


On-Site Sewage Facilities

Ryan Gerlich
Program Specialist II
Department of Biological & Agricultural Engineering




1

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
- Extension education & outreach



2

Onsite wastewater treatment




3

Onsite wastewater treatment systems?

TEXAS A&M AGRILIFE EXTENSION

- Rural and Exurban wastewater infrastructure
- Water Quality Protection
- 20 - 40%, Wastewater Infrastructure
- What is the system called?
 - OWTS – Onsite Wastewater Treatment System; Nationally
 - OSSF – On-Site Sewage Facility; Texas
 - Septic System

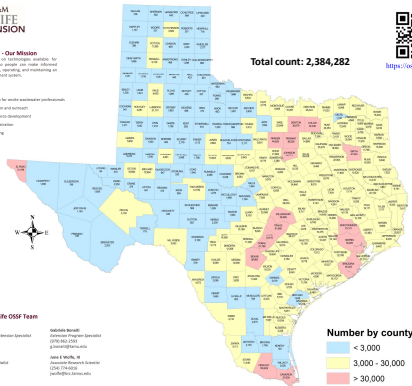


4

Texas On-Site Sewage Facilities OSSFs Count as of 2020

TEXAS A&M AGRILIFE EXTENSION

Total count: 2,384,282



Number by county

- < 3,000
- 3,000 - 30,000
- > 30,000

Texas A&M Agrilife OSSF Team

Area of Service


- Consulting services for water resource professionals
- Installation, operation and maintenance
- Training and technical development
- Research and development
- Inventory and mapping

5

Permitting Wastewater Treatment Systems in Texas

TEXAS A&M AGRILIFE EXTENSION

- Texas Commission on Environmental Quality (TCEQ), Chapter 285, 5000 gallons per day or less
 - Local Authorized Agent – Usually local Health Department
 - Authorized Agents collect data, issue permits, compliance and can set more stringent rules (10-acres rule, owner maintenance)
 - TCEQ Regional Office
- TCEQ, Chapter 217, Greater than 5000 gallons per day.

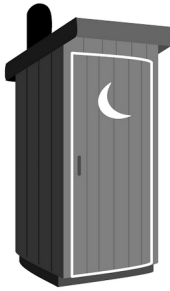


6

Evolution of wastewater management in Texas



- Prior to 1989 – no statewide guidance for installing OSSFs
- 1997 – Rules for site evaluation and wastewater treatment
- 2008 – Maintenance of advanced treatment units
- Number of licensed professionals:
 - Site evaluator/designers (891)
 - Installers (>1,500)
 - Service providers (>1,000)



7

Malfunctioning Onsite System

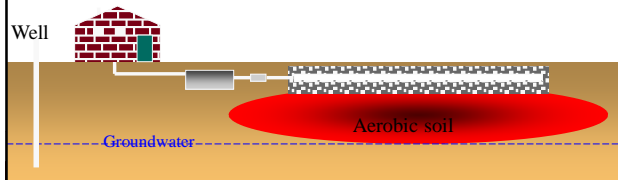


8

Evolution of wastewater management



- 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



9

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

10

Roles with septic system management



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



11

Site evaluation



- Comprehensive evaluation of soil and site conditions for a given land use.
 - Wastewater treatment
 - Wastewater acceptance



- **Licensed OSSF Site Evaluator,**
 - **Professional Engineer**



12

Design



- 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**



13

Installation

- 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**



14

Inspection



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

**Designated
Representative**



15

Operation and maintenance



- 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

16

Pumping



- 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


17

What is a conventional septic system?

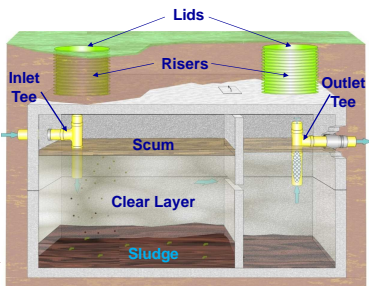


18

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



19

HOW A SEPTIC SYSTEM WORKS



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.

