Silvio O. Conte National Fish and Wildlife Refuge was established to conserve the abundance and diversity of native plants and animals and their habitats in the 7.2 million acre Connecticut River watershed in Connecticut, Massachusetts, New Hampshire and Vermont.

Silvio O. Conte National Fish and Wildlife Refuge is one of more than 560 refuges in the National Wildlife Refuge System— an extensive network of lands and waters set aside specifically for fish, wildlife, and plants. President Theodore Roosevelt designated the first national wildlife refuge in 1903. Some refuges are only half an acre in size, while others span millions of acres!
FOSSILS

Not all dinosaurs become fossils. Not all fossils are dinosaurs! It all depends on where an animal is and the conditions that were present when the organism (plant or animal) started to be preserved. Some are preserved within rocks, others in snow and ice, some even in tree sap (called amber)! Preserved footprints are even found sometimes, even here in Western Massachusetts.

Dinosaur Footprint from Holyoke, MA
Photo credit: The Trustees of Reservations
How Fossils Are Made

Living things (usually aquatic) die and then get buried quickly under sand, dirt, clay, or ash sediments. Usually, the soft parts decay, or rot away, leaving the hard parts behind. These are ammonites, one of the most common fossils that are found.

As time goes on more and more sediment accumulates. Pressure, heat, and chemical reaction cause the sediments to harden into rock called sedimentary rock.

Movements in the earth's crust, pushes the layers of sedimentary rock back up to higher ground.

Finally, through erosion caused by weather, wind, and water, the fossils become exposed at the surface again.

The Kinds of Fossils

Paleontologists are people who study ancient life. Because they study life forms that are now extinct, they rely on fossils to learn about life in the past. Fossils are the remains of living things that have transformed into stone over millions of years.

Most fossils are found in sedimentary rock. The fossils are made when living things die and get buried by sediments quickly before the hardest parts of the animal have a chance to decay. As sediments accumulate, pressure causes the sediments to harden into rock: Sand sediments become sandstone, clay sediments become shale, and shell sediments become limestone.

Groundwater carrying minerals seeps into the sedimentary rock and helps the fossils form in one of two ways. Sometimes the minerals fill in all of the empty places of the once living thing and form crystals. These crystals cause the remains of the living thing to harden along with the sedimentary rock that it is encased in. Petrified wood is an example of this process, which is called permineralization.

At other times, the minerals in the groundwater actually replace the minerals that make up the remains. So over time the hard parts are completely replaced by other minerals. This process is called replacement.

Other important fossils are impressions and molds. These are made when a hard part such as a shell, fills up with sediments that harden, and then the actual shell dissolves leaving nothing but the sediment mold. These molds can tell us much about the body structures of animals and plants.

As well, insects also get trapped in amber, which is fossilized tree sap. In the movie Jurassic Park, scientists used dinosaur DNA from the stomachs of mosquitos trapped in amber to genetically engineer dinosaurs.

Some animals have even been trapped and frozen in ice, too, preserving them extremely well. Woolly mammoths and mastodons have been found with hair intact and bones in good condition. Likewise, some animals and plants have been mummified in hot arid conditions like those found in deserts.

Finally, paleontologists can learn about ancient life from trace fossils. Trace fossils are things like footprints or animal droppings, which can tell us about the animal's behaviour.
Across
1. Sedimentary rock formed from sand deposits. (9)
3. The kind of rock that you are most likely to find fossils in. (11)
5. The process of changing the hard parts of the remains of an animal or plant with minerals. (11)
7. Sedimentary rock formed from deposits of shells. (9)
10. A fossil that look like a spiral or a rams horns. (8)
11. Permineralized wood. A permineralized piece of wood. (9)
13. A kind of fossil where an animal or plant leaves only its body impression in the mud. (4)
14. Preserved in ice or snow. (6)
15. Kind of animals most likely to be preserved. (7)
16. Some insect fossils are trapped in this rock made from tree sap. (5)

Down
2. Sedimentary rock formed from clay deposits. (5)
4. Someone who studies ancient life. (14)
6. The science of studying ancient life. (12)
8. Preserved in hot, dry conditions. (9)
9. Fossils such as footprints, burrows, and droppings. (5)
12. Not preserved (7)
STREAM LIFE

How many different plants and animals can you name that live in a stream at some point in their life? Some animals lay their eggs in the water, but spend the rest of their life on land. Others might not be able to survive if the water changes just a little. Can you name one organism that uses a river or stream?

Amphibian: ________________________________

Reptile: ________________________________

Fish: ________________________________

Insect: ________________________________

Mammal: ________________________________

Bird: ________________________________
Clean Water is important to us... and plants!

Clean water is important not just for those animals that live there, but for the plants nearby, too. This experiment shows how water moves up plants. The water we’ll use has food coloring in it, imagine it was a pesticide or chemical in the water.

What you’ll need:
- Celery stalks
- A jar
- Food coloring
- Water

Fill the jar about halfway with water, then add a few drops of food coloring. Cut about an inch off of the bottom of the celery stalk, and set it in the water. Let it sit overnight. When you take it out of the jar, notice how the celery has taken up the dye in the water.

