



Impacts of COVID-19 on the Septic Systems

Water Resources Center
UNIVERSITY OF MINNESOTA
Driven to DiscoverSM

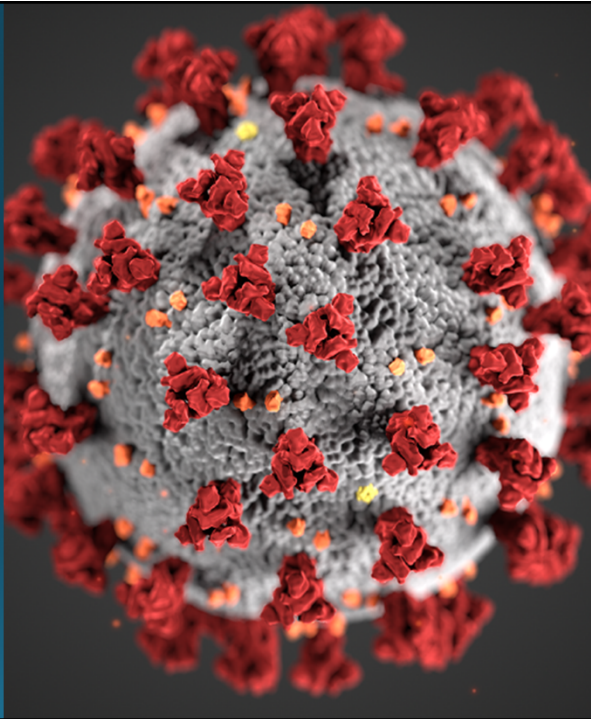
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The materials being presented represent the speaker's own opinions and do NOT reflect the opinions of NOWRA

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Presentation outline

- Background
- Treatment
- Wastewater tracking
- Worker safety
- Societal change
- Economics



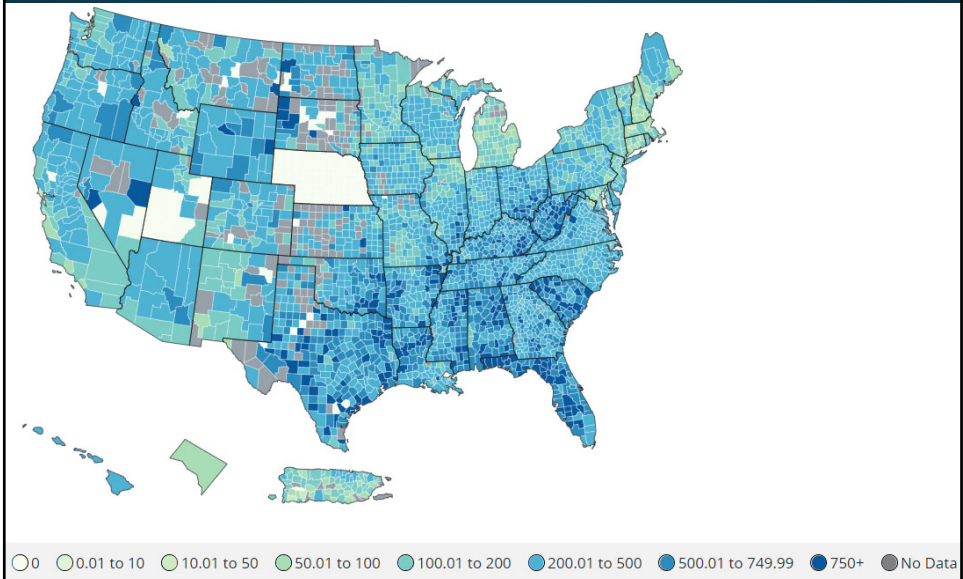
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Background

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Cases in the US by County per 100,000



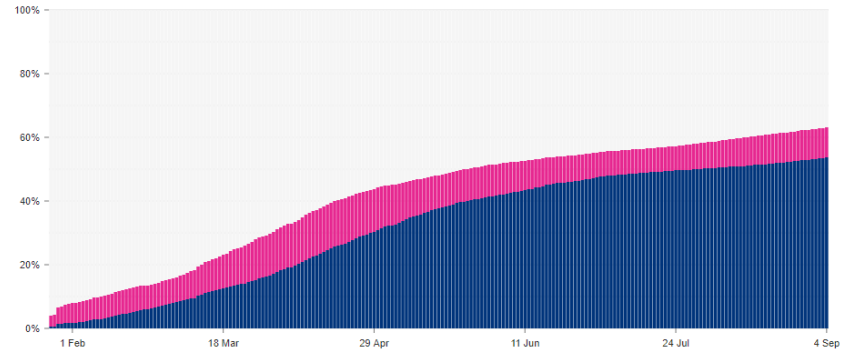
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Vaccination Progress

At least **206,908,710** people or **63%** of the population have received at least one dose.

