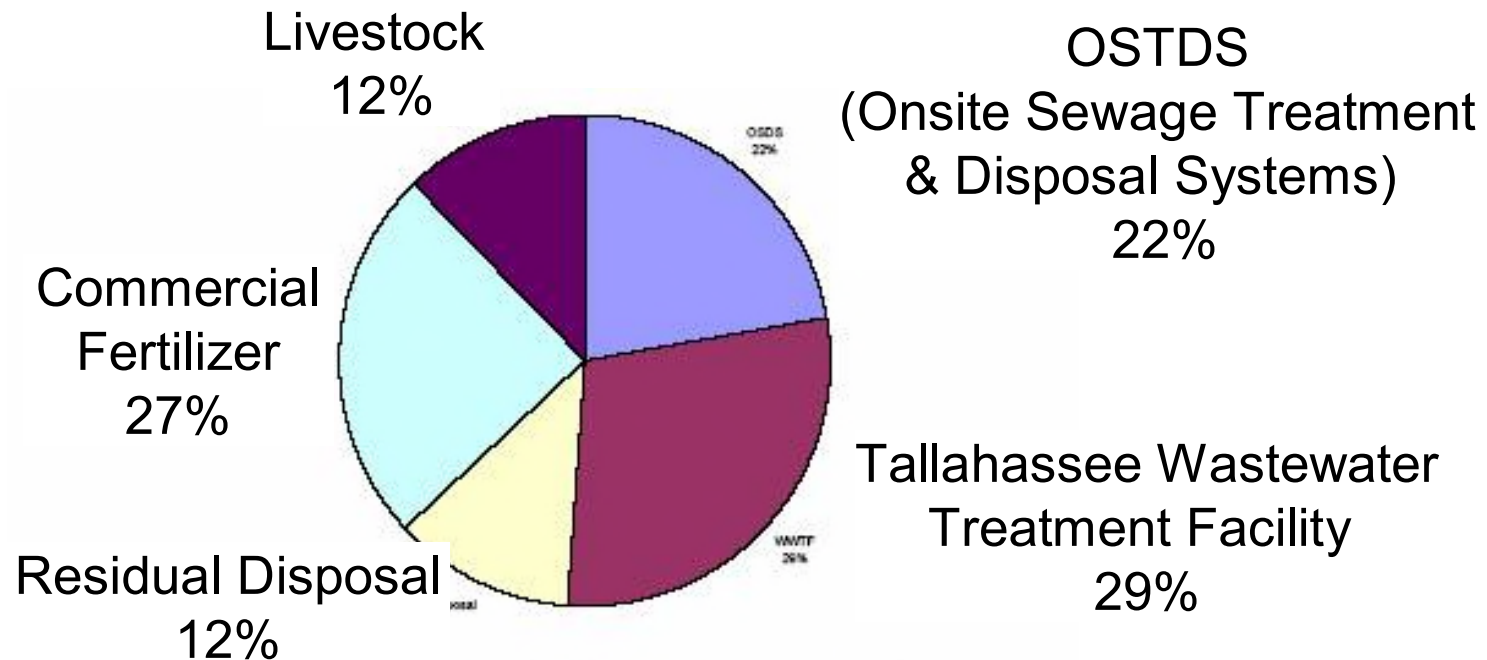
