



TEACHER RESOURCE PACK: FLUSH

November 2017

About this guide

This resource pack provides 10 lessons that supplement FLUSH – The Documentary, directed by Karina Mangu-Ward. Content can be adapted for middle-school to undergraduate level students.

These lessons do not necessarily need to be followed in order. Educators may select topics and activities based on their relevance to other issues a class is studying.

Each lesson is divided into five sections:

The Big Idea

An overview of the topic covered and a short, related clip from FLUSH.

Key Vocabulary

Words and ideas relating to the topic.

Go Deeper

Supplementary articles and videos providing more detail about the area of study.

Plunge In

Activities that provide a chance for you and your class to embark on explorations inspired by the film.

Get Creative:

Challenges that engage the creative brain to delve deeper into the subject.

Resources for Further Reading are also provided for most sections.

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Credits

Lesson 1: Where Does Poop Go?

Subjects: Engineering, Environment, Public Health

The Big Idea

Have you ever thought about what happens after you flush? FLUSH –The Documentary and these lesson plans provide an exploration of the world beyond the toilet and the different systems in use around the world. By the end of this lesson students should understand the basic steps necessary to safely manage human waste.

In the introduction to the film, Karina shares her initial inspiration for the story, starting with Hurricane Sandy in 2012. She asks why we don't know more about where our bodily waste goes.



Watch: 00:00-4:40

Playing time: 4min, 40 sec

Vocabulary

Sanitation: Conditions relating to public health, especially the provision of clean drinking water and adequate sewage disposal.

Sewage: Wastewater and excrement conveyed in sewers

Raw Sewage: Sewage that has not yet been processed or treated to remove contaminants.

Systems Thinking: A management discipline that attempts to understand a system by examining the linkages and interactions between the components that comprise the entirety of that defined system (as opposed to considering problems in isolation).

Natural Disaster: A natural event such as a flood, earthquake, or hurricane that causes great damage or loss of life.

Go Deeper

Basic Treatment of Human Waste

The United Nations recommends following these four steps for treating human waste: 1) **Containment**, 2) **Transportation**, 3) **Treatment**, 4) **Disposal or Reuse**.

Nearly all sanitation systems, no matter how they work, take these four steps into account.



Image Source: UN World Toilet Day: http://www.worldtoiletday.info/wp-content/uploads/2015/10/thumbnails_web_WTD2017_poster-2-1600x568.jpg

More information can be found on the UN World Toilet Day page: <http://www.worldtoiletday.info/where-does-our-poo-go/>

This video from the UN explains the steps to safe containment: <https://www.youtube.com/watch?v=UJqlftFVNiE>

The Nutrient Cycle

Disposal *or* reuse? As you will learn in future lessons, many of the systems we rely on today break the nutrient cycle: turning poop into a waste-product and putting it into landfill instead of recycling its Nitrogen, Phosphorous, and other vital nutrients.

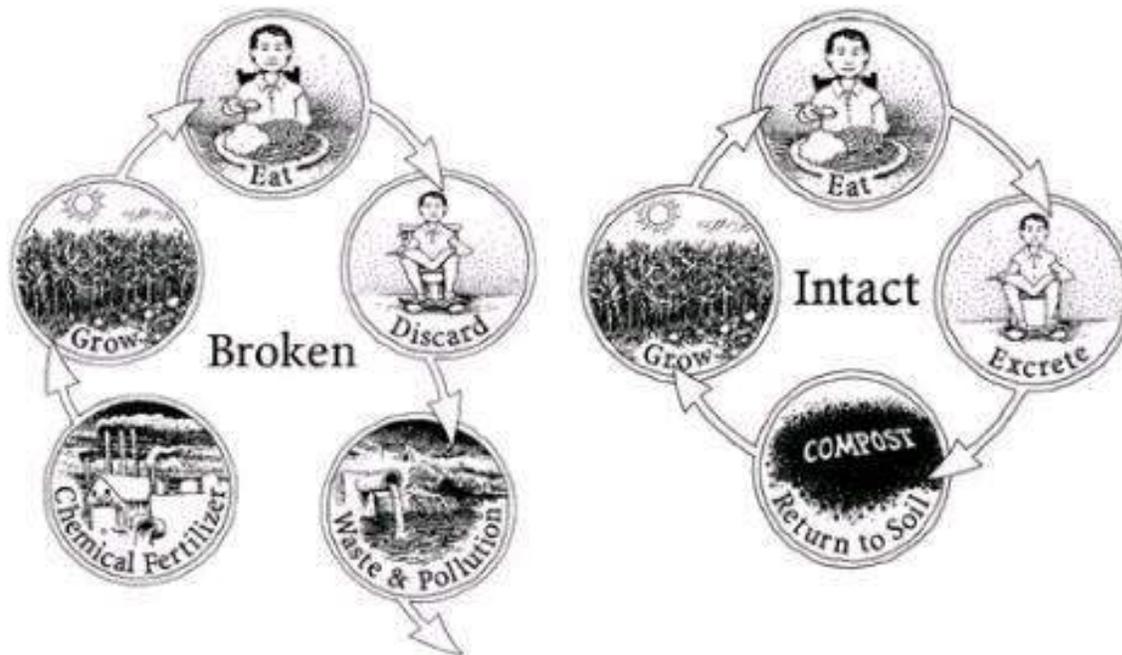


Image source: <https://barefootsavageshomestead.files.wordpress.com/2016/06/compost.jpg?w=760>

Learn more about Nitrogen and Carbon cycles with this informative and entertaining video: <https://www.youtube.com/watch?v=NHqEthRCqQ4>

Daniel Kim from online magazine Systems Thinker offers a deep dive on the practice: <https://thesystemsthinker.com/introduction-to-systems-thinking/>

Hurricane Sandy and other natural disasters

Engineered systems like water or sanitation infrastructure are designed so that, when they're work correctly, we don't think about them much. Natural disasters like Hurricane Sandy highlight these systems and their vulnerability as they are asked to cope with more material than they were designed to manage.

Hurricane Sandy facts and data:

<https://www.livescience.com/24380-hurricane-sandy-status-data.html>

Explore where sewage overflows happened during Hurricane Sandy, what caused them, and how treated each overflow was with this interactive graphic from Climate Central:

<http://www.climatecentral.org/news/11-billion-gallons-of-sewage-overflow-from-hurricane-sandy-15924>

For more information on the UN and Global Sanitation see lesson 10

For more information on Sewage Systems see lesson 2

For more information on poop as fertilizer and closing the loop see lesson 5

Plunge In

Base-line Assessment

Base-line assessments help us measure what we already know, so we can compare later progress to our starting point. Answer these questions to see what knowledge you have. Don't worry too much about getting your answers right, and don't worry if some of your answers feel or sound silly.

1. On a scale of 1-10 how comfortable do you feel talking about poop?
2. On a scale of 1-10 how knowledgeable do you feel about where your poop goes?
3. On a scale of 1-10 how knowledgeable do you feel about different types of toilets?
4. What do you think happens to your poop after you flush?
5. Have you ever experienced a situation where your toilet or sewer didn't work correctly? Maybe a small incident at home, or a larger one like a natural disaster.
6. What questions do you have about toilets and sanitary infrastructure that you might like to answer?

