

Pond Ecology:

Covers food web, habitat, adaptations of life, metamorphous, interdependence of living things

Time: an hour each for classroom pre-visit, in the park time, and post-visit follow up.

Materials needed: construction paper, string or markers, paper for drawing, crayons or markers for drawing, internet or magazine photos, at least one pair of long rubber gloves like those used for housework.

Background: Ponds are a manageable ecosystem that can be studied in the park. The pond's dynamics depend on the physics of water. Water is most dense, or heaviest, at 4 degrees Celsius or about 39 degrees Fahrenheit. This means in winter the warmest water will be at the bottom of the pond and the cold water rises. As plants and other life die and decay they release heat helping to keep the animals hibernating in the mud warm.

In summer, it is the opposite. Water at the surface warms and rises, and cooler water is at the bottom of the pond. Cooler water holds more dissolved oxygen, making it possible for animals to stay hidden at the bottom of the pond in summer. This is why we have a strict no rock throwing policy in the park. You don't know what's down there hiding that a rock might hurt.

In spring and fall, as the temperature in the ponds equalizes top and bottom, you may encounter a "turn over" when algae and sludge at the bottom of the ponds rises to the top. This lasts until the temperatures at the top and bottom of the ponds are different again. It looks bad, but is normal pond ecology.

If we have a very hot summer, the warming may cause all the oxygen to be used at the bottom of the pond and wildlife that can't leave, like mussels, die. We have had winters so cold the mud under the ponds froze and hibernating wildlife froze. These events are rare.

One of the features that ponds, bays, lakes, and the oceans have in common is that water warms slower than air and cools slower than air.

Previsit Pond Preparation:

Using construction paper or other materials build a pond on a bulletin board or wall, and explain the zones of a pond and what lives in each. This may be short many details, but that's ok. When you finish your field trip you will fill in the details.

Zone 1: Water- For discussion, what lives in the water? Frogs and other amphibians can be tricky. In their immature stage they live exclusively in the water as tadpoles eating algae. In maturity, they may spend most of their time in the water, but with lungs and legs and eating insects, they now have the option of leaving the water. Fish would be obvious, but ask what do the fish eat? This may lead to insects and plants, and other animals. Where do they get their energy? The sun will be given for plants, but what about oxygen producing plants living at the bottom of the pond? Sun light must penetrate the water to the bottom, so clean water is pretty important.

Zone 2: Sun, the air above the pond, the sky - This is not just how energy starts in the pond, but how heat and cold and oxygen are transferred to the water. Most of the oxygen in the ponds comes from the wind whipping ripples and waves in the water surface. Animals may live in the air over the ponds. When your class goes to the park, look to see what animals you see in the air over the pond. What keeps the water in place? Ground is a good answer, banks of the pond for more sophisticated students.

Zone 3 Ground or banks of the ponds- This zone gives turtles and frogs a chance to get out of the water to get sunlight they need for warming their bodies and for building good bones. Plants live on the banks, and hold the soil in place so it doesn't fall into the ponds when it rains. The plants also hide animals that drink from the pond or hunt animals in the pond. The mud under the pond is special. It traps water better than sand or some other soils. As a result, plants can take root in the bottom of the pond, grow through the water, and up into the air. Some plants that do this are water lilies, cattail, pickerel, and nuphar.

Have students look through magazines or on the internet to see if they can find animals they think would live in a pond in Washington, DC. Save the pictures in a scrapbook format to bring with you to the park. In addition, give students paper, crayons or other means to draw what they see, or share a digital camera. Assign each student to a group to study one of the three zones of the pond. Have at least one adult with the kind of rubber gloves used for washing dishes and cleaning.

At The Park: It may help to divide the class into smaller groups depending on the number of adults and cameras or paper and crayons for drawing. Each zone group goes to at least three different ponds without concrete sides. At these ponds students draw the plants and animals they see for their zone.

If they are not seeing anything in the water except plants, take the group assigned to that zone to the small concrete ponds along the road the visitor center is on. If the adult with rubber gloves reaches into the crescent shaped pond and pulls up leaves, the students will usually be able to see snails, shrimp like crustaceans, and segmented worms that live in the decaying leaves. Be sure and leave the animals on the leaves while they are examined, and put them back in the pond quickly.

Some things they may overlook in the excitement over animals is that plants are the dominant life form in the ponds, in the form of algae, the ground around and under the

ponds, growing through the water to the air, and are the primary habitat of the insects and birds that live in the air over the ponds. Since you will be completing an energy cycle in the class, make sure their role is brought out.

Emphasize: No chasing, grabbing or removing plants or animals, and no pushing or shoving around the ponds! No throwing rocks!

After the visit:

In the Class: transfer their drawings, pictures, or other images from magazines that they **actually saw** to the classroom pond. Using string or markers as appropriate, trace energy from the sun around the pond to all the species they have. If your class pulled leaves from the crescent pond, can students deduce that the animals living on the leaves were eating the leaves? This is what is going on, or they eat the algae on the leaves. Looking at the pictures discuss the adaptations that made each species fit into the zone it was found in. Some things that may come up are wings on insects and birds for the air, fins on fish, ability to hold breath for a long time for turtles in the water, roots of plants that hold the mud for the ground. Some things that might not come up but should be pointed out is the ability to move in and out of water for some of the animals that breed or hide in water, but need to get out and get sun, and the legs of the claws of the tiny animals that let them cling to the plants and mud when bigger things are moving around them.

For the magazine and internet pictures of animals that they thought they would see in the ponds but didn't, have them do research and find out what temperatures or other needs those animals have that were not met in the ponds here?