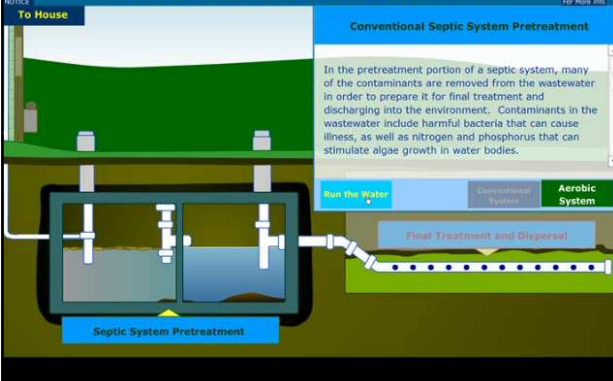
Run the Water

Septic System Pretreatment

Conventional System


Aerobic System

Final Treatment and Dispersal



20

HOW A SEPTIC SYSTEM WORKS



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.

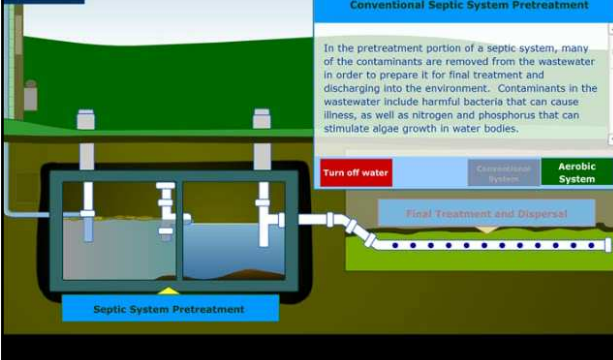
Turn off water

Septic System Pretreatment

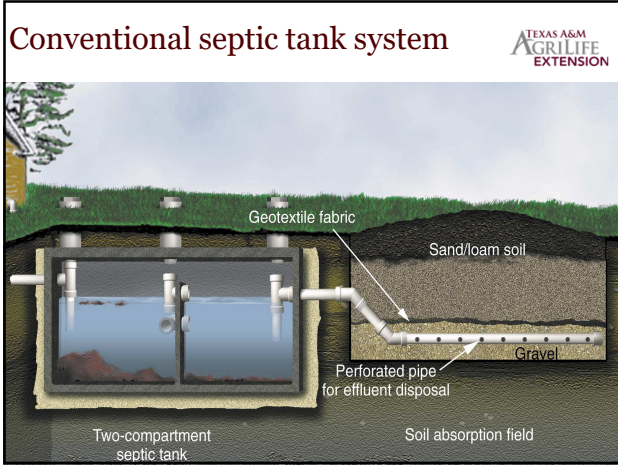
Conventional System

Aerobic System

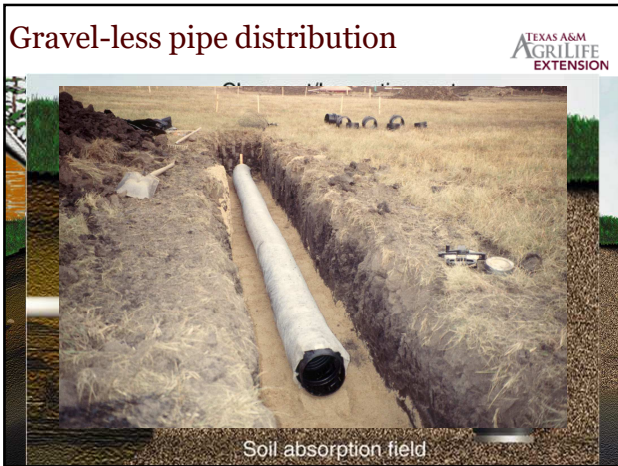
Final Treatment and Dispersal



21



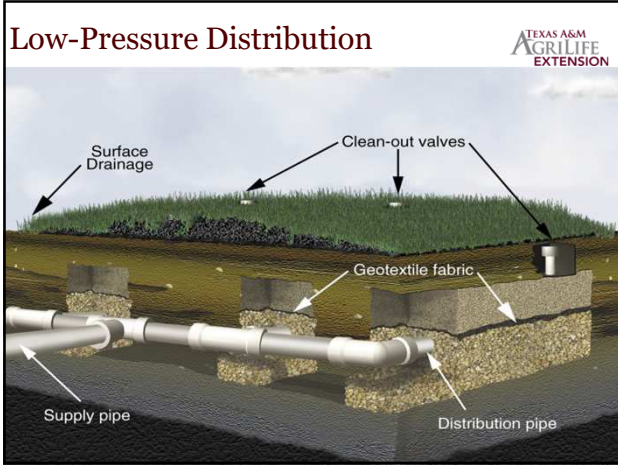
22



23



24



25



26

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

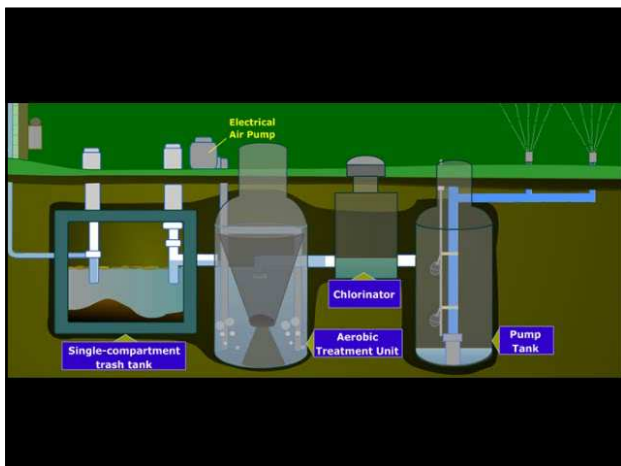


27