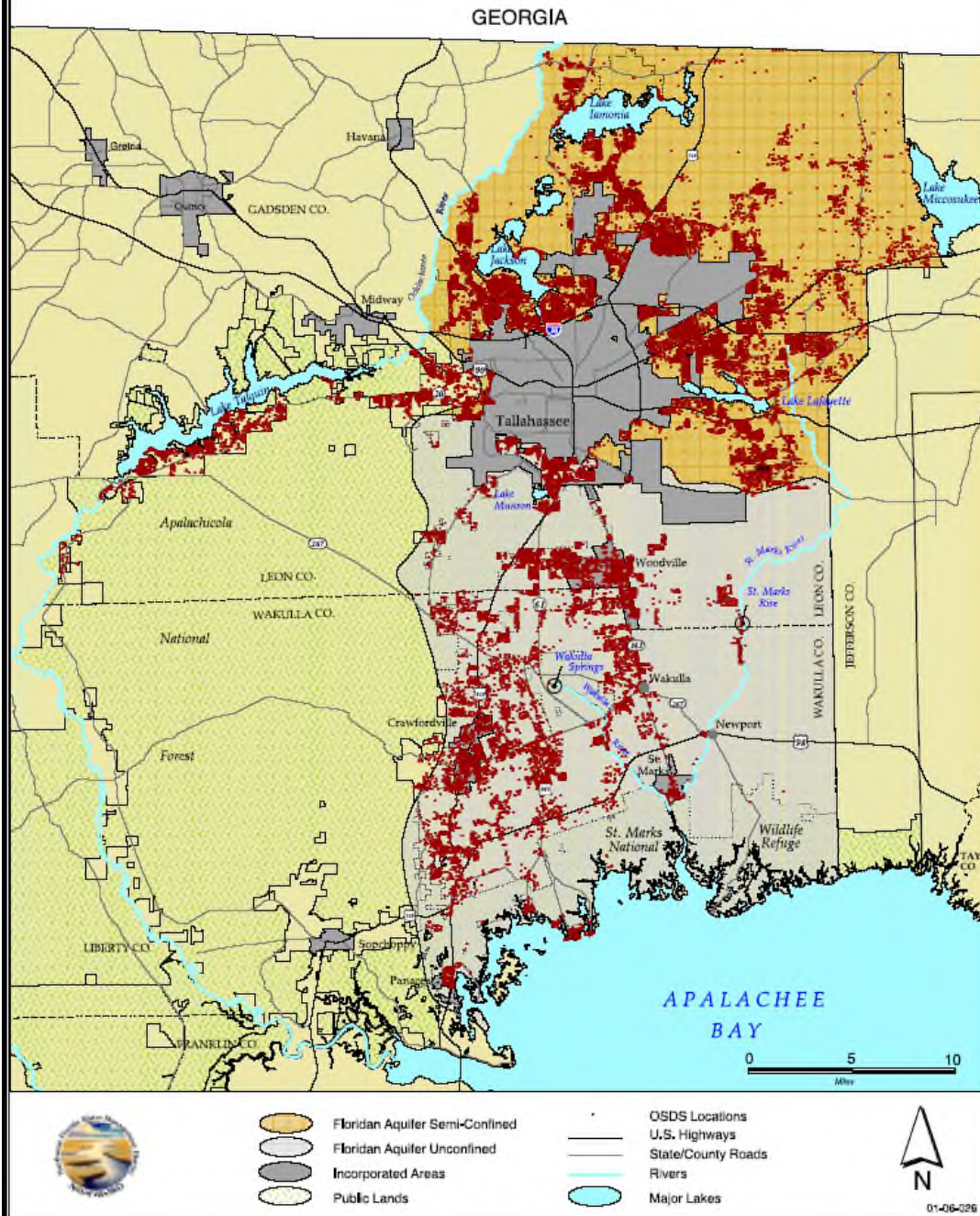


