

# Introduction to Onsite Wastewater Treatment

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## Overview



- What is an On Site Sewage Facility (OSSF)?
- Why are we concerned about wastewater?
- Evolution of onsite wastewater treatment
- Operation and maintenance of septic systems
- When to pump a septic tank?
- How to live with a septic system?



## Onsite wastewater treatment



## Onsite wastewater treatment systems?



- Rural and Exurban wastewater infrastructure
- Water Quality Protection
- 25 - 40%, Wastewater Infrastructure
- What is the system called?
  - OWTS: Onsite Wastewater Treatment System; Nationally
  - OSSF: On-Site Sewage Facility; Texas
  - Septic System

## Permitting Wastewater Treatment Systems in Texas



- Texas Commission on Environmental Quality (TCEQ), Chapter 285, 5000 gallons per day or less
  - Local Authorized Agent – Usually local Health Department
  - TCEQ Regional Office
  
- TCEQ, Chapter 217, Greater than 5000 gallons per day.



## Malfunctioning Onsite System



## Evolution of wastewater management



- From outdoor plumbing to water reuse
- We need to review the history to understand the present

## Outdoor plumbing: the pit privy



- Goal: designated place
- No carrier needed to convey waste
- Waste applied directly to the soil
- Public health concerns addressed
- Management: relocate





## Indoor plumbing

- ⊙ Convenience
- ⊙ Water carrier to convey waste out of facility
- ⊙ 'Collection system'
- ⊙ Public health and pathogens
- ⊙ Management: keep pipe flowing



TEXAS A&M  
AGRI LIFE  
EXTENSION

## Disposal

- Goal: limit human contact
- Keep wastewater below ground
- Disposal options
  - "Disposing" of pathogens
  - Treatment?
- Environment: groundwater contamination
- Management: install, flush and forget

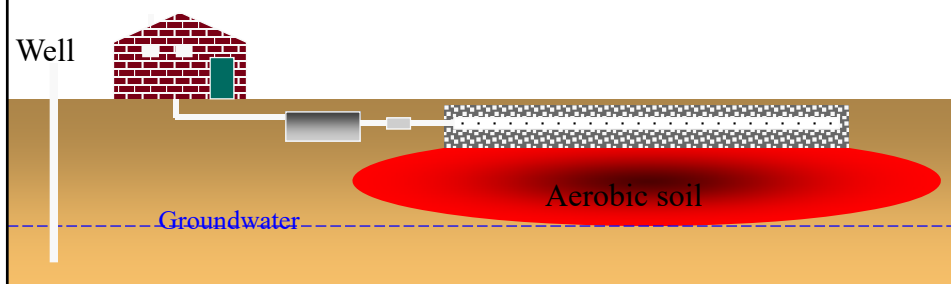


TEXAS A&M  
AGRI LIFE  
EXTENSION

## Septic tank & soil treatment area

TEXAS A&M  
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EXTENSION

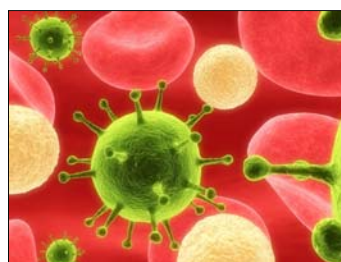
- Evolving goal:
  - Disposal: effluent goes away versus treatment
  - Dispersal: TREATMENT
- Public health AND environmental issues addressed
- Management:
  - Disposal: often no management at all
  - Dispersal: system management is critical



## Public health

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EXTENSION

- Wastewater can contain disease causing pathogens
  - Bacteria
    - E-coli
    - Salmonella
  - Viruses
    - Hepatitis A
  - Parasites
    - Giardia
    - Cryptosporidium
    - Roundworms



## Environmental protection

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EXTENSION

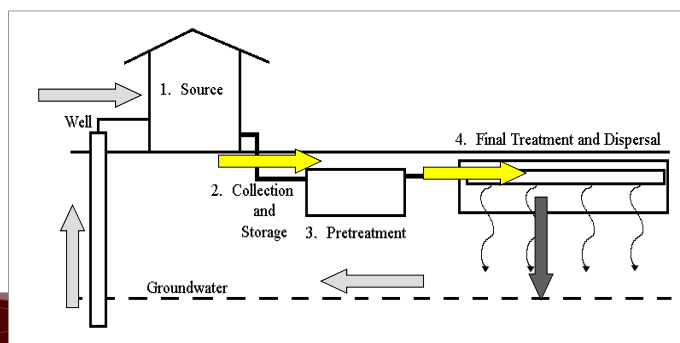


- Treat contaminants before they reach surface water or groundwater
- Nutrients
  - Phosphorus
  - Nitrogen
- Organic loading
- Pathogens

## What is an onsite wastewater treatment system?

TEXAS A&M  
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EXTENSION

1. *Wastewater source*
2. *Collection and storage*
3. *Pretreatment components*
4. *Final treatment and dispersal components*



## Wastewater source



- Facility type
  - Domestic
  - Commercial
- User
  - Owner/family
  - Employees

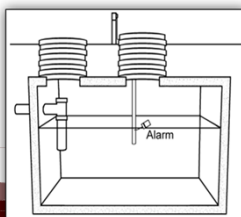


TEXAS A&M  
AGRI LIFE  
EXTENSION

## Collection

TEXAS A&M  
AGRI LIFE  
EXTENSION

- Piping from facility with cleanout
  - Blackwater
  - Graywater
- Collection Options
  - Holding tanks
  - Composting toilets
  - Incinerating toilets





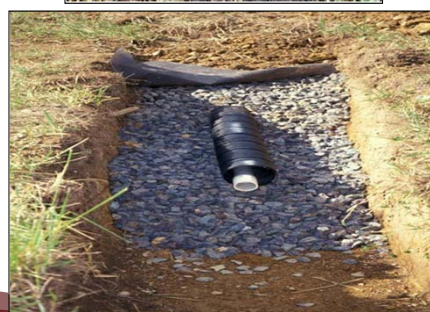
## Pretreatment

- Pre-treating waste before it reaches the soil
  - Septic tanks
  - Aerobic treatment units
  - Media filters
  - Constructed wetlands
  - Disinfection