What is an aerobic treatment unit?



28



29

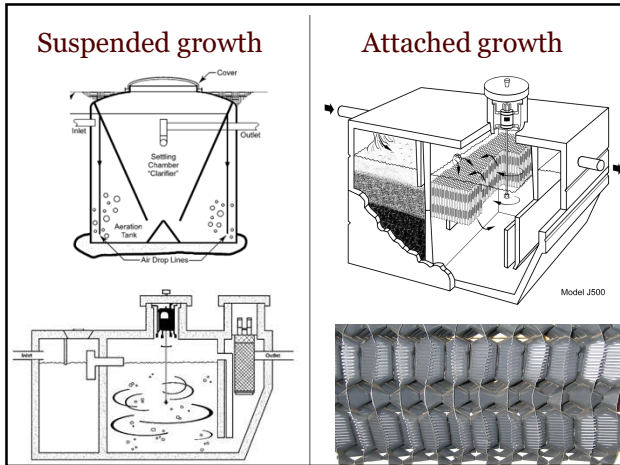
Aerobic treatment unit



- 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



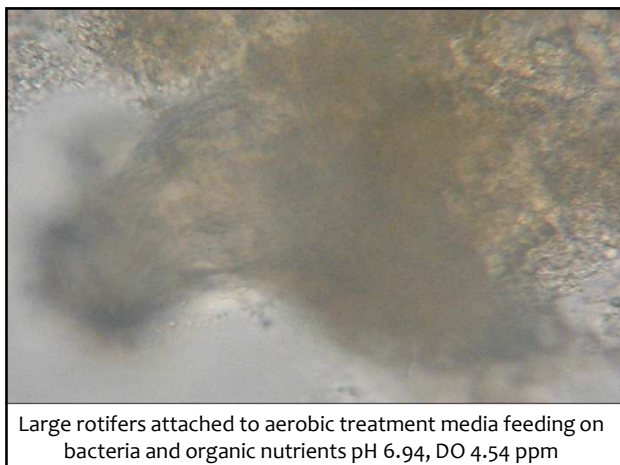
30



31



32



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

33



Mite on aerobic treatment media pH 6.94, DO 4.54

34

Disinfection

- Disinfection, **NOT Sterilization!**
- Chlorinator
 - NOT SWIMMING POOL TABLETS!
- UV light





35

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!!!!**




36



37

Living with an ATU

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





38

Homeowner maintenance exemption 285.7(d)(4)


