SEPARATE

Why?

- Pee is clean. Poo is not.
- Pee needs more space than poo.
- Both are easier to handle when not mixed.
- Pee and poo mixed require more odor control than each alone.

The Twin Bucket Toilet

What you need


buckets


lids

seat


carbon covering material


gloves


tissue


sanitizer & wipes

How to use

1. Mark buckets “pee” and “poo.” Put them in a private space with a container of carbon material nearby. You can move a single toilet seat from bucket to bucket.
2. After using the pee bucket, put the toilet tissue in the poo bucket. Cover the pee bucket with a lid that closes well.
3. After using the poo bucket, sprinkle carbon material to completely cover the surface of the poo. This eliminates odors and keeps flies away. Try to keep the poo bucket dry.
4. Wash your hands or use sanitizer.

About carbon covering material.

Choice depends on availability and quality of digestible carbon content.


Sawdust is small enough to evenly mix in compost but slows complete decomposition.


Woodchips are available from tree trimmers but large size requires longer to decompose.


Coffee hulls are small and compost quickly. Mix with woodchips or sawdust to create breathing space for the compost.


Oat straw decomposes quickly. You need a lot to provide a barrier to flies.


Dried leaves, shredded paper or cardboard must be used with other carbon materials.


Ash does NOT contain carbon and raises soil pH but controls odors and contains nutrients.

Grass clippings and fresh leaves also do NOT contain carbon.

Resources

The principal source for this exhibit is *A Sewer Catastrophe Companion: Dry Toilets for Wet Disasters.* Molly Danielsson and Mathew Lippincott eds. MDML. Portland, Oregon 2012.

For the impact of earthquakes on sewer systems and recovery times see *The Oregon Resilience Plan: Reducing Risk and Improving Recovery for the Next Cascadia Earthquake and Tsunami.* February 2013

Following the 2011 Christchurch, New Zealand earthquake, local permaculturists proposed the twin bucket system. It’s an economical alternative to manufactured urine-diverting composting toilets. In the absence of functioning sewers, entire Christchurch neighborhoods have adopted waterless sanitation, building beautiful, practical bathrooms in their homes. See website Compost Toilets for Community Resilience.

For more on the twin bucket toilet visit the PHLUSH website www.phlush.org. In the Emergency Toilets section see “Finding Parts and Supplies” and in the Ecological Sanitation section see “Urine Diversion and Reuse”.

Information oncarbon covering material is from Cornell Waste Management Institute. has more on carbon covering material. “Compost Fact Sheet #5 Compost Bulking Materials.” Ithaca, NY: Cornell, 2005.

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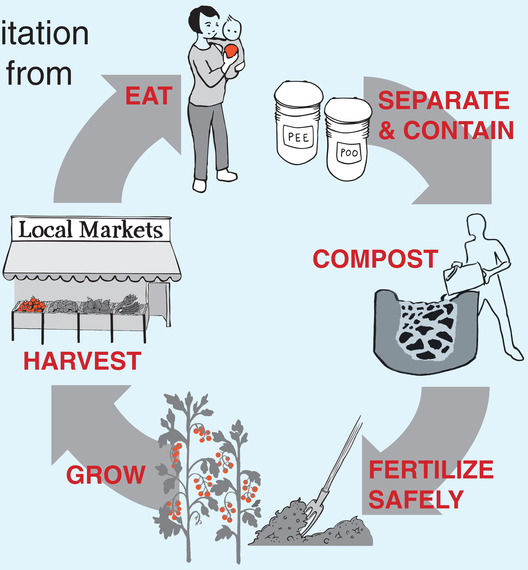
CONTAIN

Water-based sewered sanitation will probably fail in an earthquake. Repairs may take years.

Restorative sanitation protects people from pathogens until composting destroys them and produces safe fertilizer with life-giving nutrients to grow food.



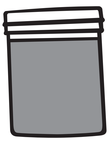
Don't contaminate. Contain pee & poo.

Adults deposit 3 to 10 ounces of poo or produce 4 to 40 ounces of pee each toilet use. Expect 2 pounds of poo and just under 2 gallons of pee per adult per week.

Poo by the Bucket

# of people served	days to fill a bucket	/day	/week	/month
1	14	1	1	1
2	7	1	1	4 x
3	3	1	2	10 x
4+	1+	1	4	14 x

Chart assumes about a pint of carbon cover plus toilet tissue are added to each deposit of poo.



