



Settle Down!

This activity center is part of the **Water Protection** theme.

What's the purpose of this activity?

Students will be introduced to the components that are necessary for healthy littoral zone function, with a strong focus on soil types, soil horizons, soil suspension in water, sedimentation, and fish habitat. Students will come to understand how important soil stability along shorelines is to all watersheds. They will see there are many plant and animal interactions amid the *Ribbon of Life*. Students will also be introduced to the thought process behind stewardship and shoreline restoration so they can become great waterfront stewards themselves.

Key messages:

- Shoreline soil stability is vital to watershed health.
- Non-living soils, when mixed with water the wrong way, can be very dangerous and detrimental to water creatures.
- Riparian and littoral zone soils can harm plant and animal habitat when they enter the watershed. Soil sediments can cause damage far downstream from their origin.
- Riparian zone soils need to be protected by humans, yet they are often disturbed and even introduced through lack of understanding.
- Waterfront Stewards understand waterfront creatures. They protect the riparian and littoral zones and set a great stewardship example by leaving waterfront soils, plants and habitat undisturbed.
- Healthy riparian plant communities hold shoreline soils in place and reduce erosion and sedimentation along the water's edge.

Materials:

- Eight jars of a variety of soil types suspended in water for shaking. Sand, Clay, Loam, Humus. Sandy forest soil, Disturbed site soil (gravel-pit), Clay forest soil, Imported beach sand.
- Jars of the aforementioned mixed varieties that are left undisturbed so that sedimentation and horizon layers can remain evident. **THESE ARE FOR DISPLAY ONLY AND ARE TO REMAIN UNTOUCHED BY THE CHILDREN.**
- 1 large jar with dried soil horizon with fish eggs and macroinvertebrates under clay for visual aid (not to be shaken).
- Several 'Feel' bins, where students can feel the texture of several soil examples, fine, to coarse, to fluffy.
- A long game-board representing a shoreline, with the 'disturbance area' at one end, and another area where creatures are just 'minding their own business' downstream with distances marked in increments. This is where the students 'place their bets'.
- 3 sets of poker chips. Each set contains 30 chips. **You only need 1 set to play**, the other 2 are for replacing lost chips. 6 different colours where each player gets their own colour set (*rim colour determines player sets*). Each player has 5 chips representing **Sand, Silt, Clay, Loam and Organics (centre dots)** that are to be used by students to 'place their bets' along the shoreline.
- Laminates: Chip Key. Visuals of a variety of human and erosion damage to shoreline soils and habitats along with good shoreline examples. Soil layers.

Activity Set Up:

1. Set up the dry, undisturbed soil examples, fish egg jar, 'feel' bins and educational graphics on one table. This will be the visual teaching table.
2. Place the soil with water jars and game pieces on another table. This will be the game table.

What will I be doing?

At the beginning of the day you will ensure that the set-up has been completed and that you have all of the materials necessary to run the station.

For each rotation you will be monitoring the students' success in guessing which soils will stay suspended in a watershed the longest/ least amount of time. Thus, which soils could be carried the furthest and cause the most damage downstream. The goal is to get the students to understand that using waterfront areas takes great responsibility and that introducing or disturbing soils into water at one property can affect others downstream, as well as wildlife.

Let the group feel the variety of soils. Sand is gritty and crumbly, Silt is fine and shiny, Clay is very fine and powdery, Peat and organics are light, chunky and fluffy. Talk about Coarse to fine textures, weight, and what the soils look like when 'sprinkled' into the bins. Then bring them to the game.

After each group has accomplished the task of 'placing their bets' as to which soils they think will carry downstream the farthest distance, initiate a discussion. Speak about the layered soils in the water jars behind the board, use them as a visual tool. Do they like what they see on the board? Where do they think sedimentation damage would be the worst? Who will be harmed? Has fair thought been put towards all of the riparian users when the soil upstream was introduced? How many creatures could be there? Discuss.

Then explain the importance of the riparian zone, how it should be shared by all creatures, and the possibility that soil damage can occur where they swim. The ideal *Super Steward* shoreline should always think about soil washout if any construction or soil changes occur in a place they are closely associated with. Silt fencing should be used throughout any construction project where soils will be exposed and disturbed so that the rain will not wash any sediment into the water.

1. Introduce topic. Use graphics: Riparian zone. Water Sharing. Human/Plant/Animal/Water.
2. Look at the dry soil examples in the jars, feel the soils. Talk about the differences between fine and heavy soils and particle sizes, weight.

3. Talk about fish egg and macroinvertebrate (fish food) habitat.
4. Shake up the wet jars and watch the soils in them settle. Note the time it takes and how fast they reach the bottom. Note how the different soils settle in layers.
5. Divide students into groups. Allow them to 'place their bets' along the shoreline game board as a group without any guidance.
6. Look at the game board and the students 'bets'. Discuss creativity and ask for reasoning. Is this balanced for all creatures? How do some aquatic creatures they are familiar with use water? What would happen if a cloud of soil covered them? What happens when volcanoes spit lava and ash on humans, landslides etc.? Can we breathe dusty air?
7. Explain then to the students that the objective of the activity is to manage their shoreline soils in a fair and thoughtful manner for all creatures.
8. Teach them about shoreline soil management stewardship, riparian plants and their roots, and how other animals use the riparian zone.
9. Ask them how they could repair a shoreline where the soils have been disturbed and exposed.