Overall, **175,968,266** people or **54%** of the population have been fully vaccinated.

Percent of people receiving vaccines in the US

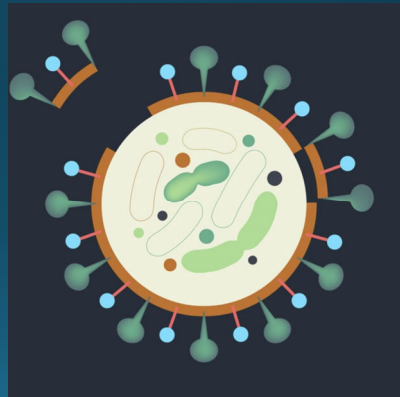


Sources: Centers for Disease Control and Prevention. [see more](#)

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Treatment of COVID-19

- Wastewater treatment plants and septic systems treat viruses and other pathogens
- COVID-19 is a type of virus that is particularly susceptible to disinfection
- COVID-19 binds with soap molecules with disrupt the fatty layer or coat surrounding the virus
 - Once the viral coat is broken down, the virus is no longer able to function



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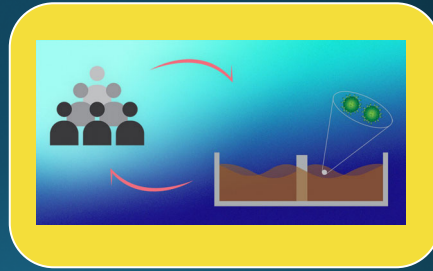
Wastewater surveillance

- Wastewater can be tested for genetic material (RNA) from SARS-CoV-2, the virus that causes COVID-19
 - Not a live virus test
- Sewage testing has been successfully used as a method for early detection of other diseases
- SARS-CoV-2 can be shed in the feces of individuals with symptomatic or asymptomatic infection
- One resource under development (NSF Funding) is a publicly accessible web-based Wastewater Pathogen Tracking Dashboard

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Wastewater surveillance

- Quantitative SARS-CoV-2 measurements can provide information on changes in total COVID-19 infection
- Depending on the frequency of testing, sewage surveillance can be a leading indicator of changes in COVID-19
- SARS-CoV-2 RNA detection is independent of healthcare-seeking behaviors and access to clinical testing



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Is COVID-19 in groundwater?

MINNESOTA

WEDNESDAY, OCTOBER 14, 2020

Minn. well water tests show no coronavirus

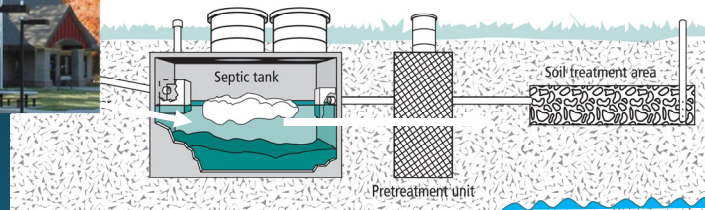
- UMN tested 30 sources of drinking water
- Mississippi river, public and private wells (located in an area prone to surface contamination)
- Researchers thought they might find it from septic systems

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UMN and MnDOT research on COVID



COVID & chili pepper virus sampling locations



#1 – septic tank

#2 secondary treatment (if present)