Get Creative

For teachers: Here are a couple ideas for making your base-line assessments interactive and fun.

- 1) Spectrum
Draw an invisible line down the room and make one end #1 and one end #10. Read each statement and give students 30 seconds to place themselves on the line at the point they feel best fits their response to the statement. After each question ask a few students to elaborate on why they chose to stand where they did.
- 2) If your classroom doesn't allow space for movement, draw the line on a large sheet of paper and allow students to place dot stickers for each question. This will create a visual graphic of the groups answers.

Lesson 2: Sewer and the City

Subjects: Health, Engineering, History

The Big Idea

In most large cities we use water, gravity, pumps, and a system of pipes to carry poo and other waste away from houses and businesses to treatment plants. By the end of this lesson students should have a basic understanding of sewer systems and how they work.

In this section of the film, Karina follows one flush with the help of Lief Percifield.

Watch: 07:19-11:51

Playing time: 4min, 32 sec



Vocabulary

Combined Sewer System: A sewer that accepts all storm water, sanitary water/sewage, and most likely industrial waste water into a centralized pipe network likely leading to a Publicly Owned Treatment Works (POTW). As opposed to a Separated Sewer System with one set of pipes for household industrial waste, and another to route storm water directly into waterbodies.

Combined Sewer Overflow: Events when wet weather flows exceed the sewage treatment plant capacity, causing combined sewers to overflow, usually into rivers and streams.

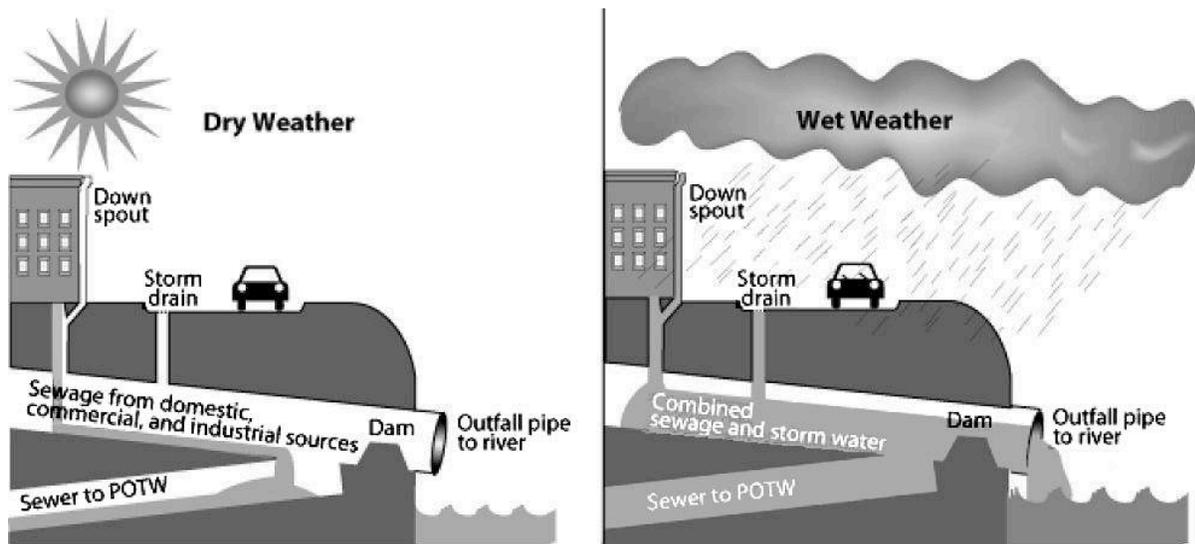


Image source: U.S. Environmental Protection Agency (EPA) - U.S. Environmental Protection Agency, Washington, D.C

Go Deeper

Explore How Sewage Treatment Works

This video from the City of Windsor and Detroit River Canadian Cleanup initiative, which includes a lot of great tips for taking care of your sewers.

<https://www.youtube.com/watch?v=oaXth88i7rk>

This animation from South East Water in Melbourne, featuring magical animated water droplets. <https://youtu.be/wAcZrC1wnss>

Explore how Sewers are Constructed

Explore different types of Sewer Systems in this slide presentation by Dr. Solomon Seyoum, who earned his doctorate at IHE Delft, the Institute for Water Education in partnership with UNESCO:

http://www.academia.edu/30813406/Type_of_Sewer_Systems_Solomon_Seyoum

Learn about the different materials that contemporary sewers can be made of in this handout from IDC Technologies, a provider of online engineering education:

http://www.idc-online.com/technical_references/pdfs/civil_engineering/Sewers_and_Types_of_Sewers.pdf

Sewers and Climate Change

This article, from the wake of Hurricane Sandy details some of the challenges faced by combined sewer systems in a shifting climate:

<https://www.citylab.com/life/2013/05/why-sewage-plants-are-especially-vulnerable-climate-change/5464/>



From The Loo Lady

Learn about the history of London's Sewers and the social and physical conditions that lead to their construction.

<https://www.youtube.com/watch?v=z3d59st8EiQ>

Plunge In

Do you know where your poo goes?

If you live in a big city, chances are you have a sewer system (either combined or separate.) If you live in a more rural area, you may use other systems such as a cesspit or septic tank. Large institutions often fall in between, with autonomous sewage and/or septage.

See if you can find out where your flush goes. Here are a few ways to get started:

1. Ask the facilities staff for your school, or examine a plumbing blueprint directly. If your flush is heading to a local septic system and leach field, you may be able to view or visit it directly.
2. Try searching online for your city or town and the phrase “Sewage Treatment Plant,” “Wastewater Treatment Plant,” or “Water Resource Recovery Facility.” If you’re having trouble, search for a map of your local sewershed (the geographical area that connects to one plant) or for your local water board.
3. GoogleMaps can help give you a good idea of where your poop is going. Zoom in on this map to you’re your nearest Sewage Treatment plant.
<https://www.google.com/maps/search/wastewater+treatment+plant/@37.5238252,-114.2689181,4z>
4. **ADVANCED!** The United States EPA maintains a [registry of all Wastewater Treatment Plants](#). Access the data [here](#), and click here to see the data [overlaid on a map](#). Note that the system is a little slow, and plants won’t appear until you’ve zoomed in a location in the US. In the lefthand sidebar, toggle the arrow next to “FRS Wastewater” to see a dropdown menu. There you can choose whether to see CSOs, and plants registered in different ways (some of which are businesses and factories doing private water treatment).

Where did the sewers come from?

The first Sewage Systems in the United States weren’t built until the 1850s! See if you can find out when your city’s sewers were built and what prompted their construction. Was the city originally planned with a sewer system, or was it added later? Was there a particular factor that led to its construction? How did people feel about it?

1. Local historical societies often have information on the construction of sewers. The website of your local sanitary district may also provide some information.
2. Search newspaper archives for editorials and articles about the sewage system.

Get Creative

1. Sewers have inspired a great deal of literature through the ages from Victor Hugo’s *Les Miserable* to Terry Pratchett’s *Dodger*. Write your own scene set in a sewer. It could feature human characters, animals or even anthropomorphic poo. See if you can incorporate some of the things you have learned about sewers.