Questions to ask Students:

Q: Which soil type do you think would cause the most damage to aquatic animal habitat at the immediate site of disturbance? (Sand & Gravel)
Which soil type do you think would cause more damage farthest downstream from the disturbance site? (Clay and Humus in which case the humus would likely be large woody debris)

Average time for soil types to settle:

Clay – 24-48 hours

Silt – 24 hours

Sand – 12 minutes to immediate

Gravel – 1 minute or less

Loam – the perfect mix of clay, silt and sand, rich in organics.

Organics – Organics float indefinitely, do not sink until waterlogged.

Q: What is the Riparian Zone in a watershed?

A: The riparian zone is also known as the 'Ribbon of Life'. They are the **areas where land and water meet** and they hold an astounding amount of plant and animal diversity. A shoreline with healthy plants slow and store

nutrients and soils, and therefore protect water quality. Riparian zones are the supermarkets, highways, and nurseries for many creatures. Exposed soils will wash into the watershed during rain and wind events and the soil will bury these creatures' 'cities'.

Q: What happens when earth (soil and organics) get into water?

A: Soil structure dissolves into the water. Sand settles quickly first, Silt follows 24 hours later, then Clay a couple of days later. Depending on water flow, the soils that stay suspended for a day or two will move elsewhere.

Q: How can one stabilize shoreline soils?

A: Vegetation along shorelines act like eyelashes for the watershed. Plants and their roots reduce soil erosion from waves and boat action. They slow soil runoff from land and reduce sedimentation. They provide food and shelter at the water's edge for creatures. They hold soils in place.

Q: What types of animals would be harmed by a sedimentation event?

A: All kinds of fish, amphibians, reptiles, mammals, insects and birds. **One third** of Ontario's mammals and **half** of Ontario's bird, fish and plant species depend on wetland habitat for survival. For example, like amphibians, Dragonflies lay their eggs in water and the larvae live submerged until they are ready to crawl onto shoreline vegetation to dry out in the sun, crack open and fly. But remember! All living creatures rely on water to survive (humans will die after 5 days without water). We all need access to healthy water.

Q: Besides plants, how can I ensure that a shoreline stays healthy?

A: Don't disturb shoreline plants and soils. Leave the 'weeds', woody debris and existing rocks on shore and in the shallow water. Woody debris can collect soil and become 'Nursery Logs' and provide animal habitat. Turtles love basking in the sun on floating logs. Rocks and rock clusters on shore are great reptile habitat and similarly underwater, provide great fish habitat.

Q: How can I repair a damaged shoreline?

A: Lead by example. If you know anyone who lives along the water, take a look and see how much of the waterfront is taken up for human activity. Do you see any exposed soil? Is it eroding or moving? Make note of how you would repair it towards fair balance.

Volunteer for shoreline restoration projects on a planting day, or for a local native plant sale. Learn how to plant a tree or shrub. Look closely at shoreline plants. How do they grow?

Q: How can I learn more about the riparian zone?

A: Sit quietly and study a planted shoreline. Look deep into the plants. Who is using them for habitat, food, and fun? Note what you see. Wear a mask when you go swimming so you can see underwater. Get a pail and a net and count and identify the creatures you catch. Get a wetland field guide. Meet your riparian pals!

Additional Background Information:

Soil Sedimentation and Riparian Habitat Facts

- Riparian zones hold the highest amount of biodiversity within ecosystems. Soil disturbance in waterways can greatly reduce this diversity.
- Sand, Silt and Clay settle into gaps between gravels and rocks where fish lay their eggs and micro and macroinvertebrates make their homes and breed. Fish eat these tiny creatures and depend on them to survive. Fish eggs covered in clay become encased in a dense shell (think of pottery) of soil which sunlight and oxygen cannot penetrate.
- Healthy riparian areas are natural, vegetated buffers that protect streams and rivers from upland impacts. They include natural vegetation, including fallen trees, branches and washed-up logs, and natural rocks or pebbles that run along any length of shoreline. Plants hold soils in place.
- Natural shoreline plant buffers maintain water quality through reducing erosion, filtering sedimentation, slowing the flow of water, taking in excess nutrients and, to a degree, processing contaminants that might otherwise enter the water unchecked. A planted shoreline acts like our eyelashes, keeping sediment and irritants out of the watershed.
- Shoreline plants can provide suitable habitat for all developmental cycles of many wildlife, particularly, amphibians, reptiles, fish and macroinvertebrates. Most North America animals depend on riparian zones for survival. Shoreline plants provide shelter so shy wildlife can drink water and bathe safely.

- Dead trees, logs and branches are very important to keep in the riparian zone, as are rocks. Woody debris can grow new plants! Sandy beaches provide little habitat for wildlife. Plant communities, along with natural debris, provide protection and movement corridors for a wide variety of aquatic, avian and terrestrial fauna. It is especially valuable to highly sensitive creatures, like reptiles.
- Soil sedimentation, if it is thick enough, can choke out existing plant life under the water. Suspended soils will block sunlight and therefore cease photosynthesis.
- Productive fish communities require food that has been produced on land (ie. insects and their young). Exposed and disturbed soils do not produce this food.
- Removing shoreline vegetation can throw clay, silt and sand onto fish spawning beds, increase pollution through way of runoff, and increase risk of soil erosion which washes soils into the watershed.



Clean Up Procedures:

At the end of the day make sure all items for the presentation are placed securely upright and that the cards and laminates are separated and ready for the next day. Leave the site as you found it for the next day's volunteers.