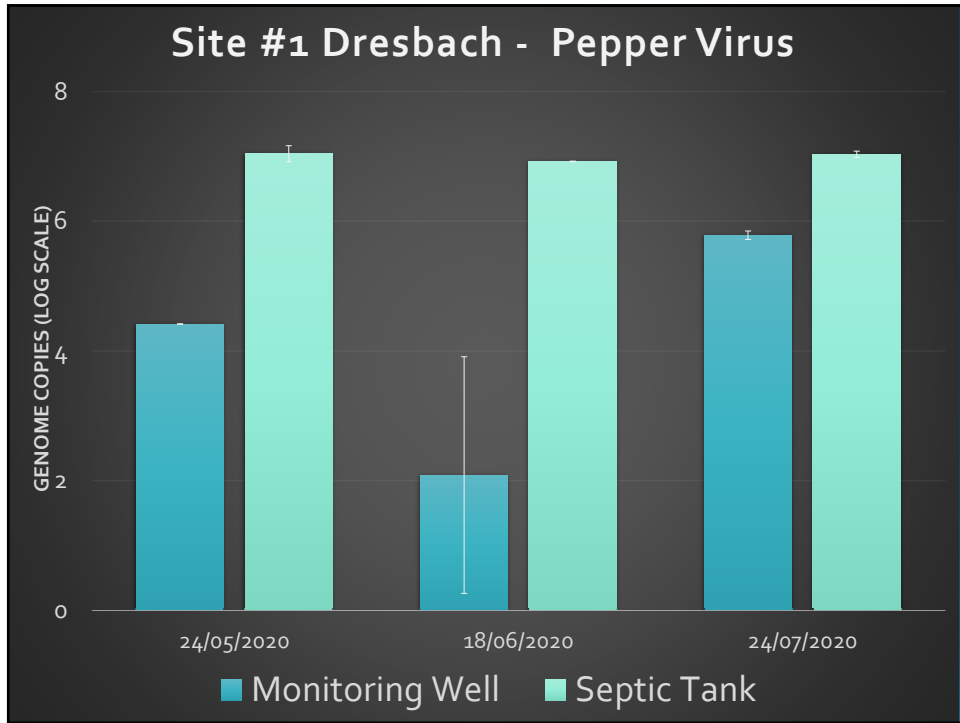
Sample #3 - groundwater

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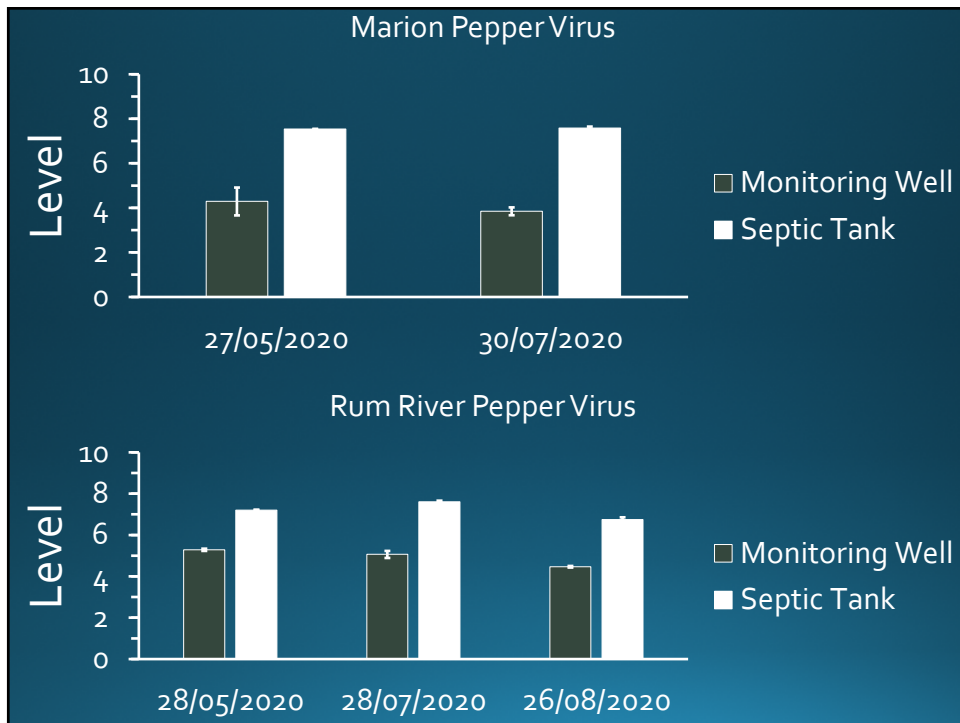
Research on COVID-19 at rest areas

- 3 rest areas were tested in May, June, and July/August for presence of COVID RNA (not active virus)
- Included testing for a chili-pepper virus which is very resistant to treatment and a good indicator of wastewater inputs

