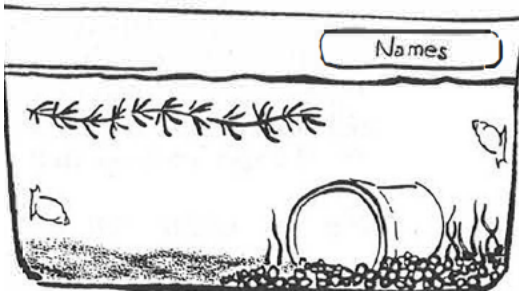
Ponds Unit Overview

Ponds are amazing places, full of life and action, never the same from one day to the next. One of the exciting features of a pond study is their accessibility, the world over. You might find one in a park, a forest, in the middle of a meadow, or even in your own backyard! These are great habitats to explore with your students year round, noticing how they change from one season to the next. If you have the opportunity to start visiting a local pond in the early fall, you may find it full of life from the warm summer months. As the school year progresses, continued visits will reveal exciting seasonal changes in the life at the pond.



Children are inherently fascinated by water—the breaking waves, a puddle on the ground, a raindrop on a flower blossom. This interest eventually leads to the realization that water is vital for the survival of all living things and home to many interesting plants and animals. We recognize that it is usually difficult or even impossible to personally take our students to the places that we would like to visit while exploring science concepts. While we can't always get our students out to a pond or other water home, we can always bring the excitement of learning about these habitats into the classroom.

In the first 11 sessions—*Desktop Model Ponds*—students set up "model ponds." Unlike the clean, filtered aquariums students may have at home, these systems are mini "habitats," that simulate a natural system. As organic waste helps to create the environmental conditions necessary for the growth of bacteria and algae, students build the ponds, adding plants, worms, snails, and fish, one at a time. Each small tank becomes a laboratory for observing nature's processes—especially how certain pond organisms interact with each other and how their basic needs are met within their habitat. As students study their model ponds, they learn a lot about how real scientists “do” science.

It is important to point out that the living organisms that make this unit so extremely fascinating for students require some special attention on the part of the teacher. Please see the "Getting Ready" section for the whole unit and each activity, for tips on gathering materials and organisms with a minimum of preparation time and expense.

In Sessions 12-14—*Build a Paper Pond Model*—students build a paper model of a pond, which allows them to learn more about the pond animals that would not fit in their desktop model ponds in the first 11 sessions. Each small group of students makes a 3-D model of two organisms and takes responsibility for becoming expert on those organisms (plants and animals)—learning what the pond animals eat, what they use for shelter, whether they breathe air or breathe underwater and other special needs that must be met by their habitat. The groups use this information to determine where the animal might live within the pond habitat so that all of its needs are met (food, water, air, shelter, space). Groups then place their 3-D model plants and animals in the class paper pond and explain why they are placing them where they are—based on the plant or animal’s needs. The teacher summarizes learning by revisiting

learning from the beginning of the unit—that all animals live where their needs are met, and that a habitat is a home that meets the needs of the animals living there; also that plants need water and light to live and grow. Through a class sort of what different pond animals eat, students also generate the key concept that some pond animals get their food from plants, some from animals, and some from both.

In Sessions 15-19—*Adopt a Playground*—students learn how litter from the land may end up in a pond, lake, river, or the ocean and effect the animals living in those habitats. They also learn why people create so much trash and ways to cut down on their own waste. They then look for litter in their schoolyard and identify patterns of where litter is found. The class collaboratively forms hypotheses about why there is litter in the schoolyard. They then survey other students and teachers to find out which of their hypotheses might be the most likely cause of the problem. After creating a bar graph of their results to identify the likely cause, the class generates some possible solutions to the litter problem and writes a persuasive essay to the principal to use one of their solutions to solve the school's litter problem. The unit concludes with students storyboarding cause and effect flow chains that demonstrate how things people do to live comfortably can affect pond and ocean animals and that people can also design solutions to those problems to take better care of animals living in those habitats.

Session-by-Session Overviews:

Investigation 1: Desktop Model Ponds

Session 1: Introducing the Pond Habitat

Students make observations of ponds in a virtual video field trip to a pond, listen to a story about pond life, and then work in small groups with pictures and books to look for evidence about what ponds look like and what lives there. They bring their evidence to a whole class discussion about what they think they know about ponds and share what they want to learn about ponds. The concept of a habitat is introduced.

Session 2: Exploring Pond Muck

Students have the opportunity to observe and explore a bit of local "pond muck." They begin the session by making predictions about what might live in the muck. They then use magnifiers to get up close and personal with the muck and with some of the smaller critters that live in a pond.

Session 3: What Belongs in a Model Pond?