Figure 55. Relative Contribution from Anthropogenic Sources to 1990-1999 Average N Loading in Semi-confined and Unconfined Portions of Leon and Wakulla Counties.

(yearly average 1990-1999: 1.3 million kg -N)

Data from Chellette, Pratt and Katz, 2002

LOCATION OF OSDS IN SEMI-CONFINED AND UNCONFINED PORTIONS
OF LEON AND WAKULLA COUNTIES



OSTDS in Leon and Wakulla

- **Estimates for number of systems in 2000**
 - **45,000 in Leon**
 - **11,000 in Wakulla**
- **Estimate for Nitrate loading (mid-range of septic tank effluent, without accounting for losses in drainfield and groundwater)**
 - **4kg /year per capita**
 - **~20-25 lbs/year per household**

NW Florida Water Management District Study (Chellette, Pratt and Katz, 2002)

FOUR COMMON STEPS OF ONSITE WASTEWATER NITROGEN REMOVAL

- Septic Treatment
- Aeration Treatment, nitrification
- Recirculation to septic zone for denitrification
- Dispersal to drip irrigation for reuse and additional nitrogen uptake

Elements Necessary for Nitrogen Reduction

- Anoxic treatment zone
- Aerobic treatment
- Recirculation

Types of Advanced Systems

- Aerobic Treatment Unit (ATU)
- Performance Based Treatment System (PBTS)
- Drip Irrigation

Aerobic Treatment Unit (ATU)

- Brings sewage into contact with air (usually pretreated by septic tank)
- Allows smaller drainfield in some soils
- NSF-40 certification required for Florida
- Reduces CBOD₅ and TSS (see next chart)
- Also reduces TN and TP but not required for NSF-40

Performance-based treatment systems (PBTS)

- Engineer-designed to achieve specified treatment levels
- Types include PBTS-ATU, filter systems (including peat, media or sand), drip irrigation, disinfection equipment (UV, chlorination)
- Sampling often required to verify treatment levels
- Includes nutrient-reducing systems where required
 - Nitrogen and Phosphorus in Florida Keys for permanent systems
 - Nitrogen reduction in Wakulla, proposed for Marion, Leon, possibly Wekiva
 - Big houses on small lots (reduced setbacks, increased flow)