2. Map it! Draw a map of the journey your poo will take from your toilet to the sewage treatment plant (or sewer outflow). Is it a direct journey, or a treacherous odyssey?

Further Reading

Burian, Steven J.; Nix, Stephan J.; Pitt, Robert E.; Durrans, S. Rocky (2000). "Urban Wastewater Management in the United States: Past, Present, and Future" (PDF). *Journal of Urban Technology*. London: Routledge. **7** (3): 33.
www.sewerhistory.org/articles/whregion/urban_wwm_mgmt/urban_wwm_mgmt.pdf

Metcalf, Leonard; Eddy, Harrison P. (1914). *American Sewerage Practice*. New York: McGraw-Hill. Vol. I: Design of Sewers.

Benidickson, Jamie (2011). *The Culture of Flushing: A Social and Legal History of Sewage*. UBC Press.

Lesson 3: Clean Water In: Flushing with Water

Subjects: Environment, Engineering

The Big Idea

Flushing toilets are one of the largest consumers of water in most households. Where does this water come from and how did this system evolve? By the end of this lesson students should have an understanding of the water cycle and the resources required to bring water to taps and toilets.

In this part of the film we see a montage of different types of toilet technology... which use approximately 2 trillion gallons of drinking water a year.

Watch: 33:52- 34:42

Playing time: 0min, 50sec



Vocabulary

Watershed: An area or ridge of land that separates waters flowing to different rivers, basins, or seas. In the context of urban infrastructure, it is the area from which water drains to provide drinking water supply.

Reservoir: A large natural or artificial lake used as a collection and storage source for drinking water supply.

Potable Water: Water that is safe to drink or to use in food preparation without risk to health.

EPA: The United States Environmental Protection Agency is responsible for national issues of environmental health.

Go Deeper

Although 70% of the earth is covered with water only 2.6% of this water is fresh water, and only about .01% of the earth's water is easily available to us.

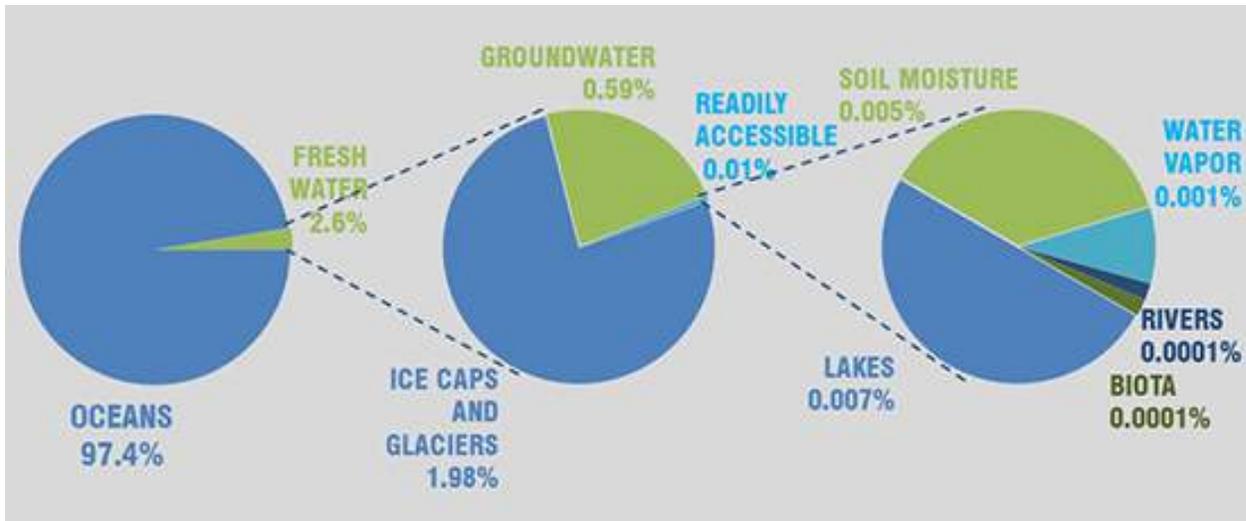


Image source: <https://www.payette.com/architecture-forum/water-unconsciousness/>
Water in our taps and toilets

Karina's water flows to Brooklyn from the Catskill/Delaware and Croton Watershed.



Learn more about how New York City gets its water here:
<http://www.nyc.gov/html/dep/html/wastewater/wssystem-history.shtml>

Get the basics on water treatment from the experts at Compound Interest:

<http://www.compoundchem.com/2016/04/21/water-treatment/>

This video was made by New Jersey American Water to show how water travels from the plant to your taps: <https://www.youtube.com/watch?v= AXtsOYnlXM>

Read 'A Brief History of Water' here:

<https://www.iwapublishing.com/news/brief-history-water-and-health-ancient-civilizations-modern-times>

Flushing Toilets

Approximately 1/3 of water in an average household is used for flushing the toilet.

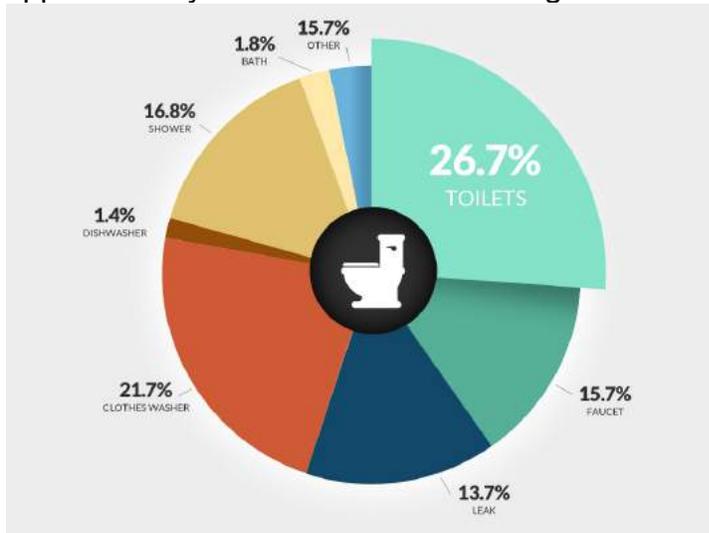


Image source: <http://www.projectdropabrick.org/wp-content/uploads/2014/09/slide61.jpg>

Read the EPA's recommendations for home toilets here:

<https://www.epa.gov/watersense/residential-toilets>

Learn about the EPA's WaterSense label awarded to products that meet the EPA's criteria for efficiency.

<https://www.epa.gov/watersense/about-watersense>

Plunge In

Where does *your* water come from? Most of the water in our homes comes from reservoirs which, depending where you live may be filled by watersheds, storm water, snow pack or ground water.

1. Check your local city or state's environmental department or water board website to find out what company supplies the water to your area. Can you find the location of your water treatment plant?

2. Looking at a topographical map, can you see what natural watershed you might be a part of?
3. In 1879, John Wesley Powell suggested using the watershed system to create borders for the Western US, suggesting that would avoid conflict over water in the arid states. What are the politics surrounding water access in your area? For more information about Powell's ideas, and to see maps of what the US might have looked like, visit: <https://communitybuilders.org/what-we-think/blog/the-united-watershed-states-of-america>

Get Creative

Make it visual

A good way to understand water-use is to compare daily water consumption to familiar objects. For example we know from the film that in one year an average person will flush 2,920 gallons... enough to fill a backyard swimming pool! Consider some of the following questions or make up your own!

