



Basics of Onsite Wastewater Treatment

Homeowner Education

Dr. Sara Heger and Dr. John Buchanan





- Homeowner Education Program
- NOWRA was subcontractor focused on the development and delivery of the training materials
- RCAP hosted the train-the-trainer event and formatted the guidebook



Acknowledgement

This project has been funded by the United States Environmental Protection Agency under an EPA Training and Technical Assistance for Wastewater Treatment Works for the Prevention, Reduction and Elimination of Pollution.

The materials being presented represent our opinions, and do NOT reflect the opinions of NOWRA



Overview

- Grant goal - provide small publicly owned treatment works, onsite/decentralized wastewater systems, and the communities they serve, training and technical assistance to improve compliance and financial sustainability, improving public health and the environment
- Material developed for RCAP and other to educate property owners, small communities, septic system professionals
- Phase I – focused on homeowner materials
- Phase II – Professionals and communities



Material Development

- John and I took the lead but we had a great review committee:
 - Allison Blodig
 - Sheryl Ervin
 - Tom Groves
 - Lucas Guinn
 - Dennis Hallahan
 - Michael Hines
 - Gary L Hawkins
 - Sushama Pradhan
 - Anne Powell
 - Danna Revis
 - Albert Rubin
 - Larry Stephens

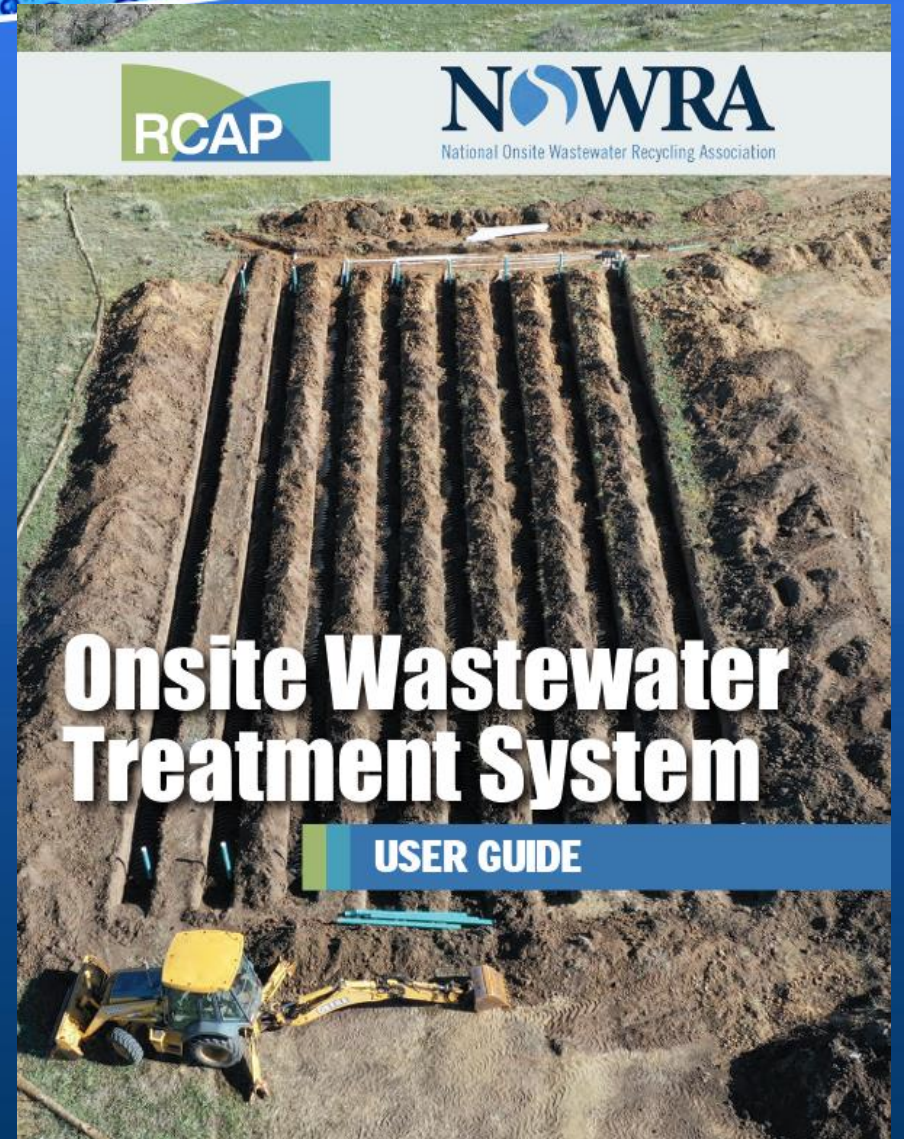


Training Materials

- Development of:
 - User manual
 - 2- 3 hour training course (in person or virtual) with 4 modules:
 - Overview of types of septic systems
 - Overview of management
 - Home management tips
 - Identifying and troubleshooting problems

User Guide

- Training modules designed to supplement the information provided in the 32 page User Guide



CHAPTER THREE

Typical Onsite Wastewater Treatment Systems Features

Fixtures and Plumbing

Approximately 80% of the water we consume becomes wastewater. All water containing human waste, nutrients, dirt, and other contaminants must be collected and delivered to the septic tank for pretreatment and then to the soil treatment area for final treatment and dispersal. In some older homes, the drain from the laundry may have been plumbed to bypass the septic tank; however, this can cause damage by allowing too many solids to enter the soil treatment area. In addition, some drains from laundry discharge to