Students are introduced to the model classroom ponds that they will create and are asked to consider what types of animals might make sense to include in their models. Pairs of students work together to sort pond animal cards into groups by animals they could add to a desktop model pond and ones they couldn't based on criteria they decide upon, e.g., size of the animal or that it could fly away.

Session 4: Creating Model Ponds
Small groups begin to build their model ponds for animals they will add in later sessions. They add water, sand, gravel, shelter, and plants. They also begin to use a science journal for drawing their observations of the model ponds and making predictions about changes they might see in their ponds in days to come.

Session 5: Investigating the Needs of Pond Plants, Part 1
The teacher "finds" several pieces of dried up Egeria (pond plant) that she left out of the holding tank. Meanwhile the rest of the Egeria is in good condition in the tank. The students work together to try to figure out what happened to the Egeria, coming to the conclusion that this pond plant needs water to survive. They are introduced to how scientists use patterns as evidence to help them answer questions about the world. They then consider where in the classroom might be best to keep their ponds—in a well-lit area or in the dark. They go on to consider investigations that might help them determine if pond plants grow best in light or in the dark and set up and take initial measurements for an investigation to test their ideas about pond plants in light and dark.

Session 6: Investigating the Needs of Pond Plants, Part 2
Students find out that it would take several sessions for them to gather the data they need to figure out whether pond plants grow better in the dark or in the light. Luckily, they find out "another class" has already conducted their experiment and collected data. They analyze and interpret the second-hand data collected by "other students" looking for patterns they can use as evidence to answer their question. After creating bar graphs with the data from "other students," the class discusses patterns in the data. They learn that plants need water and light to grow.

Session 7: Where Should We Keep Our Model Ponds?
Students participate in a "science talk" to help them decide where to keep their model ponds in the classroom—in a well-lit place or in a darker area. They use the results of the Egeria light investigation as a source of evidence for their discussion.

Session 8: Adding Worms to the Model Pond
Students add their first animals to the model ponds after examining their model ponds to note any changes since they first created them. Tubifex worms are introduced in a cup outside of the pond. Students make predictions about what they might do once added to the pond. When the worms enter the pond, the students observe the worms and make predictions about what they think the worms might eat.

Session 9: Adding Snails to the Model Pond
Students observe and add snails to their model ponds. They make predictions about what snails eat and observe them to see if they can find evidence to support their ideas. Students also watch videos of snails eating to gather more evidence. They then read books about worms to find out more about what they eat.

Session 10: Fish in the Pond
Great excitement is generated as students add Mosquito fish to the model ponds and discover that they eat worms! Students are riveted by the fascinating behaviors of fish as they use their journals for drawing and labeling the changes they see in their ponds. They end by summarizing what they have learned about what different animals in their model ponds eat.

Session 11: Reflecting on What We Learned from a Model Pond
Students reflect on their learning from the Model Ponds. They also write a story to share their learning with others.

Investigation 2: Build a Paper Pond Model

Session 12: Introducing the Paper Pond Model
Students are introduced to a large butcher paper pond model as well as some animals that live in a pond. They consider how each of the animals' needs may be met by the pond as well as questions they have about each animal's needs.

Session 13: Build a Paper Pond Model
Students work in small groups to create colorful 3-D paper and clay models to add to the class pond. Each small group then reads about the pond plant and animal they are working on. They then share what they have learned with the class and place the paper/clay plants and animals in the pond where they think they should go.

Session 14: Where Do Pond Animals Get Their Food?
Students work in small groups to determine if particular pond animals get their food from plants, animals, or both. They then sort all of the pond animals by food source. Using the patterns they notice about where pond animals get their food, students generate key concepts about where pond animals get their food.

Investigation 3: Adopt a Playground

Session 15: There's Trash in Our Pond!
Students find some "litter" in their classroom pond. The students discuss how they think litter might end up in a real pond or even in the ocean. Through readings and exploration of the "teacher's room wastebasket" and building a "green" lunchbox, students learn some ways pond animals might be affected by litter and ways we might cut down on our own waste to protect the animals.

Session 16: The Schoolyard Field Trip
Students collect data on locations of litter in their schoolyard through a field trip and data collection on a Google Earth image of the schoolyard.

Session 17: Looking for Patterns in Our Schoolyard
Students share the data they collected in Session 16 with the class. They look for patterns in the data. Where is the most litter? Are there garbage cans nearby? Students then generate hypotheses about why litter ends up in certain parts of the yard, and their ideas are used to create a survey with multiple choice responses.

Session 18: Surveying to Find the Cause of the Problem
Students visit the schoolyard in pairs to gather survey data by interviewing older students and teachers. When they return to the classroom, the class creates a bar graph to help them identify the most likely reason for the litter problem. Students brainstorm some solutions to the identified problem.

