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Governance of onsite wastewater systems for enhanced N removal in Florida's springsheds

FOR THE #GATORGOOD

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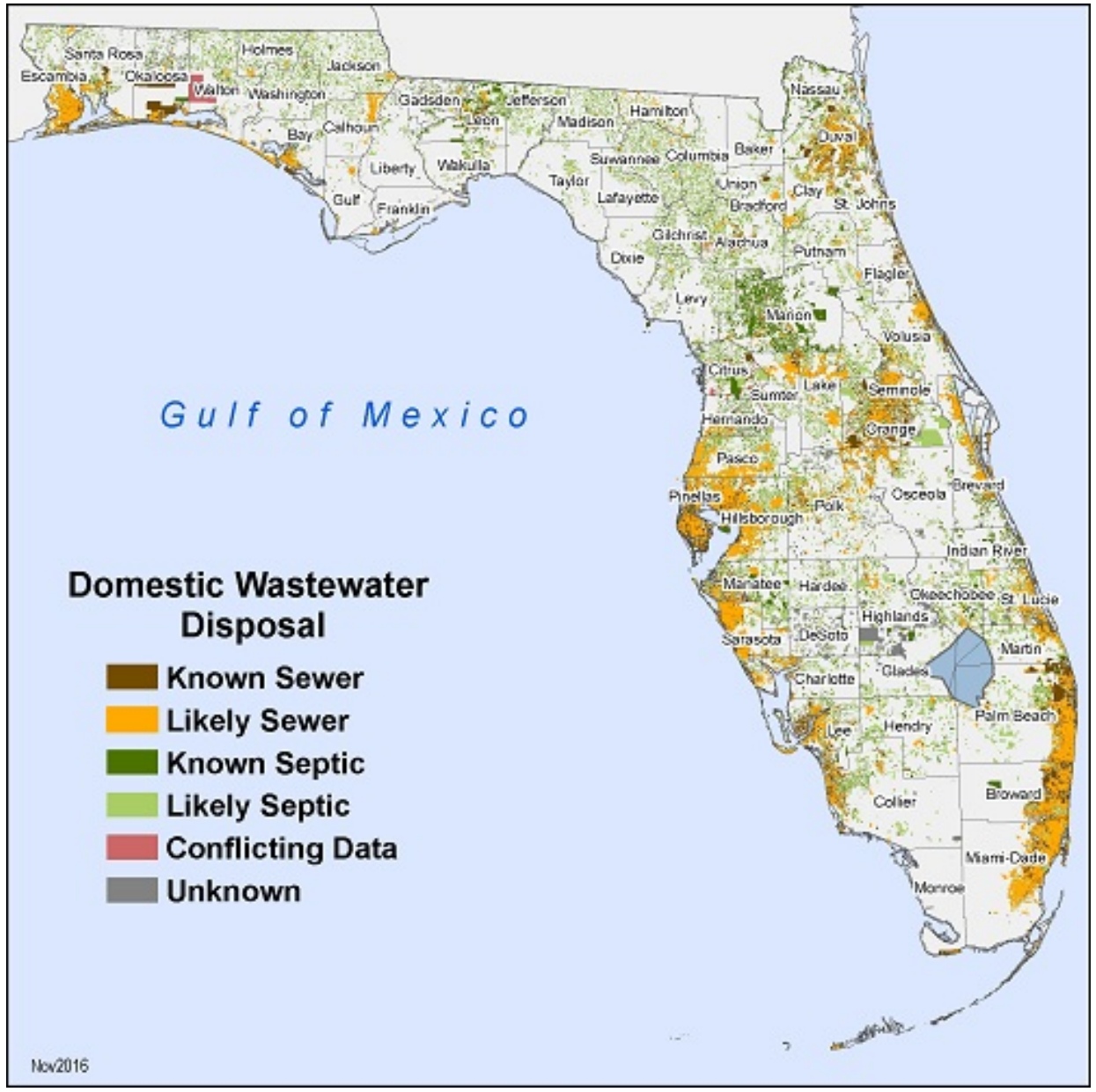
Today's Outline

1. Conventional septic systems and nitrogen
2. New regulations related to septic systems in springsheds
3. Onsite wastewater options for advanced N removal

All materials being presented represent my own opinions and do NOT reflect the opinions of NOWRA