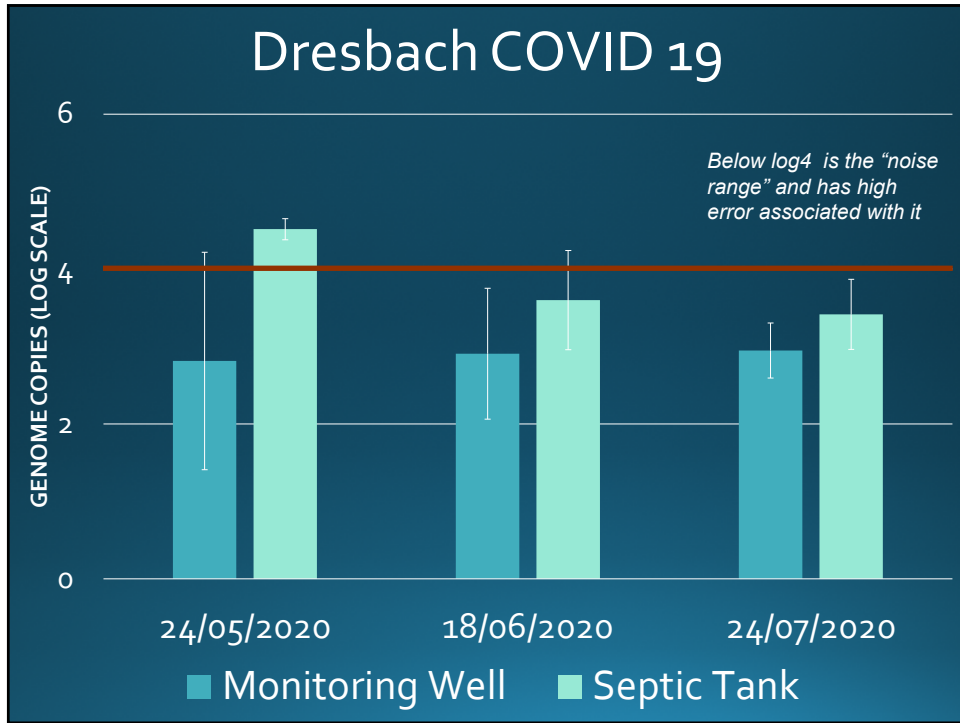
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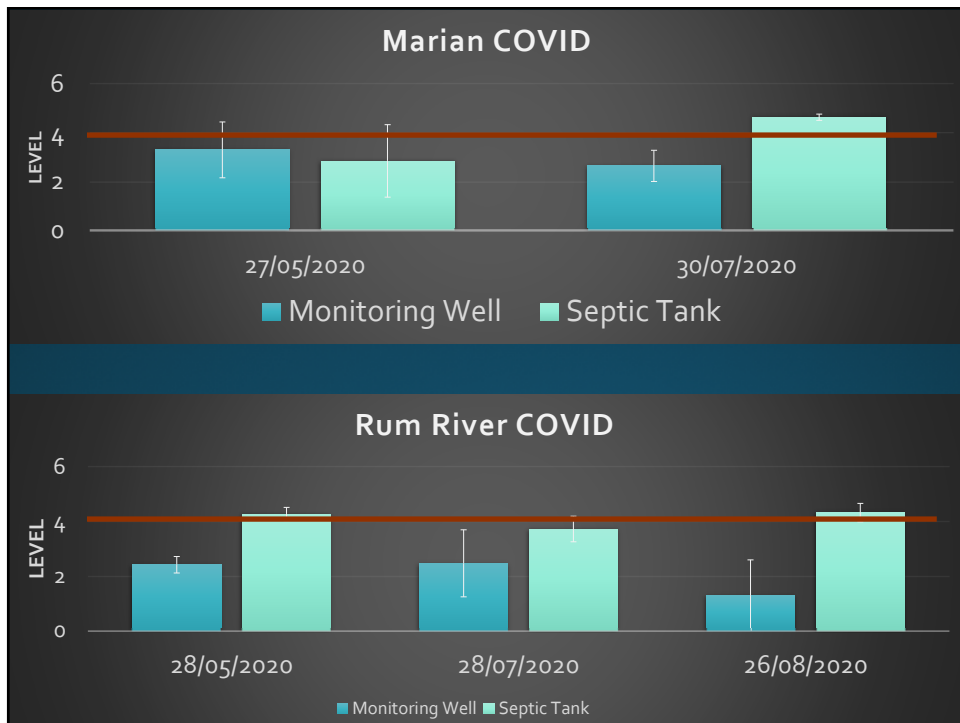
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Worker Safety