- How many soda cans would a year's worth of flushes fill?
- How many people live in your house? How many swimming pools could you fill all together?
- How many students are in your class room? If you each flush the toilet twice at school today how many soda cans could you fill? (Use 1.6 gallons/flush or find out what your school toilets actually consume)

Make a chart to show some of these comparisons! Add drawings or photos to illustrate.

Further Reading

Hartley, Dorothy (1964) *Water in England*, TBS The Book Service Ltd

Juuti, Katko & Vuorinen Eds. (2007) *Environmental History of Water: Global View of Community Water Supply and Sanitation*, IWA Publishing,

Lesson 4: Dirty Water Out: Wastewater

Subjects: Environment, Water, Engineering, Public Health

The Big Idea

Cities that rely on waterborne sanitation systems produce millions of gallons of wastewater a day. By the end of this lesson students should be able to identify some of the more common contaminants of wastewater, the steps towards treatment and the consequences when untreated water is released into the environment.

In this part of the film Karina takes a trip with John Lipscomb from the watchdog organization Riverkeeper to see the consequences of sewerage overflow first hand.

Watch: 3:34- 6:09

Playing time: 2 min 35 sec



In this part of the film Karina attempts to contact the Brooklyn Treatment Plant only to discover that getting access to the city's sewage works is more difficult than she had imagined.

Watch: 19:19-21:31

Playing Time: 2 min, 12sec



In this part of the film Karina talks to Robert Adamski, the former Deputy Commissioner at NYC Department of Environmental Protection about why the sewage works are so hard for citizens to access.

Watch: 48:40- 51:15

Playing Time: 2 min, 35sec



Vocabulary

Watchdog Organization: A not-for-profit group who view their role as critically monitoring the activities of governments, industry, or other organizations and alerting the public when they detect actions that go against the public interest

Gowanus Canal: A Canal in the New York City Borough of Brooklyn, on the westernmost portion of Long Island: one of the most polluted bodies of water in the United States.

Wastewater: Any water that has been negatively impacted by human use due to domestic, industrial, commercial or agricultural activities.

Go Deeper

Water Treatment

EPA website on Municipal Wastewater:

<https://www.epa.gov/npdes/municipal-wastewater>

Wastewater in the environment

This map shows US cities with Sewage Overflow problems. You will also find information on the locations of Sewage Treatment facilities and numbers of employees.

<https://www.arcgis.com/home/webmap/viewer.html?webmap=004909c6679a4289b629a1c26278224c>

Learn more about the work of River Keeper on their website:

<https://www.riverkeeper.org/>

“The Taboo Secret To Better Health” Ted Talk on Closed Loop Sanitation by Molly Winter: <https://www.youtube.com/watch?v=2Brajdazp1o>

Mitigating Health Hazards for Workers at Biological Wastewater Treatment Plants:

<https://www.watertechonline.com/health-hazards-biological-wastewater-treatment/>



Shhh podcast:

Shawn interviews wastewater expert Nancy Love

<https://www.mixcloud.com/shhh2/wee-my-valentine-an-hour-with-wastewater-expert-nancy-love/>

Plunge In

Learn about your local treatment process:

In lesson 2 you looked up where your poop goes. Now it's time to find out what happens there!

1. Find your local sewage treatment plant and see what information they provide about their process. You can start by looking on their website, or contact them directly and see if you have more luck than Karina in getting an interview!

2. Look for articles about your local sewage treatment. Has the process changed in the years since the plant was first built? How have people's attitudes towards it changed?

Get Creative

Be an activist!

Based on what you know so far, do you feel that your sewage is treated in the best possible way? Is there anything you think could be done better? Write a letter to a local politician or your local Department of Environmental Protection to tell them what you think should happen!

You may find it useful to find out who is already campaigning in your area. Look for local Watch Dog Organizations and environmental advocacy groups, and find out what recommendations they are making.

Note: You may also wish to re-visit this letter after the following lessons on compost toilets and uses of urine.

Watch: How To Influence and Engage Government in Sanitation, a panel discussion by SuSanA <https://www.youtube.com/watch?v=hbkVoWyOhYg>

Further Reading

Grady Jr, C.P. Leslie; Daigger, Glenn T; Love, Nancy; Filipe, Carlos; (2011) *Biological Wastewater Treatment*, CRC Press

Tibbetts, John (2005) *Combined Sewer Systems: Down, Dirty, and Out of Date* [Environ Health Perspect](https://pubmed.ncbi.nlm.nih.gov/16111111/). 2005 Jul; 113(7): A464–A467, Environews, Spheres of Influence, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1257666/>

Association between Rainfall and Pediatric Emergency Department Visits for Acute Gastrointestinal Illness, *Environ Health Perspect* <https://ehp.niehs.nih.gov/0901671/>

Lesson 5: Compost Toilets

Subjects: Engineering, Environment, Construction, Chemistry

The Big Idea

Composting toilets provide an alternative solution to flushing with water. By the end of this lesson students should have a basic understanding of different types of toilets and how they work.

In this section of the film Karina visits an eco village in Portland Oregon which uses composting toilets to fertilize their gardens.

Watch: 33:51 - 37:41

Playing time: 3min, 50sec



Vocabulary

Dry Toilet: a toilet that operates without flush water

Urine Diversion Toilet (*also called urine separation or source separation*): Toilets which collect urine and feces separately for different treatments and uses.

Composting Toilet: a type of waterless toilet or micro-flush toilet system that uses a predominantly aerobic process to treat human excreta by composting or managed aerobic decomposition.

Aerobic Process: a collection of processes by which microorganisms break down biodegradable material in the absence of oxygen.

Go Deeper

This poster shows lots of different types of toilets from around the world:

http://www.cloacina.org/fancybox/images/toilets_of_the_world/big/toilets_of_the_worldx800.jpg

Compost Toilets

There are many types of composting toilets, but they all share one thing in common: closing the nutrient cycle and turning poop into a resource instead of a waste-product.

Learn more about Kailash Eco Village and their various sustainable living projects:

<http://www.kailashecovillage.org/>

Learn about Oregon's regulations for composting toilets:
<http://www.recodenow.org/composting-toilets-in-oregon/>

Considerations for installing composting toilets from the State of Oregon Department of Environmental Quality:
<http://www.oregon.gov/deq/FilterDocs/os-compostingtoilets.pdf>

Regulations for composting toilets differ from state to state. Learn more at Greywater Action:
<https://greywateraction.org/composting-toilet-codes-and-regulations/>

Compost Toilets in an Urban Environment: A case study

Often cities have building codes requiring certain types of toilet to be installed. These codes are meant to protect public health by insuring that human waste is treated in a safe way. In order to do something different like install a compost toilet special permissions have to be acquired.