PBTS Installation

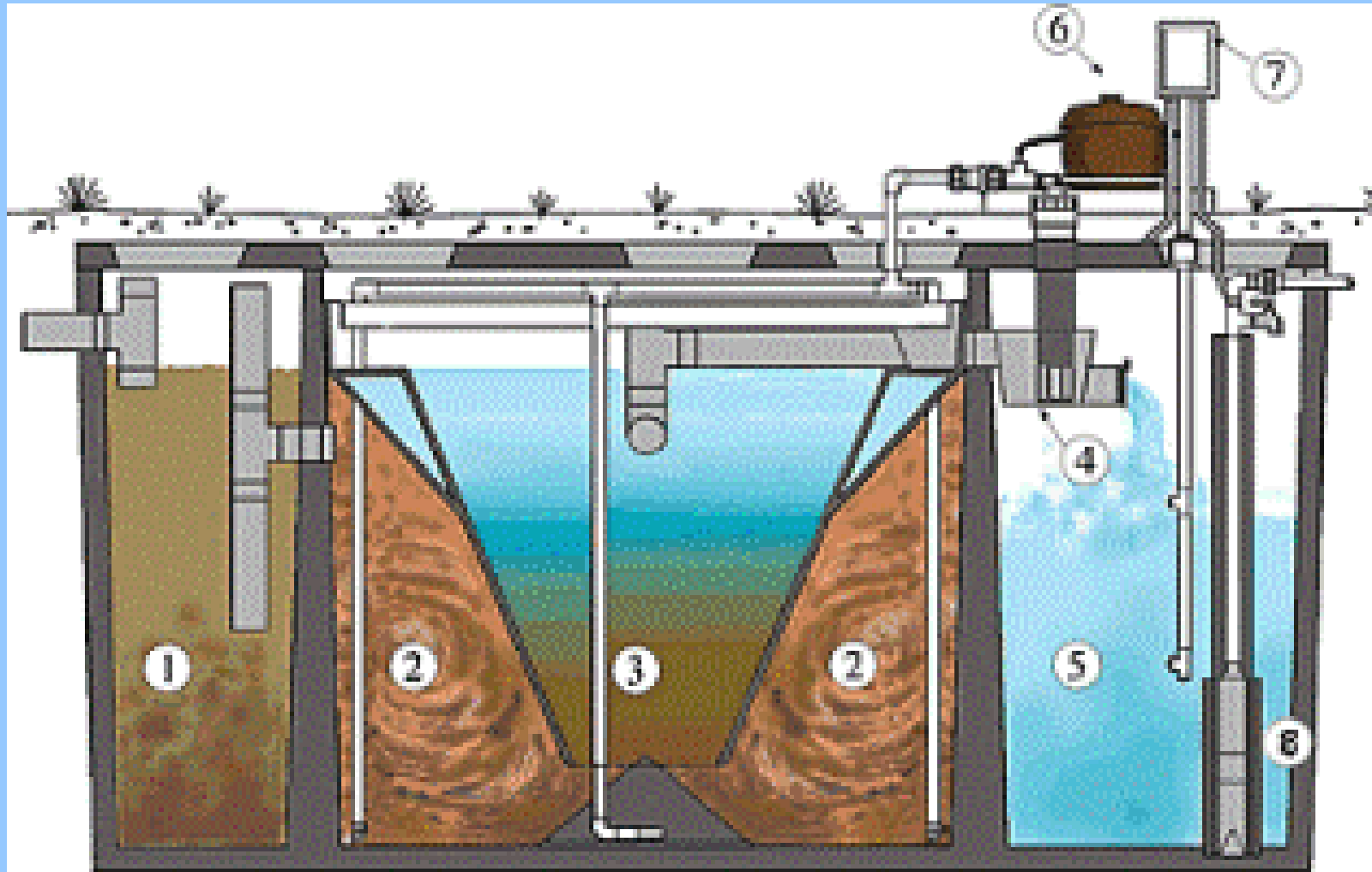


Locally Available Approved ATUs and PBTS

- Southern Precast, Inc. – Moultrie GA
- Brooks Concrete, Inc. – Panacea FL
