



# MUDDY HANDS

Soil and Water Information for Educators Brought to You  
by Lake County Soil and Water Conservation District

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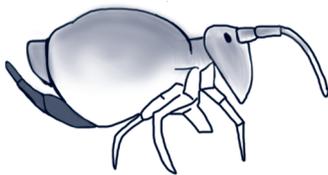
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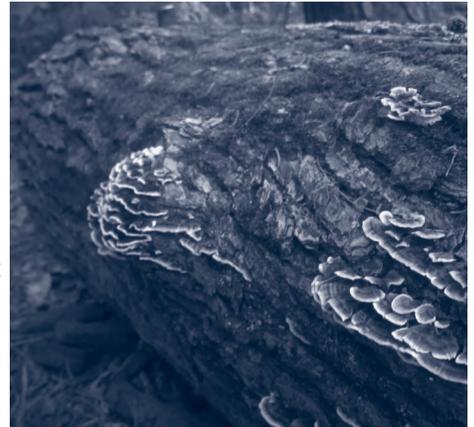


## It's a dirty job, but something has to do it!

What do earthworms, fungi, pill bugs and bacteria have in common? They are all decomposers. While the job isn't glamorous, it is important. Without decomposers life on planet earth would cease to exist. Plants would deplete the soil of nutrients. Instead of being recycled, dead plant and animal matter, and animals waste would start to pile up. Both the carbon and the nitrogen cycles would be interrupted. It wouldn't be a pretty sight!

Luckily, decomposers are all around us, in the air, soil, and even inside of us. Decomposers are broken up into two basic categories: Scavengers and Decomposers. Scavengers are the workers in the first step of decomposition. Scavengers are animals that find and eat dead animals or plants, called detritus. When they eat the detritus they break it down into smaller pieces. Examples of scavengers include turkey vultures, earthworms, flies, wasps, pill bugs and cockroaches.

The workers in the second step are called decomposers. Examples of these include: bacteria and fungi. Bacteria and fungi do the final step of decomposition by making the nutrients in the detritus available for use by plants.



## Meet Natalie, Lake SWCD's New Education/Information Coordinator

Welcome Natalie Gertz-Young to Lake SWCD. She started as the Education/Information Coordinator in September 2013. Natalie was a Growing Students in Science Instructor and Public Programs Seasonal at The Holden Arboretum, she was also an assistant naturalist at The Mentor Marsh Nature Center before she joined the Lake SWCD team. She is excited to work with you and your students!

Contact Natalie at [ngertz-young@lakecountyohio.gov](mailto:ngertz-young@lakecountyohio.gov)



## Humus Hilarities

Q: Why did the mushroom get invited to all the parties?

A: Because it was a real fungi!

Q: What kind of bacteria refuses to exercise?

A: Anaerobic bacteria

Q: What is the best advice to give to worm?

A: Sleep late!



**Lake County Soil & Water  
Conservation District**



## Composting Curriculum

### Compost as a Decomposition Visual

The process by which dead things are recycled into usable nutrients for plants is a complicated and confusing process, much of which is too small and too slow to see. Enter: The compost bin.

Few things show decomposition in action as well as a compost bin. The process by which paper, old food scraps and time turns into rich organic matter never ceases to amaze. Depending on the type of compost bin you have you may start to see compost in as little as 10 days. The short turn over provides a hands-on example of what happens in nature on a forest floor or under the living grassland vegetation.

### Compost Pile as an Ecosystem

Waste is recycled in a compost pile due to the living things which live in and eat the food and lawn waste. Many of the animals found in a compost pile use the compost for part or all of their life cycle. An example of an animal that uses compost for its entire life cycle is an earthworm. This is in contrast to a black soldier fly which uses it as a food source and home during its larval stage, but not as an adult.

### Compost as Recycling and Solid Waste Reduction

In 2011, food and yard waste composed 21.3% and 8.8% respectively of solid waste that ended up in landfills. Just like recycling steel cans or plastic bottles, composting is a way to reduce your waste and turn it into a useful product.

## Build a wormery in your classroom!

### You will need:

- 1 power drill with 1/4" bit
- 2 10-15-gallon plastic totes with snap lids
- Newspaper or cardboard
- Red worms, such as red wigglers
- Food waste in small pieces (no meat, dairy, greasy or salty)

### Building the worm bin

Drill 8 1/4" holes on each side of the worm bin for ventilation. Evenly space each hole, about 2 to 2 1/2 inches apart. Drill 18 1/4" holes on the bottom of the worm bin for drainage. Evenly space each hole, about 2 to 2 1/2 inches apart.