This case study tells about the process of installing a composting toilet on the campus of Lewis & Clark College in Portland Oregon.
<http://www.ecobuilding.org/code-innovations/case-studies/commercial-composting-toilet-at-lewis-clark-college>

You can read part of the application for the composting toilet here:
https://www.portlandoregon.gov/bds/appeals/index.cfm?action=getfile&appeal_id=11895&file_id=10017

What is poop actually made of?

The main ingredient in poop is water (75%). The rest is made up of bacteria (living and dead), fiber, fats, cholesterol, and other things your body cannot digest.

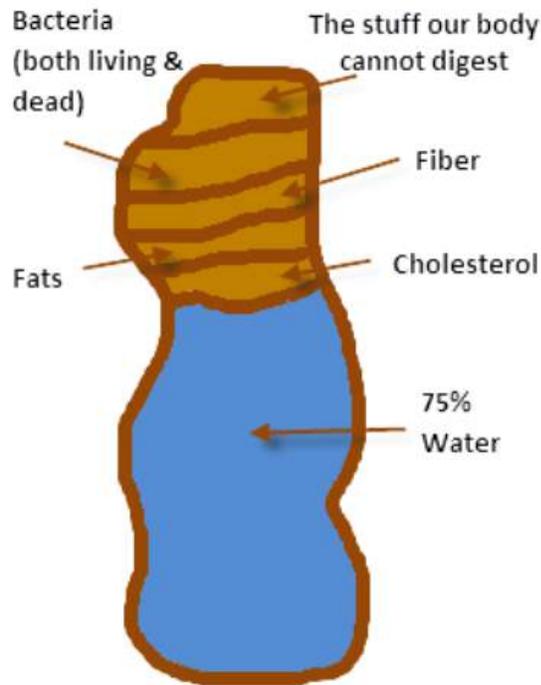


Image Source: <https://numbertwo.guide.com/questions/what-is-poop/>



Shhh podcast:

Shawn interviews Sasha Kramer, co-founder and Executive Director of SOIL about container based sanitation.

<https://www.mixcloud.com/shhh2/youre-tuned-to-cbs-soils-sasha-kramer-kory-russel-and-container-based-sanitation/>

Plunge In

There are many different commercial companies that make different types of composting and waterless toilets: Some which look and feel very much like the one in your house and others which work completely differently. Pick two or three to compare. Factors to consider are cost (how expensive are they to install and maintain) comfort (is this a loo you would look forward to using) and ease of maintenance (can you take care of the contents yourself or would you need specialist support?) Use the companies below, or research others!

<http://ekolet.com/>

<https://eco-loos.com/>
<https://www.biolet.com/>
<http://www.separett-usa.com/>
<https://compostingtoiletsusa.com/> (This website suggests several brands)

Get Creative

The best way to understand how a toilet is made is to build one yourself! Learn how to make and use a bucket composting toilet:

<http://kailashecovillage.org/experiments/sawdust.htm>

Remember: the whole process has to be considered. If you aren't working in an environment where you can safely treat the contents of your bucket toilet consider building one for display purposes only, building a scale model, or drawing your own instruction manual. The rules will also be different depending whether you are on private property (eg. your home) or public property (eg your school). Greywater Action offers a useful page of FAQ's for composting toilet construction and maintenance:

<https://greywateraction.org/composting-toilets-faq/>

Further Reading

Jenkins, Joseph (2006) *The Humanure Handbook: A Guide to Composting Human Manure*.

Available online at: <http://humanurehandbook.com/about.html>

Lesson 6: Liquid Gold: Urine as fertilizer

Subjects: Environment, Biology, Chemistry, Engineering

The Big Idea

The amount of urine that one person produces in a year is enough to grow over 300 pounds of wheat. Urine contains many useful chemicals and compounds used in fertilizer. By the end of this lesson students will understand the process of urine recycling.

Karina and Shawn visit the Rich Earth Institute in Vermont which creates fertilizer from urine

Watch: 37:46-41:41

Playing time: 3min, 55 sec



Vocabulary

Ecological Sanitation: Approaches to sanitation which “close the loop” between sanitation and agriculture.

Go Deeper

Peecycling at The Rich Earth Institute

In lesson one you learned about the four basic steps for every sanitation system: Collection, transportation, treatment, and disposal or re-use. The Rich Earth Institute explores all these areas. Explore their website and see if you can identify how they approach each of these areas: <http://richearthinstitute.org/>

This video from the Rich Earth Institute gives more information about peecycling: <https://www.youtube.com/watch?v=dCV3kWhjfl4>

A talk on urine and its chemical compounds and their uses by chemist Lee Bishop: <https://www.youtube.com/watch?v=vIVIUWJpDUk>



Shhh podcast:

Shawn interviews Hannah Ray Daniella Saetta and Cat Bryers at the Rich Earth’s Institute’s Urine Diversion Summit:

<https://www.mixcloud.com/shhh2/lil-tinklers-part-1-hannah-ray-daniella-saetta-and-cat-bryers/>

Get Creative

Make a poster or a short video advertising the benefits of urine as fertilizer. Draw on what you have learned in this lesson to convince people that urine is a good option to fertilize their own gardens.

You can find information on urine on the Rich Earth Institute's Website here:

<http://richearthinstitute.org/get-involved/fertilize-with-urine/>

Further Reading

Magnusson, Sally (2010) *Life of Pee: The Story of How Urine Got Everywhere*, Aurum Press Ltd

Steinfeld, Carol (2004) *Liquid Gold: The Lore and Logic of Using Urine to Grow Plants*, Green Books

<http://www.liquidgoldbook.com/>

Lesson 7: Trash or Treasure: A Brief History of Bodily Fluids

Subjects: Environment, City Planning, Economy

The Big Idea

Throughout history both urine and feces have been considered valuable assets... it is not until the 19th century that the term “Human Waste” comes into use. By the end of this lesson students should understand historical uses of these products.

In this section of the film, Karina talks to Dr. Daniel Gerling, a historian about the history of using poop to farm New York in the 1800’s



Watch: 30:04-33:48

Playing time: 3 min, 44sec

Vocabulary

Biosolids: organic matter recycled from sewage, especially for use in agriculture.

Fertilizer: a chemical or natural substance added to soil or land to increase its fertility.

Biomethane: A naturally occurring gas which is produced by the anaerobic digestion of organic matter such as dead animal and plant material, manure, sewage, and organic waste.

Go Deeper

The History of Urine

Urine has been seen as a useful product for over 2000 years. The mercenary Roman Emperor Vespasian famously put a tax on the collection of urine, which was sold for a range of purposes from bleaching fabric to brushing teeth.



Shhh podcast:

Shawn interviews Dr. Daniel Gerling:

<https://www.mixcloud.com/shhh2/american-wasteland-dr-daniel-gerling-gets-down-with-doodie/>

‘You can pee a Rainbow’: learn about how the different chemicals in your urine react to create different colors:

<https://www.livescience.com/37664-human-urine-colors-rainbow.html>

A History of poop

Learn more about Biosolids here: <http://biosolidsresources.org/OE/>



From The Loo Lady:

A talk from the 2014 World Science Fiction Convention on human waste in science fiction: <http://doingyourbusiness.lootours.com/2014/08/sci-fi-from-bottom-up-talk-for-loncon-3.html>

Current Uses of Poop

Radiolab Podcast about the use of New York's poop:
<http://www.radiolab.org/story/poop-train/>

WeCare Organics: <http://www.wecareorganics.com/>

This video from the POOP project about resources:
<https://www.youtube.com/watch?v=s1JnD2QU6w>

This video shows how Nakuru County in Kenya turns poop into fuel:
<https://www.youtube.com/watch?v=cdOsEleug4I>

This video shows a bus that runs on biomethane in Bristol, England:
<https://www.youtube.com/watch?v=eKjfCZXU-vE>

Plunge In

Break It Down

How many products can you find that might could be made of urine?