Both make precast concrete, “Norweco”
and “FAST” systems
- Averett Septic Tank, Inc. – Lakeland FL
Makes “HOOT” system

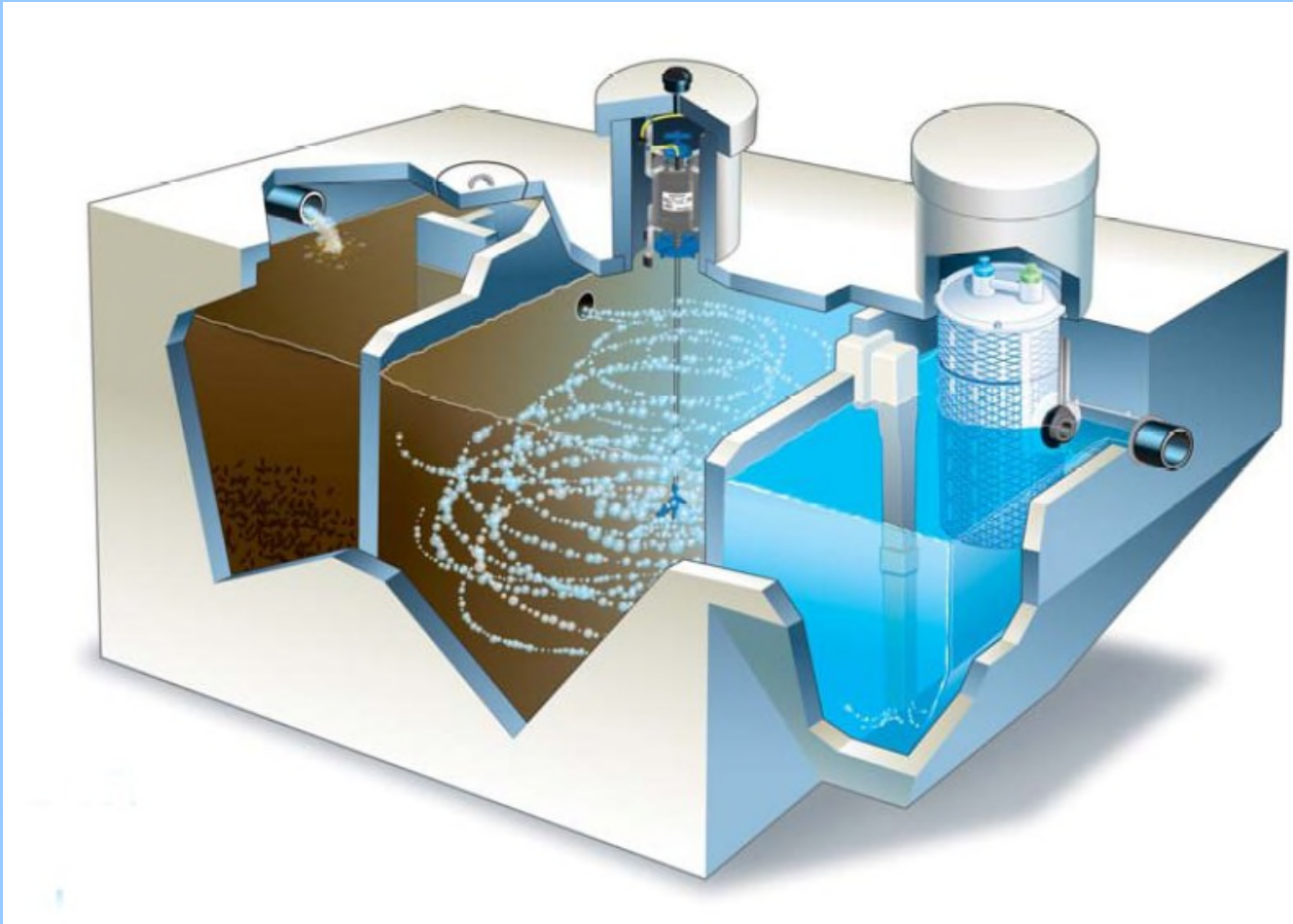
Hoot Aerobic Systems Inc.