Pee by the Bucket

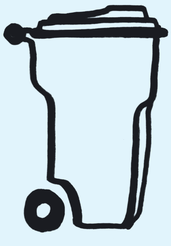
# of people served	days to fill a bucket	In Buckets & Gallons /day	/week	/month
1	16	1/4 gal	2 gal	8 gal
2	8	1/2	4	4 x 16
4	4	1	7	8 x 32
6	2+	2	3 x 11	12 x 48
12	1+	3	5 x 20	20 x 78

Chart assumes that a 5 gallon bucket will be filled only 80% or with 4 gallon of pee.

Get enough containers!

Federal law prohibits the commercial reuse of food containers for food. Supermarkets, bakeries, and restaurants often give them away or sell them cheap. Do your part to keep polyethylene out of landfills. Containers of every size from 3 gallon buckets to 55 gallon drums and 70 gal bins can be used in resilient sanitation.

A 50-gallon rolling bin can hold...



- An 8-week emergency supply of wood chips, sawdust or other carbon material.
- 9 weeks of pee
- 5 weeks of poo and carbon material

...for 4 adults

Resources

The principal source for this exhibit is *A Sewer Catastrophe Companion*, MDML, Portland, Oregon 2012.

The Oregon Resilience Plan by the Oregon Seismic Safety Policy Advocacy Commission, 2013, is available on line.

Excreta calculations are based on data from *Digestive Diseases and Sciences* Vol. 43, No. 11: 1998, 2358. and Gotaas, Harold B. "Composting — Sanitary Disposal and Reclamation of Organic Wastes". Monograph Series. Geneva: World Health Organization, No. 31. 1956. 81. Washington State University and Green Mountain Technologies have composting calculators on their websites.

For a thorough reference on composting toilet systems see *The Composting Toilet System Book* by David Del Porto and Carol Steinfeld. Concord, MA: Center for Ecological Pollution Prevention, 2000.

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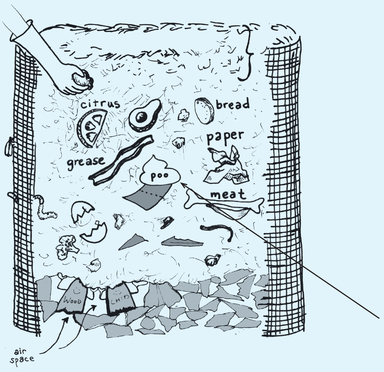
COMPOST

Why Compost?

After poo has been contained and mixed with carbon material, it's built into a composting pile for treatment. When properly managed to have enough air to heat up, it produces a humus-like compost safe for use as fertilizer on food gardens.



Load your compost pile.

Wearing gloves, uncover the pile to expose the hot, active center zone.

Add two buckets of carbon to the hot active zone. Add buckets of food scraps, poo or pee one at a time, followed by the amount of carbon needed. Disperse carbon to maintain air spaces.

Rinse buckets using a toilet brush and pouring captured rainwater from bucket to bucket.

Pour rinse water slowly to spread it over the whole pile. Cover with a foot of carbon material. Smells should be absorbed by the carbon and not by noses of animals looking for food.

Build compost. Don't build a dump!

- **Carbon materials make up about half of the pile.** They absorb odors, create air passages, and provide food for microbes.
- **Construct a bed of carbon at the bottom.** Add paper in shreds and mix with bulkier material like woodchips. This will help prevent groundwater contamination.
- **Choose good wood.** Pressure treated wood contains heavy metals. Paints and stains on wood contain dangerous chemicals.
- **Compost needs to breathe.** It will compact and eliminate air spaces if pile is built too tall.
- **Bugs volunteer for vital jobs.** Their small mouths break apart compost, making nutrients available to bacteria. Their tunnels provide aeration. Their digestive tracts chemically transform the contents of the pile.
- **Compost is moist but not wet.** To test, put on a glove and squeeze a handful of compost. Liquid should bead up but not more than a drop or two will come out.
- **Covered compost piles don't smell.** A foot of carbon on the sides and top absorbs all odors.

When is compost safe for use on a vegetable garden?

Option 1: Retention Retaining compost kills most pathogens by keeping them away from their host, our guts. But Ascaris eggs (aka roundworm) can be viable up to 130 days. Retaining compost for two years before use is considered extremely safe.

Option 2: High Temperature Most pathogens are adapted for a narrow temperature range around the body temperature of their host. Very few survive outside of this range. Two consecutive days at 57°C (135°F) kills roundworm eggs. Federal guidelines for sewage sludge treatment require three days at 55°C (131°F) for pathogen reduction.