### Building the leachate bin

Drill 8 1/4" holes on each side of the leachate bin for ventilation, about 1/2 way down. Evenly space each hole, about 2 to 2 1/2 inches apart. Leachate is the liquid that drains out of the compost. It is great fertilizer!

### Setting up your wormery

Once all the holes are drilled, place the top onto the worm bin (you'll only use one top). Then place the worm bin inside the leachate bin. Congratulations, you now have a wormery built to house composting worms! Fill your new worm bin about 3/4 full of shredded, damp newspaper or cardboard. Then add a small amount to food waste and your red wiggler worms. Finish it by adding a thin layer of shredded newspaper on the top. This will deter fruit flies.

### It is easy to take care of your wormery just FEED, WATER, FLUFF!

Feed worms shredded newspaper and food scraps once a week, spray with water when it gets dry, and fluff the bedding when it gets compacted

### Tips:

Sourcing red worms can be tricky if you don't know where to look! Start by asking around and looking on Craig's list or freecycle. Many people will give them away for free! If that turns up short they can also be purchased online.



# FREE Lake SWCD Classroom Programs

## Benthic Bugs and Bioassessment

In this program students simulate taking a stream sample, identify their 'bugs' and use their findings to determine the water quality of the 'stream' at their location. A great introduction to or alternative for stream monitoring. Requires: basic classroom setup.

**Recommended grade levels:** 5th and 7th grades, Biology and Environmental Science.

## Nonpoint Source Pollution Enviroscape

This model demonstrates nonpoint source pollution and its impact on rivers and lakes. We will use food products to mimic pollutants and then watch what happens when it rains. Students will learn some of the major causes of water pollution and discuss practices for preventing NPS pollution. Requires: a table that all the students can gather around.

**Recommended grade levels:** 3rd, 4th and 7th grades and Environmental Science.

## Drinking Water and Wastewater Treatment Enviroscape

This model demonstrates the processes that water travels through as it's cleaned for drinking, used in houses and sent to the wastewater treatment plant. Both urban and rural features. Requires: a table that all the students can gather around, about 5 minutes between classes to reset the model.

**Recommended grade levels:** 2nd, 3rd and 7th grades, and Environmental Science.

## Streamulator

This program can be done indoors or outdoors. A table model helps students to understand some of the concepts involving moving water. The model can demonstrate stream formation, bank erosion, velocity, flow rates and urbanization, among other things. This highly adaptable program can be formatted to your curriculum. Requires: Electricity, a place to fill a 5-gallon bucket and a space where all the students can gather around the model (no wood gym floors please).

**Recommended grade levels:** 4th, 6th, and 7th grades.

## Soil Sleuths

This program can be done indoors or outdoors depending on weather and preference. Students will have a hands-on experience with different soil types while exploring soil particles, profiles and soil history in the United States. This program requires: permission to take the class outside (if desired) and a tolerance for muddy hands!

**Recommended grade levels:** 3rd and 6th grades.

## Incredible Journey

Water is a valuable resource, and a limited one. This program is an interactive demonstration of the water cycle that gets students up and moving around the classroom. They will learn about the different pathways water follows, how it gets 'recycled,' and where it can be stored. We will explore the complexity of the water cycle and move away from the simple circle model. Requires: a fairly open classroom, or a gym or multi-purpose room where we can put up 9 stations, students will need pencils and the ability to read easy words. Accommodations can be made for younger students.

**Recommended grade levels:** 1st, 2nd, and 3rd grade.

## Fred the Fish

A storytelling program for younger students who aren't quite ready for the Envirosapes. Kids will go on a trip down the river with Fred and see what happens to his water as he passed through various landscapes. Students will then visit a seaside town where the residents learn what really happens when you throw things away. Participants will learn about different causes of water pollution and also what can be done to keep water clean. Requires: a place where the entire class can sit and see a fish tank.

**Recommended grade levels:** Pre-K, Kindergarten, and 1st grade.

## Ground Water

This profile model allows students a window to see into various types of aquifers. We will use dyes to demonstrate how groundwater pollution happens, how it can be mitigated and groundwater's connection to surface water. This model in combination with the Enviroscape are excellent for helping students understand the complexity of clean water and their role in maintaining it. Requires: electricity, a table or counter that all the students can see and a place to fill a 5-gallon bucket.

**Recommended grade levels:** 6th grade.

## Web of Life

Younger students will learn to separate real animals and plants from imaginary ones, older students will also identify which are native to Ohio. We will then use an activity to explore how the native animals and plants interact with each other as they seek and provide food and shelter. Additionally, we will observe what happens if we make changes in their system. Can be adapted to the outdoors. Requires: a space where the entire class can comfortably sit in a circle.