## Final treatment and dispersal

- Final treatment occurs in the soil
  - Conventional trench or bed distribution
  - Low pressure distribution
  - Drip field
  - Spray field
  - Evapotranspiration beds



## How do we make the OSSF work?



- Evaluate the wastewater source:
  - Hydraulic and organic loading
- Evaluate site
  - Wastewater treatment
  - Wastewater acceptance
- Choose a final treatment and dispersal component
- Choose the appropriate pretreatment system
- Operation and maintenance

## Choices of distribution for various soil types

Soil conditions	Distribution systems							Soil substitution drain field	Pumped effluent drain field
	Standard drain field <sup>a</sup>	Low-pressure distribution	Subsurface drip distribution	Spray distribution <sup>b</sup>	Mound system	ET bed <sup>c</sup>			
Soil type <sup>d</sup>	Ia	No	No <sup>e</sup>	No <sup>e</sup>	Yes	Yes	Yes (lined only)	Yes	No
	Ib	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	II	Yes <sup>f</sup>	Yes <sup>f</sup>	Yes <sup>f</sup>	Yes	Yes <sup>f</sup>	Yes	Yes <sup>f</sup>	Yes <sup>f</sup>
	III	Yes <sup>f</sup>	Yes <sup>f</sup>	Yes <sup>f</sup>	Yes	Yes <sup>f</sup>	Yes	Yes <sup>f</sup>	Yes <sup>f</sup>
	IV	No	Yes	Yes	Yes	Yes	Yes	No	Yes
Depth of good soil (type Ib, II, III) below application depth	2 or more feet	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	1 foot	No	Yes	Yes	Yes	Yes <sup>g</sup>	Yes (lined only)	Yes <sup>g</sup>	Yes
	Less than 1 foot	No	No	Yes <sup>h</sup> (6 inches)	Yes (must support vegetation)	Yes <sup>g</sup>	Yes (lined only)	Yes <sup>g</sup>	No
Groundwater depth below application depth	2 feet or more	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	1 foot	No	No	Yes <sup>h</sup>	Yes	Yes <sup>g</sup>	Yes (lined only)	No	No
	Less than 1 foot	No	No	No	Yes	Yes <sup>g</sup>	Yes (lined only)	No	No
Soil surface slope	0-30%	Yes <sup>i</sup> < 30%	Yes	Yes	Yes <sup>i</sup>	≤10%	Yes	Yes	≤2%
	Over 30% or complex slopes	No	Yes	Yes	Yes <sup>i</sup>	No	No	No	No

<sup>a</sup> This option includes conventional gravel-filled trench, leaching chambers and gravelless pipe.  
<sup>b</sup> This option is available with a pretreatment system giving a secondary-quality effluent and disinfection. Class I aerobic units and sand filters are designed to give secondary-quality effluent. Other treatment systems need to be professionally designed to obtain the secondary-quality effluent.  
<sup>c</sup> ET= Evapotranspiration  
<sup>d</sup> Soil types: Ia - sandy soil with more than 30% gravel; Ib - sand and loamy sand; II - sandy loam and loam; III - silt, silt loam, silty clay loam, clay loam, sandy clay loam and sandy clay; and IV - silty clay and clay. A site evaluator determines these conditions.  
<sup>e</sup> The soil substitution drain field is built by removing the unsuitable soil and placing 2 feet of suitable soil around the absorption system. However, this system cannot be used in a type IV soil.  
<sup>f</sup> The mound must be constructed to maintain 2 feet of good soil below the wastewater application level and above groundwater, 18 inches to restrictive horizon.  
<sup>g</sup> Spray distribution of wastewater can be used on surface slopes of 0-15%. Land with steeper slopes needs to be landscaped and terraced to minimize runoff.  
<sup>h</sup> May require gravel analysis for determining further suitability.  
<sup>i</sup> Sites with a slope of less than 2% need a drainage plan for removing rainfall runoff.

## Minimum required separation distances

From	To					
	Sewage treatment tanks or holding tanks	Soil absorption systems and unlined ET beds	Lined evapotranspiration beds	Sewer pipe with watertight joints	Surface distribution (spray area)	Drip distribution
Public water wells	50	150	150	50	150	150
Public water supply lines	10	10	10	10	10	10
Private water well	50	100	50	20	100	100
Private water line	10	10	5	10 except at connection to structure	0	10
Private water well (pressure cemented or grouted to 100 ft. or cemented or grouted to water table if water table is less than 100 ft. deep)	50	50	50	20	50	50
Streams, ponds, lakes, rivers (measured from normal pool elevation (with and water level); saltwater bodies (high tide only))	50	75, LPD (Secondary treatment and disinfection) - 50	50	20	50	25 when $R_a \leq 0.1^a$ 75 when $R_a > 0.1$ secondary treatment and disinfection) - 50
Foundations, buildings, surface improvements, property lines easements, swimming pools and other structures	5	5	5	5	No separation distances except: property lines - 10 <sup>b</sup> swimming pools - 25	No separation distances except <sup>c</sup> property lines - 5
Sharp slopes, breaks	0 Special support may be required for zero separation distances	25	5	10	25	10 when $R_a \leq 0.1^a$ 25 when $R_a > 0.1^a$
Edwards Aquifer recharge features <sup>d</sup>	50	150	50	50	150	100 when $R_a \leq 0.1^a$ 150 when $R_a > 0.1^a$

<sup>a</sup> All distances measured in feet.

<sup>b</sup>  $R_a$  refers to the application rate for wastewater to the soil. This term is presented as gallons of wastewater applied per square foot of absorption area. Soil types Ia, Ib, II, III and IV have the corresponding  $R_a$  values 0.5, 0.38, 0.25, 0.20 and 0.1, respectively.