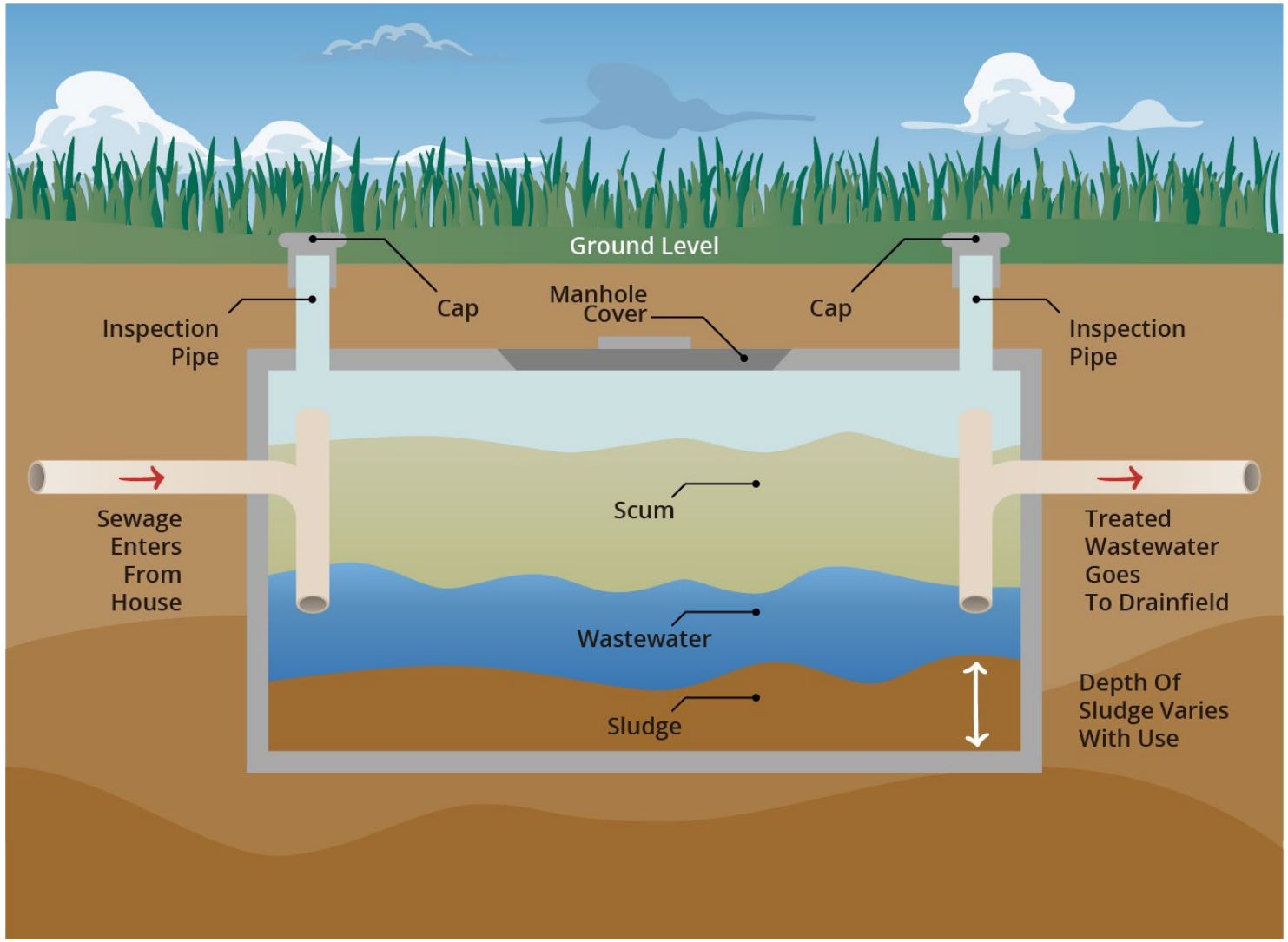
Septic Systems and Nitrogen



2.6 million septic systems in Florida

Serve 30% of the state's population

Septic tank



The Conventional Septic System

1. the septic tank
2. the leach field (drainfield, soil treatment unit, STU)

Nitrogen

Table 1. Sources and contributions of nitrogen in domestic wastewater.

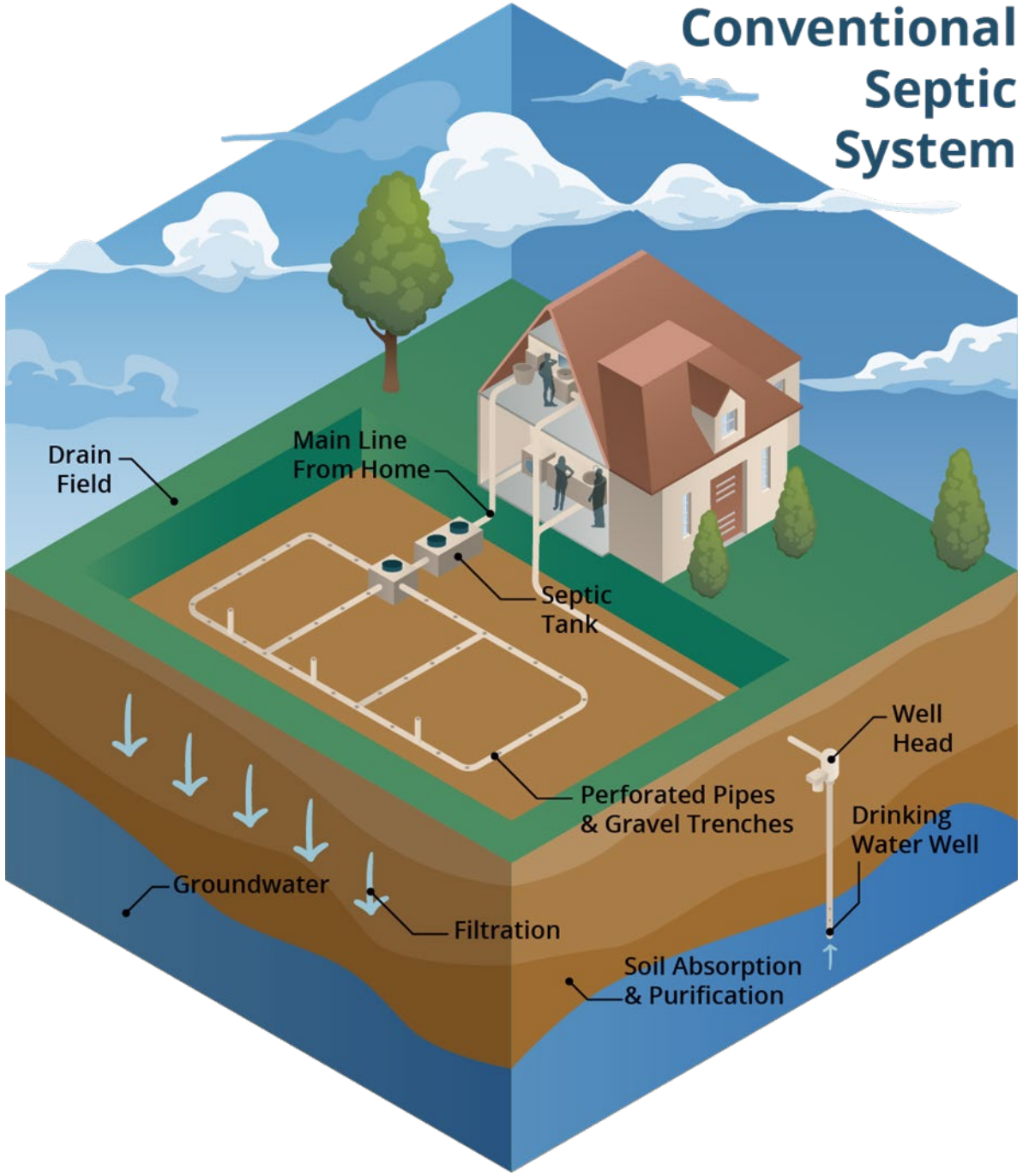
Source of nitrogen	Contribution	
	Grams per person per day	Percent of total
Kitchen sink	0.6	5
Toilet	8.7	78
Baths, sinks, appliances	1.9	17
Total	11.2	100
(Source: FDOH 2011).		