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What we know – wastewater workers

- World Health Organization
- “there is no evidence to date that COVID-19 has been transmitted via sewer systems, with or without wastewater treatment”



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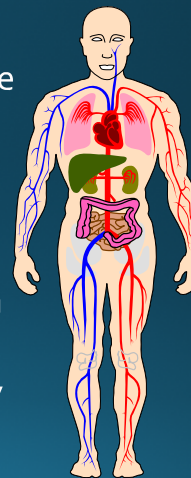
What we know

- OSHA states there is no evidence to suggest that additional, COVID-19 specific protections are needed for employees
- OSHA encourages workers to follow routing practices to prevent exposure to wastewater
- The Center for Disease Control and Prevention (CDC) notes that wastewater and sewage workers should use standard practices of basic hygiene precautions
 - handwashing
 - wear personal protective equipment (PPE) as prescribed for work tasks

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Pathogen pathways

- Oral-hand to mouth contact during eating, drinking, and smoking or by wiping your face with contaminated hands or gloves
- Dermal-skin contact from wastewater splashes - having cuts, scratches, and wounds raise the risk
- Eyes-pathogens can enter the body through the eyes
- Lungs-inhaling airborne microbes carried by dust, mist, or fumes



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Points of contamination

- Respiratory exposures
- All of the tools touched
- Truck door handle
- Steering wheel
- Radio
- Gear shifter
- Lunch
- Cigarette, gum, etc.



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Recommendations

- Wear latex or rubber gloves
- Wipe down surfaces (steering wheels, gearshifts, door handles, door tools) with disinfectant
- Keep hands and fingers away from mouth, nose, eyes, ears
- Separate work clothes from personal ones
- Soak work clothes in hot water with chlorine bleach
- Vaccinations for typhoid fever, tetanus, paratyphoid, polio, hepatitis
- Use of waterless hand cleaners, anti-bacterial soaps, hand wipes
- Clean implements (soil auger, paddles, sludge/scum tubes, hand tools for opening riser covers)

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PPE overview

- Wastewater professionals must be provided proper PPE and be trained on how to use it
- Goggles to protect eyes from splashes
- Protective face mask or splash-proof face shield to protect nose and mouth from splashes/ aerosolization
- Depending on the type of work this could include N95 masks with a verification of "face fit" testing for the employee including the limitation of facial hair
- Liquid-repellent coveralls to keep sewage off clothing
- Waterproof gloves
- Rubber boots

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Hand washing

- Hand washing is the #1 thing you can do to prevent the spread of harmful bacteria and viruses
- Be provided hand washing facilities/ waterless sanitizers
- Workers should wash hands with soap and water immediately after removing PPE or use waterless sanitizers
- Waterless hand sanitizers are not as effective on hands that are dirty with grime and grit
- Workers should avoid touching their face, mouth, eyes, nose, and open sores and cuts and not chew gum or tobacco while handling sewage



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Risk

- Wastewater professionals and their family in high-risk categories due to
 - age,
 - underlying health issues or
 - have family members at risk should be particularly careful working around untreated sewage
- Consider removing work clothes before returning home is advisable

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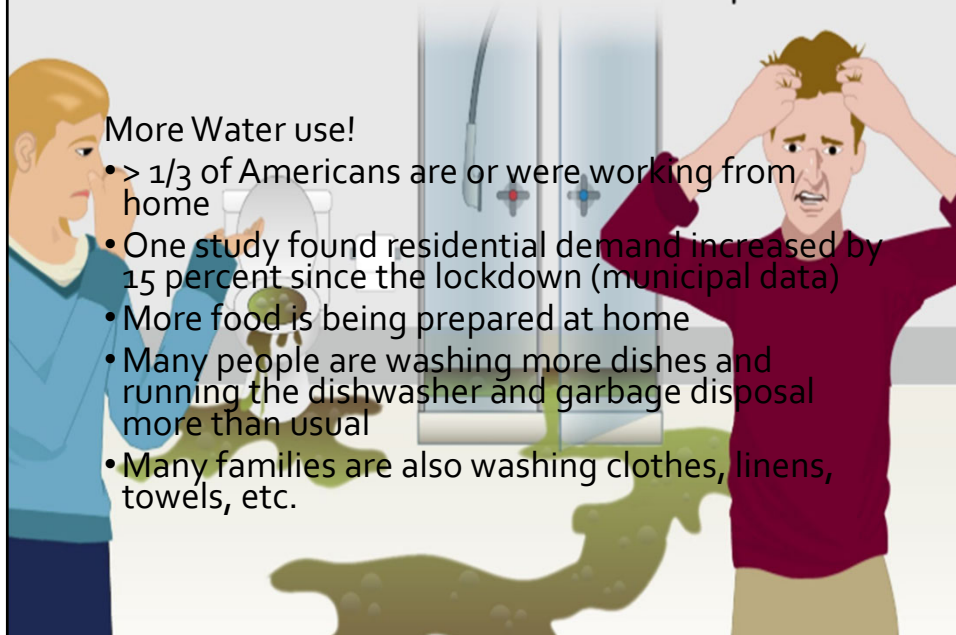
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Societal change



