



Friend's Watershed Related Topics for Classrooms

Teachers and Administrators:

Below is a list of possible lesson topics and projects, organized by appropriate age level, that are available for **FREE** to schools located in the Cobbossee Watershed by the *Friends of the Cobbossee Watershed Education Program*. It is important to note that this is not a comprehensive list and will be added to as lessons are developed. By the same token, teachers should feel free to **contact me** (link to e-mail address: **tamara@watershedfriends.com**) with lesson topics that they are interested in that do not appear on this list – all possible effort will be made to develop innovative and hands-on activities tailored to individual teachers needs. Please feel free to contact me with questions regarding specific activities for the lesson topics below.

I look forward to working with you!

Tamara

Elementary

- The Water Cycle – The Incredible Journey
- Water Properties
- Web of Life – interconnectedness of everything in an ecosystem
- Lake Food Webs/Chains – Lake Food Web Game
- Producer/Consumer/Decomposers
- Vermiculture and Composting – Worm Bin
- Invasive Aquatic Plants – Identify plastic plants (upper elementary)
- Algae – Excess nutrients – Algae Blooms – Experiment: The Effects of Common Household Cleaners on Algae Growth
- Freshwater Fish – Go Fish and Identify!
- Phytoplankton and Zooplankton – Make a Plankton!
- Water Uses
- History of Water Consumption – Common Water
- Biomagnification (of toxins up through the food chain)
- Water Ecosystems – Lake, River, Forest, Wetlands, Riparian, Bogs, etc.
- Animal Habitats
- Watersheds – What is a Watershed? Delineating Watersheds (easy)
- Point and Non-point source Pollution
- Runoff and Erosion
- Macroinvertebrates
- Importance of Buffers
- Groundwater
- Build a Rain Garden – service leaning project on school grounds
- Storm Drain Stenciling Projects – service learning project in local town

Middle School

- Watersheds – What is a Watershed?
- Delineating Watersheds using topographic maps.
- Web of Life – interconnectedness of everything in an ecosystem
- Lake Food Webs/Chains
- Biomagnification and Bioaccumulation
- Invasive Aquatic Plants – Identify Plastic plants
- Point and Non-point source Pollution
- Runoff and Erosion
- Macroinvertebrates
- Water Quality Testing and Monitoring
- Importance of Buffers
- Groundwater
- Stages of Lake Succession
- Algae Blooms
- Biomanipulation (of Food Webs)
- Limited Resources
- Current Events regarding Water
- Water Issues – water usage, water scarcity, dams, etc. – environmental and human aspects
- Land use issues – especially as relates to water quality
- Build a Rain Garden
- DEP – Watershed Protection Grants – service learning project to protect a water body

High School

- Stream Team – Water Quality Testing and Monitoring on a local stream
- Watershed Surveys – using topographic maps and on-line aerial viewing computer programs.
- DEP – Watershed Protection Grants – service learning project to protect a water body
- Local Land Use Issues
- Reading the Forested Landscape
- Project Learning Tree's – The Changing Forest: Forest Ecology
- Invasive Aquatic Plants – Courtesy Boat Inspector Program
- Erosion Control Design – Youth Conservation Corps Program
- Envirothon team assistance

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Sample Curriculum – Fourth Grade

Based on *The Watershed Journey of Linus Loon*, by Josh Atwood

Goal: To introduce complex biological and ecological concepts that affect water quality through the reading of "The Watershed Journey of Linus Loon"; the reading of each chapter is followed by an interactive activity (developed by the Friends) that aids the students' understanding of that chapters' topics.

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Session 1 - Introduction Lesson

- Introduction of Myself and Friends
- Pre-Assessment
- Common Water Activity (Project WET) – An activity that simulates how water consumption and the polluting of water have changed during our local history.

Session 2 - Linus Loon Chapter 1- Food Chains & Biomagnification

- Food Chain of Phytoplankton to Loon
- Biomagnification Concept Story Activity – Students become the organisms in the Phytoplankton to Loon food chain to learn about the deposition of Mercury into our Maine lakes – and the magnification of the toxin as it "moves" up the food chain.
- Discuss the effects of Mercury on Loons, Otters and Eagles – and the reasons for Human concern

Session 3 - Linus Loon Chapter 2 – Bog Habitats, Primary/Secondary Production, Eutrophication

- Build a Bog Activity – Each student is an organism that lives in a bog.
- Discuss Primary vs. Secondary Production
- Eutrophication and Succession Demonstration – Using a teaching tank as our "lake" we discuss how Maine lakes were formed and how they age through soil and nutrients in runoff changing the properties of the lake over time – eventually moving on to a wetland community and finally a forest community.