www.hootsystems.com



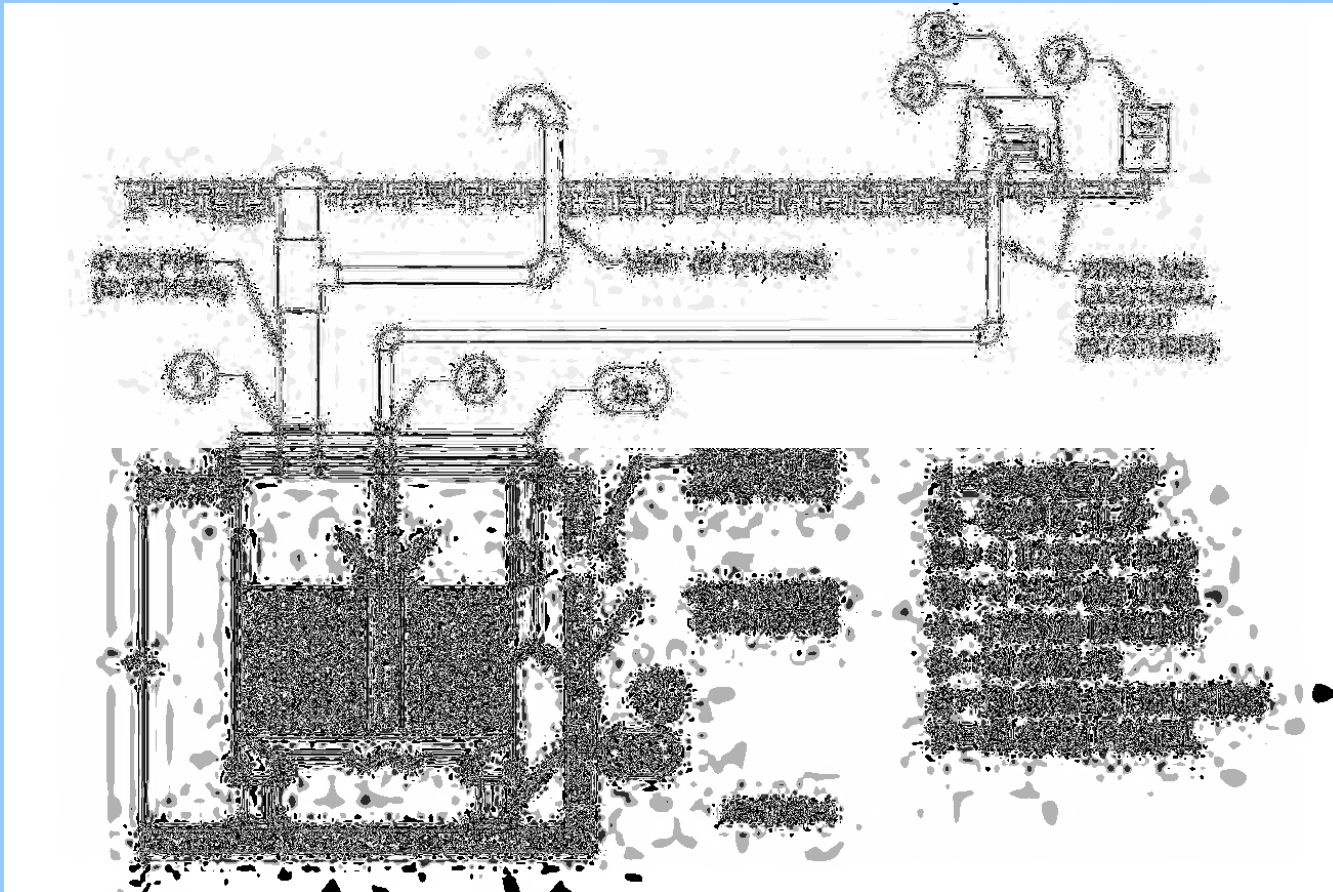
Noweco Singlair 960

www.noweco.com



Biomicrobics MicroFAST

http://www.biomicrobics.com/Products/MicroFAST/about_MCF.html



Nutrient Reducing PBTS Test Center Results from Florida DOH 12/6/07 by E. Roeder

Component/ Configuration	Type of testing	CBOD5 (mg/L)		TSS (mg/L)		TN (mg/L)		TP (mg/L)		Vendor
		in	out	in	out	in	out	in	out	
Advantex 20x	NSF-40	162	5	291	4					Oreco Systems
Advantex 20x Mode 1	N-testing concurrently with NSF-40	166	5	292	4	33	12			Oreco Systems
Advantex 20x Mode 3	N-testing after NSF- 40	112	7	170	9	35	12			Oreco Systems
Aerocell ATS SCAT- 8-AC-C500	NSF-40+Nitrogen	240	2	290	2	40	9.3			Quanics
Enviro-Guard 0.75 (Multi-Flo)	NSF+Nitrogen with reduced sampling	220	5	220	5	46	20			Consolidated Treatment Systems
HOOT 500 AND (with recirculation for nitrogen reduction))	N-testing (25 samples) with NSF- 40	196.1	2.2	194.3	1.5	26.3	9.6	8.8	3.1	Hoot Aerobic Systems
MICRO-FAST	NSF-40+Nitrogen	144	9	197	7	34.5	9.3			Bio-Microbics
MICRO-FAST	Keys Study, Phase I (12 samples)	138	2.6	117	4.63	38	11	8.4	5.4	Bio-Microbics
MICRO-FAST	Keys Study, Phase II (n=13/ 14)	110	1.2	92.	3.9	48	11.5	8.7	6.6	Bio-Microbics
MICRO FAST	NSF-40 April 2007	250	3	310	5					Bio-Microbics
RETROFAST 0.375	ETV	150	12	180	28	39	19			Bio-Microbics
Septitech Model 400	ETV	250	5.4	150	3	39	14			Septitech
Singular 960 w/ Biokinetics	NSF-40	184	6	238	10					Norweco
Singular 960 w/ Biokinetics phase 1 with recirculation	16 N-tests at NSF- testing facility	167		226		25	6.8			Norweco
Singular 960 w/ Biokinetics phase2 no recirculation	8 N-tests at NSF- testing facility	167		226		25	11.8			Norweco
24" unsaturated crushed brick ~1 gpd/sqft	Keys Study, Phase I (11 samples)							6.04	0.60	
24" unsaturated crushed brick ~1.7 gpd/sqft	Keys Study, Phase II (n=13/ 4)							8.72	2.65	
24" unsaturated LECA ~1 gpd/sqft	Keys Study, Phase I (11 samples)							6.04	1.31	
24" unsaturated filterlite P ~1.7 gpd/sqft	Keys Study, Phase II (n=13/ 10)							8.72	0.53	