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Don't let the COVID-19 crisis cause a septic disaster!



More Water use!

- > 1/3 of Americans are or were working from home
- One study found residential demand increased by 15 percent since the lockdown (municipal data)
- More food is being prepared at home
- Many people are washing more dishes and running the dishwasher and garbage disposal more than usual
- Many families are also washing clothes, linens, towels, etc.

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More water use

- Most students (elementary – college) were or are at home
 - 40% of parents said they would consider home schooling post pandemic
- 43% of full-time American employees say they want to work remotely more often even after the economy has reopened
 - 20% of their employers are actively considering it



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Impacts of more water usage

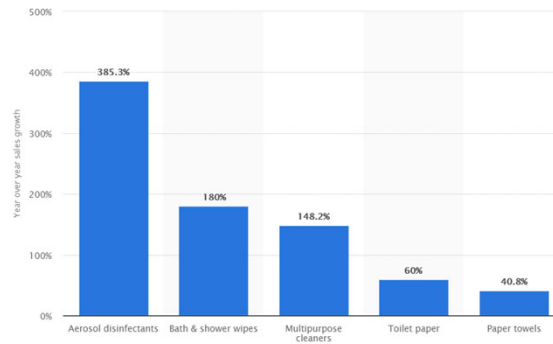
- Increase in service calls
- Education needed to space out use usage
- Older systems may come due for replacement



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Sanitizer increasing usage

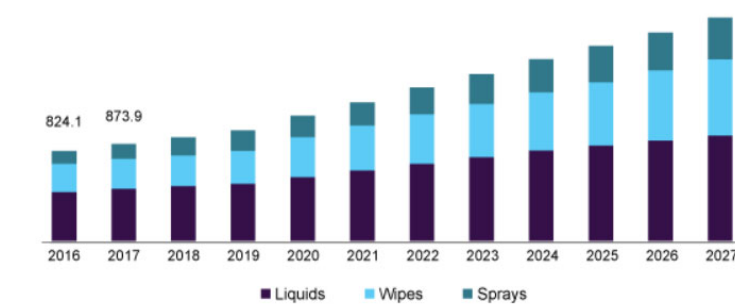
- Calls to US poison control center about cleaner and disinfectant exposure up by 20%
- Antibiotic soaps and wipes are now used by >75% of American households



Sales growth of cleaning products (March 2020)

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The U.S. surface disinfectant market size, by form, 2016 - 2027 (USD Million)



Source: www.grandviewresearch.com

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Impacts of sanitizers on septic systems

- They have cumulative effects on system performance
- Problem products
 - Soaps labeled disinfecting or containing quaternary ammonia
 - Antibiotics
 - Harsh toilet bowl and tub and tile cleaners
 - Drain cleaners
 - Dishwashing detergents
 - Laundry soap

What do product labels mean?

Signal Word	Toxicity if swallowed, inhaled or absorbed through the skin
Caution	One ounce to a pint maybe harmful
Warning	One teaspoon or one ounce maybe harmful or fatal
Danger	One taste to one teaspoon is fatal

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Label impact on septic systems

- **POISON/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

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What products to use/recommend?