the surface, resulting in a risk to public health and the environment due to the contaminants. In contrast, water from roof drains, basement drainage sump pumps, hot tubs, swimming pools, and air conditioning condensate are not considered wastewater, and should not be put into the OWTS. The discharge from water treatment systems (such as a water softener or reverse osmosis) could be handled separately from the OWTS because the large water volume needed to regenerate these devices could overload the system.

Original and remodeled plumbing systems must be correctly designed and installed to allow trouble-free operation. **Before remodeling, consider the impact of changes on the OWTS.** The addition of a bedroom may trigger a need to upgrade the OWTS to a larger capacity.

Every home has a wastewater piping system that collects wastewater from the source and transports the wastewater to the OWTS. This plumbing is called the drain, waste, and vent (DWV) system, because it is used to drain wastewater from the home and to allow air to vent. You may have noticed pipes protruding from your roof—these pipes allow air to enter the DWV system as water moves through the plumbing system. Air is displaced as water moves through the piping, and this air must be allowed to vent. Likewise, after the water moves through, air must be allowed to enter the piping, or a vacuum will form. This vacuum can pull the water out of the toilet bowl and other gas traps, which will allow sewer gases to enter the home.



* Please note: The configuration of your septic tank may vary.

3	Chapter 1 Importance of Sewage Treatment
5	Chapter 2 Overview of Household Wastewater Treatment
6	Chapter 3 Typical OWTS Features
12	Chapter 4 Final Treatment and Dispersal
18	Chapter 5 Management
20	Chapter 6 Wastewater Strength
22	Chapter 7 Safety
23	Chapter 8 Landscaping and Land Use Near Your OWTS
25	Chapter 9 Maintenance
28	Chapter 10 Troubleshooting
29	Chapter 11 Common Problems
30	Chapter 12 OWTS Troubleshooting Guide for Homeowners



Training Course Learning Objectives

- As a result of this training, participants will be able to:
 - Explain how an OWTS processes wastewater
 - Describe the needed maintenance with typical onsite systems
 - Implement changes in their home to reduce the load to their OWTS
 - Solve basic problems homeowners may have with their system and/or identify resources to help solve problems