Table 2. Comparison of nitrogen forms in raw domestic wastewater and septic tank effluent.

Parameter	Description	Median value, mg N/L		Range of values, mg N/L	
		Raw wastewater	Septic tank effluent		
Total Kjeldahl Nitrogen	Total Kjeldahl Nitrogen (TKN) is organic N plus ammonium-N.	57	57	16–189	33–171
Ammonium-N	May be present as ammonium (NH_4) ions or ammonia gas (NH_3), with NH_4 dominating when pH is below 9.3.	13.7	53	1.6–94	25–112
Organic N	Organic N is the difference between TKN and ammonium-N.	43.3	4.0	14.4–187.4	8–146
Nitrate-N	Very little nitrate-N is found in raw wastewater.	1.9	0.5	0.2–8.5	0.1–7.1

Raw wastewater: wastewater that has not yet entered a septic tank.
Septic tank effluent: wastewater that has passed through the septic tank but has not entered the drain field.
(Source: Lowe et al. 2009).

Toor et al., 2011



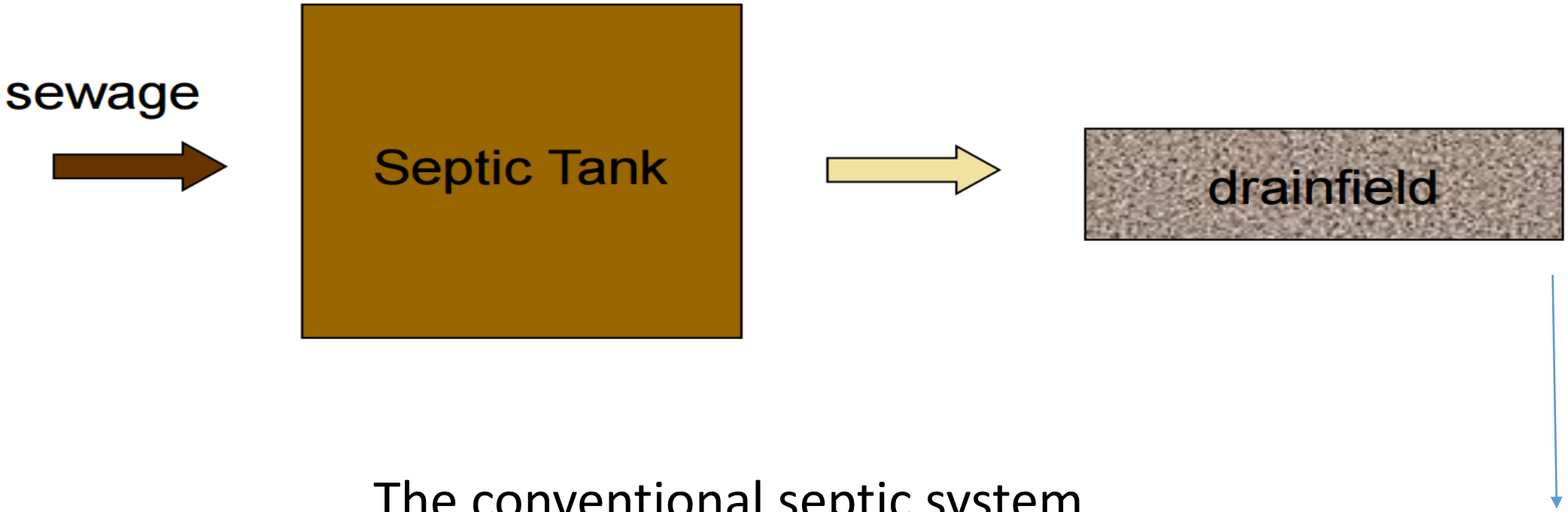
Most N entering the drainfield is ammonia-N