- At the end of the initial two-year service policy period, the owner of an Aerobic Treatment Unit for a single family residence shall either maintain the system personally or obtain a new maintenance contract.
 - Limitation: An owner may not maintain an OSSF under the provisions of this section for commercial, speculative residential, or multifamily property.
 - Many Authorized Agents require Aerobic Treatment Units to be professionally maintained on a continuous basis
 - Some Authorized Agents allow homeowner maintenance upon completion of an approved course

TEXAS A&M
AGRILIFE
EXTENSION

39

Homeowner education

TEXAS A&M AGRILIFE EXTENSION



Homeowner Maintenance of Aerobic Treatment Units

COURSE INFORMATION

An aerobic septic system, or aerobic treatment unit (ATU), uses oxygen to breakdown both dissolved and solid constituents like grease, oil, soap, and non-digestible material contained in wastewater. This online course will teach you how to properly maintain and operate your ATU.

Topics

- Understand the basic operation and maintenance activities for an ATU
- Be a better consumer in the aerobic wastewater treatment industry
- Have the knowledge needed to understand and communicate with maintenance providers

Course Details

Cost: \$150
 Duration: 30 days from sign-up date
 To register, go to aag.1066372 and click "Enroll Now".

Visit aag.1066372 for more information.

Contact Dr. Arden Lawrence Arden.Lawrence@tamu.edu

40

Septic system additives

TEXAS A&M AGRILIFE 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

41

Kitchen

TEXAS A&M AGRILIFE EXTENSION



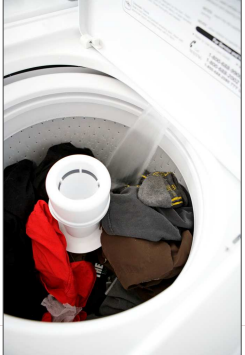
- Dishwasher
 - Hydraulic surges of wastewater
 - Space out loads
 - Organic load
 - Clean/scrape plates
- Garbage Disposal
 - Increases scum by 20%
 - Pumping required 1-2 years sooner
 - Organic matter had not been digested, so it will take longer to break down
 - Small particles take longer to settle

42

Laundry

TEXAS A&M AGRILIFE 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




43

Toilet

TEXAS A&M AGRILIFE 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?




44

Cleaning products

TEXAS A&M AGRILIFE 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 painted wood.

PRECAUTIONARY STATEMENTS: HAZARDS TO HUMANS AND DOMESTIC ANIMALS
CAUTION: Causes moderate eye irritation. Avoid contact with eyes. Wash thoroughly with water and rinse slowly and gently with water for 15-20 minutes. Call a poison control center for treatment advice. See label for more information.

45

Prescription drugs & antibiotics



- > Can kill microbes living in system
 - o 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

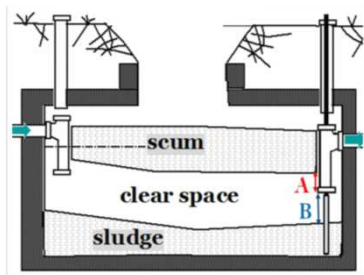


46

Septic tank pumping recommended?

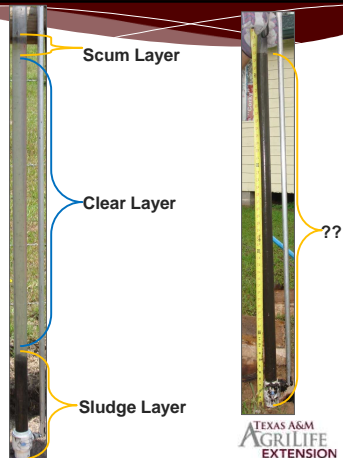


- o Should be pumped when total solids reach 25-33% of tank capacity.
 - o If 'A' is less than 3"
 - o If 'B' is less than 12"
- o Typically required every 3 to 5 years
- o Pump during dry seasons to reduce the risk of tank flotation



47

Measuring solids




48

Current OSSF Projects

TEXAS A&M
AGRI LIFE
EXTENSION

- Lampasas River Watershed Protection Plan
 - Homeowner education
 - OSSF inspections
 - Provide up to \$8,000 toward the replacement of a failing OSSF
- San Bernard River in Brazoria County
 - Homeowner education
 - Pumping & inspection of OSSFs