Session 19: Pollution Solutions
The class writes a persuasive essay to the principal with a suggestion to solve the litter problem. They conclude the Ponds unit by creating a cause and effect flow chain with pictures showing how humans might impact the pond environment in negative ways and how they can also create solutions to those problems that can help maintain a healthy pond habitat.

Standards Correlations:

Next Generation Science Standards (NGSS), Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects (CCSS ELA), Common Core State Standards for Mathematics (CCSS Math)

NGSS Correlations		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations • *With guidance, plan and conduct an investigation in collaboration with peers (for K).* • *Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.* • *Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.* • *Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.* • *Make predictions based on prior*	*LS1.C Organization for matter and energy flow in organisms.* All animals need food in order to live and grow. They obtain their food from plants or other animals. Plants need water and light to grow. *ESS2.E: Biogeology.* Plants and animals can change their environment. *ESS3.A: Natural Resources.* Living things need water, air, and	*Patterns:* Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. *Cause and Effect:* Events have causes that generate observable patterns. *Systems and System Models:* Systems in the natural and designed world have parts that work together.

experiences. Asking Questions • *Ask questions based on observations to find more information about the natural and/or designed world(s).* • *Ask and/or identify questions that can be answered by an investigation.* Analyzing and Interpreting Data • *Record information (observations, thoughts, and ideas).* • *Use and share pictures, drawings, and/or writings of observations.* • *Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.* • *Compare predictions (based on prior experiences) to what occurred (observable events).* Using Mathematical & Computational Thinking • *Use counting and numbers to identify and describe patterns in the natural and designed world(s).* • *Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs.* Constructing Explanations and Designing Solutions • *Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.* Engaging in Argument from Evidence • *Listen actively to arguments to indicate agreement or disagreement based on evidence, and/or to retell the main points of the argument.* • *Construct an argument with evidence to support a claim.*	resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. *ESS3.C: Human Impacts on Earth Systems.* Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. *ETS1.A: Defining and Delimiting an Engineering Problem.* Asking questions, making observations, and gathering information are helpful in thinking about problems.	

<table>
<tr><td>Developing and Using Models
• Distinguish between a model and the actual object, process, and/or events the model represents
• Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).
Obtaining, Evaluating, and Communicating Information
• Read grade-appropriate texts and/or use media to obtain scientific and/or technical information to determine patterns in and/or evidence about the natural and designed world(s).
• Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question and/or supporting a scientific claim.
• Communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, or numbers that provide detail about scientific ideas, practices, and/or design ideas.</td><td></td><td></td></tr>
<tr><td colspan="3">CCSS ELA Correlations</td></tr>
<tr><td>Reading: Informational Texts</td><td>Writing</td><td>Speaking & Listening</td><td>Language</td></tr>
<tr><td>Key ideas and details</td><td>• Text types and purposes
• Research to build knowledge</td><td>• Comprehension and collaboration
• Presentation of knowledge and ideas</td><td>Vocabulary acquisition and use</td></tr>
<tr><td colspan="3">CCSS Math Correlations</td></tr>
<tr><td colspan="3">Measurement and Data:
-Describe and compare measurable attributes.
-Classify objects and count the number of objects in each category.</td></tr>
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Ocean Literacy Correlations

Because the focus of this unit is on pond habitats, no ocean literacy principals or concepts are directly addressed. However, because students learn about organisms and living space in an aquatic habitat, the foundation is set for them to apply those understandings to an ocean habitat in the first grade curriculum or beyond. For example, students learn that pond life ranges in size from microscopic organisms to much larger organisms. They also learn that there is a great diversity of organisms that live in a pond. Both of these ideas support later understanding of Ocean Literacy Principle 5 (http://www.coexploration.org/oceanliteracy/documents/OceanLitChart.pdf). Additionally, students learn about the inextricable interconnection between humans and nature. They learn that humans have impacted the natural world and can make choices to protect the natural world. Although the focus of their attention is on protecting pond habitats, these ideas support later understanding of Ocean Literacy Principle 6. At grades K-2, the Ocean Literacy Scope & Sequence (http://www.coexploration.org/oceanliteracy/CFDs/EP6/GB_K-2/cfd_6a.html) asks students to consider that human activities sometimes pollute the ocean; storm drains and rivers carry pollutants, trash, and sediments from inland and coastal areas to the ocean; people can keep the ocean healthy; people can keep the shoreline clean by not littering, by picking up litter and recycling; and that people can protect ocean animals and seaweeds by not collecting them, and by keeping their habitats safe and healthy. All of these ideas can be applied to ponds or extrapolated from ponds to the ocean. In Sessions 15-19, some students may make a direct connection to the ocean as well.

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