Ammonia-N is quickly and readily converted in the soil to nitrate-N through nitrification

Nitrate-N is highly mobile and quickly moves to groundwater

Denitrification is the only process that permanently removes N from the system

11.2 g N/person/day

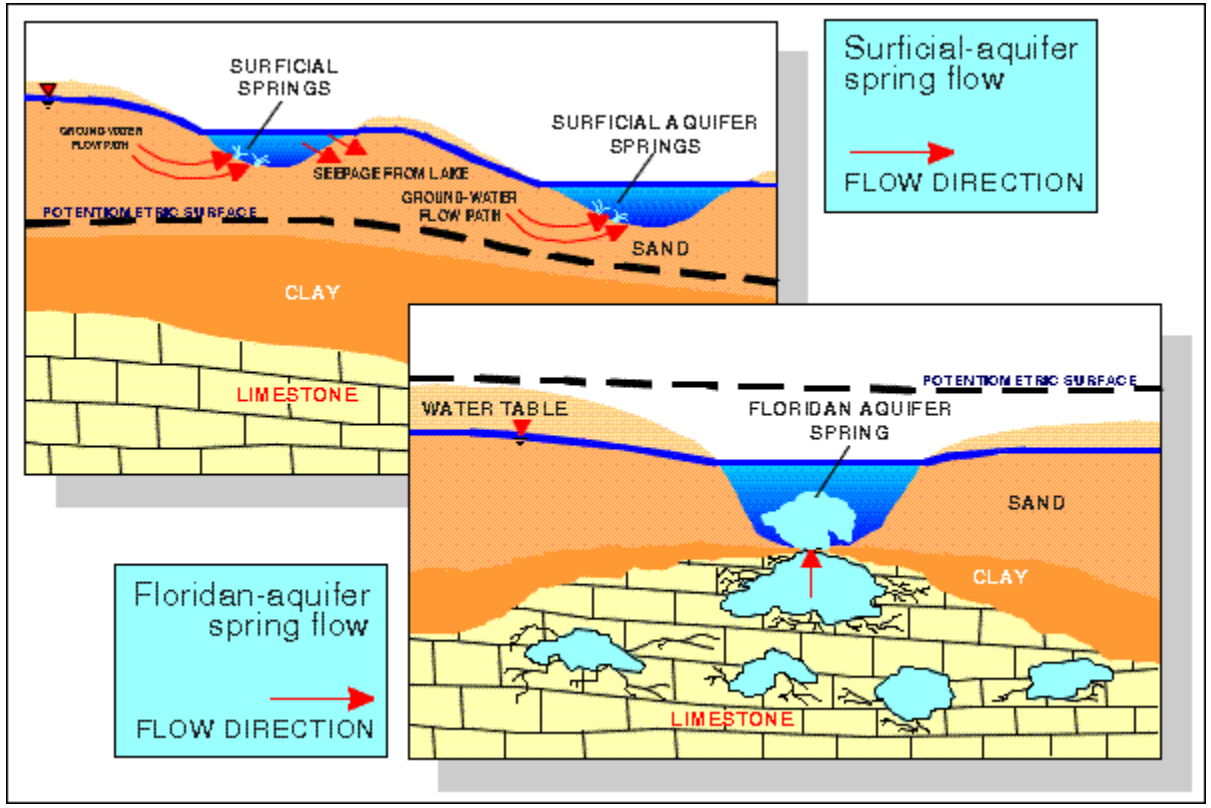


The conventional septic system only removes about 30% of N input

7.8 g N/person/day

Conventional Septic Tank Systems are not designed to remove N

Add to that our characteristic Florida environment that promotes rapid N leaching



Rollins.edu

Vulnerable Environments:

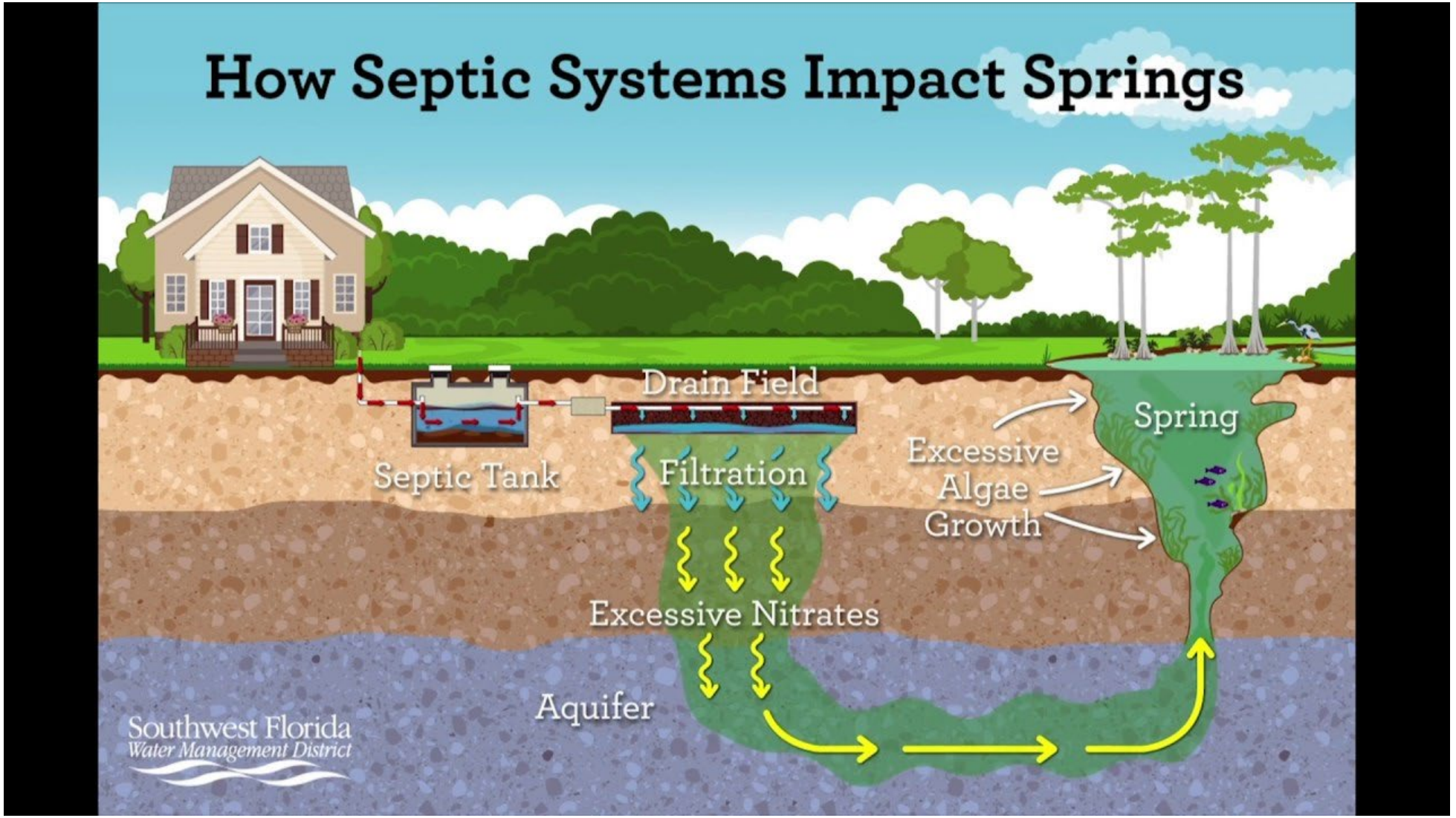
- porous soils
- fractured bedrock
- high septic tank density
- karst topography (sinkholes and caves)
- shallow water tables

What does Florida have more of than any other state?

First Magnitude Springs

Orlandoweekly.com

Floridasprings.org



Watermatters.org

Regulating Septic Systems in the Springs Areas

Regulatory Activities in the Springsheds

- 2106 Florida Water Bill created the Florida Springs and Aquifer Protection Act (FSAPA)
  - Established a new class of protected waters in the state: The Outstanding Florida Springs – those with flows > 100 cfs
  - 24 out of 30 Outstanding Florida Springs have been identified as N-impaired

- FSAPA requires a Priority Focus Area (PFA) be delineated for these springs
  - Based on hydrology, land use, etc. . .an area of the springshed identified to be most prone to N loading to the spring system
- IF, onsite wastewater systems (septic systems) contribute 20% or more of N to the PFA, then a septic system remediation plan must be put into place for the springshed