49

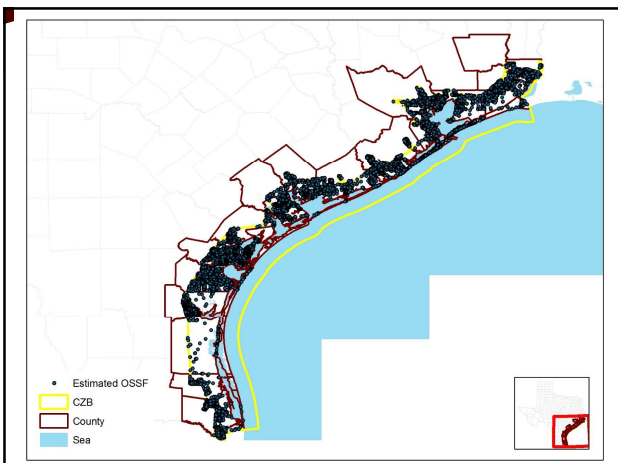
Coastal Zone Act Reauthorization Amendments (CZARA)

TEXAS A&M
AGRI LIFE
EXTENSION

- Funded through TCEQ
- Nonpoint source pollution
- Tasks
 - Outreach
 - OSSF Inspections and Survey
 - Establish and maintain an OSSF Inventory



50



• Estimated OSSF

■ CZB

■ County

■ Sea

51

Inspections & Pump-outs


- Voluntary inspections
- Participants receive:
 - Free system pump out
 - Visual inspection of the septic tank
 - Report of operational status
 - A better understanding of OSSF operation and maintenance
 - Suggestions to improve system operation







52

Causes of Failures



- Age and deterioration of components
- Undersized tanks and drainfields
 - Originally weekend homes / fishing camps
 - Small lots
 - Exceeding design flow
- Unsuitable soils
 - Clay
 - High water table
- Owner abuse / neglect
- No access for maintenance

53

Soil and site conditions






54

Texas OSSF Grant Program (TOPG)

Research Topic 2.3.2 Wastewater challenges at recreational vehicle (RV) parks

- The number of RV Parks in Texas is increasing
- The regulated community, and regulators, report increasing design challenges, compliance issues, operational issues, and system malfunctions
- Parks are offering an increasing number of amenities
- Stay lengths are increasing; short-term (<4 months), long-term (> 4 months)
- Real-world data on which to base new designs and to understand malfunctions of existing designs is needed



55

Texas OSSF Grant Program (TOPG)

Research Topic 2.3.3 Aerobic Treatment Units in the Real World

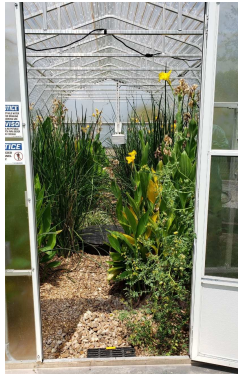
- Permit records indicate the aerobic treatment unit (ATU) is the most common OSSF wastewater treatment method used in Texas
- A real-world field study is needed to determine if minimum treatment requirements are being achieved



56

Texas OSSF Grant Program (TOPG)

- Research Topic 2.3.1 Understanding Problems and Identifying Solutions for Texas OSSFs using Drip Irrigation
- Research Topic 2.3.4 Reduction of Wastewater Effluent from On-Site Sewage Facilities



57



58

Summary

- OSSFs will play a vital role in our future infrastructure needs
- Responsible management of OSSF is a MUST
- Advanced technologies available for most situations
- TAMU offers Education, Research, and Extension Services related to OSSFs and in future will focus on reuse

The cartoon shows a man in a trench digging a hole. A speech bubble above him says "Ooooo... This not be cheap." The caption below the cartoon is "Early plumbers".

59

Thank you

Ryan Gerlich
Office # 979-458-4185
rgerlich@tamu.edu
<http://ossf.tamu.edu/>

The screenshot shows the homepage of the On-Site Sewage Facilities (OSSF) website. It features a navigation menu, a main content area with a photo of a person working on a sewage system, and a sidebar with additional links and information.

60