Session 4 - Linus Loon Chapter 3 – Water Cycle, Point Source Pollution

- Incredible Journey (Project WET) – Students will simulate the complex life cycle of a water molecule by moving from station to station (9 total), the path of which is determined by the role of a gigantic die at each station. Each station represents a part of the water cycle. (Ex. River, Ocean, Clouds, Animal, etc.) Students will pick up a different colored bead at each station. The beads will be placed, in order, onto a pipe cleaner, which the students can make into a bracelet that shows their journey as a water molecule.
- Point Source Pollution – will introduce a point source of pollution (factory) into the cloud station mid-way during the activity (will stop play to explain concept and directions to students).
- Worksheet available for students to write a story and/or draw a diagram of their journey as a water molecule and how they transitioned from one form to another.

Session 5 - Linus Loon Chapter Four – Estuaries and Biodiversity

- Exciting Estuaries – Students will learn about the chemical and physical characteristics of an estuary and the plants and animals that live there.
- Biodiversity game – Round 1 – students are all the same organism and must compete for food and habitat. Round 2 – students represent many different organisms with different food needs. Students will find it easier to survive longer, since not all organisms are competing for the same "food".

Session 6 - Linus Loon Chapter Five – Non Point Source Pollution

- Using the watershed model, we will discuss the impacts of humans' everyday actions that result in pollution of our water bodies. Emphasis will be place on alternative actions and preventative measures. We will discuss the concept that each of our little actions can add up when combined with other peoples "little actions", as well as build through time, to create a huge impact on our natural world.
- Worksheet available – students identify sources of everyday non-point source pollution.

Session 7 - Linus Loon Epilogue – Watersheds

- What is a Watershed?
 - Crumpled Paper Activity
 - Play dough activity (in groups, students use play dough to make land forms (hills). Hills are put together to form the high points for a watershed. Will prepare them for learning about contours and topographical maps in the future.
- Review of Linus the Loons' Watershed Journey, using review worksheet (fill in as class)
- Assignment: Draw Linus' Watershed - by drawing his journey from lake to ocean and incorporating as many concepts learned as possible. (use review worksheet as guide)

Session 8 – Intro to Macroinvertebrates

- Students are introduced to the world of aquatic macroinvertebrates.
- Using pictures of macroinvertebrates and funny props, students learn the amazing adaptations that certain aquatic bugs have and why they are important to the stream or pond ecosystem.

Session 9 – Plankton

- Students are introduced to plankton by viewing of a video in the *Eye of the Cyclops* series, "Plankton Play"
- Students have the opportunity to view live plankton, taken from a local water body, under microscopes
- Students will be given the chance to create and draw their own plankton via a worksheet. Students will decide whether their plankton makes its own energy from the sun, or consumes other organisms for energy; how the plankton stays afloat or how it moves; if the plankton has a mouth and/or appendages and what they might look like; and give their plankton creature a name.

Session 10 - Field Trip

- Field Trip to local lake or pond - activities aboard the OTTER II (our 22' pontoon boat) to learn about lake water quality (also chance to catch live algae and zooplankton) as well as land based activities.

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Goal: To build on student understanding of biological and ecological processes & issues that affect water quality and begin to foster a sense of stewardship for natural resources.

Session 1 – Intro Lesson – Water is a Limited Resource

- Beginning of year assessment
- A Drop in the Bucket Demonstration (Project Wet) – students observe an estimation of the available fresh water on Earth to understand that water is a limited resource and must be conserved.
- Pass the Jug Activity (Project Wet) – students simulate and analyze different water rights policies to learn how water availability and people’s proximity to the resource influence how water is allocated.

Session 2 – Water Resource Threats / How do diseases and natural disasters affect our water resources?

- Poison Pump Activity (Project Wet) – Students apply investigative methods used by epidemiologists to trace the source of contagious diseases.
- Will relate this activity to natural disasters by discussing current or recent situations that are limiting fresh water resources for people locally, nationally or globally.

Session 3 – Lake Food Webs & Biomanipulation (Part I)

- Students will review types of organisms in a lake food web: phytoplankton, zooplankton, planktivores and piscivores.
- Students will act out a lake food chain from phytoplankton to piscivore for 3 rounds and measure how much phytoplankton was “consumed” during each round.
- Data will be recorded on a class data table.

Session 4 - Lake Food Webs & Biomanipulation (Part II)

- Data from the activity will be used to develop ideas on how we can use biological factors to reduce the amount of algae in a lake, called Biomanipulation.
- Hand out worksheet and have students write down data in data table provided. Students are then asked to brainstorm a solution for the people of Spotter Lake to lessen their algae bloom problem (on worksheet).