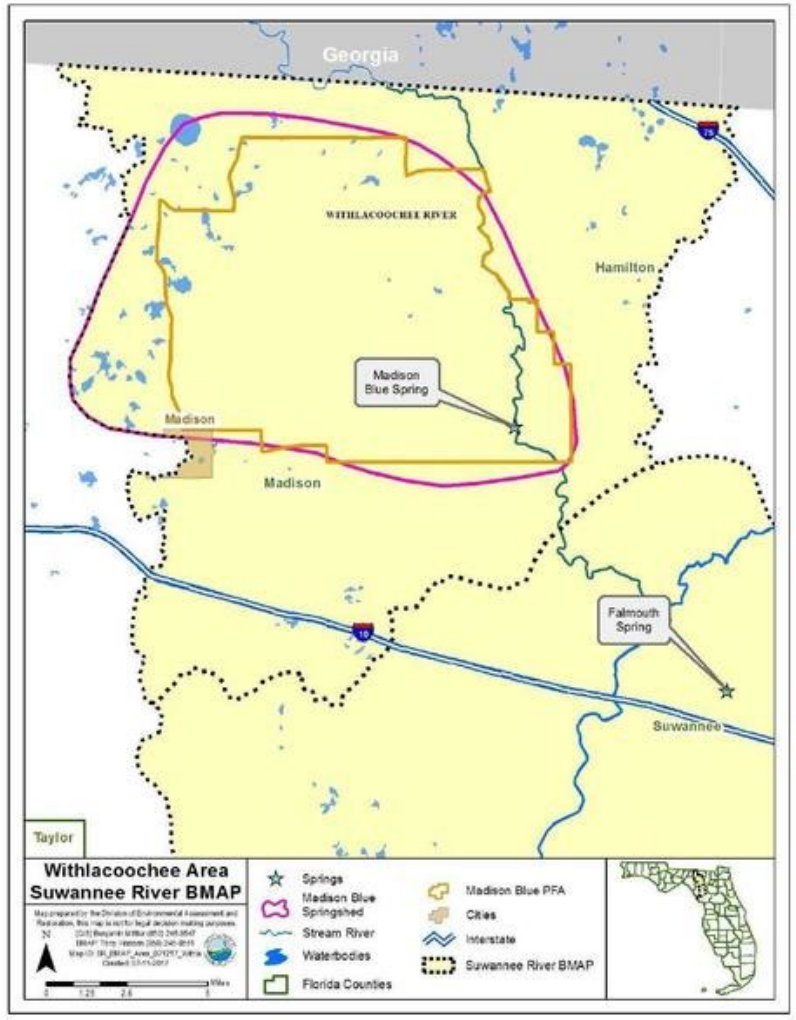


Figure 4. Withlacoochee River PFA, sub-basin boundary, and springshed boundary

Estimated N Contributions by Septic Systems

weekiwachee.com

Weeki Wachee	30%
Volusia Blue	62%
Crystal River	42%
Jackson Blue	1%
Lower Suwannee	2%

Weeki Wachee Springs, FDEP

Nitrogen Source	Total Nitrogen Load to Groundwater (lb-N/yr)	% Contribution
OSTDS	282,875	30%
UTF	209,833	22%
Atmospheric Deposition	93,208	10%
FF	163,935	17%
STF	53,841	6%
LW	91,347	10%
WWTF	45,105	5%
Total	**940,144**	**100%**

If sewer is already available to lots in the PFA, new or repair permits will not be issued. Connection to sewer service is required when such service is available

Empiremasoncontracting.com

On lots of less than one acre in the PFA, any . . .

installation, repair, alteration, modification, abandonment, or replacement of an OSTDS that requires a construction permit . . . .

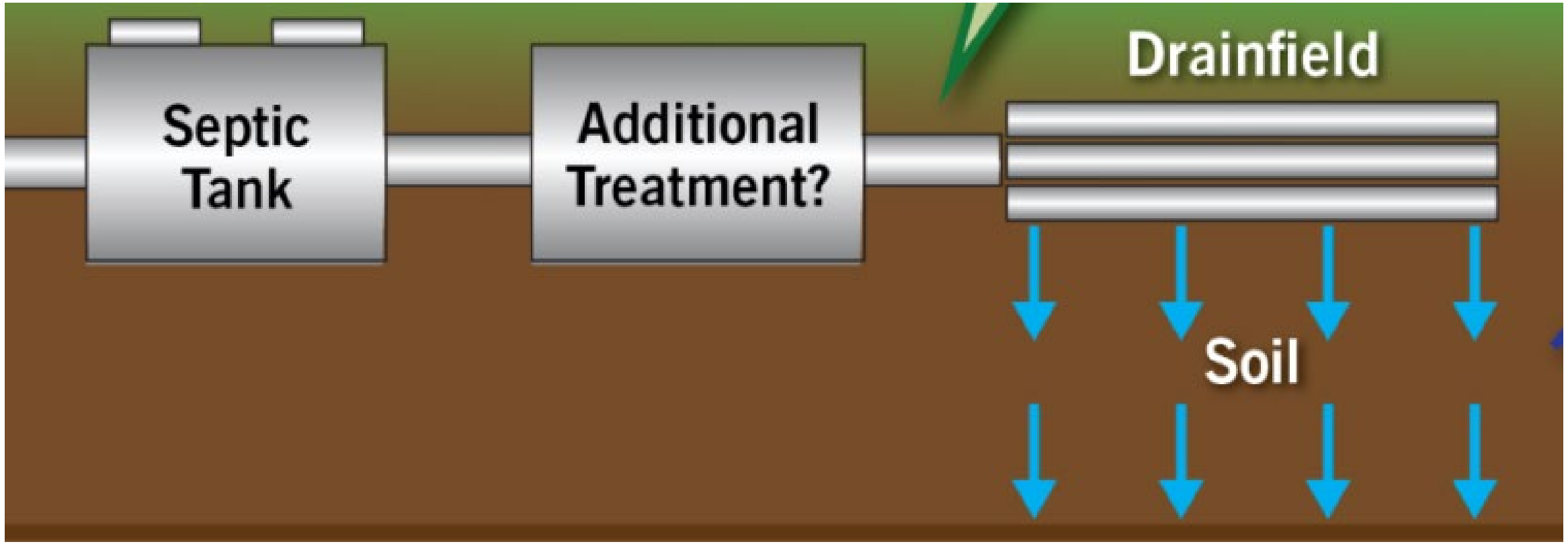
must include at least one of the following nitrogen-reducing enhancement features:

1. in-ground nitrogen-reducing biofilters (media layer systems);
2. in-tank nitrogen reducing biofilters identified in FDOH's Florida Onsite System Nitrogen Removal Strategy Studies;
3. other FDOH-approved treatment systems (e.g., ATU and PBTS) for advanced N removal.