Resources

The principal source for this exhibit is *A Sewer Catastrophe Companion.* Molly Danielsson and Mathew Lippincott eds. MDML. Portland, Oregon 2012.

For details on how to compost see Jenkins, J. *The Humanure Handbook.* Pennsylvania, Jenkins Publishing, 1999; Yamada, Y., and Y. Kawase. "Aerobic Composting of Waste Activated Sludge: Kinetic Analysis for microbiological Reaction and Oxygen Consumption." *Waste Management* 26.1. 2006: 49-61; and Dickson, N., R. Thomas and R. Kozlowski. "Composting to Reduce the Waste Stream. A guide to Small Scale Food and Yard Waste Composting." Ithaca, NY: Northeast Regional Agricultural Engineering Service Cooperative Extension, 1991.

For pathogenic safety of composted excreta reuse, see National Research Council. *Biosolids Applied to Land: Advancing Standards and Practices.* Washington, D.C.: National Academies, 2002. 265 and Gotaas, Harold B. "Composting - Sanitary Disposal and Reclamation of Organic Wastes". Monograph Series. Geneva: World Health Organization, Numaber 31. 1956. 81

Additional resources are at www.phlush.org. See pages "Composting Toilets" and "Urine Diversion and Reuse."

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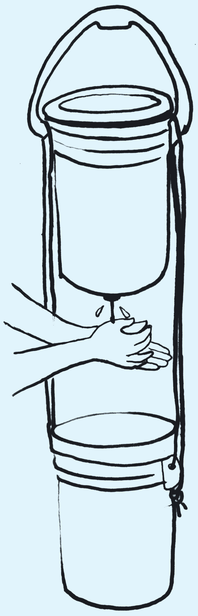
WASH

Handwashing with soap is a DIY “vaccine” that prevents infection. Poo is the main source of diarrheal pathogens such as typhoid, cholera, shigellosis, gastrointestinal diseases and even respiratory infections such as influenza and pneumonia. A single gram of poo can contain 10 million viruses and one million bacteria.



This innovative Tap Up hand sink combines radical water conservation with the sound hygiene required in restorative sanitation management.

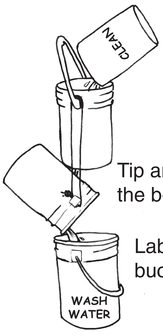
The lower bucket captures the used wash water so it doesn’t spill onto the ground and can be properly emptied.

Using simple tools, you can make the unit from two similarly sized buckets and a few purchased parts.

Hang it near restrooms and in food prep, dining, and first aid areas. Use with a dispenser of foaming soap that requires little water to lather up.

How to Use the Tap Up

Clean water goes in top. Be safe. Pour only what you can lift!

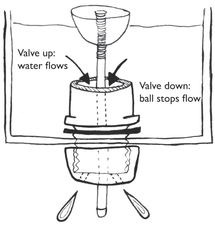


Tip and pour out the bottom bucket

Label all wash water buckets.

Label the top bucket Clean Water and the bottom bucket Wash Water.

Empty Wash Water in a marked off area near the root zone of a tree or bushes. Avoid waterways, including drains.



A tap of the hand pushes the rod up, opens the valve and allows a small amount of water to flow.

Make your own Tap Up

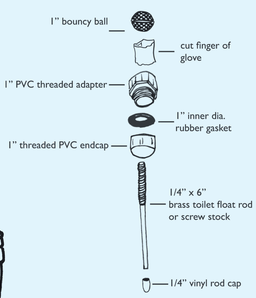
Materials Needed


a rubber glove

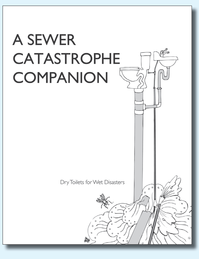

Teflon tape


8 ft rope (50lb test)


Two matching buckets, one with a handle, and one lid



Complete instructions for building the Tap Up are in the 24-page manual *A Sewer Catastrophe Companion*. Download free at www.mdml.co



Resources

The principal source for this exhibit is *A Sewer Catastrophe Companion*. Molly Danielsson and Mathew Lippincott eds. MDML. Portland, Oregon 2012.

Tap Up was designed by Mathew Lippincott, 2011, released by CERN Open Hardware License.

For the impact of earthquakes on clean water systems see *The Oregon Resilience Plan,* 2013.

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