- Environmental working group
- Non-profit organization
- Has a comprehensive website which rates the full range of household products
- <http://www.ewg.org>
- A good resource to find the active ingredient in a product is:
 - <http://householdproducts.nlm.nih.gov>

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Quaternary ammonia

- Typically known as "Quats"
 - Many individual chemicals
 - Present in thousands of end-use formulations, many of which are blends of various Quats
 - Varying levels, some are worse than others
- Common uses include disinfectants/sanitizers, surfactants, fabric softeners, antistatic agents, and septic tank additives (controls odor by killing bacteria)

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Quats impacts



Compounds are very stable and hard to break, so has long lasting biocidal effect



Certain quats will biodegrade

Biodegradation poor under anaerobic conditions
Biodegradability of QACs under aerobic conditions
90% removal cited in literature



Anaerobic environments

Inhibitory at 5-15 mg/l



Aerobic

Inhibitory at 10 – 30 mg/l for BOD
2 – 5 mg/l for nitrification

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Testing Quats

- Quat test strips
 - Most are used to test the concentration in commercial kitchen sinks at >200 mg/l
 - Lower level needed
 - <https://www.indigoinstrument.com>
- Quat test kit low range
 - <https://catalog.aquaphoenixsci.com>

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Quat recommendations



- Avoid whenever possible
- In home disinfectant -
Use borax: 1/2 cup in a gallon of water;
deodorizes also (baking soda/vinegar too)

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Quat recommendations cont'd

- Commercial sanitizing is done by either a chemical or with high temperature (165°F)
 - Bleach/iodine preferred
 - Benefect botanical disinfectant (on EPA registered disinfectant list) which contains hydrogen peroxide that breaks down to water and oxygen
- Many national or regional restaurant chains will not stop using Quats
 - For these sites, consider the use of NeutraQuat or QuatKill

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Drain cleaners

- Harsh chemicals used in many drain cleaners kill the essential bacteria
- Gross (1987) study found significant decreases in concentrations of coliform bacteria at very low Drano concentrations
 - 0.1 mg of Drano per liter of septic tank effluent reduced the concentration of coliforms ten-fold
 - 1.3 mg/l is enough to kill most bacteria
 - 3 mg/l they are completely destroyed
 - This amount would typically be used by a homeowner in a short time period while unclogging a drain

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Drain cleaner recommendations

- Use adequate catch basins in all drains from sinks, showers, tubs, laundry, etc.
 - Inexpensive metal or plastic drain screens
- When drains do plug usually in trap below sink
 - Take it apart, use a plunger or snake
- Call a professional

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Toilet and bathtub/shower cleaners

- Many toilet cleaners contain corrosive ingredients:
 - Sulfates, sodium hydroxide, sodium hypochlorite (bleach), or phosphoric acid
 - Antibacterial
- Tub and tile cleaners often contain:
 - Emulsifiers
 - Antibacterial, disinfecting and sanitizing products
- Rust removers contain very strong bases, emulsifier and surfactants



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Recommended toilet cleaners

- Sprinkle baking soda or Bon Ami, then scrub with a toilet brush
 - Bon Ami is non-scouring, biodegradable, nontoxic and hypoallergenic
- Lime and hard-water deposits can sometimes be removed with hot white vinegar



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Bathing and handwashing

American Medical Association
– antibacterial soaps not needed and is promoting “super” bugs

2000

2016

U.S. Food and Drug Admin. banned the use of 19 specific active ingredients in antiseptic hand wash including triclosan due to health concerns, but exempts waterless hand sanitizers

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General surfactant recommendations

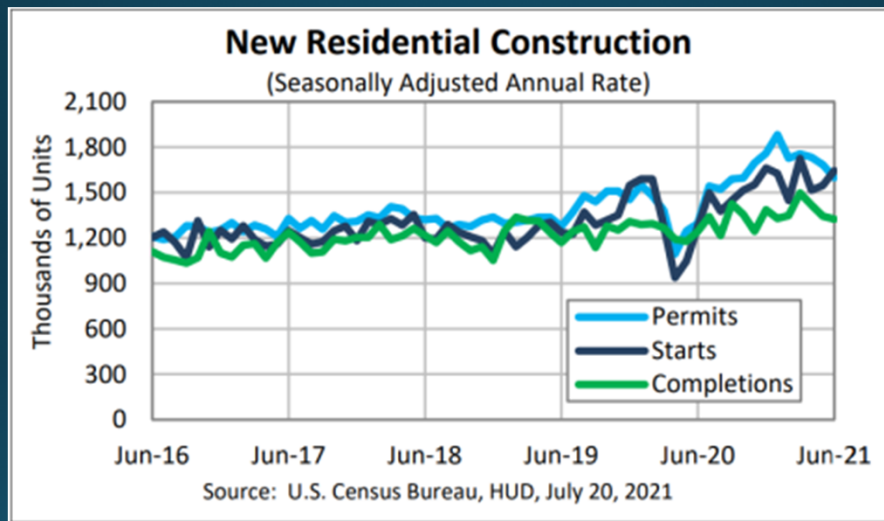
- **Minimize bleach/sanitizing detergents**
- **Reduce the amount** - 50% of the recommended amount will usually work (particularly with soft water)
- Bar soap which does not contain an anti-bacterial agent is recommended as less product is typically used than liquid
- Free of scents, dyes, phosphorous and preservatives
- Free of antibacterial ingredients