**Recommended grade levels:** Kindergarten, 1st, 2nd, 3rd and 5th grades.

# Get Outside!...Field Opportunities

## **Watershed Watch** *We want your 5th, 7th, Biology and Environmental Science classes!*

Stream monitoring is an excellent way to understand real life ecosystems and collect real scientific data. Every May and September, Lake County schools take to the streams with kick seines in hand. With the help of Lake SWCD staff, they collect and identify macro-invertebrates and use their findings to determine water quality. Since 1994 this program has collected data for Ohio DNR's Scenic Rivers program.

## **Watershed Clean-ups**

An important part of keeping our streams clean is removal of trash and litter from stream banks and roadsides. If your class or group is interested in this type of action project we would be happy to help you.

## **Easement Aid**

Is your class or group looking for a community service project and want to help out Lake SWCD staff? If so we may have just the project. Lake SWCD manages an easement in a housing development in Concord, different times of the year require different jobs. Examples of projects on this property include, vernal pool monitoring, invasive species removal, plant and animal surveys, and general trash clean up.

**For more information on any of these field opportunities contact Natalie.**

**As always, these programs are free to all Lake County schools, sadly we are unable to provide transportation.**

## Equipment for Loan

### **Great Lakes Timeline Trunk**

Explore the history of the Great Lakes watershed through time and place. Three threads are available: Exploration and Settlement, Mining and Shipping, and Environment and Ecology. A great way to kick off a unit using the loaner trunk.

### **Forest Fire Prevention Trunk**

This is a collection of materials and literature about the impact of wildfires. Students can set up 'matchstick forests' to demonstrate different forestry practices and their effects on how wildfires burn.

### **Maps and Mapping**

This kit includes the materials for students to create topographic maps in small groups, to create a landscape from an actual topographic map (will be customized to each school), and other activities that help students understand and interpret maps. Other types of large-format maps and lesson plans will also be included.

### **Streamulator**

This is available for extended use in classrooms if it is not scheduled for our programs

### **Groundwater Model**

Lake SWCD has an older version of the groundwater flow model that is gravity-fed. This is available for teachers to borrow and use in the classroom.

### **Videos and DVDs**

Lake SWCD has numerous videos and DVDs on many environmental topics. Let us know what you are looking for and we'll check our library!

## Smart Device Programs

Do you have a class set of iPads or tablets? Or do many of your students have smart phones? If so, Lake SWCD is developing programming which utilizes these smart devices. Proposed program topics include, mapping, watersheds, and soil science.

**If you would like to help us test a smart device program please contact Natalie.**

## Lake SWCD is here to serve YOU!

We develop our programs and purchase new materials based on feedback from educators like you!

We are always looking for suggestions. Let us know if there is a content area you'd like to have more materials on, information for or a program about. Most of our programming is easily customized, so don't hesitate to ask for us to tweak a program to suit your needs!

**If you would like to schedule a free program for your students, please contact:**

Natalie Gertz-Young

Education/Information Coordinator

440-350-2730

125 East Erie St.

Painesville, Ohio 44077

ngertz-young@lakecountyohio.gov

www.lakecountyohio.gov/soil

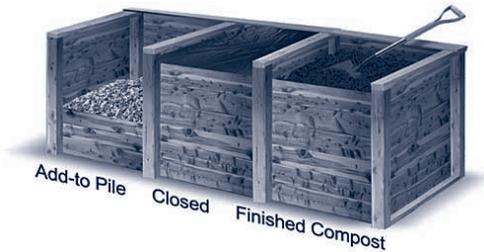


## Types of Composting

### Backyard on-site pile

On-site piles are great to have in an outdoor learning lab. The fungi, bacteria, micro and macro invertebrates that colonize the pile transform the waste into compost. They can be a little tricky to get going, or "hot" as they say in the compost world.

**3 Bin System** Bin #1 receives waste, #2 holds last year's waste and #3 holds finished compost.



**Tumbler** All vegetable scraps and food wastes are added to a barrel that is turned to increase oxygen flow and speed decomposition.

**In-bed** vegetable and yard wastes are added to flower or vegetable bed and turned to speed decomposition. When finished, plants are planted directly into the bed.

### Bokashi

This lesser known type of composting uses fermentation to break down ALL kinds of food scraps, including meat and dairy. Fermentation is an anaerobic process (without oxygen) by which yogurt, beer, wine and pickles are made. In bokashi, added bacteria, like lactobacillus, convert the carbohydrates in the food waste into lactic acid, essentially pickling it. After the initial fermentation process the compost is buried outside to finish decomposing. The "pickling" of the waste makes the nutrients more readily available to soil organisms. As a result, the process takes weeks instead of months.