Session 5- What is a Watershed? & Mapping Watersheds

- Make your own watershed activity (using dish pans, newspaper and pieces of shower curtain)
- Introduce topographic maps using play dough and dental floss to slice “mountains” into measured altitude segments. Students then trace each layer to create a topographic representation of their mountain.
- Learn to read topographic maps – using worksheet

Session 6 - Runoff/Importance of Buffers/NPS

- Why do we map the watershed area for a particular lake?
- Build a Buffer Activity (in groups students get to make land use decisions and discover the perviousness of different land covers)
- Introduce Non-point source pollution
- Discuss importance of buffers in slowing down polluted runoff and keeping waterways healthy

Session 7 - Soil and Groundwater

- What is underground?
- Is soil all the same?
- Groundwater Demonstration using Groundwater model
- Affects of landfills/chemical underground storage on groundwater sources – importance of recycling/composting and careful handling of hazardous wastes
- Groundwater worksheet and/or groundwater model boxes or website

Session 8 - What can you do? Earth Day Projects

- Could be as one class group (or both classes) to do a community service learning project, or as individual research and action projects
- Students select a topic to research and either complete a service learning project or develop a tool that educates the public about their topic (ex: poster, brochure, song, video, etc.)
- Project Planning worksheet will be provided to help students pick a subject and plan their project

Session 9 – Earth Day Projects Presentation

- Each student has 1-2 minutes to present their Earth Day project to the group.
- Self/Peer assessment possibility

Session 10 - Field Trip to a local Lake

- Multi-station field trip – one of the “stations” being the OTTER II, our 22’ pontoon boat used as a “floating classroom” to teach lake water quality.

Alternative Lesson Topics:

- Protozoa: One-celled organisms
- Plankton: Phyto and Zoo

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Goal: To facilitate and promote the awareness, understanding and stewardship of water quality topics and issues through the study of local natural resources and real-life issues.

Session 1 - Introduction

- Review of myself and FOCW
- Pre-Assessment
- PowerPoint Presentation – Importance of Water Resources/Water Quality/Water Quality Testing

Session 2 – Field Trip

- Collect Water Quality Data aboard the Friends pontoon boat, the OTTER II
- Water Quality Data Sheets provided
- Land based activities as well while other groups are on the boat

Session 3 – Water Quality Data – What does it mean?

- Review data collected on field trip and what each water quality parameter means.
- Compare student data to historical data for same water body
- Compare water quality data for this water body to that of another pond or lake in the watershed
- Brainstorm reasons for differences

Session 4 – Non-Point Source Mystery (Part I – December and January lessons can be scheduled closer if desired)

- There is No Point to This Pollution Lesson, from *Healthy Water, Healthy People*: students analyze data to solve a mystery, interpret a topographic map, and analyze and compare water quality data to learn about the cumulative impacts of non-point source pollution.

Session 5 – Non-Point Source Mystery (Part II – December and January lessons can be scheduled closer if desired)

- There is No Point to This Pollution Lesson, from *Healthy Water, Healthy People*: students analyze data to solve a mystery, interpret a topographic map, and analyze and compare water quality data to learn about the cumulative impacts of non-point source pollution.

Session 6 – Watershed Delineation

- Review of Topographic maps and reading contours
- Using copies of topographic maps of the local waterbody, students delineate the area of the watershed by:
 - Finding the highest altitudes around the waterbody and marking them with an X
 - Connecting these high points by drawing a line perpendicular to contour lines
 - Show the flow of water in the watershed from highest elevation to lowest elevation
- Why do we care what the area of a watershed is? Because what happens to the land in this area is affecting the water quality in the water body.
- Use Google Earth to look at the watershed from satellite point of view. What land uses do you see happening in the watershed? How might these land uses affect the quality of water in this lake or pond?

Session 7 – Land Use Decisions and Water Quality

- Color Me a Watershed Activity (Project Wet): Students use maps and data to analyze how population growth and land use variations in a watershed can affect the runoff of water and water quality of local water bodies.

Session 8 – Invasive Aquatic Plants

- Review of IAP's – what they are, how they get here, how reproduce, affects on lake ecosystems, etc.
- PowerPoint or pictures of invasive plants and their effects on lakes
- Introduce Maine Center for Invasive Plants website
- Worksheet on IAP's using MCIAP website – created by Helen Colbath

Session 9 – Water Issues Wrap-up

- Post-Assessment
- Have students bring in news articles (from newspapers or internet) that discuss current water related issues in Maine.
- Discuss the sides to each issue and possible solutions
- Alternative: Dilemma Derby (Project Wet)
- Alternative: Students sketch a land use plan for their own piece of lakefront property. How have they decided to use their land and what impacts (both positive and negative) might these decisions have on the water?

Session 10 – Optional Ideas:

- Watershed Protection Grant – Action Project
- Service Learning Project
- Help with field trip for younger students, etc.