Advanced Systems Requirements (64E6-6.012) for Owners of ATUs or PBTS

Permits & Contracts:

- DOH Annual Operating Permit (\$50 per year)
- Signed Maintenance Contract with approved Maintenance Entity (\$150-300 per year)

Inspections:

- Minimum twice annual system inspection & maintenance by approved Maintenance Entity (ME reports to county in writing or electronically---ex. Carmody System)
- One annual system inspection by DOH

What is an “Approved Maintenance Entity”?

- ❖ **Licensed septic tank installer** or
- ❖ **Class D certified wastewater operator**

Must meet the following requirements:

- Approved DOH maintenance service permit (\$25/yr)
- One annual DOH inspection of Maintenance Entity facilities and replacement parts supplies
- On manufacturer’s approved list indicating entity is trained for that system

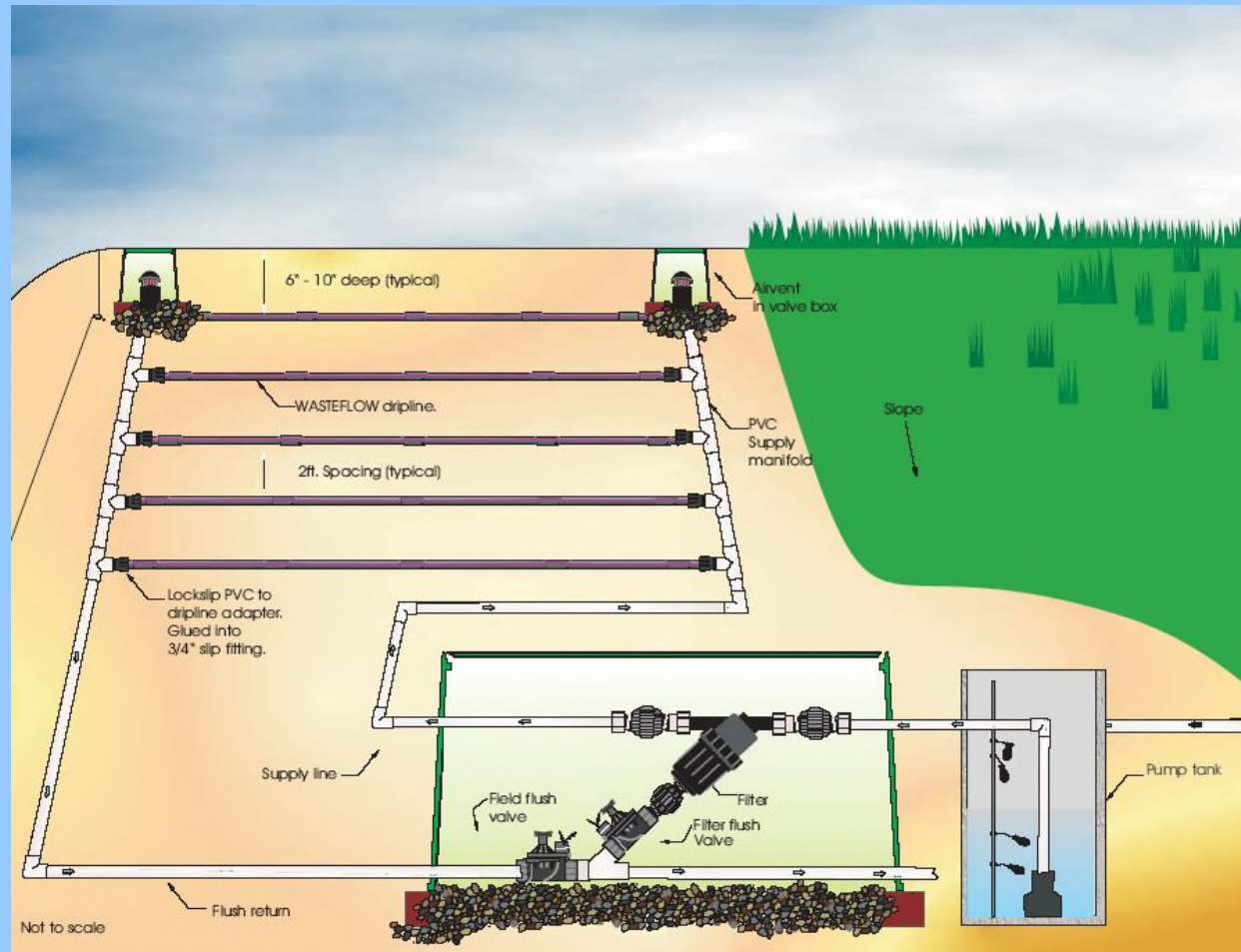
If approved by one FL county entity can operate in all counties