The Urine Metabolome Database details over 3000 different molecules found in urine! Have a browse and see what you can discover about what urine shares in common with everything from citrus fruits to household cleaners to fireworks.

<http://www.urinemetabolome.ca/> (If you're not sure where to start revisit Lee Bishop's lecture on urine)

Get Creative

Holy S***

Lots of cultures have a god of poop or sewers. But Dr. Gerling says “We don’t have one in this country yet.” What sort of god/spirit would you create? Draw their picture or write their story. What things do you feel they would be responsible for looking after?

FACT: Many cultures have deities and folks characters assigned to poop and toilets, including the Aztec *Tlazolteotl*, the German *ukatenscheisser*, Japanese *Kawayano-kami*, and ancient Roman *Cloacina*. Find out more about Toilet Gods here: https://en.wikipedia.org/wiki/Toilet_god

Further Reading

Gene Logsdon (2010) *Holy Shit: Managing Manure to Save Mankind*, Chelsea Green Publishing Co

Lesson 8: Behind the Stall Door: A Shameful Pooping Culture

Subjects: Health, psychology, medicine

The Big Idea

We learn from a very young age how to talk and think about poop based on the culture and social norms in which we are raised. Often this can inhibit us or make it an uncomfortable subject to discuss. By the end of this lesson students should have learned about the language we use around poop and different terminology for different contexts.

In this section of the film Karina discusses her own feelings about the topic of poop and talks with Shawn Shafter of The Poop Project and talks to Doctor Tom DuHamel about Chronic Constipation (*Content notice for teachers: “Crap” and “Shit”*)

Watch: 11:50-19:19

Playing time: 7min, 29sec



In this section of the film we see some of Shawn’s performance work with the POOP project and he discusses his work as an artist.

Watch: 22:49-25:21

Playing time: 2min 32sec



Vocabulary

Shame: a painful feeling of humiliation or distress caused by the consciousness of wrong or foolish behavior.

Chronic Constipation: A condition of infrequent bowel movements for weeks at a time or straining or having difficulty passing stools.

Taboo: (adj.) a subject prohibited or restricted by social custom.

Fecal Denial: a strong sense of shame associated with the act of pooping, “associating poop with savagery”

Go Deeper

“It’s important for kids to understand that poop is something that every living creature does and it’s important for kids to understand that poop is nothing more than what’s leftover of our food once our body takes out all the good things.” Dr. Tom DuHamel
<http://www.theinsandoutsofpoop.com/insandouts/aboutdrtom.html>

Learn more about the Chronic Constipation Centre at John Hopkins University:
<https://www.hopkinsmedicine.org/johns-hopkins-childrens-center/what-we-treat/specialties/gastroenterology-hepatology-nutrition/programs-centers/chronic-constipation-center.html>

Watch the trailer for Shawn’s solo show ‘An Inconvenient Poop’:
https://www.youtube.com/watch?v=FJE9q4q_F-I

Poop in Popular Culture- Tackling the Taboo

The Japanese Toilet Museum

Visit the website for the Toilet Exhibition at the National Museum of Emerging Science and Innovation:

<http://www.miraikan.jst.go.jp/sp/toilet/info-en.html>

A video on Japanese toilet manners produced by toilet manufacturer Toto:
<http://www.toto.com/en/wtjapan/manners/>

The Poo Emoji

Originally created in 1998 or 1999, the “pile of poo” had become one of the world’s most popular emojis by 2016.



Learn more about the history of the poo emoji here:

<https://www.fastcompany.com/3037803/the-oral-history-of-the-poop-emoji-or-how-google-brought-poop-to-america>



Shhh podcast:

Shawn interviews Dave Prager, author of *Poop Culture: How America is Shaped by its Grossest National Product*.

<https://www.mixcloud.com/shhh2/author-of-poop-culture-dave-praeger/>

Plunge In

Thesaurus:

How many words can you think of to describe poop? List as many as you can in a minute. Often these words are divided into different categories: “Medical” (Feaces, stool) “slang” (crap, kaka) ”Polite” (BM, number 2). Can you think of any other categories to include?

When in Rome...

Do some research into how different cultures talk about poop. Based on what you’ve learned are there cultures who seem more open to talking about it than others?

Get Creative

Put on a show!

Shawn uses performance to help people get more comfortable talking about poop. The Toilet Museum in Japan uses characters and songs to introduce children to the subject of sanitation. Worldwide people use humour of all sorts to help deal with a not always comfortable subject. Write your own short song or scene about poop sharing something you feel is important for people to know. If you’re not sure what to do, here are a couple ideas to get you started:

1. Pick a popular song and re-write the words. (if you’re feeling very ambitious you could try a music video like this one: <https://www.youtube.com/watch?v=7666A5kb7G8>)
2. Use the character you created in Lesson 7 (or another pre-existing toilet god) as the protagonist.
3. Pick a real-life historical character

Further Reading

DuHamel, Dr. Thomas (2012) *The Ins and Outs of Poop: A Guide to Treating Childhood Constipation*, Maret Publishing

Praeger, Dave (2007) *Poop Culture: How America is Shaped by its Grossest National Product*, Feral House

Glowacki, Jamie (2015) *Oh Crap! Potty Training: Everything Modern Parents Need to Know to Do It Once and Do It Right*, Touchstone Books

Lesson 9: Poop & Health

Subjects: Health, science, medicine, biology

The Big Idea

The composition of our poop is closely related to our health and wellbeing. This section explores C Dif and other bladder and bowel related illnesses, and how fecal transplants can help keep our microbiome in balance. By the end of this lesson students should understand the difference between healthy and unhealthy bowel movements, and what poop can tell us about our health.

In this part of the film Karina visits OpenBiome, and learns about stool donation and bowel diseases such as C. Diff

Watch: 41:41- 46:53

Playing time: 5min, 12 sec



Vocabulary

Clostridium difficile (C. diff): a bacterium that can infect the bowel and cause diarrhoea.

Crohne's Disease: a type of inflammatory bowel disease (IBD) that may affect any part of the gastrointestinal tract from mouth to anus. Signs and symptoms often include abdominal pain, diarrhea, fever, and weight loss.

Fecal Transplant: the process of transplantation of fecal bacteria from a healthy individual into a recipient. This may be done through an enema or by mouth in the form of a capsule.

IBS: Irritable Bowel Syndrome

Microbiome: the bacteria, archaea, protists, fungi and viruses that make up your body (the counterpart to the human genome).

Go Deeper

What Does a healthy poop look like?