Resources

- Training course overview and outline
- Slide sets with extensive speaker notes
- Pre/post test
- Integrated EPA videos and diagrams
- Videos and drone photos to show construction and for troubleshooting
- Evaluation



Train-the-Trainer

- 3 train-the-trainer events held in late May/early June
- RCAP staff and other professionals from the area including engineers, regulators, associations
- Including more background information and tips on customizing the information for the audience



Final Materials

- Materials are to be modified to fit the amount of time and systems in the community
 - Editable slides
 - Videos – provided both impeded and separately
 - Construction videos and photos
 - User manual (not editable)
 - Available at:
www.nowra.org/library/homeowner-training-materials/

CHAPTER TWELVE

OWTS Troubleshooting Guide for Homeowners

The system is failing if it is not effectively treating the sewage. Diagnosing the specific causes of failure may be difficult for the owner and often requires the skills of a professional. The following chart shows common problems, possible causes, and remedies.

PROBLEM	RISK	CAUSES	REMEDIES
Alarm going off	Effluent may back up into home or surface in yard.	<ul style="list-style-type: none"> • Pump failed or undersized • Fuse breaker tripped • Pump plugged • Controls malfunctioning • Water infiltration • Excessive water use • Frozen or blocked pipe • Stuck toilet valve 	<ul style="list-style-type: none"> • Control water use • Check breaker & plugs • Check controls & pump • Make sure a professional replaces pump with proper size unit • Fix leaks in plumbing, tank, or piping • Hire a professional to thaw the system
Freezing	Effluent may back up into home or surface in yard.	<ul style="list-style-type: none"> • Extreme cold temperatures • Improper drainage of pipes and components • Lack of proper soil cover • Lack of snow cover • Leaks or other low use 	<ul style="list-style-type: none"> • Control water use • Thaw line and determine where and why it froze • Fix leaks • Insulate components • Confirm no components were damaged
Fire over system	System components above the ground and shallowly buried may have been damaged.	<ul style="list-style-type: none"> • Grass or forest fire over system 	<ul style="list-style-type: none"> • Evaluate safety concerns due to exposed/damaged components • Hire a professional to evaluate the system • Repair damaged components prior to use

PROBLEM	RISK	CAUSES	REMEDIES
Flooding over system	Effluent may back up into home or surface in yard.	<ul style="list-style-type: none"> • Large rainfall events • System in a floodplain • Improper grading 	<ul style="list-style-type: none"> • Do not use system when flooded • After flood water recedes, clean out the tanks/pre-treatment components to remove sediment and debris • Keep traffic off the system to limit compaction • Have a professional evaluate your system • Repair/replace damaged components
Sewage on surface or backing up in home	Human contact with sewage is a serious public health risk. Many waterborne diseases exist in household sewage.	<ul style="list-style-type: none"> • Excess water entering system • Improper plumbing • Blockage in plumbing • Improper operation • Pump/control panel failure • Improper system design • Roots clogging pipes • Improper venting • A portion of the system is frozen or flooded • Stuck toilet valve 	<ul style="list-style-type: none"> • Fence off area or operate as a holding tank until fixed • Fix leaks/vents • Install water-saving fixtures • Stop using garbage disposal • Pump septic tank and check pump(s) • Replace broken or cracked pipes and remove roots • Avoid planting water-loving trees • Seal pipe connections • Hire a professional to thaw the system
Sewage odors inside or outside the house	Toxic gases can cause discomfort or illness.	<ul style="list-style-type: none"> • Improper plumbing • Sewage surfacing in yard • Sewage backup in house • Unsealed basement/crawl space sewage pump • Roof vent pipe frozen shut or blocked • Dry trap in underused fixture or floor drain 	<ul style="list-style-type: none"> • Repair plumbing • Pump septic tank and check pump(s) • Add water to drain traps in the house • Tighten seals on pump(s) and cleanout(s) • Thaw or clear roof vent • Add water to fill the dry trap

Training Resources

Training Presentations:

- [Module 1 – Overview of Sewage Treatment and Typical OWTS](#)
- [Module 2 – Overview of Management](#)
- [Module 3 – Home Management Tips](#)
- [Module 4 – Troubleshooting](#)

Supporting Materials:

- [OWTS Guidance for Trainers](#)
- [NOWRA Training Tips](#)
- [Presentation Tips](#)
- [Pretest](#)
- [Property Owner Course Evaluation Form](#)
- [Final Septic System Users Guide](#)

Pictures and Videos for Instructors

- [Diagrams \(zip file\)](#)
- [Example System Photos \(zip file\)](#)
- [Videos](#) - link to listing





Online Free Self Paced Module
<https://www.pathlms.com/nowra/>

**Onsite
Wastewater
Treatment
System
Homeowner
Education**

RESUME COURSE





Future activities

- Homeowner materials converted to Spanish
- Train materials for septic professionals and communities:
 - O&M curriculum
 - Difficult site curriculum
 - Small community curriculum



Operation and Maintenance Materials

- Objective - focus on workforce development related to system management including the operation, maintenance, monitoring, and troubleshooting
- Primary audience - service providers and maintainers of decentralized system.
- Secondary audience - local and state-level permitting staff, designers, engineers, and soil scientists
- Updated/enhanced:
 - Manual
 - Training materials
 - Videos and interactive training



Solutions for Challenging Sites

- Objective – develop training regarding solutions for challenging sites, soils, environmental concerns and waste characteristics
- Primary audience - design professionals, regulators
- Secondary audience community leaders, technical and managerial staff, and
- Course materials will be provided as modules based on the challenges and related solutions



Small Community Education Program

- Objective – develop training for communities on an effective processes and steps to solve their wastewater treatment
- This task will develop a training manual and materials to guide an engineer/designer, regulatory authority, and/or an engaged community member through the process with the below highlighted steps:
 - Identifying current and anticipated wastewater treatment problems
 - Information needs
 - Working with professionals
 - Decentralized system treatment options
 - Decentralized management options
 - Community structure options
 - Financing
 - Implementation



Questions about these training materials?


Dr. Sara Heger, sheger@umn.edu



Example Module Troubleshooting



Learning Objectives

1. Solve basic problems you may have with your system
 2. Identify resources to help solve problems
- 



Common Problems with OWTS

1. Improper maintenance

Most common - lack of septic tank pumping

2. Overuse or misuse of the system

Too much water, organics, solids and cleaners

3. System not properly designed or installed

Mistake during design/installation or system not match the use (home, business or small community)



Identify, Locate and Understand Your OWTS

- Septic tank or tanks
 - Effluent filter
- Advanced treatment unit
- Pump, controls and alarm
- Review your design/as-built
- Contact your permitting authority for records
- Ask your installer, service provider or pumper



Locating Your OWTS

- Hire a licensed contractor/installer, service provider or pumper
- Locate your septic tank
 - If there are manholes or inspection pipes at ground level it should be easy to find
 - If not go into basement or crawlspace and determine where sewer pipe (typically largest pipe made of cast iron or plastic) exits the building
 - Then with a metal rod start poking in the soil 10 – 15 feet from the foundation in the direction pipe was leaving the house (be sure to have utilities located)
 - A metal detector may be helpful as many concrete tanks have metal reinforcing rods
 - Often the first spot to melt snow is over the septic tank



Locate Soil Treatment Area

- Look in general direction sewer pipe was leaving the house and after the septic tank if you can find it
- Potential signs are areas where grass isn't growing as well, slight rise or depression, where soil is soggy or vegetation is green while the rest of the yard is dry
- Probe in the soil trying to find media in the system
- **Call a professional who has tools & experience**



Troubleshooting

What's the Problem?



Alarm going off

What's the Problem?



Wastewater backing up in the home

What's the Problem?