Drip Irrigation System

- Small holes in tubing
- Requires at least ATU level pretreatment
- Engineer-designed
- Less fill material needed
- Water reuse
- May reduce Total Nitrogen (TN) by additional 75%



Drip Irrigation Drainfields



Installing Drip Irrigation Lines



- Replacement system using drip irrigation in fine sandy loam
- Ground saw used to cut trenches



Drip Lines 6-8 inches deep



Headworks for Drip Lines



Benefits of Drip Irrigation

- Can reduce TN by an additional 75%
- Shallow installation of lines (6" – 8" below grade) allows for root uptake of nutrients
- Mound systems are one foot lower
- Minimal disturbance to soil structure due to low impact equipment used

Performance Based Treatment System Costs

- Current installation costs in Wakulla Co.
\$5,500 to \$8,500 range (down from \$9,500-12,000)
- Maintenance contract \$150-300 per year
- Operating Permit \$50 per year
- Drip system materials cost less than standard drainfield materials
- Electrical operating costs: 2.1 kw per day @ \$0.12 per kw = \$7.65 per month
- Standard Systems cost \$2,200 to \$5,500 in Primary Springs Protection Zone (excluding fill)

How Do We Know They Work?

- Independent testing through the National Sanitation Foundation Standard 245
– www.NSF.org
- Tested with real sewage, “vacation” and “power outage” stress tests
- Multiple samples tested for nitrogen removal

Industry Trends

- Prices decreasing
- New manufacturers will be offering systems with 10-13 mg/L TN
- Current manufacturers now offering even lower TN (HOOT now has 5.8 mg/L system)
- NSF Standard 245 certifies a 50% reduction in TN from input to output

The Future of Advanced Treatment Onsite Wastewater Systems

In 1999, EPA stated for the first time that Onsite Systems were a permanent and effective solution to wastewater treatment.

Nutrient Reduction & Advanced Treatment requirements will increase

- throughout Florida
- throughout the United States.

My recommendations for Restoration of Wakulla Springs

- 1. That Leon County adopt the new Nitrogen reducing Onsite System Ordinance
- 2. That a local county or regional RME be set up to manage all onsite systems in the Wakulla Springs basin, including all of Leon and Wakulla Counties.
- 3. No sewer to Woodville. The net effect of running sewer to Woodville will be increased density which will increase the nutrient load to the spring and only replace a small number of existing septic systems, while increasing the number of new homes and commercial development.

Questions?