<sup>c</sup> Drip distribution lines may not be placed under foundations.

<sup>d</sup> No on-site sewage facility may be installed closer than 75 feet from the banks of the Nueces, Dry Frio, Frio or Sabinal rivers downstream from the northern Uvalde County line to the recharge zone.

<sup>e</sup> A separation distance of 10 feet is for spray systems controlled by a timer. A separation distance of 20 feet is required for uncontrolled spray systems, which spray effluent when the pump tank is full. This can occur at any time of the day.

## Roles with septic system management

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AGRI LIFE  
EXTENSION

- Site evaluation
- Design
- Installation
- Startup
- Inspection
- Operation
- Maintenance
- Monitoring
- Pumping



## Site evaluation

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EXTENSION



- Comprehensive evaluation of soil and site conditions for a given land use.
  - Wastewater treatment
  - Wastewater acceptance
  
- **Licensed OSSF Site Evaluator,**
  - **Professional Engineer**



## Design

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AGRI LIFE  
EXTENSION

- The process of selecting, sizing, locating, specifying and configuring treatment train components that match site characteristics and facility use, as well as creating the associated written documentation.
- A design is also the written documentation of size, location, specification, and configuration.

**Professional Engineer,  
Registered Sanitarian**





## Installation

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**AGRI**LIFE  
EXTENSION

- The assembly and placement of components of a system, including final grading and establishment of an appropriate cover
- Startup

***Licensed OSSF Installer I  
or  
OSSF Installer II***



## Inspection

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**AGRI**LIFE  
EXTENSION

- The evaluation of and reporting on the status of a wastewater treatment system

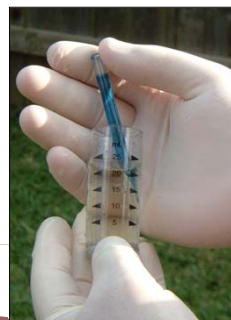
***Designated  
Representative***



## Operation and maintenance

TEXAS A&M  
AGRI LIFE  
EXTENSION

- Operation
  - Assessing whether each component of the system is functioning properly
- Maintenance
  - taking care of the pieces
- Monitoring
  - verifying performance for a regulatory authority or a manufacturer



***Licensed OSSF Maintenance Provider***

## Pumping

TEXAS A&M  
AGRI LIFE  
EXTENSION

- The action of removing septage from a wastewater treatment system component
- Necessary to prevent accumulated solids from moving into downstream components
  - Drain fields
  - Pumps
- TCEQ Registered Sludge Transporter

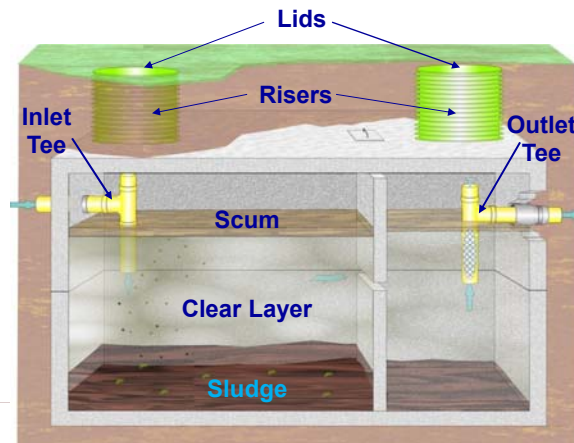


***Pumper***

# What is a septic tank?



- Water tight containers
  - Concrete
  - Plastic / Fiberglass
  - NOT Metal
- Detention time
  - Typically 2-3 days
  - Calm conditions
- Gravity separation
  - Heavy sinks
  - Lighter floats
- Anaerobic digestion



## HOW A SEPTIC SYSTEM WORKS

**To House**

**Septic System Pretreatment**

**Conventional Septic System Pretreatment**

In the pretreatment portion of a septic system, many of the contaminants are removed from the wastewater in order to prepare it for final treatment and discharging into the environment. Contaminants in the wastewater include harmful bacteria that can cause illness, as well as nitrogen and phosphorus that can stimulate algae growth in water bodies.

Run the Water
Conventional System
Aerobic System

**Final Treatment and Dispersal**

## HOW A SEPTIC SYSTEM WORKS

AgriLIFE EXTENSION  
Texas A&M System

NOTICE

**To House**

### Conventional Septic System Pretreatment

In the pretreatment portion of a septic system, many of the contaminants are removed from the wastewater in order to prepare it for final treatment and discharging into the environment. Contaminants in the wastewater include harmful bacteria that can cause illness, as well as nitrogen and phosphorus that can stimulate algae growth in water bodies.