Sewage odors in the yard

What's the Problem?

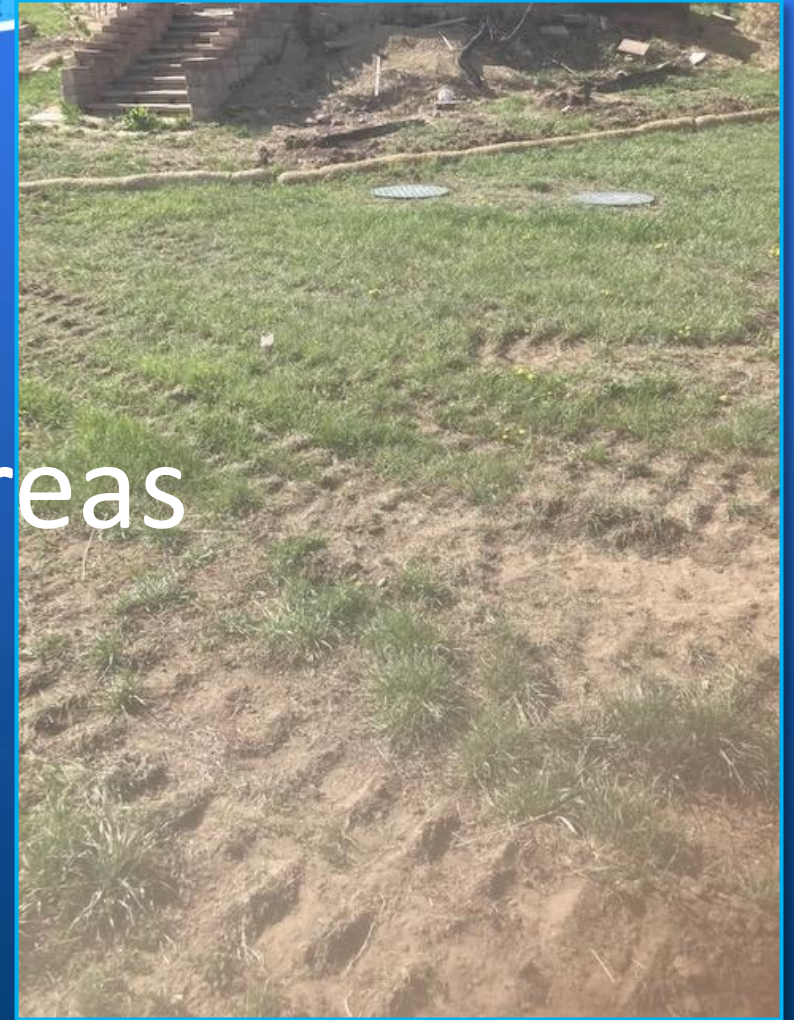


**Electrical cord running through surface water to pump and
poor surface drainage**

What's the Problem?



Soil treatment areas



Lack of vegetation and compaction

What's the Problem?



Crushed and overloaded distribution box

What's the Problem?

Soil treatment area



Surfacing of effluent and traffic over the system

What's the Problem?



Roots in a distribution box and out of a septic tank

What's the Problem?



Using more water than need or not spacing out usage

What's the Problem?



Broken pipe full of fat, oil and grease

What's the Problem?



Surfacing of sewage in the yard = health threat

What's the Problem?



Lack of septic tank maintenance

What's the Problem?