In the PFA and on lots of less than one acre, all property owners must, no later than 20 years after BMAP adoption, abandon the OSTDS, install a new OSTDS, or retrofit an existing OSTDS to include nitrogen-reducing enhancement features

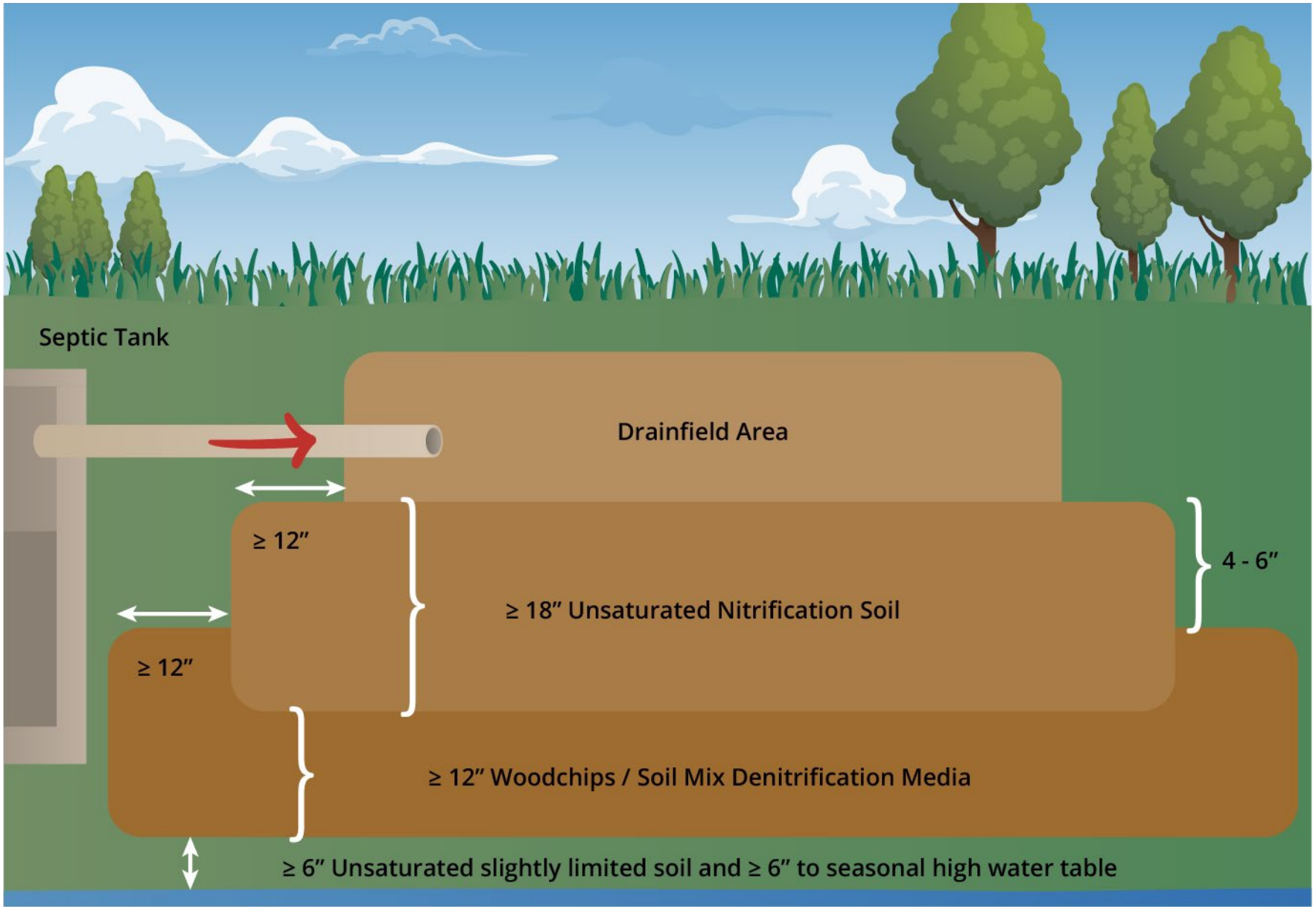
Common Solutions in Florida for Enhanced N Removal

What do these advanced technologies look like?



They add steps to the conventional system to improve contaminant removal

In-Ground Nitrogen-Reducing Biofilter (INRB)



They are onsite wastewater systems that reduce effluent N using reactive media for denitrification and a single liquid pump, if necessary.

Two stage process:

Stage 1

"nitrify" nitrogen compounds to NO_3 (nitrification)