Turn off water    Conventional System    **Aerobic System**

### Final Treatment and Dispersal

**Septic System Pretreatment**

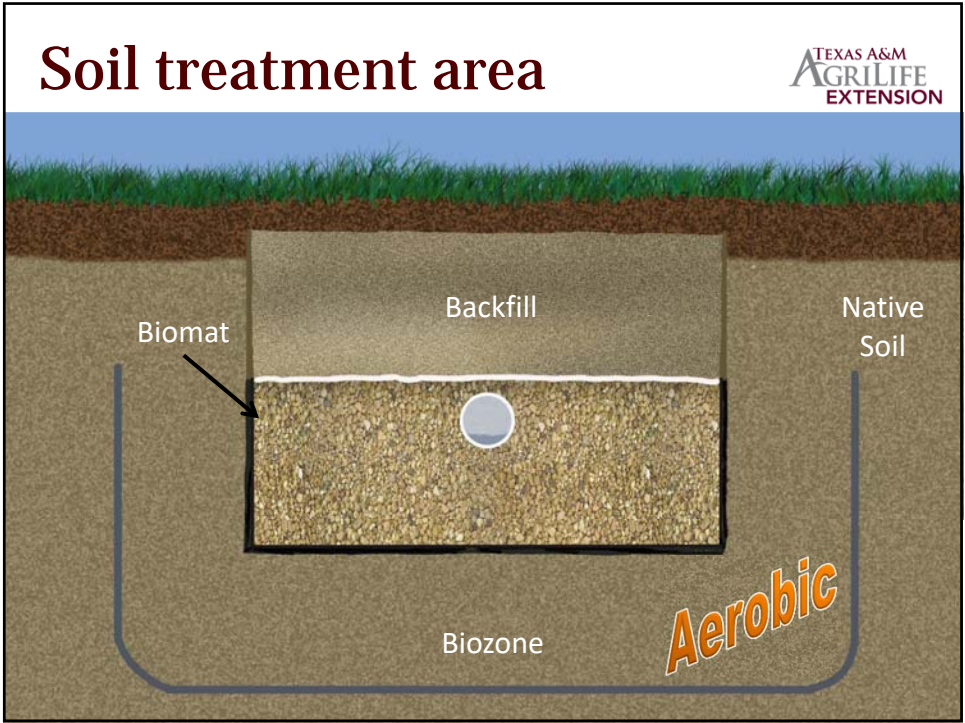
The diagram illustrates a cross-section of a septic system. On the left, a house is shown with a pipe leading to a two-compartment septic tank. The first compartment is labeled 'Septic System Pretreatment'. The second compartment is labeled 'Final Treatment and Dispersal'. A pipe leads from the second compartment to a perforated pipe buried in the ground. The ground is shown in layers: topsoil, sand/loam soil, and gravel. The perforated pipe is labeled 'Perforated pipe for effluent disposal'.

## Conventional septic tank system

TEXAS A&M  
**AgriLIFE**  
EXTENSION

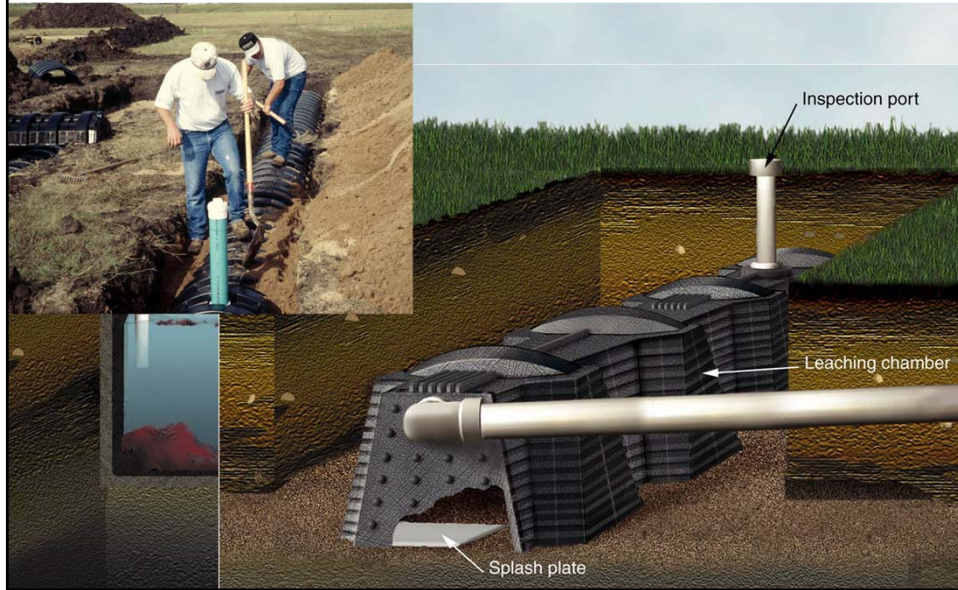
The diagram shows a cross-section of a conventional septic tank system. On the left is a 'Two-compartment septic tank'. A pipe leads from the second compartment to a 'Soil absorption field'. The absorption field consists of a 'Perforated pipe for effluent disposal' buried in a layer of 'Gravel'. Above the gravel is a layer of 'Sand/loam soil', and above that is a layer of 'Geotextile fabric'. The entire system is shown in a cross-section of the ground.