The Bristol Stool Chart was developed in 1997 at the Bristol Royal Infirmary as a diagnostic medical tool for conditions like Irritable Bowel Syndrome. A normal healthy poop should be type 3 or type 4.

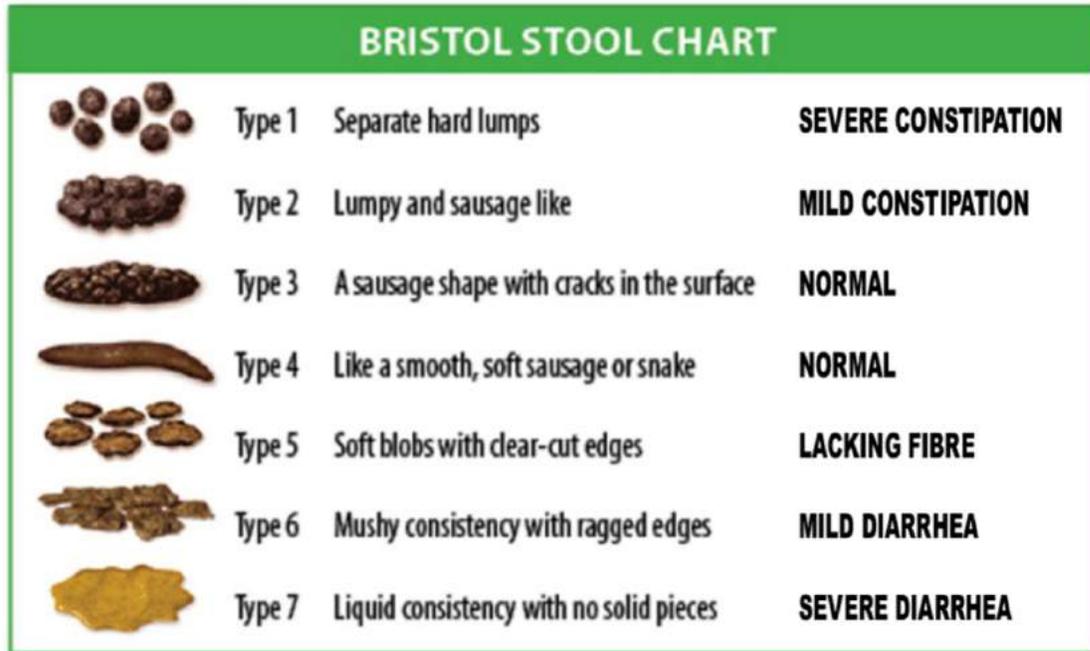


Image Source: Cabot Health, Bristol Stool Chart - <http://cdn.intechopen.com/pdfs-wm/46082.pdf>

How do you Doo? (Pooping and posture)

In recent years conversations about how we poop and whether a seated position might cause greater risk of bowel complications have become more prevalent. The rise of products like Squatty Potty have helped to bring conversations to the public. While the body of research on the extent of these health benefits is limited there is evidence that a squatting position can ease elimination by correctly aligning the colon.

This article from NPR tells about the origins of squatty potty:

<https://www.npr.org/sections/health-shots/2012/09/20/161501413/for-best-toilet-health-squat-or-sit>

Squatty Potty have produced several commercials using fantasy characters to describe the benefits of squatty potty:

<https://www.squattypotty.com/>

In this behind the scenes video you can hear the advertising team behind squatty potty talk about the creative process of making the subject of poop palatable.

<https://www.youtube.com/watch?v=thI3wBOJFjw>

“Charming Bowels” This TED Talk by Giulia Enders provides an introduction to her research on bowel function.

<https://www.youtube.com/watch?v=NM5WFzSr04A>

Gut Bacteria

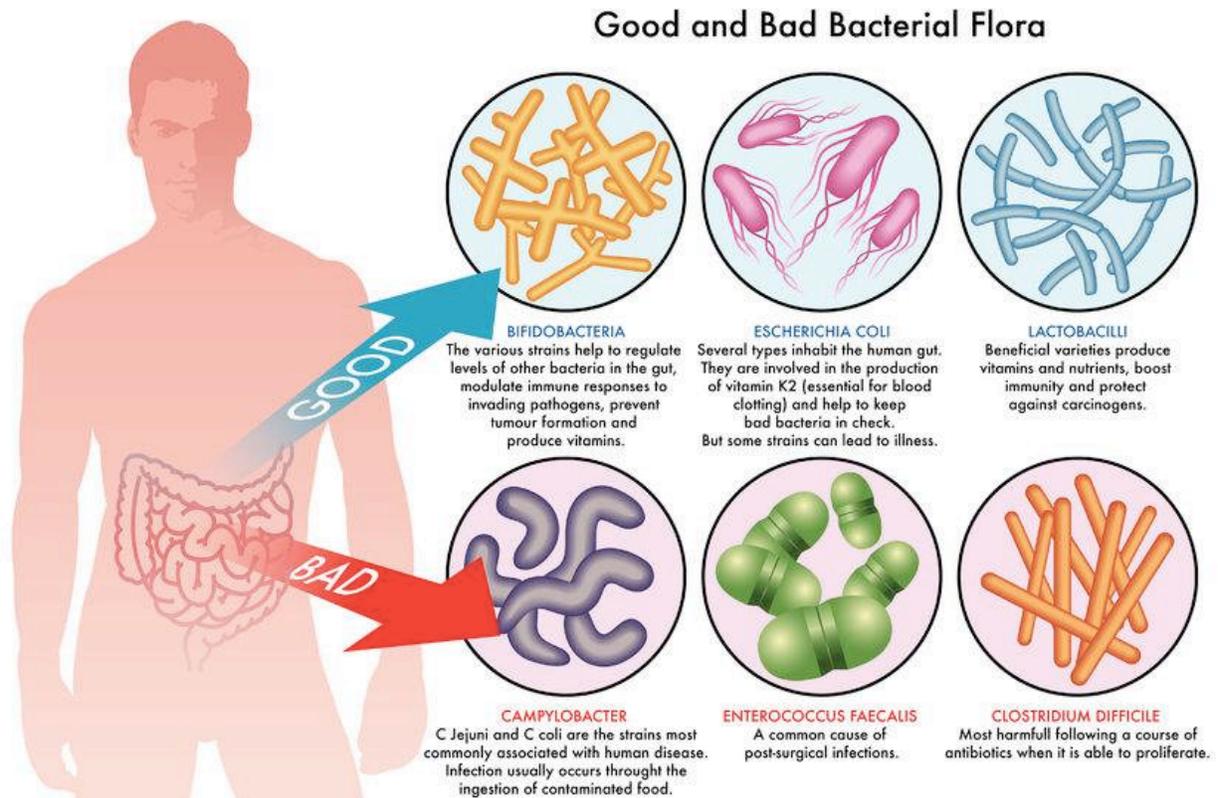


Image source: <https://thesensitivegut.files.wordpress.com/2015/08/probiotics-diagram.jpg>

More about Fecal Transplants

Learn about the work of OpenBiome: <http://www.openbiome.org/>

Learn more about fecal transplants: <https://news.vanderbilt.edu/2016/07/12/these-days-fecal-transplantation-is-no-joke/>

Living with Crohn's & IBS

The Crohn's & Colitis foundation is committed to supporting people with bowel conditions and finding treatments:

<http://www.crohnscolitisfoundation.org/?referrer=https://www.google.co.uk/>

Watch one woman's story about finding dignity while living with IBS:

<http://www.bbc.co.uk/news/av/uk-41416086/the-poo-girl-mapping-toilets-for-conditions-like-ibs>

Plunge In

Keep a poop journal

We don't often spend much time looking at our poo... often we want to flush and get rid of it as fast as we can. But your poo can tell you a lot about how healthy you are. Try tracking your poops for a week and see what you can learn! Things to observe include:

- Time of day
- Color
- Smell
- Texture
- Sinking or floating
- Quantity
- Food

Some more information about keeping a poop journal and what all these different things mean can be found here: <https://www.joyfulbelly.com/Ayurveda/article/How-to-Assess-the-Health-of-Your-Stool/5212>

Could You Become a Stool Donor?