Bokashi bins do not have a bad odor which is why they are the compost bin of choice for apartment dwellers in large cities, like Tokyo, Japan.

### Vermicomposting

Vermicomposting is fast and good for an in-classroom bin. It uses a type of earthworms, called red worms, red wigglers or super-worms, to eat waste. These worms are well suited to composting because they move well from side to side and are voracious eaters. In fact, red worms can eat half their body weight in food per day! And since food wastes are consumed quickly, these bins rarely smell.

Just like most composting, meat and dairy are no-no's as they will cause a foul stench.

Additionally, processed foods and foods high in salt can kill worms. Virtually all other types of produce, paper, coffee grounds and tea bags are excellent food for worms.



The red worms are not cold-hardy so the bin must remain indoors in the winter.

### Windrow

Large-scale commercial operations use this type of composting. Organic material is placed in long rows and the material is turned periodically to accelerate the composting process and provide uniform compost. An open space is left between each windrow to allow room for turning equipment. Lake County Solid Waste Management uses this method to turn waste from the water treatment plant into compost.



For more information about Lake county's composting efforts visit <http://www.lakecountyohio.gov/utilities/Divisions/SolidWaste/CompostSales.aspx>

# MUDDYHANDS

## Stormwater Sidebar

HAB might sound like a cute nickname, but there is nothing cute about Harmful Algal Blooms. These blooms occur due to stormwater runoff which carries nutrients like nitrogen and phosphorus into our streams and rivers and ultimately into Lake Erie. The source of these nutrients is primarily from large farms in the form of animal waste and chemical fertilizer, but it can also be from home fertilizer use, or failing sewer and septic systems. These nutrients are food for organisms called cyanobacteria or blue-green algae. Cyanobacteria are always present in Lake Erie and are usually harmless, they only become a problem when they are present in large numbers.

When too many nutrients, primarily phosphorus, are washed into the lake by heavy late summer rains, followed by hot, still days it causes a population explosion, a bloom. This turns usually transparent lake water into a thick chartreuse-colored milkshake. While there are many kinds of cyanobacteria, the species which causes problems in Lake Erie is, *Microcystis aeruginosa*.



### Ways you can reduce nutrient pollution

- Don't over-fertilize your lawn and never fertilize right before it rains.
- Always pick up and properly dispose of your pet waste.
- Install a rain barrel or rain garden to reduce runoff.
- Use phosphate-free soaps and detergents.

Without oxygen the animals that live in the bottom of the lake suffocate. These hypoxic areas are called dead zones.

Lake Erie is not the only body of water to be plagued by HAB and dead zones. Algal blooms caused by nutrient pollution are a worldwide problem. One of the largest and most well known dead zones in the US is in the Gulf of Mexico, at the mouth of the Mississippi River. In July 2013 the dead zone was roughly the size of Connecticut!

### CALLING ALL STREAM MONITORS!

Lake SWCD needs your class, group or community organization for **Watershed Watch**. We welcome all groups aged 10 and up to help us research the quality of the water in our streams and rivers.

**For more information, or to sign up please contact Natalie at [ngertz-young@lakecountyohio.gov](mailto:ngertz-young@lakecountyohio.gov)**

*Microcystis aeruginosa* is of particular concern due to its potentially harmful effects on wildlife and people. Under the right conditions *M. aeruginosa* release chemicals which are toxic. Human contact with the water can cause skin irritation and in severe cases damage to the nervous system and liver. These toxins are a concern to communities that use Lake Erie as their source of drinking water.

HAB's effects on wildlife can be devastating. HAB's impacts are not limited to the cyanotoxins they produce, wildlife is also negatively affected after the bright green bloom fades. When the population dies the dead bacteria sink to bottom of the lake where they decompose. This decomposition is aerobic, and uses up all of the available oxygen in the lower layers of the lake, this is called hypoxia.

### Did you know?

- Earthworms are not native to Northeastern Ohio?
- Earthworms were introduced from Europe to aid farmers with nutrient break down and soil aeration. Further south, in the unglaciated part of Ohio, there are populations of native earth worms.
- Today non-native earthworms are doing too good of a job breaking down decaying matter and are hurting our native forests. In forests with high populations of earth worms leaf litter is broken down too quickly, destroying the habitat for many native soil organisms and increasing erosion.
- To reduce the spread of non-native earthworms it is important to dispose of unused fishing bait in the garbage and only use red worms that are not cold hardy, such as red wigglers, for vermicomposting.