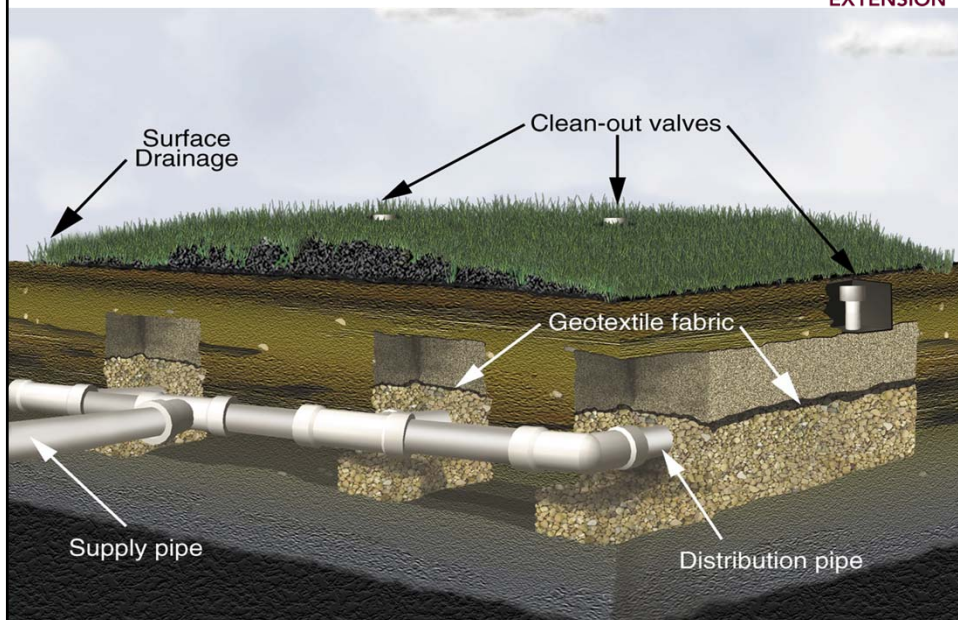
## Leaching chambers

TEXAS A&M  
AGRI LIFE  
EXTENSION



## Low-Pressure Distribution

TEXAS A&M  
AGRI LIFE  
EXTENSION





## Mound distribution field

TEXAS A&M  
AGRI LIFE  
EXTENSION



## Role of vegetative cover in treatment system

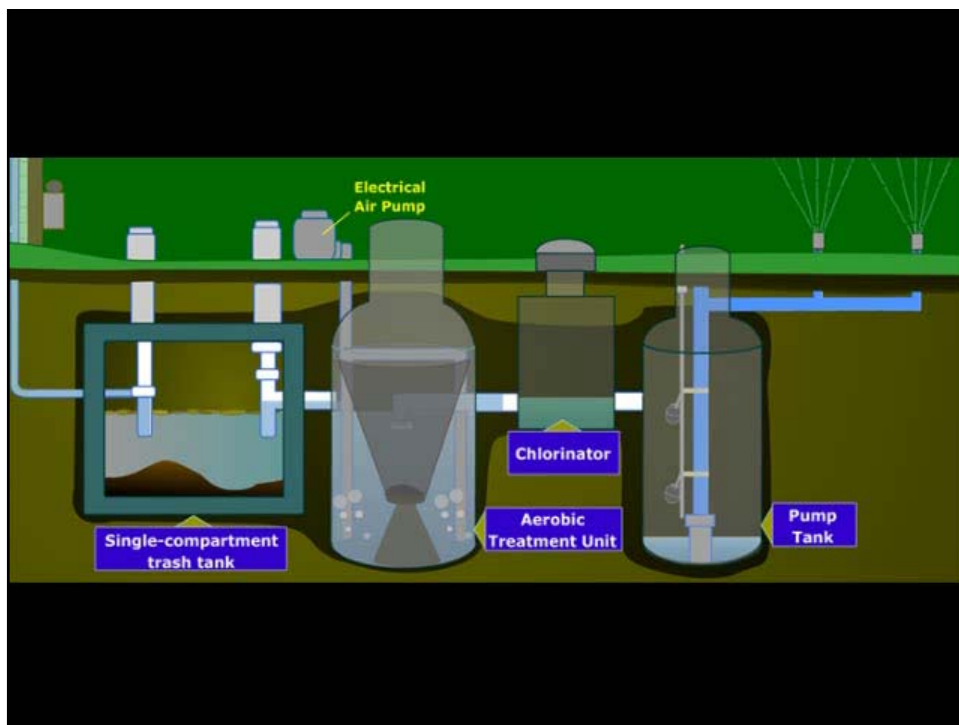
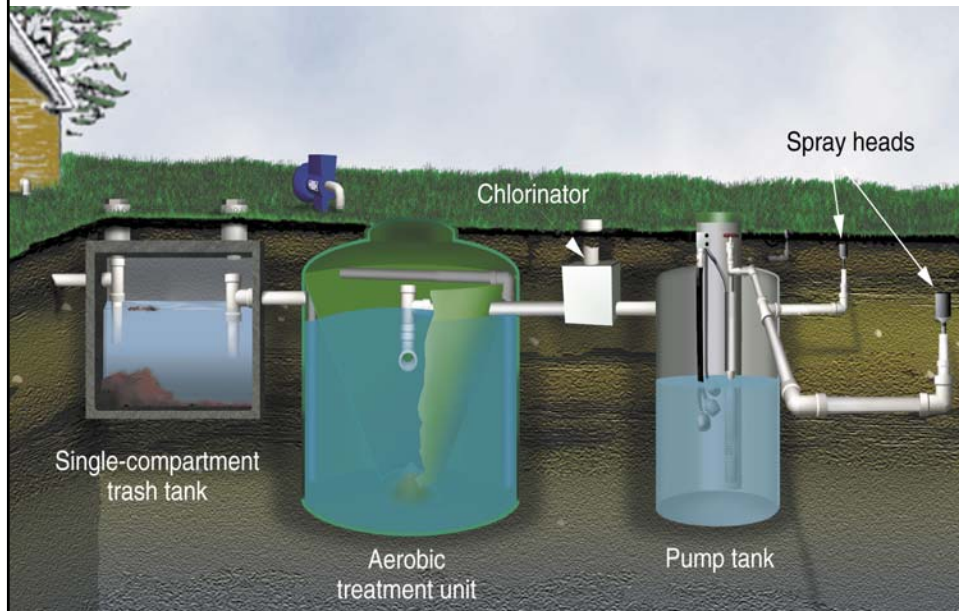
TEXAS A&M  
AGRI LIFE  
EXTENSION

- A healthy cover crop is essential for the system to function properly.
- Plants will:
  - Take up water and nutrients
  - Stabilize the soil & prevent erosion
  - Support beneficial soil organisms
- Do NOT park vehicles on drainfield
- Do NOT construct decks, driveways or buildings over drainfield
- NO woody vegetation over drainfield