What does it take to become a stool donor? Find out more on OpenBiome's website and see if you would qualify:

<http://www.openbiome.org/stool-donation/>

Get Creative



A DROP OF LONDON WATER.

What lives in your gut?

The cartoon on the left appeared in PUNCH Magazine in London in the 1850's. The one below entitled "Monster Soup" was engraved in 1828. Both illustrate London's water contaminated by raw sewage.

Using these images as inspiration (you can also search for more online or in the library) draw your own caricature of your gut and the good and bad bacteria it contains.



Further Reading

Parker, Steve (2006) *Break It Down: The Digestive System (Body Talk)*, Raintree

Chutkan, Dr. Robynne (2015) *The Microbiome Solution: A Radical New Way to Heal Your Body from the Inside Out*, Avery

Enders, Julia (Trans. by Shaw, David) (2015) *Gut: the inside story of our body's most under-rated organ*, Scribe UK

Lesson 10: World Toilet Day and the Global Sanitation Crisis

Subjects: International Relations, Public Health, Engineering

The Big Idea

In 2013 the UN General Assembly officially designated 19th November World Toilet Day, a day dedicated to inspiring action to tackling the global sanitation crisis. Worldwide 2.4 billion people still lack access to basic sanitation. This section explores the human health consequences of this crisis and initiatives underway to hit the UN's target of toilets for all by 2013.

In this part of the film we learn about global sanitation and approaches to achieving the goal of sanitation for all.

Watch: 50:57-52:46

Playing time: 1min, 49sec



Vocabulary

WASH: an acronym for Water, Sanitation and Hygiene, usually used in the context of global development.

World Toilet Association: Founded in 2001, the WTO is a global non-profit committed to improving toilet and sanitation conditions worldwide, through education, training and building local marketplace opportunities to advocate for clean and safe sanitation.

Go Deeper

Watch the full video about the Janicki OmniProcessor:

<https://www.youtube.com/watch?v=bVzppWSIFU0>

There have been a number of high-profile Ted Talks on various aspects of human waste and global sanitation over the years. Here are a couple of them:

Watch Peter Janicki: Turning Waste Into Wealth:

<https://www.youtube.com/watch?v=IE0Y82Nv3E8>

Rose George: Let's Talk Crap, Seriously.

<https://www.youtube.com/watch?v=ZmSF9gVz9pg>

The World Toilet Organization (or "The *Other* WTO")

The World Toilet Organization was founded in 2001 by Singaporean entrepreneur Jack Sim. The organization runs year round training and advocacy campaigns and holds a World Toilet Summit most years to bring together stake-holders in global sanitation. Learn more on their website: <http://worldtoilet.org/>



From The Loo Lady:

A blog post from the 2013 World Toilet Summit in Solo, Indonesia:
<http://doingyourbusiness.lootours.com/2013/10/diving-in.html>

Plunge In

SuSanA (The Sustainable Sanitation Alliance)

SuSanA have a large array of resources and working groups open to anyone! Have a look at their “Shit Flow Diagrams” for many international cities providing information about the waste and how it is transported and treated <http://sfd.susana.org/> Pick a city and compare what you learned about your own local area in lessons 2-4

Get Creative

SuSanA Wiki Project

Join SuSanA’s 2017 Wikipedia project, helping to insure that information provided about WASH is as current as possible. Register on their network, have a look through there topics and see if you can draw from what you have learned in these lessons to add to the efforts.

<http://www.susana.org/en/news-and-events/sanitation-events/upcoming-events/details/194>

Further Reading

(2012) *The Toilet: An Unspoken History*: <https://youtu.be/0ZHm3vkavgM>
BBC four,

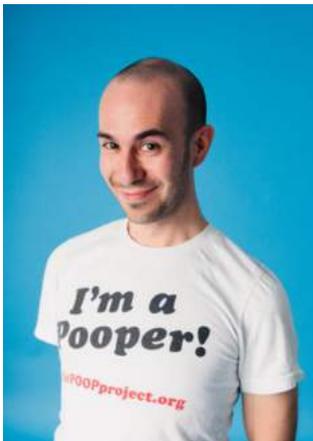
George, Rose (2008) *The Big Necessity: The Unmentionable World of Human Waste and why it matters*, Metropolitan Books, New York.

Who's Who



Karina Mangu-Ward: Director/Producer

Karina Mangu-Ward is a Brooklyn-based filmmaker and media producer. She uses non-fiction film, interactive content, and social networking to spread big ideas. Her feature documentary FLUSH raises awareness about how toilets and sewer systems work in the US, and increases citizen advocacy for more sustainable solutions at the local level. She has directed content and strategy for ArtsFwd.org, a platform for arts and culture leaders about innovative new approaches to the persistent challenges facing the sector. She produced "Made Here" (www.madehereproject.org), an online documentary project featuring 30 short films about the life/work balance of New York City artists, featured on Hulu. Her work also includes a webseries, short films, and commercial advertising. MFA Columbia. AB Harvard College.



Shawn Shafner is an artist, educator and activist. Creator of The People's Own Organic Power Project (www.thePOOPproject.org), he has catalyzed conversation about sustainable sanitation from NYC's largest wastewater treatment plant to the United Nations. Major works include: [An Inconvenient Poop](#), family musical [Innie / Outie](#), and ongoing monthly episodes of [SHHH: The Poopcast \(aka Sh*t and Shame with Shawn\)](#). Shawn was a 2014-15 LABA Fellow, 2014-15 iLAND/LMCC resident, 2017 Global Social Impact House fellow through UPenn's Center for Social Impact Strategy, 2017 summer resident to the Art Monastery Project, and a member of the Schusterman Foundation's ROI

Community. Shawn is also a teaching artist, curriculum developer, and consultant for cultivating creativity, mindfulness and joy.



Rachel Cole-Wilkin (The Loo Lady) Research Assistant
When it comes to toilets, Rachel has been a daily user most of her life, but she found her true passion in 2013 when she founded London Loo Tours, a walking tour that lifts the lid on the politics of public toilets. More information about her work can be found at <http://lootours.com> or <http://theloolady.com>

You can contact her at rachel@lootours.com

You can learn more about other contributors to this documentary at <https://thepoopproject.org/flush-go-deeper>