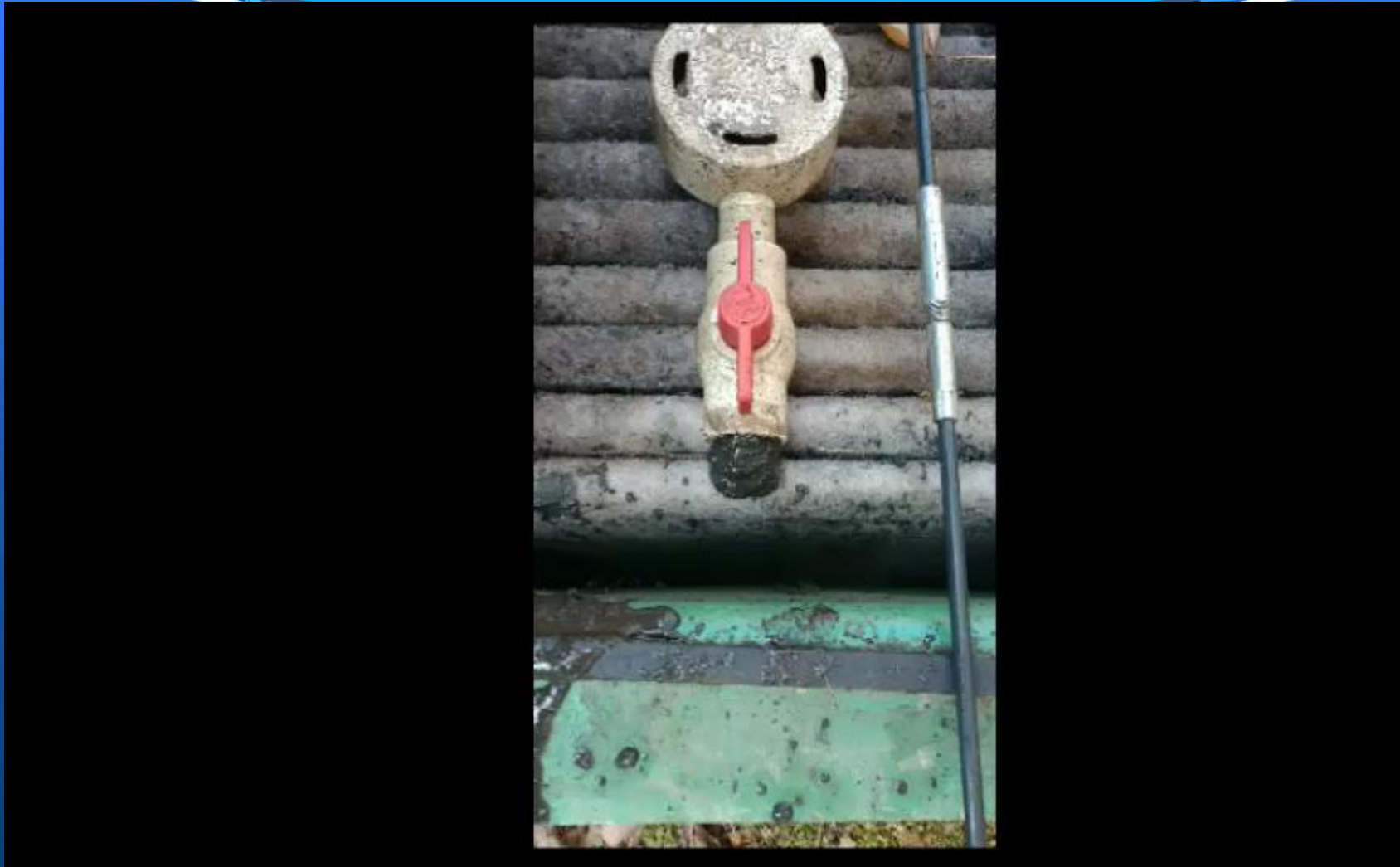
Tank lid collapse – safety issue

What's the Problem?



Flushing of inappropriate materials

What's the Problem?



Sludge coming out of a pipe in a media filter

What's the Problem?



System that had not had routine maintenance for 10 years

What's the Problem?



Plugged up effluent screen

What's the Problem?



Chemical/soap upset of the OWTS

What's the Problem?



Frozen system and straw bales for insulation not removed

What's the Problem?



Fire over the OWTS media filter

What's the Problem?