# What is an Aerobic Treatment Unit?

TEXAS A&M  
AGRI LIFE  
EXTENSION

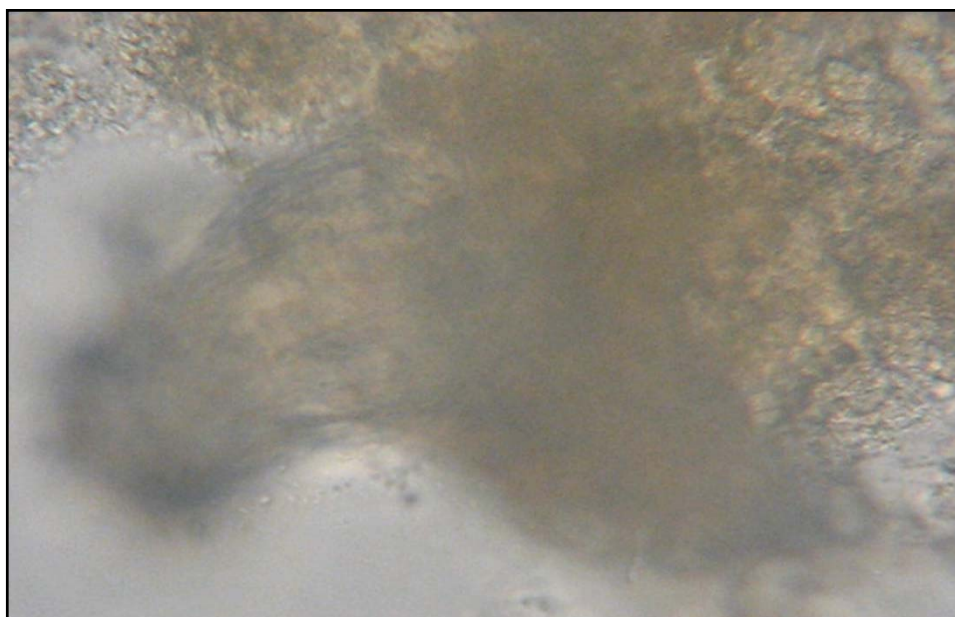




## Aerobic treatment unit

TEXAS A&M  
AGRI LIFE  
EXTENSION

- Aerobic Microbes
  - Require Oxygen to live and grow
  - Consume waste and bacteria
- Air supply
  - Compressor / Aerator
  - Diffusers
  - Oxygen transfer to wastewater
  - Mixing of food and organisms
- Clarifier



Large rotifers attached to aerobic treatment media feeding on bacteria and organic nutrients pH 6.94, DO 4.54 ppm

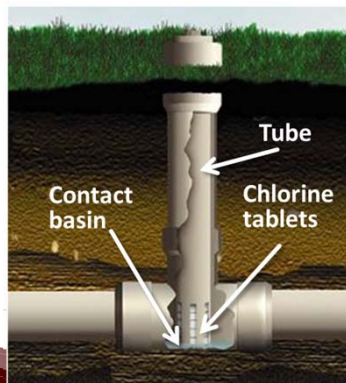


Mite on aerobic treatment media pH 6.94, DO 4.54

## Aerobic treatment unit system

TEXAS A&M  
AGRI LIFE  
EXTENSION

- Disinfection
  - Disinfection, **NOT Sterilization!**
  - Chlorinator
    - **NOT SWIMMING POOL TABLETS!**
  - UV light
- Distribution
  - Pump tank
  - Spray field



## Water Quality – Spray Field

- High potential for human contact with water
- Secondary Quality Effluent
  - Remove 85-98% of solids and organic matter
  - Remove pathogens?
- Soil microbes are the final treatment!
- This is effluent – ***NOT DRINKING WATER!!!!***



TEXAS A&M  
AGRI LIFE  
EXTENSION

## Spray field vegetation

- A healthy cover crop is essential for the system to function properly.
  - Take up water and nutrients
  - Stabilize the soil and prevent erosion
  - Provide food and habitat for beneficial soil organisms
- Clear area around spray head – 10 feet in the direction of spray from the head.
- Dead vegetation should be reseeded to establish vegetation.



TEXAS A&M  
AGRI LIFE  
EXTENSION



## Living with an ATU

- Hydraulic and organic loading
- Flow equalization
- Operation and maintenance



## Subsurface drip distribution

TEXAS A&M  
AGRI LIFE  
EXTENSION





# Feeding the System

Conventional and Aerobic Systems

TEXAS A&M  
**AGRI**LIFE  
 EXTENSION

## Fats, oils and grease

TEXAS A&M  
**AGRI**LIFE  
 EXTENSION

Constituent	State at room temperature	Comments
Fats	Solid	Non-toxic to the system, origin – animals, will separate in water
Oils	Liquid	Non-toxic to the system, origin – plants, trouble separating in water
Grease	Solid	Residual material on appliances; solid material on pans/equipment; petroleum products; moisturizers; bath oils; tanning oils; <b>Toxic</b> to the wastewater system

## In-Home Businesses/Hobbies

- Add stronger waste
- Add chemicals
- Increase flow



- Examples of Businesses:
  - Barber shops
  - Day care
  - Bakery
  - Dog grooming
  - Taxidermy
  - Artist
  - Home photography developing lab

TEXAS A&M  
AGRI LIFE  
EXTENSION

## Prescription drugs & antibiotics

TEXAS A&M  
AGRI LIFE  
EXTENSION

- Can kill microbes living in system
  - Won't discriminate against organisms living in the system
- Additional treatment components may be necessary
- Increase maintenance
- Do not pour unused medicines down the drain



## Kitchen

TEXAS A&M  
AGRI LIFE  
EXTENSION

### Dishwasher

- Hydraulic surges of wastewater
  - Space out loads
- Organic load
  - Clean/scrape dishes

### Garbage Disposal

- Increases scum by 20%
- Pumping required 1-2 years sooner
- Organic matter has not been digested, so it will take longer to break down
- Small particles take longer to settle



## Laundry

TEXAS A&M  
AGRI LIFE  
EXTENSION

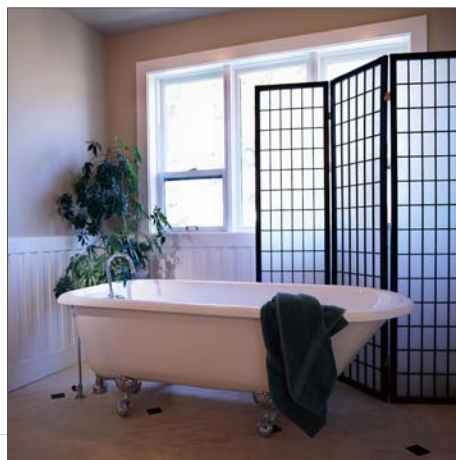
- Use should be spread out
  - Returning from vacation
- Liquid soap is recommended
  - Use less
  - Remove risk of fillers in powders
  - Use bleach sparingly
- Consider a high efficiency washer