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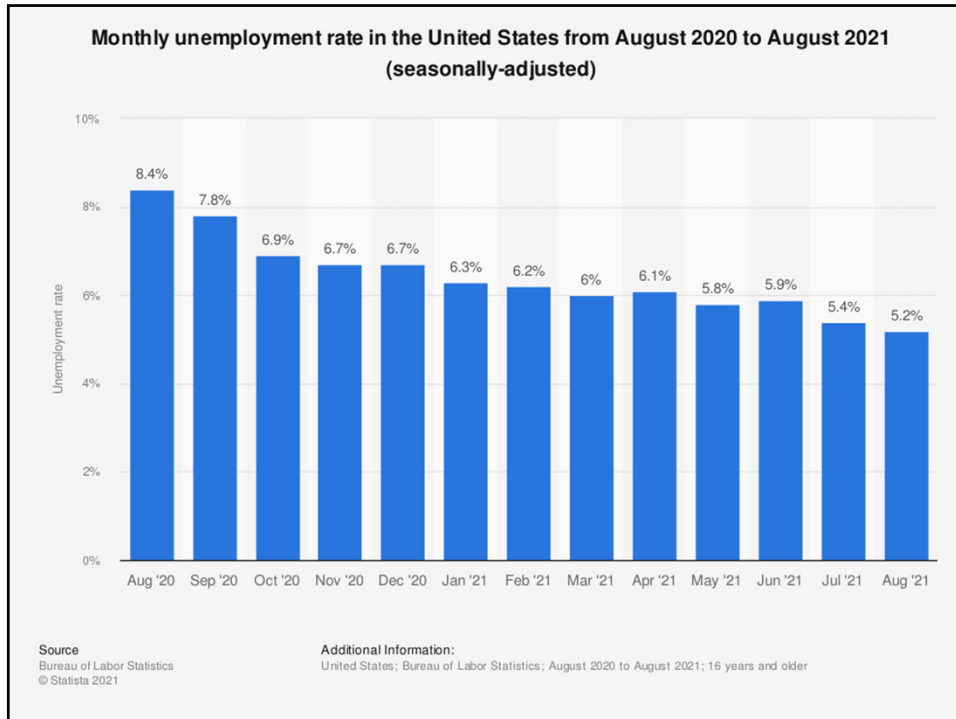
Economics




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More septic system work

- People are spending more time in their homes:
 - Remodeling projects
 - Stress on septic systems
 - Results in more septic system work
- More people want to move to the "country" due to pandemic
 - Trend across the US was +20% from 2019 to 2020

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Summary

- Our landscape has changed and will continue to evolve
- COVID is easy to kill and protect yourself from with the proper PPE
- Wastewater tracking provides an interesting method of tracking COVID occurrence
- Education of septic system users is needed around water use and sanitizers
 - Home office and schooling design/service question?
- Septic system service and installation is going strong, but there is the potential for a slow down to due to unemployment

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Questions

The screenshot shows the website for the Onsite Sewage Treatment Program at the University of Minnesota. The header includes the university logo and navigation tabs for Home, Workshops, Research, Publications, Septic System Owners, SSTS Professionals, Real Estate Agents, and Small Community Septic. The main content area features a description of the program's mission and a photograph of a cabin by a lake. Below this, there are sections for staff contact information and upcoming workshops.

Staff	Dan Wheeler	Upcoming Workshops
Sara Heger Technical Questions Phone: (612) 625-7243 Fax: (612) 624-6434 E-mail: sheger@umn.edu	Soils Questions Phone: (612) 625-8754 Fax: (612) 625-2208 E-mail: ahed022@umn.edu	10.1 Introduction to Onsite Systems Feb 8 2016 to Feb 10 2016 Marquette

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