Flooding over the OWTS



Your Problems or Questions



Resources

- See back page of User Guide for:
 - List of state regulatory contacts
 - Product disposal and selection information
 - National level resources from EPA, NOWRA and RCAP



Rural
Community
Assistance
Partnership



National Onsite Wastewater Recycling Association



Conclusion of Module 4

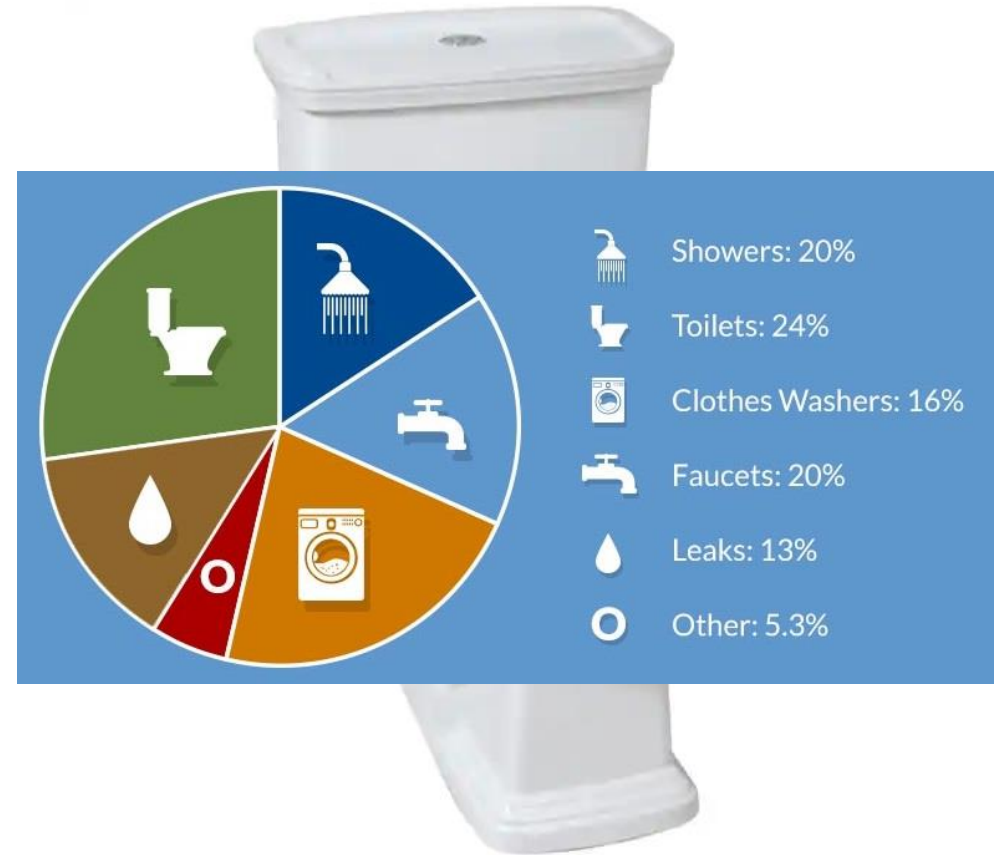
INSTRUCTOR NAME
INSTRUCTOR CONTACT INFORMATION




Post Test

What device in the house uses the most water?

1. Clothes washer
2. Shower
3. Toilet
4. Faucets





At what percentage full of solids (sludge and scum) should a septic tank be pumped?

- 10%
- 25%
- 33%
- 50%
- 100%



25%



What is a problem with older toilets?

1. They use 5+ gallons per flush
2. Leaky gaskets



If you don't know where your septic system components are located what can you do?

- Contact your permitting authority for records
- Reach out to the designer, installer, inspector, service provide who was involved with it was designed or hire one to locate it
- Try to find it out your own



Rural
Community
Assistance
Partnership



If you use these materials
please be in touch!

Sara Heger
sheger@umn.edu