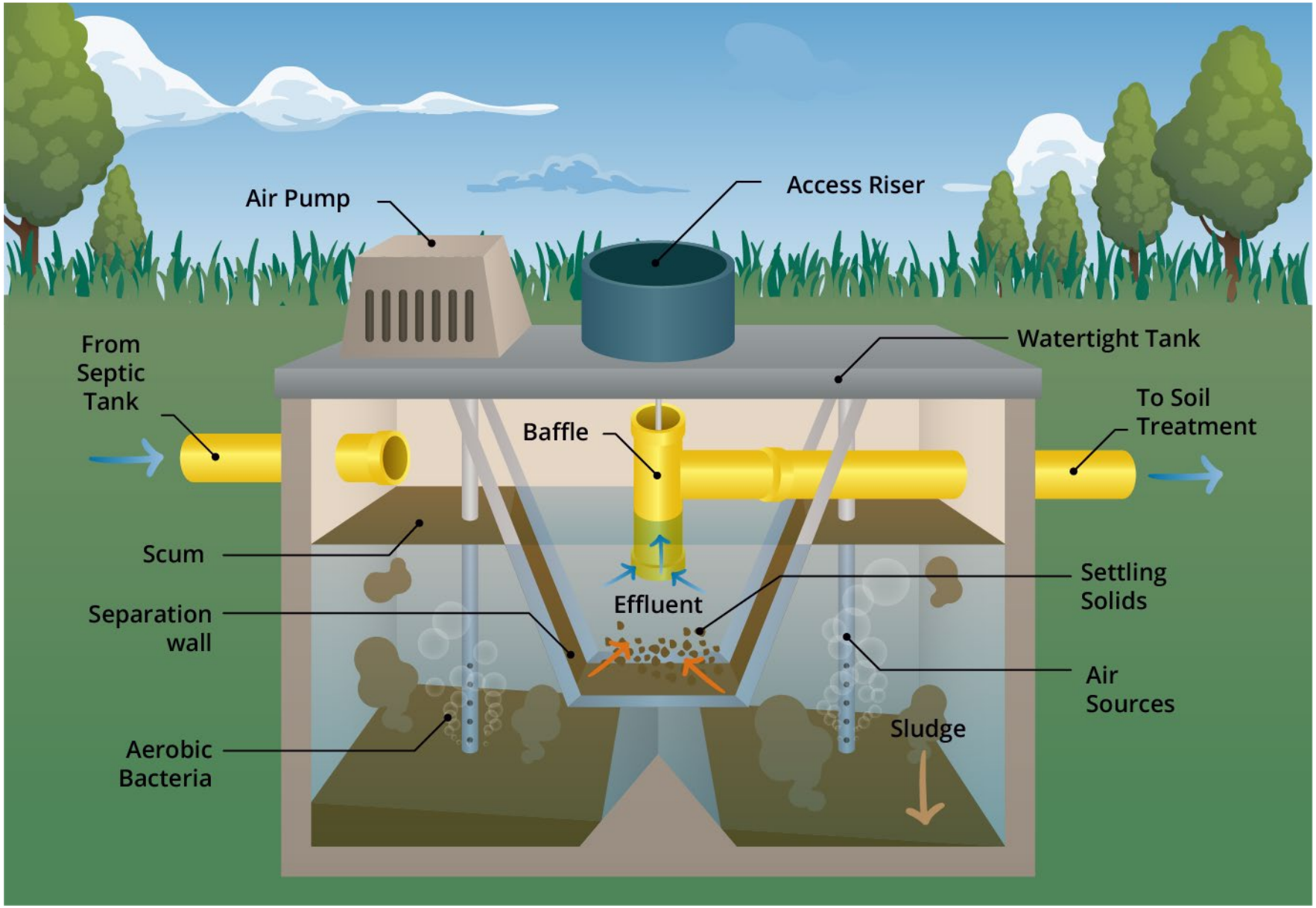
nitrification media: sand & expanded clay

Stage 2

"denitrify" NO_3 to nitrogen gas (denitrification)

denitrification media: lignocellulosics & elemental sulfur

Aerobic Treatment Unit (ATU -Tank Detail)



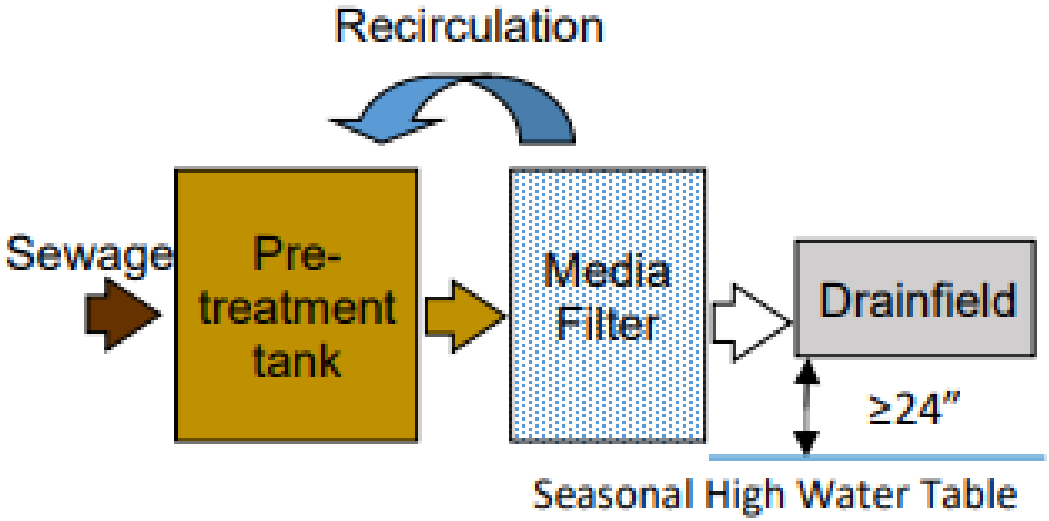
NSF-245 certified ATUs are also an option

Proprietary N-Reducing Performance-based Treatment Systems are also an option, under the following guidelines:

Require a maintenance contract with the homeowner

Must be capable of at least 50% N removal BEFORE discharge to the drainfield if you have at least 24 inch of unsaturated soil

If you have less than 24 inches of unsaturated soil, the system must be capable of at least 65% N removal before discharge to the drainfield



Cost to Homeowners

- $10,000 to $20,000
- FDEP will work with municipalities and counties to consider funding/cost share options
- FDEP rolled out the Septic System Upgrade Incentive Program – cost shares up to $10,000 but has now been all expended

Thank You!

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