## Bathroom fixtures

TEXAS A&M  
AGRI LIFE  
EXTENSION

- Garden tubs
  - Use large volumes of water
  - Add hydraulic surges
  - How often it is used?
- Multi-head showers
- No every-use shower cleaner



## Toilet

TEXAS A&M  
AGRI LIFE  
EXTENSION

- Only urine, feces, soap, toilet paper and limited amounts of cleaner should be going down drain
- No feminine products, prophylactics, cigarette butts, etc.
- No every-flush toilet bowl sanitizers

**Septic Safe?**





## Toilet paper

TEXAS A&M  
AGRI LIFE  
EXTENSION

- Excessive use results in faster sludge build up
- Treated toilet paper (with lotions) prevents paper from settling
- Wet wipe disposal is discouraged



## Cleaning products

TEXAS A&M  
AGRI LIFE  
EXTENSION

- Cumulative effects on system performance
- Look at Labels!
  - **DANGER**: Means the chemical will kill the bacteria, and its use should be minimized or eliminated.
  - **WARNING**: Means limited use should have a minimal impact on the system.
  - **CAUTION**: Typically means the product will have little effect.



including acrylic, fiberglass and vinyl. Not recommended for use on unpainted wood.

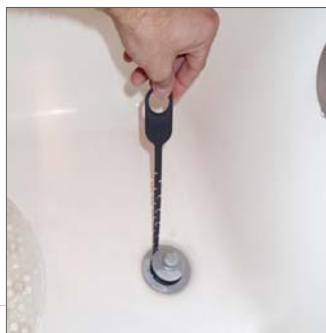
PRECAUTIONARY STATEMENTS: HAZARDS TO HUMANS AND DOMESTIC ANIMALS

**CAUTION:** Causes moderate eye irritation. Avoid contact with eyes. If contact occurs, flush eyes open and rinse slowly and gently with water for 15-20 minutes. Call a poison control center for treatment advice. Have this label with you when calling.

## Drain cleaner

TEXAS A&M  
AGRI LIFE  
EXTENSION

- Toxic drain cleaners can impact ability to properly treat wastewater
- Affect bacteria activity



## Septic system additives

TEXAS A&M  
AGRI LIFE  
EXTENSION

- **Not** been proven to be beneficial to system performance
- **Not recommended**
- Break up particles that are settled at the bottom and make them suspended
- Potential solids loading to downstream components



# Operation & Maintenance of Septic Systems



## Gases and chemicals of concern



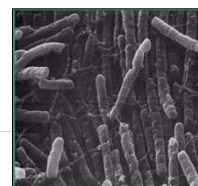
- Hydrogen Sulfide
- Sulfuric Acid (converted from H<sub>2</sub>S)
- Chlorine Gas
- CO(x)'s
  - Carbon Dioxide
  - Carbon Monoxide
- Methane



## Common biological hazards around the site

TEXAS A&M  
AGRI LIFE  
EXTENSION

- Kids
- Pets
- Insects
- Snakes
- Vegetation



## Site conditions

TEXAS A&M  
AGRI LIFE  
EXTENSION

- Divert rainwater from system components
- Excessive, uneven or poor vegetation
- Saturated soils
- Odors





## Tank access

- Access Location:
  - Inlet
  - Outlet
  - Center



TEXAS A&M  
AGRI LIFE  
EXTENSION

## Accessibility issues

- Accessibility = ease of maintenance
  - Depth of installation
  - Inspection ports & risers
  - Encroachment

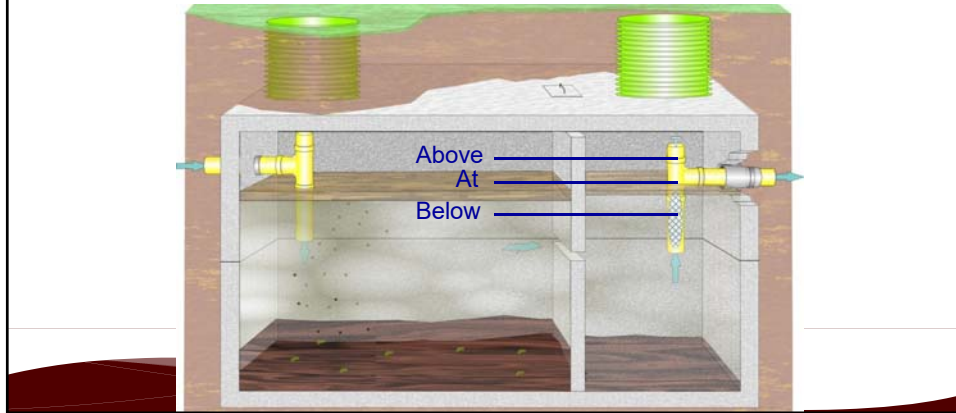
TEXAS A&M  
AGRI LIFE  
EXTENSION



## Operating condition

TEXAS A&M  
AGRI LIFE  
EXTENSION

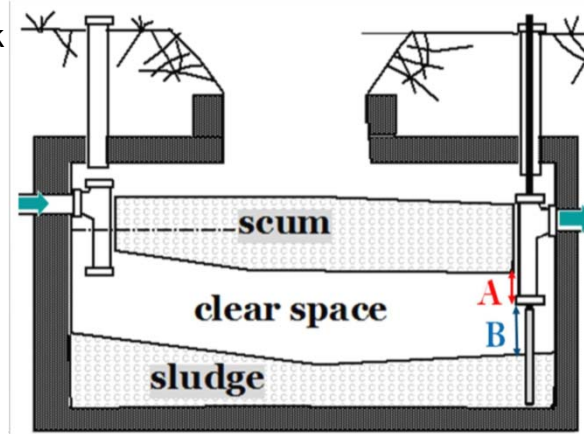
- Liquid level in respect to outlet (inches):
  - At
  - Above
  - Below



## Septic tank pumping recommended?

TEXAS A&M  
AGRI LIFE  
EXTENSION

- Should be pumped when total solids reach 25-33% of tank capacity
  - If 'A' is less than 3"
  - If 'B' is less than 12"
- Typically required every 3 to 5 years
- Pump during dry seasons to reduce the risk of tank floatation



## Measuring solids

Scum Layer

Clear Layer

Sludge Layer

??