Imagine that this was in a wetland or stream. Was the plant able to take up all of the pollution? Do you think that pollution in the water is good for the plant? Some plants are actually able to use some of the chemicals, but only to a point. When the plant dies, those pollutants might be released back into the system.
FORESTS

Leaves, trunks, branches, rings, bark... there is a lot to learn about forests! One way that scientists study trees is by looking at their growth rings. You might even be able to tell the story of the tree's life just by looking at them closely! Different clues in the pattern might be able to give you a hint about the environment the tree grew up in.

Can you write a short story of this tree? What might it have looked like? Try to draw a picture of the whole tree!
Which trees do these leaves belong to?

Red maple
White ash
Oak
Birch
Quaking aspen
Sugar maple
Beech
Tamarack
Can you match these trees to their names?

- Northern red oak
- Quaking aspen
- Sugar maple
- Gray birch
Let's Take a Closer Look...

These “doors” are called stomata. They help the leaf to conserve and keep water. Sometimes, you can even see the stomata on the underside of the leaf. Try using a magnifying glass!

This oak leaf is how the leaf takes in sun energy to make food, called photosynthesis. It’s important that they have water, but not too much! This is why leaves have stomata— to release water when there is too much, or to hold water in during dry times.

Leaf patterns and growth can help you identify a tree. Some trees grow their leaves opposite from each other, like a ‘Y’. Others are alternate. Some leaves, like oaks, have lobes, and others are more pointed, or serrated, like a maple.

Many trees together create a forest. It may be all one type, or species, or many kinds mixed in with one another. Trees that lose all of their leaves within a short period of time are called deciduous. Trees that keep their leaves during the cold season, and don’t shed them all at once, are called coniferous.
SCAVENGER HUNT

Can you find these things near where you live?

- A smooth rock
- Evidence of a mammal
  What was the clue? ________________
- A bush with berries
  What color are the berries? ________________
- A feather
  Guess what kind of bird ________________
- A yellow flower
  What is it? ________________
- A spider
  Is it in a web? ________________
- A cocoon or chrysalis
- An amphibian
  Where was it? ________________
- A bird nest
- A five-point leaf
- An acorn
- A pollinator (like a bee or a butterfly)
- A flying insect
- A swimming insect
- A beetle
We more often see the tracks of something instead of the actual animal! This makes learning about what animals are in our backyard more of a detective activity. What was the animal doing? How big was it? These are good questions to think about when you find a track you don’t know. Here are some other clues that might help...

- **Waddling**
  
  Like a: _________________________________________

- **Bounding**
  
  Like a: _________________________________________

- **Hopping**
  
  Like a: _________________________________________

- **Walking/Trotting**
  
  Like a: _________________________________________
The best place to look for tracks is near water. Often, there is mud along the banks and animals reaching for water (or fishing!) might leave their footprints behind.

Near bird feeders, you can not only watch the birds that visit, but set a “track trap” to look at the impressions their feet leave!

- Set out a cookie tray covered lightly with cornmeal. It usually works best to place some peanut butter or cup of seeds in the middle to invite birds (and squirrels) to visit. [Make sure you take the tray in at night, though, to avoid inviting unwanted animal neighbors!] Wait a little while, then check out who took part in leaving tracks for you to find!

During the summer, birds can usually find enough food to survive. In the winter (especially really snowy or wet winters), they might have a little more trouble, so setting out feeders or suet for them can be beneficial. Here’s a recipe for suet that’s pretty simple:

Mix:
- 1 part peanut butter (try the crunchy kind)
- 1 part shortening (not the liquid kind)
- 2 parts cornmeal
- Add dried fruits (like apples), oats, and peanuts
Have you seen these birds visit your feeder? Which type of food did they seem to like the best? Can you label the pictures with the type of bird?

- Northern Cardinal
- Goldfinch
- Blue Jay
- Black-capped Chickadee
- Woodpecker
- Cedar Waxwing
- Mourning Dove
- White-breasted Nuthatch
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Check out these books...

Fossil (DK Eyewitness Book) by Paul Taylor
Jurassic Poop: What Dinosaurs (and others) Left Behind by Jacob Berkowitz
Monster Bones: The Story of a Dinosaur Fossil by Bailey, Jacqui, Lilly, and Matthew
Rocks, Fossils, and Arrowheads (Take Along Guide) by Laura Evert

Between Cattails by Terry Tempest Williams
A Freshwater Pond by Adam Hibbert
In the Small, Small Pond by Denise Fleming
Pond by Paul Fleisher
The Trip of a Drip by Vicki Cobb
Trout Are Made of Trees by April Pulley Sayre

Dead Log Alive! by Jo S. Kittinger
The Heart of the Wood by Marguerite Davol
Leaf Man by Lois Ehler
A Log’s Life by Wendy Pfeffer
Oak Tree by Paul Fleisher
Trees, Leaves, and Bark (Take Along Guide) by Diane Burns, Linda Garrow

Crickleroot’s Guide to Animal Tracking by Jim Arnosky
Tracks, Scats, and Signs (Take Along Guide) by Leslie Dendy
Who Pooped in the Northwoods? by Gary Robson
Wild Tracks! by Jim Arnosky

A Guide to Amphibians and Reptiles by Thomas F. Tyning
Trees (published) by Hubbard Scientific (a Nature Finder identification wheel)
A Field Guide to the Animals of Vernal Pools by Leo Kenney and Matthew Burne
Mammal Tracks & Sign by Mark Elbroch
Fossils and Fossil Collecting by Steve Parker
We hope you enjoyed this activity booklet. Make sure and visit us to share what you’ve learned!