TEXAS A&M  
AGRI LIFE  
EXTENSION

## Septic tank pumping recommended?

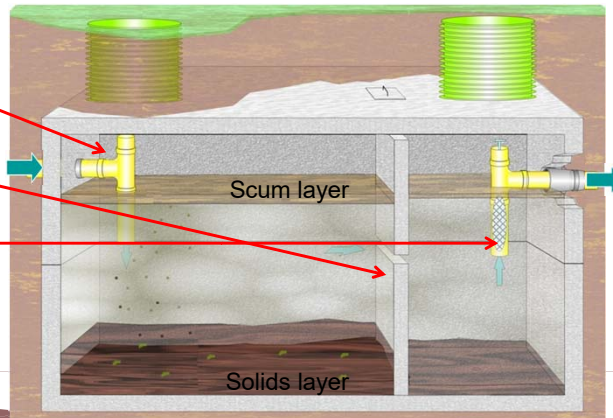
Tank Size (gals)	Household Size (Number of People)									
	1	2	3	4	5	6	7	8	9	10
500	5.8	2.6	1.5	1.0	0.7	0.4	0.3	0.2	0.1	—
750	9.1	4.2	2.6	1.8	1.3	1.0	0.7	0.6	0.4	0.3
1,000	12.4	5.9	3.7	2.6	2.0	1.5	1.2	1.0	0.8	0.7
1,250		7.5	4.8	3.4	2.6	2.0	1.7	1.4	1.2	1.0
1,500		9.1	5.9	4.2	3.3	2.6	2.1	1.8	1.5	1.3
1,750			6.9	5.0	3.9	3.1	2.6	2.2	1.9	1.6
2,000			8.0	5.9	4.5	3.7	3.1	2.6	2.2	2.0
2,250				6.7	5.2	4.2	3.5	3.0	2.6	2.3
2,500					5.9	4.8	4.0	4.0	3.0	2.6

Note: More frequent pumping needed if a garbage disposal is used.

# Baffles

- Critical to retention of solids in the septic tank
- Determine if baffles are in place

- Inlet baffle
- Compartment baffle
- Outlet baffle



# Baffles



- Concrete
- Plastic
- Fiberglass
- PVC tee
- Sanitary tee





## Effluent screens

- Installed at the septic tank outlet
- Trap solids trying to leave the septic tank
- Protect the drainfield
- Screen is washed off directly into the inlet side of the septic tank



## Tank structural condition

- Watertight (no visual leaks)
- Rebar exposed
- Root intrusion
- Corrosion or spalling present
- Cracks or Flex

TEXAS A&M  
AGRI LIFE  
EXTENSION



## Why perform maintenance?

- Keep systems functioning properly
- Maintain effluent quality
- Early detection of problems
- Public health
- Environmental Protection
- System reliability



Early plumbers

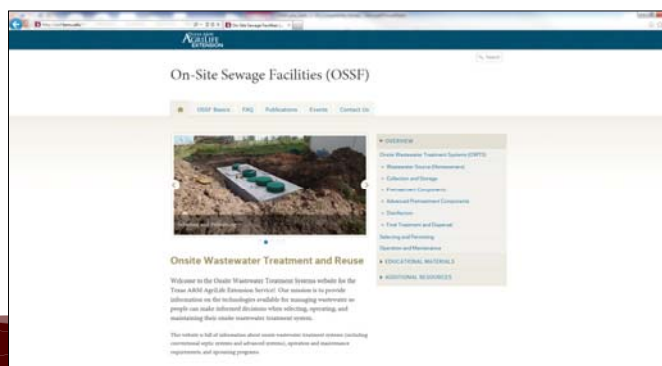
## Thank you

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# Evaluation





**AgriLIFE EXTENSION**  
Texas A&M System

**Texas AgriLife Extension Service**  
Participant Survey

Your views on the quality and effectiveness of Extension programs are extremely important. Please take a few minutes to help us assess your experience with this activity. Your answers to the following questions will help us better meet your needs. (Circle the best choice and check all that apply as they apply, responses are anonymous). Thank you!

**MARKING INSTRUCTIONS**  
Circles ■ responses 1 of 4 10

1. For each item listed below, mark the ONE number in the left column that best describes your level of understanding BEFORE the program and then mark the ONE number in the right column that best describes your level of understanding AFTER the program.

	BEFORE Program				AFTER Program			
	1	2	3	4	1	2	3	4
Your understanding of ...								
Understanding of how nitrates occur as part of our wastewater infrastructure								
Understanding of how practices in the home affect sewage characteristics								
Understanding of nitrates, tank operation and maintenance criteria								
Understanding of how air flows through								
Understanding of how aerobic treatment with recirculated water flow works								
Understanding of how a nitrifying nitrates system can impact water quality								
Importance of proper nitrates system operation for protection of public health								

2. Please indicate your intention to adopt each item listed below (circle) indicate if you have already adopted the item listed or if done and apply to your situation.

Practice or technology that would be adopted ...	Definitely Intend to Adopt		Probably Intend to Adopt		Already Adopted	
	1	2	3	4	5	6
Implement water conservation practices to limit water to the EIS						
Install nitrates testing to the EIS						
Reduce operation and maintenance activities on my nitrates system						
Performing nitrates work as needed						

Please continue on the other side